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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

METRO VANCOUVER REGIONAL DISTRICT
ZERO WASTE COMMITTEE

MEETING

Thursday July 4, 2024
1:00 pm
28th Floor Committee room, 4515 Central Boulevard, Burnaby, British Columbia
Webstream available at https://www.metrovancouver.org

A G E N D A[1]

A. ADOPTION OF THE AGENDA

1. July 4, 2024 Meeting Agenda
That the Zero Waste Committee adopt the agenda for its meeting scheduled for July 4, 2024, as circulated.

B. ADOPTION OF THE MINUTES

1. June 13, 2024 Meeting Minutes *Pg. 4*
That the Zero Waste Committee adopt the minutes of its meeting held June 13, 2024, as circulated.

C. DELEGATIONS

D. INVITED PRESENTATIONS

E. REPORTS FROM COMMITTEE OR CHIEF ADMINISTRATIVE OFFICER

1. Draft Solid Waste Services 2025 - 2029 Capital Plan *Pg. 9*
That the Zero Waste Committee receive for information the report dated June 28, 2024, titled "Draft Solid Waste Services 2025 - 2029 Capital Plan".

2. GVS&DD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw *Pg. 20*
That the GVS&DD Board:
a) give first, second, and third reading to *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024*; and

[1] *Note: Recommendation is shown under each item, where applicable.*

b) adopt *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024.*

3. 2023 Disposal Ban Program Update *Pg. 44*

That the Zero Waste Committee receive for information the report dated June 25, 2024, titled "2023 Disposal Ban Program Update".

4. 2023 Waste Composition Data *Pg. 51*

That the Zero Waste Committee receive for information the report dated June 27, 2024, titled "2023 Waste Composition Data".

5. 2024 Regional Clothing Waste Reduction Campaign Results *Pg. 60*

That the Zero Waste Committee receive for information the report dated June 25, 2024, titled "2024 Regional Clothing Waste Reduction Campaign Results".

6. Commercial Organics Recycling: GVS&DD Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024 *Pg. 76*

That the GVS&DD Board:

a) approve an amendment to the Tipping Fee Bylaw to add a new recycling fee titled "Commercial Organics" with a fee of $140 per metric tonne, effective September 1, 2024;
b) give first, second and third reading to *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*; and
c) adopt *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*.

7. Waste-to-Energy Facility Environmental Monitoring and Reporting 2023 Update *Pg. 91*

That the Zero Waste Committee receive for information the report dated June 26, 2024, titled "Waste-to-Energy Facility Environmental Monitoring and Reporting 2023 Update."

8. Manager's Report *Pg. 218*

That the Zero Waste Committee receive for information the report dated June 28, 2024 titled "Manager's Report.

F. INFORMATION ITEMS

1. Metro Vancouver's 2024 Financial Performance Report No. 1 *Pg. 222*

G. OTHER BUSINESS

H. RESOLUTION TO CLOSE MEETING

Note: The Committee must state by resolution the basis under section 90 of the Community Charter on which the meeting is being closed. If a member wishes to add an item, the basis must be included below.

I. ADJOURNMENT

That the Zero Waste Committee adjourn its meeting of July 4, 2024.

Membership:

Kirby-Yung, Sarah (C) – Vancouver
Hodge, Craig (VC) – Coquitlam
Calendino, Pietro – Burnaby
Darling, Steve – Port Coquitlam
Ferguson, Steve – Langley Township
Fry, Pete – Vancouver
Muri, Lisa – North Vancouver District
Wallace, Rosemary – Langley City
Weverink, Paul – Anmore

METRO VANCOUVER REGIONAL DISTRICT
ZERO WASTE COMMITTEE

Minutes of the Regular Meeting of the Metro Vancouver Regional District (MVRD) Zero Waste Committee held at 1:01 pm on Thursday, June 13, 2024 in the 28th Floor Committee Room, 4515 Central Boulevard, Burnaby, British Columbia.

MEMBERS PRESENT:
Chair, Director Sarah Kirby-Yung, Vancouver
Vice Chair, Director Craig Hodge, Coquitlam
Director Pietro Calendino, Burnaby*
Councillor Steve Darling, Port Coquitlam
Director Steve Ferguson, Langley Township*
Councillor Pete Fry, Vancouver
Director Lisa Muri, North Vancouver District*
Councillor Rosemary Wallace, Langley
Councillor Paul Weverink, Anmore

*denotes electronic meeting participation as authorized by the *Procedure Bylaw*

STAFF PRESENT:
Paul Henderson, General Manager, Solid Waste Services
Janis Knaupp, Program Manager, Legislative Services, Board and Information Services
Lucy Duso, Division Manager, Collaboration & Stakeholder Engagement
Stephanie Liu, Program Manager, Solid Waste Services
Denise Phillipe, Policy Coordinator, Collaboration & Stakeholder Engagement, External Relations

OTHERS PRESENT:
Andrea Reimer, Chair, Solid Waste Management Plan Independent Consultation and Engagement Panel, Tawâw Strategies

A. ADOPTION OF THE AGENDA

1. June 13, 2024 Meeting Agenda

It was MOVED and SECONDED
That the Zero Waste Committee adopt the agenda for its meeting scheduled for June 13, 2024, as circulated.

CARRIED

B. ADOPTION OF THE MINUTES

1. May 9, 2024 Meeting Minutes

It was MOVED and SECONDED
That the Zero Waste Committee adopt the minutes of its meeting held May 9, 2024, as circulated.

CARRIED

C. DELEGATIONS

No items presented.

D. INVITED PRESENTATIONS

No items presented.

E. REPORTS FROM COMMITTEE OR CHIEF ADMINISTRATIVE OFFICER

1. GVS&DD Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024

Report dated June 6, 2024 from Paul Henderson, General Manager, Solid Waste Services, seeking GVS&DD Board approval of *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024*. The proposed bylaw amendments streamline definitions, strengthen records management requirements, and improve bylaw enforceability.

Paul Henderson provided members with a presentation titled "Smart Waste Program and Tipping Fee Bylaw Updates" providing a comparison of tipping fees among comparable jurisdictions, an overview of the Metro Vancouver's generator levy, an outline of proposed bylaw amendments, and a review of the engagement and feedback received on proposed changes to the tipping fees bylaw.

It was MOVED and SECONDED
That the GVS&DD Board:

a) give first, second, and third reading to *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024*; and
b) adopt *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024*.

CARRIED

2. Update on the Love Food Hate Waste Canada Campaign for 2023-2024

Report dated May 13, 2024 from Joanne Gauci, Senior Policy Advisor, Collaboration and Engagement, External Relations, and Secretariat National Zero Waste Council, providing an update on the *Love Food Hate Waste Canada* behaviour change campaign delivered by Metro Vancouver through the National Zero Waste Council.

Lucy Duso, Division Manager and Denise Phillipe, Policy Coordinator, Collaboration & Stakeholder Engagement, External Relations provided a verbal update on the *Love Food Hate Waste Canada Campaign* noting that this is a global campaign that Metro Vancouver modified for this regions' needs.

It was MOVED and SECONDED
That the Zero Waste Committee receive for information the report dated May 13, 2024, titled "Update on the Love Food Hate Waste Canada Campaign for 2023-2024".

CARRIED

3. Solid Waste Management Plan Vision and Guiding Principles

Report dated June 6, 2024 from Stephanie Liu, Program Manager, Solid Waste Services, seeking GVS&DD Board approval of the vision and guiding principles, providing an overview of engagement feedback received on the vision and guiding principles for an updated regional solid waste management plan. The report notes that, the next phase of engagement will be focused on idea generation.

Stephanie Liu provided members with a presentation titled "Solid Waste Management Plan Vision and Guiding Principles Report Back" highlighting the timeline on updates to a solid waste management plan, involvement by the Solid Waste Management Plan Independent Consultation and Engagement Panel, key feedback from engagement, related priorities in the Board's Strategic Plan, development of a draft vision statement and guiding principles, and next steps to engage stakeholders on idea generation.

1:38 pm Chair Kirby-Yung stepped out of the meeting and Vice Chair Hodge assumed the chair.
1:40 pm Chair Kirby-Yung returned to the meeting and reassumed the chair.

Andrea Reimer, Chair, Solid Waste Management Plan Independent Consultation and Engagement Panel, spoke to members about:

- Panel's efforts in supporting engagement on the Plan;
- the commitment of staff to have consistent engagement with First Nations;
- engaging community groups to provide public engagement within their communities, which significantly extended the reach of engagement into equity-deserving groups; and
- the need to engage the tourism and hospitality industry leaders to ensure the plan meets their needs.

Members noted challenges with both ensuring recycling and minimizing costs for waste management associated with special events.

In response to questions, Stephanie Liu and Paul Henderson informed members that staff would report back on best practices for special events and waste management including a scan of municipal practices.

It was MOVED and SECONDED
That the GVS&DD Board approve the vision and guiding principles for an updated regional solid waste management plan as presented in the report dated June 6, 2024, titled "Solid Waste Management Plan Vision and Guiding Principles".

CARRIED

4. Manager's Report

Report dated June 6, 2024 from Paul Henderson, General Manager, Solid Waste Services, providing the Zero Waste Committee with an update on the Regional Food Recovery Network contract extension; publication of the Canada Plastics Pact Elimination List; Waste-to-Energy Facility operation and maintenance contract procurement; weigh scale system software replacement; June 2024 Home Rescue Event, and the Committee's Work Plan.

Paul Henderson noted that implementation of the new weigh scale software system has begun, and a number of process improvements will be achieved through the software implementation. He also noted the upcoming June 18, 2024 Home Rescue Event.

It was MOVED and SECONDED
That the Zero Waste Committee receive for information the report dated June 6, 2024, titled "Manager's Report.

CARRIED

F. INFORMATION ITEMS

1. Regional Food System Strategy – Project Launch

Report dated May 14, 2024 from Carla Stewart, Senior Planner, Regional Planning and Housing Services, providing the Zero Waste Committee with the report dated February 8, 2024 from Carla Stewart, titled "Regional Food Systems Strategy – Scope of Work and Engagement (Phase 2)", which was presented to the Regional Planning Committee on March 8, 2024 and which provides an update on the scope of work and engagement plan for an update to the *Regional Food System Strategy*.

G. OTHER BUSINESS

No items presented.

H. RESOLUTION TO CLOSE MEETING

It was MOVED and SECONDED
That the Zero Waste Committee close its meeting scheduled for April 4, 2024 pursuant to section 226 (1) (a) of the *Local Government Act* and the *Community Charter* provisions as follows:

90 (1) A part of a council meeting may be closed to the public if the subject matter being considered relates to or is one or more of the following:

(e) the acquisition, disposition or expropriation of land or improvements, if the council considers that disclosure could reasonably be expected to harm the interests of the municipality; and

(k) negotiations and related discussions respecting the proposed provision of a municipal service that are at their preliminary stages and that, in the view of the council, could reasonably be expected to harm the interests of the municipality if they were held in public.

CARRIED

I. ADJOURNMENT

It was MOVED and SECONDED
That the Zero Waste Committee adjourn its meeting of June 13, 2024.

CARRIED
(Time: 2:11 pm)

Janis Knaupp,
Program Manager, Legislative Services

Sarah Kirby-Yung,
Chair

68612384

To: Zero Waste Committee

From: Paul Henderson, General Manager, Solid Waste Services

Date: June 28, 2024 Meeting Date: July 4, 2024

Subject: **Draft Solid Waste Services 2025 - 2029 Capital Plan**

RECOMMENDATION

That the Zero Waste Committee receive for information the report dated June 28, 2024, titled "Draft Solid Waste Services 2025 - 2029 Capital Plan".

EXECUTIVE SUMMARY

The draft 2025 - 2029 Solid Waste capital plan has been prepared based on direction received at spring Board budget workshops and continues to meet the region's solid waste management goals. As part of Metro Vancouver's focus on enhancing the transparency and governance of the capital plan, this report allows the Zero Waste Committee to provide comment on the draft capital plan. Feedback will then be incorporated into the 2025-2029 Solid Waste Services Financial Plan and included in the fall budget presentations to the Zero Waste Committee and Board.

The estimated 2025 capital cash flow is $53.4M with a total estimated spend of $339.9M over the five years (2025 - 2029). For the common four years compared to the prior cycle's capital plan, the estimated spend has decreased by $35.7M. This is offset by 2024 projects re-budgeted in later years, so the overall 2024-2028 projected cash flow is decreasing by $4.2M.

PURPOSE

To present to the Zero Waste Committee the draft Solid Waste Services 2025 - 2029 Capital Plan for input and feedback, which will then be incorporated into the fall budget approvals.

BACKGROUND

Metro Vancouver held Board budget workshops in the spring of 2024 with the objective to seek direction for the preparation of the 2025 - 2029 Financial Plan. In addition, Metro Vancouver is looking to enhance the transparency and governance of the capital planning process by involving standing committees earlier to seek input and feedback that will be incorporated into the 2025 - 2029 Financial Plan.

Solid Waste Services

Solid Waste Services initiatives within the draft 2025 - 2029 Capital Plan are guided by achieving exceptional customer service, system maintenance requirements, and advancing zero waste, circular economy, and greenhouse gas emission reduction.

CAPITAL PLAN HIGHLIGHTS

The draft 2025 - 2029 Capital Plan includes $53.4M for 2025 and a total of $339.9M over the five years, or an average of $68M per year (Attachment 1). There are 23 projects and the largest six

projects make up 78% of the capital spending over the next five years. The 2025 capital cash flow is $10.2M (16.1%) less than last year's projection for 2025.

Key 2025 to 2029 capital projects include:

- Waste-to-Energy Facility District Energy
- North Surrey and Langley recycling depot development
- Biosolids processing
- Waste-to-Energy Facility maintenance and capital replacement projects

The acid gas reduction project has been moved into future years, based on ambient air quality data demonstrating that the initiative is not needed at this time. A request to update the Waste-to-Energy Facility Provincial Operating Certificate to delay implementation of acid gas reduction measures to allow additional monitoring has been submitted to the Ministry of Environment and Climate Change Strategy for consideration.

Key capital projects planned or ongoing in 2025 – 2029 for Solid Waste Services include the following:

Infrastructure Type	Project Name	Primary Driver	Proposed 2025 Cashflow
Waste to Energy Facility	Waste-to-Energy Facility Maintenance	Maintenance	$ 13,350,000
Landfills	Coquitlam Landfill Maintenance	Maintenance	$6,550,000
Recycling and Waste Centres	North Surrey Recycling Depot Development	Upgrade	$6,500,000
Recycling and Waste Centres	Langley Recycling Depot Development	Upgrade	$5,500,000
Waste to Energy Facility	District Energy	Resilience	$5,500,000
Recycling and Waste Centres	Langley Recycling and Waste Centre Site Reconfiguration	Maintenance	$4,000,000
Waste to Energy Facility	Biosolids Processing	Resilience	$2,550,000
Recycling and Waste Centres	Weigh Scale Replacement	Maintenance	$2,500,000
Other Projects	Other Projects	Various	$2,450,000
Waste to Energy Facility	Refuse Crane	Maintenance	$2,100,000
Landfills	Coquitlam Landfill Gas Collection Upgrades	Maintenance	$2,000,000
Waste to Energy Facility	Generation Bank Replacement	Maintenance	$400,000
			$53,400,000

Capital Plan Changes
Metro Vancouver's annual capital planning process allows the Board to adjust the capital budget once a year, in the fall, to accommodate changes required to fund projects transitioning from one phase to another (e.g. design phase to construction phase), and in response to new or changing project needs, emerging issues, and changing priorities.

Proposed changes in the draft 2025 - 2029 Capital Plan can be described within the following categories:

- Projected carry-forward – project expenditures which were expected to occur in 2024, but are now scheduled to occur in 2025 or after
- Timing changes – project expenditures that have re-scheduled beyond 2029
- Cost adjustments – project cash flow changes resulting from project budget changes not related to scope

The following table summarizes the total proposed capital plan adjustments in the draft 2025 - 2029 Capital Plan (presented in $ millions):

Prior Cycle Cash Flow 2024-2028	Cash Flow 2024	Adjustments to 2025 - 2028 Capital Plan			Cash Flow 2029	Draft Capital Plan 2025-2029
		Carry-Forward	Net Adjustments	Total		
313.5	(54.1)	31.5	(35.7)	(4.2)	84.8	339.9

The draft 2025 - 2029 Capital Plan expected cash flow has decreased for the common four years from last year's budget, with a decrease of $4.2M of what was projected last year. This represents about a 1.6% decrease. This includes 2024 projects re-budgeted in later years, so the overall 2024-2028 plan is decreasing by $35.7M.

Capital Plan Review Process
Solid Waste Services diligently reviewed project schedules to update expected delivery times for various projects.

Throughout the capital planning process, Solid Waste reviews each project line to ensure efficient project timing, deliverability, and scope. This exercise was performed in preparing the Solid Waste Services 2025 - 2029 Capital Plan and resulted in the movement of $35.7 million in capital expenditures into future years.

ALTERNATIVES
This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS
The draft 2025 - 2029 Capital Plan includes $53.4M for 2025 and a total of $339.9M over the five years, an average of $68M per year. Any feedback and input from the Zero Waste Committee will be incorporated into the fall budget presentations to the standing committees and Boards.

Capital expenditures are funded through debt charges in the annual operating budget and five-year financial plan. The Solid Waste function revenues are almost exclusively from tipping fee revenues, with revenues based on the amount of garbage disposed.

CONCLUSION

The 2025 - 2029 Capital Plan illustrates how Solid Waste Services supports projects that enhance recycling opportunities and provide cost-effective disposal for ratepayers, and the financial impacts of these projects over the next five years.

The presentation of the draft 2025 - 2029 Capital Plan for Solid Waste Services provides the Zero Waste Committee the opportunity to provide input and feedback which will be incorporated into the fall budget presentations to the standing committees and Boards.

ATTACHMENTS

1. Draft Solid Waste Services 2025 - 2029 Capital Plan
2. Presentation re: Draft Solid Waste Services 2025 - 2029 Capital Plan

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GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
CAPITAL PORTFOLIO
SOLID WASTE SERVICES
2025 CAPITAL BUDGET AND 2025-2029 CAPITAL PLAN

	CAPITAL BUDGET FOR APPROVAL	2025 CAPITAL CASH FLOW	2026 CAPITAL CASH FLOW	2027 CAPITAL CASH FLOW	2028 CAPITAL CASH FLOW	2029 CAPITAL CASH FLOW	2025 TO 2029 TOTAL CAPITAL CASH FLOW	ACTIVE PHASE	PRIMARY DRIVER
CAPITAL EXPENDITURES									
Landfills									
Coquitlam Landfill Gas Collection Upgrades	$ 8,350,000	$ 2,000,000	$ —	$ —	$ —	$ —	$ 2,000,000	Construction	Maintenance
Coquitlam Landfill Maintenance	15,400,000	6,550,000	2,400,000	—	—	—	$ 8,950,000	Multiple	Maintenance
Total Landfills	**$ 23,750,000**	**$ 8,550,000**	**$ 2,400,000**	**$ —**	**$ —**	**$ —**	**$ 10,950,000**		
Recycling and Waste Centres									
Langley Recycling and Waste Centre Site Reconfiguration	10,500,000	4,000,000	6,500,000	—	—	—	$ 10,500,000	Construction	Maintenance
Langley Recycling Depot Development	9,800,000	5,500,000	3,750,000	—	—	—	$ 9,250,000	Construction	Upgrade
Maple Ridge Recycling and Waste Centre Upgrades	2,000,000	750,000	750,000	—	—	—	$ 1,500,000	Construction	Upgrade
North Shore Recycling and Waste Centre Compactor Replacement	—	—	—	1,000,000	3,000,000	—	$ 4,000,000	Not Started	Maintenance
North Surrey Compactor	3,000,000	1,000,000	—	—	—	—	$ 1,000,000	Construction	Maintenance
North Surrey Recycling Depot Development	36,400,000	6,500,000	5,750,000	—	—	—	$ 12,250,000	Construction	Upgrade
North Surrey Site Reconfiguration	7,500,000	500,000	3,000,000	4,000,000	—	—	$ 7,500,000	Construction	Upgrade
Solid Waste Facility Land Purchase	—	—	—	—	—	50,000,000	$ 50,000,000	Not Started	Opportunity
Weigh Scale Replacement	3,500,000	2,500,000	—	—	—	—	$ 2,500,000	Construction	Maintenance
Total Recycling and Waste Centres	**$ 72,700,000**	**$ 20,750,000**	**$ 19,750,000**	**$ 5,000,000**	**$ 3,000,000**	**$ 50,000,000**	**$ 98,500,000**		
Waste To Energy Facilities									
Acid Gas Reduction	2,100,000	—	—	—	1,650,000	5,000,000	$ 6,650,000	Design	Upgrade
Biosolids Processing	23,750,000	2,540,000	6,400,000	13,500,000	—	—	$ 22,440,000	Construction	Resilience
Bottom Ash Processing	6,800,000	100,000	—	—	—	—	$ 100,000	Construction	Opportunity
Generation Bank Replacement	12,000,000	400,000	3,000,000	7,000,000	—	—	$ 10,400,000	Construction	Maintenance
Primary Economizer Replacement	7,000,000	100,000	—	—	—	—	$ 100,000	Construction	Maintenance
Refuse Crane	17,850,000	2,100,000	8,900,000	5,000,000	—	—	$ 16,000,000	Construction	Maintenance
Waste-to-Energy Facility Maintenance	42,800,000	13,365,000	13,950,000	8,500,000	2,200,000	8,750,000	$ 46,765,000	Multiple	Maintenance
WTE Facility District Energy	84,000,000	5,500,000	19,500,000	30,000,000	27,000,000	—	$ 82,000,000	Construction	Resilience
WTE Facility District Energy Phase 2	—	—	—	—	15,000,000	20,000,000	$ 35,000,000	Not Started	Resilience
WTE Facility Education Centre	—	—	3,000,000	7,000,000	—	—	$ 10,000,000	Not Started	Opportunity
WTE Facility First/Second Pass Waterwall Replacement	—	—	—	—	—	500,000	$ 500,000	Not Started	Maintenance
WTE Facility Stokers Major Overhaul	—	—	—	—	—	500,000	$ 500,000	Not Started	Maintenance
Total Waste To Energy Facilities	**$ 196,300,000**	**$ 24,105,000**	**$ 54,750,000**	**$ 71,000,000**	**$ 45,850,000**	**$ 34,750,000**	**$ 230,455,000**		
TOTAL CAPITAL EXPENDITURES	**$ 292,750,000**	**$ 53,405,000**	**$ 76,900,000**	**$ 76,000,000**	**$ 48,850,000**	**$ 84,750,000**	**$ 339,905,000**		

	CAPITAL BUDGET FOR APPROVAL	2025 CAPITAL CASH FLOW	2026 CAPITAL CASH FLOW	2027 CAPITAL CASH FLOW	2028 CAPITAL CASH FLOW	2029 CAPITAL CASH FLOW	2025 TO 2029 TOTAL CAPITAL CASH FLOW
SUMMARY BY DRIVER							
Growth	$ —	$ —	$ —	$ —	$ —	$ —	$ —
Maintenance	$ 120,400,000	$ 32,015,000	$ 34,750,000	$ 21,500,000	$ 5,200,000	$ 9,750,000	$ 103,215,000
Resilience	$ 107,750,000	$ 8,040,000	$ 25,900,000	$ 43,500,000	$ 42,000,000	$ 20,000,000	$ 139,440,000
Upgrade	$ 57,800,000	$ 13,250,000	$ 13,250,000	$ 4,000,000	$ 1,650,000	$ 5,000,000	$ 37,150,000
Opportunity	$ 6,800,000	$ 100,000	$ 3,000,000	$ 7,000,000	$ —	$ 50,000,000	$ 60,100,000
Total	**$ 292,750,000**	**$ 53,405,000**	**$ 76,900,000**	**$ 76,000,000**	**$ 48,850,000**	**$ 84,750,000**	**$ 339,905,000**

United Boulevard Recycling and Waste Centre Scale

SOLID WASTE SERVICES

2025 – 2029 DRAFT CAPITAL PLAN

Paul Henderson, P.Eng.
General Manager, Solid Waste Services

Zero Waste Committee – July 4, 2024
69064395

metrovancouver

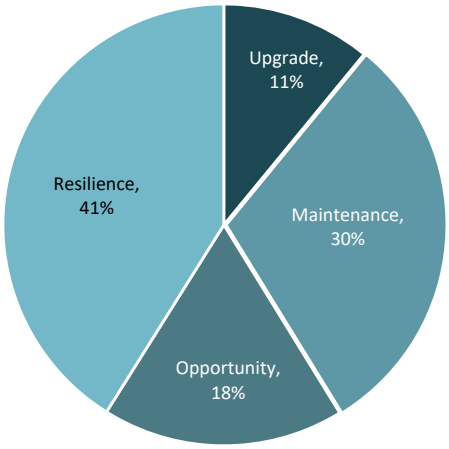
SERVICE OBJECTIVES

Solid Waste Services

- Exceptional customer service at the Metro Vancouver solid waste facilities
- System maintenance
- Advancing waste reduction, circular economy, and greenhouse gas emission reduction

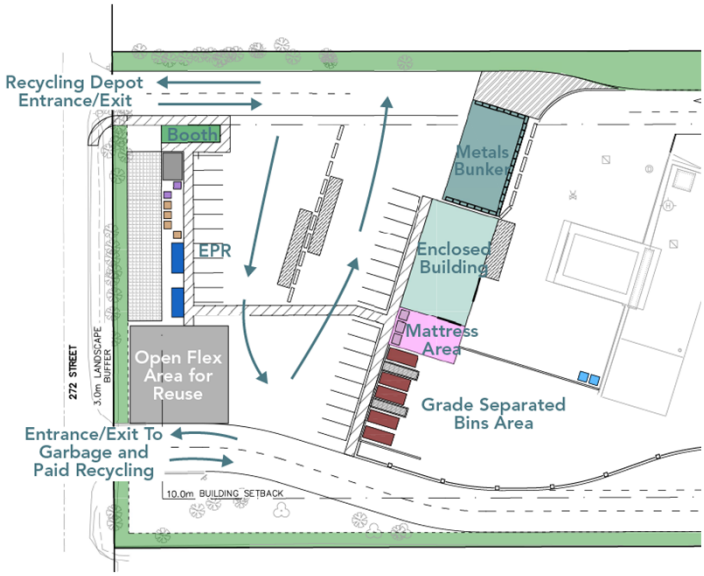
CAPITAL PLAN DRIVERS

Driver	Outcome	% 2025 - 2029 Capital Plan
Maintenance	Maintain assets in a state of good repair	30%
Resilience	Minimize impacts resulting from seismic events and climate change	41%
Upgrade	Enhance levels of service	11%
Opportunity	Reduce life-cycle costs and/or achieve Board goals	18%



MAJOR PROJECTS

NORTH SURREY AND LANGLEY RECYCLING DEPOTS



WASTE-TO-ENERGY FACILITY DISTRICT ENERGY

SOLID WASTE

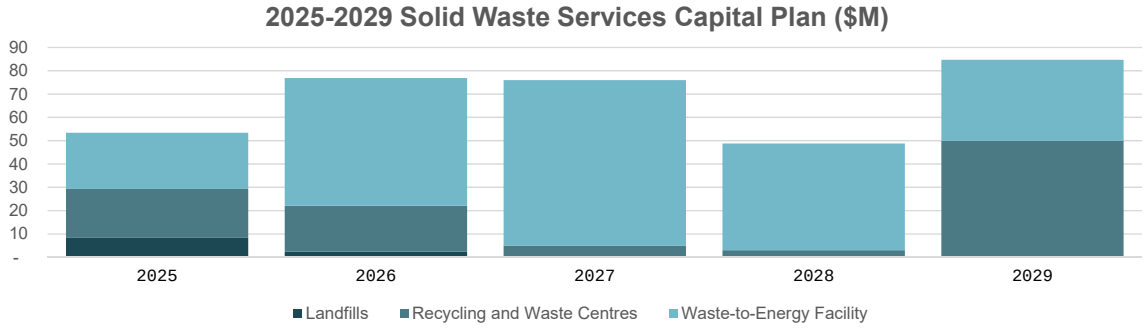
2025 - 2029 Capital Plan Expenditures

Overview:

- 2025 - 2029 Capital Plan: $339.9M
- 2025 cash flow: $53.4M
- 23 projects

Drivers:

- Waste-to-Energy Facility
  - Capital replacement
  - District Energy
- North Surrey and Langley Recycling Depots



2025-2029 CAPITAL EXPENDITURES

Key projects in the five year capital plan:

- Waste-to-Energy Facility District Energy project
- North Surrey and Langley recycling depot development
- Biosolids processing
- Waste-to-Energy facility maintenance and capital replacement projects

PROPOSED CAPITAL PLAN CHANGES

($ Millions)

Prior Cycle Cash flow 2024 - 2028	Cash flow 2024	Adjustments to 2025 - 2028 Capital Plan			Cash flow 2029	Draft Capital Plan 2025 - 2029
		Carry-Forward	Cost Adjustments	Total		
$313.5M	$(54.1)M	$31.5M	$(35.7)M	$(4.2)M	$84.8M	$339.9M

NEXT STEPS

- Consider Committee comments on the 2025-2029 Capital Plan
- Present revised 2025-2029 Capital Plan and 2025 Operating and Capital Budgets for Committee and Board consideration in October

Central Surrey Recycling and Waste Centre

Thank you

metrovancouver

To: Zero Waste Committee

From: Paul Henderson, General Manager, Solid Waste Services

Date: June 28, 2024 Meeting Date: July 4, 2024

Subject: **GVS&DD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw**

RECOMMENDATION

That the GVS&DD Board:

a) give first, second, and third reading to *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024*; and

b) adopt *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024.*

EXECUTIVE SUMMARY

This report proposes the adoption of a bylaw amending the *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 378, 2024* (Bylaw 378). Bylaw 378 designates bylaw contraventions that may be enforced through notices of bylaw violation, and establishes a process for dispute adjudication. Bylaw 378 lists penalties of up to $500 for the designated liquid waste bylaw contraventions. The proposed amendments would add penalties for designated contraventions of the *Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996*, as amended (Bylaw 181). Bylaw 181 specifies requirements for private solid waste facilities. Using notices of bylaw violation for contraventions of Bylaw 181 provides a new tool to encourage bylaw compliance, particularly if other processes such as education have not been successful. Metro Vancouver engaged potentially affected parties, including licensed solid waste facility operators.

PURPOSE

To seek GVS&DD Board adoption of *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024*, included as attachment 1.

BACKGROUND

The Metro Vancouver Regional District has had the ability to issue notices of bylaw violation to promote compliance of its regional parks, air quality, and electoral area bylaws since 2010.
In 2023, the provincial government added the Greater Vancouver Sewerage and Drainage District (GVS&DD) to the *Bylaw Notice Enforcement Regulation,* BC Reg. 175/2004, enabling GVS&DD to enact a notice of bylaw violation enforcement and dispute adjudication bylaw. Bylaw 378, adopted in May 2024, authorizes GVS&DD to issue notices of bylaw violation, with associated administrative penalties for bylaw contraventions, for up to $500 per contravention for liquid waste bylaws. Notices of bylaw violation may be issued on a daily basis where contraventions are ongoing or

repeated. Bylaw 378 also establishes an adjudication process for disputed notices. Prior to Bylaw 378, the only enforcement action available to GVS&DD was prosecution through the court system. The ability to issue notices of bylaw violation with associated penalties for non-compliance provides an additional, simplified mechanism to seek compliance with GVS&DD bylaws.

PROPOSED BYLAW 378 AMENDMENT BYLAW

The proposed amendment bylaw is included as attachment 1, and a blackline version showing the proposed changes is included as attachment 2. The amendment bylaw designates contraventions of Bylaw 181 and prescribes penalties of up to $500 per contravention, as set out in Schedule G. Metro Vancouver's enforcement approach will continue to focus on compliance promotion. Notices of bylaw violation will supplement the existing compliance promotion tools such as education and warnings.

Notice of Bylaw Violation Examples

Penalties are proposed based on the severity of Bylaw 181 contraventions. Examples of contraventions and associated penalties are shown in Table 1. The complete list of designated bylaw contraventions is in Schedule G of the proposed amendment bylaw. Penalties were set in accordance with Metro Vancouver's *Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw Policy* (Attachment 3), and, where possible, are consistent with similar bylaw contraventions across GVS&DD and MVRD.

Table 1: Examples of Bylaw Contraventions and Associated Penalties

Contravention	Penalty
Violation of a licence quantity limit or restriction	$500
Operation of a facility with a cancelled or suspended licence	$500
Failure to provide entry	$375
Failure to keep or submit records	$125
Failure to control litter	$125

As a general rule, bylaw contraventions designated under Bylaw 378 are relatively simple for an adjudicator to determine whether the contravention occurred or not. In addition, notices of bylaw violation are typically used for relatively minor contraventions of a bylaw. For more complex or serious bylaw contraventions, Metro Vancouver would continue to use the court system for enforcement.

Engagement

In May 2024, Metro Vancouver notified operators of licensed solid waste facilities, as well as waste haulers and other solid waste facility operators, about the proposed bylaw and provided an opportunity for comment.

Licensed facility operators and interested parties were sent information via email, and licensed facility operators received a follow-up phone call. Metro Vancouver received one letter providing feedback (Attachment 4), expressing concerns that the proposed bylaw would burden industry and penalize well-intentioned operators. Metro Vancouver's approach to compliance promotion is to

focus on education. The ability to apply penalties using notices of bylaw violation provides a new tool to encourage bylaw compliance, particularly if other processes such as education have not been successful in achieving compliance.

ALTERNATIVES

1. That the GVS&DD Board:
   a) give first, second, and third reading to *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024*; and
   b) adopt *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024.*

2. That the GVS&DD Board receive for information the report dated June 28, 2024, titled "GVS&DD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw", and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Notices of bylaw violation are intended to encourage bylaw compliance. The revenue generated through notices of bylaw violation is expected to be insignificant. No additional resources are expected to be required to allow for the addition of notices of bylaw violation to the compliance promotion program, and as such overall financial implications are expected to be minimal.

CONCLUSION

GVS&DD was provided the authority to adopt a notice of bylaw violation enforcement and dispute adjudication bylaw in 2023. In May 2024, Bylaw 378 established notice of bylaw violation and dispute adjudication processes for designated liquid waste bylaw contraventions, with associated penalties of up to $500. The proposed bylaw amendment would designate contraventions of Bylaw 181 as eligible for enforcement by notices of bylaw violation, and prescribe associated penalties for each of the designated contraventions. Staff recommend alternative 1 that the Board adopt *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024.*

ATTACHMENTS

1. *Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024*
2. Blackline Version of Proposed Changes to GVSDD Notice of Bylaw Violation and Dispute Adjudication Bylaw 378, 2024
3. Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw Policy, 2024
4. Letter dated May 3, 2024, titled "Re: New Bylaw to Encourage Compliance – Licensed Solid Waste Facilities"

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GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
BYLAW NO. 380, 2024
A bylaw to amend Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 378, 2024

WHEREAS:

A. the Board of Directors of the Greater Vancouver Sewerage and Drainage District ("the Board") has enacted "Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 378, 2024"; and

B. the Board wishes to amend "Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 378, 2024".

NOW THEREFORE the Board of the Greater Vancouver Sewerage and Drainage District enacts as follows:

Citation

1. The official citation of this bylaw is "Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 380, 2024".

Schedule

2. The following Schedule is attached to and forms part of the bylaw:
    - Schedule "G", *Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996*, as amended;

Amendment of Bylaw

3. "Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 378, 2024" is amended as follows:

    (a) In sections 1 through 23, all references to the phrase "Schedules A through F" are deleted and replaced with the phrase "Schedules A through G";

    (b) Section 2 is deleted and replaced with the following:

        2. The following Schedules are attached to and form part of the Bylaw:
            - Schedule "A", *Greater Vancouver Sewerage and Drainage District Sewer Use Bylaw No. 299, 2007*, as amended;
            - Schedule "B", *Greater Vancouver Sewerage and Drainage District Food Sector Grease Interceptor Bylaw No. 365, 2023*;
            - Schedule "C", *Hospital Pollution Prevention Bylaw No. 319, 2018*, as amended;
            - Schedule "D", *Greater Vancouver Sewerage and Drainage District Fermentation Operations Bylaw No. 294, 2015*, as amended;

- Schedule “E”, *Greater Vancouver Sewerage and Drainage District Trucked Liquid Waste Bylaw No. 345, 2021*, as amended;
- Schedule “F”, *Greater Vancouver Sewerage and Drainage District Sani-dump Bylaw No. 346, 2021*; and
- Schedule “G”, *Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996*, as amended.

(c) Schedule “G”, *Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996*, as amended, which is attached to and forms part of this bylaw, is added in alphabetical order.

Read a first, second, and third time this _____ day of _____, _____.

Adopted this _____ day of _____, _____.

_____
Board Chair

_____
Dorothy Shermer, Corporate Officer

Schedule G

***Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996*, as amended**

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
2.1	Operation of a facility with a suspended licence	$375	$500	$500	No
2.1	Operation of a facility with a cancelled licence	$375	$500	$500	No
4.1(a)	Violation of a licence quantity limit or restriction	$375	$500	$500	Yes
4.1(b)	Violation of a licence material restriction	$375	$500	$500	Yes
4.1(d)	Failure to post signage	$95	$125	$155	Yes
4.1(d)	Failure to control litter	$95	$125	$155	Yes
4.1(d)	Failure to control vectors	$95	$125	$155	Yes
4.1(d)	Failure to notify Solid Waste Manager of a fire or emergency	$290	$375	$460	No
4.1(h)	Failure to keep or submit records	$95	$125	$155	Yes
4.1(i)	Failure to comply with operating plan	$290	$375	$460	Yes
8.1	Failure to provide entry	$290	$375	$460	No
8.7(d)	Failure to undertake action as required by Solid Waste Manager	$290	$375	$460	No
8.7(e)	Failure to provide information as required by Solid Waste Manager	$95	$125	$155	Yes
8.9	Failure to keep or submit records as required by Solid Waste Manager	$95	$125	$155	Yes
12.3	Failure to pay annual administration fee	$190	$250	$310	Yes
12.4	Failure to pay disposal fees	$190	$250	$310	Yes

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
12.5	Failure to deliver monthly statement	$95	$125	$155	Yes
14.1	Failure to report licence or bylaw contravention	$290	$375	$460	No
14.1	Failure to take remedial action to remedy a licence or bylaw contravention	$375	$500	$500	Yes

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
BYLAW NO. 378, 2024
A bylaw respecting the enforcement of Notices of Bylaw Violation and establishing a Bylaw Violation Dispute Adjudication System

WHEREAS:

A. Further to the *Local Government Bylaw Notice Enforcement Act*, SBC 2003, c. 60 a local government may designate bylaw contraventions which may be dealt with by bylaw notice; and

B. The Board of Directors (the "Board") of the Greater Vancouver Sewerage and Drainage District wishes to designate certain bylaw contraventions which may be dealt with by bylaw notice.

NOW THEREFORE the Board of the Greater Vancouver Sewerage and Drainage District enacts as follows:

Citation

1. The official citation of this Bylaw is "Greater Vancouver Sewerage and Drainage District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 378, 2024".

Schedules

2. The following Schedules are attached to and form part of the Bylaw:
    - Schedule "A", *Greater Vancouver Sewerage and Drainage District Sewer Use Bylaw No. 299, 2007*, as amended;
    - Schedule "B", *Greater Vancouver Sewerage and Drainage District Food Sector Grease Interceptor Bylaw No. 365, 2023*;
    - Schedule "C", *Hospital Pollution Prevention Bylaw No. 319, 2018*, as amended;
    - Schedule "D", *Greater Vancouver Sewerage and Drainage District Fermentation Operations Bylaw No. 294, 2015*, as amended;
    - Schedule "E", *Greater Vancouver Sewerage and Drainage District Trucked Liquid Waste Bylaw No. 345, 2021*, as amended; ~~and~~
    - Schedule "F", *Greater Vancouver Sewerage and Drainage District Sani-dump Bylaw No. 346, 2021*; and ~~.~~
    - Schedule "G", *Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996*, as amended.

Definitions

3. In this Bylaw, unless the context requires otherwise, the following definitions apply:

    "**Act**" means the *Local Government Bylaw Notice Enforcement Act* (British Columbia);

    "**Day**" means a calendar day;

"**Discounted Penalty**" means the amount due when a discount is deducted from the Penalty, as described in Section 6 of the Act and identified in Column 3 of Schedules A through GF;

"**GVS&DD**" means the Greater Vancouver Sewerage and Drainage District;

"**Late Payment Penalty**" means the amount due when a surcharge is added to the Penalty, as described in section 6 of the Act and identified in Column 5 of Schedules A through GF;

"**Notice of Bylaw Violation**" means a notice issued by a GVS&DD Bylaw Enforcement Officer pursuant to this Bylaw and section 4 of the Act;

"**Penalty**" means the amount that the recipient is liable to pay in respect of a violation of the related bylaw as identified in Column 4 of Schedules A through GF; and

"**Registry**" means the GVS&DD bylaw violation dispute adjudication registry established pursuant to section 11 of this Bylaw.

4. Capitalized terms used in this Bylaw that are not defined in section 3 have the same meaning as the terms defined in the Act.

Bylaw Violations

5. The bylaw violations designated in Schedules A through GF may be dealt with by Notice of Bylaw Violation.

Penalty

6. The amount due for a bylaw violation referred to in section 5 is:

(a) subject to paragraphs (b), (c) and (d) of this section, the Penalty amount set out in Column 4 of Schedules A through GF for the related violation described in Columns 1 and 2;

(b) if payment is received by the GVS&DD within 14 Days from the date of receipt of the Notice of Bylaw Violation in accordance with the Act, the Discounted Penalty set out in Column 3 of Schedules A through GF for the related violation described in Columns 1 and 2;

(c) if payment is received by the GVS&DD more than 28 Days from the date of receipt of the Notice of Bylaw Violation in accordance with the Act, the Late Payment Penalty set out in Column 5 of Schedules A through GF for the related violation described in Columns 1 and 2; or

(d) if payment is made under a Compliance Agreement, 50% of the Penalty set out in Column 4 of Schedules A through G~~F~~ for the related violation described in Columns 1 and 2.

Period for Paying or Disputing a Notice of Bylaw Violation

7. A person who receives a Notice of Bylaw Violation may, within 14 Days from the date of receipt of the Notice of Bylaw Violation in accordance with the Act:

   (a) pay the Discounted Penalty established in section 6(b) of this Bylaw in any manner described on the reverse of the Notice of Bylaw Violation; or

   (b) request dispute adjudication by completing the form on the reverse side of the Notice of Bylaw Violation and delivering it to the Registry.

8. After 14 Days of having received a Notice of Bylaw Violation, a person may not request adjudication and, if the person has taken no action under section 7, must pay the Penalty or the Late Payment Penalty established in section 6(c).

9. Within 21 Days of receiving a follow-up letter from the GVS&DD indicating the amount owing pursuant to a Notice of Bylaw Violation that was not delivered personally, a person may advise the GVS&DD, in writing, that they did not receive the original Notice of Bylaw Violation. In these circumstances the time limits for responding to the Notice of Bylaw Violation established under section 7 and 8 of this Bylaw do not begin to run until the day after the date that the Notice of Bylaw Violation is re-issued and delivered to them in accordance with the Act.

10. A person is conclusively deemed to have received a re-issued Notice of Bylaw Violation:

   (a) if it was delivered in person, on the date it was delivered; or

   (b) if it was mailed in accordance with the Act, on the 7th day after it was mailed.

Notice of Bylaw Violation Dispute Adjudication Registry

11. The Registry is established as a dispute adjudication system in accordance with the Act to resolve disputes relating to Notices of Bylaw Violation.

12. The civic address of the Registry is 4515 Central Blvd, Burnaby, BC V5H 0C6.

13. Every person who is unsuccessful in dispute adjudication for a Notice of Bylaw Violation or a Compliance Agreement must pay the GVS&DD an additional fee of $25 to cover the GVS&DD's costs of administering the adjudication system.

Screening Officers

14. Pursuant to section 10 of the Act, the position of Screening Officer is established to review the circumstances surrounding a Notice of Bylaw Violation. Before dispute adjudication in respect of a Notice of Bylaw Violation can be scheduled a Screening Officer must review the circumstances surrounding the issuance of the Notice of Bylaw Violation.

15. The following are designated titles of persons that are appointed as Screening Officers:

    (a) Environmental Control Officer;

    (b) Program Manager, Environmental Regulation and Enforcement; and

    (c) Director, Environmental Regulation and Enforcement.

Powers, Duties and Functions of Screening Officers

16. The powers, duties and functions of Screening Officers are as set out in the Act, and include the following powers:

    (a) Where requested by the person to whom a Notice of Bylaw Violation has been issued:

        (i) communicate information respecting the nature of the violation;
        (ii) provide a copy or reference to the bylaw violated;
        (iii) outline the facts on which the violation allegation is based;
        (iv) confirm the penalty for a violation;
        (v) where permitted, provide the opportunity to enter into a Compliance Agreement;
        (vi) provide the opportunity to proceed to the Registry; and
        (vii) confirm the fee or fees payable for the enforcement process.

    (b) To communicate with any or all of the following so that the Screening Officer can perform their functions under this Bylaw or the Act:

        (i) the person against whom a violation is alleged or their representative;
        (ii) the Bylaw Enforcement Officer issuing the Notice of Bylaw Violation;
        (iii) the complainant or their representative; and
        (iv) GVS&DD staff.

    (c) Where permitted to prepare and enter into a Compliance Agreement under the Act with a person who disputes a Notice of Bylaw Violation, including to establish terms and conditions for compliance that the Screening Officer considers necessary or

advisable, including time periods for payment of penalties and ultimate compliance with the bylaw;

(d) To provide for payment of a reduced Penalty if a Compliance Agreement is entered into; and

(e) To cancel Notices of Bylaw Violation in accordance with the Act or GVS&DD policies and guidelines.

17. The bylaw violations for which a Screening Officer may enter into a Compliance Agreement are indicated in Column 6 of Schedules A through G~~F~~.

18. Where a Compliance Agreement is entered into, the Penalty payable for the bylaw violation shall be reduced to 50% of the Penalty for the violation as listed in Column 4 of Schedules A through G~~F~~.

19. The maximum duration of a Compliance Agreement is one year.

Bylaw Enforcement Officers

20. Persons acting as any of the following are hereby designated as Bylaw Enforcement Officers for the purposes of this Bylaw and the Act:

(a) any person appointed by the GVS&DD Board to be an officer pursuant to Part 3 of the *Environmental Management Act*;

(b) Program Manager, Protective Services & Emergency Management;

(c) Coordinator, Protective Services & Emergency Management;

(d) Municipal Bylaw Enforcement Officer;

(e) Royal Canadian Mounted Police Officer;

(f) Municipal Police Officer;

(g) Local Assistant to the Fire Commissioner; and

(h) British Columbia Provincial Conservation Officer.

Form of Notice of Bylaw Violation

21. The Director, Environmental Regulation and Enforcement may from time to time prescribe the form for a Notice of Bylaw Violation, provided the form of Notice of Bylaw Violation complies with section 4 of the Act.

General

22. Male gender words include the female gender and vice versa and either includes the neuter. Singular number words include the plural and vice versa.

Severability

23. If a section, subsection, sentence, clause or phrase of this Bylaw is for any reason held to be invalid by the decision of a Court of competent jurisdiction, such decision will not affect the validity of the remaining portions of the bylaw.

Read a first, second, and third time this _____ day of _____, _____.

Adopted this _____ day of _____, _____.

_____
George V. Harvie, Chair

_____
Dorothy Shermer, Corporate Officer

***Greater Vancouver Sewerage and Drainage District Sewer Use Bylaw No. 299, 2007*, as amended**

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
5.3 (a)	Violation of permit discharge quantity limit	$375	$500	$500	No
5.3 (a)	Violation of permit discharge composition restriction	$375	$500	$500	No
5.3 (a)	Violation of permit discharge frequency restriction	$375	$500	$500	No
5.3 (c)	Violation of permit monitoring requirement	$190	$250	$310	No
5.3 (c)	Violation of permit record keeping requirement	$95	$125	$155	No
5.3 (c)	Failure to provide information	$95	$125	$155	Yes
5.6	Failure to provide information	$95	$125	$155	Yes
5.6	Failure to provide drawing	$95	$125	$155	Yes
5.6	Failure to provide specification	$95	$125	$155	Yes
5.9	Violation of a reporting requirement	$95	$125	$155	Yes
5.9 (a)	Violation of a reporting requirement	$95	$125	$155	Yes
5.9 (b)	Violation of a reporting requirement	$95	$125	$155	Yes
5.9 (c)	Violation of a reporting requirement	$95	$125	$155	Yes
5.9 (d)	Violation of a reporting requirement	$95	$125	$155	Yes
5.9 (e)	Violation of a reporting requirement	$95	$125	$155	Yes
8.1	Violation of a monitoring requirement	$190	$250	$310	No
8.2	Failure to install or maintain monitoring point	$290	$375	$460	Yes
12.1	Tampering with any manhole cover or other appurtenance	$375	$500	$500	No

Schedule B

Greater Vancouver Sewerage and Drainage District Food Sector Grease Interceptor Bylaw No. 365, 2023

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
8.1	Failure to use a grease interceptor	$375	$500	$500	Yes
8.2	Failure to connect a grease bearing fixture	$190	$250	$310	Yes
8.6	Inaccessible grease interceptor	$190	$250	$310	Yes
9.1(a), 9.1(b)	Failure to provide requested information	$95	$125	$155	Yes
10.2(a), 10.2(b)	Failure to maintain grease interceptor as required	$375	$500	$500	No
11.1(a), 11.1 (b)	Violation of record keeping requirement	$95	$125	$155	No
11.1(c)	Failure to provide requested records	$95	$125	$155	Yes
12.1	Failure to pay fee as required	$190	$250	$310	Yes

***Hospital Pollution Prevention Bylaw No. 319, 2018*, as amended**

Column 1 Section	Column 2 Authorized Words or Expressions	Column 3 Discounted Penalty	Column 4 Penalty	Column 5 Late Payment Penalty	Column 6 Compliance Agreement Available
8	Failure to submit a hospital pollution prevention plan as required	$375	$500	$500	Yes
11	Failure to submit annual report	$95	$125	$155	Yes
15	Failure to amend and resubmit a pollution prevention plan within the specified timeframe	$95	$125	$155	Yes
19	Failure to amend plan to include any discharges of wastes listed in Part 2	$95	$125	$155	Yes
22(a), 22(b)	Failure to pay annual fee	$190	$250	$310	Yes

***Greater Vancouver Sewerage and Drainage District Fermentation Operations Bylaw No. 294, 2015*, as amended**

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
8(b)	Discharge of total suspended solids in excess of 1,200 mg/L	$375	$500	$500	No
9	Discharge of wastewater with pH lower than 5.5 or higher than 10.5	$375	$500	$500	No
11	Failure to install sampling point	$290	$375	$460	Yes
12	Inaccessible sampling point	$290	$375	$460	Yes
17(a)	Failure to keep production records	$95	$125	$155	No
17(c)	Failure to keep records	$95	$125	$155	No
18(a)	Failure to keep records for 2 years	$95	$125	$155	No
18(b)	Failure to provide requested records	$190	$250	$310	Yes
19(a), 19(b)	Failure to pay administration fee	$190	$250	$310	Yes
20	Failure to pay treatment fee	$190	$250	$310	Yes
23	Unauthorized discharge	$375	$500	$500	Yes

Schedule E

***Greater Vancouver Sewerage and Drainage District Trucked Liquid Waste Bylaw No. 345, 2021*, as amended**

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
7	Discharge at a facility not designated for trucked liquid waste	$375	$500	$500	No
7.1(a)	Unauthorized Non Domestic Waste discharge	$375	$500	$500	No
8	Discharge without valid credit privileges	$375	$500	$500	No
12	Discharge without "out-of-region discharge number" as required	$375	$500	$500	No
26	Failure to submit manifest containing required information	$190	$250	$310	Yes
27	Failure to pay discharge fee	$190	$250	$310	Yes

Schedule F

Greater Vancouver Sewerage and Drainage District Sani-dump Bylaw No. 346, 2021

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
8(a)	Failure to register as required	$190	$250	$310	Yes
8(b)	Failure to pay registration fee	$190	$250	$310	Yes
9	Failure to post registration	$190	$250	$310	Yes
11	Failure to provide requested information	$95	$125	$155	Yes
12 (d), 12 (e)	Failure to post required signage	$190	$250	$310	Yes
12(g)	Failure to provide access	$290	$375	$460	No

Schedule G

Greater Vancouver Sewerage and Drainage District Municipal Solid Waste and Recyclable Material Regulatory Bylaw No. 181, 1996, as amended

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
2.1	Operation of a facility with a suspended licence	$375	$500	$500	No
2.1	Operation of a facility with a cancelled licence	$375	$500	$500	No
4.1(a)	Violation of a licence quantity limit or restriction	$375	$500	$500	Yes
4.1(b)	Violation of a licence material restriction	$375	$500	$500	Yes
4.1(d)	Failure to post signage	$95	$125	$155	Yes
4.1(d)	Failure to control litter	$95	$125	$155	Yes
4.1(d)	Failure to control vectors	$95	$125	$155	Yes
4.1 (d)	Failure to notify Solid Waste Manager of a fire or emergency	$290	$375	$460	No
4.1(h)	Failure to keep or submit records	$95	$125	$155	Yes
4.1(i)	Failure to comply with operating plan	$290	$375	$460	Yes
8.1	Failure to provide entry	$290	$375	$460	No
8.7(d)	Failure to undertake action as required by Solid Waste Manager	$290	$375	$460	No
8.7(e)	Failure to provide information as required by Solid Waste Manager	$95	$125	$155	Yes
8.9	Failure to keep or submit records as required by Solid Waste Manager	$95	$125	$155	Yes
12.3	Failure to pay annual administration fee	$190	$250	$310	Yes
12.4	Failure to pay disposal fees	$190	$250	$310	Yes

Schedule G

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
12.5	Failure to deliver monthly statement	$95	$125	$155	Yes
14.1	Failure to report licence or bylaw contravention	$290	$375	$460	No
14.1	Failure to take remedial action to remedy a licence or bylaw contravention	$375	$500	$500	Yes

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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

CORPORATE POLICY

NOTICE OF BYLAW VIOLATION ENFORCEMENT AND DISPUTE ADJUDICATION BYLAW POLICY

Effective Date: March 13, 2024

Approved By: Chief Administrative Officer

Policy No. GV-039

PURPOSE

The purpose of this policy is to establish principles that will guide decision making and provide a consistent approach for the development and application of notice of bylaw violation enforcement and dispute adjudication bylaws across Greater Vancouver Sewerage and Drainage District ("GVS&DD"), Greater Vancouver Water District ("GVWD"), and Metro Vancouver Regional District ("MVRD").

POLICY

The GVS&DD, GVWD, and MVRD each have authority to establish notice of bylaw violation enforcement and dispute adjudication bylaws. This policy establishes a framework for the development and implementation of notice of bylaw violation enforcement and dispute adjudication bylaws.

PENALTY SETTING

Under the *Local Government Bylaw Notice Enforcement Act*, penalties must not exceed $500 per bylaw contravention including any surcharge for late payment. In general, penalties should be set at an amount that will deter non-compliance with the specified bylaw. Penalties should be set at amounts that:

- Are commensurate with the seriousness of the contravention.
- Where possible, are consistent across GVS&DD, GVWD and MVRD for similar bylaw violations.
- Do not disproportionately impact underrepresented and equity denied populations.

ADJUDICATION PROCESSES/COLLECTION OF PENALTIES

Notice of bylaw violation enforcement and dispute adjudication bylaws should include consistent notice periods, and screening and adjudication processes to ensure consistent consideration of penalty disputes. They may also authorize compliance agreements, which set terms and conditions for future behavior to be performed within a designated period of time in return for a reduced penalty, to encourage future compliance with Metro Vancouver bylaws.

Collections should be through Metro Vancouver's Finance Department, with failure to pay a notice of bylaw violation considered a debt to the GVS&DD, GVWD or MVRD.

PUBLICATION OF ENFORCEMENT MEASURES

Where a notice of bylaw violation has been issued to a corporate entity, and the corporate entity has not requested adjudication within the required notice period, the name and corporate address of the entity to which the notice of bylaw violation was issued, the bylaw provision the corporate entity is alleged to have contravened, and the penalty imposed may be published on Metro Vancouver's website for up to three years commencing upon the earlier of: a) the date of payment; or, in the case of nonpayment, b) the date of filing of a certificate in the Provincial Court, pursuant to section 26(1) of the *Local Government Bylaw Notice Enforcement Act*.

Where a notice of bylaw violation has been issued to a corporate entity, and a violation is disputed by that corporate entity, following a hearing whereby an adjudicator is satisfied that the contravention alleged in the notice of bylaw violation occurred, the name and corporate address of the entity to which the notice of bylaw violation was issued, the bylaw provision the corporate entity contravened, and the penalty imposed, may be published on Metro Vancouver's website for up to three years commencing upon expiry of the time period for seeking judicial review of the adjudicator's decision. If judicial review of the adjudicator's decision is sought, publication may commence following the court's final determination if the adjudicator's decision is upheld.

For municipal ticket information and prosecution enforcement measures involving corporate entities, the name and corporate address of the entity, the bylaw provision contravened, and the fine may all be published on Metro Vancouver's website once the entity has been deemed guilty of the offence.

Other summary information about enforcement measures of GVS&DD's, GVWD's, and MVRD's bylaws, such as the number of bylaw violations issued by violation type, may be published on Metro Vancouver's website. Personal information will not be published.

Happy Stan's Recycling Services Ltd.
1603 Langan Avenue
Port Coquitlam, BC.
V3C 1H6

May 3, 2024

Dear Metro Vancouver Solid Waste Management Division;

Re : New Bylaw to Encourage Compliance – Licensed Solid Waste Facilities

I am concerned with the new proposed by-law that would allow Metro Vancouver to charge a penalty for various non-compliance of their by-law and add a further burden to our already struggling industry. As an organization that prides themselves in the work we do for our community and that works hard to maintain compliance but has been at times out of compliance, I see this decision to penalize a number of well-intentioned operators misguided. Without understanding the true effects of these violations, it is difficult to agree to adding another layer of burden. This is especially challenging when our facilities are having to compete with facilities such as Metro Vancouver's transfer stations and incinerator which, without inspection, are accepting thousands of tons of materials which our facilities are licensed to accept but are ban from the transfer stations and incinerator.

If the intent of these changes is to ensure that materials are being responsibly managed in the region, I propose instead to focus on the following activities which have been proposed several times by our industry but have yet to be followed through with in any meaningful way:

1) Ensure that all facilities which are required to be licensed, are licensed in order to create a level playing field.

2) Increase the number and quality of inspections as well as the penalties at the Metro Vancouver transfer stations and Burnaby incinerator in order to divert the materials which these facilities are not supposed to be accepting. This includes thousands of tons of recyclable, compostable, and other hazardous materials which are banned from these facilities but yet are still entering these facilities due to lack of a thorough inspection of materials placed in black bags or infrequent inspections.

3) Increase the level of reclaimed reusable durable goods from your transfer stations.

These three measures would significantly support the work of the licensed brokerage facilities while increasing the responsible management of discards in the region.

Sincerely,

Jamie Kaminski, ZWa & True Advisor
President
Corporate | HSR

(604) 464-0242 ext 109
jamie@happystan.com
happystan.com
1603 Langan Ave., Port Coquitlam, BC, V3C 1K6

To: Zero Waste Committee

From: Brandon Ho, Senior Project Engineer, Solid Waste Services

Date: June 25, 2024 Meeting Date: July 4, 2024

Subject: **2023 Disposal Ban Program Update**

RECOMMENDATION

That the Zero Waste Committee receive for information the report dated June 25, 2024, titled "2023 Disposal Ban Program Update".

EXECUTIVE SUMMARY

The disposal ban program encourages waste reduction and recycling through surcharges for garbage loads that contain banned materials above prescribed thresholds. Garbage loads are visually inspected to identify banned materials. Approximately 20% of the garbage loads received at Metro Vancouver and City of Vancouver solid waste facilities were inspected in 2023, and of those loads approximately 8.4% contained banned materials, with 2% receiving surcharges. Inspectors worked with customers to provide alternative recycling options to prevent more than 10,000 loads containing banned materials from being disposed. Electronic waste, corrugated cardboard, and gypsum were the top three banned materials in loads receiving surcharges.

A pilot program is being developed to create incentives for haulers working with their customers to maximize recycling efforts at source, and also recognize processors that have taken all reasonable steps to eliminate recyclables from their garbage loads.

PURPOSE

The purpose of this report is to provide the annual update to the Zero Waste Committee on the 2023 results of the Metro Vancouver disposal ban program.

BACKGROUND

Disposal ban program results are reported annually as outlined in the Zero Waste Committee work plan. The program helps keep readily recyclable materials and hazardous materials that pose operational risks out of the waste stream.

2023 DISPOSAL BAN PROGRAM RESULTS

The *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 306, 2017*, as amended (Tipping Fee Bylaw) specifies a list of over 40 banned materials restricted from disposal (Attachment 1). The disposal ban program is a key tool for Metro Vancouver to encourage waste reduction and recycling. Garbage loads received at Metro Vancouver and City of Vancouver solid waste facilities are visually inspected for banned materials, and surcharges are applied if banned materials are present in quantities exceeding the thresholds defined in the Tipping Fee Bylaw. Metro Vancouver reports annually on program results including inspection and surcharge rates, and surcharges by material and customer type.

Disposal Ban Program Results

In 2023, the number of garbage loads received at regional solid waste facilities was 4.2% higher than in 2022. This is primarily due to additional loads received at the new Central Surrey Recycling and Waste Centre that opened in September 2022. Some inspectors were reallocated to the new facility to conduct load inspections and educate customers. Consequently, with fewer customers at the smaller facilities, fewer loads were inspected in 2023. Table 1 provides a multi-year comparison of disposal ban program results.

In 2023, 165,906 loads were inspected (20% inspection rate), and 13,958 (or approximately 8.4%) of inspected loads contained banned materials. Inspectors were able to work with customers and provide alternative recycling options to prevent 10,674 loads (re-loads) containing banned materials from being disposed as garbage. The number of re-loads was lower in 2023 compared to 2022, because inspectors are providing more up front education to customers which has resulted in more compliant loads and fewer materials that need to be re-loaded by residential customers.

Table 1: Inspection Statistics for Regional Solid Waste Facilities

Year	Garbage Loads	Loads Inspected	Inspection Rate	Re-Loads	Surcharge Notices	Surcharge Rate
2021	822,060	194,329	24%	13,677	3,104	1.6%
2022	800,855	194,588	24%	20,161	3,462	1.8%
2023	834,626	165,906	20%	10,674	3,284	2.0%

Results by Material Type

Table 2 summarizes the distribution of surcharged loads by banned material type. Electronic waste (including computers, home entertainment systems, household electronics, kitchen appliances, and vacuums), represented 31% of surcharged loads, down from 32% in 2022. Corrugated cardboard accounted for 24% of the surcharge notices in 2023, up from 21% in 2022. Gypsum accounted for 9% of the surcharge notices in 2023, up from 6% in 2022. Food waste and mattresses both accounted for 8% and 7%, respectively.

Table 2: Summary of Materials Contained in Surcharged Loads at Regional Solid Waste Facilities

Material	2021	2022	2023
Electronic Waste	26%	32%	31%
Cardboard	25%	21%	24%
Gypsum	4%	6%	9%
Food Waste	5%	9%	8%
Mattresses	9%	7%	7%
Tires	3%	3%	4%
Other Banned Materials	5%	5%	4%
Large Objects	11%	4%	2%
Paint (Includes empty containers)	3%	3%	2%
Clean Wood	3%	2%	2%
Expanded Polystyrene Packaging	3%	2%	2%

Green Waste	1%	1%	2%
Oil (Includes containers and filters)	1%	1%	1%
Wire, Hosing, Rope or Cable	N/A	2%	<1%
Mixed Recyclables (includes paper and containers)	1%	3%	<1%

Surcharges by Customer Type

Table 3 summarizes the number of inspections and surcharge notices by customer type in 2023. The surcharge rate for commercial loads is typically higher than other customer types due to the load volumes, types of materials, and how they are collected. Typically, it is not safe/practical to prevent disposal of banned materials from a commercial or municipal load. Municipal loads are generally from single family households and typically have less visible banned materials than commercial loads. Residential cash and other non-account customers arriving in small vehicles normally unload materials manually and can separate, retrieve and recycle banned materials more easily.

Table 3: Summary of Surcharges by Customer Type for 2023

Customer Type	Inspections	Surcharge Notices	Surcharge Rate
Commercial	43,173	2,690	6%
Municipal	8,807	210	2%
Non-account	113,926	384	0.3%
Totals	165,906	3,284	2.0%

Dispute Resolution

Customers may dispute a surcharge within 30 days of issue by completing a dispute form. Metro Vancouver received 13 surcharge disputes in 2023, down from 21 in 2022. Seven surcharge notices were rescinded as summarized in Table 4.

Table 4: Surcharge Dispute Summary

Year	Surcharge Disputes Received	Surcharge Notices Rescinded
2021	15	10
2022	21	13
2023	13	7

Hauler Surcharge Information

The 2023 surcharge amount and surcharge rate for each hauler with total surcharges exceeding $1,000 is shown in Attachment 2 (surcharges applied at Metro Vancouver facilities only). The hauler surcharge rate is the number of surcharge notices divided by the number of inspections for each hauler.

Disposal Ban Exemption Pilot Program

In 2023, Metro Vancouver conducted a disposal ban program review through a third party consultant. The review found that the program is effective and that surcharges are being applied consistently. The review also identified some potential areas for program improvement. One key finding was that there is an opportunity to work with haulers through incentives to encourage the

haulers to work with generators to further increase recycling, and reduce the potential for banned materials being disposed in garbage containers.

A pilot program is under development that will aim to create incentives for waste haulers to maximize opportunities for their customers to recycle and also recognize the work of processors that take all practical measures to eliminate recyclables from the residual material from those facilities that requires disposal.

ALTERNATIVES
This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS
In 2023 surcharge revenues were $442,307 with $429,276 from Metro Vancouver solid waste facilities and $13,031 from City of Vancouver solid waste facilities as shown in Attachment 3. Total program expenditures in 2022 were $1,070,264. The program is not intended to be cost neutral but rather encourage haulers to work with their customers to increase recycling. Any cost implications of the pilot program under development will be reported to the Zero Waste Committee as the program is finalized.

CONCLUSION
The disposal ban program helps keep readily recyclable materials and materials that pose operational risks and other hazards out of the waste stream. In 2023, 165,906 loads were inspected, 13,958 loads were found to contain banned materials, and 3,284 surcharge notices were issued. The disposal ban program remains an effective tool to encourage waste reduction and recycling.

ATTACHMENTS
1. 2023 Banned Materials
2. 2023 Solid Waste Surcharge Information at Metro Vancouver Facilities
3. 2023 Solid Waste Surcharge Summary

65794352

2023 Banned Materials

Banned Hazardous and Operational Materials ($69 surcharge on any single item plus the costs of remediation and clean-up)	
• Agricultural Waste	• Hazardous Waste
• Automobile Parts	• Inert Fill Materials
• Barrels or Drums (205 L or greater)	• Liquids or Sludge
• Creosote Treated Wood	• Mattresses
• Dead Animals	• Oversize Objects
• Dusty or Odourous	• Personal Hygiene Products over 10% of the load
• Excrement	• Propane Tanks
• Flammable Materials	• Toxic Plants
• Gypsum	• Wire, Hosing, Rope or Cable longer than 1 m

Banned Recyclable Materials (50% surcharge on Items above the threshold)
5% threshold on any combination of the following: • Beverage containers • Other recyclable plastic, glass, metal, and composite material containers • Corrugated cardboard • Recyclable paper • Green waste • Clean Wood
25% threshold on food waste

Banned Recyclable Materials (100% surcharge on Items above the threshold)
20% threshold on expanded polystyrene packaging

Banned Product Stewardship Materials ($69 surcharge on any single item)	
• Antifreeze and Containers	• Paint and Paint Containers
• Electronics and Electrical Products	• Pesticides
• Gasoline	• Pharmaceutical Products and Medications
• Lead-Acid Batteries	• Solvents and Flammable Liquids
• Lubricating Oil and Containers	• Tires
• Oil, Oil Filters, Oil Containers	

Attachment 2

2023 Solid Waste Surcharge Information Metro Vancouver Facilities		
Hauler (MV Facilities)	Surcharge Amount*	Hauler Surcharge Rate**
Canada Minibins Ltd.	$16,488	15%
Cascades Recovery	$1,143	2%
City of Burnaby	$7,859	4%
City of Coquitlam	$1,521	7%
City of Surrey	$7,570	6%
District of North Vancouver	$2,622	6%
Four Season Roofing & Disposal Ltd.	$6,457	30%
GFL Environmental	$44,167	6%
Halton Recycling Ltd.	$8,151	10%
Maple Leaf Disposal Ltd.	$29,897	11%
Metro Disposal	$2,001	2%
NSD Disposal Ltd.	$3,502	8%
RJ Disposal Ltd.	$3,502	9%
SF Disposal Queen	$5,057	10%
Super Save Disposal Inc.	$53,399	10%
Two Guys Recycling & Disposal Services Inc.	$3,284	15%
Urban Impact Recycling Ltd.	$7,403	3%
Vancouver Coastal Health	$8,649	28%
Waste Connections of Canada	$105,761	11%
Waste Control Services Inc.	$14,819	5%
Waste Management of Canada Corporation	$51,911	12%
Wescan Disposal	$1,522	6%

* Does not include haulers with surcharge amounts less than $1,000.

** Hauler surcharge rate is equal to the number of surcharges divided by the estimated number of inspections for each hauler. The estimated inspection rate is assumed to be equal to the overall inspection rate for that category of customer.

Attachment 3

2023 Solid Waste Surcharge Summary	Surcharge Amount
Metro Vancouver Facilities ($ 429,276)	
- Commercial	$ 378,788
- Municipal	$ 23,224
- Cash Customers	$ 27,264
City of Vancouver Facilities	$ 13,031
Total	$ 442,307

To: Zero Waste Committee

From: Kelly Du, Project Engineer, Solid Waste Services

Date: June 27, 2024 Meeting Date: July 4, 2024

Subject: **2023 Waste Composition Data**

RECOMMENDATION

That the Zero Waste Committee receive for information the report dated June 27, 2024, titled "2023 Waste Composition Data".

EXECUTIVE SUMMARY

Metro Vancouver's waste composition program includes a series of annual studies to learn about the types and quantities of waste disposed in the region. The 2023 full-scale study results suggest waste composition is no longer directly impacted by the COVID-19 pandemic, and new trends are emerging.

- Single-use item disposal decreased in 2023 compared to 2022, with early indication that retail bags disposed with garbage are declining since 2021.
- Paper was no longer one of the three most common materials disposed and was replaced by non-compostable organics, which includes engineered wood products and natural fibre textiles.
- Compostable organics remained the largest component of the waste stream, particularly in the multi-family sector, but was the lowest percentage recorded since 2020.
- Electronic waste increased in 2023 compared to 2021 and 2022, which will be monitored in future compositions studies to understand whether the observed increase indicates an ongoing trend.

Waste composition results are used to help identify program priorities, and to provide baseline data for the solid waste management plan update.

PURPOSE

The purpose of this report is to update the Zero Waste Committee on the results of waste composition studies completed in 2023.

BACKGROUND

As reported to the Zero Waste Committee on October 16, 2020, the frequency of full-scale and sector-specific waste composition studies increased from alternating every other year, to annually for the duration of the solid waste management plan update. Waste composition studies provide valuable estimates of the types and quantities of material disposed in the region and provide baseline data for the solid waste management plan update.

2023 WASTE COMPOSITION PROGRAM

Three waste composition studies were conducted in 2023: a full scale study of waste received at regional disposal facilities from residential and commercial/institutional sources, and two sector-specific studies of waste from the multi-family and commercial/institutional sectors.

Full Scale Waste Composition Study Overall Results

Field work for the full-scale study took place in October and November 2023 at the North Surrey, United Boulevard, and North Shore recycling and waste centres. Field work involved obtaining 100 samples of approximately 100 kg each from incoming waste loads, and sorting those samples into 175 material categories. Each category was then weighed, and aggregated weights were combined to provide an estimate of composition for the region.

Notable changes from prior studies include:

- a decrease in paper from 19% in both 2021 and 2022 to 14% in 2023;
- a decrease in compostable organics from 28% in 2021 to 23% in 2023; and
- an increase in non-compostable organics, primarily composed of finished wood, from 9% in 2021 to 15% in 2023.
- an increase in electronic waste from 1% in 2021 to 3% in 2023. Samples containing a large quantity of a single material type can skew overall results. Metro Vancouver will continue to monitor electronic waste disposal trends in future waste composition studies to determine if electronic waste disposal in the region is increasing.

Table 1: Regional Waste Disposal by Material[1,2]

	2021		2022		2023	
Material	**kg/ capita**	**%**	**kg/ capita**	**%**	**kg/ capita**	**%**
Paper	60	19%	59	19%	47	14%
Plastic	62	20%	52	17%	57	18%
Compostable Plastic	<1	<1%	<1	<1%	<1	<1%
Compostable Organics	87	28%	84	27%	73	23%
Non-Compostable Organics	27	9%	46	15%	50	15%
Metals	10	3%	10	3%	16	5%
Glass	6	2%	11	4%	8	3%
Building Material	14	5%	18	6%	21	7%
Electronic Waste	3	1%	5	1%	9	3%
Household Hazardous	6	2%	2	1%	6	2%
Household Hygiene	29	9%	23	7%	17	6%
Bulky Objects	2	1%	1	0%	9	3%
Fines	5	2%	3	1%	3	1%
Total	**312**	**100%**	**315**	**100%**	**318**	**100%**

[1] Per capita tonnages for waste composition studies are typically based on the last reported year of data available at the time of publishing.

[2] Numbers may not add up to totals due to rounding, whole numbers were used to calculate totals.

Single-Use Items

Metro Vancouver has been counting single-use items disposed in residential and commercial/institutional garbage since the 2018 waste composition study. Despite representing only 2% of the waste stream by weight, littered single-use items can have detrimental impacts on marine ecosystems and represent an opportunity to encourage waste reduction. The categories studied correspond with the items prioritized in Metro Vancouver and member jurisdictions which includes items most commonly targeted by municipal single-use item reduction bylaws.

Total single-use item disposal decreased from 2022 to 2023. There is an early indicator that retail bags disposed with garbage since 2021 are declining. This is most likely due to actions at all levels of government that have implemented bans on plastic shopping bags, and fees for recycled paper and reusable alternatives. The number of takeout containers and cups stayed consistent with 2022 levels, which may be due to the popularity of food delivery services and mobile ordering, and the increased cost of dining out.

Table 2: Single-Use Items

	2018		2020		2021		2022		2023	
SUI Item	Item/ capita	Total items millions (mil.)	Item/ capita	Total items (mil.)	Items/ capita	Total items (mil.)	Items/ capita	Total items (mil.)	Items/ capita	Total items (mil.)
Retail Bags[1]	101	256	117	318	116	320	76	214	54	163
Cups	102	262	64	174	98	272	172	484	126	408
Containers[2]	70	179	95	259	65	180	87	245	68	207
Straws	40	102	34	92	33	90	30	84	22	70
Utensils	130	331	49	135	80	221	114	319	88	243
Total	**443**	**1130**	**359**	**978**	**391**	**1083**	**479**	**1346**	**358**	**1092**

[1] The proportion of paper bags compared to plastic has increased since measurement started in 2018. Retail bags consists of checkout bags.

[2] The number of expanded polystyrene (foam) containers has decreased significantly since measurement started in 2018.

Multi-Family Waste Composition Study

The 2023 Multi-Family Waste Composition Study examined waste disposed at 90 multi-family residences throughout the Metro Vancouver region. Results indicate that the largest component of multi-family waste remains compostable organics (34% or 61 kg/capita), followed by plastic, paper, and household hygiene products such as diapers and pet waste. Per capita disposal decreased to 181kg/capita, the lowest per capita disposal since 2017 (212 kg/capita). Reducing organics disposal in multi-family residences was a focus of this year's "Food Scraps Aren't Garbage" behaviour change campaign. Exploring multi-family waste reduction and recycling solutions will be a key component of an updated solid waste management plan.

Table 3: Multi-Family Waste Composition								
	2017		2021		2022		2023	
Material	kg/ capita	Percent	kg/ capita	Percent	kg/ capita	Percent	kg/ capita	Percent
Paper	34	16%	30	15%	35	17%	27	15%
Plastic	31	15%	34	17%	28	14%	30	17%
Compostable Products and Packaging	<1	<1%	<1	<1%	<1	<1%	<1	<1%
Compostable Organics	80	38%	77	37%	76	37%	61	34%
Non-Compostable Organics	10	5%	8	4%	13	6%	12	7%
Metal	6	3%	5	3%	5	3%	7	4%
Glass	6	3%	7	3%	7	3%	6	3%
Building Material	3	2%	4	2%	2	1%	4	2%
Electronic Waste	4	2%	4	2%	6	3%	3	2%
Household Hazardous	2	1%	1	1%	2	1%	1	1%
Household Hygiene	31	15%	31	15%	27	13%	25	14%
Bulky Objects	<1	<1%	5	3%	<1	<1%	3	1%
Fines	3	1%	1	1%	3	1%	3	2%
Total	**212**	**100%**	**206**	**100%**	**205**	**100%**	**181**	**100%**

Commercial/Institutional Waste Composition

The 2023 Metro Vancouver Commercial/Institutional Waste Composition Study examined waste from 145 businesses throughout the region in three subsectors: retail and wholesale trade, business and commercial services (offices), and food services. In 2022, all six sectors were sampled, which included manufacturing, education and welfare. As the 2022 results indicated significant variability within each subsector based on varying types of businesses, the sampling plan was revised in 2023 to focus on multiple office towers and a large shopping mall complex to trial if the data would show less variability.

The 2023 results are not included as they continued to show variability and the ranges do not provide enough accuracy to show any specific trends or information, however, it is notable that the top three components of waste across the three sectors continue to be organics, paper, and plastic. Together these materials make up approximately 90% of garbage in retail and wholesale trade, business and commercial services (offices) and food services. Metro Vancouver plans to focus on specific subsectors in upcoming commercial/institutional waste composition studies to obtain more data and help strengthen baseline data for the solid waste management plan update.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

The waste composition program is ongoing and is included in the solid waste services annual operating budget.

CONCLUSION

Metro Vancouver's waste composition program provides valuable information on the progress of various waste reduction and recycling initiatives, and identifies potential target materials for future waste reduction programs and policies. Three studies were completed in 2023. The 2023 full-scale study suggested waste composition showed a decrease in compostable organics and paper. Actions by all levels of government to reduce single-use items are reflected in the decrease in plastic retail bags and other single-use items. The multi-family waste composition study found that compostable organics remain the highest proportion of multi-family residential waste. Multi-family residents were the focus of this year's "Food Scraps Aren't Garbage" behaviour change campaign. Metro Vancouver will continue to monitor waste composition annually. Three waste composition studies are planned for 2024.

REFERENCES

1. 2023 Full-Scale Waste Composition Study
2. 2023 Multi-Family Waste Composition Study
3. 2023 Commercial/Institutional Waste Composition Study

ATTACHMENTS

1. Presentation re: 2023 Waste Composition Data

65867323

Unsorted Sample

2023 Waste Composition Monitoring Program

RESULTS

Kelly Du, P.Eng.
Project Engineer, Solid Waste Services

Zero Waste Committee Meeting – July 4, 2024

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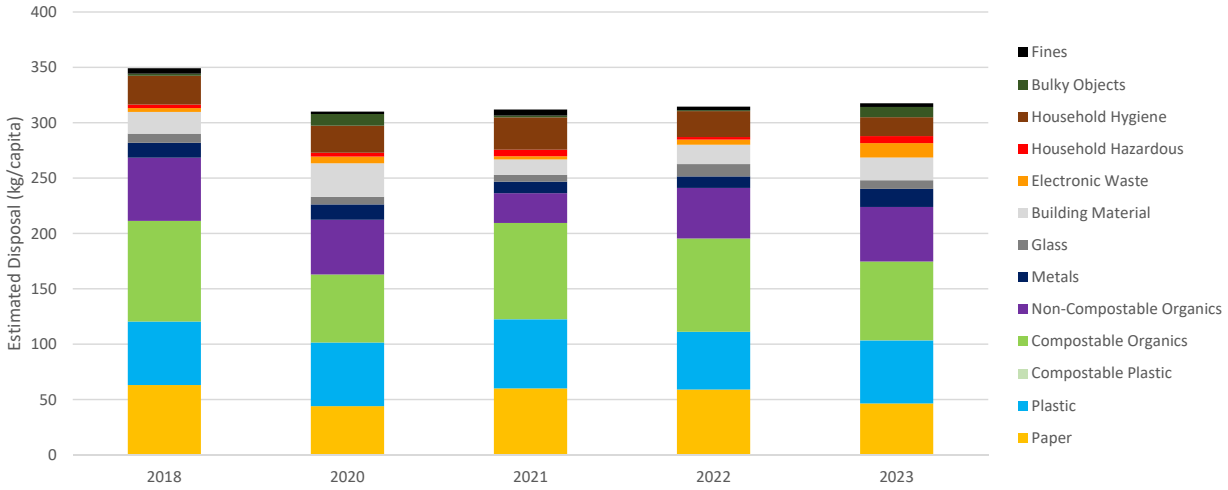
WASTE COMPOSITION PROGRAM PLAN

Type of Study	Description	Frequency
Full-scale	- Samples from all sectors	Annually
Multi-family	- Apartments - Townhomes	Annually (until SWMP is updated)
Commercial/ Institutional	- Businesses	Annually (until SWMP is updated)
Construction & Demolition	- Composition of large construction and demolition loads	Every three years

FULL-SCALE STUDY RESULTS

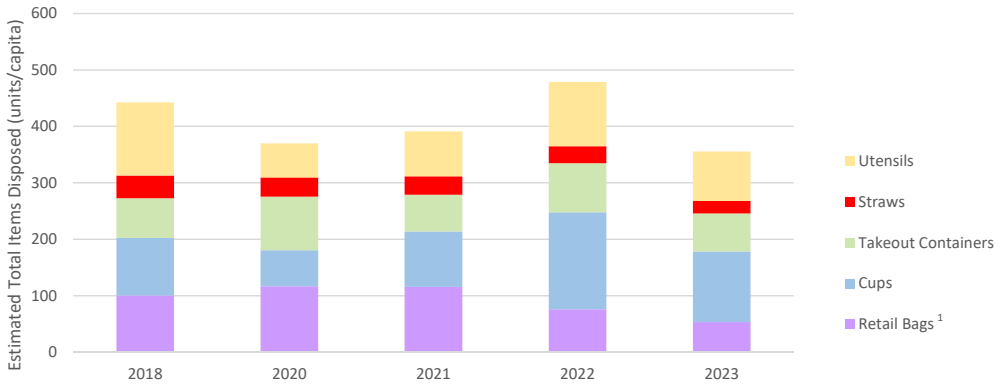
Residential, Commercial/Institutional and Small Load Waste



FULL-SCALE STUDY RESULTS

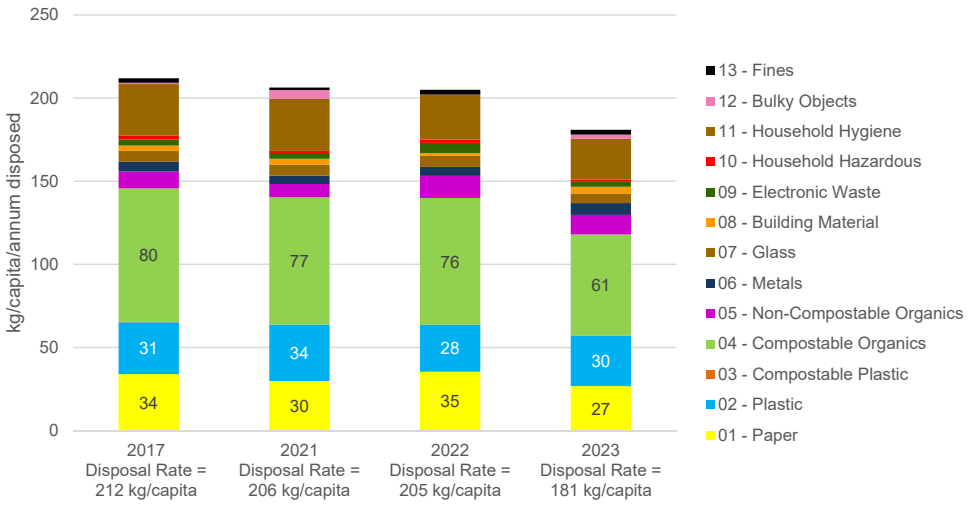
*2% of waste stream by weight

Single-use Items Counts

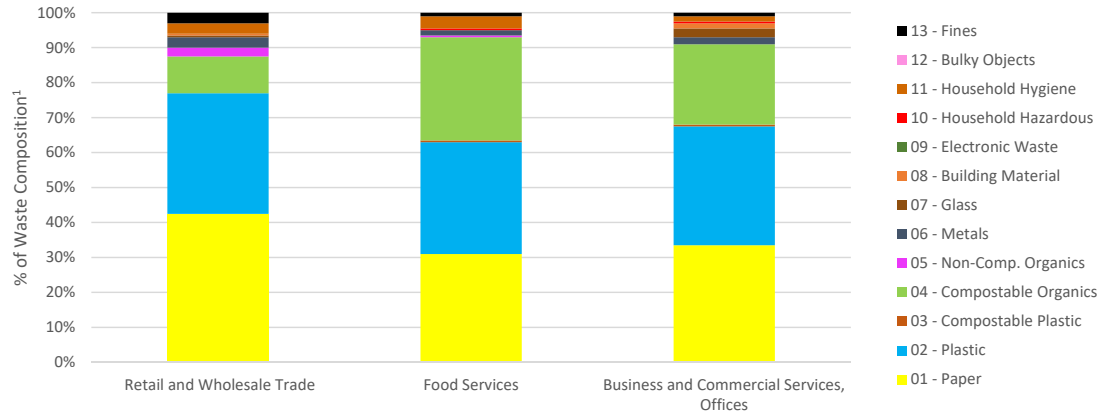


[1] Retail Bags consists of checkout bags

MULTI-FAMILY WASTE COMPOSITION



COMMERCIAL/INSTITUTIONAL WASTE COMPOSITION



[1] Percentages are calculated based on averages

CONCLUSIONS

- Organics, plastic, paper and wood are the largest components of the waste stream
- Early indication in decrease of checkout bags
- Organics remain highest component in multi-family
- Waste composition study provides baseline data for solid waste management plan update

Sorted Plastic, Rigid Plastic Cups, Empty Plastic bags

Questions?

metrovancouver

To: Zero Waste Committee

From: Shellee Ritzman, Division Manager, Corporate Communications, External Relations
Jay Soper, Communications Specialist, External Relations

Date: June 25, 2024 Meeting Date: July 4, 2024

Subject: **2024 Regional Clothing Waste Reduction Campaign Results**

RECOMMENDATION

That the Zero Waste Committee receive for information the report dated June 25, 2024, titled "2024 Regional Clothing Waste Reduction Campaign Results".

EXECUTIVE SUMMARY

Now in its sixth year, Metro Vancouver's "Think Thrice About Your Clothes" behaviour change campaign continues to reach and engage residents with messaging that encourages diverting textiles from the waste stream. While raising awareness of the textile waste problem, residents were empowered to donate, recycle, reduce, repair, and reuse their clothes. Several new mediums were added to this year's media plan to expand campaign reach, including on-air host endorsements with Virgin and CFOX radio, digital and traditional SkyTrain screens, Pinterest ads, and campus screens in post-secondary campuses across the region. The campaign achieved over 42.8 million impressions between digital and traditional media tactics, comparable to the impressions delivered in its previous year.

PURPOSE

To update the Zero Waste Committee on the results of the 2024 regional clothing waste reduction campaign, "Think Thrice About Your Clothes."

BACKGROUND

Clothing is one of the fastest growing waste streams due to rapidly changing fashion trend cycles and low prices, leading to increased clothing consumption and disposal. Approximately 20,000 tonnes of clothing waste is disposed annually in Metro Vancouver, despite local options to swap, sell, or donate unwanted clothing. Metro Vancouver residents throw out an average of 8 kg of clothing per person per year, equivalent to the weight of 44 t-shirts per person per year.

2024 was the sixth year of the Think Thrice campaign, which supports Metro Vancouver's commitment to achieving zero waste in the region.

2024 REGIONAL "THINK THRICE ABOUT YOUR CLOTHES" CAMPAIGN

Campaign Approach

The campaign ran from February 26 to April 28, 2024 and aimed to:

- Increase diversion of textiles waste from the waste stream
- Empower residents to take action to reduce their textile waste (reduce, repair, reuse)
- Increase awareness among Metro Vancouver residents about the textiles waste problem
- Connect textiles waste reduction to climate action

On average, women purchase and shop more frequently for clothing, footwear, accessories, linens, and other fabrics than do men and the average number of items purchased decreases with age. In light of this, the campaign's audience narrowed in 2024 to focus on 18–44 year olds with a 75% female skew.

Creative Direction and Messaging

The 2024 campaign shared hopeful and action-oriented messaging, while addressing associated barriers to reducing textile waste. The campaign creative platform celebrates the lives of "caring owners" by focusing exclusively on items of clothing and the stories they collect. The platform builds off the premise that if clothes are to be spared from the landfill, they require "caring owners." The 2024 campaign featured five different types of "caring owners", each listing memories and experiences the garment has lived through and each connecting to a clothing waste reduction behaviour, such as care and repair (e.g. removing stains, repairing clothes) and reduction tips (e.g. thrifting). The five types of owners featured were "Thoughtful", "Enterprising", "Grateful", "Hardy", and "Dedicated" (see Attachment for visual examples).

Website

The campaign website was built to support residents in adopting desired behaviours for clothing waste reduction. It serves as an information hub that contains helpful tips, video tutorials, infographics, local donation and recycling listings, and a stain removal guide.

The campaign website focuses on three main areas of messaging:

- Reduce – tips for identifying quality items when purchasing new or second-hand clothing
- Repair – tips for better care and repair of clothing, including laundry and stain removal, as well as DIY clothing repair and alteration options and ideas
- Donate/Recycle – what to do with unwanted clothing, including information on reselling, repurposing, recycling, and donating

Promotional Strategy

A combination of traditional and digital media placements were used to reach the target audience. Placements included digital (YouTube, Facebook, Instagram, Pinterest, and year-round search ads), a television PSA, radio host endorsements with Virgin and CFOX, and out-of-home (SkyTrain, bus exteriors, campus digital screens). In addition to radio endorsements, the popular radio hosts further amplified campaign messaging through their own social media channels, acting as campaign influencers and contributing additional ad value.

Community outreach events were included in the 2024 campaign to provide the opportunity for face-to-face interactions and more in-depth discussions about the campaign and clothing waste reduction messaging. Elements of the outreach event booth space included a clothing donation infographic, examples of what can be donated, clothing tip signs, laundry care tip cards, and free button giveaways for residents who engaged with Metro Vancouver representatives.

In addition, the campaign partnered with local fashion and lifestyle influencer Erin Jay to create social media content. The authentic endorsement from Erin helped reach a targeted audience, fostering meaningful engagement and providing cross-promotional opportunities, making the partnership both cost-effective and highly impactful.

All channels drove residents to the campaign website, www.think-thrice.ca.

Engagement of Metro Vancouver Members
Campaign materials were made available to all Metro Vancouver members, including social media content, video, and co-branded assets like posters and digital transit shelters.

Results
Website Traffic

- The campaign website observed over 15,800 visits from February 26–April 28, 2024.
- Digital ads, including Google Search and social media (Facebook and Instagram), were the largest source of website traffic.
- Besides the landing page, the most popular pages were in the donation and recycling section of the website (i.e., "Where can I donate or recycle"), indicating there's still a need to focus messaging on providing information about what clothing can be donated and where.

Media Performance

- The campaign delivered over 42.8 million impressions — comparable to the 2023 campaign.
- Out-of-home tactics (SkyTrain LEDs, Super Bus Kings, and campus digital screens) delivered over 31.1 million impressions.
- Digital tactics (Google Search, Facebook, Instagram, YouTube, Pinterest) delivered 9.4 million impressions and reached 1.4 million people, with social media ads on Facebook and Instagram representing the highest reach (1 million).
- Social media ads (Facebook, Instagram, and Pinterest) generated 5,659 engagements (likes, comments, shares).
- The television PSA aired 2,912 times to Telus subscribers in the region.
- Over 387,900 YouTube videos were viewed.
- Radio received an estimated 2.3 million impressions (286 spots).

Community Outreach

- Metro Vancouver outreach representatives attended two community events to engage with residents to promote campaign messaging and answer questions:
    - Cambie Community Centre Earth Day, Richmond – April 20
    - Free Clothing Drop-off and Clothing Swap, Vancouver – April 27

Bi-annual Post-Campaign Survey

- Residents are more inclined to donate clothing (67%) to reduce waste. Suggestions to reduce textile consumption garner mixed reactions: the most well-received messages are buying clothing that lasts longer (50%) and repairing damaged clothing (25%).
- Residents aged 18-34 were most likely to say they've seen or heard the campaign advertising.
- As a result of viewing Metro Vancouver's advertising, most residents who saw or heard the advertising feel the ads are effective at reminding them to repair clothing (72%) and reduce clothing consumption (64%).
- Half of residents (50%) say they are now more likely to buy clothing that lasts longer, while fewer (42%) will repair clothing and (35%) will reduce the amount of clothing consumed.
- Overall, four-in-ten (30%) residents who saw or heard Metro Vancouver's advertising say they discussed its message with others.
- Residents were most likely to have seen or heard the ads on SkyTrain platforms (60%) and social media (56%).

Plans for 2025 Regional Campaign

The research findings combined with our understanding of residents' barriers to reducing clothing waste indicates there is an opportunity to revisit the campaign purpose and creative platform. For example, limited clothing/textile donation and recycling locations pose a barrier to achieving higher textile recycling rates. Additionally, previous research states that residents prefer donating over reducing or repairing their clothes which is made worse by the fast fashion industry which offers trendy, inexpensive items. The current campaign strategy offers multiple solutions for residents to reduce their textile waste but given research findings, we recommend exploring a more singular approach — dedicated to addressing the issue residents are most likely to be inspired to act upon.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

The 2024 Think Thrice campaign had a $155,000 budget supported under the Zero Waste Communications Program of the 2024 General Government budget.

CONCLUSION

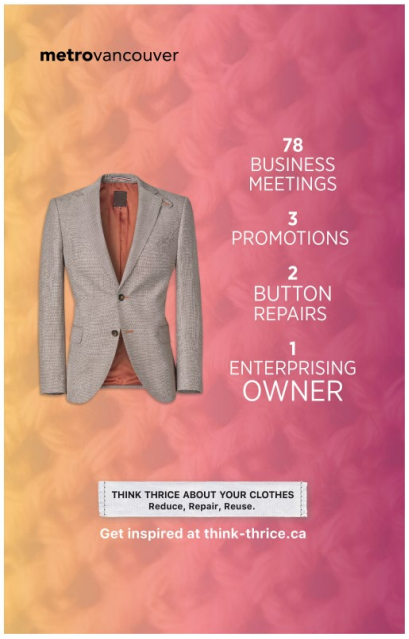
In its sixth year, Metro Vancouver's "Think Thrice About Your Clothes" campaign raised awareness about clothing waste and empowered residents to engage in reducing, repairing, and reusing textiles. The campaign introduced new media channels to expand its reach, achieving over 42.8 million impressions. Despite these efforts, challenges remain — notably the limited availability of donation and recycling options and the influence of the fast fashion industry. Survey results indicate that while residents are more inclined to buy durable clothing, fewer are committed to repairing or reducing consumption. Future strategies will focus on refining the campaign's objectives and revisiting audience barriers to find the most influential issue that residents are motivated to change.

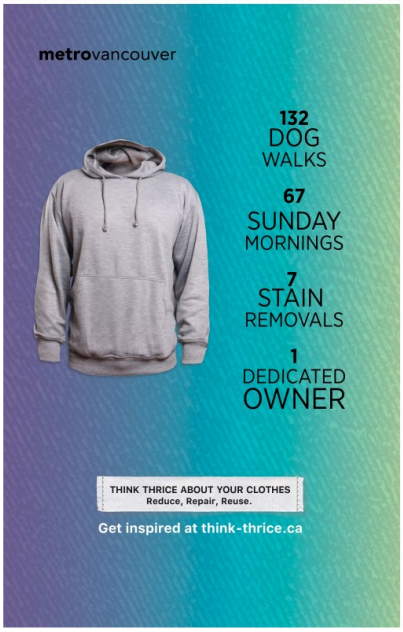
ATTACHMENTS

1. "Think Thrice About Your Clothes" Sample Creative
2. Presentation re: 2024 Regional Clothing Waste Reduction Campaign Results

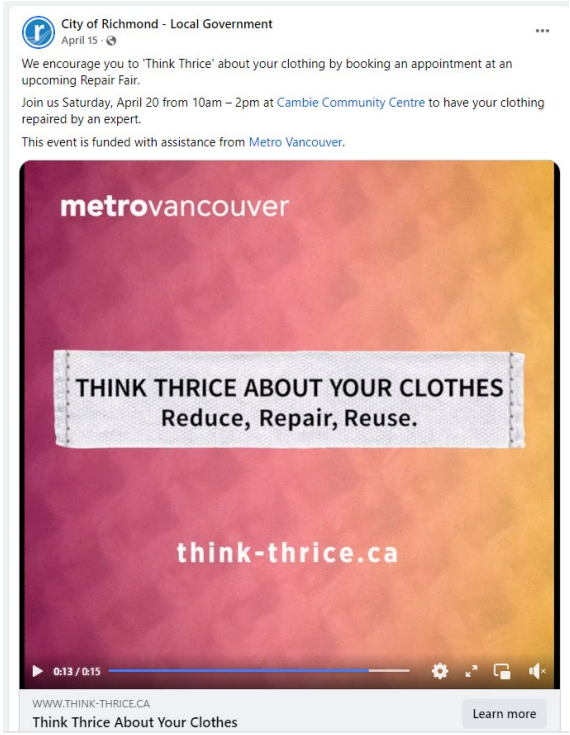
68051289

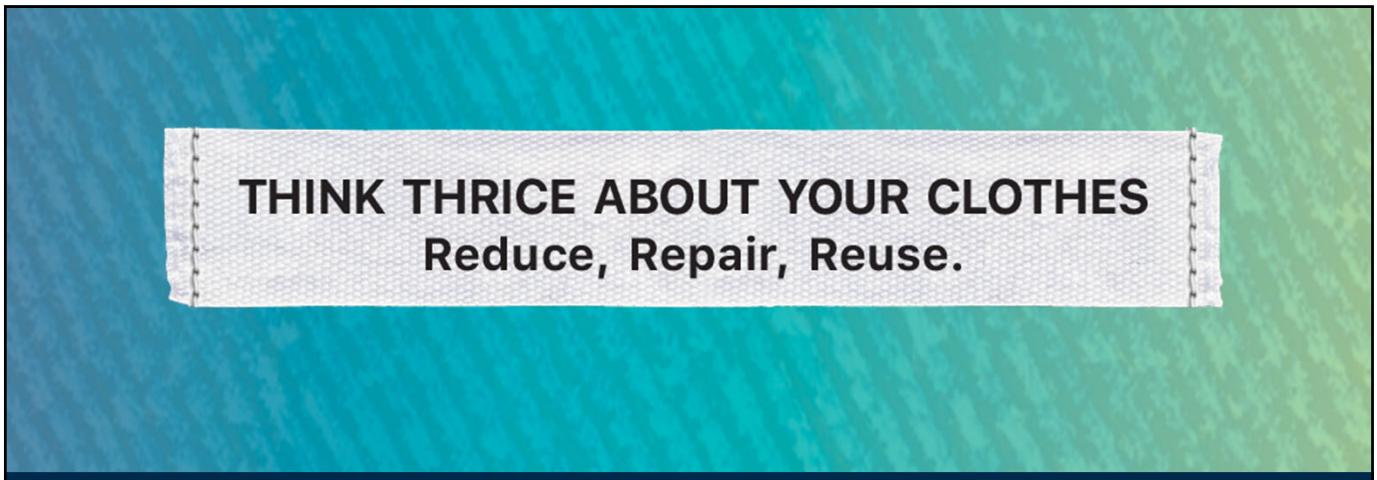
Posters





Social Media





2024 Regional Clothing Waste Reduction Campaign Results

THINK THRICE ABOUT YOUR CLOTHES

Jay Soper
Communications Specialist, Corporate Communications

Zero Waste Committee Meeting, July 4, 2024
68985745

metrovancouver

CAMPAIGN SUMMARY

In-Market Dates:

- February 26 – April 28, 2024
- Sixth year of regional clothing waste reduction campaign

Objectives:

- Increase diversion of textile waste from the waste stream
- Empower residents to take action reduce their textile waste (**reduce, repair, reuse**)

Audience:

- Primary: 18-44 year olds in Metro Vancouver region, 75% female / 25% male
  - On average, women purchase and shop more frequently for clothing, footwear, accessories, linens, and other fabrics than do men.
  - The average number of items purchased decreases with age. Residents aged 65 and older purchase the fewest clothing items and shop least frequently.

Caption here

CAMPAIGN STRATEGY

- Encourage residents to look for long lasting clothing
  - Share tips and information on how to identify quality items (natural fibres, stitching, seams, clothing weave, etc.)
  - Highlight options to shop second-hand, clothing swaps, capsule wardrobes
- Highlight “care and repair” options, such as mending, altering, laundry tips, stain removal
- Clarify what can be donated or recycled, and where
- Focus on positive, hopeful, and action-oriented messaging
- Drive residents to think-thrice.ca for tips and information

PROMOTIONAL STRATEGY

Digital

- Facebook, Instagram, Pinterest, influencer content, YouTube video
- Google Search (year round)

Broadcast

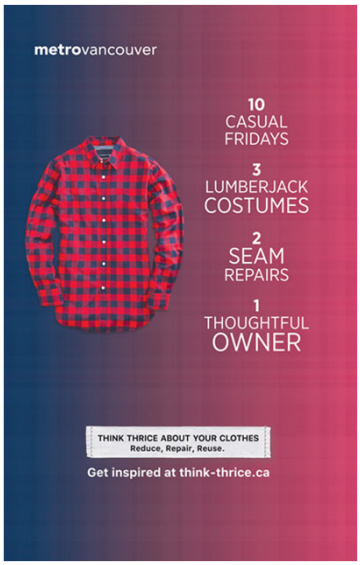
- TV PSA
- Radio (CFOX, Virgin)

Out-of-Home

- Super Bus Kings (12 throughout the region)
- SkyTrain Posters
- LED Spectaculars (Metrotown, Broadway City Hall, Commercial & Broadway)
- Campus Digital Screens (43 screens, 12 locations)
- Community Outreach events (April 20 & 27)

REFRESHED CAMPAIGN CREATIVE

REFRESHED CAMPAIGN CREATIVE



CAMPAIGN HIGHLIGHTS

- **Campaign delivered over 42.8 million impressions**
  - Out-of-home: 31.1 million
  - Digital: 9.4 million
  - Radio: 2.3 million (286 spots)
  - Television PSA aired 2,912 times to TELUS subscribers in the region
  - 387,900+ video views on YouTube

- **Campaign website had over 15,800 visits**
  - Google Search and social media (Facebook and Instagram) were largest source of website traffic
  - Most popular pages within donation and recycling section

CAMPAIGN HIGHLIGHTS

Out-of-Home – Super Bus Kings

12 bus exteriors
- Vancouver
- North Vancouver
- Burnaby
- Richmond
- Surrey
- Delta
- Port Coquitlam

Metrotown Station, Burnaby

CAMPAIGN HIGHLIGHTS

Out-of-Home – SkyTrain Posters

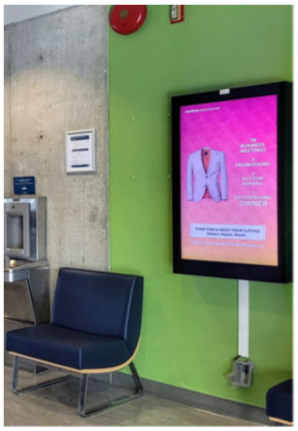
16 platform locations

- Vancouver
- Burnaby
- Coquitlam
- New West
- Surrey
- Richmond

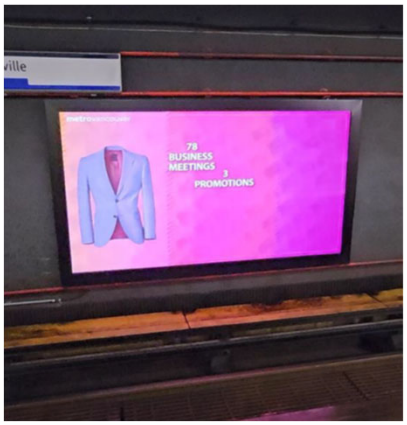
Lougheed Town Centre, Coquitlam

CAMPAIGN HIGHLIGHTS

Out-of-Home – Digital Screens



BCIT – Burnaby

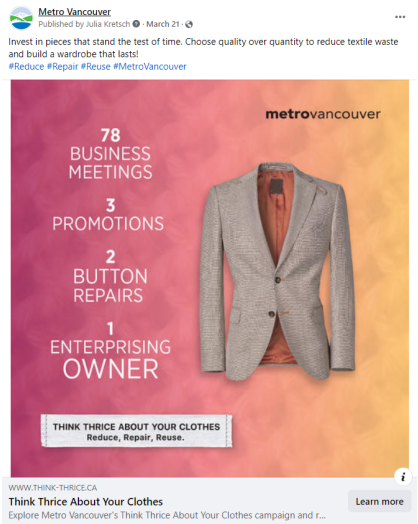


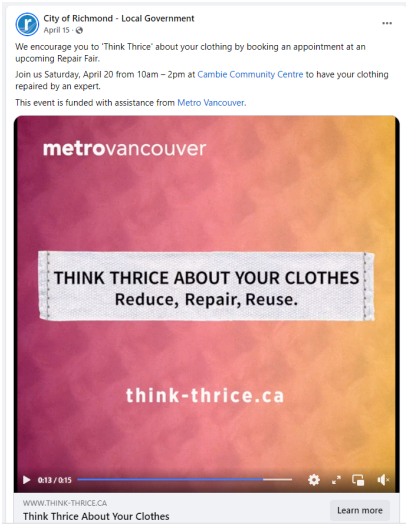
Granville Station – Vancouver

SkyTrain LED Spectacular

CAMPAIGN HIGHLIGHTS
Television PSA

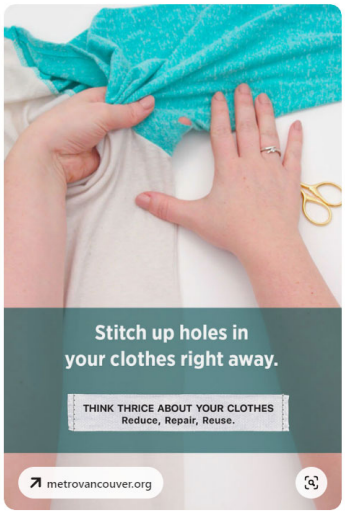
CAMPAIGN HIGHLIGHTS
Social Media





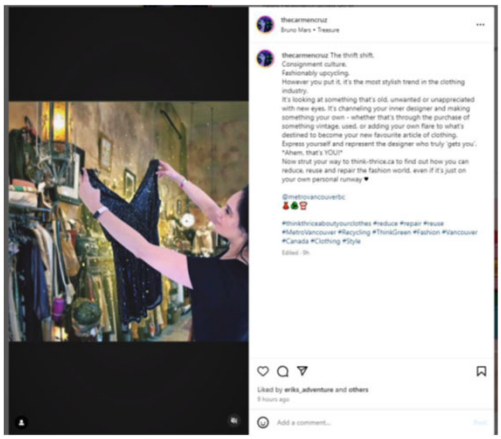
CAMPAIGN HIGHLIGHTS

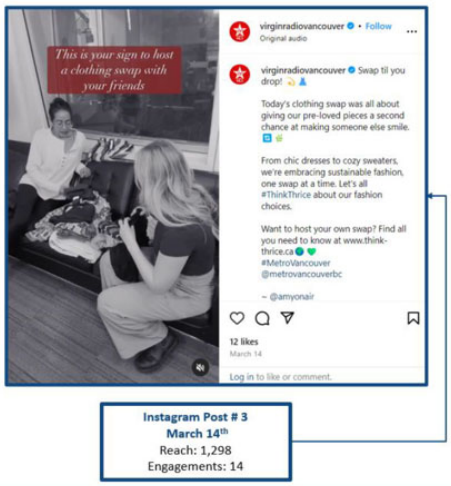
Pinterest



CAMPAIGN HIGHLIGHTS

Radio Host Endorsements



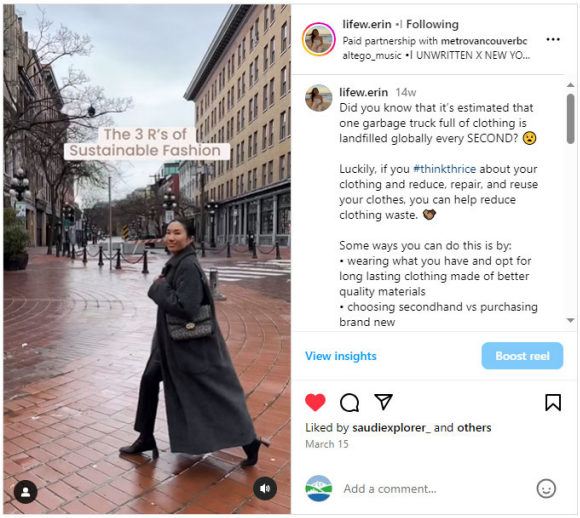


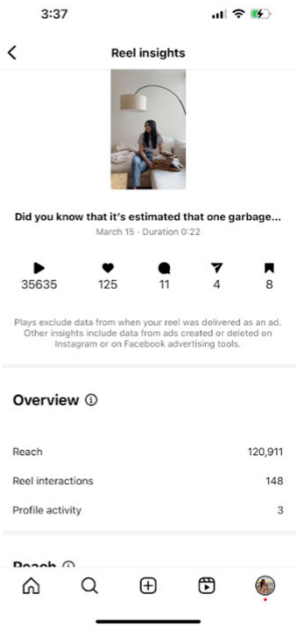
Instagram Post # 3
March 14th
Reach: 1,298
Engagements: 14

CAMPAIGN HIGHLIGHTS

Influencer

[Erin Jay]





CAMPAIGN HIGHLIGHTS

Community Outreach

Earth Day, Cambie Community Centre, Richmond – April 20

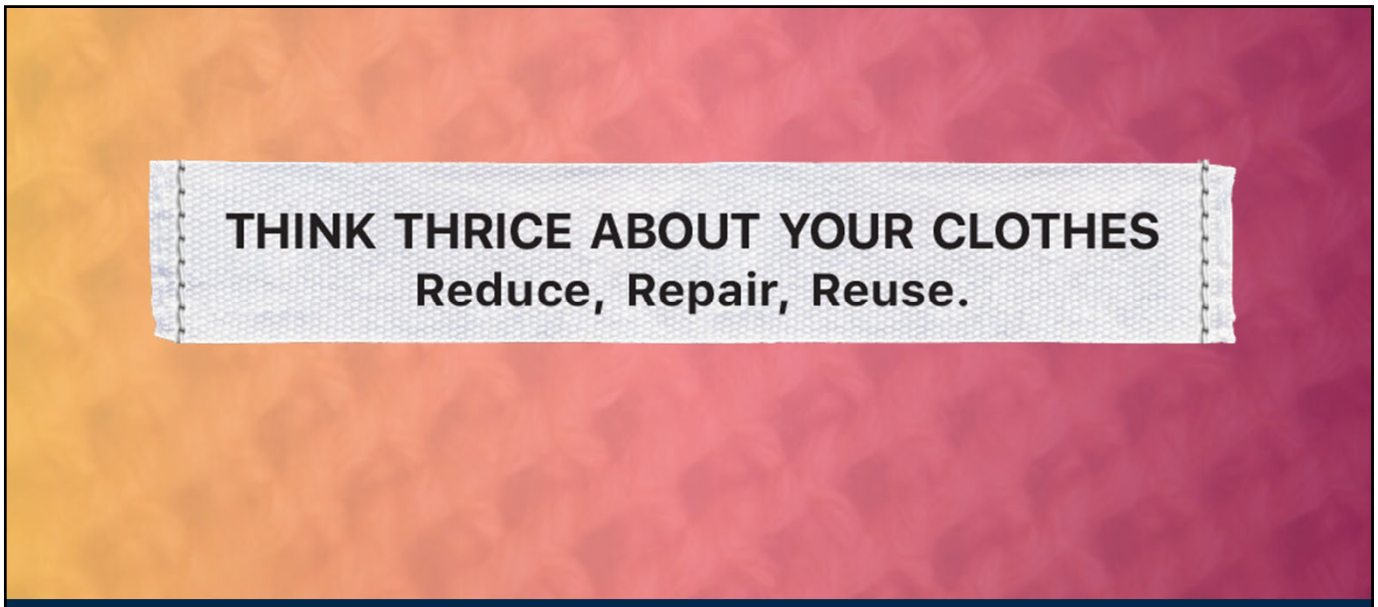
Free Clothing Donation and Swap, Lord Byng Secondary, Vancouver – April 27

POST-CAMPAIGN SURVEY FINDINGS

- Residents more inclined to donate clothing (67%) to reduce waste
- Suggestions to reduce textile consumption garner mixed reactions: the most well-received messages are buying long-lasting (50%) and repairing damaged clothes (25%)
- Residents aged 18-34 were most likely to say they've seen or heard advertising
- Half of residents (50%) say they are now more likely to buy clothing that lasts longer, while just under half (42%) will repair clothing and (35%) will reduce the amount of clothing consumed
- Four-in-ten (30%) residents who saw or heard Metro Vancouver's advertising say they discussed its message with others
- Residents most likely to have seen or heard the ads on SkyTrain platforms (60%) and social media (56%)

PLANS FOR 2025

- Current campaign strategy offers multiple solutions for residents to reduce clothing waste
- Research findings and understanding of residents' barriers suggests opportunity to revisit campaign purpose and creative platform
- Focus on refining campaign objectives and revisiting audience barriers to find most influential issue residents are motivated to change



Questions?

metrovancouver
Together we make our region strong

19

To: Zero Waste Committee

From: Allen Jensen, Senior Project Engineer, Solid Waste Services

Date: June 27, 2024 Meeting Date: July 4, 2024

Subject: **Commercial Organics Recycling: GVS&DD Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024**

RECOMMENDATION

That the GVS&DD Board:

a) approve an amendment to the Tipping Fee Bylaw to add a new recycling fee titled "Commercial Organics" with a fee of $140 per metric tonne, effective September 1, 2024;
b) give first, second and third reading to *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*; and
c) adopt *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*.

EXECUTIVE SUMMARY

The *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024* (Tipping Fee Bylaw) sets rates and requirements at Metro Vancouver solid waste facilities. This report proposes the addition of a commercial organics recycling fee of $140 per tonne at the North Shore Recycling and Waste Centre to take effect September 1, 2024.

Commercial organics (primarily multi-family and commercial/institutional food scraps) have been accepted at the North Shore Recycling and Waste Centre on a pilot basis since the fall of 2022 following the closure of a private organics receiving facility. The current fee for commercial organics was set because the commercial organics were commingled with other higher quality organics. The current fee is below market rates for the service. The pilot demonstrated that commercial organics have higher contamination rates and need to be managed separately from other organics. The proposed fee covers the cost of processing commercial organics, primarily at an anaerobic digestion facility in the Fraser Valley creating renewable natural gas.

PURPOSE

To recommend changes to the Tipping Fee Bylaw to add a new recycling fee for commercial organics and seek GVS&DD Board adoption of *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024.*

BACKGROUND

The Tipping Fee Bylaw sets levies, rates, charges, and disposal ban requirements at Metro Vancouver solid waste facilities, under the authority of the *Greater Vancouver Sewerage and Drainage District Act.* This report recommends adding a new recycling fee for commercial organics effective September 1, 2024.

COMMERCIAL SOURCE SEPERATED ORGANICS

Metro Vancouver contracts with Arrow Transportation Systems Inc. (Arrow) to manage municipally collected single family organics, yard trimmings, and clean wood at the North Shore Recycling and Waste Centre. The contract historically did not include the processing of commercial organics, composed primarily of food scraps collected from multi-family and commercial/institutional generators, as commercial organics were not initially accepted for recycling.

In October 2022, a private commercial organics receiving facility in Vancouver closed, reducing options for management of commercial organics in the region. Metro Vancouver worked with Arrow to begin the receipt of commercial organics at the North Shore Recycling and Waste Centre on a pilot basis. Currently, approximately 1,000 tonnes per month of the commercial organics are received at the North Shore Recycling and Waste Centre, or roughly 25% of all of the organics received at that facility. The pilot has demonstrated that commercial organics are more challenging to manage than other organics received at the facility due to higher levels of contamination and the high food waste content of the material.

The Arrow contract is being amended to allow processing of commercial organics primarily at an anaerobic digestion facility in the Fraser Valley. The anaerobic digestion facility is better suited to receive the material and produces biogas that is converted to renewable natural gas. Due to the level of contamination and other challenges of managing commercial organics, the processing fee is higher than for other organic material.

Proposed Commercial Organics Rate

Organic materials received at the North Shore Recycling and Waste Centre are currently accepted at $113 per tonne. The existing $113 per tonne rate was previously possible due to the comingling of commercial organics with higher quality organics, and is below the market rate for commercial organics. To cover the additional costs associated with managing commercial organics separately from other organics, the proposed recycling fee to receive these materials is $140 per tonne. The proposed $140 per tonne recycling fee ensures that receipt of the commercial organics is on a cost neutral basis, and aligns with the market price for processing commercial organics. Commercial haulers have the option of using private facilities if the Metro Vancouver fee exceeds the market rate.

Updates to the Tipping Fee Bylaw to accommodate the change are included in the proposed *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024* (Attachment 1). A blackline version of the proposed changes to the Tipping Fee Bylaw is included as attachment 2.

If the amendment bylaw is approved, Metro Vancouver would notify its solid waste facility customers. The proposed effective date of September 1, 2024 would allow time for haulers to communicate with their customers prior to the change.

ALTERNATIVES

1. That the GVS&DD Board:
   a) approve an amendment to the Tipping Fee Bylaw to add a new recycling fee titled "Commercial Organics" with a fee of $140 per metric tonne, effective September 1, 2024;
   b) give first, second and third reading to *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*; and
   c) adopt *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*.

2. That the GVS&DD Board receive for information the report dated June 27, 2024, titled "Commercial Organics Recycling: GVS&DD Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

If the Board approves Alternative 1, the amendment bylaw will take effect September 1, 2024. The proposed $140 per tonne recycling fee will fund the additional costs associated with processing commercial organics.

CONCLUSION

A pilot program involving the receipt of commercial organics at the North Shore Recycling and Waste Centre has demonstrated that these materials are more contaminated than other organics and cannot be comingled with other organics for processing. The additional complexity of processing commercial organics results in a higher processing cost, necessitating the change in the recycling fee for these materials to recover costs. Staff recommend Alternative 1, that the Board amend the Tipping Fee Bylaw to add a $140 per tonne recycling fee for commercial organics.

ATTACHMENTS

1. *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024*
2. Blackline Version Proposed Changes to *Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024*

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GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
BYLAW NO. 381, 2024
A bylaw to amend Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024

WHEREAS:

A. the Greater Vancouver Sewerage and Drainage District ("GVS&DD") Board (the "Board") adopted the "Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024", a bylaw to establish, among other things, scales of charges for services rendered by the GVS&DD and for the use of any of the GVS&DD's waste disposal facilities; and

B. the Board wishes to amend "Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024" as set out in this bylaw.

NOW THEREFORE the Board of the Greater Vancouver Sewerage and Drainage District enacts as follows:

Citation

1. The official citation of this bylaw is "Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Amendment Bylaw No. 381, 2024".

Effective Date

2. This bylaw will come into force and take effect on September 1, 2024.

Schedule

3. The following Schedule is attached to and form part of this bylaw:
    - Schedule "B", Fees and Surcharges.

Amendment of Bylaw

4. "Greater Vancouver Sewerage and Drainage District Tipping Fee and Solid Waste Disposal Regulation Bylaw No. 379, 2024" is amended as follows:

    (a) Section 5.1 is amended by:

        i. adding the following new definition in alphabetical order:

        "Commercial Organics" means unpackaged Food Waste, Green Waste, Clean Wood, Recyclable Paper that has been soiled by or comingled with food residue, tissue paper, paper napkins or towels, or any combination thereof, other than Municipal Organics, that is picked up from or transported for residential, commercial or institutional sources and that does not contain:

        (i) more than 0.5% (by wet weight) of any other type of Solid Waste; or

(ii) plastic bags or bin liners, whether or not labelled 'biodegradable' or 'compostable';

ii. Deleting and replacing the definition "**Recycling Area**" with the following definition:

"Recycling Area" means those parts of a Solid Waste Facility or Vancouver Disposal Site designated for Green Waste, Municipal Organics, Commercial Organics, Source-Separated Organic Waste, Clean Wood, Gypsum, Mattresses and the specific materials, substances and objects that comprise Recyclable Material;

iii. Deleting and replacing the definition "**Recycling Fee**" with the following definition:

"Recycling Fee" means the recycling fee charged by the GVS&DD for Green Waste, Municipal Organics, Commercial Organics, Source-Separated Organic Waste, Clean Wood, Gypsum, Mattresses and the specific materials, substances and objects that comprise Recyclable Material dropped off in the designated Recycling Area at a Solid Waste Facility, as set out in Table 3 of Schedule "B";

(b) Section 7.13 is revised by adding the phrase "(other than Commercial Organics)" after the phrase "Source-Separated Organic Waste".

(c) A new Section 7.14 is added as set out below, and current sections 7.14 to 7.27, and all references to those sections, are renumbered accordingly:

7.14 Every person who drops off a Load of Commercial Organics at a designated Recycling Area that contains more than 0.5% (by wet weight) of any other type of Solid Waste must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

(d) Table 3 in Schedule "B" is deleted in its entirety and replaced with Table 3 in Schedule "B" attached to this bylaw.

(e) Table 4 in Schedule "B" is deleted in its entirety and replaced with Table 4 in Schedule "B" attached to this bylaw.

Read a first, second, and third time this _____ day of _____, _____.

Adopted this _____ day of _____, _____.

_____
Board Chair

_____
Dorothy Shermer, Corporate Officer

Table 3 - Recycling Fees for Recyclable Material dropped off in designated Recycling Areas

	North Shore Recycling and Waste Centre	North Surrey Recycling and Waste Centre	United Boulevard Recycling and Waste Centre	Central Surrey Recycling and Waste Centre	Maple Ridge Recycling and Waste Centre	Langley Recycling and Waste Centre	Waste-to-Energy Facility
Municipal Organics	$113/metric tonne, $10 minimum	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.
Commercial Organics	$140/metric tonne, $10 minimum	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.
Source-Separated Organic Waste	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	Not accepted.
Green Waste	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	Not accepted.
Clean Wood	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum.	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum.	Not accepted.
Gypsum – New: less than ½ metric tonne	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	Not accepted.
Gypsum – Used: less than ½ metric tonne	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	Not accepted.
Mattresses	$15 per Mattress	$15 per Mattress	$15 per Mattress	$15 per Mattress	$15 per Mattress	$15 per Mattress	Not accepted.

Table 4 – Surcharges

Loads containing Banned Recyclable Materials other than Food Waste or Expanded Polystyrene Packaging that exceeds either 5% of the total weight of the Load or 5% of the total volume of the Load (section 7.9)	50% of the applicable Tipping Fee
Loads containing Contaminated Recyclable Paper that exceeds either 5% of the total weight of the Load or 5% of the total volume of the Load (section 7.10)	50% of the applicable Tipping Fee
Loads containing Expanded Polystyrene Packaging that exceeds either 20% of the total weight of the Load or 20% of the total volume of the Load (section 7.11)	100% of the applicable Tipping Fee
Loads containing Food Waste that exceeds either 25% of the total weight of the Load or 25% of the total volume of the Load (section 7.12)	50% of the applicable Tipping Fee
Loads of Municipal Organics or Source-Separated Organic Waste (other than Commercial Organics) containing more than 0.05% (by wet weight) of any other type of Solid Waste (section 7.13)	$50 per Load
Loads of Commercial Organics containing more than 0.5% (by wet weight) of any other type of Solid Waste (section 7.14)	$50 per Load
Loads containing any Hazardous and Operational Impact Materials or Product Stewardship Materials (section 7.15)	$73 per Load plus any remediation or clean-up costs
Unsecured Loads (section 7.16)	50% of the applicable Tipping Fee to a maximum of $50.00

(ii) wastes from hatcheries or dairy processing;

(iii) digestates from anaerobic digestion;

(iv) materials produced or used in accordance with the *Organic Matter Recycling Regulation*, B.C. Reg. 76/2022;

(v) soil amendments within the meaning of, and used in accordance with, the *Code of Practice for Soil Amendments,* B.C. Reg. 40/2021; or

(vi) fish feces;

"Banned Recyclable Materials" means the specific materials, substances and objects listed in Schedule "D";

"Board" means the board of directors of the GVSⅅ

"Clean Wood" means Municipal Solid Waste that comprises solid wood, lumber or pallets:

(i) that does not contain any glues or resins;

(ii) that is unpainted, unstained and untreated; and

(iii) that may or may not be pierced with nails or other metal fasteners;

"Collection Location" means a civic address from which a Waste Hauler picks up or transports Solid Waste;

"Commercial Organics" means unpackaged Food Waste, Green Waste, Clean Wood, Recyclable Paper that has been soiled by or comingled with food residue, tissue paper, paper napkins or towels, or any combination thereof, other than Municipal Organics, that is picked up from or transported for residential, commercial or institutional sources and that does not contain:

(i) more than 0.5% (by wet weight) of any other type of Solid Waste; or

(ii) plastic bags or bin liners, whether or not labelled 'biodegradable' or 'compostable';

"Compliance Manager" means the person employed by MVRD as the Director of Environmental Regulation and Enforcement and includes any person designated to act in their place from time to time;

"Quarter" or **"Quarterly"** means, within any calendar year, the three month period from January 1 to March 31, April 1 to June 30, July 1 to September 30, or October 1 to December 31;

"Receiving Facility" means a Solid Waste Facility, Vancouver Disposal Site or other facility or location to which a Waste Hauler delivers Solid Waste;

"Recyclable Material" means Municipal Solid Waste that has been diverted from disposal, and satisfies at least one of the following criteria:

(i) is organic material from residential, commercial or institutional sources and is capable of being or is being composted or anaerobically digested at a site;

(ii) is managed as a marketable commodity with an established market by the owner or operator of a site;

(iii) is being used in the manufacture of a new product that has an established market or is being processed as an intermediate stage of an existing manufacturing process;

(iv) has been identified as a recyclable material in the Solid Waste Management Plan; or

(v) is any other material prescribed by the Lieutenant Governor in Council, or the Minister of Environment and Climate Change Strategy pursuant to the *Environmental Management Act*;

"Recyclable Paper" means Municipal Solid Waste manufactured from thin sheets from wood pulp or other fibrous substances that may be converted into reusable materials and includes newspapers and inserts, magazines, telephone directories, catalogues, office papers, envelopes, boxboard, paper bags and mail, but excluding photographic paper, carbon paper, tissue paper, paper napkins or towels, and paper that is adhered to or coated with plastic or metal;

"Recycling Area" means those parts of a Solid Waste Facility or Vancouver Disposal Site designated for Green Waste, Municipal Organics, Commercial Organics, Source-Separated Organic Waste, Clean Wood, Gypsum, Mattresses and the specific materials, substances and objects that comprise Recyclable Material;

"Recycling Fee" means the recycling fee charged by the GVS&DD for Green Waste, Municipal Organics, Commercial Organics, Source-Separated Organic Waste, Clean Wood, Gypsum, Mattresses and the specific materials, substances and objects that comprise Recyclable Material dropped off in the designated Recycling Area at a Solid Waste Facility, as set out in Table 3 of Schedule "B";

7.7 Unless otherwise permitted pursuant to a written agreement between a municipality and the GVS&DD, every person who drops off a Load of Municipal Organics, Source-Separated Organic Waste, Green Waste, Clean Wood, Gypsum or Mattresses at a designated Recycling Area must pay the applicable Recycling Fee set out in Table 3 of Schedule "B".

7.8 If a person attends a Solid Waste Facility with a Load that contains any combination of Source-Separated Organic Waste, Green Waste, Food Waste, Clean Wood, Gypsum, Mattresses, Recyclable Material and/or other Solid Waste and the person chooses not to weigh-out after dropping off each part of the Load at the designated Recycling Areas, then the person must pay to the GVS&DD the Tipping Fee or Recycling Fee for the entire Load that is based on the highest fee payable for any part of the Load, in the amounts set out in Schedule "B", together with any applicable Surcharges.

7.9 Every person who disposes of a Load at a Solid Waste Facility that contains a quantity of Banned Recyclable Materials other than Food Waste or Expanded Polystyrene Packaging that exceeds either 5% of the total weight of the Load or 5% of the total volume of the Load must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

7.10 Every person who disposes of a Load at a Solid Waste Facility that contains Contaminated Recyclable Paper that exceeds either 5% of the total weight of the Load or 5% of the total volume of the Load must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

7.11 Every person who disposes of a Load at a Solid Waste Facility that contains Expanded Polystyrene Packaging that exceeds either 20% of the total weight of the Load or 20% of the total volume of the Load must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

7.12 Every person who disposes of a Load at a Solid Waste Facility that contains Food Waste that exceeds either 25% of the total weight of the Load or 25% of the total volume of the Load must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

7.13 Every person who drops off a Load of Municipal Organics or Source-Separated Organic Waste (other than Commercial Organics) at a designated Recycling Area that contains more than 0.05% (by wet weight) of any other type of Solid Waste must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

7.14 Every person who drops off a Load of Commercial Organics at a designated Recycling Area that contains more than 0.5% (by wet weight) of any other type of Solid Waste must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

~~7.14~~7.15 Every person who disposes of a Load at a Solid Waste Facility that contains any Hazardous and Operational Impact Materials or Product Stewardship Materials must pay a Surcharge in the amount set out in Table 4 of Schedule "B", plus the costs of remediation

and clean-up.

~~7.15~~7.16 Every person who enters a Solid Waste Facility with an Unsecured Load must pay a Surcharge in the amount set out in Table 4 of Schedule "B".

~~7.16~~7.17 Special Handle Waste is exempt from all Surcharges, but if a Load of Special Handle Waste contains any Hazardous and Operational Impact Materials, it will be subject to the costs of remediation and clean-up.

~~7.17~~7.18 Where a single Load is subject to multiple Surcharges, the Surcharge with the highest value will apply for the weight of the entire Load.

~~7.18~~7.19 Despite anything else in this Bylaw, in advance of any person transporting a single Load or multiple Loads to a Solid Waste Facility, the Manager may, at their discretion, waive any Surcharge or Surcharges or a portion thereof for a specified period and for specified classes of persons.

~~7.19~~7.20 Despite anything else in this Bylaw, in the event of a service disruption at either a Solid Waste Facility or a Vancouver Disposal Site, in advance of any person transporting a single Load or multiple Loads to a Receiving Facility other than a Solid Waste Facility or Vancouver Disposal Site, the Manager may, at their discretion, waive the Generator Levy for a specified period and for specified classes of persons.

~~7.20~~7.21 Despite anything else in this Bylaw, the Manager may, at their discretion, waive all fees and Surcharges for a Load delivered to a Solid Waste Facility by a non-profit or volunteer group resulting from a community clean-up project, provided that:

(a) the community clean-up project is conducted within the geographic area of the MVRD;

(b) the community clean-up project involves collecting Noxious Weeds or Solid Waste from the natural environment from any of the following publicly owned areas:

(i) green space, such as natural areas, recreational parks or playgrounds;

(ii) roads;

(iii) marine shorelines and harbours; or

(iv) lakes, ponds, rivers, creeks, streams or other natural waterways.

(c) the Load does not contain Banned Recyclable Materials, Product Stewardship Materials, or Hazardous and Operational Impact Materials;

(d) the Manager receives an advance written request from the non-profit or volunteer group prior to the date the community clean-up project is to be held;

(e) the Manager confirms in writing to the non-profit or volunteer group that fees and Surcharges otherwise payable under this Bylaw will be waived; and

(f) the non-profit or volunteer group brings the Manager's written confirmation to the Solid Waste Facility at the time of disposal.

~~7.21~~7.22 The weigh scales at Solid Waste Facilities weigh to the nearest 0.005 metric tonnes. For any person who does not have a customer charge account, as described in Schedule "F", the total amount payable to the GVS&DD is rounded to the nearest dollar.

~~7.22~~7.23 Every person who enters a Solid Waste Facility to obtain a Weight Only Ticket must pay a fee of $15 per ticket.

~~7.23~~7.24 Every person who disposes of a Load at the Waste-to-Energy Facility that is made up of at least 85% by weight of metals will receive a credit of $25 per metric tonne on exiting the scale house at the Waste-to-Energy Facility.

~~7.24~~7.25 Despite section 7.4, any person may apply to the GVS&DD for a customer charge account in accordance with Schedule "F".

~~7.25~~7.26 In the event the weigh scale system at a Solid Waste Facility is not functioning for any reason, the Manager may, at their discretion:

(a) close the Solid Waste Facility until the weigh scale system is functioning; or

(b) permit a person to dispose of a single Load at the Solid Waste Facility subject to the following:

(i) the Load must not measure more than 0.5 cubic metres in volume; and

(ii) the minimum Tipping Fee set out in Table 1 of Schedule "B", plus the Transaction Fee, will be charged for the Load.

~~7.26~~7.27 In the event that a person enters a Solid Waste Facility with a rental vehicle, out-of-province or dealer licence plate, or previously left without payment, then a $50 deposit is required on entry to the Solid Waste Facility.

~~7.27~~7.28 All unpaid fees, charges or levies imposed by this Bylaw are a debt due to the GVS&DD and the GVS&DD may take such action as it considers necessary and as permitted by law to collect the debt.

Table 3 - Recycling Fees for Recyclable Material dropped off in designated Recycling Areas

	North Shore Recycling and Waste Centre	North Surrey Recycling and Waste Centre	United Boulevard Recycling and Waste Centre	Central Surrey Recycling and Waste Centre	Maple Ridge Recycling and Waste Centre	Langley Recycling and Waste Centre	Waste-to-Energy Facility
Municipal Organics	$113/metric tonne, $10 minimum	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.
Commercial Organics	$140/metric tonne, $10 minimum	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.	Not accepted.
Source-Separated Organic Waste	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	Not accepted.
Green Waste	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	Not accepted.
Clean Wood	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum.	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum	$113/metric tonne, $10 minimum.	Not accepted.
Gypsum – New: less than ½ metric tonne	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	$150/metric tonne, $10 minimum	Not accepted.
Gypsum – Used: less than ½ metric tonne	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	$200/metric tonne, $10 minimum	Not accepted.
Mattresses	$15 per Mattress	$15 per Mattress	$15 per Mattress	$15 per Mattress	$15 per Mattress	$15 per Mattress	Not accepted.

Table 4 – Surcharges

Loads containing Banned Recyclable Materials other than Food Waste or Expanded Polystyrene Packaging that exceeds either 5% of the total weight of the Load or 5% of the total volume of the Load (section 7.9)	50% of the applicable Tipping Fee
Loads containing Contaminated Recyclable Paper that exceeds either 5% of the total weight of the Load or 5% of the total volume of the Load (section 7.10)	50% of the applicable Tipping Fee
Loads containing Expanded Polystyrene Packaging that exceeds either 20% of the total weight of the Load or 20% of the total volume of the Load (section 7.11)	100% of the applicable Tipping Fee
Loads containing Food Waste that exceeds either 25% of the total weight of the Load or 25% of the total volume of the Load (section 7.12)	50% of the applicable Tipping Fee
Loads of Municipal Organics or Source-Separated Organic Waste containing more than 0.05% (by wet weight) of any other type of Solid Waste (section 7.13)	$50 per Load
Loads of Commercial Organics containing more than 0.5% (by wet weight) of any other type of Solid Waste (section 7.14)	$50 per Load
Loads containing any Hazardous and Operational Impact Materials or Product Stewardship Materials (section 7.154)	$73 per Load plus any remediation or clean-up costs
Unsecured Loads (section 7.165)	50% of the applicable Tipping Fee to a maximum of $50.00

To: Zero Waste Committee

From: Sarah Wellman, P.Eng., Senior Engineer, Solid Waste Services

Date: June 26, 2024 Meeting Date: July 4, 2024

Subject: **Waste-to-Energy Facility Environmental Monitoring and Reporting 2023 Update**

RECOMMENDATION

That the Zero Waste Committee receive for information the report dated June 26, 2024, titled "Waste-to-Energy Facility Environmental Monitoring and Reporting 2023 Update".

EXECUTIVE SUMMARY

This report provides the Waste-to-Energy environmental performance update for 2023.

All air emission related parameters monitored during 2023 were similar to 2022, and well below regulatory limits in the Waste-to-Energy Facility Provincial Operational Certificate. The Waste-to-Energy Facility's contributions of nitrogen dioxide, fine particulates, and anthropogenic (human caused) greenhouse gases are less than 1% of regional emissions. Emission data is reported to various regulatory agencies and posted on the Metro Vancouver website.

Ambient air quality monitoring in proximity to the Waste-to-Energy Facility found sulphur dioxide, hydrogen chloride and nitrogen dioxide ambient levels are low, and that other regional sources are the primary drivers of ambient concentrations of these parameters in proximity to the Waste-to-Energy Facility. Metro Vancouver has submitted a request to the BC Ministry of Environment and Climate Changes Strategy to amend the Waste-to-Energy Operational Certificate extending the interim discharge limits for sulfur dioxide and hydrogen chloride to March 3, 2028, to allow for additional ambient air monitoring both in the vicinity of the Waste-to-Energy Facility, and at other monitoring stations.

PURPOSE

The purpose of this report is to provide the Zero Waste Committee with an annual overview of the Waste-to-Energy Facility's environmental monitoring program and implementation of Provincial Operational Certificate requirements.

BACKGROUND

Metro Vancouver continuously monitors the environmental performance of the Metro Vancouver Waste-to-Energy Facility and, since 2010, annual environmental performance summaries have been provided to the Zero Waste Committee.

This report provides updates on the facility's 2023 environmental performance. Annually reporting on the environmental performance of the Waste-to-Energy Facility is included in the Zero Waste Committee work plan.

ENVIRONMENTAL MONITORING AND REPORTING UPDATE

Since the Waste-to-Energy Facility opened in 1988, Metro Vancouver has continually reduced emissions through assessment, operational and plant infrastructure improvements, and environmental controls. All air emission related parameters monitored during 2023 were in compliance with the requirements of Operational Certificate 107051.

To assess regulatory compliance, measurements from the environmental monitoring program are compared to the regulatory limits specified in the Waste-to-Energy Facility Operational Certificate 107051 issued by the BC Ministry of Environment and Climate Change Strategy. Results are reported in the following ways:

- Monthly compliance reports, which provide a summary of all air emissions monitoring results for each month, are provided to the BC Ministry of Environment and Climate Change Strategy, City of Burnaby, and Fraser Health Authority.
- Results of manual stack testing, conducted four times per year by an independent company, are provided to the BC Ministry of Environment and Climate Change Strategy, City of Burnaby, and Fraser Health Authority.
- Results from annual stack testing for semi-volatile organic compounds are provided to the BC Ministry of Environment and Climate Change Strategy, City of Burnaby, and Fraser Health Authority.
- Annual reporting of greenhouse gas emissions is provided to the BC Ministry of Environment and Climate Change Strategy and Environment and Climate Change Canada.
- Annual reporting of substances emitted into the air and contained in bottom ash and fly ash is provided to Environment and Climate Change Canada for the National Pollutant Release Inventory.

Environmental Monitoring Program

The 2023 Waste-to-Energy Facility environmental monitoring program consisted of the following:

- Air Emissions Monitoring – Continuous Emission Monitoring System:
    - The Waste-to-Energy Facility is equipped with a real-time flue gas continuous emission monitoring system that measures and records emission parameters at the exit of the air pollution control plant 24 hours per day, seven days a week, using a United States Environmental Protection Agency certified and auditable tracking system.
    - The following parameters are measured: sulphur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, hydrogen chloride, total hydrocarbons, and opacity.
    - The following key operational parameters are also monitored: furnace temperature, total flue gas flow, flue gas moisture, and flue gas oxygen.
- Air Emissions Monitoring – Periodic Manual Stack Testing:
    - Triplicate tests are conducted four times per year on each of the three plant lines to measure particulate matter, trace metals, and hydrogen fluoride.
    - A single test is conducted annually on one boiler (rotating between boilers each year) in triplicate to monitor for semi-volatile organic compounds, including dioxins and furans, chlorobenzenes, chlorophenols, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons.
- Fly and Bottom Ash Monitoring:

- Each fly ash load is tested prior to transport and disposal.
- Bottom ash samples are collected from each truck loaded with bottom ash for transport and disposal. Samples are combined to form a weekly composite sample for analysis.

Continuous emission monitoring data, grab sample data, and fly ash and bottom ash analytical data are all posted on the Metro Vancouver website along with an annual report for the facility.

Comparison with Regulatory Limits

Table 1 shows comparisons for various emission parameters with regulatory limits. Overall, the Metro Vancouver Waste-to-Energy Facility operates well within environmental standards.

Table 1: 2023 Emissions Summary Table

Parameter (Average Values)	Units	Regulatory Levels	2023 Emissions Data	Percentage Of Limit
Manual Stack Tests:				
Particulate Matter	mg/dscm	9	1.1	13%
Hydrogen Fluoride (HF)	mg/dscm	1	0.04	4%
Sum of Lead, Arsenic, and Chromium	ug/dscm	64.0	4.1	6%
Cadmium (Cd)	ug/dscm	7.0	0.2	3%
Mercury (Hg)	ug/dscm	20.0	0.05	0.2%
Trace Organics Tests:				
Dioxins/Furans (PCDD/PCDF)	ng/dscm	0.08	ND	-
Chlorophenols	ug/dscm	1	0.006	1%
Chlorobenzenes	ug/dscm	1	0.35	35%
Polycyclic Aromatic Hydrocarbons (PAHs)	ug/dscm	5	0.08	2%
Polychlorinated Biphenyls (PCBs)	ug/dscm	1	0.02	2%
Continuous Emissions Monitoring System:				
Nitrogen Oxides (NOx)	mg/dscm	190	131	69%
Carbon Monoxide (CO)	mg/dscm	50	28	57%
Sulphur Dioxide (SO_2)	mg/dscm	200	61	31%

Operational Certificate Implementation and Ambient Air Monitoring

On December 3, 2020, the Metro Vancouver Waste-to-Energy Facility Operational Certificate was amended to defer a reduction in discharge limits for hydrogen chloride and sulphur dioxide from December 31, 2022, to March 3, 2025.

Metro Vancouver has monitored ambient air monitoring quality at the locations modelled to be the most influenced by the Waste-to-Energy Facility. The monitoring concluded that ambient sulphur dioxide and hydrogen chloride are less than 10% of ambient air objectives, and below 3% of ambient air quality objectives ninety-eight percent of the time. Ambient nitrogen dioxide levels are within ambient air quality objectives and lower than many other monitoring stations within the region. The monitoring determined that there was no statistically significant correlation between the Waste-to-Energy Facility continuous emissions monitoring system data and ambient air quality data for hydrogen chloride, sulphur dioxide and nitrogen dioxide at the monitoring locations. The results suggest other regional emission sources are the primary drivers of the concentration of these parameters in proximity to the Waste-to-Energy Facility (Attachment 1). Metro Vancouver will continue to monitor ambient air quality levels at the Burnaby South air quality monitoring station, and will install hydrogen chloride monitors at other regional stations to obtain more information on sources of hydrogen chloride in the region.

Metro Vancouver has submitted a request to the Ministry of Environment and Climate Change Strategy to extend the interim discharge limits for hydrogen chloride and sulphur dioxide to March 3, 2028, to allow for additional ambient monitoring, particularly collecting more information on hydrogen chloride levels at other regional stations in comparison to the Burnaby South location.

Greenhouse Gas Emissions Reporting

Greenhouse gas emissions from the Waste-to-Energy Facility are comprised mainly of carbon dioxide with trace amounts of methane and nitrous oxides.

Non-biogenic (anthropogenic) emissions from the facility were 124,540 tonnes carbon dioxide equivalents, a 10% increase from 2022. This increase is primarily due to annual fluctuations in waste composition. Over the past five years, the anthropogenic portion of greenhouse gas emissions has ranged from 40% to 48%. More frequent monitoring of the portions of anthropogenic and biogenic carbon dioxide is being implemented. This is expected to reduce the annual variability of the data.

Overall greenhouse gas emissions from the facility in 2023, including both anthropogenic and biogenic, were 277,886 tonnes carbon dioxide equivalents, a decrease of approximately 3% compared to 2022. As in past reporting years, the Waste-to-Energy Facility accounted for less than 1% of all anthropogenic greenhouse gas emissions in the region.

National Pollutant Release Inventory Reporting

The National Pollutant Release Inventory is Canada’s legislated, publicly accessible inventory of pollutant releases to air, water, and land, as well as from disposal and transfer for recycling. The National Pollutant Release Inventory is managed by Environment and Climate Change Canada and currently tracks over 300 substances and groups of substances. Metro Vancouver is required to report air emissions (e.g., particulate matter, metals, organic compounds, and acid gases) and substances transported for off-site disposal, including fly ash and bottom ash for the preceding calendar year, to the National Pollutant Release Inventory. Table 2 summarizes the information which has been reported to the National Pollutant Release Inventory for 2023.

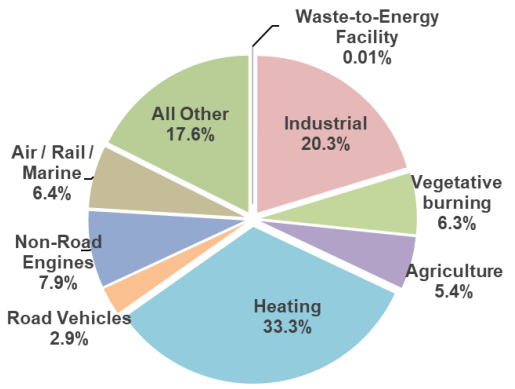
Table 2: 2023 National Pollutant Release Inventory Substance Reporting Summary

	Reported Quantity (tonnes)	
Substance	**Stack Emissions**	**Ash Disposal**
Nitrogen Oxides	215	N/A
Carbon Monoxide	46.8	N/A
Sulphur Dioxide	101	N/A
Hydrogen Chloride/Hydrochloric Acid	90.5	N/A
Aluminum (dust)	0.016	N/A
Arsenic	0.00082	1.04
Cadmium	0.00016	1.15
Cobalt	0.00015	2.3
Copper	0.0009	80.6
Lead	0.0011	20.0
Manganese	0.0013	26.0
Mercury	0.00008	0.052
Phosphorus	0.0031	488.6
Zinc	0.0086	184.9
Particulate Matter ≤ 10µm	0.86	N/A
Particulate Matter ≤ 2.5µm	0.69	N/A
Dioxins and Furans	N/A	N/A
Hexachlorobenzene	N/A	N/A

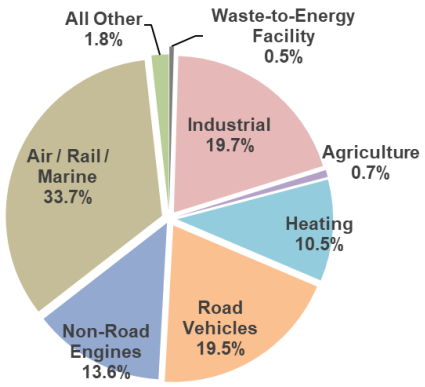
Waste-to-Energy Facility in a Regional Context

Figure 1 compares Waste-to-Energy Facility emissions to total emissions from all regional sources for two key air contaminants in the Lower Fraser Valley – fine particulate matter and nitrogen oxides (a key smog forming pollutant). In 2023, the Waste-to-Energy Facility accounted for 0.01% of regional fine particulate matter emissions and 0.5% of regional nitrogen oxide emissions. The Nitrogen Oxide Reduction Project, completed in October 2014, reduced nitrogen oxide emissions from 0.9% of the regional total in 2013 to 0.5% in 2023.

Figure 1: 2023 Regional Emissions Distribution



2023 Lower Fraser Valley Fine Particulate Matter Emission Sources



2023 Lower Fraser Valley Nitrogen Oxide Emission Sources

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

Activities related to emissions monitoring and reporting are included in the approved Solid Waste Services operational budget.

CONCLUSION

The Waste-to-Energy Facility operates well within environmental standards and regulatory limits. All air emission related parameters monitored during 2023 were in compliance with Operational Certificate 107051. Continuous emissions monitoring data and all compliance reports are available on the Metro Vancouver website. Ambient air monitoring at the Waste-to-Energy Facility and the nearby Burnaby South monitoring station show low levels of hydrogen chloride, sulfur dioxide and nitrogen dioxide, with analysis showing other emission sources as the primary drivers of the observed ambient concentrations for these parameters.

ATTACHMENTS

1. Waste-to-Energy Facility Ambient Air Monitoring Program Assessment 2021-2022 Summary
2. Presentation re: Waste-to-Energy Facility Environmental Monitoring and Reporting 2023 Update

68701510

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT

WASTE-TO-ENERGY FACILITY AMBIENT AIR MONITORING PROGRAM ASSESSMENT

2021 - 2022 SUMMARY

MAY 27, 2024

WASTE-TO-ENERGY FACILITY AMBIENT AIR MONITORING PROGRAM ASSESSMENT

2021 - 2022 SUMMARY

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT

PROJECT NO.: 211-10855-00
DATE: MAY 27, 2024

WSP
SUITE 1000
840 HOWE STREET
VANCOUVER, BC, CANADA V6Z 2M1

T: +1 604 685-9381
F: +1 604 683-8655
WSP.COM

May 27, 2024

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT
4730 Kingsway, Metrotower III, Mailroom 15th Floor
Burnaby, BC V5H 0C6

Attention: Sarah Wellman, Senior Engineer

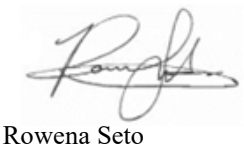
Dear Sarah:

Subject: WASTE-TO-ENERGY FACILITY AMBIENT AIR MONITORING PROGRAM ASSESSMENT - 2021 - 2022 SUMMARY

WSP Canada Inc. (WSP) submits this assessment report in fulfilment of the scope requirements under Greater Vancouver Sewerage and Drainage District contract No. 20-342 for the Waste-to-Energy Facility Ambient Air Monitoring Program Assessment. We trust that our report meets the project requirements and the Corporations expectations. If you have any questions or would like clarification regarding our submission, please reach out to the undersigned.

Yours sincerely,

Tyler Abel
Senior Air Quality Specialist



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1 EXECUTIVE SUMMARY

As a follow-up to the dispersion modelling and human health risk assessment studies conducted in 2018 in response to the requirements from the Metro Vancouver (MV) Waste-to-Energy Facility (WTEF) Operational Certificate (OC), issued December 15, 2016 by the BC Ministry of Environment and Climate Change Strategy, an ambient air monitoring station measuring NO_x, SO_2 and HCl was installed near the WTEF in 2020, and an HCl monitor was installed at Metro Vancouver Regional District's (MVRD) existing T18 – Burnaby South monitoring station. WSP Canada Inc. (WSP) prepared an assessment of the two-year monitoring program. Focusing on nitrogen oxides (NO_x), sulphur dioxide (SO_2) and hydrogen chloride (HCl) in the 2021 and 2022 calendar years, the purpose of this assessment was to evaluate the MV WTEF's contribution to ambient air quality by means of data analysis using ambient air quality data collected at two monitoring stations (S150 – MV WTEF and T18 - Burnaby South), MV WTEF emissions data, and air dispersion modelling results.

COMPARISON WITH AMBIENT AIR QUALITY OBJECTIVES

As a first step in the assessment, ambient concentrations of NO_2, SO_2, and HCl collected at the two MVRD monitoring stations during the 2021-2022 monitoring period were summarized and compared to ambient air quality objectives (AAQOs). Within the 2-year monitoring period, no exceedances of short-term nor long-term (1-hour, 24-hour, and annual) AAQOs for NO_2, SO_2, and HCl were recorded at either MVRD monitoring stations.

HCl and SO_2 concentrations were particularly low in comparison to AAQOs. For HCl, 1-hour maximum ambient air concentrations were 6% of the AAQO at the S150 – MV WTEF station and 9% of the AAQO at T18 – Burnaby South station. While the maximum concentrations of HCl monitored were low in comparison to AAQOs, in general, HCl concentrations were even lower, as 98% of the time, HCl concentrations were less than 3% of the ambient air quality objectives at both stations, highlighting that HCl was consistently low. For SO_2, 1-hour maximum ambient air concentrations were 10% of the AAQO at the S150 – MV WTEF station and 6% of the AAQO at the T18 – Burnaby South station. Similar to HCl concentrations though, 98% of the time, ambient concentrations of SO_2 were less than 2% of the AAQO at both stations.

NO_2 ambient air concentrations were higher in comparison to AAQOs than the other two pollutants analyzed., with 1-hour maximum ambient air concentrations at 76% of the AAQO at the S150 – MV WTEF station and 62% of the AAQO at the T18 – Burnaby South station. This was anticipated given that the primary contributor to NO_2 concentrations in the region are road traffic emissions. The two stations exhibited the expected trend of peak 1-hour average NO_2 concentrations during peak traffic. Slightly higher levels of NO_2 were measured at S150 – MV WTEF station compared to T18 – Burnaby South station, but both were clearly influenced primarily by traffic emissions.

WIND DATA ANALYSIS

Monitored concentrations during particular wind direction and wind speed conditions were analyzed as a tool to investigate directions and wind speeds from which contaminants may be originating from. Polar plots analyzing wind directions and wind speeds associated with monitored pollutant levels suggest the potential influence of WTEF emissions may be observable during Winter periods at the S150 – MV WTEF station, particularly during stagnant periods with low wind speeds. Seeing this relationship in the data is not unexpected given that the station was sited near the location with the highest expected ambient air concentrations identified by the WTEF dispersion modelling assessment. Although this relationship can be observed, as explained above maximum pollutant concentrations remained well below AAQOs and the levels predicted in the dispersion modelling assessment. During the Summer for S150 – MV WTEF, and at T18 – Burnaby South during the full year, measured ambient NO_2, SO_2, and HCl levels were likely associated with emissions from other sources combined with seasonal and regional meteorological patterns such as Summertime sea breezes.

RELATIONSHIP BETWEEN WTEF EMISSIONS DATA AND AMBIENT AIR MONITORING DATA

To further investigate whether the WTEF operations were impacting the levels of all three pollutants at the monitoring stations, an analysis was conducted using ambient concentrations of NO_2, SO_2, and HCl collected at S150 – MV WTEF station and T18 – Burnaby South station and continuous emissions monitoring (CEMS) data collected at MV WTEF's three boiler lines during the 2-year monitoring period. Specifically, linear regression models were utilized and determined no statistically significant linear correlation between WTEF CEMS readings and S150 and T18 ambient air quality data for all three pollutants. This suggests that there were other significant regional emission sources and meteorological factors that impact the ambient levels of NO_2, SO_2, and HCl recorded at both the S150 – MV WTEF station and T18 – Burnaby South station during the monitoring campaign.

Emissions during WTEF start up and shut down events were also evaluated as these events can result in higher emission releases. A comparison analysis determined that the ambient concentrations levels of NO_2, SO_2, and HCl recorded during different boiler unit operational statuses were very similar, and that the distributions of data were non-normal and right-skewed. Statistical analysis techniques determined that there were some statistically significant differences between ambient concentrations during different boiler operational statuses, but the differences in median concentrations for each operational status were very small. This result suggests that there were other significant regional sources and meteorological factors that had a greater impact on the S150 and T18 ambient levels of NO_2, SO_2, and HCl than the startup – shutdown status of the WTEF.

CONCLUSIONS AND RECOMMENDATIONS

The monitoring conducted at the 2 MVRD stations over the 2-year period provided insight into the near-field levels of NO_2, SO_2, and HCl within the vicinity of the WTEF. Monitored levels were confirmed to be low for SO_2 and HCl and established that NO_2 concentrations patterns did not exceed any AAQOs and that peaks were primarily linked to typical road traffic emissions patterns. Overall, the analysis of ambient air quality and CEMS data from the WTEF using spatial and statistical analysis tools did not reveal any significant correlations, trends, or patterns that suggested the WTEF is significantly impacting ambient air concentrations of NO_2, SO_2 or HCl at two ambient air monitoring stations near the facility. For all three pollutants monitored, the analysis showed that there are likely other primary drivers of ambient air concentrations at the monitoring locations. For SO_2 and NO_2, the other regional sources of emissions are well known. WSP's research of HCl emission sources and atmospheric chemistry shows that an understanding of the concentration of HCl in ambient air in a marine or coastal environment is dependent on an understanding of the contribution from the sea salt dechlorination process and the interplay with meteorological influences and anthropogenic sources. According to Crisp et al., 2013[13], in areas like Metro Vancouver meteorological and atmospheric processes related to the marine boundary layer result in the sea salt dechlorination process being a dominant influence on HCl concentrations, while biomass burning, coal combustion, and waste incineration processes are thought to be more likely influential in continental areas away from the marine boundary. Current global reactive chlorine emission inventories have estimated that greater than 80% of total tropospheric HCl stems from sea salt particle dechlorination reactions, but the understanding of the impact of chlorine catalyzed chemistry is limited due to the highly spatially variable anthropogenic HCl emissions which have not been adequately observed. Understanding that the WTEF does represent a major anthropogenic source of HCl emissions in the airshed that is not "showing up" in the ambient monitoring analysis, our discussion of the results hypothesizes that the primary driver of HCl in the near coast portion of the Lower Fraser Valley airshed (as we would characterize the location of the WTEF) is the contribution of sea salt dechlorination.

For this reason, in addition to the continuation of HCl monitoring (along with all existing parameters) at T18 – Burnaby South and NO_2, SO_2, HCl and meteorological monitoring at a station near to the WTEF to confirm monitoring results during the 2021 – 2022 period on an ongoing basis, it is also recommended that additional HCl monitoring at a minimum of two additional regional locations (one coastal and one inland). The additional monitoring is recommended to enhance understanding of the atmospheric behaviour of ambient HCl across the Lower Fraser Valley airshed.

2 INTRODUCTION

The Greater Vancouver Sewerage and Drainage District ("the Corporation") owns the Metro Vancouver (MV) Waste-to-Energy Facility (WTEF) located in Burnaby, British Columbia, which is operated under contract by Covanta Burnaby Renewable Energy, ULC. The WTEF is equipped with an air pollution control system designed to reduce emissions of nitrogen oxides (NO_x), sulphur dioxide (SO_2) and hydrogen chloride (HCl), along with a host of other air contaminants. The emissions discharge limits and performance requirements for the air pollution control equipment are laid out in the WTEF's Operational Certificate (OC), issued December 15, 2016 by the BC Ministry of Environment and Climate Change Strategy. In response to OC requirements, dispersion modelling and human health risk assessment studies were conducted in 2018. As a follow up to these studies, an ambient air monitoring station measuring NO_x, SO_2 and HCl was installed near the WTEF in 2020, and an HCl monitor was installed at Metro Vancouver Regional District's (MVRD) existing Burnaby South monitoring station, which also monitors NO_x and SO_2.

The inclusion of HCl monitoring, specifically monitoring at very low levels of HCl, makes this ambient air monitoring program unique to the Metro Vancouver region. At the time of submission of this report, we are not aware of any other Canadian regulatory agencies implementing low-level HCl monitoring. Therefore, to provide context to the HCl monitoring data presented herein, WSP have prepared a discussion of HCl atmospheric chemistry and a jurisdictional review of ambient HCl guidelines and objectives.

WSP Canada Inc. (WSP) has prepared the following report, outlining the results of the ambient air monitoring data analysis from the January 1, 2021 to December 31, 2022 period. In particular, the analysis considers ambient air quality data collected at two ambient air quality monitoring stations (S150 – WTEF and T18 – Burnaby South), emissions data and dispersion modelling results with a focus on NO_x, SO_2 and HCl.

3 HYDROGEN CHLORIDE OVERVIEW

Due to the unique nature of ambient hydrogen chloride (HCl) monitoring in the Vancouver region, a general literature review of HCl was conducted by WSP to establish a baseline understanding of HCl emission sources, atmospheric chemistry, and relevant jurisdictional regulatory air quality requirements. The following sections outline the findings of the literature review of HCl.

3.1 HCL EMISSIONS SOURCES AND ATMOSPHERIC CHEMISTRY

HCl emission sources were identified based on literature review pertaining to ambient production processes and sources of HCl, as well from the national emission reporting databases (e.g., Canada's National Pollutant Release Inventory [NPRI] and US National Emissions Inventory [NEI]). There are a total of 8 HCl emission types identified in the LFV region, which include:

- WTEF;
- Industrial Processes (industrial operations such as cement production facilities and metal finishing facilities);
- Natural Marine (resulting from the sea salt dechlorination process involving sea salt aerosols reacting with air contaminants already present in the atmosphere);
- Industrial/Agricultural Wood Boilers;
- Residential Wood Burning;
- Vehicle and Structure Fires (burning of vehicle wastes, building materials and PVC pipes);
- Cremation Emissions; and,
- Open-air Biomass Burning.

The sources of HCl are not as well inventoried as other pollutants and therefore the relative contributions to ambient HCl concentrations as more traditionally monitored pollutants such as SO_2 and NO_2. Complicating the interpretation of ambient HCl monitoring data is also the role atmospheric chemistry processes play. Therefore, the review of HCl atmospheric chemistry focused primarily on peer reviewed publications and synthesizes these results into a regionally relevant discussion of HCl chemistry. A particular area of focus was the speed of atmospheric chemical processes relating to HCl and the potential for bias in dispersion modelling results due to the lack of HCl chemistry in standard dispersion modelling approaches.

Globally, the largest source of chlorine gases to the troposphere is the mobilization of chloride (Cl^-) from sea salt aerosol (Graedel and Keen, 1995[1] and Finlayson-Pitts, 2003[2]). These gases have a wide range of implications for tropospheric chemistry, based on its potential to generate chlorine radicals, which include budgets of ozone, OH (the main tropospheric oxidant), volatile organic compounds (VOCs), nitrogen oxides, other halogens, and mercury (Saiz-Lopez and von Glasow, 2012[3]; Simpson et al., 2015[4]). Although sea salt aerosols contribute to a large chloride

[1] Graedel, T. E. and Keene, W. C.: Tropospheric budget of reactive chlorine, Global Biogeochem. Cy., 9, 47–77, https://doi.org/10.1029/94GB03103, 1995.

[2] Finlayson-Pitts, B. J.: The Tropospheric Chemistry of Sea Salt: A Molecular-Level View of the Chemistry of NaCl and NaBr, Chem. Rev., 103, 4801–4822, https://doi.org/10.1021/cr020653t, 2003.

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[4] Simpson, W. R., Brown, S. S., Saiz-Lopez, A., Thornton, J. A., and Glasow, R.: Tropospheric halogen chemistry: sources, cycling, and impacts, Chem. Rev., 115, 4035–4062, https://doi.org/10.1021/cr5006638, 2015.

flux to the atmosphere, most of the chloride is removed rapidly through deposition (Wang et al., 2019[5]). The small fraction of remaining chloride is primarily mobilized to the gaseous phase of HCl through sea salt dechlorination. Direct emissions of gas phase HCl into the atmosphere include the combustion of chloride-containing fuels (e.g., waste incineration, biomass burning, and coal combustion), volcanic emissions, water treatment, emissions during manufacturing processes, open fires, road salt application, and fugitive dust (Keene et al., 1999[6]; Khalil et al., 1999[7]; McCulloch et al., 1999[8]; Lobert et al., 1999[9]; Sarwar et al., 2012[10]; WMO, 2014[11]; Kolesar et al., 2018[12]).

Overall, understanding of the impact of chlorine catalyzed chemistry is limited due to the highly spatially variable anthropogenic HCl emissions which have not been adequately observed (Crisp et al., 2013[13]). However, current global reactive chlorine emission inventories have estimated that greater than 80% of total tropospheric HCl stems from particle dechlorination reactions (Keene et al., 1999[6]). According to Crisp et al., 2013[13], sea salt dechlorination is dominant in the marine boundary layer, while biomass burning, coal combustion, and waste incineration processes are thought to be more likely influential in continental areas. In addition, according to Wang et al., 2019[5], the HCl mixing ratios in marine surface air are usually highest along polluted coastlines where acid displacement of sea salt aerosols is driven by large sources of HNO_3 and H_2SO_4 from anthropogenic NO_x and SO_2 emissions. On the other hand, HCl mixing ratios over the Southern Ocean are low because of the low supply of acid gases.

According to Finlayson-Pitts and Pitts, 1999[14], the lifetime of HCl in the atmosphere depends on wet and dry deposition, where dry deposition velocity in marine environments is estimated to be 1-5 cm/s. At a boundary layer height of 1 km and a deposition rate of 1 cm/s, the lifetime of HCl with respect to dry deposition is 1.2 days. On the other hand, the 24-hour average lifetime of HCl with respect to OH oxidation is approximately 15 days. In addition, Keene et al., 1990[15] and Watson et al., 1990[16] have determined that equilibrium partitioning of HCl to aerosols is pH dependent, where basic to circumneutral aerosols are expected to be a net sink for HCl. Therefore, the deposition rate of HCl is primarily controlled by HCl lifetime in the marine boundary layer and integrated Cl atom production resulting from HCl reactions with OH (Crisp et al., 2013[13]).

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[5] Wang, X., Jacob, D. J, Eastham, S. D., Sulprizio, M. P., Zhu, L., Chen, Q., Alexander, B., Sherwen, T., Evans, M. J., Lee, B. H., Haskins, J. D., Lopez-Hilfiker, F. D., Thornton, J. A., Huey, G. L., and Liao, H.: The role of chlorine in global tropospheric chemistry, Atmos. Chem. Phys., 19, 3981–4003, https://doi.org/10.5194/acp-19-3981-2019, 2019.

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[9] Lobert, J. M., Keene, W. C., Logan, J. A. and Yevich, R.: Global chlorine emissions from biomass burning: Reactive Chlorine Emissions Inventory, J. Geophys. Res., 104(D7), 8373–8389, https://doi.org/10.1029/1998JD100077, 1999.

[10] Sarwar, G., Simon, H., Bhave, P., and Yarwood, G.: Examining the impact of heterogeneous nitryl chloride production on air quality. across the United States, Atmos. Chem. Phys., 12(14), 6455–6473, https://doi.org/10.5194/acp-12-6455-2012, 2012.

[11] WMO: Scientific Assessment of Ozone Depletion: 2014, World Meteorological Organization, Global Ozone Research and Monitoring Project – Report No. 55, 416 pp., World Meteorological Organization, Geneva, Switzerland, 2014.

[12] Kolesar, K. R., Mattson, C. N., Peterson, P. K., May, N. W., Prendergast, R. K., and Pratt, K. A.: Increases in wintertime PM2:5 sodium and chloride linked to snowfall and road salt application, Atmos. Environ., 177, 195–202, https://doi.org/10.1016/j.atmosenv.2018.01.008, 2018.

[13] Crisp, T. A., Lerner, B. M., Williams, E. J., Quinn, P. K., Bates, T. S. and Bertram, T. H.: Observations of gas phase hydrochloric acid in the polluted marine boundary layer, J. Geophys. Res. Atmos., 119, 6897–6915,, https://doi.org/10.1002/2013JD020992, 2013.

[14] Finlayson-Pitts, B. J. and Pitts, J. N.: Chemistry of the Upper and Lower Atmosphere: Theory, Experiments, and Applications, Science, Elsevier, 1999.

[15] Keene, W. C., Pszenny, A. A. P., Jacob, D. J., Duce, R. A., Galloway, J. N., Schultz-Tokos, J. J., Sievering, H. and Boatman, J. F.: The geochemical cycling of reactive chlorine through the marine troposphere, Global Biogeochem. Cy., 4, 407–430, https://doi.org/10.1029/GB004i004p00407, 1990.

[16] Watson, L. R., Van Doren, J. M., Davidovits, P., Worsnop, D. R., Zahniser, M. S. and Kolb, C. E.: Uptake of HCl molecules by aqueous sulfuric acid droplets as a function of acid concentration, J. Geophys. Res., 95(D5), 5631–5638, https://doi.org/10.1029/JD095iD05p05631, 1990.

3.2 HCL JURISDICTIONAL REVIEW

In the absence of HCl ambient air quality objectives in the Metro Vancouver Regional District and in the province of BC at large, the 2018 MV WTEF Dispersion Modelling Study by RWDI selected the following HCl ambient air quality objectives from other jurisdictions to evaluate the potential air quality impacts from the WTEF emissions:

- For the 1-hour averaging period, the 75 µg/m^3 from Alberta was utilized;
- For the 24-hour averaging period, the 20 µg/m^3 from Ontario was utilized; and finally,
- For the annual averaging period, the 20 µg/m^3 from US EPA was utilized.

To determine whether the above objectives are still relevant and applicable for assessing the potential air quality impacts from the WTEF, a review of the currently available HCl ambient air objectives from jurisdictions across North America was conducted by gathering and comparing objectives across jurisdictions as well evaluating their basis of criteria development. The jurisdictional review included all provinces in Canada and key US jurisdictional sources such as Texas Department of Environmental Quality (TDEQ), California Office of Environmental Health Hazard Assessment (OEHHA) and US EPA.

The summary table for the jurisdictional review of ambient HCl objectives is presented in Appendix B. There are only a few North American jurisdictions with credible HCl criteria that were well-substantiated by toxicology research and documentation for the basis of the criteria derivation – US EPA, California, and Texas. The US EPA's annual criteria of 20 µg/m^3 was adopted by many of the jurisdictions examined, including Quebec, Michigan, Oregon, and New York; hence it is still suitable for assessing the annual air quality predictions from the WTEF.

HCl objectives established for Canadian jurisdictions were observed to be either outdated or devoid of documentations for their basis. The 1-hour HCl objective of 75 µg/m^3 from Alberta is the most stringent criteria for the 1-hour averaging period among all jurisdictions assessed and this objective was indicated as being adopted from Texas. However, the current HCl criteria in Texas are higher – 190 µg/m^3 for regulatory air permitting purposes and 660 µg/m^3 as the air monitoring concentration benchmark. The basis of criteria development and associated toxicology studies are extensively documented by the TDEQ for their current objectives. However, despite the limited scientific basis or documentation for the Alberta objective, it has been retained for use in this study for consistency with the 2018 dispersion modelling study, and because it represents the most conservative 1-hour objective.

Of the jurisdictions examined, only 3 had 24-hour HCl objectives: Ontario (20 µg/m^3), Massachusetts (7 µg/m^3), and Idaho (375 µg/m^3). Although no documentations were provided by any of the 3 jurisdictions, the Massachusetts Department of Environmental Protection (MassDEP) indicated that their criteria were Threshold Effects Exposure Limits (TELs) based on non-cancer health effects (MassDEP, 2011). However, the MassDEP acknowledged that their TELs are dated in December 1995 and stated that "while a number of these values have been reviewed and updated since inception of the original TELs, many need to be re-evaluated given the newer, widely accepted methods for deriving inhalation toxicity values and availability of new primary literature since the mid-1980s" (MassDEP, 2011). The Idaho Department of Environmental Quality (IDEQ) specified that their criteria were based on occupational exposure limits expressed in terms of an Acceptable ambient concentration for a non-carcinogenic toxic air pollutant (IDEQ, 2021). The Ontario 24-hour objective has been retained for this study for consistency the 2018 dispersion modelling study, and because the Massachusetts objective was deemed to be outdated and poorly supported.

4 REGIONAL AIR QUALITY REGULATORY FRAMEWORK

4.1 AIR QUALITY OBJECTIVES

The management of air quality in Canada is accomplished primarily through federal and provincial government collaboration. At the federal level, the Canadian Council of Ministers of the Environment (CCME) acts as a forum for provincial governments to jointly undertake initiatives to address major environmental issues. Regarding air quality, the CCME approved the current air quality management system (AQMS) in 2012. The AQMS is a comprehensive approach for improving air quality in Canada and is the product of collaboration by the federal, provincial, and territorial governments and stakeholders. Each province is tasked with implementing the components of the AQMS within their respective jurisdiction.

In British Columbia, the management of air quality in the Metro Vancouver region is delegated through the Environmental Management Act (EMA) to the MVRD, a regional body governed by a board constituted of elected representatives from each municipality and electoral area within the region. Specifically, MVRD is a federation of 21 municipalities, one electoral area, and one treaty First Nation. As a result of the CCME initiatives regarding the AQMS, MVRD have adopted or updated air quality objectives for a number of air contaminants.

Air quality objectives are used to:

- Assess and provide context to current or historical air quality and trends;
- Guide decisions on the permitting of new or modified facilities;
- Guide decisions on episode management, such as air quality advisories;
- Develop long-term air quality management strategies and evaluate progress; and
- Aid in the development of new regulatory and non-regulatory initiatives.

In this assessment, ambient air quality concentrations recorded at S150 – MV WTEF station and T18 – Burnaby South station will be compared against the statistical form of the current ambient air quality objectives (AAQOs) with rules (e.g., data completeness checks) established by CCME. Ambient concentrations of nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) will be compared against MVRD AAQOs[17]. On the other hand, due to the lack of MV AAQOs for HCl (as is the case with most jurisdictions across Canada), ambient concentrations of hydrogen chloride (HCl) will be compared against objectives / criteria from other jurisdictions (Alberta Environment (AENV)[18], Ontario Ministry of Environment (Ontario MoE)[19], and US Environmental Protection Agency (US EPA)[20]). Table 4-1 below outlines the list of AAQOs used in this assessment.

[17] *Metro Vancouver Ambient Air Quality Objectives (Updated January 2020):* http://www.metrovancouver.org/services/air quality/AirQualityPublications/CurrentAmbientAirQualityObjectives.pdf

[18] *Alberta Ambient Air Quality Objectives and Guidelines Summary (January 2019):* https://open.alberta.ca/dataset/0d2ad470-117e-410f-ba4f-aa352cb02d4d/resource/4ddd8097-6787-43f3-bb4a-908e20f5e8f1/download/aaqo-summary-jan2019.pdf

[19] *Ontario's Ambient Air Quality Criteria (April 2012):* http://www.airqualityontario.com/downloads/AmbientAirQualityCriteria.pdf

[20] *United States Environmental Protection Agency: Hydrogen Chloride IRIS Summary:* https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=396

It is important to note that although the statistical form of the 1-hour NO_2 AAQO is the "98th percentile of the daily maximum 1-hour concentration, averaged over three consecutive years", the data completeness criteria required to calculate the 1-hour NO_2 metric only involves two of the possible three annual 98th percentiles[21]. As such, the 2 years of ambient 1-hour average NO_2 data collected at the two monitoring stations were used to calculate the 2 year average of 98th percentile daily maximum of 1-hour concentrations for comparison against the 1-hour NO_2 AAQO.

Table 4-1 Ambient Air Quality Objectives (AAQOs)

AIR CONTAMINANT	AVERAGING PERIOD	STATISTICAL FORM OF OBJECTIVE	OBJECTIVE	JURISDICTION OF OBJECTIVE	OBJECTIVE TYPE
Nitrogen Dioxide (NO_2)	1-Hour	98th percentile of the daily maximum 1-hour concentration, averaged over three consecutive years[A]	60 ppb (113 µg/m^3)	Metro Vancouver Regional District (MVRD)	Metro Vancouver Ambient Air Quality Objective (MVAAQO)
	Annual	Annual average of 1-hour concentrations	17 ppb (32 µg/m^3)		
Sulphur Dioxide (SO_2)	1-Hour	Maximum 1-hour concentration	70 ppb (183 µg/m^3)		
	Annual	Annual average of 1-hour concentrations	5 ppb (13 µg/m^3)		
Hydrogen Chloride (HCl)	1-Hour	Maximum 1-hour concentration	50 ppb (75 µg/m^3)	Alberta Environment (AENV)	Alberta Ambient Air Quality Objective (AAAQO)
	24-Hour	Maximum 24-hour block average concentration	13.4 ppb (20 µg/m^3)	Ontario Ministry of Environment (Ontario MoE)	Ontario Ambient Air Quality Criteria (OAAQC)
	Annual	Annual average of 1-hour concentrations	13.4 ppb (20 µg/m^3)	US Environmental Protection Agency (US EPA)	US EPA Reference Concentration for Inhalation Exposure (RfC)

Note: [A]Since there is only two years of ambient air quality data available for use in this assessment, the 98th percentile of the daily maximum 1-hour concentration averaged over 2-years will be compared against the 1-hour NO_2 AAQO.

[21] *Canadian Council of Ministers of the Environment: Guidance Document on Achievement Determination for Canadian Ambient Air Quality Standards for Nitrogen Dioxide (2020):* https://ccme.ca/en/res/gdadforcaaqsfornitrogendioxide_en1.0.pdf

5 MONITORING STATIONS

The analysis of ambient air quality monitoring data was focused on data collected at two stations, namely the S150 – MV WTEF station and the T18 – Burnaby South station. Figure 5-1 shows the locations of the two stations relative to the MV WTEF facility. Table 5-1 provides additional details about the two stations, including exact locations and parameters monitored. In addition, on-site photos are provided in Table 5-2.

The S150 – MV WTEF station was installed in the fall of 2020 to measure NO_2, SO_2, and HCl near the location with the highest expected ambient air concentrations identified by the dispersion modelling submitted to the Ministry of Environment and Climate Change Strategy in December 2018 as per the requirements of the WTEF's Operational Certificate (issued December 15, 2016). In September 2021, a meteorological station was installed on the roof of the WTEF to provide information on local meteorological conditions and allow for comparison of measured ambient air quality concentrations to operations at the WTEF.

Metro Vancouver's existing T18 – Burnaby South station was put in place in advance of the development of the WTEF with the goal of monitoring for any potential impacts of the WTEF on air quality. The instrumentation at the station, which already included SO_2 and NO_2 monitoring, was upgraded in the fall of 2020 with the addition of an HCl monitor.

Table 5-1 Ambient Air Quality Monitoring Station Details

STATION NAME	OPERATOR	STATION TYPE	PARAMETERS MEASURED CONTINUOUSLY	LATITUDE	LONGITUDE
S150 – MV WTEF	MVRD	Air Quality	SO_2, NO_2, HCl	49.1868ºN	122.9788ºW
		Meteorology	T_{air}, W_{spd}, W_{dir}, RH	49.1862ºN	122.9777ºW
T18 – Burnaby South		Air Quality and Meteorology	SO_2, NO_2, HCl, CO, O_3, BC, PM_{10}, $PM_{2.5}$ T_{air}, W_{spd}, W_{dir}, RH, Station Pressure, Precipitation	49.2152ºN	122.9857ºW

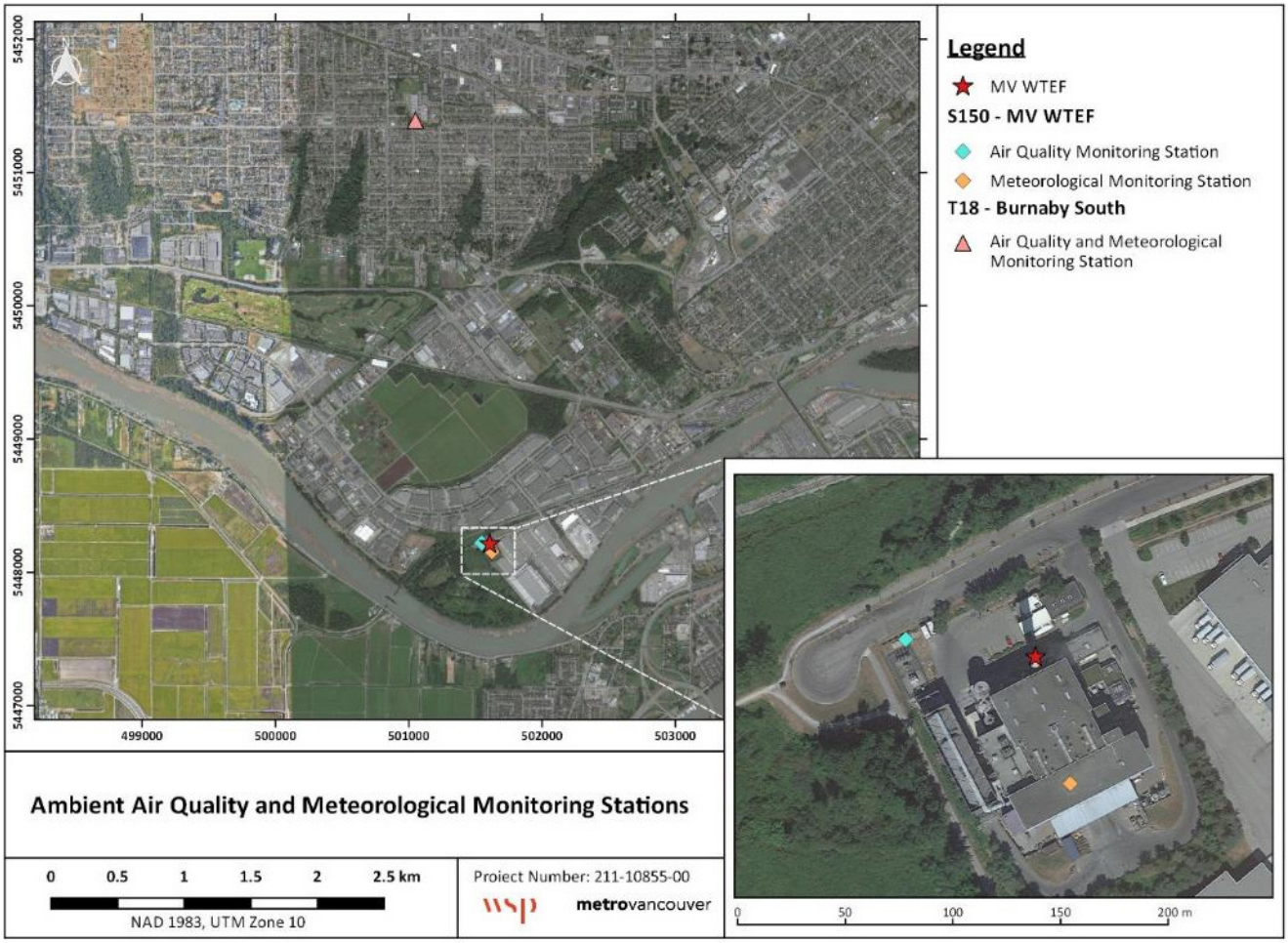


Figure 5-1 Ambient Air Quality Monitoring Station Locations

Table 5-2 Photos of the Air Quality and Meteorological Monitoring Stations

S150 – MV WTEF Air Quality Monitoring Station

S150 – MV WTEF Meteorological Monitoring Station

T18 – Burnaby South Air Quality and Meteorological Monitoring Station

6 METEOROLOGICAL DATA SUMMARY

The following section summarizes relevant meteorological data collected at S150 – MV WTEF station and T18 – Burnaby South station from January 1, 2021 to December 31, 2022. The hourly meteorological data summarized in this report were obtained from Metro Vancouver, where it has been thoroughly checked for quality assurance/quality control (QA/QC). It should be noted that the meteorological sensors were installed at the S150 – MV WTEF station on September 16, 2021 so the data record is limited in the 2021 calendar year.

Comparing to trends in meteorology from previous years, the higher than normal temperatures recorded at T18 – Burnaby South station in June and July 2021 are directly attributable to the heat dome event that occurred between June 25 to July 1, 2021. According to an article published by the Government of Canada[22], the 2021 heat dome event resulted in temperatures up to 20°C above normal, with more than 103 all-time heat records broken across the western provinces. Lytton, BC suffered the worst impacts, experiencing Canada's highest temperature recorded (49.6°C on June 29, 2021) and a disastrous wildfire event.

6.1 TEMPERATURE

Air temperature affects the movement and dispersion of air pollutants and has the potential to increase photochemical activity in an airshed, which in turn can increase production of secondary air pollutant such as ozone. Temperature also impacts air convection and the potential for inversions which can enhance or limit the dispersion of pollutants.

Table 6-1 and Table 6-2 summarize the 1-hour average temperature statistics recorded at S150 – MV WTEF station and T18 – Burnaby South station during the 2021 – 2022 monitoring period, respectively. Monthly boxplots of 1-hour average temperatures for each of the two stations are presented in Figure 6-1. In addition, monthly timeseries of 1-hour average temperatures recorded at the two stations are presented in Figure 6-2.

The monthly boxplots (Figure 6-1) show that the 1-hour average temperatures measured at both stations are relatively comparable, with slight differences in temperature on average by month during the 2-year monitoring period. The 1-hour timeseries (Figure 6-2) also shows that the 1-hour average temperatures measured at both stations track together fairly well. This result confirms that the S150 – MV WTEF station, which is located on the roof of the WTEF, is not significantly impacted by releases of steam or heated air from vents also located on the building roof.

Table 6-1 Monthly 1-Hour Temperature (°C) Summary at S150 – MV WTEF Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	0.0	N/A	N/A	N/A
February 2021	0.0	N/A	N/A	N/A
March 2021	0.0	N/A	N/A	N/A
April 2021	0.0	N/A	N/A	N/A
May 2021	0.0	N/A	N/A	N/A
June 2021	0.0	N/A	N/A	N/A
July 2021	0.0	N/A	N/A	N/A
August 2021	0.0	N/A	N/A	N/A
September 2021	48.3	10.3	14.4	23.5
October 2021	99.3	3.0	10.7	17.8
November 2021	100.0	1.5	8.2	14.0

[22] https://science.gc.ca/site/science/en/blogs/science-health/surviving-heat-impacts-2021-western-heat-dome-canada

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
December 2021	100.0	-12.9	1.8	12.3
January 2022	100.0	-6.2	4.6	13.4
February 2022	100.0	-4.5	5.3	12.5
March 2022	99.7	0.5	8.0	17.0
April 2022	99.2	2.0	8.9	20.2
May 2022	92.9	5.2	11.7	22.1
June 2022	99.6	10.4	16.6	32.7
July 2022	100.0	12.4	19.7	34.8
August 2022	99.3	14.3	20.8	32.7
September 2022	99.2	11.1	17.8	29.3
October 2022	99.6	5.7	13.5	26.7
November 2022	100.0	-3.1	4.8	13.1
December 2022	100.0	-11.0	1.3	12.3

Note: Due to the timing of the installation of the meteorological sensors at the S150 – MV WTEF station on September 16, 2021, the resulting data completeness for the first 9 months of 2021 (January through September) were lower than one would expect.

Table 6-2 Monthly 1-Hour Temperature (°C) Summary at T18 – Burnaby South Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	100.0	-0.6	5.2	11.0
February 2021	100.0	-5.4	2.9	10.1
March 2021	99.9	0.3	6.5	13.7
April 2021	100.0	1.6	10.7	22.6
May 2021	100.0	6.8	12.8	22.4
June 2021	98.6	8.2	18.9	39.8
July 2021	99.9	12.8	19.5	31.8
August 2021	100.0	10.9	18.8	34.9
September 2021	100.0	8.8	15.2	25.1
October 2021	98.3	4.7	9.8	17.8
November 2021	99.4	1.3	7.4	13.2
December 2021	99.7	-13.5	0.9	11.6
January 2022	100.0	-6.0	4.0	12.5
February 2022	100.0	-5.1	4.7	12.4
March 2022	100.0	0.6	7.0	13.8
April 2022	100.0	1.9	7.7	18.3
May 2022	93.4	4.5	10.7	18.8
June 2022	100.0	9.7	15.9	31.8
July 2022	100.0	12.1	19.6	34.1
August 2022	99.2	13.7	20.8	31.3
September 2022	100.0	10.8	17.8	28.4
October 2022	100.0	5.7	13.8	24.4
November 2022	100.0	-3.7	4.4	13.7
December 2022	100.0	-11.5	1.3	12.2

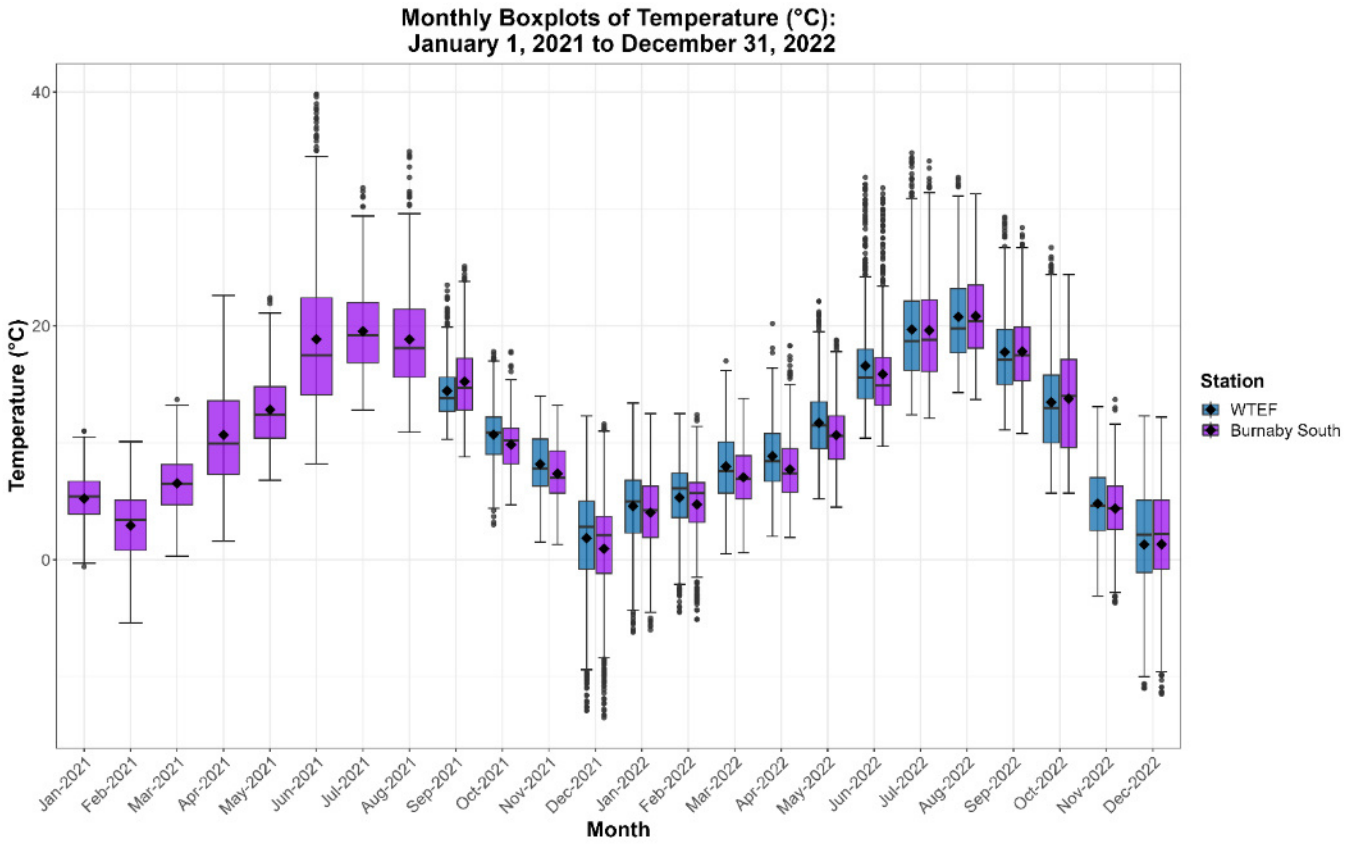


Figure 6-1 **Monthly Boxplots of 1-Hour Temperature (°C) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022**

Figure 6-2 **Monthly Timeseries of 1-Hour Temperature (°C) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021**

6.2 WIND

Wind speed and wind direction data recorded at S150 – MV WTEF station and T18 – Burnaby South station are presented in the following section. Wind speed and wind direction are key parameters influencing the dispersion of pollutants from the MV WTEF and other local and regional sources.

Table 6-3 and Table 6-4 summarize the 1-hour average wind speed statistics recorded at S150 – MV WTEF station and T18 – Burnaby South station during the 2021 – 2022 monitoring period. Monthly timeseries of 1-hour average wind speed recorded at the two stations are presented in Figure 6-3. Both the statistics within Table 6-3 and Table 6-4 and timeseries within Figure 6-3 show that there was a slight uptick in overall peak hourly winds in the Autumn and Winter months. This is consistent with the climate normals of the Lower Mainland, when increased storm activity occurs during the Autumn and Winter months.

Figure 6-4 through Figure 6-7 show the annual and seasonal windroses from S150 – MV WTEF station and T18 – Burnaby South station during the 2021 – 2022 monitoring period. Wind roses are used to display the frequency of wind speed by wind direction, and typically show a dominant wind path dictated by the wind regime and topographical influences surrounding the station. Within this assessment, all windroses display winds blowing from a particular cardinal direction.

The annual windroses for the S150 – MV WTEF station in Figure 6-4 show that the winds were most commonly from the east and east-northeast directions for both years (2021 and 2022). This is confirmed by the seasonal windroses in Figure 6-5, which show winds from the east and east-northeast directions for all seasons (from Autumn 2021 to Winter 2022) except for Summer 2022 where the winds were most commonly from the southerly direction. This pattern is broadly indicative of easterly valley outflow influenced winds during the cooler seasons, and a strong southwesterly sea breeze during the warm Summer season.

The annual windroses for the T18 – Burnaby South station in Figure 6-6 show that highest wind speeds came from the south and south-southeast directions for both years (2021 and 2022), while the seasonal windroses (Figure 6-7) show that the proportion of dominant wind directions varied throughout the seasons. The seasonal patterns observed indicate that Winter winds were dominated by northeasterly valley outflow windows, while Summer windows were dominated by a strong southwesterly sea breeze during the warm Summer season, with shoulder seasons showing a combination of weaker valley outflows and mild sea breezes.

Calm winds, defined as less than or equal to 0.5 m/s, were recorded 0% of the time at the S150 – MV WTEF station and 1.66 % of the time at the T18 – Burnaby South station during the 2021 – 2022 monitoring period. Further breakdowns of calm wind percentages by year and season are displayed below each windrose figure (Figure 6-4 through Figure 6-7).

Table 6-3 Monthly 1-Hour Wind Speed (m/s) at S150 – MV WTEF Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	0.0	N/A	N/A	N/A
February 2021	0.0	N/A	N/A	N/A
March 2021	0.0	N/A	N/A	N/A
April 2021	0.0	N/A	N/A	N/A
May 2021	0.0	N/A	N/A	N/A
June 2021	0.0	N/A	N/A	N/A
July 2021	0.0	N/A	N/A	N/A
August 2021	0.0	N/A	N/A	N/A
September 2021	48.3	0.7	3.0	7.8
October 2021	99.3	0.6	3.2	8.6
November 2021	100.0	0.8	3.7	9.0
December 2021	100.0	0.7	3.4	9.5

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2022	100.0	0.6	3.0	8.6
February 2022	100.0	0.6	3.0	9.3
March 2022	99.7	0.7	3.1	6.1
April 2022	99.2	0.7	3.4	9.9
May 2022	92.9	0.6	3.2	7.7
June 2022	99.6	0.8	3.0	6.2
July 2022	100.0	0.6	2.6	5.0
August 2022	99.3	0.6	2.5	5.3
September 2022	99.2	0.6	2.4	6.8
October 2022	99.6	0.6	2.3	7.9
November 2022	100.0	0.6	2.9	12.3
December 2022	100.0	0.7	3.4	8.8

Note: Due to the timing of the installation of the meteorological sensors at the S150 – MV WTEF station on September 16, 2021, the resulting data completeness for the first 9 months of 2021 (January through September) were lower than one would expect.

Table 6-4 Monthly 1-Hour Wind Speed (m/s) at T18 – Burnaby South Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	100.0	0.3	2.8	10.7
February 2021	100.0	0.1	2.4	7.0
March 2021	99.9	0.6	2.6	9.8
April 2021	100.0	0.4	2.3	6.6
May 2021	100.0	0.4	2.2	5.4
June 2021	98.6	0.2	2.2	6.4
July 2021	99.9	0.0	2.1	5.7
August 2021	100.0	0.0	1.9	5.4
September 2021	100.0	0.1	2.2	8.7
October 2021	98.3	0.3	2.5	7.9
November 2021	99.9	0.0	2.9	9.6
December 2021	99.7	0.0	2.5	9.7
January 2022	100.0	0.2	2.2	8.8
February 2022	100.0	0.3	2.2	6.7
March 2022	100.0	0.1	2.4	5.6
April 2022	100.0	0.6	2.9	10.2
May 2022	93.4	0.1	2.5	7.8
June 2022	100.0	0.2	2.4	6.2
July 2022	100.0	0.1	1.9	4.3
August 2022	99.2	0.0	2.0	5.2
September 2022	100.0	0.0	1.9	4.8
October 2022	100.0	0.0	1.8	8.1
November 2022	100.0	0.2	2.2	9.3
December 2022	100.0	0.2	2.4	9.5

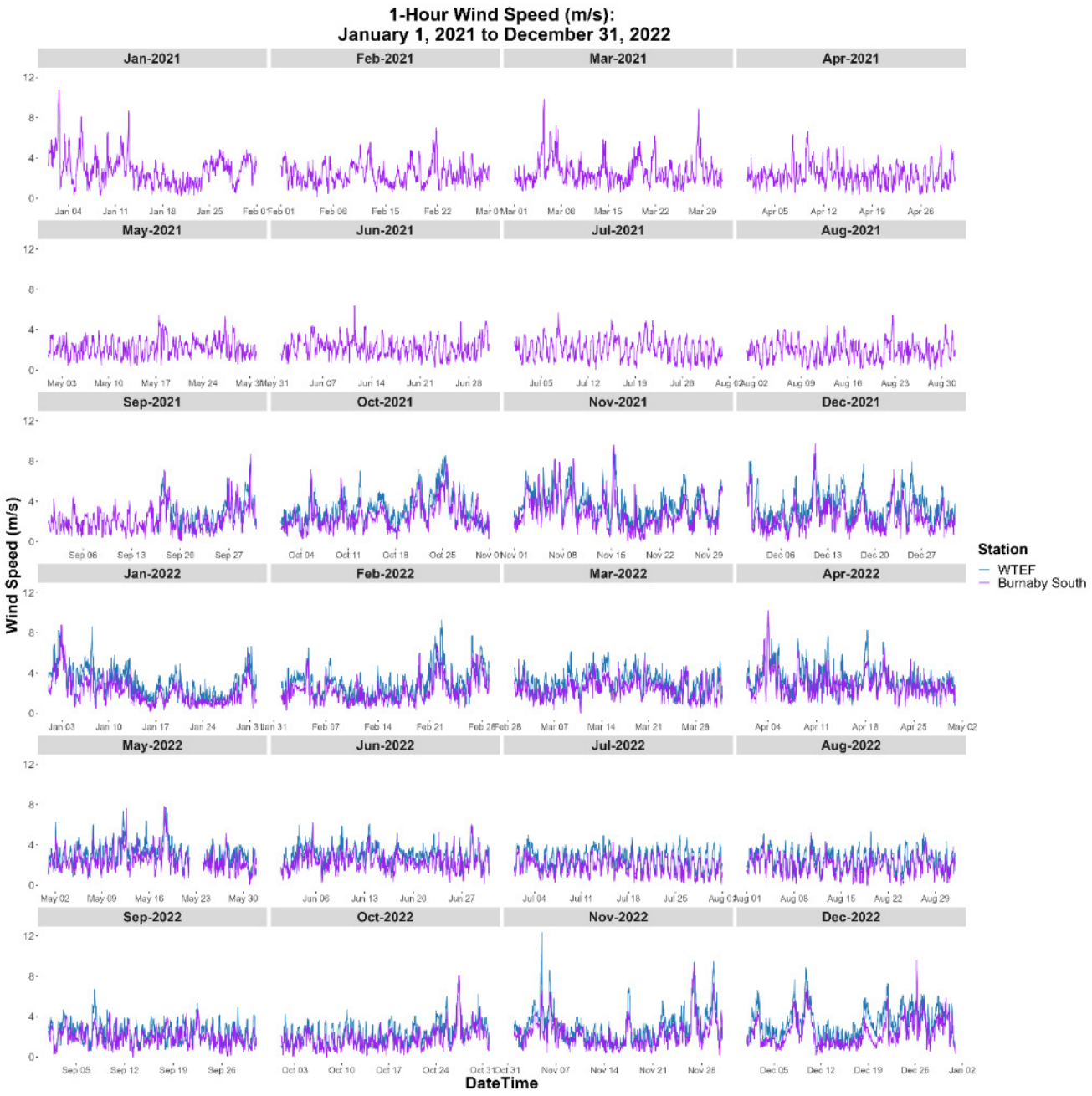
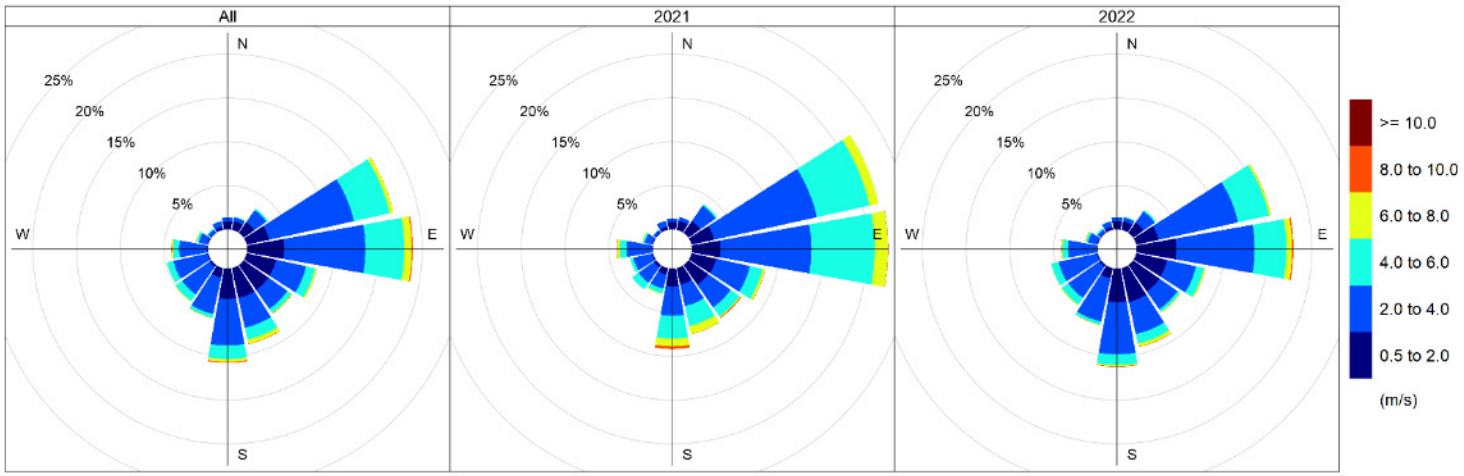


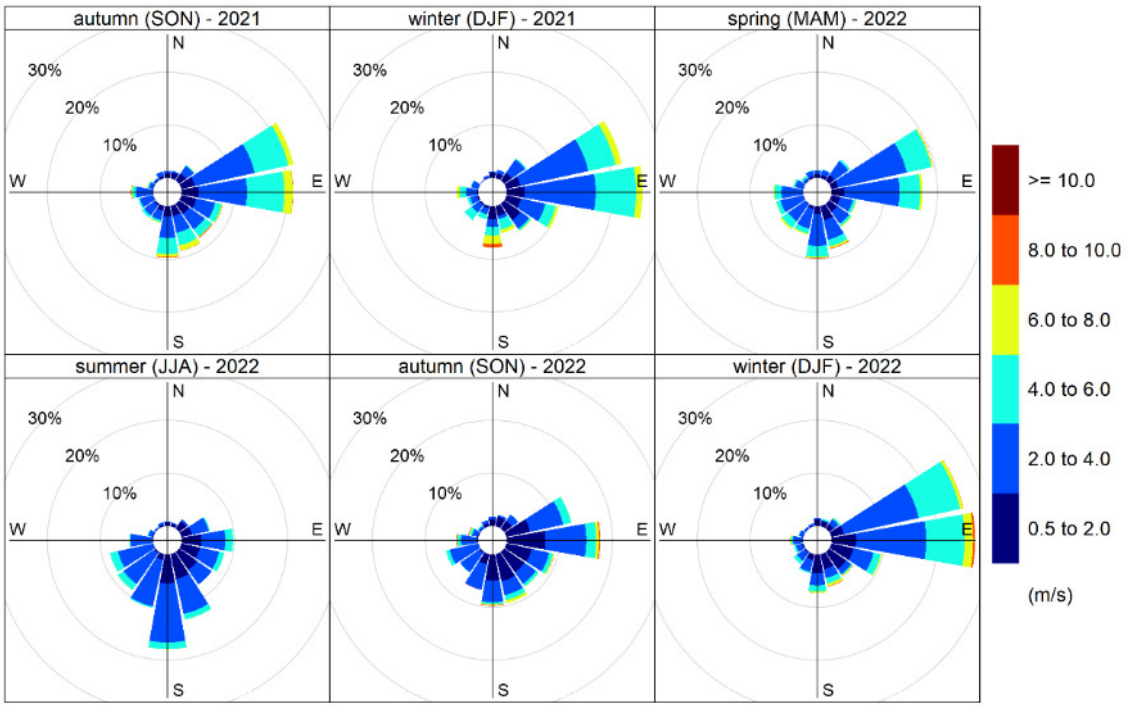
Figure 6-3 **Monthly Timeseries of 1-Hour Wind Speed (m/s) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022**



Calms (<0.5m/s): 2021-2022: 0 %, 2021: 0 %, 2022: 0 %

Note: Due to the timing of the installation of the meteorological sensors at the S150 – MV WTEF station on September 16, 2021, the windrose labelled "All" includes observed winds from September 16, 2021 to December 31, 2022; the windrose labelled "2021" includes observed winds from September 16, 2021 to December 31, 2021; and the windrose labelled "2022" includes observed winds from January 1, 2022 to December 31, 2022.

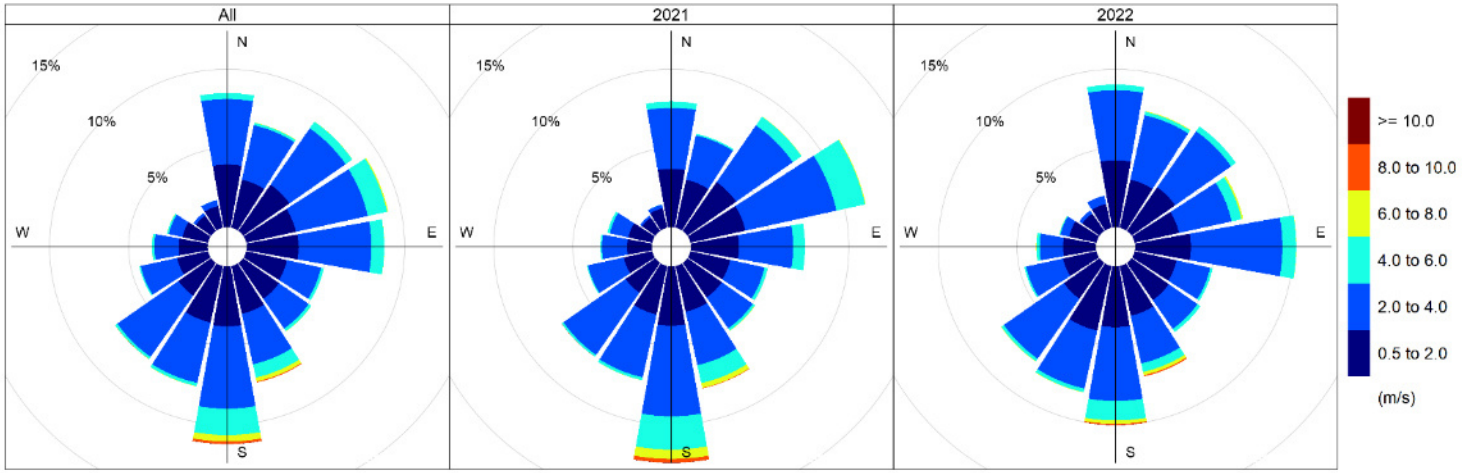
Figure 6-4 Annual Windroses at S150 – MV WTEF Station in 2021 and 2022



Calms (<0.5m/s): Autumn 2021: 0 %, Winter 2021: 0 %,
Spring 2022: 0 %, Summer 2022: 0 %, Autumn 2022: 0 %, Winter 2022: 0 %

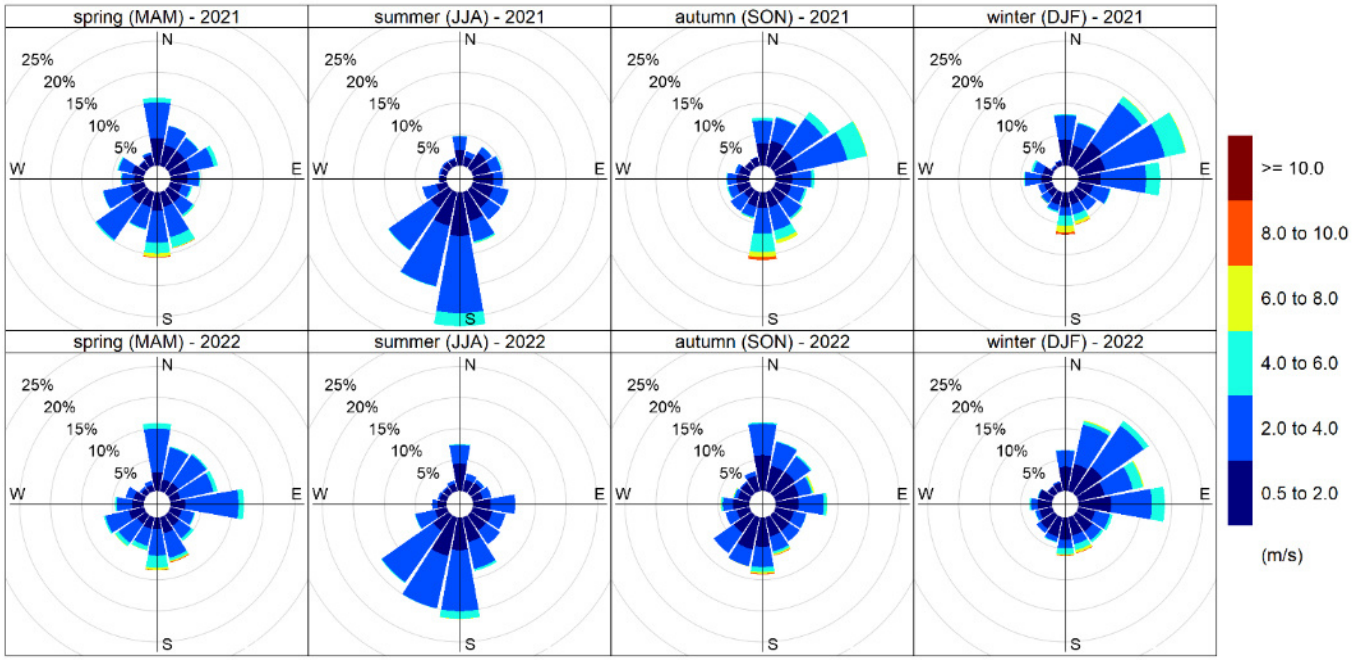
Note: Due to the timing of the installation of the meteorological sensors at the S150 – MV WTEF station on September 16, 2021, the windrose labelled "autumn (SON) 2021" includes observed winds from September 16, 2021 November 30, 2021.

Figure 6-5 Seasonal Windroses at S150 – MV WTEF Station in 2021 and 2022



Calms (<0.5m/s): 2021-2022: 1.66 %, 2021: 1.56 %, 2022: 1.77 %

Figure 6-6 Annual Windroses at T18 – Burnaby South Station in 2021 and 2022



Calms (<0.5m/s): Spring 2021: 0.32 %, Summer 2021: 2.91 %, Autumn 2021: 1.75 %, Winter 2021: 1.25 %, Spring 2022: 0.23 %, Summer 2022: 3.09 %, Autumn 2022: 2.79 %, Winter 2022: 0.93 %

Figure 6-7 Seasonal Windroses at T18 – Burnaby South Station in 2021 and 2022

7 AMBIENT AIR MONITORING DATA SUMMARIES

The following section presents the results of the ambient air monitoring data analysis using observations recorded at S150 – MV WTEF station and T18 – Burnaby South station between January 1, 2021 and December 31, 2022. Similar to the meteorological data summary in Section 6, the hourly ambient data summarized in the following section has been obtained from Metro Vancouver, where quality assurance/quality control (QA/QC) procedures have been thoroughly applied prior to analysis. The air contaminants of interest include nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and hydrogen chloride (HCl).

7.1 COMPARISON TO AMBIENT AIR QUALITY OBJECTIVES

The following sections 7.2 through 7.4 provide details data summaries for NO_2, SO_2 and HCl, while this section provides a simple direct comparison to the AAQOs for each contaminant. The comparison of ambient air quality data against AAQOs are presented in Table 7-1, which shows that the ambient levels of NO_2, SO_2, and HCl observed at both S150 – MV WTEF station and T18 – Burnaby South station during the 2021 – 2022 monitoring period were below all the AAQOs of interest:

- **NO_2**:
    - 1-hour maximum NO_2 levels at S150 – MV WTEF station and T18 – Burnaby South station were 45.6 ppb (76% of the MVAAQO) and 37.3 ppb (62% of the MVAAQO), respectively;
    - Annual average NO_2 levels at S150 – MV WTEF station and T18 – Burnaby South station were 13.9 ppb (81% of the MVAAQO) and 11.7 ppb (69% of the MVAAQO), respectively;
- **SO_2**:
    - 1-hour maximum SO_2 levels at S150 – MV WTEF station and T18 – Burnaby South were 6.9 ppb (10% of the MVAAQO) and 4.4 ppb (6% of the MVAAQO), respectively;
    - Annual average SO_2 at S150 – MV WTEF station and T18 – Burnaby South station were 0.2 ppb (4% of the MVAAQO) and 0.3 ppb (5% of the MVAAQO), respectively;
- **HCl**:
    - 1-hour maximum HCl levels at S150 – MV WTEF station and T18 – Burnaby South station were 2.8 ppb (6% of the AAAQO) and 4.7 ppb (9% of the AAAQO), respectively;
    - 24-hour maximum HCl levels at S150 – MV WTEF station and T18 – Burnaby South station were 1.7 ppb (13% of the OAAQC) and 1.7 ppb (13% of the OAAQC), respectively; and
    - Annual average HCl levels at S150 – MV WTEF station and T18 – Burnaby South station were 0.4 ppb (3% of the US EPA RfC) and 0.4 ppb (3% of the US EPA RfC), respectively.

For short time periods compliance with AAQOs focuses on the maximum monitored values as summarized above. However, it should be noted that all other monitored values fall below these maximums. An assessment of frequency of higher values can add context to a strict AAQO comparison. In terms of frequency, the ambient air monitoring data shows that:

- For 1-hour NO_2, 95% of the time, ambient concentrations of NO_2 are 50% or less of the AAQO at both stations;
- For 1-hour SO_2, 98% of the time, ambient concentrations of SO_2 are less than 2% of the AAQO at both stations; and
- For 1-hour HCl, 98% of the time, ambient concentrations of HCl are less than 3% of the AAQO at both stations.

Table 7-1 Ambient Air Quality Objectives (AAQOs) Comparison Results

AIR CONTAMINANT	AVG PERIOD	JURISDICTION	AAQO	STATISTICAL FORM OF OBJECTIVE	S150 – MV WTEF				T18 – BURNABY SOUTH			
					VALUE: ppb (µg/m³)			2-YR MAX[B] % OF OBJECTIVE	VALUE: ppb (µg/m³)			2-YR MAX[B] % OF OBJECTIVE
					2021	2022	2-YR MAX[B]		2021	2022	2-YR MAX[B]	
Nitrogen Dioxide (NO_2)	1-Hour	Metro Vancouver Regional District (MVRD)	60 ppb (113 µg/m³)	98th percentile of the daily maximum 1-hour concentration, over three consecutive years[A]	49.0 (92.1)	42.2 (79.4)	45.6 (85.7)	76%	37.5 (70.5)	37.0 (69.6)	37.3 (70.0)	62%
	Annual		17 ppb (32 µg/m³)	Annual average of 1-hour concentrations	13.3 (25.1)	**13.9 (26.1)**	13.9 (26.1)	81%	10.6 (19.9)	**11.7 (22.1)**	11.7 (22.1)	69%
Sulphur Dioxide (SO_2)	1-Hour		70 ppb (183 µg/m³)	Maximum 1-hour concentration	3.9 (10.2)	**6.9 (18.1)**	6.9 (18.1)	10%	**4.4 (11.5)**	3.4 (8.9)	4.4 (11.5)	6%
	Annual		5 ppb (13 µg/m³)	Annual average of 1-hour concentrations	0.2 (0.6)	**0.2 (0.6)**	0.2 (0.6)	4%	0.2 (0.6)	**0.3 (0.7)**	0.3 (0.7)	5%
Hydrogen Chloride (HCl)	1-Hour	Alberta Environment (AENV)	50 ppb (75 µg/m³)	Maximum 1-hour concentration	2.3 (3.4)	**2.8 (4.2)**	2.8 (4.2)	6%	3.4 (5.1)	**4.7 (7.0)**	4.7 (7.0)	9%
	24-Hour	Ontario Ministry of Environment (Ontario MoE)	13.4 ppb (20 µg/m³)	Maximum 24-hour block average concentration	1.6 (2.4)	**1.7 (2.6)**	1.7 (2.6)	13%	1.5 (2.2)	**1.7 (2.5)**	1.7 (2.5)	13%
	Annual	US Environmental Protection Agency (US EPA)	13.4 ppb (20 µg/m³)	Annual average of 1-hour concentrations	0.4 (0.5)	**0.4 (0.6)**	0.4 (0.6)	3%	0.4 (0.5)	**0.4 (0.6)**	0.4 (0.6)	3%

Notes: The maximum year is highlighted in **bold** where the achievement of the AAQO is based on the maximum year over the 2-year monitoring period.

[A] Since there is only two years of ambient air quality data available for use in this assessment, the 98th percentile of the daily maximum 1-hour concentration averaged over 2-years will be compared against the 1-hour NO_2 AAQO.

[B] The 2-year average is computed for ambient 1-hour NO_2 due to the required statistical form for comparison to the 1-hour AAQO level.

7.2 NITROGEN DIOXIDE (NO_2) DATA REVIEW

Nitrogen dioxide (NO_2) is a highly reactive, reddish- brown gas with a pungent and irritating odour and is partially responsible for the "brown haze" sometimes seen in the air. Nitric oxide (NO) and nitrogen dioxide (NO_2) are known collectively as nitrogen oxides (NO_x). Regional sources of nitrogen oxides include vehicles and mobile equipment that burn fossil fuels internal combustion engines, as well as industrial facilities that burn fossil fuels. Nitrogen oxides also react with other pollutants to form ground-level ozone or fine particulate matter, both of which are also harmful air pollutants.

Table 7-2 and Table 7-3 provide summaries of NO_2 measurements collected in 2021 and 2022 at S150 – MV WTEF station and T18 – Burnaby South station, respectively. Monthly timeseries of 1-hour average NO_2 at the two stations are presented in Figure 7-1.

The boxplots in Figure 7-2 and Figure 7-3 show the monthly and hourly variation in 1-hour average NO_2 concentrations at the two stations. The monthly boxplots show that, on average, there were slightly higher levels of NO_2 observed at S150 – MV WTEF station for most months of the 2-year period (with more comparable levels in the July and August months). The hourly boxplots show a similar pattern of slightly higher levels of NO_2 observed at S150 – MV WTEF station compared to the levels of NO_2 observed at T18 – Burnaby South station for most hours of the day, with the difference being most noticeable during the morning and night-time hours (00:00 to 10:00, and 20:00 to 23:00).

In addition, the time variation plots in Figure 7-4 show that, at both stations for the 2021 – 2022 monitoring period, the peak 1-hour average NO_2 concentrations occurred in the early morning on weekdays (Monday – Friday), which is indicative of a peak in traffic during the morning commute. Local waste haul trucking / vehicle activity entering and exiting the MV WTEF, where the frequency of truck deliveries is higher during weekdays compared to weekends, may have also impacted levels of 1-hour average NO_2 measured at S150 – MV WTEF station. The trends in 1-hour averaged NO_2 remained consistent at both stations between the 2 years of monitored data. As expected, Summer NO_2 levels were significantly lower at both stations, indicating higher photochemical activity causing the reaction of NO_2 with volatile organic compounds (VOC) to form ozone (O_3).

The 1-hour average NO_2 pollution roses by year and season at both stations are shown in Figure 7-5 through Figure 7-8. These pollution roses illustrate the frequency distribution of wind direction (blowing from each cardinal direction) temporally correlated with 1-hour average NO_2 concentrations observed at both stations within the 2021 – 2022 monitoring period. It is important to note that the annual and seasonal pollution roses associated with 1-hour average NO_2 concentrations collected at S150 – MV WTEF station in 2021 have not been included due to insufficient wind data collected in the 2021 year (data record begins on September 16, 2021 after the installation of the WTEF meteorological sensors). The pollution roses for S150 – MV WTEF in Figure 7-5 and Figure 7-6 show that the highest 1-hour NO_2 concentrations arose most frequently from the east and east-northeast directions for most of the 2022 year, with the exception of the Summer months. The pollution roses for T18 – Burnaby South station in Figure 7-7 and Figure 7-8 show more variation in the wind directions associated with higher concentrations of 1-hour average NO_2. Higher frequencies of elevated 1-hour NO_2 concentrations were observed during the Autumn and Winter months of 2021 and 2022 at T18 – Burnaby South station.

Alternative visualizations of 1-hour NO_2 concentrations as they relate to wind speed and wind direction are shown in the form of polar plots (Figure 7-9 through Figure 7-12), which show the concentration of NO_2 weighted by wind speed and wind direction. Each segment (10-degree by 1m/s interval) of the plot provides the percentage contribution to the total NO_2 concentration. For the S150 – MV WTEF station in 2022, Figure 7-9 shows that the highest levels of 1-hour NO_2 arose from the east and east-northeast directions with low wind speeds (2 m/s to 5 m/s). Figure 7-10 shows that the pattern seen in the annual polar plot (Figure 7-9) was primarily associated with the Spring and Winter months, with more variability in the contributions of NO_2 from different wind speeds and wind directions during the Summer and Autumn months. For the T18 – Burnaby South station, Figure 7-11 and Figure 7-12 show that there was a high level of variability in wind speed and wind direction associated with the highest levels of NO_2. There was a fairly consistent pattern between years (2021 and 2022) and within each season (e.g., Winter 2021 and Winter 2022 look similar).

Comparison of the 2021 and 2022 data measured at S150 – MV WTEF and T18 – Burnaby South with historical data up to 2021 from Metro Vancouver's monitoring network indicates that the average values and diurnal and seasonal patterns agree well with other monitoring stations in the middle western parts of the region (T13 North Delta, T17 Richmond South, T46 New Westminster), and generally higher than for stations at the eastern margins of the region (i.e., T27 Langley, T30 Maple Ridge).

Taken together, the monitoring results indicate that the S150 – MV WTEF station experienced higher NO_2 levels than T18 – Burnaby South, likely associated with its proximity to upwind NO_2 sources such as Highways 91 and 91A, Marine Way, and activity in the Riverbend and Queensborough industrials areas. The WTEF stack is also upwind of S150 (based on predominant easterly wind flows), so WTEF emissions may impact measured levels, but likely only at very low wind speeds, due to station proximity to the facility. However, because the WTEF and other major proximate NO_2 sources are aligned in the predominant upwind direction from S150, it was not possible to definitively distinguish WTEF impacts from other major sources. For T18 – Burnaby South, elevated NO_2 levels were associated with a range of different wind directions and speeds, indicating influence from many different sources. Winds from the direction of the WTEF (south-southeasterly) were not notably associated with high NO_2 levels, indicating that its influence on T18 was likely indistinguishable from background. During Winter, Spring and Autumn, the highest NO_2 levels at T18 were associated with northeasterly winds from the direction of the Kingsway corridor and Highway 1 beyond, while during the Summer, the highest NO_2 levels were associated with southwesterly windows from the direction of Highway 91, Highway 99 and the cement plants on the Fraser River in Richmond and Delta, which are the two largest NO_2 point sources in the region[23]. As indicated in Section 7.1, measured NO_2 levels at both stations remained below AAQO levels throughout the study period. In particular, with regards to 1-hour concentrations, 95% of the time, ambient concentrations of NO_2 are 50% or less of the AAQO at both stations.

Table 7-2 Monthly 1-Hour NO_2 (ppb) Summary at S150 – MV WTEF Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	95.3	1.4	19.4	51.0
February 2021	95.2	1.2	17.5	49.2
March 2021	95.8	1.1	15.7	49.0
April 2021	95.8	0.6	13.6	49.6
May 2021	99.2	0.8	9.5	38.8
June 2021	100.0	0.7	8.7	34.6
July 2021	100.0	1.0	7.4	29.8
August 2021	99.7	0.7	10.1	50.1
September 2021	99.9	1.1	11.5	34.0
October 2021	100.0	0.8	13.0	32.6
November 2021	100.0	1.1	15.2	42.4
December 2021	100.0	1.2	19.3	58.1
January 2022	100.0	1.1	18.4	45.6
February 2022	99.7	1.1	18.3	42.2
March 2022	100.0	1.0	15.7	42.5
April 2022	100.0	1.1	12.0	38.6
May 2022	99.9	0.8	9.4	35.3
June 2022	98.5	0.9	8.5	35.8
July 2022	99.5	0.8	8.0	39.9
August 2022	100.0	1.0	9.3	36.5
September 2022	100.0	1.1	12.6	52.1
October 2022	100.0	1.6	15.0	47.7
November 2022	99.4	1.0	19.1	44.9
December 2022	100.0	2.0	20.4	45.8

[23] *https://search.open.canada.ca/openmap/274ede77-27b9-46b8-96c8-4d7d4a706f08*

Table 7-3 Monthly 1-Hour NO_2 (ppb) Summary at T18 – Burnaby South Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	99.1	1.4	13.3	40.1
February 2021	99.3	1.4	13.1	34.8
March 2021	98.4	1.6	11.9	37.5
April 2021	98.6	1.4	10.1	36.6
May 2021	99.1	1.3	7.9	28.1
June 2021	98.5	1.4	7.7	26.4
July 2021	98.0	1.4	8.0	26.7
August 2021	98.3	1.3	8.7	35.4
September 2021	98.8	1.3	9.7	33.8
October 2021	99.9	1.2	9.9	32.8
November 2021	99.6	1.6	11.3	30.5
December 2021	99.7	1.9	15.4	38.9
January 2022	99.7	1.9	15.4	37.1
February 2022	98.5	1.5	14.7	37.5
March 2022	100.0	1.5	10.6	30.0
April 2022	99.4	1.2	8.1	33.2
May 2022	99.3	1.5	7.5	28.9
June 2022	98.1	0.6	6.7	22.3
July 2022	98.9	1.4	8.5	26.6
August 2022	98.1	1.2	10.1	28.7
September 2022	100.0	1.3	10.9	42.3
October 2022	100.0	1.8	16.0	49.5
November 2022	99.6	1.2	16.0	36.1
December 2022	100.0	2.3	16.4	40.2

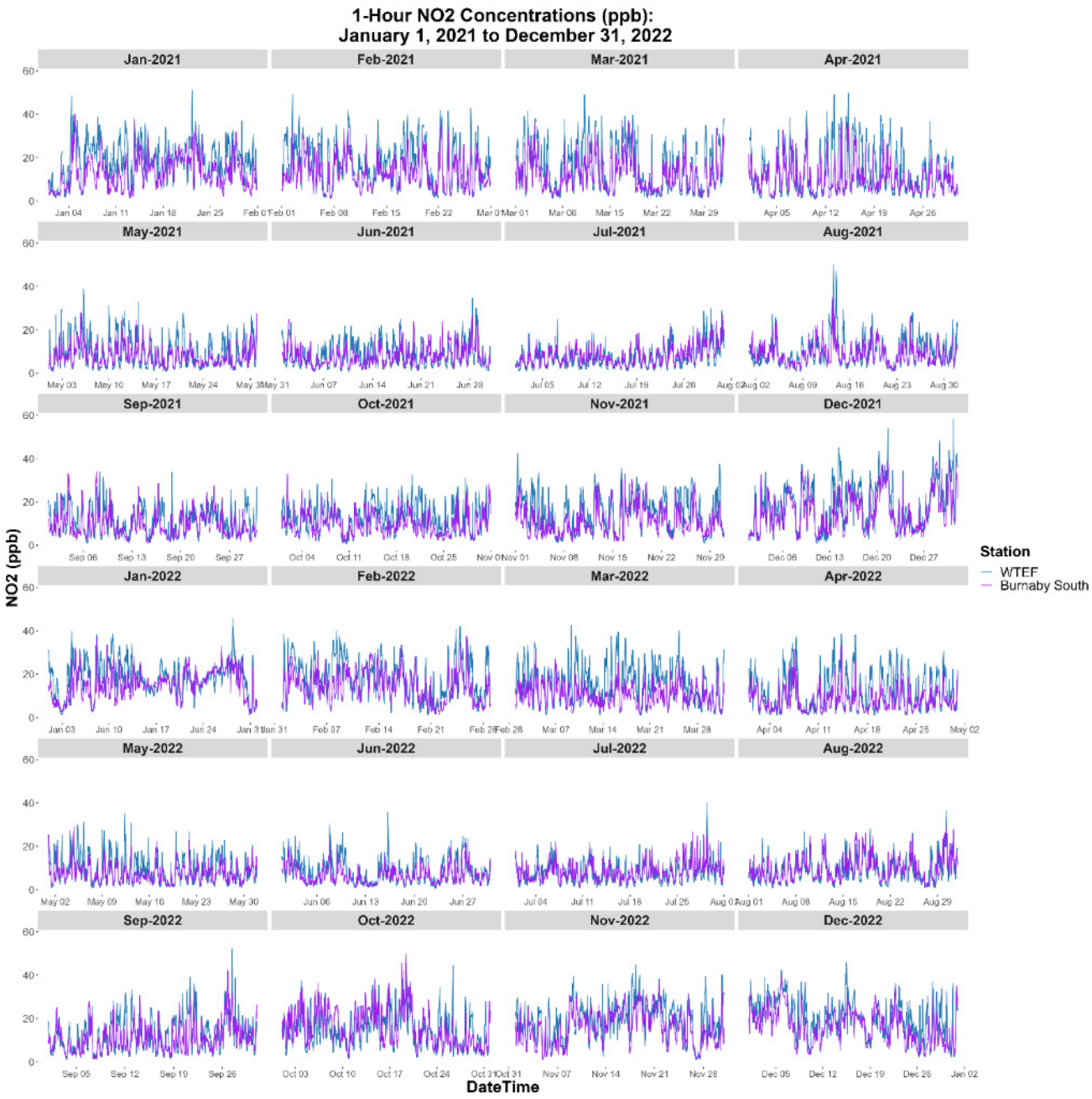


Figure 7-1 Monthly Timeseries of 1-Hour NO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

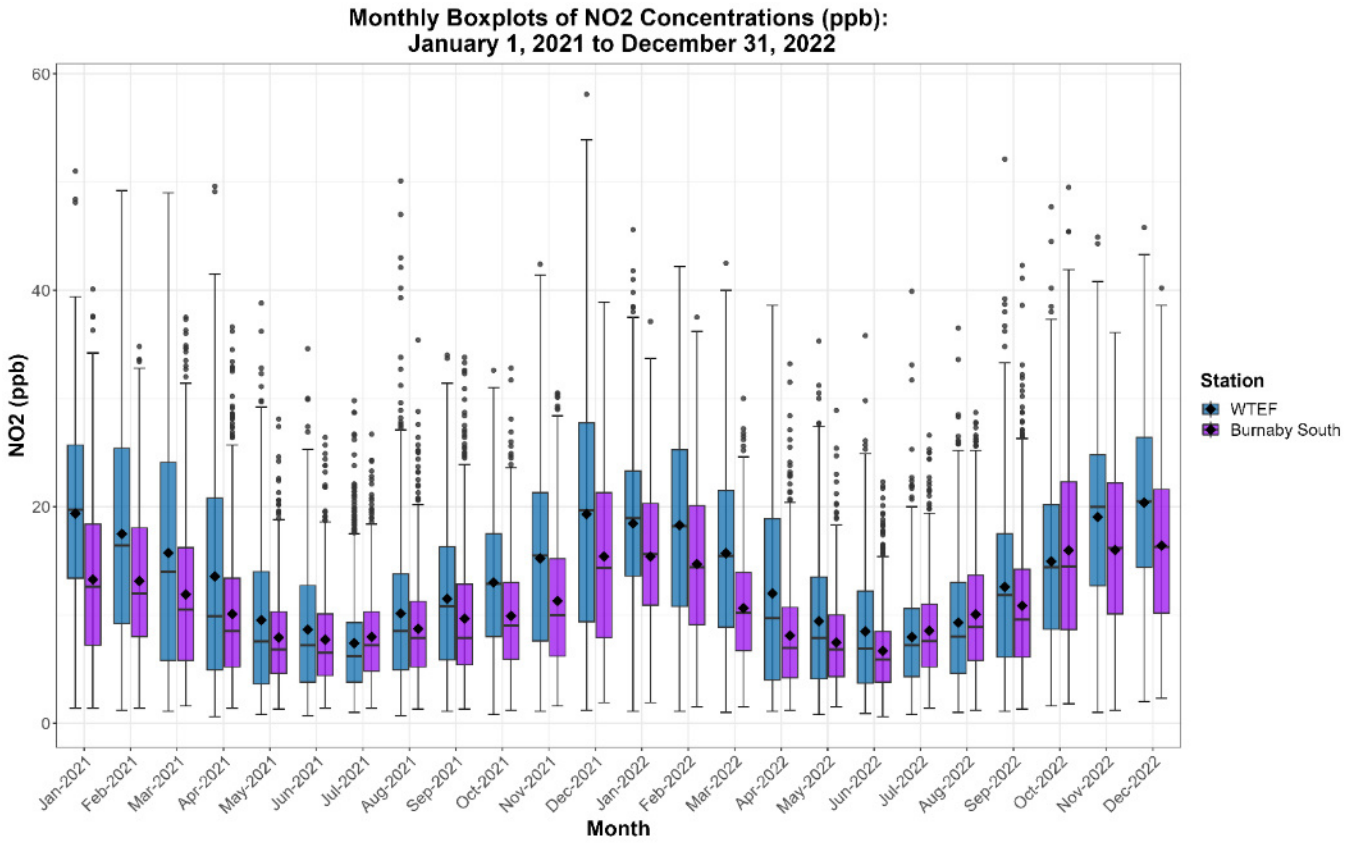


Figure 7-2 Monthly Boxplots of 1-Hour NO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

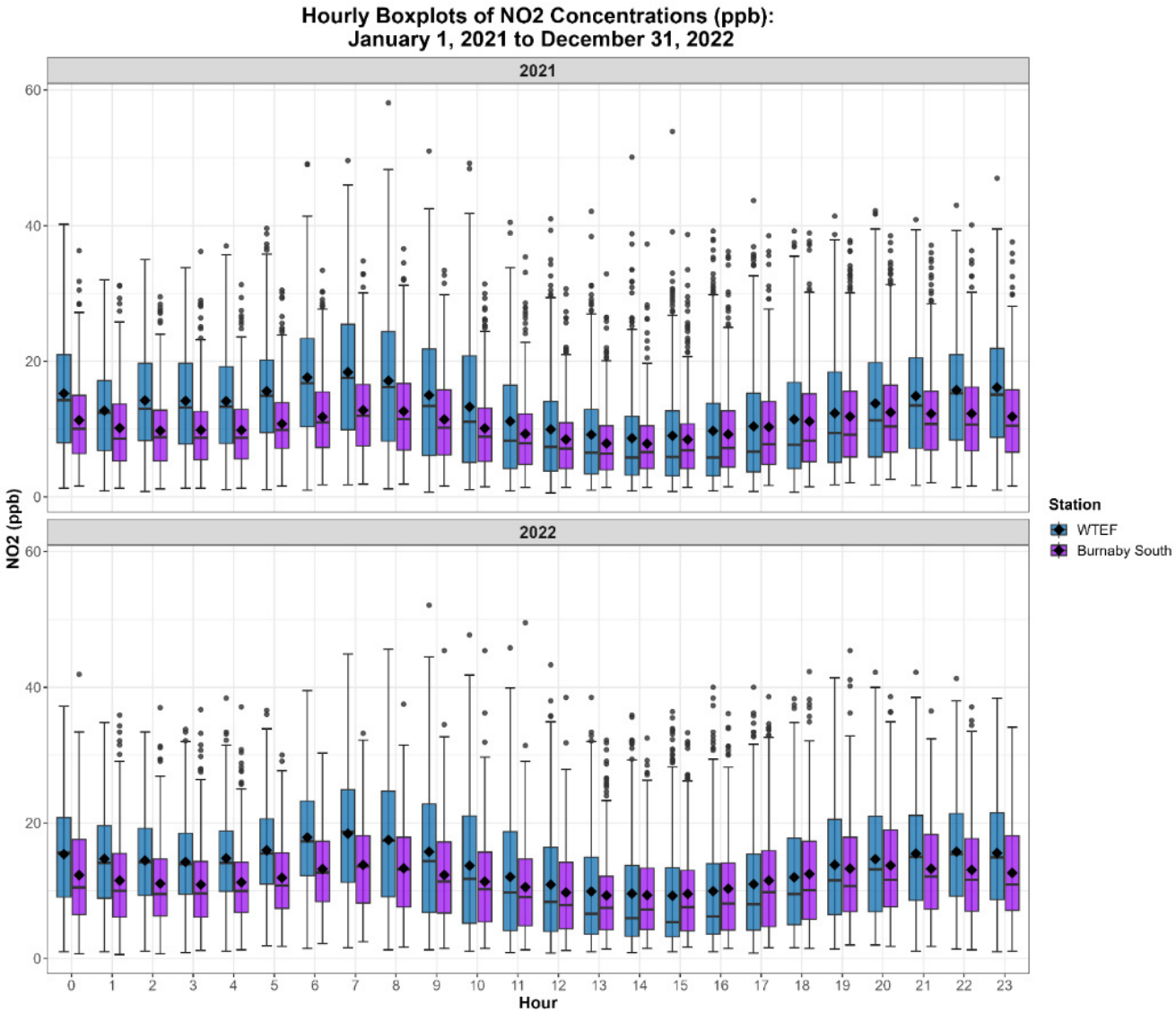


Figure 7-3 Hourly Boxplots of 1-Hour NO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

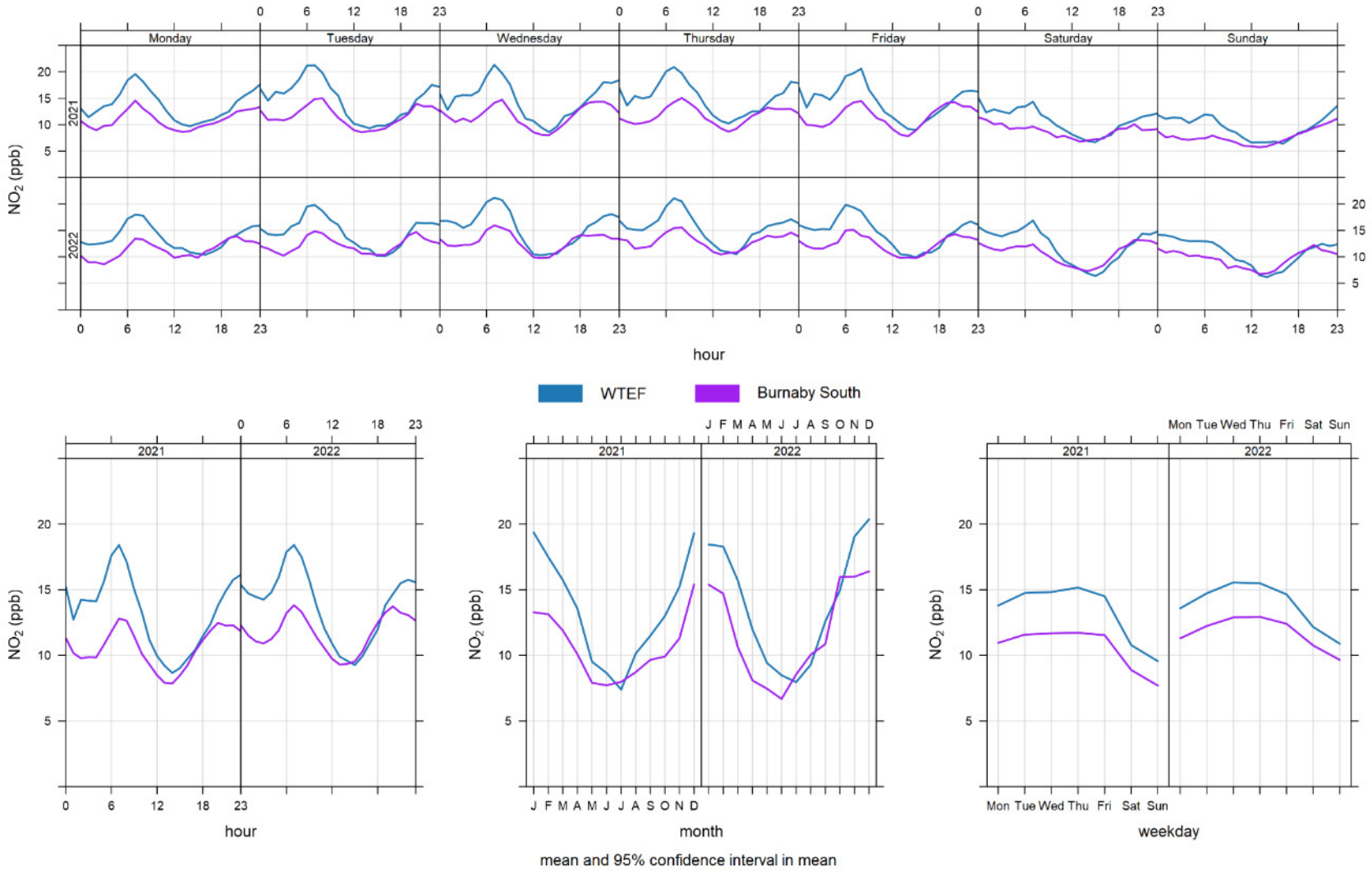


Figure 7-4 Time Variation of 1-Hour NO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

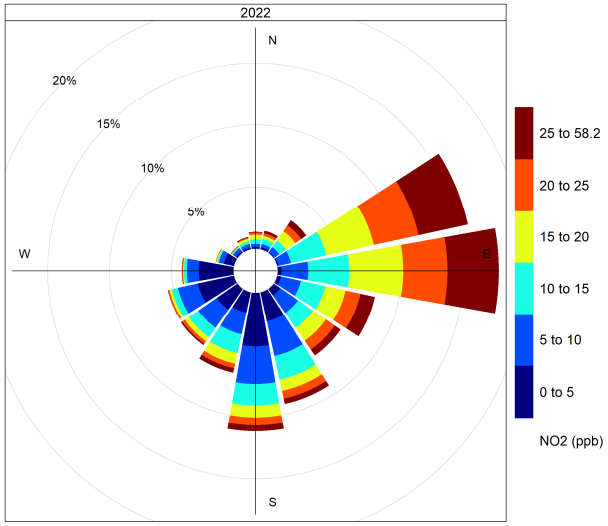


Figure 7-5 Annual Pollution Rose of 1-hour NO_2 (ppb) at S150 – MV WTEF Station in 2022

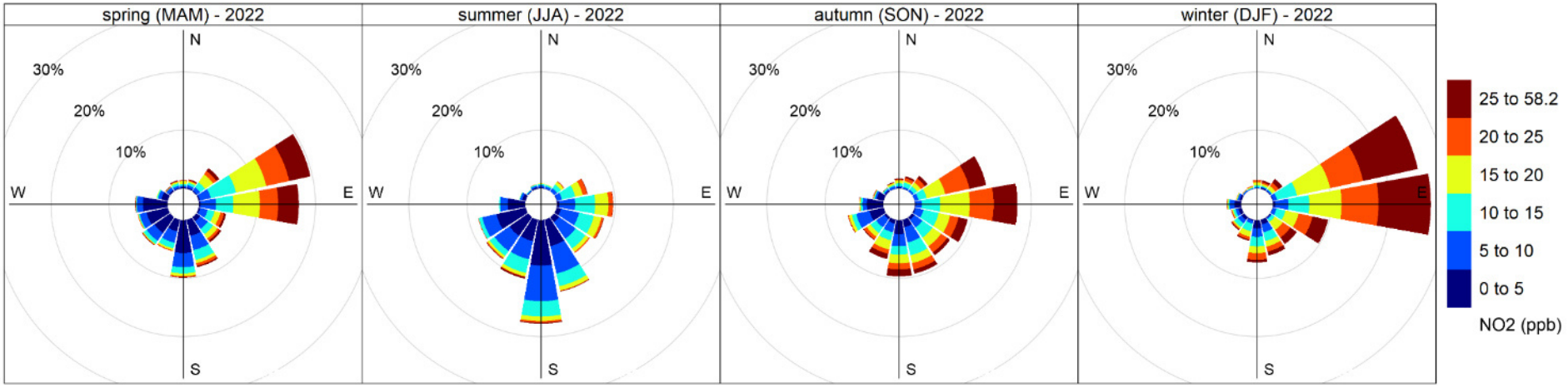


Figure 7-6 Seasonal Pollution Roses of 1-hour NO_2 (ppb) at S150 – MV WTEF Station in 2022

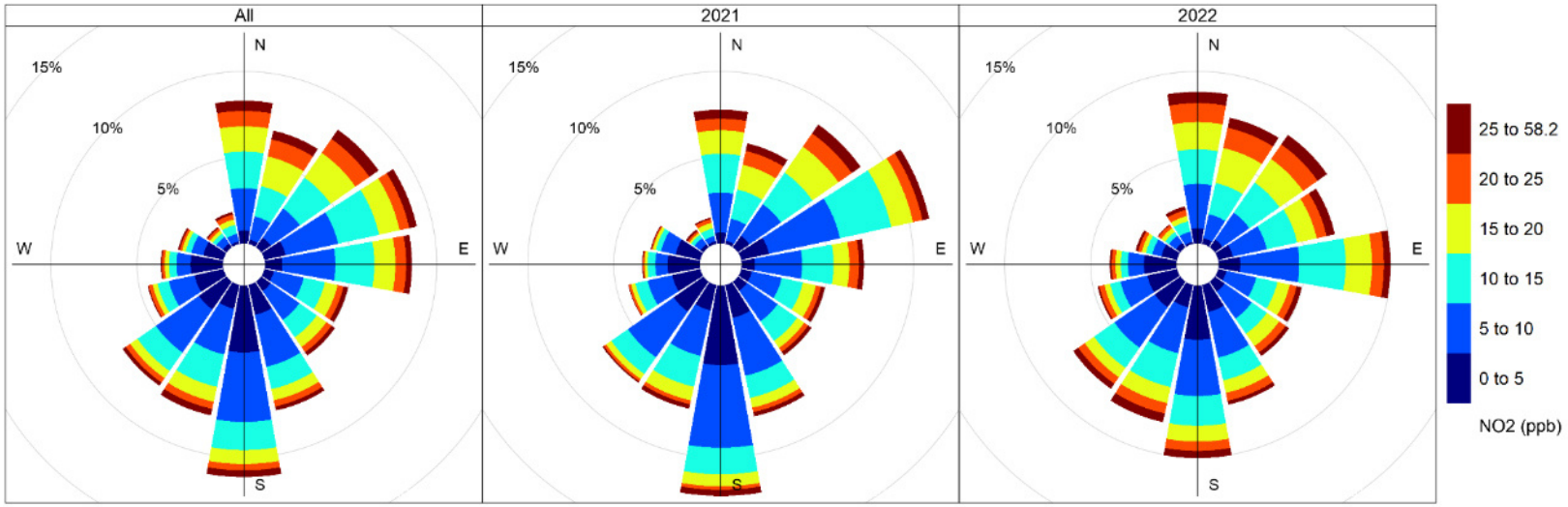


Figure 7-7 Annual Pollution Roses of 1-hour NO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

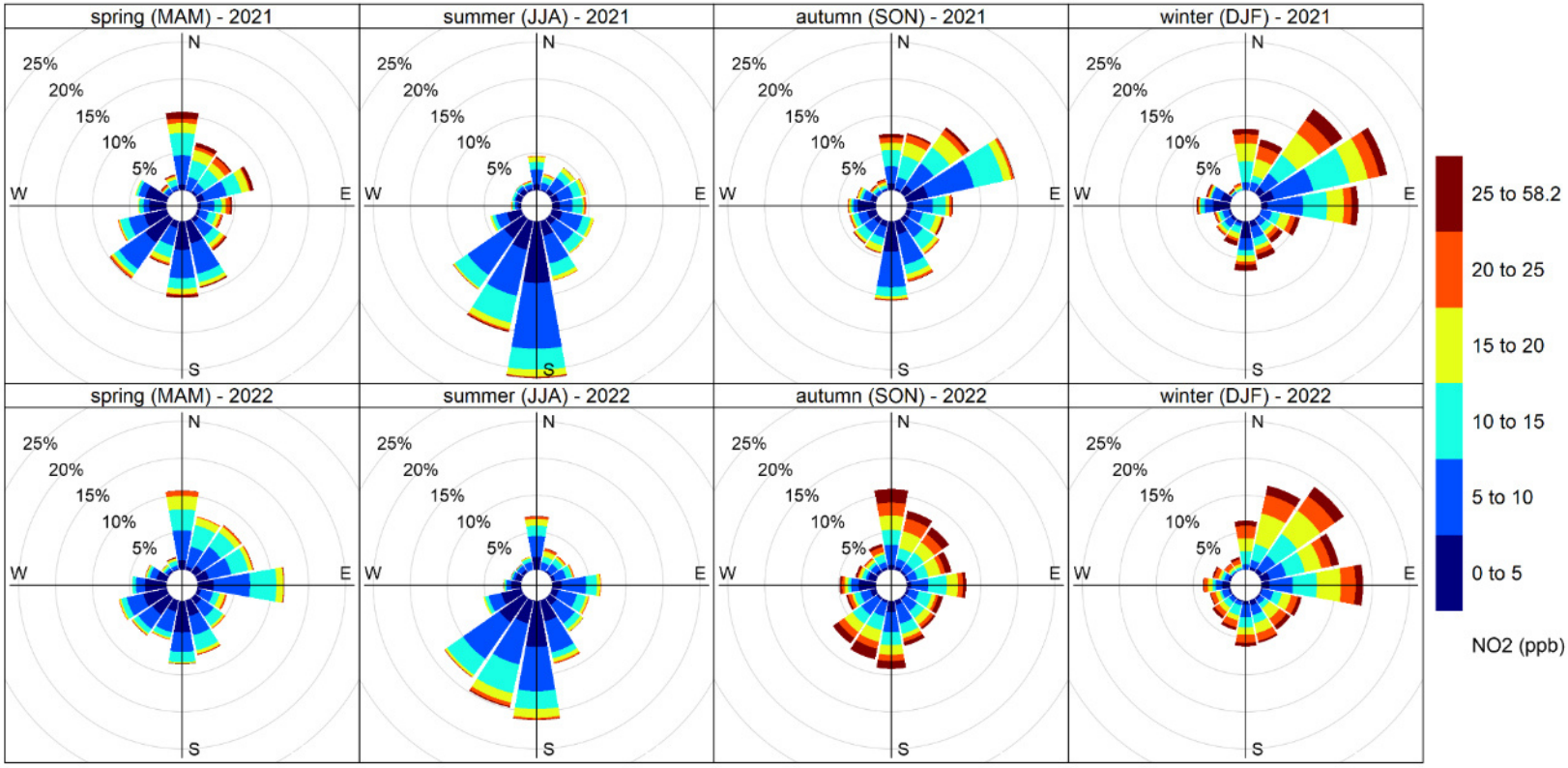


Figure 7-8 Seasonal Pollution Roses of 1-hour NO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

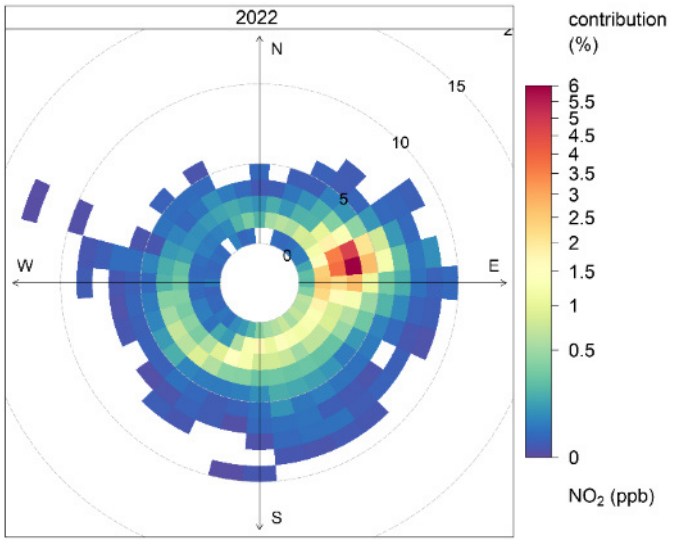


Figure 7-9 Annual Polar Plot of Percentage Contribution to Total 1-hour NO_2 (ppb) at S150 – MV WTEF Station in 2022

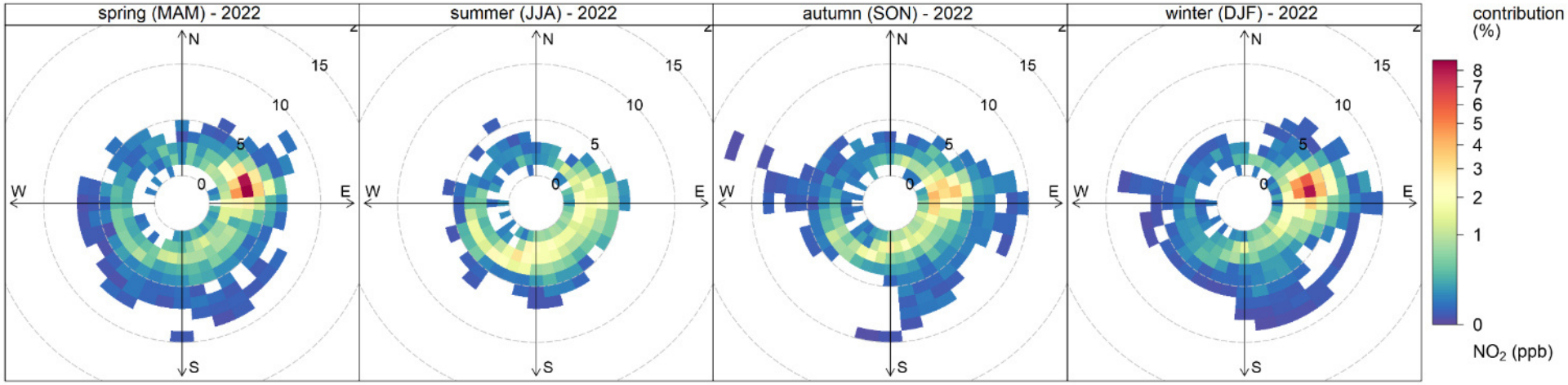


Figure 7-10 Seasonal Polar Plot of Percentage Contribution to Total 1-hour NO_2 (ppb) at S150 – MV WTEF Station in 2022

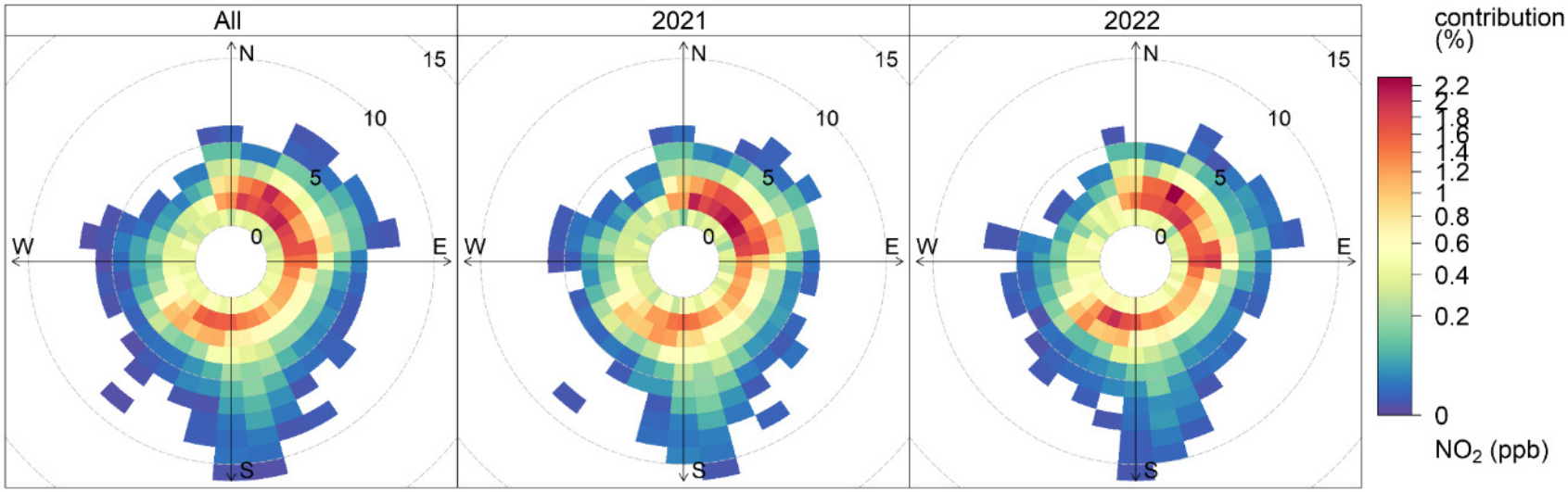


Figure 7-11 Annual Polar Plot of Percentage Contribution to Total 1-hour NO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

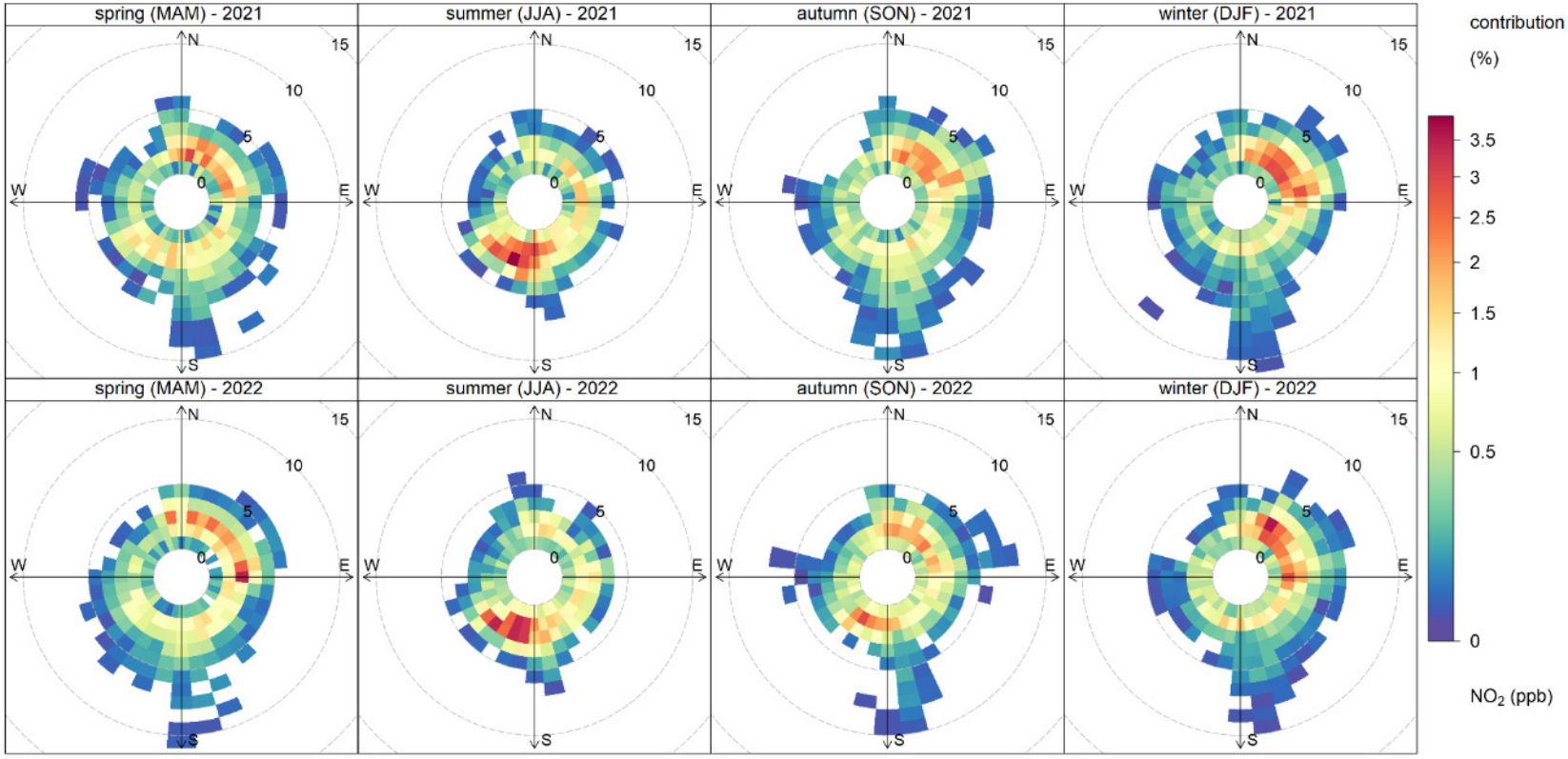


Figure 7-12 Seasonal Polar Plot of Percentage Contribution to Total 1-hour NO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

7.3 SULPHUR DIOXIDE (SO_2) DATA REVIEW

Sulphur dioxide (SO_2) is a colourless gas that smells like burnt matches. It is emitted when fossil fuels containing sulphur are burned. Sulphur dioxide can also react with other substances in the air to form particulate matter which can affect human health and create a "white haze" in the air. Regional sources of sulphur dioxide include marine vessels that burn sulphur-containing fuels, a petroleum refinery, and industrial facilities that combust solid fuels containing sulphur.

Table 7-4 and Table 7-5 provide summaries of sulphur dioxide (SO2) measurements collected in 2021 and 2022 at S150 – MV WTEF station and T18 – Burnaby South station, respectively. Monthly timeseries of 1-hour average SO2 at the two stations are presented in Figure 7-13.

The boxplots in Figure 7-14 and Figure 7-15 show the monthly and hourly variation in 1-hour average SO_2 concentrations at the two stations. In general, the boxplots show that the 1-hour average SO_2 concentrations observed at the two stations are very low, with the majority of the concentrations falling below 1 ppb. The monthly boxplots show that, on average, the levels of SO_2 observed at both stations were comparable during most of the 2-year monitoring period, with slightly higher levels observed at T18 – Burnaby South station during 2 periods (June to September 2021 and June to November 2022). The hourly boxplots show slightly higher SO_2 levels observed at T18 – Burnaby South station compared to the corresponding levels observed at S150 – MV WTEF station during the midday hours from 08:00 to 14:00 during both monitoring years.

In addition, the time variation plots in Figure 7-16 show that, at both stations, the peak 1-hour average SO_2 concentrations occurred midday on all days of the week. The trends in 1-hour averaged SO_2 also appear to stay consistent at both stations between the 2 years of monitored data.

The 1-hour average SO_2 pollution roses by year and season at both stations are shown in Figure 7-17 through Figure 7-20. These pollution roses illustrate the frequency distribution of wind direction (blowing from each cardinal direction) temporally correlated with 1-hour average SO_2 concentrations observed at both stations within the 2021 – 2022 monitoring period. It is important to note that the annual and seasonal pollution roses associated with 1-hour average SO_2 concentrations collected at S150 – MV WTEF station in 2021 have not been included due to insufficient wind data collected in the 2021 year (data record begins on September 16, 2021 after the installation of the sensor). The pollution roses for S150 – MV WTEF station in Figure 7-17 and Figure 7-18 show relatively low levels of 1-hour SO_2 (i.e., most frequently less than 1 ppb), with most observations of SO_2 arising from the east and east-northeasterly directions during the Spring, Autumn, and Winter months and most observations of SO_2 arising from the southerly direction during the Summer months. For the T18 – Burnaby South station, the pollution roses in Figure-7-19 and Figure 7-20 show that the highest 1-hour average SO_2 concentrations arose from the southerly, south-southwesterly, and southwesterly directions in the Summer months (June to August in 2021 and 2022) and the Autumn months of 2022 (September to November).

Alternative visualizations of 1-hour SO_2 concentrations as they relate to wind speed and wind direction are shown in the form of polar plots (Figure 7-21 through Figure 7-24), which show the concentration of SO_2 weighted by wind speed and wind direction. Each segment (10-degree by 1m/s interval) of the polar plot therefore provides the percentage contribution to the total SO_2 concentration. For S150 – MV WTEF station in 2022, Figure 7-21 shows that the highest levels of 1-hour SO_2 arose from the east, east-northeast, and south-southwest, southwest, and west-southwest directions with low wind speeds (2 m/s to 4 m/s). Figure 7-22 shows that there was more variability in the contributions of SO_2 from different wind speeds and wind directions, where the pattern in the Summer months of 2022 differs from the remaining 3 seasons. Annual polar plots of 1-hour SO_2 measured at T18 – Burnaby South station (Figure 7-23) show that the highest levels of 1-hour SO_2 arose from the southwest, south-southwest, and south directions during low wind speeds (2 m/s to 4 m/s) for both monitoring years. Furthermore, Figure 7-24 shows that the annual pattern of higher levels of SO_2 from the southwestern directions in the annual polar plots (Figure 7-23) was primarily driven by the SO_2 levels measured in the Summer months of 2021 and 2022.

Comparison of the 2021 and 2022 data measured at S150 – MV WTEF and T18 – Burnaby South with historical data up to 2021 from Metro Vancouver's monitoring network[24] indicates that the maximum and average SO_2 values and diurnal and seasonal patterns agree well with other monitoring stations in western parts of the region near the Salish Sea and western end of Burrard Inlet (T31 Vancouver Airport, T50 Vancouver Clarke Drive). Measured values for the study stations are generally lower than for stations near Burrard Inlet with direct influence of oil refinery emissions and marine vessel emissions (i.e., T23 Burnaby Capitol Hill, T9 Port Moody), and generally higher than for stations further east in the region (i.e., T27 Langley, T21 Pitt Meadows).

Taken together, the monitoring results indicate that the T18 – Burnaby South station experienced higher SO_2 levels than S150 – MV WTEF during the Summer, likely associated with transport of SO_2 emitted by sources to the west and southwest such as marine shipping on the Fraser River and Salish Sea and industrial sources such as the cement plants on the Fraser River in Richmond and Delta[25]. Daily Summer wind patterns associated with the switch from overnight land breezes to daytime sea breezes, along with the rising boundary layer during the morning hours likely contribute to the observed daily morning peak. The WTEF may contribute somewhat to the observed Summer morning SO_2 at T18, perhaps leading to higher peak SO_2 levels at T18 vs S150, but its location to the south-southeast of the station makes it a less likely source than those to the south west. The higher elevation of T18 may also play a role in positioning the station more directly in the SO_2 plume carried by south westerly winds. During the Winter months, the WTEF stack is upwind of S150 (based on predominant easterly Winter wind flows), so WTEF emissions may impact measured S150 levels, but likely only at very low wind speeds, due to station proximity to the facility. As indicated in Section 7.1, measured SO_2 levels at both stations remained far below AAQO levels throughout the study period. In particular, with regards to 1-hour concentrations, 98% of the time, ambient concentrations of SO_2 are less than 2% of the AAQO at both stations.

Table 7-4 Monthly 1-Hour SO_2 (ppb) Summary at S150 – MV WTEF Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	95.2	0.0	0.2	1.2
February 2021	95.5	0.0	0.2	1.0
March 2021	95.8	0.0	0.2	1.3
April 2021	95.8	0.0	0.3	3.9
May 2021	99.2	0.0	0.3	3.3
June 2021	100.0	0.0	0.3	2.1
July 2021	99.9	0.0	0.3	3.8
August 2021	99.6	0.0	0.2	3.6
September 2021	99.9	0.0	0.2	2.2
October 2021	100.0	0.0	0.2	0.8
November 2021	100.0	0.0	0.2	1.2
December 2021	100.0	0.0	0.2	0.9
January 2022	100.0	0.0	0.2	1.7
February 2022	99.7	0.0	0.2	1.7
March 2022	100.0	0.0	0.2	0.9
April 2022	100.0	0.0	0.2	1.2
May 2022	99.9	0.0	0.2	2.2
June 2022	99.0	0.0	0.2	6.9
July 2022	99.6	0.0	0.2	2.8
August 2022	100.0	0.0	0.2	2.6

[24] *https://metrovancouver.org/services/air-quality-climate-action/air-quality-reports*
[25] *https://search.open.canada.ca/openmap/274ede77-27b9-46b8-96c8-4d7d4a706f08*

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
September 2022	100.0	0.0	0.2	1.5
October 2022	100.0	0.0	0.2	1.7
November 2022	99.7	0.0	0.3	1.3
December 2022	100.0	0.1	0.3	1.6

Table 7-5 Monthly 1-Hour SO_2 (ppb) Summary at T18 – Burnaby South Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	100.0	0.0	0.2	1.5
February 2021	100.0	0.0	0.2	1.9
March 2021	99.3	0.0	0.2	1.5
April 2021	99.6	0.0	0.3	3.6
May 2021	100.0	0.0	0.2	2.2
June 2021	99.9	0.0	0.3	3.9
July 2021	99.9	0.0	0.5	4.4
August 2021	99.2	0.0	0.3	2.5
September 2021	100.0	0.0	0.3	1.7
October 2021	100.0	0.0	0.2	2.0
November 2021	99.3	0.0	0.1	2.6
December 2021	99.9	0.0	0.2	1.8
January 2022	99.9	0.0	0.2	1.1
February 2022	99.0	0.0	0.2	1.7
March 2022	100.0	0.0	0.2	2.1
April 2022	100.0	0.0	0.2	1.7
May 2022	100.0	0.0	0.2	1.2
June 2022	100.0	0.0	0.2	3.4
July 2022	100.0	0.0	0.3	2.0
August 2022	98.5	0.0	0.3	2.4
September 2022	100.0	0.0	0.4	3.2
October 2022	100.0	0.0	0.5	2.6
November 2022	99.6	0.0	0.3	1.4
December 2022	100.0	0.0	0.2	2.1

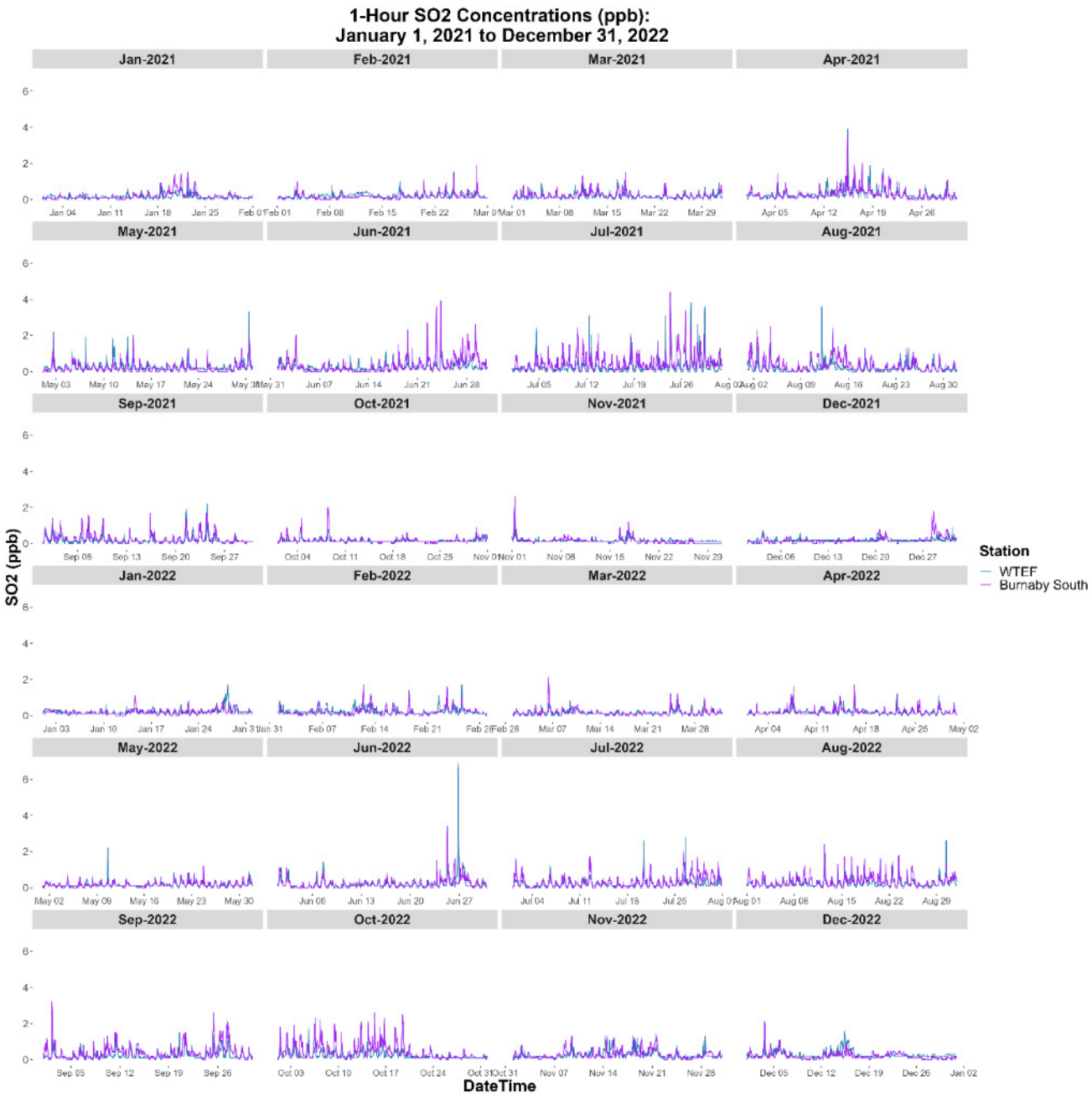


Figure 7-13 Monthly Timeseries of 1-Hour SO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

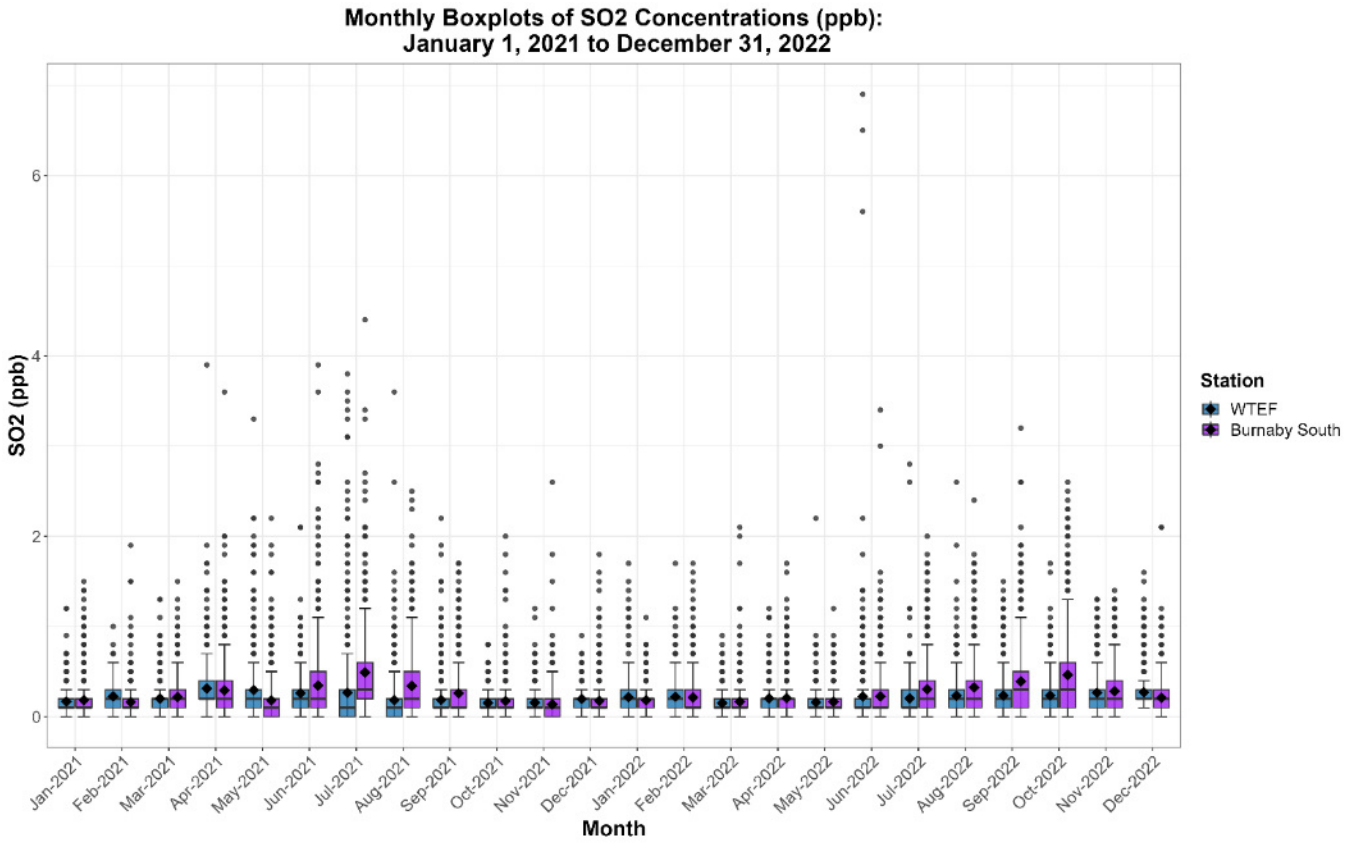


Figure 7-14 Monthly Boxplots of 1-Hour SO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

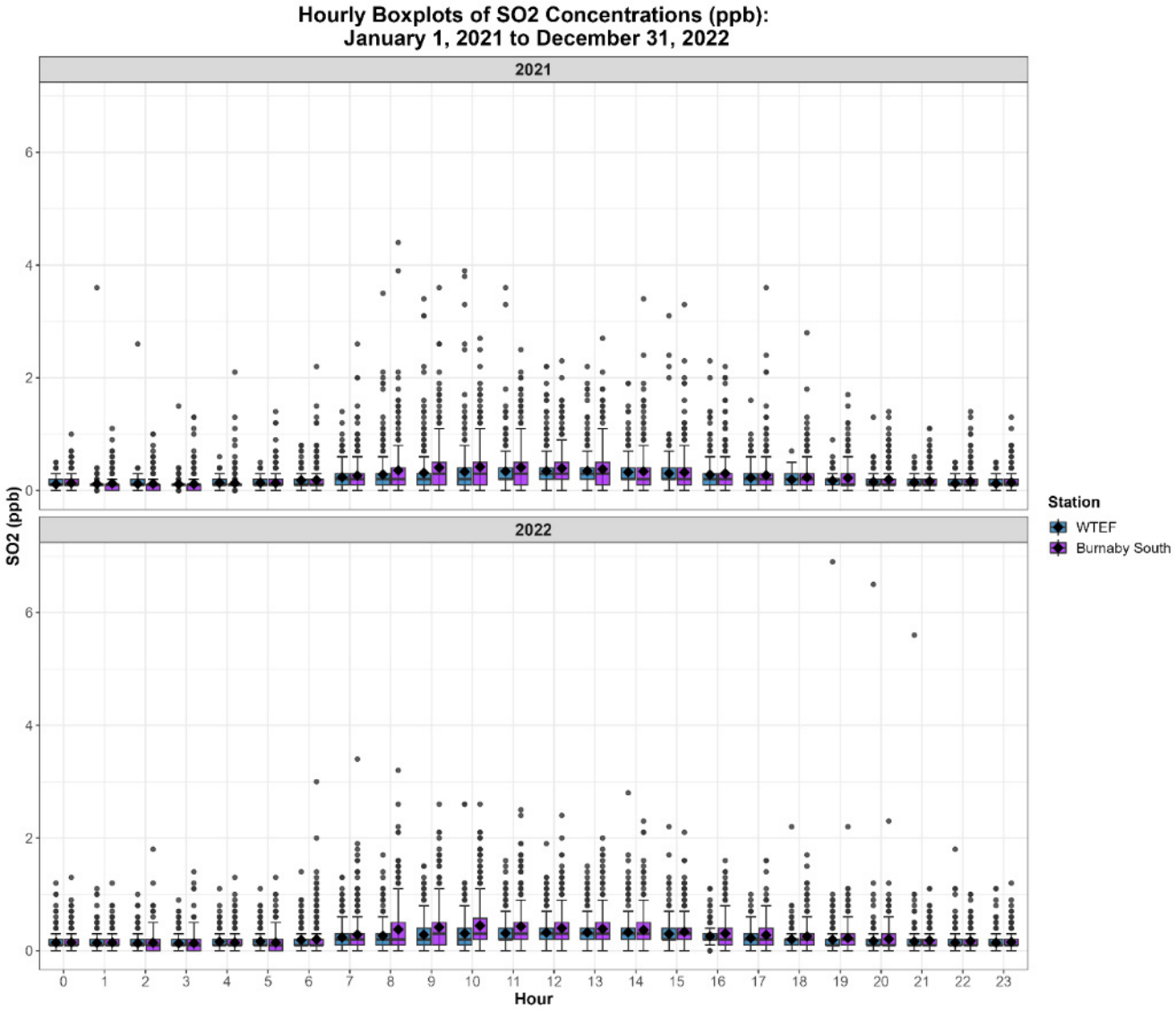


Figure 7-15 Hourly Boxplots of 1-Hour SO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

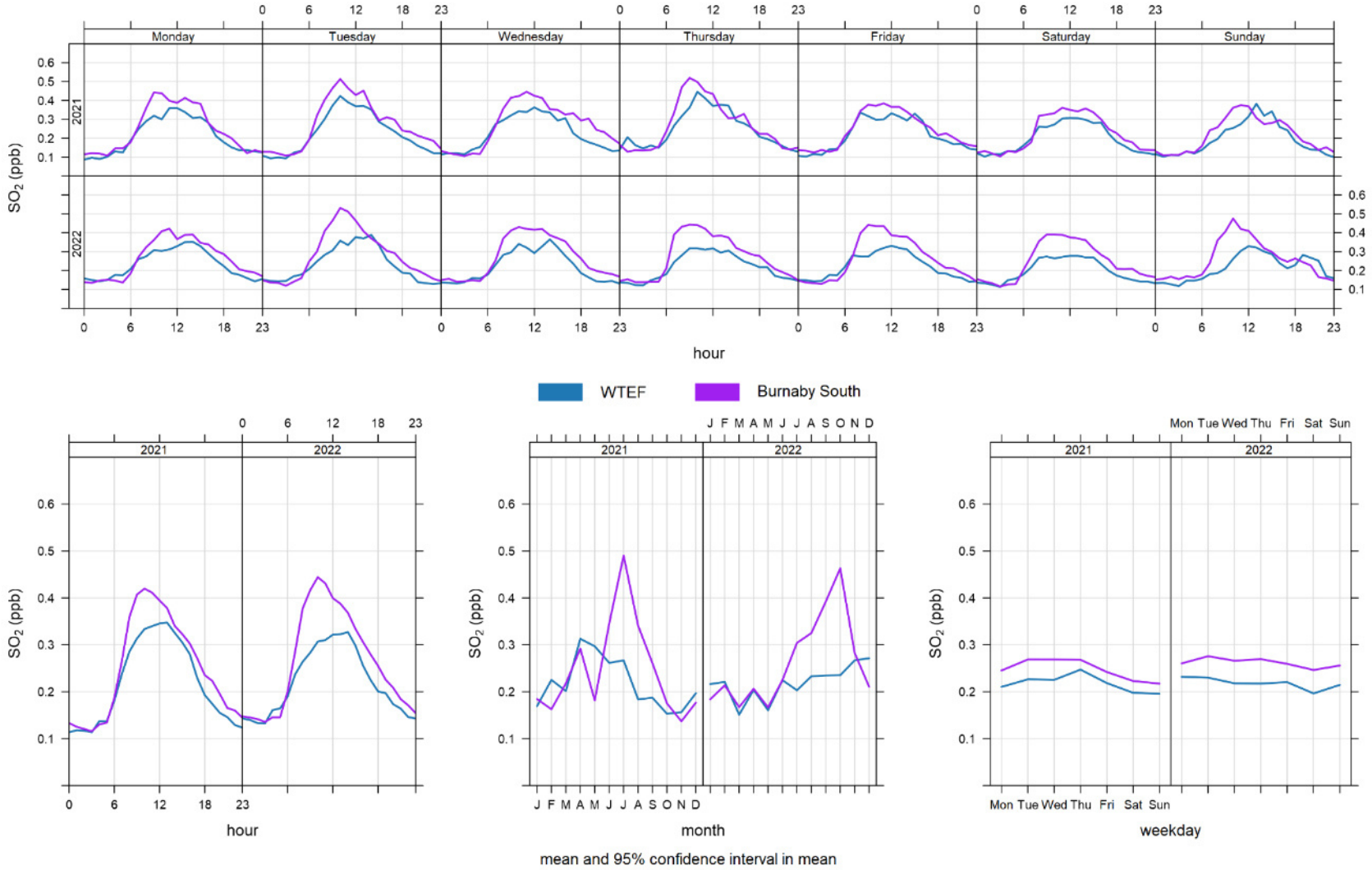


Figure 7-16 Time Variation of 1-Hour SO_2 (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

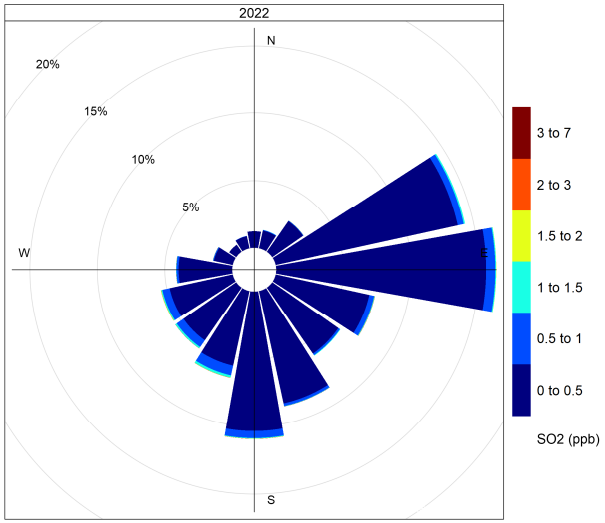


Figure 7-17 Annual Pollution Rose of 1-hour SO_2 (ppb) at S150 – MV WTEF Station in 2022

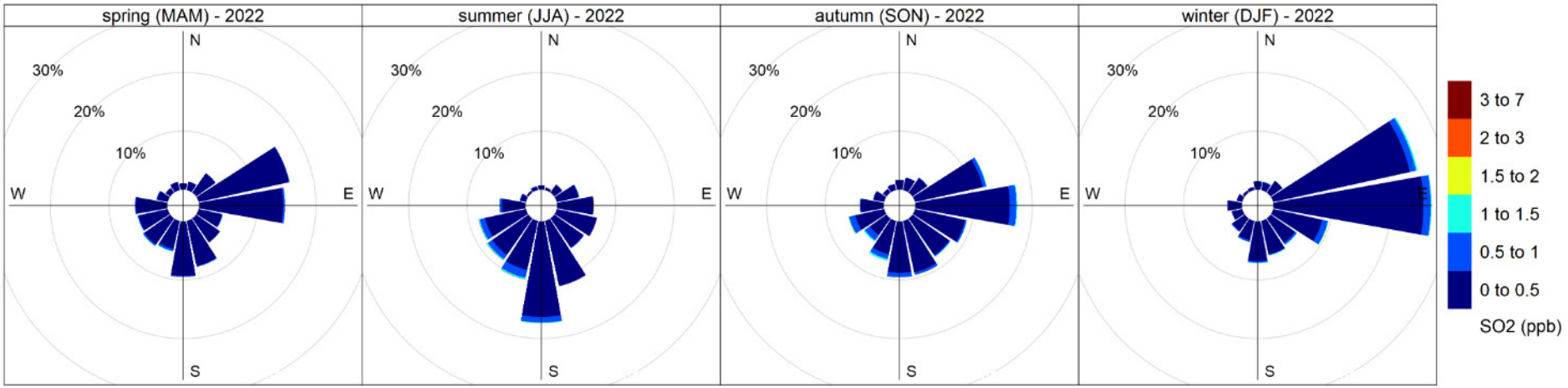


Figure 7-18 Seasonal Pollution Roses of 1-hour SO_2 (ppb) at S150 – MV WTEF Station in 2022

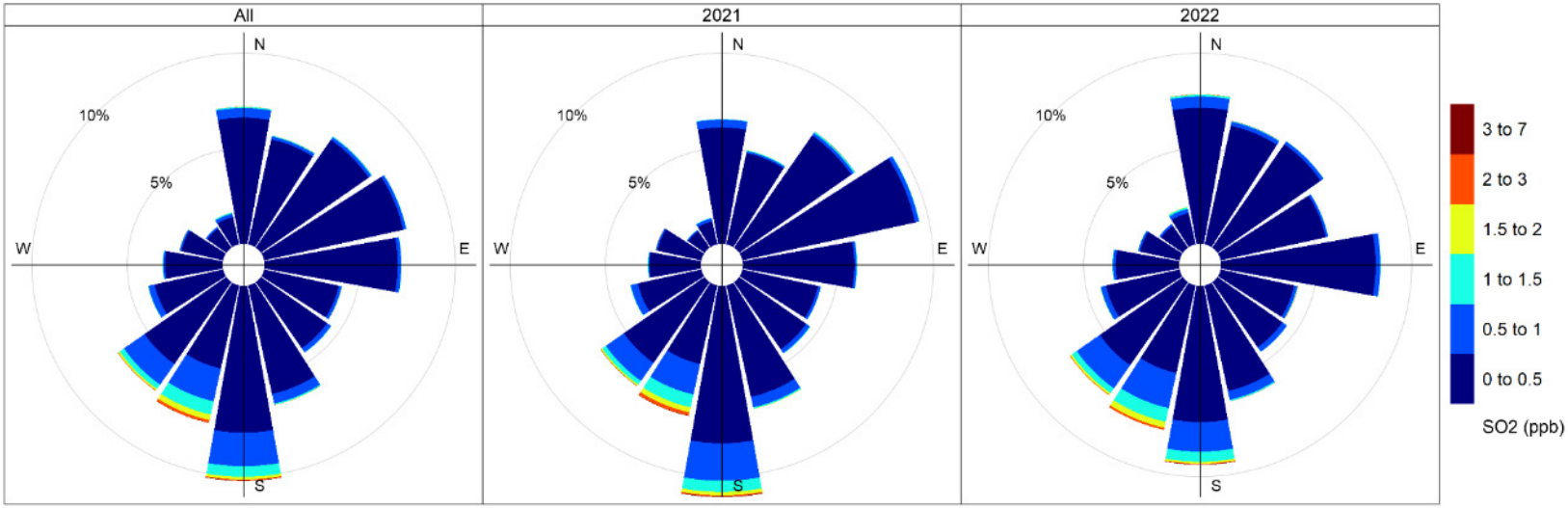


Figure-7-19 Annual Pollution Roses of 1-hour SO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

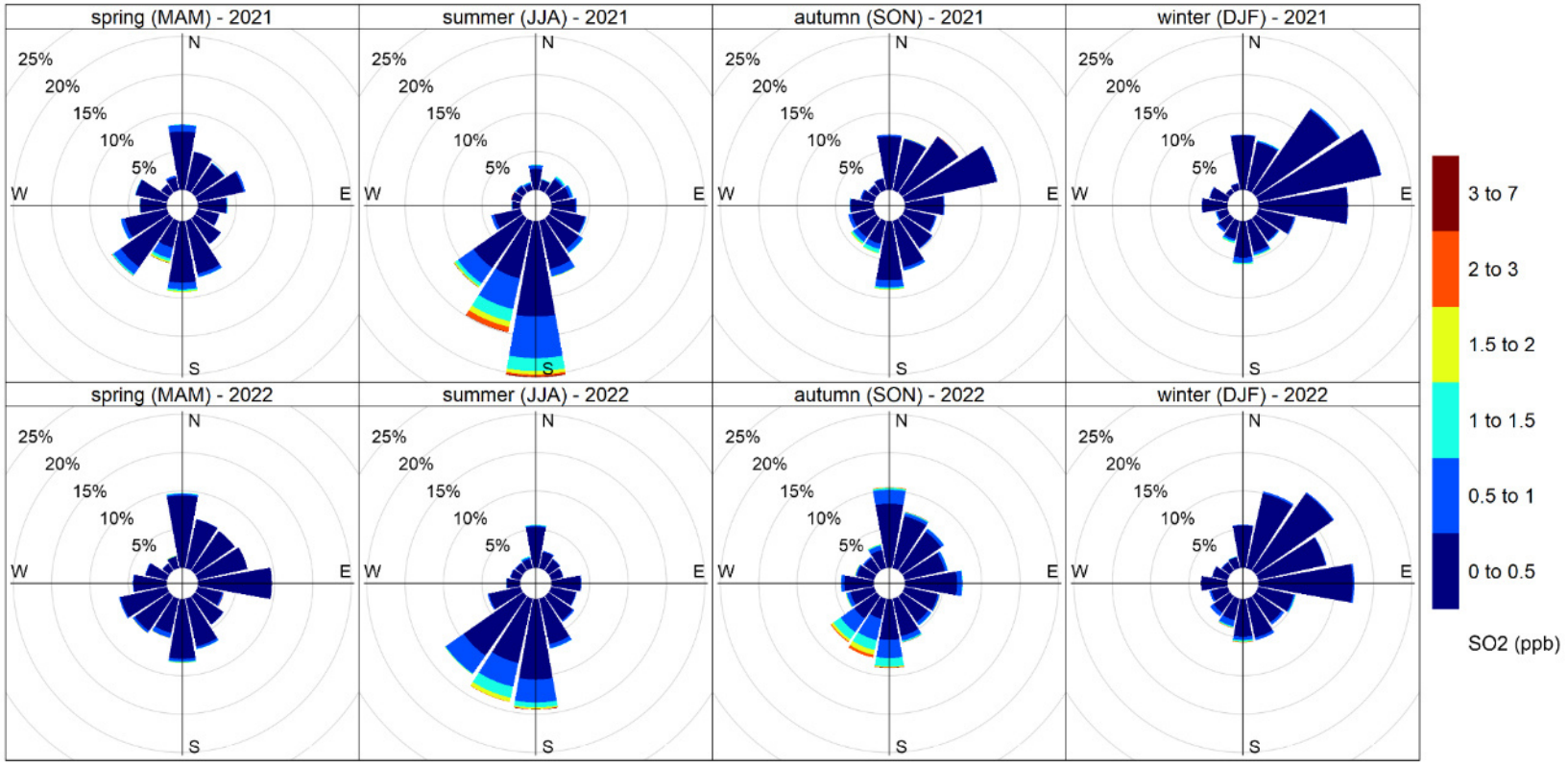


Figure 7-20 Seasonal Pollution Roses of 1-hour SO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

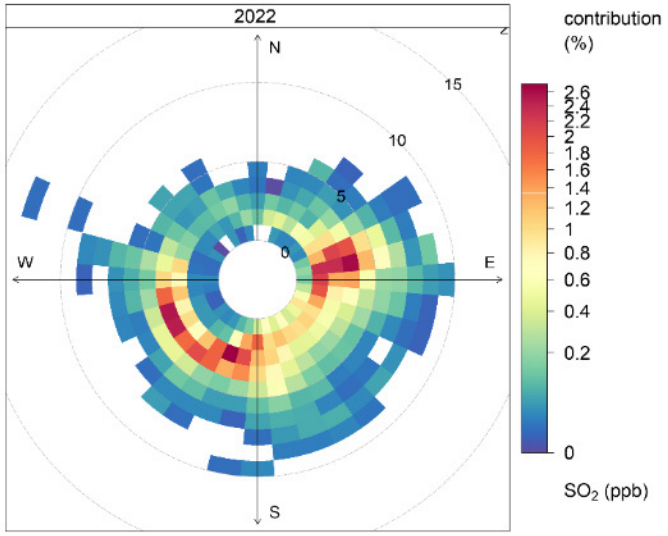


Figure 7-21 Annual Polar Plot of Percentage Contribution to Total 1-hour SO_2 (ppb) at S150 – MV WTEF Station in 2022

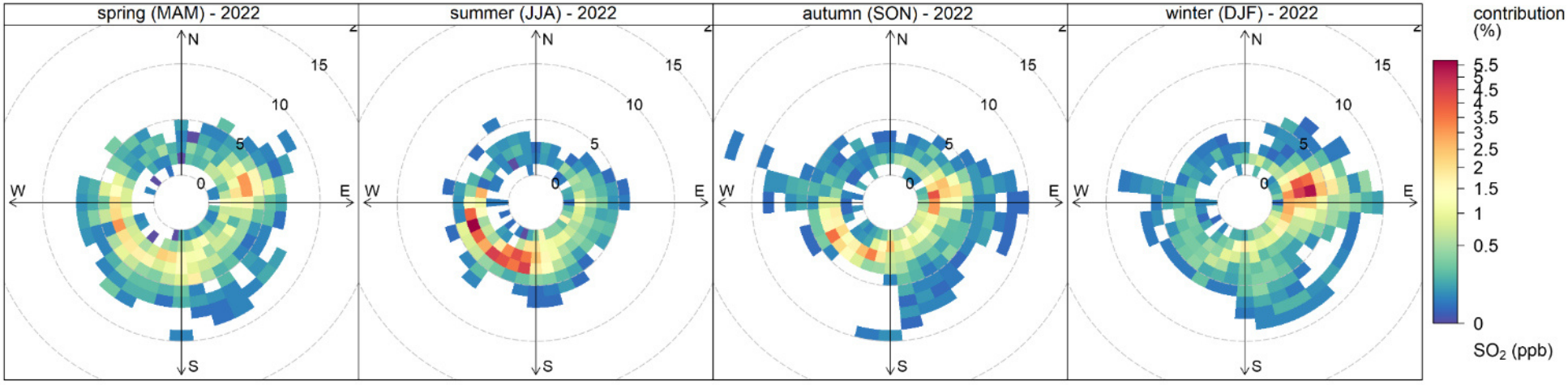


Figure 7-22 Seasonal Polar Plot of Percentage Contribution to Total 1-hour SO_2 (ppb) at S150 – MV WTEF Station in 2022

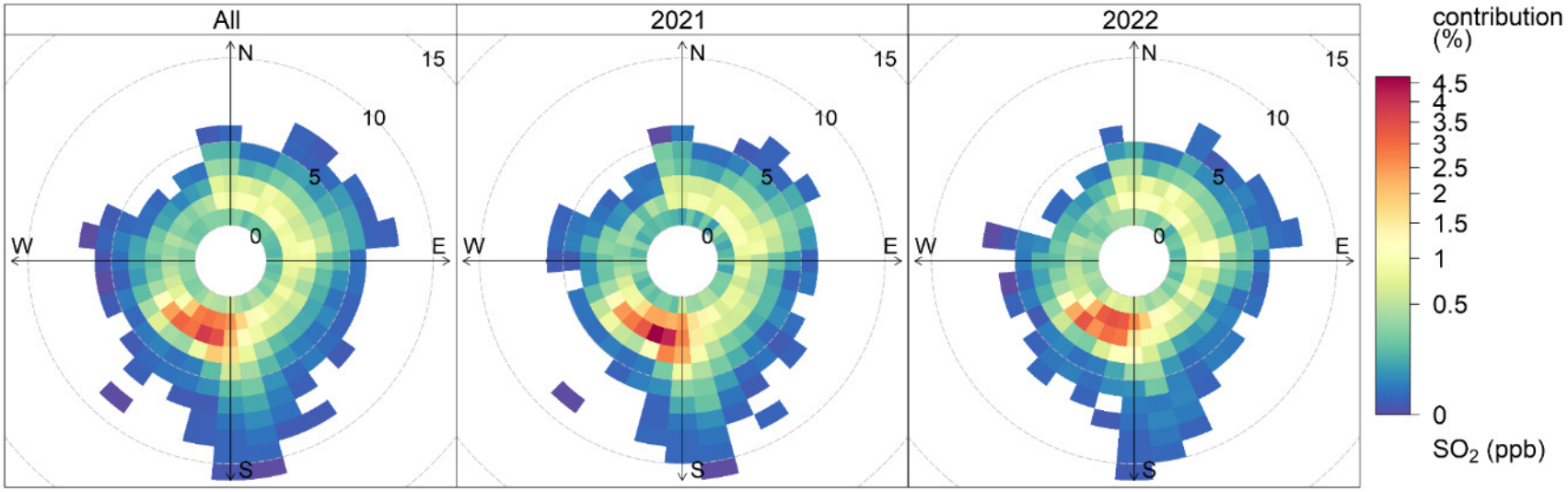


Figure 7-23 Annual Polar Plot of Percentage Contribution to Total 1-hour SO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

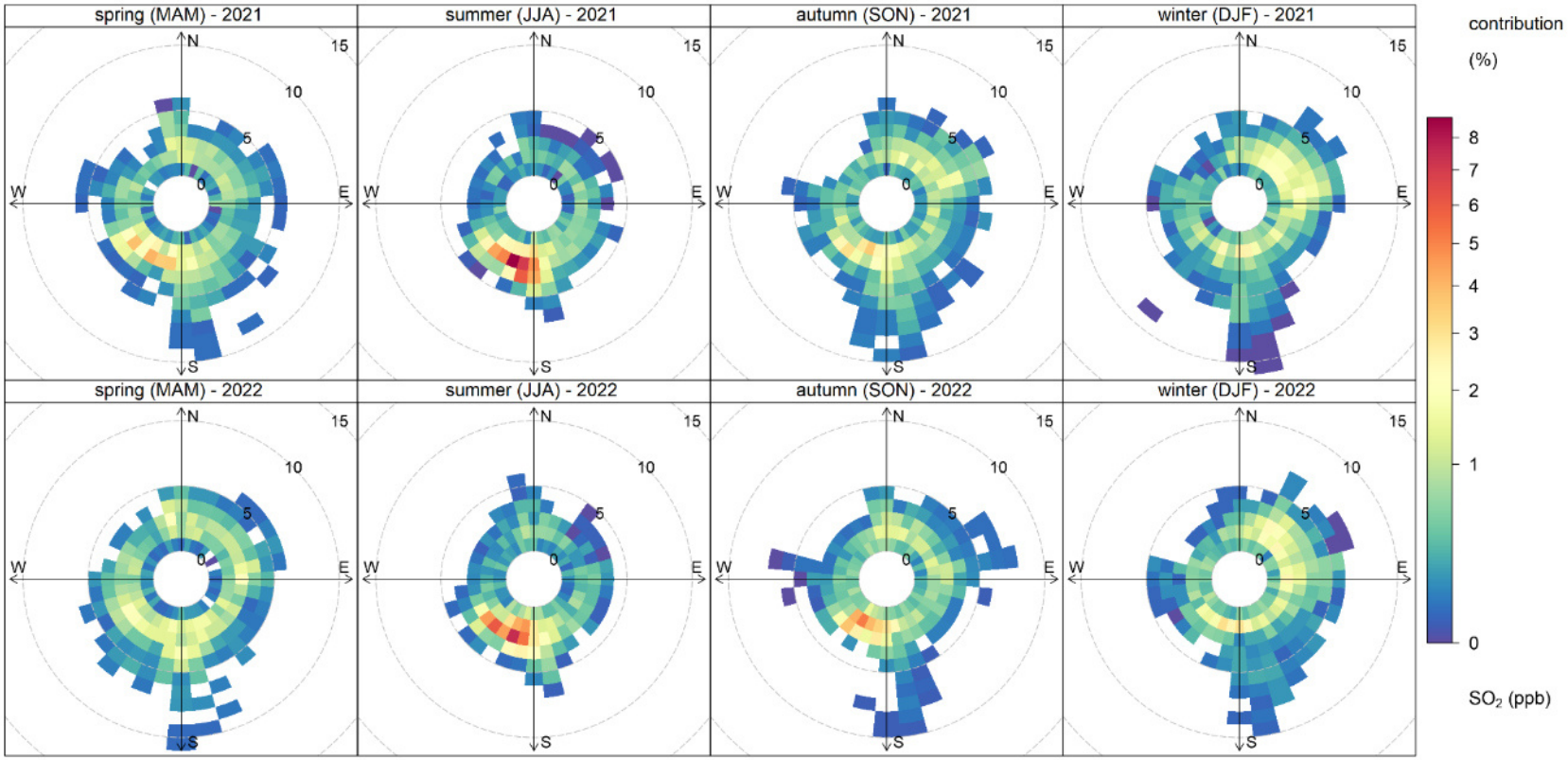


Figure 7-24 Seasonal Polar Plot of Percentage Contribution to Total 1-hour SO_2 (ppb) at T18 – Burnaby South Station in 2021 and 2022

7.4 HYDROGEN CHLORIDE (HCL) DATA REVIEW

Hydrogen chloride (HCl) is a colourless to slightly yellow gas with a pungent odour. It exists as a colourless gas at room temperature and becomes a white fume of hydrochloric acid within in the atmosphere upon contact with atmospheric water vapour. Exposure to HCl can cause irritations to the skin, nose, eyes, throat, and larynx. As detailed in Section 3, regional sources of HCl include the WTEF, industrial processes, natural marine sea salt dechlorination, industrial/agricultural wood boilers, residential wood burning, vehicle and structure fires, cremation emissions, and open-air biomass burning.

Table 7-6 and Table 7-7 provide summaries of hydrogen chloride (HCl) collected in 2021 and 2022 at S150 – MV WTEF station and T18 – Burnaby South station, respectively. Monthly timeseries of 1-hour average HCl at the two stations are presented in Figure 7-25. The timeseries show higher levels of 1-hour average HCl at T18 during the Spring months (March and April) and Summer in both monitoring years, while HCl levels at S150 were typically higher during the Winter.

The boxplots in Figure 7-26 and Figure 7-27 show the monthly and hourly variation in 1-hour average HCl concentrations at the two stations. .In general, the boxplots show that the 1-hour average HCl concentrations observed at the two stations are very low, with the majority of the concentrations falling below 1 ppb. The monthly boxplots (Figure 7-26) show that there was a pattern of higher levels of 1-hour average HCl at T18 – Burnaby South station during the Spring and Summer months compared to the Autumn and Winter months, while there was a pattern of higher levels of 1-hour average HCl at S150 – MV WTEF station during the Winter months (January and February in both years, and November and December 2022) compared to the other seasons of the 2-year monitoring period. The hourly boxplots (Figure 7-27) show that during the 2-year monitoring period there were slightly higher 1-hour HCl concentrations measured at T18 – Burnaby South station during the afternoon hours approximately between 13:00 and 18:00.

The time variation plots in Figure 7-28 show that the peak 1-hour average HCl concentrations at both stations occurred mid-afternoon (approximately 14:00 to 15:00) on all days of the week. This pattern is most evident on weekdays at the T18 – Burnaby South station during both years in the monitoring period, and least evident at S150 – MV WTEF station in 2022. The trends in 1-hour average HCl stayed consistent between the 2 years of monitoring at T18 – Burnaby South station, but changed slightly at the S150 – MV WTEF station.

The 1-hour average HCl pollution roses by year and season at both stations are shown in Figure 7-29 through Figure 7-32. These pollution roses illustrate the frequency distribution of wind direction (blowing from each cardinal direction) temporally correlated with 1-hour average HCl concentrations observed at both stations within the 2021 – 2022 monitoring period. It is important to note that the annual and seasonal pollution roses associated with 1-hour average HCl concentrations collected at S150 – MV WTEF station in 2021 have not been included due to insufficient wind data collected in the 2021 year (data record begins on September 16, 2021 after the installation of the sensor). The pollution roses for S150 – MV WTEF station in Figure 7-29 and Figure 7-30 show that the highest 1-hour HCl concentrations arose from the east and east-northeast directions during the Autumn and Winter months of 2022. The pollution roses for T18 – Burnaby South station in Figure 7-31 and Figure 7-32 show that the highest 1-hour average HCl concentrations arose from south-west directions in the Spring months (March to May) during both years of the monitoring period.

Similar to previous sections, polar plots are shown in the following figures to visualize 1-hour HCl concentrations in relation to wind speed and wind direction (Figure 7-33 through Figure 7-36). Specifically, the polar plots show the concentration of HCl weighted by wind speed and wind direction. Each segment (10-degree by 1 m/s interval) of the polar plot therefore provides the percentage contribution to the total HCl concentration. Figure 7-33 shows that the highest levels of 1-hour HCl at S150 – MV WTEF station in 2022 arose from the east and east-northeast directions with low wind speeds (2 m/s to 5 m/s). Figure 7-34 shows that the pattern seen in the annual polar plot (Figure 7-33) is driven by the Spring, Autumn, and Winter months. The annual polar plots of 1-hour HCl measured at T18 – Burnaby South station (Figure 7-35) show that the highest levels of 1-hour HCl arose from the southwest, south-southwest, and west directions during both monitoring years. The seasonal polar plots in Figure 7-36 show that there was more variation in terms of the combinations of wind speed and wind direction that are attributed to the highest

levels of HCl during each season, southwesterly winds were predominantly associated with high HCl values throughout the Spring, Summer and Autumn.

Unlike NO_2 and SO_2, no other HCl monitoring data from the region is available for comparison. Taken together, the monitoring results indicate that the T18 – Burnaby South station experienced higher HCI levels than S150 – MV WTEF during the Spring and Summer, while S150 experienced higher levels during the Winter. The Spring/Summer daytime afternoon peak at T18 is associated with both peak sea breeze intensity and peak photochemical activity, suggesting that HCl emissions associated with sea salt dechlorination occurring over the Salish Sea could be playing a role. It should also be noted that at the low levels of HCl monitored, the diurnal pattern could also be influenced by known temperature artifacts on the monitoring of HCl.

Given the predominant southwesterly wind direction associated with the peak Spring and Summer HCl levels at T18, significant contribution of the WTEF emissions to observed levels is unlikely, as it is located south southeast of the station. The fact that S150 did not experience peak HCl concentrations during similar Spring/Summer afternoon periods is puzzling, as it is affected by similar sea breeze winds, especially in the Summer The higher elevation of T18 may play a role in positioning the station more directly in the HCl plume carried by southwesterly winds or this could be related to the temperature artifacts influencing the HCl at the T18 location where a longer inlet may magnify its affects at the low concentrations of HCl that were monitored. During the Winter months, the WTEF stack is upwind of S150 (based on predominant easterly Winter wind flows), so WTEF emissions may impact measured S150 levels, but likely only at very low wind speeds, due to station proximity to the facility. As indicated in Section 7.1, measured HCl levels at both stations remained far below AAQO levels throughout the study period. In particular, with regards to 1-hour concentrations, 98% of the time, ambient concentrations of HCl are less than 3% of the AAQO at both stations.

Table 7-6 Monthly 1-Hour HCl (ppb) Summary at S150 – MV WTEF Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	91.8	0.1	0.5	1.8
February 2021	89.0	0.1	0.5	2.3
March 2021	95.8	0.1	0.3	1.1
April 2021	95.8	0.1	0.4	2.3
May 2021	99.2	0.1	0.4	1.0
June 2021	99.9	0.1	0.3	1.5
July 2021	99.9	0.1	0.4	1.3
August 2021	100.0	0.1	0.3	0.8
September 2021	88.1	0.1	0.3	1.0
October 2021	99.9	0.1	0.3	1.3
November 2021	100.0	0.1	0.3	2.1
December 2021	99.9	0.1	0.3	1.5
January 2022	100.0	0.1	0.5	2.5
February 2022	99.7	0.1	0.4	1.3
March 2022	100.0	0.1	0.3	1.7
April 2022	100.0	0.1	0.2	0.7
May 2022	99.9	0.1	0.2	0.6
June 2022	90.8	0.1	0.2	0.6
July 2022	99.6	0.1	0.3	0.9
August 2022	100.0	0.1	0.3	0.8
September 2022	99.9	0.1	0.4	1.4
October 2022	99.9	0.1	0.5	1.3
November 2022	96.8	0.1	0.7	2.5
December 2022	100.0	0.1	0.7	2.8

Table 7-7 Monthly 1-Hour HCl (ppb) Summary at T18 – Burnaby South Station in 2021 and 2022

MONTH / YEAR	DATA COMPLETENESS (%)	MINIMUM	AVERAGE	MAXIMUM
January 2021	100.0	0.1	0.2	1.3
February 2021	100.0	0.0	0.2	1.6
March 2021	99.1	0.1	0.4	3.4
April 2021	99.9	0.1	0.5	2.5
May 2021	100.0	0.1	0.4	1.5
June 2021	98.3	0.1	0.6	2.4
July 2021	98.7	0.2	0.6	1.5
August 2021	99.5	0.1	0.6	2.4
September 2021	100.0	0.1	0.4	1.1
October 2021	99.7	0.1	0.2	0.9
November 2021	100.0	0.1	0.2	0.7
December 2021	99.9	0.0	0.1	1.2
January 2022	99.7	0.1	0.2	2.2
February 2022	99.4	0.1	0.2	1.7
March 2022	100.0	0.1	0.4	3.9
April 2022	100.0	0.1	0.5	4.7
May 2022	99.9	0.1	0.5	2.3
June 2022	100.0	0.2	0.6	2.9
July 2022	99.7	0.2	0.6	2.0
August 2022	96.6	0.1	0.6	2.2
September 2022	100.0	0.1	0.5	1.3
October 2022	100.0	0.1	0.4	1.5
November 2022	94.7	0.1	0.2	1.6
December 2022	100.0	0.0	0.2	1.8

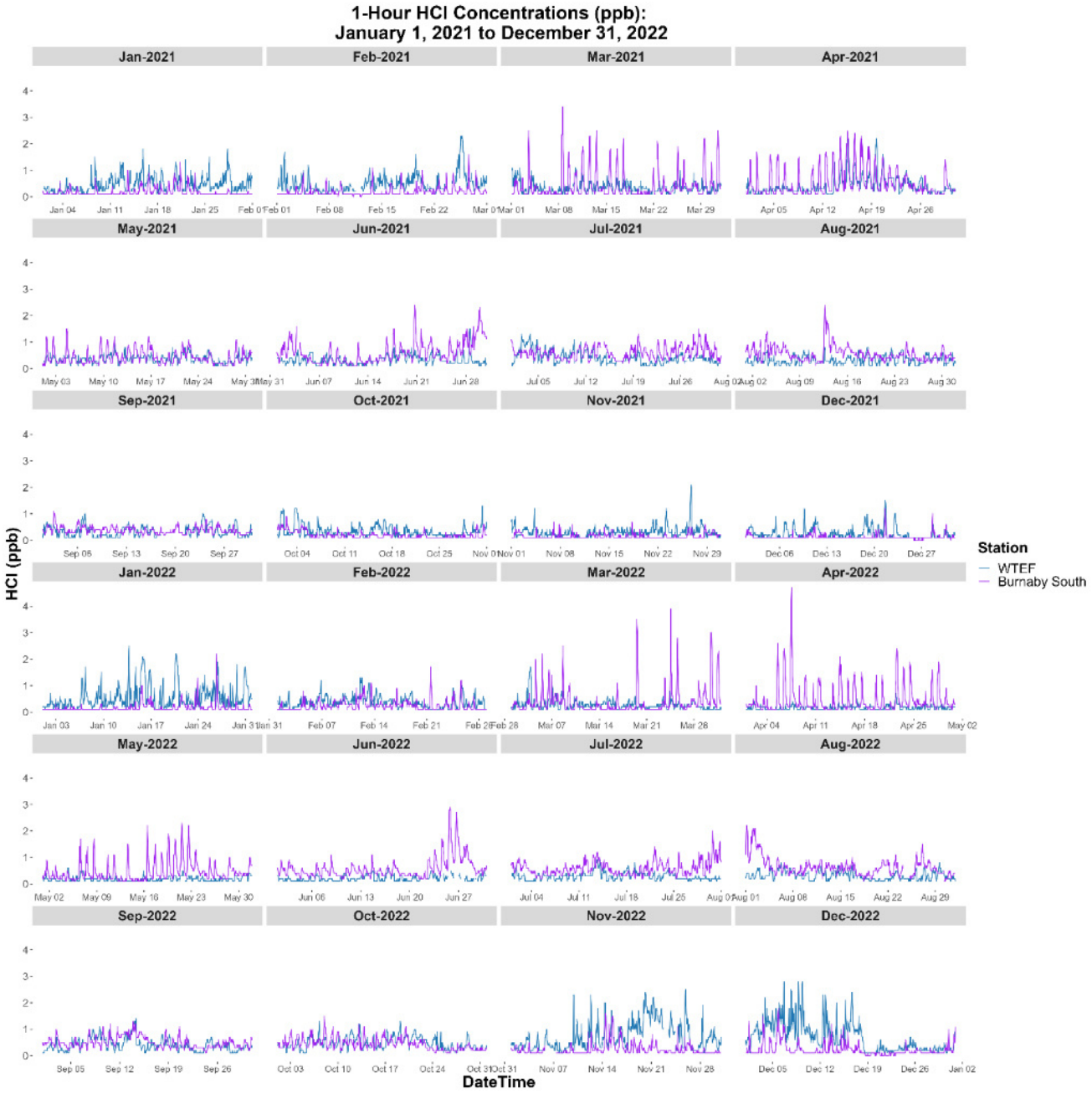


Figure 7-25 Monthly Timeseries of 1-Hour HCl (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

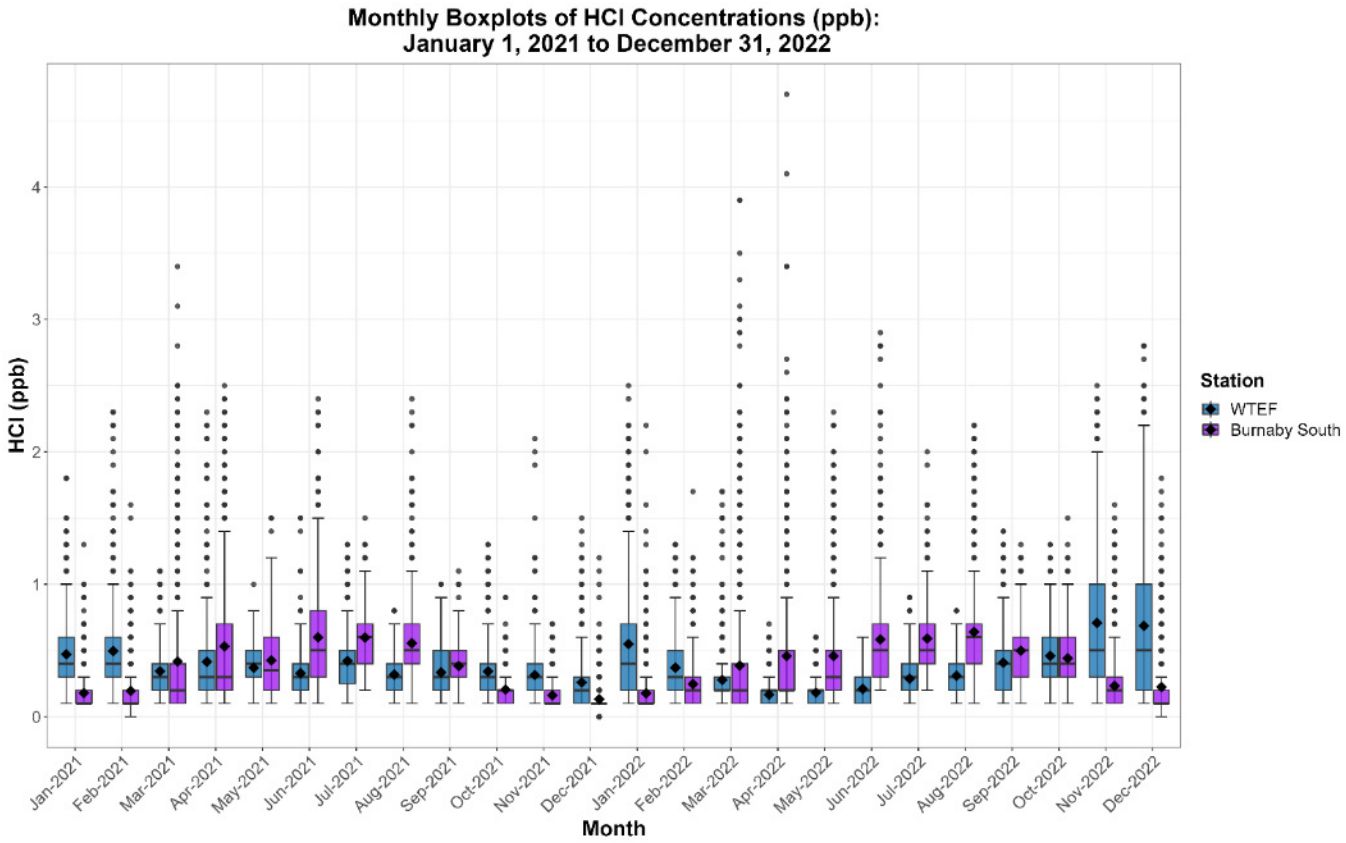


Figure 7-26 **Monthly Boxplots of 1-Hour HCl (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022**

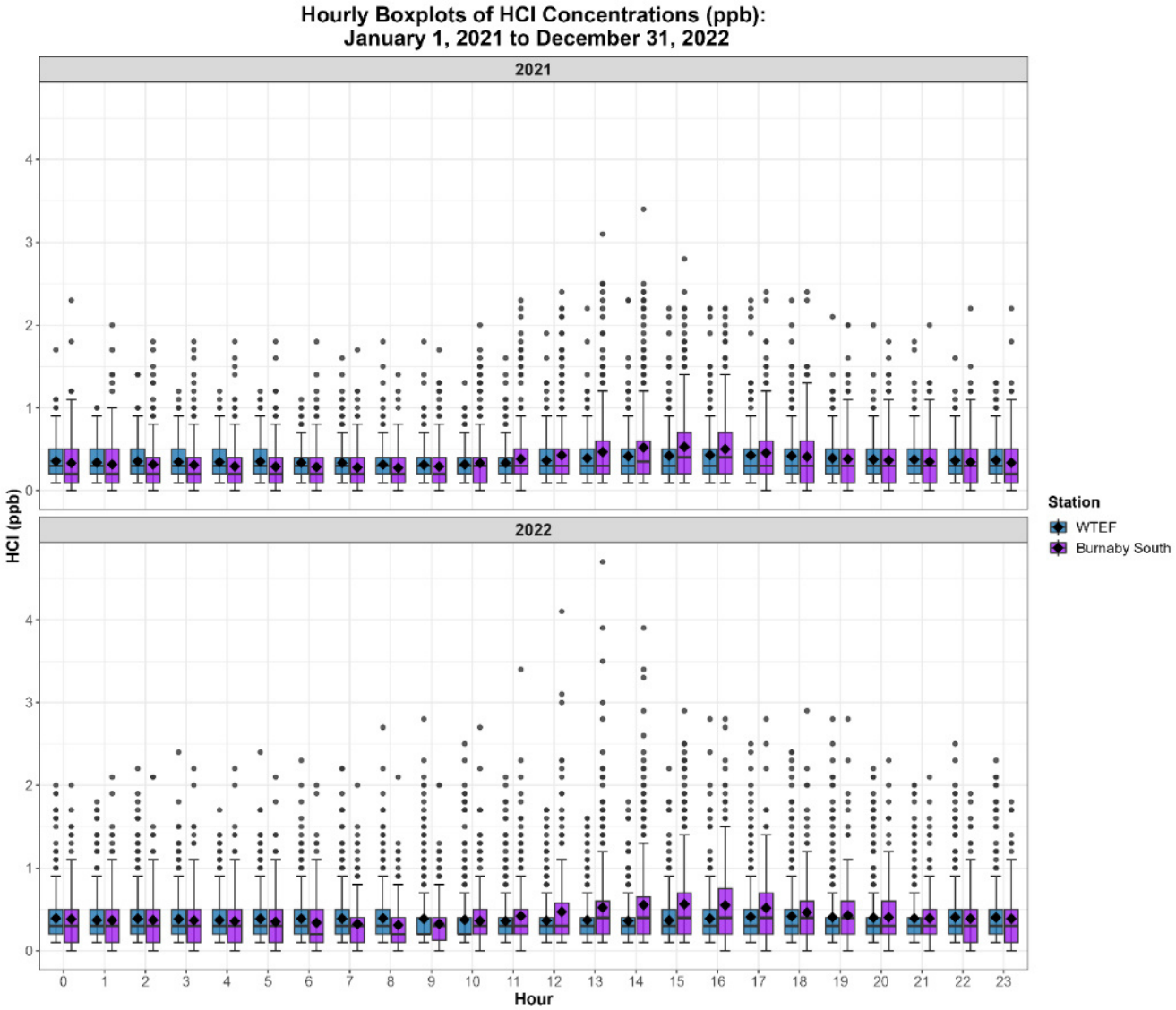


Figure 7-27 Hourly Boxplots of 1-Hour HCl (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

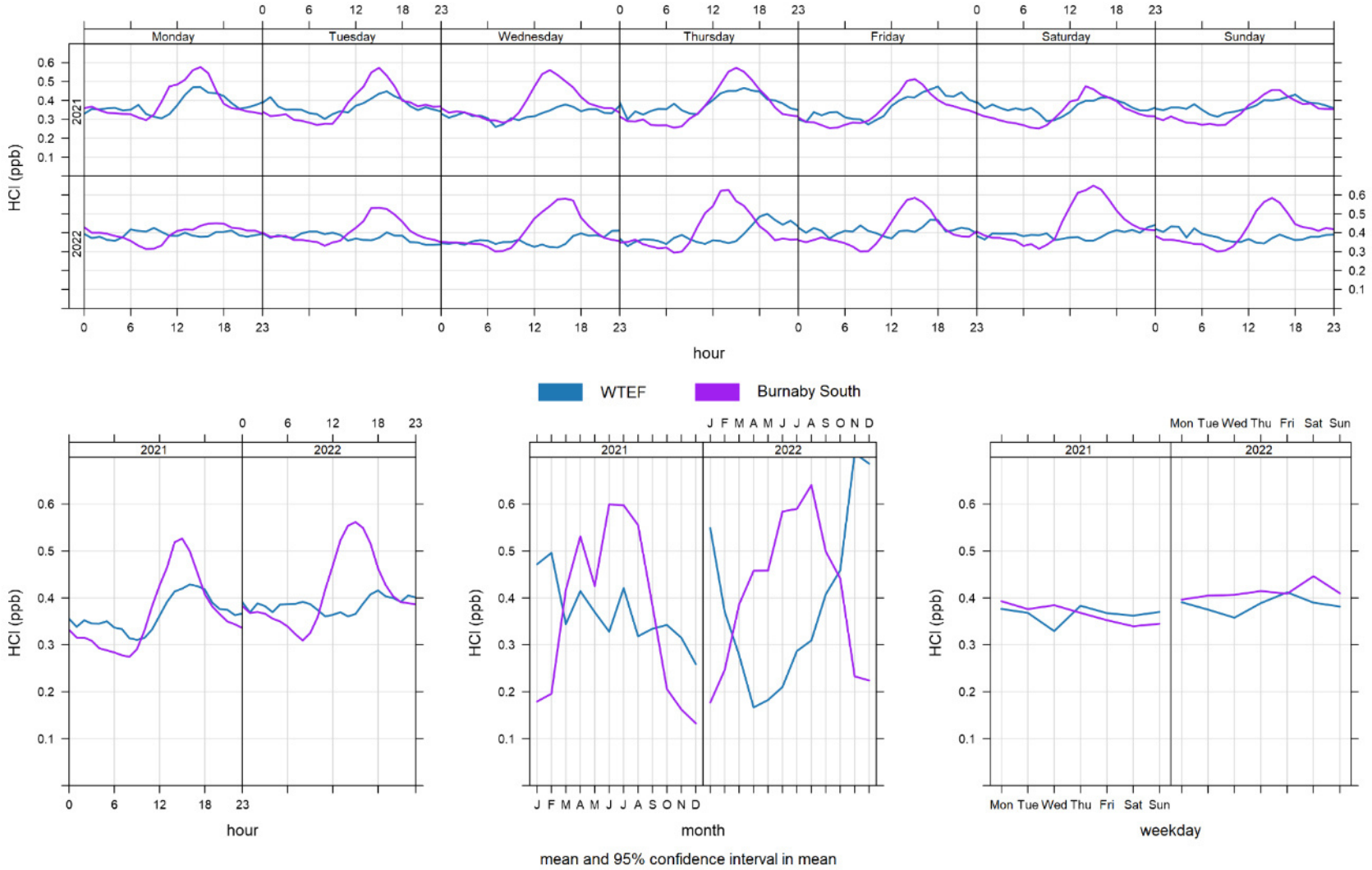


Figure 7-28 Time Variation of 1-Hour HCl (ppb) at S150 – MV WTEF Station and T18 – Burnaby South Station in 2021 and 2022

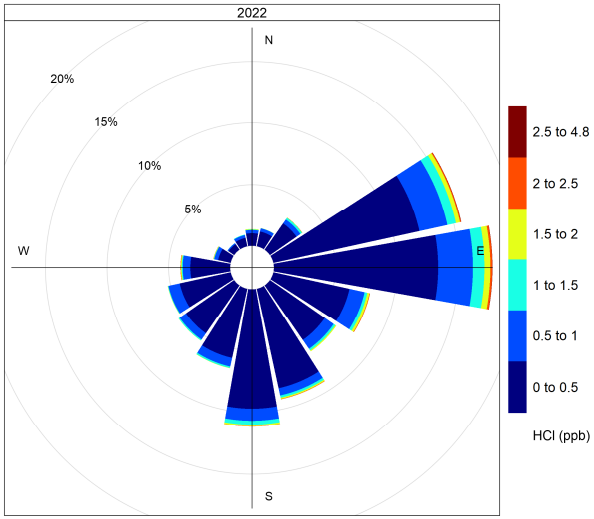


Figure 7-29 Annual Pollution Rose of 1-hour HCl (ppb) at S150 – MV WTEF Station in 2022

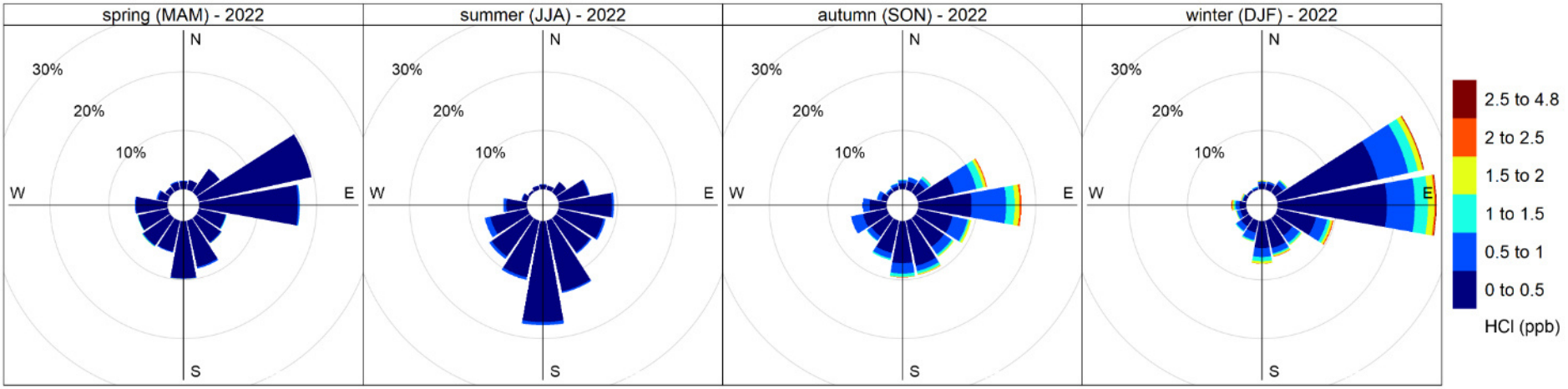


Figure 7-30 Seasonal Pollution Roses of 1-hour HCl (ppb) at S150 – MV WTEF Station in 2022

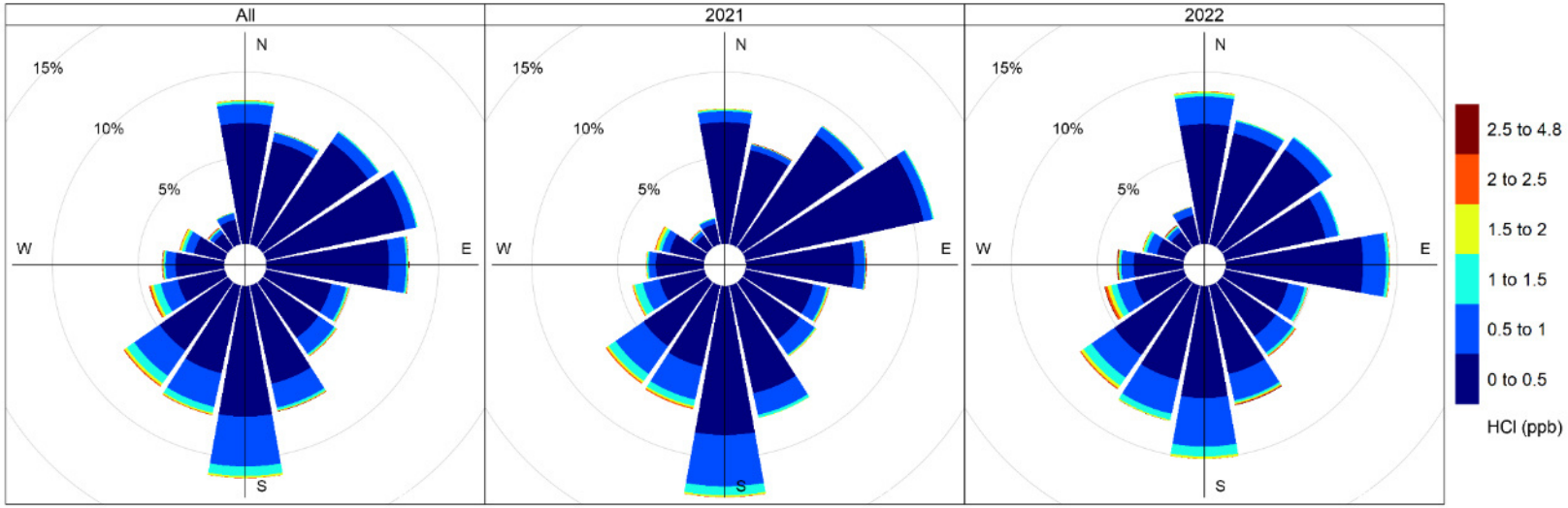


Figure 7-31 Annual Pollution Rose of 1-hour HCl (ppb) at T18 – Burnaby South Station in 2021 and 2022

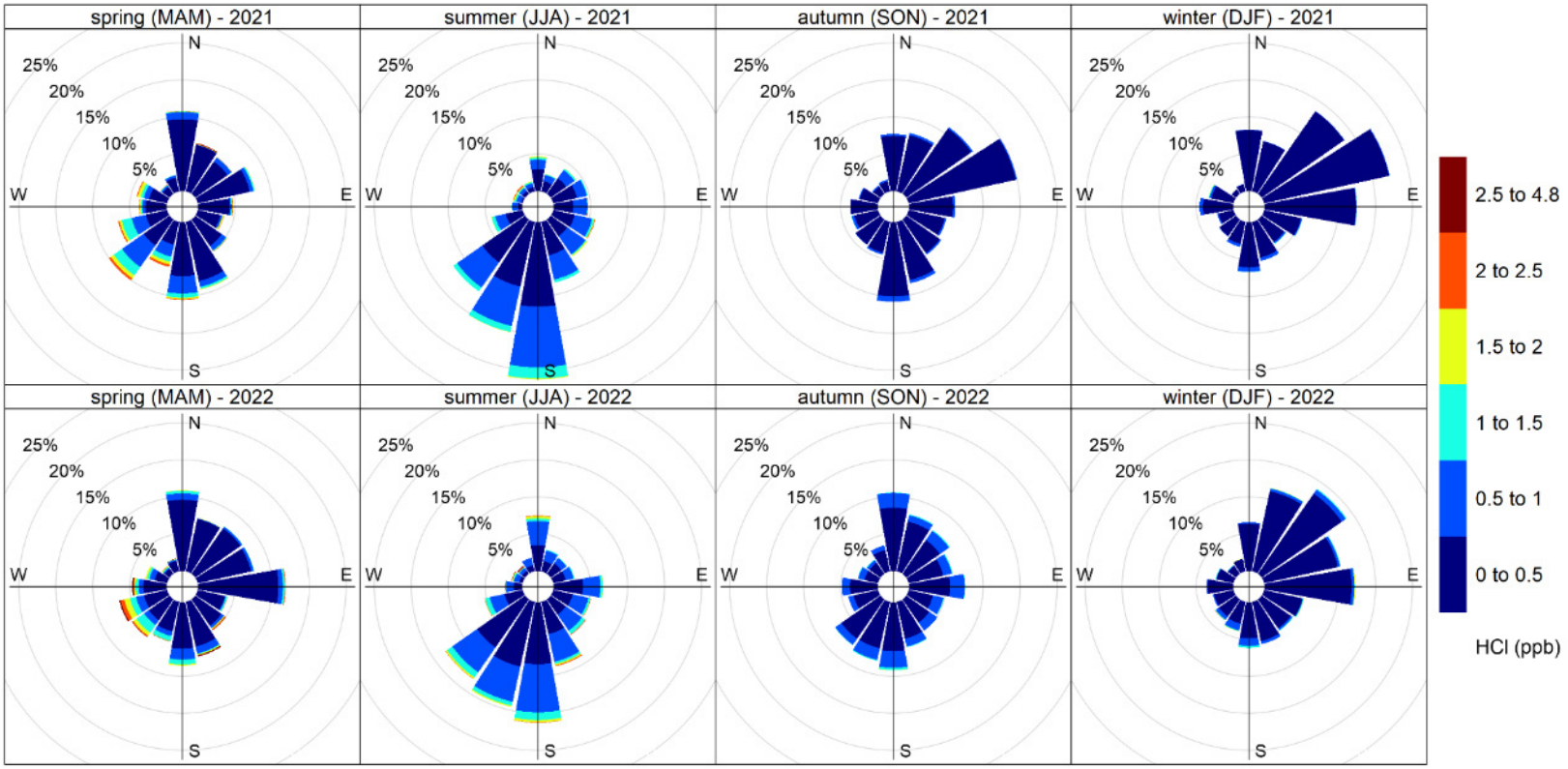


Figure 7-32 Seasonal Pollution Roses of 1-hour HCl (ppb) at T18 – Burnaby South Station in 2021 and 2022

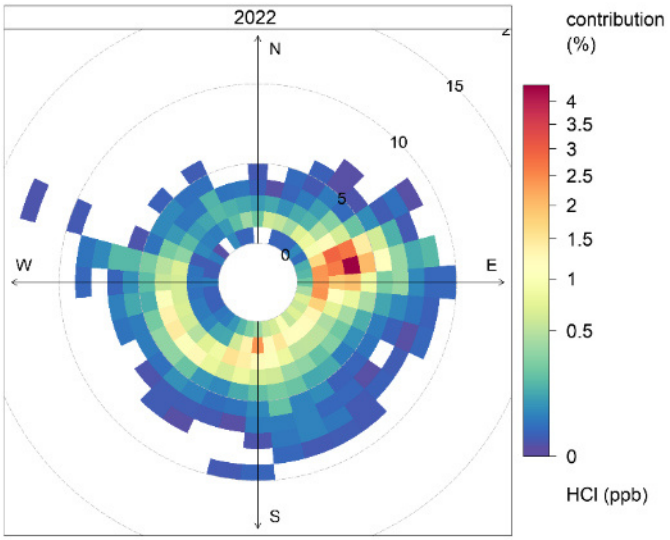


Figure 7-33 Annual Polar Plot of Percentage Contribution to Total 1-hour HCl (ppb) at S150 – MV WTEF Station in 2022

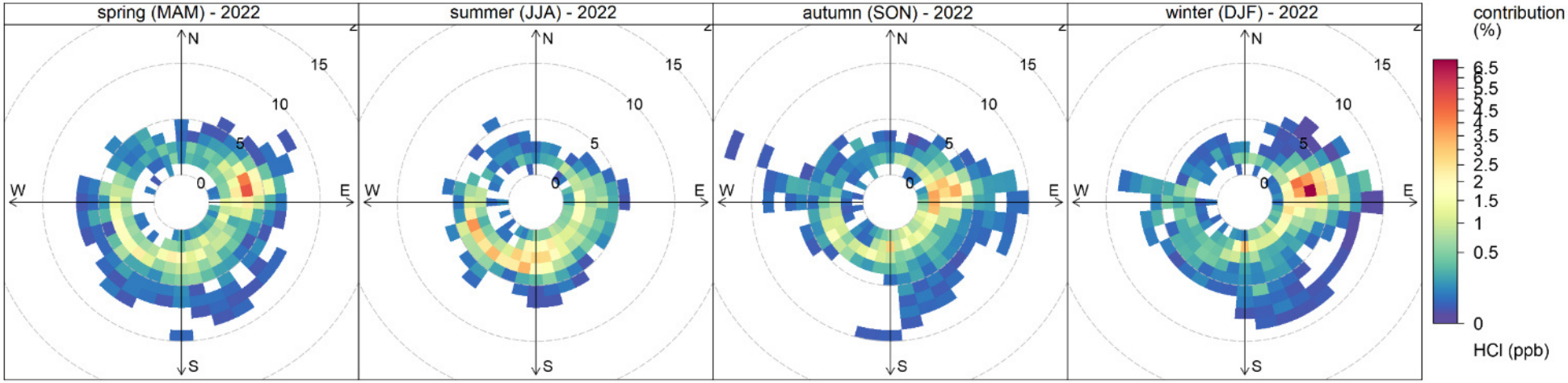


Figure 7-34 Seasonal Polar Plot of Percentage Contribution to Total 1-hour HCl (ppb) at S150 – MV WTEF Station in 2022

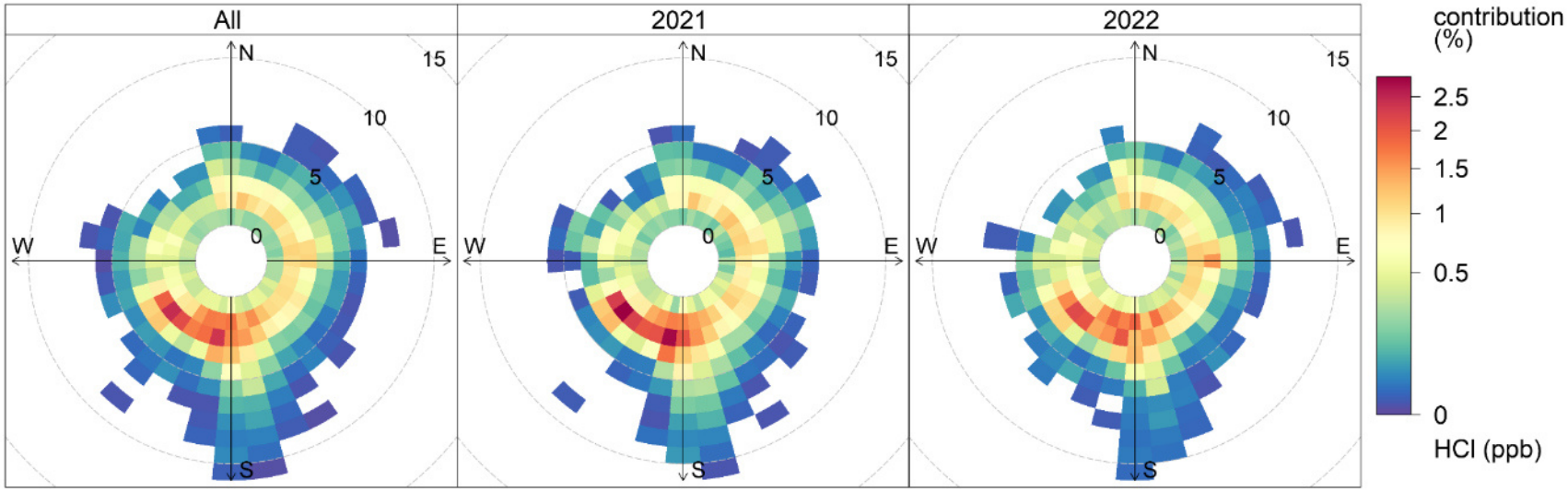


Figure 7-35 Annual Polar Plot of Percentage Contribution to Total 1-hour HCl (ppb) at T18 – Burnaby South Station in 2021 and 2022

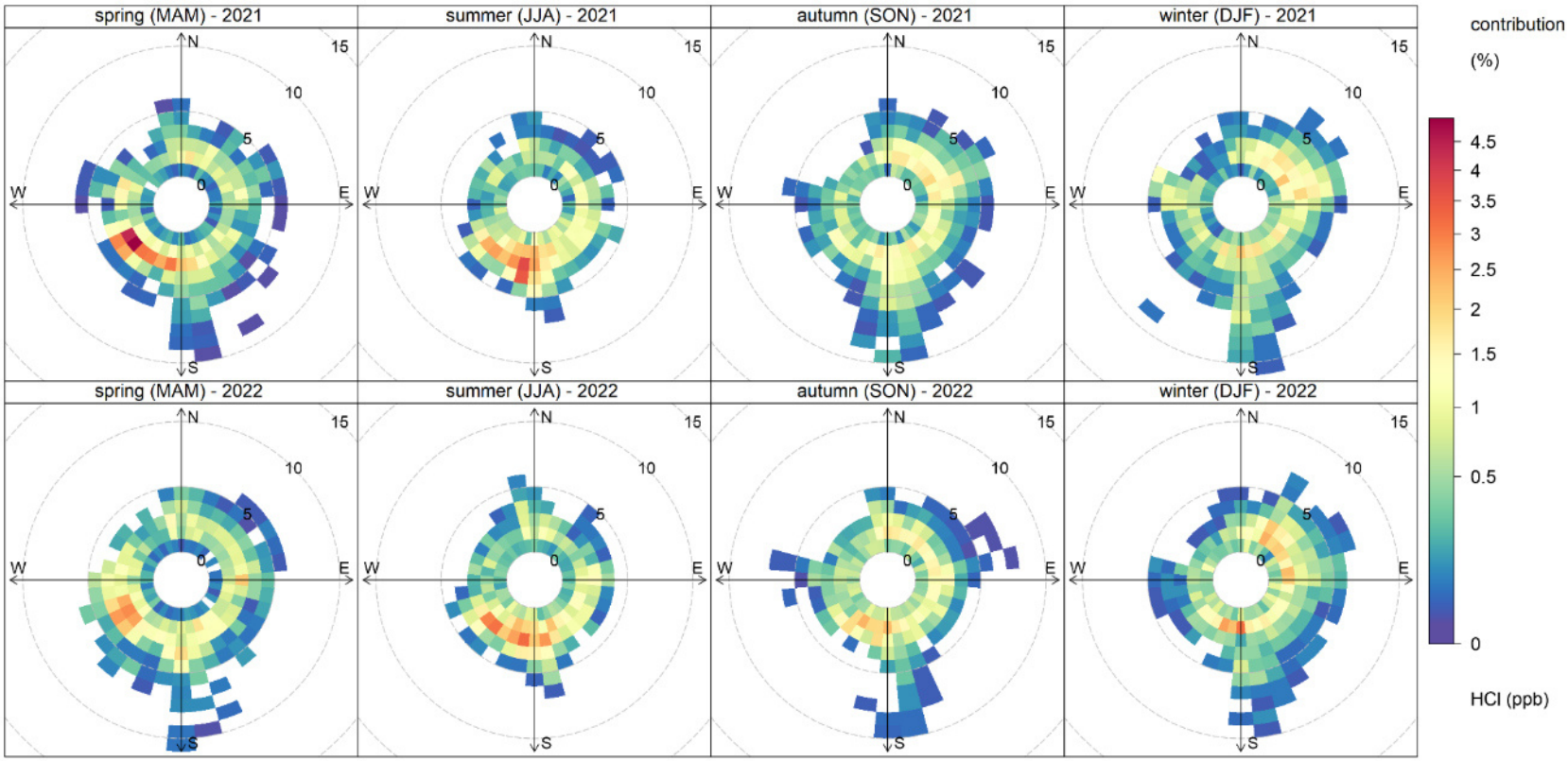


Figure 7-36 Seasonal Polar Plot of Percentage Contribution to Total 1-hour HCl (ppb) at T18 – Burnaby South Station in 2021 and 2022

8 RELATIONSHIP BETWEEN CEMS AND AMBIENT AIR MONITORING DATA

The following analysis was conducted to determine if there was any observable correlation between CEMS data collected at the 3 MV WTEF boiler units and the ambient air quality data collected at the 2 monitoring stations of interest (S150 – MV WTEF station and T18 – Burnaby South station) in the 2021 and 2022 calendar years. Due to the difference in data measurements (averaging period and units of measurement), the following conversions were applied prior to applying the correlation analysis:

- **CEMS Data**: 1-minute averaged CEMS data (at actual stack conditions) in mg/m^3 was converted into 1-hour averages in $\mu g/m^3$
    - Calculate 1-hour averages from 1-minute average data;
    - Convert mg/m^3 into $\mu g/m^3$ by multiplying by a factor of 1000;
    - Note: 100% conversion from NO_x to NO_2 was assumed in this correlation analysis to compare with the NO_2 observations at the two ambient air quality monitoring stations. It is important to recognize that this is a conservative estimate because, in reality, the quantity of NO_x converted to NO_2 in an equilibrium state is dependent on numerous factors (e.g., O_3 concentrations).
- **Ambient Air Quality Data**: 1-hour averaged data in ppb was converted into 1-hour averages in $\mu g/m^3$
    - Convert each of the NO_2, SO_2, and HCl concentrations from ppb to $\mu g/m^3$ by multiplying by the appropriate conversion factor according to the procedure outlined in Section 3.2.1.2.1 of the 2021 Guidance for NO_2 Dispersion Modelling in British Columbia document[26]

      $C\ [\mu g/m^3] = (ppb/1000) \times MW \times 40.8727$

      Where MW is the molecular weight of the pollutant in grams/mole.

Correlation between the CEMS data collected at the 3 MV WTEF boiler units and ambient air quality data collected at the S150 – MV WTEF station and T18 – Burnaby South station was determined using Pearson's correlation coefficient (r). The coefficient of determination (r^2), i.e., the proportion of variance in one variable that is "explained" by the other variable, was calculated by taking the squared value of the correlation coefficient (r). The regression of ambient air quality data on CEMS data, as represented by a linear regression equation, was then calculated to approximate the change in ambient air quality data with any given change in CEMS data.

Figure 8-1 through Figure 8-3 display the scatterplots of CEMS data collected at the 3 MV WTEF boiler units versus the ambient air quality data collected at the S150 – MV WTEF station and T18 – Burnaby South station for the 2021 and 2022 calendar years. The linear regression equations and coefficient of determination (r^2) are displayed within each scatterplot figure. It was determined that there is no statistically significant linear correlation ($r^2 \leq 0.02$) between CEMS data collected at the 3 MV WTEF boiler units and ambient air quality data collected at the S150 – MV WTEF station and T18 – Burnaby South station for NO_2, SO_2, and HCl.

As no statistically significant linear correlation between CEMS and ambient air quality data was found at both stations and all 3 air contaminants using all of the available data in both monitoring years, 4 additional linear regressions (with increasing complexity) were investigated to determine if alternative approaches to splitting the dataset could reveal any statistically significant relationships (Figure 8-4). Steps 2 through Step 4 from Figure 8-4 detail the methodology used to apply linear regressions on the total emissions from all 3 boiler units, the split of data temporally by month of year and hour of day, and the subsets of data based on wind speeds and wind directions

[26] British Columbia Ministry of Environment & Climate Change Strategy: *Guidance for NO_2 Dispersion Modelling in British Columbia:* https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/modelling_guidance_nitrogen_dioxide.pdf

having the potential to result in higher levels of ambient concentrations per station location. Furthermore, a stepwise multiple linear regression approach was utilized in Step 5 whereby meteorological variables (wind speed, wind direction, and temperature) were included in the analysis to assess the impact of meteorology on ambient levels of NO_2, SO_2, and HCl. None of the additional linear regressions resulted in any detectable statistically significant linear relationship between CEMS and ambient air quality data, suggesting that there are other significant regional sources that have an impact on the ambient levels of NO_2, SO_2, and HCl recorded at both the S150 – MV WTEF station and T18 – Burnaby South station. Given the previous section's analysis, this is not an unexpected result since monitored values of SO_2 and HCl were particularly low, NO_2 levels appear primarily linked to traffic emission patterns and the potential influence of WTEF emissions observed in the polar plot analysis did not result in a corresponding observable increase in monitored concentrations. Section 10 builds on this analysis to see if particular startup or shutdown events were associated with higher pollutant concentrations.

In addition, to provide context for the result of the multiple linear regression utilized in Step 5 of the stepwise analysis (Figure 8-4), scatterplots of ambient concentrations versus each of the 3 boiler unit CEMS concentrations and the 3 meteorological variables (wind speed, wind direction, and temperature) are presented in Figure 8-5 and Figure 8-6.

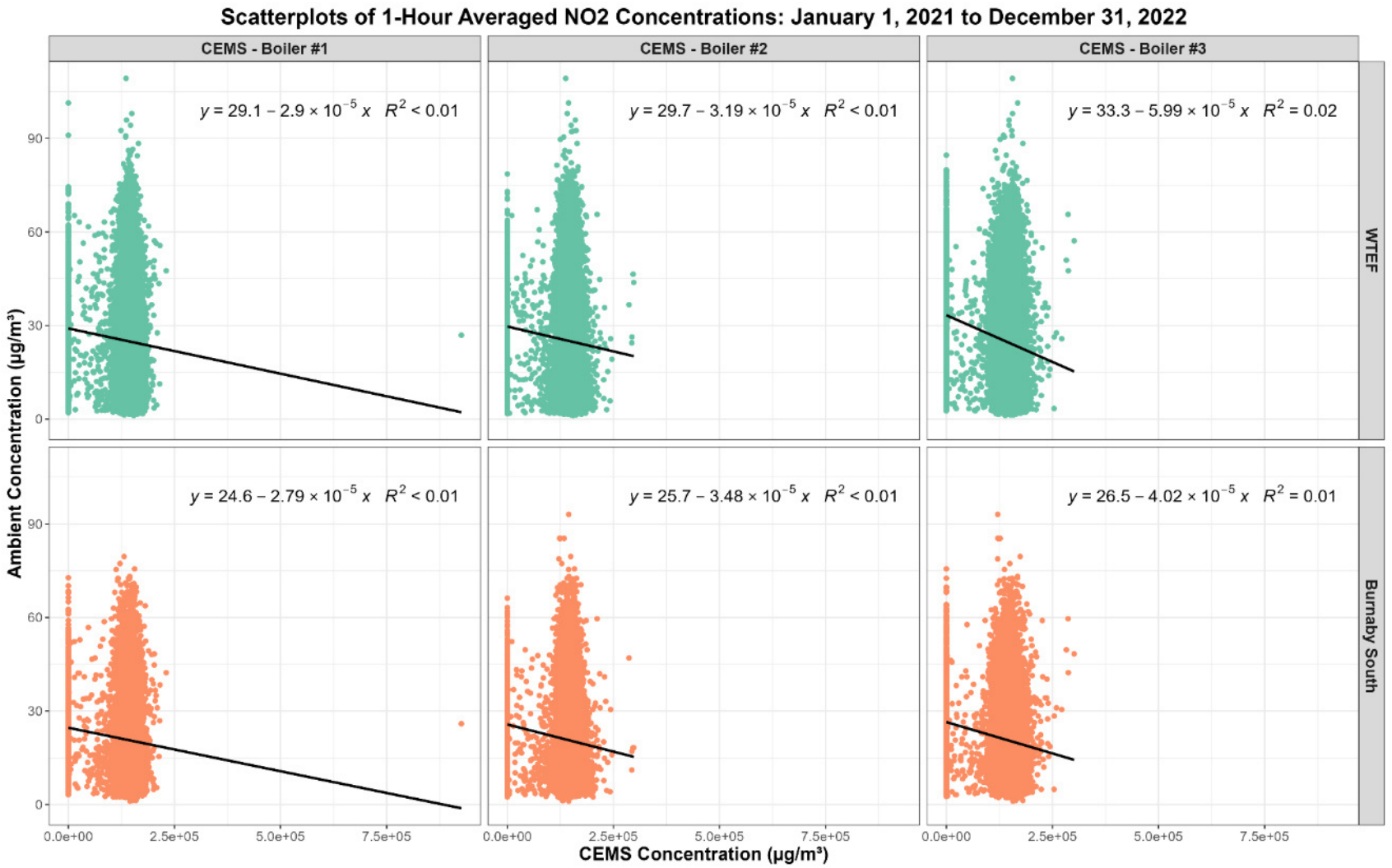


Figure 8-1 Scatterplots of 1-Hour Averaged NO_2 Concentrations in 2021 and 2022 – CEMS Data vs. Ambient Air Quality Data

Figure 8-2 Scatterplots of 1-Hour Averaged SO_2 Concentrations in 2021 and 2022 – CEMS Data vs. Ambient Air Quality Data

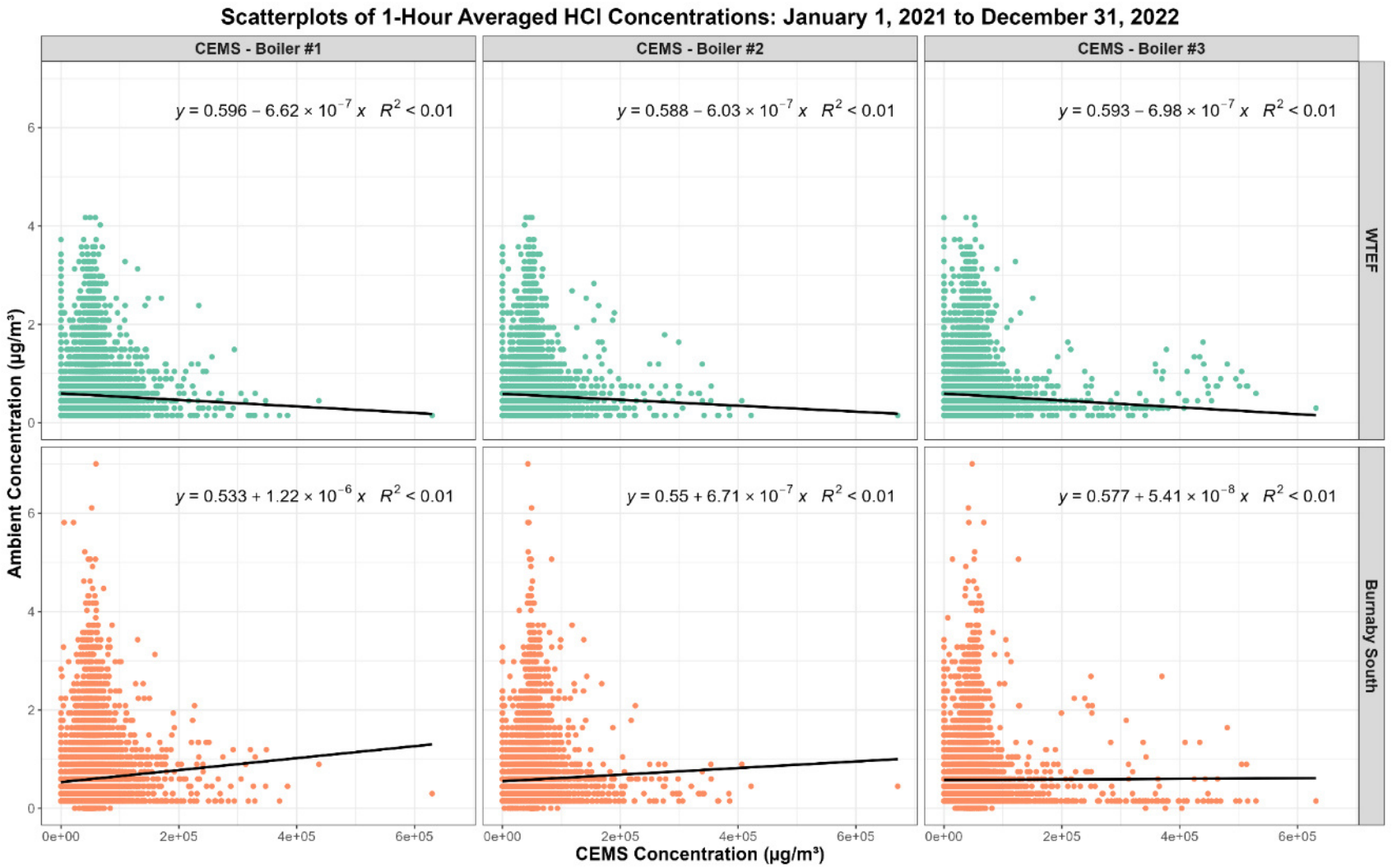


Figure 8-3 Scatterplots of 1-Hour Averaged HCl Concentrations in 2021 and 2022 – CEMS Data vs. Ambient Air Quality Data

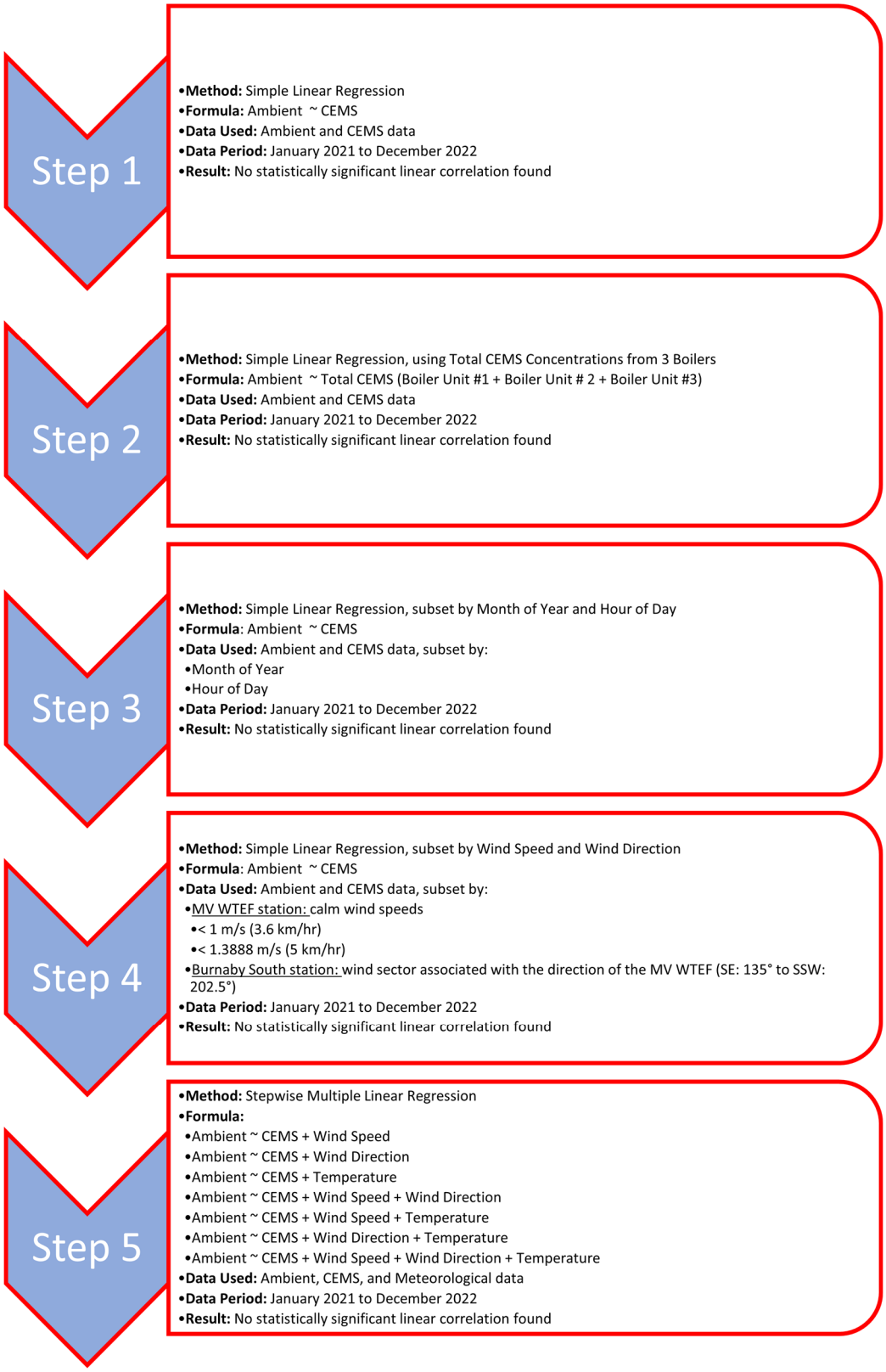


Figure 8-4 Stepwise Approach of Linear Regressions

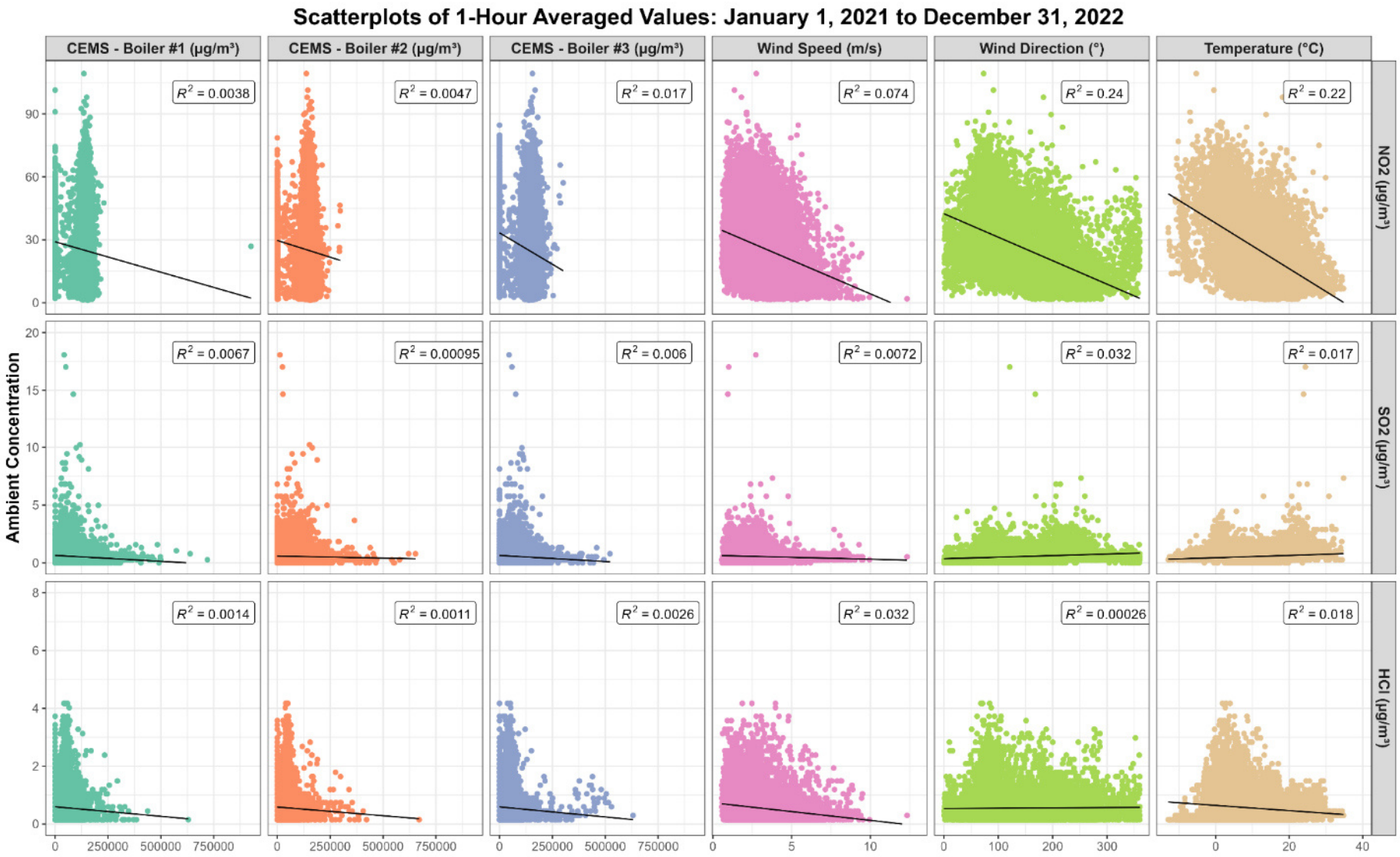


Figure 8-5 Scatterplots of 1-Hour Averaged Ambient Concentrations vs. CEMS and Meteorological Data in 2021 and 2022 at S150 – MV WTEF Station

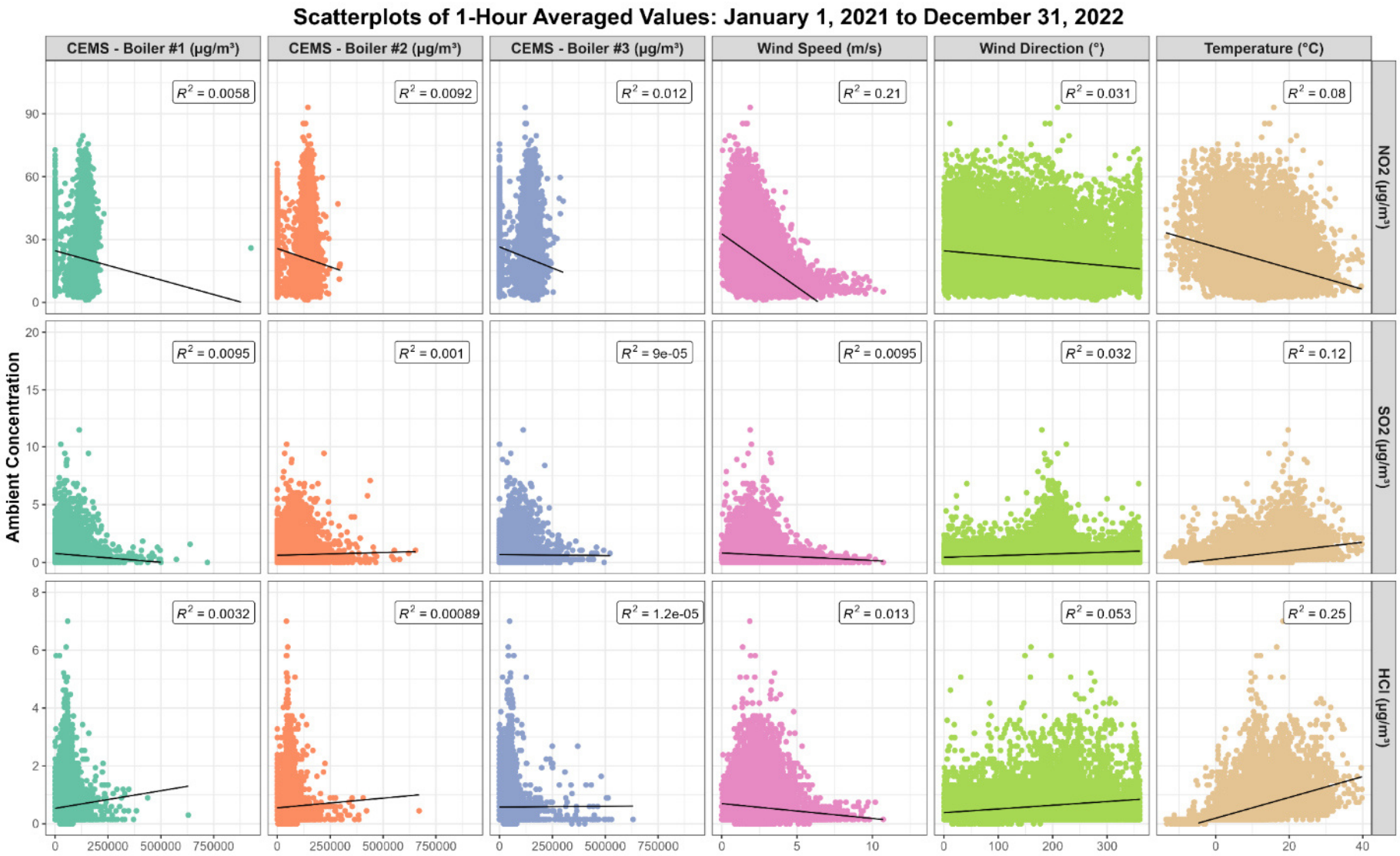


Figure 8-6 Scatterplots of 1-Hour Averaged Ambient Concentrations vs. CEMS and Meteorological Data in 2021 and 2022 at T18 – Burnaby South Station

9 AMBIENT AIR MONITORING DATA COMPARED TO DISPERSION MODEL PREDICTIONS

Since the S150 – MV WTEF station was installed near the location with the highest expected ambient air concentrations identified by the dispersion modelling, the following section presents the comparative results between the ambient air quality data collected at S150 – MV WTEF station and T18 – Burnaby South station against the air dispersion model predictions reported by RWDI[27] in 2018 for the "operational" model scenario.

9.1 KEY LOCATIONS FOR COMPARISON

RWDI's air dispersion model receptors were analyzed in detail, and the receptors corresponding to the locations of the S150 – MV WTEF station and T18 – Burnaby South station were selected for the comparison analysis. As there was no specific model receptor placed at the location of the S150 – MV WTEF station, the nearest 3 MV WTEF fenceline receptors were chosen to be representative of the S150 – MV WTEF station location. Table 9-1 and Figure 9-1 show the exact locations of the selected RWDI air dispersion model receptors in tabular and map formats. In the following sections, the model predictions at the 3 MV WTEF fenceline receptors will be averaged to produce one value representative of the S150 – MV WTEF station location.

Table 9-1 Key Receptor Locations from the RWDI Air Dispersion Model

REPRESENTATIVE STATION NAME	MODEL RECEPTOR TYPE	LATITUDE	LONGITUDE
T18 – Burnaby South	Discrete	49.2152ºN	122.9857ºW
S150 – MV WTEF	Fenceline	49.1866ºN	122.9788ºW
		49.1867ºN	122.9789ºW
		49.1868ºN	122.9787ºW

[27] https://metrovancouver.org/services/solid-waste/Documents/wtef-air-dispersion-modelling-study.pdf

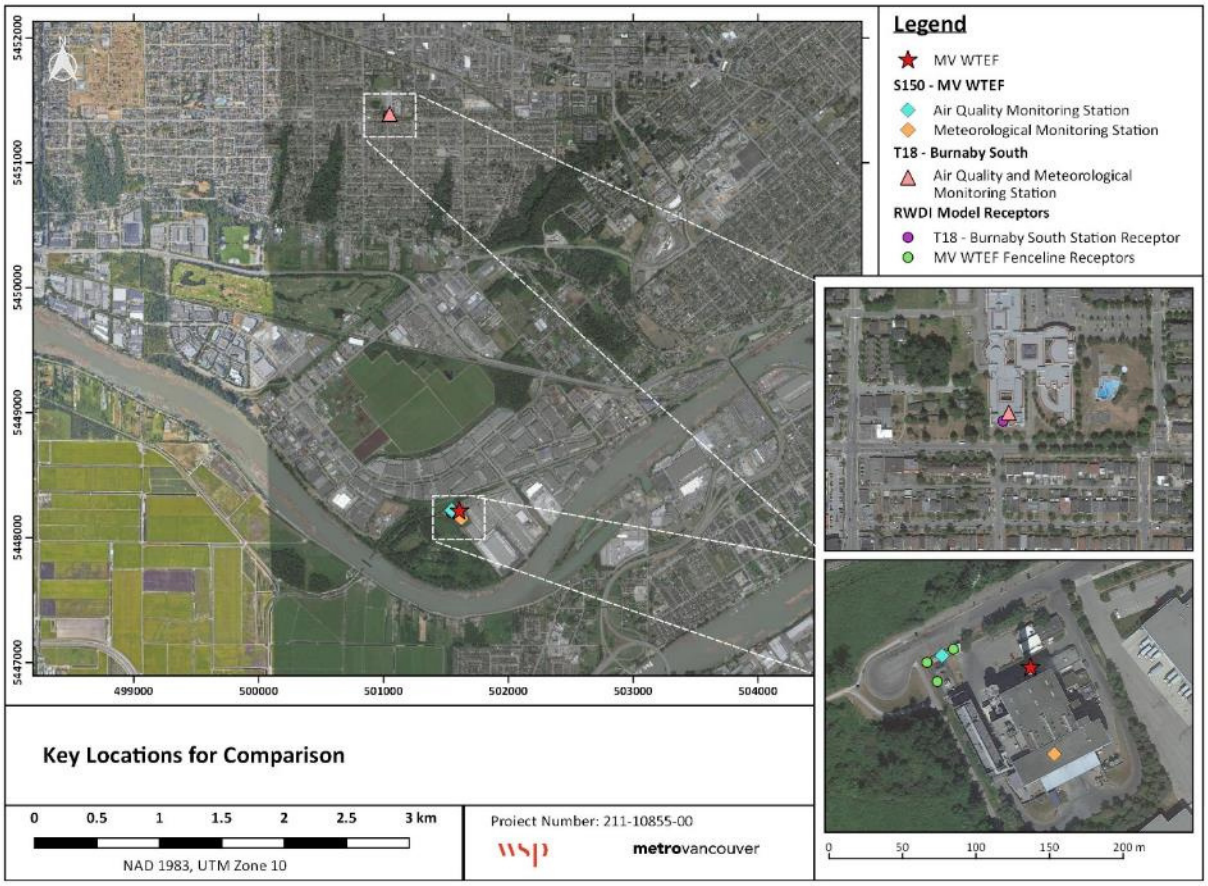


Figure 9-1 Map of Key Locations for Comparison

9.2 COMPARISON RESULTS

The ambient air quality data collected at S150 – MV WTEF station and T18 – Burnaby South station was compared against the air dispersion model predictions reported by RWDI in 2018 for the "operational" model scenario. The "operational" model scenario represents typical operations at the MV WTEF, using typical emissions from 2017 CEMS data to develop the emission rates for NO_2, SO_2, and HCl.

The maximum 1-hour concentrations for each of the 3 air contaminants (NO_2, SO_2, and HCl) were extracted from the ambient air quality data sets and the RWDI air dispersion model for the "operational" scenario at the key locations defined in Section 9.1. In all comparisons (outlined in Table 9-2), the "operational" scenario of the RWDI model predicted concentrations are above the 2021 and 2022 monitored ambient concentrations at both the S150 – MV WTEF station and T18 – Burnaby South station.

Table 9-2 Measured Ambient Air Quality Concentrations Compared to RWDI Model Predictions for the "Operational" Scenario

AIR CONTAMINANT	AVERAGING PERIOD	STATISTICAL FORM	OBJECTIVE	JURISDICTION	STATION	CONCENTRATION: ppb (µg/m³)		
						MEASURED AMBIENT AIR QUALITY[A]		RWDI "OPERATIONAL" MODEL SCENARIO (2013 – 2015)[B]
						2021	2022	
Nitrogen Dioxide (NO_2)	1-Hour	Maximum 1-hour concentration	60 ppb (113 µg/m³)[C]	Metro Vancouver Regional District (MVRD)[C]	S150 – MV WTEF	58.1 (109.3)	45.6 (85.7)	66.6 (125.3)
					T18 – Burnaby South	38.9 (73.1)	42.3 (79.5)	44.0 (82.8)
Sulphur Dioxide (SO_2)			70 ppb (183 µg/m³)	Metro Vancouver Regional District (MVRD)	S150 – MV WTEF	3.8 (10.0)	6.9 (18.1)	14.4 (37.7)
					T18 – Burnaby South	4.4 (11.5)	3.4 (8.9)	6.1 (16.0)
Hydrogen Chloride (HCl)			50 ppb (75 µg/m³)	Alberta Environment (AENV)	S150 – MV WTEF	2.3 (3.4)	2.8 (4.2)	20.4 (30.5)
					T18 – Burnaby South	3.4 (5.1)	4.7 (7.0)	6.8 (10.1)

Notes: [A] Hours corresponding to start-up and shut down events at the MV WTEF have been removed from the ambient air quality data set prior to calculating the maximum 1-hour concentrations
[B] RWDI's air dispersion model considers a 3-year period between 2013 to 2015, so the maximum 1-hour concentration have been calculated per year and the maximum of the 3-years have been presented here. In addition, baseline air quality concentrations have been accounted for in the presented values.
[C] After the removal of hours corresponding to start-up and shutdown events at the MV WTEF from the ambient air quality data set, the statistical form of the NO_2 MVRD AAQO (i.e., the 98th percentile of the daily maximum 1-hour concentrations) does not make sense to compute for comparisons. Thus, we have altered the statistical form to use the maximum 1-hour NO_2 concentrations, which does not follow the statistical form of the NO_2 MVRD AAQO.

10 START UP AND SHUT DOWN EVENTS AT THE MV WTEF

Following the analysis of potential linkages between the CEMS data at the WTEF and ambient monitoring data (Section 8), startup and shutdown events were explored to see if a statistical relationship could be found during these events that have the potential of resulting in higher emissions.

10.1 IDENTIFICATION OF START UP / SHUT DOWN EVENTS

Monthly boiler downtime summary reports generated by Covanta Burnaby Renewable Energy, ULC (the contracted operator of the MV WTEF) were shared with WSP from the Corporation. These monthly downtime summary reports were used to identify the times within the 2021 and 2022 calendar years associated with boiler shut down events. Within the monthly downtime summary reports exist brief shut down periods less than 30 minutes in duration due to minor issues at the MV WTEF. These minor shut down events (less than 30 minutes in duration) were not classified as boiler shut down events for the purposes of the assessment.

The 2018 "Start Up / Shut Down Test Report" written by HDR[28] was used as a reference to inform the identification of start up events at the MV WTEF. Although the HDR report summarizes the results of the start up and shut down testing conducted in November 2017, it serves as an example to determine the approximate duration of time prior to boiler shut downs (i.e., boiler shutting down) and after boiler shut downs (i.e., boiler starting up) to analyze. From the information made available in the HDR report, it was determined that the 4-hour period prior to a full boiler shut down would be classified as "boiler shutting down" and the 4-hour period after initial boiler start up would be classified as "boiler starting up." Furthermore, boiler shut down events generally do not occur at all 3 boiler units simultaneously, so 5 boiler unit operational statuses were created considering the events occurring at each of the 3 boiler units for each hour of the 2021 and 2022 calendar years (outlined in Table 10-1).

Table 10-1 Boiler Unit Operational Status Categories

BOILER OPERATIONAL STATUS	DESCRIPTION
Operational	All 3 boiler units are operating as normal
At least 1 boiler shutting down	One or more boiler units shutting down
1 boiler shutdown	Exactly one boiler unit shut down
At least 1 boiler starting up	One or more boiler units starting up
Multiple boilers not operational	More than one boiler unit not operating as normal (either shutting down, shut down or starting up)

[28] HDR: Start Up / Shut Down Test Report: Metro Vancouver Waste-to-Energy Facility Operational Certificate Assessment Reports (June 14, 2018).

10.2 SUMMARIES

The breakdown of the number of hours for each boiler unit operational status in 2021 and 2022 is presented in Table 10-2, while the detailed ambient air quality data summary by station and boiler unit operational status is presented in Table 10-3. To show the distribution of ambient concentrations by boiler unit operational status category, boxplots (Figure 10-1 through Figure 10-3) and histograms (Figure 10-4 through Figure 10-9) are presented to show the variation in 1-hour observations of NO_2, SO_2, and HCl per station and boiler unit operational status in 2021 and 2022. Both the boxplots and histograms show that the ambient concentrations recorded during different boiler unit operational statuses are very similar, and that the distributions of data are non-normal and right-skewed (especially skewed for SO_2 and HCl). In addition, in relation to the data summaries presented within Section 7, the histogram figures show that the observed levels of NO_2, SO_2, and HCl were well below AAQOs, with very low levels of SO_2 and HCl in particular. As noted in Section 7 It is important to note that there were no exceedances of the AAQO for any of the three air contaminants under all 5 boiler operational statuses within the 2021 – 2022 monitoring period.

Table 10-2 Summary of Hours by Boiler Unit Operational Status

BOILER OPERATIONAL STATUS	NUMBER OF HOURS		PERCENTAGE OF ANNUAL HOURS (%)	
	2021	2022	2021	2022
Operational	5697	5779	65.0	66.0
At least 1 boiler shutting down	362	321	4.1	3.7
1 boiler shutdown	2039	1975	23.3	22.5
At least 1 boiler starting up	362	321	4.1	3.7
Multiple boilers not operational	300	364	3.4	4.2
TOTAL	8760	8760	100	100

Table 10-3 Summary of Air Contaminants by Boiler Unit Operational Status

STATION	AIR CONTAMINANT	BOILER OPERATIONAL STATUS	DATA COMPLETENESS (%)		1-HOUR AVERAGE CONCENTRATION (ppb)					
					MINIMUM		AVERAGE		MAXIMUM	
			2021	2022	2021	2022	2021	2022	2021	2022
S150 – MV WTEF Station	Nitrogen Dioxide (NO_2)	Operational	98.5	99.8	0.6	0.8	12.8	13.3	58.1	45.6
		At least 1 boiler shutting down	99.2	99.4	1.1	1.2	14.7	12.5	49.2	40.1
		1 boiler shutdown	98.4	99.9	0.9	1.0	14.4	15.6	53.9	47.7
		At least 1 boiler starting up	96.7	100.0	1.3	0.8	13.8	13.0	37.4	52.1
		Multiple boilers not operational	97.7	98.9	1.1	1.8	13.5	15.4	48.4	45.8
	Sulphur Dioxide (SO_2)	Operational	98.6	99.8	0.0	0.0	0.2	0.2	3.8	6.9
		At least 1 boiler shutting down	99.2	99.4	0.0	0.0	0.2	0.3	1.8	1.3
		1 boiler shutdown	98.4	100.0	0.0	0.0	0.2	0.2	3.9	2.6
		At least 1 boiler starting up	96.4	100.0	0.0	0.0	0.2	0.2	1.7	1.3
		Multiple boilers not operational	97.3	99.5	0.0	0.0	0.2	0.2	2.4	1.9
	Hydrogen Chloride (HCl)	Operational	97.7	98.8	0.1	0.1	0.4	0.3	2.3	2.8
		At least 1 boiler shutting down	98.9	98.8	0.1	0.1	0.4	0.4	1.5	1.7
		1 boiler shutdown	95.2	99.8	0.1	0.1	0.4	0.4	2.3	2.8
		At least 1 boiler starting up	96.7	97.5	0.1	0.1	0.3	0.4	2.1	2.0
		Multiple boilers not operational	85.0	97.3	0.1	0.1	0.4	0.6	1.3	2.5
T18 – Burnaby South Station	Nitrogen Dioxide (NO_2)	Operational	98.9	99.1	1.2	0.6	10.4	11.2	38.9	42.3
		At least 1 boiler shutting down	99.4	99.7	1.9	1.5	10.9	10.7	36.0	33.7
		1 boiler shutdown	98.9	99.7	1.3	1.5	11.0	13.1	40.1	49.5
		At least 1 boiler starting up	99.4	99.7	1.6	1.2	10.6	11.6	37.6	34.5
		Multiple boilers not operational	98.7	99.5	1.4	2.3	10.1	13.3	31.2	32.8
	Sulphur Dioxide (SO_2)	Operational	99.8	99.7	0.0	0.0	0.3	0.3	4.4	3.4
		At least 1 boiler shutting down	100.0	100.0	0.0	0.0	0.2	0.3	2.3	1.6
		1 boiler shutdown	99.6	99.8	0.0	0.0	0.2	0.3	3.9	2.5
		At least 1 boiler starting up	100.0	100.0	0.0	0.0	0.2	0.3	2.0	2.1
		Multiple boilers not operational	99.7	100.0	0.0	0.0	0.3	0.3	1.7	2.4
	Hydrogen Chloride (HCl)	Operational	99.5	98.9	0.0	0.0	0.4	0.4	3.4	4.7
		At least 1 boiler shutting down	100.0	99.4	0.1	0.1	0.4	0.4	2.4	1.4
		1 boiler shutdown	99.6	99.6	0.0	0.1	0.4	0.4	2.5	3.9
		At least 1 boiler starting up	100.0	100.0	0.1	0.1	0.3	0.4	2.1	3.0
		Multiple boilers not operational	100.0	100.0	0.1	0.1	0.4	0.5	2.0	1.5

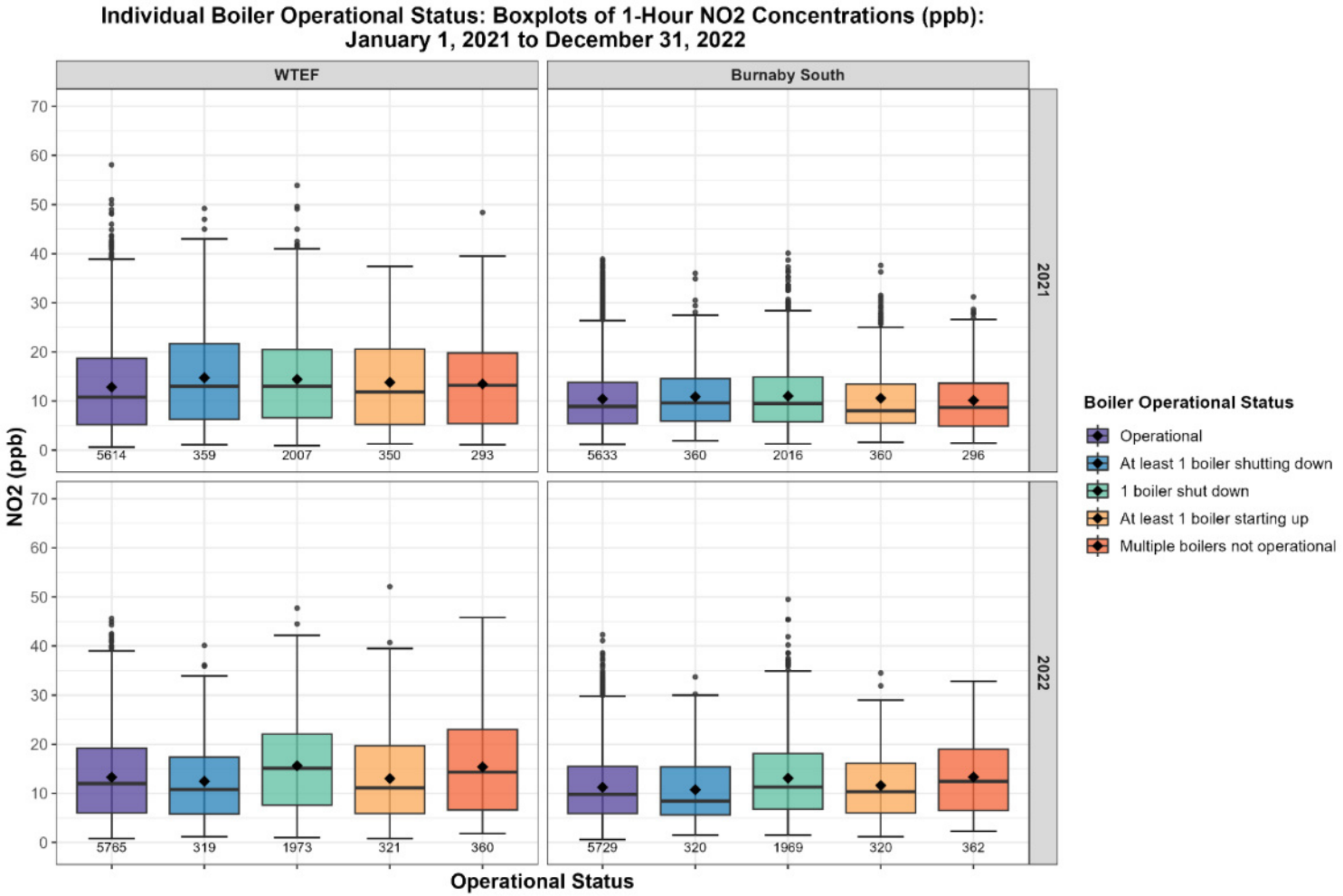


Figure 10-1 Boxplots of 1-Hour Average NO_2 Concentrations by Operational Status at Both Stations (2021 – 2022)

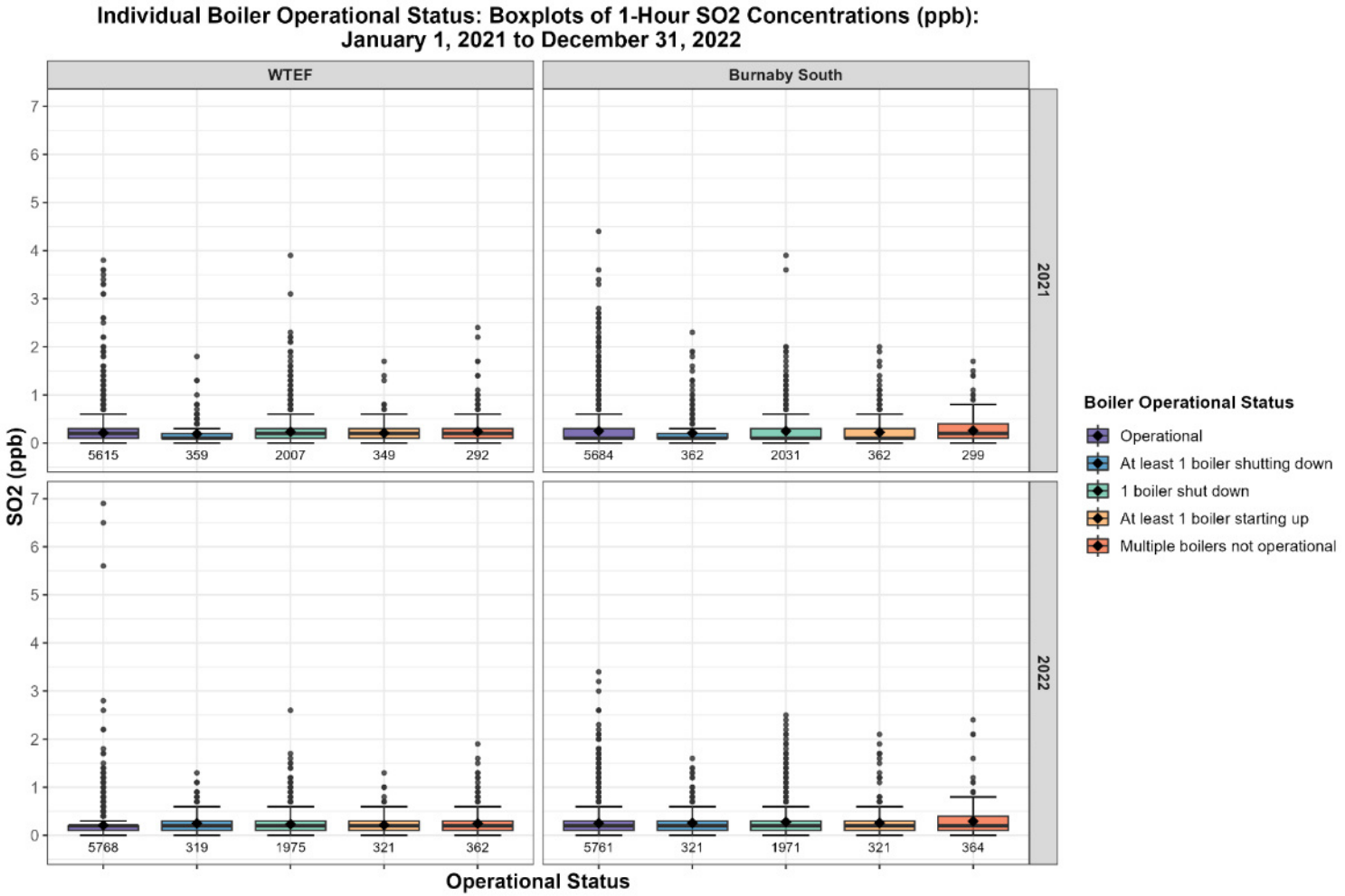


Figure 10-2 Boxplots of 1-Hour Average SO_2 Concentrations by Operational Status at Both Stations (2021 – 2022)

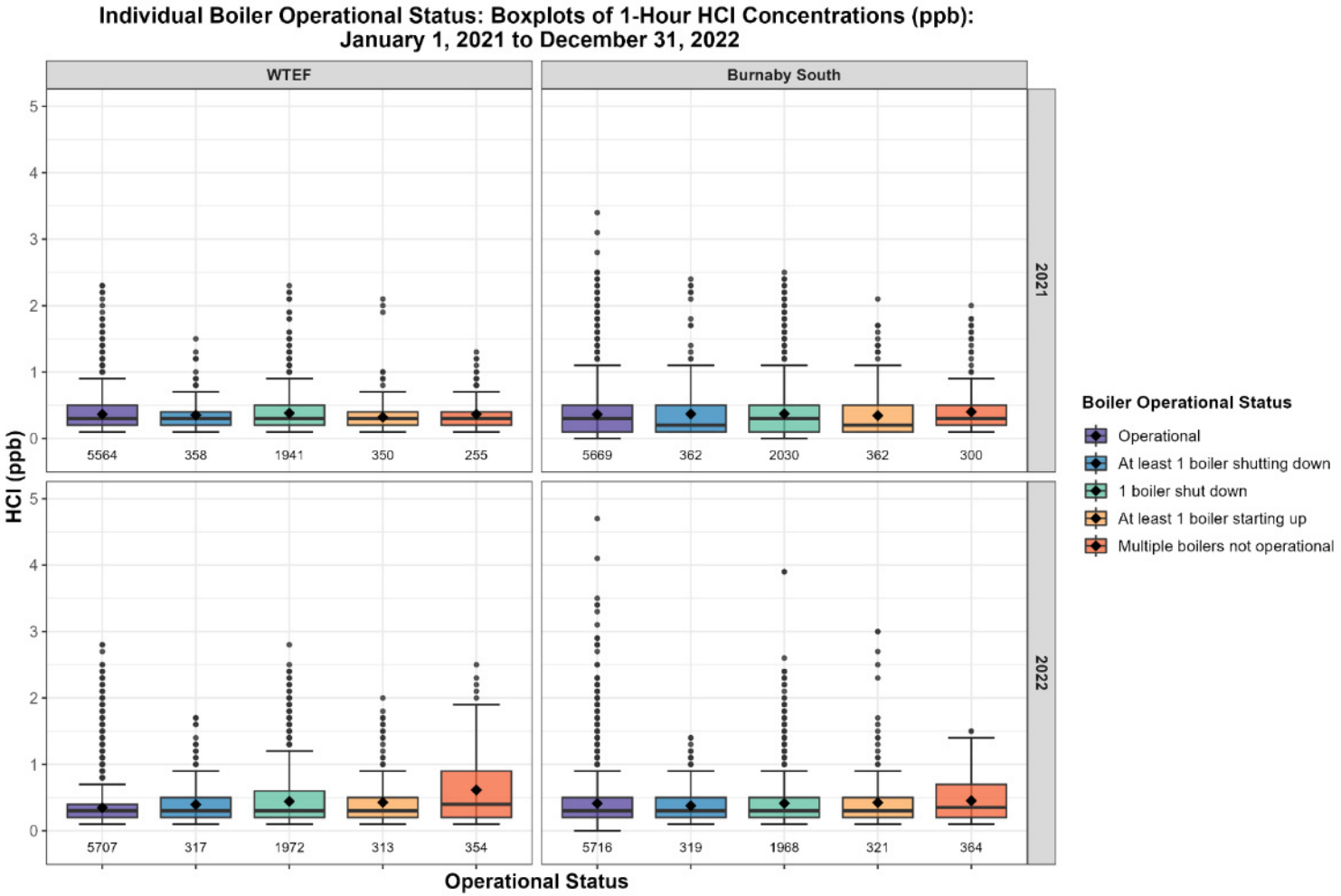


Figure 10-3 Boxplots of 1-Hour Average HCl Concentrations by Operational Status at Both Stations (2021 – 2022)

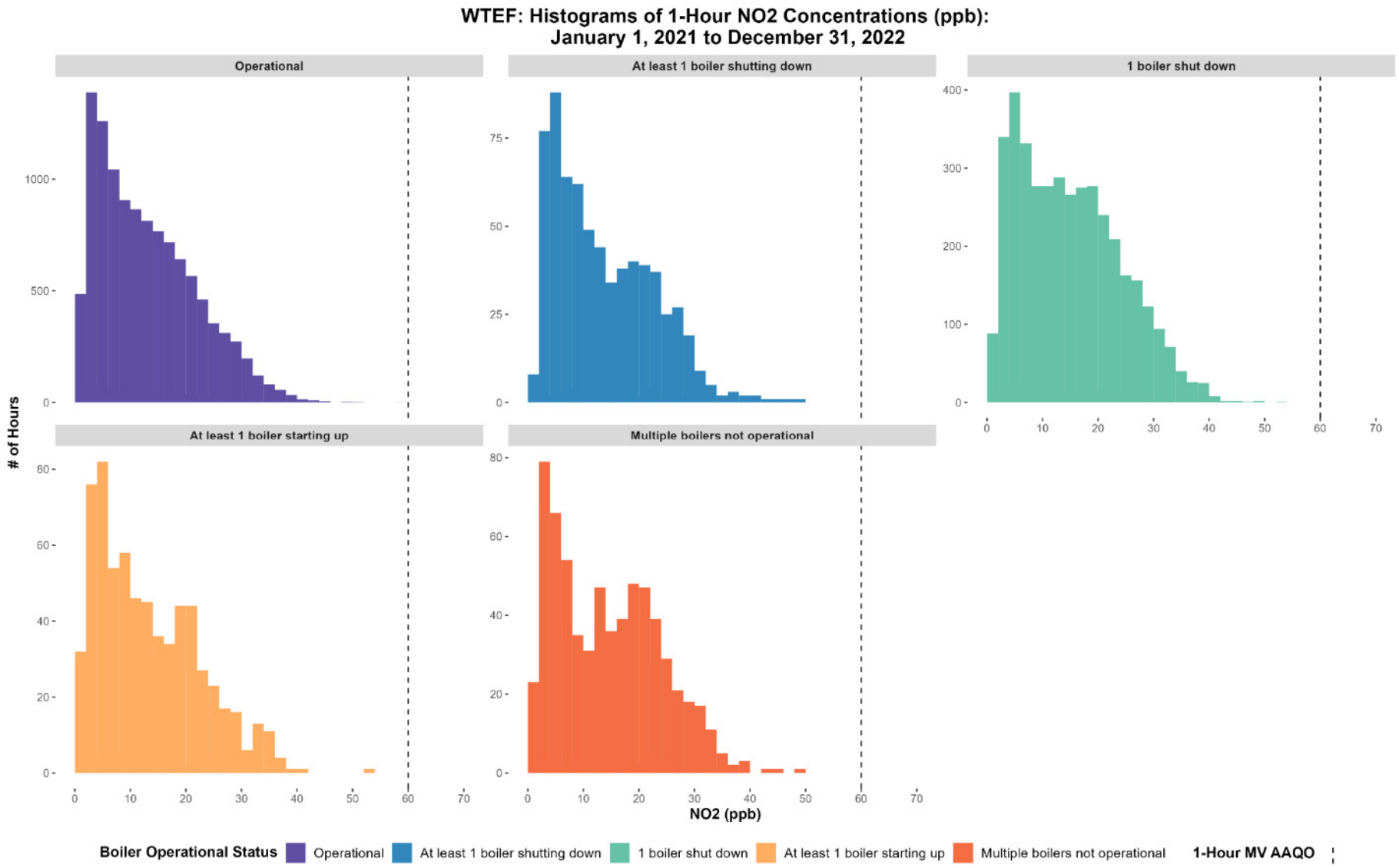


Figure 10-4 Histograms of 1-Hour Average NO_2 by Boiler Operational Status at S150 – MV WTEF Station (2021 – 2022)

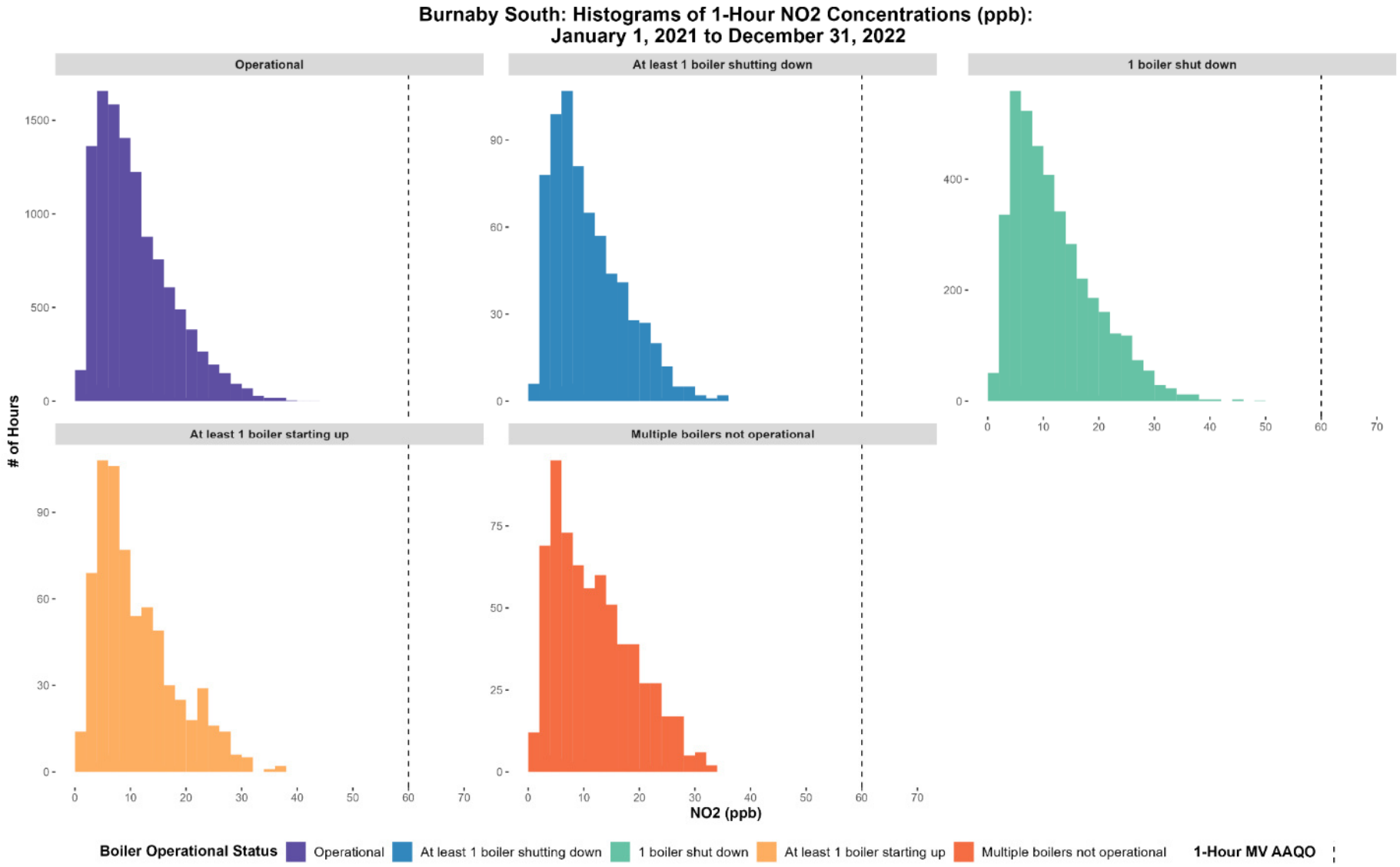


Figure 10-5 Histograms of 1-Hour Average NO_2 by Boiler Operational Status at T18 – Burnaby South Station (2021 – 2022)

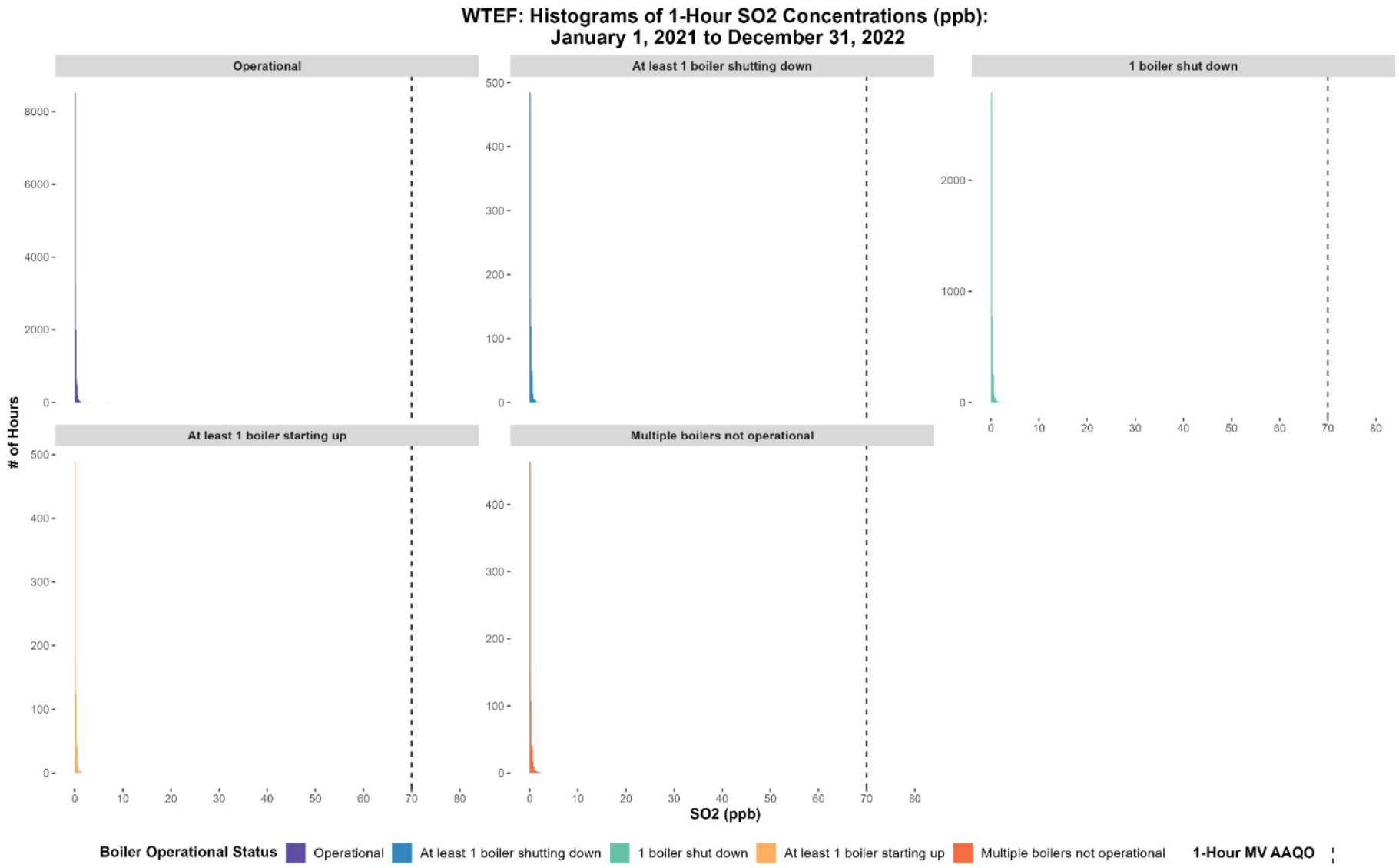


Figure 10-6 Histograms of 1-Hour Average SO_2 by Boiler Operational Status at S150 – MV WTEF Station (2021 – 2022)

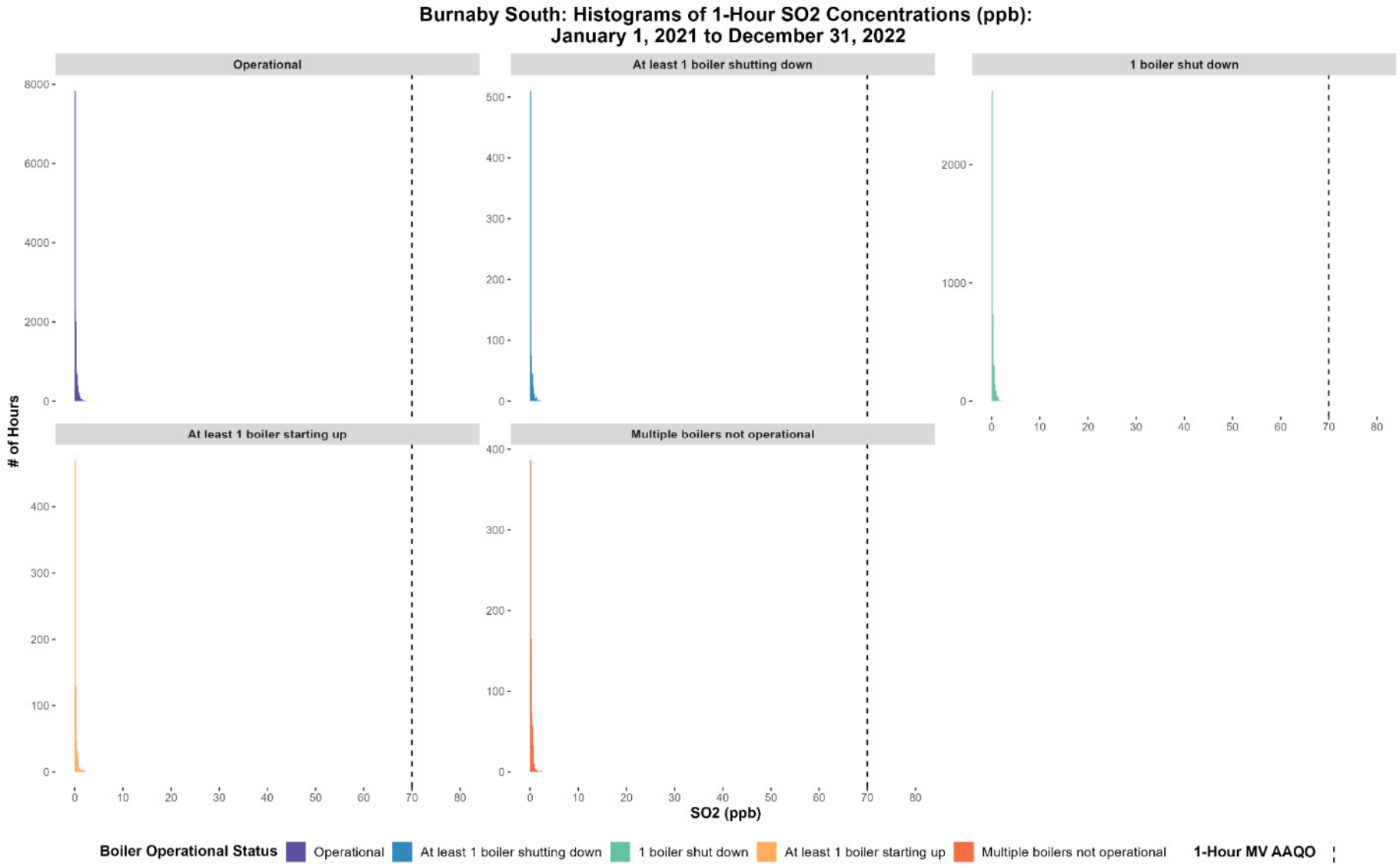


Figure 10-7 Histograms of 1-Hour Average SO_2 by Boiler Operational Status at T18 – Burnaby South Station (2021 – 2022)

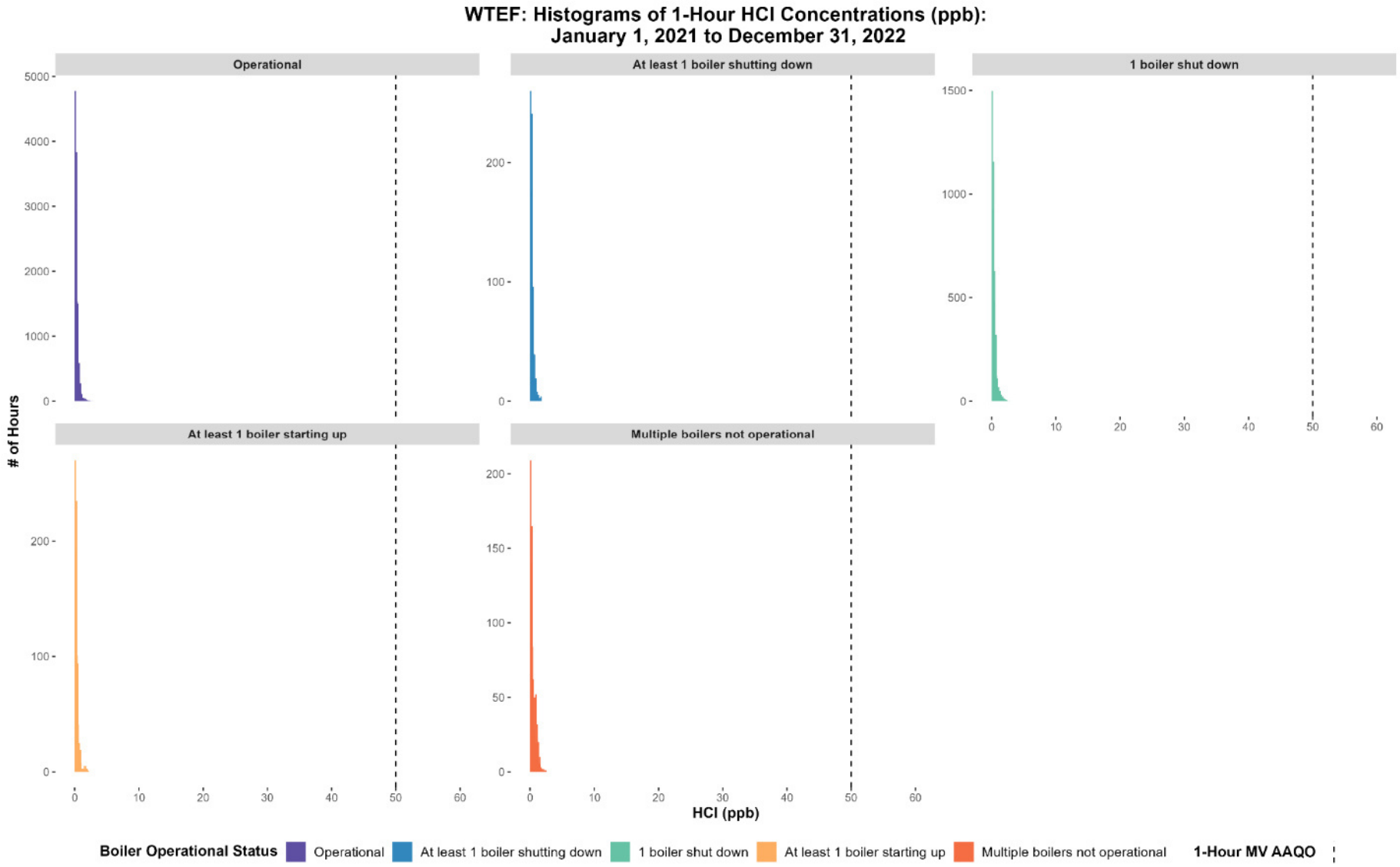


Figure 10-8 Histograms of 1-Hour Average HCl by Boiler Operational Status at S150 – MV WTEF Station (2021 – 2022)

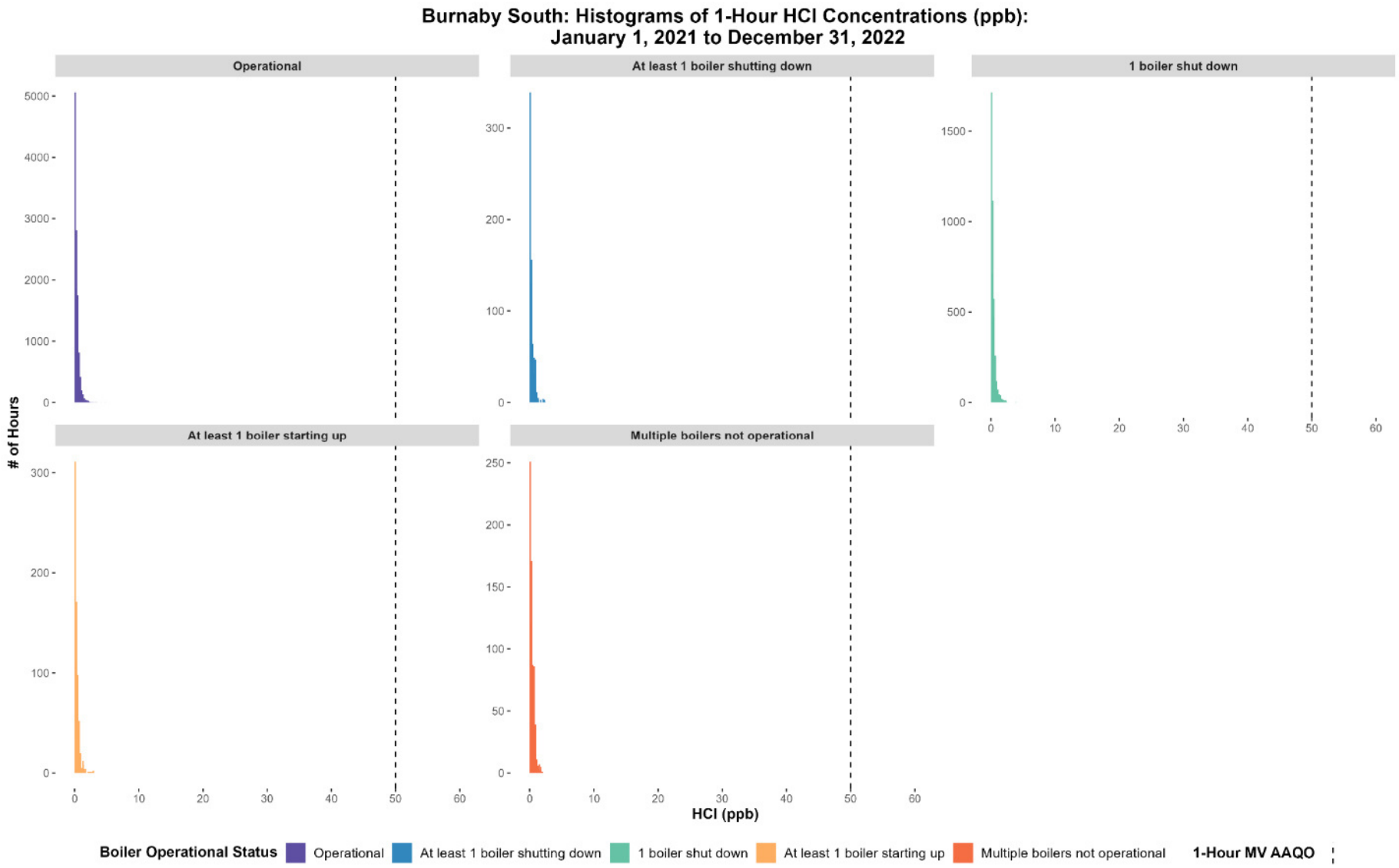


Figure 10-9 Histograms of 1-Hour Average HCl by Boiler Operational Status at T18 – Burnaby South Station (2021 – 2022)

10.3 WILCOXON RANK SUM TEST

Due to the non-normal distributions of 1-hour average NO_2, SO_2, and HCl observations at both the ambient monitoring stations (S150 – MV WTEF station and T18 – Burnaby South station) for each boiler unit operational status category, a comparison of means cannot be conducted through a standard Student's t-test. Therefore, an alternative statistical difference test, the Wilcoxon Rank Sum Test which tests whether samples are likely derived from the same population, was considered for comparison. In particular, the Wilcoxon Rank Sum Test was used to summarize the statistical difference between each of the 4 non-operational boiler unit statuses to the operational boiler unit status in terms of the median of the difference between each pair of observational samples.

The Wilcoxon Rank Sum Test is a statistical method used to determine the differences between two samples, without the need for any data distributional assumptions (i.e., no normal distribution requirement). The summary of the test is as follows:

Hypotheses:

- Null Hypothesis (H_0): The two distributions are identical.
- Alternative Hypothesis (H_A): The values in one distribution are systematically higher or lower than the values in the other distribution.
    - For similarly shaped quantitative distributions (as we have here), this test may be viewed as comparing medians.

Assumptions:

- Independence Groups Assumption: The groups must be independent of each other (i.e., the data within each group were collected independently).
- Independence Assumption: The data within each group must be independent (i.e., within each group, the individual values were collected independently from one another).

The results of the Wilcoxon Rank Sum Test are outlined in Table 10-4. With respect to NO_2, a statistically significant difference was found between two sets of boiler statuses at both stations, namely the operational vs. 1 boiler shut down statuses and the operational vs. multiple boilers not operational statuses. In terms of SO_2, a statistically significant difference between the operational vs. 1 boiler shut down statuses was found at S150 – MV WTEF station while a statistically significant difference between 3 sets of boiler operational statuses (operational vs. at least 1 boiler shutting down, operational vs. 1 boiler shut down, and operational vs. multiple boilers not operational) was found at T18 – Burnaby South station. Lastly, with respect to HCl, three sets of boiler statuses (operational vs. at least 1 boiler shutting down, operational vs. 1 boiler shut down, and operational vs. multiple boilers not operational) at S150 – MV WTEF station and two sets of boiler statuses (operational vs. at least 1 boiler shutting down and operational vs. multiple boilers not operational) at T18 – Burnaby South station were found to be statistically different from one another.

It is important to note that, where the Wilcoxon Rank Sum Test detected statistically significant differences between ambient concentrations during different boiler operational statuses, the differences in medians are very small. The accompanying histograms in Section 10.2 (Figure 10-4 through Figure 10-9) showing the distributions of ambient concentrations per boiler operational status also provide insight to similarity of ambient concentrations between operational statuses. Further, in some cases, the differences also do not align with the expected emissions from the facility; for example, the median ambient concentrations for NO_2 are higher during periods when 1 boiler is shutdown, or multiple boilers are not operational, which would mean that facility emissions are lower than normal. Thus, it is more likely that the periods when boilers are shut down are correlated with periods when regional NO_2 levels are higher due to other emissions sources or meteorological factors, than there being a negative association between WTEF shutdown periods and ambient NO_2 levels. Based on the above, its is reasonable to conclude that other regional emissions sources and prevailing meteorological patterns have a larger impact on measured NO_2, SO_2, and HCl recorded at S150 – MV WTEF station and T18 – Burnaby South stations than the operational / shutdown status of the WTEF.

Table 10-4 Summary of Results of the Wilcoxon Rank Sum Test

AIR CONTAMINANT	STATION	BOILER OPERATIONAL STATUSES COMPARED	P-VALUE	MEDIANS DIFFER?	ESTIMATED MEDIAN OF DIFFERENCE BETWEEN SAMPLES	95% CONFIDENCE INTERVAL OF ESTIMATE	MEDIAN		HOURS IN 2-YEAR MONITORING PERIOD	
							OPERATIONAL	NON-OPER-ATIONAL	OPERATIONAL	NON-OPER-ATIONAL
Nitrogen Dioxide (NO_2)	S150 – MV WTEF	Operational vs. At least 1 boiler shutting down	6.87E-02	No	-6.00E-01	(-1.20E+00, 2.23E-05)	11.5	11.7	11379	678
		Operational vs. 1 boiler shut down	2.31E-33	Yes	-1.90E+00	(-2.20E+00, -1.60E+00)		14		3980
		Operational vs. At least 1 boiler starting up	4.40E-01	No	-2.00E-01	(-9.00E-01, 4.00E-01)		11.4		671
		Operational vs. Multiple boilers not operational	1.25E-04	Yes	-1.30E+00	(-1.90E+00, -6.00E-01)		13.6		653
	T18 – Burnaby South	Operational vs. At least 1 boiler shutting down	9.02E-01	No	-2.88E-05	(-5.00E-01, 4.00E-01)	9.3	9.05	11362	680
		Operational vs. 1 boiler shut down	4.68E-17	Yes	-9.00E-01	(-1.20E+00, -7.00E-01)		10.3		3985
		Operational vs. At least 1 boiler starting up	7.85E-01	No	-1.00E-01	(-5.00E-01, 4.00E-01)		9		680
		Operational vs. Multiple boilers not operational	5.78E-04	Yes	-9.00E-01	(-1.40E+00, -4.00E-01)		10.5		658
Sulphur Dioxide (SO_2)	S150 – MV WTEF	Operational vs. At least 1 boiler shutting down	3.46E-01	No	-2.79E-05	(-4.61E-05, 5.15E-05)	0.2	0.2	11383	678
		Operational vs. 1 boiler shut down	1.33E-07	Yes	-1.54E-05	(-6.12E-05, -1.87E-05)		0.2		3982
		Operational vs. At least 1 boiler starting up	5.03E-01	No	-5.35E-05	(-2.58E-05, 3.12E-05)		0.2		670
		Operational vs. Multiple boilers not operational	2.71E-01	No	-3.15E-05	(-4.91E-05, 4.34E-05)		0.2		654
	T18 – Burnaby South	Operational vs. At least 1 boiler shutting down	1.74E-03	Yes	3.06E-05	(3.45E-05, 2.36E-05)	0.2	0.1	11445	683
		Operational vs. 1 boiler shut down	1.39E-05	Yes	-5.73E-05	(-8.59E-06, -2.89E-05)		0.2		4002
		Operational vs. At least 1 boiler starting up	1.80E-01	No	5.86E-05	(-4.19E-09, 6.17E-05)		0.1		683
		Operational vs. Multiple boilers not operational	1.78E-06	Yes	-2.70E-05	(-1.45E-05, -6.06E-05)		0.2		663

AIR CONTAMINANT	STATION	BOILER OPERATIONAL STATUSES COMPARED	P-VALUE	MEDIANS DIFFER?	ESTIMATED MEDIAN OF DIFFERENCE BETWEEN SAMPLES	95% CONFIDENCE INTERVAL OF ESTIMATE	MEDIAN		HOURS IN 2-YEAR MONITORING PERIOD	
							OPERATIONAL	NON-OPER-ATIONAL	OPERATIONAL	NON-OPER-ATIONAL
Hydrogen Chloride (HCl)	S150 – MV WTEF	Operational vs. At least 1 boiler shutting down	1.91E-02	Yes	-8.09E-06	(-1.32E-05, -6.44E-05)	0.3	0.3	11271	675
		Operational vs. 1 boiler shut down	3.14E-17	Yes	-8.25E-05	(-6.09E-06, -4.19E-05)		0.3		3913
		Operational vs. At least 1 boiler starting up	1.29E-01	No	-7.03E-05	(-7.95E-05, 2.56E-05)		0.3		663
		Operational vs. Multiple boilers not operational	1.79E-17	Yes	-1.00E-01	(-9.99E-02, -1.00E-01)		0.4		609
	T18 – Burnaby South	Operational vs. At least 1 boiler shutting down	4.81E-02	Yes	1.74E-05	(1.99E-05, 7.57E-05)	0.3	0.3	11385	681
		Operational vs. 1 boiler shut down	2.55E-01	No	-3.80E-05	(-4.30E-05, 2.66E-05)		0.3		3998
		Operational vs. At least 1 boiler starting up	4.32E-01	No	4.34E-05	(-6.30E-05, 2.98E-05)		0.3		683
		Operational vs. Multiple boilers not operational	2.96E-06	Yes	-3.68E-05	(-1.00E-01, -3.20E-05)		0.3		664

10.4 COMPARISON TO START UP / SHUTDOWN DISPERSION MODEL PREDICTIONS

The RWDI air dispersion model predictions for the “Start Up” and “Shut Down” scenarios were extracted at the same key locations outlined in Section 9.1 for comparisons against the ambient air quality observations collected at the S150 – MV WTEF station and T18 – Burnaby South station during boiler start-up and shut down events in 2021 and 2022. In particular, the RWDI air dispersion model predictions for the “Start Up” scenario were compared to ambient air quality data during hours corresponding to “at least 1 boiler starting up”, while the RWDI air dispersion model predictions for the “Shut Down” scenario were compared to ambient air quality data during hours corresponding to “1 boiler shut down”. The results presented in Table 10-5 show that in all cases except two (maximum 1-hour NO_2 concentration measured at T18 – Burnaby South in 2022 and maximum 1-hour SO_2 concentration measured at T18 – Burnaby South in 2021), the RWDI model predicted concentrations above the monitored ambient concentrations at both the S150 – MV WTEF station and T18 – Burnaby South station for all 3 air contaminants (NO_2, SO_2, and HCl). Similar to Section 9.2, only maximum 1-hour concentrations were considered within these comparisons. It is important to note that despite the monitored data exceeding the model predictions, that the monitored data during all startup / shutdown events for 2021 and 2022 remained below AAQOs.

Table 10-5 Ambient Air Quality Compared to RWDI Model Predictions for the "Start Up" and "Shut Down" Scenarios

AIR CONTAMINANT	AVERAGING PERIOD	STATISTICAL FORM	OBJECTIVE	JURISDICTION	STATION	CONCENTRATION: ppb (µg/m³)					
						START UP SCENARIO			SHUT DOWN SCENARIO		
						AMBIENT AIR QUALITY (2021)[A]	AMBIENT AIR QUALITY (2022)[A]	RWDI MODEL (2013 – 2015)[B]	AMBIENT AIR QUALITY (2021)[A]	AMBIENT AIR QUALITY (2022)[A]	RWDI MODEL (2013 – 2015)[B]
Nitrogen Dioxide (NO_2)	1-Hour	Maximum 1-hour concentration	60 ppb (113 µg/m³)[C]	Metro Vancouver Regional District (MVRD)[C]	S150 – MV WTEF	37.4 (70.3)	52.1 (98.0)	58.5 (110.0)	53.9 (101.4)	47.7 (89.7)	57.9 (108.9)
					T18 – Burnaby South	37.6 (70.7)	34.5 (64.9)	41.3 (77.7)	40.1 (75.4)	49.5 (93.1)	41.1 (77.4)
Sulphur Dioxide (SO_2)			70 ppb (183 µg/m³)	Metro Vancouver Regional District (MVRD)	S150 – MV WTEF	1.7 (4.5)	1.3 (3.4)	12.5 (32.7)	3.9 (10.2)	2.6 (6.8)	5.4 (14.0)
					T18 – Burnaby South	2.0 (5.2)	2.1 (5.5)	5.5 (14.3)	3.9 (10.2)	2.5 (6.5)	3.1 (8.1)
Hydrogen Chloride (HCl)			50 ppb (75 µg/m³)	Alberta Environment (AENV)	S150 – MV WTEF	2.1 (3.1)	2.0 (3.0)	20.5 (30.6)	2.3 (3.4)	2.8 (4.2)	20.5 (30.6)
					T18 – Burnaby South	2.1 (3.1)	3.0 (4.5)	6.8 (10.1)	2.5 (3.7)	3.9 (5.8)	6.8 (10.1)

Notes: [A] Only hours corresponding to start-up and shut down events at the MV WTEF have been included in the ambient air quality data set prior to calculating the maximum 1-hour concentrations

[B] RWDI's air dispersion model considers a 3-year period between 2013 to 2015, so the maximum 1-hour concentration have been calculated per year and the maximum of the 3-years have been presented here. In addition, baseline air quality concentrations have been accounted for in the presented values.

[C] After the removal of hours corresponding to non-start-up and non-shut down events at the MV WTEF from the ambient air quality data set, the statistical form of the NO_2 MVRD AAQO (i.e., the 98th percentile of the daily maximum 1-hour concentrations) does not make sense to compute for comparisons. Thus, we have altered the statistical form to use the maximum 1-hour NO_2 concentrations, which does not follow the statistical for of the NO_2 MVRD AAQO.

11 SUMMARY

The evaluation of MV WTEF's contribution to ambient air quality (NO_2, SO_2, and HCl) in 2021 and 2022 has been completed by means of data analysis using ambient air quality and meteorological data collected at two MVRD monitoring stations (S150 – MV WTEF and T18 - Burnaby South), MV WTEF emissions data, and air dispersion modelling results.

Prior to assessing the ambient air quality data collected, given the novel nature of regional HCl monitoring and assessment, an HCl literature review was conducted to establish a baseline understanding of HCl emission sources, atmospheric chemistry and relevant jurisdictional regulatory air quality requirements. In terms of HCl atmospheric chemistry, current global reactive chlorine emission inventories have estimated that greater than 80% of total tropospheric HCl stems from sea salt particle dechlorination reactions, but the understanding of the impact of chlorine catalyzed chemistry is limited due to the highly spatially variable anthropogenic HCl emissions which have not been adequately observed. The HCl ambient air quality objectives (AAQOs) utilized in the 2018 MV WTEF Dispersion Modelling Study by RWDI were reviewed and deemed appropriate for utilization within this assessment after a thorough jurisdictional review of HCl AAQOs was conducted.

Next, short-term and long-term ambient air quality objectives (AAQOs) were selected for comparison to the levels of ambient air quality (NO_2, SO_2, and HCl) measured at the two MVRD monitoring stations (S150 – MV WTEF and T18 - Burnaby South) within the two-year monitoring period (2021-2022). In particular, the MVRD 1-hour and annual objectives were selected for NO_2, the MVRD 1-hour and annual objectives were selected for SO_2, and a combination of different jurisdictions were selected for HCl (1-hour objective from Alberta Environment, 24-hour objective from Ontario Ministry of Environment, and annual objective from US Environmental Protection Agency).

Ambient concentrations of NO_2, SO_2, and HCl collected at the two MVRD monitoring stations during the 2021-2022 monitoring period were summarized and compared to ambient air quality objectives (AAQOs). Within the 2-year monitoring period, no exceedances of short-term nor long-term (1-hour, 24-hour, and annual) AAQOs for NO_2, SO_2, and HCl were recorded at either MVRD monitoring stations.

HCl and SO_2 concentrations were particularly low in comparison to AAQOs. For HCl, 1-hour maximum ambient air concentrations were 6% of the AAQO at the S150 – MV WTEF station and 9% of the AAQO at T18 – Burnaby South station. While the maximum concentrations of HCl monitored were low in comparison to AAQOs, in general, HCl concentrations were even lower, as 98% of the time, HCl concentrations were less than 3% of the ambient air quality objectives at both stations, highlighting that HCl was consistently low. For SO_2, 1-hour maximum ambient air concentrations were 10% of the AAQO at the S150 – MV WTEF station and 6% of the AAQO at the T18 – Burnaby South station. Similar to HCl concentrations though, 98% of the time, ambient concentrations of SO_2 were less than 2% of the AAQO at both stations.

NO_2 ambient air concentrations were higher in comparison to AAQOs than the other two pollutants analyzed., with 1-hour maximum ambient air concentrations at 76% of the AAQO at the S150 – MV WTEF station and 62% of the AAQO at the T18 – Burnaby South station. This was anticipated given that the primary contributor to NO_2 concentrations in the region are road traffic emissions. The two stations exhibited the expected trend of peak 1-hour average NO_2 concentrations during peak traffic. Slightly higher levels of NO_2 were measured at S150 – MV WTEF station compared to T18 – Burnaby South station, but both were clearly influenced primarily by traffic emissions.

Monitored concentrations during particular wind direction and wind speed conditions were analyzed as a tool to investigate directions and wind speeds from which contaminants may be originating from. Polar plots analyzing wind directions and wind speeds associated with monitored pollutant levels suggest the potential influence of WTEF emissions may be observable during Winter periods at the S150 – MV WTEF station, particularly during stagnant periods with low wind speeds. Seeing this relationship in the data is not unexpected given that the station was sited near the location with the highest expected ambient air concentrations identified by the WTEF dispersion modelling assessment. Although this relationship can be observed, as explained above maximum pollutant concentrations remained well below AAQOs and the levels predicted in the dispersion modelling assessment. During the Summer for S150 – MV WTEF, and at T18 – Burnaby South during the full year, measured ambient NO_2, SO_2, and HCl levels were likely associated with emissions from other sources combined with seasonal and regional meteorological patterns such as Summertime sea breezes.

To investigate whether the WTEF operations were impacting the levels of all three pollutants at the monitoring stations, an analysis was conducted using ambient concentrations of NO_2, SO_2, and HCl collected at S150 – MV WTEF station and T18 – Burnaby South station and continuous emissions monitoring (CEMS) data collected at MV WTEF's three boiler lines during the 2-year monitoring period. Specifically, linear regression models were utilized and determined no statistically significant linear correlation between WTEF CEMS readings and S150 and T18 ambient air quality data for all three pollutants. This suggests that there were other significant regional emission sources and meteorological factors that had an impact on the ambient levels of NO_2, SO_2, and HCl recorded at both the S150 – MV WTEF station and T18 – Burnaby South station.

Emissions during WTEF start up and shut down events were also evaluated as these events can result in higher emission releases. WTEF start up and shut down events were identified by using monthly boiler downtime summary reports generated by Covanta Burnaby Renewable Energy, ULC (the contracted operator of the MV WTEF). Five boiler unit operational statuses were determined using the summary reports and the hourly ambient dataset collected in 2021-2022 at the two MVRD monitoring stations were categorized as per the 5 statuses. A comparison analysis determined that the ambient concentrations recorded during different boiler unit operational statuses were very similar, and that the distributions of data were non-normal and right-skewed. A Wilcoxon Rank Sum Test was utilized to determined that there were some statistically significant differences between ambient concentrations during different boiler operational statuses, but the differences in medians were very small. This result suggests that there were other significant regional sources and meteorological factors that had a greater impact on the S150 and T18 ambient levels of NO_2, SO_2, and HCl than the startup – shutdown status of the WTEF.

Finally, a comparison between the ambient air quality data collected at S150 – MV WTEF station and T18 – Burnaby South station against the air dispersion model predictions reported by RWDI in 2018 for the "operational" model scenario was conducted. RWDI's model predictions at receptors corresponding to the locations of the two MVRD stations were compared to the ambient data collected during the 2-year monitoring period. The results show the conservative nature of the model predictions, where the "operational" scenario of the RWDI model predicted concentrations were consistently above the monitored ambient concentrations at both the S150 – MV WTEF station and T18 – Burnaby South station. Comparisons between ambient concentrations and RWDI dispersion model-predicted concentrations during "Start Up" and "Shut Down" events showed that, that in all cases except two (maximum 1-hour NO_2 concentration measured at T18 – Burnaby South in 2022 and maximum 1-hour SO_2 concentration measured at T18 – Burnaby South in 2021), the RWDI model predicted concentrations above the monitored ambient concentrations at both the S150 – MV WTEF station and T18 – Burnaby South station for all 3 air contaminants (NO_2, SO_2, and HCl).

The monitoring conducted at these 2 stations over the 2-year period provided insight into the near-field levels of NO_2, SO_2, and HCl within the vicinity of the WTEF. Monitored levels were confirmed to be low for SO_2 and HCl and established that NO_2 concentrations patterns did not exceed any AAQOs and that peaks were primarily linked to typical road traffic emissions patterns. Overall, the analysis of ambient air quality and CEMS data from the WTEF using spatial and statistical analysis tools did not reveal any significant correlations, trends, or patterns that suggested the WTEF is significantly impacting ambient air concentrations of NO_2, SO_2 or HCl at two ambient air monitoring stations near the facility. For all three pollutants monitored, the analysis showed that there are likely other primary drivers of ambient air concentrations at the monitoring locations. For SO_2 and NO_2, the other regional sources of emissions are well known. WSP's research of HCl emission sources and atmospheric chemistry shows that an understanding of the concentration of HCl in ambient air in a marine or coastal environment is dependent on an understanding of the contribution from the sea salt dechlorination process and the interplay with meteorological influences and anthropogenic sources. According to Crisp et al., 2013[13], in areas like Metro Vancouver meteorological and atmospheric processes related to the marine boundary layer result in the sea salt dechlorination process being a dominant influence on HCl concentrations, while biomass burning, coal combustion, and waste incineration processes are thought to be more likely influential in continental areas away from the marine boundary. Understanding that the WTEF does represent a major anthropogenic source of HCl emissions in the airshed that is not "showing up" in the ambient monitoring analysis, our discussion of the results hypothesizes that the primary driver of HCl in the near coast portion of the Lower Fraser Valley airshed (as we would characterize the location of the WTEF) is the contribution of sea salt dechlorination.

12 RECOMMENDATIONS

As a follow-up to the dispersion modelling and human health risk assessment studies conducted in 2018 in response to the requirements from the WTEF's Operational Certificate (OC), issued December 15, 2016 by the BC Ministry of Environment and Climate Change Strategy, an ambient air monitoring station measuring NO_x, SO_2 and HCl was installed near the WTEF in 2020, and an HCl monitor was installed at Metro Vancouver Regional District's (MVRD) existing T18 – Burnaby South monitoring station. Monitored levels were confirmed to be low for SO_2 and HCl and established that NO_2 concentrations patterns did not exceed any AAQOs and that peaks were primarily linked to typical road traffic emissions patterns. Both monitoring stations have not shown a significant impact from WTEF emissions.

It is recommended, however, to continue HCl monitoring (along with all existing parameters) at T18 – Burnaby South and a monitoring station near to the WTEF to confirm the trends and patterns observed to date and grow the dataset and regional understanding for this novel contaminant. It is worth noting that the initial goal of installing the T18 – Burnaby South station was to monitor for potential impacts of the WTEF on air quality. A monitoring location near to the WTEF should be re-evaluated (potentially through an updated dispersion modelling exercise) to target the maximum location of potential impacts using data from the recent on-site meteorological station installed at the WTEF and updated emissions information (as available).

Furthermore, to establish a better understanding of HCl and its variation across the Metro Vancouver region, it is recommended that Metro Vancouver consider deploying additional HCl monitors in areas that would have the potential to detect the impact of different sources of HCl on ambient air quality. Primarily, the goal of this monitoring would be to understand the atmospheric behaviour of ambient HCl in the Lower Fraser Valley airshed as conditions change from being influenced by potential sea salt dechlorination processes in the marine boundary layer near the coast to areas further inland in the Fraser Valley where this process would be less influential. Considering MVRD's extensive existing monitoring network (Figure 12-1), the most straightforward approach would be to add HCl monitors to existing regional monitoring stations. In particular, WSP recommends installing HCl monitors at the existing T39 – Tsawwassen station to capture coastal levels of HCl, and at another station, such as T27 Langley, T30 Maple Ridge, or T45 Abbotsford Airport stations to capture inland levels of HCl.

A better understanding of HCl, through the addition of HCl monitoring in the Lower Fraser Valley airshed, should provide additional insight into the levels of HCl observed at close proximity to the MV WTEF.

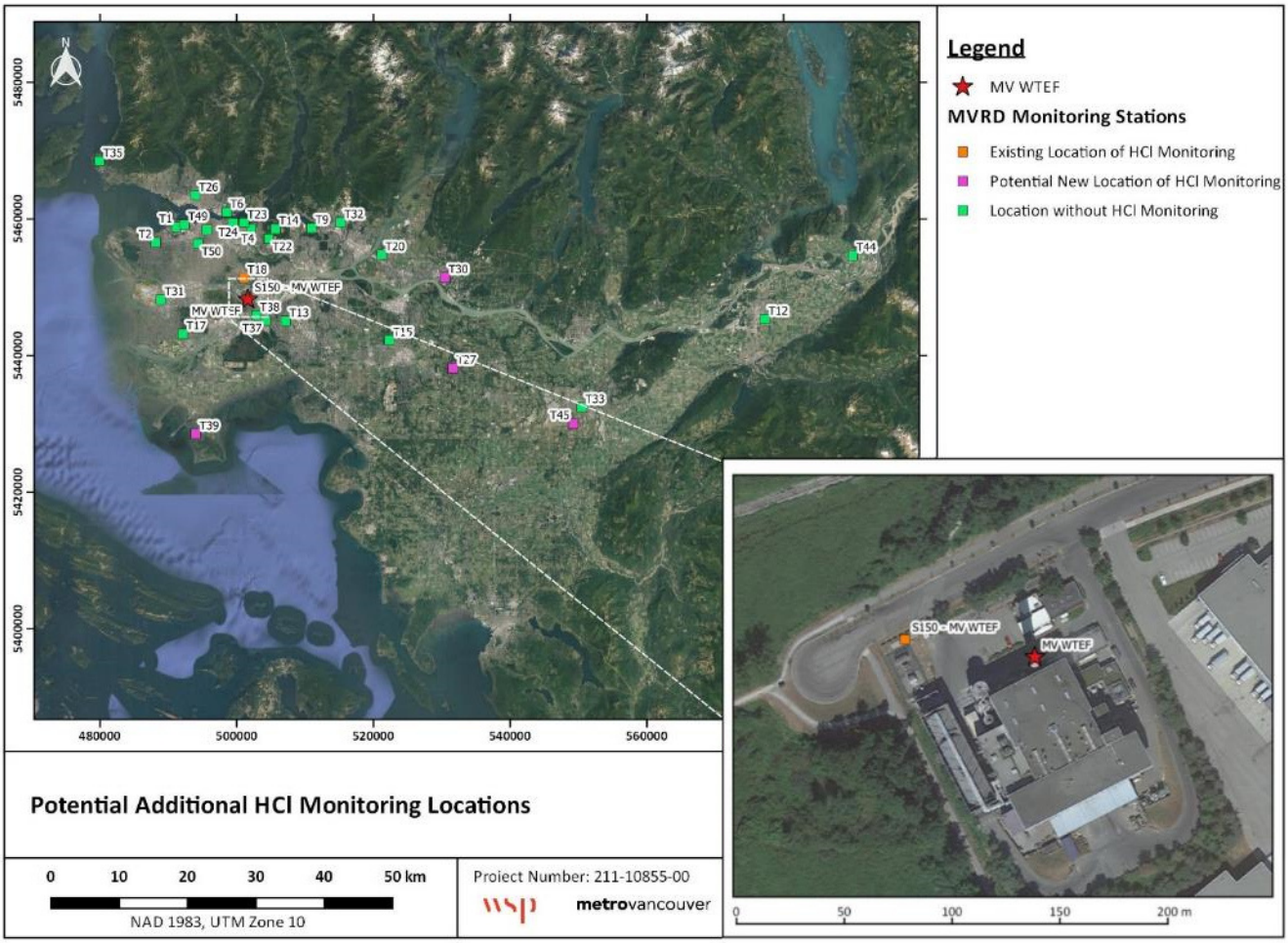


Figure 12-1 Potential New HCl Monitoring Locations using the Existing MVRD Monitoring Network

APPENDIX

A JURISDICTIONAL REVIEW OF AMBIENT HCL OBJECTIVES

Table A-1 Jurisdictional Review of Ambient HCl Objectives

JURISDICTION	CRITERIA TYPE	AVERAGING PERIOD	CRITERIA (µG/M^3)	BASIS OF CRITERIA	DATE OF CRITERIA/	DATA SOURCE	
Alberta	Alberta Ambient Air Quality Objectives (AAAQOs)	**1-hour**	**75**	Adopted from Texas	January 2019	Table 1 Alberta Ambient Air Quality Objectives	https://open.alberta.ca/dataset/0d2ad470-117e-410f-ba4f-aa352cb02d4d/resource/4ddd8097-6787-43f3-bb4a-908e20f5e8f1/download/aaqo-summary-jan2019.pdf
Ontario	Ontario Ambient Air Quality Criteria (AAQCs)	**24-hour**	**20**	Health: Adverse health effects that could occur from short-term or long-term exposure to the contaminant in air	April 2012	Ontario's Ambient Air Quality Criteria	http://www.airqualityontario.com/downloads/AmbientAirQualityCriteria.pdf
US	Reference Concentration for Inhalation Exposure (RfC)	**Annual**	**20**	Hyperplasia of the nasal mucosa larynx and trachea	July 1, 1995	Integrated Risk Information System (IRIS)	https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=396
Manitoba	Manitoba Ambient Air Quality Criteria	**1-hour**	**100**		July 2005	Environment Management Division, 1982. Internal Tentative Guideline. Manitoba Department of Environment and Workplace Safety and Health.	https://www.gov.mb.ca/sd/envprograms/airquality/pdf/criteria_table_update_july_2005.pdf
Quebec	Norme	**4-min**	**1150**		2011	Quebec standards and criteria for atmospheric quality	https://www.environnement.gouv.qc.ca/air/criteres/Normes-criteres-qc-qualite-atmosphere.xlsx
Quebec		**Annual**	**20**		2011		
Greater Montreal	Limites	**15-min**	**100**		September 1, 2019	By-law number 2001-10 on releases to the atmosphere and the delegation of its application	https://cmm.qc.ca/wp-content/uploads/2019/11/2001-10_Codification.pdf
Texas	Acute ReV (reference value)	**Short-term**	**660**	Critical Effect: Upper respiratory symptoms (sore throat, nasal discharge) and lower respiratory symptoms (pulmonary function, cough, chest pain) in exercising asthmatics	September 14, 2015	Table 1 Air Monitoring Comparison Values (AMCVs) for Ambient Air, Short-Term Health	https://www.tceq.texas.gov/assets/public/implementation/tox/dsd/final/sept15/hydrogen_chloride.pdf
Texas	$^{acute}ESL_{odor}$	**Short-term**	**1100**	Irritating, pungent	September 14, 2015	Table 1 Air Monitoring Comparison Values (AMCVs) for Ambient Air, Odor acute odor-based Effects Screening Level	
Texas	Chronic ReV (reference value)	**Long-term**	**26**	Critical Effect: Hyperplasia of nasal mucosa, larynx, and trachea in rats	September 14, 2015	Table 1 Air Monitoring Comparison Values (AMCVs) for Ambient Air, Long-Term Health	

JURISDICTION	CRITERIA TYPE	AVERAGING PERIOD	CRITERIA (µG/M^3)	BASIS OF CRITERIA	DATE OF CRITERIA/	DATA SOURCE	
Texas	^{acute}ESL [1 h]	**1-hour**	**190**	Critical Effect: Upper respiratory symptoms (sore throat, nasal discharge) and lower respiratory symptoms (pulmonary function, cough, chest pain) in exercising asthmatics	September 14, 2015	Table 2 Air Permitting Effects Screening Levels (ESLs), Short-Term ESL for Air Permit Reviews, acute health-based Effects Screening Level for chemicals meeting minimum database requirements	
Texas	^{chronic}ESL$_{threshold(nc)}$	**Annual**	**7.9**	Critical Effect: Upper respiratory tract effects in Sprague-Dawley rats	September 14, 2015	Table 2 Air Permitting Effects Screening Levels (ESLs), Long-Term ESL for Air Permit Reviews, chronic health-based Effects Screening Level for threshold dose response noncancer effects	
California	Reference Exposure Level (REL)	**1-hour**	**2100**	Respiratory system; eyes	November 2019	Office of Environmental Health Hazard Assessment (OEHHA) Acute, 8-hour and Chronic Reference Exposure Level (REL) *Note: Exposure averaging time for acute RELs is 1 hour. Chronic RELs are designed to address continuous exposures for up to a lifetime: the exposure metric used is the annual average exposure.*	https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary
California		**Annual**	**9**	Respiratory system	November 2019		
Massachusetts	Threshold Effects Exposure Limit (TEL)	**24-hour**	**7**		1995	MassDEP Ambient Air Toxics Guidelines *Note: TELs based on non-cancer health effects. TEL is a concentration intended to protect the general population, including sensitive populations such as children, from adverse health effects over a lifetime of continuous exposure. TELs take into account the fact that people may be exposed to a chemical from other sources, including indoor air, food, soil, and water.*	https://www.mass.gov/service-details/massdep-ambient-air-toxics-guidelines https://web.archive.org/web/20110112174442/http://www.mass.gov/dep/air/aallist.pdf https://web.archive.org/web/20110318091257/http://www.mass.gov/dep/air/chem_aal_sum.pdf
Massachusetts	Allowable Ambient Limit (AAL)	**Annual**	**7**		1995		
Michigan	Initial Threshold Screening Level (ITSL)	**Annual**	**20**	Derived from US EPA.	October 28, 2009	Michigan Air Toxics System Initial Threshold Screening Level/Initial Risk Screening Level (ITSL/IRSL)	https://www.michigan.gov/documents/deq/deq-aqd-toxics-xcelitsl_411837_7.zip
Michigan		**1-hour**	**2100**	Michigan Department of Environmental Quality, Air Quality Division (AQD)	October 28, 2009		

JURISDICTION	CRITERIA TYPE	AVERAGING PERIOD	CRITERIA (µG/M^3)	BASIS OF CRITERIA	DATE OF CRITERIA/	DATA SOURCE	
Oregon	Ambient Benchmark Concentrations (ABC)	**Annual**	**20**	ABC is the 1995 US EPA IRIS RfC value. OEHHA REL is lower (9) and newer (2000). Both US EPA and OEHHA relied on the same study but used different analysis assumptions. Choice of ABC based on preference for newer US EPA toxicity information, because the ATSAC (Oregon State Air Toxics Science Advisory Committee) did not accept the uncertainty factors applied by OEHHA.	May 11, 2018	Oregon Air Toxics Benchmarks	https://www.oregon.gov/deq/FilterDocs/airtox-abc.pdf
New York	Short-term Guideline Concentration (SGC)	**1-hour**	**2100**	Derived from New York State Department of Environmental Conservation. The NYSDEC derives short-term (1-hr) and annual exposure limits (SGCs and AGCs, respectively) to protect the general population from adverse acute and long-term (months, years, or a lifetime) inhalation exposures. Some of these limits are derived independently by the NYSDEC and others are based upon the exposure data published by other agencies like California's CalEPA. The CalEPA derives many acute and chronic Reference Exposure Limits (RELs) and cancer Unit Risk Estimates (UREs) to protect the general population from adverse inhalation exposures. These values are available at: http://www.oehha.ca.gov/air.html	February 12, 2021	DAR-1 AGC/SGC Tables, Short-term Guideline Concentration (SGC)	https://www.dec.ny.gov/docs/air_pdf/dar1.pdf

JURISDICTION	CRITERIA TYPE	AVERAGING PERIOD	CRITERIA (µG/M^3)	BASIS OF CRITERIA	DATE OF CRITERIA/	DATA SOURCE	
New York	Annual Guideline Concentration (AGC)	**Annual**	**20**	Derived from US EPA. The US EPA derives both carcinogenic and non-carcinogenic annual exposure limits for use in assessing the impact from chronic exposure. RfCs are inhalation exposure limits designed to protect against adverse chronic noncarcinogenic effects. Whereas carcinogenic exposure limits are derived from the US EPA's URE values and are used to protect the public from the additional one-in-one-million excess cancer risk over a lifetime of continuous exposure. UREs and RfCs values are published on the IRIS website available at: http://www.epa.gov/iris/	February 12, 2021	DAR-1 AGC/SGC Tables, Annual Guideline Concentration (AGC)	https://www.dec.ny.gov/docs/air_pdf/dar1.pdf
Idaho	Reference Occupational Exposure Level (OEL)	**8-hour**	**750**		July 1, 2021	58.01.01 – Rules for the Control of Air Pollution in Idaho, Toxic Air Pollutants Non-Carcinogenic Increments, OEL *Note: Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELS) are 8-hour time weighted averages (TWAs) unless otherwise indicated: https://www.osha.gov/annotated-pels/table-z-1#notes. The AAC are 24-hour averages.*	https://adminrules.idaho.gov/rules/current/58/580101.pdf
Idaho	Acceptable Ambient Concentrations (AAC)	**24-hour**	**375**		July 1, 2021		
US	Acute Exposure Guideline Levels	**10 min**	**2700**	NOAEL in exercising asthmatic subjects (Stevens et al. 1992)	2004	Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 4	https://www.epa.gov/sites/default/files/2014-11/documents/tsd52.pdf
US		**30 min**	**2700**		2004		
US		**1-hour**	**2700**		2004		
US		**4-hour**	**2700**		2004		
US		**8hr**	**2700**		2004		

Photo: Waste-to-Energy Facility

Waste-to-Energy Facility Environmental Monitoring and Reporting – 2023 Update

Sarah Wellman, P.Eng.
Senior Engineer, Solid Waste Services

Zero Waste Committee Meeting - July 4, 2024

metrovancouver

CONTINUOUS EMISSIONS MONITORING SYSTEM

Stack Sampling Ports

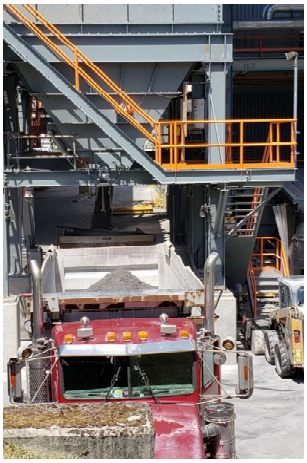
Continuous Emission Monitoring Analyzers

QUARTERLY MANUAL STACK TESTING

FLY ASH AND BOTTOM ASH MONITORING

Bottom Ash Loading

Bottom Ash Weekly Composite Samples



Loaded Fly Ash Trailers

Fly Ash Composite Samples

OPERATIONAL CERTIFICATE

All environmental reporting submitted to the Province is posted to the website:

- Monthly compliance reports
- Annual compliance reports
- Quarterly stack test results
- Semi-volatile organic compound stack test results
- Bottom ash weekly composite data
- Quarterly fly ash summary

AMBIENT MONITORING

- Temporary mobile monitoring station installed at the Waste-to-Energy Facility (2021-2023)
- Hydrogen chloride monitor added at existing station
- Study concluded that ambient levels of sulphur dioxide and hydrogen chloride are less than 10% of air quality objectives
- No statistically significant correlation between the Waste-to-Energy Facility operations and ambient air quality data
- Other sources primary drivers of observed hydrogen chloride, sulfur dioxide and nitrogen oxides
- Operational Certificate amendment application to extend timing on acid gas reduction

GREENHOUSE GAS EMISSIONS REPORTING

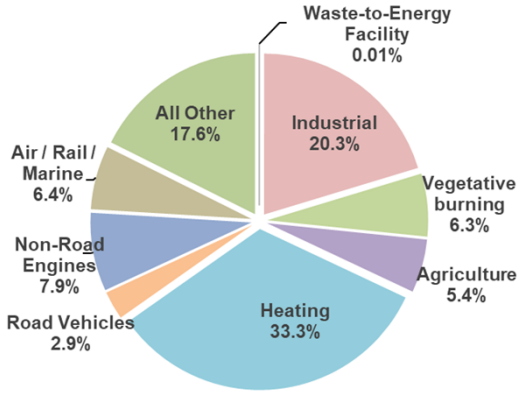
2023 Greenhouse Gas Emissions:

- Anthropogenic 124,540 tonnes (45%)
- Biogenic 153,346 tonnes (55%)
- Annual reports to provincial and federal databases

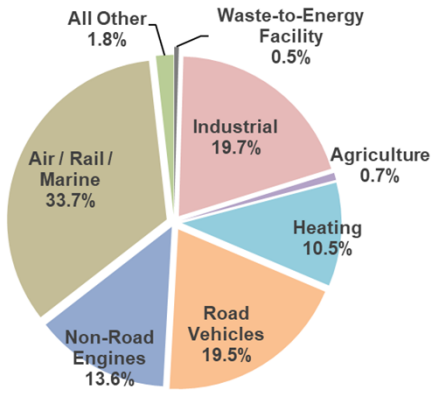
Air sample for biogenic testing

WASTE-TO-ENERGY IN A REGIONAL CONTEXT

2023 Lower Fraser Valley Fine Particle Matter (PM2.5) Emissions Sources

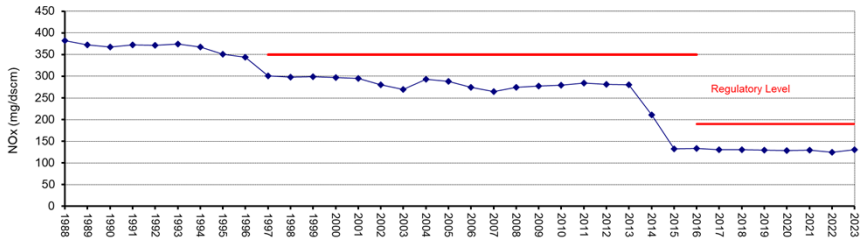


2023 Lower Fraser Valley Nitrogen Oxides (NOx) Emissions Sources

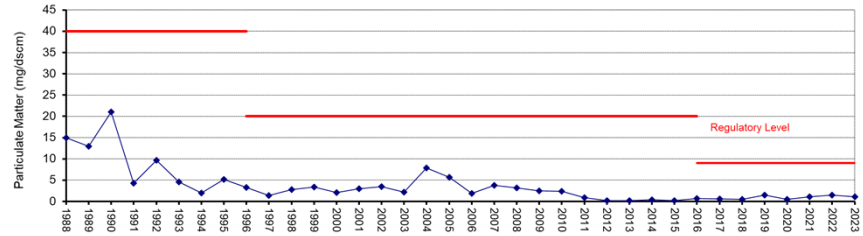


HISTORICAL TRENDS

Nitrogen Oxides

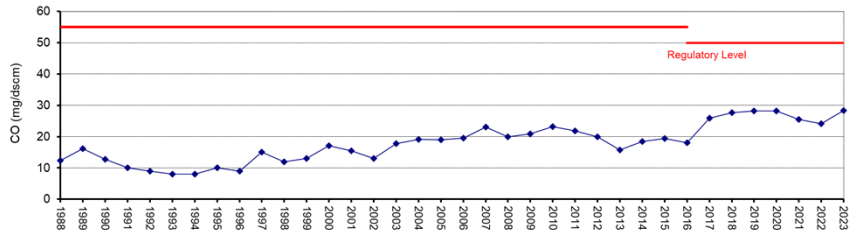


Particulate Matter

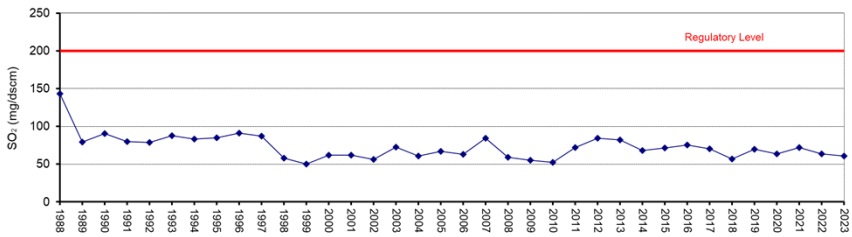


HISTORICAL TRENDS

Carbon Monoxide

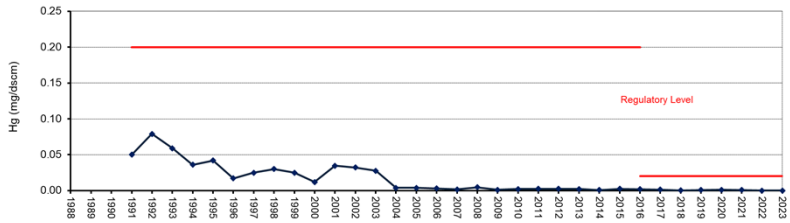


Sulfur Dioxide

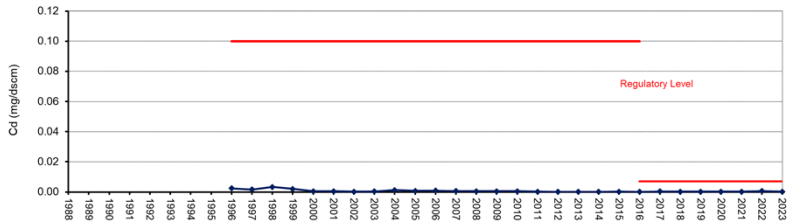


HISTORICAL TRENDS

Mercury

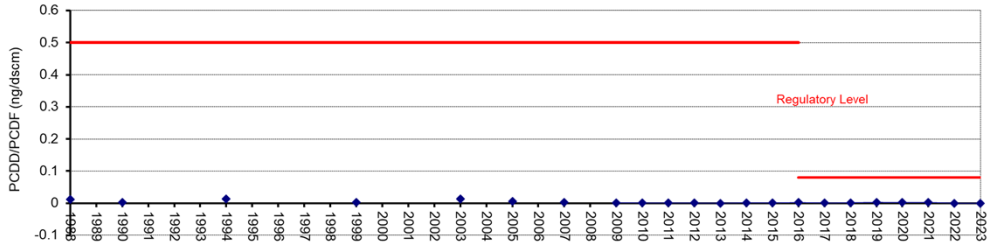


Cadmium



HISTORICAL TRENDS

Dioxins/Furans



Metro Vancouver skyline

Questions?

metrovancouver

13

To: Zero Waste Committee

From: Paul Henderson, General Manager, Solid Waste Services

Date: June 28, 2024 Meeting Date: July 4, 2024

Subject: **Manager's Report**

RECOMMENDATION
That the Zero Waste Committee receive for information the report dated June 28, 2024, titled "Manager's Report".

Plastics Accepted for Recycling at Recycling and Waste Centres
At the May Zero Waste Committee meeting, members asked what types of plastics are being recycled at Metro Vancouver's recycling and waste centres and what plastics are currently not accepted.

Central Surrey, North Shore, and United Boulevard Recycling and Waste centres offer recycling depots that accept a wide variety of plastic products for recycling. These facilities accept residential plastic packaging products that are typically included in residential curbside recycling collection programs, including jugs, jars, bottles, trays, tubs, pails, drink cups, microwaveable bowls and cups, lunch containers, lightweight plastic hangers, straws, stir sticks, cutlery, gift boxes, tape and dental floss dispensers, plant pots, and clamshells. These three facilities also accept residential packaging film and foam products that are beyond curbside recycling collection programs, including: plastic bags, overwrap, pouches, woven and net plastic bags, envelopes, air packets, bubble wrap, sandwich and freezer bags, shrink wrap, gift bags, curbside recycling bags, plastic sheets, foam food containers and trays, and plastic and foam packaging cushion blocks. Commercial expanded polystyrene and cardboard are accepted separately from residential materials due to restrictions from RecycleBC.

In addition to residential packaging, the three recycling and waste centres collect a variety of durable rigid plastic products that are recyclable as indicated by recycling symbol resin code #2 and #5, such as: bottles, bins, automobile components, and building components. Plastic resin code #3 (polyvinyl chloride) products can release toxic gases during the recycling process and there is currently no viable option for recycling these products. Plastic products with resin code #6, #7, and plastics without any resin code marking also have limited viable recycling options. Work is underway with end processors to evaluate if additional plastic products can be collected for recycling.

New depots under development at North Surrey and Langley recycling and waste centres will have the same material list as the recycling and waste centres with depots. The Maple Ridge recycling depot located in front of the Maple Ridge Recycling and Waste Centre provides a similar range of plastic recycling options as at the depots included in the other recycling and waste centres.

Increase in Use of Free Recycling at Recycling and Waste Centres

At the May Zero Waste Committee meeting, members asked how the development of recycling depots has increased recycling at Metro Vancouver recycling and waste centres.

Over the last decade, significant effort has been made to improve accessibility to recycling services offered at Metro Vancouver recycling and waste centres. This includes construction of recycling depots that are located ahead of weigh scales offering ease of access to encourage free recycling of a growing number of materials. The North Shore Recycling and Waste Centre was reconfigured in 2016 to construct a recycling depot ahead of scales. The United Boulevard Recycling and Waste Centre (which replaced the Coquitlam Recycling and Waste Centre) and the new Central Surrey Recycling and Waste Centre were both constructed in 2022 with free recycling depots located ahead of scales. Recycling depots are being developed at both Langley and North Surrey recycling and waste centres.

Customer traffic at the North Shore Recycling and Waste Centre recycling depot has continuously increased since its reconfiguration and is now estimated at over 600 customers per day, on average. The recycling depot at United Boulevard Recycling and Waste Centre serves approximately 550 customers daily, an increase of 30% compared to an estimated 400 customers daily at the recycling depot located within the Coquitlam Recycling and Waste Centre prior to its closure. Usage of the recycling depot at the new Central Surrey Recycling and Waste Centre also continues to increase with approximately 200 customers daily in 2024, up from 50 average daily customers in 2022. The facilities with free recycling offered ahead of scales consistently receive positive feedback from the public.

Reuse at Recycling and Waste Centres

Expanding reuse opportunities at recycling and waste centres continues to be a priority. For 2024, Urban Repurpose is again providing reuse collection at the North Shore Recycling and Waste Centre with service starting on June 20. The number of reuse days Urban Repurpose is hosting is increasing from 12 days in 2023 to a minimum of 15 days in 2024, and up to 38 days. Reuse services are also expanding to other recycling and waste centres in 2024 with 12-month pilot programs for the collection of reusable small household goods starting in the coming months at the United Boulevard and Central Surrey recycling and waste centres. More details will be available when arrangements with service providers are finalized.

Waste-to-Energy District Energy Piping RFQ

On June 27, 2024, a Request for Qualifications (RFQ 24-195) for piping supply and installation for the first phase of the Waste-to-Energy Facility District Energy System Project was posted publically. The intent of this RFQ is to shortlist respondents to participate in the future stages of the procurement process. The resulting contract will be for the construction of the approximately 6-kilometre hot water pipe system to connect the Waste-to-Energy Facility district energy centre, adjacent to the Waste-to-Energy Facility, to the River District community district energy system in Vancouver. Construction of the energy centre will be completed through a separate procurement process that will be initiated following engagement on the design of the energy centre.

Zero Waste Committee Work Plan

Attachment 1 to this report sets out the Committee's Work Plan for 2024. The status of the Committee's key priorities is shown as pending, in progress, or complete together with the quarter that each is expected to be considered by the Committee.

ATTACHMENTS

1. Zero Waste Committee Work Plan

68729172

Zero Waste Committee 2024 Work Plan

Report Date: June 28, 2024

Priorities

1st Quarter	**Status**
2023 Holiday Waste Reduction Campaign Results	Complete
2023 Zero Waste Conference Report	Complete
Solid Waste Management Plan: Vision and Guiding Principles	Complete
National Zero Waste Council 2023 Accomplishments and 2024 Projects	Complete
2022 Solid Waste and Recycling Biennial Report	Complete
2nd Quarter	**Status**
Tipping Fee Bylaw Updates	Complete
2023 Disposal Ban Program Results	In progress
GVS&DD Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw	In progress
2023 Waste-to-Energy Facility Financial Summary	Pending
2023 Waste Composition Data	In progress
2023 – 2024 Metro Vancouver Engagement with the Love Food Hate Waste Canada Campaign	Complete
2024 Food Scraps Recycling Campaign Results	Complete
Waste-to-Energy Facility District Energy System Update	Complete
2024 Think Thrice Textiles Waste Reduction Campaign Results	In progress
Solid Waste Services 2023 Year-End Financial Performance Results Review	Complete
Solid Waste Services 2024 Financial Performance Reporting and Annual Forecast #1	In progress
Waste-to-Energy Facility Biosolids Management System Contract	Pending
3rd Quarter	**Status**
2023 Waste-to-Energy Facility Environmental Performance Summary	In progress
2024 National Zero Waste Council Projects	Pending
Recycling and Waste Centre Reuse Scale-Up	Pending
Solid Waste Services 2024 Financial Performance Reporting and Annual Forecast #2	Pending
Repair Events, Reuse Programs, and Regional Food Recovery Network	Pending
Solid Waste Management Plan: Idea Generation	Pending
Multi-Family Residential Waste Prevention	Pending
4th Quarter	**Status**
2024 Single-Use Item Reduction Campaign Results	Pending
Solid Waste Services Annual Budget and 5-Year Financial Plan	Pending
Solid Waste Services 2024 Financial Performance Reporting and Annual Forecast #3	Pending
2025 Tipping Fee Bylaw Revisions	Pending
North Surrey and Langley Recycling Depot Development	Complete

To: Zero Waste Committee

From: Harji Varn, General Manager, Financial Services
Chief Financial Officer

Date: June 28, 2024 Meeting Date: July 4, 2024

Subject: **Metro Vancouver's 2024 Financial Performance Report No. 1**

RECOMMENDATION

That the Zero Waste Committee receive for information the report dated June 28, 2024, titled "Metro Vancouver's 2024 Financial Performance Report No. 1".

Metro Vancouver's 2024 Financial Performance Report No. 1 is the first of three financial performance and forecast reports for 2024, and it includes forecasts to the end of 2024, procurement activity, treasury, continuous improvement reporting, and progress on delivering the Board's Strategic Priorities. The attached report was provided to the Finance Committee at its June 19, 2024 meeting and is presented to the Zero Waste Committee for information. Solid Waste Services details are highlighted below for ease.

HIGHLIGHTS

Operating Results – Solid Waste Services

For Solid Waste Services, the year-end deficit projection for 2024 is $2.4 million. Although there are higher than expected revenues of $13.3 million due to more waste flows along with additional commercial organics, this is offset by higher forecasted costs of $15.7 million, primarily related to increased contingency disposal costs.

Solid Waste Services

	2024 Budget	Year-end Forecast	Projected Variance
Revenues	$ 142.4M	$155.7M	$ 13.3M
Expenditures	142.4M	158.1M	(15.7M)
Surplus (Deficit)	$ -	$ (2.4M)	$ (2.4M)

Capital Expenditures Program – Solid Waste Services

Solid Waste Services is forecasted to spend $20.0 million (37%) of the $54.1 million projected capital cash flow in the 2024 Budget. The forecasted spend is lower than initially projected as a result of longer than expected timelines to initiate construction on various capital projects. Contributing factors include longer than expected timelines to develop municipal agreements for infrastructure projects, and additional permitting steps not initially anticipated. A number of projects are near to initiating construction, and as such the expectation is that 2025 capital spends will be more aligned with projections.

ATTACHMENTS

1. Metro Vancouver's 2024 Financial Performance Report No. 1

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Finance Committee

From: Harji Varn, General Manager, Financial Services
Chief Financial Officer

Date: June 12, 2024 Meeting Date: June 19, 2024

Subject: **Metro Vancouver's 2024 Financial Performance Report No. 1**

RECOMMENDATION

That the MVRD Board receive for information the report dated June 12, 2024 titled "Metro Vancouver's 2024 Financial Performance Report No. 1".

EXECUTIVE SUMMARY

The Metro Vancouver 2024 Financial Performance Report No. 1 is the first of three financial performance and forecast reports for 2024, and it includes forecasts to the end of 2024, procurement activity, treasury, continuous improvement reporting, and progress on delivering the Board's Strategic Priorities. It is forecasted that for 2024, operating surplus to budget will be $9.2 million (0.8% of the $1.2 billion budget). This is resulting from anticipated surpluses in Water Services ($3.5 million), Liquid Waste Services ($1.0 million), Metro Vancouver Housing ($1.4 million) and Regional District Services ($5.7 million), primarily due to higher water sales revenues, delays in filling staff vacancies and less spending on consulting and contracting services from project delays, and lower debt service costs due to less borrowing. These surpluses are offset by a projected deficit in Solid Waste Services ($2.4 million) due to increased contingency disposal costs.

At this point in the year, it is forecasted that for 2024, capital expenditures will be approximately 75% of the $1.4 billion cash flow. Although spending to date is approximately 10%, or $130M of the total planned spending of $1.4 billion, a significant ramp up in construction and related spending is expected for major projects moving into construction phases, such as the Annacis Water Supply Tunnel, North Shore Wastewater Treatment Plant Program, Second Narrows Water Supply Tunnel, Widgeon Marsh Park Development and housing development projects including Heather Place B, Kingston Gardens and Salal Landing.

As a result of lower capital spending than targeted, long-term borrowing for 2024 is anticipated to be $350 million versus $482 million as planned. Investment returns are averaging 4.51% and are expected to remain favorable in the current high interest environment as maturing investments are reinvested in higher yielding products. Cash flow projections are on target and remain positive.

For the first quarter of 2024, procurement activity included 4 awards approved by the Board with a value of $72.1 million, which is 81% of the total value of awarded contracts in the first quarter.

There are currently 140 continuous improvement initiatives underway that will continue to advance the Board's Strategic Priorities.

PURPOSE

To present the Finance Committee and MVRD Board with the Metro Vancouver 2024 Financial Performance Report No. 1, including forecasts to the end of 2024, procurement activity, treasury and continuous improvement reporting.

BACKGROUND

As per the Terms of Reference, the Finance Committee is a standing committee of the Metro Vancouver Board that monitors Metro Vancouver's financial management, providing advice and recommendations on financial matters, as well as reviewing periodic and annual financial results and providing oversight on the annual audit. The Metro Vancouver 2024 Financial Performance Report No. 1 is the first of three financial performance and forecast reports for 2024, and is intended to support the Finance Committee with their monitoring and oversight role and is focused on the annual forecast and overall financial health of the organization. The report highlights any major risks, opportunities, and seeks to enhance the annual budget process.

HIGHLIGHTS

Operating Results

On a net surplus basis, at this point in the year, it is expected that the year-end operating surplus to budget will be $9.2 million or 0.8% of the total $1.2 billion operating budget. This is resulting from anticipated surpluses in Water ($3.5 million), Liquid Waste ($1.0 million), Metro Vancouver Housing ($1.4 million) and Regional District Services ($5.7 million), primarily due to higher water sales revenues, overall staffing vacancies and less spending on consulting and contracting services from project delays, and lower debt service costs due to less borrowing. These surpluses are offset by projected deficits in Solid Waste ($2.4 million) due to increased contingency disposal costs.

Water Services

	2024 Budget	Year-end Forecast	Projected Variance
Revenues	$ 374.5M	$ 379.2M	$ 4.7M
Expenditures	374.5M	375.7M	(1.2M)
Surplus (Deficit)	$ -	$ 3.5M	$ 3.5M

For Water Services, the year-end surplus projection for 2024 is $3.5 million, which is a result of higher than expected revenues of $4.7 million, primarily due to higher than expected water sales resulting from more year to date water sales and higher than estimated water sales in the peak months due to expected warmer summers. However, the projection for water sales is subject to change based on actual weather patterns. The higher than forecasted revenues are offset by higher than expected expenditures of $1.2 million primarily due to higher contracting and consulting costs within water supply program.

Liquid Waste Services

	2024 Budget	Year-end Forecast	Projected Variance
Revenues	$ 485.8M	$ 483.9M	$ (1.9M)
Expenditures	485.8M	482.9M	2.9M
Surplus (Deficit)	$ -	$ 1.0M	$ 1.0M

For Liquid Waste Services, the year-end surplus projection for 2024 is $1.0 million. Revenues are expected to be lower than budget with a shortfall of $1.9 million primarily due to less than projected DCC reserve usage to fund growth debt servicing as a result of delays in growth projects. With respect to expenditures, Liquid Waste Services is projected to be underspent by $2.9 million primarily resulting from lower debt service costs related to less borrowing and underspends in operations and maintenance.

Solid Waste Services

	2024 Budget	Year-end Forecast	Projected Variance
Revenues	$ 142.4M	$155.7M	$ 13.3M
Expenditures	142.4M	158.1M	(15.7M)
Surplus (Deficit)	$ -	$ (2.4M)	$ (2.4M)

For Solid Waste Services, the year-end deficit projection for 2024 is $2.4 million. Although there are higher than expected revenues of $13.3 million due to more waste flows along with additional commercial organics, this is offset by higher forecasted costs of $15.7 million, primarily related to increased contingency disposal costs.

Metro Vancouver Housing

	2024 Budget	Year-end Forecast	Projected Variance
Revenues	$ 60.3M	$ 61.0M	$ 0.7M
Expenditures	52.2M	51.5M	0.7M
Surplus (Deficit)	$ 8.1M	$ 9.5M	$ 1.4M

For Metro Vancouver Housing, the year-end surplus projection for 2024 is $1.4 million, which is a result of higher projected revenues of $0.7 million related to slightly higher than projected rents and lower than expected expenditures of $0.7 million related to delays in filling staffing vacancies and spending on material and supplies.

Regional District Services

	2024 Budget	Year-end Forecast	Projected Variance
Revenues	$ 143.1M	$ 141.5M	$ (1.6M)
Expenditures	143.1M	135.8M	7.3M
Surplus (Deficit)	$ -	$ 5.7M	$ 5.7M

For Regional District Services, the year-end surplus projection for 2024 is $5.7 million. There are slightly lower than forecasted revenues of $1.6 million primarily due to less reserve usage because of delays to reserve funded projects for Regional Parks and lower than expected permit fee revenues ($200,000) in the Air Quality and Climate Action Function. Expenditures are expected to be lower than budget by $7.3 million, which is mostly attributed to delays in filling staffing vacancies across the Regional District Services and litigation delays.

Capital Expenditures Program

At this point in the year, the total forecasted capital spend for 2024 is approximately 75% of the projected $1.4 billion capital cash flow in the 2024 Budget. This is a higher spend compared to previous years due to the anticipated construction advancement in major projects as they move into the construction phase such as the Annacis Water Supply Tunnel, NSWWTP, Second Narrows Water Supply Tunnel Widgeon Marsh Park Development and Metro Vancouver Housing development projects.

Water Services

	2024 Capital Cash Flow	2024 Forecasted Expenditures	Projected Variance
Water Mains	$ 312.6M	$ 256.2M	$ 56.4M
Pump Stations	46.5M	29.3M	17.2M
Reservoirs	23.9M	23.6M	0.3M
Treatment Plants	25.1M	16.6M	8.5M
Others	16.7M	8.5M	8.2M
Total	**$ 424.8M**	**$ 334.2M**	**$ 90.6M**

Water Services is forecasted to spend $334.2 million (79%) of the $424.8 million projected capital cash flow in the 2024 Budget. The ramp up of expected spend is a result of increasing construction activities, for major projects including: Coquitlam Main No. 4, Second Narrows Water Supply Tunnel and Annacis Water Supply Tunnel. In addition, there are construction activities underway for Central Park Main, Kennedy Newton Main and Fleetwood Reservoir which is increasing the forecasted capital spends for 2024.

Liquid Waste Services

	2024 Capital Cash Flow	2024 Forecasted Expenditures	Projected Variance
Collections	$ 167.9M	$ 157.2M	$ 10.7M
Treatment Plants	613.3M	477.4M	135.9M
Total	**$ 781.2M**	**$ 634.6M**	**$ 146.6M**

Liquid Waste Services is forecasted to spend $634.6 million (81%) of the $781.2 million projected capital cash flow in the 2024 Budget. Although there are some delays related to the ground improvements work at the NLWWTP, there is an expected increase in forecasted spend in 2024 for Liquid Waste Services primarily due to anticipated construction advancement of the NSWWTP program. In addition, there is construction at Annacis Outfall System, Gilbert Brighouse Trunk Pressure Sewer Twinning and Burnaby Lake North Interceptor which is expected to increase the confidence in the forecasted spend.

Solid Waste Services

	2024 Capital Cash Flow	2024 Forecasted Expenditures	Projected Variance
Landfills	$ 3.9M	$ 1.1M	$ 2.8M
Recycling and Waste Centres	5.1M	3.8M	1.3M
Waste to Energy Facilities	45.1M	15.1M	30.0M
Total	**$ 54.1M**	**$ 20.0M**	**$ 34.1M**

Solid Waste Services is forecasted to spend $20.0 million (37%) of the $54.1 million projected capital cash flow in the 2024 Budget. The forecasted spend is lower than initially projected as a result of longer than expected timelines to initiate construction on various capital projects. Contributing factors include longer than expected timelines to develop municipal agreements for infrastructure projects, additional permitting steps not initially anticipated. A number of projects are near to initiating construction, and as such the expectation is that 2025 capital spends will be more aligned with projections.

Metro Vancouver Housing

	2024 Capital Cash Flow	2024 Forecasted Expenditures	Projected Variance
Development Capital	$ 108.2M	$ 72.2M	$ 36.0M
Building Rehabilitation	23.1M	16.4M	6.7M
Total	**$ 131.3M**	**$ 88.6M**	**$ 42.7M**

Metro Vancouver Housing is forecasted to spend $88.6 million (67%) of the $131.3 million capital cash flow in the 2024 Budget. Although there are some delays related to housing developments projected due to delays in permitting and agreements with MVHC's partners, there is an expected construction ramp up for development projects in the latter part of the year including: Heather Place B, Kingston Gardens and Salal Landing.

Regional Parks

	2024 Capital Cash Flow	2024 Forecasted Expenditures	Projected Variance
Capital Development	$ 12.0M	$ 10.8M	$ 1.2M
Parkland Acquisition	20.0M	20.0M	-
Total	**$ 32.0M**	**$ 30.8M**	**$ 1.2M**

Regional Parks is forecasted to spend $30.8 million (96%) of the $32.0 million projected capital cash flow in the 2024 Budget. Capital development expenditures are expected to increase significantly over the summer months with construction on several major projects scheduled to begin, including Baden-Powell Trail Improvements, Campbell Valley Greenway extension, Widgeon Marsh Park Development, and the təmtəmíxʷtən/Belcarra South Picnic Area redevelopment.

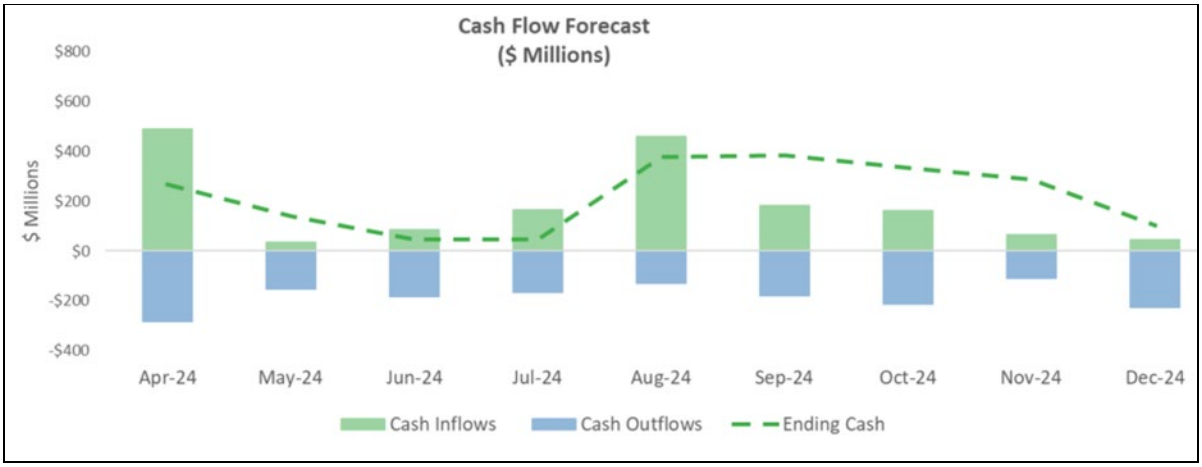
Although timing of expenditures with respect to land acquisition is dependent on availability and market conditions, directed funds are expected to be fully expended by end of the year with several acquisitions in progress.

Treasury Results

As a result of the capital underspends, the total forecasted borrowing for 2024 is $350 million, which is less than the budgeted $482 million. Furthermore, the MFA long-term borrowing rate for the 2024 Spring borrowing was 4.4%, which is lower than the Fall 2023 rate of 4.97% indicating a softening in long-term interest rates.

Figure 1 below provides the cash flow forecast for Metro Vancouver from March 2024 to December 2024. Treasury is continuously reviewing cash and reserve balances to ensure adequate liquidity to sustain operations and managing risk while also making efficient use of its cash.

Figure 1. Metro Vancouver Cash Flow Forecast for March – December 2024



The average investment returns as of April 2024 have increased since December 2023, to 5.53% for short-term and 4.17% for long-term. As interest rates are expected to decline, Metro Vancouver's rate of return is expected to remain favourable because matured investments in 2023 were reinvested with higher yielding products or held in cash to take advantage of high-interest savings account rates. Currently, the total estimated weighted average annualized return is 4.51%.

Procurement

The tables below provide: a) the number of awards of contracts that have been awarded by the Metro Vancouver Board and b) the value of contracts awarded by the Metro Vancouver Board and those that are less than $5 million (which are not awarded by the Board in accordance with Board approved procurement policies). It is expected that procurement activity will increase with respect to the number of awards as well as the value due to the significant 2024 capital program.

Table 1. Number of Contracts Awarded by the Metro Vancouver Board

Award Type	2024 Q1	2023	2022	2021
MV Board Awarded	4	16	20	25
Less than $5 Million	10	51	53	51
Total	14	67	73	76

Table 2. Value of Contract Awarded by the Metro Vancouver Board and Those Less Than $5M

Award Type	2024 Q1	2023	2022	2021
MV Board Awarded	$ 72,134,299	$465,895,019	$434,664,449	$798,139,628
Less than $5 Million	$ 17,234,419	$71,980,936	$ 89,019,028	$ 92,545,559
Total	$ 89,368,718	$537,875,955	$523,683,477	$890,685,187

Continuous Improvement

There are currently 140 continuous improvement projects underway across the organization. Continuous improvement is a core value for the organization and is intended to enhance efficiencies and deliver better service internally and externally. The table below highlights completed continuous improvement projects and how they align with Board priorities.

Table 3. Select Completed Continuous Improvement Projects and Alignment with Board Strategic Plan

Highlighted Select Completed Continuous Improvement Projects			
Department/ Project Title	**Board Priority**	**Description**	**Outcomes**
Liquid Waste: LIWWTP Renewable Natural Gas	• Financial Sustainability & Affordability • Climate Action	Process to upgrade digester gas to renewable natural gas for sale to Fortis BC	• New GVS&DD revenue stream • Renewable natural gas available for decarbonization for Fortis customers • Estimated $0.9 M annual income; 2,200 tonnes of GHG reduction
Liquid Waste: LIWWTP Digestion Optimization-Phase 1 Testing	• Financial Sustainability & Affordability • Climate Action	Platform for testing alternative sludge treatment approaches	• Intensification tests indicate existing digesters can serve larger populations to defer costly capacity expansions. • Future tests will evaluate ways to increase production of low-carbon biofuels.
Invest Vancouver: Collaboration	• Resilient Services & Infrastructure	Partner collaboration	• Identified synergies with partners to help promote the region and attract foreign direct investment
Liquid Waste: Flush Truck	• Financial Sustainability & Affordability	New recycling technology	• Reduce water consumption, labour, fuel, and disposal costs resulting in estimated $0.3M annual savings

Appendix 1 provides more detailed information on Metro Vancouver's financial performance.

ALTERNATIVES

This report is provided for information; no alternatives are presented.

FINANCIAL IMPLICATIONS

The Metro Vancouver 2024 Financial Performance Report No. 1 indicates that Metro Vancouver anticipating an operating surplus to budget of $9.2 million for 2024 and a capital spend approximately 75% of the $1.4 billion approved capital cash flow in the 2024 Budget. Staff will continue to monitor the financial performance including reporting on treasury, procurement and continuous improvement on monthly basis and report back to the Finance Committee and Board in 2024 in Quarter 3 and Quarter 4.

CONCLUSION

This report provides the first report for 2024 on the financial performance of Metro Vancouver. It is forecasted that Metro Vancouver will have a $9.2 million operating surplus to budget for 2024. Staff will continue to monitor the financial performance including reporting on treasury, procurement and continuous improvement on monthly basis and report back to the Finance Committee in 2024 in Quarter 3 and Quarter 4.

ATTACHMENTS

1. Metro Vancouver 2024 Financial Performance Report No. 1

METRO VANCOUVER 2024 FINANCIAL PERFORMANCE REPORT No. 1

Estimated Financial Forecast to December 31, 2024

Table of Contents

INTRODUCTION

This report presents first of three Financial Performance Reports for fiscal 2024. This report combines the financial performance and annual forecast information of Metro Vancouver's four legal entities: Greater Vancouver Water District, Greater Vancouver Sewerage and Drainage District, Metro Vancouver Housing Corporation, and Metro Vancouver Regional District.

FINANCIAL PERFORMANCE AT A GLANCE

	Trend	Commentary
Operating Results		For the four months ended April 30, 2024, operating results indicate a surplus of $23.2M. Operating expenditures are at 92% of the year-to-date (YTD) expected budget or 25% of the annual budget ($298.5M out of $1.2B). YTD revenues are slightly lower than budget by $2.8M (1.9% of YTD budget). As approved budgeted spending and projects ramp up throughout the remainder of the year, the projected year-end operating surplus to budget is $9.2M (0.8% out of $1.2B). This surplus is mainly driven from higher than anticipated revenues of $15.2M, primarily due to higher water sales and tipping fees, offset by $6.0M higher expenditures, largely from projected increased contingency disposal costs in Solid Waste, offset by overall less spending on consulting and contracting services from project delays, and lower debt service costs due to less borrowing.
Capital Expenditures		Capital expenditures as of April 30, 2024 are $131.3M or 10% of total planned spending of $1.4B annual capital cash flow. However, by year-end, capital expenditures are projected to be approximately 75% of the total $1.4B annual capital cash flow. A significant ramp up in construction and related spending is expected for the major projects moving into construction phases, such as the Annacis Water Supply Tunnel, NSWWTP, Second Narrows Water Supply Tunnel, Widgeon Marsh Park Development and Metro Vancouver Housing development projects (Heather Place B, Kingston Gardens and Salal Landing).
Awarded Procurement		4 awards were approved by the Board with a value of $72.1M, which is 81% of the total value of awarded contracts in the first quarter.
Cash Flow Scenarios		Projected annual cash balance remains positive, however indicates a decline in cash due to less borrowing and lower capital spending than targeted.
Investments		The latest report on investments indicated an estimated weighted average annualized return of 4.46%.
Financial Indicators		The ratios indicate a sufficient position to pay off current liabilities and debt servicing is less than budgeted.

OPERATING RESULTS

Overall Operating Surplus to Budget

As of April 30, 2024, Metro Vancouver's year-to-date operating surplus to budget is at $23.2 million. As the year progresses and approved budgeted spending ramps up, the projected year-end surplus to budget is $9.2 million (0.8% of the $1.2 billion budget) by the end of the year. This resulting from anticipated year-end surpluses in Water Services ($3.5 million), Liquid Waste Services ($1.0 million), Housing ($1.4 million) and Regional District Services ($5.7 million) primarily due to higher water sales revenues, overall staffing vacancies and less spending on consulting and contracting services from project delays, and lower debt service costs due to less borrowing. These surpluses are offset by a projected deficit in Solid Waste Services ($2.4 million) due to increased contingency disposal costs.

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Greater Vancouver Water District	$ -	$ 3,474,031	$ 3,474,031	$ (5,477,234)	$ 185,426	$ 5,662,660
Greater Vancouver Sewerage						
Liquid Waste Services	-	1,010,594	1,010,594	(126,190,525)	(116,164,033)	10,026,492
Solid Waste Services	-	(2,377,054)	(2,377,054)	2,420,108	2,399,548	(20,560)
Metro Vancouver Housing Corporation	8,053,663	9,473,139	1,419,476	455,233	3,671,790	3,216,557
Metro Vancouver Regional District	-	5,679,351	5,679,351	(40,348,150)	(36,074,841)	4,273,309
	$ 8,053,663	$ 17,260,061	$ 9,206,398	$(169,140,568)	$(145,982,110)	$ 23,158,458

Key drivers related to the surpluses are highlighted in the following schedules.

Operating Budget Summary

Metro Vancouver
Operating Budget Summary
Four Months Ended April 30, 2024

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	% Actuals to YTD Budget	Year-to-date Variance
REVENUES							
Key Service Revenues							
Water Sales	$ 367,535,244	$ 372,735,244	$ 5,200,000	$ 81,102,155	$ 82,734,559	102%	$ 1,632,404
Liquid Waste Services Levy	389,498,103	389,498,103	-	-	-	0%	-
Solid Waste Tipping Fees	132,115,288	145,172,977	13,057,689	44,038,416	45,758,511	104%	1,720,095
Metro Vancouver Regional District Requisitions	113,604,713	113,178,691	(426,022)	-	-	0%	-
Housing Rents	45,207,881	45,493,252	285,371	15,069,328	15,169,095	101%	99,767
	1,047,961,229	1,066,078,267	18,117,038	140,209,899	143,662,165	102%	3,452,266
Other Revenues	49,122,537	50,164,322	1,041,785	9,821,359	7,030,643	72%	(2,790,716)
Reserve Transfers	109,028,342	105,076,998	(3,951,344)	5,388,796	1,835,074	34%	(3,553,722)
TOTAL REVENUES	**$ 1,206,112,108**	**$ 1,221,319,587**	**$ 15,207,479**	**$ 155,420,054**	**$ 152,527,883**	98%	**$ (2,892,171)**
EXPENDITURES							
Greater Vancouver Water District	$ 374,463,930	$ 375,685,829	$ (1,221,899)	$ 87,563,961	$ 83,367,508	95%	$ 4,196,453
Greater Vancouver Sewerage and Drainage District							
Liquid Waste Services	485,831,252	482,928,102	2,903,150	128,645,561	118,389,535	92%	10,256,026
Solid Waste Services	142,411,329	158,116,072	(15,704,743)	45,050,320	44,079,380	98%	970,940
Metro Vancouver Housing Corporation	52,266,690	51,523,630	743,060	18,238,651	12,796,755	70%	5,441,896
Metro Vancouver Regional District							
Regional Parks	85,683,837	81,042,058	4,641,779	27,757,591	25,276,624	91%	2,480,967
Air Quality	16,113,207	15,295,686	817,521	4,822,601	4,214,287	87%	608,314
Other Regional Services	41,288,200	39,468,149	1,820,051	12,481,937	10,385,905	83%	2,096,032
TOTAL EXPENDITURES	**$ 1,198,058,445**	**$ 1,204,059,526**	**$ (6,001,081)**	**$ 324,560,622**	**$ 298,509,993**	92%	**$ 26,050,629**
SURPLUS (DEFICIT)	**$ 8,053,663**	**$ 17,260,061**	**$ 9,206,398**	**$ (169,140,568)**	**$ (145,982,110)**		**$ 23,158,458**

- Overall revenues at April 30, 2024 are lower than budget by $2.8M (1.9% of YTD budget) due to lower energy revenues and other revenues. The reduction is anticipated to be temporary and is offset by higher than anticipated system waste flows and higher water consumption. Reserve transfers for funding Housing and Parks capital replacement and maintenance programs were $3.6M lower than anticipated due to seasonality of the projects and will be on budget by end of the year. It is anticipated that the trend for higher system waste flows and water consumption will continue and overall revenues are projected to be $15.2M higher than budget.

- Overall expenditures at April 30, 2024, are at 92% of the year-to-date expected budget or 25% of the annual budget ($298.5M out of $1.2B). Key factors contributing to lower expenditures than budget include staff vacancies, deferred operating projects, and seasonality of expenditures. As the year progresses, it is anticipated that landfill costs and operations and maintenance program costs will be higher than budget. This variance is mitigated by lower than anticipated debt service costs. By year-end, overall expenditures are projected to be over budget by $6M or 0.50% of annual budget.

- Based on current forecasts, the year-end surplus to budget is projected to be $9.2M (0.8% of the $1.2 billion budget) higher than budget.

Operating Surplus Analysis by Entity

Four Months Ended April 30, 2024

Water Services had a YTD surplus of $5.7M with a projected surplus of $3.5M by year-end.

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Greater Vancouver Water District						
Revenues	$ 374,463,930	$ 379,159,860	$ 4,695,930	$ 82,086,727	$ 83,552,934	$ 1,466,207
Expenditures	374,463,930	375,685,829	(1,221,899)	87,563,961	83,367,508	4,196,453
Surplus (Deficit)	$ -	$ 3,474,031	$ 3,474,031	$ (5,477,234)	$ 185,426	$ 5,662,660

- Water sales are currently $1.6M higher than budget and are projected to exceed budget by $5.2M by year-end as the higher trend is expected to continue throughout the summer months. However, the projection for water sales is subject to change based on actual weather patterns for the remainder of the year. Higher water sales are expected to be offset by lower reserve revenues by close to $500K, leading to a net projected revenue surplus by year-end of $4.7M. The $500K under for reserves is largely tied to less projected reserve usage than planned due to delayed projects and related underspends.
- Year-to-date expenditures are $4.2M below budget, primarily in the operations and maintenance program of $1.9M, policy and planning project work of $0.7M, and other operating programs of $1.6M.
- Expenditure projections to indicate $1.2M over budget by year-end, largely in the operations and maintenance program (contracting, consulting and professional) of $3M and minor capital work of $1M. This is offset by lower than expected debt servicing costs of $1.2M and approximately $1.6M lower expenditures in several other operating and allocated programs, largely due to vacancies where position recruitments are underway and in consulting due to delays in project work.

Liquid Waste Services had a YTD surplus of $10M with a projected surplus of $1M by year-end.

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Greater Vancouver Sewerage and Drainage District						
Liquid Waste Services						
Revenues	$ 485,831,252	$ 483,938,696	$ (1,892,556)	$ 2,455,036	$ 2,225,502	$ (229,534)
Expenditures	485,831,252	482,928,102	2,903,150	128,645,561	118,389,535	10,256,026
Surplus (Deficit)	$ -	$ 1,010,594	$ 1,010,594	$(126,190,525)	$(116,164,033)	$ 10,026,492

- Year-to-date revenues are in a slight budget shortfall of $0.2M primarily due to the delayed receipt of user fees. By year end, revenues are expected to be lower than budget with a shortfall of $1.9 million primarily due to less than projected DCC reserve usage to fund growth debt servicing as a result of delays in growth projects.
- Year-to-date expenditures are $10.3M lower than budget primarily related to deferred or delayed operating costs (such as contract, consulting, professional and salary underspends due to staff vacancies currently being recruited) in a number of core programs, such as operations and maintenance ($6.9M), Environmental Management Quality Control ($1.0M), Project Delivery and allocated costs ($1.2M) and Policy and Planning ($1.2M).

- Overall expenditures by year-end are projected $2.9M lower than budget primarily from lower debt service costs related to less borrowing and underspends in operations and maintenance.
- With projected underspend of $2.9M in expenditures and slight shortfall in revenue of $1.9M, the overall year-end forecasted surplus is $1.0M.

Solid Waste Services was on budget at April 30, with a projected deficit of $2.4M by year-end.

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Greater Vancouver Sewerage and Drainage District						
Solid Waste Services						
Revenues	$ 142,411,329	$ 155,739,018	$ 13,327,689	$ 47,470,428	$ 46,478,929	$ (991,499)
Expenditures	142,411,329	158,116,072	(15,704,743)	45,050,320	44,079,380	970,940
Surplus (Deficit)	$ -	$ (2,377,054)	$ (2,377,054)	$ 2,420,108	$ 2,399,548	$ (20,560)

- Revenues were $1M under budget driven primarily by equipment failure at the Waste-to-Energy facility. It is anticipated that the claim from business interruption will be resolved by the end of th year. This was offset by lower contracted costs at the Waste-to-Energy facility as it relates to this energy conversion program.
- Economic recovery and regional growth following the pandemic continues to contribute to an expectation of increases in waste quantities in 2024. As a result, higher waste flows along with additional commercial organics are expected to drive tipping fees revenues $13.3M greater than budget.
- Expenditures by year-end are projected to be higher by $15.7M mainly due to increased contingency disposal, offset by lower contracted services costs at the Waste-to-Energy Facility, deferral of alternative fuel pilot project costs, and timing of capital expenditures resulting in lower debt costs.

The **Metro Vancouver Housing Corporation** had a YTD surplus of $3.2M with a projected surplus of $1.4M by year-end.

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Metro Vancouver Housing Corporation						
Revenues	$ 60,320,353	$ 60,996,769	$ 676,416	$ 18,693,884	$ 16,468,545	$ (2,225,339)
Expenditures	52,266,690	51,523,630	743,060	18,238,651	12,796,755	5,441,896
Surplus (Deficit)	$ 8,053,663	$ 9,473,139	$ 1,419,476	$ 455,233	$ 3,671,790	$ 3,216,557

- For the first four months, revenues were $2.2M lower than anticipated due to reduced reserve transfers for funding Housing capital replacement and maintenance programs as a result of seasonality of the projects. By year-end, it is anticipated that revenues will be $0.7M higher than projected, largely from slightly higher rental income.
- Year-to-date expenditures were lower than anticipated by $5.4M due to delays in maintenance activities and capital replacement and maintenance projects. The expectation is to complete the planned work by the end of 2024.
- The projected year-end net operating surplus to budget of $1.4M is due to salary vacancies during the first four months and higher than anticipated housing mortgage subsidies.

Metro Vancouver Regional District

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Metro Vancouver Regional District						
Regional Parks						
Revenues	$ 85,683,837	$ 84,653,837	$ (1,030,000)	$ 3,278,719	$ 1,558,047	$ (1,720,672)
Expenditures	85,683,837	81,042,058	4,641,779	27,757,591	25,276,624	2,480,967
Surplus (Deficit)	$ -	$ 3,611,779	$ 3,611,779	$ (24,478,872)	$ (23,718,577)	$ 760,295

Regional Parks had a YTD surplus of $0.76M with a projected surplus of $3.6M by year-end.

- Year-to-date revenues were under budget by $1.72M largely due to less reserve usage due to delays to reserve-funded projects in the capital maintenance program. These are anticipated to be largely on target by end of the year.
- Year-to-date expenditures for the Parks were $2.48M lower than budget largely due to delayed capital maintenance underspend which will take place in Q2 and Q3, and an underspend in centralized administration costs.
- By year end, overall expenditures are expected to be under budget by $4.6M as a result of a deferred budget allotment for ongoing litigation with kʷikʷəƛ̓əm (Kwikwetlem First Nation) and implementation of compensation funds related to the Trans Mountain Expansion Project, staff vacancies, and a deferred capital maintenance spend.

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Metro Vancouver Regional District						
Air Quality						
Revenues	$ 16,113,207	$ 15,913,207	$ (200,000)	$ 989,200	$ 1,342,834	$ 353,634
Expenditures	16,113,207	15,295,686	817,521	4,822,601	4,214,287	608,314
Surplus (Deficit)	$ -	$ 617,521	$ 617,521	$ (3,833,401)	$ (2,871,453)	$ 961,948

Air Quality had a YTD surplus of $0.96M with a projected surplus of $0.62M by year-end.

- Year-to-date revenues are slightly higher than budget by $0.35M, largely from the timing of receipt of grant revenues; however, by year-end revenues are projected to have a slight shortfall of $0.20M due to lower than expected permit fee revenues.
- Year-to-date expenditures were $0.61M lower than budget primarily due to labour underspends from position vacancies and delayed project consulting work in the first quarter. By year-end, expenditures are projected to be lower than budget by $0.82M largely from labour underspends due to vacancies ($0.43M) and underspends for project consulting ($0.39M).

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actual	Year-to-date Variance
Metro Vancouver Regional District						
Other Regional Services						
Revenues	$ 41,288,200	$ 40,918,200	$ (370,000)	$ 446,060	$ 901,094	$ 455,034
Expenditures	41,288,200	39,468,149	1,820,051	12,481,937	10,385,905	2,096,032
Surplus (Deficit)	$ -	$ 1,450,051	$ 1,450,051	$ (12,035,877)	$ (9,484,811)	$ 2,551,066

Other Regional Services had a YTD surplus of $2.6M with a projected surplus of $1.5M by year-end.

- Overall year-to-date expenditures for Regional Services were $2.1M lower than budget largely due to lower salary costs from staff vacancies, less spending in consulting and contract services from projects delays than anticipated in the budget.
- By year end, overall expenditures are expected to continue to be under budget by $1.8M largely due to staff vacancies, timing of hiring for vacant positions, and deferred projects. Revenues are projected to be under budget by $0.3M primarily due to lower reserve funding for deferred projects, resulting in a projected year-end surplus of $1.5M.

Other Revenues (supplementary information to Operating Budget Summary)

Metro Vancouver
Other Revenues
Four Months Ended April 30, 2024

	Annual Budget	Year-end Forecast	Projected Variance	Year-to-date Budget	Year-to-date Actuals	% Actuals to YTD Budget	Year-to-date Variance
Variable Service Revenues:							
Other External Revenues	$ 15,231,044	$ 15,766,616	$ 535,572	$ 4,075,505	$ 3,359,872	82%	$ (715,633)
Liquid Waste Industrial Charges	13,169,057	13,169,057	-	-	324,074	0%	324,074
User Fees	9,289,531	9,102,249	(187,282)	2,526,482	1,796,691	71%	(729,791)
Energy Sales	6,254,000	6,254,000	-	2,084,668	-	0%	(2,084,668)
Non-Road Diesel Permit Fees	1,316,250	1,316,250	-	526,700	683,928	130%	157,228
Love Food Hate Waste	375,000	375,000	-	125,000	413,070	330%	288,070
Zero Waste Conference	260,000	260,000	-	65,000	-	0%	(65,000)
	45,894,882	46,243,172	348,290	9,403,355	6,577,635	70%	(2,825,720)
Key Service Supplemental Revenues:							
Housing Mortgage Subsidies	1,254,012	1,521,485	267,473	418,004	453,008	108%	35,004
Collective Bargaining Services Revenue	1,061,436	1,061,436	-	-	-	0%	-
Compensation Services Revenue	598,160	598,160	-	-	-	0%	-
Electoral Area Requisition	433,645	433,645	-	-	-	0%	-
Regional Global Positioning System User Fees	306,424	306,424	-	-	-	0%	-
	3,653,677	3,921,150	267,473	418,004	453,008	108%	35,004
Total Other Revenues	**$ 49,548,559**	**$ 50,164,322**	**$ 615,763**	**$ 9,821,359**	**$ 7,030,643**	**72%**	**$ (2,790,716)**

- Other revenues consist of liquid waste industrial charges, user fees, energy sales, permit fees, housing mortgage subsidies, and external revenues. External revenues comprise of leases, grants, and other variable service revenues that tend to fluctuate month over month.

- At April 30, 2024, energy sales were under budget by $2.1M largely from equipment failure and claim for business interruption insurance for Solid Waste. It is anticipated that the claim will be resolved by end of the year. Revenues are also $700K lower than budget related to sundry revenues from Solid Waste transfer stations, parking revenue from Parks Central Area, and lease revenue for Water. The variance is expected to be temporary, and revenues are expected to be on budget by end of the year

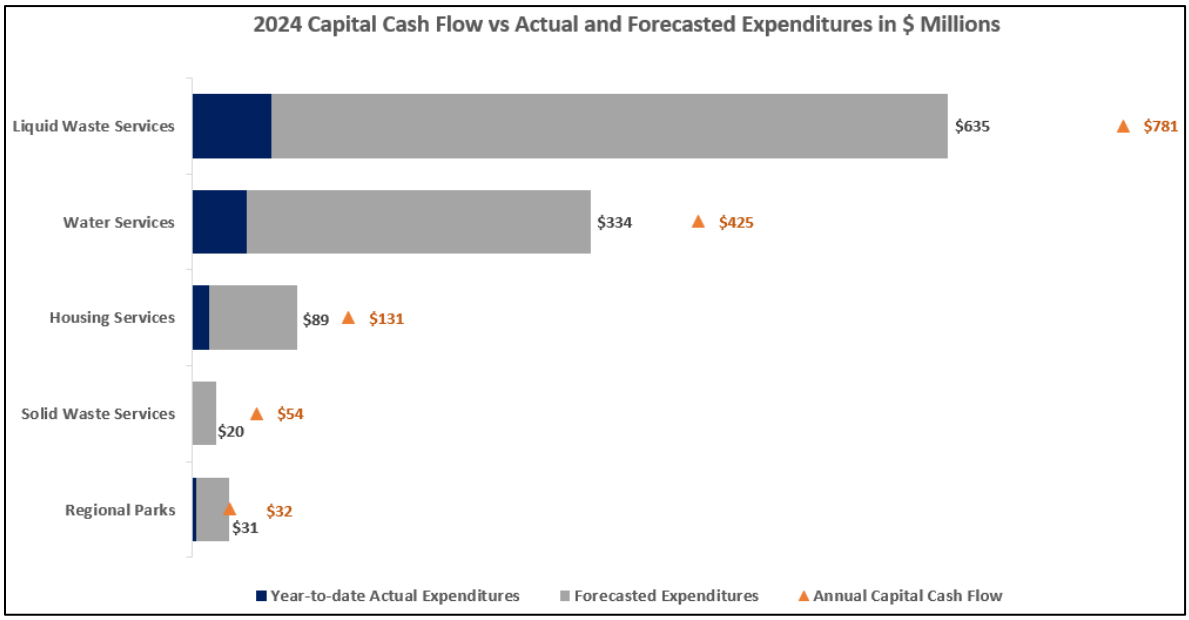
- Despite the temporary downward trend at April 30, overall other revenues are projected to be $616K higher than budget by end of the year. This increase is driven by higher than anticipated housing mortgage subsidies, housing facility revenues, with a slight reduction in Air Quality permit fees due to fewer applications.

CAPITAL PROGRAM

Overall Capital Expenditures

At end of April 2024, capital expenditures are $131.3M, or 10% of the annual cash flows. Significant spending is expected in Liquid Waste and Water Services, nearly 85% of the total cash flows of $1.4B. By year end, capital expenditures are projected to be approximately 75% of the annual cash flows. This is a higher spend compared to previous years due to the anticipated construction advancement in major projects as they move into the construction phase.

Capital Expenditure at a Glance



Capital Expenditure Summary

Metro Vancouver
2024 Capital Spending Summary
For the 4 months ended April 30, 2024

	Annual Capital Cash Flow	Year-to-date Actual Expenditures	Forecasted Expenditures	Forecasted Expenditures of Annual Cash Flow (%)	Forecasted Expenditures Variance from Annual Cash Flow ($)	Forecasted Expenditures Variance from Annual Cash Flow (%)
Housing Services						
Development Capital	108,200,000	12,020,047	72,172,412	66.7%	36,027,588	33.3%
Building Rehabilitation	23,134,400	2,194,221	16,467,767	71.2%	6,666,633	28.8%
	131,334,400	**14,214,267**	**88,640,179**	**67.5%**	**42,694,221**	**32.5%**
Liquid Waste Services						
Collections	167,942,000	20,866,433	157,160,136	93.6%	10,781,864	6.4%
Treatment Plants	613,292,000	45,542,510	477,425,264	77.8%	135,866,736	22.2%
	781,234,000	**66,408,943**	**634,585,400**	**81.2%**	**146,648,600**	**18.8%**
Regional Parks						
Capital Development	11,970,000	1,035,171	10,773,000	90.0%	1,197,000	10.0%
Parkland Acquisition Fund Projects	20,000,000	2,691,800	20,000,000	100.0%	-	0.0%
	31,970,000	**3,726,971**	**30,773,000**	**96.3%**	**1,197,000**	**3.7%**
Solid Waste Services						
Landfills	3,850,000	11,442	1,100,000	28.6%	2,750,000	71.4%
Recycling and Waste Centres	5,100,000	410,319	3,800,000	74.5%	1,300,000	25.5%
Waste To Energy Facilities	45,150,000	466,106	15,100,000	33.4%	30,050,000	66.6%
	54,100,000	**887,867**	**20,000,000**	**37.0%**	**34,100,000**	**63.0%**
Water Services						
Water Mains	312,615,000	31,862,151	256,240,640	82.0%	56,374,360	18.0%
Pump Stations	46,500,000	5,861,192	29,250,000	62.9%	17,250,000	37.1%
Reservoirs	23,890,000	3,777,474	23,580,000	98.7%	310,000	1.3%
Treatment Plants	25,150,000	3,654,501	16,644,273	66.2%	8,505,727	33.8%
Others	16,700,000	871,392	8,500,000	50.9%	8,200,000	49.1%
	424,855,000	**46,026,709**	**334,214,913**	**78.7%**	**90,640,087**	**21.3%**
Total	**1,423,493,400**	**131,264,756**	**1,108,213,492**	**77.9%**	**315,279,908**	**22.1%**

Metro Vancouver Housing (MVHC)

Year-to-date capital expenditures are $14.2M and are forecasted at $88.6M (67%) by year-end.

- Although there are currently some in permitting and agreements with MVHC's partners, there is an expected construction ramp up for development projects in the latter part of the year including: Heather Place B, Kingston Gardens, and Salal Landing.

Liquid Waste Services

Year-to-date capital expenditures are $66.4M with a forecasted spend of $634.6M by year-end.

- Although there are some delays anticipated for ground improvement works at NLWWTP, design delays at Annacis WWTP (Stage 5 Expansion), and delays in projects starts for Glenbrook Trunk Kingsway Section, Glenbrook Trunk CSO Gates, North Road Trunk Sewer, and AIWWTP Trickling Filter Rehab, there is an expected increase in construction advancement in major projects as, including the NSWWTP project, Iona WWTP, Annacis Outfall System, Gilbert Brighouse Trunk Pressure Sewer Twinning and Burnaby Lake North Interceptor.

Regional Parks

Year-to-date capital expenditures are $3.7M and are forecasted at $30.8M by year end.

- Construction on several major projects is scheduled increase significantly over the summer months with construction on several major projects scheduled to begin, including the Pacific Spirit Regional Park Service Yard replacement, Baden-Powell Trail Improvements, Campbell Valley Greenway extension and Staging area improvements, Widgeon Marsh Phase 1 Park Development, and the Belcarra South Picnic Are redevelopment. Although timing of expenditures with respect to land acquisition is dependent on availability and market conditions, directed funds are expected to be fully expended by end of the year with several acquisitions in progress.

Solid Waste Services

Year-to-date capital expenditures are $888K and are forecasted at $20.0M by year-end.

- Delays in spending for 2024 were related to delays in contractor lead projects, delays in expenditure authorizations for contractors, additional permitting steps not initially anticipated, and longer than expected timelines to develop municipal agreements for infrastructure development.

Water Services

Year-to-date capital expenditures $46M and forecasted at $334.2M by year-end.

- The ramp up of expected spend is a result of increasing construction and procurement activities for major project including Coquitlam Main No. 4, Second Narrows Water Supply Tunnel and Annacis Water Supply Tunnel. In addition, construction activities are underway for Central Park Main, Kennedy Newton Main, and Fleetwood Reservoir, which is increasing the forecasted capital spends for 2024.

The following schedules provide detailed information on the capital expenditures by project against annual capital cash flow ***as of April 30, 2024***.

	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Housing Services		
Housing Development - Heather Place - Building B	$ 19,000,000	$ 5,279,192
Housing Development - Heather Place - Building C	970,500	4,164
Housing Development - Heron's Nest	25,000,000	153,388
Housing Development - Kingston Gardens - Phase 1	14,000,000	2,189,738
Housing Development - Malaspina	2,000,000	226,940
Housing Development - Projects in Planning	787,010	-
Housing Development - Riverside Drive	742,490	8,180
Housing Development - Salal Landing	15,700,000	2,589,359
Housing Development - The Connection	20,000,000	1,131,944
Housing Development - The Steller	10,000,000	437,142
Development Capital	108,200,000	12,020,047
Housing Development - Crown Manor	350,000	448
Housing Development - Le Chateau Place	846,400	4,908
Housing Development - Manor House	11,000,000	2,188,865
Housing Development - Minato West	5,888,000	-
Housing Development - Somerset Gardens	50,000	-
Housing Development - Strathearn Court	5,000,000	-
Building Rehabilitation	23,134,400	2,194,221
	$ 131,334,400	**$ 14,214,267**

Liquid Waste Services	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Albert Street Trunk Sewer	$ 450,000	$ 11,557
Burnaby Lake North Interceptor Cariboo Section	50,000	-
Burnaby Lake North Interceptor Winston Section	23,890,000	598,025
Burnaby South Slope Interceptor West Branch Extension	200,000	-
Cloverdale Pump Station Capacity Upgrade	370,000	122,933
Cloverdale Trunk Sewer Capacity Upgrade	450,000	66,228
Combined Sewer Overflow Sampling Station Enhancements	400,000	96,557
Drainage - Port Moody Storm Drain Rehabilitation	400,000	7,260
Drainage - Still Creek Culvert Rehabilitation (Gilmore section)	100,000	-
EMQC-Chemistry Laboratory	400,000	18,723
Fraser Sewerage Area Integrated Resource Recovery (IRR) Study	250,000	(6,091)
Front Street Pressure Sewer Access Hatches Reinforcement	1,700,000	358,624
FSA Flow Metering Program	620,000	88,399
FSA River Crossing Scour Protection Program - Phase 1	450,000	9,592
FSA Sewer Relocations and Protections	500,000	-
FSA Statutory Right of Way Acquisitions Phase 1	5,350,000	96,362
Gilbert/Brighouse Trunk Pressure Sewer Twinning Phase 2	1,541,000	1,149,573
Gilbert/Brighouse Trunk Pressure Sewer Twinning Phase 3	18,000,000	2,970,709
Gilbert/Brighouse Trunk Pressure Sewer Twinning Phase 4	18,550,000	5,621,368
Glenbrook Combined Trunk Kingsway Sanitary Section	5,200,000	81,628
Glenbrook CSO Gate Replacement	3,780,000	151,389
Gleneagles Forcemain Replacement Phase 2	2,130,000	50,940
Gleneagles Pump Stations Improvements	6,400,000	3,040,707
Harbour Pump Station Discharge Header Repair and Valve Replacements	4,273,000	54,704
Harbour Pump Station Power Distribution Equipment Replacement	2,107,000	68,120
Harbour Sewerage Pump Station (HRB) - Suction Piping Replacement	200,000	-
Highbury Interceptor Diversion Junction Chamber Wall Rehabilitation	350,000	11,883
Jervis Pump Station 25kV Voltage Conversion	990,000	68,833
Jervis Sewerage Pump Station (JRV) - Suction Piping Replacement and Wet Well Modifications	200,000	-
Kent Pump Station High Voltage Switchgear Replacement	1,030,000	85,354
LSA Flow Metering Program	50,000	(10,831)
Marshend Pump Station Capacity Upgrade	700,000	33,379
New West Interceptor - Annacis Section 2	1,320,000	199,931
New West Interceptor Grit Chamber	400,000	-
New Westminster Interceptor Annacis Channel Crossing Scour Protection	500,000	-
New Westminster Interceptor Repair Columbia St. Section	200,000	97,516
New Westminster Interceptor West Branch and Columbia Extension Rehabilitation	1,135,000	210,252
North Road Trunk Sewer	1,280,000	19,663
North Road Trunk Sewer Phase 2	4,100,000	191,670
North Surrey Interceptor - Port Mann Section - Odour Control	750,000	13,832
North Surrey Interceptor Manson, Roebuck Road and Port Mann Sections	500,000	-
North Surrey Interceptor River Crossings	1,450,000	-
North Surrey Interceptor Roebuck Section Replacement	2,500,000	336,252
NSA Flow Metering Program	55,000	62,126
NSA Scour Protection Upgrades	200,000	46,680
NSI Flow Management	3,250,000	202,993
NSI Rehab or Replacement	1,270,000	187,603
NWP Dip Replacement	1,000,000	-
Ocean Park Trunk Manholes Lining	50,000	-
Ocean Park Trunk Sewer - Air Management Facility	1,340,000	8,837
Other - Sewer Heat Projects	2,400,000	-
Port Coquitlam Pump Station Refurbishment	500,000	118,449
Port Moody Pump Station Capacity Upgrade	230,000	4,778
Port Moody South Interceptor Capacity Upgrade	50,000	-
Production Way Facility Access and Parking Improvements	4,600,000	140
Production Way Operation Centre	2,300,000	153,335
Royal Ave PS Rehabilitation	1,430,000	66,569

Liquid Waste Services	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Sapperton Pump Station	520,000	190,802
Sapperton Pump Station Emergency Backup Power	1,725,000	34,214
Sewer Heat Projects - Surrey	1,400,000	-
South Surrey Interceptor Delta Section (SSD) Rehabilitation	1,400,000	70,023
South Surrey Interceptor Johnston Section	1,180,000	1,529,841
South Surrey Interceptor Rehabilitation-Scott Road Section	500,000	-
SSI Influent Control Chamber Repair and Replace Gates	60,000	1,865
SSI Sulfide Odour and Corrosion Control	5,700,000	39,569
Stoney Creek Sanitary Trunk	682,000	73,161
Surrey Corrosion Control Facility Replacement	125,000	25,314
VSA Emergency Backup Power	3,850,000	706,520
VSA Flow Metering Program	530,000	101,406
VSA Grit Chamber Access Improvements Spanish Banks	100,000	-
VSA Sewer Relocations and Protections	200,000	9,491
VSA Statutory Right of Way Acquisitions 2024-2026	8,500,000	-
Westridge FM Replacement	5,099,000	76,556
Westridge Pump Stations 1 & 2 Refurbishment	1,380,000	294,603
White Rock Forcemain Rehabilitation	1,100,000	129,565
Other projects	-	816,951
Collections	**167,942,000**	**20,866,433**
AIWWTP Ammonia Removal – Sidestream	200,000	106,080
AIWWTP Centrifuge Schwing HPU replacement	170,000	-
AIWWTP Chemical Lab UPS System Replacement	150,000	210,345
AIWWTP Cogeneration Backup Power	400,000	65,237
AIWWTP Cogeneration Backup Power 69 kV Substation Modifications	100,000	13,881
AIWWTP Digester No. 5	500,000	22,313
AIWWTP Electrical Distribution System Protection Control and Monitoring	200,000	240,564
AIWWTP Hydrothermal Processing Pilot	8,550,000	2,014,020
AIWWTP ICS Replacement Program	1,400,000	85,713
AIWWTP Influent System Remediation	250,000	655,722
AIWWTP IPS Gates Replacements	75,000	-
AIWWTP IPS Pump Building Roof Replacement Phase 2	100,000	5,098
AIWWTP Lubrication Storage Facility Conversion	500,000	-
AIWWTP O&M Building Refurbishment	100,000	-
AIWWTP PWD line refurbishment/replacement	250,000	-
AIWWTP Replacement of Protective Relays	50,000	34,444
AIWWTP Scheduled 64kV Potential & Current Transformer Replacements	50,000	-
AIWWTP SCL Flow Balancing	50,000	-
AIWWTP SCL Flow Control	700,000	28,090
AIWWTP SCL Flow Leveling Phase 2	700,000	29,251
AIWWTP Scum Pump Replacement	200,000	-
AIWWTP Sludge Control Building Electrical Room HVAC upgrade	425,000	48,780
AIWWTP Stage 5 Expansion Phase 2	1,000,000	65,823
AIWWTP Stage 5 Expansion Phase 2 - PDE	40,780,000	1,649,744
AIWWTP Stage 5 Expansion Phase 2b	21,000,000	1,860,865
AIWWTP Station Battery Replacement - PHASE 2	50,000	19,008
AIWWTP Trickling Filter Media & Distributor Arms & Ducting Replacement	5,485,000	962,979
AIWWTP UPS Condition Monitoring System	50,000	-
All WWTPs Power Quality Monitoring & Outage Alarming Network	50,000	2,541
Annacis Influent System Surge Control Refurbishment	2,100,000	220,737
Annacis MCC 80 051, 80 070, 80 071 Replacement	50,000	3,973
Annacis Outfall System	11,500,000	2,503,085
Biosolids Dryer	500,000	118,258
Golden Ears Forcemain and River Crossing	160,000	2,399,935
Golden Ears Pump Station	123,000	477,249
IIWWTP - Biogas Lines Relocation	50,000	27,872
IIWWTP Biosolids Dewatering Facility	1,150,000	134,666
IIWWTP CEPT Polymer Line Replacement	1,750,000	81,516
IIWWTP CEPT Winterization	1,100,000	56,103

Liquid Waste Services	Annual Capital Cash Flow	Year-to-date Actual Expenditures
IIWWTP Digester 4 Roof Replacement & Mixing Replacement	50,000	21,702
IIWWTP ICS IPS Control Replacement	700,000	-
IIWWTP ICS Replacement Program	300,000	4,023
IIWWTP Influent Gate Refurbishment	100,000	-
IIWWTP IPS Drive Remediation	125,000	56,541
IIWWTP MCC/Power Distribution Assess/Replace - Phase 2	50,000	242
IIWWTP Non-Domestic Trucked Liquid Waste Alternative	50,000	-
IIWWTP Outfall Refurbishment	2,000,000	314,660
IIWWTP PA Tanks Improvement	1,500,000	-
IIWWTP PA-Sed Tank & Gallery Wall Refurbishment	100,000	13,671
IIWWTP Replacement of CoGen Control System	100,000	17,713
IIWWTP Siphon Chamber Refurbishment	200,000	11,113
IIWWTP Solids Handling Refurbishment	50,000	-
IIWWTP Standby Diesel Generators	100,000	-
IIWWTP Surge Mitigation	25,000	-
Iona Island Control & Instrumentation Replacement 2011	50,000	-
Iona Island Wastewater Treatment Plant	109,220,000	11,063,029
LIWWTP Admin Dewatering Building Roof Repair	50,000	12,699
LIWWTP Biogas Clean-up Project	50,000	154,060
LIWWTP Effluent Heat Recovery Project	500,000	293,620
LIWWTP Gravity Thickener Redundancy	475,000	26,220
LIWWTP Ground Fault Detection System Replacement	200,000	20,595
LIWWTP High Efficiency Boiler	400,000	-
LIWWTP ICS Electrical Distribution System Migration Program	500,000	-
LIWWTP ICS Replacement Program	2,250,000	44,651
LIWWTP PA-Sed Tank Refurbishment	300,000	10,623
LIWWTP Pilot Digestion Optimization Facility	500,000	44,029
LIWWTP Power Reliability	2,380,000	43,381
LIWWTP SCL Refurbishment	300,000	13,673
LIWWTP Trickling Filter Refurbishment	400,000	22,042
NLWWTP 25 kV Substation Replacement	50,000	24,472
NLWWTP Ground Improvements	43,311,000	1,058,548
NLWWTP Outfall	2,483,000	170,823
NLWWTP Stage 1	32,693,000	5,082,763
NLWWTP Standby Diesel Generator	700,000	-
North Shore WWTP Secondary Upgrade, Conveyance and Decommissioning	308,812,000	12,320,912
WWTPs Electrical System Studies & Upgrades	200,000	15,706
Other projects	-	537,107
Treatment Plants	**613,292,000**	**45,542,510**
	$ 781,234,000	**$ 66,408,942**

Regional Parks	**Annual Capital Cash Flow**	**Year-to-date Actual Expenditures**
Capital Development - Boundary Bay - Perimeter Trail	$ 1,500,000	$ -
Capital Development - Bowen Island - Park Development	400,000	-
Capital Development - Burnaby Lake - Glencarin Greenway Connection	1,500,000	-
Capital Development - Burns Bog Delta Nature Reserve Development	500,000	51,929
Capital Development - Campbell Valley - Perimeter Greenway Trail	500,000	123,765
Capital Development - Campbell Valley - Replacement of Little River Loop Boardwalk	100,000	24,450
Capital Development - Crippen - Davies Orchard Cabins	50,000	68,823
Capital Development - Lynn Headwaters - Park Entry Bridge & Day Use Area	150,000	-
Capital Development - Tynehead - Perimeter Trail Phase 2	1,500,000	-
Capital Development- Feasibility Studies	500,000	-
Capital Replacement and Development - Belcarra - South Picnic Area and Cabins	750,000	122,274
Capital Replacement and Development - Capilano New Service Yard	500,000	11,447
Capital Replacement and Development - Grouse BCMC Realignment & Improvement	750,000	330,687
Capital Replacement and Development - Small Capital Replacement and Development Projects	2,270,000	83,711
Capital Replacement and Development - Widgeon Marsh New Park Development	1,000,000	7,285
Other projects	-	210,800
Capital Development	**11,970,000**	**1,035,170**
Regional Land Acquisition	20,000,000	2,691,800
Parkland Acquisition Fund Projects	**20,000,000**	**2,691,800**
	$ 31,970,000	**$ 3,726,970**

Solid Waste Services	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Coquitlam Landfill East Closure	$ 1,100,000	$ -
Coquitlam Landfill Gas Collection Upgrades Phase II	1,500,000	2,501
Coquitlam Landfill Maintenance Leachate Collection System Grade Realignment	50,000	-
Coquitlam Landfill Maintenance Lot 3 Development	200,000	8,942
Coquitlam Landfill Maintenance Pump Station Upgrade	1,000,000	-
Landfills	**3,850,000**	**11,442**
Langley Recycling Depot Development	1,000,000	68,999
Maple Ridge Recycling and Waste Centre Upgrades	500,000	-
North Surrey Recycling and Waste Centre Compactor Replacement	100,000	271,153
North Surrey Recycling Depot Development	1,000,000	68,999
Weigh Scale Replacement	2,500,000	-
Other Projects	-	1,169
Recycling and Waste Centres	**5,100,000**	**410,319**
Acid Gas Reduction	850,000	-
Air System Piping Replacement	150,000	-
Biosolids Processing	8,000,000	43,721
Bottom Ash Processing	50,000	-
Generation Bank Replacement	5,900,000	-
Primary Economizer Replacement	500,000	3,386
Refuse Crane	5,650,000	28,056
Secondary Economizers Replacement	1,750,000	-
WTE Facility Boiler and APC Roof Replacement	100,000	-
WTE Facility Bottom Ash Crane Replacement	500,000	11,499
WTE Facility Compressed Air System Replacement	900,000	17,590
WTE Facility District Heating	12,500,000	278,338
WTE Facility District Heating Opportunities	50,000	33,414
WTE Facility Electrical Transformers Replacement	2,500,000	13,939
WTE Facility Fabric Filter Hopper and Pulse Header Refurbishment	1,000,000	21,620
WTE Facility Feed Hopper/Chute	100,000	-
WTE Facility Feedwater Pump Replacement	50,000	2,377
WTE Facility Fire Suppression System	500,000	-
WTE Facility Fly Ash Silo Refurbishment	400,000	12,167
WTE Facility Primary Superheaters Replacement	2,000,000	-
WTE Facility Programmable Logic Controllers Replacement	500,000	-
WTE Facility Pug Mill Enclosure Ventilation System Replacement	500,000	-
WTE Facility Refuse Pit Bunker Door Replacement	300,000	-
WTE Facility Soot Blower Piping Replacement	150,000	-
WTE Facility Stack Refurbishment	250,000	-
Waste To Energy Facilities	**45,150,000**	**466,106**
	$ 54,100,000	**$ 887,867**

Water Services	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Angus Drive Main	$ 50,000	$ 3,438
Annacis Main No. 2 - Queensborough Crossover Improvement	50,000	-
Annacis Main No. 2 and Barnston Island Main Online Chlorine and pH Analyzers	700,000	6,064
Annacis Main No. 3 BHP Potash Facility Pipe Protection	50,000	-
Annacis Main No. 5 (North)	1,500,000	244,747
Annacis Main No. 5 (South)	5,100,000	3,049
Annacis Water Supply Tunnel	76,000,000	10,993,188
Burnaby Mountain Main No. 2	600,000	-
Cambie-Richmond Water Supply Tunnel	6,100,000	(1,187,798)
Central Park Main No. 2 (10th Ave to Westburnco)	1,500,000	124,706
Central Park Main No. 2 (Patterson to 10th Ave)	10,350,000	3,450,834
Clayton Langley Main No. 2	500,000	24,470
Coquitlam Main No. 4 (Cape Horn)	2,700,000	633,556
Coquitlam Main No. 4 (Central Section)	14,500,000	497,512
Coquitlam Main No. 4 (South Section)	78,000,000	5,122,858
Douglas Road Main No. 2 (Flow Meter 169) Replacement	500,000	22,517
Douglas Road Main No. 2 (Vancouver Heights Section)	450,000	-
Douglas Road Main No. 2 Still Creek	11,050,000	2,053,900
Douglas Road Main Protection	550,000	-
Haney Main No. 4 (West Section)	750,000	37,671
Haney Water Supply Tunnel	1,750,000	166,954
Improvements to Capilano Mains No. 4 and 5	250,000	-
Kennedy Newton Main	17,100,000	372,572
Lulu Island - Delta Main - Scour Protection Phase 2	50,000	-
Lulu-Delta Water Supply Tunnel	1,250,000	-
Lynn Valley Road Main, Seymour Main No. 3 & Seymour Main No. 4 Aerial Crossings Rehabilitation	2,270,000	47,259
Maple Ridge Main West Lining Repairs	50,000	30,683
Newton Reservoir Connection	450,000	-
Palisade Outlet Works Rehabilitation	900,000	44,078
Port Mann Main No. 2 (South)	50,000	31,401
Port Mann Main No. 2 (South) Whalley Reservoir Feeder Main	3,000,000	-
Port Mann No. 1 South Section Decommissioning	350,000	2,675
Port Moody Main No. 1 Christmas Way Relocation	100,000	-
Port Moody Main No. 3 Scott Creek Section	2,000,000	107,862
Queensborough Main Royal Avenue Relocation	100,000	-
Rehabilitation of AN2 on Queensborough Bridge	470,000	4,395
Relocation and Protection for MOTI Expansion Project Broadway	100,000	-
Relocation and Protection for MOTI George Massey Crossing Replacement	100,000	-
Relocation and Protection for Translink Expansion Project Surrey Langley SkyTrain	100,000	-
Sapperton Main No. 1 New Line Valve and Chamber	50,000	23,804
Sapperton Main No. 2 North Road Relocation and Protection	6,400,000	122,065
Scour Protection Assessments and Construction General	150,000	951,969
Second Narrows Water Supply Tunnel	25,000,000	4,120,645
Seymour Main No. 2 Joint Improvements	100,000	21,117
Seymour Main No. 5 III (North)	2,100,000	389,430
South Delta Main No. 1 - Ferry Road Check Valve Replacement	100,000	12,506
South Fraser Storage Yard	250,000	172,763
South Surrey Main No. 1 Nickomekl Dam Relocation	3,600,000	-
South Surrey Main No. 2	800,000	171,658
South Surrey Main No. 2 Nickomekl Dam Prebuild	1,000,000	-
South Surrey Supply Main (Serpentine River) Bridge Support Modification	50,000	225,507
Stanley Park Water Supply Tunnel	26,075,000	653,919
Tilbury Junction Chamber Valves Replacement with Actuators	200,000	-
Tilbury Main North Fraser Way Valve Addition	1,500,000	626
Water Chamber Improvements and Repairs	250,000	525
Water Meter Upgrades	2,000,000	1,506,665
Water Optimization - Instrumentation	1,150,000	173,593

Water Services	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Water Optimization Automation & Instrumentation Phase 1	50,000	188,837
Whalley Kennedy Main No. 2	300,000	228,947
Whalley Main	50,000	33,770
Other Projects	-	25,216
Water Mains	**312,615,000**	**31,862,151**
Barnston/Maple Ridge Pump Station - Back-up Power	2,100,000	-
Burnaby Mountain Pump Station No. 2	400,000	39,061
Cape Horn Pump Station No. 3	2,500,000	732,177
Capilano Raw Water Pump Station - Back-up Power	21,000,000	2,865,057
Capilano Raw Water Pump Station Bypass PRV Upgrades	1,950,000	29,725
Central Park WPS Starters Replacement	5,000,000	26,928
Grandview Pump Station Improvements	1,500,000	27,726
Newton Pump Station No. 2	9,450,000	2,084,506
Westburnco Pump Station - Back-up Power	1,500,000	41,313
Westburnco Pump Station No. 2 VFD Replacements	1,100,000	7,785
Other Projects	-	6,915
Pump Stations	**46,500,000**	**5,861,192**
Burnaby Mountain Tank No. 2	990,000	52,419
Cape Horn Reservoir Condition Assessment and Structural Repair	250,000	725
Capilano Energy Recovery Facility Operational Upgrades	750,000	12,800
Clayton Reservoir	50,000	90,048
Dechlorination for Reservoir Overflow and Underdrain Discharges	1,000,000	8,311
Fleetwood Reservoir	16,500,000	2,968,841
Hellings Tank No. 2	400,000	49,361
Kersland Reservoir No. 1 Structural Improvements	500,000	4,927
Pebble Hill Reservoir No. 3 Seismic Upgrade	50,000	-
Pebble Hill Reservoir Seismic Upgrade	500,000	53,803
Reservoir Isolation Valve Automation	550,000	26,731
Reservoir Preliminary Structural Assessments (Annual Inspection 2023 to 2025)	1,200,000	403,187
Reservoir Sampling Kiosks - Multi Location	350,000	30,564
Sasamat Reservoir Refurbishment	250,000	12,064
Sunnyside Reservoir Units 1 and 2 Seismic Upgrade	100,000	36,142
Vancouver Heights System Resiliency Improvements	450,000	3,509
Other Projects	-	24,041
Reservoirs	**23,890,000**	**3,777,474**
CLD and SFD Lead Paint Removal, Surface Crack Injection and General Corrosion Mitigation	500,000	44,236
Coquitlam Intake Tower Seismic Upgrade	100,000	4,118
Coquitlam Lake Water Supply - Intake No. 2 & Tunnel	9,000,000	380,411
Coquitlam Lake Water Supply - Water Treatment	5,000,000	300,022
CWTP CO2 System Improvements	500,000	-
CWTP Mobile Disinfection System	500,000	1,436
CWTP Ozone Generation Upgrades for Units 2 & 3	1,000,000	264,965
CWTP Ozone Sidestream Pipe Heat Trace and Insulation	150,000	14,093
CWTP Ozone Sidestream Pump VFD Replacement	500,000	34,646
Loch Lomond Outlet Works Rehabilitation	250,000	536
Microbiology Laboratory Expansion	250,000	-
Online Chlorine and pH Analyzers Phase 1	1,400,000	13,353
SCFP Centralized Compressed Air System	1,350,000	11,306
SCFP Clearwell Baffle Replacement Pilot	250,000	44,301
SCFP Clearwell Membrane Replacement	600,000	37,190
SCFP Floc Tank Baffle Replacement and Ladder Installation to Improve Accessibility	500,000	4,802
SCFP OMC Building Expansion	500,000	12,035
SCFP Polymer System Upgrade	1,000,000	103,001
SCFP SCADA/ICS Controller Replacement	1,200,000	2,381,824
Water Utilities SLC Control System Upgrades	600,000	278
Other Projects	-	1,950
Treatment Plants	**25,150,000**	**3,654,501**

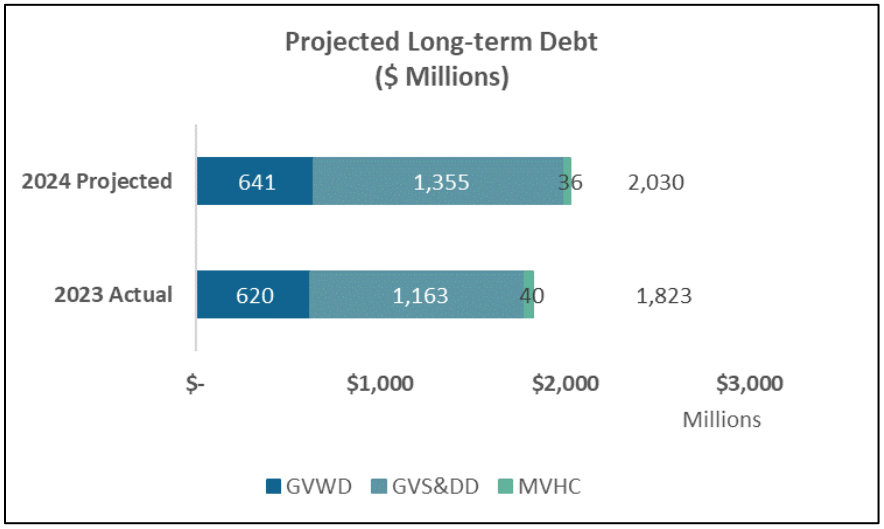
	Annual Capital Cash Flow	Year-to-date Actual Expenditures
Water Services		
Capilano Raw Water Pump Station VFD Upgrades	300,000	-
Capilano Reservoir and Seymour Reservoir Dam Safety Boom Replacement	500,000	51,416
Capilano Watershed Security Gatehouse	1,800,000	9,157
CLD & SFD Fasteners Replacement & Coating Repairs	50,000	-
Cleveland Dam - Lower Outlet HBV Rehabilitation	250,000	21,177
Cleveland Dam Drumgate Seal Replacement	500,000	-
Cleveland Dam Power Resiliency Improvements	700,000	4,174
Cleveland Dam Public Warning System and Enhancements	1,750,000	461,570
Cleveland Dam Seismic Stability Evaluation	400,000	28,656
Facilities O&M Documentation Development - Phase 1	1,000,000	8,549
Lake City HVAC Upgrade	400,000	-
Lower Seymour Conservation Reserve Learning Lodge Replacement	50,000	12,162
Rechlorination Station SHS Storage Tank Replacement	100,000	28,102
Rechlorination Station Upgrades	2,000,000	63,012
Rice Lake Dams Rehabilitation	900,000	64,473
SCADA Moscad Server & ICS Historian Expansion & Partitioning	1,500,000	-
Seymour Falls Dam Public Warning System	1,250,000	2,610
Seymour Falls Dam Seismic Stability Assessment	750,000	-
South Fraser Works Yard	2,500,000	(80,290)
Other Projects	-	196,623
Others	**16,700,000**	**871,391**
	$ 424,855,000	**$ 46,026,709**

TREASURY RESULTS

Long-term debt

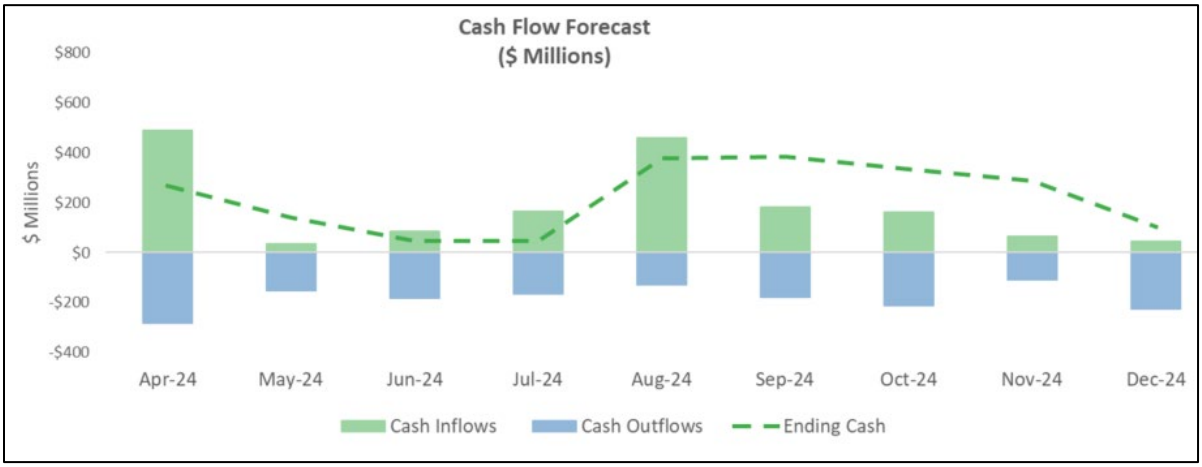
As a result of the capital underspends, the total forecasted borrowing for 2024 is $350 million, which is less than the budgeted $482 million. Furthermore, the MFA long-term borrowing rate for the 2024 Spring borrowing was 4.4%, which is lower than the Fall 2023 rate of 4.97% indicating a softening in long-term interest rates. The impact of the lower amount of borrowing and lower interest rates results in a lower than expected debt service ratio (interest and principal payments to revenue) from 21.5% to 20.3%.

Long-term debt is expected to increase by $207 million by the end of 2024 to $2,030 billion compared to $1,823 billion at the end of 2023. The increase is largely from the $350 million new debenture debt issued in the spring ($274M GVSⅅ $76M GVWD), offset by $143 million in annual debenture payments.

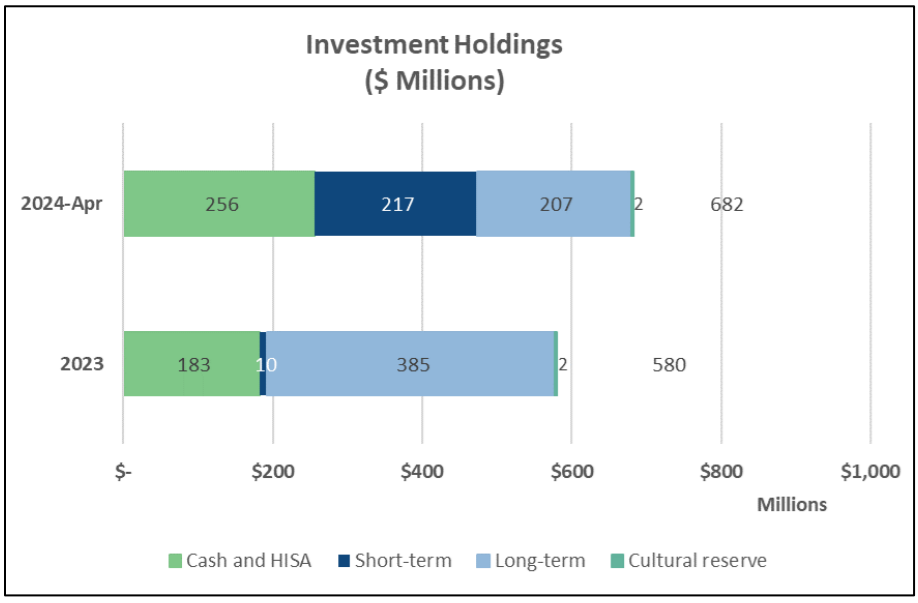


Cash and Investments

The chart below provides the cash flow forecast for Metro Vancouver from April 2024 to December 2024. Treasury is continuously reviewing cash and reserve balances to ensure adequate liquidity to sustain operations and managing risk while also making efficient use of its cash.



The charts below provide summaries of the cash and investment holdings as of April 30, 2024 compared to December 31 2023, as well as the investment maturities over the next five years. Cash and investments has increased in 2024 from $580.2 million at December 31, 2023 to $682.0 million. This is largely due to the spring debenture borrowing of $350 million. Finance is continuously monitoring the cash and reserve balances with a strategy to utilize cash instead of locking in borrowing at high market rates as it is anticipated that interest rates will decrease in 2024.

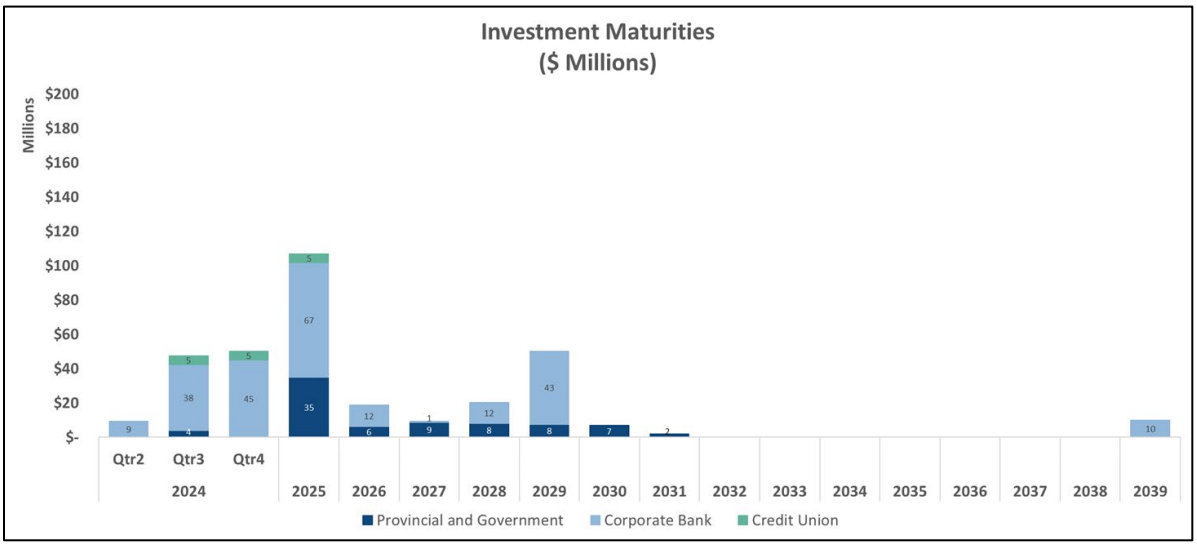


(in thousands of dollars)	**2024 Apr**	**2023**
High-interest saving accounts	$ 256,239	$ 10,000
Short-term investments *	216,795	182,895
Long-term investments **	206,554	385,101
Cultural reserve investments ***	256,239	2,231
Total Cash & Investment Holdings	**$ 681,953**	**$ 580,227**

* Short-term investments have terms of less than one year and include bankers' acceptances, Canadian bank bonds and credit union term deposits.

** Long-term investments have terms of greater than one year and include Canadian bank bonds, guaranteed investment certificates, credit union term deposits and MFA pooled funds.

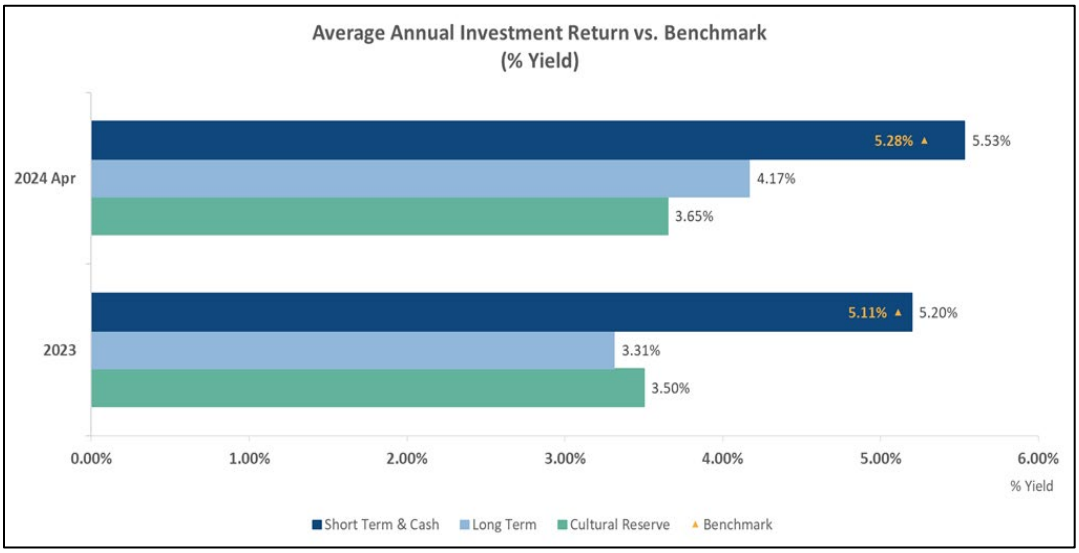
*** Cultural reserve investments are reserve for contribution to cultural activities. Investments are held to 2031, however the majority of the portfolio will mature within two years. Investment maturities in 2024 are expected to be $126M. Treasury will strategically reinvest funds or convert to cash if cash resources are required.



Investment Returns

The average investment returns as of April 2024 have increased since December 2023, to 5.53% for short-term and 4.17% for long-term. As interest rates are expected to decline, Metro Vancouver's rate of return is expected to remain favourable because matured investments in 2023 were reinvested with higher yielding products or held in cash to take advantage of high-interest savings account rates. Currently, the total estimated weighted average annualized return is 4.51%.

The chart below summarizes the investment returns by investment category against benchmark rates. The chart indicates the return on short-term investments of 5.53% has surpassed the MFA benchmark of 5.28%:



Financial Position Indicators

Illustrated below is additional insight into Metro Vancouver's financial position. These ratios measure Metro Vancouver's current performance compared to budget and prior year.

	2024-April	2024-Budget	2024-Forecast	2023-Q4
Current Ratio	5.6	-	-	2.5
Debt Servicing	18.8%	21.5%	20.3%	18.8%
Interest Burden	18.8%	8.3%	7.1%	6.7%
Investments	$ 8.2M	$ 17.7M	$ 24.5M	$ 29.3M

Current ratio is calculated as current assets divided by current liabilities. The current ratio indicates cash exceeds our current obligations by 5.6 times. The organizations financials assets are more than sufficient at the end of April to offset the amount of short-term obligations.

Debt servicing costs is a calculation of long-term debt principal and interest payments divided by revenue. Interest burden is a component of the debt servicing costs, interest payments divided by revenue. Currently, the debt servicing and interest burden ratio forecast is less than the budgeted ratio due to spring 2024 borrowing amount being less than anticipated ($350M spring borrowing vs $400M budgeted) due to delays in capital spending.

Investment returns as of April 2024 indicate a positive trend, as returns are 46% of the budgeted goal of $17.7M.

PROCUREMENT

Awarded Procurement

- The tables below provide:
  - the number of contracts that have been awarded, and
  - the value of contracts awarded by the Metro Vancouver Board and those that are less than $5 million and in excess of $500,000 (which are not awarded by the Board in accordance with existing Board approved procurement policies).
  - Four contract awards were approved by the Board in the first quarter of 2024, representing 25% of the total contracts awarded in 2024.
  - It is expected that procurement activity will increase with respect to the number of awards as well as the value due to the significant 2024 capital program.

Award Type	2024 To Date	2023	2022	2021
Board Awarded	4	16	20	25
Less than $5 Million	10	51	53	51
Total	14	67	73	76

Award Type	2024 To Date	2023	2022	2021
Board Awarded	$ 72,134,299	$465,895,019	$434,664,449	$798,139,628
Less than $5 Million	$ 17,234,419	$71,980,936	$ 89,019,028	$ 92,545,559
Total	$ 89,368,718	$537,875,955	$523,683,477	$890,685,187

Awarded Bids – January to March 2024

The following contracts have been awarded by the Metro Vancouver. Contracts have been entered into with the vendors offering the best value to the Corporation determined in accordance with the evaluation criteria, factors or methods previously disclosed in the public solicitation documents.

RESULTS OF OPEN PUBLIC COMPETITIVE PROCUREMENTS - AWARDS IN 2024 JANUARY - MARCH

Competition #	Competition Type	Competition Description	Awarded Date	Vendor Name	Awarded Amount	Awarded
24-008	RFP-MA	Dechlorination for Reservoir Underdrain	2-Jan-24	AECOM Canada Ltd.	$ 229,958	Yes
23-085	RFP	South Surrey Supply Main Bridge Support Modifications	3-Jan-24	Acuren Group Inc.	$ 979,231	Yes
23-085	RFP	South Surrey Supply Main Bridge Support Modifications	3-Jan-24	Seismic 2000 Construction Ltd.	NA	No
23-369	SS/NOIC	Enhanced Hydrodynamic Modelling, Scenario Analysis and Screening Level Risk Assessment Consulting	4-Jan-24	Tetra Tech Canada Inc.	$ 510,979	Yes
23-260	ITT	Lulu Island WWTP C1 and C2 Piping Replacement Project	9-Jan-24	Tritech Group Ltd.	$ 766,834	Yes
23-004	ITT	Supply and Installation of Glenbrook Combined Trunk Sewer Replacement – Kingsway Section	10-Jan-24	NorLand Limited	$ 4,021,642	Yes
23-004	ITT	Supply and Installation of Glenbrook Combined Trunk Sewer Replacement – Kingsway Section	10-Jan-24	Jacob Bros. Construction Inc.	NA	No
23-004	ITT	Supply and Installation of Glenbrook Combined Trunk Sewer Replacement – Kingsway Section	10-Jan-24	Sandpiper Contracting LLP	NA	No
23-287	RFP	Coquitlam Landfill Flare Station Design Services	17-Jan-24	Comcor Environmental Limited	$ 353,868	Yes
23-287	RFP	Coquitlam Landfill Flare Station Design Services	17-Jan-24	GHD Limited	NA	No
23-287	RFP	Coquitlam Landfill Flare Station Design Services	17-Jan-24	Sperling Hansen Associates	NA	No
23-289	ITT	Supply & Delivery of Ductile Iron Pipe for Central Park Main No. 2 – Phase 4 – 10th Avenue to Westburnco Project	17-Jan-24	Iconix Waterworks LP	$ 403,920	Yes
23-289	ITT	Supply & Delivery of Ductile Iron Pipe for Central Park Main No. 2 – Phase 4 – 10th Avenue to Westburnco Project	17-Jan-24	Flocor Inc.	NA	No
23-289	ITT	Supply & Delivery of Ductile Iron Pipe for Central Park Main No. 2 – Phase 4 – 10th Avenue to Westburnco Project	17-Jan-24	EMCO Water Works	NA	No
23-289	ITT	Supply & Delivery of Ductile Iron Pipe for Central Park Main No. 2 – Phase 4 – 10th Avenue to Westburnco Project	17-Jan-24	Andrew Sheret Ltd.	NA	No
24-025	SS/NOIC	Abatement of Hazardous Materials at Cleveland Dam	19-Jan-24	Nucor Environmental Solutions Ltd.	$ 391,365	Yes
24-030	ITT	Manor House - Deep Energy Retrofit Aluminum Guardrails	26-Jan-24	A.R.M.S. Manufacturing Ltd.	$ 81,816	Yes
24-031	ITT	Manor House - Deep Energy Retrofit Windows and Doors	26-Jan-24	Centra Construction Group Ltd.	$ 341,185	Yes
24-033	ITT	Manor House - Deep Energy Retrofit Interior Finishes	26-Jan-24	J.J.K Developments Inc.	$ 195,000	Yes
24-034	ITT	Manor House - Deep Energy Retrofit Exterior Walls	26-Jan-24	Master Stucco Ltd.	$ 769,980	Yes
24-035	ITT	Manor House - Deep Energy Retrofit Rough Carpentry	26-Jan-24	PR Pomeroy Restoration & Construction Ltd.	$ 308,513	Yes
24-037	ITT	Manor House - Deep Energy Retrofit Roofing & PMMA	26-Jan-24	Renewal Constructions Inc.	$ 977,100	Yes
24-038	ITT	Manor House - Deep Energy Retrofit Scaffolding	26-Jan-24	Scaffold Depot Ltd.	$ 229,794	Yes
24-039	ITT	Manor House - Deep Energy Mechanical & Electrical	26-Jan-24	Slopeside Mechanical Systems Ltd.	$ 3,517,569	Yes
24-040	ITT	Manor House - Deep Energy Demolition & Asbestos Abatement	26-Jan-24	West York Developments Ltd.	$ 170,100	Yes
23-229	SS/NOIC	Small Load Waste Alternative Fuel Processing Trial	7-Feb-24	Geocycle Canada Inc.	$ 1,290,000	Yes
23-355	RFP	Supply & Installation of Scour Protection for Annacis Main No. 2	8-Feb-24	Fraser River Pile & Dredge (GP) Inc.	$ 992,910	Yes
23-234	RFP	Supply and Delivery of MCC for the Royal Avenue Pump Station Rehabilitation Project	9-Feb-24	Stellar Power & Control Solutions	$ 326,845	Yes
23-234	RFP	Supply and Delivery of MCC for the Royal Avenue Pump Station Rehabilitation Project	9-Feb-24	enCompass Solution Group	NA	No
23-234	RFP	Supply and Delivery of MCC for the Royal Avenue Pump Station Rehabilitation Project	9-Feb-24	Western Integrated	NA	No
23-234	RFP	Supply and Delivery of MCC for the Royal Avenue Pump Station Rehabilitation Project	9-Feb-24	Raelkon Teams	NA	No
23-375	SS/NOIC	Disposal Services for Iona Stockpile Grit to Campbell Hill Landfill	9-Feb-24	Wastech Services Inc.	$ 1,005,000	Yes
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	Arcadis Professional Services (Canada) Inc.	$ 249,600	Yes
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	ABL Energy and Marine Consultants Canada Ltd.	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	Deloitte	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	Exergy Solutions	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	GHD Limited	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	ILF Consultant Inc.	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	Interlock Energy Ltd.	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	Ramboll Canada Inc.	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	RINA Tech Canada Ltd.	NA	No
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	Sacre-Davey Engineering	NA	No

Competition #	Competition Type	Competition Description	Awarded Date	Vendor Name	Awarded Amount	Awarded
23-372	RFP	Consulting Services for Studying the Pre-Feasability of Green Hydrogen Production from Hydropower at Cleveland Dam (Green Hydrogen Project)	14-Feb-24	WSP Canada Inc.	NA	No
23-072	RFP	Cathodic Protection Maintenance Services	20-Feb-24	Corrosion Service Company Ltd.	$ 903,000	Yes
23-072	RFP	Cathodic Protection Maintenance Services	20-Feb-24	Acuren Group Inc.	NA	No
23-072	RFP	Cathodic Protection Maintenance Services	20-Feb-24	Corrpro Canada Inc.	NA	No
23-072	RFP	Cathodic Protection Maintenance Services	20-Feb-24	Pure Technologies Ltd.	NA	No
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	T&T Power Group	$ 320,598	Yes
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	Arrow Speed Controls Limited	NA	No
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	Stellar Power & Control Solutions	NA	No
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	enCompass Electrical Solutions	NA	No
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	Wesco Distribution	NA	No
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	HSL Automation Ltd.	NA	No
23-300	RFP	Supply and Delivery of VFD for Ozone Sidesstream Injection	20-Feb-24	Celco Controls	NA	No
23-330	RFP	Consulting Services for Delta South Surrey Greenway Design Phase 3	20-Feb-24	R.F. Binnie & Associates Ltd.	$ 349,680	Yes
23-330	RFP	Consulting Services for Delta South Surrey Greenway Design Phase 3	20-Feb-24	Aplin & Martin Consultants Ltd.	NA	No
23-330	RFP	Consulting Services for Delta South Surrey Greenway Design Phase 3	20-Feb-24	Hatch Corporation	NA	No
23-330	RFP	Consulting Services for Delta South Surrey Greenway Design Phase 3	20-Feb-24	AECOM Canada Ltd.	NA	No
22-505	RFP	Construction - IIWWTP CEPT Winterization	21-Feb-24	Bennett Mechanical Installations (2001) Ltd.	$ 3,449,700	Yes
22-505	RFP	Construction - IIWWTP CEPT Winterization	21-Feb-24	North America Construction (1993) Ltd.	NA	No
23-134	RFP	Solid Waste Compaction System at North Surrey Recycling & Waste Centre	21-Feb-24	SSI Shredding Systems, Inc.	$ 3,315,123	Yes
24-068	SS/NOIC	Supply & Install of a 32" single line-stop on existing steel Water main in South Burnaby	22-Feb-24	Pacific Flow Control Ltd.	$ 154,185	Yes
23-241	RFP-MA	AIWWTP Sludge and Scum Area I/O Migration	25-Feb-24	BBA Engineering Ltd.	$ 424,728	Yes
23-241	RFP-MA	AIWWTP Sludge and Scum Area I/O Migration	25-Feb-24	Wood Canada Limited	NA	No
23-241	RFP-MA	AIWWTP Sludge and Scum Area I/O Migration	25-Feb-24	Tetra Tech Canada Inc.	NA	No
23-241	RFP-MA	AIWWTP Sludge and Scum Area I/O Migration	25-Feb-24	Brown and Caldwell	NA	No
23-184	RFP	Iona WWTP Long-Term Lagoon Cleaning	11-Mar-24	American Process Group (Canada) Ltd.	$ 29,913,644	Yes
23-184	RFP	Iona WWTP Long-Term Lagoon Cleaning	11-Mar-24	GFL Environmental Services Inc.	NA	No
23-184	RFP	Iona WWTP Long-Term Lagoon Cleaning	11-Mar-24	Clean Harbors Canada	NA	No
23-184	RFP	Iona WWTP Long-Term Lagoon Cleaning	11-Mar-24	Lambourne Environmental Ltd.	NA	No
23-184	RFP	Iona WWTP Long-Term Lagoon Cleaning	11-Mar-24	Secure Energy	NA	No
24-095	SS/NOIC	Contingency Disposal Services for Biosolids	12-Mar-24	Wastech Services Inc.	$ 193,000	Yes
23-214	RFP	Odour Monitoring and Assessment Services at Wastewater Treatment Plants	15-Mar-24	Kerr Wood Leidal Associates Limited	$ 365,282	Yes
23-214	RFP	Odour Monitoring and Assessment Services at Wastewater Treatment Plants	15-Mar-24	GHD Limited	NA	No
23-214	RFP	Odour Monitoring and Assessment Services at Wastewater Treatment Plants	15-Mar-24	Envirochem Services Inc.	NA	No
23-214	RFP	Odour Monitoring and Assessment Services at Wastewater Treatment Plants	15-Mar-24	BioMaxx Waste Water Solutions (NL) Inc.	NA	No
23-214	RFP	Odour Monitoring and Assessment Services at Wastewater Treatment Plants	15-Mar-24	DAY Mottech Inc.	NA	No
23-214	RFP	Odour Monitoring and Assessment Services at Wastewater Treatment Plants	15-Mar-24	Triton Environmental Consultants	NA	No
23-425	RFP	Supply and Delivery of Electric Vehicle Kiosks	19-Mar-24	Code Electric Products Ltd.	$ 199,173	Yes
23-425	RFP	Supply and Delivery of Electric Vehicle Kiosks	19-Mar-24	KJ Controls Ltd.	NA	No
23-425	RFP	Supply and Delivery of Electric Vehicle Kiosks	19-Mar-24	AC Dandy Products	NA	No
23-378	ITT	Royal Avenue Pump Station Rehabilitation	21-Mar-24	Kenaidan Contracting Ltd.	$ 6,845,655	Yes
23-378	ITT	Royal Avenue Pump Station Rehabilitation	21-Mar-24	Graham Infrastructure LP	NA	No
23-378	ITT	Royal Avenue Pump Station Rehabilitation	21-Mar-24	North America Construction (1993) Ltd.	NA	No
24-125	SS/NOIC	Kingston Gardens Owner's Representative Services	22-Mar-24	RAM Engineering Ltd.	$ 200,000	Yes
23-008	RFQ	Installation of Heat Tracing and Insulation at the Coquitlam Water Treatment Plant Ozone Sidestream Tower	26-Mar-24	J A Electric Inc.	$ 311,550	Yes

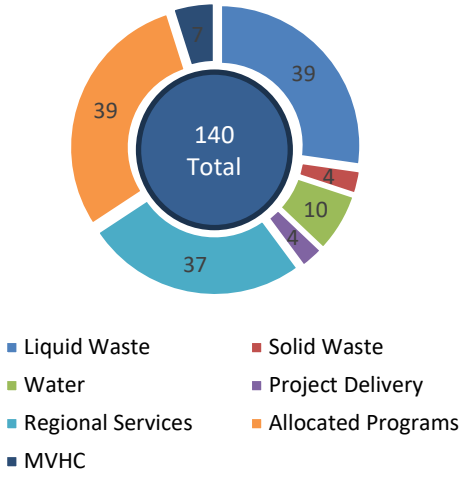
CONTINUOUS IMPROVEMENT PROJECTS

In October 2023, the Metro Vancouver Boards approved the 2024-2028 Financial Plan which included departmental planned continuous improvement projects. There is a foundational target outcome of fostering a commitment to continuous improvement in Metro Vancouver's core culture. The role of continuous improvement is to further the Board priorities, including:

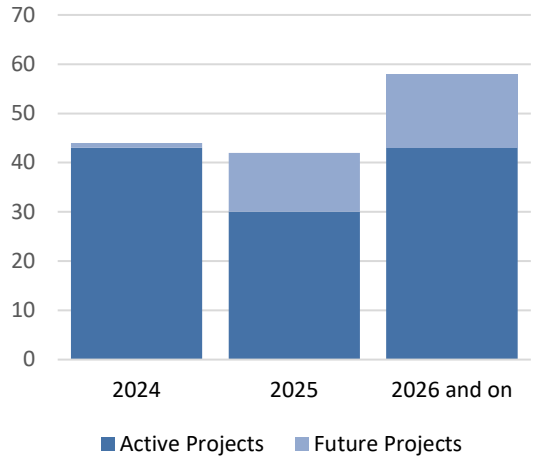
- Financial Sustainability and Regional Affordability
- Climate Action
- Resilient Services and Infrastructure
- Reconciliation
- Housing

This report is part of Financial Services' work plan to provide regular reporting on Metro Vancouver Continuous Improvement (CI) projects and highlight select completed project's contributions to service levels and affordability for regional rate payers.

Total CI Projects by Service Area[1]



CI Projects by Completion Date[2]



[1]*Total CI Projects by Service Area* illustrates the total number of projects identified and by service area. The number of CI projects within an area may not reflect the significance or potential cost savings of the initiatives.
[2]*CI Projects by Completion Date* displays the number of active and future projects by expected year of completion.

Below is a summary of key completed Continuous Improvement Projects so far. Continuous Improvement reporting will continue to highlight completed projects. These projects vary from one-year to multi-year timelines depending on complexity and stakeholders.

Highlighted Select Completed Continuous Improvement Projects			
Department/ Project Title	**Board Priority**	**Description**	**Outcomes**
Liquid Waste: LIWWTP Renewable Natural Gas	• Financial Sustainability & Affordability • Climate Action	Process to upgrade digester gas to renewable natural gas for sale to Fortis BC	• New GVS&DD revenue stream • Renewable natural gas available for decarbonization for Fortis customers • Estimated $0.9 M annual income; 2,200 tonnes of GHG reduction
Liquid Waste: LIWWTP Digestion Optimization-Phase 1 Testing	• Financial Sustainability & Affordability • Climate Action	Platform for testing alternative sludge treatment approaches	• Intensification tests indicate existing digesters can serve larger populations to defer costly capacity expansions. • Future tests will evaluate ways to increase production of low-carbon biofuels.
Invest Vancouver: Collaboration	• Resilient Services & Infrastructure	Partner collaboration	• Identified synergies with partners to help promote the region and attract foreign direct investment
Liquid Waste: Flush Truck	• Financial Sustainability & Affordability	New recycling technology	• Reduce water consumption, labour, fuel, and disposal costs resulting in estimated $0.3M annual savings

On February 15, 2024, Continuous Improvement Project Highlights and Updates were addressed at the Finance Committee. The below table outlines key updates to highlighted continuous improvement projects.

Board Strategic Priority	Primary CI Projects	Progress
Financial Sustainability	LIWWTP create Effluent Heat Recovery System	5%
	Contingency Disposal Requirements	100%
	Proactive formal valve exercising program	10%
	Installation and operation of equipment to upgrade digester gas to Renewable natural gas quality and sell this to FortisBC.	10%
Climate Action	Biorock: Innovative Building Material for Shoreline Protection, Carbon Sequestration, and Habitat Creation	15%
	GHG emission reduction initiatives in the building and transportation sectors	20%
	Reduction of gas powered vehicles and equipment and convert to battery powered	20%
	Waste-to-Energy carbon capture study and analysis	30%
Resilient Services and Infrastructure	EAM system reconfiguration to improve Corporate Asset Management	5%
	Lean Six Sigma process improvement for safety incidents in Water Services	10%
	Improve lifecycle process for Digital Workflows for Engineering Drawing	100%
Reconciliation	Improved Indigenous Relations' team capacity	40%
	Diversity Equity Inclusion strategy with emphasis on Reconciliation	50%
	Develop KPIs for Indigenous Relations training sessions	90%
Housing	Innovate and expand partnerships to develop more affordable units	10%
	Alternative rental housing approaches	20%
	Transfer of GVS&DD excess property acquired for construction of Poplar Landing CSO Storage Tank to Metro Vancouver Housing for affordable housing	2%