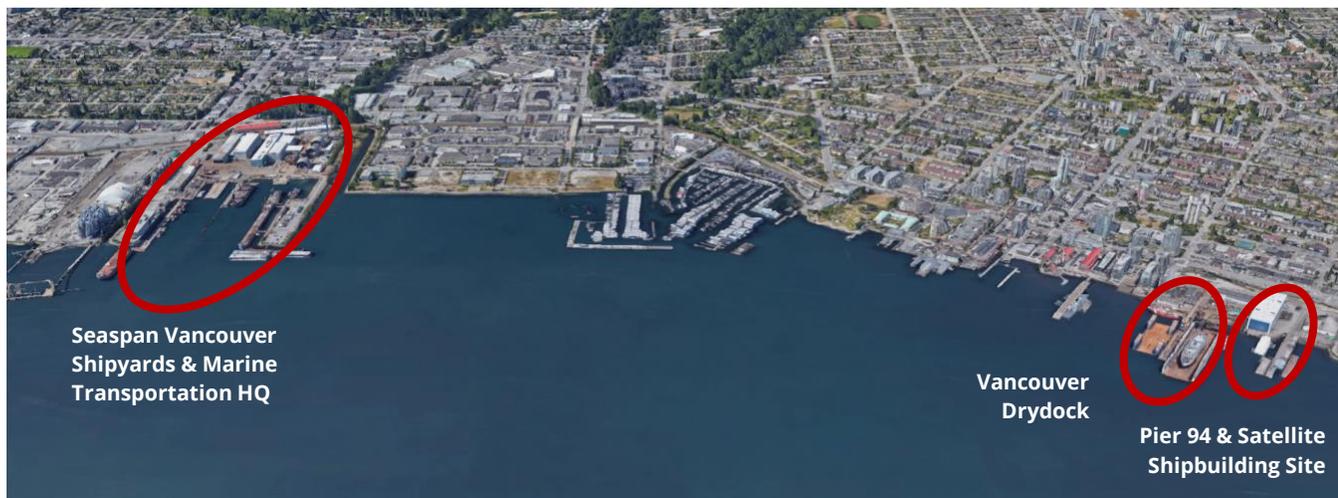


Seaspan Master Waterfront Planning in North Vancouver

Seaspan operates three sites along the North Vancouver waterfront: its Pemberton Avenue campus, which is the headquarters for Seaspan Shipyards and Seaspan Marine Transportation; Vancouver Drydock at the base of St Georges Avenue; and Pier 94, which is directly east of Vancouver Drydock.



The nature of the shipbuilding, ship repair and marine transportation industries involves long-term planning and significant capital investment. In 2020, Seaspan engaged engineering consulting company Stantec to develop a master waterfront plan for its North Vancouver sites. The waterfront plan examined how Seaspan could meet growing demand for its services and expertise and how it could optimize its existing water lot use and on-land areas to support operations for both Seaspan Shipyards and Seaspan Marine Transportation – now and for decades to come. This plan was the catalyst for several projects that are now underway, including the proposed water lot project.

The waterfront plan determined that Seaspan’s repair and drydocking services should be consolidated at Vancouver Drydock. Some repair and drydocking had been performed at Vancouver Shipyards, however consolidating this at Vancouver Drydock would enable Vancouver Shipyards to make all available space at the Pemberton Avenue site dedicated to construction and outfitting of the large, non-combat vessels for the Royal Canadian Navy and Canadian Coast Guard under the National Shipbuilding Strategy.

Today, Vancouver Drydock is Seaspan’s primary vessel repair and drydock site in North Vancouver. The adjacent Pier 94 water lot is used for moorage, vessel maintenance and minor repairs, which do not require heavy mobile equipment or drydock services. These activities are consistent with the port authority’s ‘Industrial’ land-use plan designation for these locations.



Existing uses of the Vancouver Drydock and Pier 94 sites

With the consolidation of repair and drydocking services at Vancouver Drydock, and recognizing the sustained high demand for these services, in spring 2021 Seaspan initiated a permit application to add two smaller drydocks and a work pontoon, and to extend its water lot by 40 metres to the west. This proposed change in the water lot exercises Seaspan's option in its 2018 lease agreement with the port authority to extend the Vancouver Drydock water lot to the west, subject to permit approval.

In addition to the proposed project at Vancouver Drydock, the master waterfront plan outlined several other projects, now underway at Seaspan's Pemberton site, to support the launching and outfitting of vessels constructed at Vancouver Shipyards. Details of the approved projects are available on the port authority's **Status of Permit Applications** page.

Two of these projects include the **Ship Load-Out Gravel Bed**, which involves building a 7,500 square metre gravel bed needed to safely launch the Joint Support Ships and the **Outfitting Pier Extension**, which entails removal of the existing timber pier from 1966 and replacing it with a concrete deck secured by steel piles.

The various projects at Vancouver Shipyards have reduced the amount of available water space around Seaspan's Pemberton Avenue site that has traditionally been used for Seaspan's Marine Transportation's tug fleet and moorage of its marine equipment.

Consequently, the waterfront plan identified the solution to move several barges from the Pemberton Avenue site to the Pier 94 site where they will continue to support the operating needs of the marine transportation business.

In September 2021, the port authority approved the **Pier 94 Mooring Piles project** (a category B project). This involves removing three existing steel-piled dolphins including their timber fenders and installing seven new one-metre diameter cantilevered steel mooring piles on the east side of Pier 94. Construction is scheduled to begin in summer 2022. Once complete, the area will continue to be used for moorage, vessel maintenance and minor repairs, which do not require heavy mobile equipment or drydock services. These activities are consistent with the port authority's 'Industrial' **land use plan** designation for this location.

Criteria for Drydock Siting Locations

In its assessment of potential siting locations for additional floating drydocks, Seaspan considered that several operational criteria must be met in order to carry out vessel repair and maintenance services. These criteria include:

1. A sheltered location, free from significant wave height and strong currents.

Floating drydocks must be secured against a stable pier and must be sheltered from significant wave height and strong currents to protect the drydocks and the vessels within them. In the case of the Vancouver Drydock location, the existing drydocks benefit from the protection of the adjacent public pier and Lonsdale Quay.

2. An overall yard configuration that accommodates a 1:1 ratio of berth space to drydock length.

To provide vessel repair and maintenance services, an operation must have equal drydock and berth space capacity to provide the necessary dry and water-based services. Drydock operations include both drydock and in-water activities. Drydock activities include painting and refinishing exteriors, replacing hull sections or propellers. In-water activities in the berth space include testing, trialing and commissioning of systems and equipment modifications or upgrades.

Vancouver Drydock currently uses the berth space in the northwest of its water lot, as well as east side of the Panamax drydock. For example, the recent retrofit of the Canadian Coast Guard vessel *Sir Wilfred Laurier* included three months of activity in the Careen drydock, followed by six weeks in the berth space north of the Careen to trial and test the newly-installed vessel infrastructure.

3. Close to the on-site workshop and stores to provide access to replacement parts and materials, and proximity to employee spaces, such as lunchrooms.

When a vessel is in drydock for repair or maintenance, there is a steady stream of employee and equipment activity between the on-land shipyard and the drydocks. Examples include components of the ship that need refurbishment or replacement need to move from the drydock to the shipyard, and from the shipyard workshop to the drydock for installation or equipment used for repair and maintenance must move from the shipyard to the drydocks.

The components and equipment travelling between the shipyard and the drydocks are often large, weigh upwards of 20 tons, and need to be either carried by vehicle or lifted by cranes. On average, workers at Vancouver Drydock make six to eight roundtrips a day between the on-land shipyard and the drydocks, with each roundtrip ranging from approximately 200m to 700m. These trips include moving components and equipment as in the above examples, along with travel to and from employee spaces used for such activities as health and safety training and the lunchroom areas during designated break times.

Having an efficient layout is important to drydock operations to ensure that the team can carry out repair and maintenance projects at the required safety and quality standards in a timely way. The current on-land layout at Vancouver Drydock is designed for efficient operations and minimal travel between the shipyard and the drydocks. As an analogy, when completing a home renovation, the availability and proximity of construction supplies, tools and equipment is a necessity for timely and efficient renovations.

4. Direct access to the drydocks via the service pier for frequently-used mobile equipment – specifically cranes, forklifts, and mobile lifts – that weigh upwards of 20 tons.

Service piers must have the size and capacity to carry the loads of large mobile equipment, components which are either removed from or installed into the vessels, and supplies used for vessel repair activities. The equipment and machinery to serve the smaller drydocks would be of a similar weight and scale as those used in operations today at Vancouver Drydock. For example, a mobile lift weighs 14 tons itself, a forklift weighs up to 18 tons and carries loads of up to 15 tons.

5. Water depth of between 12 metres and 15 metres.

12 meters is the minimum depth required to operate a drydock, given that it needs to move up and down within the water column for arriving and departing vessels.

6. Unencumbered barge access to the adjacent W Building Site – the satellite shipbuilding facility.

Barges require access to the W Building, at minimum, every two weeks. Within the basin, the distance between the Panamax and Pier 94 is approximately 95m. Shipbuilding components leave the W building by barge approximately every two weeks. The barges servicing the W building are approximately 20 metres wide. To safely maneuver the barges, there must be sufficient clearance for the tugs, barges and vessels occupying the berth space.

7. Does not impede safe navigation of vessels within the Vancouver Drydock basins and in Burrard Inlet.

Vessels and tugs must be able to be safely berthed within the existing and proposed drydocks and safely navigate within the basins to the west and east of the existing drydocks. Drydocking is a complex task that requires a high degree of accuracy to ensure that the vessel being drydocked is placed precisely in the drydock so that it remains stable, upright, and free from damage when it is raised out of the water.

Adequate space around the drydock is needed, as drydocking a vessel requires two to four tugboats to precisely maneuver the vessel into position.

Any future proposed drydocks must have sufficient distance from the Burrard Dry Dock public pier and the main Burrard Inlet navigation channels. The future proposed drydocks also must stay within the southern boundaries of the water lot, which restricts how far south the drydocks can be positioned. Additionally, anything that is too far south would not be permitted by the port authority.

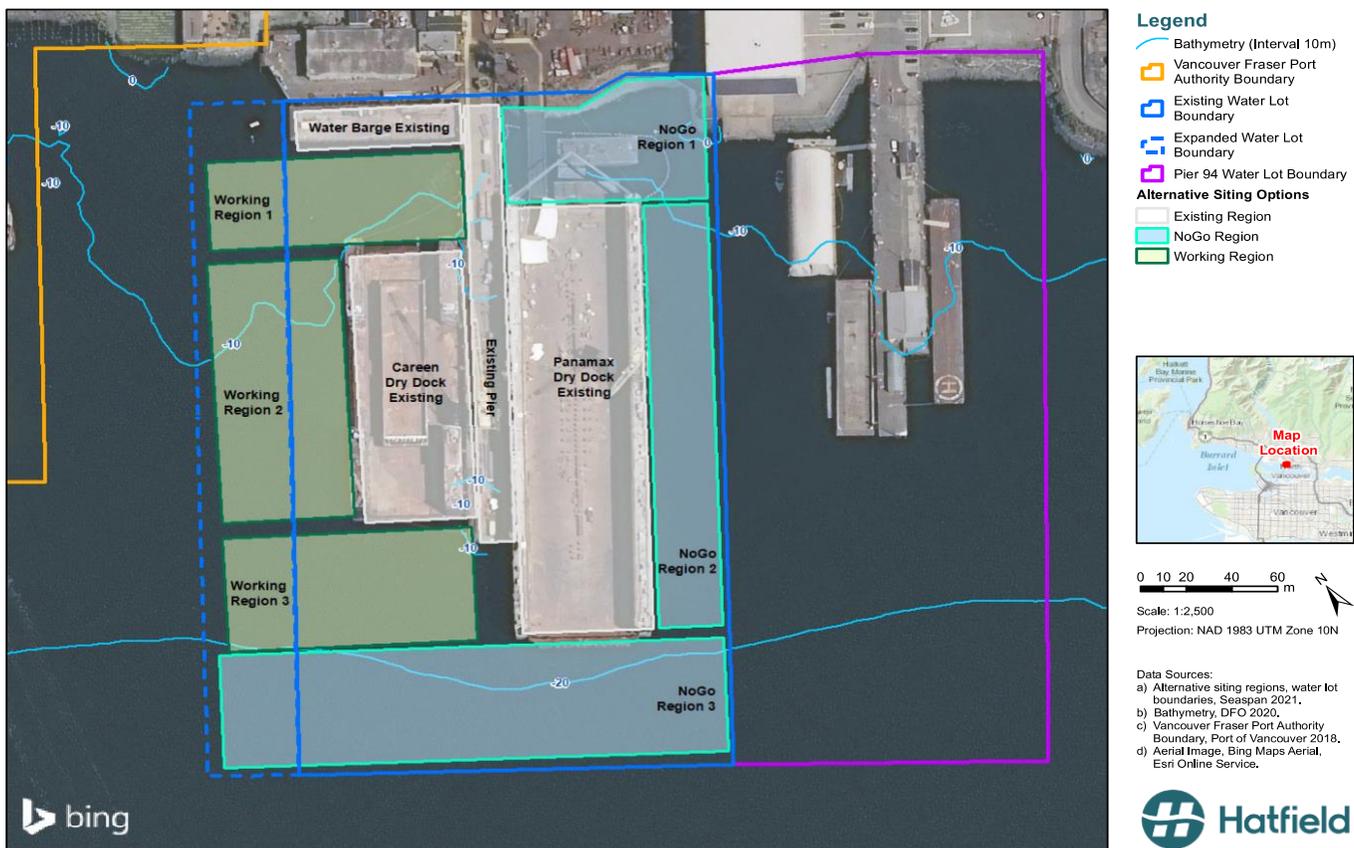
8. Community Proximity

Given that the area to the west of Vancouver Drydock's site, previously used for industrial activity, has been developed for adjacent residents and businesses as the Shipyards District, Seaspan added an eighth criteria, community proximity, in its assessment of potential drydock locations, with the intent to reduce impacts of operations on the adjacent community.

Potential Siting Locations

Through the lens of the eight criteria noted above, Seaspan conducted an analysis to determine potential areas within Vancouver Drydock’s water lot and, subsequently, the feasibility of the adjacent water lot directly east of Vancouver Drydock’s current operations (Pier 94), which is leased by Seaspan ULC.

The western areas of Vancouver Drydock’s water lot were a primary focus because the company’s lease terms with the port authority allow for an expansion of the water lot to the west. The southern areas were also considered because they were not in active use by Vancouver Drydock other than for vessel movements and were a farther distance away from adjacent residences. The eastern portion of the water lot was also considered, although already in active use by Vancouver Drydock.



Vancouver Drydock potential siting locations

Seaspan identified six potential site locations for the additional drydocks within its existing water lot, expanding to the west, east and south. For each of these locations, Seaspan applied a rating of *requirement met* (green), *requirement partially met* or *inefficiency introduced* (yellow), or *requirement not met* (red) against the criteria. Any potential site where one or more of the criteria could not be met (red) was eliminated.

Based on this analysis, three of the six sites were identified as potential siting options (Working Regions) and three were eliminated (No-Go Regions). Results of the analysis are discussed below.

Analysis of Effective Siting Locations

The working regions 1 and 2 are operationally viable, while working region 3 is not viable:

| Operational Requirements | Working #1 | Working #2 | Working #3 | No-Go #1 | No-Go #2 | No-Go #3 |
|---|------------|------------|------------|----------|----------|----------|
| Sheltered location | ● | ● | ● | ● | ● | ● |
| 1:1 berth space to drydock length ratio | ● | ● | ● | ● | ● | ● |
| Workshop stores and employee spaces proximity | ● | ● | ● | ● | ● | ● |
| Mobile equipment direct access with 20T pier capacity | ● | ● | ● | ● | ● | ● |
| 12m to 15m water depth | ● | ● | ● | ● | ● | ● |
| W Site barge access | ● | ● | ● | ● | ● | ● |
| Safe navigation | ● | ● | ● | ● | ● | ● |
| Community proximity | ● | ● | ● | ● | ● | ● |

| | | | |
|-----|----------------------|-----------------------------|-----------------------|
| Key | ● Requirement is met | ● Requirement partially met | ● Requirement not met |
|-----|----------------------|-----------------------------|-----------------------|

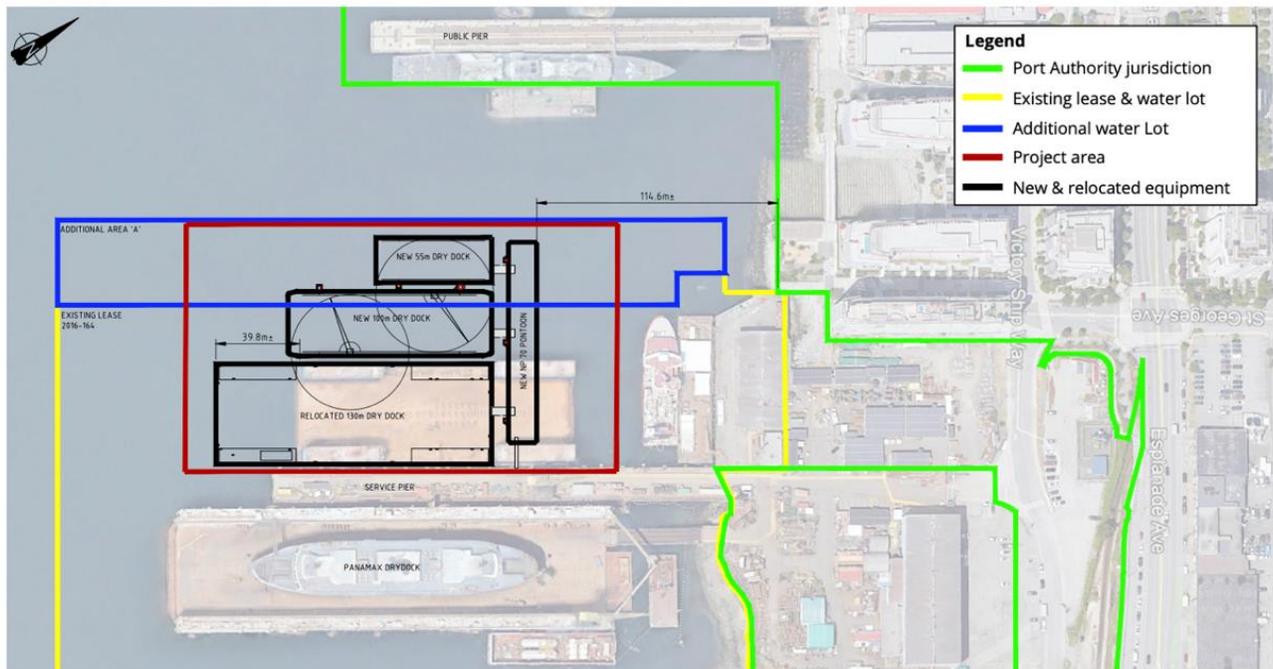
Criteria Rationale

- Working Region 1 can only accommodate one drydock and has an operational and environmental downside; dredging of the area would be required and is closest to the adjacent community.
- Working Region 2 can accommodate both drydocks if a work pontoon is included, and is similar proximity to Region 1
- Working Region 3 can only accommodate one drydock, but is not viable, as access to the Caren is blocked, which would restrict the safe navigation into and out of the Caren. There is also too much exposure to the main Burrard Inlet navigation channel.
- NoGo Region 1 is not operationally viable because it eliminates shore access to the Panamax and requires significant dredging to address the shallow seabed elevation, does not provide sufficient berth space and can only accommodate one drydock.
- NoGo Region 2 is not operationally viable because the existing berth space (east side of Panamax) is eliminated, movement to and from the drydocks would require two crane lifts and the drydock is not accessible when the Panamax is loading and unloading vessels, and can only accommodate one drydock (a second drydock would block access to the W-building).

- NoGo Region 3 is not viable because it has unsafe exposure in deep water, it blocks the entrance to the Panamax, and would require excessive marine structure to facilitate mooring of the drydock.

Proposed Site Location

From its analysis, Seaspan determined that the combination of Working Regions #2 and #3 – that is, shifting the Caren away from the shore by approximately 40 metres and siting the new drydocks next to it – presented the best balance of operational requirements and reduced adjacent community impacts. This is the siting that Vancouver Drydock presented to the port authority in 2021 for consideration, along with a number of technical studies in support of its application.



Vancouver Drydock Proposed Water Lot Project Siting

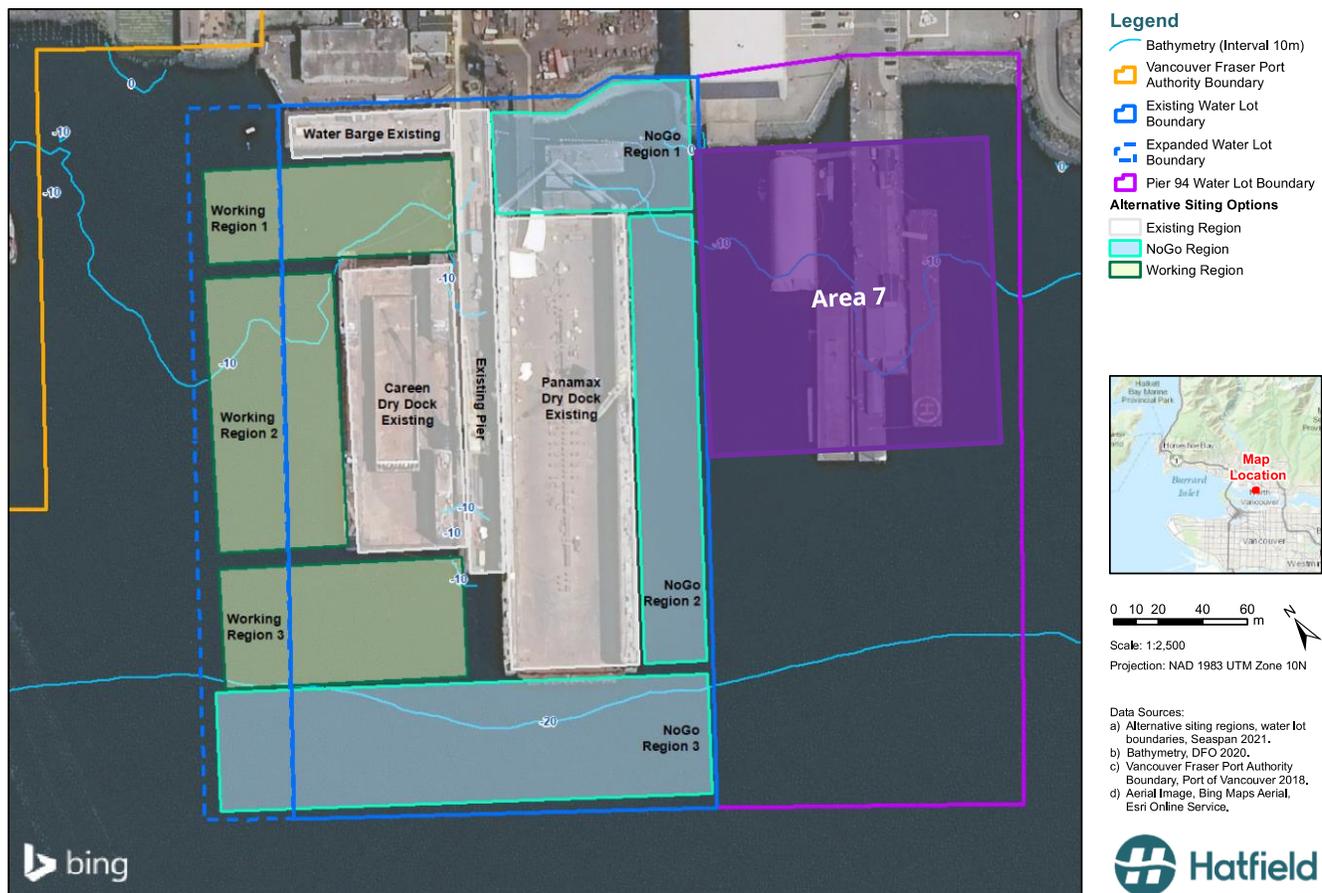
Alternate Siting Location – Area 7 (Pier 94)

In its siting assessment submitted in 2021, Seaspan did not consider any locations beyond the Vancouver Drydock water lot that were not specifically noted in its lease agreement with the port authority.

The water lot to the east of Vancouver Drydock’s operations is commonly known as Pier 94. Vancouver Drydock did not present this as an option for the proposed new drydocks in 2021 for two reasons:

First, this water lot is leased to Seaspan ULC for its Marine Transportation business. While Seaspan ULC is the parent company of Vancouver Drydock and the Marine Transportation businesses, they are separate legal entities. Similarly, if business owner leases a commercial property and is planning an addition, they would not typically consider making the addition on an adjacent property leased by their neighbour.

Second, the Pier 94 water lot is already in use for moorage, vessel maintenance and minor vessel repairs (activities not requiring heavy mobile equipment or drydock services) and will continue to be used for these activities. As noted above, Seaspan’s master waterfront plan to make the best use of existing water lot areas in North Vancouver identified the Pier 94 water lot area to accommodate moorage of marine assets, displaced at Vancouver Shipyards, to support the operating needs of the Marine Transportation business. Seaspan received a permit from the port authority in September 2021 to carry out the necessary site upgrades to accommodate these marine assets.



Water lot boundaries for Vancouver Drydock and Pier 94 areas, noting the additional area analyzed (Area 7)

Analysis of Area 7 (Pier 94)

While the Pier 94 water lot is leased to and in use by another legal entity, with the feedback from the community in summer 2021, Vancouver Drydock completed a detailed review to assess the feasibility of using this adjacent water lot.

The analysis applied the same criteria used for the Vancouver Drydock water lot and again applied a rating of *requirement met* (green), *requirement partially met or inefficiency introduced* (yellow), or *requirement not met* (red) against the criteria.

This further analysis affirmed that, even if the Pier 94 water lot was available to Vancouver Drydock, this location does not adequately support operational requirements.

| Operational Requirements | Area #7 |
|---|---------|
| Sheltered location | ● |
| 1:1 berth space to drydock length ratio | ● |
| Workshop stores and employee spaces proximity | ● |
| Mobile equipment direct access with 20T pier capacity | ● |
| 12m to 15m water depth | ● |
| W Site barge access | ● |
| Safe navigation | ● |
| Community proximity | ● |

Criteria Rationale

- The use of both new proposed drydocks in Area 7 would require demolition of the existing Pier 94 and a complete reconstruction to enable the operational weight bearing requirements to be met. Pier 94 is old, in poor condition and does not have the load bearing capacity to support manlifts, forklifts and mobile cranes – all of which are essential for a ship repair operation. The amount of capital investment required for complete reconstruction is not economically feasible for this project.
- There is currently no access for pedestrians or vehicles to travel on land on the south side between the Vancouver Drydock site and the Pier 94 site. To enable workers and equipment to travel efficiently between these two sites, a bridge would need to be constructed. The amount of capital investment required for this construction is not economically feasible for this project.

- To travel on land on the north side between the Vancouver Drydock and Pier 94 site, workers and equipment would need to travel 900m to 1.2km and would be required to exit and enter two secure areas and four security checkpoints (as they enter and exit each site) for each round trip. While technically feasible, this is logistically and financially unsustainable.

Between these two secure sites, workers and equipment would be on an open port authority roadway between the Vancouver Drydock and Pier 94 sites. While challenging to move large equipment in this way, it also compromises the security requirements that are part of some of the vessel repair activities that happen at Vancouver Drydock today.

In addition, the road may need to be regularly blocked to other traffic in order to move large equipment between sites. This could be problematic for road access to Richardson International or for emergency services requiring access along the road.

Heavy equipment is used in vessel repair operations, and it is unknown if the existing road has enough reinforcement to withstand regular heavy loads transported between the sites. The road may need to be upgraded to allow for the safe movement to and from the machine shop on the Pier 94 site next door.

- A new crane with rails may be required to operate the drydocks in this location. Drydock operations occasionally require a crane to travel while carrying a heavy load, an activity that cannot be accomplished with a mobile crane.
- A permanent drydock at Pier 94 would further restrict the open space in the W building basin, reducing Vancouver Drydock's existing and necessary berth space, as noted in the criteria descriptions above.