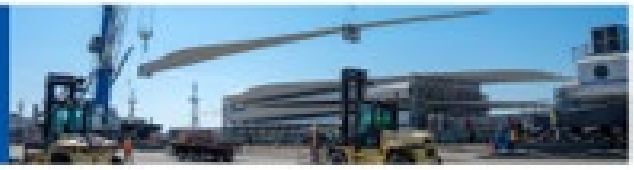
Port of Vancouver USA

Berth 8/9 Extension and Efficiency Improvement Project

Discretionary Grant Program

Benefit-Cost Analysis

May 2024



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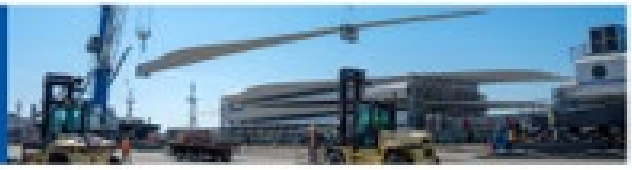

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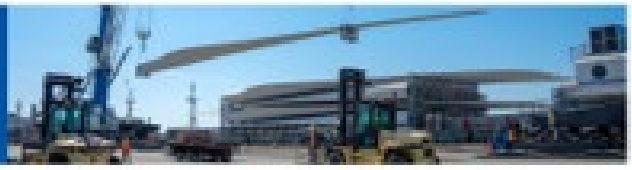
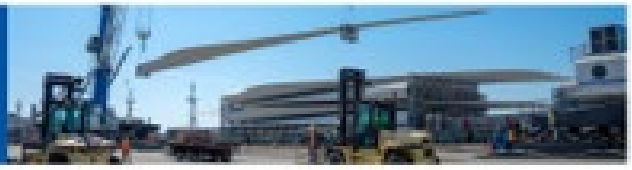
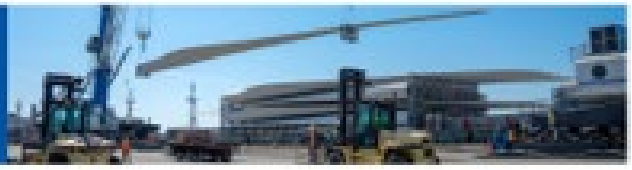


List of Exhibits





Section I. BCA Summary

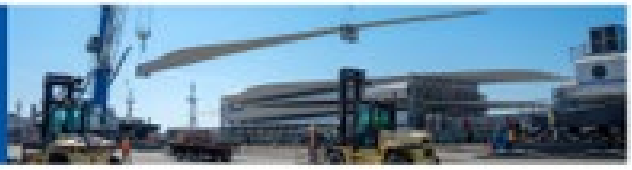
I.A. OVERVIEW

This memo provides detailed documentation of the Benefit-Cost Analysis (BCA) performed to evaluate the public benefits generated by the Port of Vancouver's (Port) Berth 8/9 Extension and Efficiency Improvement Project (the Project). The BCA demonstrates the cost effectiveness of the project for which the project sponsor is seeking Federal support, measured in terms of a benefit-cost ratio (BCR) and net present value (NPV). The Project has independent utility with benefits exceeding cost.

The BCA methodology used in this analysis is consistent with the U.S. Department of Transportation, *Benefit-Cost Analysis Guidance for Discretionary Grant Programs*, December 2023. The detailed cost and benefit assumptions are provided in the BCA Spreadsheet and have been prepared by an independent professional accountant and economist. Exhibit.1.1 describes the Current Status (Baseline), the anticipated changes to the baseline (the Build Scenario), types of impacts, Population Affects, anticipated Societal benefits and references to where the details can be found both in this technical memo as well as to which Tab the calculations can be found in the Excel Spreadsheet.

Exhibit 1: Benefit-Cost Analysis Overview Matrix

BERTH 8/9 EXTENSION AND EFFICIENCY IMPROVEMENTS PROJECT						
Current Status/ Base line (No Build) & Problem to be Addressed	**Change to Baseline/ Alternatives**	**Type of Impacts**	**Population Affected by Impacts**	**Societal Benefit**	**Summary of Results (Mill $2022)**	**Tab in Spreadsheet**
Currently, Wind Energy components destined for the PNW are moved through Corpus Cristi, TX and trucked by to the PNW.	The Port of Vancouver (POV) would like to modernize its Berth 9 facility to support a more direct route to the inland PNW destinations that are installing Wind Energy facilities to support the electrification efforts. The route through the POV will remove VMT off our highways and reduce Travel Time by utilitize a Truck/ Barge routing to reduce operating cost and emissions.	Improved efficiency in freight modal choice by switching freight to Truck/ Barge vs. Truck only	Wind Energy Shippers utilizing POV	Monetized value of reduced operational costs to shippers	Estimated $322.5 million in operational costs savings to shippers	Operational Savings
		Reduced Travel Time of Modal Transportation Operators	Modal Operating Crew	Monetized value of reduced travel time costs	Estimated $8.2 million in travel time value is saved	Time Value Savings
		Reduced road maintenance cost due to the reduction of VMT on highways	Government	Monetized value of reduced road maintenance costs due to reduced VMT	Estimated $1.6 million of Road maintenance savings to the states along the TX route	Road Maintenance
		Reduced potential fatalities on highways	General public	Monetized value of the reduction of potential fatalities on roadways due to reduced VMT	Estimated $2.3 million of reduced fatalities and injuries from reduction of Vehicle Miles Traveled on the roads	Collision Reduction
		Reduced pollutant emissions	Local, state, region and national populations	Monetized value of emission reductions due to reduced trucking	Estimated $4.5 million in reduced emissions utilizing the POV truck/barge route	Emission Savings



I.A.1. NO-BUILD SCENARIO

Under the no-build scenario, Port Breakbulk especially wind energy volume will be constrained to the current level, and additional cargo movements will be at Berth 8/9 due to the current configuration for the facility. The current constraints include:

1. Limited Berth Length

The original Berth 8/9 dock was constructed in the late 1970s on reinforced concrete piling, with a length of 500 feet and nominal width of 170 feet. In the 1980s, the dock was extended 420 feet downstream and 320 feet upstream using concrete piling to increase the total dock length to 1,240 feet. The additional 740 feet on the dock allowed for two vessels to moor simultaneously at Berth 8 and Berth 9.

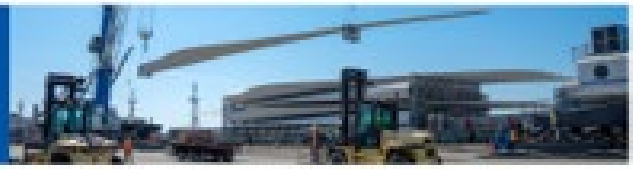
In 2010, the U.S. Army Corp of Engineers completed the Columbia River Channel Improvements Project. The project deepened the Columbia River navigation channel from 40 feet to 43 feet to accommodate the fleet of international bulk cargo and container ships traveling approximately 100 miles from the mouth of the Columbia River at the Pacific Ocean to Vancouver, WA. After project completion, the opening of the channel drew bigger vessels, with more volumes and heavier cargo to the port.

Exhibit 2: Vessel at Berth 7 Encroaching on Berth 8

Source: Google Earth

As cargo vessels continued to increase in size and length, the dock became insufficient in length to accommodate two large bulk carriers at Berth 8 and Berth 9 simultaneously. With the proliferation of these larger cargo vessels, like Handymax (492'-656' in length) and Supramax (650'+ in length), the dock did not have the length to moor two vessels with the minimum 100 feet clearance between the ships. Due to length limitations, Berth 8 and Berth 9 became Berth 8/9, able to accommodate only one large bulk carrier at a time.

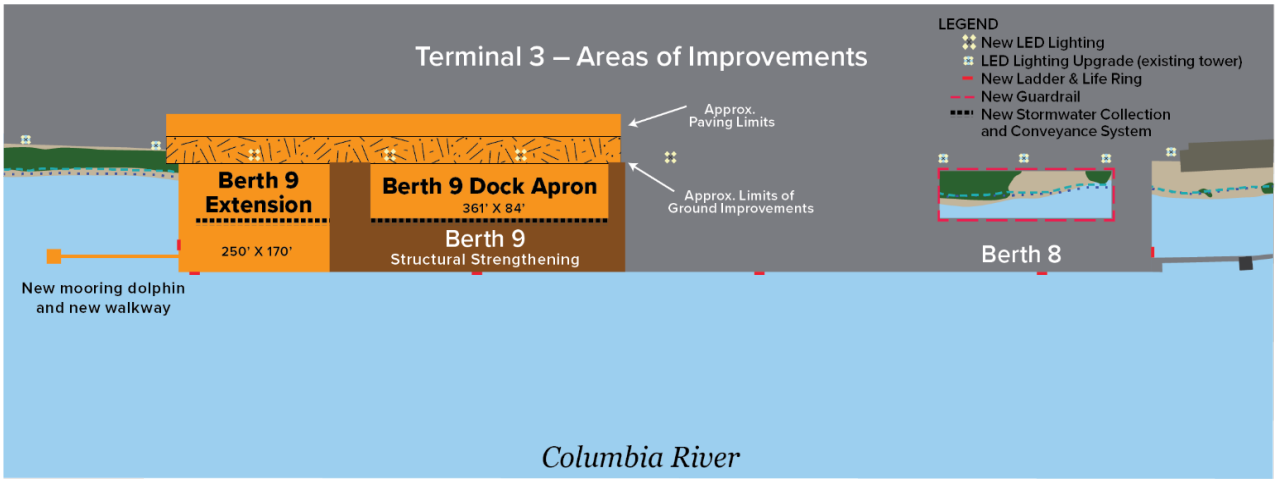
This situation is further compounded by vessels moored at adjacent Berth 7 located at Terminal 2. Berth 7 operations have a fixed loader and require line hauling of vessels to load bulk cargoes into the holds of ships being loaded at Berth 7. When Berth 7 operations require the forward holds to load the



vessel, the line hauls downriver taking up Berth 8 dock space. This encroachment of Berth 7 vessels further limits the available dock space of Berth 8/9.

The Port of Vancouver currently has two docks (8/9 and 3) that accommodate breakbulk and project cargo, and in recent years, Berth 8/9's operations have been limited due to its infrastructure. Breakbulk cargo includes steel and steel slabs, pulp, aluminum, and project cargo such as wind energy components and other non-container cargo, which account for 40% of the port's import cargo volume. In the last five years, when a vessel was moored at Berth 3, nearly half the time (45%) a vessel was moored concurrently at the other breakbulk/project cargo dock, Berth 8/9. If both breakbulk/project cargo berths have vessels loading and unloading, other vessels must wait to unload their goods, resulting in delays, inefficiencies, and an increase in greenhouse gas emissions.

Exhibit 3: Terminal 3 - Areas that Need Improvement

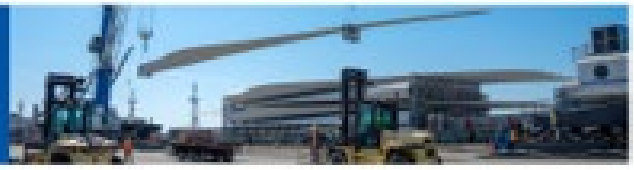


Source: Mott Macdonald

Capacity issues at West Coast ports have been met by a reduction of general cargo berths on the Columbia River, including the neighboring Port of Portland in Oregon. Located across the Port of Vancouver on the Columbia River, the Port of Portland has reduced availability for marine cargo, with one terminal now a dedicated layberth site and another terminal focused on automobiles and containers. In recent years, the Port of Vancouver has seen an increase in steel and steel slab moving through our port instead of Portland, contributing to an increase in non-containerized cargo volume moving through our port.

2. Limited Berth Load Capacity

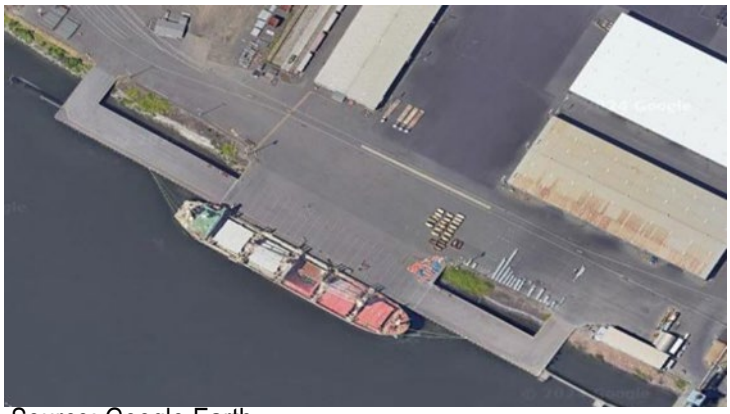
The Berth 8/9 complex was designed as a multipurpose cargo facility to serve the then-current cargo capacities and sizes. Cargo at that time mainly consisted of breakbulk cargo palletized, bundled or otherwise packaged. As mentioned previously, with the deepening of the Columbia River channel, vessel sizes have increased along with the weight, size, and quantity of goods being transported through the port. As cargo has increased in size and weight, so has the equipment used to move it. The current berth design does not accommodate the full capacity of our modern heavy lift equipment.



The demand on our berth facilities is further complicated with limited mooring space, limitations to cargo weight, safety challenges and logistical problems. Specifically, large size cargoes such as wind energy blades and heavy lift cargoes such as steel slabs and wind turbines are not transferred across Berth 8/9, creating efficiency issues for operations confined to Berth 3.

3. Limited Operational Surface Area

Exhibit 4 Open panels on the Berth 8(R)/9(L) dock



Source: Google Earth

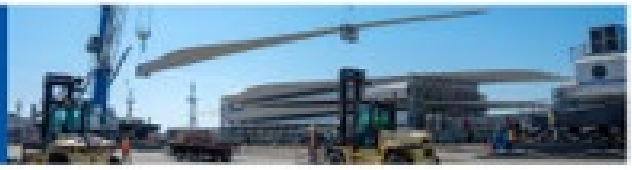
Beyond the limited load capacity, the current dock has two large open panels which create operational challenges. When berth extensions were added in the 1980s, large open panels were in each of the dock extensions as a cost savings measure. While these large open panels limited the operational surface area of the berth, the design was able to serve the small cargo sizes of the day. The port is now seeing breakbulk and project cargos in increased size, weight and sometimes awkwardly shaped; adding the reduced operational surface area due to the open panels compounds the logistical challenges to move these commodities across the dock. Additionally, the openings pose a risk of equipment or personnel falling through them.

4. Vulnerable to Damage from a Large Seismic Event

The dock was originally constructed in the late 1970s and extended in the 1980s, designed to seismic codes at the time of construction. No seismic upgrades have been made, and the dock does not meet current seismic design codes for the Pacific Northwest. In the very likely event of a large earthquake in our region, the dock is extremely vulnerable to damage and/or partial collapse. In fact, the 2019 Washington State Department of Transportation (WSDOT) Regional Resiliency Assessment found that in the event of a large seismic event, the dock would likely be destroyed and collapse into the Columbia River. Dock vulnerability is due to liquefaction and lateral spreading forces induced on the structure during an earthquake caused by the shoreline embankment moving towards the river.

I.A.2. BUILD SCENARIO

The completion of this project, scheduled for 2028, will create significant increases in Economic Competitiveness Benefits, as measured by operating costs saved by shipper Port of Vancouver's truck/barge route and Travel time saved by cargo vehicle transportation operators; State of Good Repair Benefits from savings in road maintenance and preservation costs; Safety Benefits from the prevention of fatalities and injuries resulting in reduced vehicle miles traveled on the roadways; and Emission savings from the reduced fuel usage. The BCA recognizes life-cycle costs of the project as well as the useful life of the assets of the transportation capital improvements remaining at the end of



the 26-year analysis. To be conservative, this analysis assumes that 10% of the addressable/potential Wind Energy Component Market that is currently moving through the Port of Corpus Cristi, can be captured by the Port of Vancouver once this Project is completed and goes into full operation in 2029. Thus, for years 1-5 post construction 10% of the potential volume is assigned to this project's BCA. For years 6-10, it is assumed that the Port of Vancouver can attract 30% of the potential market and by year 11-20 the port will capture 50% of the potential market of the wind energy currently moving to Lewiston, ID from the Gulf of Texas. The Build Scenario addresses the limitations that the current facility has as well as addresses resiliency by strengthening the dock and ensuring the dock extension is designed and constructed to current seismic codes would not only support heavy cargo but also make it more resilient to earthquakes.

Ground stabilization and retaining structures will significantly reduce liquefaction and lateral spreading at the dock. These seismic mitigation improvements would result in a significant reduction of post-earthquake operational downtime.

I.A.3. BCA Model Development

An Excel spreadsheet-based BCA model was developed for the purpose of this analysis. The model utilizes available data provided by the port, project specific data elements, and nationally accepted parameters. Many of the national parameters were provided by the United States Department of Transportation (USDOT) specifically for the purposes of Discretionary Grant applications such as INFRA, RAISE and PIDP.

I.A.4. Components of the Project

USDOT Guidance recommends that a Project Sponsor prepare a BCA for each component of the Project that has independent utility. For this project, the port does not consider the smaller components to have independent utility in respect to the ability to import and discharge wind energy components through Berth 8/9.

The Port of Vancouver is expanding berth and terminal capacity at berth 8/9 of terminal 3 to accommodate growth of dry bulk and breakbulk cargoes.

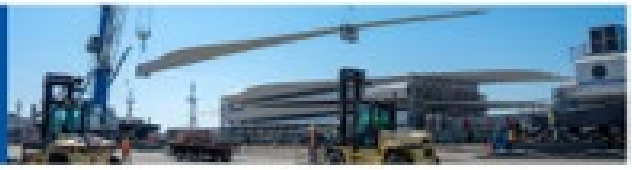
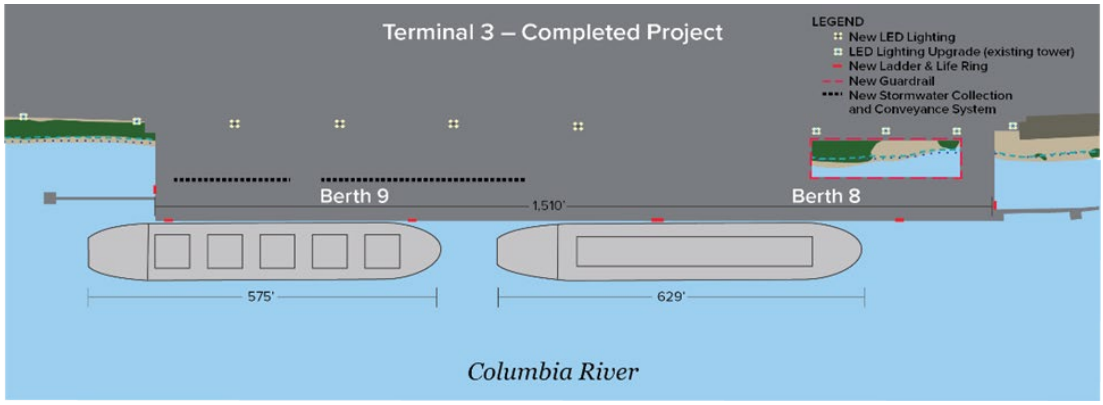
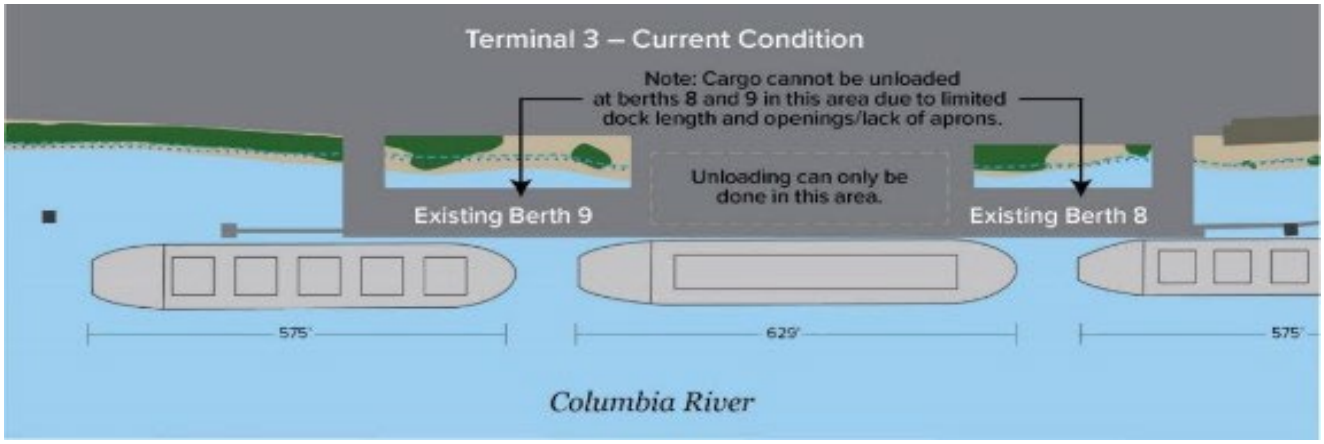


Exhibit 5: Berth 8/9 Extension and Efficiency Improvement Project at Terminal 3



Source: Mott Macdonald

Exhibit 6: Current Condition of Terminal 3

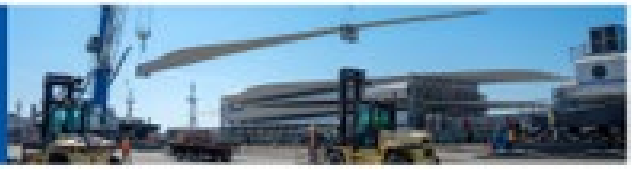


Source: Mott Macdonald

As can be seen in the exhibits above, the extension of berth 8/9 and the efficiency improvements when completed will provide the port and its customers with a modernized berth and terminal area that will be able to unload and load cargo efficiently, while providing terminal area behind the dock that is safe and is configured to match current and future cargo demands.

PROJECT COMPONENTS OF THIS MULTIMODAL PORT IMPROVEMENT INCLUDE:

- A 250-lineal-foot extension will be added to the Berth 8/9 dock, creating two fully operational and independent berths — Berth 8 and Berth 9. After project completion, the two berths at the dock will have the length to moor two modern-sized vessels simultaneously, allowing for more vessels and increased volumes of breakbulk commodities moving through the port.
- Along with the extension, a dock apron (infill) will be added to the large open panel behind Berth 9. The open panel measures at 361 feet by 84 feet (or 30,324 square feet) and impacts the structural integrity, operational efficiency, and safety of dock. Both the 250-foot extension



and Berth 9 dock apron (infill) will be installed with a 1,000 PSF capacity, stronger than berth 8/9's current 750 PSF capacity. The higher PSF capacity dock apron and extension will allow heavy breakbulk and project cargo, and the equipment needed to transport it, to move across the dock. Currently high and heavy cargo, like the wind towers and blades, which can reach up to 295 feet, must use Berth 3 due to the weight of the cargo being too heavy to move on the Berth 8/9 dock.

- In addition to the extension and apron construction, the existing Berth 9 dock will be structurally strengthened to also allow heavy breakbulk and project cargo, and the equipment needed to transport it, to move across the existing dock.
- The construction of a dock apron behind Berth 9 will increase operational efficiencies of cargo movement on the dock, increasing the surface area cargo, equipment, and workers can utilize on the dock. Closing the open panel will also eliminate the risk of longshore workers and equipment falling through the open panel. A guardrail around the Berth 8 open panel and a bull rail around the dock extension will be installed as part of this project, further enhancing safety for the longshore workers and overall efficiency at the dock. Lastly, the dock extension and dock apron will increase the strength of the Berth 8/9 dock, improving the overall resilience of the dock in the event of an earthquake. Ground stabilization performed as part of the project will reduce the dock's vulnerability due to seismic activity.
- The Berth 8/9 Extension and Efficiency Improvements Project will increase berthing space, structural capacity, operational efficiencies, and resiliency to bring more volume of breakbulk and project cargo to the Port of Vancouver.

I.A.5. Organization of the BCA Memorandum

Section II describes the inputs and results of each of the Benefit components of the BCA model. The project specific inputs include items such as freight forecasts, project capital and operating costs, life-cycle costs, annual benefits, residual value of the project's assets at the end of this analysis. National modeling parameters include emission rates, crash rates, unit operating costs, values of time, average trip lengths, fuel efficiency and monetization factors for all classes of benefits. This section also displays the results of each benefit and cost category.

Section III describes the capital cost components of the BCA model.

Section IV summaries the results of the BCA and the resulting BCA ratio.

I.B. BCA SUMMARY

The results of the BCA analysis indicate a positive Benefit-Cost Ratio. As shown in **Exhibit 7**, **the BCA ratio at a 3.1% discount rate for non CO_2 benefits and costs /2% discount rate for CO_2 benefits is 3.04.**

Exhibit 7: BCA Results (20-year analysis)

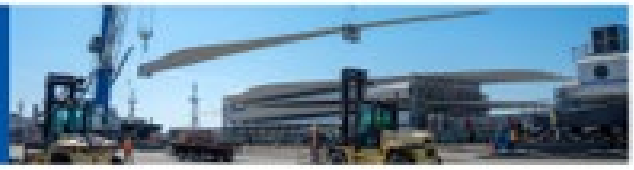
Benefit Cost Analysis Summary				
Long-term Outcomes	**Social Benefit**	**Inputs**	**Value**	**Monetized Value Discount Rate 3.1%/2.0%**
Quality of Life	Fuel savings due to reduced miles traveled by cargo using Truck/ Barge at POV vs. Truck only from TX	Gallons of fuel saved	7.8 million gallons of fuel saved by reducing miles traveled with modal shift to POV truck/ barge route	Cost Savings included in Op. Cost
Economic Competiveness	Operational Cost Savings	Savings of POV Truck/ Barge routing vs. Truck only from TX	1790 million ton-miles saved by using POV and truck/ barge routing, reducing the shipper's costs	$ 198,760,246
Mobility	Travel Time Savings	Savings of POV Truck/ Barge routing vs. Truck only from TX	The efficiency of POV Truck/Barge versus a Truck only route saves 262,615 hours of travel time	$ 4,638,625
Safety	Reduced fatalities from reduction of Truck VMT	Reduction of Collison costs on Roads	Savings of 0.18 lives	$ 1,282,738
State of Good Repair	Reduction of maintenance on Roads & Hwys, Consistent with State and Regional Plans	Maintenance, preservation and upgrade savings of Highways	13.4 million VMT reduced off the highways	$ 912,169
Environmental Sustainability	Environmental Benefits from Reduced Emissions by modal change to barge	CO_2 and other Pollutant cost savings	78,592 MT of CO2 saved with POV Truck / Barge services	$ 3,032,654
Total Public Benefits				$ 208,626,431
Less Life-Cycle Costs				$ (8,441,540)
Plus Residual				$ 12,811,492
Total Benefits				$ 212,996,384
Total Cost				($70,050,311)
Net Present Value				**$ 142,946,072**
Benefit to Cost Ratio				**3.04**

RESULTS WITH COMPLETION OF THE BUILD SCENARIO

Exhibit 8: Total Annual Benefits and Costs

Cost Benefit Summary

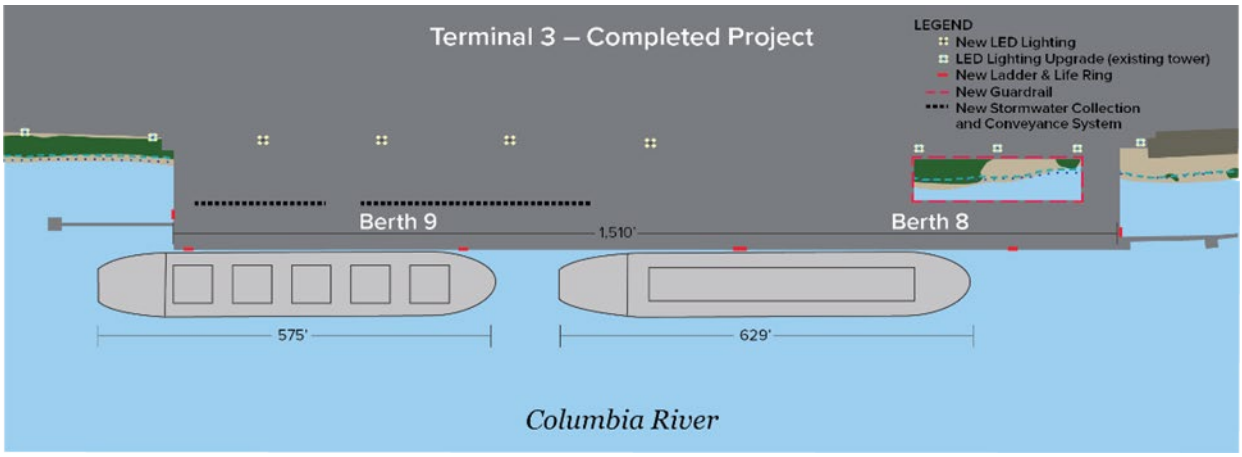
Year	Calendar Year	Non-CO2 Benefits	Maintenance	Residual	Total Non-CO2 Benefits	CO2 Benefits	Total Benefits	Non-CO2 Benefits 3.1% Disc.	CO2 Benefits 2.0% Disc	Total Social Benefits Disc 3.1%/ 2.0%	Maintenance 3.1% Disc.	Residual 3.1% Disc.	Total Benefits Disc 3.1%/ 2.0%	Costs ($2022)	3.1% NPV Costs	Net Benefits ($2022) (H+O)	3.1% /2.0% NPV Net Benefits
	2022													$0		$0	$0
1	2023													$ (1,013,056)	($982,595)	($1,013,056)	($982,595)
2	2024													$ (1,061,260)	($998,400)	($1,061,260)	($998,400)
3	2025													$ (625,790)	($571,022)	($625,790)	($571,022)
4	2026													$ (11,915,628)	($10,545,867)	($11,915,628)	($10,545,867)
5	2027													$ (23,831,256)	($20,457,549)	($23,831,256)	($20,457,549)
6	2028													$ (43,831,256)	($36,494,879)	($43,831,256)	($36,494,879)
7	2029	$16,921,693	($687,782)		$16,233,911	$57,465	$16,291,376	$13,665,740	$50,027	$13,715,767	($555,444)	$0	$13,160,323		$0	$16,291,376	$13,160,323
8	2030	$16,921,690	($687,782)		$16,233,907	$57,461	$16,291,368	$13,254,837	$49,042	$13,303,880	($538,743)	$0	$12,765,137		$0	$16,291,368	$12,765,137
9	2031	$16,921,690	($687,782)		$16,233,907	$57,456	$16,291,363	$12,856,292	$48,076	$12,904,369	($522,544)	$0	$12,381,824		$0	$16,291,363	$12,381,824
10	2032	$16,921,690	($687,782)		$16,233,907	$57,452	$16,291,360	$12,469,731	$47,131	$12,516,862	($506,832)	$0	$12,010,029		$0	$16,291,360	$12,010,029
11	2033	$16,921,690	($687,782)		$16,233,907	$57,447	$16,291,354	$12,094,792	$46,203	$12,140,995	($491,593)	$0	$11,649,402		$0	$16,291,354	$11,649,402
12	2034	$16,787,368	($687,782)		$16,099,585	$172,474	$16,272,060	$11,638,007	$135,995	$11,774,002	($476,812)	$0	$11,297,190		$0	$16,272,060	$11,297,190
13	2035	$16,787,368	($687,782)		$16,099,585	$172,463	$16,272,049	$11,288,077	$133,320	$11,421,397	($462,475)	$0	$10,958,922		$0	$16,272,049	$10,958,922
14	2036	$16,787,368	($687,782)		$16,099,585	$172,453	$16,272,038	$10,948,668	$130,698	$11,079,366	($448,570)	$0	$10,630,796		$0	$16,272,038	$10,630,796
15	2037	$16,787,368	($687,782)		$16,099,585	$172,440	$16,272,025	$10,619,465	$128,125	$10,747,590	($435,082)	$0	$10,312,508		$0	$16,272,025	$10,312,508
16	2038	$16,787,368	($687,782)		$16,099,585	$172,432	$16,272,017	$10,300,160	$125,607	$10,425,767	($422,000)	$0	$10,003,767		$0	$16,272,017	$10,003,767
17	2039	$16,653,046	($687,782)		$15,965,264	$287,420	$16,252,684	$9,910,518	$205,265	$10,115,783	($409,311)	$0	$9,706,472		$0	$16,252,684	$9,706,472
18	2040	$16,653,046	($687,782)		$15,965,264	$287,399	$16,252,663	$9,612,530	$201,225	$9,813,755	($397,004)	$0	$9,416,751		$0	$16,252,663	$9,416,751
19	2041	$16,653,046	($687,782)		$15,965,264	$287,382	$16,252,646	$9,323,501	$197,268	$9,520,769	($385,067)	$0	$9,135,702		$0	$16,252,646	$9,135,702
20	2042	$16,653,046	($687,782)		$15,965,264	$287,361	$16,252,625	$9,043,163	$193,386	$9,236,549	($373,489)	$0	$8,863,060		$0	$16,252,625	$8,863,060
21	2043	$16,653,046	($687,782)		$15,965,264	$287,344	$16,252,608	$8,771,255	$189,583	$8,960,837	($362,259)	$0	$8,598,578		$0	$16,252,608	$8,598,578
22	2044	$16,653,046	($687,782)		$15,965,264	$287,323	$16,252,586	$8,507,521	$185,852	$8,693,373	($351,367)	$0	$8,342,006		$0	$16,252,586	$8,342,006
23	2045	$16,653,046	($687,782)		$15,965,264	$287,306	$16,252,569	$8,251,718	$182,197	$8,433,915	($340,802)	$0	$8,093,113		$0	$16,252,569	$8,093,113
24	2046	$16,653,046	($687,782)		$15,965,264	$287,284	$16,252,548	$8,003,606	$178,611	$8,182,217	($330,555)	$0	$7,851,663		$0	$16,252,548	$7,851,663
25	2047	$16,653,046	($687,782)		$15,965,264	$287,263	$16,252,527	$7,762,955	$175,096	$7,938,050	($320,615)	$0	$7,617,435		$0	$16,252,527	$7,617,435
26	2048	$16,653,046	($687,782)	$28,335,118	$44,300,381	$287,242	$44,587,623	$7,529,539	$171,650	$7,701,189	($310,975)	$12,811,492	$20,201,706		$0	$44,587,623	$20,201,706
		$335,075,753	($13,755,649)	$28,335,118	$349,655,221	$4,022,867	$353,678,088	$205,852,077	$2,774,354	$208,626,431	($8,441,540)	$12,811,492	$212,996,384	($82,278,246)	($70,050,311)	$271,399,842	$142,946,072



Section II. PROJECT DESCRIPTION

The Port of Vancouver Berth 8/9 Extension and Efficiency Improvement Project

Exhibit 9: Schematic of Project



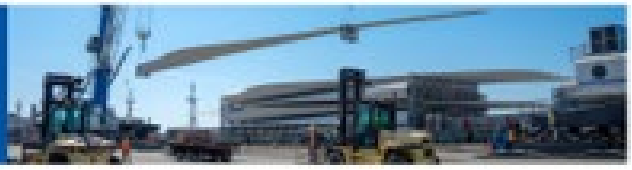
Source: Mott Macdonald

Several years ago, the port identified the Berth 8/9 Extension and Efficiency Improvement project as a needed infrastructure investment. In 2019, the port added the Berth 8/9 project in the port Terminal Rehabilitation and Improvement Program (TRIP), part of the port comprehensive development and improvement scheme. Early design work started in 2019 but was suspended during COVID so the port could focus its efforts on reducing supply chain issues. In 2023, the project was reinstated with permitting underway and 30% design reached that April. In the last year, the project has continued to advance and is currently at 90% design, with 100% design anticipated within the year.

The Berth 8/9 project will include the following construction elements:

Dock Extension
The port will extend Berth 9 downstream by 250 lineal feet. With a current dock width of 170 feet, the proposed increase in usable area is approximately 42,500 square feet (SF). Like the existing dock, the new dock extension includes plumb steel piling with a reinforced concrete superstructure. An asphaltic concrete wearing course will be placed over the concrete as a protective layer. Potable water and storm drainage piping and appurtenances will be integrated within the dock extension footprint.

Dock Apron (Infill)
A dock apron will be added to the open panel behind Berth 9, completing and closing that section of the dock. The size of this panel is approximately 84 feet by 361 feet, yielding a net increase of usable and safer dock space of 30,324 SF. The Berth 9 apron will improve cargo operations and create new



travel corridors for equipment, resulting in substantial operational efficiency and safety improvements for Berths 8 and 9. A guardrail will be installed for safety over the Berth 8 open panel with a dock apron installation planned in a future Phase 2.

Ground Stabilization

Ground liquefaction and lateral spreading resulting from an earthquake is a significant concern at the Port of Vancouver. Ground improvements will be part of this project, added upland and riverward of the dock extension and the Berth 9 apron to mitigate liquefaction and the subsequent lateral spreading of the shoreline embankment. Ground stabilization will improve the subsurface soils around the Berth 9 portion of the dock, reducing ground deformations to improve resilience during seismic events. Several ground-improvement strategies were investigated, and preliminary engineering analysis indicates that the most effective ground improvement solution for this project will be a deep soil mixing (DSM) buttress. Additional geotechnical investigation will be conducted during project design to confirm and finalize the optimal DSM ground stabilization layout and performance criteria.

The deep soil mixing process forms columns of cemented material in the ground by mechanically mixing the in-situ soil with an introduced binder agent such as cement or lime. By forming a DSM buttress with grids or lines of soil mix columns, the improved ground will have increased strength and stiffness and has more uniform load/settlement response properties needed to resist ground deformations during an earthquake event. Additionally, a sheet pile cut-off wall will be installed, which will be braced at its top by a cast-in-place (CIP) concrete beam connected to the dock structure. These improvements will enhance reliability and resiliency of the port during and after an earthquake event. The ground stabilization will take place at Berth 9, but enhancements will strengthen the reliance of the entire dock, including the Berth 8 section. Overall, it will reduce the risk of significant damage or catastrophic failure, such as collapse of the dock.

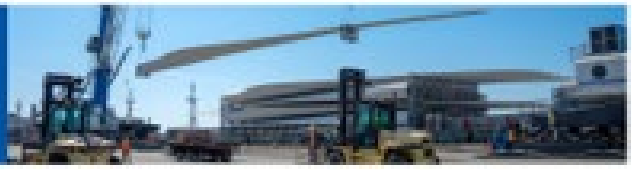
The design life for improvements is 50 years of service but is expected to last longer due to the mild atmospheric environment. Maintenance costs for the facility will be minimized by using durable materials such as coated steel piling and reinforced concrete.

Dock Strengthening

The existing Berth 9 dock is not structurally adequate to support the heavier cargo and equipment To address this deficiency, the port will implement structural strengthening measures to the existing Berth 9 dock. The structural strengthening will include the application of fiber reinforced polymer (FRP) layers to the underside of the existing concrete deck panels and pile caps that support the make up the deck structure. The FRP layers are saturated with epoxy resins and bonded to the underside of the existing concrete elements to provide additional tensile strength where needed.

Additional Mooring Dolphin

The current mooring dolphin will be removed, and a new dolphin will be constructed to serve the extended dock. This dolphin will have the capacity to support vessels that call on the facility and will be constructed of battered steel piling with a concrete cap creating an overall configuration function as an



integrated structural system. A mooring bollard will be affixed to the pile cap for connection of ship lines and an access walkway will extend from the proposed extension to the mooring dolphin.

Planning for Climate Change and Sustainability

The port is committed to environmental stewardship, and this value is integrated throughout the organization in our projects, policies, and programs. The port has a five-person Environmental team whose efforts are focused on making improvements to protect and preserve the air, land, and water at the port and surrounding neighborhoods. Through our Climate Action Plan, the port worked with the community to create a strategy for enhancing our environmental reach. The Climate Action Plan includes port electrification efforts as an important element to decarbonization, and through this project we will undertake the following:

Conduit for Shore Power

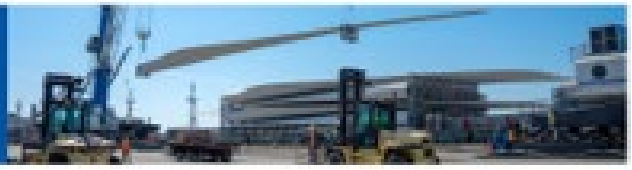
The ultimate goal for the Port of Vancouver is to provide shore power for all freight vessels dwelling at the port for more than 18 hours. However, electrical plug-in connections on freight ships, especially with the Handymax- and Panamax-sized vessels that come to our port, have yet to be standardized. We are hopeful that the maritime industry will work together to standardize vessel-side electrical systems and to enable shore power at most port facilities in the United States. As part of this PIDP funding request, conduit, pads and vaults for future shore power will be installed. A shore power feasibility study performed in 2023 is being used to advance shore power efforts at Berth 8/9 and throughout the port.

Electric Equipment and Vehicle Charging

Our stevedores and longshore workers expressed an interest in starting the conversion from diesel to electric vehicles and equipment. As part of the Berth 8/9 project, we will install a charging station for electric vehicles at Berth 8/9. This charging station can be used by port vehicles, as well as those belonging to stevedores and longshore teams. Beyond this project, the port is actively advancing its electrification plans, adding more electric vehicles and equipment to its fleet to replace older, higher greenhouse gases emitting equipment. The port has identified the area behind Berth 8/9 as a possible location for electric equipment charging infrastructure.

Stormwater Management

The Pacific Northwest has strict permit limits for zinc and copper in stormwater discharges. These contaminants are known to cause harm to anadromous fish, and therefore, reduction of these concentrations is extremely important. A diversion structure and a subsurface vault will be installed as part of this project, allowing for a pretreatment facility for Berth 8/9 stormwater runoff to be installed in the future if needed. Currently, the types of cargo using the dock do not need additional pretreatment filtering of the berth stormwater. However, if new cargo comes that would benefit from additional treatment, the newly installed stormwater diversion structure will allow the port to expand our treatment facilities. Potentially harmful contaminates will be removed as a precautionary measure, before the stormwater moves into the existing Terminal 4 Regional Stormwater Treatment Facility for further treatment.



Safety Improvements

Safety improvements include installation of dock apron (infill) at Berth 9, installation of a guardrail around the Berth 8 open panel, upgrade of site lighting systems and adding a dock bull rail on the dock extension. A curb-like structure at the waterside perimeter of the dock, the bull rail will prevent accidental entry of personnel and equipment into the Columbia River.

New high-mast lighting will be added to the dock extension and current site lighting will be upgraded to provide five foot-candle illumination levels in the work area. The new system will utilize LED fixtures, and where possible, existing incandescent and metal halide systems will be replaced. LED lighting will be directed at the work areas and shielded to reduce light pollution impacts to wildlife in the adjacent areas such as the river or night sky.

Section III. PROJECT BENEFITS

This section describes the key assumptions and results of each of the anticipated project benefit category. Each Category describes the calculation of the benefit, displays the anticipated annual project benefits associated with the no-build and build scenarios.

III.A. SUMMARY OF DETAILED BENEFITS

Exhibit 10: Detailed Benefits by year

Detailed Benefits								
Year	Calendar Year	Savings in operational cost of switching to Truck/Barge from Truck only	Travel Time Savings	Highway maintenance cost savings using barge/truck or barge only vs truck only	Reduced severity of accidents due to VMT reduction	Reduced Non-CO_2 Pollutant Emissions	Reduced CO_2 Pollutant Emissions	Total Benefits
	2022							
1	2023							
2	2024							
3	2025							
4	2026							
5	2027							
6	2028							
7	2029	$16,745,173	$114,656	$23,017	$32,367	$ 6,480	$ 57,465	$16,921,693
8	2030	$16,745,173	$114,656	$23,017	$32,367	$ 6,477	$ 57,461	$16,921,690
9	2031	$16,745,173	$114,656	$23,017	$32,367	$ 6,477	$ 57,456	$16,921,690
10	2032	$16,745,173	$114,656	$23,017	$32,367	$ 6,477	$ 57,452	$16,921,690
11	2033	$16,745,173	$114,656	$23,017	$32,367	$ 6,477	$ 57,447	$16,921,690
12	2034	$16,250,772	$350,895	$69,050	$97,102	$ 19,549	$ 172,474	$16,787,368
13	2035	$16,250,772	$350,895	$69,050	$97,102	$ 19,549	$ 172,463	$16,787,368
14	2036	$16,250,772	$350,895	$69,050	$97,102	$ 19,549	$ 172,453	$16,787,368
15	2037	$16,250,772	$350,895	$69,050	$97,102	$ 19,549	$ 172,440	$16,787,368
16	2038	$16,250,772	$350,895	$69,050	$97,102	$ 19,549	$ 172,432	$16,787,368
17	2039	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,420	$16,653,046
18	2040	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,399	$16,653,046
19	2041	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,382	$16,653,046
20	2042	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,361	$16,653,046
21	2043	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,344	$16,653,046
22	2044	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,323	$16,653,046
23	2045	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,306	$16,653,046
24	2046	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,284	$16,653,046
25	2047	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,263	$16,653,046
26	2048	$15,756,371	$587,133	$115,084	$161,837	$ 32,621	$ 287,242	$16,653,046
		$322,543,436	$8,199,085	$1,611,177	$2,265,718	$456,337	$4,022,867	$335,075,753

To be conservative, the Benefits summarized in Exhibit 10 are based upon 10% of a potential incremental tonnage in years 1-5 that the port has identified as the potential catchment market for wind energy components destined for the Pacific Northwest. This percentage is anticipated to grow to 30% of today's potential market by year 6 for year 6-10 and increase to 50% for year 11-20. This recognizes the Rule of Half as referenced in the USDOT BCA Guidance. The port anticipates total

cargo growth starting 2029 after the completion of the Project will attract from Texas a total of 7,644 units of Wind Components destined for Lewiston, ID and beyond. To not overstate future benefits, no growth from today's level of potential volume has been assumed for this analysis. Further, the port's engineers estimate that the annual wind component volume along with other projected cargo volume is less than 60% of the terminal's capacity.

Exhibit 11: Percent of Volume Assumptions Attracted from Texas to Port of Vancouver from Addressable Market by Year

Assumptions on conversion from TX to POV	
year 1-5	10%
year 6-10	30%
year 11-20	50%

Exhibit 12: Current Addressable Market in Units Destined for Lewiston, ID

	Wind Movements in Units		Existing POV Wind Movements in Units	Existing POV Wind Movements in Units	Total Addressable Market in Units
Calendar Year	All Truck From Corpus Christi		Water, From POV	Truck, From POV to Pt. Morrow/Lewiston	
2029	1,092		142	950	2,184
2030	1,092		142	950	2,184
2031	1,092		142	950	2,184
2032	1,092		142	950	2,184
2033	1,092		142	950	2,184
2034	1,092		142	950	2,184
2035	1,092		142	950	2,184
2036	1,092		142	950	2,184
2037	1,092		142	950	2,184
2038	1,092		142	950	2,184
2039	1,092		142	950	2,184
2040	1,092		142	950	2,184
2041	1,092		142	950	2,184
2042	1,092		142	950	2,184
2043	1,092		142	950	2,184
2044	1,092		142	950	2,184
2045	1,092		142	950	2,184
2046	1,092		142	950	2,184
2047	1,092		142	950	2,184

Currently, there are 1,092 Wind Movements from Corpus Christi to Lewiston, ID by truck. In addition, the Port of Vancouver (POV) moves 142 movements by water (barge) to Lewiston and 950 movements of wind components by truck to Lewiston. All three movements total 2,184 units per year. The analysis does not grow the market size into the future to be conservative. It assumes that based on historical data, approximately 13% of the components will be transported by barge of the units that POV attracts for the POV to Lewiston route.

Exhibit 13: Total Attraction by Year to POV routing, and Net change over 20-years post construction

Year #	Year	No Build Total Movement (in Units)				Build Total Movements (in Units)				Change (in Units)			
		Texas No Build	POV Barge No Build	POV Trucks - No Build	Total No Build (in Units)	Texas Build in units	POV Build Barges Units	POV Build - Trucks in units	Total Units	Texas Build in units	POV Build Barges Units	POV Build - Trucks in units	Net Change Total Units
	2022												
	2023												
	2024												
	2025												
	2026												
	2027												
	2028												
Facility opens	2029	1092	142	950	2184	983	156	1045	2184	-109	14	95	0
	2030	1092	142	950	2184	983	156	1045	2184	-109	14	95	0
	2031	1092	142	950	2184	983	156	1045	2184	-109	14	95	0
	2032	1092	142	950	2184	983	156	1045	2184	-109	14	95	0
	2033	1092	142	950	2184	983	156	1045	2184	-109	14	95	0
	2034	1092	142	950	2184	764	185	1235	2184	-328	43	285	0
	2035	1092	142	950	2184	764	185	1235	2184	-328	43	285	0
	2036	1092	142	950	2184	764	185	1235	2184	-328	43	285	0
	2037	1092	142	950	2184	764	185	1235	2184	-328	43	285	0
	2038	1092	142	950	2184	764	185	1235	2184	-328	43	285	0
	2039	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2040	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2041	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2042	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2043	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2044	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2045	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2046	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2047	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
	2048	1092	142	950	2184	546	213	1425	2184	-546	71	475	0
		21840	**2840**	**19000**	**43680**	**14196**	**3834**	**25650**	**43680**	**-7644**	**994**	**6650**	**0**

The Exhibit 13 above displays the net change by year of the total number of units by mode by route. There currently are a total of 43,680 units of wind components moving to Lewiston, ID from either Texas by truck or from POV by barge or truck.

It is estimated that over the 20-year analysis period that under the No-Build Scenario, Texas will move 21,840 by truck to Lewiston, POV will handle 2,840 units by barge and 19,000 by truck to Lewiston. Under the Build Scenario, Texas will lose 109 units per year for the first 5 years, of which 14 units will move by barge from POV and 95 units will move by truck to Lewiston. From years 6-10, there will be a total of 328 units diverted from Texas to POV. Once at POV, 43 units will move by barge and 285 units will move by truck to Lewiston. For the final 10 years of the analysis, A total of 546 units will be attracted per year from Texas to POV. Once arriving at POV, Of the 546 units attracted, 71 of the units each year will be moved by barge and 475 units will be transported by truck to Lewiston. As noted, there is no anticipated growth in the potential market to keep the analysis conservative on the potential cargo volumes attracted to POV upon the completion of this Project.

The Benefits of the completion of this project have been divided into five societal benefits describe below: Economic-Operating Cost savings; Mobility-Travel Time Saved by the Mode Operator; State of Good Repair-Road Maintenance and Preservation Savings; Safety-Prevention of Fatalities and Injuries; and Emission Savings.

III.A.1. Operating Cost Savings

Operating cost savings is calculated by estimating the operating cost savings achieved by shipper when this project is completed. The assumptions above of the Attainable Market and the conservative percent that the Port of Vancouver will attract from trucking from the Port of Corpus Cristi to Lewiston, ID to the Port of Vancouver by a combination of truck and barge from the Port of Vancouver to Lewiston, ID. The volume is in number of units converted to either truck moves or barges for comparison. Thus, attainable or potential market for the volume that is currently trucked from Texas is 1,092 units per year. This number of units estimated for the potential market remains flat for the 20-year analysis period post-construction. As can be seen from the routes displayed on maps, and assumptions below. It is estimated that the current truck route from Texas to Lewiston is 2054 miles, the route from POV to Lewiston by road is 342 miles and by barge 360 miles.

Exhibit 14: Map of Route Port of Corpus Cristi, TX to Lewiston, ID

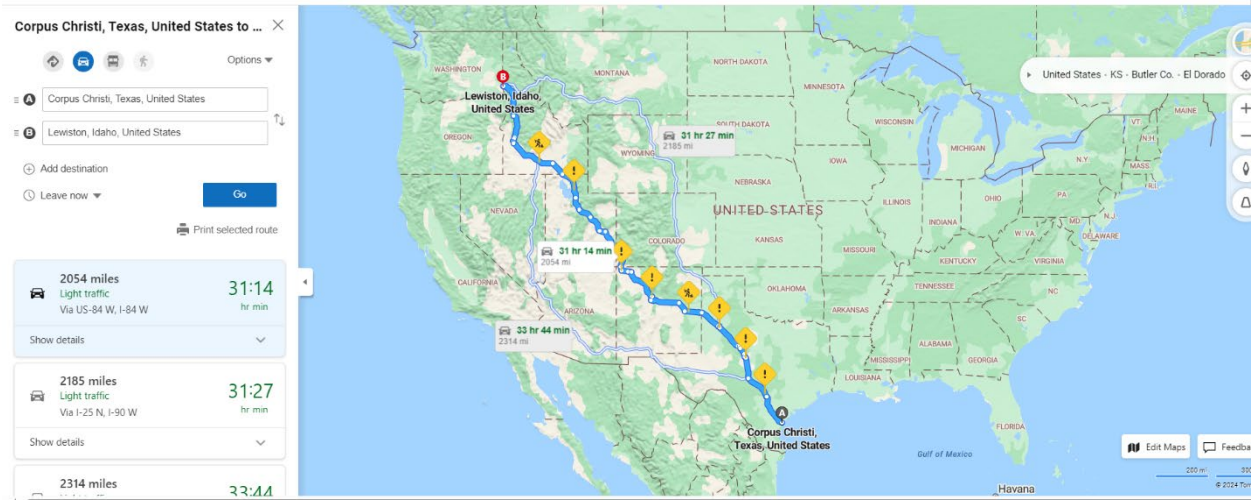


Exhibit 15: Map of Route from Port of Vancouver to Lewiston, ID

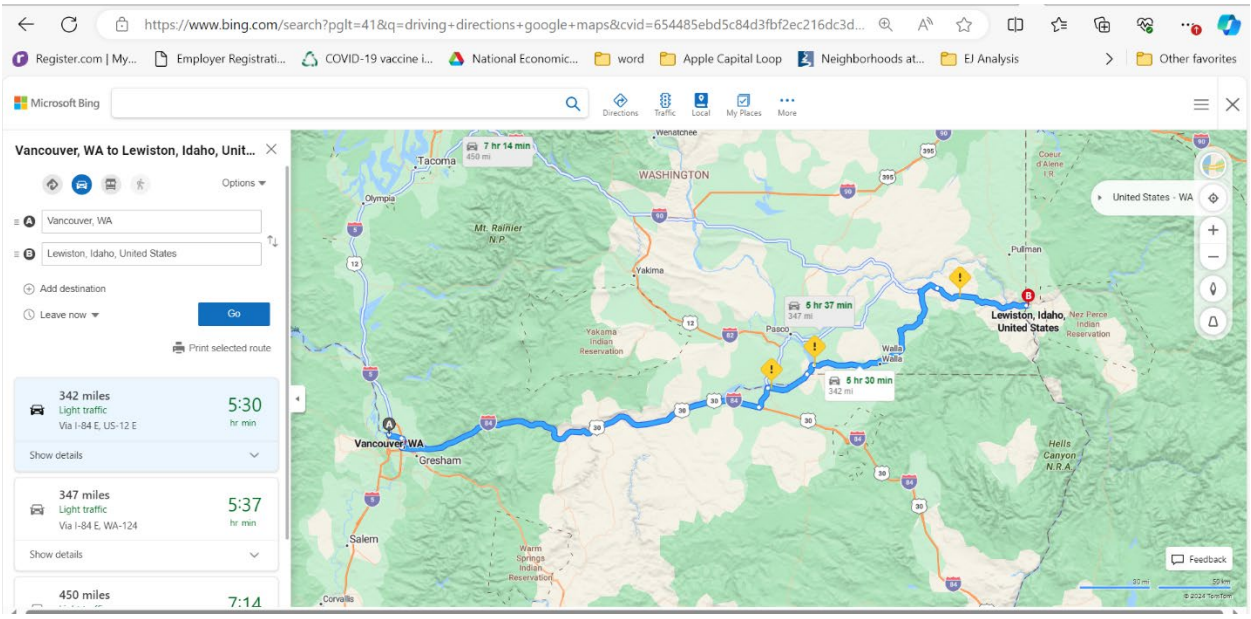


Exhibit 16:Assumptions used in calculating operational cost savings

Assumption	Value		Unit	Source:
Shipping Cost Truck	$	0.1894	per ton mile	US DOT National Transportation Statistics Average Freight Revenue per Ton Mile
Shipping Cost Barge	$	0.0200	per ton mile	
Tons per Truck	$	40	tons per truck	
Distances	Road	Barge		
No-Build	2054	-	miles	Port of Vancouver, WA
Build	342	360	miles	

		Barges		Total Additional Units	Vessels	
Volume		Per Month	Per Year	Per Year	Per Year	
Year 1-5		0.167	2	95		Port of Vancouver, WA
Year 6-10		0.417	5	285		
Year 11-20		0.67	8	475		

Exhibit 17: Calculations of Savings from route change

Savings from modal change from Truck to Barge/Truck Transportation

		Net No-Build Truck only miles TX to Lewiston, ID								Build Remaining Truck only miles TX to Lewiston, ID				
Year #	Year	Total Movements moving to Lewiston, ID	# Trucks	Tons/ truck	Total Trucks @40 MT/ Truck	Travel distance in Miles / truck	Total Truck Miles	Total Truck Ton miles	Total Gallons of Truck Fuel used	Total Movements moving to Lewiston, ID	# Trucks	Total Truck Miles	Total Truck ton miles	Total Gallons of fuel used by Truck
				40	+D	2,054	"+G*+H	Total tons * miles	"+I/ 6.2					
									6.2			2054	40	6.2
	2022						-	-	-					
	2023				-		-	-	-					
	2024				-		-	-	-					
	2025				-		-	-	-					
	2026				-		-	-	-					
	2027				-		-	-	-					
	2028				-		-	-	-					
Facility opens	2029	1,092	1,092		1,092		2,242,968	89,718,720	361,769	983	983	2,018,671	80,746,848	325,592
	2030	1,092	1,092		1,092		2,242,968	89,718,720	361,769	983	983	2,018,671	80,746,848	325,592
	2031	1,092	1,092		1,092		2,242,968	89,718,720	361,769	983	983	2,018,671	80,746,848	325,592
	2032	1,092	1,092		1,092		2,242,968	89,718,720	361,769	983	983	2,018,671	80,746,848	325,592
	2033	1,092	1,092		1,092		2,242,968	89,718,720	361,769	983	983	2,018,671	80,746,848	325,592
	2034	1,092	1,092		1,092		2,242,968	89,718,720	361,769	764	764	1,570,078	62,803,104	253,238
	2035	1,092	1,092		1,092		2,242,968	89,718,720	361,769	764	764	1,570,078	62,803,104	253,238
	2036	1,092	1,092		1,092		2,242,968	89,718,720	361,769	764	764	1,570,078	62,803,104	253,238
	2037	1,092	1,092		1,092		2,242,968	89,718,720	361,769	764	764	1,570,078	62,803,104	253,238
	2038	1,092	1,092		1,092		2,242,968	89,718,720	361,769	764	764	1,570,078	62,803,104	253,238
	2039	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2040	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2041	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2042	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2043	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2044	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2045	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2046	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2047	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
	2048	1,092	1,092		1,092		2,242,968	89,718,720	361,769	546	546	1,121,484	44,859,360	180,885
		21,840			21,840		44,859,360	1,794,374,400	7,235,381	14,196	14,196	29,158,584	##########	4,702,997

These calculations can be found on the “BB to Lewiston” Tab. It calculates the data on number of truck or barge by route. The respective total miles, tons miles and total gallons of fuel by mode as input into the Operations Cost tab.

Exhibit 17: Calculations of Savings from route change- continued

Build Increased Truck Miles POV to Lewiston, ID					Build Increase in Barge Miles POV to Lewiston, ID							Change due to use of Truck/Barge from POV vs Truck only from TX to Lewiston, ID
Total Movements moving POV to Lewiston, ID	# Trucks	Total Truck Miles	Total Truck ton miles	Total Gallons of fuel used by Truck	# barges	Total Barge Miles	Total Barge ton miles	Total Gallons of fuel used by Barge	Savings (Reduction) in miles	Savings (Reduction) in Ton miles	Net Reduction in gallons of fuel used Truck only vs Barge/Truck
						=+S*T	=Z*W	+V/675			
		342	40	6.2		360	97.8	675			
					-						
					-						
					-						
					-						
					-						
					-						
					-						
95	95	32,490	1,299,600	5,240	2.0	720	70,416	104	191,087	7,601,856	30,832
95	95	32,490	1,299,600	5,240	2.0	720	70,416	104	191,087	7,601,856	30,832
95	95	32,490	1,299,600	5,240	2.0	720	70,416	104	191,087	7,601,856	30,832
95	95	32,490	1,299,600	5,240	2.0	720	70,416	104	191,087	7,601,856	30,832
95	95	32,490	1,299,600	5,240	2.0	720	70,416	104	191,087	7,601,856	30,832
285	285	97,470	3,898,800	15,721	5.0	1,800	176,040	261	573,620	22,840,776	92,549
285	285	97,470	3,898,800	15,721	5.0	1,800	176,040	261	573,620	22,840,776	92,549
285	285	97,470	3,898,800	15,721	5.0	1,800	176,040	261	573,620	22,840,776	92,549
285	285	97,470	3,898,800	15,721	5.0	1,800	176,040	261	573,620	22,840,776	92,549
285	285	97,470	3,898,800	15,721	5.0	1,800	176,040	261	573,620	22,840,776	92,549
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
475	475	162,450	6,498,000	26,202	8.0	2,880	281,664	417	956,154	38,079,696	154,266
	6,650	2,274,300	90,972,000	366,823	115	41,400	4,048,920	5,998	13,385,076	533,010,120	2,159,562

These calculations can be found on the “BB to Lewiston” Tab. It calculates the data on number of truck or barge by route. The respective total miles, tons miles and total gallons of fuel by mode as input into the Operations Cost tab.

Exhibit 18: Results of the Operating Cost saving between the No-Build and the Build Alternatives.

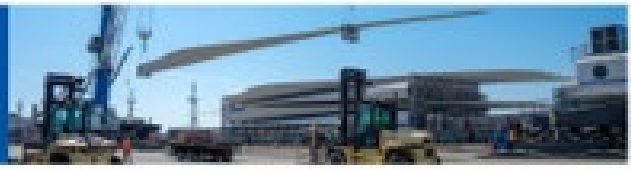
Operating Cost Savings					
			No Build		
Post -CN Year	Calendar Year	Total Trucks TX to Lewiston	Total Truck Miles TX to Lewiston	Ton Miles Truck Only Route	Operating Cost Truck only
					$ 0.1894
	2022				
	2023				
	2024				
	2025				
	2026				
	2027				
	2028				
1	2029	1092	2,242,968	89,718,720	$16,992,726
2	2030	1092	2,242,968	89,718,720	$16,992,726
3	2031	1092	2,242,968	89,718,720	$16,992,726
4	2032	1092	2,242,968	89,718,720	$16,992,726
5	2033	1092	2,242,968	89,718,720	$16,992,726
6	2034	1092	2,242,968	89,718,720	$16,992,726
7	2035	1092	2,242,968	89,718,720	$16,992,726
8	2036	1092	2,242,968	89,718,720	$16,992,726
9	2037	1092	2,242,968	89,718,720	$16,992,726
10	2038	1092	2,242,968	89,718,720	$16,992,726
11	2039	1092	2,242,968	89,718,720	$16,992,726
12	2040	1092	2,242,968	89,718,720	$16,992,726
13	2041	1092	2,242,968	89,718,720	$16,992,726
14	2042	1092	2,242,968	89,718,720	$16,992,726
15	2043	1092	2,242,968	89,718,720	$16,992,726
16	2044	1092	2,242,968	89,718,720	$16,992,726
17	2045	1092	2,242,968	89,718,720	$16,992,726
18	2046	1092	2,242,968	89,718,720	$16,992,726
18	2047	1092	2,242,968	89,718,720	$16,992,726
18	2048	1092	2,242,968	89,718,720	$16,992,726
		21,840	44,859,360	1,794,374,400	$339,854,511

Exhibit 19: Results of the Operating Cost saving between the No-Build and the Build Alternatives - continued.

Operating Cost Savings			Build														
Post -CN Year	Calendar Year	Total Trucks TX to Lewiston	Total Trucks TX to Lewiston	Total Truck Miles TX to Lewiston	Ton Miles Truck TX to Lewiston	Truck operational cost of switching to Truck/Barge from Truck only	Total # Barges	Total Barge Miles	Ton Miles Barge POV to Lewiston	Barge operational cost of switching to Truck/Barge from Truck only	Total Truck POV to Lewiston	Total Truck Miles POV to Lewiston	Ton Miles Truck POV to Lewiston	Truck operational cost of switching to Truck/Barge from Truck only	Total Operations Cost Savings	Discounted at 3.1%
						$ 0.1894				$ 0.02				$ 0.1894		
	2022															
	2023															
	2024															
	2025															
	2026															
	2027															
	2028															
1	2029	1092	983	2,018,671	80,746,848	$15,293,453	2.00	720	70,416	$1,408	95	720	1,299,600	$246,144	$16,745,173	$ 13,523,185
2	2030	1092	983	2,018,671	80,746,848	$15,293,453	2.00	720	70,416	$1,408	95	720	1,299,600	$246,144	$16,745,173	$ 13,116,571
3	2031	1092	983	2,018,671	80,746,848	$15,293,453	2.00	720	70,416	$1,408	95	720	1,299,600	$246,144	$16,745,173	$ 12,722,183
4	2032	1092	983	2,018,671	80,746,848	$15,293,453	2.00	720	70,416	$1,408	95	720	1,299,600	$246,144	$16,745,173	$ 12,339,654
5	2033	1092	983	2,018,671	80,746,848	$15,293,453	2.00	720	70,416	$1,408	95	720	1,299,600	$246,144	$16,745,173	$ 11,968,627
6	2034	1092	764	1,570,078	62,803,104	$11,894,908	5.00	1,800	176,040	$3,521	285	1,800	3,898,800	$738,433	$16,250,772	$ 11,266,007
7	2035	1092	764	1,570,078	62,803,104	$11,894,908	5.00	1,800	176,040	$3,521	285	1,800	3,898,800	$738,433	$16,250,772	$ 10,927,262
8	2036	1092	764	1,570,078	62,803,104	$11,894,908	5.00	1,800	176,040	$3,521	285	1,800	3,898,800	$738,433	$16,250,772	$ 10,598,702
9	2037	1092	764	1,570,078	62,803,104	$11,894,908	5.00	1,800	176,040	$3,521	285	1,800	3,898,800	$738,433	$16,250,772	$ 10,280,021
10	2038	1092	764	1,570,078	62,803,104	$11,894,908	5.00	1,800	176,040	$3,521	285	1,800	3,898,800	$738,433	$16,250,772	$ 9,970,923
11	2039	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 9,376,891
12	2040	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 9,094,948
13	2041	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 8,821,482
14	2042	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 8,556,239
15	2043	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 8,298,971
16	2044	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 8,049,438
17	2045	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 7,807,408
18	2046	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 7,572,656
18	2047	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 7,344,962
18	2048	1092	546	1,121,484	44,859,360	$8,496,363	8.00	2,880	281,664	$5,633	475	2,880	6,498,000	$1,230,721	$15,756,371	$ 7,124,115
		21,840	14,196	29,158,584	1,166,343,360	$220,905,432	115	41,400	4,048,920	80,978	6,650	41,400	$90,972,000	$17,230,097	$322,543,436	$198,760,246

The cost of moving the additional wind cargo tonnage that the port anticipates capturing over the 20-years post construction is estimated to save shippers over $322.5 million in 2022 dollars and $198.8 million when discounted at 3.1%. It is estimated that the cost to move cargo by truck is $0.1894 per Short ton (ST) versus $0.02 per ST on barge in 2022 dollars.

The model calculates Vehicle miles traveled (VTM) by road for each route, No-Build vs Build, then converts the VTM into ton-miles for both scenarios. Once ton-miles are determined for each mode, the model calculates the modal cost by multiplying the respective ton-mile by modal cost per ton-mile.



III.A.2. Travel Time Value Savings

Travel Time Value Saving Benefit captures the net value savings to the transportation operator for transporting the goods via railroad as opposed to truckload carrier. Using estimated volumes as described above, the No-Build and Build Scenarios are calculated by mode and origin. Total truck driver's hours are calculated and multiplied by the Hourly Truck Driver Time Value rate of $33.50/ hour; barge crews are estimated to have an hourly rate of $44.90 for each of the 3 crew members. Thus, the hourly cost for barges is $134.70. In each case, the number of hours by mode is multiplied by the total hourly labor cost. The model estimates that $127 million in travel time value will be saved in the 20-years post construction.

Exhibit 20: Assumptions used in calculating Travel Time Value savings

Assumption	Assumption Value			Unit	Source:
Truck Driver Hourly Value of Travel Time Savings	$ 33.50			$/ hr	Source: USDOT BCA Guidance Table A-2, Dec2023
Average Drivers per Truck	1.00				Benefit -Cost Analysis Guidance for Discretionary Grant Programs, Dec 2023 Table A-3: Average Vehicle Occupancy
Average Speed of Truck	50			mph	WSDOT
Tx to Lewiston - No Build					
Truck Miles No-Build	2054			miles	Port of Vancouver, WA
POV to Lewiston					
Truck Miles-only Build	342			miles	Port of Vancouver, WA
Barge-only Miles Build	360			miles	Port of Vancouver, WA
Barge Crew Hours Value of Travel Time	$ 44.90			$/ hr	Port of Vancouver, WA
Average Crew per Barge	3.00				
Average Speed of Barge	7			mph	
This Tab calculates the number of Truck Driver hours saved when the cargo is moved by Truck/ Barge from POV vs. Truck only from TX.					

Exhibit 21: Travel Time Value Savings

Year Post CN	Calendar Year	Truck Only Route- VMT TX to Lewiston	Remaining TX Truck VMT	Truck/ Barge Route- POV Added Truck VMT	Total VMT Saved	Driver Hours Saved	Truck travel Time cost saved by switching from TX Truck Only to POV Barge/ Truck Route	Total Truck Travel Time Cost Savings	Year Post CN	Calendar Year	BB Barges	Total Barge Miles	Barge Crew Hours Increased	Barge Crew travel Time Increases by switching to POV	Total Barge Crew Travel Time Cost Increase	Net Decrease in Travel Time	Discounted at 3.1%
						at 50 mph	$ 33.50					360	at 7 mph	$ 134.70			
	2022	-								2022							
1	2023	-							1	2023	-	-					
2	2024								2	2024	-	-					
3	2025								3	2025	-	-					
4	2026								4	2026	-	-					
5	2027								5	2027	-	-					
6	2028								6	2028	-	-					
7	2029	2,242,968	2,018,671	32,490	191,807	3,836	$33.50	$128,511	7	2029	2	720	103	$134.70	$13,855	$114,656	$ 92,594
8	2030	2,242,968	2,018,671	32,490	191,807	3,836	$33.50	$128,511	8	2030	2	720	103	$134.70	$13,855	$114,656	$ 89,810
9	2031	2,242,968	2,018,671	32,490	191,807	3,836	$33.50	$128,511	9	2031	2	720	103	$134.70	$13,855	$114,656	$ 87,110
10	2032	2,242,968	2,018,671	32,490	191,807	3,836	$33.50	$128,511	10	2032	2	720	103	$134.70	$13,855	$114,656	$ 84,491
11	2033	2,242,968	2,018,671	32,490	191,807	3,836	$33.50	$128,511	11	2033	2	720	103	$134.70	$13,855	$114,656	$ 81,950
12	2034	2,242,968	1,570,078	97,470	575,420	11,508	$33.50	$385,532	12	2034	5	1,800	257	$134.70	$34,637	$350,895	$ 243,261
13	2035	2,242,968	1,570,078	97,470	575,420	11,508	$33.50	$385,532	13	2035	5	1,800	257	$134.70	$34,637	$350,895	$ 235,947
14	2036	2,242,968	1,570,078	97,470	575,420	11,508	$33.50	$385,532	14	2036	5	1,800	257	$134.70	$34,637	$350,895	$ 228,852
15	2037	2,242,968	1,570,078	97,470	575,420	11,508	$33.50	$385,532	15	2037	5	1,800	257	$134.70	$34,637	$350,895	$ 221,971
16	2038	2,242,968	1,570,078	97,470	575,420	11,508	$33.50	$385,532	16	2038	5	1,800	257	$134.70	$34,637	$350,895	$ 215,297
17	2039	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	17	2039	8	2,880	411	$134.70	$55,419	$587,133	$ 349,413
18	2040	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	18	2040	8	2,880	411	$134.70	$55,419	$587,133	$ 338,907
19	2041	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	19	2041	8	2,880	411	$134.70	$55,419	$587,133	$ 328,717
20	2042	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	20	2042	8	2,880	411	$134.70	$55,419	$587,133	$ 318,833
21	2043	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	21	2043	8	2,880	411	$134.70	$55,419	$587,133	$ 309,246
22	2044	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	22	2044	8	2,880	411	$134.70	$55,419	$587,133	$ 299,948
23	2045	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	23	2045	8	2,880	411	$134.70	$55,419	$587,133	$ 290,929
24	2046	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	24	2046	8	2,880	411	$134.70	$55,419	$587,133	$ 282,182
25	2047	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	25	2047	8	2,880	411	$134.70	$55,419	$587,133	$ 273,697
26	2048	2,242,968	1,121,484	162,450	959,034	19,181	$33.50	$642,553	26	2048	8	2,880	411	$134.70	$55,419	$587,133	$ 265,468
		44,859,360	29,158,584	2,274,300	13,426,476	268,530		$8,995,739			115		5,914		$796,654	$8,199,085	$4,638,625

It is estimated that based on the routing shift over the 20-year period Travel Time Value Saved will be 8.2 million in 2022 dollars equivalent to $4.6 million when discounted at 3.1%.

III.A.3. State of Road Good Repair

Savings on Road Maintenance and Preservation is calculated based upon the number of VMT that the Project is estimated to take off of the local roads and highways. For this analysis, it is estimated that over the 20-year period post construction that 13.4 million miles of VMT will not be driven on the roads and highways due to the availability to move cargo in and out of the Port of Vancouver by a combination of truck and barge versus truck that cargo from Texas.

Exhibit 22: Assumptions used to calculate Road Maintenance and Preservation Cost savings.

Assumption	Value	Unit	Source:
Pavement Maintenance Cost	$0.12	per truck mile	WSDOT

Based upon estimates provided by Washington State Department of Transportation, savings can be estimated based upon $0.12 per truck mile not travelled on the local roads and highways.

Exhibit 23: Annual Saving in Road Maintenance and Preservation Costs

Decreased road maintenance due to construction of Project and use of COB				
Year	Truck Miles saved	Maintenance rate/ mile	Decrease in Road Maintenance Costs using truck/barge vs. truck only	Disc at 3.1%
		$ 0.12		
2023		$ 0.12	$ -	$ -
2024		$ 0.12	$ -	$ -
2025		$ 0.12	$ -	$ -
2026		$ 0.12	$ -	$ -
2027		$ 0.12	$ -	$ -
2028		$ 0.12	$ -	$ -
2029	191,807	$ 0.12	$ 23,017	$ 18,588
2030	191,807	$ 0.12	$ 23,017	$ 18,029
2031	191,807	$ 0.12	$ 23,017	$ 17,487
2032	191,807	$ 0.12	$ 23,017	$ 16,961
2033	191,807	$ 0.12	$ 23,017	$ 16,451
2034	575,420	$ 0.12	$ 69,050	$ 47,870
2035	575,420	$ 0.12	$ 69,050	$ 46,431
2036	575,420	$ 0.12	$ 69,050	$ 45,034
2037	575,420	$ 0.12	$ 69,050	$ 43,680
2038	575,420	$ 0.12	$ 69,050	$ 42,367
2039	959,034	$ 0.12	$ 115,084	$ 68,489
2040	959,034	$ 0.12	$ 115,084	$ 66,429
2041	959,034	$ 0.12	$ 115,084	$ 64,432
2042	959,034	$ 0.12	$ 115,084	$ 62,495
2043	959,034	$ 0.12	$ 115,084	$ 60,615
2044	959,034	$ 0.12	$ 115,084	$ 58,793
2045	959,034	$ 0.12	$ 115,084	$ 57,025
2046	959,034	$ 0.12	$ 115,084	$ 55,310
2047	959,034	$ 0.12	$ 115,084	$ 53,647
2048	959,034	$ 0.12	$ 115,084	$ 52,034
	13,426,476		$ 1,611,177	$ 912,169

This will save $1.6 million in road maintenance and preservation over the 20-years post construction of the Project. When discounted at 3.1% the State of Good Repair savings is estimated to exceed $912,000.

III.A.4. Prevention of Fatalities and Severe Injuries

This benefit is calculated based upon VMT removed for the local roads and highways when rail capacity is available to move cargo between the port and inland destinations. National factors obtained for fatality and severe injuries per 100 million VMT were multiplied by the VMT removed from the roads times the value of each type of collision.

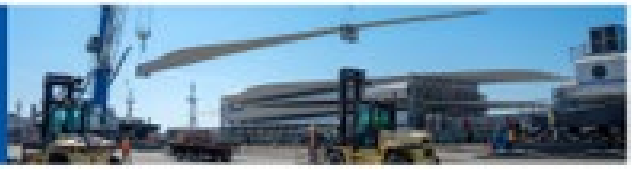
Exhibit 24: Assumptions for the Prevention of Fatalities and Severe Injuries on the Roads

Fatality and Injury Rates per 100 Million VMT				
Type	Rate	Value		Sources
Fatality-2022	1.35	$12,500,000	https://www-fars.nhtsa.dot.gov/States/StatesFatalitiesFatalityRates.aspx	USDOT BCA Guidance Table A-1: Value of Reduced
Injury- Severity Unknown		$ 217,000		https://www.transportation.gov/briefing-room/nhtsa-estimates-2022-show-roadway-fatalities-remain-flat-after-two-years-dramatic#:~:text=The%20estimated%20fatality%20rate%20decreased%20to%201.35%20fatalities,1.37%20fatalities%20per%20100%20million%20VMT%20in%202021.

Exhibit 25: Savings from Prevention of Fatalities and Severe Injuries on the Roads

Preventions of Collisions							
Year	Reduction of Truck VMT in 100 Million Miles	Fatalities Prevented 1.35	Value $12,500,000	Injuries Prevented 0	Value of Injuries Prevented $ 217,000	Total Value of Accidents Prevented	Discounted at 3.1%
2020		-					
2021		-					
2022	-	-					
2023	-	-					
2024							
2025							
2026							
2027							
2028							
2029	0.002	0.00	$32,367	-	$0	$32,367	$ 26,139
2030	0.002	0.00	$32,367	-	$0	$32,367	$ 25,354
2031	0.002	0.00	$32,367	-	$0	$32,367	$ 24,591
2032	0.002	0.00	$32,367	-	$0	$32,367	$ 23,852
2033	0.002	0.00	$32,367	-	$0	$32,367	$ 23,135
2034	0.006	0.01	$97,102	-	$0	$97,102	$ 67,317
2035	0.006	0.01	$97,102	-	$0	$97,102	$ 65,293
2036	0.006	0.01	$97,102	-	$0	$97,102	$ 63,330
2037	0.006	0.01	$97,102	-	$0	$97,102	$ 61,426
2038	0.006	0.01	$97,102	-	$0	$97,102	$ 59,579
2039	0.010	0.01	$161,837	-	$0	$161,837	$ 96,312
2040	0.010	0.01	$161,837	-	$0	$161,837	$ 93,416
2041	0.010	0.01	$161,837	-	$0	$161,837	$ 90,607
2042	0.010	0.01	$161,837	-	$0	$161,837	$ 87,883
2043	0.010	0.01	$161,837	-	$0	$161,837	$ 85,240
2044	0.010	0.01	$161,837	-	$0	$161,837	$ 82,677
2045	0.010	0.01	$161,837	-	$0	$161,837	$ 80,192
2046	0.010	0.01	$161,837	-	$0	$161,837	$ 77,780
2047	0.010	0.01	$161,837	-	$0	$161,837	$ 75,442
2048	0.010	0.01	$161,837	-	$0	$161,837	$ 73,173
Total	0.134	0.18	$2,265,718	-	$0	$ 2,265,718	$ 1,282,738

The results indicate that removing 13.4 million miles off the roads and highways will prevent 0.18 fatalities and an unknown number of severe injuries for a total Safety benefits saving of $2.2 million in 2022 dollars and $1.3 million when discounted at 3.1%.



III.A.5. Emission Savings

Emission savings were calculated based upon fuel savings of transporting cargo by rail versus road. Each pollutant was estimated and valued based upon the cost per unit of each pollutant.

Exhibit 26: Assumptions Emission Rates for Truck and Barge Transportation

Assumption	Unit	Truck	Barge	Source
Volatile Organic Compounds (VOCs)	grams per ton-mile			TTI: A Modal Comparison of Domestic Freight Transportation Effects on the General Public. January 2022
Nitrogen Oxides (NOx)	grams per ton-mile	0.221	0.1526	
Particulate Matter ($PM_{2.5}$)	grams per ton-mile			
Carbon dioxide (CO_2)	MT/ gallon	0.01018	0.01018	USDOT BCA Guidance Table A-7 References and Notes

Gallons of diesel consumed

In the preamble to the joint EPA/Department of Transportation rulemaking on May 7, 2010 that established the initial National Program fuel economy standards for model years 2012-2016, the agencies stated that they had agreed to use a common conversion factor of 10,180 grams of CO2 emissions per gallon of diesel consumed (Federal Register 2010). For reference, to obtain the number of grams of CO2 emitted per gallon of diesel combusted, the heat content of the fuel per gallon can be multiplied by the kg CO2 per heat content of the fuel.

This value assumes that all the carbon in the diesel is converted to CO2 (IPCC 2006).

Calculation

10,180 grams of CO2/gallon of diesel = 10.180 × 10-3 metric tons CO2/gallon of diesel

Sources

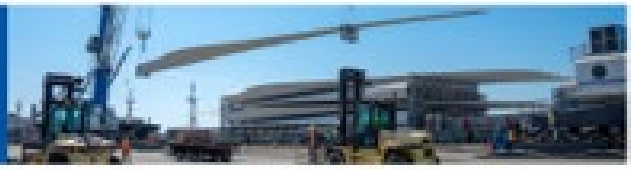
Federal Register (2010). Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, page 25,330 (PDF) (407 pp, 5.7MB, About PDF).

IPCC (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2 (Energy). Intergovernmental Panel on Climate Change, Geneva, Switzerland.

Exhibit 27: Emission Savings of the Project - Volume

Total Value of Emissions Saved																	
	Trucks			Barges								Total Emissions Savings					
Pollution Source:	Net VMT Removed from Roads	CO2 Emission - Truck	Non-CO_2 Emission$_s$- Truck	Increased Barge Ton Miles	Increased Barge Gallons of Fuel Usage	Increase MT CO_2 from Barges	Social Cost of CO2 / MT	Increased CO2 Emission - Barge	Increased Non-CO2 Emission-Barge	Social Cost of NOx / MT	Increased Non-CO2 Emission-Barge	Net CO2 Emission Savings-Truck less Barge	Net Non-CO_2 Emission Savings - Truck less Barge	CO2 Emissions Savings	Non-CO2 Emissions Savings	Total Emissions Savings
														2.0% Discount	3.1% Discount	3.1%/2.0% Discount
		$	$			MT		$	MT		$	$	$			
2023		$ 0.301	$ 0.035													
2024																
2025																
2026																
2027																
2028																
2029	191,807	$ 57,734	$ 6,713	70,416	104	1.1	$ 253	$ 269	0.011	$ 21,700	$ 233	$ 57,465	$ 6,480	$50,027	$5,233	$55,260
2030	191,807	$ 57,734	$ 6,713	70,416	104	1.1	$ 257	$ 273	0.011	$ 22,000	$ 236	$ 57,461	$ 6,477	$49,042	$5,073	$54,116
2031	191,807	$ 57,734	$ 6,713	70,416	104	1.1	$ 262	$ 278	0.011	$ 22,000	$ 236	$ 57,456	$ 6,477	$48,076	$4,921	$52,997
2032	191,807	$ 57,734	$ 6,713	70,416	104	1.1	$ 265	$ 281	0.011	$ 22,000	$ 236	$ 57,452	$ 6,477	$47,131	$4,773	$51,904
2033	191,807	$ 57,734	$ 6,713	70,416	104	1.1	$ 270	$ 287	0.011	$ 22,000	$ 236	$ 57,447	$ 6,477	$46,203	$4,629	$50,832
2034	575,420	$ 173,202	$ 20,140	176,040	261	2.7	$ 274	$ 727	0.027	$ 22,000	$ 591	$ 172,474	$ 19,549	$135,995	$13,552	$149,547
2035	575,420	$ 173,202	$ 20,140	176,040	261	2.7	$ 278	$ 738	0.027	$ 22,000	$ 591	$ 172,463	$ 19,549	$133,320	$13,145	$146,465
2036	575,420	$ 173,202	$ 20,140	176,040	261	2.7	$ 282	$ 749	0.027	$ 22,000	$ 591	$ 172,453	$ 19,549	$130,698	$12,750	$143,447
2037	575,420	$ 173,202	$ 20,140	176,040	261	2.7	$ 287	$ 762	0.027	$ 22,000	$ 591	$ 172,440	$ 19,549	$128,125	$12,366	$140,491
2038	575,420	$ 173,202	$ 20,140	176,040	261	2.7	$ 290	$ 770	0.027	$ 22,000	$ 591	$ 172,432	$ 19,549	$125,607	$11,994	$137,602
2039	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 294	$ 1,249	0.043	$ 22,000	$ 946	$ 287,420	$ 32,621	$205,265	$19,413	$224,678
2040	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 299	$ 1,270	0.043	$ 22,000	$ 946	$ 287,399	$ 32,621	$201,225	$18,829	$220,055
2041	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 303	$ 1,287	0.043	$ 22,000	$ 946	$ 287,382	$ 32,621	$197,268	$18,263	$215,531
2042	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 308	$ 1,308	0.043	$ 22,000	$ 946	$ 287,361	$ 32,621	$193,386	$17,714	$211,100
2043	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 312	$ 1,325	0.043	$ 22,000	$ 946	$ 287,344	$ 32,621	$189,583	$17,181	$206,764
2044	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 317	$ 1,347	0.043	$ 22,000	$ 946	$ 287,323	$ 32,621	$185,852	$16,665	$202,516
2045	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 321	$ 1,364	0.043	$ 22,000	$ 946	$ 287,306	$ 32,621	$182,197	$16,164	$198,360
2046	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 326	$ 1,385	0.043	$ 22,000	$ 946	$ 287,284	$ 32,621	$178,611	$15,678	$194,289
2047	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 331	$ 1,406	0.043	$ 22,000	$ 946	$ 287,263	$ 32,621	$175,096	$15,206	$190,302
2048	959,034	$ 288,669	$ 33,566	281,664	417	4.2	$ 336	$ 1,427	0.043	$ 22,000	$ 946	$ 287,242	$ 32,621	$171,650	$14,749	$186,399
	13,426,476	$ 4,041,369	$ 469,927	4,048,920	5,998	61.1		$ 18,502	0.62		$ 13,590	$ 4,022,867	$ 456,337	$ 2,774,354	$ 258,300	$ 3,032,654

Based upon the results displayed above, it is estimated that $3.0 million when discounted in public benefit will be achieve from lower emissions by removing trucks off the roads from Texas to Lewiston, ID.



III.B. SECONDARY BENEFITS

In addition to the primary benefits that are quantified by this BCA, there would also be added benefits that have not been included in the B-C ratio at this time. Such secondary benefits include:

- Construction job creation attributed to project design and construction.
- Permanent job creation attributed to new cargo at the Port of Vancouver.

Section IV. Project Costs

This section identifies the basis of the capital cost estimates used in this BCA.

IV.A. CONSTRUCTION COST

The design and construction costs associated with the Project is estimated to be $62.28 million ($2022). These figures are based on the detailed construction cost estimates provided as part of the Discretionary Grant application. This includes the $2.7 million of pre-incurred costs. When the future estimated costs of procuring two electric cranes is added, the Total Project Cost is estimated to be $82.28 million in 2022 dollars.

Exhibit 28: Future Eligible Project Costs

Total Project Costs in millions			
$2022	Capital Cost For BCA Purposes		
Prior Cost Incurred	$	2.70	4%
Future Eligible Costs			
Berth 8/9 Extension and Efficiency Improvements	$	59.58	96%
Total Project Cost	$	62.28	100%
Future Costs for purcurement of Electric Cranes	$	20.00	
Total Project Cost used in this BCA	$	82.28	

Exhibit 29: Project Schedule

Project Phase	2023				2024				2025				2026				2027				2028			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Planning/Preliminary Engineering	■	■	■	■	■	■	■	■																
Federal Award							■																	
Environmental								■	■	■	■	■	■											
Obligation													■											
Final Engineering													■											
Secure Permits													■											
Bid														■										
Construction															■	■	■	■	■	■	■	■	■	
Contract Close out																								■

It is anticipated that the Project can be completed by Fall of 2028 assuming Obligation occurs in Q1 2026.

Exhibit 30: Project Cost Schedule by Year

Port of Vancouver *Capital Projects: Berth 9 Cost and Timing Estimates in $2024*												
	%	*Costs*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*Total*
Berth 9 Infill and Extension												
Berth 8 & 9 - Engineering and Permitting		2,700,000	1,055,266	979,000	665,734	-	-	-	-	-	-	2,700,000
Berth 8 & 9 - Construction Support - moved to CN			-	-	-				-	-	-	
Berth 8 & 9 - Soft Costs moved to CN			-	-	-				-	-	-	
Berth 8 & 9 - Building Permit Fees		150,000	-	150,000	-	-	-	-	-	-	-	150,000
Berth 8 & 9 - Misc		-	-	-	-	-	-	-	-	-	-	-
Total: Berth 8 & 9 - Design & Permitting		*2,850,000*	*1,055,266*	*1,129,000*	*665,734*	-	-	-	-	-	-	*2,850,000*
Berth 9 - Infill, Dock Extension and Strengthing		63,381,000	-	-	-	12,676,200	25,352,400	25,352,400	-	-	-	63,381,000
Total: Berth 8/ 9 CN		***66,231,000***	***1,055,266***	***1,129,000***	***665,734***	***12,676,200***	***25,352,400***	***25,352,400***	***-***	***-***	***-***	***66,231,000***
Prior incurred costs (pre-construction)		***2,850,000***										
		Converted to $2022										
Berth 8/9 Infill and Extension		factor	0.960	0.94	0.94	0.94	0.94	0.94				
Berth 8/9 - Engineering and Permitting			1,013,056	920,260	625,790	-	-	-	-	-	-	2,559,106
Berth 9 - Building Permit Fees			-	141,000	-	-	-	-	-	-	-	141,000
Total: Berth 9 - Design & Permitting			1,013,056	1,061,260	625,790	-	-	-	-	-	-	2,700,106
Berth 9 - Infill, Dock Extension and Strengthing			-	-	-	11,915,628	23,831,256	23,831,256	-	-	-	59,578,140
Total: Berth 9 - Gross			1,013,056	1,061,260	625,790	11,915,628	23,831,256	23,831,256	-	-	-	62,278,246
Future procurement of Electric Cranes ($2022)								20,000,000				20,000,000
												82,278,246
pre-construction = prior incurred costs		**2,700,106**	**1,013,056**	**1,061,260**	**625,790**							

Total Future Eligible Costs for the years 2023-2028 equal $86.3 million in 2022 dollars including the procurement of future electric cranes

IV.B. LIFE CYCLE COSTS

Life Cycle costs have been estimated at 1% per annum of the future Project costs, including the future procurement of electric cranes, (or $822,782) less the current No-Build Annual Maintenance per year. For a net annual Maintenance increase of $687,872 equal to a $13.8 million increase maintenance cost over the analysis period or $8.4 million when discounted at 3.1%.

Exhibit 31: Life Cycle Costs

Life-Cycle				
Year	No Build Annual Maint.	Build Annual Maint.	Annual Maint.	3.1% Discounted
2022				
2023				
2024				$0
2025				$0
2026				$0
2027				$0
2028				$0
2029	$ 135,000	$ (822,782)	$ (687,782)	($555,444)
2030	$ 135,000	$ (822,782)	$ (687,782)	($538,743)
2031	$ 135,000	$ (822,782)	$ (687,782)	($522,544)
2032	$ 135,000	$ (822,782)	$ (687,782)	($506,832)
2033	$ 135,000	$ (822,782)	$ (687,782)	($491,593)
2034	$ 135,000	$ (822,782)	$ (687,782)	($476,812)
2035	$ 135,000	$ (822,782)	$ (687,782)	($462,475)
2036	$ 135,000	$ (822,782)	$ (687,782)	($448,570)
2037	$ 135,000	$ (822,782)	$ (687,782)	($435,082)
2038	$ 135,000	$ (822,782)	$ (687,782)	($422,000)
2039	$ 135,000	$ (822,782)	$ (687,782)	($409,311)
2040	$ 135,000	$ (822,782)	$ (687,782)	($397,004)
2041	$ 135,000	$ (822,782)	$ (687,782)	($385,067)
2042	$ 135,000	$ (822,782)	$ (687,782)	($373,489)
2043	$ 135,000	$ (822,782)	$ (687,782)	($362,259)
2044	$ 135,000	$ (822,782)	$ (687,782)	($351,367)
2045	$ 135,000	$ (822,782)	$ (687,782)	($340,802)
2046	$ 135,000	$ (822,782)	$ (687,782)	($330,555)
2047	$ 135,000	$ (822,782)	$ (687,782)	($320,615)
2048	$ 135,000	$ (822,782)	$ (687,782)	($310,975)
Total	$ 2,700,000	$ (16,455,649)	($13,755,649)	($8,441,540)

IV.C. RESIDUAL AT YEAR 2048

Exhibit 32: Assumptions for the Calculation of Residual Value

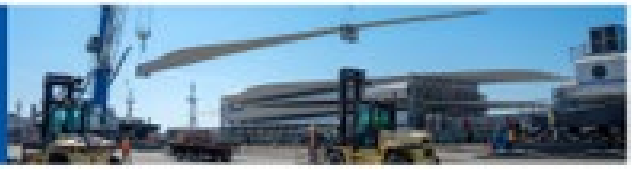
REMAINING CAPITAL VALUE OF PROJECT					
Asset	Expected Life of Asset	Total Project Cost ($2022)	Remaining Life Proporation at 20 years after project completed	Remaining Capital Value in 2047	Discounted 3.1%
Per Construction Activities	30	$ 2,700,106	33%	$ 1,809,071	**$ 817,957**
Berth 8/9 Extension and Efficiency Improvements	30	$ 59,578,140	33%	$ 19,859,380	**$ 8,979,257**
Cranes	30	$ 20,000,000	33%	$ 6,666,667	**$ 3,014,279**
		$ 82,278,246		**$ 28,335,118**	**$ 12,811,492**
POV Finance provided that Asset Service Life for this project is	50		60%	$ 49,366,947	**$ 22,320,863**
Assuming there is not Residual Value	20			0	

BCA Guidance on Residual Value

Section 6.3 Residual Value and Remaining Service Life pages 33 and 34 of the Benefit-Cost Analysis Guidance for Discretionary Grant Programs Dec 2023

A simple approach to estimating the residual value of an asset is to assume that its original value depreciates in a linear manner over its service life.[32] An asset with an expected useful life of 60 years would thus retain half of its value after 30 years in service, while an asset with a 45-year life would retain one third of its value at that point in time.[33] Those residual values would then be discounted to their present value using the discount rate applied elsewhere in the analysis. An example calculation of residual value is included in Appendix B.

The port Asset Management policy states Capital investments in berths and other improvements are assumed to have a 50-year lifecycle. To be conservative, in this analysis a life of 30 years was used. Hence, by year 20, it is assumed that the residual value of Project investments will equate to 1/3 of the capital investment cost, which equates to $49.3 million in 2022 dollars. This amount has been discounted at 3.1% in the BCA. To show the sensitivity of the Service life on the BCR, an Asset Service Life of 20 years was tested, which in sense removes the Residual Value for the Total Benefits. **When the Residual Value was zero, the BCA dropped slightly from 3.04 to 2.86**. If the longer 50 year Asset Value was used, the BCR would increase slightly to 3.18. The port has chosen to use 30 years as the basis as this improvement extends the life of the Project longer than the end of this analysis even though the USDOT Economist may try to determine that this Project increases capacity so there should not be any residual value benefit included in the BCR as it is being constructed inside a current asset.



Section V. Benefit Cost Summary

A favorable Benefit-Cost Ratio is one that exceeds 1.0, indicating that the 20-year analysis of the benefits, life-cycle costs and residual value of the asset exceed the capital costs expended during that same time period. As Exhibit 33 shows, the Project's Non-CO_2 Benefits are discounted at 3.1%, this generates $208.6 million in public (societal) benefits before life-cycle costs of $8.4 million and a residual value of $12.8 million, for a total benefits of $213 million. This includes CO_2 benefits discounted at 2% which are estimated to generate $2.8 million in benefits.

Project costs are $70.1 million when discounted at 2%. Note that this Project cost includes the direct project's cost in this application and an allocation for $20 million ($2024) for future electric crane purchases. The Benefit Cost Ratio is estimated to exceed 1 with a Net Present Value of $143 million. Economic Competitiveness accounts for 95% of the total societal benefit with $198.8 million in operating cost savings. Mobility Improvements are estimated at $4.6 million, or 3% based upon Travel Time Value savings. Savings in Emission accounting for $3.4 million or 1% of the total societal benefits. State of Good Repair for Roads and Safety Benefits each account for 1% of the societal benefits.

Exhibit 33: Selection Criteria Summary

Benefit Cost Analysis Summary				
Long-term Outcomes	**Social Benefit**	**Inputs**	**Value**	**Monetized Value Discount Rate 3.1%/2.0%**
Quality of Life	Fuel savings due to reduced miles traveled by cargo using Truck/ Barge at POV vs. Truck only from TX	Gallons of fuel saved	7.8 million gallons of fuel saved by reducing miles traveled with modal shift to POV truck/ barge route	Cost Savings included in Op. Cost
Economic Competiveness	Operational Cost Savings	Savings of POV Truck/ Barge routing vs. Truck only from TX	1790 million ton-miles saved by using POV and truck/ barge routing, reducing the shipper's costs	$ 198,760,246
Mobility	Travel Time Savings	Savings of POV Truck/ Barge routing vs. Truck only from TX	The efficiency of POV Truck/Barge versus a Truck only route saves 262,615 hours of travel time	$ 4,638,625
Safety	Reduced fatalities from reduction of Truck VMT	Reduction of Collison costs on Roads	Savings of 0.18 lives	$ 1,282,738
State of Good Repair	Reduction of maintenance on Roads & Hwys, Consistent with State and Regional Plans	Maintenance, preservation and upgrade savings of Highways	13.4 million VMT reduced off the highways	$ 912,169
Environmental Sustainability	Environmental Benefits from Reduced Emissions by modal change to barge	CO_2 and other Pollutant cost savings	78,592 MT of CO2 saved with POV Truck / Barge services	$ 3,032,654
Total Public Benefits				$ 208,626,431
Less Life-Cycle Costs				$ (8,441,540)
Plus Residual				$ 12,811,492
Total Benefits				$ 212,996,384
Total Cost				($70,050,311)
Net Present Value				**$ 142,946,072**
Benefit to Cost Ratio				**3.04**