



Digitalisation of Port Rules to Support Safe and Efficient Vessel Scheduling

The Origins of Port Rules

The British Royal Navy can be credited with some of the first attempts in the 1700's to formalize in writing, practical rules for managing safety of shipping:



“All ships on the larboard tack are to bear up for those on the starboard tack when passing on opposite tacks.”

Royal Navy General Instructions to the Night Signals, Lord High Admiral, Sir C. Knowles. <https://www.usni.org/magazines/proceedings/1955/november/twenty-five-hundred-years-rules-road>

Contemporary Port Rule Management

Port Rules for managing safety are stored electronically in 'Harbour Master Directions' publications.

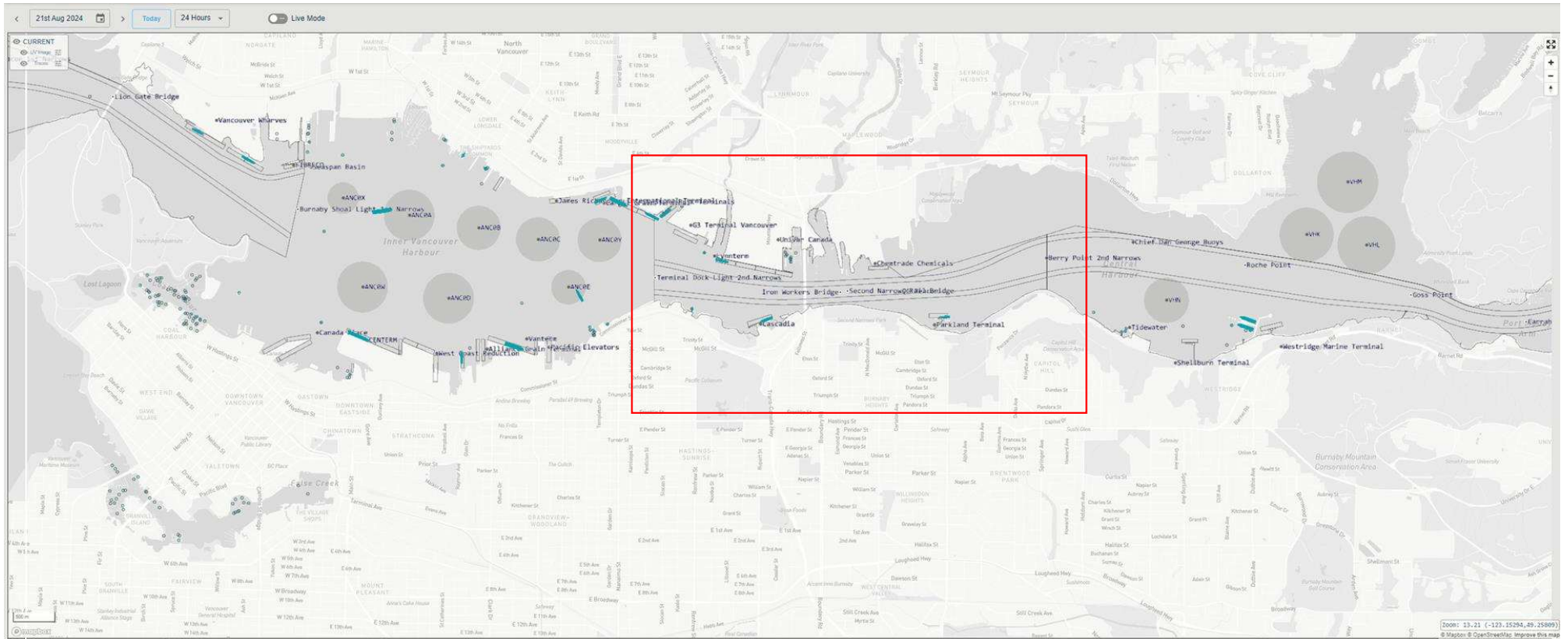
Harbour Masters Directions – Port Botany, Table 16 - Kurnell Berth 1 and 2

Requirement	Kurnell 1
Maximum vessel Length	257m
Daylight berthing for vessels draft <9.8m or displacement <35,500 tonnes	Anytime
Daylight berthing for vessels draft >9.8m or displacement >35,500 tonnes	Pilot must board between 90 and 30 minutes before HW/LW
Daylight berthing for vessels Length 230m – 240m	Pilot must board between 90 and 30 minutes before HW/LW Wind Speed must be <20 knots
Daylight berthing for vessels with Length 240 - 257m	Pilot must board between 45 and 75 minutes before HW/LW
Night berthing	Only for vessels with a Length < 200m Pilot must board 1 hour before HW/LW
Unberthing	Anytime
Swell during berthing	Maximum 1m at Captain Cook Buoy



Contemporary Ports are Complex Operations!

e.g. Port of Vancouver – Second Narrows

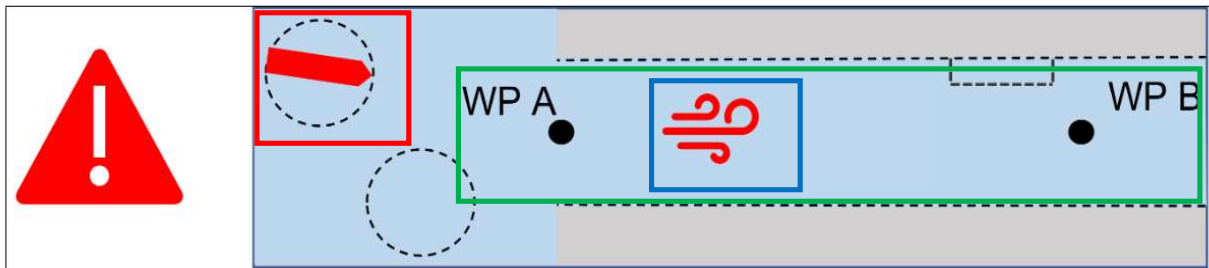


Digitalisation of Port Rules

Harbour Masters Directions – Port Botany Table 16

'Kurnell Berth 1 :

- Daylight berthing for vessels with Length 240 - 257m
- Wind Speed must be <20 knots



1. Vessel Definition

A logical statement identifying the vessel definition that evaluates to TRUE/FALSE

2. Port Rule Variable & Value

The variable and its value that is to be applied as a scheduling constraint or operational requirement

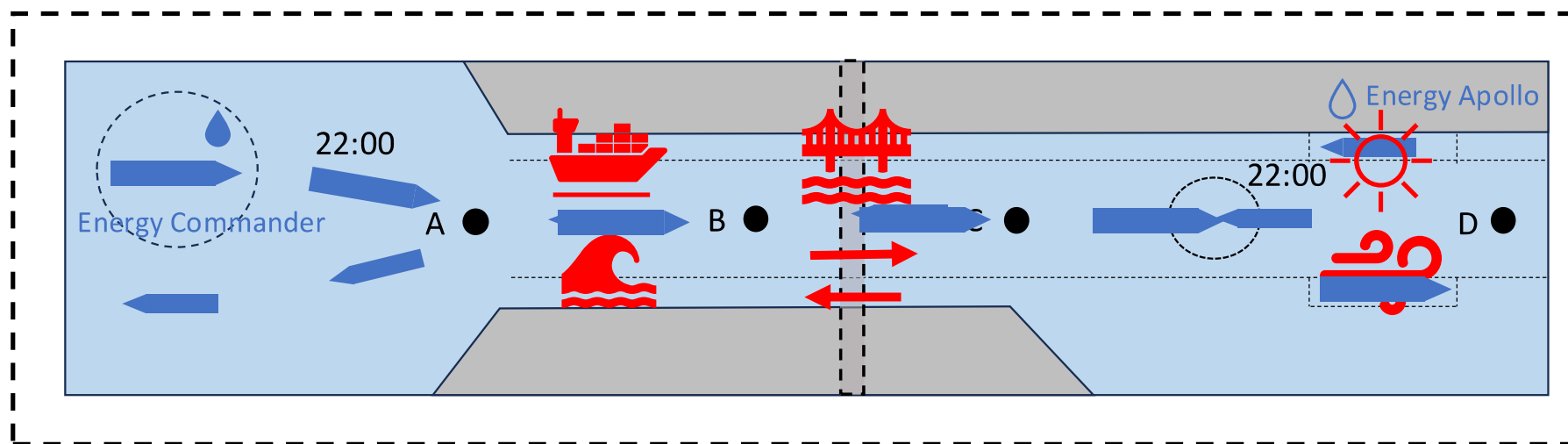
3. Spatial Definition

The location within the port where the rule applies. i.e, channel reach, berth, anchorage waypoints

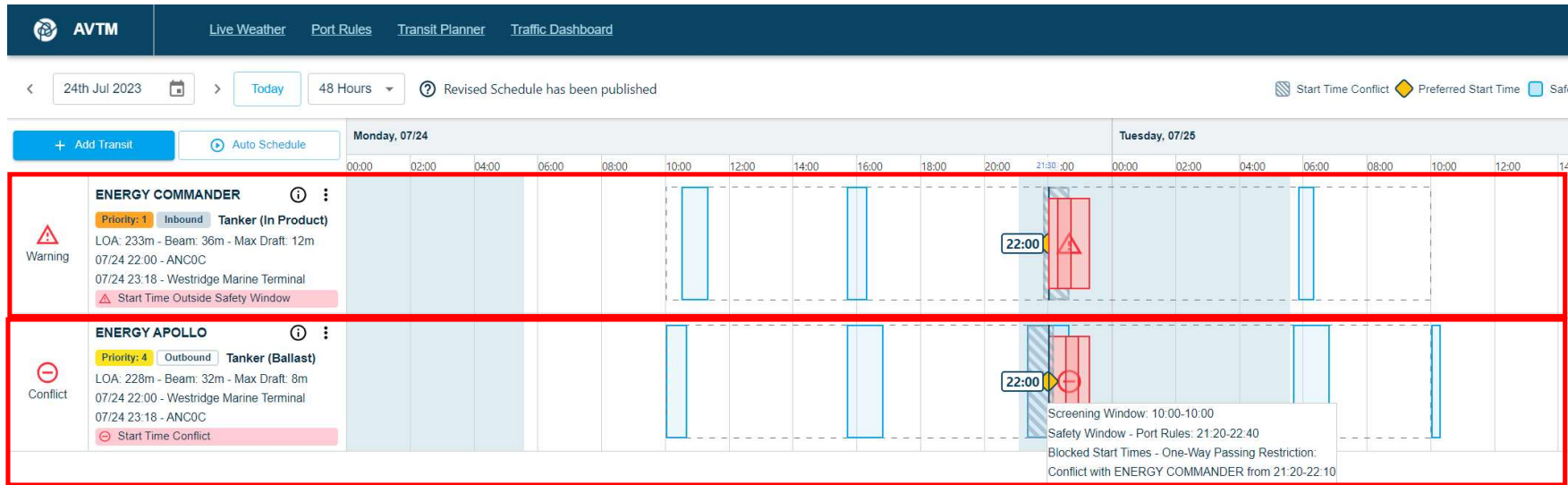
Simple Digitalised Port Rule Vessel Scheduling Scenario



Digitalised Port Rules



Port Rule Digitalised Vessel Scheduling



ENERGY COMMANDER X

Priority: 1 Inbound

- (1) Maximum Following Current Rule
- (2) Daylight Only Transit Rule
- (3AE) Maximum Air Draft Rule
- Passing Conflict Rule

TRANSIT DETAILS PORT RULES EVALUATION

(1) Maximum Following Current Rule
Maximum following current speed must be < 0.5kn between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.
Maximum evaluated following current speed was 1.4kn

(2) Daylight Only Transit Rule
The daylight only transit rule between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.

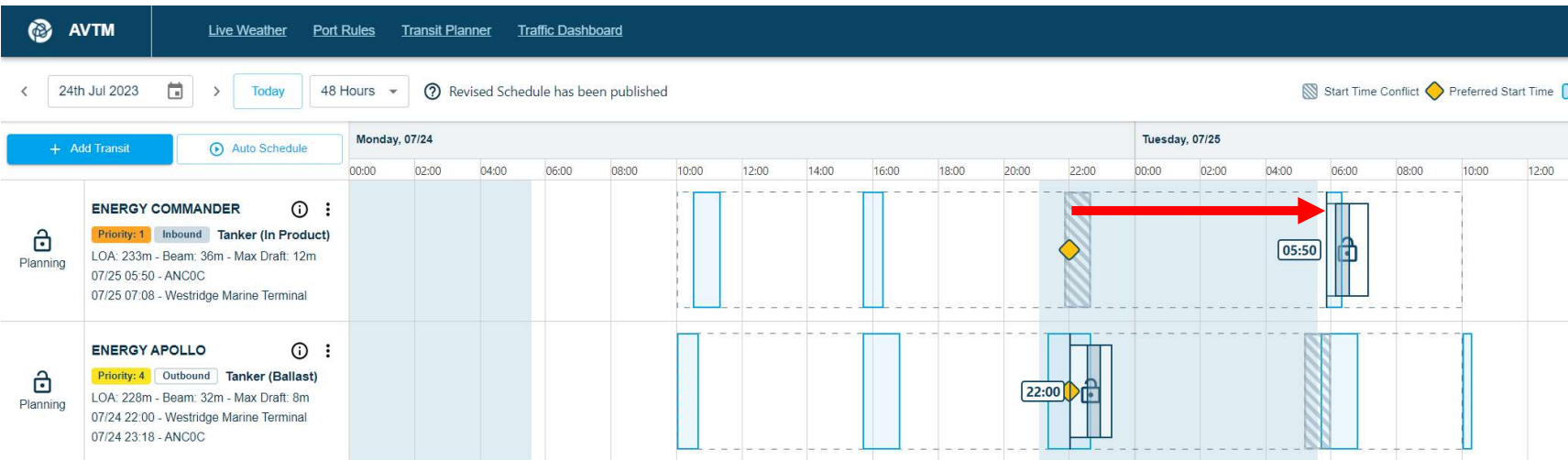
(3AE) Maximum Air Draft Rule
Maximum air draft must be < 44.3m above mean sea level between Second Narrows Rail Bridge and Iron Workers Bridge.
Maximum evaluated air draft was 45.42m above mean sea level.

(4) Maximum Wind Speed Rule
Maximum wind speed must be < 30kn between all waypoints.
Maximum evaluated wind speed was 1.01kn

(5) Maximum Opposing Current Rule
Maximum opposing current speed must be < 1kn between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.
Maximum evaluated opposing current speed was 0.095kn

(8AE) Static UKC Control Depth
Static UKC control depth between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows is equal to 15.13m MSL.
Minimum evaluated static UKC was 4.52m between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.

Port Rule Digitalised Vessel Scheduling



ENERGY COMMANDER [Close]

Priority: 1 Inbound

TRANSIT DETAILS | PORT RULES EVALUATION

- ✓ (1) **Maximum Following Current Rule**

Maximum following current speed must be < 0.5kn between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.

Maximum evaluated following current speed was 0.06kn
- ✓ (2) **Daylight Only Transit Rule**

The daylight only transit rule between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.
- ✓ (3AE) **Maximum Air Draft Rule**

Maximum air draft must be < 44.3m above mean sea level between Second Narrows Rail Bridge and Iron Workers Bridge.

Maximum evaluated air draft was 42.7m above mean sea level.
- ✓ (4) **Maximum Wind Speed Rule**

Maximum wind speed must be < 30kn between all waypoints.

Maximum evaluated wind speed was 0.97kn
- ✓ (5) **Maximum Opposing Current Rule**

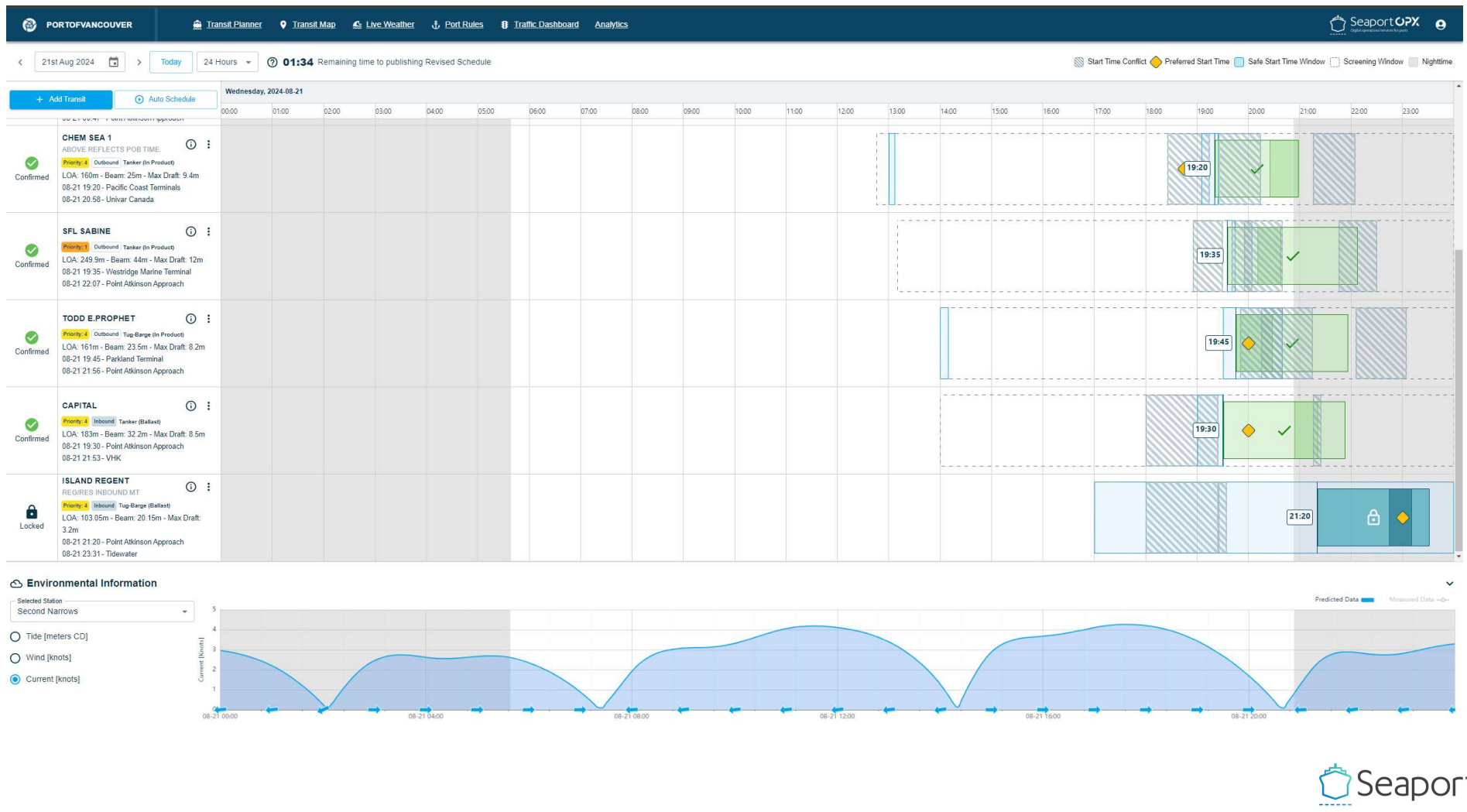
Maximum opposing current speed must be < 1kn between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.

Maximum evaluated opposing current speed was 0.835kn
- ✓ (8AE) **Static UKC Control Depth**

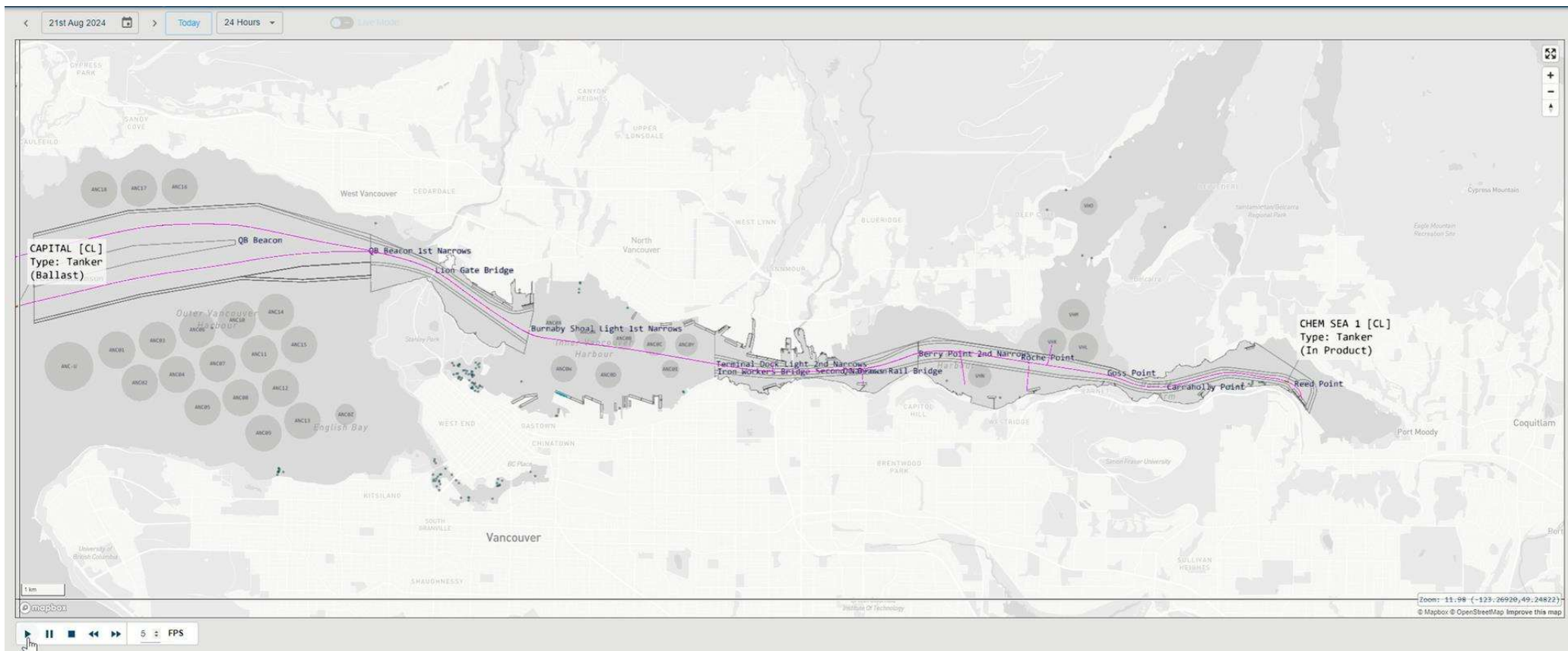
Static UKC control depth between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows is equal to 15.13m MSL.

Minimum evaluated static UKC was 1.8m between Berry Point 2nd Narrows and Terminal Dock Light 2nd Narrows.

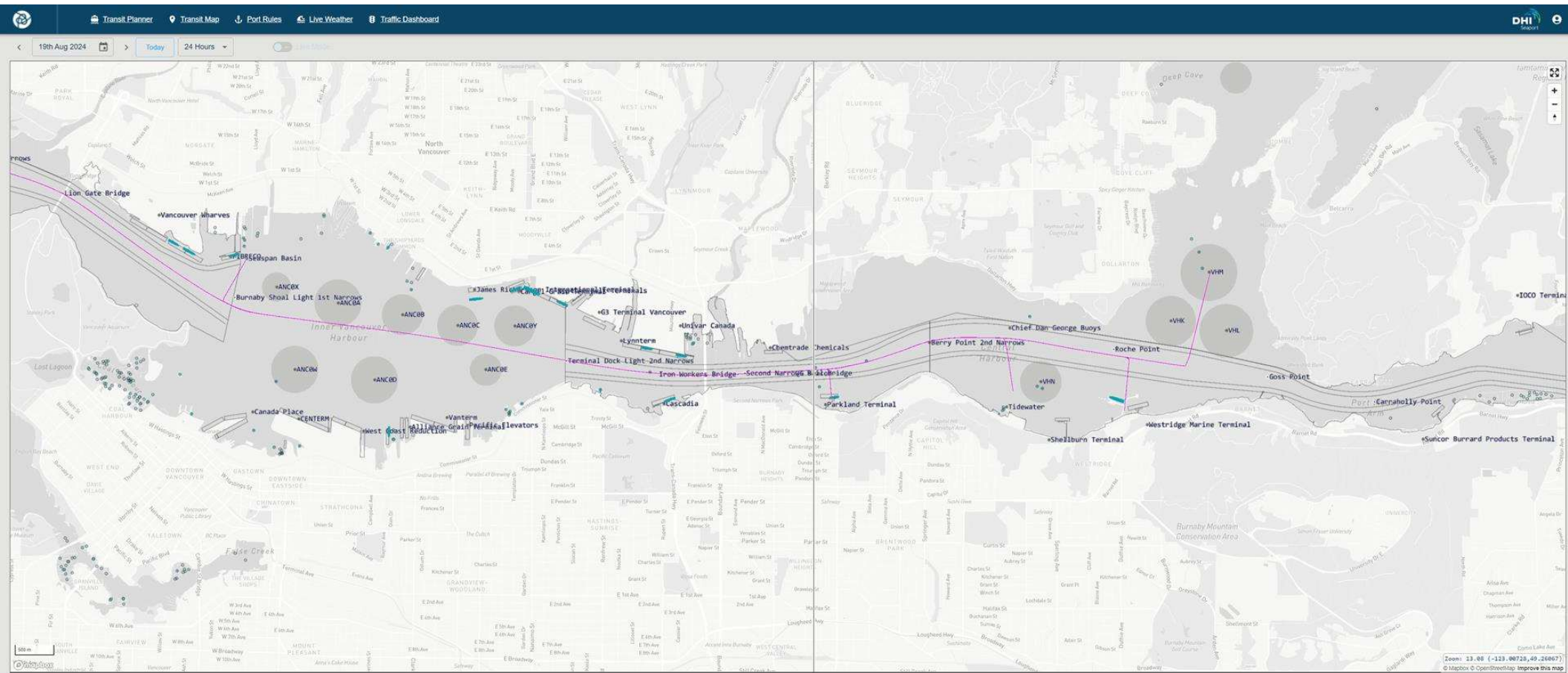
Digitalisation of Port Rules in Complex Ports – Port of Vancouver



Digitalisation of Port Rules in Complex Ports – Port of Vancouver



Digitalisation of Port Rules in Complex Ports – Validation



Digitalisation of Port Rules to Support Safe and Efficient Vessel Scheduling

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BC	1.29 m
MM	1.69m
Squat	0.79m
Dynamic Heel	0m
Hs Swell	0.2m
Current	0.4 knots
Wind	3.2 knots
Planned Speed	9.5 knots

