4.0 Proposed Modification

4.1 Introduction

The overall objective of the Outer Harbour Development is to develop additional port and landside facilities in the Outer Harbour to attract new trades, as well as increase the volume of existing cargoes. This modification proposes to increase the approved capacity of bulk throughout at the first multi-purpose terminal berth within the Outer Harbour Development. To enable a larger throughput, both the Concept Plan and Major Project approvals would require modification.

Overall, the method of construction, layout and operation of the Outer Harbour Development would remain similar to that outlined in the existing approvals. However, the majority of changes to the development are related to the Major Project (Stage 1) to allow for increased capacity at the first multi-purpose berth for a total throughput of 16 Mtpa. Land transport for the increase in throughput would be provided by rail, rather than road. As a result, port side and landside infrastructure at the Port wold require reconfiguration and alterations to the local freight rail network to handle increased train movements. The local road network would also require modification to accommodate changes to the rail infrastructure, in particular on Old Port Road.

4.2 Concept Plan

4.2.1 Overview

The Concept Plan provides a framework for the progressive completion of the Outer Harbour Development and comprises creation of land dedicated to port activity. Modifications to particular elements of construction and operation of the Concept Plan include:

- Increase in the bulk cargo capacity to 16 Mtpa through the first multi-purpose berth.
- Dredging to a greater depth to allow larger Cape size vessels to access the first multi-purpose berth.
- Increased number of ship movements to cater for increased bulk volumes and more efficient movement of cargo.
- An enlarged operational land area for the multi-purpose terminal to support the increase in cargo volumes.
- Minor amendments to the reclamation footprint due to progression of detailed design.
- Covered conveyors and construction of storage sheds to enable the movement of product between trains, trucks and terminals.
- Increased train movements to facilitate delivery of larger volumes of bulk cargo.
- Additional rail and supporting infrastructure to facilitate increased train movements.
- Changes to road infrastructure in the vicinity of the Outer Harbour to accommodate increased train movements.

It should be noted that the majority of changes to the Concept Plan are included in Stage 1 due to the increase in capacity at the first multi-purpose berth, and the construction and operation of this berth in Stage 1. These changes have some implications for Stages 2 and 3 of the development, though these are relatively minor. An overview of proposed changes to the Concept Plan is provided below, with details of Stage 1 modifications outlined in **Section 4.3**.

The Concept Plan scenario, inclusive of land-based activities is provided in **Figure 4-1**. The operational scenario for the Concept Plan is provided in **Figure 4-2**. A summary of the key stages that comprise the Concept Plan is provided in **Section 4.2.2** and shown on **Figure 4-3**, **Figure 4-4** and **Figure 4-5**.

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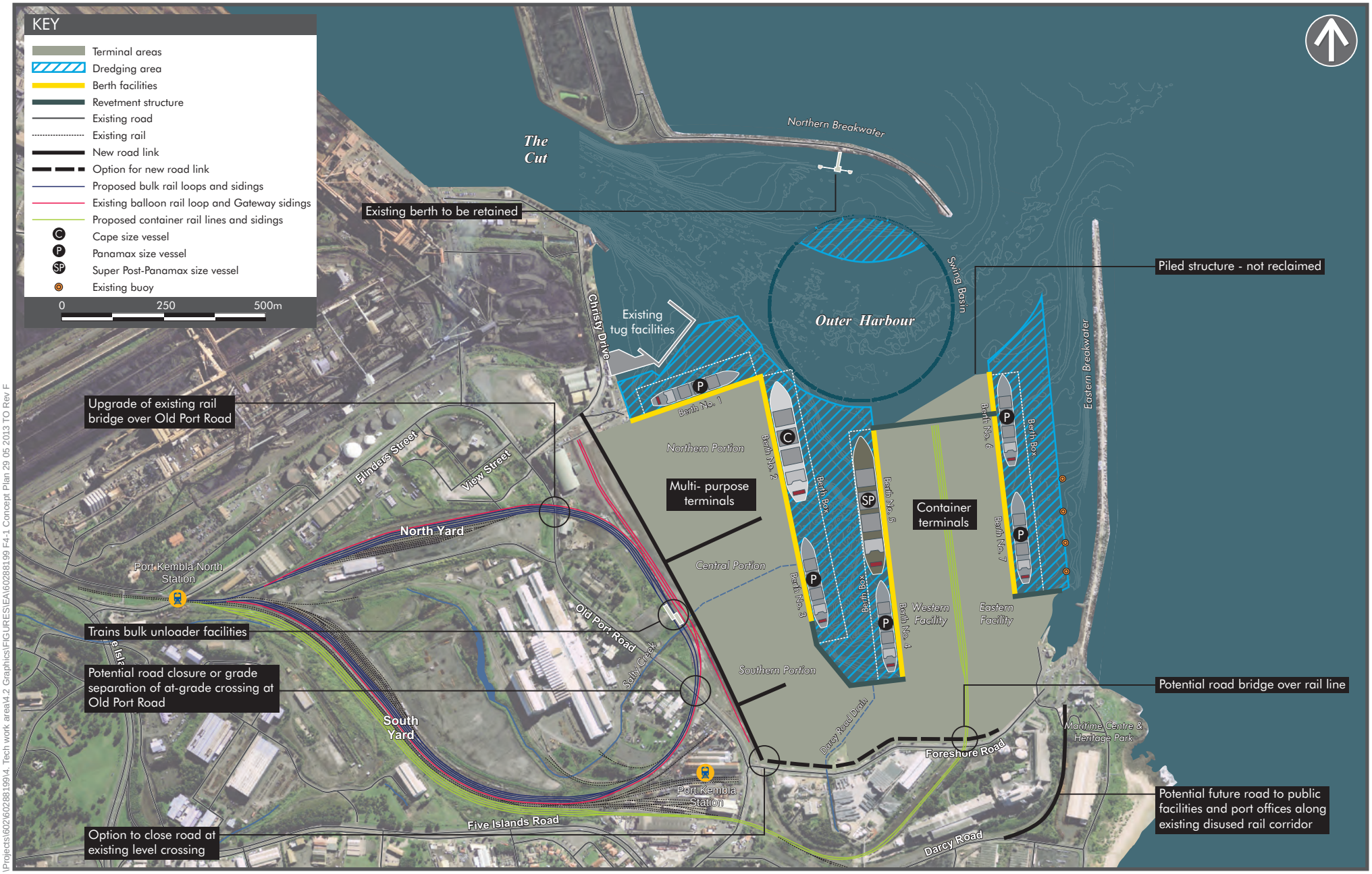


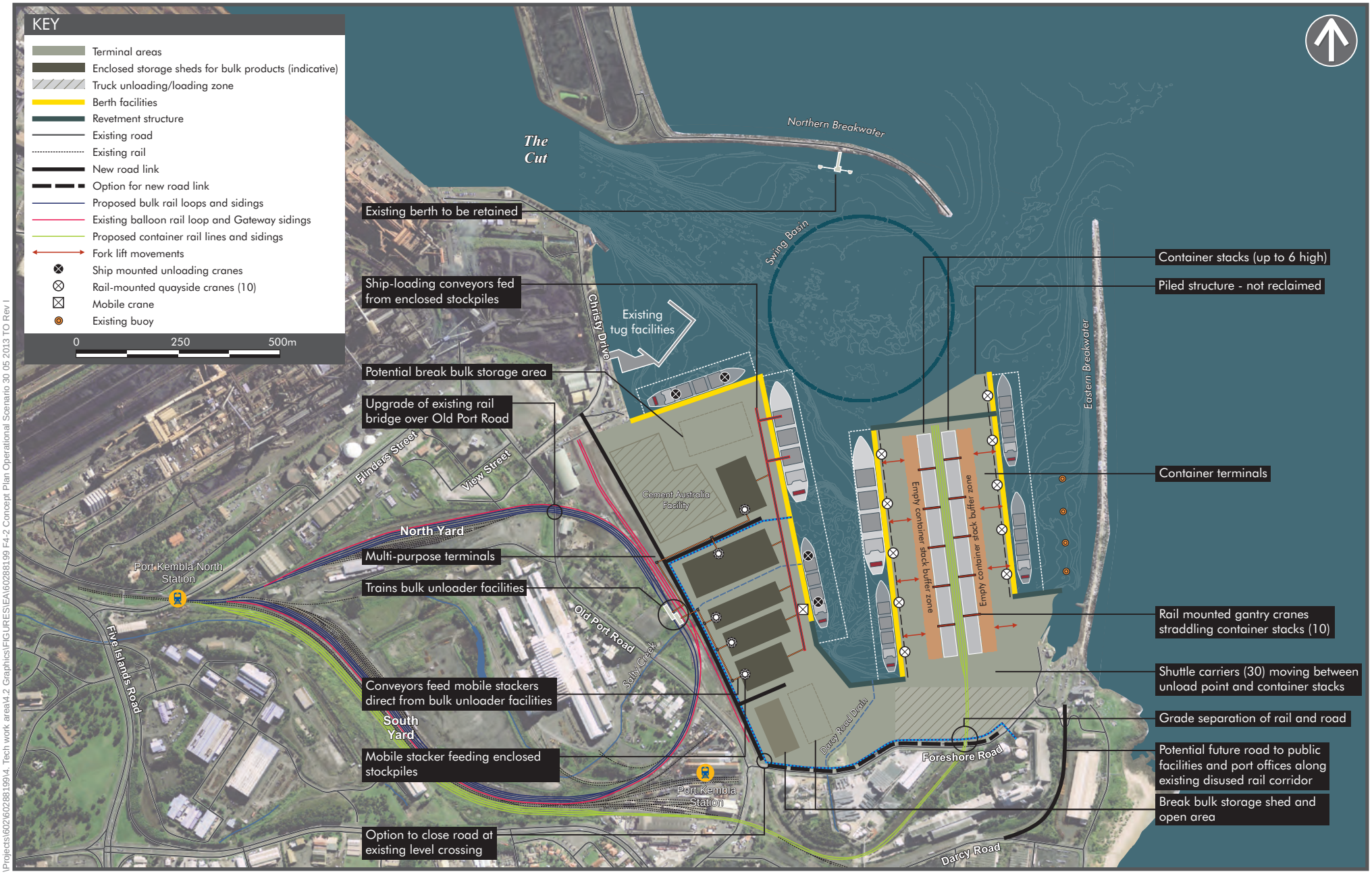
\Projects\60216028819914. Tech work area\4.2 Graphics\FIGURES\EA\60288199 F4-1 Concept Plan 29 05 2013 TO Rev F

AECOM

CONCEPT PLAN (AS MODIFIED)

Port Kembla Outer Harbour Development Modification
Environmental Assessment

FIGURE 4-1



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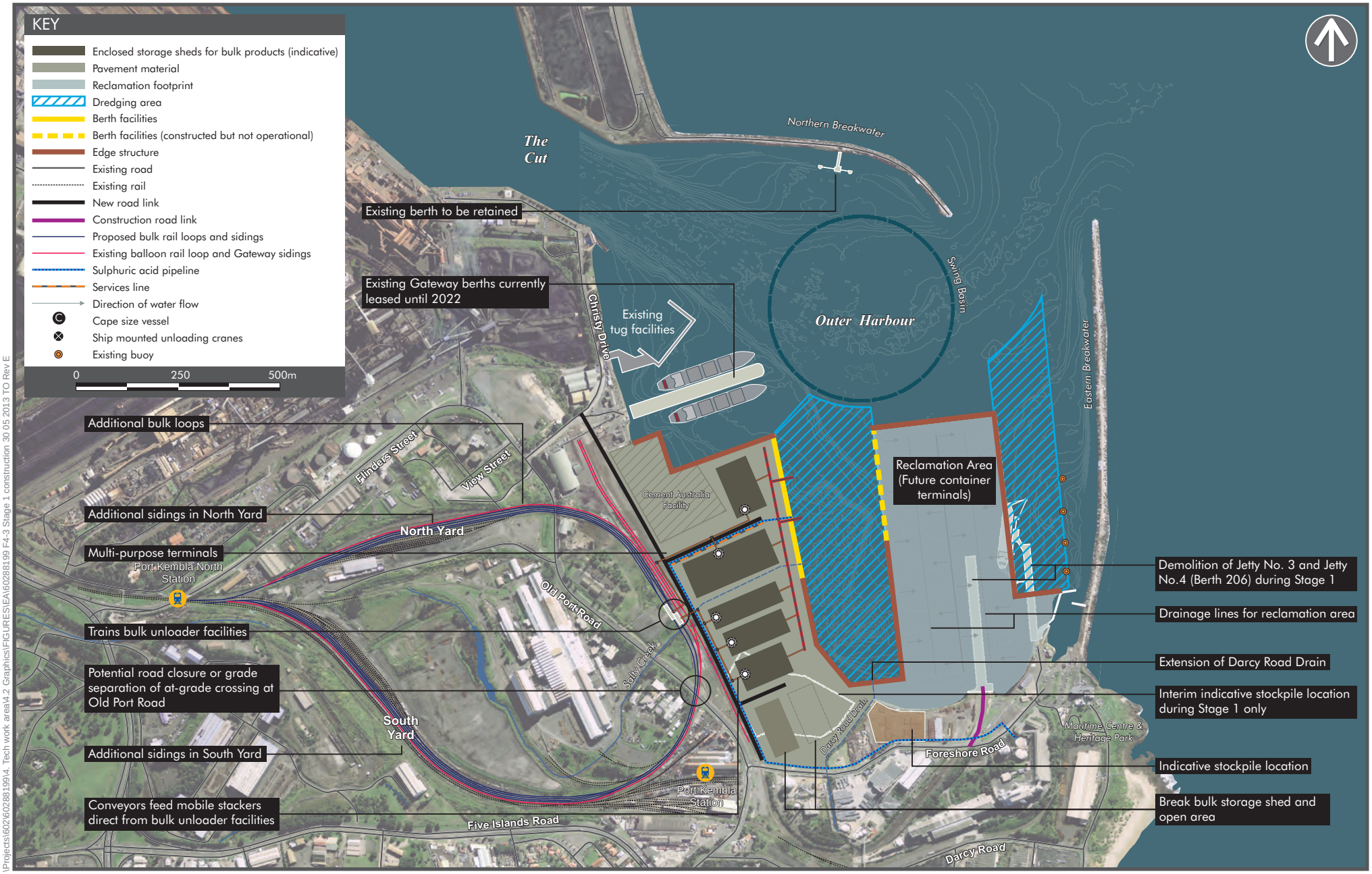
CONCEPT PLAN - INDICATIVE OPERATIONAL SCENARIO (AS MODIFIED)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 4-2



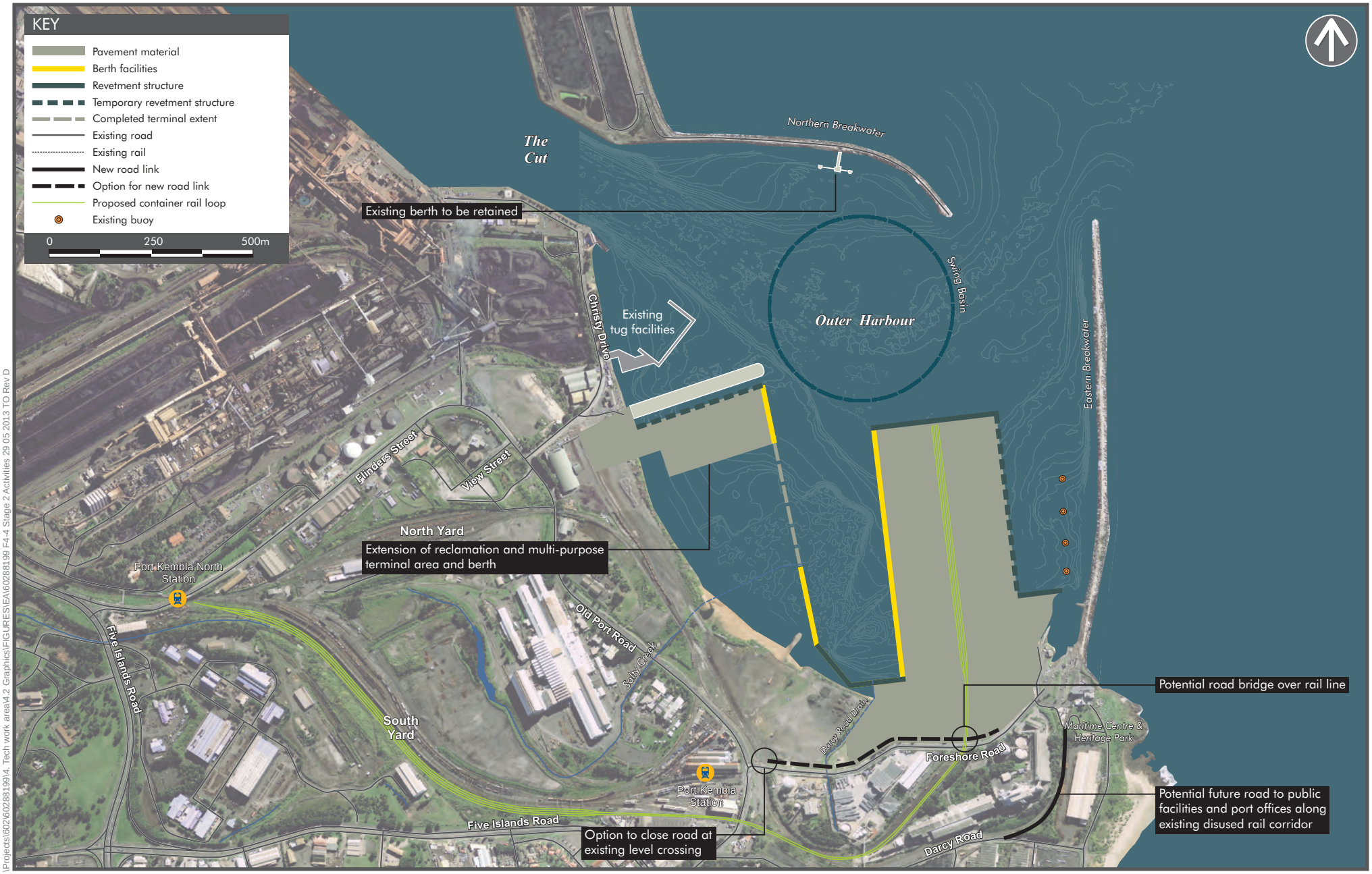
\Projects\60216028819914. Tech work area\4.2 Graphics\FIGURES\EA\60288199 F4-3 Stage 1 construction 30 05 2013 TO Rev E

AECOM

STAGE 1 (AS MODIFIED)

Port Kembla Outer Harbour Development Modification
Environmental Assessment

FIGURE 4-3



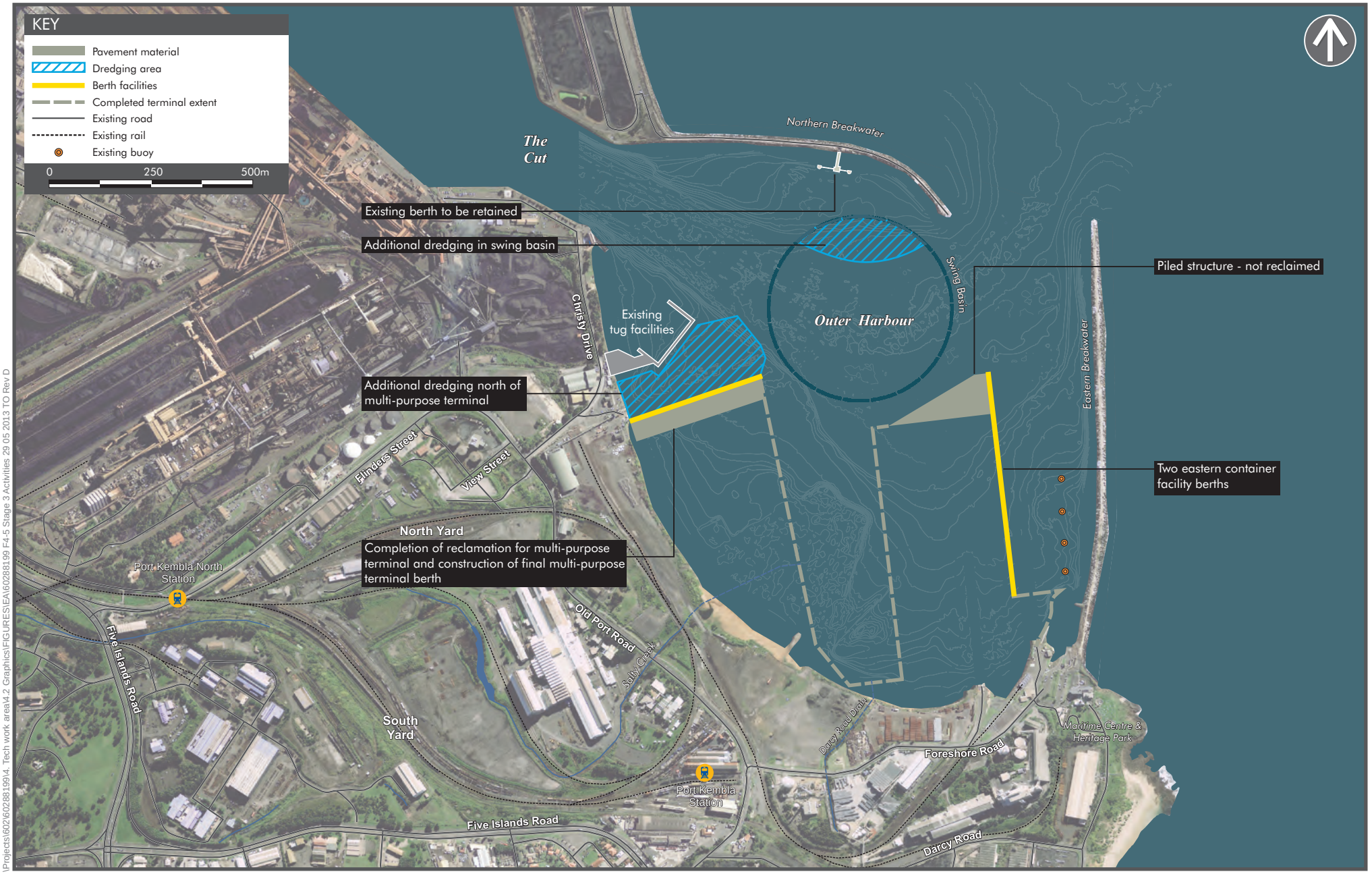
\Projects\60216028819914. Tech work area\4.2 Graphics\FIGURES\EA\60288199 F4-4 Stage 2 Activities 29 05 2013 TO Rev D

AECOM

STAGE 2 (AS MODIFIED)

Port Kembla Outer Harbour Development Modification
Environmental Assessment

FIGURE 4-4



\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F4-5 Stage 3 Activities 29 05 2013 TO Rev D

AECOM

STAGE 3 (AS MODIFIED)

Port Kembla Outer Harbour Development Modification
Environmental Assessment

FIGURE 4-5

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4.2.2 Concept Plan Staging

Table 4-1 shows the overall staging for the Outer Harbour Development as approved and including the proposed modification.

Table 4-1 Approved and modified staging timeframes

	Stage 1	Stage 2	Stage 3
Approved	2010 – 2018	2014 – 2025	2026 – 2037
Modification	2011 – 2020	2015 – 2025	2026 – 2037

A list of the construction and operational activities for each stage of the Concept Plan are outlined in **Table 4-2** and shown on **Figure 4-3**, **Figure 4-4** and **Figure 4-5**. This includes all elements that would be modified under this application.

Table 4-2 Proposed modifications to the Concept Plan

Approved Activities	Modified Activities
Stage 1 (Major Project)	
Erection of site compound approximately 100 metres south east of Salty Creek outlet.	Erection of site compound (somewhere within site footprint on PKOPL land).
Delineation of temporary stockpiling area on southern foreshore of the Outer Harbour, to the west of Darcy Road drain, capable of storing up to 100,000 cubic metres of material at any one time.	Delineation of temporary stockpiling areas on southern foreshore of Outer Harbour, to the west and east of Darcy Road drain, capable of storing up to 360,000 cubic metres of material at one time.
Dredging footprint as outlined in Figure 5-3 of the original Environmental Assessment.	Dredging footprint to cover slightly more area due to refined reclamation design and the shrinking of the container terminal by 10 metres width on the western side.
Dredging to a depth between -15 metres and -16.5 metres.	No change. Dredging to a depth between -15 metres and -16.5 metres.
Dredging volume for Stage 1 of 1.22 million cubic metres.	Dredging volume has been increased for Stage 1 to 1.62 million cubic metres.
Redirection of Salty Creek from the foreshore, through the reclamation area to the harbour. Salty Creek to remain an open channel through reclamation area.	Redirection of Salty Creek from foreshore through reclamation area to harbour on a revised, more direct alignment. Salty Creek to remain open channel through reclamation area in the short term before being covered.
Reclamation of central and southern portions of the multi-purpose terminal and all of container terminals.	Minor amendment of land reclamation footprint for southern portion of the multi-purpose terminal and all of container terminals to encompass a reduction of 10 metres in width of container terminals.
Reclamation volume for Stage 1 of 4.63 million cubic metres.	Reclamation volume for Stage 1 of 4.16 million cubic metres.
Construction of: - The central part of the dry bulk/multi-purpose terminal, partly paved for common users, including drainage systems, with a total operational area of 9 hectares.	Construction and pavement of: - Central and southern portion of the multi-purpose terminal, extending from the northern end of the central portion to the western boundary of Darcy Road drain, with a total operational area of 22.6 hectares.

Approved Activities	Modified Activities
Construction of: - Additional sidings in South Yard. Use of existing rail infrastructure (balloon loop) for rail traffic to the Outer Harbour.	Construction of: - Two additional bulk rail loops parallel to existing balloon loop. - Additional bulk sidings in the North and South Yard. - Two bulk unloading facilities on the eastern side of the bulk loops. - Upgrade of the rail bridge over Old Port Road to accommodate additional bulk loops.
Use of multi-purpose terminal for open stockpiling of bulk materials. Construction of: - Two break bulk sheds in central – southern portion of the terminal area.	Construction of: - Enclosed conveyor system from bulk unloading facilities to storage sheds located on multi-purpose terminal. - Enclosed storage sheds for dry bulk product storage. Enclosed conveyor system from storage sheds to ships. - Break bulk storage shed and open storage area.
Construction of: - New access road from Christy Drive to the multi-purpose terminals (not extending as far south as Foreshore Road).	Construction of: - New access road to extend from Christy Drive to Foreshore Road, with addition of smaller terminal access roads to the east, as required. - Potential road closure/diversion or grade separation of at-grade rail crossing on Old Port Road.
Operational capacity of first multi-purpose berth at 4.25 Mtpa.	Operational capacity of first multi-purpose berth at 16 Mtpa.
An estimated 4.3 trains per day to access Outer Harbour.	An estimated 11 to 13 trains per day to access Outer Harbour.
Operation of: - Central portion of the multi-purpose terminal. - Operational area of 9 hectares.	Operation of: - Central and southern portions of the multi-purpose terminal. - Extension of operational area further south and increase in terminal area from 9 to 22.6 hectares.
Stage 2	
Pavement of northern and southern portion of the multi-purpose terminals and western container facility.	Pavement of northern portion of the multi-purpose terminals. Pavement of existing foreshore area extending from the eastern boundary of Darcy Road drain to the northern boundary of container terminal area. This pavement would connect to pavement completed as part of Stage 1 works in the southern portion of the multi-purpose terminal.
Stage 3	
Pavement between extent of reclamation and boundary of development (i.e. landside area to the rail line along the south western edge of the Outer Harbour, and to Foreshore Road in the south).	This section of pavement has been moved to Stage 1.

Table 4-3 outlines the activities that would not change as a result of the modification.

Table 4-3 Approved activities not pertaining to the modification

Stage 1 (Major Project)
Demolition of No. 3 Jetty (now disused and abandoned) and No. 4 Jetty (currently used for import and export of non-flammable liquids).
Relocation of utilities for import of sulphuric acid to operational area of multi-purpose terminal including dedicated pipeline/services corridor.
Temporary construction access road from Foreshore Road to the proposed future container terminal area to be utilised for reclamation and dredging activities.
Extension of Darcy Road drain through reclamation area.
Dredging of: - Approach channel and berth boxes for first multi-purpose terminal berth. - All container berth boxes and approach channels. - Basins between multi-purpose terminal and container terminal. - Basin east of container terminal.
Construction of: - Temporary revetment structures. - Series of discrete bunded fill areas for encapsulation of contaminated dredged material. - Permanent revetment structure along northern edge of container terminals and reclaimed area between container terminals and multi-purpose terminals.
Construction of: - Multi-purpose terminal area and first multi-purpose terminal berth (berth operational). - First container berth with permanent edge structure (berth not operational).
Operation of: - First multi-purpose terminal berth.
Stage 2
Salty Creek open channel through multi-purpose terminal area to be enclosed under hardstand for operational movement in this area.
Potential creation of new road parallel to Foreshore Road.
Potential creation of new road link along existing disused rail corridor off Darcy Road to service PKOPL office and public facilities.
Commence land reclamation for northern portion of multi-purpose terminals.
Construction of: - Second multi-purpose berth. - Second container terminal berth (western container facility). - Pavement of container terminal and northern portion of multi-purpose terminal.
Construction of: - Graded separation between road and rail at Foreshore Road to service container terminals. - Rail link to container terminals and rail sidings onto container terminal area.
Operation of: - First and second container terminal berths (western facility).
Demolition or refurbishment of No. 6 Jetty (Gateway).
Dredging of: - Berth box and basin for northern portion of multi-purpose berth boxes. - Northern portion of Outer Harbour to accommodate ship swing basin.
Complete land reclamation for: - Northern portion of multi-purpose terminal.

Stage 3
Construction of: - Third multi-purpose berth. - Third and fourth container berths. - Northern portion of container terminal (piled structure). - Pavement of northern portion of multi-purpose terminal.
Operation of: - Third and fourth container berths (eastern container facility). - Northern portion of container terminal (piled structure). - Third multi-purpose berth (northern portion).

The modified elements are explained in the following sections in more detail.

4.2.3 Construction

Dredging and Reclamation

Extent of dredging

The Concept Plan includes dredging activities associated with basins and berth boxes proximal to the multi-purpose terminals and container terminals, and widening of the existing shipping swing basin located to the south of the northern breakwater.

The modification proposes larger vessels to access the Outer Harbour to cater for the increased bulk throughput. The first multi-purpose berth would accommodate a Cape size vessel and the first container terminal berth would accommodate a Super Post-Panamax size vessel. All other berths would accommodate Panamax size vessels, as originally approved. As larger vesselswould access the berths, dredging depths have been revised to accommodate larger berth boxes and basin areas.

The extent of this dredging would be slightly increased to encompass a marginally larger footprint following the detailed design of Stage 1 dredging and reclamation. Related to this is the modification to the reclamation footprint, which is less than that originally approved (further detailed in **Section 4.3.2**).

A comparison of the approved and modified dredging and reclamation footprints is provided in **Figure 4-6**.

Depth of dredging

The original application assessed a depth of dredging between -15 metres and -16.5 metres. Whilst the overall assumed dredging volumes have been refined, based on the progression of detailed design for the first multi-purpose berth (refer to **Section 4.3**), dredging would still occur at a depth between -15 metres and -16.5 metres.

Dredging and reclamation volumes

Dredging and reclamation volumes for the Concept Plan area have been refined since the original approval following initial reclamation works and the progression of detailed design for the first multi-purpose berth and associated dredging.

A comparison between indicative dredging and reclamation volumes for the existing approval and modification for the Concept Plan is outlined in **Table 4-4**. Volumes shall be confirmed as detailed design is undertaken for future components of the development.

Table 4-4 Comparison between indicative dredging and reclamation volumes for the existing approval and modification for the Concept Plan

	Reclamation Volume (cubic metres)	Dredging Volume (cubic metres)	Imported Fill Volume (cubic metres)
Existing Approval	5.3 million	1.27 million	4.03 million
Modification	4.67 million	1.85 million	2.14 million[1]

1 - Total excludes 671,250 cubic metres of fill already imported for initial reclamation works for central portion of multi-purpose terminal.

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F4-6 Comparison of Approved and Modified Reclamation Footprints 29 05 2013 TO Rev C

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COMPARISON OF APPROVED AND MODIFIED DREDGING AND RECLAMATION FOOTPRINTS

Port Kembla Outer Harbour Development
Environmental Assessment

Note: No dredging will be undertaken in Stage 2

FIGURE 4-6

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Table 4-5 provides the breakdown of the volumes shown for Stage 1 (Major Project).

Table 4-5 Comparison between indicative dredging and reclamation volumes for the existing approval and modification for Stage 1

	Reclamation Volume (cubic metres)	Dredging Volume (cubic metres)	Imported Fill Volume (cubic metres)
Existing Approval	4.63 million	1.22 million	3.41 million
Modification	4.16 million	1.62 million	1.87 million[1]

Reclamation

The volume of the proposed reclamation has slightly decreased since the original approval during detailed design. To accommodate the changes in vessel sizes and berth boxes, the modified design incorporates the following changes:

- Additional dredging in the basin against the southern wall between the multi-purpose and western container terminals (thus increasing the dredging volume from that originally estimated).
- Increased volume of dredged spoil to be used in the reclamation area therefore reducing volume of imported fill required for reclamation.
- Slight decrease in the overall width of the container terminal facility by 10 metres. This provides more space for larger vessels in the basin between the multi-purpose and western container terminals, and has reduced the overall reclamation footprint.
- Refinement of reclamation footprint design adjacent to southern foreshore, resulting in further minor reductions in the overall volume of reclamation required.

The finished reclamation level would remain at approximately +4 metres Port Kembla Height Datum (PKHD). The balance of fill required for the Concept Plan area is approximately 2.14 million cubic metres. Approximately 670,000 cubic metres of fill has already been placed at Port Kembla for initial reclamation of the central portion of the multi-purpose terminal.

Dredging methodology

Dredging plant and equipment to be used would likely include a combination of those approved in the original application, being:

- small cutter suction dredger
- backhoe dredger
- grab dredger.

Supporting plant and equipment would include:

- self-propelled barges
- workboat
- survey/crew boat
- flat top barge
- auxiliary equipment.

Drilling and blasting activities would require a jack-up barge, drill and explosives. Blasted rock would then be dredged using the mechanical or other dredging technique.

Multi-purpose terminals

The key modifications to the construction of the multi-purpose terminals include:

- Increase in the size of the paved operational area from 9 hectares to 22.6 hectares during Stage 1.

[1] Total excludes 671,250 cubic metres of fill already imported for initial reclamation works for central portion of multi-purpose terminal.

- Construction of enclosed conveyor systems to transfer material from bulk unloading facilities on the eastern side of the bulk loops to storage sheds on the multi-purpose terminal. The bulk loops would be constructed parallel to the existing balloon loop at the Outer Harbour.
- Construction of storage sheds at the multi-purpose terminal for the storage of dry bulk material. Sheds would be sized in accordance with cargo throughput requirements.
- Construction of enclosed conveyor systems to transfer material from storage sheds to ships for export.
- Relocation of two break bulk storage areas (the approved location of which is adjacent to the new access road south of the former open stockpile area) to the southern and northern portions of the multi-purpose terminal including:
    - storage shed/s
    - open cargo storage area.
- Stockpiling of imported fill material in two stockpiles, with an increased combined total capacity of 360,000 cubic metres in the following locations:
    - east of Darcy Road drain
    - west of Darcy Road drain.

Container terminals

Construction of the container terminals would be largely unchanged from that originally approved. The only modification relates to the slight footprint alteration which would move the terminal area approximately 20 metres to the east and a reduction in the overall width of the container terminal by 10 metres to a total width of 300 metres. There would be no change to the approved number of berths and cargo volumes.

Rail infrastructure

The existing approval planned to primarily utilise the existing balloon loop to provide access for bulk cargo to the Outer Harbour. The proposal to transport increased bulk volumes to the Port by rail, necessitates the following modifications to Concept Plan rail infrastructure:

- Construction of two additional bulk loops parallel to the existing balloon loop.
- Construction of additional bulk sidings in the North and South Yards (to accommodate trains of up to 850 metres in length).
- Upgrade of the rail bridge over Old Port Road to accommodate additional bulk loops.
- Construction of two bulk handling facilities on the eastern side of the bulk loops. The bulk handling facilities are likely to consist of one bottom-dump unloading facility for coal and one tippler unloading facility for iron ore/bauxite.

Rail infrastructure would be upgraded progressively, as warranted by growth in cargo volumes.

The existing approval outlined the following plans for container trains, which would remain unchanged by the modification:

- Two lines to be used for container trains, extending from the western junction of the balloon loop through the South Yard to the container terminal.
- Two container sidings in the South Yard (minimum 1,036 metres in length).
- Container sidings on the container terminal, for the purposes of ship to train container transfer.

The modified rail infrastructure is shown on **Figure 4-1**. However, it should be noted that these plans are indicative and would be subject to further detailed design and planning prior to future project applications for Stages 2 and 3.

Road infrastructure

The existing approval outlined the following plans for road infrastructure, which would remain unchanged:

- New road link to be constructed between Christy Drive and Foreshore Road to provide access to the multi-purpose terminal.

- Potential new road link to be constructed on the southern foreshore of the Outer Harbour parallel to the existing Foreshore Road.
- Potential new road link to connect from Darcy Road, along an existing disused rail corridor, to public facilities located in the east of the Outer Harbour.

The proposed modifications to rail infrastructure would necessitate adjustments to the local road infrastructure, including:

- Potential road closure or grade separation at the at-grade rail crossing on Old Port Road.
- Construction of shorter access roads extending east from the new road link into the multi-purpose terminal for accessibility.

Other works

Other works requiring modification include:

- Revised alignment of Salty Creek on a more direct and shorter route from its existing outlet point through the reclamation area to the Harbour

Further detail regarding the redirection of Salty Creek is provided in **Section 4.3.2**.

Plans to relocate the sulphuric acid pipeline currently servicing Berth 206 on Jetty No. 4 would remain unchanged as a result of the modification. The pipeline and facilities would be relocated during a later period of Stage 1 when Berth 206 is decommissioned, to allow reclamation of the eastern container terminal areas.

4.2.4 Operation

Once fully operational, the Concept Plan would comprise two new areas of reclaimed land, one multi-purpose terminal area with three operational berths dedicated to handling dry bulk, break bulk, bulk liquid and general cargo, and another terminal area with four operational berths dedicated to handling containers. In this respect, this modification would not alter the general operation of the Outer Harbour Development.

A schematic depicting an operational scenario for the Concept Plan is illustrated in **Figure 4-2**.

Capacity

The modification proposes to increase bulk throughput capacity at the first multi-purpose terminal berth from 4.25 Mtpa (as approved) to 16 Mtpa. The terminal is intended to be a multi user facility handling a variety of products. Based on current market interest, the three main commodities contributing to the increased bulk throughput would likely be coal, iron ore and bauxite, to be sourced from regional NSW. However, other products such as clinker, granulated slag, sand, woodchips, coal and coke would also be handled over the first multi-purpose berth. A comparison between the existing Concept Plan approval and the modified Concept Plan approval is provided in **Table 4-6**.

Table 4-6 Capacity of berths under approved and modified Concept Plan

	Multi-purpose Terminals		Container Terminals
Cargo	General Cargo	Dry Bulk	Containers
Approved			
Number of berths	2	1	4
Capacity per berth	1 mtpa	4.25 mtpa	300,000 TEUs
Total capacity	2 mtpa	4.25 mtpa	1,200,000 TEUs
Modification			
Capacity per berth	2	1	4
Number of berths	1 mtpa	**16 mtpa**	300,000 TEUs
Total capacity	2 mtpa	**16 mtpa**	1,200,000 TEUs

NB: Bold indicates where a modification to berth capacity has occurred.

Capacity Assumptions

Capacity assumptions for the general cargo and container berths would not change under this modification.

Concept Plan capacity for the dry bulk product berth has been modified as follows:

- Number of ship loaders: 2
- Loading rate per ship loader: 5,000 tonnes per hour
- Average combined loading rate for both ship loaders: 40 percent x 5000tph x 2 = 4,000 tonnes per hour
- Berth utilisation: 48 percent

On this basis the capacity of the dry bulk berth is calculated as follows:

4,000 tph x 24 hrs x 350 (days/yr) x 0.48 (utilisation) = 16.0 mtpa

Multi-purpose terminals

Proposed modifications to the operation of the multi-purpose terminals include:

- Dry bulk to be transferred from bulk unloading facilities on eastern side of bulk loops via enclosed conveyors to storage sheds located on multi-purpose terminal.
- Loading conveyors and ship loaders would transfer product from dry bulk storage sheds onto ships.

All other operational elements of the multi-purpose terminal would remain as outlined in the original application.

Container terminals

There would be no change to the operation of the container terminals.

Rail traffic

Under the existing Concept Plan approval, it was estimated that the development would generate approximately 21 trains per day in total that would use the existing balloon loop.

The proposed modification would generate additional operational rail traffic, resulting in approximately 28 to 30 trains per day in total passing through the two new bulk loops. These bulk loops would be developed progressively to respond to growth in dry bulk cargo volumes. The growth would come from bulk rail traffic, which would increase from the approved four trains, to a total of 13 trains per day.

Road traffic

Approved operational traffic volumes for the Concept Plan included 121 vehicle movements per hour (102 trucks and 19 employee vehicles).

The modification would generate approximately eight additional employee vehicle movements per hour for the Concept Plan, resulting in a total of 129 vehicle movements per hour.

Shipping traffic

The Port currently has approximately 1,000 vessel visits per year, comprising 900 vessel visits to the Inner Harbour and up to 100 visits to the Outer Harbour. The development, as already approved, could generate up to 1,500 vessel visits per year in the Outer Harbour once fully operational. The Outer Harbour is largely underutilised compared with the Inner Harbour and has capacity to manage additional shipping movements proposed as part of the modification, based on trade forecasts over the next 20 to 30 years (Maunsell AECOM, 2008). Safeguards currently used at the Port would still be appropriate for managing shipping within the Outer Harbour.

The increase in bulk cargo throughput would be accommodated through larger vessels and increased ship visits. As modified, the development could generate approximately 1,670 vessel visits per year for the port due to increased shipping traffic at the first multi-purpose berth.

Under the original application, ships accessing the Outer Harbour multi-purpose and container terminals would be of Panamax size. By comparison, the modification proposes to accommodate a Cape size vessel (of approximately 300 metres in length and 200,000 dead weight tonnes (DWT) at the first multi-purpose berth, and a Super-Post Panamax vessel (of approximately 330 metres in length and maximum loading capacity of 8,000 TEUs) at the north western container berth. All other berths would hold Panamax vessels or smaller. Cape and Super-Post Panamax size vessels are able to handle significantly more product per single shipment than Panamax vessels.

Public recreation areas and boating harbour

Access to the recreational boating harbour would be maintained throughout all stages of the Concept Plan, with no change to occur as a result of the modification. The boating harbour would remain operational throughout all stages of the development.

4.3 Major Project (Stage 1)

4.3.1 Overview

The majority of changes proposed as part of this modification are associated with the increase in bulk throughput to 16 Mtpa, which necessitates modifications to the Major Project approval.

The modifications to the original Project Approval for Stage 1 works include:

- Increase of bulk material to be handled at the first multi-purpose bulk berth, from 4.25 Mtpa to 16 Mtpa.
- Slight alteration to dredging and reclamation footprints and volumes due to refinement of design, due to an increase in the size of the vessels to be docked at the first multi-purpose terminal berth and first (outer western) container berth.
- Change to the sources of reclamation fill and consequent change to the modal split for the transportation of this fill to site, resulting in a slight increase in construction traffic.
- Alterations to rail infrastructure including:
    - two additional bulk loops to be constructed parallel to the existing balloon loop
    - additional sidings in the North and South Yards
    - upgrade to the rail bridge over Old Port Road.
- Alterations to road infrastructure including:
    - Extension of new road link from Christy Drive further south to Foreshore Road.
    - Changes to road infrastructure in the vicinity of the Outer Harbour to accommodate increased train movements, including the potential road closure, diversion or overbridge at the railway level crossing on Old Port Road.
- Increased operational area for the multi-purpose terminal from 9 hectares to 22.6 hectares.
- Increased train movements to transport bulk material to the Outer Harbour from 4.3 to 13 trains per day.

The following sections further detail these key changes, and other related modifications.

4.3.2 Construction

Dredging and reclamation

Dredging campaigns

The majority of dredging would occur as part of Stage 1. Dredging would be undertaken in a series of campaigns to construct:

- all container berth boxes
- basin between multi-purpose terminal and container terminals
- basin east of container terminal
- approach channels and swing basin.

Some campaigns may be combined (e.g. one dredging campaign may encompass the approach channels and much of the basin between the multi-purpose terminal and container terminal).

Vessel size

Under Project Approval, the first multi-purpose berth was approved to accommodate Panamax size vessels. To cater for the increased bulk throughput of 16 Mtpa, the modification proposes the berthing of larger Cape size vessels at the first multi-purpose berth. A comparison of Panamax, Cape and Super Post-Panamax size vessels is outlined in **Table 4-7**.

Table 4-7 Comparison between Panamax, Cape and Super Post-Panamax size vessels

Specifications (approximate)	Panamax Vessel	Cape Vessel	Super Post-Panamax Vessel
Dead weight tonnes (DWT)	70,000	Up to 200,000	Approximately 105,000
Length (metres)	230	300	330
Beam (metres)	32	50	42
Maximum draft (metres)	12	15.9	14.5

Dredging depth

As a result of the move to Cape and Super Post-Panamax size vessels, the overall assumed dredging volume has been revised. However, whilst dredging depths have been refined following initial detailed design of Stage 1, the proposed depths remain within the original remit, as outlined in **Table 4-8**.

Table 4-8 Dredging requirements

Area	Dredging Requirement	
	Approved Depth	Modified Depth
Approach channels	Between -15.0 and -16.5 m PKHD	No change. Between -15.0 and 16.5 m PKHD
First multi-purpose terminal berth box	Between -15.0 and -16.5 m PKHD	No change. Between -15.0 and 16.5 m PKHD

Dredging volumes and reclamation design

Additional navigation simulation was carried out in June 2012 by AECOM, based on the revised vessel sizes and the most recent bathymetric data (2012 data set). As a result, the reclamation footprint and dredging requirements for Stage 1 have altered from those originally approved, as shown in **Table 4-9**.

Table 4-9 Comparison of original and proposed dredging and reclamation volumes for Stage 1 works

	Reclamation Volume (cubic metres)	Dredging Volume (cubic metres)	Imported Fill Volume (cubic metres)
Existing Approval	4.63 million	1.22 million	3.41 million
Modification	4.16 million	1.62 million	1.87 million[1]

1 - Total includes 671, 250 million cubic metres of fill already imported for initial reclamation works for central portion of multi-purpose terminal. Volume of fill to be imported for the remainder of Stage 1 reclamation totals 1.87 million cubic metres.

Dredging requirements for Stage 1 works are greater than those presented in the original application. Dredging volumes have increased due to the following:

- Reduction in the overall reclamation footprint and subsequent increase in dredging:
  - Adjacent to the southern wall of the basin between the multi-purpose and western container terminals due to progression of detailed design.
  - Adjacent to the western berths of the container facility.
- Refinement of detailed design for both dredging and reclamation footprints for part of Stage 1 construction works, generating more precise volumes than estimated for the original Concept Plan.

The increased dredging volumes have resulted in a lower volume of imported fill required for reclamation, as all dredged spoil would be used in the reclamation footprint.

Due to the minor extension to the south of the basin between the multi-purpose and container terminals, there may be a small increase in blasting volumes as a result of the modification.

The construction methodology for reclamation would not alter from the method approved in the original application, being:

- Land reclamation for the central and southern areas of the multi-purpose terminals and the total reclamation footprint of the container terminal.
- Construction of permanent revetment structures along the northern perimeter of the container terminal area and the perimeter of the reclaimed area between container terminals and multi-purpose terminals.
- Construction of temporary revetment structures along the perimeter of the remainder of the reclamation footprint apart from areas where two berths are constructed.
- Construction of a series of containment structures (discrete bunded fill areas) within the reclamation footprint for encapsulation of contaminated dredged material. Bund size and location would reflect dredging phases.
- Reclamation edge structures (temporary and permanent) incorporating geotextile sediment filtration to mitigate the effects of wave actions and any significant hydraulic gradient between the sediment and the Outer Harbour which could result in leaching of contaminants.
- Construction of temporary sediment basins on unsealed reclamation areas to channel surface water flow including stormwater.

Dredging methodology

Dredging methods approved in the original application included:

- small cutter suction dredger
- backhoe dredger
- grab dredger.

Supporting plant and equipment would include:

- self-propelled barges
- workboat
- survey/crew boat
- flat top barge
- auxiliary equipment.

Detailed design has determined that mechanical dredging methods (backhoe and/or grab dredging) are likely to be most appropriate for initial Stage 1 dredging. The ability for mechanical dredging to remove all rock and to produce sufficient coarse rock for spoil emplacement bunds is advantageous. In addition, mechanical dredging results in fewer turbidity and settlement issues for the dredged spoil. Turbidity is lessened as the bucket can work within a water column, which is shielded by a silt curtain suspended underwater. Compared to a mobile or self-propelled dredge, which causes turbidity from the drag-head and overflowing and prop-wash from propeller action, mechanical dredging is more effective in minimising potential turbidity.

While these dredging methods, including drilling and blasting pre-treatment for rock, are preferred for initial Stage 1 dredging works, the suite of options presented in the original application is still considered appropriate to the Outer Harbour Development, and may be preferred for later dredging components.

Dredging works would be shielded by silt curtains, to control turbidity. These would be suspended below water level from a flotation device to a drop that is determined to be suitable for each stage of works dependent on the bathymetry.

Spoil emplacement methods for the movement of the spoil currently in the Outer Harbour, would be similar to those outlined in the previous Environmental Assessment. Barges would transfer material from dredged areas to

the spoil containment bunds, with land-based equipment required in later stages when the emplacement area approaches sea level and access by barge is no longer possible.

All dredging work would be undertaken in accordance with the Dredging and Reclamation Environmental Management Plan and relevant conditions outlined in the existing Project Approval.

Reclamation methodology

Construction of containment structures for contaminated sediment

Contaminated sediments that are dredged from the Stage 1 dredging locations would be encapsulated and confined within a series of engineered containment structures, or bunds. The containment structures would be constructed within the reclamation footprint to slightly above the water line. Since the original Project Approval, the progression of detailed design has warranted a minor revision to the cross-section of a containment structure included in the Environmental Assessment. The amended design places the interim revetment further from the edge structure to allow for further reclaimed fill to be placed on the outside of the containment structure for additional structural stability.

Bunds (as seen in reclamation works completed to date - central portion of multi-purpose terminal) would be constructed primarily using rock which is currently stockpiled on the southern foreshore of the Outer Harbour, sourced from the West Keira development undertaken by GPT Group in Wollongong CBD, as well as rock dredged from Stage 1 dredging locations. If required, interburden rock from local quarries may also be imported by road for use in the later stages of bund construction.

Construction of rock revetments

Revetments would be constructed at the northern and southern ends of the first multi-purpose berth during construction, and would tie into existing revetments, formed as part of reclamation works completed to the central portion of the multi-purpose terminal. The methodology for the construction of these bunds would remain as outlined in the original application (refer Section 6.3.11 of original Environmental Assessment).Rubble mound revetment structures consisting of rock armour, with a geotextile liner, would be placed along the perimeter of all remaining reclamation areas, until permanent edge structures are required. The structures would be formed on a bund perimeter at a slope of between 1:1.5 and 1:2.5.

Consolidation of fill material

Soft dredged spoil within the reclamation area would require consolidation. As noted in the original application, a range of treatment options are available for consolidating fill material. Selection of the most suitable option would occur at a later stage prior to construction, and following consideration of environmental, economic and timeframe factors.

Reclamation fill

Potential sources of reclamation fill

Initial reclamation of the central portion of the multi-purpose terminal was undertaken using uncrushed blast furnace slag produced from the nearby Port Kembla Steelworks. This resource has been subsequently exhausted and PKOPL is investigating alternative sources of fill for the remainder of the reclamation works.

Potential indicative sources of fill have been identified by PKOPL and are contained in **Table 4-10**.

Table 4-10 Potential indicative sources of reclamation fill

Reclamation Fill Material	Potential Sources of Fill	Likelihood of Use
Dredge spoil (rock and material other than rock)	Outer Harbour Development dredging	Certain
	Inner Harbour and Outer Harbour maintenance dredging	Possible
Interburden rock and overburden fill	Southern Illawarra quarries (Albion Park, Bass Point, Dunmore)	Probable
Quarry overburden material		
Coal washery refuse	BlueScope Steel Recycling Area, Springhill Road	Probable

Reclamation Fill Material	Potential Sources of Fill	Likelihood of Use
Tunnelling and excavation spoil from major building and infrastructure projects	Civil construction projects within Sydney Basin and/or Illawarra regions (e.g. WestConnex, North West Rail Link, Maldon to Dombarton rail link, Gerringong to Berry Bypass, Berry to Bomaderry Bypass)	Uncertain

PKOPL would continue to track potential fill sources from within the Sydney Metropolitan Area, Illawarra and Shoalhaven region to source the remaining fill. As per Condition B17 of the Project Approval, all imported fill material shall be classified as Virgin Excavated Natural Materials (VENM), unless applied in accordance with the terms of a Resource Recovery Exemption under the *POEO (Waste) Regulations 2005*, or as otherwise agreed by the Director-General.

Construction traffic

The existing Project Approval identified the following modal split for the transportation of fill to the site:

- Road: 1.8 million cubic metres – 53 percent.
- Rail: 1.1 million cubic metres – 32 percent.
- Barge: 500,000 cubic metres – 15 percent.

Based on this split, construction traffic was capped under the original approval at 38 vehicles per hour (27 trucks and 11 workforce vehicles per hour). This modification proposes to increase this cap to approximately 46 vehicles per hour (35 trucks and 11 workforce vehicles per hour). The increase in trucks would accommodate the additional increase in reclamation fill being transported by road, rather than by rail or barge.

Based on potential sources of fill outlined in **Table 4-10**, road transportation of this material is likely to be more feasible. In addition, based on experience derived from the initial stage of reclamation works, the transportation of fill by road has enabled more efficient movement of fill and construction of the reclamation area. The Environmental Assessment for this modification has assumed a worst case scenario of the following modal split for the transportation of the balance of fill for the remainder of Stage 1 construction works:

- Road: 1.87 million cubic metres – 100 percent.
- Rail: 0 cubic metres – 0 percent.
- Barge: 0 cubic metres – 0 percent.

Stockpile of fill

Stockpiling is currently approved to take place in two locations on the southern foreshore of the Outer Harbour:

- West of Darcy Road drain – approved under the original application for handling up to 100,000 cubic metres of material at any one time.
- East of Darcy Road drain – approved in June 2012 under a Construction Environmental Management Plan (CEMP) submitted to P&I for handling up to 60,000 cubic metres of material at any one time.

PKPC submitted another modification application in July 2012 to increase the combined total volume of these stockpiles to 360,000 cubic metres. This application was subsequently withdrawn prior to approval, and the request to increase stockpile capacity to 360,000 cubic metres is now included under this modification.

The modification proposes that the area to the west of Darcy Road drain is to become operational during Stage1, as an extension of the multi-purpose terminal. For this reason, the western stockpiling area would be an interim stockpile during Stage 1, prior to the construction and operation of the southern portion of the multi-purpose terminal (refer **Figure 4-3**). The area east of Darcy Road drain would remain available to use for construction material stockpiling purposes after completion of the southern portion of the multi-purpose terminal.

Multi-purpose berth and terminal

Berth structures

A permanent edge structure suitable for vessel berthing (i.e. wharf) is required for the first multi-purpose terminal berth to become operational. The original approval suggested a range of options including the use of mass gravity permanent edge structures, to be confirmed through detailed design. Since the original approval, the design process for the first multi-purpose berth is now well advanced and has refined this berth design to incorporate tubular bulk head walls, rather than mass gravity structures, for economic and structural feasibility reasons.

The tubular bulk head wall is considered a more pragmatic design due to its construction advantages such as the ability to use more land-based equipment, negating the need for extensive water-based construction methods. Tubular bulk head walls are deemed to be the most cost-effective and realistic construction method for the first multi-purpose berth as they require substantially less concrete and can be constructed on site. By comparison, a gravity structure requires significant pre-fabrication off site and transportation of these parts to site via heavy vehicles.

The construction method for a tubular bulk head wall is summarised as follows:

- Imported select fill material is placed as underwater reclamation berm to formbulk head wall foundation.
- Piles are driven through fill to bedrock level.
- Further select fill is placed behind the bulk head wall to +1.5 metres PKHD and compacted by impact roller.
- Pile sockets are drilled and backfilled with concrete using land-based plant.
- An upper concrete plug is formed in tube, with a connector placed through the tubes above mean sea level.
- Precast deadman anchor panels are installed and backfilled to +1 metre PKHD.
- Tie rods and waterproof conduits are connected between the piles and deadmen.
- Further select fill (coal wash) is placed in layers to +4 metres PKHD and compacted. Settlement monitoring plates are installed and monitored during filling.
- Underwater berm in front of the wall is removed. Surcharge is placed behind wall for additional 4 metre height, settlements are monitored, and then the surcharge is removed.
- Capping beam is then installed.
- Services are installed in berth apron area and then the pavement is constructed.

A cross-section of a tubular bulk head wall is illustrated in **Appendix F**.

Gravity structures may still be appropriate for the permanent edge structures of other berths in the Outer Harbour Development, though this would be considered and confirmed during later stages of detailed design. It should be noted that the construction of the first container berth remains within the scope of the Major Project approval (Stage 1), as originally approved and identified on **Figure 4-3**.

Pavement

Pavement works undertaken as part of Stage 1 would cover a larger area to that outlined in the original approval. Under the original application, pavement constructed during Stage 1 was to cover the central portion of the multi-purpose terminal. To maximise utilisation of the multi-purpose terminal in Stage 1, this modification proposes that in its entirety, pavement would cover the area bounded by the edge of the multi-purpose terminal reclamation in the north, the new access road between Christy Road and Foreshore Road in the west, Foreshore Road in the south and Darcy Road drain in the east. The construction of pavements and buildings would occur progressively as additional storage area is required to accommodate trade growth and new cargoes. The finished level of pavement would be approximately +5.2 metres PKHD.

It is proposed that paving works within the Stage 1 operational area will be undertaken progressively as trade and associated demand for cargo storage and handling facilities increases.

Materials handling facilities

Materials handling facilities to be constructed as part of this modification include:

- Two bulk unloaders (likely to consist of one bottom-dump, one tippler) to be enclosed by shed structures (open at each end), through which trains would pass to unload product.
- Enclosed conveyor system linking bulk unloaders to storage sheds at the multi-purpose terminal.
- Storage sheds at the multi-purpose terminal.
- Enclosed conveyor system to transport materials from the sheds to the shiploaders for loading vessels for export.

The bulk unloaders would be located at the eastern-most part of the double rail loop, north of the existing Salty Creek. The two would be slightly offset (refer to **Figure 4-1**). It is likely that one facility would comprise a bottom-dump unloader system for coal, and the other would comprise a tippler unloader system for iron ore/bauxite. Each bulk unloader would consist of a dump-station hopper, enclosed extraction conveyor feeder and a structure to support and shelter the facility. Construction of the bulk unloaders would require significant excavation for the purposes of installing the dump-station hopper and extraction conveyor system onto which trains would dump their loads.

A typical plan for a bottom-dump unloader similar to the one to be constructed at the Outer Harbour is shown in **Figure 4-7**. This plan is indicative only and is shown for clarity, rather than design purposes. For this reason it does not include services and other details that would be subject to detailed design.

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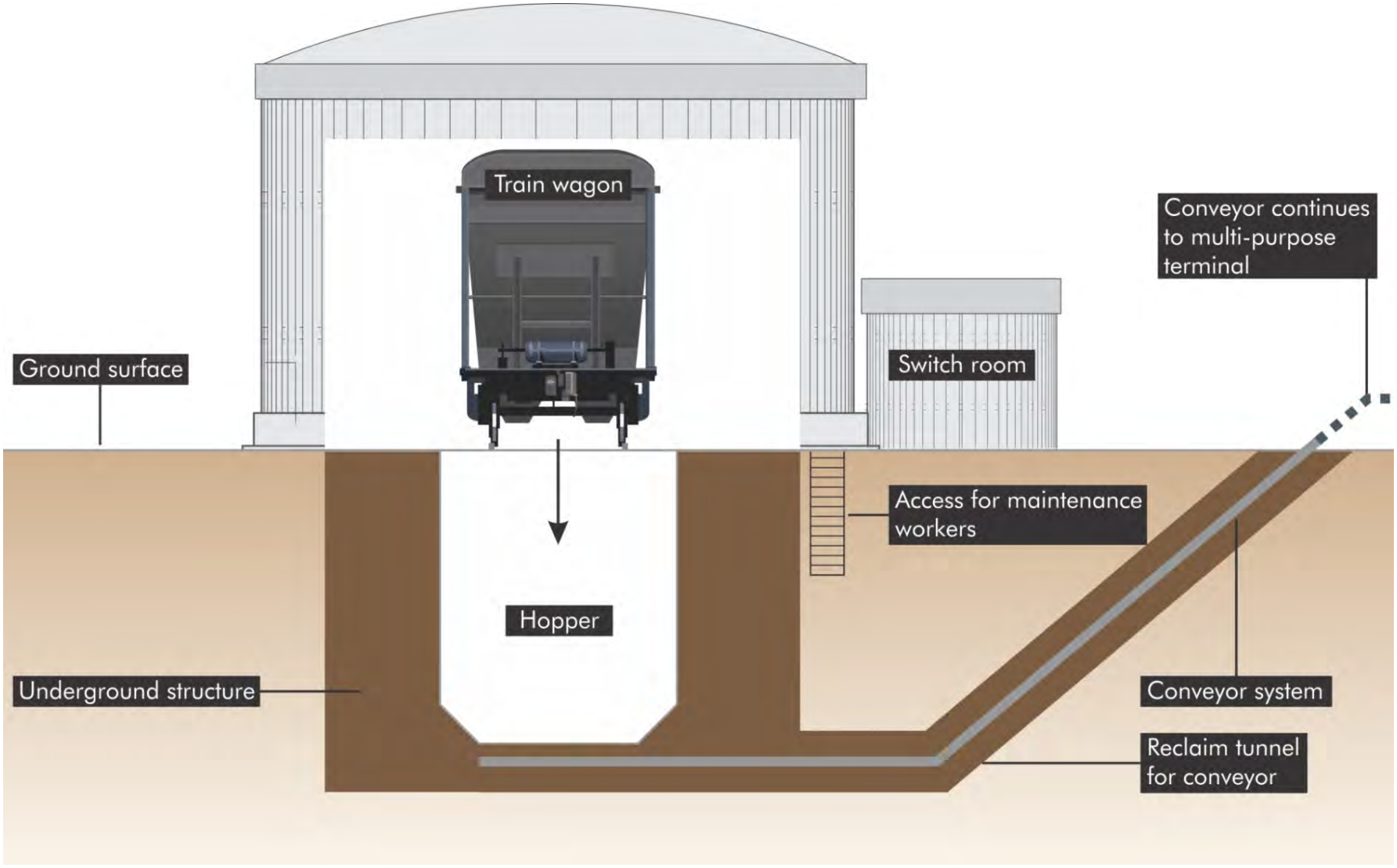

Figure 4-7 Indicative cross-section of a bottom-dump unloader rail receival system

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The storage sheds on the multi-purpose terminal would be constructed to provide a combined total of approximately 750,000 tonnes of storage space for bulk materials. The overall height of sheds would be up to 20 metres. Sheds would likely be constructed from steel panels and would be located on the northern, central and southern portions of the multi-purpose terminal.

Rail infrastructure

The original approval assumed the delivery of bulk materials to the Port using the existing rail infrastructure. The bulk volume increase through the Port as a result of this modification would require the construction of additional rail infrastructure to handle increased train movements and the longer trains up to 850 metres in length that would be used to transport larger volumes.

The proposed modification comprises the following additional rail infrastructure to be constructed in Stage 1:

- Two additional bulk loops to be constructed parallel to the existing balloon loop.
- Additional bulk sidings in the North and South Yards (minimum 896 metres in length).
- Upgrade of the existing rail bridge over Old Port Road to accommodate the double bulk loop.
- Upgrade of the at-grade rail crossing at Old Port Road.

The bulk loops would be constructed progressively as bulk cargo volumes gradually increase. In the event that construction might interfere with the operation of Old Port Road, impacts would be minor and temporary.

Figure 4-3 shows the proposed modifications to rail infrastructure.

Road infrastructure

Several changes are proposed to road infrastructure in the vicinity of the Outer Harbour. These are consequential changes resulting from increased operational rail traffic due to the additional bulk throughput at the first multi-purpose berth. No change to operational road traffic would occur as a result of the modification.

Old Port Road at-grade rail crossing

On the eastern side of the balloon loop, the rail line intersects Old Port Road at an at-grade level crossing. The proposed operation of the Outer Harbour rail network poses potential issues relating to this crossing and potential conflicts between road and train traffic, which need to be appropriately managed.

Bulk trains of approximately 850 metres in length are expected to pass through the bulk unloader at a rate of approximately 1.6 kilometres per hour. At this speed, trains are predicted to block the at-grade rail crossing, delaying traffic for approximately 40 minutes each time a train is unloading (approximately 13 times per day at maximum capacity).

To manage the potential for rail crossing closures on Old Port Road, several alternatives have been considered. These include:

- Option 1 – temporary closure of the at-grade crossing with rail scheduling. As far as possible bulk trains would be scheduled to operate at night time (6 pm to 6 am) with variable message signs/fixed signs provided on Five Islands Road and Old Port Road to inform motorists of crossing closure. Turn around facilities and automatic boom gates would also be provided.
- Option 2 – permanent closure of the at-grade crossing with traffic diverted to Five Island Road (through traffic) or the new port access road (internal road to run between Christy Drive and Foreshore Road) (local traffic).
- Option 3 – grade separation of the at-grade crossing, maintaining current traffic flows once operational.

The most viable option is dependent on the number of trains passing through the bulk unloading system per day. For this reason, the final solution may incorporate one option in the short to medium term when train movements are fewer and another in the medium to long term when movements increase. Examples include:

- Short to medium term option being a combination of the use of variable message signs (VMS) and operation of some bulk cargo trains outside road traffic peak periods.
- Long term option of grade separation.

If grade separation is deemed to be the most feasible option, it would likely comprise a bridge with approach ramps to provide access onto and off the bridge.

Meetings to discuss these options have been held with RMS and it has not ruled out its consideration of the identified options subject to further investigation and extensive consultation as part of the modification process. This issue is discussed further in **Chapter 10.0**.

Extension of new access road

The original application outlined the construction of a new road to access the multi-purpose terminals. Stage 1 construction of the road encompassed the portion of the road that would run south from Christy Drive, parallel with existing rail sidings, before turning east to provide access to the central part of the terminal (refer **Figure 4-3**).

To facilitate access to the expanded area of the multi-purpose terminal, the modification proposes to extend the construction of this road further south during Stage 1. The road would run the length of the multi-purpose terminal before connecting with Foreshore Road in the south. This access road connection to Foreshore Road was originally proposed to occur in Stage 3 of construction, but would now occur in Stage 1. Additional easterly extensions off this road would be constructed further south along this road, as required to provide access to the southern portion of the multi-purpose terminal (refer **Figure 4-3**).

Other infrastructure

Salty Creek and Darcy Road Drain

The proposed modification would alter the alignment of Salty Creek from that originally approved. The proposed redirection of Salty Creek would traverse from its existing outlet point, through the new reclamation area parallel to the proposed shed alignment, turning slightly so that it intersects the berth edge at an angle of 90 degrees, entering the harbour perpendicular to the proposed berth line.

The Salty Creek alignment construction would be undertaken progressively during Stage 1, as the reclamation area expands. Initially, the outlet would consist of an open rock revetment channel, approximately 30 metres in width. Later, during construction of the multi-purpose terminal, the outlet would consist of a culvert which, in the long term may be covered and paved to form part of the terminal surface.

Given the broadness of the channel, no energy dissipation or hydraulic impacts would be required at the berth edge, where Salty Creek discharges into the Outer Harbour. Detailed design of the culvert would ensure existing and future flow rates are not restricted and the culvert size would be no smaller than the existing culvert within Salty Creek that is situated under the rail crossing.

The box culverts for conveying Salty Creek flows would be designed in accordance with the relevant condition of consent (Condition B25) in the existing Project Approval. These outline that the creek would be designed to the satisfaction of Industry and Investment NSW, and shall incorporate a V-shaped recess to facilitate the movement of fish and other mobile aquatic species during periods of low flow. The channel would also be designed so as not to preclude light access as part of future project applications, unless otherwise agreed by the Director General.

The extension of Darcy Road drain would still occur as part of Stage 1 construction works and would not differ from the method proposed as part of the original application.

Drainage

During detailed design, surface and sub-surface drainage would be developed for individual phases of construction.

During construction, unpaved reclamation surfaces would be profiled to form temporary sediment basins or drainage lines, the design of which has altered since the original approval (refer to **Figure 4-3**). This drainage infrastructure would be designed to capture and filter sediment-laden runoff from unpaved areas, which would percolate into the reclamation material.

As per the Project Approval Condition C19, sediment and pollution controls would be installed and maintained at or above design capacity for the duration of construction of the project, and until such time as all ground disturbed by the works has been stabilised and rehabilitated, so that it no longer acts as a source of sediment. In addition, PKOPL would prepare and implement a Construction Soil and Water Quality Management Plan to detail how excavated and imported materials would be managed and water courses protected throughout construction. The plan would be prepared in consultation with the EPA and Industry and Investment NSW.

To manage stormwater during the operation of the multi-purpose terminal, a secondary stormwater management system would be designed and installed to capture sediment and oils on the pavement, which would be directed

to a tank that would be cleaned as required. Where possible, stormwater would be captured off the roofs of storage sheds on the multi-purpose terminal for reuse.

Pavements

Pavement works to be undertaken as part of Stage 1 would extend from the northern edge of the multi-purpose terminal area to the western border of Darcy Road drain. The terminal area would be paved with a heavy-duty engineered pavement material such as deep-lift asphalt, concrete or concrete pavers designed to accommodate heavy usage and weight.

General construction requirements

Construction compound

The location of the construction compound on the southern edge of the Outer Harbour, as originally approved, would require relocation, owing to the altered design of the multi-purpose terminal.

The modification proposes that a construction compound would be contained within the envelope of the site footprint on Port land. The exact location would be determined during detailed design. The compound would be used during the construction period for site offices and amenities, storage of construction materials, heavy machinery and site offices. Site parking would also be provided within the compound for construction workers.

Construction access

Access to the construction compound and parking facilities would be provided via Foreshore Road, Christy Drive or the new road link extending between these two existing roads.

Construction equipment

Construction equipment likely to be required for Stage 1 construction activities, incorporating the proposed modification, is listed in **Table 4-11**.

Table 4-11 Major construction equipment for Stage 1

Construction Activity	Equipment	Task
Demolition of Jetties No. 3 and No. 4 (approximately 12 months each)	Cranes barges, boats	Moving structural timber, timber fenders and decking from jetty structure
	Excavators	Dismantling jetties
	Wheeled loaders	Moving demolished material around active construction work area
	Tip trucks	Transporting demolished material to salvage yard or landfill
Dredging and spoil emplacement (18 months)	Trucks	Delivery of fill material
	Trains	Delivery of fill material
	Vibratory roller and compactors	Compaction of fill
	Graders	Grading final surface of fill
	Excavator and long reach excavator	Trenching/placing material for Salty Creek diversion and Darcy Road drain extension. Placing rock material for rock revetments.
	Front end loaders	Moving rock material for revetments
	Bulldozers	Levelling reclamation
	Grab/backhoe dredgers	Dredge sediments and rock
	Cutter suction dredger	Dredge contaminated sediments

Construction Activity	Equipment	Task
	Barges	Storage of dredged sediment and rock material before placing in reclamation
	Tugs and small craft	Tow barges laden with sediment
	Water carts	Dust suppression
	Blasting equipment	Rock blasting
General construction such as access roads, shed construction, construction compound, potential bridge construction (6 – 12 months)	Excavators	Minor excavation of existing surface
	Graders	Levelling surface
	Rollers	Compaction of surface
	Asphalt paver	Laying asphalt
	Bitumen spray truck	To seal surface of road
	Padfoot and smooth drum compactors	Compaction of surface
	Mobile cranes	Position pre-fabricated materials and heavy loads
	Pile rig	To drill pile holes or drive piles
	Articulated dump trucks	Earth moving trucks
	Sweeper	Clean surface between stages of road construction
	Concrete trucks	Move and pour concrete
	Water cart	Dust suppression
Terminal and berth construction including multi-purpose berth, container berth and utilities installation (up to 24 months per berth)	Cranes and piling cranes	Position pre-fabricated materials and heavy loads
	Excavators	Earthworks
	Asphalt paver	Laying asphalt
	Rotary bore piling rig	Installation of piles for quay walls
	Backhoe	Excavation for services and relocation of sulphuric acid pipeline
	Front end loader	Stockpiling material behind quay walls
	Graders	Grading and levelling surface
	Roller	Compaction and completion of surface
	Trucks	Concreting and movement of fill around site
	Compressor	Power tools
	Generator	Power equipment during construction

Construction Activity	Equipment	Task
Rail infrastructure upgrades (18 months - 2 years)[2]	Excavator	Excavate area for new turnout and rail siding
	Dump truck	Transport of spoil and ballast around site
	Bulldozer	Levelling area
	Rail ballast tamper	Adjust ballast once track is laid
	Mobile crane	Move rail infrastructure into place and remove turnout
	Demolition saw	To aid turnout removal
	Water cart	Dust suppression
	Track layer	Machine on front of train which lays railway tracks
	Regulator	Shape ballast
	Trains	To carry rail and track layer
	Portable welding equipment	Welding
	Scraper	Movement of spoil

Construction hours and workforce

Construction activities, with the exception of dredging and related activities, would be scheduled between the hours of 7 am and 6 pm Monday to Friday, and 8 am and 1 pm on Saturday. Where necessary, work may be permitted out-of-hours providing that the impacts associated with such works and appropriate mitigation measures are adequately addressed in the CEMP and conducted in accordance with Condition C4 of the Project Approval.

Dredging and related activities (including spoil emplacement which may necessitate some land based movements in the later stages of reclamation construction) would occur 24 hours per day, 7 days per week for the duration of dredging activities.

Services and utilities

Utilities and power would be temporarily hired or connected to existing mains to service the compound yard and construction activities.

Construction waste

General construction waste and materials arising as a result of the jetty demolition would be recycled wherever possible on site. Non-recyclable materials would be transported off-site to appropriate disposal facilities.

4.3.3 Operation

Capacity

The development, as approved, allowed for the transfer of 4.25 Mtpa of bulk material at the multi-purpose terminal. Due to changing market demands, PKOPL proposes to modify the operation of the Outer Harbour Development to allow the transfer of up to 16 Mtpa of bulk material. **Section 4.2.4** outlines the modified capacity requirements for each berth.

Material type

The bulk material likely to be transported through the multi-purpose terminal would include dry bulk, break bulk and bulk liquid materials. It is expected that a broad range of bulk materials, including those outlined in the original application (i.e. clinker, granulated slag, sand, woodchips, coal and coke) would still be exported through the Outer Harbour. In addition, the main products to be exported would be likely to include coal, iron ore and bauxite.

[2] Indicative construction timing only. Timing would be dependent on resources and constraints to construction. Additional time would be required for detailed design.

Terminal operation

Layout

To handle increased capacity, the operational area of the multi-purpose terminal in Stage 1 would expand to include the south western portion of the existing Outer Harbour foreshore extending to the western boundary of the Darcy Road drain. Under the previous application, this area was to remain as a stockpiling area, which was to become operational after the completion of Stage 3. The multi-purpose terminal layout has been altered from the previous approval to encompass five storage sheds in which bulk materials would be housed, prior to loading onto vessels.

As a result of these changes, the total operational area for Stage 1 would increase from the approved 9 hectares to 22.6 hectares.

Shipping traffic

To handle the increased capacity, larger vessels would berth at the Port at a greater frequency. As outlined in **Section 4.3.2**, the modification allows for Cape size vessels to dock at the first multi-purpose terminal berth.

The original approval estimated the first multi-purpose berth would receive approximately 100 Panamax size vessels per year. With the increased vessel size and bulk material throughput, the first multi-purpose berth would receive a mix of approximately 270 Cape and Panamax vessels per year under the proposed modification.

Additional ship movements would be accommodated within the existing pilotage, navigation, security and quality management systems provided by PKOPL.

Rail traffic

Rail movements

Under the original approval, approximately 4.3 trains movements per day (bulk only) would occur at the Outer Harbour during Stage 1.

The proposed modification would result in approximately 13 trains per day for bulk materials passing through the bulk loops during Stage 1.

Materials handling system

The system to transfer goods from trains to ships would occur as follows:

- Trains would pass through one of the two enclosed bulk unloader facilities on the eastern side of the bulk loops and bottom-dump product onto an unloading conveyor system as carriages pass through the enclosed conveyor facility.
- Material would be transferred via the unloading conveyor system into appropriate sheds, where they would be stockpiled before being exported.
- When an appropriate vessel is berthed, material would be transferred from sheds to the ships for export via a separate loading conveyor system.

Road traffic

Stage 1 operational road traffic approved under the original application was capped at 70 movements per hour (including those generated by the CGM). Under this modification, operational traffic movements would increase to 78 movements per hour, comprising the 70 approved movements, and eight additional employee vehicle movements per hour.

Operational hours and operational workforce

There would be no change to operational hours of the Port due to the modification. All operational activities would occur 24 hours per day, seven days per week.

It is anticipated by PKOPL that an additional 75 direct jobs would be created as a result of the modification,

Operational plant and equipment

Plant and equipment required for the operation of the first multi-purpose berth during Stage 1 of proposed modification is outlined in **Table 4-12**.

Table 4-12 Operational plant and equipment for Stage 1

Dry and Break Bulk	
Equipment	**Task**
Trucks	To load and unload dry bulk, break bulk and general cargo to be transported to and from the Port
Dry Bulk	
Trains	To load and unload dry bulk, break bulk and general cargo to be transported to and from the Port
Ships	To transport material from port
Ship cranes	Cranes located on ships that load and unload cargo to and from ships
Mobile quayside crane (not likely to be working simultaneously with ship cranes)	Cranes located on shore that load and unload cargo to and from ships
Two ship loaders (combined average loading rate of 4000tph)	Load material onto ships
Rail unloaders (one bottom dump, one tippler)	Transport material from trains to storage sheds
Enclosed conveyors	Transport of dry bulk material direct from train to storage and storage to ship
Break Bulk	
Fork lifts	To move break bulk around terminal area and load and unload trucks and trains
Small mobile cranes	Unload material off trains
Low loader	Move large plant around terminal
Front end loaders	To level surfaces

Car parking

Adequate car parking would be provided on site for employees. Spaces and design would be determined during the detailed design phase.

4.3.4 Staging

Development staging has been amended slightly under this modification, as outlined in **Table 4-13**, though this is indicative and subject to market demand.

Table 4-13 Approved and modified staging timeframes

	Stage 1	Stage 2	Stage 3
Approved	2010 – 2018	2014 – 2025	2026 – 2037
Modified	2011 – 2019	2014 – 2025	2026 – 2037

Construction staging

Construction of Stage 1 would occur in phases, which would be determined by the construction contractor prior to the commencement of construction. Generally, activities would be phased as follows:

- multi-purpose terminal reclamation construction
- multi-purpose terminal civil works and service construction
- extension of Salty Creek and Darcy Road drain through reclaimed area to Outer Harbour
- multi-purpose berth dredging
- first multi-purpose berth wharf construction

- container terminals reclamation construction
- container berth dredging
- container berth wharf construction
- basin dredging (between southern portion of the multi-purpose terminal and western container berths)
- reclamation of remainder of container terminals and multi-purpose terminals.

The previous Environmental Assessment referred to three indicative sub-stages of Stage 1, being Stages 1a, 1b and 1c. For the purposes of this modification, Stage 1 has been consolidated into one single stage with no delineation between sub-stages. Consolidation of Stage 1 provides PKOPL greater flexibility to respond to external factors such as the availability of materials and new customer requirements. Condition A10 of the Project Approval allows for submission of management plans and monitoring programs on a progressive basis in relation to either discrete components of the project, or for a specified time period.

Operational staging

Operation of the first multi-purpose terminal and the central portion of the multi-purpose terminal would commence in approximately 2015. Operation of the southern portion of the multi-purpose terminal would commence in approximately 2019, or as required by the growth of trade. It should be noted that these timeframes are indicative timeframes subject to market demand.

4.4 Conditions requiring modification

In addition to the matters described in **Table 4-14**, a modification to the determinations under Section 75P of the EP&A Act is also sought. This is explained in **Chapter 5.0** of this report.

Table 4-14 Proposed modifications to the Conditions of Approval – Concept Plan and Major Project

Concept Plan		
Reference	**Condition of Approval**	**Reason for Modification**
Schedule 1		
Proposal description Schedule 1 contains a description of the sub-stages of Stages 1 –3	Modify / delete as follows (changes shown in italics): Stage 1 (*General Port Facilities*): - *Construction and operation of one multi-purpose berth, and the construction and operation of the central and southern area of the multi-purpose terminal extending to the Darcy Road drain.* - *New road link from Christy Drive to Foreshore Road* - *Rail infrastructure, including two additional bulk loops, the upgrade of the Old Port Road rail bridge, two bulk unloading facilities and additional bulk sidings in the North and South Yard.* - *Construction of enclosed storage sheds and conveyor systems for cargo handling at the multi-purpose terminal.* - *Treatment of the Old Port Road railway crossing.* Stage 2: - *Insert after the third dot point, construction and operation of the northern area of the multi-purpose terminal.* - *Within the current fourth dot point, replace the word terminal with berth concerning the second multi-purpose berth, as there is only one multi-purpose terminal.* - *Delete extension of new road link from Christy Drive so that the only aspect of the project is the option for a Port Road.*	It is no longer proposed to have discrete sub-staging of Stage 1. The previous Environmental Assessment referred to three indicative sub-stages of Stage 1. For the purposes of this modification, Stage 1 has been consolidated into one single stage with no delineation between sub-stages. Consolidation of Stage 1 provides PKOPL greater flexibility to respond to external factors, such as the availability of materials and new customer requirements. Propose that this is referred to as Stage 1 (General Port Facilities) to distinguish from Stage 1 (Cement Australia Grinding Mill). The staging description is also to reflect the changes to components incorporated into each stage. Minor discrepancies between Stage 2/3 descriptions, with suggested changes identified (for example, the timing for the operation of the second multi-purpose berth).

Concept Plan		
Reference	**Condition of Approval**	**Reason for Modification**
	Stage 3 - *Modify fourth dot point as follows construction and operation of the third multi-purpose berth.*	
Definitions	Modify the definitions to reflect the existence of PKOPL within the definition of the Proponent. Modify the definitions to reflect the name changes for DPI, and NSW RTA. Further, separate the agency role of OEH to EPA and OEH (threatened species / heritage). It is also requested that the changes continue throughout approval.	Corrections to Agency names and to PKOPL that have occurred since approval.
Schedule 2		
Conditions 1.1 and 1.2	Insert the title of the document above the last dot point in Condition 1.1, and correct the cross references within Condition 1.2 to Condition 1.1.	Corrections to reflect the assessment report for the proposed modification, and relationship between previous reports, the modification report, and the terms of the approval.
Condition 1.5 - Staging	Delete references to Stage 1A, Stage 1B and Stage 1C, and replace with Stage 1 (General Port Facilities).	It is no longer proposed to have discrete sub-staging of Stage 1.
Schedule 3		
Condition 2.4a)	Replace the cross reference to the previous Environmental Assessment with a cross reference to this assessment report in respect to the volume of cargo to be transported by road and rail.	This condition makes specific reference to the modal split and the description between bulk/general/container cargo in the previous traffic report. Table 4.4 in Appendix I of the AECOM (2010) EA, is largely duplicated by Table 1 of the approval (Condition 2.7). Given there would be an increase in total bulk cargo throughput, with additional bulk cargo throughput proposed under the modification to be transported by rail, the cross reference needs to be replaced with a reference to this report.
Condition 2.5g)iii.	Insert the current guideline reference as follows *Road Noise Policy (EPA, 2011)*	Refers to the *Environmental Criteria for Road Traffic Noise* (EPA, 1999) to be used in future assessments for road traffic noise. This guideline has been replaced by the *Road Noise Policy* (EPA, 2011).

Concept Plan		
Reference	**Condition of Approval**	**Reason for Modification**
Condition 2.6	Replace the cross reference to the previous Environmental Assessment with a cross reference to this assessment report in respect to the volume of cargo to be transported by road and rail. Modify the condition to require the completion of the Rail Master Plan prior to any project applications relating to Stage 2 and Stage 3 of the Concept Plan.	This condition makes specific reference to the modal split and the description between bulk/general/container cargo in the previous traffic report. This includes 50 percent of bulk volume by road per year. Table 4.4 in the Appendix I of the AECOM (2010) EA is largely duplicated by Table 1 of the approval (Condition 2.7). As detailed earlier, this requires amendment. The condition for the Rail Master Plan identifies triggers for the completion of the master plan, unless otherwise agreed by the Director General. This includes the construction of Stage 1B and Stage 1C. It is considered appropriate to modify this condition to relate to Stage 2 and Stage 3 of the Concept Plan. This is discussed further in **Section 9.3.2** of this report.
Condition 2.7	Addition of eight additional employee movements associated with the modifications within the total for Stage 1 and the total for the Concept Plan (78 vehicles per hour for Stage 1 and 129 vehicles per hour for Concept Plan respectively).	Table 1 of this condition sets out road traffic limits per hour. The limits require modification to reflect the additional vehicle numbers.
Condition 2.20	Replace the cross reference to the previous Environmental Assessment with a cross reference to the technical air quality report prepared for the modification, provided in **Appendix I**.	This condition makes specific reference to the relevant pollution assessment criteria in section 3 of the technical paper prepared for air quality for the previous Environmental Assessment. An updated air quality technical report has been prepared for this proposed modification to the Concept Plan.

Table 4-15 Proposed modifications to the Conditions of Approval – Project Application

Major Project Approval		
Reference	**Condition of Approval**	**Reason for Modification**
Schedule 1		
Project Description	Modify / delete as follows (changes shown in italics): Stage 1 (*General Port Facilities*): - *Modify the exclusions to the reclamation and dredging as follows except for the northern area for the multi-purpose terminal and berth, and the dredging of the swing basin in the northern Outer Harbour.* - *Construction and operation of the central and southern area of the multi-purpose terminal extending to the Darcy Road drain, and including one multi-purpose berth.* - *New link to from Christy Drive to Foreshore Road* - *Rail infrastructure, including two additional bulk loops, the upgrade of the Old Port Road rail bridge, two bulk unloading facilities and additional bulk sidings in the North and South Yard.* - *Construction of enclosed storage sheds and conveyor systems for cargo handling at the multi-purpose terminal.* - *Treatment of the Old Port Road railway crossing.*	It is no longer proposed to have discrete sub-staging of Stage 1. Additional components of the Major Project (stage 1) need to be identified in the Schedule.
Definitions	Modify the definitions to reflect the existence of *PKOPL* within the definition of the Proponent. Modify the definitions to reflect the name changes for DPI, the Department (Heritage Branch), Railcorp and NSW RTA. Further, separate the agency role of OEH to EPA and OEH (threatened species / heritage). It is also requested that the changes continue throughout approval.	Corrections to Agency names and PKOPL that have occurred since approval

Major Project Approval		
Reference	**Condition of Approval**	**Reason for Modification**
Schedule 2		
A1/A2 Terms of Approval	Insert the title of the document in Condition A1 and recognise the altered numbering in Condition A2.	Corrections to reflect the assessment report for the proposed modification, and relationship between previous reports, the modification report, and the terms of the approval.
A5. Approval Stages	It is proposed that this condition is deleted.	This condition of approval identifies stages as described in the previous Environmental Assessment and the triggers for the completion of the master plan, unless otherwise agreed by the Director General. This includes the construction of Stage 1B and Stage 1C. As detailed earlier, these sub stages are no longer proposed.
B3 – Operation Traffic	Modify the limit to 35 vehicle movements per hour per day.	Condition identifies the number of vehicles per hour per day as 27 vehicles. An additional eight operational staff movements needs to be added to this number.
C3 – Construction Hours	It is proposed that the exception to the construction hours for dredging activities incorporates the ancillary support activities, such as the transport and emplacement of dredge spoil.	This condition identifies that dredging is excluded from the standard construction hours. However, it is not clear if this also excludes related land based activities (i.e support activities).
C7 – Construction Noise	It is recommended that P&I consider amending the cross reference to the updated noise and vibration impact assessment for the modification, as provided in **Appendix J**.	Reference is made to the noise impact assessment of the previous Environmental Assessment (Table 19), unless otherwise agreed by the Director General
C10 – Blasting	It is recommended that P&I consider amending this condition to reflect the blasting criteria provided in Chapter 12.	Blasting condition is based on human comfort levels, and does not state that these are levels as measured at sensitive receivers. It is proposed that the condition is replaced, as recommended in **Chapter 12.0**, as compliance with the condition as worded would be difficult to comply with.
C15 – Construction Vehicle Numbers	Increase from 27 to 35 trucks per hour, and the total traffic from 38 to 46 per hour.	Table C15 identifies limits for construction heavy vehicles and workforce vehicles. The number of heavy vehicles would increase as a result of the proposed modification.

Major Project Approval		
Reference	**Condition of Approval**	**Reason for Modification**
D1 – Noise and Vibration	It is proposed that the noise condition is modified in the context of the revised noise impact assessment provided in **Chapter 12.0** and **Appendix J** of this environmental assessment.	This condition identifies project noise limits, as specified in Table D1.