PNG Ports
Corporation Ltd
Regulatory demand forecast
13 January 2013
Dear Fego

Re: Regulatory demand forecast

Thank you for the opportunity to assist PNG ports Corporation Limited (PNG Ports) with advice on regulatory demand forecasts for the upcoming regulatory period. Please find herein demand forecasts for the separate ports of Lae and Port of Moresby (PoPM), as well as a grouped forecast for all other regional ports in PNG.

Two of the key issues facing PNG Ports in the coming regulatory period are the treatment of the Curtain Bros’ Motukea facility in Fairfax Harbour and the tidal basin at Lae. We understand that there is some uncertainty as to whether PNG Ports will take over operational responsibilities for these facilities, with outcomes subject to policy decisions by the Government of PNG. As such, while we have considered the impact of these facilities on demand, the forecasts of throughput for PNG Ports presented in this report relate only to the current PNG Ports facilities. Separate forecasts have been prepared for Motukea and the tidal basin, which should be added to the PNG Ports forecasts in the event that PNG Ports takes over these facilities.

Please do not hesitate to contact Michael Black in my team on +61 3 9671 7764 or mblack@deloitte.com.au if you have any questions on this report.

Yours sincerely

Robert Southern
Partner
Deloitte Access Economics Pty Ltd
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Executive Summary

Scope of work
Deloitte Access Economics has been engaged by PNG Ports Corporation Limited (PNG Ports) to provide advice on its demand forecasts for the next regulatory period, being the five year period from 2015 to 2019 (inclusive). In performing the services, we have produced forecasts for the following sources of demand for port infrastructure services provided by PNG Ports:

- Container throughput, in twenty-foot equivalent units (TEUs)
- Cargo throughput, including containerised, bulk and liquid (fuel and palm oil) cargo, in revenue tonnes
- Vessel calls.

Forecasting methodology
In developing demand forecasts for the next regulatory period, we have undertaken the following steps:

1. Reviewed historical data – using data on overseas TEUs, coastal TEUs and cargo (break bulk, containers, fuel and palm oil) throughput sourced from PNG Ports
2. Identified key drivers of demand and undertook statistical analysis to determine relationships between demand drivers and throughput – we conducted statistical analysis of a number of potential drivers of demand including Gross Domestic Product (GDP) measures, a trade weighted index of PNG’s trade partners and palm oil indicators
3. Where statistically significant relationships were found, forecasts have been based on application of elasticities to forecasts of explanatory variables. Where data did not reveal statistically significant relationships, forecasts have been based on trend analysis (e.g. average historical growth rates).

Key demand drivers
Demand for port infrastructure services is a derived demand, in that it is driven by underlying demand for goods. As such, demand for port infrastructure services is generally driven by factors such as:

- Macroeconomic conditions – Gross Domestic Product (GDP) is closely correlated with demand for port infrastructure services, and as such has formed a key part of our analysis of demand for the next regulatory period. We have also assessed the impacts of the PNG LNG Project, which is expected to have a significant impact on GDP going forward
- Competition between providers of port infrastructure services – in particular, we have considered the implications of the development of the Curtain Bros’ Motukea port facility on the demand for port infrastructure services at PoPM
- Infrastructure capacity constraints and upgrades – for Lae port, we have considered the impact of the completion of the Lae tidal basin and expansion of Berth 3 on the current capacity constraints faced at the port.
Port of Port Moresby forecasts

In addition to the statistical analysis described in section 1, in developing forecasts of demand for PoPM we considered the impact of the winding down of the construction phase of the PNG LNG project and increases in throughput at the Curtain Bros’ Motukea facility. There is some uncertainty as to the future ownership and operating arrangements for Motukea, with the decision on whether PNG Ports will take over operational responsibilities being subject to policy decisions by the Government of PNG. As such, the forecasts of throughput for PNG Ports presented below relate only to the current PNG Ports facilities. Separate forecasts have been prepared for Motukea, which should be added to the PNG Ports forecasts in the event that it takes over operational responsibilities for Motukea.

Figure 1-1 PoPM container throughput (TEUs)

![Figure 1-1 PoPM container throughput (TEUs)](image)

Source: Deloitte analysis
Note: Excludes Motukea

Figure 1-2 PoPM cargo throughput (revenue tonnes)

![Figure 1-2 PoPM cargo throughput (revenue tonnes)](image)

Source: Deloitte analysis
Note: Excludes Motukea

**Deloitte Access Economics**: Regulatory demand forecast
Port of Lae forecasts

In developing our forecasts for Lae, we have considered the impact of the Lae tidal basin and international Berth 3 extension projects on throughput in addition to the statistical analysis described in section 1. There is some uncertainty as to the future ownership and operating arrangements for the tidal basin, with the decision on whether PNG Ports will take over operational responsibilities being subject to policy decisions by the Government of PNG. As such, the forecasts of throughput for PNG Ports presented below relate only to the current PNG Ports facilities. Separate forecasts have been prepared for the tidal basin, which should be added to the PNG Ports forecasts in the event that it takes over operational responsibilities.

Figure 1-3 Lae container throughput (TEUs)

Source: Deloitte analysis
Note: Excludes tidal basin throughput

Figure 1-4 Lae cargo throughput (revenue tonnes)

Source: Deloitte analysis
Note: Excludes the tidal basin throughput
Regional ports forecasts

For the purposes of our analysis, we have grouped the remaining ports together (Kimbe; Aitape; Alotau; Buka; Daru; Kavieng; Kieta; Lorengau; Madang; Oro Bay; Rabaul; Vanimo; and Wewak), as individually the throughput figures are generally too small to allow for meaningful statistical analysis.

Table 1-1 Regional ports container throughput (TEUs)

Table 1-2 Regional ports cargo throughput (revenue tonnes)
1 Introduction

1.1 Scope of work

Deloitte has been engaged by PNG Ports Corporation Limited (PNG Ports) to provide advice on its demand forecasts for the next regulatory period, being the five year period from 2015 to 2019 (inclusive). In performing the services, we have produced forecasts for the following sources of demand for port infrastructure services provided by PNG Ports:

- Container throughput, in twenty-foot equivalent units (TEUs)
- Cargo throughput, including containerised, bulk and liquid (fuel and palm oil) cargo, in revenue tonnes
- Vessel calls.

Our work is based on historical throughput data provided by PNG Ports, plus data from various publicly available sources including the Bank of PNG, Asian Development Bank (ADB), World Bank and International Monetary Fund (IMF), among others. We have not audited or otherwise verified the data provided to us in developing the demand forecasts presented in this report.

Forecasts are, by their very nature, subject to uncertainty, and it is common to produce forecasts as a range rather than specific point estimates. However, given the regulatory requirement for specific demand estimates for individual port infrastructure services in order to develop prices, we have presented our forecasts as best estimates of the most likely outcomes, rather than ranges.

Furthermore, we note that while PNG Ports’ submission to the ICCC is due in January of 2014, the next regulatory period does not start until 1 January 2015. To ensure the currency of the forecasts provided in this report, we suggest that they be updated for actual 2013 throughput data when this becomes available.

1.2 Forecasting methodology

In developing demand forecasts for the next regulatory period, we have undertaken the following steps:

1. Reviewed historical data – using data on overseas and coastal TEUs and cargo (break bulk, containers, fuel and palm oil) throughput sourced from PNG Ports
2. Identified key drivers of demand and undertook statistical analysis to determine relationships between demand drivers and throughput – we conducted statistical analysis of potential drivers of demand including a trade weighted index of PNG’s trade partners, palm oil indicators and Gross Domestic Product (GDP) measures
3. Where statistically significant relationships were found, forecasts have been based on application of elasticities to forecasts of explanatory variables. Where data did not reveal statistically significant relationships, forecasts have been based on simple trend analysis (e.g. average historical growth rates)
4. For the larger ports of the Port of Port Moresby (PoPM) and Lae, we also considered specific factors likely to have an impact on demand going forward, including the PNG LNG project and competition from Motukea at PoPM, and infrastructure capacity constraints and upgrades at Lae.

Individual forecasts were developed for throughput at PoPM and Lae, as they are the largest of PNG’s ports by a considerable margin, and account for the majority of PNG Ports’ revenue. For the remaining regional ports, demand forecasts were produced at an aggregate level, as the volumes at
these ports are generally too small and variable to generate meaningful results under statistical analysis when considered in isolation.

1.3 Key demand drivers

1.3.1 Overview

Demand for port infrastructure services is a derived demand, in that it is driven by underlying demand for goods. Demand for port infrastructure services is generally driven by factors such as:

- Macroeconomic conditions – Gross Domestic Product (GDP) is typically closely correlated with demand for port infrastructure services, and as such has formed a key part of our analysis of demand for the next regulatory period. We have also assessed the impacts of the PNG LNG Project, which is expected to have a significant impact on GDP going forward.
- Competition between providers of port infrastructure services – in particular, we have considered the implications of the development of the Curtain Bros’ Motukea port facility on demand for port infrastructure services at PoPM.
- Infrastructure capacity constraints and upgrades – for Lae port, we have considered the impact of the completion of the Lae tidal basin and expansion of Berth 3 on current capacity constraints faced at the port.

The remainder of this chapter provides an overview of macroeconomic conditions and their implications for demand for port infrastructure services in PNG in the next regulatory period, with additional port-specific factors covered in the following chapters for each of the ports.

1.4 Macroeconomic conditions

1.4.1 Gross Domestic Product

GDP is the monetary value of all finished goods and services produced in a country over a specific period of time (usually a year). GDP is widely accepted as a key driver of demand for port infrastructure services, as it generally reflects the level of economic activity in a country. If a country has high level of economic activity, it will generally also have a high level of trade (both international and domestic).

The Bank of PNG publishes national statistics for both total GDP and non-mining GDP, where non-mining GDP excludes GDP produced from activity in the mineral and petroleum resource extraction industries in PNG. The following figures set out actual outcomes and forecasts for total GDP and non-mining GDP from 2004 to 2019 (the end of the next regulatory period).
As shown in the figures above, total GDP and non-mining GDP growth rates have historically been closely correlated. The implication of this for our analysis is that when determining statistical relationships between GDP and demand for port infrastructure services (which is necessarily based on historical data), there is little distinction between the use of either total GDP or non-mining GDP. The table below illustrates the statistical relationship between demand for port infrastructure services (represented by international TEU imports and exports at Fairfax Harbour) and GDP (total and non-mining). Note that the regression analysis relates to total volumes of TEUs at Fairfax Harbour, including both PoPM and Motukea (non-project cargo).
Table 1-1 Elasticities of demand (overseas TEUs) with respect to total and non-mining GDP, Fairfax Harbour

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Elasticity</th>
<th>Adjusted R-squared</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total GDP</td>
<td>1.61</td>
<td>0.95</td>
<td>&lt;0.01 (5.8E-6)</td>
</tr>
<tr>
<td>Non-mining GDP</td>
<td>1.57</td>
<td>0.96</td>
<td>&lt;0.01 (5.3E-7)</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

The results shown in the table above can be interpreted as follows:

- In relation to total GDP – for every 1% increase in total GDP, international TEU volumes increase by 1.61%
- In relation to non-mining GDP – for every 1% increase in non-mining GDP, international TEU volumes increase by 1.57%.

The R-squared figure measures the amount of variation in international TEUs that is captured by the explanatory variable (i.e. total GDP or non-mining GDP). In both cases, changes in GDP (whether total or non-mining) explain over 90% of the movement in international TEU demand. ‘Adjusting’ R-squared ensures that the R-squared does not automatically increase simply by adding new variables, whether relevant or not. P-values less than 0.01 suggest both total and non-mining GDP are significant explanatory variables for international TEUs at the 99% confidence level.

However, in 2014 and 2015, the commencement of production from the PNG LNG project results in a significant divergence in the forecasts of total GDP and non-mining GDP. As such, the choice between the two for use as an explanatory variable is an important factor.

In our view, the use of non-mining GDP as an explanatory variable is likely to provide more accurate forecasts of demand for port infrastructure services provided by PNG Ports, on the basis of the following:

- PNG Ports is primarily a provider of port infrastructure services to general cargo, as opposed to the more specialised infrastructure requirements of extractive resource projects. Most large resource projects (including the PNG LNG project) have their own dedicated port facilities for handling both imports of materials during the construction phase and exports of goods during the production phase. Thus, the impact on demand for port infrastructure services at PNG Ports’ facilities will typically be related to the increase in economic activity more generally, rather than being directly related to the project activity.

- All economic activity within a country counts towards total GDP, regardless of ownership of revenue streams and entitlement to profits. For example, where extractive resource projects are majority foreign-owned, all revenues earned by that project are counted towards GDP. However, the impact on the domestic economy will typically be limited to taxes and royalties earned by the Government, returns to domestically-based equity holders, and payments to local workers and suppliers (as this will result in increased spending in the domestic economy), as a significant proportion of the revenue will be spent off-shore (in payments to foreign labour and suppliers and returns to foreign shareholders). While a resource extraction project may lead to a significant increase in GDP due to the revenues earned by project proponents from commodity sales, it is the distribution and use of those revenues that ultimately affects activity in the wider, local economy. Non-mining GDP is more likely to reflect the flow-on effects of extractive resource projects, via increases in Government spending, increases in consumption from wages paid to locally-based employees, and payments to locally-based support services such as catering, security, fuel supply, transport, etc. It is therefore our view that economic activity described in non-mining GDP is more likely to be consistent with drivers of demand for port infrastructure services provided by PNG Ports.

The following section provides further analysis on the expected impacts of the PNG LNG project and implications for demand for port infrastructure services provided by PNG Ports over the next regulatory period.
1.4.2 Impact of the PNG LNG project

Project overview
The PNG LNG project involves the extraction and production of natural gas from a number of gas and oil fields in the Southern Highlands, Hela and Western Provinces of PNG, which will be transported via a 700km pipeline to a liquefaction and export terminal situated 20 kilometres north-west of Port Moresby. Construction on the US$19 billion project began in 2010, with production scheduled for 2014 involving two trains exporting 6.6 million tonnes per annum (mtpa) of LNG to Asian buyers.

The project is being led and constructed by ExxonMobil (shareholding 33%), with other major shareholders including Oil Search (29%), the PNG Government (19%), Santos (13.5%) and JX Nippon Oil & Gas Exploration (5.5%).

Economic impact of the project
In 2009, ExxonMobil commissioned consultants Acil Tasman to produce a report to estimate the impact of the PNG LNG project on the PNG economy. The Acil Tasman study identified a number of direct and indirect impacts of the PNG LNG project on the PNG economy.

Direct impacts
Direct impacts identified by Acil Tasman include the following:

- Capital investment in LNG production and support facilities, upstream gas production and processing development, pipelines, storage and other infrastructure
- Employment
- Direct cash flows to government and landowners in the form of taxes, royalties, development levies and other charges, and returns on equity participation.

The direct impacts of the PNG LNG project in relation to capital investment and employment occur mainly during the construction phase of the project, from 2010 to 2014.

Acil Tasman estimated total capital expenditure of around US$10 billion over the life of the project, including field development, pipeline and LNG plant including liquefaction, storage and load out, with US$8.3 billion spent over the initial construction. The original construction profile is shown in the chart below. Although we note that in addition to project slippage of 1-2 years, estimated construction costs have now increased significantly, with total capital expenditure (including financing costs) expected to amount to around US$19 billion, we would expect the profile to remain largely the same.

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2. Acil Tasman (2009), PNG LNG Economic Impact Study, April
3. Acil Tasman (2009), PNG LNG Economic Impact Study, April
The employment profile of the PNG LNG project is shown in Figure 1-4 below. Following completion of the construction phase of the project, the number of employees is expected to drop to around 850 full-time employees, most of whom will be PNG nationals. Latest figures available indicate that employment on the project over 2012-13 has been around 20,000, around half of whom are PNG nationals (however, it is not clear whether this relates to full-time equivalent positions or number of individuals).5

Figure 1-4 Direct benefits of PNG LNG – employees

Acil Tasman estimated that Government revenues from taxes, levies and royalties accruing to the Government would amount to around PGK 2 billion per annum in the decade post construction and that the 19% equity share held by Government would provide returns of around PGK 1 billion per annum (net of taxes and financing costs).6

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5 ExxonMobil (2013), PNG LNG Quarterly Environmental and Social Report, Second Quarter 2013
6 Acil Tasman (2009), PNG LNG Economic Impact Study, April
Indirect impacts

Indirect impacts identified by Acil Tasman relate to the flow-on economic impact of the PNG LNG project in other sectors of the economy. Flow-on economic impacts occur as project proponents, Government and employees increase investment and consumption in the broader domestic economy. The key indirect impacts identified by Acil Tasman include local business opportunities in industries supporting the PNG LNG project, including catering, engineering, security, fuel supply, managerial and technical assistance. At a high-level, the Acil Tasman report estimated that the PNG LNG project would have a positive impact on most sectors of the economy, other than the agricultural sector, where appreciation of the exchange rate harms competitiveness.

Impact on port demand for port infrastructure services

The impacts of the PNG LNG project on the PNG economy, as estimated by Acil Tasman on behalf of ExxonMobil, appear to be very large. However, this should be balanced against the fact that the PNG LNG project is majority owned (81%) by foreigners, and as noted in a joint study undertaken by Monash University’s Centre of Policy Studies, the impact of the PNG LNG project should be considered on the basis of the use of PNG factors of production and revenues flowing to the Government (from tax and net dividend receipts):

*From the point of view of the PNG economy, expenditure on imported materials and labour (paid for by foreigners) is largely irrelevant. All that matters are the expenditures that ... draw on PNG factors of production. Similarly, the project may generate enormous exports from PNG and have a correspondingly enormous effect on GDP. Again, from the point of the PNG economy this is largely irrelevant.*

As noted by the World Bank Group in its 2013 Economic Briefing on PNG, the economic growth derived from the PNG LNG project will be due to increased resource extraction, rather than more value-added in the broader economy.

The PNG LNG project’s largest contribution to the domestic PNG economy comes in the form of revenue to the Government from taxes and dividends. While these revenues are significant, amounting to around PGK 3 billion per annum over the first decade of production, the Department of Treasury has also indicated that this positive impact is counterbalanced by falling revenues from other mineral projects in the wind-down phase. In particular, Treasury has noted that revenue from the PNG LNG project replaces, but does not increase the mineral revenues received by the Government (with declining revenues expected from other extractive projects such as Ok Tedi and the Kutubu oil fields). The following chart illustrates this point:

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7 Acil Tasman (2009), PNG LNG Economic Impact Study, April
9 World Bank Group (2013), Papua New Guinea Economic Briefing – From the last days of the boom to lasting improvements in living standards, p.12
The PNG Government’s use of the revenue received is also critical to the overall impact on demand for port infrastructure services. In general, government spending is dominated by spending on ‘non-tradeable’ sectors of the economy (for example, health and education), which tends to drive up the exchange rate and reduce production in the tradeable sectors of the economy. Balancing this, the importing sectors of the economy benefit from imports becoming relative cheaper.

Similarly, the impact on demand for port infrastructure services provided by PNG Ports, which services demand of a largely general nature (as opposed to imports and exports for large resource projects), will be driven by growth in exporting sectors of the PNG economy and imports related to domestic consumption. Given that the Government itself is typically not directly involved in significant port-related trade activity, we consider that the overall impacts of the PNG LNG project on demand for port infrastructure services are likely to be related to indirect impacts in other sectors of the economy.

While the overall impact on PNG trade is not clear, research by Monash University has suggested that the positive impact on imports and negative impact on exports will be broadly balanced (excluding the imports and exported directly associated with the PNG LNG project, which as noted above, are not relevant).11

1.4.3 Forecasting risk and uncertainty

As noted above, forecasts by their nature are subject to uncertainty. Given the strong relationship between GDP and demand for port infrastructure services provided by PNG Ports, should GDP outcomes vary significantly from the forecasts produced by the Bank of PNG and the IMF, then we would expect demand to be similarly affected.

While the overall impact on the economy from the PNG LNG project is expected to be positive (consistent with forecasts of total GDP and non-mining GDP growth outlined in section 1.4.1 above), the following issues and risks have been identified by the IMF in a staff working paper:

- Unproductive use of government revenues from the project
- Loss in competitiveness due to increased government spending driving appreciation of the Kina and contraction of the tradeable sector (with expansion in the non-tradeable sector)
- Diminished size of the tradeable sector could lead to lower overall economic development (depending on the importance of this sector to development).12

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A number of commentators have identified the risks of ‘Dutch Disease’ to the PNG economy given the size of the PNG LNG project relative to the size of the PNG economy as a whole.\(^{13}\) Dutch Disease occurs when an increase in economic activity in a certain tradeable sector (extractive resources in this case) causes the domestic currency to appreciate, reducing the international competitiveness of exports from other sectors, with the overall result being a reduction in total GDP. In its 2013 Economic Briefing on PNG, the World Bank Group indicated that some of the effects of Dutch Disease were already apparent in the PNG economy, including:

- Real appreciation of the exchange rate
- Increased Government spending
- Increases in the prices of non-traded goods (in particular, agricultural and manufactured goods) and a subsequent shift in resources out of these sectors (noting that data limitations make assessment difficult)
- A current account deficit (again, data limitations make assessment difficult).\(^{14}\)

Additionally, the IMF recently reported that there are a number of key risks to achieving economic growth forecasts, including uncertainty about international demand for LNG and major export commodities such as palm oil. In particular, the IMF has noted that risks to economic growth out to 2015 are broadly balanced, but are increasingly tilted toward the downside over the longer term:

*After several years of strong growth, Papua New Guinea (PNG) now faces less certain prospects, as construction winds down on a large LNG project and the external environment evolves rapidly. To bolster growth prospects and maintain the hard-won macroeconomic stability, the government will need to focus on a prudent fiscal policy, making the most of resource revenues by improving the efficiency of public spending.*\(^{15}\)

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\(^{13}\) See for example: Bank of PNG (2013), *Monetary Policy Statement*, March; IMF (2012), *Staff Report for the 2012 Article IV Consultation*, April; and World Bank Group (2013), *Papua New Guinea Economic Briefing – From the last days of the boom to lasting improvements in living standards*

\(^{14}\) World Bank Group (2013), *Papua New Guinea Economic Briefing – From the last days of the boom to lasting improvements in living standards*

2 Port Moresby

2.1 Key issues

In developing forecasts of demand for PoPM, we primarily followed the approach set out in section 1.2 above – with regression analysis used to determine statistical relationships between demand and non-mining GDP, and trend analysis substituted where the data did not reveal statistically significant relationships. In addition, key issues taken into consideration in developing forecasts for PoPM include the winding down of the construction phase of the PNG LNG project and increasing competition from the Curtain Bros’ Motukea facility.

Demand at PoPM in the current regulatory period has been buoyed by the construction phase of the PNG LNG project, with demand growth rates during construction years being relatively consistent with the forecasts adopted by the ICCC in its 2010 final decision. However, an analysis of historical demand at PoPM also reveals the following:

- The Curtain Bros’ Motukea facility, while principally designed to cater for project-based cargo of a kind not traditionally handled at PoPM, appears to have captured a share of the general cargo market that would have otherwise been served by PNG Ports
- Demand at PoPM has been soft in recent years, with international TEU throughput falling away due to the winding down of the construction phase of the PNG LNG project and competition from Motukea, while coastal cargo volumes are lower due to weakening economic conditions.

There is some uncertainty as to the future ownership and operating arrangements for Motukea, with the decision on whether PNG Ports will take over operational responsibilities being subject to policy decisions by the Government of PNG. As such, the forecasts of throughput for PNG Ports presented below relate only to the current PNG Ports facilities. Separate forecasts have been prepared for Motukea, which should be added to the PNG Ports forecasts in the event that it takes over operational responsibilities for Motukea.

2.1.1 Competition from Motukea

Situated in Fairfax Harbour on Motukea Island, the port of Motukea is a private venture established by Curtain Bros for the purpose of handling imports for construction materials for the PNG LNG project. The Motukea facility comprises a 150m by 70m international wharf, slipway and dockyard.

Since it commenced operations in 2010, the cargo handled by Motukea has been mainly related to the PNG LNG project. However, with the wind-down of the PNG LNG project construction phase, Motukea is emerging as a potentially significant competitor to PoPM. Motukea’s growth in cargo volumes since inception is shown in Table 2-1.

<table>
<thead>
<tr>
<th>Table 2-1 Historical Motukea demand, by category</th>
</tr>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Cargo revenue tonnes</td>
</tr>
<tr>
<td>Market share (% of total international cargo in Fairfax Harbour)</td>
</tr>
<tr>
<td>TEU throughput</td>
</tr>
<tr>
<td>Market share (% of total international TEUs in Fairfax Harbour)</td>
</tr>
</tbody>
</table>

Source: PNG Ports Corporation, Deloitte analysis
Note: *2013 data available to July only. Data extrapolated based on monthly average over the first 7 months to give projected annualised figures.
The following figure illustrates the relationship of TEU throughput at Motukea to total international TEU throughput at Fairfax Harbour (i.e. PoPM and Motukea combined). As shown in the figure, when considered at an aggregate level, international TEU throughput at Fairfax Harbour wharves has grown at a steady rate from 2008. However, growth at PoPM has slowed from 2011 with Motukea taking a significant market share (estimated at 19% in 2013).

We understand that the future ownership and operational arrangements for Motukea are currently uncertain. However, if the current ownership and operational arrangements were to continue, we would expect Motukea to significantly increase its volumes of general cargo going forward as construction on the PNG LNG project winds down and the facility is left with significant excess capacity.

**Figure 2-1 International container volumes at Fairfax Harbour (PoPM and Motukea) (TEU)**

Source: PNG Ports

Note: figures for 2013 are annualised totals, using actual data to July 2013

A Deed of Agreement between PNG Ports and Curtain Bros includes a revenue sharing arrangement for cargo handled at the Motukea facility through an agreed tariff formula and other standard terms and conditions. Under the Deed of Agreement, Curtain Bros is required to pay tariffs to PNG Ports for any wharfage services Curtain Bros provides to containerised and bulk cargo not related to the PNG LNG project based on rates established in 2002 and adjusted by CPI each year.

We expect that as PNG LNG cargo winds down and is replaced by general cargo, PNG Ports will receive increased revenue from Motukea under the Deed of Agreement. Accordingly, demand forecasts are required for Motukea to inform both the impact on demand at PoPM and also the revenue recovered by PNG Ports via the Deed of Agreement.

**2.1.2 Forecasts for Motukea**

For the purposes of our statistical analysis and forecasting, we have estimated a statistical relationship between total TEU volumes at Fairfax Harbour (PoPM and Motukea combined) and non-mining GDP, rather than individually estimating relationships for PoPM and Motukea volumes separately, on the basis that:

- Going forward, the Motukea facility will be serving underlying demand for port infrastructure services at Fairfax Harbour, rather than creating ‘new demand’ over and above what would have been served by PoPM. This is because demand for port infrastructure services is a derived demand, based on an underlying demand for goods. Therefore, we consider that it is more
accurate to define a relationship between GDP and total volumes at Fairfax Harbour as a whole, rather than PoPM and Motukea individually

- The limited number of historical data points and uncertainty about the future use of the Motukea facility mean that it is not possible to establish a reliable statistical relationship between volumes and explanatory variables such as GDP.

This approach enabled us to forecast volumes for Fairfax Harbour as a whole and then deduct volumes handled by Motukea from the total to arrive at a forecast for PoPM. The following table sets out the results of our statistical analysis of the relationship between TEUs and non-mining GDP for Fairfax Harbour as a whole.

### Table 2-2 Elasticity of demand at Fairfax Harbour

<table>
<thead>
<tr>
<th>Demand</th>
<th>Category</th>
<th>Key metrics</th>
<th>Resulting average annual increase, 2013 to 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEUs</td>
<td>Overseas</td>
<td>Elasticity 1.57 (for every 1% increase in non-mining GDP, TEU throughput increases 1.57%)</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

Applying the elasticity set out in the table above results in Motukea’s share of overseas TEUs at Fairfax Harbour remaining at around 19% (the current level) over the next regulated period. Annual growth in cargo (revenue tonnes) is assumed to broadly match the forecast growth in TEUs over the analysis period (i.e. 6.6% per annum). This results in Motukea’s share of international cargo demand (in revenue tonnes) remaining at around 24-25% over the next regulatory period. It is important to note that these forecasts are based on the assumption that Motukea remains in private hands, with PNG Ports addressing capacity issues at PoPM either by expanding existing wharf capacity or partially relocating to Tatana Island (i.e. Motukea does not increase its market share due to capacity constraints at PoPM).

The following charts present our forecasts for international containers (TEUs) and cargo (revenue tonnes) for Motukea. While we note that Motukea also handles some coastal cargo, this is expected to be relatively minor, and as such all volumes are treated as international.

**Figure 2-2 Motukea international container throughput (TEU)**

Source: Deloitte analysis
We consider our assumptions to be conservative with respect to prospects for growth at Motukea. As the PNG LNG project construction phase comes to an end, it is likely that Motukea will have significant excess capacity and become a strong competitor to PNG Ports’ PoPM facility. We understand that Motukea is capable of handling a greater volume of TEUs per annum than current throughput levels, and as such, it could capture a larger share of demand than currently held (and projected in our forecasts). This would reduce throughput for PoPM.

We also note that the PNG Government has signalled its intention to purchase Motukea facility from Curtain Bros’ for the purposes of relocating some or all of the wharfage operations of PNG Ports to Motukea. Given the significant impact that policy decisions concerning Motukea could have on PNG Ports’ demand (and hence prices), it will be important to revisit these forecasts and assumptions prior to the commencement of the next regulatory period to ensure that the most up-to-date information is taken into account.

### 2.2 Forecasts for PoPM

This section sets out our forecasts of throughput for PoPM. As noted above, forecasts were developed in one of two ways: (1) by regressing throughput against non-mining GDP; or (2) adopting average rates of growth based on historical trends, where regression analysis did not reveal statistically significant relationships.

The following table provides a summary of the forecasting approach and key metrics for each category of demand.

**Table 2-3 PoPM key forecasting metrics**

<table>
<thead>
<tr>
<th>Demand</th>
<th>Category</th>
<th>Key metrics</th>
<th>Resulting average annual increase, 2013 to 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEUs</td>
<td>Overseas</td>
<td>Elasticity 1.57 (for every 1% increase in non-mining GDP, TEU throughput increases 1.57%)</td>
<td>6.6%</td>
</tr>
<tr>
<td></td>
<td>Coastal</td>
<td>Elasticity 0.63</td>
<td>2.6%</td>
</tr>
<tr>
<td>Cargo (revenue tonnes)</td>
<td>Overseas containers</td>
<td>Elasticity 1.45</td>
<td>6.1%</td>
</tr>
<tr>
<td></td>
<td>Overseas break bulk</td>
<td>Elasticity 1.69</td>
<td>7.1%</td>
</tr>
<tr>
<td></td>
<td>Overseas fuel</td>
<td>Average annual growth 6.3%</td>
<td>6.3%</td>
</tr>
</tbody>
</table>
The following figures set out our forecasts for each category of demand at PoPM for the remainder of this regulatory period and to 2019.

**Figure 2-4 PoPM container throughput (TEUs)**

![Graph showing container throughput (TEUs) from 2004 to 2019](source: Deloitte analysis)

**Figure 2-5 PoPM cargo throughput (revenue tonnes)**

![Graph showing cargo throughput (revenue tonnes) from 2004 to 2019](source: Deloitte analysis)
2.2.1 Combined Fairfax Harbour forecast

The following charts set out combined forecasts for Fairfax Harbour (PoPM plus Motukea), based on the forecasts set out above. Note that these forecasts are presented for illustrative purposes, to demonstrate total demand growth across both ports over the assessment period.

As shown in Figure 2-7 below, total demand at Fairfax Harbour is expected to broadly remain consistent with the last 4-5 years of growth. However, the recent entry of Motukea to the market for general TEU volumes is expected to result in a diminished market share for PNG Ports. As noted above, our modelling results demonstrate Motukea’s share of overseas TEU throughput increasing from 19% in 2013 to 27% by 2019.

Figure 2-7 Fairfax Harbour total overseas TEU throughput

Figure 2-8 shows total overseas cargo throughput combined for PoPM and Motukea. The impact of the construction phase of the PNG LNG project is readily apparent in throughput figures for 2010, 2011 and 2012, with the most recently available data suggesting that demand for 2013 will soften as
the construction phase winds down. Our modelling results show the share of overseas cargo demand serviced by Motukea increasing from 24% in 2013 to 30% in 2019.

**Figure 2-8 Fairfax Harbour total overseas cargo throughput (revenue tonnes)**

![Chart showing Fairfax Harbour total overseas cargo throughput (revenue tonnes)](chart.png)
3 Lae

3.1 Key issues

Lae Port is the largest port providing general cargo services in PNG. Lae Port services the Lae and surrounding areas, the north coast of PNG and the highlands provinces linked by the Highlands Highway. Lae Port services over 50% of total port throughput for PNG Ports and provides a gateway to the hinterland containing over half the nation’s population.

One of the key issues for consideration when developing forecasts for Lae is the impact of capacity constraints and planned capacity expansions. Throughput at Lae has been impacted by capacity constraints since the middle of last decade, when cargo throughput reached 2.5 million revenue tonnes, effectively the full capacity of the port at that time. Since then, further investments have enabled throughput to increase to more than 4 million revenue tonnes (as shown by Figure 3-1), however, we understand that severe capacity constraints, including congestion and delays to berthing, remain.

Figure 3-1 Historical cargo throughput at Lae, revenue tonnes

Source: PNG Ports

Two major port facility upgrades are currently underway to address capacity constraints at Lae, being the Lae tidal basin and international Berth 3 extension projects. In addition to the statistical analysis described in section 1, in developing our forecasts for Lae, we have considered the potential impact of these projects on throughput.

There is some uncertainty as to the future ownership and operating arrangements for the tidal basin, with the decision on whether PNG Ports will take over operational responsibilities being subject to policy decisions by the Government of PNG. As such, the forecasts of throughput for PNG Ports presented below relate only to the current PNG Ports facilities. Separate forecasts have been prepared for the tidal basin, which should be added to the PNG Ports forecasts in the event that it takes over operational responsibilities.

3.1.1 Berth 3 extension

Expansion works to Berth 3 will add 108m of additional berth capacity when complete. In combination, we understand that current works underway will also include around 1.1ha of additional terminal area behind Berth 3 extension, 3.65ha of high density container storage using

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Asian Development Bank (2007), Papua New Guinea: Lae Port Development Project, p.3
RTGC, passenger terminal building and shed and storage area reconfiguration within the terminal.\textsuperscript{17} Berth 3 extensions are expected to be completed by the end of 2014.

**Figure 3-2 Lae Port international Berth 3 extension**

PNG Ports has advised that the completion of the Berth 3 extension in 2014 will provide capacity to handle an additional 3,600 TEUs each year, or approximately 3\% on top of current (2012) overseas TEU throughput of 127,020. Based on typical loading of approximately 13 tonnes per container, this amounts to around 46,800 additional revenue tonnes of containerised cargo.

### 3.1.2 Forecasts for Lae tidal basin

The Lae tidal basin project involves dredging a 700m by 400m tidal basin North-West of the port current facilities, plus a multi-purpose 240m long berth (45-50m wide) and terminal works including buildings, storage area, roads, electricity, water, sewerage and drainage. When complete, the tidal basin will be capable of handling vessels up to 200m in length. The tidal basin also provides capability to increase the berth by another 150m without further dredging if required.\textsuperscript{18} This amounts to a substantial increase on the current effective overseas berth length of 310m.

The works are 70\% funded by the Asian Development Bank (ADB) and 30\% by the PNG Government. While we understand that future ownership and operational responsibilities are yet to be finalised,

\textsuperscript{17} AECOM (2012), *Lae Port Physical & Operational Characteristics and Constraints – DRAFT*, January
\textsuperscript{18} Asian Development Bank (2007), *Papua New Guinea: Lae Port Development Project*, p.8
for the purposes of our report, we have assumed that PNG Ports takes on operation and thus all increases in throughput accrue to PNG Ports’ Lae volumes.

PNG Ports has advised that it expects the project to be complete by the start of 2015.

**Figure 3-3 Lae tidal basin expansion**

![Diagram of Lae tidal basin expansion]

Source: AECOM (2012)

Work undertaken by the ADB estimated the following elasticities of demand for cargo (with respect to GDP) handled at the port of Lae:

- 1.7 for 1967 to 2005 – i.e. for every 1% increase in GDP, cargo throughput increases by 1.7%
- 1.3 for 2003-2011
- 1.37 for 2011-2030 (based on a scenario where the tidal basin is constructed).

Our analysis of demand elasticities based on data from 2004 to 2012, where capacity constraints have had a significant influence suggests much lower demand elasticities. For example, total cargo has had an elasticity of 0.81 with respect to non-mining GDP since 2004. Figures for other cargo types are set out in the table below.

**Table 3-1 Deloitte calculated demand elasticities with respect to non-mining GDP, 2004 to 2012**

<table>
<thead>
<tr>
<th>Cargo type</th>
<th>Overseas/Coastal</th>
<th>Elasticity with respect to non-mining GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEUs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Coastal</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Containerised cargo (revenue tonnes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas</td>
<td>1.04</td>
<td></td>
</tr>
<tr>
<td>Coastal</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Break bulk cargo (revenue tonnes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Coastal</td>
<td>-0.85</td>
<td></td>
</tr>
<tr>
<td>Fuel cargo (revenue tonnes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas + coastal</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>Total cargo – containerised, break bulk, fuel, palm oil (revenue tonnes)</td>
<td></td>
<td>0.81</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

The key reason for lower demand elasticities under our analysis is that they take capacity constraints into consideration. On the other hand, the ADB figures assume unconstrained demand – with the elasticity of 1.37 relating to a scenario where the tidal basin is constructed.

While we note that current capacity constraints suggest there is some unmet demand at Lae, we also note that increases in demand following completion of the tidal basin are likely to be gradual (rather than an instantaneous step-change) as land side infrastructure is developed and terminal operations...
adjust. Therefore, to forecast volumes for the Lae tidal basin, we have adopted a scenario using our own elasticities until the commencement of the tidal basin, and the ADB elasticities thereafter. The resulting figures for throughput for the tidal basin are set out in the figures below.

**Figure 3-4 Lae tidal basin container throughput (TEU)**

![Graph showing container throughput (TEU) for Lae tidal basin]

Source: Deloitte analysis, ADB

**Figure 3-5 Lae tidal basin cargo throughput (revenue tonnes)**

![Graph showing cargo throughput (revenue tonnes) for Lae tidal basin]

Source: Deloitte analysis, ADB

### 3.2 Forecasts for Lae

This section sets out our forecasts of throughput for Lae Port. As noted above, forecasts were developed in one of two ways: (1) by regressing throughput against non-mining GDP; or (2) adopting average rates of growth based on historical trends, where regression analysis did not reveal statistically significant relationships. In addition, we have applied further increases to throughput based on the capacity expansion to Berth 3 outlined above.

The following table provides a summary of the forecasting approach and key metrics for each category of demand.
Table 3-2 Lae key forecasting metrics

<table>
<thead>
<tr>
<th>Demand</th>
<th>Category</th>
<th>Key metrics and impacts of capacity upgrades</th>
<th>Resulting average annual increase, 2013 to 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEUs</td>
<td>Overseas</td>
<td>Elasticity 1.10 (for every 1% increase in non-mining GDP, TEU throughput increases 1.1%)</td>
<td>3,600 additional TEU from 2014 onwards</td>
</tr>
<tr>
<td></td>
<td>Coastal</td>
<td>Elasticity 0.33</td>
<td></td>
</tr>
<tr>
<td>Cargo (revenue tonnes)</td>
<td>Overseas containers</td>
<td>Elasticity 1.04</td>
<td>46,800 additional RT from 2014 onwards</td>
</tr>
<tr>
<td></td>
<td>Overseas break bulk</td>
<td>Elasticity 1.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overseas fuel</td>
<td>Elasticity 1.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overseas palm oil</td>
<td>Growth equivalent to overseas containers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal containers</td>
<td>Elasticity 0.36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal break bulk</td>
<td>Elasticity -0.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal fuel</td>
<td>Elasticity 1.06</td>
<td></td>
</tr>
<tr>
<td>Vessel calls</td>
<td>Overseas + coastal</td>
<td>Average annual growth 0.3%</td>
<td>Average annual growth 4.8% from 2015</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis
Note: Palm oil exports have only recently (2010) commenced from Lae, in the absence of detailed data we have used the average growth rate in containers as a proxy for increases in palm oil exports.

The following figures set out our forecasts for each category of demand at Lae for the remainder of this regulatory period and to 2019.

Figure 3-6 Lae container throughput (TEUs)

Source: Deloitte analysis
Figure 3-7 Lae cargo throughput (revenue tonnes)

Source: Deloitte analysis

Figure 3-8 Lae vessel calls (overseas and coastal combined)

Source: Deloitte analysis
4 Regional ports

Together, PoPM and Lae handle the vast majority of PNG Ports’ throughput, and in 2012 accounted for:

- 82% of overseas TEU throughput
- 67% of coastal TEUs
- 80% of overseas cargo (revenue tonnes)
- 66% of coastal cargo (revenue tonnes).

For the purposes of our analysis, we have grouped the remaining ports together, as individually the throughput figures are often too small to allow for meaningful statistical analysis (as relatively small absolute variations can have large impacts in percentage change terms). The ports included in the ‘regional ports’ category are: Kimbe, Aitape; Alotau; Buka; Daru; Kavieng; Kieta; Lorengau; Madang; Oro Bay; Rabaul; Vanimo; and Wewak.

This section sets out our forecasts of throughput for the regional ports. As noted above, forecasts were developed in one of two ways: (1) by regressing throughput against non-mining GDP; or (2) adopting average rates of growth based on historical trends, where regression analysis did not reveal statistically significant relationships.

The following table provides a summary of the forecasting approach and key metrics for each category of demand.

<table>
<thead>
<tr>
<th>Table 4-1 Regional ports key forecasting metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>TEUs</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Cargo (revenue tonnes)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Vessel calls</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

The following figures set out our forecasts for each category of demand at the regional ports for the remainder of this regulatory period and to 2019.
Table 4-2 Regional ports container throughput (TEUs)

Table 4-3 Regional ports cargo throughput (revenue tonnes)

Source: Deloitte analysis
Table 4-4 Regional ports vessel calls (overseas and coastal combined)

![Graph showing total vessel calls over time from 2004 to 2019.

Source: Deloitte analysis]
5 Limitation of our work

General use restriction

This report is prepared solely for the internal use of PNG Ports Corporation. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared for the purpose set out in our engagement letter dated 30 April 2013. You should not refer to or use our name or the advice for any other purpose.

Limitations and assumptions of our work

Our work is based on the information provided to us. We have not audited, tested or otherwise verified any of the information use in the preparation of this report.
Appendix A: Detailed results

Table A 1: Actual and forecast demand for port infrastructure services for PoPM, 2005-2024

<table>
<thead>
<tr>
<th>Year</th>
<th>TEU Containers (revenue tonnes)</th>
<th>Break bulk (revenue tonnes)</th>
<th>Fuel (revenue tonnes)</th>
<th>Vessel calls Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overseas</td>
<td>Coastal</td>
<td>Overseas</td>
<td>Coastal</td>
</tr>
<tr>
<td>2005</td>
<td>28,879</td>
<td>22,793</td>
<td>390,798</td>
<td>307,264</td>
</tr>
<tr>
<td>2006</td>
<td>28,700</td>
<td>23,629</td>
<td>456,181</td>
<td>338,838</td>
</tr>
<tr>
<td>2007</td>
<td>39,777</td>
<td>26,290</td>
<td>502,900</td>
<td>373,302</td>
</tr>
<tr>
<td>2008</td>
<td>37,968</td>
<td>28,888</td>
<td>574,967</td>
<td>430,609</td>
</tr>
<tr>
<td>2009</td>
<td>44,594</td>
<td>29,102</td>
<td>584,266</td>
<td>431,609</td>
</tr>
<tr>
<td>2010</td>
<td>51,665</td>
<td>33,628</td>
<td>786,399</td>
<td>476,998</td>
</tr>
<tr>
<td>2011</td>
<td>53,518</td>
<td>31,688</td>
<td>807,327</td>
<td>458,814</td>
</tr>
<tr>
<td>2012</td>
<td>56,796</td>
<td>30,358</td>
<td>821,844</td>
<td>465,736</td>
</tr>
<tr>
<td>2013</td>
<td>58,932</td>
<td>33,864</td>
<td>861,348</td>
<td>503,528</td>
</tr>
<tr>
<td>2014</td>
<td>59,959</td>
<td>34,100</td>
<td>875,230</td>
<td>508,074</td>
</tr>
<tr>
<td>2015</td>
<td>63,925</td>
<td>35,000</td>
<td>928,787</td>
<td>525,492</td>
</tr>
<tr>
<td>2016</td>
<td>68,348</td>
<td>35,967</td>
<td>988,240</td>
<td>544,336</td>
</tr>
<tr>
<td>2017</td>
<td>73,609</td>
<td>37,072</td>
<td>1,058,606</td>
<td>566,050</td>
</tr>
<tr>
<td>2018</td>
<td>78,617</td>
<td>38,079</td>
<td>1,125,240</td>
<td>586,011</td>
</tr>
<tr>
<td>2019</td>
<td>86,264</td>
<td>39,558</td>
<td>1,226,494</td>
<td>615,552</td>
</tr>
<tr>
<td>2020</td>
<td>94,655</td>
<td>41,094</td>
<td>1,336,859</td>
<td>646,583</td>
</tr>
<tr>
<td>2021</td>
<td>103,863</td>
<td>42,690</td>
<td>1,457,156</td>
<td>679,179</td>
</tr>
<tr>
<td>2022</td>
<td>113,966</td>
<td>44,348</td>
<td>1,588,278</td>
<td>713,417</td>
</tr>
<tr>
<td>2023</td>
<td>125,051</td>
<td>46,070</td>
<td>1,731,198</td>
<td>749,382</td>
</tr>
<tr>
<td>2024</td>
<td>137,215</td>
<td>47,859</td>
<td>1,886,979</td>
<td>787,159</td>
</tr>
</tbody>
</table>

Source: Deloitte analysis

Note: Actual data apply until mid-way through 2013
## Table A2: Actual and forecast demand for port infrastructure services for Lae Port, 2005-2024

<table>
<thead>
<tr>
<th></th>
<th>TEU</th>
<th>Containers (revenue tonnes)</th>
<th>Break bulk (revenue tonnes)</th>
<th>Fuel (revenue tonnes)</th>
<th>Palm oil (revenue tonnes)</th>
<th>Vessel calls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overseas</td>
<td>Coastal</td>
<td>Overseas</td>
<td>Coastal</td>
<td>Overseas</td>
<td>Coastal</td>
</tr>
<tr>
<td>2005</td>
<td>68,709</td>
<td>49,230</td>
<td>1,089,519</td>
<td>651,121</td>
<td>377,447</td>
<td>221,136</td>
</tr>
<tr>
<td>2006</td>
<td>62,380</td>
<td>47,841</td>
<td>1,119,477</td>
<td>608,641</td>
<td>311,195</td>
<td>200,901</td>
</tr>
<tr>
<td>2007</td>
<td>71,044</td>
<td>52,023</td>
<td>1,171,647</td>
<td>643,207</td>
<td>460,228</td>
<td>235,892</td>
</tr>
<tr>
<td>2008</td>
<td>76,576</td>
<td>52,575</td>
<td>1,248,323</td>
<td>717,583</td>
<td>649,858</td>
<td>221,062</td>
</tr>
<tr>
<td>2009</td>
<td>75,974</td>
<td>49,535</td>
<td>1,220,624</td>
<td>639,843</td>
<td>511,736</td>
<td>213,035</td>
</tr>
<tr>
<td>2010</td>
<td>84,560</td>
<td>56,092</td>
<td>1,427,310</td>
<td>756,310</td>
<td>559,635</td>
<td>156,119</td>
</tr>
<tr>
<td>2011</td>
<td>103,070</td>
<td>55,091</td>
<td>1,697,969</td>
<td>731,686</td>
<td>544,083</td>
<td>145,117</td>
</tr>
<tr>
<td>2012</td>
<td>127,020</td>
<td>55,717</td>
<td>2,022,515</td>
<td>711,147</td>
<td>701,643</td>
<td>151,496</td>
</tr>
<tr>
<td>2013</td>
<td>139,082</td>
<td>57,704</td>
<td>2,098,901</td>
<td>751,347</td>
<td>605,316</td>
<td>159,659</td>
</tr>
<tr>
<td>2014</td>
<td>144,382</td>
<td>57,913</td>
<td>2,169,878</td>
<td>754,332</td>
<td>613,539</td>
<td>158,147</td>
</tr>
<tr>
<td>2015</td>
<td>154,684</td>
<td>58,708</td>
<td>2,311,581</td>
<td>765,712</td>
<td>645,187</td>
<td>152,460</td>
</tr>
<tr>
<td>2016</td>
<td>165,794</td>
<td>59,551</td>
<td>2,464,139</td>
<td>777,795</td>
<td>680,000</td>
<td>146,726</td>
</tr>
<tr>
<td>2017</td>
<td>178,349</td>
<td>60,502</td>
<td>2,636,343</td>
<td>791,448</td>
<td>720,815</td>
<td>140,586</td>
</tr>
<tr>
<td>2018</td>
<td>190,464</td>
<td>61,356</td>
<td>2,801,750</td>
<td>803,730</td>
<td>759,062</td>
<td>135,387</td>
</tr>
<tr>
<td>2019</td>
<td>207,064</td>
<td>62,595</td>
<td>3,028,746</td>
<td>821,559</td>
<td>816,639</td>
<td>128,228</td>
</tr>
<tr>
<td>2020</td>
<td>224,797</td>
<td>63,858</td>
<td>3,270,341</td>
<td>839,784</td>
<td>878,584</td>
<td>121,448</td>
</tr>
<tr>
<td>2021</td>
<td>243,740</td>
<td>65,147</td>
<td>3,527,474</td>
<td>858,414</td>
<td>945,227</td>
<td>115,026</td>
</tr>
<tr>
<td>2022</td>
<td>263,977</td>
<td>66,462</td>
<td>3,801,144</td>
<td>877,457</td>
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Source: Deloitte analysis

Note: Actual data apply until mid-way through 2013
Table A 3: Actual and forecast demand for port infrastructure services for Regional Ports, 2005-2024

<table>
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<tr>
<th>Year</th>
<th>TEU</th>
<th>Containers (revenue tonnes)</th>
<th>Break bulk (revenue tonnes)</th>
<th>Fuel (revenue tonnes)</th>
<th>Palm oil (revenue tonnes)</th>
<th>Vessel calls</th>
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Source: Deloitte analysis
Note: Actual data apply until mid-way through 2013