

MEMORANDUM

Date: October 14th,2021
To: Noel Allison, Planner, Vancouver Fraser Port Authority
Cc: Jurgen Franke, Acting Vice President Major Projects & Environment
Mike Tattersfield, Project Manager, Berth 2 Upgrade
Danny Tang, Area Lead, Berth 2 Upgrade
From: Envirochem Services, Inc.
Re: **Berth 2 Shiploader Project – Emissions Overview Memorandum**

Introduction

On behalf of Neptune Bulk Terminal Ltd. (NBTL), Envirochem Services Inc. (Envirochem) is pleased to provide this emissions overview to Vancouver Fraser Port Authority (VFPA) in support of NBTL's Berth 2 Shiploader Project and Environmental Review (PER) process.

Project Overview

NBTL currently exports two products; metallurgic coal through Berth 1 and potash through Berth 2 and 3. NBTL is currently permitted to handle 20 million tonnes of dry bulk commodities (potash) through Berth 2 and 3 (with 14 million tonnes handled through Berth 2). Marine loading at Berth 2 is currently completed by dual quadrant shiploaders, the West Potash Shiploader (WPSL) and East Potash Shiploader (EPSL). The shiploaders are fed from the Berth 2 potash surge bin via feed conveyor lines (conveyors #9 #10, #11, and #12, #13, #14). An overview of the site is shown in **Figure 1** for reference.

The WPSL and EPSL were installed in 1969 and are used for loading potash vessels ranging from small Handy size vessels up to 80,000 DWT Kamsarmax vessels for export.

As these existing shiploaders at Berth 2 are nearing the end of their useful service life (estimated as June 2023), both shiploaders (WPSL & EPSL) will be demolished and replaced with a single traveling slewing shiploader.

The Berth 2 Shiploader Project will design, construct, and commission a new traveling slewing potash shiploader, marine structures, and approach conveyors to replace the existing WPSL and EPSL shiploaders at Berth 2 and related feed conveyor lines. Design/concept figures and reference photos for the new traveling slewing potash shiploader are included in **Appendix A**.

Overviews/comparisons of the current and conceptual future Berth 2 shiploading configurations are presented in the sections below.

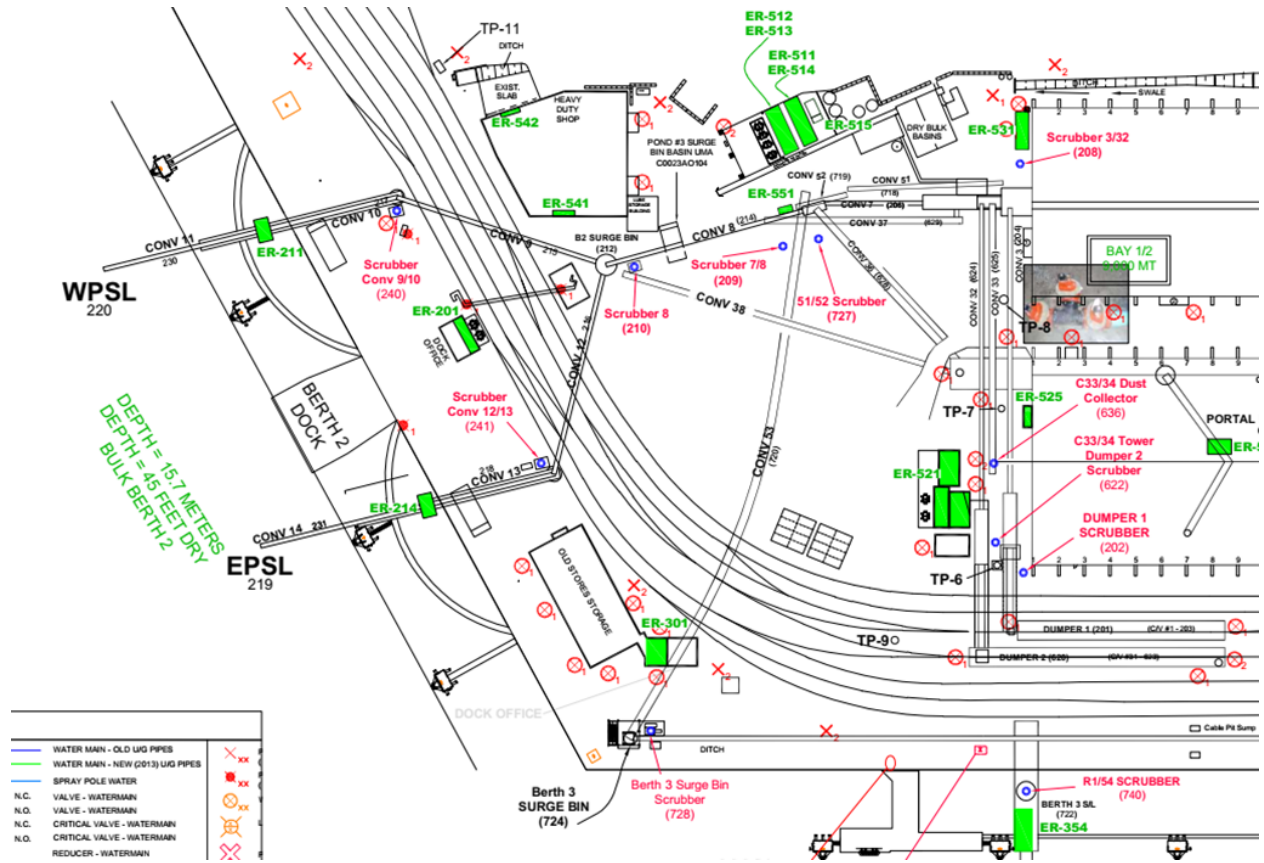


Figure 1: Site Overview

Berth 2 – Current Configuration

The current Berth 2 shiploading configuration consists of 8 transfer points from the surge bin to the ship (as shown in **Figure 2**). The two shiploaders (WPSL & EPSL) in the current setup have a combined maximum hourly throughput rate of 5,000 tonnes/hr.

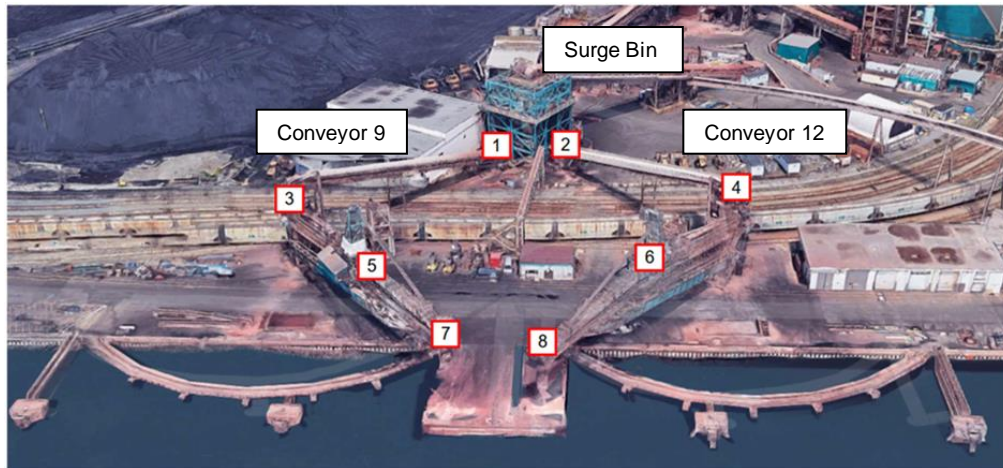


Figure 2: Berth 2 – Current Configuration

Berth 2 – Conceptual Future Configuration

The conceptual Berth 2 shiploading configuration consists of 6 transfer points from the surge bin to the ship (as shown in **Figure 3**). The new traveling slewing shiploader is expected to have a maximum hourly throughput rate of 6,300 tonnes/hr (however daily and annual throughput will remain unchanged). Additional design/concept figures and reference photos for the new traveling slewing potash shiploader are included in **Appendix A**.

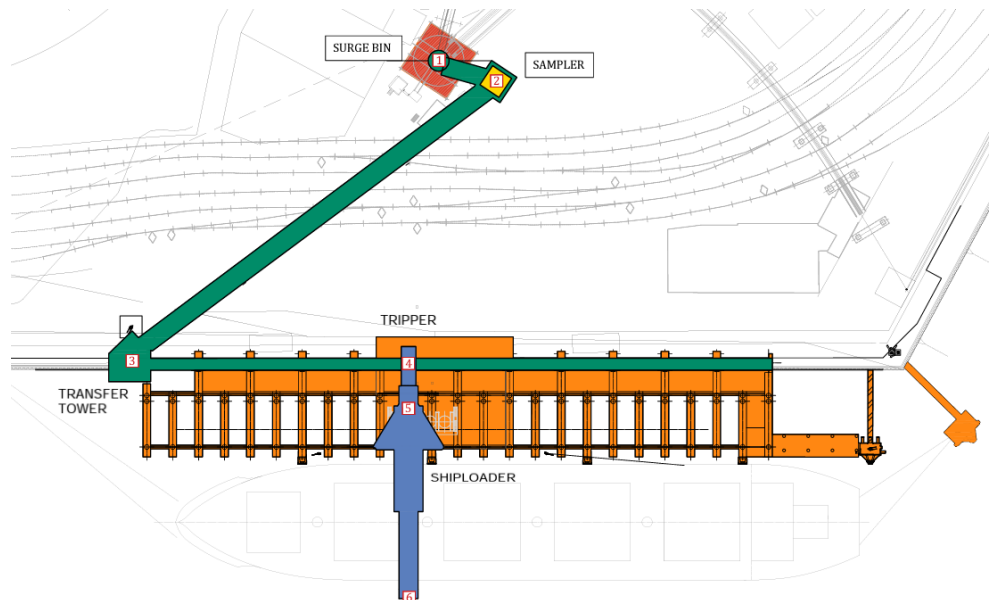


Figure 3: Berth 2 – Conceptual Future Configuration

Berth 2 – Current and Future Configuration Air Emission Comparison

As highlighted in **Figure 2** and **Figure 3**, the conceptual Berth 2 shiploading configuration allows for an overall reduction in the number of transfer points required (8 to 6). Based on the existing air permit for the two shiploaders (EPSL and WPSL) at Berth 2, the current combined daily throughput limit is 120,000 tonnes/day.

Although it is technically possible to exceed this limit with the conceptual design of the new shiploader at 6,300 tonnes/hr, it is not realistic to run the shiploader at the maximum design throughput for 24 hours. Nor is NBTL capable of doing so with the upstream equipment before the surge bin (which they are not modifying) and the vessel accommodation (they cannot load more than one vessel max 80,000 DWT per day). Hence, the maximum daily throughput of 120,000 tonnes at Berth 2 and annual throughput will remain unchanged. There are no expected changes to the ship schedule or maximum ship capacity for the future scenario at Berth 2. It should be also noted that there are no expected changes to the facility's existing air permit.

The current Berth 2 shiploading configuration includes: enclosed conveyor systems, transfer points (connected to scrubbers 240 & 241), and cascade chutes at the WPSL & EPSL spouts to mitigate fugitive dust from loading operations. The future concept Berth 2 shiploading configuration will include state of the art enclosed conveyor systems, galleries and transfer points (under vacuum to scrubbers), and upgraded cascade chutes at the shiploader spout.

The future configuration is expected to have a better/improved enclosure/vacuum system compared to the current configuration/setup. A comparison summary of operational factors for current/future Berth 2 configurations is shown in **Table 1** for reference.

Table 1: Berth 2 Operational Summary

Scenario	# Transfer Points	Maximum throughput			Controls Applied
		tonnes/hour	tonnes/day	tonnes/year	
Current Configuration	8	5000	120,000	14,000,000	Enclosed conveyors, transfer points (connected to scrubbers), and cascade chute at the shiploader spout
Future Configuration	6	6300	120,000	14,000,000	Enclosed conveyors, galleries and transfer towers (under vacuum to scrubbers), and cascade chute at the shiploader spout

Based on the project characteristics and factors noted above, emissions for each operational scenario (current and future Berth 2 configurations) were estimated in **Table 2** and **Table 3** below, respectively. As is shown below, there is no predicted change in air emissions resulting from the proposed Berth 2 shiploader project. However, it is worth noting that due to the improved infrastructure mentioned above, there is a reduced potential for fugitive emissions along the conveyance system.

As potash conveyors transfer points are enclosed and treated by scrubbers (240 and 241), emission rates were determined using a combination of design volumetric flow rates, permit concentration limits, and operational criteria. The permitted flow rates for scrubbers 240 and 241 are combined with two other scrubbers (728 and 740) in Source ES-22 (MV Air Permit GVA0081) and is limited to 1350 Sm³/min for all

four scrubbers. As each scrubber is slightly different, for calculation purposes, relevant scrubber emissions (240 and 241) were calculated based on manufacturer flowrates and previous experience (i.e., for scrubber 240 and 241, the combined flowrate is 850 m³/min), which is proportional to the Source ES-22 permitted flowrate. However, as mentioned, this is only for calculation and comparison purposes as the source is permitted based on the combined flow from all four scrubbers. It should also be noted that the scrubbers at Neptune are sampled regularly per their MV Air Permit GVA0081 requirements. Year-over-year sampling results are well within permit limits.

The drop equation (AP-42 Section 13.2.4 Aggregate Handling and Storage Piles (U.S. EPA, 2006)) was used to estimate fugitive emissions associated with loading operations. A 75% control efficiency was applied to account for the cascade chutes (AWMA). For permitting purposes, to estimate daily emissions, the maximum daily wind speed (over one year) was used as a conservative approach, and for annual emissions, the average annual wind speed was used. It should be noted that the parameters used in the emission calculation here are consistent with what was used in the MV air permit amendment application and were approved by MV during that process

Table 2: Berth 2 Emissions Summary (Current Configuration)

Source Description				Source Parameters				Daily TPM Emission Rate	Annual TPM Emission Rate	
Location on Site	Source	Discharge Point	Type of Control	Operating Hours		Assumed Permitted Flowrate	Permitted Emission Concentration	Control Efficiency	(tonnes/day)	(tonnes/year)
				Daily	Annual	m ³ /min	mg/m ³			
Berth 2 - West Potash Shiploader	Potash loading of marine vessels	Ship's holds and loading area	Telescopic Chute	24	8760	-	-	75%	0.059	2.35
Berth 2 - East Potash Shiploader	Potash loading of marine vessels	Ship's holds and loading area	Telescopic Chute					75%	0.059	2.35
Conveyance system ^(a)	Potash conveyance in Berth 2 Area	Scrubber 240	Covered conveyors, Scrubber			850	20	-	0.024	8.94
		Scrubber 241		20						
TOTAL								0.143	13.63	

^{a)} Please note that there are four scrubbers (240, 241, 728 & 740) with a combined permitted flowrate of 1,350 m³/min under emission source ES-22 in Neptune's MV Air Permit GVA0081. However, only two of the scrubbers (240 & 241) are relevant to emissions related to the B2 project. For calculation purposes, relevant scrubber emissions (240 and 241) were calculated based on manufacturer flowrates and previous experience (i.e., for scrubber 240 and 241, the combined flowrate is 850 m³/min).

Table 3: Berth 2 Emissions Summary (Future Configuration)

Source Description				Source Parameters				Daily TPM Emission Rate	Annual TPM Emission Rate	
Location on Site	Source	Discharge Point	Type of Control	Operating Hours		Assumed Permitted Flowrate	Permitted Emission Concentration	Control Efficiency	(tonnes/day)	(tonnes/year)
				Daily	Annual	m ³ /min	mg/m ³			
Berth 2 - New traveling slewing shiploader	Potash loading of marine vessels	Ship's holds and loading area	Telescopic Chute	24	8760	-	-	75%	0.118	4.69
Conveyance system ^(a)	Potash conveyance in Berth 2 Area	Scrubber 240	Covered conveyors, Scrubber					850	20	-
		Scrubber 241				20				
TOTAL								0.143	13.63	

^{a)} Please note that there are four scrubbers (240, 241, 728 & 740) with a combined permitted flowrate of 1,350 m³/min under emission source ES-22 in Neptune's MV Air Permit GVA0081. However, only two of the scrubbers (240 & 241) are relevant to emissions related to the B2 project. For calculation purposes, relevant scrubber emissions (240 and 241) were calculated based on manufacturer flowrates and previous experience (i.e., for scrubber 240 and 241, the combined flowrate is 850 m³/min).

Conclusion

As the daily and annual throughput will remain unchanged, and air emissions at Berth 2 in the future configuration are expected to be the same as or reduced from the current configuration, our opinion is that the air emissions should not be of concern for this project nor should impact the category “B” vs. “C”. Hence, it is believed this project should fall under Category B.

We trust this memo meets your requirements at this time. If you have any questions or comments regarding this report, please contact NBTL and Envirochem.

Yours truly,

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File Path: 2021-10-14 Memo - NbtI Berth 2 Emissions Overview

APPENDIX A: DESIGN/CONCEPT FIGURES AND REFERENCE PHOTOS

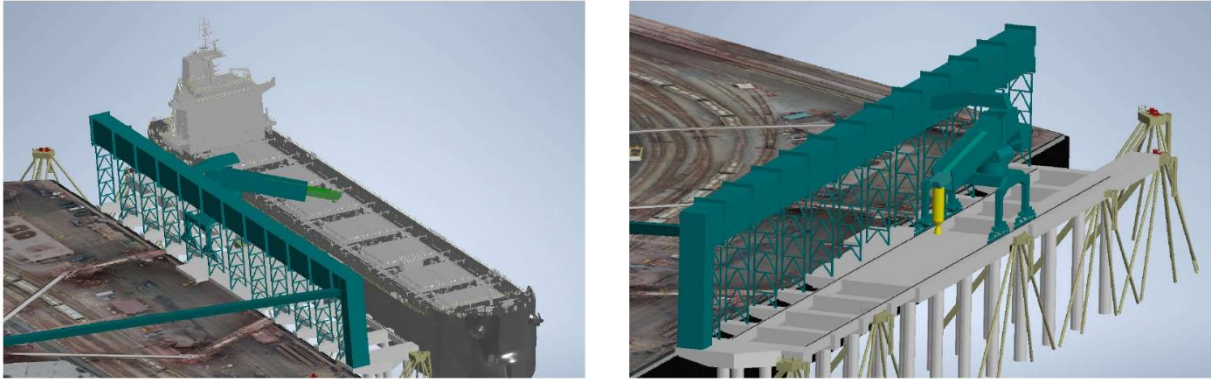


Figure A- 1: New Traveling Slewing Potash Shiploader (conceptual design at NBTL)



Figure A- 2: New Traveling Slewing Potash Shiploader (reference photo from similar facility)

APPENDIX B: AIR EMISSION INVENTORY CALCULATIONS



Scrubber Number	Particulate Emissions		Flow Rate	
	Permitted	Manufacturer	Permitted	Distributed Permitted Flowrate
	(mg/Sm ³)		(m ³ /min)	
240		TBD		850.0
241	20	TBD	1350	
728		337		400.0
740		100		100.0

Current	Source Description				Source Parameters										Daily TPM Emission Rate (tonnes/day)	Annual TPM Emission Rate (tonnes/year)
	Location on Site	Source	Discharge Point	Type of Control	Throughput		Windspeed		Moisture Content %	Permitted Flowrate m ³ /min	Permitted Emission Concentration mg/m ³	Operating Hours		Control Efficiency Applied %		
					Daily tonnes	Annual Annual	Daily m/s	Annual m/s				Daily	Annual			
Berth 2 - west shiploader	Potash loading of marine	Ship's holds and loading area	Telescopic Chute	60,000	7,000,000	5.55	2.42	2.00	-	-	-	-	75	0.059	2.35	
Berth 2 - east shiploader	Potash loading of marine	Ship's holds and loading area	Telescopic Chute	60,000	7,000,000	5.55	2.42	2.00	-	-	-	-	75	0.059	2.35	
Conveyor system	Potash Conveyance in Berth 2 Area	Scrubber 240	Covered conveyors, Scrubber	-	-	-	-	-	850.0	20	24	8760	-	0.024	8.94	
		Scrubber 241		20	24	8760										
TOTAL														0.143	13.63	

Future	Source Description				Source Parameters										Daily TPM Emission Rate (tonnes/day)	Annual TPM Emission Rate (tonnes/year)
	Location on Site	Source	Discharge Point	Type of Control	Throughput		Windspeed		Moisture Content %	Permitted Flowrate m ³ /min	Permitted Emission Concentration mg/m ³	Operating Hours		Control Efficiency Applied %		
					Daily tonnes	Annual Annual	Daily m/s	Annual m/s				Daily	Annual			
Berth 2 new traveling slewing shiploader	Potash Loading of marine vessels	Ship's holds and loading area	Telescopic Chute	120,000	14,000,000	5.55	2.42	2.00	-	-	-	-	75	0.118	4.69	
Conveyor system	Potash Conveyance in Berth 2 Area	Scrubber 240	Covered conveyors, Scrubber	-	-	-	-	-	850.0	20	24	8760	-	0.024	8.94	
		Scrubber 241		20	24	8760										
TOTAL														0.143	13.63	