North Island Container Port Review

Long-Term New Zealand Container Vessel Outlook Supplement

19th March 2020

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Disclaimer: This report was prepared for Sapere Research Group, to inform their work on the Upper North Island Supply Chain Strategy. It does not represent the views of the Ministry of Transport.

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1 Introduction

1.1 Reporting Requirements

Black Quay Consulting (Black Quay) has been engaged by Sapere Research Group Ltd in New Zealand (Sapere) to provide high-level independent desktop port planning advice as part of Sapere's commission to review all work undertaken to date in determining the best solution for Auckland's long-term container port needs.

It is understood that Sapere's review includes examining and testing the outcomes of the Port Future Study (PFS), the Northport Study and various claims and assumptions made by Port of Auckland (POAL) and Port of Tauranga (POT) in terms of their ability to accommodate the long-term trade task.

Specifically, Black Quay have been engaged to provide the following:

PART I: NZ Long-Term Maximum Container Vessel Review

- Desktop Based op n on on the future ong term New Zea and f eet, restr cted to h gh eve assumpt ons around the max mum des gn vesse that can be expected to frequent North Is and ports n the ong term (th s report)

PART II: New Port Options Review

- Cr t ca desktop rev ew of the two a ternat ve port opt ons presented n the PFS; name y the preferred opt ons n the F rth of Thames and the Manukau Harbour w th the ntent of ga n ng mproved conf dence around the techn ca and operat ona v ab ty of those opt ons and rev ew of the order of magn tude cap ta cost assoc ated w th each

PART III: Port of Auckland Expert Advice

- Expert ndependent op n on and adv ce on POAL's c a med future capac ty to dea w th the ong term trade task (restr cted to desktop eve rev ew on y)
- Other expert adv ce and op n on f requ red by Sapere, nc ud ng potent a nput to prov ng c a ms made at other ex st ng North Is and ports (to be determ ned).

This report and other work prepared by Black Quay makes reference to timeframes, and therefore it is important to understand these in context. For clarity, timeframes referred to are as follows:

It is worth noting that this generally corresponds to the timeframe assumptions within the PFS.

1.2 Limitations of Use

This report and its contents form only part of Black Quay's wider remit to deliver the items listed in Section 1.1. Accordingly, all contents, assumptions and findings contained within this report must be considered alongside all other elements within Black Quay's remit.

The report may contain forward looking statements. These are based on Black Quay's initial views and assumptions of future scenarios or events as at the date of this report and are subject to change, including generally as a result of changing future economic conditions or other changes that might emerge.

Actual and future results and trends could differ materially from those included in these statements throughout this report due to various unforeseen factors, including, without limitation, those discussed in this study. These factors are beyond Black Quay's ability to control or predict. Accordingly, Black Quay makes no warranty or representation that any of the projected values or results contained in this report will eventuate. This study is qualified in its entirety by these limitations, conditions and considerations. Specifically:

- This report may include forecasts, projections and other predictive statements that represent Black Quay's assumptions and expectations considering currently available information.
- Forward looking statements apply only as of the date of this report and are expressly qualified in their entirety by the cautionary statements included in this report.
- Any forecasts are preliminary only and based on general industry trends, and subject to circumstances involving current users, the economy, political issues, and other factors, and they involve risks, variables and uncertainties. Large variations may occur from year to year.
- The actual performance results may differ from those projected, consequently, no guarantee is presented or implied as to the accuracy of specific forecasts, projections or predictive statements contained herein.
- Inevitably, some assumptions will not materialize, and unanticipated events and circumstances may affect the ultimate results.

The findings in this report, general or specific, have been prepared specifically for Sapere and must not be used by any other party for any purpose, current or future, without the express permission of Black Quay. This includes any other party or consultants involved in the study, both directly and indirectly.

Specifically, this report contains intellectual property and confidential wider industry findings that belong to Black Quay. As such, the report must not be shared with any other party other than

Sapere, including those involved in this study, other than the conclusions contained at the end of the report.

This report replaces all previous versions.

2 Strategic Context

2.1 Background

The future of Auckland port has been questioned for some time. There is public pressure to relocate the port out of the city's waterfront, and this culminated with a court order for the port to cease land reclamation into the Waitemata Harbour. This effectively limited the port's ability to handle the future trade task that the port is there to facilitate.

Subsequent to the court order, Auckland Council (owner of the Port of Auckland) commissioned a comprehensive study into Port of Auckland's future and where best to locate the long-term port serving the city. The PFS generally concluded that Port of Auckland is constrained on a number of fronts, but that it could in theory continue to service at least some of the future trade task, depending on the level of trade growth over a limited timeframe.

However, this would require considerable reworking of its operations and did not provide ultimate surety around accommodating the long-term task. The PFS considered these technical and operational findings alongside other social and environmental factors; not least of all the public desire the see the port relocated out of the city centre. The Port has gained consent to extend Bledisloe wharf, but by suspending the extension rather than through reclamation.

However, the main finding of the PFS was that the construction of a new purpose built and state of the art port elsewhere scored higher than any other option investigated, including those to allow Port of Auckland to remain and expand in the longer term, or for Tauranga to take Auckland's future trade task alongside its own. The PFS also scored the notion of developing Northport to serve Auckland's future trade relatively low.

A primary reason for these findings was relative distance to markets. Whilst Port of Auckland's location means that freight must travel through the city centre to some degree (not ideal and generally contrary to modern port planning principles), the very nature of the port, being an historic hub within the city it serves means that its distance to market is relatively good.

Conversely, rather than simply being a port planning principle, the notion of relocating the port some distance from the primary markets within Auckland is questionable and would inevitably lead to higher freight costs.

This is of primary importance, not only to the study, but to Auckland's future as a trading hub. Should freight costs increase, then service providers along the supply chain will almost certainly pass these costs on to the consumer or customer. This in turn drives up export and import costs and competitiveness down.

As such, a primary factor in the scoring of options in the PFS was distance to markets. It is generally agreed that the South Auckland region will continue to be the central industrial hub for Auckland, and in being so, is at least in some ways equivalent to being the central industrial hub for New Zealand.

The PFS identified two (2) general areas where a new future port might be located; those being within the Firth of Thames and the

Manukau Harbour. Whilst scores of the various options differed, the relatively short distance to markets for these areas (relative to South Auckland) scored highest. Indeed, an option constructed within the Manukau Harbour would mean that the port would be effectively integrated into South Auckland and the primary markets of the city.

Other principal advantages were claimed for these options, including the ability to stage and expand the capacity of the port almost indefinitely, thereby securing Auckland against a repeat of current long-term port related uncertainty. Whilst capital costs were inevitably high, all options investigated would require significant capital spending, and the ability to reduce operational costs was a contrary advantage.

Black Quay (who were involved in the PFS) will re-examine the viability of these options separately to this report, however this should be read in conjunction with the findings of this report (given that the long-term shipping task is clearly of key importance in determining future port needs).

As part of the PFS, a fleet forecast was produced by Black Quay. This covered both container shipping and automotive shipping. Whilst high level in nature (Black Quay regularly undertake detailed global fleet forecasting), it was an important element of the PFS and proved a considerable improvement over the then assumptions around the future New Zealand container design vessel.

In essence, prior to the PFS, the New Zealand industry assumed a container vessel no larger than 8,000 TEU would frequent its ports. The PFS recommended that 8,000 TEU vessels would visit the country much sooner and that up to 9,600 TEU vessels would emerge on New Zealand loops. Since the study was completed, this has in fact occurred already.

The ability of New Zealand ports to accommodate the future fleet is of paramount importance. Therefore, understanding what it may be, should be a key part of this overall study (as it was within the PFS).

3 Fleet Study Introduction

As part of this study, Black Quay has undertaken a broad high-level review of what the future container fleet might include, and specifically around the upper-end vessel over time. Whilst high-level in nature and not the extent of work typically undertaken as part of detailed fleet forecasting, it is informed by other recent full fleet forecasts prepared by Black Quay in the region.

Fleet forecasting includes the detailed analysis of what the entire fleet might include, as well as the upper-end vessel. Although full fleet spectrum analysis has not been undertaken as part of this study, it does provide some evidence based opinion on what the upper-end vessel for New Zealand might be in the longer term.

The upper-end vessel is particularly important for this study, because the ability of ports to accommodate them does in theory influence the viability of that port.

3.1 Critical Factors

Whilst the upper end container vessel is a primary consideration for future port capacity and capability, the relationship between the upper end vessel and the ports they serve is rather more complex and needs to be generally understood.

Container ship sizes continue to grow globally (including New Zealand) and this is discussed in this report. The drivers for size increase generally comes from the shipper's desire for increased economies of scale, as well as generally reduced overhead costs.

Ports are then typically required to provide sufficient infrastructure to accommodate the increased vessel sizes, however the routes and ports themselves do often play a part in determining the shipper's decisions around vessel size (capacity and dimensions).

For example, where fixed constraints exist, or markets are comparatively limited, shippers will introduce vessels more appropriate to that route. There are some instances where shippers specifically develop vessels to serve those constrained routes (East Coast Canada for instance), however this is rare and restricted to relatively high volume services.

In Australia, Melbourne provides the critical constraint on Australian routes due to numerous infrastructure and operational issues. In turn, the Australian (and to some extent, the wider Oceanic) fleet is constrained to a certain size vessel. This and the related impacts on the New Zealand fleet are discussed and examined in this report.

Finally, Black Quay make note that this study is currently restricted to container ports and fleet. It is important that the future port needs of the North Island include consideration of wider shipping types and fleets (as did the PFS), as these combined with the container task, will influence the future port needs of Auckland and beyond.

There is a need for this in order to plan the infrastructure and operational requirements of the ports to handle them. Furthermore, the infrastructure or ability to create additional infrastructure at each port in the future, is likely to dictate what the largest sized vessels will be. This does not diminish the fact that the fleet mixes and visitation profiles will also have significant influence on the port's ability to handle the future shipping task.

4 Shipping Sector Context

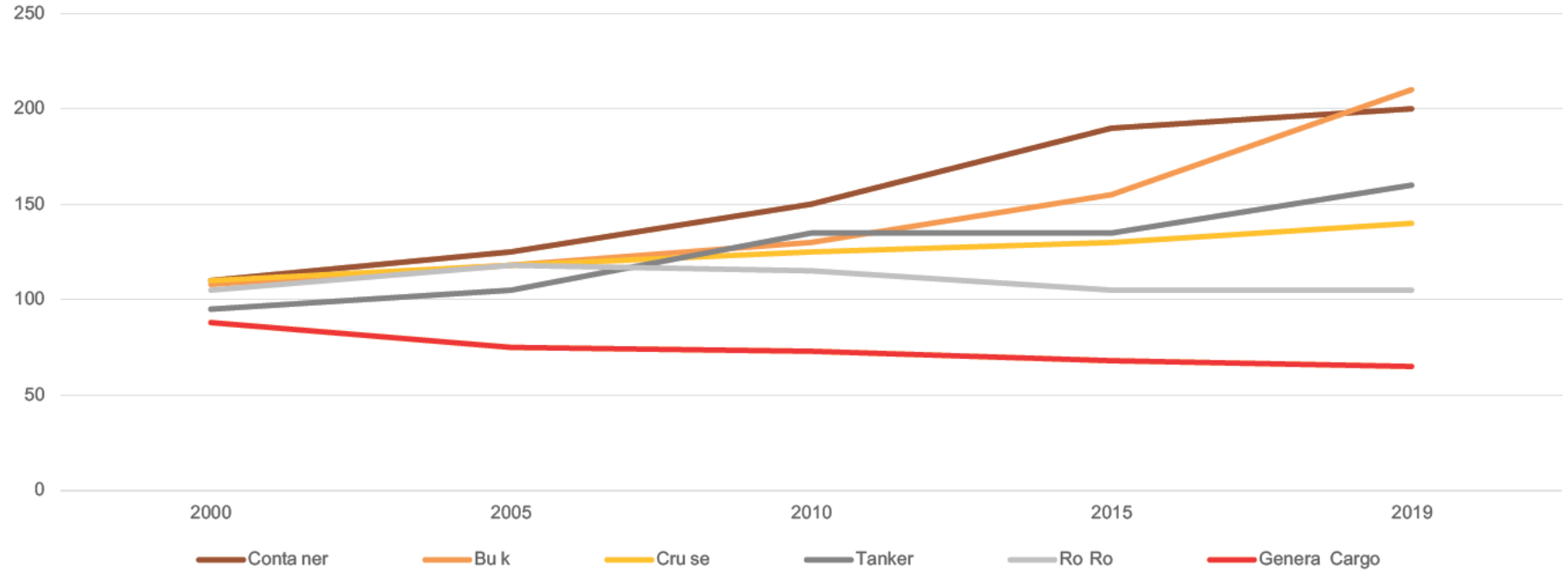
4.1 Industry Overview

As volumes have increased over time, vessels have become increasingly tailored and specialized.

A snapshot of the changes in vessel sizes across each of the categories in the last 20 years alone, demonstrates this point (refer Figure 1).

Whilst container vessels for example have displayed a strong trend in increasing vessel size, the general cargo fleet has decreased in ship size over the same period (generally as a result).

Figure 1 Development of Cross-Sector Ship Size in DWT 2000-2019[1] (Black Quay, 2019)



Source: OECD and B ack Quay Data, 2019

[1] *Ship size growth in DWT (based on DWT: 100 Index) This also represents a spectrum rather than max vessel capacity*

5 The Global Container Fleet

5.1 Historic Growth Overview

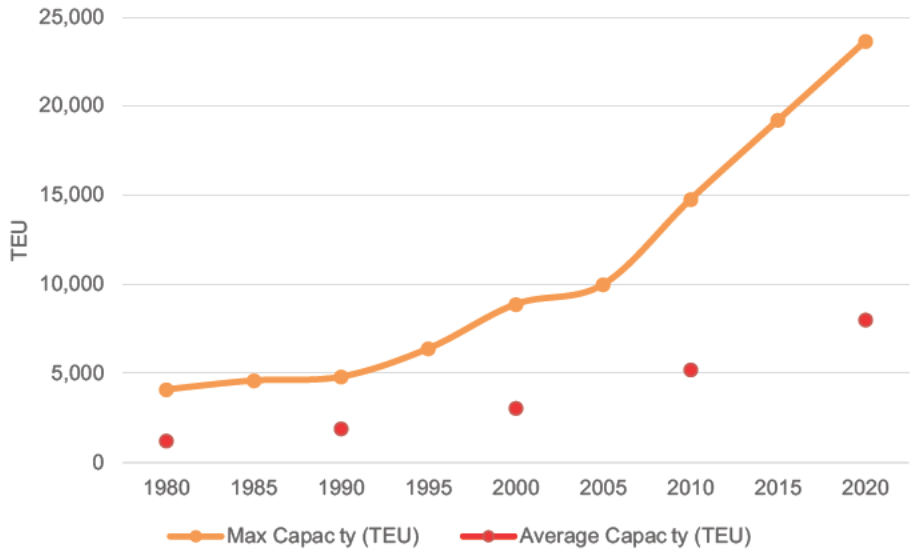
Despite uncertain market conditions over the last ten years, 2019 heralded the introduction of the latest size bracket increase, with the delivery of 24,000 TEU vessels on several primary routes (Megamax-24 vessels).

The continuing size increases in uncertain times is a reflection of shipper's continuing attempts to improve their overall and per box profits. The front line of the relentless size increases is the North Europe-Asia route where the new Megamax-24 vessels are already deployed.

This is an important contradiction to those in the industry that were sceptical of any further growth and those proposing a likelihood of a near-term halt to upper end vessel growth.

Figure 2 displays the historic growth of container vessel sizes over recent times. The last decade alone saw a doubling in average size of new-builds.

Figure 2 Maximum & Average Container Ship Sizes Over Time (Black Quay, 2019)



5.2 Current Upper End Fleet

Realized economies of scale from utilising larger vessels vary across the routes they serve, however as an indicative guide, the cost saving for a shipping company changing up from an 8,000 TEU vessel to an equally utilised 13,000 TEU vessel is approximately 18% and this continues to increase as the vessel size increases (Black Quay, 2018).

Figure 3 illustrates the change in the maximum vessel sizes deployed across the world's primary routes between 2016 and 2020.

Figure 3 Largest Deployed Box Vessels Globally (TEU) (Black Quay, 2020)

Route	Max. Vessel 2016	Max. Vessel 2020
As a North Europe	19,870 TEU	23,700 TEU
As a Med terranean	15,000 TEU	19,000 TEU
As a US West Coast	13,800 TEU[2]	17,800 TEU
As a East Coast South Amer ca	10,500 TEU	11,000 TEU
Europe East Coast South Amer ca	11,500 TEU	11,800 TEU
As a West Coast South Amer ca	13,100 TEU	14,400 TEU
As a M dd e East	14,000 TEU	21,000 TEU
Europe South Afr ca As a	12,500 TEU	13,000 TEU

[2] *CMA CGM did deploy its 18 000TEU class on this route in early 2016 however they pulled the route shortly after before ship size grew again*

5.2.1 Primary Cascading Effects

Essentially, the increases on the primary trade routes have resulted in an increase in cascading across the global fleet, which is currently having critical impact on the global over-capacity scenario (although this typically fluctuates over time).

As shown, the upper end of the global fleet is largely driven by the primary east west Asia – North Europe route, from where the introduction of new larger vessels has driven the relentless cascading of redundant smaller vessels onto secondary transhipment or primary spoke routes over the last decade.

A total of 26 ULCS vessels were delivered in 2018 alone; all of which were deployed on the North Europe-Asia route. More, including additional Megamax-24 vessels, will come into service in 2020 and 2021.

19,000 TEU vessels have now been deployed on the Asia-Mediterranean route, and there is strong potential for Megamax-24 vessels being redeployed onto this route from the North Europe-Asia route in the short-term.

At the same time, lower-end vessels are being removed from primary routes as average vessel sizes rise. 5,500 TEU bracket vessels have now been removed from the North Europe-Asia route; a vessel size that dominated the route a little more than a decade ago.

To varying extents, this has worked well to date, with secondary east west routes such as the Asia – Mediterranean Route absorbing the cascade and, in many ways, benefiting from it (reduced costs and so on).

However, east west routes have now become saturated with upper end vessel capacity, likely forcing the shipping lines to cascade increased Ultra Large Container Ships (ULCS) onto secondary routes focused around north south trade, bringing infrastructure issues and reduced freight returns in poor market conditions with them.

Black Quay anticipate redeployment of ULCS to secondary routes will occur within the next 5 years on the Asia – West Coast US route and is already occurring on the Asia-Middle East route, and the Europe – Middle East route has seen a significant uplift in the maximum service vessel size over the last few years.

The dominance of ULCS vessels on the primary routes is clear and as this increases, so will cascading of smaller vessels onto the secondary routes.

Despite current market conditions, the largest shipping lines continue to deploy new high capacity vessels onto saturated routes. They are largely managing this by slowing ships as they gradually phase in the new vessels.

Aside from the capacity factors and issues associated with the large liners cascading large vessels onto secondary routes, it also reduces the ability of smaller liners to compete.

The increasing supply of 14,000+ TEU vessels from the primary routes has already produced unprecedented cascading of 8,000 TEU to 10,000 TEU vessels to secondary services around the world. This is now increasing to 11,000 TEU vessels. The situation could potentially have the largest effect on container shipping in the industry's history, with the exception perhaps of the top end growth phenomenon itself.

As for the primary spoke routes, these are likely to see continued circumstantial cascading as a result, with top-end vessels changing from 10,000 TEU to 14,000 TEU and likely beyond in the short to medium term. New builds of larger vessels are also affecting these routes.

Whilst pressures remain on low cargo rates for the secondary routes and many of the primary routes, there are recent signs of rate recovery on primary east west routes, which could eventually change the ways in which the big alliances operate once again. This will be dependent on a delicate balance of scrapping rates versus new build orders and competitive reactions to one another.

Route and cascading factors specifically affecting Australasia are discussed in detail in Section's 6 and 7.

5.3 Broader Container Fleet Spectrum

It is not only the upper end of the fleet that has been experiencing rapid growth in size. Across the container fleet, increase in average ship sizes has been evident. Whilst the limitations around this high-level outlook report mean that it does not include full fleet spectrum and average vessel analysis, it is worth noting the context of global medium vessel size increase.

Increases experienced across the last ten years are displayed in Figure 4. The primary Australasian route[3] is included for comparison and shows the linear relationship between that and the global upper-end average.

The size increases across the board are largely due to cascading effects (refer to previous Section).

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The relationship between the Australasian fleet and the global fleet are clear from this.

From a container fleet perspective, the average vessel size will continue to vary considerably across the routes that they serve.

6 New Zealand Container Fleet Drivers

6.1 Australasian Container Trade Routes

Container Liner services to and from New Zealand can predominately be classified in two ways; those that service New Zealand as part of Australian routes, and those that service New Zealand directly.

The primary trade routes servicing New Zealand are as follows:

- Direct Services – North America / South America / Panama Canal
- Direct Services – North Asia
- Australasian Loops – East Coast & West Coast / New Zealand (connecting Europe, SE Asia and North Asia)

Figure 5 Approximate NZ Prominent International Shipping Route Posture (Black Quay, 2020)

The North Asia route is the largest Australasian trade route by container volume, accounting for approximately twice as much as the Southeast Asian route, however volumes tend to vary.

These are general routes and specific alliance strings differ; often adopting different first calls, as well as some operating as loops whilst others as return trips.

An example route is provided here for context.

Figure 6 Australian West Coast US Route 2019 (Flinders Ports, 2019)

As a valid generalisation, two routes influence the New Zealand upper end vessel; those also serving Australia as part of Oceanic loops, and those directly servicing New Zealand.

The majority of Australian routes are restricted in vessel size by limitations at the Port of Melbourne. This is discussed in the following section.

6.2 Physical Drivers on Australian Routes

6.2.1 Current Constraints Overview

Whilst there are varying degrees of physical limitation at most Australian ports (including both landside and waterside), the primary limitations relate to the Port of Melbourne.

The significance of the Port of Melbourne as Australia's largest port by container volume means that its constraints have effectively shaped the largest container vessels to call at Australia (as the east coast and often west coast routes typically call at Melbourne).

Melbourne's constraints relate to two factors; navigational constraints at Port Phillip Head ('The Heads') as vessels enter and make their way into Port Phillip Bay, and the Westgate bridge clearance which limits air-draft for vessels destined for two of three of Melbourne's container terminals in Swanson Dock. Further vessel restrictions exist within Swanson Dock given its limited width and length as well as the swing basin dimensions at the mouth of the Dock.

The Port currently applies a 14m actual draft limitation on vessels transiting the Port Phillip channel, providing uninterrupted all states of tide access to the port.

Whilst the limitation on vessel size has restricted ships to 300m in length, 40m beam and a 14m draft, it is at the harbourmaster's discretion to approve larger vessels on a case by case basis.

Various studies were undertaken by the Port of Melbourne prior to the lease process several years ago to determine theoretical maximum vessels. Simulations were ran for a vessel 318m in length, a beam of 42.8m and a draft of 14m. At that time, this

equated to a vessel of up to 7,800TEU. Subsequently, a 336m long vessel with a beam of 45.8m and a draft of 14m was simulated, equating then to a 10,000 TEU vessel.

In late 2018, the port worked with the harbourmaster to accept the 'MSC Archimidis'; a 317.8m long, 43.2 m beam and 14.5m draft vessel, with a capacity of 8,266 TEU. Interestingly, the vessel berthed at Swanson Dock.

In mid 2019, the 'Maersk Skarstind', was accepted at the port. Whilst also a pilot test visit, the implications of this ship call are significantly greater.

Whilst the Skarstind is shorter than the Archimidis at 300m in length, it has a significantly larger beam of 48.2m, whilst having a 14m draft, matching current broad restrictions at Melbourne. In better matching current vessel trends (the ship was built in 2016), it can carry nearly 9,500TEU. This vessel also visited Swanson Dock.

Perhaps of more importance is that fact that the Skarstind formed part of Maersk's 'Boomerang' service (now renamed) and is already scheduled to call to Australia regularly. This includes Melbourne.

Similarly, MSC have introduced multiple 9,500 TEU vessels onto its 'Australia Express' service in partnership with CMA CGM, with similar dimensions to the Maersk vessel.

This trend (and push) has clear implications for Melbourne, but also for New Zealand.

To summarise; the Port of Melbourne has accepted vessels significantly larger, both in terms of dimensions and capacity, than its stated limits over the last two years. Both vessel lengths and beams have increased considerably, whilst draft has remained largely constant. That corresponds with Port of Melbourne's position prior to the lease of the port but has clearly involved significant relaxation of the harbourmaster's position. It is normal process in the maritime industry that operating parameters change over time as a result of both changing needs and an appropriate level of technical scrutiny.

Almost 90% of vessels calling at Melbourne now have a draft of over 11.6m, and it is likely that draft related pressure will also eventuate there as ship size on secondary routes continues to rise.

The Port of Melbourne's restrictions are in contrast to Sydney and Brisbane which can already accommodate 10,000 TEU vessels, and removing any restrictions could increase this further.

6.2.2 Maximum Melbourne Vessel

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6.3 Direct New Zealand Services

Certain shippers are now visiting New Zealand on routes that omit Melbourne. This is so as to avoid the constraints described previously.

However, these services continue to change as the shippers chase greater economy and increased certainty over ship by ship volumes.

Maersk first sent a 9,500 TEU ship to Tauranga in 2016 and then a 11,300 TEU ship to the same port in 2017. The 11,300 TEU vessel visit was a trial test, however the introduction of 9,500 TEU vessels by Maersk appears to be permanent (in as much as shipper's strategies can be determined).

Auckland is currently constrained to vessels under 6,000 TEU in capacity.

7 Long-Term North Island Maximum Container Vessel

This Section of the report is aimed at providing a future long-term maximum container vessel for New Zealand. It does not provide a fleet mix over that time which will require further study. However, understanding the maximum size ship demand for New Zealand is an essential component of this study, as it will provide some critical guidance on which port options in the North Island (existing or potential) could in theory cater for the upper end of the fleet.

Whilst it may be possible for the smaller regional ports to survive based on smaller vessel visitation over time, the main ports (i.e. those serving Auckland and the majority population) will be required to be competitive for the largest vessels.

It is worth noting that this may also play a major transformation role for the smaller ports also as there could be increased transhipment to service them from a primary New Zealand port location (as opposed to those seeing direct visitation from the upper end of the New Zealand fleet).

Cascading and other effects discussed in Section 5.2.1 are likely to produce and increase the upper end of the New Zealand fleet, and certainly across the wider Australasian fleet (given both will likely continue to be intrinsically linked). The average vessel size is also expected to increase accordingly.

With the delivery of 24,000 TEU vessels on the primary global routes, and Black Quay's longer term expectation of 28,000 TEU vessels on those routes (and possibly up to 30,000 TEU), it is very difficult to predict that Oceania routes will not see increases in current fleet sizes (as a result of cascading to all other routes, and eventually to the North Asian and South east Asian – Australasian services.

Normally as part of detailed strategic port planning, considerable work is required to test the effects of volumetric trade changes on specific routes and services, along with individual fleet forecasting associated with the serviced city.

The study for New Zealand is then rather unusual, in that these factors are not necessarily being considered, although they were as part of the PFS.

In Black Quay's opinion, Auckland's future maximum container vessel will be a result of one of three scenarios:

- New Zealand fleet will mirror the Australian fleet as governed by Port of Melbourne
- A North Island port becomes a central hub for New Zealand containers, bypassing Melbourne, and in turn, ship size will increase beyond that predicted for Melbourne (or Melbourne manages to increase ship size)
- A mix of both.

It is Black Quay's opinion that whilst in some ways, the introduction of 9,500 TEU ships to Tauranga loops has introduced further appetite from the shippers to increase Melbourne's maximum vessel to the same, any increases beyond that at Melbourne may not influence vessel size in New Zealand. This is purely volume and demand based.

However, if the shippers did increase the New Zealand vessel in line with those calling at Melbourne in the longer term, this could in

theory reach 13,000 TEU (and possibly up to 14,000 TEU). Certainly, in the shorter to medium term, Black Quay see demand for 10,000 to 11,000 TEU ships calling at Australia and New Zealand.

Maersk is currently altering its services to New Zealand by introducing an additional vessel to its Southern Star service which will include a call at Timaru and link to South East Asia as well as east Coast Australia (minus Melbourne). Timaru successfully ran trials of a 5,900 TEU Maersk vessel (Hamburg Sud) last year and it is presumed that this route will be restricted to this size, at least for some time. This will lift this route from 4,500 TEU vessels (approximately) until relatively recently.

Maersk's Triple Star service provides weekly connectivity for both New Zealand exports (Northbound Service) and imports (South Bound Service) to North Asia. Maersk have decided not to include Port of Tauranga on its Asia – West Coast Latin America service in 2020, meaning that imports will need to be via its Southern Star service and exports to West Coast South America via its OC1 service.

This is not unusual, and New Zealand has experienced significant strategic changes from Maersk and other lines in the past (2006 saw Maersk pull out of Tauranga and relocate services to Auckland, which was then subsequently reversed).

The Triple Star service is a de-coupled route as the Northbound and southbound services are provided as part of separate loops. Changes to its New Zealand services emerged after Maersk's takeover of Hamburg Sud in 2018 (and the company is rationalising services across the two companies).

This all generally equates to a 5,900 TEU serving imports south and a 9,500 TEU vessel serving exports north.

The story for Auckland is different and changing. The port is generally constrained to vessels less than 6,000 TEU capacity.

It is understood that when Auckland's 3rd container berth is completed, it will be able to accommodate up to 11,000 TEU vessels, but this will be dependent on the consent to dredge the channel and berth pocket accordingly. This is discussed further in this report.

7.1 Projected Fleet Proposal

Based upon historical information and the discussion above, Black Quay provides our own high-level conclusion on what trends might mean for the vessels seen at North Island New Zealand in the short to long term.

7.1.1 Short-Term Expectation (15 years or sooner)

Over the next 10 to 15 years, Black Quay anticipate that vessels calling to Australia that are less than 6,000 TEU in size will gradually be replaced, moving from 6,000 TEU vessels to 8,500 TEU vessels. This will provide the majority of capacity to meet the future trade task there.

There is potential for New Zealand calls to mirror this (linked calls but also potentially direct calls), but probably over a longer timeframe. In unison, some of the primary services to Australia will increase maximum vessel size to 10,000TEU (possibly up to 11,000 TEU – Melbourne dependant).

These vessels may call at New Zealand as part of their route services. However, it is likely that vessels calling at Tauranga would increase to this size regardless.

7.1.2 Medium-Term Expectation (30 years or sooner)

Between 2035 and 2050, most if not all services to both Australia and New Zealand handling 6,000 TEU vessels will have upgraded, and therefore further capacity needs would be met through increased services or further introduction of vessels greater than 7,500 TEU in size.

7,500 to 8,000 TEU vessels added after 2019 will gradually be replaced by vessels 8,500 TEU and above. By 2050 there could be three calls per day by vessels beyond the current New Zealand maximum size.

The maximum New Zealand size at that time is expected to be 11,000 TEU (noting as above that this in theory could come sooner and may well do as part of either direct services and/or those calling at Australia). It may also be the case that Black Quay's predicted long-term vessel (see below) could eventuate sooner and visit New Zealand in the medium-term.

7.1.3 Long-Term Expectation (beyond 30 years)

Between 2050 and 2070, the ability to upsize services is limited as most routes will be operating close to their largest possible vessels.

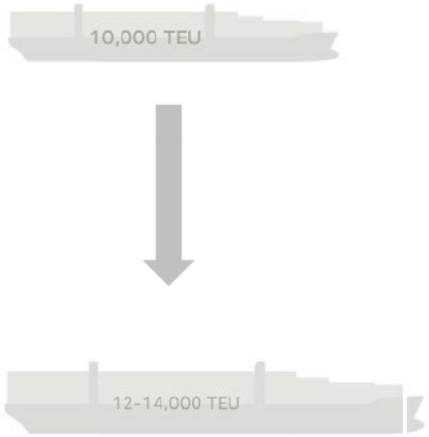
However, Black Quay believe that a small number of dimension specific 13,000 to 14,000 TEU vessels will be operated on the primary Australasian services.

These are likely to represent only 3% of the fleet, but a significant component of overall service capacity. By this time, Black Quay expects that no vessels lower than 4,000 TEU will be operated on primary Australasian routes.

Accordingly, Black Quay proposes the following long-term design vessel for North Island New Zealand may be appropriate, recognising that it is likely to represent only a small percentage of the overall fleet (likely between 3% and 5% of the fleet, but representing a higher percentage of the overall carrying capacity).

Figure 8 Proposed Theoretical Maximum NZ Container Vessel Examples (Black Quay, 2020)

	Vessel Capacity	LOA	Beam	Draft	Assumption Basis	Approximate Differential Visualisation
Current	9,500 TEU	300m to 336m	46m to 48.3m	12.5m	9,500 vesse s vary n d mens ons cons derab y. Th s s our expected range for Ocean c vesse s based on var ous m tat ons	
Short-Term	10,000 TEU	336m	48m	14.5m	10,000 vesse assumed or around that capac ty and wh st d mens ons m ght vary, they w be around th s s ze g ven current f eet and cascade assumpt ons over t me	
Medium-Term	11,000 TEU[4]	366m	48.5 to 49m	15m	11,000 vesse assumed or around that capac ty and wh st d mens ons m ght vary, they w be around th s s ze g ven current f eet and cascade assumpt ons over t me	
Long-Term	13,000/14,000 TEU	366m to 380m	49m to 52m	15m to 15.5m	Thought ke y to represent to Oceana a upper end n the ong term. However, d mens ons perm tt ng, h gher capac ty vesse s w th s m ar d mens ons cou d be ntroduced out to 2060 (14,000 TEU).	



[4] *Black Quay make note that it is possible that the long term vessel expectation could come in the medium term*

Increased exchanges as vessels increase in size will be a major factor in New Zealand port capacity due to increased berth utilisations (overcome to some extent through improved crane productivity, but certainly not entirely).

However, for the purposes of this limited study, the increases in vessel dimensions are of critical concern to port's abilities to accommodate them.

Beam will have significant impact on channel and berth capacity as well as crane needs, however, vessel lengths and drafts are likely to provide the ultimate challenges for NZ ports, and are therefore of primary concern when assessing North Island port capabilities in simple terms.

Accordingly, Black Quay have plotted the anticipated increases in both container vessel lengths and maximum drafts over broad timeframes. These are provided below in two charts; the first being the anticipated minimum dimensions of the upper end vessel, and the second the maximum.

Figure 9 Scenario 1 - Theoretical Maximum NZ Container Vessel Growth in LOA and Maximum Draft Over Time (Black Quay, 2020)

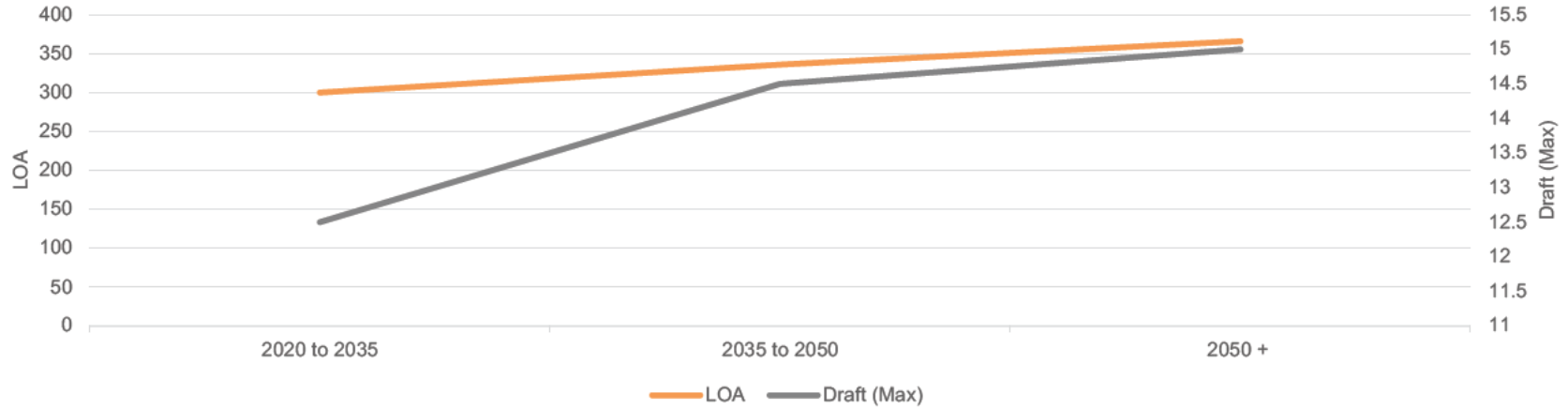
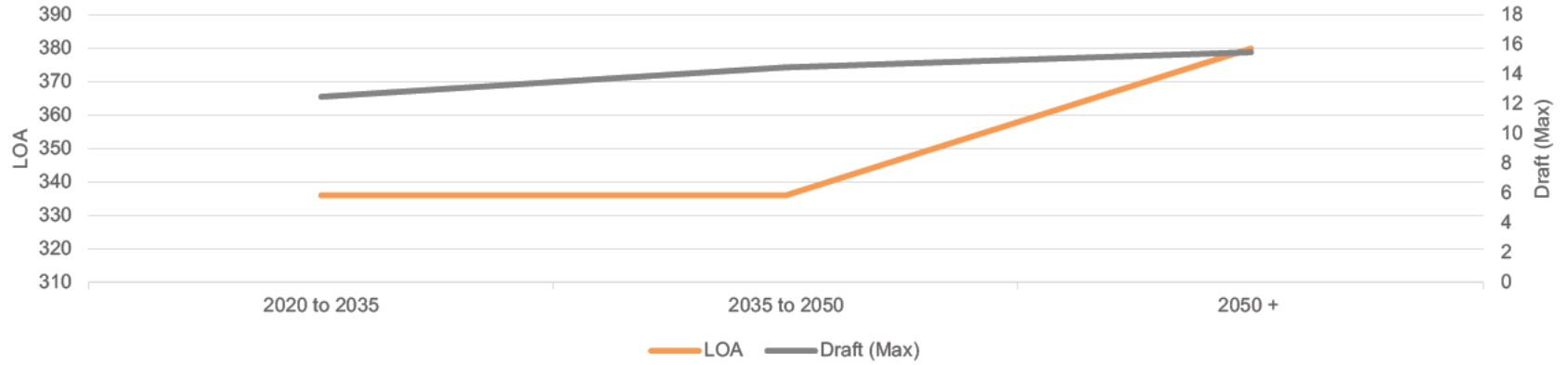


Figure 10 Scenario 2 - Theoretical Maximum NZ Container Vessel Growth in LOA and Maximum Draft Over Time (Black Quay, 2020)



8 Broad Implications Summary

This section provides a theoretical list of possible consequences to New Zealand North Island primary ports of changes to the upper end container vessel into the long-term; namely Tauranga and Auckland.

8.1 POAL Claims

Black Quay has not seen any fleet forecasting from POAL or any information on their basis for future vessel visitations. This includes anticipated vessel exchanges, weights and laden conditions, underkeel clearance assumptions and so on.

However, Black Quay were provided a high-level summary paper from POAL which broadly explained their planning assumptions around terminal and channel capacity and infrastructure needs (UNISC Workshop, provided February 2020).

The POAL contains various high-level information including:

- An image on page 20 showing a concept of the port, which includes the 'North Berth' at 330m length.
- Information on the proposed channel deepening on page 23, including:
  - Claim that the stage 1 dredge (13.5m on straights) would allow visitation of 6,000 TEU to 7,000 TEU vessels.
  - Claim that the stage 2 dredge (14m on straights) would allow visitation of 'New Panamax' vessels.
  - An image claiming that the full dredge could lift the maximum vessel size from a current 320m LOA, 43m beam, 12.7m draft to a vessel of 366m LOA, 49m beam and a 15.2m draft.

The indicative vessel shown at the North Berth on page 20 of the POAL document is a 265m LOA, 32m beam vessel. Although this seems at odds with the vessel claims on page 23, it seems likely

that POAL are suggesting that larger vessels would continue to be accommodated along the current Fergusson berthline.

The claimed maximum vessel (366m LOA) based on a 14m deep channel would likely fall between an 11,000 TEU vessel and a 13,000 TEU vessel (see Section 7.1). This generally equates to a 'New Panamax' vessel. There are clearly assumptions being made by POAL on the laden condition of the upper end vessels and the tidal constraints on visitation times. Whilst this is not unusual in ports (ports often accommodate vessels operating under their maximum drafts), Black Quay have not been able to verify the basis of POAL's assumptions. Nevertheless, a 14m deep channel would likely be constrained in terms of its ability to accommodate vessels with a draft of 15.2m (as proposed by POAL). To be clear, whilst it may be theoretically possible to accommodate vessels of this size, it would likely need to occur during a small tidal window and be under constrained laden conditions (i.e. travelling light). Understanding the channel and berth pocket depths required to accommodate vessels of this size (and 14,000 TEU size) reliably requires detailed study beyond the scope of this supplement. However, Black Quay believes that a channel depth requirement of between 15m and 15.5m is likely. To do this would effectively mean a 'Stage 3' channel deepening and would be a considerable dredging project in its own right.

This is made more important when shipper's demands are taken into account (i.e. they may require better berthing windows), and the fact that these larger vessels would spend longer at port, means the timing to depart the port would also become more critical.

8.2 Scenario Implications

Figure 11 North Island Upper End Vessel Implications Summary (Black Quay, 2020)

	Scenario	Sub-Scenario	Port of Tauranga	Port of Auckland
Current	Upper end conta ner vesse to 9,500 TEU n s ze	N/A	A ready serv c ng and ev dence of market share ga n for Auck and bound/or g n trade	Unab e to serv ce >6,000 TEU n s ze contr but ng to stagnant growth and ncreas ng oss of market share to Tauranga
Short-Term	Upper end vesse ncreases to 10,000 TEU (or poss b y up to 11,000 TEU as a resu t of chang ng Austra an restr ct ons)	New Auck and 3rd berth comes on ne, and consent granted to dredge to 13.5m (Phase 1 Dredge)	Can ke y a ready serv ce these vesse s resu t ng n ncreased market share ga n over Auck and	Ab ty to serv ce up to 7,000 TEU vesse s, but st ose market share as nes cont nue to ook towards arger vesse opportun t es
		New Auck and 3rd berth comes on ne, and consent dec ned to dredge to 13.5m (Phase 1 Dredge)	Can ke y a ready serv ce these vesse s resu t ng n ncreased market share ga n over Auck and	Unab e to serv ce >6,000 TEU n s ze contr but ng to stagnant growth and ncreas ng oss of market share to Tauranga
Medium-Term	Upper end vesse ncreases to 11,000 TEU (or poss b y up to 13,000 TEU as a resu t of chang ng Austra an restr ct ons)	Consent granted to dredge to 14m (Phase 2 Dredge)	A ready capab e of hand ng some vesse s of th s s ze from a channe perspect ve. May requ re term na work etc.	Ab ty to serv ce some 11,000 TEU vesse s under certa n states of t de and aden cond t ons. L m ted to ma n berth ne, but term na ke y capab e of hand ng[5].
		Consent dec ned to dredge to 14m (Phase 2 Dredge)	Can ke y a ready serv ce some 11,000 TEU vesse s resu t ng n ncreased market share ga n over Auck and but wou d ke y requ re s gn f cant works to accommodate 13,000 TEU vesse s (see be ow).	Unab e to serv ce >7,000 TEU n s ze contr but ng to stagnant growth and ncreas ng oss of market share to Tauranga

[5] *It should be noted that if the long term largest vessel eventuates in the medium term (a possibility in Black Quay's opinion) then the restrictions noted under the long term scenario would apply*

Long-Term	Upper end vesse ncreases to 13,000 TEU (or poss b y up to 14,000 TEU as a resu t of chang ng Austra an restr ct ons)	N/A	L ke y to requ re another cap ta dredg ng pro ect and berth extens on and may requ re add t ona term na work	L ke y to requ re another cap ta dredg ng pro ect and berth extens on, and may requ re term na work

8.3 Conclusions

- There is potential for New Zealand's upper end container vessels to reach up to 14,000 TEU in size out to the long-term. The timing of this could vary, and potentially come sooner, largely dependent on lifting/elimination of certain Australian port limitations.
- If this were to occur now, Port of Tauranga would in its current state, be better placed to accommodate them than Auckland (whilst recognising that significant upgrade/expansion works may be required at Tauranga and that operational restrictions might be in place).
- The feasibility of works required at Tauranga to reliably accommodate vessels of 14,000 TEU capacity is unclear but is likely to represent major works with significant planning approval requirements and capital costs. This may include consent to dredge over and beyond current depths.
- Port of Auckland is highly dependent on various resource consents to meet even its medium term aspirations (noting that POAL have stated that they see their design life being medium term limited in any case as a result of the PFS recommendations).
- Should Port of Auckland be granted consent to increase its channel, berth and terminal capacities, based on its current plans and stated ultimate limitation, it may still be relatively limited compared to Tauranga depending on the size of vessel at that time, but possibly in the short to medium term (i.e. would require increased depth and berth length over and above its current resource consent applications).
- Whilst the proposed POAL Stage 2 dredge (14m) would allow visitation of some 11,000 TEU approx. vessels, they would likely be limited, both in terms of specific vessel dimensions and operating parameters (i.e. visiting within a limited tidal window and be weight/carrying capacity limited). The upper end vessel at Auckland would potentially be less than this if the shippers required more reliable or consistent berthing opportunities.
- Black Quay do make the point that vessel drafts are not uniform and can vary significantly across size brackets. There can be notable variance across 11,000 TEU to 13,000 TEU vessel drafts for instance. Additionally, the operating weight of vessels can vary significantly across vessels and services, with some vessels travelling lighter and in turn squatting less than their maximum drafts. Accordingly, it may be possible for some 11,000 TEU vessels to call at Auckland with a 14m channel. However, it is our opinion that this would be significantly limited. Accordingly, Port of Auckland may be limited in its ability to dependably accommodate the entire New Zealand fleet at that time.
- Should vessels increase to 13,000 to 14,000 TEU in size and up to 380m long and 15.5m draft, Port of Auckland would not be able to accommodate these without sizeable further increases in channel and berth depths and significant increases in berth length over and above its current masterplan. It is also Black Quay's opinion that further dredging beyond POAL's Stage 2 proposal may be required to give adequate operating flexibility for vessels above 11,000 TEU in capacity.
- Auckland is currently at a critical disadvantage over Tauranga in terms of its ability to accommodate larger container vessels. Even

if both stages of POAL's planned dredging are consented, Auckland will still be at a disadvantage to Tauranga (14m vs. 14.5m). Assuming a need for channels of 15m+ depth to accommodate the longer term upper end fleet, the comparative feasibility of dredging Tauranga's vs. Auckland appears more probable, especially when the restrictions to expand Port of Auckland beyond its current footprint are taken into account.

> A new port location servicing Auckland and its hinterland would be inevitably designed to accommodate vessels of this size, as well as have contingency for any further increases. New options identified within the PFS could in theory achieve this.

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