Concept of operations for Western Australia's next container port

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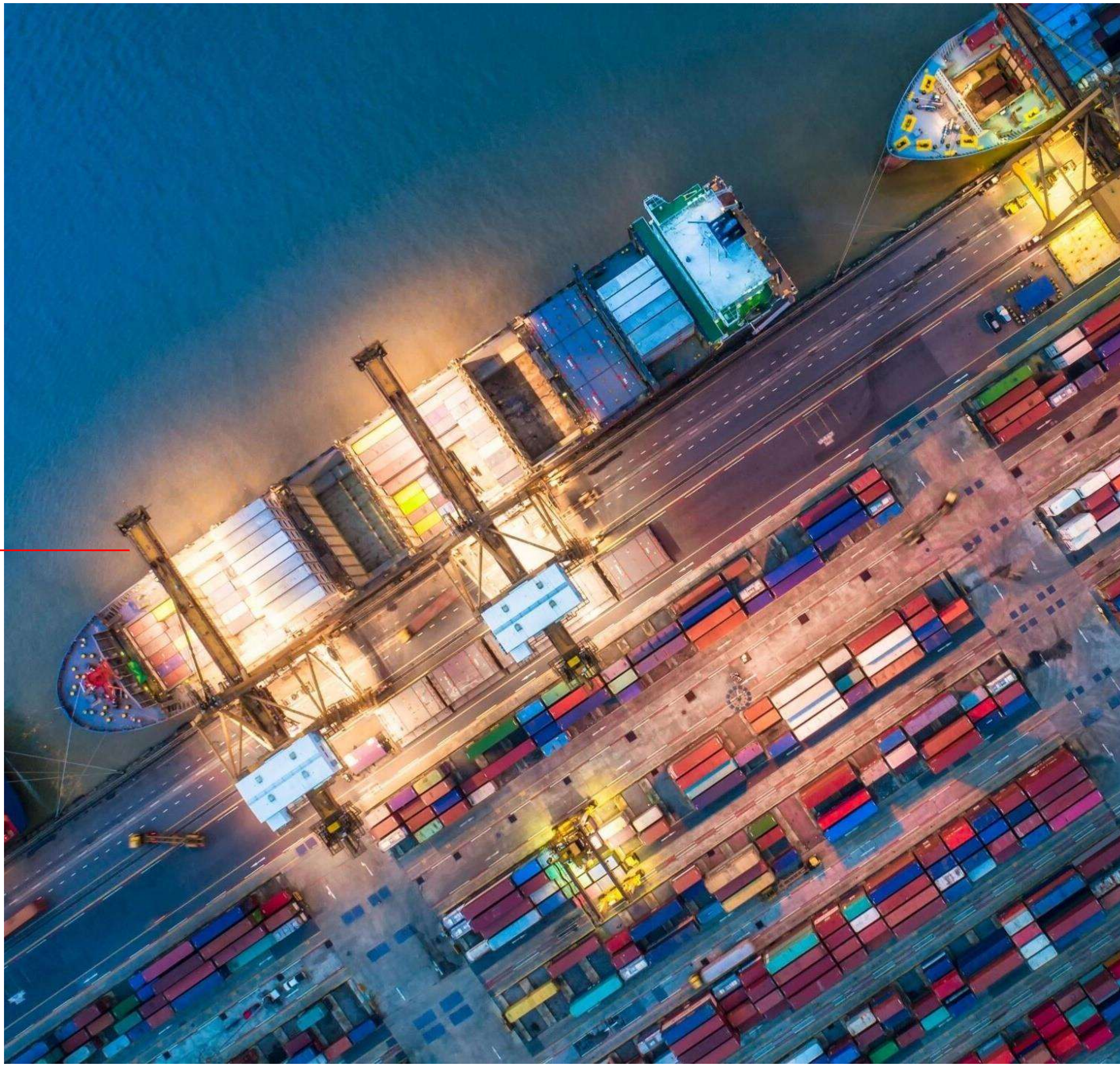
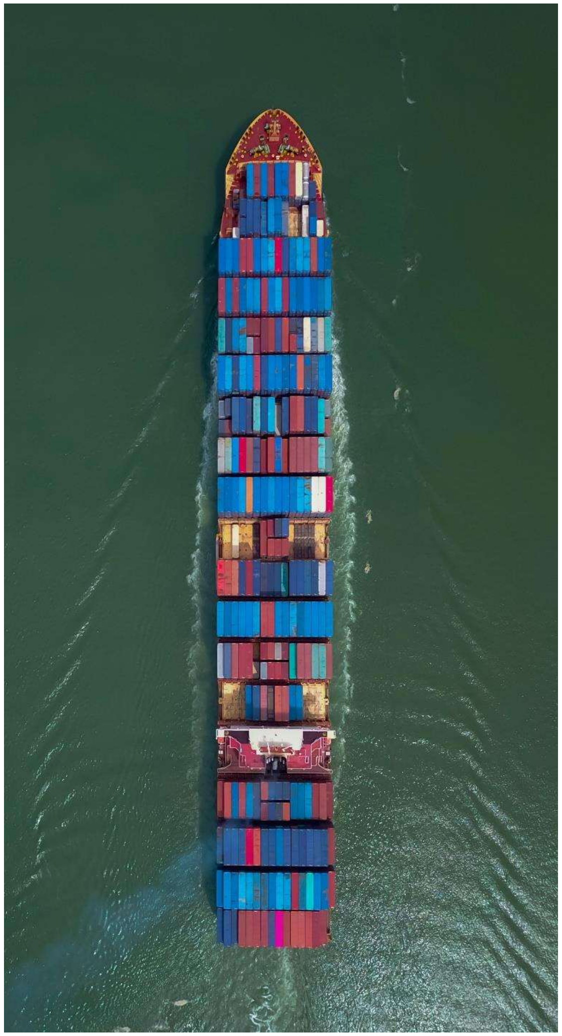
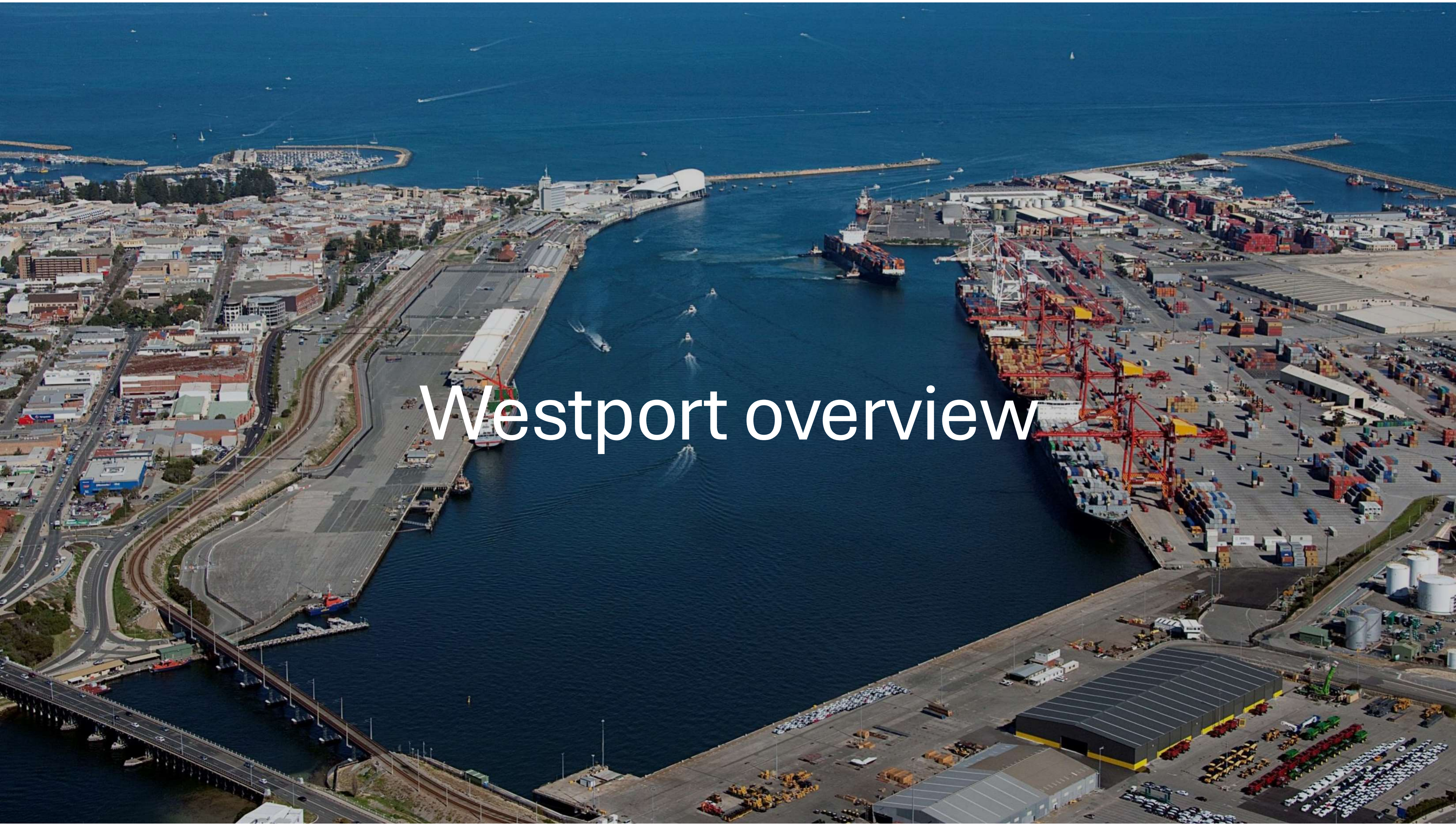


Presentation outline

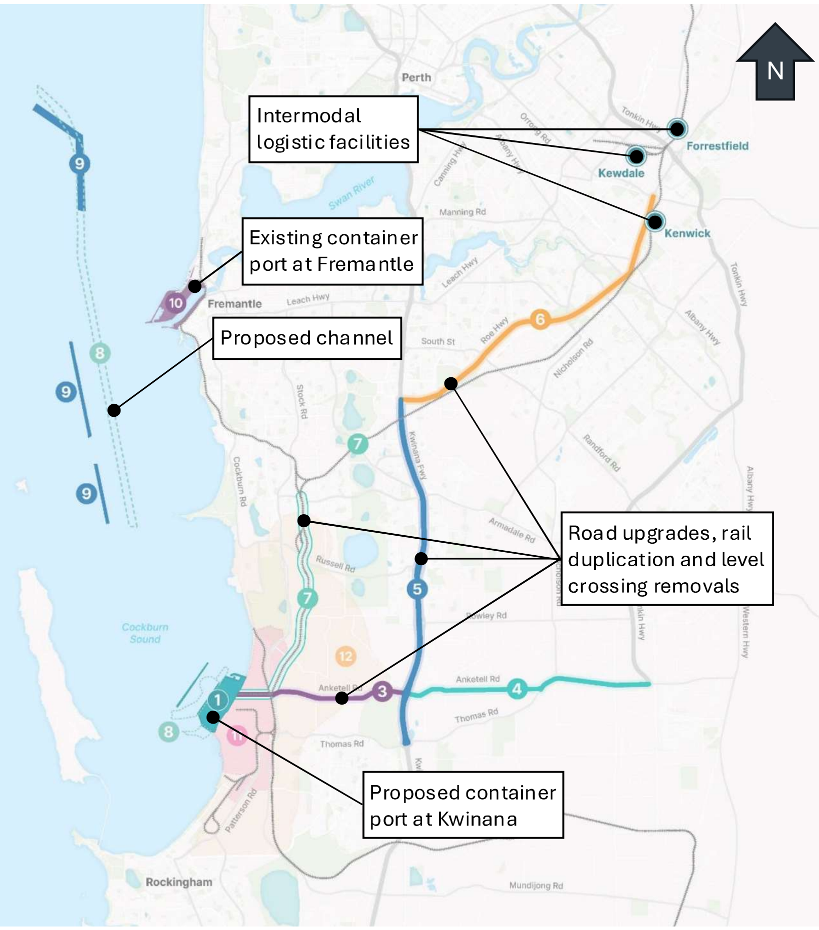


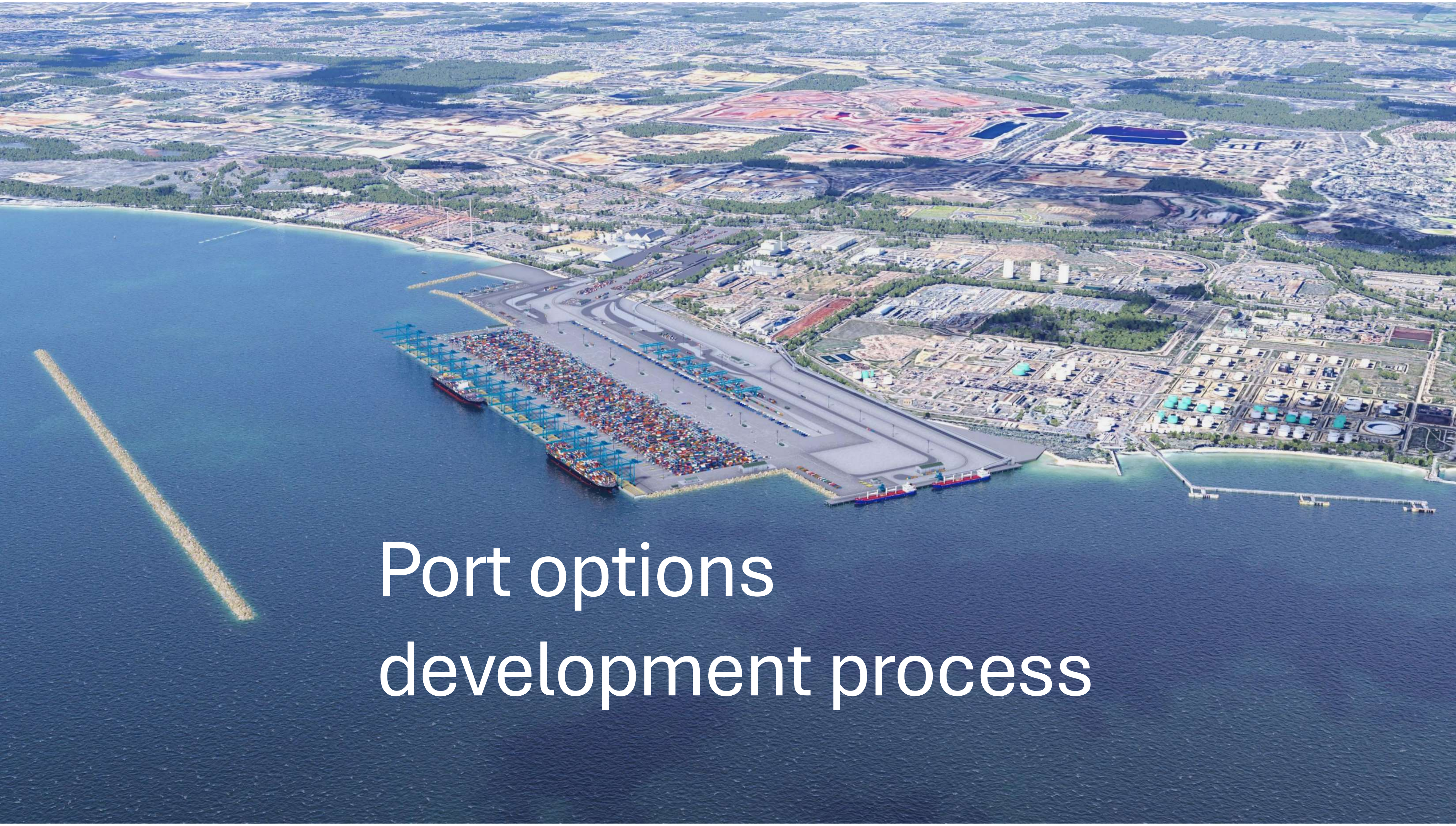
Westport overview



What is Westport and its key objectives?

- WA Government's planning program to move container trade from Fremantle to Kwinana to meet future demand
- Develop a new port with integrated road and rail network linked to intermodal logistic facilities
- Deliver a resilient and optimised supply chain that unlocks opportunities for the WA economy
- A preferred design was identified late 2023 in the Westport Supply Chain Integrated Design (SCID) Project, as shown on the right





Port options development process

Defining the key port requirements

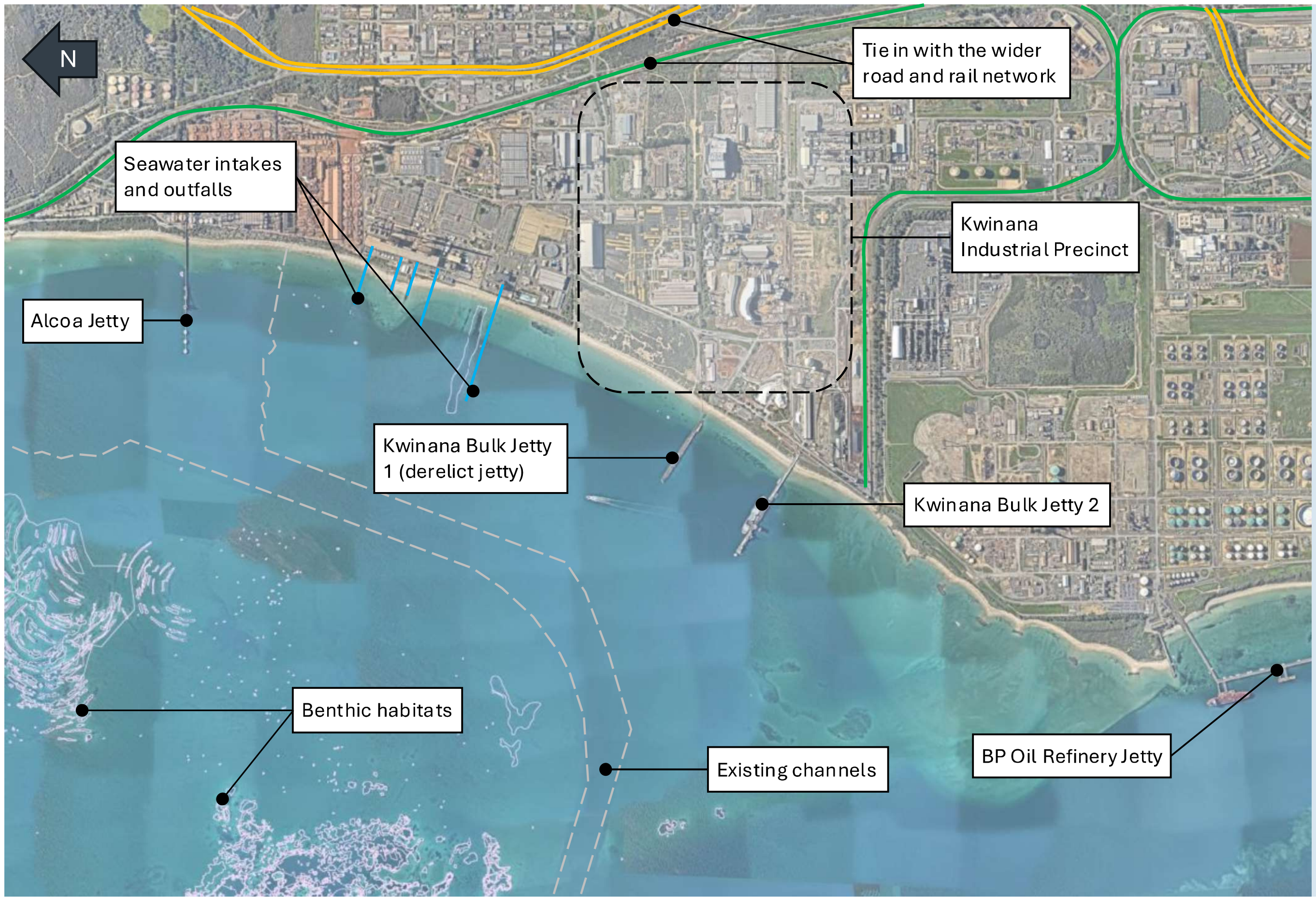
Westport's vision and goals

1. Better trade outcomes for exporters, importers and the economy
2. Local economic growth and jobs creation
3. Acceptable impact on the State's finances
4. Planning, building and operating the most sustainable port in Australia
5. Benefiting the community and Aboriginal peoples
6. Safety for workers and the community

What this means for planning the port

- The **port is resilient and scalable** to meet the container trade forecast
- **Critical State infrastructure remains operational** during and after the construction of Westport
- **Minimise capital and operating cost** of the port
- **Minimise environmental impact** on Cockburn Sound
- The **port is well connected** to the broader road and rail network

Understanding the key site constraints and interfaces



Other key considerations

(not shown diagrammatically)

State Agreements where impact requires significant expenditure and/or legislative amendments

Planned capital projects including expansion of the Perth Seawater Desalination Plant, New Kwinana Bulk Jetty and future rail corridor

Figure is indicative only

Link between developing the port options and the concept of operations

- Key port requirements
- Site constraints and interfaces

Principles underpinning the development of port options

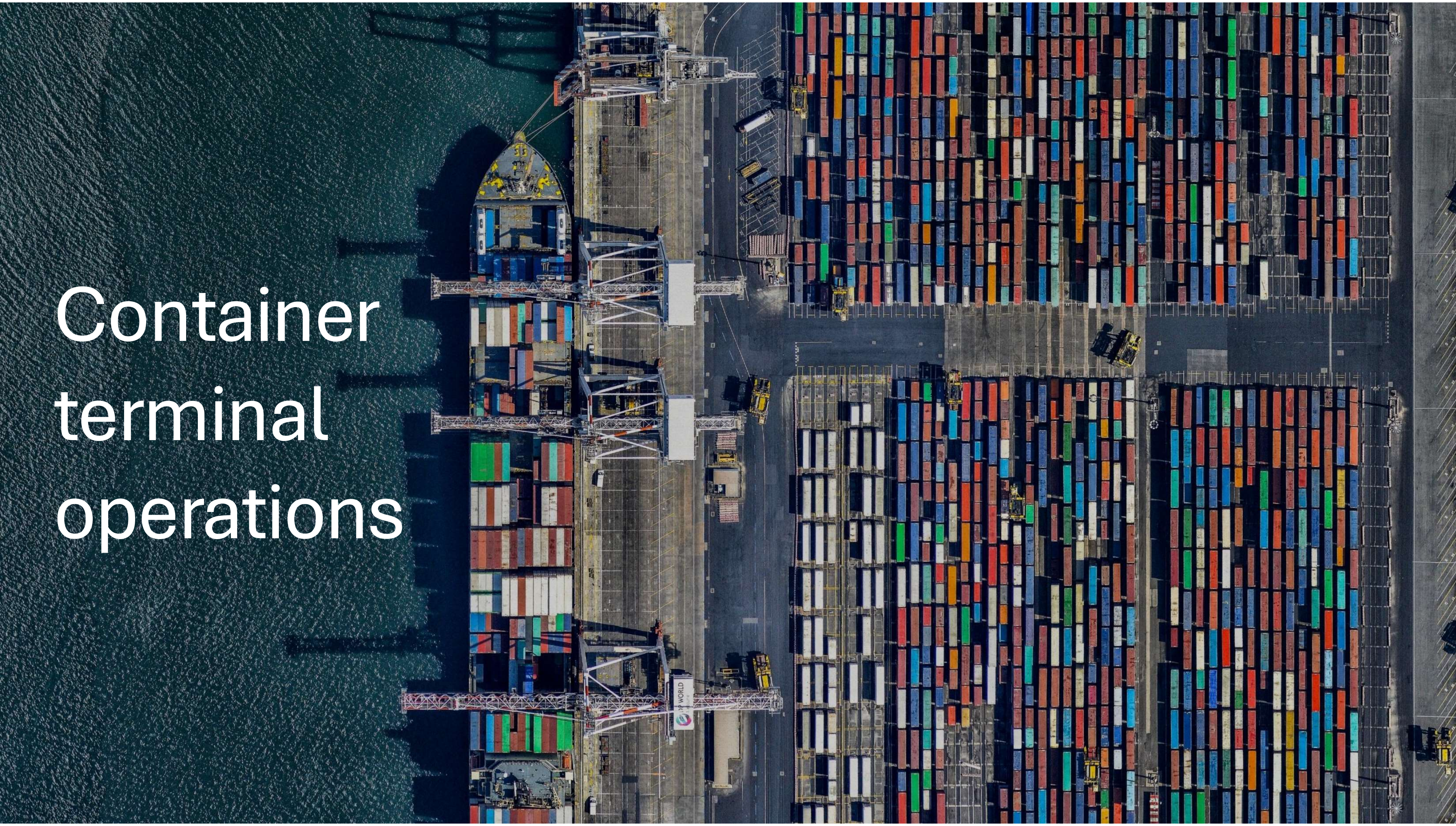
- Number of stevedores*
- Quay length
- Container terminal area
- Rail terminal area

- Container terminal concept of operations
- Rail terminal concept of operations

- Preliminary analysis and benchmarking

*Planning for two stevedores as the 'core case' was agreed with Westport for the SCID Project

Container terminal operations



Selecting the preferred mode of operation in the container terminal

Identifying suitable modes of operation

Building on the key port requirements developed from Westport's goals

- **Proven mode of operation** in high performing container terminals
- **Semi-fully automated operations** to increase operational efficiency and health and safety of workers
- **High container stacking density** to minimise the footprint considering the number of site constraints
- **Reasonable lifecycle costs** including capital, replacement/maintenance and operating

Preliminary analysis and benchmarking

Spatial requirements and equipment needs based on

- Container trade and vessel forecast
- Container dwell times to determine number of slots required
- Equipment productivities and circulation needs
- Spatial needs for auxiliary facilities (e.g. workshops and charging buildings)
- Generic layouts developed to understand how everything fits on together on a plan

Comparative assessment

Modes of operation considered in the container terminal

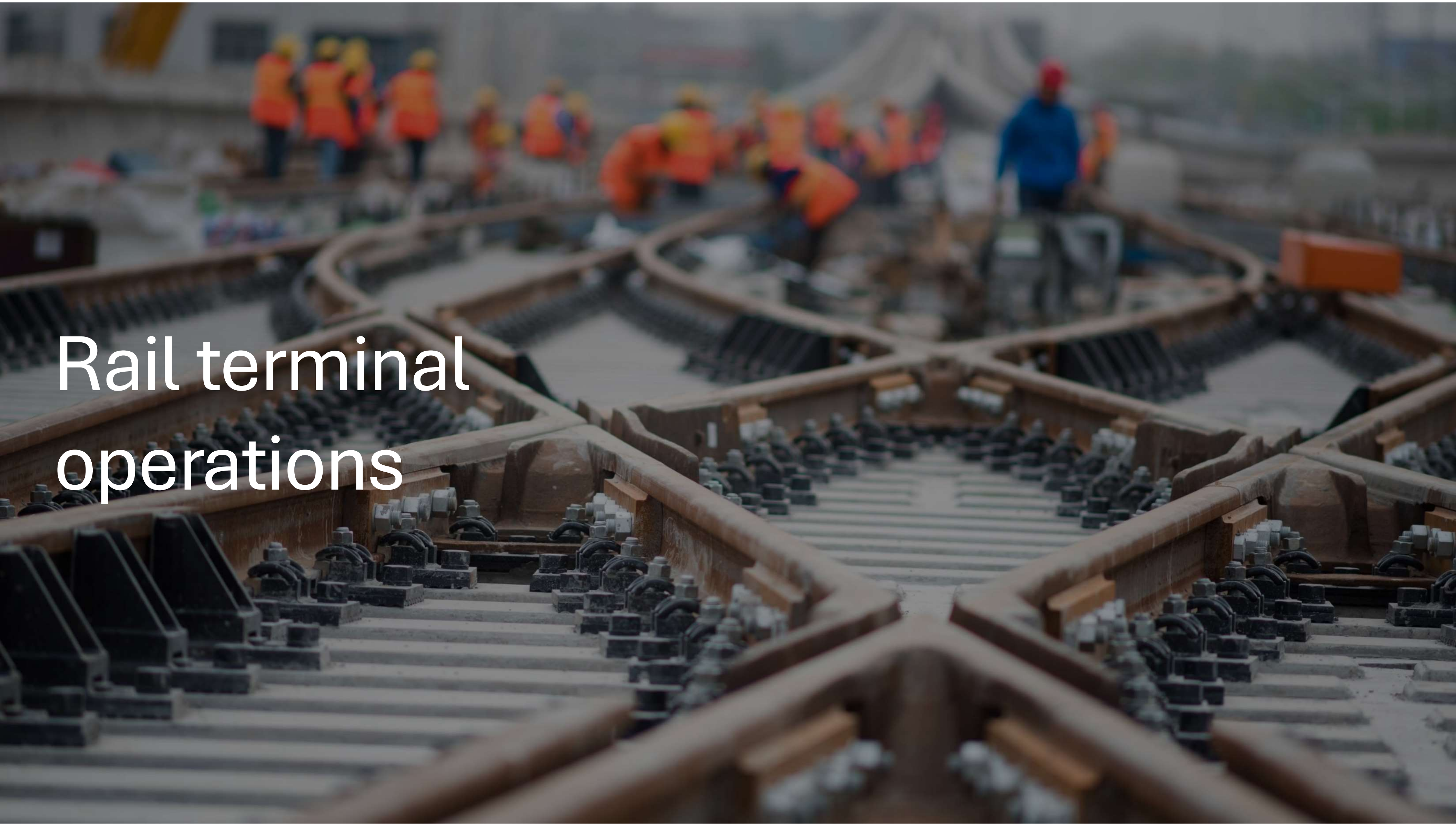
Characteristic	Automated Stacking Cranes (ASCs)	Automated Straddle Carriers (AutoStrads)	Automated Rubber Tyred Gantry Cranes (ARTGs)
Container stacking density	High – containers generally stacked in blocks up to 10 wide and 6 high	Medium – containers can be stacked up to 4 high	Medium/High – comparative to ASCs, but container blocks generally not as wide
Operational flexibility	Low – ASCs are rail mounted and fixed to a container block	High – stacking arrangement can be adjusted to suit terminal requirements	Medium – ARTGs can move between container blocks, although electric versions are more constrained in their deployment
Segregation with manual operations	High – interaction generally limited to landside transfer interface	High – interaction generally limited to landside transfer interface	Low/Medium – for side loaded ARTGs, interaction between road vehicles, ARTGs and potentially horizontal transfer equipment
Proven mode of operation in an automated terminal	Highly demonstrated – improves health and safety of workers and operational efficiency	Highly demonstrated – improves health and safety of workers and operational efficiency	Evolving – challenges with mixing manual and automated operations to be resolved
Capital costs*	High – highest civil and equipment costs	Medium – comparatively lower civil and equipment costs	Medium – comparatively lower civil and equipment costs
Maintenance/replacement cost*	Medium – longer equipment design life, although requires separate equipment fleet for container stacking and horizontal transfer	Medium – shorter equipment design life, although uses the same (but larger) fleet for container stacking and horizontal transfer	Medium – longer equipment design life, although requires separate equipment fleet for container stacking and horizontal transfer
Operating costs*	Medium – more housekeeping moves compared to other modes of options	Medium – fewer housekeeping moves, but higher energy per move than ASCs	Medium – fewer housekeeping moves for side loaded ARTGs and comparative energy per move to ASCs

ASCs were selected as the preferred mode of operation, coupled with Automated Guided Vehicles (AGVs) as the horizontal transfer equipment on the waterside, primarily due to:

1. Proven mode of operation in high performing and automated terminals.
2. High container stacking density which allows storage needs to be met in smaller footprints. It can also more easily support the ‘high’ container trade forecast and presents other on-dock opportunities if container trade follows a ‘low’ profile.

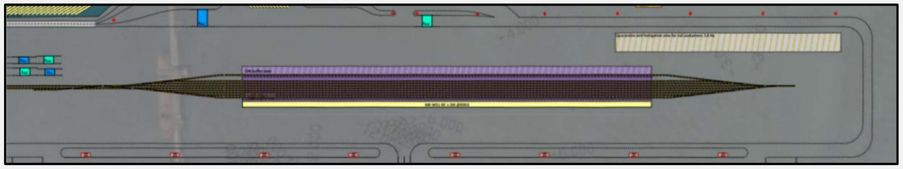
The **other modes of operation** were also tested on the **preferred port footprint** to ensure there is **flexibility** with the mode of operation.

*Based on the analysis carried out during the SCID Project, costs were not materially different in present value terms over the Westport planning horizon



Rail terminal operations

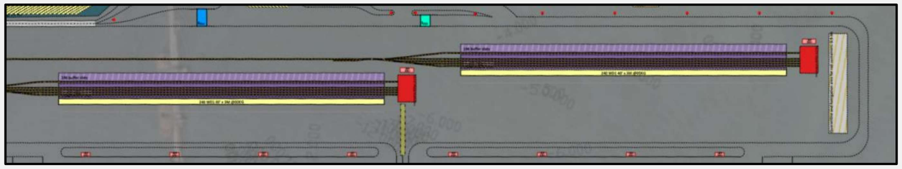
Planning for one or two on-dock rail terminals



One on-dock rail terminal

(assumed to be operated independently from the stevedores)

- Lower capital expenditure, particularly if the port footprint is deliberately designed to support one only rail terminal
- More practical to implement longer rail sidings to serve longer trains



Two on-dock rail terminals

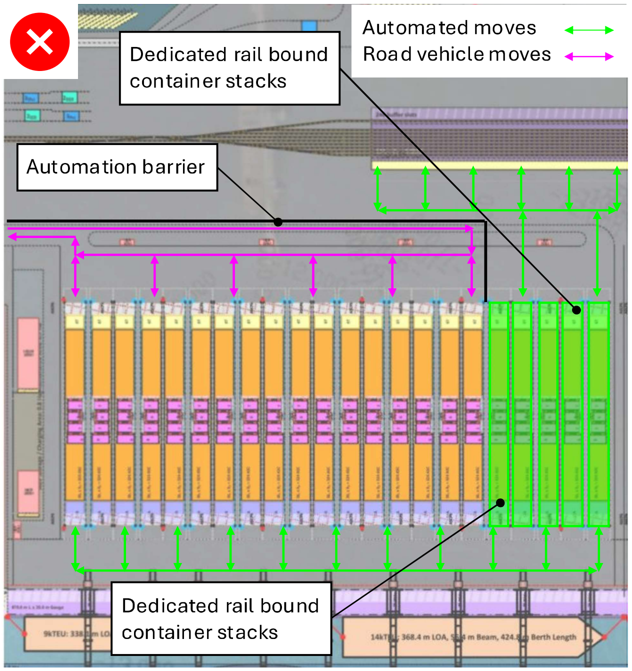
(one dedicated to each stevedore)

- Potential for higher rail modal share
- Potential for lower dwell times at particular points of the supply chain (e.g. at the container yard which can increase capacity)
- Relies on good vertical integration to realise many of the above benefits
- Sharing of common use facilities with the container terminal (e.g. equipment, workshops, charging buildings)
- Practical rail siding length limited based on spatial constraints
- Will likely require transfer of containers between operators, increasing number of moves

While in the early planning phase of Westport, it is difficult to quantitatively justify the advantages of two on-dock rail terminals over a single on-dock rail terminal, as there are too many variables and assumptions that would need to be made.

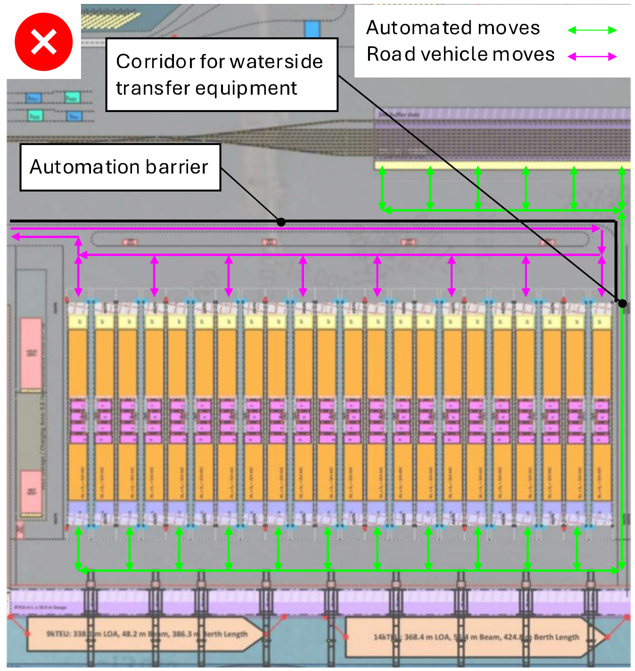
For the **SCID Project**, the port was **designed with a single rail terminal** but has been **space proofed for two rail terminals** if future studies show this as the preferred solution.

Container terminal to rail terminal transfer options



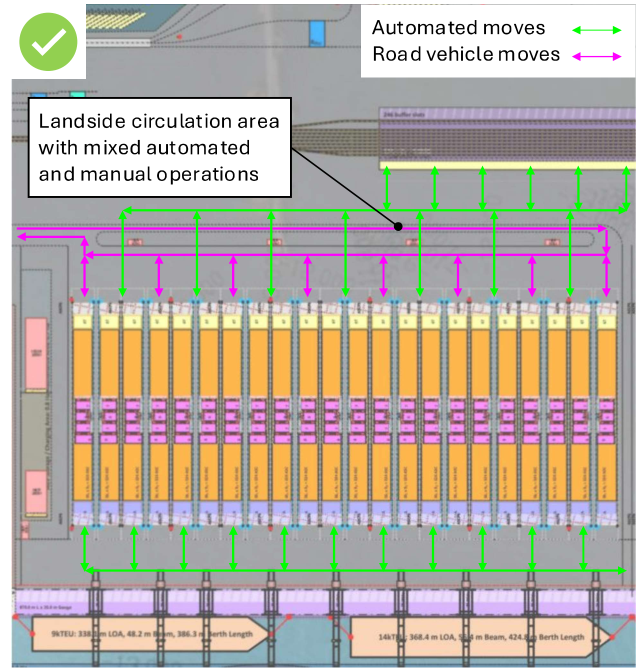
Dedicated rail bound container stacks

- Currently adopted at APM Terminals Maasvlakte II
- Requires certainty with the container modal split
- Inflexible to changes in volumes and container split which would lead to loss of container yard capacity



Use of waterside transfer equipment

- Long transport corridor from the waterside, requiring higher than typical horizontal transfer equipment
- Typically seen when the rail terminal is aligned perpendicular to the quay
- Increased congestion on the waterside
- Significant imbalance in waterside and landside ASC utilisation, such that additional ASC blocks may be required to meet the waterside demand



Mixing of automated and manual operations

- Proof of concept projects (e.g. Hutchison Ports Thailand) are currently be explored which involve mixing of road vehicles and automated tractor trailers (ATTs)
- By the time Westport is constructed, it is assumed automation concepts such as this would have developed for full commercial deployment

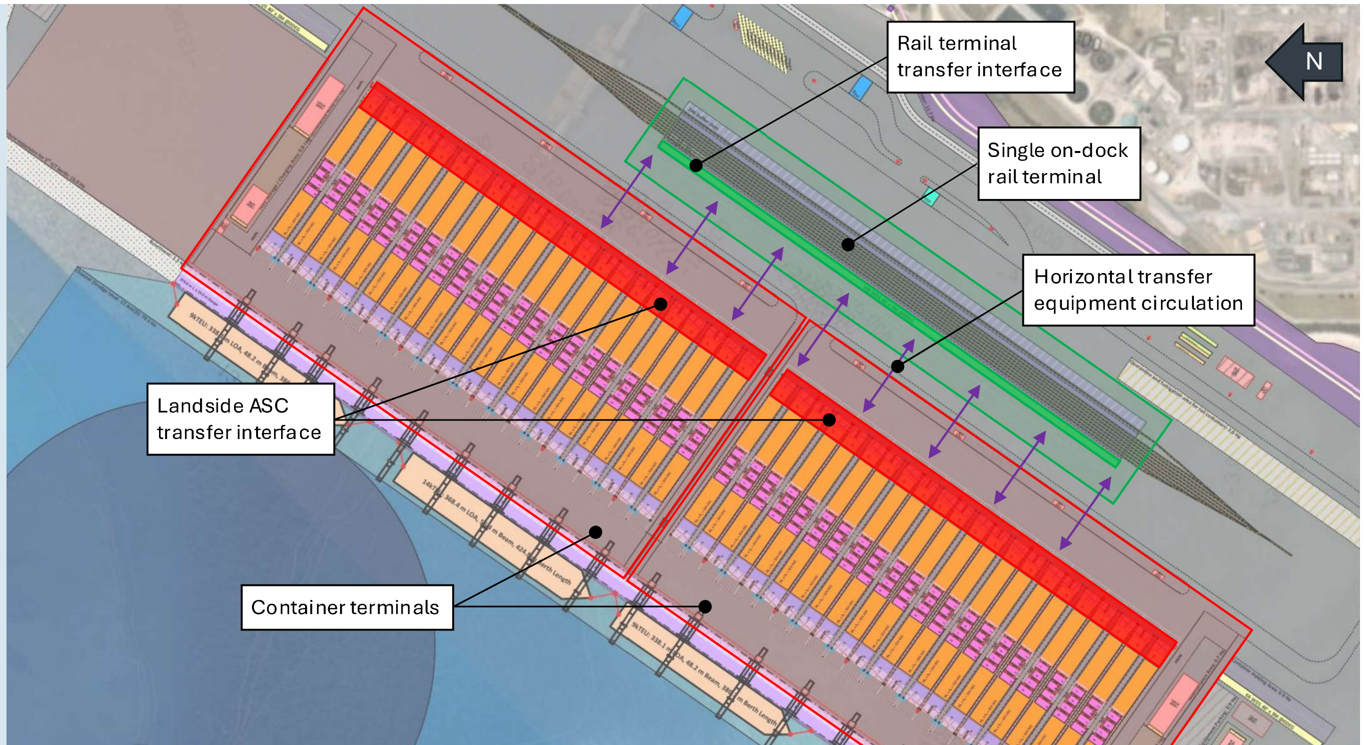
Preferred on-dock rail terminal solution

Single on-dock rail terminal closely integrated with container terminals

Aims to increase rail modal to improve movement of containers across the supply chain

High level of performance with cantilevered rail mounted gantry cranes (CRMGs) spanning over eight sidings

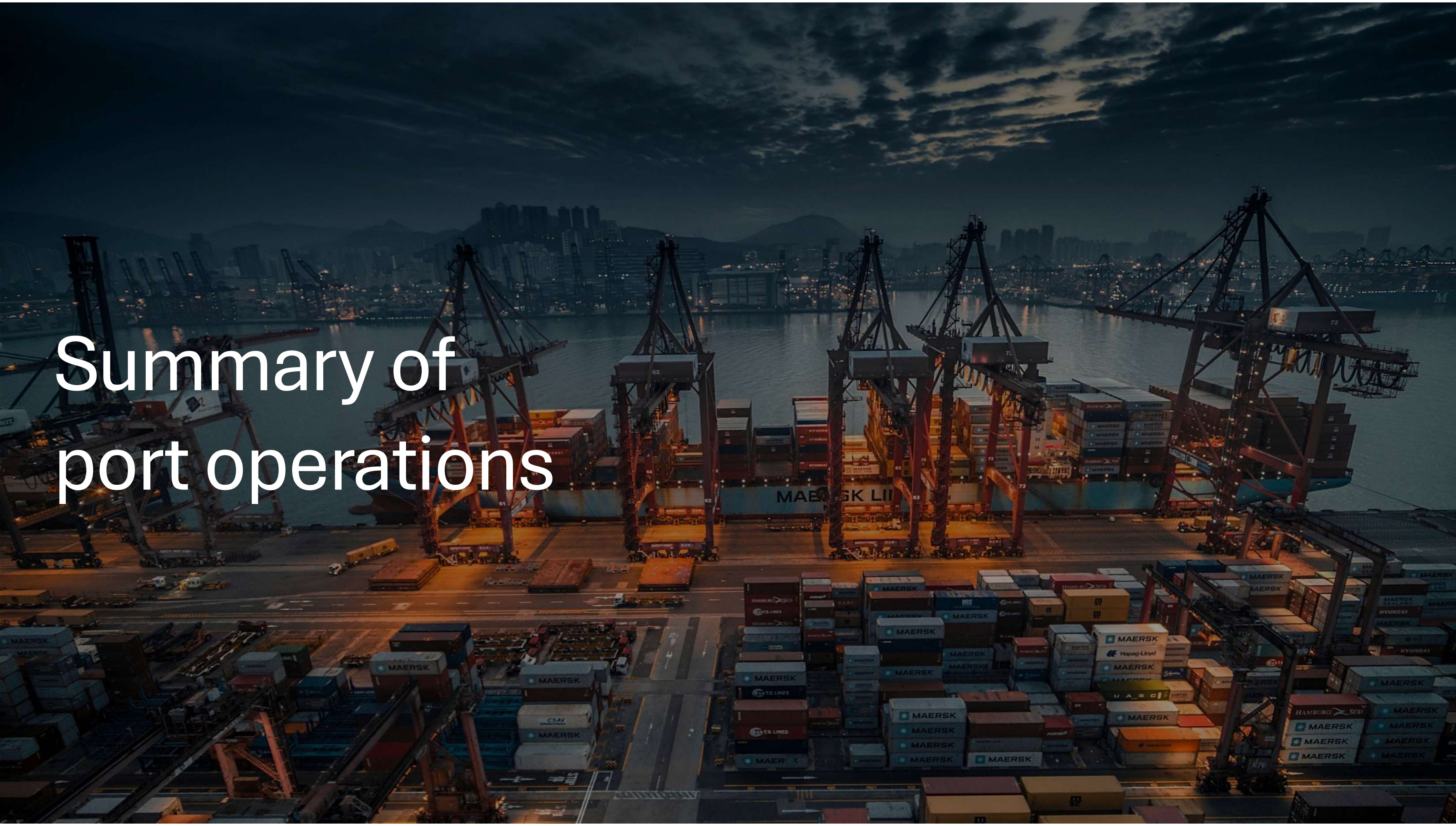
ATTs used as horizontal transfer equipment between the container terminals and rail terminal



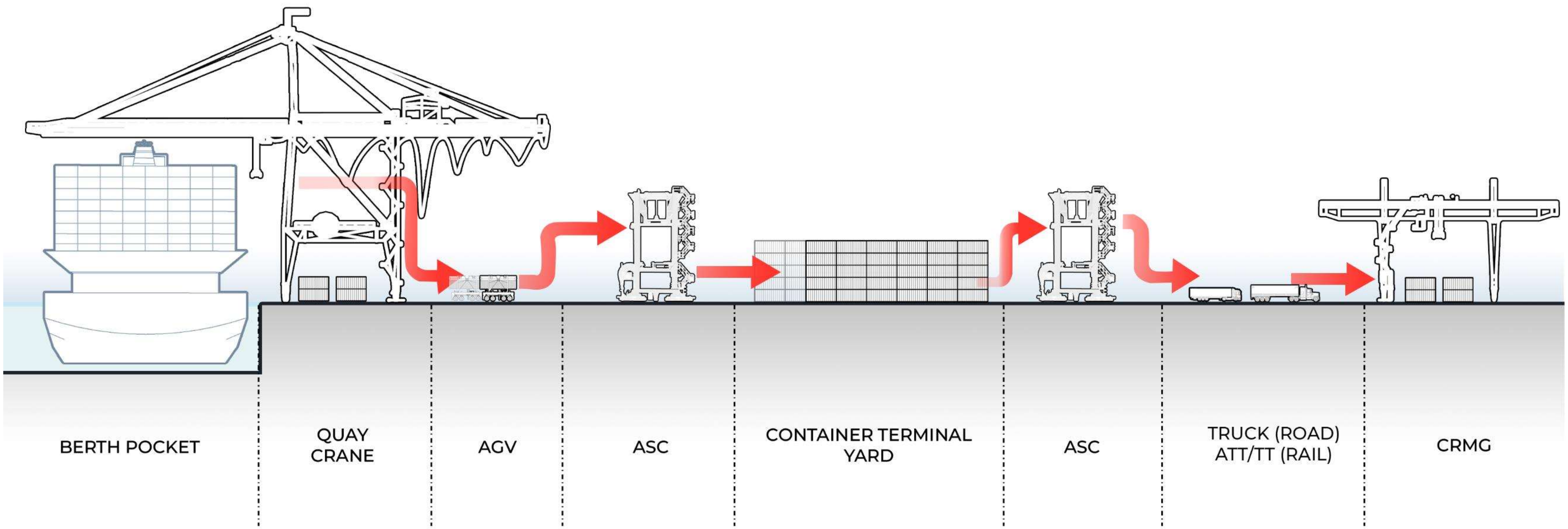
General movement of containers between the container terminals and on-dock rail terminal

Container Yard ←ASC→ ATT ←CRMG→ Rail stacks ←CRMG→ Train

Summary of port operations

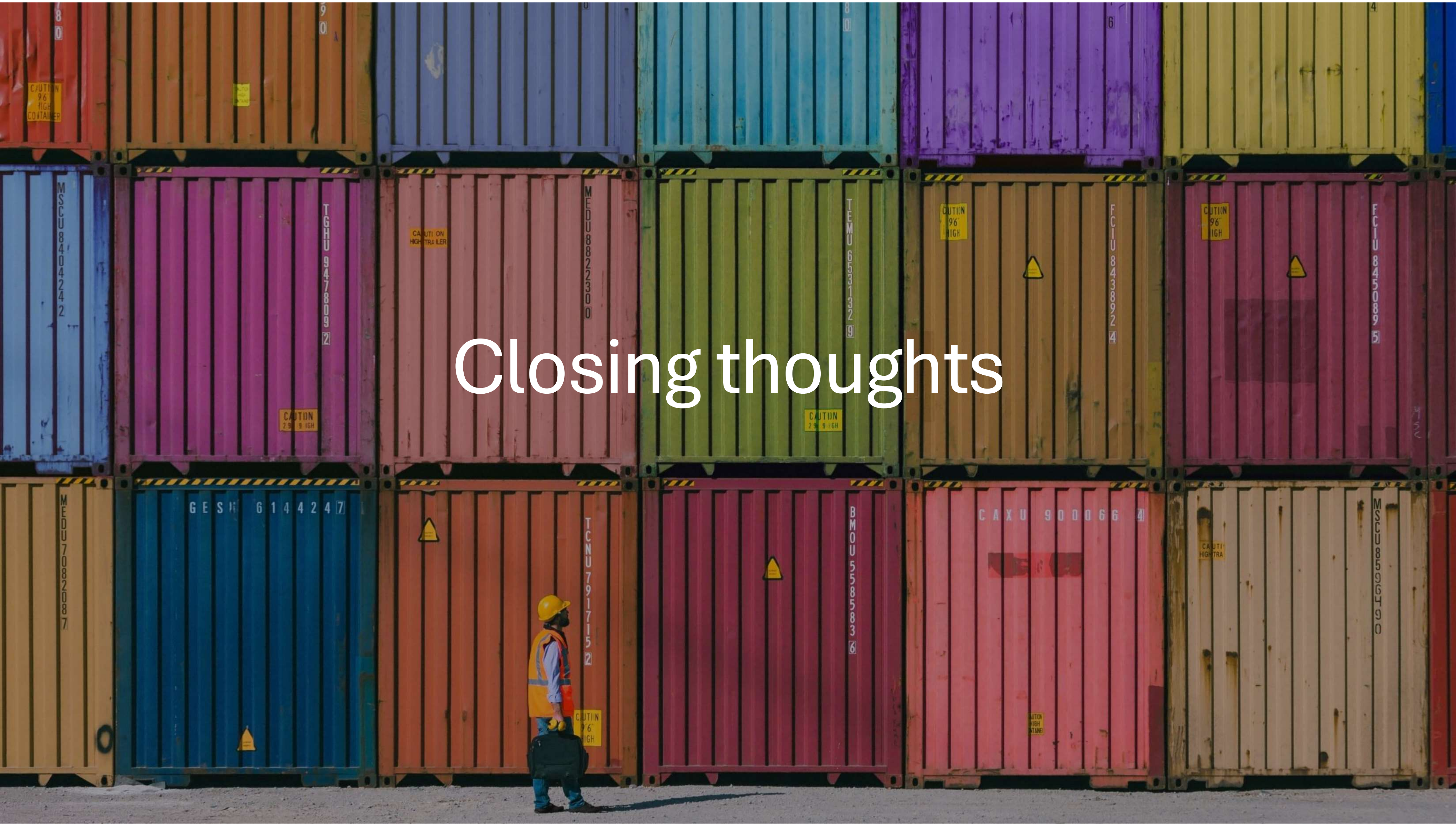


Port concept of operations



Import direction shown only

Closing thoughts

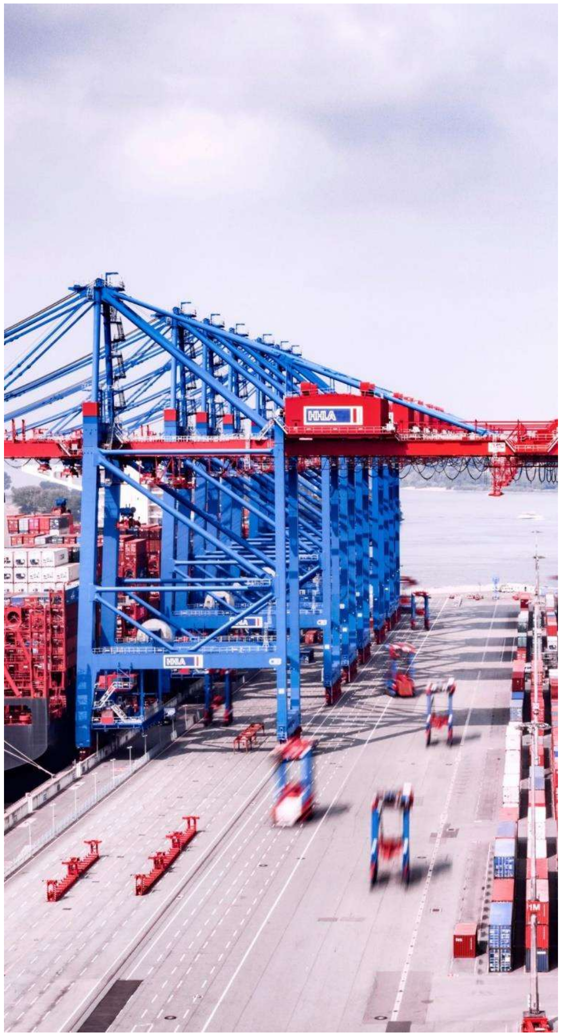


Port planning and concept of operations

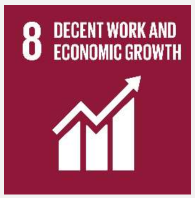
- There is a clear link between the port planning and the concept of operations
- Can be challenging when planning for ports over a decade before construction

- Most optimal solution may not be evident in the planning phase due to new and emerging technologies
- The preferred solution at the time of planning may be phased out and less desirable at the time of constructing the port
- Future technology advancements and innovations should be considered in the planning phase, although the design should not necessarily rely on them

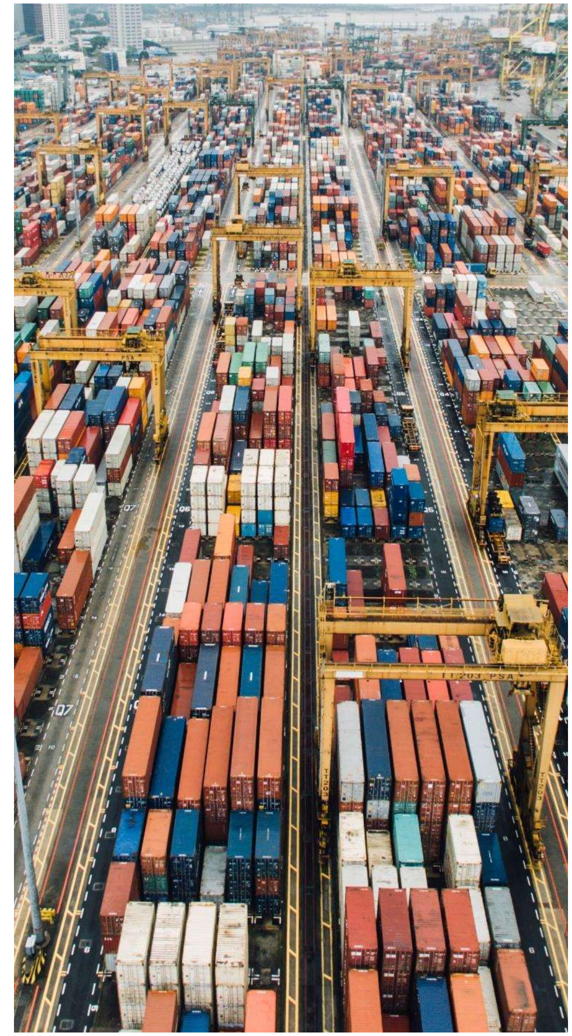
- In Australia where a port land model is commonly adopted, the final terminal arrangement, mode of operation and technology solutions are generally the responsibility of the appointed terminal operator(s)
- In the early planning phase, it is desirable be technology agnostic and to retain as much flexibility as possible, to allow implementation of an optimal solution at the time of construction



United Nation Sustainable Development Goals



- A multi-criteria assessment has been used to identify a preferred port option which considers
  - environmental impacts
  - long term sustainability
  - supply chain efficiency
  - financial value
- Port operations are a significant emitter of carbon emissions – for the purpose of the SCID Project, it has been assumed all equipment is electric
- The port design will promote inclusive and sustainable industrialisation and enable innovation



Questions?

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