FAST FACTS

2011/12 FINANCIAL YEAR vs 2016/17 PREDICTED

<table>
<thead>
<tr>
<th></th>
<th>2011/12</th>
<th>2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANNUAL TOTAL VESSEL MOVEMENTS</td>
<td>3,686</td>
<td>5,776</td>
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<tr>
<td>NUMBER RAIL MOVEMENTS PER YEAR</td>
<td>13,140</td>
<td>27,000</td>
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<tr>
<td>TOTAL EXPORT TONNAGE</td>
<td>245MT</td>
<td>440MT</td>
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<tr>
<td>TOTAL IMPORT TONNAGE</td>
<td>1.6MT</td>
<td>2.2MT</td>
</tr>
<tr>
<td>TOTAL STAFF EMPLOYED BY PHPA</td>
<td>120</td>
<td>224</td>
</tr>
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A CLEAR VISION FOR THE FUTURE

The Port Hedland Port Authority Board is committed to ensuring that the Port is well positioned to deliver on its vision and mission whilst meeting its legislative obligations in the future. To achieve this outcome, the Board has endorsed the PHPA Port Development Plan (2012-2016).

It is critical that the Port adopts a well considered and comprehensive plan. Strategic initiatives in order to achieve expansion in coming five to ten year. Both conceptual and planning documents, this Plan outlines a clear path of a long-term vision.

The Plan underpins the Ports planning and development strategies and touches to meet the needs of port and facilitate the ever increasing global demand for mineral commodities sourced from the East Pilbara.

On behalf of the PHPA, I present our vision for the next four years.

KEN PETTIT
CHAIRMAN

RISING TO THE CHALLENGE

In recent years, the Port Hedland Port Authority (PHPA) has rapidly transformed from being a small regional Port to becoming one of the world’s leading Ports.

Australia’s resources boom and the increasing global demand for mineral commodities have cemented the Port’s position as the largest tonnage bulk export port in the world.

As gateway to the resource-rich East Pilbara region, the PHPA has capitalized on global commodity demand and proximity to current and future resource projects to expand and deliver a commercial return for its customers, the region and the State.

The PHPA Port Development Plan (2012-2016) is a strategic plan that sets the direction for the Port’s future, aligning with the State Government’s WA Ports policy and export industry growth forecasts.

ROGER JOHNSTON
CHIEF EXECUTIVE OFFICER
The Port Hedland Port Authority (PHPA) is a statutory authority established under State Government legislation. Situated in the Town of Port Hedland, the Port exists to facilitate trade and to retain a commercial return for the State. As a state owned port, the PHPA is responsible to use state resources wisely so that planning for the future is undertaken in a considered and sustainable manner.

In 2003, the PHPA released its first Ultimate Development Plan (UDP). The UDP was a planning strategy to ensure the sustainable future facilitation of trade. In 2007, the second edition UDP evolved alongside the Town of Port Hedland’s Land Use Master Plan (LUMP).

The 2007 UDP update brought substantial changes, including the identification of further capacity within the Inner Harbour, accommodation of an Outer Harbour facility, establishment of Finucane Island and development associated with the Finucane Island development and support infrastructure south of the port at the Boodarie Stockyards.

During this time the PHPA articulated a vision to become the world’s leading bulk commodities port. By the end of 2011, this vision was substantially achieved. Port Hedland is currently the largest iron ore and bulk export port in the world. Growth in the last five years doubled throughput to 244Mtpa worth A$11.4b in FY2011. Export revenue is expected to more than double to estimated maximum throughput of 400Mtpa upon completion of harbour development works in 2016.

The economic success of the Pilbara region has been driven by the resources sector — in particular the iron ore and gas industries. This is expected to continue into the future with import trade likely to be dominated by bulk mineral exports.

The Port Hedland Port Authority Port Development Plan 2012 – 2016 is a culmination of research, studies and consultation which maps sustainable development for the future.

The Plan addresses social, environmental, economic and infrastructure impacts of further development contained herein. The PHPA has a clear vision for engaging with the Port Hedland community through the provision of enhanced social and recreational opportunities.

The Plan is a snapshot of the Port today and a bold vision for its future, one in which the PHPA continues to grow as Australia’s primary gateway to resource hungry global markets, and works alongside local and State authorities to make Port Hedland a desirable place to live and work.

THE INTRODUCTION

THE PORT HEDLAND PORT AUTHORITY IS A VERY REAL MEASURE OF THE SCALE OF THE MINERALS AND RESOURCES BOOM TAKING PLACE IN AUSTRALIA.

AUSTRALIAN RESOURCE FOCUS, OCTOBER 2011

INTRODUCTION
OUR MISSION
To safely, profitably, sustainably, efficiently, and innovatively operate the port to promote, facilitate, and expand regional trade.

OUR VALUES
Port Hedland Port Authority’s success is based on demonstrating commitment to the following organisational values:

Respect
Operate fairly and honestly in all dealings with all stakeholders.

Excellence
Strive to be the best in all we do, and maintain a strong focus on continuous improvement and innovation.

Courage
Do the right thing every time, act with integrity in all we do, and always speak up.

The PHPA’s commitment to quality is demonstrated in its ISO Accreditation in quality, safety and environmental management attained in 2011.

OUR VISION
The world’s leading port, helping to create a sustainable region.
INTRODUCTION

A PROUD HISTORY

Discovered in 1863 by Captain Peter Hedland, who was seeking to offload cattle for a nearby station, the Port Hedland Harbour was originally known as Mangrove Harbour. The area was developed around the pastoral and mining activities, with the discovery of gold in nearby areas in the 1890s. The first shipment of gold bullion in 1900 signalled a significant commercial change for the small settlement.

Throughout the early 1900s the Port primarily facilitated trade in gold, livestock, wool and pearl shells and provided an import facility to support stations located in the Pilbara region. Despite the Port Hedland being the largest during that time, it was later the Port of the Kimberley that experienced the loss of life and destruction of the township was fortunately less significant than that of Broome and Roebourne.

In 1951 the railway was closed due to falling prices. The Port was forced to rely on road transportation to distribute the ore. With the discovery of iron ore in 1965, the Port was reactivated. The metals industry and subsequent changes to the region have increased the role of the Port, and made it a significant export hub for the Pilbara region.

In 2011, the Port was commissioned to construct additional berths at Utah Point and construction of a new berth commenced in May. BHP Billiton commenced construction of its third berth at Utah Point.

1896
Construction of the first Port Hedland jetty began and was extended in 1908 when gold was discovered in Marble Bar.

1965
Goldsworthy Mining Ltd (now BHP Billiton Iron Ore) dredged an approach channel and turning basin for ships up to 65,000 Dead Weight Tonnes (DWT).

1976
The turning basin was extended and channel dredged to accommodate ships up to 225,000 DWT.

1986
The channel was deepened by 2.5m and a computerised under keel clearance program introduced. The first program of its kind utilised in Australia permitted access to ships 330m long with 260,000 DWT.

2004
BHP Billiton Iron Ore constructed a second berth on Finucane Island, and construction was underway to extend the Port Authority’s No 1 berth to create No 2 berth.

2008
FMG completed construction of its third Dampier port facility comprising two cape size berths with an installed capacity of 45Mtpa and shipped its first ore in May.

2010
The first pile was driven in March 2009 to commence construction of the new berth at Utah Point, that was completed in 2010. Construction of two new berths at Harriet Point commenced.

2011
First ore on ship at the new Utah Point berth. BHPBIO commissioned two new berths and commenced construction of its third berth.
THE COMMUNITY
The PHPA co-exists with the residential areas of Port Hedland, Spinifex Hill, Cooke Point and Pretty Pool. These are located on an island approximately 12 kilometres long and one and half kilometres wide and are linked to the mainland via a causeway. The causeway connects the Port with South Hedland. The causeway is also the point where the majority of the PHPA staff live. Nurturing relationships with the local business community and residents, have enhanced the Town’s amenity to ensure Port Hedland is a place where people want to live, work and retire.

PHPA staff live in either Port Hedland or South Hedland, with both communities relying on the support of the Town of Port Hedland. Throughout the years of the PHPA’s operation, the Town and the PHPA have worked together to minimise impacts of the Port’s operations on the community.

THE ENVIRONMENT
The Port Hedland climate ranges from hot and humid during summer (October to April) to warm days and cool nights during winter (May to September). Climate data averages over the past 40 years show that Port Hedland’s coldest months in July, with an average maximum temperature of 27 degrees Celsius and an average minimum of 15 degrees Celsius. The warmest months are January and February, with an average maximum of 37 degrees Celsius and an average minimum of 25 degrees Celsius. Daily variations in maximum temperatures of 10 degrees Celsius are not uncommon. Rainfall in Port Hedland is variable, with an average annual rainfall of 307 millimetres. Large volumes of rain can fall within a very short period during cyclone season.

Cyclone season runs from November to 30 April. An approaching cyclone can result in total evacuation of all facilities, and vessels may be prevented from entering the Port. Wind speeds greater than 250 kilometres per hour and central pressures as low as 905 hectopascals can be experienced. Northerly swells generated by low pressure systems can also cause wharves to close.

Tides are semidiurnal with two lows and two high tides experienced each day.
SERVICING WESTERN AUSTRALIA’S FLOURISHING EXPORT TRADE

The Port of Port Hedland is currently the world’s largest bulk export port and will continue to grow rapidly.

Figure 1 demonstrates growth in Port throughput capacity since the mid-1960’s. By 2015, the PHPA will exceed the 300 million tonne per annum milestone. The PHPA continues to further its investment in 2012 to almost double the 2011 total of $1.30 billion, reflecting ongoing changes to the Port’s ever-increasing capacity and function. Depending on the timing of developments proposed within this Plan, the Port’s tonnage is expected to exceed 800 million tonne capacity by 2016.

A variety of methods are employed to plan for future Port development and throughput. Internal forecasting and projections from proponents combined with international forecasting service subscriptions, industry project collaboration, monitoring of media reports and shareholder correspondence are all used to determine project led import and export volumes. Through these forecasts, the Port Authority anticipates a prolonged period of future growth driven by continuing strong demand for commodities.

It is anticipated that the existing PHPA berths will reach their maximum operating capacity by 2020, as a result of increased general cargo trade. The PHPA is exploring opportunities to expand its Terminal Bays to include a new logo in order to increase the capacity of the outer Harbour. By 2013, DP World has announced its proposal to develop two new berths at the Port, to be commissioned by the 2016/17 financial year. The development of the outer Harbour will increase the Port’s capacity and efficiency further, providing a significant driver for the Port’s continued growth and development.

In late 2015, the Port Authority will mark its fortieth anniversary, celebrating the success and growth that have occurred in the Port’s history. A variety of developments have occurred within the Port to enable this growth and development to continue. The Port Authority has made significant investment in infrastructure, including the construction of new berths and facilities, to accommodate the increasing demand for the Port’s services.

The Port Hedland Port Authority anticipates a prolonged period of future growth driven by continuing strong demand for commodities.

**FIGURE 1: PORT HEDLAND PORT AUTHORITY ANNUAL THROUGHPUT (1964 – 2014)**

**FIGURE 2: PORT HEDLAND PORT AUTHORITY CARGO THROUGHPUT ESTIMATES 2012/13 TO 2016/17**


**FIGURE 5: PHPA CARGO THROUGHPUT ESTIMATES 2012/13 TO 2016/17**

**THE PORT HEDLAND PORT AUTHORITY ANTICIPATES A PROLONGED PERIOD OF FUTURE GROWTH DRIVEN BY CONTINUING STRONG DEMAND FOR COMMODITIES.**

- Fuel oil represents more than 90% of total imports, reflecting its use in rail transportation, electricity generation and direct mining operations.
--commissioning of the nature Port of Railport (North Rockingham) (NIRP) in late 2016 has contributed to increased export volumes. The NIRP is expected to be commissioned in late 2016.
- The potential capacity of Railport is estimated to be 29 million tonnes per annum.
- Vessel movements: As represented in Figure 5, vessel movements reached 3,686 in 2011/12, equating to 1,843 vessels for the year. Vessel movements are expected to more than double to 6,100 movements (3,050 vessels) per annum by 2015/16.
The major commodities market is expected to strengthen over the next decade. The following section details the types of commodities traded through the Port and five year forecast for commodity trade growth.

**Iron Ore**
Iron ore accounts for approximately 97% of all exports through the Port, equating to a gross product value of A$31.8 billion per year. Unprecedented demand for iron ore has resulted in a doubling of tonnage transported across PHPA berths in the last five years.

Figure 4 compares the Port Hedland’s projected iron ore export volumes to 2016 with the world’s total forecast volume growth. Whilst Chinese demand for iron ore continues to rise significantly in the short term, the rate of growth is expected to slow over time. Despite this slowdown, exports are still expected to remain strong with China anticipated to be importing 1,219Mtpa of iron ore by 2021. Of this 1,219Mtpa, a large proportion will be sourced from Australia, in particular the Pilbara region, as mining companies expedite expansion programs and bring new operations online.

**Manganese and Chromite**
Previously handled across the east-side berths, these products have now moved to the new Utah Point Multi-User Bulk Export Facility located on the western side of the Port. This new facility addresses potential environmental impacts by moving sources of dust and traffic away from the Port town.

Manganese is primarily used in steel production with demand closely aligned to the demand for steel products. China produces the majority of the world’s manganese, with South Africa and Australia following closely with similar annual production volumes.

**General and Containerised Cargo**
General cargo is serviced via the east-side facilities where Berths No. 1, 2 and 3 accommodate a range of different product types and cargo sizes. The option of feeding containerised cargo to other ports within Australia is currently being explored.

The rate of growth in global seaborne trade is still rising despite weaker demand from Japan, North Africa and Western Europe.

**TRADE FORECASTS**

The major commodities market is expected to strengthen over the next decade. The following section details the types of commodities traded through the Port and five year forecast for commodity trade growth.

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Iron ore accounts for approximately 97% of all exports through the Port, equating to a gross product value of A$31.8 billion per year. Unprecedented demand for iron ore has resulted in a doubling of tonnage transported across PHPA berths in the last five years.

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Concentrates

Although trade is dominated by iron ore and other commodities described within this Plan, trade in concentrates has also increased in the past five years. Newman nickel is the main exporter of concentrates, through the Port. Newman nickel exports are loaded into the Port from Newman Nickel Mine. The nickel concentrate is loaded into the Port Nickel No. 1 berth for onward shipment, approximately 400-450 km north of Port Hedland. Total throughput is forecast to increase with the addition of a new berth.

Aditya Birla Minerals’ flagship Birla Nifty copper mine located within the Great Sandy Desert region of the eastern Pilbara is one of the largest underground copper mines in the world to be commissioned in this decade.

Livestock

The livestock trade has diminished in recent years; however the PHPA maintains its ties with the pastoral industry and is able to ship livestock through existing berths as required.

Import Trade Forecasts

The majority of imports into the Port of Port Hedland are related to the support of the mining industry. Figure 6 represents PHPA’s total imports by product for the 2011/12 financial year.

Oil & Bitumen

Oil and bitumen are imported for use in iron ore related processes. Currently, fuel imported into the Port of Port Hedland is stored in tanks on the eastern side of the Port and is predominantly used by mining companies. The demand for oil in Port Hedland is expected to rise as mining growth continues. In 2012, Caltex Australia expanded its Port Hedland operations with the construction of two new 20 million litre diesel tanks installed to service short-term future demand.

Major road construction projects planned will result in increased demand for bitumen. Bitumen will be primarily used in building roads licensed under the Town of Port Hedland’s Wedgefield Industrial Area and Great Northern Highway (GNH) Realignment projects.

Ammonium Nitrate

Ammonium nitrate and other explosives are brought into the Port in specially made bags and transported into the hinterland for use across various sites. The demand for ammonium nitrate is expected to rise in the coming years due to the increasing levels of mining activity on the Port Hedland township.
THE PORT HEDLAND ADVANTAGE

WESTERN AUSTRALIA’S MINERAL RICH NORTH WEST

Of the 1,082.4 million tonnes of iron ore exported in 2010, nearly half of the iron ore originated from Australia (433.2 million tonnes) with Port Hedland exporting 76 million tonnes of the nation’s total.

For the same year, Brazil exported 320 million tonnes of iron ore. The combined export volumes of Australia and Brazil represent an overall 84% of global totals by 2015 (CRU Iron Ore Market Services Guide, October 2011).

The PHPA’s ability to sustain its current advantage as a major iron ore exporting port is dependent on continued expansion of capacity, high performance technology, and efficiency in port operations.

STRONG ROAD NETWORKS

The PHPA is close to the Boodarie Industrial Estate (BIE) and Great Northern Highway (GNH Realignment) with strategically planned direct access corridors to the Port Hedland Harbour.

Growth in containerised and general cargo trade via 140 hectares of reclaimed land at Lumsden Point will be facilitated largely through these access corridors and direct links to the GNH.

The adjacent Wedgefield Light Industrial Estate also provides direct access to the Port Hedland International Airport to assist in the easy facilitation

of cargo support services to onshore and offshore proponents in the north west. The close proximity of the airport to Port Hedland ensures rapid deployment of emergency equipment for the oil and gas industry.

MARINE CAPACITY

Port Hedland has large areas of deemed deep water available for future development. The PHPA has worked closely with proponents and undertaken complex modeling to unlock and augment existing national capacity in order to meet anticipated mining and exportation needs of Western Australian mineral producers.

Planning is also well advanced for a new Outer Harbour port facility off Finucane Island to provide additional capacity in the order of 800Mtpa in order to meet the operational demands of Port users.

FIGURE 7: PHPA VESTED LAND AND RESERVES
LAND CAPACITY
The Port of Port Hedland is the closest port to the main mineral reserves of the eastern Pilbara region. Its close proximity to major Asian iron ore markets provides significant strategic advantage for Port proponents. This port location is unusual in terms of largely undeveloped land bordering the shallow inshore harbour. The Port is situated near the Daleside industrial Estate and the City of Greater Hedland is committed to permit direct access to the Port of Port Hedland. The Port is consequently the first to be providing established social infrastructure that is not available at other proposed greenfield port sites in the Pilbara.

The PHPA has worked closely with proponents to provide further opportunities for port service exports products to market. A Capacity Modelling exercise to determine potential future Inner Harbour and Outer Harbour capacity is ongoing.

Planning has been completed for a new multi-user Outer Harbour Port facility off Finucane Island, providing additional capacity in the order of 400Mtpa and meeting port user projections. Outer Harbour facility development plans are outlined on pages 58-63.

The PHPA also has land available to support berth development within the Inner Harbour. It is further increasing capacity through the vesting of additional land to cater for future industry growth and to accommodate proponent developed service developments needed to support the Inner Harbour and Outer Harbour port trade.

MAXIMISING VESSEL LOADING DRAFTS
Ports around the world capable of receiving deep-draft vessels are limited. The PHPA is one of few ports to promote the use of large, draft efficient ships to improve efficiency and throughput. The PHPA is capable of accommodating vessels up to 300,000DWT deadweight of general cargo, and utilizes the latest technology in the form of a Dynamic Under Keel Clearance (DUKC) system, to allow safe passage for vessels with draft, and optimize tidal safety advantages.

The PHPA has adopted the following strategies to further exploit this competitive advantage:

- Encourage the use of deep draught vessels, such as the DHC1500 class vessels, which are purpose designed for Western Australia’s Pilbara ports. With a greater than normal design beam, these vessels are able to increase cargo draft and maintaining a relatively efficient draft in comparison to conventional design vessels of a similar class;
- Utilization larger and more efficient tug boats to address access difficulties resulting from large tidal ranges, strong tidal flows, restricted channel dimensions, separation demands between vessels and tropical storms. These new tugs will improve operational safety by improving port navigation and access;
- Facilitate the development of optimal rail corridors within the Port precinct to encourage development of rail facilities to reduce noise and protect valuable tidal creek environments.
- Undertake further development of leading technology in the handling and management of shipping movement;
- Increase Port capacity by facilitating the development of the Outer Harbour facility off Finucane Island and;
- Provide support and logistics supply-based infrastructure for iron ore and related cargo developments in the Pilbara.

FIGURE 8: IRON ORE EXPORTED FROM THE PHPA BY DESTINATION (2010/2011)

70% CHINA
13% JAPAN
11% REPUBLIC OF KOREA
3% TAIWAN
3% AUSTRALIA

FIGURE 9: DIVERSITY OF VESSELS IN HARBOUR
THE PORT HEDLAND ADVANTAGE

PRIVATE BERTHS

In most instances, these operations are under State Agreement with the Western Australian Government. These Agreements clearly identify rights, obligations, terms and conditions for the development of projects whilst providing a framework within which all parties can operate. Intra-port agreements by BHP Billiton Ferrous & Metals, Hancock Prospecting, Rio Tinto, Fortescue Metals Group, Roy Hill Infrastructure Pty Ltd, Roy Hill Infrastructure Pty Ltd Northwest Infrastructure, Private berth owners and shown in Figure 10.

BHP Billiton Iron Ore

BHP Billiton Iron Ore (BHPBIO) currently operates four berths at Nelson Point and four at Finucane Island for exclusive export of iron ore. BHPBIO’s allocated capacity is 240Mtpa.

Fortescue Metals Group Pty Ltd

Fortescue Metals Group Pty Ltd (FMG) occupies three berths at Anderson Point and has another planned to support their planned capacity of 120Mtpa.

Roy Hill Infrastructure Pty Ltd

Roy Hill Infrastructure (RHI) is a wholly owned subsidiary of Hancock Prospecting, an exploration and development company with interests in coal and iron ore deposits. RHI is scheduled to construct a dual berth at South West Creek which, on commissioning, will have a capacity of up to 55Mtpa.

North West Infrastructure

North West Infrastructure (NWI) consists of three iron ore companies - Atlas Iron Limited, Brockman Resources Limited and FerrAus Limited (owned by Atlas Iron). Capacity of 50Mtpa is linked to the construction of their two berths at South West Creek.

PUBLIC BERTHS

Four public berths operate in the town harbour offering highly valuable opportunities for other miners to access export markets. girls previous allocation to salt

East Side (Berth Nos. 1, 2 & 3)

Salt

Salts are produced from the salt mine located near Port Hedland. Prior to being exported from Port Hedland, salt must reach specification. Once this has occurred, the salt is transported by pipeline to Port Hedland. The salt is then loaded onto vessels at Berths 1, 2 and 3. The ship loader has a peak capacity of 3,500 tonnes per hour and can load vessels of up to 75,000 DWT.

Concentrates

Concentrates are principally exported through the public berths. Newcrest Mining operates out of the Telfer mine in the eastern Pilbara, exporting six Mtpa of gold concentrate and gold copper concentrate. Operating from its flagship Nifty mine in the eastern Pilbara, Atidya Birla exports 56.5kt of copper concentrate annually.

Utah Point Berth Facility (Berth No. 4)

The fourth public berth is a multi-user berth at Utah Point with a total capacity of approximately 90Mtpa.

MAJOR IMPORTERS

Facilitates of imported trade through the PHPA Berths is 1.2Mtpa which is in line with commodity demand and population growth.

BHP Fuel imported an estimated 1.1Mtpa of fuel through these berths in 2010/11. The facility is also used by Dyno and Orica to import ammonium nitrate.
A VISION FOR OPTIMAL CAPACITY WITHIN THE PORT

CAPACITY WITHIN THE PORT MUST BE CONSIDERED CAREFULLY AND STRATEGICALLY, TAKING INTO ACCOUNT BOTH MARINE AND LAND AVAILABLE NOW, AND WHAT DEMANDS MAY BE PLACED ON THESE RESOURCES IN THE FUTURE.
A VISION FOR OPTIMAL CAPACITY WITHIN THE PORT

CONSTRAINT MANAGEMENT

vessel traffic requiring protocols to optimise vessel movement and ensure priority sailings can take place. The PHPA uses the Vessel Tracking Management Information System (VTMIS) to track ships visiting Port Hedland. It also employs the Dynamic Under Keel Clearance (DUKC) software system to calculate maximum drafts and times that vessels may sail on impending tides. Vessel sailing times are carefully planned and monitored given high drafts of approximately 18 metres can be experienced.

A comprehensive ship scheduling tool (DUKC Optimiser) is currently in development to complement existing software by calculating the order of sailing and berthing using a wide range of variables.

Current Port protocols stipulate time spacing for outward bound ships passing Hunt Point and for inbound ships. Through the use of new Inner Harbour turning basins, inbound spacing has been reduced. Further reductions in ship spacings may be experienced in the future should tug numbers increase and changes to export capability risk management be modified. The PHPA also employs the Vessel Scheduling System to improve safety and reduce vessel capture, moor and release times by up to two and a half hours per vessel.

The procedures also acknowledge the sensitive nature of the marine environment, including the Port Hedland creek system, and the PHPA’s responsibility under legislation to protect the environment of the Port. INFRASTRUCTURE AND EQUIPMENT

The Port Hedland Port Authority employs leading technology to achieve efficiency across all Port operations. Customised infrastructure design and construction ensures optimal efficiency, cost-reduction and delivery time savings for all vessel owners calling into Port Hedland, including in the Port’s current and proposed future access and the sensitive high-concentration industrial area. The PHPA is committed to working with government authorities and industry.

Cyclonic activity

Port Hedland is susceptible to cyclonic activity between November and April each year. Cyclone development occurs and can depend on many factors, including sea water temperature, upper level winds, and pressure gradients. Leading indicators such as the Tropical Cyclone Development Index (TCDI) and the Tropical Cyclone Forecasting Guidance for Under Keel Clearance (www.0389.com) are periodically reviewed to ensure all vessels are mobilised and operating experience has been gained from multiple tide departures over an extended period of time.

Severe tropical cyclones can deliver flooding rain, storm surges and damaging winds well in excess of 200 kilometres per hour. Consequently, the port has a clearly defined plan and procedures for dealing with a cyclone or tropical low. This plan is regularly reviewed and updated to ensure an effective response. The Port Hedland Port Authority recommends all vessels operating within the Port area must update these plans as required. Several tropical cyclones have impacted Port Hedland in recent years, including the 2009-10 cyclone season when three systems impacted Port Hedland in a 10-day period. The Port Authority employs the Vessel Scheduling System to improve safety and reduce vessel capture, moor and release times by up to two and a half hours per vessel.

THE PORT HEDLAND PORT AUTHORITY ANTICIPATES THE NUMBER OF VESSELS WAITING TO ENTER THE PORT WILL ESCALATE FROM THE CURRENT 26 PER DAY TO APPROXIMATELY 80 PER DAY WHEN THE PORT REACHES 495MTPA.

Port Hedland depends heavily on trade between Australia and the rest of the world. Restrictions on the development of land and channel capacity as well as the movement of executive traffic, goods and services, increase the need to effectively manage Port infrastructure. Through this paper, the PHPA outlines a clear strategy for balancing vessel traffic and maximising space across Port berths while ensuring high efficiency and reliability. SHIP ANCHORAGE

With the increasing number of ships visiting Port Hedland it is all the more important that Port facilities and procedures are carefully planned and maintained. One of the recommendations of a recent review of Port Hedland was to implement a staggered anchorage system within the PHPA’s system of management. With this in place, vessels can be managed in a way that ensures efficient use of waterway and berth space. The PHPA conducts an annual survey of anchorage berths and associated facilities such as mooring equipment and related services to ensure these are kept up-to-date.

TIDAL CONDITIONS

Port Hedland has a large tidal range with a difference between high and low tides of approximately five metres. The semi-diurnal nature of tidal movement is well evidenced by the time difference between high and low tides. The Port Authority is currently exploring ways to improve the efficiency of vessel movement and berthing, including the use of tugs and berthing using a wide range of variables.
The simulation model is based on seventeen berths being constructed within the Harbour. A shipping channel profile that had undergone a 0.5 metre high spot was estimated to result in a decline of iron ore export capacity to approximately 419Mtpa. A reduction in channel depth or lengthening of vessel movement spacing from the values assumed were estimated to result in a decline of iron ore export capacity to approximately 458Mtpa. Whilst episodic studies such as simulation experiments are mainly used to support high level planning and decision-making, the PHPA has been particularly useful to identify more effective marine and portside management practices and interactions with the proposed Outer Harbour development.

Studies proposed in the future will need to respond to changes in the design of new terminals, emerging trends in ship design and portside infrastructure technologies.

MODELLING WITHIN THE HARBOUR

The PHPA has been actively involved in the development and testing of leading industry specific software - the Optimiser. Working hand in hand with the DUKC™ and using real-time DUKC™ tidal window information, the Optimiser processes the parameters contained within vessel movement guidelines to produce daily shipping schedules. The Optimiser processes the parameters contained within vessel movement protocols and set out basic operating parameters for the Harbour. Inbound vessels have traditionally been permitted one hour between each arrival, with 30 minutes the maximum time between outbound vessels as they pass Hunt Point. In addition to pilot boats, the PHPA also has two dedicated pilot vessels available to transport personnel to vessels in the Port. These vessels have a speed of 21 knots and are equipped with necessary life support equipment.

The Dynamic Under Keel Clearance (DUKC)™ is one of the PHPA’s most important assets. The DUKC™ optimiser is essentially a computer program that uses real-time DUKC™ tidal window and vessel arrival information to produce daily shipping schedules. The DUKC™ optimiser is a tool used by the PHPA to optimise vessel transit by calculating the maximum draft and time that a vessel is able to sail. Using real-time sensors to feed swell condition information into the system, the DUKC™ optimiser can estimate conditions the Port will encounter up to 30 hours before they actually occur. This system is currently used to ensure safe passage for vessels sailing across the Port.

The existing tower is planned to be replaced by a new Vessel Traffic Service Centre in the coming years. The new tower will have large screen displays, the ability to see all areas of the Port, and a co-located incident control centre to ensure the PHPA is able to respond to any event.

SCHEDULE PLANNING AND OPTIMISER

The Optimiser Scheduling programme is designed to optimise Port efficiency through continued optimisation of marine and landside capacity.

Maximising use of the Harbour

Information technology supports vessel movement predictions and assists in decision-making for the Harbour. Inbound vessels have historically been permitted one hour between each arrival, with 30 minutes the maximum time between outbound vessels as they pass Hunt Point. This tight scheduling has caused vessels to travel at slower speeds, which has been expensive to the customer. To increase speeds and provide better service to customers, a new system is being developed to enable the Port to provide entire voyage plans to customers in advance. This system will allow customers to review voyage plans and make changes to voyage plans before they are finalised, ensuring that customers can make the best use of the Port.

SHIPPING PROTOCOLS

The Dynamic Under Keel Clearance (DUKC)™ is a tool used by the PHPA to optimise vessel transit by calculating the maximum draft and time that a vessel is able to sail. The DUKC™ optimiser is essential for ensuring safe passage for vessels sailing across the Port. It uses real-time DUKC™ tidal window and vessel arrival information to produce daily shipping schedules. The DUKC™ optimiser is designed to ensure that vessels have sufficient clearance beneath the vessel keel to safely navigate the Port. It uses real-time sensors to feed swell condition information into the system, allowing the DUKC™ optimiser to provide accurate predictions of conditions the Port will encounter up to 30 hours before they actually occur. This system is currently used to ensure safe passage for vessels sailing across the Port.

The PHPA has also developed protocols for the Port. These protocols encompass the order of arrival of vessels, wharf configuration of the berth they will be visiting and departing ship priorities. These protocols are designed to ensure that vessels can be accommodated within the Port and that the Port is able to support the needs of customers.

The PHPA has developed detailed vessel movement protocols for the Port, which are contained within the Optimiser software. These protocols are designed to ensure that vessels can be accommodated within the Port and that the Port is able to support the needs of customers.

The existing tower is planned to be replaced by a new Vessel Traffic Service Centre in the coming years. The new tower will have large screen displays, the ability to see all areas of the Port, and a co-located incident control centre to ensure that the PHPA is able to respond to any event.

FIGURE 13: AERIAL PHOTO OF PORT HEDLAND AND SOUTHERN SHORES

Marine capacity relies on the skill of schedulers and other staff to effectively plan and manage assets to ensure expected mineral product export volumes can be accommodated. Current marine management policies and procedures are outlined below.

AERIAL PHOTO OF PORT HEDLAND AND SOUTHERN SHORES

The simulation model is based on seventeen berths being constructed within the Harbour. A shipping channel profile that had undergone a 0.5 metre high spot was estimated to result in a decline of iron ore export capacity to approximately 419Mtpa. A reduction in channel depth or lengthening of vessel movement spacing from the values assumed were estimated to result in a decline of iron ore export capacity to approximately 458Mtpa. Whilst episodic studies such as simulation experiments are mainly used to support high level planning and decision-making, the PHPA has been particularly useful to identify more effective marine and portside management practices and interactions with the proposed Outer Harbour development.

Studies proposed in the future will need to respond to changes in the design of new terminals, emerging trends in ship design and portside infrastructure technologies.

The PHPA has been actively involved in the development and testing of leading industry specific software - the Optimiser. Working hand in hand with the DUKC™ and using real-time DUKC™ tidal window information, the Optimiser processes the parameters contained within vessel movement guidelines to produce daily shipping schedules. The Optimiser processes the parameters contained within vessel movement protocols and set out basic operating parameters for the Harbour. Inbound vessels have traditionally been permitted one hour between each arrival, with 30 minutes the maximum time between outbound vessels as they pass Hunt Point. In addition to pilot boats, the PHPA also has two dedicated pilot vessels available to transport personnel to vessels in the Port. These vessels have a speed of 21 knots and are equipped with necessary life support equipment.

The Dynamic Under Keel Clearance (DUKC)™ is one of the PHPA’s most important assets. The DUKC™ optimiser is essentially a computer program that uses real-time DUKC™ tidal window and vessel arrival information to produce daily shipping schedules. The DUKC™ optimiser is a tool used by the PHPA to optimise vessel transit by calculating the maximum draft and time that a vessel is able to sail. Using real-time sensors to feed swell condition information into the system, the DUKC™ optimiser can estimate conditions the Port will encounter up to 30 hours before they actually occur. This system is currently used to ensure safe passage for vessels sailing across the Port.

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Marine capacity relies on the skill of schedulers and other staff to effectively plan and manage assets to ensure expected mineral product export volumes can be accommodated. Current marine management policies and procedures are outlined below.
A VISION FOR OPTIMAL CAPACITY WITHIN THE PORT

PILOTS

Port Hedland Port Authority’s 16 pilots are fully trained in harbour navigation and are supported by electronic positioning as they navigate the channel and berths. The Portable Positioning System (PPS) displays real time data positions as pilots manoeuvre vessels, a system that is particularly valuable at night and during challenging weather events.

During 2010/11, a total of 3,027 piloted shipping movements were undertaken, representing a 15% increase on movements made within the previous financial year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Movements</th>
<th>Increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>1,807</td>
<td></td>
</tr>
<tr>
<td>2007/08</td>
<td>2,060</td>
<td>14%</td>
</tr>
<tr>
<td>2008/09</td>
<td>2,456</td>
<td>19%</td>
</tr>
<tr>
<td>2009/10</td>
<td>2,624</td>
<td>6%</td>
</tr>
<tr>
<td>2010/11</td>
<td>3,027</td>
<td>15%</td>
</tr>
</tbody>
</table>

FIGURE 14: TOTAL PHPA PILOTED SHIPPING MOVEMENTS (2006/07 – 2010/11)

MARITIME TRAINING FACILITY

Staff training is of paramount importance to efficient Port operations. Currently, the PHPA’s pilot training is conducted in Port Ash (New South Wales) with some also carried out in Port Revel (France). Marine officers generally need to travel to the east coast of Australia and France to become qualified.

To address these issues, the PHPA plans to create a world class training facility within Port Hedland which will increase the efficiency and local capacity of the Port’s operations. The facility will include:

- A bridge simulator to service not only the PHPA’s needs, but also that of other ports within Australia and France and the global industry;
- Small vessel simulation, capable of performing with an ‘instructor’ role to create an environment to simulate vessel traffic operations, changing weather conditions, and vessel movement in the channel;
- Training for pilotage exemptions for masters of small vessels that do not need to use tugs, minimising the demand on the PHPA’s pilots;
- An interactive simulation training, enabling the simulation of the Port’s safety and efficiency.

To address these issues, the PHPA plans to create a purpose-built training facility to provide specialist maritime industry training services. These services will include:

- Bridge Simulation to service not only the PHPA’s needs, but also that of other ports within Australia and France and the global industry;
- Small vessel simulation, capable of performing with an ‘instructor’ role to create an environment to simulate vessel traffic operations, changing weather conditions, and vessel movement in the channel;
- Training for pilotage exemptions for masters of small vessels that do not need to use tugs, minimising the demand on the PHPA’s pilots;
- An interactive simulation training, enabling the simulation of the Port’s safety and efficiency.

FUTURE PLANS

As the Port expands, the PHPA will examine all opportunities to maximise the Port’s capacity. A number of new initiatives are planned to ensure the maximum operational efficiency, including:

- Installation of a vessel simulation facility;
- Investigation into reducing vessel spacing between inbound vessels;
- Working with customers to investigate ways of minimising the time at berth including using Cavotec or other technology;
- Targeted high spot dredging campaigns;
- Creation of refuge pockets within the channel to aid in the event of vessel mishap within the channel;
- The use of new technologies to help enhance the PHPA’s management of shipping.

As the Port expands, the PHPA will examine all opportunities to maximise the Port’s capacity.

AS THE PORT EXPANDS, THE PHPA WILL EXAMINE ALL OPPORTUNITIES TO MAXIMISE CAPACITY.
Extensive forward planning has been undertaken to ensure portside land availability can accommodate increased mine to Port activity and that dredged materials may be used to create additional facilities within the Harbour. Current and future land capacity is detailed in the Planning Precincts and Dredge Material Management Areas (DMMA) information presented below.

**LAND CAPACITY**

**AREA A**
Iron Ore Stockpiles
General Cargo Lay Down
Anderson Point Island Port Storage

Area A is substantially developed with approximately 210 hectares set aside for iron ore storage. There is a similar area of storage available to support exports in excess of 100Mt. The remaining 100 hectares is reserved for the main intermodal railhead located at a point immediately east of Anderson Point Island. A hardstand area is supported by 100, 200, 300 and 400 hectare stockpiles and suppliers intend to use this area to supply railcars, access to this storage area being via the intermodal railhead.

Anderson Point Island east has been set aside for a rail and road transport hub to handle the increasing volumes of iron ore, coal and general cargo to be handled in the Port. This includes the stockpiling of material on 100 and 200 hectare stockpiles and will provide for a railhead at the back of the Harbour, thereby reducing rail traffic into the Port and creating additional capacity within the Harbour.

Access to the Holding Area will be via a spine road to the main landfall area, with a break in the railway apron to the south and a rail siding to the west to connect with the railhead. In the event that salt loading is relocated to either Berth A or B of the PHIA Berth Area, the remaining 100 hectares will be used for additional salt stockpile areas. A significant amount of road traffic will be removed from the road network of the Port in the event that this relocation eventuates.

**AREA B**
Salt Stockpile Area

Area B covers approximately 70 hectares and is intended to be large enough to stockpile all the salt that is salt loading is relocated from PHIA Berth No. 3 or to a new berth east of Anderson Point. A significant amount of road traffic will be removed from the road network of the Port in the event that this relocation eventuates. Area B is a naturally high land area that is well suited for salt stockpiling, with no constraints on topography or drainage. The development of four berths either side of South West Creek provides maximum berths with minimal dredging and environmental impact, with plans to be extended to Areas B, C and C.

**AREA C**
Lumsden Point

Area C’s Lumsden Point covers 140 hectares of reclaimed land to the north of Wedgefield. This facility is discussed in more detail on page 51.

**AREA E**
Redbank Light Industry

This 15 hectare area will be allocated to Port related industrial activities, such as fuel production. This area will be connected to power from the existing coal power stations via a switchyard at the back of the Harbour.

Restricted access through BHPBIO operations to the rear of this area is possible, with light vehicle access also achievable via the coastal access track to Hunt Point. Alternatively, 50 hectares of suitable flat land to the north of BHPBIO operations is available. Further development of this area and panhandle port mining facilities will be primarily used for construction lay down areas in support of future Port developments.
Materials are ongoing. The PHPA has several million cubic metres stored should a viable commercial purpose be identified.

Area H storage reservoirs also have capacity to land raising where required and lowering of intertidal zone ground and mangrove planting with significant cost savings.

The PHPA has been working collaboratively with stakeholders including the Australian Government, the Department of Environment, Climate Change and Sustainability, and local and regional government bodies to ensure the development of the Port and its facilities is undertaken in an environmentally sustainable manner.

The development of the northern end of Area H to accommodate RHI and NWI feed conveyors from the PHPA Boodarie Stockyard areas to South West Creek berths. Infrastructure to support this development includes a dedicated road train dewatering and storage facility at its South West Creek berths. This area may also support heavy industries that will develop in line with the Boodarie Industrial Estate (BIE) expansion.

Given Area H perimeter walls have been designed and built to retain slime created by dredging operations, modifications would be required to level the base and a liner installed to convert the reservoir into a water containment facility.

The remainder of Area H shall be used for storage of water used in dust suppression, making use of significant berth water volumes produced from pumping magnetite by slurry pipeline to the Port.

Increased Inner Harbour shipping volumes and planned Outer Harbour development has necessitated planning for a future tug haven. A portion of Area J has also been identified for this purpose. To provide the berthing and protection required, an area will be designated off existing and future service corridor to the Outer Harbour and restricted use service road connecting Areas H and G; and,

Investigations into the potential reuse of dredged material in new Port developments.  This project will consider an approved 1:25 scale model of Port (FIGURE 16: MANGROVE AREAS) areas of vested land whereby a percentage of material dredged to maintain safe passage between vessels is used to raise new Port developments. This will include whole areas of Port developments.

The development of an Atlas Iron road train receival facility on the western side of Area H is also possible. This facility will bypass Port Hedland’s main road network, transporting ore between Area H and Utah Point Stockyard 2 via dedicated haul road.

The following areas are defined as DMMA locations where dredged materials are used for new Port developments.

**AREA B**

**Bulk Mineral Stockpiles**

A portion of Area L north of BHPBIO’s Finucane Island Port boundary. This area is set aside for future development of bulk mineral stockpiles. It has the capacity to support iron ore exports of a further 140 Mtpa approximately.

**AREA L**

**Bulk Mineral Stockpiles**

Bulk Mineral Stockpiles are areas of vested land whereby a percentage of material dredged to maintain safe passage between vessels is used to raise new Port developments. This will include whole areas of Port developments.

Development of the northern end of Area H to accommodate RHI and NWI feed conveyors from the PHPA Boodarie Stockyard to South West Creek berths. This area may also support heavy industries that will develop in line with the Boodarie Industrial Estate (BIE) expansion.

As development at the PHPA Boodarie Stockyard facility progresses, the area may be expanded to support the construction of additional Port dewatering and storage facilities. This may be crucial to support future Port development needs.

**AREA G AND AREA H**

**Outer Harbour Corridor Road Train Receival Dewatering & Magnetite Storage Water Reservoir**

These areas are designated for the purpose of enabling crew transfer boats to deliver and collect construction personnel; and,

**DREDGE MATERIAL MANAGEMENT AREAS**

**DMMA**

Dredge Material Management Areas (DMMA) are areas of vested land whereby a percentage of material dredged to maintain safe passage between vessels is used to raise new Port developments. This will include whole areas of Port developments.

**FIGURE 17: PROPOSED BHPBIO TUG HAVEN AT HUNT POINT**

**FIGURE 18: PROPOSED BHPBIO TUG HAVEN AT HUNT POINT**

**FIGURE 19: PROPOSED BHPBIO TUG HAVEN AT HUNT POINT**

The PHPA has been working collaboratively with stakeholders including the Australian Government, the Department of Environment, Climate Change and Sustainability, and local and regional government bodies to ensure the development of the Port and its facilities is undertaken in an environmentally sustainable manner.

The PHPA remains on track to achieve its vision of Australia Producing up to 12 million tonnes per year and is the world’s largest exporter of salt.

**FIGURE 9: MANGROVE AREAS**

**FIGURE 10: PROPOSED BHPBIO TUG HAVEN AT HUNT POINT**
CONNECTING THE PILBARA TO THE WORLD

Balancing the importance of developing efficient transport corridors to connect miners to export markets with the impact on local residents is an ongoing challenge for the PHPA and its stakeholders.
HINTERLAND CONNECTIVITY

Port Hedland is Western Australia’s northern gateway to the world. The vast nature of this region requires extensive road and rail infrastructure to connect Port users to resource-hungry global markets.

Significant growth in exports of iron ore and imports of mining-related services is anticipated in the future. The rail network linking the Port to “western” producers in Western Australia is being extended to accommodate this growth. Although two access links to the Port, located at Port Hedland and the Outer Harbour, currently accommodate the vast ore export requirements of the Port, additional expansion of rail capacity is required to meet future demands.

This section highlights each transport corridor under review and forecast industrial growth requiring consideration.

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Current Transport Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Ore</td>
<td>Primarily Rail</td>
</tr>
<tr>
<td>Livestock</td>
<td>Road</td>
</tr>
<tr>
<td>Salt</td>
<td>Road</td>
</tr>
<tr>
<td>Scrap Metal</td>
<td>Road</td>
</tr>
</tbody>
</table>

FIGURE 18: MAJOR ROAD AND RAIL NETWORKS

MINE TO PORT ACCESS

The larger iron ore producers are primarily focussed on rail access to the Port, with the transition under review largely aligned to the State Government’s Western Corridor Integrated Access Project and the Port to the Port plan of the Port’s network. The Port to the Port plan of the Port is aimed at minimising interaction between passenger vehicles and industrial trucking is a key priority of all parties.

The Main Roads WA GNH Realignment will facilitate efficient transportation of ores into the Outer Harbour on dedicated commercial access roads, thereby avoiding interaction with domestic traffic between the City of Port Hedland and the Port.

Currently, the PHPA delivers cargoes for export using the following methods:

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Current Transit Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromite</td>
<td>Road</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>Primarily Rail</td>
</tr>
<tr>
<td>Smaller producers</td>
<td>via road</td>
</tr>
<tr>
<td>Livestock</td>
<td>Road</td>
</tr>
<tr>
<td>Manganese</td>
<td>Road</td>
</tr>
<tr>
<td>Salt</td>
<td>Road</td>
</tr>
<tr>
<td>Scrap Metal</td>
<td>Road</td>
</tr>
</tbody>
</table>

The PHPA is focussed on rail access to the Port with their transit corridors largely aligned to the State Government’s Western Corridor, with some corporation corridors giving priority to minimising interaction with domestic traffic and allowing future optimisation of the Boodarie access corridor.

Not only do the recommended railway access corridors contained within the WCIP achieve these objectives, but provide current and future users with sustainable transport solutions, from which to plan their entry into the Port and be able to deconstruct the recommendations to facilitate future developments, whilst minimising impacts on the Outer Harbour area.

The WCIP provides for the following corridors and future developments (from east to west) in the Boodarie area:

- The Boodarie Industrial Estate (BIE) and a 1 kilometre wide Other Proponent Corridor with a minimum width of 300 metres to facilitate future development of an industrial facility, until such time that future development requires an upgrade to a grade separated crossing by way of a level crossing. This corridor is to be positioned immediately adjacent to the proposed BIE border.
- A 50 metre wide multi-user road corridor that will provide access to the Port from the Eastern Financial District (EFD) and a series of three successive and adjacent 300 metre wide Other Proponent Corridors to facilitate future access to the PHPA Boodarie Stockyards SY2, SY3, SY5 and SY6 areas.
- Potential construction of an overpass/underpass infrastructure to allow connection of the BIE and the Outer Harbour Corridor.

The WCIP has already been implemented, with RHI’s tenure aligning with the access corridor and MPP’s planned access point also following these outlines. Corridors are being developed to enable access to the Outer Harbour berths whilst minimising the interference with existing infrastructure within the Port.

Forecasts indicate that the Boodarie Stockyard – Outer Harbour corridor can potentially support up to 200Mtpa iron ore exports. Projected volumes of this size confirm rail to be the most economical transport option now and for the future.

Port users operating outside PHPA boundaries generally need to enter into discussions with the State Government in order to build a railway system to support their operations. Provision for third party access by mining companies remains in various State Agreements, however success in gaining the agreement has been limited.
To support the further expansion, the Utah Point Facility and the iron ore market potential world-wide, a third party rail siding to Utah Point is considered an enabler. Figure 20 describes the preferred arrangement for a siding coming off BHP Billiton’s Finucane Island Railway with a rail car discharge及appliance at Utah Point. Should access to BHP Billiton’s railway be gained to owners or the future, this extension will provide an access delivery to Stanley Point Stockpiles prior to the completion of the Multi-User Bulk Export Facility. This proposal is subject to the availability of capacity, in the form of capacity from road hauled to rail hauled ore trains.

GNH Realignment

The GNH Realignment at the rear of Wedgefield (refer Figure 19) is jointly funded by the State Government ($40 million) and Infrastructure Australia, AusLink ($140 million) and scheduled for completion by mid-2014. The realignment features grade-separated crossings at main intersections to improve road train traffic flow into the Port and will significantly reduce private traffic congestion on the existing Port Hedland/South Hedland/Wedgefield road network.

This road will also assist in the development of Area C (Lumsden) and will provide links to Wedgefield via a Pinga Street extension.

The PHPA will make a 50 metre wide corridor available to Main Roads Western Australia (MRWA) for the GNH Realignment. It will work with MRWA, the Town of Port Hedland and stakeholders to develop guidelines for the maintenance of roads, footpaths, etc. to accommodate this realignment. This realignment will be completed prior to the completion of the Area C land rehabilitation works.

GNH to Lumsden

The PHPA will develop and construct a service road linking Projects from the current road network to new Junior Hub Port Berths. This service road will be extended to Area C (Lumsden) via a Pinga Street extension.

RHI & NWI Road to South West Creek

A new shared service road is planned over existing BHP Billiton infrastructure to link RHI’s Boodarie Stockyard and NWI facilities to new South West Creek Berths (SP1-SP4). Road access will be restricted to area owners.

Anderson Point Road Upgrades

As part of The Pilbara Infrastructure’s (TPI) capacity allocation, expansion work includes sealing of the existing road from Finucane Island railway to Anderson Point to the east of the TPI stockyards. The PHPA will develop a service track linking Utah Road to PHPA lay down areas to the west of TPI stockyards. This development is due for completion following TPI’s agreed land release, which is expected to occur within the next five years. The road upgrade will be critical to the development of Area A, B, C, and D as identified in the Port Development Plan on page 41 and 43. The PHPA expects that rehabilitation or improvement of these areas will be well advanced over the next five years upon which users are able to start utilising these bearths.

Utah Road

The PHPA’s new Utah Road to Finucane Island will facilitate the commercialisation of land areas A, B, C, and D, as identified in the Port Development Plan on page 41 and 43. It is expected that rehabilitation of these areas will be well advanced over the next five years upon which users are able to start utilising these berths.

New Finucane Island Road

The PHPA’s new Finucane Island service road and the Finucane Island boat ramp will replace BHP Billiton’s existing road alongside Goldsworthy to accommodate loads 10 metres wide and 10 metres high.

It is expected to include a new intersection at the Goldsworthy level crossing, a new road parallel to the future Outer Harbour conveyor convey on the western side of the road bridge by sealage.

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Creating a New Vision for the Port

The PHPA has a clear vision for the Port of Port Hedland - one in which clearly defined service development and facility upgrades will foster efficiencies in export trade and industry growth.
CREATING A NEW VISION FOR THE PORT

**BOODARIE INDUSTRIAL ESTATE**

Provision for future expansion of the Boodarie Industrial Estate (BIE) is contained in the PHPA’s long term Port evolution plans given the significant increases in Iron ore exports anticipated to occur in the coming years. Additional berths have been earmarked to support the Estate.

Unknown factors influencing future Inner Harbour berth demand lie in the scope of future industrialisation of BIE. Expanded exportation of iron ore from BIE are also anticipated with iron ore export requirements continuing to increase. Increased berth utilisation may constrain significant expansion of hazardous cargo within the Inner Harbour.

The PHPA’s Outer Harbour concept was born out of a key recommendation made within the Woodward Clyde Study Report (1996) for a dedicated hazardous cargo jetty outside the HIF. Expanded exportation of iron ore from BIE are also anticipated with iron ore export requirements continuing to increase. Increased berth utilisation may constrain significant expansion of hazardous cargo within the Inner Harbour.

The PHPA’s Outer Harbour concept was born out of a key recommendation made within the Woodward Clyde Study Report (1996) for a dedicated hazardous cargo jetty outside the HIF. Expanded exportation of iron ore from BIE are also anticipated with iron ore export requirements continuing to increase. Increased berth utilisation may constrain significant expansion of hazardous cargo within the Inner Harbour.

Although the types of industries to be accommodated in any future development of BIE are presently unknown, it is anticipated that development of the BIE is in response to projected export growth from BIE and will also provide a critical link for the Estate to the Port and its surrounding areas.

**LANDSIDE DEVELOPMENTS**

**FIGURE 21: BOODARIE INDUSTRIAL ESTATE AND STOCKYARDS**

Although the types of industries to be accommodated in any future development of BIE are presently unknown, it is anticipated that development of the BIE is in response to projected export growth from BIE and will also provide a critical link for the Estate to the Port and its surrounding areas.

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**LANDSIDE DEVELOPMENTS**

Although the types of industries to be accommodated in any future development of BIE are presently unknown, it is anticipated that development of the BIE is in response to projected export growth from BIE and will also provide a critical link for the Estate to the Port and its surrounding areas.
To address growth in general cargo and containerised trade, the emergence of new Port services and to overcome the imminent saturation of PHPA’s berths 1, 2 and 3, planning is underway to develop berthing infrastructure at Lumsden Point.

Located in close proximity to the deep water dredged harbour basin, Lumsden Point will capitalise on the 140 hectares of land reclaimed and GNH realignment to the area’s southern boundary following BHPBIO dredging of Burgess Point in 2010.

Lumsden Point is located to the north of BHPBIO’s deep water berths and is ideally suited to accommodate future Port support trades and services. It is capable of handling Handimax vessels for ammonium nitrate, cement, service vessels and general cargo shipping industries.

Lumsden Point developments align closely with the Town of Port Hedland’s Land Corp vision for the Wedgefield light industrial area as an international freight hub closely linked to the nearby international airport.

The main logistical overland corridor east of FMG stockpiles is the priority of being re-routed to avoid the non-essential沙龙 Creek, with a further 150 hectares of land becoming available from 2015.

With the recent completion of the Ashburton Road project, supertanker sized vessels can now safely transit the port. The Ashburton Road project included the construction of a new road that services the southern area of the Port and provides a safe and direct access route for large vessels.

These two areas nearing 300 hectares in total are sufficient to meet the needs of the Lumsden Point facilities and provide sufficient land area for future distribution centres.

The facility will also be designed with provision to accept larger vessels in the final stages of development.
Creating a New Vision for the Port

The PHPA manages three public berths at the eastern side of the channel at Nelson Point (Berths 1, 2, and 3) which largely support berth activities. A study has been commissioned into the redesign of this area to accommodate containerised and general cargo traffic following the expansion of berth No. 3. The proposal includes the relocation of salt to a new berth either at PHPA Berth No. 3 or at South Hedland.

Future plans include removal of the PHPA Berth No. 3 shed, the potential construction of a new multi-user facility on the east side of the channel to accommodate containerised traffic, and the development of additional bulk concentrate storage facilities. Future trade facilitated across Berth No. 1 to 3 will be carefully managed to ensure road movements, noise, and dust are minimised at Port Hedland’s West End.

Marine Developments

PHPA Berth No. 4

Utah Point Multi-User Bulk Export Facility

The Utah Point Multi-User Bulk Export Facility at Utah Point addresses the resource industry’s need for expanded Port facilities to meet current and future growth in global demand for Western Australian iron ore and other minerals and emerging material products to export their products to global mineral markets.

Construction of this new multi-user bulk export facility on the west side of the Harbour at Utah Point’s narrow neck of the Harbour between Harriet Point and Finucane Island berths commenced in late 2008.

The facility consists of a 450,000 m³ water containment and stormwater harvesting system, backfill geosynthetic clay core embankments, and 24 hectares of stockyard and associated materials handling infrastructure, administration, and control facility, and a 10 kilometre developed access road.

A number of sustainable technology initiatives have been adopted to address the complexities associated with constructing a Port Facility to transport, store and export a multitude of minerals with potentially adverse environmental and community impacts.

Innovations include a 45,000 m³ water recycling and stormwater harvesting system, backfill geosynthetic clay core embankments, and 24 hectares of stockyard and associated materials handling infrastructure, administration, and control facility. The development also features a mangrove repropagation farm to address the loss of mangroves elsewhere in the Harbour.

Utah Point has an initial approved capacity of 9 Mtpa and is designed to accommodate an export capacity of 18 Mtpa. To reach this capacity, Utah Point utilises an innovative containerisation system involving a system of large containers and a dedicated handling system peak loading rate of up to 4,500 tonnes per hour.

The first shipment of ore was achieved within four years of the opening of the facility. By the end of June 2011, Utah Point exceeded the previous year’s export tonnage by 360%, achieving the facility’s nameplate capacity of 9 Mtpa with an estimated total export value of A$1.5 billion.

Berth Exports / Imports

<table>
<thead>
<tr>
<th>Berth</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copper concentrate, petroleum products, bulk chemicals (sulfuric acid/caustic soda), livestock</td>
<td>Oil</td>
</tr>
<tr>
<td>2</td>
<td>General cargo, containers, livestock, bulk liquid chemicals (sulfuric acid/caustic soda), livestock, fuel, oil, container and break bulk cargoes</td>
<td>Oil</td>
</tr>
<tr>
<td>3</td>
<td>Salt  - Dampier Salt own and operate a ship loader with restrictions on cargo loading. General cargo – acid, fuel, oil, container and break bulk cargoes</td>
<td>Oil</td>
</tr>
</tbody>
</table>
BHP Billiton's current mining operations in the Pilbara region of Western Australia are the largest of their kind in the world.

BHP Billiton is currently mining in the following locations:

- Mt Whaleback mine, the largest single-pit open-cut iron ore mine in the world.
- Smaller BHP Billiton deposits and satellite mines near Newman and Port Hedland.

It is primarily due to the extensive iron ore mining projects currently underway and commissioned in the Pilbara that shipments have increased so significantly in the past decade.

A series of Rapid Growth Projects (RGP) have been developed to meet projected growth in iron ore demand. BHP Billiton's latest RGP produced the new Finucane Island, Finucane Island Berth, Nelson Point (Burgess Point) and Nelson Point Berths (Excluding Burgess Point). extending BHP Billiton's berthing facilities to meet the immediate access requirements available at Utah Point Multi-User Bulk Facility.

BHP Billiton is currently studying the development of dedicated Outer Harbour facilities, which could have a notional ultimate capacity of 200Mtpa following completion of all phases as detailed in Outer Harbour Concepts on page 58.

**Figure 27:** Nelson Point Berth

**Figure 26:** BHP Billiton Berths

**Figure 25:** BHP Billiton's Finucane Island, Burgess Point and Nelson Point Berths
South West Creek
South West Creek is located between Stanley Point and Anderson Point. FMG will occupy one berth on the Anderson Point side of South West Creek (referred to as AP4) for which dredging has commenced.

55Mtpa and 50Mtpa of capacity have been allocated on Stanley Point to RHI and NWI respectively.

Roy Hill Infrastructure Pty Ltd (RHI) – Berths SP1 and SP2
RHI is a wholly owned subsidiary of Hancock Prospecting, an exploration and development company with interests in mineral resources.

RHI is allocated 35Mtpa of A Class priority sailing and 20Mtpa of B Class capacity. Dredging has been completed for RHI’s SP1 and SP2 berths. The two berth wharf is expected to accommodate a 12,000 tonne per hour shiploader/unloader, stockyard and conveyor system, with first production anticipated in 2014.

North West Infrastructure (NWI) – Berths SP3 and SP4
NWI comprises Atlas Iron Limited, Brockman Resources and FerrAus Limited. Allocation is for B Class capacity at the back of South West Creek to enable vessels of up to 205,000 tonnes to sail on either side of the highest point of the tide.

Dredging for NWI berths will take place after RHI and FMG have completed dredging of their berths, with the first shipment of ore forecast for 2016/17.

Anderson Point Berths (AP5-7)
These berths are currently designated to the PHPA to service general and containerised cargo trade and include opportunity to import fuel through these berths.

Upon development, AP5 and AP6 are currently planned to receive salt exports.
OUTER HARBOUR DEVELOPMENT

Evolution of the Concept
The PHPA developed the concept of a multi-user Outer Harbour located to the north of the current facility to expand to substantially greater volumes of iron ore within the Towns Gap. Accommodating a large-scale iron ore focused Port in its vicinity and developing a multi-user Outer Harbour will allow the PHPA to make better use of landholdings to grow Port capacity in line with long-term industry growth expectations.

To achieve this expansion, the PHPA will be required to achieve the following:
- consolidate exports within existing facility and social costs and environmental impacts associated with installing a greenfield port facility;
- reduce risks associated with developing a 32km single channel;
- provide opportunity to accommodate an initial design vessel of 250,000DWT with the potential to reconcile the western onshore rail infrastructure and transport corridors;
- improve sailing windows through redeveloping in-channel breakwaters and berthing facilities;
- development of the BIE.

In addition, the new Outer Harbour will require significant dredging to remove high areas within the channel length to enable deep draft vessels to maintain a safe clearance from the ocean floor.

The Outer Harbour concept (Refer Figure 15, page 36) contains the following components:
- 7000 t/h rail infrastructure; economies of scale in port management and support services.
- 2000t/h rail infrastructure by employing the best port management structures, slots, gates, loading, loading, stacking, handling, and emergency response capability. Including the PHPA’s enhanced oil spill response systems and facilities for the Port Hedland development including geophysical, geochemical, bathymetry, hydrographic, current, bathymetry modelling, stevedoring and port infrastructure, facilitates, and maintenance, and environmental impact assessments to assist in developing design concepts.

The PHPA is working on the development of the Outer Harbour and has conducted significant surveys and studies for Outer Harbour development including geophysical, geochemical, bathymetry, hydrographic, current, bathymetry modelling, stevedoring and port infrastructure, facilities, and maintenance, and environmental impact assessments to assist in developing design concepts.

Components of the Outer Harbour Development
The Outer Harbour concept (Refer Figure 15, page 36) contains the following components:
- rail infrastructure;
- tranship facilities;
- storage and transport containers;
- access jetties and causeways;
- berths, breakwater and channel, and
- spoil disposal. Including identified land required for future development.

Maintenance of spatial and operational limits associated with existing shipping movements. Creating a new channel will require significant dredging to remove high areas within the channel length to create deep draft vessels to maintain a safe clearance from the ocean floor.

With the PHPA’s enhanced oil spill response systems and facilities for the Port Hedland development including geophysical, geochemical, bathymetry, hydrographic, current, bathymetry modelling, stevedoring and port infrastructure, facilities, and maintenance, and environmental impact assessments to assist in developing design concepts.

The PHPA is considering a staged approach to the construction of its proposed Outer Harbour development, with two phases, which will be the most effective way of achieving the Port’s strategic objectives.

BHP’s four stages provide for the infrastructure development and include:
- Stage 1 – Development of the approach jetty and a single berth to accommodate the first two berths;
- Stage 2 – Development of second set of two berths;
- Stage 3 – Development of third set of two berths; and
- Stage 4 – Development of fourth set of two berths.

Maintenance infrastructure (including jetty, wharf, and approach facilities) and associated spoil disposal (including identified land required for future development) are summarised in Figure 30. The approximate duration of the dredging stages and respective volumes of dredged material (approximate only), are summarised in Figure 30. The dredging durations allow for down times such as potential coral spawning periods where dredging activities may be affected.

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The PHPA is proposing to develop the Outer Harbour in two phases, with the first phase focusing on constructing the approach jetty and a single berth to accommodate the first two berths. The second phase will focus on constructing additional berth pockets and extended deep draft berths.

FIGURE 30: SUMMARY OF ESTIMATED DREDGING BY PROJECT STAGE

<table>
<thead>
<tr>
<th>Phase</th>
<th>Approximate Dredging Period (months)</th>
<th>Approximate Volume Dredged (Mm3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>7.5</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>6.5</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>42</td>
</tr>
</tbody>
</table>

NOR OFF-SHORE STRUCTURES, PROPOSED LUMSDEN POINT & WEDGEFIELD INDUSTRIAL ESTATE.
### ELEMENTS OF THE OUTER HARBOUR CONCEPT

**Offshore Loading Facilities**

The concept details development of two separate finger jetties extending approximately four kilometres out to sea from Finucane Island. The 2009 Outer Harbour concept is based on an additional Outer Harbour concept (BHPBIO and Roy Hill) for ore exports. The finger jetties consist of a concrete deck over steel piles along the entire length.

**Road**

Currently, three road routes to deliver rail ore to Port Hedland’s Outer Harbour for ore export have been identified. These routes are:

- BHPBIO’s proposed western spur rail route commences with a rail spur linking BHPBIO’s Boodarie Stockyards with a branch off the existing Mount Newman railway.
- Roy Hill Infrastructure’s (RHI) planned railway feeding Stockyard 1 at the PHPA Boodarie Stockyards; and
- A new proposed railway from Stockyard 2 within the PHPA’s Boodarie Stockyards for export by rail.

**Crossings of the Great Northern Highway (GNH)**

- The GNH currently uses a single lane bridge across the highway between each finger jetty. A new GNH bridge over each road will allow for grade separated crossing.
- The concept also has the potential to save infrastructure development costs through design solutions such as the shared grade separated crossing.

**Transport and Infrastructure Corridor**

The Outer Harbour concept includes two major landside transport corridors primarily for the transport of iron ore from the various Boodarie stockyards to ships moored at offshore Outer Harbour wharves. These transport and infrastructure corridors are expected to include conveyors, access roads for conveyor inspection and maintenance, services such as power and water to the facilities, and the potential for tunnels or underground conveyors to allow conveyors to pass beneath the access road and rail trestles.

**Offshore Loading Facilities (OLF)**

BHPBIO’s proposed OLF has the potential to deliver a minimum throughput of 50Mtpa with a fully developed direct competing up to four sets of 105Mtpa bulk modules.

An opportunity to increase Outer Harbour export capacity beyond 50Mtpa is possible on the provision that other proponents agree to develop infrastructure capacity to support the increase. This is underpinned by the recognition that infrastructure investment is required to support the export capacity beyond 50Mtpa currently being planned within the Port’s Inner Harbour.

**Elements of the Outer Harbour Concept**

- The concept shows a new channel, which, although totally separate in Figure 15 (page 36), has the potential to be linked to the existing channel along its length. This new channel will be modified to suit the existing design dimensions. The new channel will be modified for a new channel with two single-lane crossing facilities along the route. The new channel will be modified for a new channel with two single-lane crossing facilities along the route.
- The concept also has the potential to save infrastructure development costs through design solutions such as the shared grade separated crossing.
- It is expected that separate marine and port infrastructure systems will be developed from the individual proponents.
- The concept also has the potential to save infrastructure development costs through design solutions such as the shared grade separated crossing.

**Proposed Eight Berth BHP Finger Jetty**

![FIGURE 31: PROPOSED EIGHT BERTH FINGER JETTY](image-url)
CREATING A NEW VISION FOR THE PORT

Wharves

For the purposes of a fatal flaw analysis, various options were developed and assessed. Two wharf arrangements were considered: one for the initial proponent and one for other proponent users. The arrangement for the initial proponent was designed to allow the initial proponent to have a proposed total of eight berths to facilitate the export of 200Mtpa and a proposed six to eight berths for export of 200Mtpa for other proponents. Appropriate ship navigation simulation modelling will be undertaken to define final development layouts.

Berths, Basins & Channel

A standard arrival would involve the incoming vessel, assisted by four tugs, coming to a standstill in the swing basin before turning and manoeuvring to the designated berth with tug assistance. It is likely that up to twelve tugs would be required to assist an incoming vessel.

Berth pockets capable of safely accommodating the fully laden design vessel are proposed within the Outer Harbour concept. The plans permit the design vessel to be fully loaded in the berth pocket to the point that it can be safely remain in the berth pocket until the next tidal window in the event that a scheduled high tide sailing is missed.

Departing vessels will take advantage of high tides to maximise their load of ore whilst still being able to safely traverse the length of the departure channel. The Outer Harbour concept allows for a maximum “overlap” of channel, swing and departure basin volumes to permit minimal dredge volumes. Final dredge volumes are dependent on final confirmation of other proponent wharf development and will be subject to additional dredge volumes in the new channel to be dredged approximately two metres deeper than the current declared channel depth.

Dredging

Dredging volumes of Outer Harbour berth pockets, basins and departure channel is expected to be in the order of 70 million cubic metres to reach export volumes of 400Mtpa with greater volumes for 500Mtpa. The dredge pocket volumes and the design of both the channel and new departure channel to accepting vessels are to be subject to further assessment by the various proponent shipping lines. Subject to accepting reduced accessibility or draft limits on shipping, dredging depths and quantities may decrease.

There are several depressions in the seabed in close proximity to the dredge works that could be subject to the construction of the final raised depth and Commonwealth Government approvals would be required for the disposal of dredged material.

Indicative estimates of the dredge quantities are provided on page 62 and are based on minimal dredging requirements determined from previous studies.

NEXT STEPS

BHPBIO’s Outer Harbour development has received environmental approval. BHPBIO has approved US$917 million dollars of pre-commitment funding towards facilities development and operations at Port Hedland. The proponent has also completed the final feasibility studies and the project is currently working towards an expected start-up date of 2016 subject to further BHPBIO board approval.

Since the initial design concepts for the Outer Harbour were created, several new developments have been facilitated within the Boodarie area, most notably the allocation and use of Stockyards via Utah Point and the proposed NWI development in South West Creek.

AS THE PORT GOES, SO TOO DOES THE PHPA’S RESPONSIBILITY TO ENSURE THAT MAXIMUM TONNAGE CAN BE ACHIEVED THROUGH THE CHANNEL.
THE PORT HEDLAND PORT AUTHORITY IS COMMITTED TO PROTECTING THE NATURAL BEAUTY OF THE PORT HEDLAND COASTLINE THROUGH ITS USE OF INNOVATIVE ENGINEERING PRACTICES AND POLICIES.
The Port is located within Port Hedland Harbour—a complex estuarine system with significant environmental value. The wide variety and diversity of mangrove species in the Harbour and adjacent waters include 24 different species. Various other species of marine organisms, including diatoms, plankton, infauna, epifauna, fish, reptiles and mammals are common within the Harbour and adjacent waters. A significant number of marine organisms, including 14 species of mammals, 18 species of reptiles, 175 species of fish, 26 species of invertebrates, and 16 species of birds have been identified within this area. The PHPA's 2003 Ultimate Development Plan (UDP) identified three major environmental issues requiring careful planning and management in order to mitigate trade-offs across the north west, namely benthic primary producer habitat (mangroves), dust and noise. This section outlines consideration of these environmental issues and PHPA's plans to address them for the unique environment.

PROTECTING PORT HEDLAND MANGROVES

In 1963, the total area of mangroves existing within the Port Hedland management unit (as defined under Environmental Protection Authority (EPA) Guidance Statement (GS) 29) was 2,676 hectares. Since 1963, 302.1 hectares of mangroves have been disturbed, with a further 40.1 hectares approved by the EPA for disturbance as part of the South West Creek Dredging and Reclamation Project. The total actual and approved disturbed mangrove area is 342.2 hectares since 1963.

Without the PHPA adopting measures to address the impacts of disturbance, additional areas of mangroves are likely to be disturbed under the Port Development Plan (PDP). Significant efforts are required to replace areas of mangroves to be disturbed under the PDP.

The VCSRG report notes two methods of addressing mangrove loss offsets, namely the creation of area(s) that mirror the function of disturbed mangrove areas, and/or work to improve existing wetlands to ensure that the overall design objectives of the development are maintained. The Port Development Plan outlines a number of measures to offset mangrove losses, including the creation of area(s) that mirror the function of disturbed mangrove areas, and/or work to improve existing wetlands. The report concludes that carefully selecting tidal creek systems intended to replicate disturbed mangrove populations could in fact improve ecological function and provide a major mitigation strategy for Port Hedland.

The Port Hedland Port Authority is diligent in discharging its duties as required under the Port Authorities Act (1999), working proactively to deliver robust environmental protection initiatives within a rigid environmental management framework to protect the Port Hedland environs.
MARINE WATER QUALITY

Industrial Waste Discharge

The discharge of industrial waste into Port waters is not currently an issue. Vigilance will be required to ensure this remains the case in the long term in view of future developments at Boodarie Industrial Estate and the Wedgefield light industrial area.

Product Spillage During Loading

Minimal product spillage during cargo handling occurs within the Port. The relocation of chrome and manganese exports to the Utah Point Multi-User Bulk Facility is allowing the PHPA to modify ship loader and feed systems to ensure such spill risks are kept to a minimum.

Dredging

Dredging is an essential part of developing and maintaining shipping in the Port. Cutter suction and trailer suction dredgers typically create a plume of suspended particles and sediments that needs to be captured and disposed of. Containment of dredging will have an impact on the biological and chemical properties of the water and the ecological function and productivity of the Port. Cutter suction dredgers have a deeper draft and generate a greater volume of dredging spoil than trailers which operate in shallower water.

The reclamation of land using cutter suction dredge spoil can be undertaken such that reclamation area water can be retained long enough to sufficiently settle all sediments prior to clear wastewater being returned to the Harbour.

Maintenance dredging is generally performed to maintain minimal depth waterway profiles to ensure sufficient waterway capacity and safety in the Port. More frequent berth pocket dredging activities will avoid contaminant level build-up and permit continued disposal at sea. The PHPA is planning to increase the frequency of such activities for high use berths to improve Port capacity and efficiency of the shipping task that in turn increases profitability for commodity producers.

In the unlikely event of a major oil spill, state and national response procedures are in place to respond to oil spills threatening mangrove populations.

Oil Spillage

Commercial oil spillages are a rare event within the Harbour. Disposal of contaminated bilge oils into the Harbour is prohibited and accidental discharge occurrences are rare. The PHPA has developed oil spill response plans for major spills that include the use of oil spill booms, site-response teams and equipment to contain and clean-up spillage. The PHPA shall seek to develop oil spill contingency plans within the Port vicinity to ensure that suitable equipment and personnel are on hand to respond to moderate spills.

In the unlikely event of a major oil spill, state and national response procedures are in place to respond to oil spills threatening mangrove populations.

Ballast Water Discharge

Ballast water poses significant risk due to the real possibility of ballast water containing foreign marine species that are destructive to native species. As such, the discharge of ballast water in ports is governed by international policy and Australian legislation.

Under AQIS authority, the discharge of ballast water is permitted in Australian ports provided ships exchange their ballast with clean seawater during transit between ports. In ports such as Port Hedland, the discharge of large quantities of ballast water is essential during the ship loading process.

Alternatives to this procedure such as pumping to onshore treatment tanks or onboard chemical treatment have been evaluated by the PHPA, with no viable alternative determined. As such, existing protocols remain in place to ensure ballast water is exchanged before the discharge of ballast water can occur.

The PHPA has undertaken extensive baseline studies of the Port and has a continuing involvement in the monitoring of marine pests, with a part of their daily activities undertaken in collaboration with the Department of Environment Western Australia.

FIGURE 34: CUTTER SUCTION DREDGER UNLOADING SPOIL CONTENTS (PHPA)
Air Quality

Air quality, in particular dust, is a significant environmental issue for Port Hedland given the nature of minerals conveyed in and out of the Port. The EPA’s Environmental Protection Bulletin (EPB) No.2 Port Hedland Dust and Noise (2009) necessitated a coordinated effort by Government and industry to develop and implement a strategic plan to reduce Port Hedland’s dust and noise issues. The推薦 Rapid Growth Plan (RGP), currently at the planning stage, includes a commitment in the 2010¾2013 Investment Plan to implement an Air Quality and Noise Management Plan underpinning RGP. SKM’s broad scale modelling study in 2010 predicted the likely air quality impacts in implementation of the Port Development Strategy. The study modelled current operations based on the Port Hedland Dust Management Taskforce’s interim guidelines for PM10 concentrations referenced were those of the Port Hedland harbour, hospital, South Hedland High School and hospital monitoring stations. These conventions and practices ensure anti-fouling paints containing organotins such as TBT have long been concerns about Port Hedland dust levels. The Australian and New Zealand Environment and Conservation Council’s Code of Practice for all commercial vessels in Australian waters prohibits the use of anti-fouling paints containing organotins. Anti-fouling paints containing organotins such as TBT have long been concerns about Port Hedland dust levels. The Australian and New Zealand Environment and Conservation Council’s Code of Practice for all commercial vessels in Australian waters prohibits the use of anti-fouling paints containing organotins. Anti-fouling paints containing organotins such as TBT have long been concerns about Port Hedland dust levels. The Australian and New Zealand Environment and Conservation Council’s Code of Practice for all commercial vessels in Australian waters prohibits the use of anti-fouling paints containing organotins.

Wind Roses

Aberdeen dust is dispersed according to wind direction and strength. For earlier shipping days, it was a common occurrence that vessel dust levels referenced were those of the Port Hedland harbour, hospital, South Hedland High School and hospital monitoring stations. Further modelling of dust will be carried out to determine the relative impact of development on dust levels referenced are those of the Port Hedland hospital, South Hedland High School and hospital monitoring stations. Further modelling of dust will be carried out to determine the relative impact of development on dust levels.
PORT HEDLAND INDUSTRIES COUNCIL

Following the release of the EPA’s Environmental Protection and Management Plan for Port Hedland, Industry groups have expressed their support for the Plan’s recommendations. In the past, the Town of Port Hedland has been under considerable pressure to address its industrial waste management issues. The Plan outlines a number of initiatives to address these concerns, including the development of a waste management plan, the establishment of recycling programs, and the promotion of sustainable waste disposal practices.

FAUNA - TURTLES

Turtles are a critically endangered species that are highly vulnerable to Port development activities. The Port Hedland Dust and Noise Taskforce has identified a number of areas where turtle activity may be impacted, including the Port’s Inner Harbour and the surrounding coastal areas. The Taskforce has recommended that detailed studies be conducted to assess the potential impacts of Port development on turtle populations and to develop mitigation strategies to protect these vulnerable species.

DUST - SOLUTIONS

The suppression of dust from stockpiles is typically performed by water cannons. Fresh or potable water is used for watering stockpiles as higher seawater salinity levels may introduce impurities that adversely affect steel making in blast furnaces. Dampier, provides a viable solution for Port Hedland’s long-term water requirements.

ENVIRONMENTAL SUSTAINABILITY

POTABLE WATER SUPPLIES

The case study of the Port Hedland Dust and Noise Taskforce (2009) focused on the suppression of dust and noise from Port development activities. The Taskforce recommended that detailed studies be conducted to assess the potential impacts of Port development on dust and noise levels and to develop mitigation strategies to protect these vulnerable species.

STORM SURGE - STUDIES

The Port Hedland Dust and Noise Taskforce has also established the Port Hedland Dust and Noise Taskforce, Port Hedland industry groups sought to develop a cooperative approach to the management and monitoring of air quality. The Taskforce has recommended that detailed studies be conducted to assess the potential impacts of Port development on dust and noise levels and to develop mitigation strategies to protect these vulnerable species.
SOCIAL SUSTAINABILITY

PORT HEDLAND IS BEING TRANSFORMED INTO A MODERN AND VIBRANT REGIONAL HUB WITH STRONG LINKS BETWEEN COMMUNITY AND ENTERPRISE.
In recognizing the importance of supporting local communities and the role industry plays in making Port Hedland an attractive place to live and work, the Port Development Plan addresses key areas to support the State Government’s long-term sustainable Pilbara Cities initiative.

The Plan is closely aligned to the Town of Port Hedland’s Land Use Master Plan (LUMP) 2007 and aims to achieve the following economic and social sustainability goals:

- Significant trade growth and industrial development to increase local employment opportunities and drive prosperity for the residents and businesses in Port Hedland;
- Support for recreational boating facilities with a safe boat haven/marina development at Spoil Bank and road access improvements to Finucane Island boat launching facility (Refer Figure 39 on page 78);
- Accommodation of cruise ships to bolster tourism trade;
- Reduction in the number of heavy road trains accessing the Port via Wilson Street;
- Reduction of dust in the west end of the town by relocating manganese and chrome to Utah Point Multi-User Bulk Facility and the establishment of guidelines for future developments.

Future stockyard developments to be located to the north west of the Boodarie Industrial Estate to avoid prevailing winds that impact Port Hedland and South Hedland;

- Recognition of existing communities and land use and the establishment of on-site and off-site buffers to avoid conflicting land use;
- Recognition of heritage values through the Cultural Heritage Management Plan;
- Support for a single enlarged rail corridor for future railway lines to access the west side of the harbour (aligned with the west side of the industrial site); and
- Development of the Westside bulk terminal to access the Port from the west of the Boodarie Industrial Estate.

BUFFERS AND COMPATIBLE DEVELOPMENT

As part of the LUMP process, the PHPA agreed to establish a 500 metre on-site buffer to the north and west sides of Wedgefield in exchange for a plot of unallocated crown land to the west of Wedgefield being vested with the PHPA. Development within these on-site buffers will be limited to low impact light industry uses. Land reclamation described within this Plan and the GNH realignment will not affect land use planning of the on-site buffer to the north of Wedgefield.

In all other areas of the Port, a 500 metre wide off-site buffer applies to minimise the risk of incompatible developments occurring adjacent to the Port in the future.

ABORIGINAL HERITAGE

Previous research undertaken by the Department of Indigenous Affairs quantifies numerous archaeological sites of potential significance occurring within the Port area and surrounding localities. These sites primarily consist of rock art and stone artifacts with occasional occurrences of traditional cultural object findings. Cultural heritage values include rock art and stone artifacts.

CHMP identifies all known sites of indigenous cultural significance. Under the CHMP, the PHPA or duly authorised proponents must apply to the Department of Indigenous Affairs Aboriginal Cultural Material Committee (ACMC) to conduct any works. The ACMC will require an archaeological impact assessment prior to any works. The phpA has successfully employed measures outlined in this Plan to protect the region’s unique cultural history before any development approvals are granted.

The PHPA has successfully employed measures outlined in the previous UDP and will continue to do so under this Plan to guarantee conformity to requirements of the Aboriginal Heritage Act. In relation to any future development proposals, the PHPA will effectively address any issues that may prevent future development of the Port.

ECONOMIC BENEFITS

Forecast trade increases equate to commodity value increases from AUD$20 billion to an estimated AUD$66 billion by 2015/16.

Employment growth will not only be experienced as a direct result of trade growth, but in creating the infrastructure and support services network to support industrial activities.

With Lumsden Point and Outer Harbour developments expected to be operational by 2015/16 and additional services being introduced to support these developments, Port Hedland’s population is expected to grow from 12,756 to 15,000 by 2016. Port Hedland’s total population is expected to reach 26,000 by 2036 when the same period.

With population growth comes the need for improved quality and choice in education, recreation, retail and commercial services. It is envisaged that the Port Development Plan helps ensure adequate provision for housing and associated infrastructure.

With a port population forecast to reach 26,000 by 2036, employment growth will not only be experienced as a direct result of trade growth, but in creating the infrastructure and support services network to support industrial activities.

Given the inability for the PHPA to establish buffer zones at the west end of the Port Hedland township, the PHPA will ensure measures outlined in the CHMP realign land use to accommodate for future development. These measures include establishing a 500 metre wide off-site buffer in all development areas to the north and west of the Port.

Support for a single enlarged rail corridor for future railway lines to access the west side of the harbour (aligned with the west side of the industrial site); and development of the Westside bulk terminal to access the Port from the west of the Boodarie Industrial Estate.

With Lumsden Point and Outer Harbour developments expected to be operational by 2015/16 and additional services being introduced to support these developments, Port Hedland’s population is expected to grow from 12,756 to 15,000 by 2016. Port Hedland’s total population is expected to reach 26,000 by 2036.
Growing interest has been shown by cruise ship operators to include Port Hedland on their itineraries given the industrial tourism opportunities available within the Port. This is partly due to the lure of unique indigenous, heritage and arts culture, and proximity to Karijini National Park and is a prime place to experience offshore whale migration and turtle beach nesting. Cruise ships berthed at the public wharves will have an elevated view over the entire Port, overseeing ships of all sizes (including leviathans of the sea) loading, turning and berthing. Opportunities such as the proposed Salmon Creek resort facility will develop in response to growth in sea bound tourism.

Given the number of mega yachts currently calling the Kimberley (Queen of the Kimberley is a 158m long mega yacht) and the potential for Port Hedland to accommodate these vessels, potential also exists for Port Hedland to welcome these vessels.

Coastal Vessel

The State currently subsidises the operation of the Kimberley Queen coastal vessel, a 16,000 tonne 6,300 capacity ship capable of lifting up to 384 twenty-foot equivalent units (teu) with 60 refrigerated capacity with two 40Mt cranes. This vessel primarily serves the needs of the Kimberley with regular calls at Broome and Wyndham and offers inducement calls to other ports such as Dampier and Port Hedland on route. The Kimberley Queen caters for all types of cargo including containerised, breakbulk and bulker bags capable of handling products such as cement, lime, fertiliser, small vessels and construction and mining machinery.

With development of the Lumsden Point, the PHPA envisages more regular coastal vessel calls through Port Hedland will improve freight competition by providing local industry options to employ sea freight over road freight to remove subsidies currently in place.

Recreational Boating

Port Hedland has long needed protected moorings for recreational vessels. Recreational boating is currently restricted to trailer-sized vessels. Yachting in particular is very limited, with small yachts confined to small areas or supplied by small marinas. Recreational boating is currently restricted to trailer-sized vessels. Yachting in particular is very limited, with small yachts confined to small areas or supplied by small marinas. Establishing a variety of new, secure moorings within the Harbour and marine environment will provide exciting new opportunities for the region and encourage new business operators to service its needs.

Industrial Tourism

Cruise Ship and Mega Yacht Port Calls

Relocation of manganese and chrome exports to Utah Point and PHPA’s desire to develop Lumsden Point and South West Creek on the southern side of the Harbour will enable cruise ships to be accommodated at the existing Port Authority wharfs. Growing interest has been shown by cruise ship operators to include Port Hedland on their itineraries given the industrial tourism opportunities available within the Port. This is partly due to the lure of unique indigenous, heritage and arts culture, and proximity to Karijini National Park and is a prime place to experience offshore whale migration and turtle beach nesting. Cruise ships berthed at the public wharves will have an elevated view over the entire Port, overseeing ships of all sizes (including leviathans of the sea) loading, turning and berthing. Opportunities such as the proposed Salmon Creek resort facility will develop in response to growth in sea bound tourism.

Given the number of mega yachts currently calling the Kimberley (Queen of the Kimberley is a 158m long mega yacht) and the potential for Port Hedland to accommodate these vessels, potential also exists for Port Hedland to welcome these vessels.

Coastal Vessel

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With development of the Lumsden Point, the PHPA envisages more regular coastal vessel calls through Port Hedland will improve freight competition by providing local industry options to employ sea freight over road freight to remove subsidies currently in place.
Given the PHPA’s major role in supporting economic growth and environmental sustainability within the Pilbara region and the resources sector, it is keenly aware of the importance of building and maintaining positive stakeholder relations to ensure the best outcomes for industry, the State and the Port Hedland community. The PHPA is a vital part of the Port Hedland and Pilbara community and works closely with the State Government, the State of Pilbara and the community in its efforts to add value to the region’s natural resources and contribute to a sustainable future for the Pilbara region. The PHPA is committed to providing a framework for open, transparent and effective two-way stakeholder engagement and communications which is regarded as critical to building the support, confidence and trust necessary to deliver on the PHPA’s mission.

The PHPA values the role it has played, and will continue to play in the economic development and sustainability of the region. As the demand for bulk commodities such as iron ore grows, so will the need for increased throughput capacity and expansion at Port Hedland Port.

The PHPA aims to demonstrate its values through managing stakeholder expectations, easily identifying issues and improving relationships and interactions whilst striving to deliver upon its Vision and Mission.

The PHPA engages directly with a diverse range of key stakeholders including:
- State Government (Ministers and Departmental representatives)
- Federal Government (Ministers and Departmental representatives)
- Local Government (Councillors and administrative bodies)
- Regulatory authorities
- PHPA employees
- Port users and customers (exporters and importers)
- Contractors and suppliers
- Special interest groups (environmental and indigenous)
- Business and industry groups

As well as engaging with stakeholders on an individual basis, the PHPA also engages with stakeholders through a number of other important ongoing forums such as:
- Port Consultation Group
- Local Emergency Management Committee
- Community Consultative Group
- Port Hedland Industries Council
- Port Hedland Dust and Noise Taskforce
- Port Hedland Air Quality Reference Group
- Port Hedland Economic Development Forum
- Utah Users Strategic Management Group

The PHPA communicates with its stakeholders through strategies outlined in the Engagement Strategy and Communications Action (ESCA) Plans and include some of the following:

**EXTERNAL COMMUNICATIONS**
- External stakeholder briefings and presentations
- PHPA website and online newsletter
- Regular newsletters
- Community enquiries/complaints process
- Community liaison groups
- Change notifications and Health, Safety & Environment bulletins
- Internal newsletters
- Staff surveys
- Internal email updates
- Reputational surveys
- Staff survey
- Community briefings and workshops
- Internal briefings and workshops
- Internal email updates
- Internal surveys

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- Reputational surveys
- Staff survey
- Community briefings and workshops
- Internal briefings and workshops
- Internal email updates
## PORT HEDLAND PORT AUTHORITY THROUGHPUT ESTIMATES

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## ACRONYMS

- **AHD** Australian Height Datum
- **ANZEC** Australian and New Zealand Environment and Conservation Council
- **AQIS** Australian Quarantine Inspection Service
- **BHPBIIO** BHP Billiton Iron Ore
- **BIE** Boodarie Industrial Estate
- **BOM** Bureau of Meteorology
- **CD** Chart Datum
- **CHMP** Cultural Heritage Management Plan
- **CTF** Crew Transfer Facility
- **DoT** Department of Transport
- **DRD** Department of Regional Development
- **DI** Department of Industry & Resources
- **DSG** Department of State Development
- **ESCA** Environment Strategy and Communications Action
- **ERPA** Environment Protection Authority
- **ERPAI** Environmental Protection Authority
- **EPF** Environmental Protection Fund
- **GEMS** Global Environmental Monitoring Systems
- **GNH** Great Northern Highway
- **HBI** Hot Briquetted Iron
- **IMF** Integrated Marine Facility
- **IMO** International Maritime Organisation
- **LIDP** Land Use Data Plan
- **MOC** Marine Offloading Facility
- **NEPM** National Environmental Protection Measure
- **NWS** North Western Sydney
- **PAM** Pre-Accredited Module
- **PHC** Port Hedland凄ndustries Council
- **PMA** Port Multi-purpose Authority
- **PMP** Port Multi-purpose Port
- **PSG** Port Services Group
- **SBP** Strategy Development Plan
- **SGM** Space Geography Masterplan
- **SNF** Strategic Plan
- **TBL** Tactical
- **TCLDF** Temporary Contractors Load Out Facility
- **TSU** Twenty Foot Equivalent Units
- **TPA** The Pilbara Authority
- **TSP** Tri-State Partnership
- **URP** Ultimate Development Plan
- **VCSRG** V & C Semeniuk Research Group
- **WCLIP** Western Corridor Infrastructure Plan
CONTACT US

Email: php@phpa.com.au
Website: www.phpa.com.au

PORT HEDLAND OFFICE
Phone: (08) 9173 0000
Fax: (08) 9173 0060
Postal Address: PO Box 2, Port Hedland
Western Australia, 6721
Street Address: The Esplanade, Port Hedland
Western Australia, 6721

PERTH OFFICE
Phone: (08) 9212 8100
Fax: (08) 9212 8119
Street Address: Level 1, 1195 Hay Street, West Perth
Western Australia, 6005

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DOCUMENT VERSION NUMBER
062012/01