

3.0 CHALLENGES AND OPPORTUNITIES FOR GROWTH

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The current challenges facing Port Hedland are well known amongst government, industry and community stakeholders, and continue to be documented in a wide range of publications and media reports. Increasing international demand for mineral resources, combined with Port Hedland's strategic infrastructure assets and locational advantages, provides a strong economic platform for future growth. In turn, the rapid expansion of mining and export operations in the Pilbara has placed significant additional pressures on local housing markets, infrastructure capacity and local communities.

This section provides an overview of the key challenges and opportunities facing the town as it grows into a modern, sustainable City.

3.1 POPULATION AND DEMOGRAPHICS

Current Population and Growth Trends

Port Hedland has an estimated 'total service population' of 19,216 persons, comprised of 14,624 permanent residents, 2,906 fly-in fly-out (FIFO) and contract workers and 1,686 short-term visitors (AEC group, 2011). Whilst an average annual population growth rate of only 1.5% was experienced over the last decade, increasing regional mining activity and exports through Port Hedland has significantly accelerated population growth in more recent years (approximately 5% in 2009). This volatility in annual population growth rates is common in many regional mining communities, where population growth is strongly linked to periods of operational expansion and major construction projects.

Population growth is expected to remain strong, linked to robust economic growth estimates and international resources demand. Economic forecasts suggest that a population of approximately 40,000 people will be required by 2031 to support projected levels

of economic growth and meet anticipated labour requirements. However, as history has demonstrated, Port Hedland's economy and associated population growth is extremely dynamic and can vary significantly depending on resources demand levels and/or the timing of new strategic expansion projects.

This unpredictable nature of economic and population growth poses significant challenges in planning for the supply of additional housing and infrastructure. The Growth Plan is therefore planning for a total population of at least 50,000 people by 2031. This is consistent with the Pilbara Planning and Infrastructure Framework (PIIF) target of a city of 50,000 people.

The Growth Plan plans for an uplift on the economy-led population forecasts, thereby ensuring that there will be more than enough new residential and non-residential land, services and infrastructure in the forward pipeline to meet future demand, correct current under supply issues and normalise the housing

market (including a reinstatement of typical urban vacancy rates of approximately 8%).

In order for Port Hedland to reach a total population of over 50,000 people by 2031, the residential population would need to grow at an average rate greater than 4% per year. To put this in perspective, Port Hedland has only exceeded a 4% annual growth rate once in the last decade (in 2009), and since 2001, only three regional local government areas (LGA's) in Australia have been able to sustain such a growth rate (Weipa, Qld; Dardanup, WA; and East Pilbara, WA).

Given current skills sets and the scale of new construction work required, it is clear that Port Hedland does not have a large enough construction workforce at present to build the number of houses associated with this level of population growth. This impediment is complicated further by significant future industrial projects competing for construction personnel and materials,

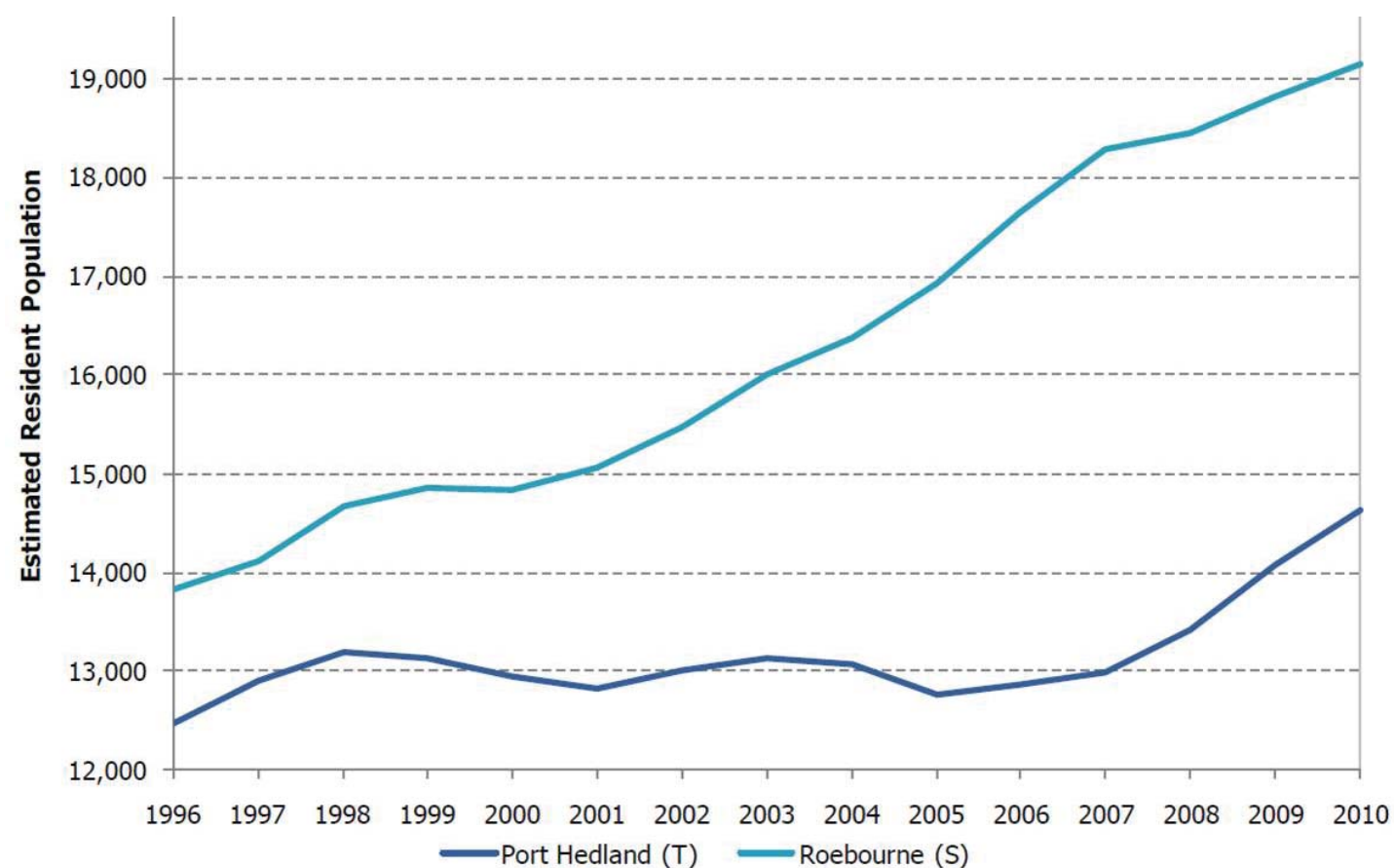


Figure 3.1: Historical Population Growth, Port Hedland, 1996 -2010 (Source - ABS 2011, AEC group, 2011)

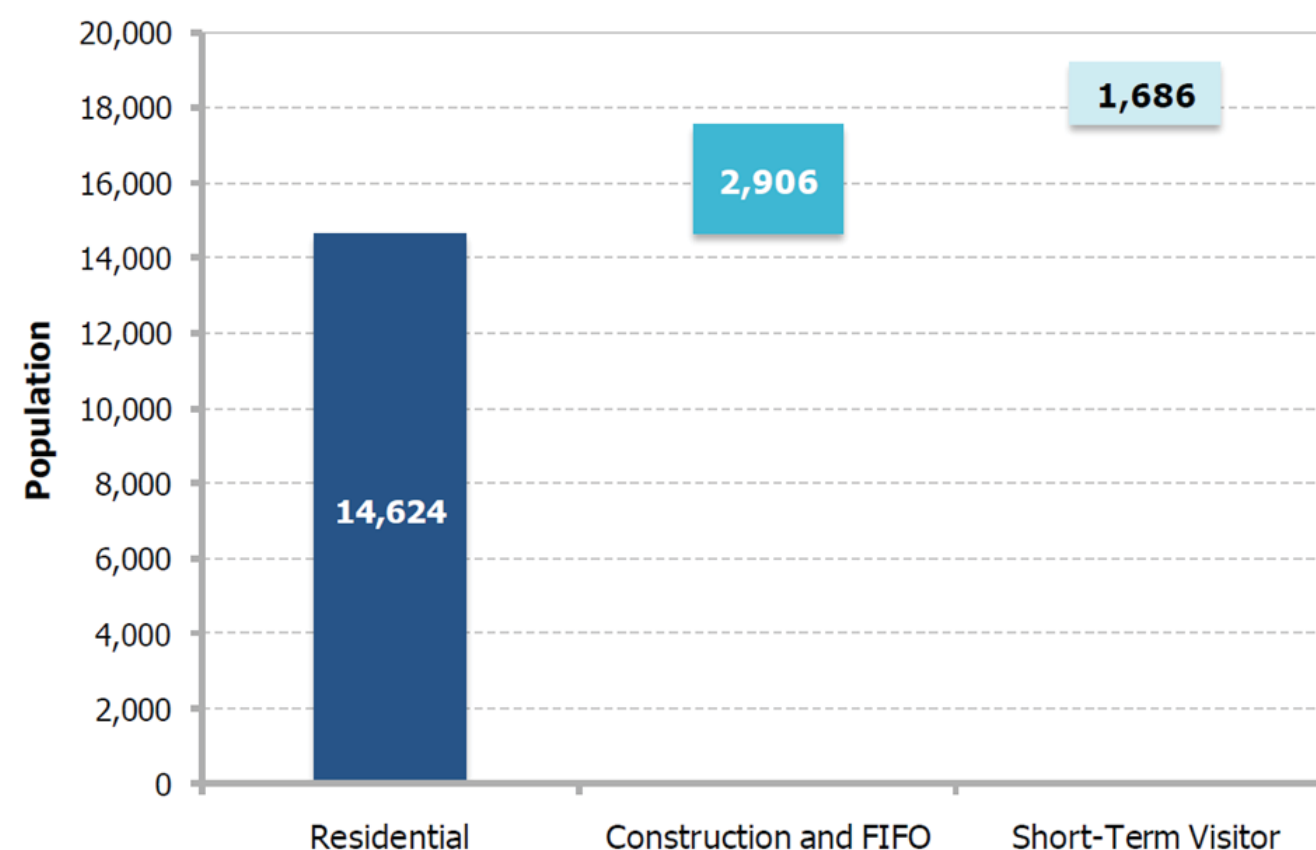


Figure 3.2: Composition of Total Service Population, 2010 (Source - AEC group, 2011)

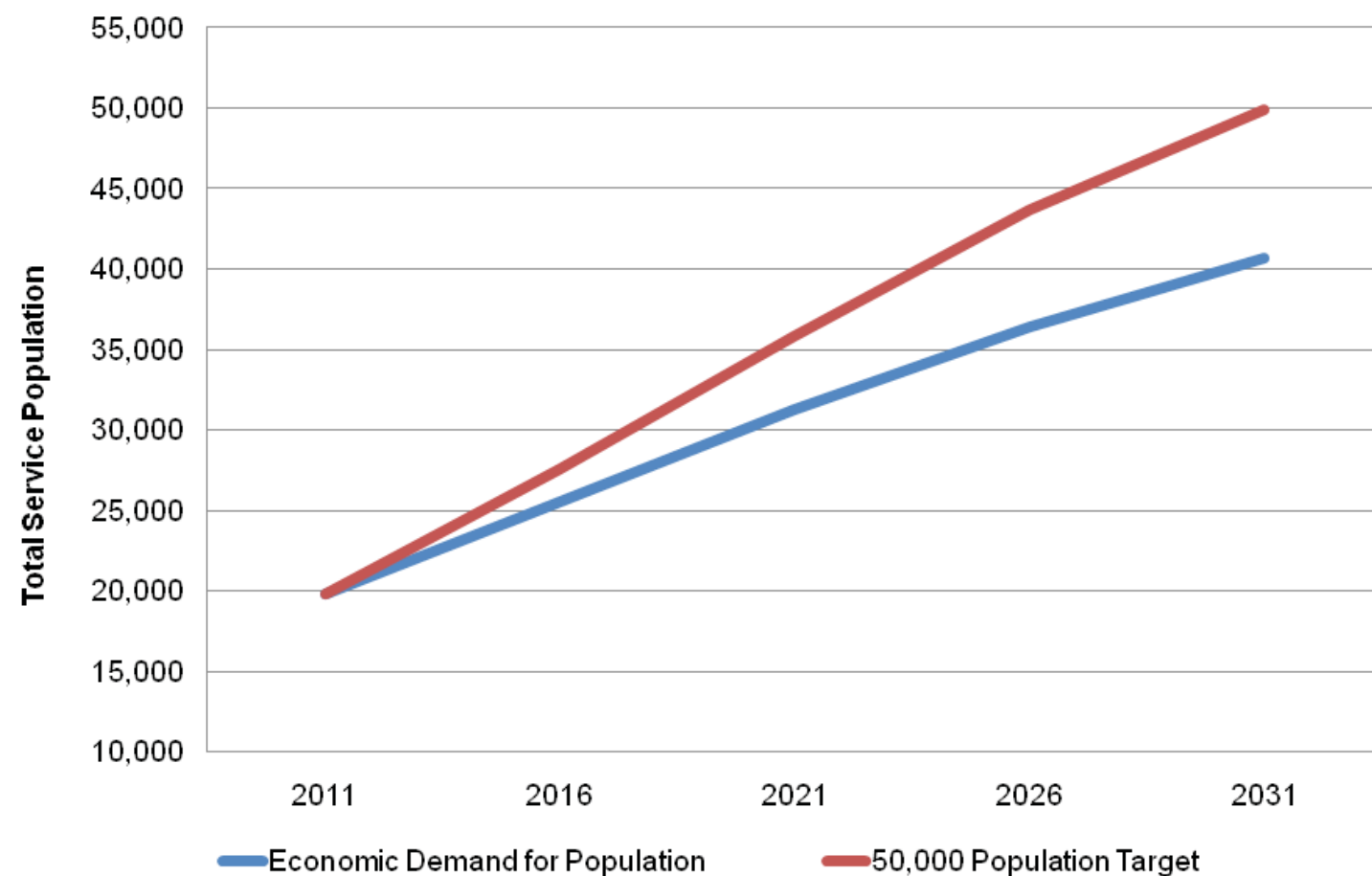


Figure 3.3: Future Population Growth, 2011 - 2031 (Source - AEC group, 2011 and RPS, 2011)

driving up costs.

The extent of these challenges dictates that a fundamental change is required in the way new housing is delivered and a skilled construction labour force is accommodated in the City. It is clear that in the short to medium term, there are few other options than to attract additional skilled labour through fly-in fly-out (FIFO) arrangements and accommodate them in workforce accommodation. Without a critical mass of skilled labour being accommodated in the City, existing issues of housing supply and affordability will be further exacerbated, potentially having lasting negative effects on both the local community and strategic industrial operations. In the medium to long term however, a move towards greater residential permanency of the skilled labour workforce will be required to ensure the City continues to grow and operate in a sustainable and socially inclusive manner, without having to rely on temporary arrangements.

Key Challenges and Opportunities

- Attracting and sustaining a resident population growth rate of over 4% per annum;
- Attracting and accommodating a significantly large construction workforce in the short term to deliver both industrial and essential domestic construction projects;
- Reducing the reliance on a FIFO workforce and encouraging an increased permanent residential workforce in the long term;
- Annual population growth rates of over 4% are achievable in Port Hedland, as evidenced in recent years (2009); and
- Population growth is supported by a very strong platform of economic growth.

3.2 ECONOMY

Economic Profile

The significant mineral, oil and gas reserves of the Pilbara region (accounting for 47% of WA mineral and petroleum production in 2009/10) are driving strong economic growth, with Port Hedland playing a key role as the regional and international gateway unlocking much of this wealth (In 2009/10, Port Hedland exported US\$18.7b of Iron Ore). On the back of this mining and export activity, Port Hedland's economy has grown 61.3% over the last three years, with significant additional growth projected as a result of considerable long term global demand for steel and iron.

Gross Regional Product (GRP) estimates illustrate that Port Hedland is a mono-economy, with almost three quarters of production value (73% of the total \$3.3b GRP) and 46% of total employment resulting from activity in the mining industry. Additionally, economic activity in the construction and transport sectors is strongly linked to the mining industry, through the

dominance of civil engineering projects, mineral resource exports through the Port Hedland Port and the prominence of business related visitors through the Port Hedland International Airport.

In 2031, Port Hedland's economy is projected to reach over \$8.7b annually. This is over four times as large as the economy in 2006/07 (\$2.0b) and over twice as large as 2009/10 (\$3.3b). The mining sector is expected to remain the most significant contributor to GRP, with an expected increase of \$3.8b (or 165.6%) expected over the period.

The reliance of local prosperity and quality of life on a single industry poses a medium to long-term risk for Port Hedland, should a decline in international resources demand be experienced. The dominance of mining (and associated port activities) also places significant demands on the labour market, including large numbers of transient workers, which in turn creates a shortage of employees in other sectors of the economy. Industrial construction



Figure 3.4: Gross Regional Product (\$b), 2006-7 to 2009-10 (Source - AEC group, 2011)

“...Port Hedland’s economy has grown 61.3% over the last three years, with significant additional growth projected as a result of considerable long term global demand for steel and iron. “

activity is poised for significant growth over the next five years, with \$46b worth of major projects designated in the immediate region.

To support the growth of the broader resource sector activity, Port Hedland is expected to invest approximately \$1b in supporting iron ore infrastructure and over \$45m in associated road and air infrastructure. This activity will consume materials and labour which would otherwise be required for local residential and commercial building projects in Port Hedland.

Employment and Skills

Mining is the region’s largest employer by far. Given the significant growth and development of the region over the past five years, Port Hedland’s next largest employers are construction

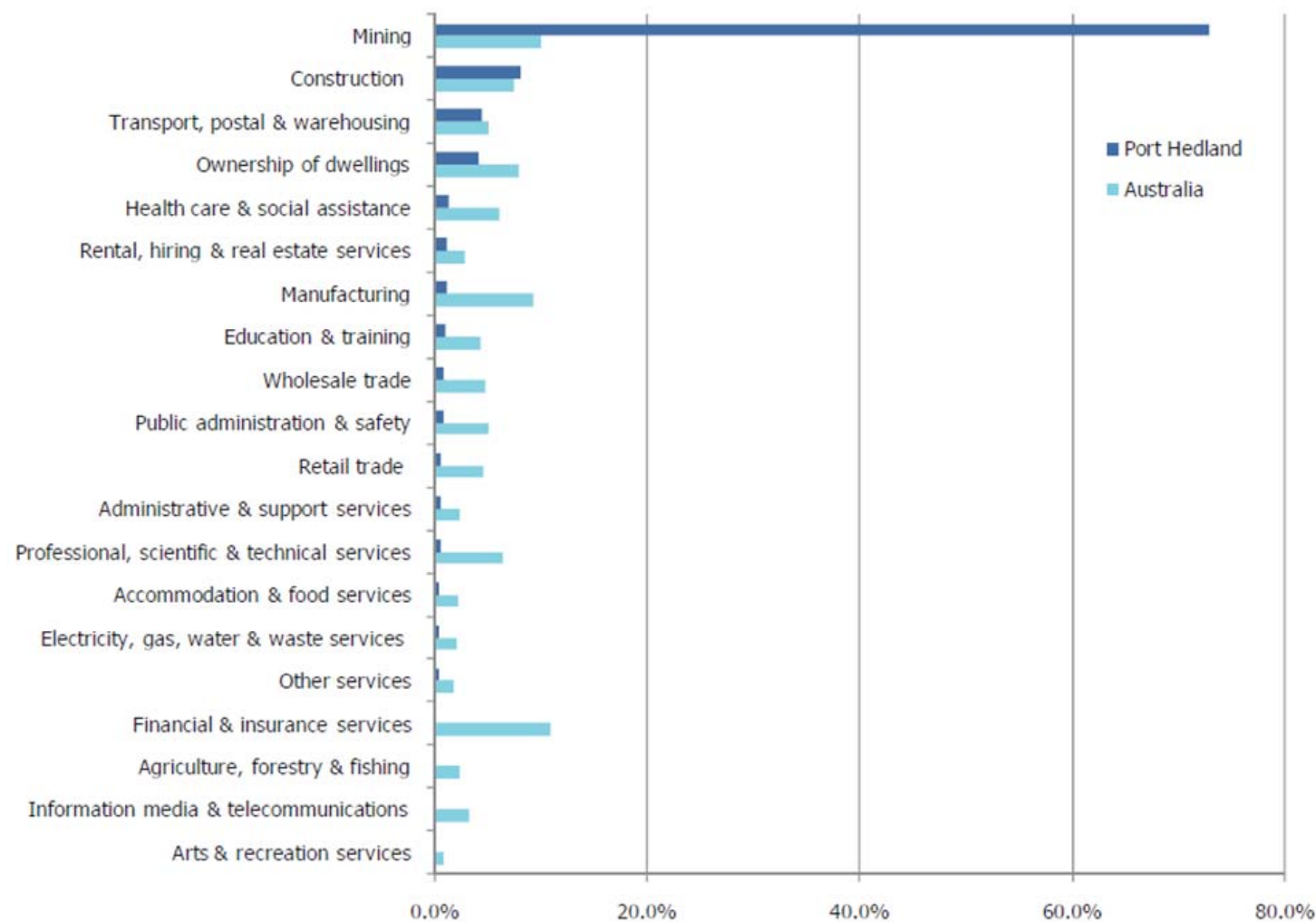


Figure 3.5: Percentage of Gross Regional Product by Industry, 2009-10 (Source - AEC group, 2011)

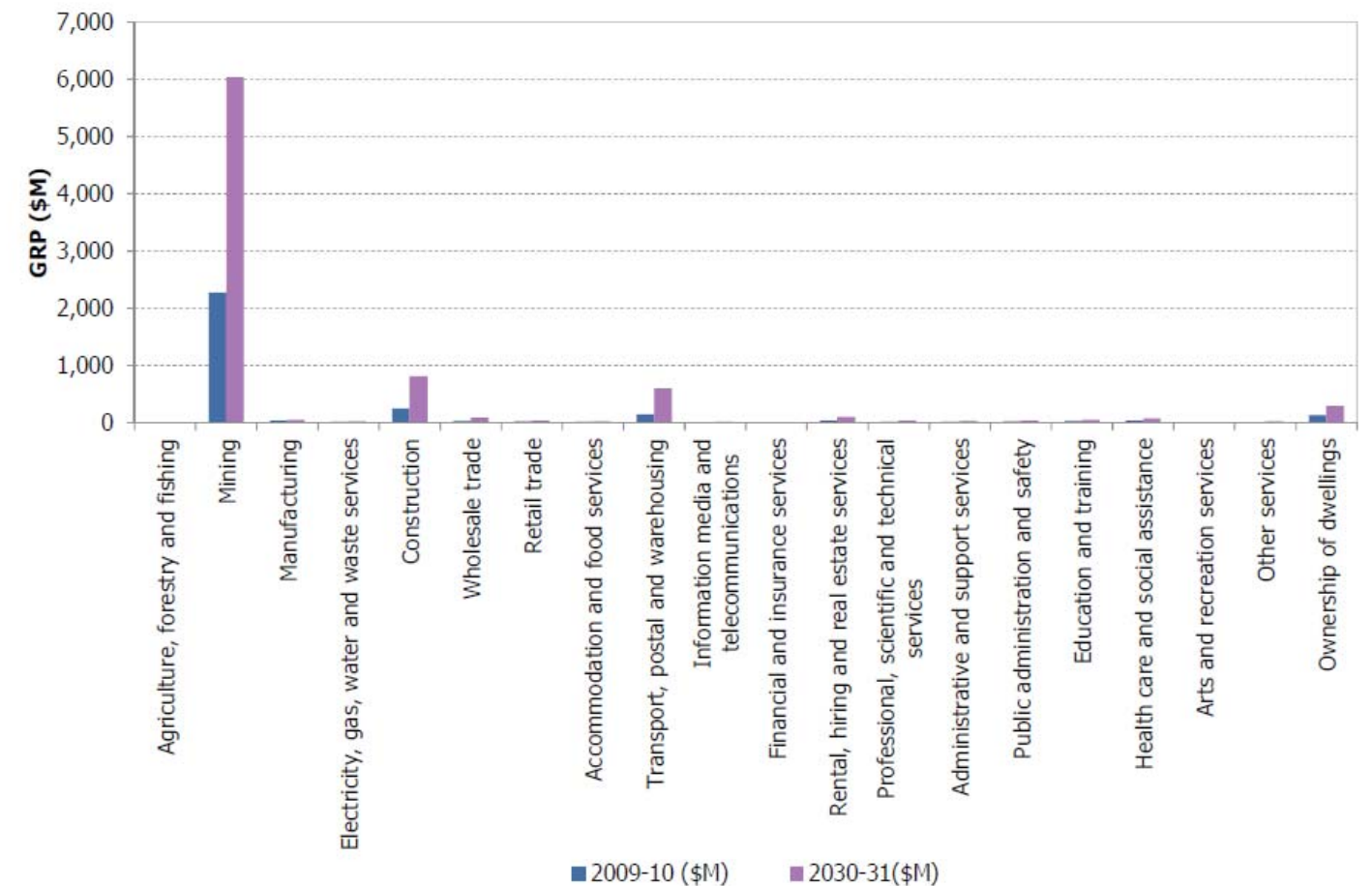


Figure 3.6: Gross Regional Product by Industry, 2031-32 (Source - AEC group, 2011)

and transport, followed by postal and warehousing. Population service industries feature as the remaining key sectors in the region with only a very small proportion of employment generated by professional and business types of services, electricity, gas, waste and water services, manufacturing or technical service areas. This highlights the dependency of the Port Hedland economy upon the mining sector and its associated industries and the relative vulnerability of the economy to the health of this sector for the generation of jobs and economic activity.

Port Hedland has a very high proportion of persons with a post-school qualification when compared to elsewhere in the Pilbara Region, Perth or Regional WA. This is due to the high proportion of skilled trades, technicians and other skill areas required by the mining sector. Key occupations and skill areas within Port Hedland and the broader Pilbara Region are tradespersons and

related workers, labourers and related workers and intermediate production and transport workers – all skill areas that are well above the Perth SD and regional Western Australia averages. Demand for these skill types reflect a similar skills profile other highly resource based economies face throughout Australia.

Employment Rate and Forecasts

Employment is forecast to increase strongly between 2011 and 2016 (by 7.0% or almost 3500 jobs), and then less rapidly over the period 2016 to 2031. This is a reflection of expected GRP growth over the same period. As at 2009-10, the majority of workers in 2030-31 are expected to be employed in the mining sector. Construction (3,373 jobs) and Transport, Postal and Warehousing (2,679 jobs) are the next largest employing industries in 2031.

Despite the continued dominance of the mining sector in terms of total employment, other sectors account for a larger proportion of total employment in 2031 than they do GRP. This reflects the fact that the mining sector has a relatively low direct employment yield in comparison to sectors such as construction and transport. Nevertheless, the mining sector will continue to play a critical role in driving employment through its supply chain relationships with other parts of the economy.

As reflected by expected GRP growth, employment is forecast to grow fastest for the transport, postal and warehousing sector between 2009-10 and 2030-31 (212.2%). This is partly a reflection of the increase of Port capacity over the period, but also reflects growth in general road and rail transport in response to increased population growth over time. Construction (160.6%), rental hiring and real estate services (140.4%), mining (127.4%), and wholesale trade (114.1%) are also expected to experience fast employment growth.

Despite having a strong local economy which has been built upon the resources sector, Port Hedland has a high unemployment rate when compared to the broader Pilbara Region, Perth and regional WA. This is likely due to the higher levels of socially disadvantaged persons and indigenous persons within Port Hedland. Over the

past three quarters, unemployment levels have declined which is in line with State trends and is reflective of the strengthening of the WA economy as a whole over the period.

Regional Trends

Across Australia, regional centres are undergoing significant changes in their economic structure and development. Challenges in sustaining population growth, securing access to major resources and reducing over dependence on single sectors are resulting in the emergence of clear trends in regional economic development. These trends include:

- Increased utilisation of existing economic assets (such as the redevelopment of regional airport precincts);
- Increased economic diversification (away from a reliance on agriculture) through increased exposure to mining activity;
- Promoting population growth through the provision of comparably affordable housing options;
- Encouraging retirement village, aged care and health related developments;

- Increased competition between towns for the role of major service centre in a broader region, with associated concentrations of higher order retail, government administration and services and health and education facilities;
- Leveraging strategic locations on major freight routes to encourage establishment of transport industry nodes;
- Attraction of major defence bases and activities; and
- Tailoring tourism products to the preferences of domestic market growth areas (for example, “grey nomads”).

Port Hedland is experiencing a similar mono-economy structure to many regional towns (although in this case it is as a result of strong exposure to mining activity, rather than agriculture), and there is a strong desire to increase economic diversification. The Port Hedland International Airport, one of the largest regional airports in terms of passenger movements, is a critical asset that can be leveraged against to increase economic activity and investment.

Port Hedland is remote from metropolitan Perth and cannot trade on any difference in relative house prices to attract residents. This situation is further exacerbated by the fact Port Hedland has significantly higher prices than Perth, making the fostering

of inward migration to the area very difficult. While access to employment is the key driver of migration to Port Hedland, more affordable housing options are required to enable effective relocation to the municipality.

There is strong competition between Karratha and Port Hedland for the role as the major service centre of the Pilbara region. The co-location of Port Hedland with Australia's largest Port facilities should be leveraged in order to capture key transport and distribution activities across the region. It is likely that government services will continue to be split evenly between cities in the Pilbara, though there is an existing opportunity to capture defence activity in response to the recently announced Defence Force Posture Review, as highlighted in Section 1.3.

Finally, visitation to Port Hedland is overwhelmingly dominated by business visitors. As the population of the Town increases, this will invariably increase the “Visiting Friends and Relatives” component of total visitation. However, there is a strong desire to capture increased market share of leisure tourism. Regional centres are increasingly focusing on “grey nomad” travellers in response to a depressed domestic tourism market. Port Hedland, located between Perth and the key destination of Broome, has the capability of capturing a portion of the “grey nomad” stopover market, through the provision of high quality, high amenity facilities and services.

Industry Sector	GRP by Industry	Employment by Industry
Mining	72.8%	45.5%
Construction	8.1%	13.9%
Transport, postal & warehousing	4.5%	5.1%
Health care & social assistance	1.3%	4.8%
Rental, hiring & real estate services	1.2%	1.8%
Manufacturing	1.2%	1.9%
Education & training	1.1%	4.9%
Wholesale trade	0.9%	2.2%
Public administration & safety	0.9%	4.2%
Retail trade	0.7%	3.7%
Administrative & support services	0.5%	1.3%
Professional, scientific & technical services	0.5%	1.4%
Accommodation & food services	0.5%	4.1%
Electricity, gas, water & waste services	0.5%	1.1%
Other services	0.4%	2.5%
Financial & insurance services	0.2%	0.3%
Agriculture, forestry & fishing	0.2%	0.5%
Information media & telecommunications	0.2%	0.3%
Arts & recreation services	0.1%	0.4%

Note: GRP by industry will not sum to 100% due to the ownership of dwellings being omitted from the table.

Figure 3.7: Gross Regional Product and employment by Industry, 2009-10 (Source - AEC group, 2011)

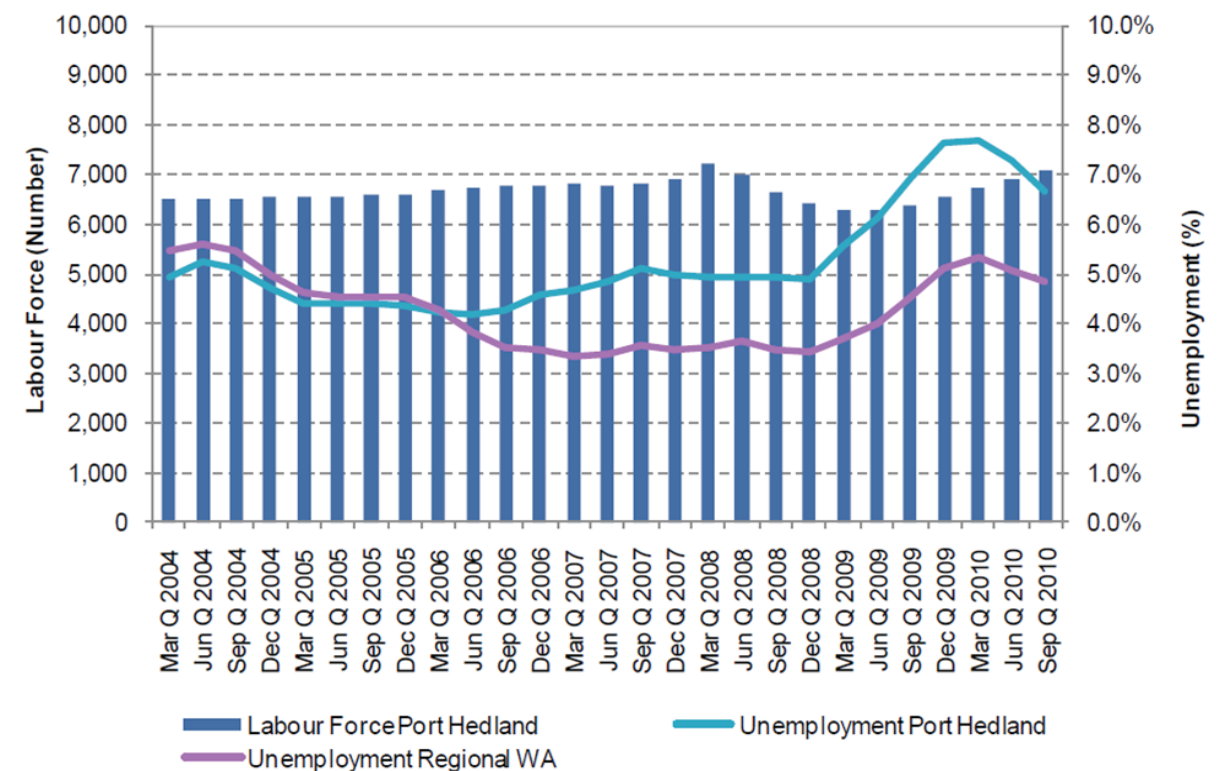


Figure 3.8: Labour Force and Unemployment, 2004 to 2010 (Source - AEC group, 2011)

Key Challenges and Opportunities

Port Hedland is in a fortunate position in comparison to many regional economies with its strong exposure to the mining sector. This will underpin strong ongoing economic growth for the foreseeable future. However, there is a need to diversify the local economy away from its current (almost total) dependence on direct mining investment and activity to reduce its exposure to global economic risks and promote a more sustainable business environment characterised by improved affordability and choice.

Investment in transport and communications infrastructure is critical to support increased economic activity and diversity in the future. Additionally, core infrastructure related to water and energy is critical to enable increased housing supply.

Economic opportunities have been identified in professional services, construction services, heavy industries, defence, local agriculture, population-serving industries and regional tourism. Promotion and attraction of these industries and businesses will assist in diversifying the economy, creating a sustainable business environment and allow Port Hedland to capture a greater share of the value-add and supply chain of future mining sector activity.

Key Challenges and Opportunities:

- Mono-economy reliant on the Mining Sector, exposed to significant risk from disturbances to global markets and local operational changes. There is therefore a need to increase resilience to potential future changes through further de-risking of industrial operations and increased diversification of the local economy.
- Housing undersupply is the most critical impediment to future economic growth, placing significant pressure on the property market and preventing the inward migration of new residents and businesses outside of the mining sector.
- Shortage of property across a range of industrial, commercial and retail sectors, restricting the rate of growth and placing further upward pressure on market prices.
- Lack of local innovation and knowledge, which could assist in diversifying the economy and reducing reliance on the mining sector.
- Timely supply of critical strategic transport and utilities infrastructure to support economic activity.
- Expansion of local mining support activities to improve supply chain efficiency and replace import requirements.
- Economic diversification opportunities within the professional services, construction services, defence, local agriculture, population servicing industries and tourism sectors.

3.3 HOUSING AND LAND SUPPLY

Housing

The recent growth in population (resident and transient workers) and economic activity, coupled with a general undersupply of residential and non-residential properties, has had a significant effect in driving up property and rental prices in Port Hedland. Residential sales and rental prices have both increased by an average of 14% between 2008-2010, with average house prices of \$1.12m (triple that of Perth) and average rental prices of \$1,772 / week (four times higher than Perth) at present.

Such high prices and lack of supply have created significant problems for local communities and businesses, and is a significant constraining factor for future population growth and the provision of a strong labour market to support strategic industry and local/regional services.

Over the next twenty years, rapid residential population growth will drive increased housing demand, and require the identification and subsequent delivery of residential development sites (both infill and greenfield) across both Port and South Hedland. Estimates suggest that to meet a population target of 50,000 people, some 21,000 new dwellings would need to be built in the urban areas of Port Hedland and South Hedland by 2031.

The move to a population of up to 50,000 will not only require significant increases in housing stock, but will also require increased diversity and choice in the location and type of residential products provided to cater for an increasingly segmented property market. In the immediate and short term, the critical constraining factors to delivering the additional housing supply are (i) the availability of utilities infrastructure capacity (particularly water); and (ii) the presence of a construction labour force large enough to deliver the number of dwellings required.

YEAR	TOTAL POPULATION	TOTAL DWELLINGS	NEW DWELLINGS REQUIRED
2011	19,822	5,392	-
2031	50,000	At least 26,000	At least 21,000

Figure 3.9: Current estimated population and dwelling requirements for 50,000 target. (Source - AEC group, RPS, 2011)

Transient Worker and Short Stay Accommodation

Port Hedland currently relies on at least 3,000 fly-in fly-out workers (although unofficial estimates place this number a lot higher) to supply the skilled labour requirements of the local mining and construction industry. Whilst a proportion of this workforce is

accommodated in permanent residential housing in established areas of Port and South Hedland, a large number of FIFO workers are accommodated in a variety of short stay accommodation and transient workforce accommodation facilities throughout the town.

Not all FIFO arrangements are the same, with some workers operating on short term contract arrangements (for example, those associated with single time limited construction projects) and others employed on a much longer term basis (for example, highly skilled workers employed for ongoing operational work on major resources projects). Likewise, the type, form and location of TWA facilities required to accommodate these different types of workers will vary, with construction workers often needing to be located in close proximity (sometimes on) the worksite they are servicing, whereas operational FIFO workers are often more appropriately located in close proximity or within established urban areas (potentially with integrated/shared use of facilities and services with permanent residential communities).

As noted in Section 3.1, the short term provision of additional TWA

facilities (particularly to cater for a skilled housing construction workforce) is essential to help support and sustain industrial activity and overcome immediate challenges in constructing required levels on new housing stock. In the longer term however, as the permanent residential population continues to grow and the local labour force increases, a slowing in the growth of FIFO demand and associated TWA is anticipated. The current significant demand for construction workforce TWA capacity will eventually shift towards a need for higher quality and more permanent accommodation for a workforce associated with the ongoing industry operations.

In addition to TWA demand, short-term visitor numbers will continue to grow in the future, requiring a significant amount of new accommodation to be delivered in the next five to ten years. This additional supply is required not only to address the current extreme undersupply (currently experiencing 90% average occupancy rates), but also to facilitate a diversification of local economic activity.

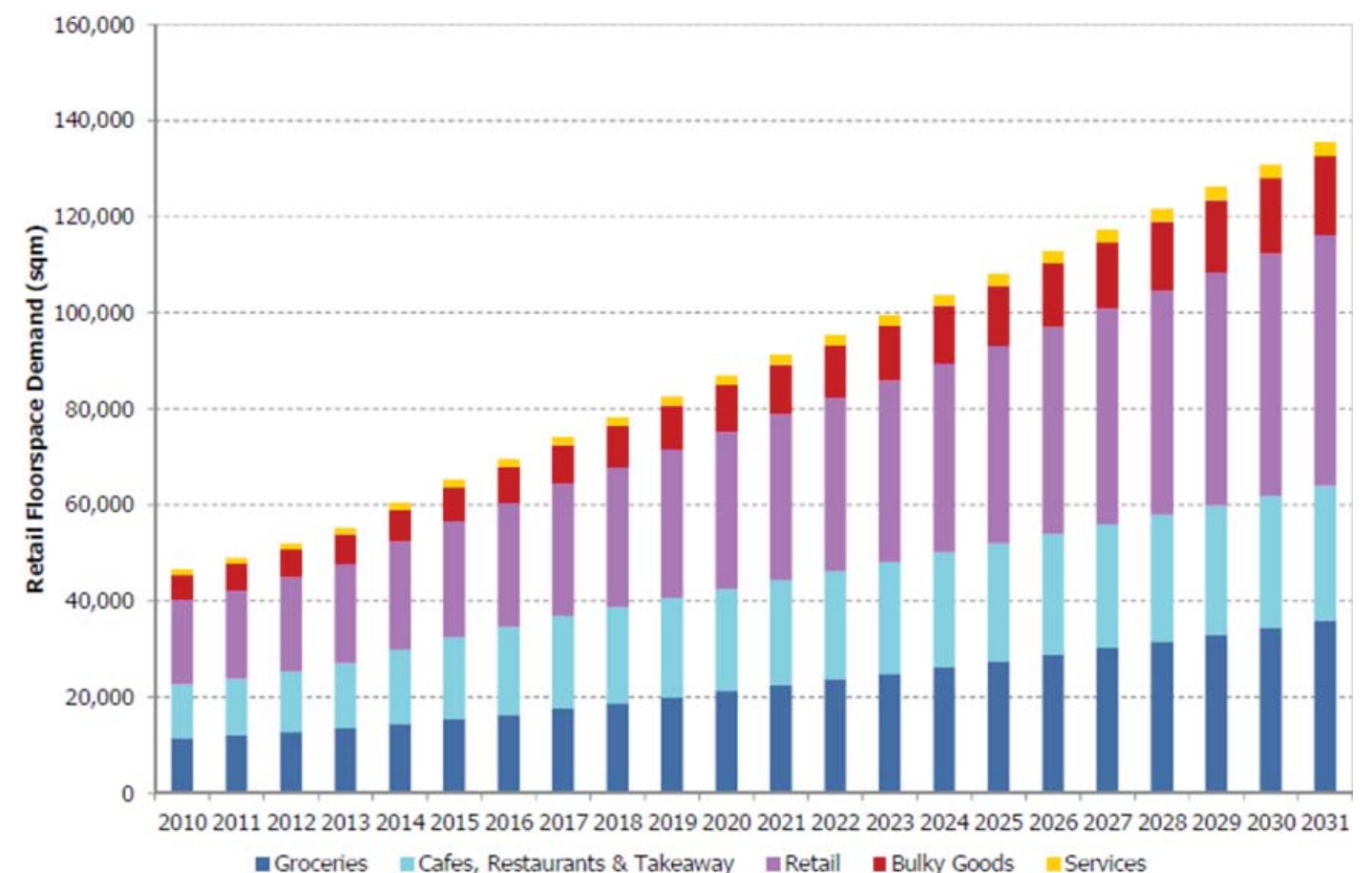


Figure 3.10: Retail Floor Space Demand 2010 - 2031 (Source - AEC group, 2011)

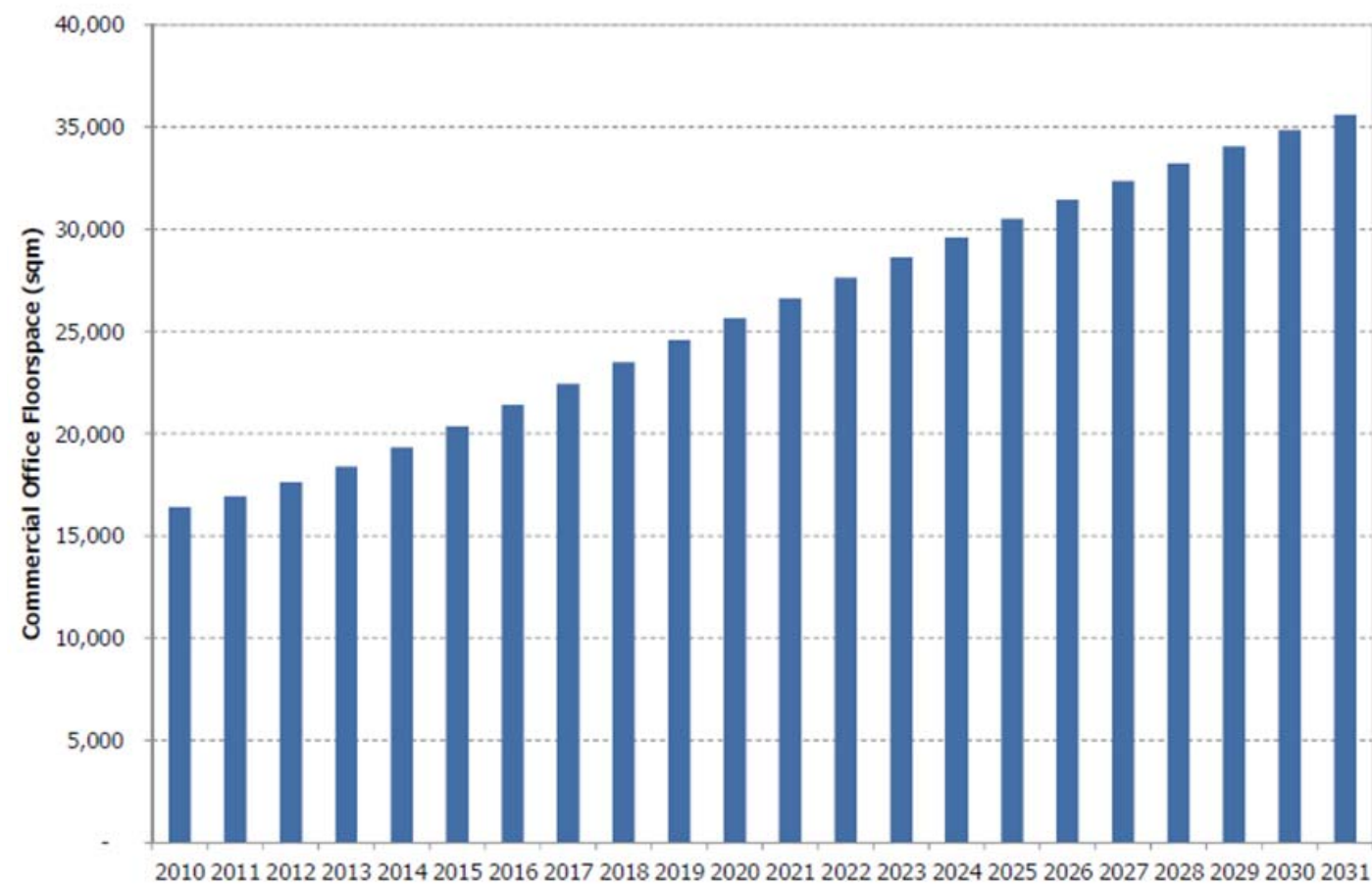


Figure 3.11: Commercial Office Floorspace Demand, 2010 to 2031 (Source - AEC group, 2011)

Retail and Commercial

Demand for retail and commercial floor space in the City is expected to grow significantly over the next 20 years, in response to strong population growth, increased residential settlement and growing incomes. By 2031, retail demand is expected to reach at least 135,000sqm (over 93,000sqm more than current levels). However, in the immediate term there is an urgent need to address the current retail undersupply of cafés, restaurants/takeaways, groceries and shop retail offering in the area.

The current undersupply of commercial floor space also needs to be corrected, as this is placing additional pressure on the retail market (with commercial office premises now competing with and often occupying valuable retail space). In addressing the shortfall and increasing demand for retail and commercial floor space at an LGA level (growing to just over 35,000sqm in 2031), it is important that the type of property products offered in various catchments (i.e. Port Hedland West End, South Hedland Town Centre etc) are complementary and appropriate to their activity

centre role and function, and help facilitate increased levels of specialisation in the medium to long term.

Industrial

The industrial property market is characterised by significant supplies of strategic industrial land (associated with Port Authority and Dampier Salt operations, along with the Boodarie Strategic Industrial Area) and non-strategic industrial land (including the Port Hedland light industrial and Wedgefield industrial areas). Whilst there appears to be sufficient zoned land supply for both strategic and non-strategic industry demand in the short to medium term, a key challenge is to provide increased location choice (particularly for general/light industry and logistics operations) beyond the existing estate areas such as Wedgefield.

Additional industrial land supply, over and above anticipated future demand, is required in the medium to long term and ideally needs to be provided in new locations to maximise choice for prospective tenants and encourage further specialisation

(particularly into emerging 'green economies' and supply chain areas associated with the resources and export industries).

Key Challenges and Opportunities

The Town of Port Hedland is projected to experience continued robust growth in demand across all property markets (doubling or even tripling of demand in some markets), resulting from not only growth in the local population and economy, but also from demographic, settlement, and income and wealth changes. Current supply pipelines are generally insufficient to accommodate this demand with some markets unable to respond to even short-term requirements. This reflects a range of factors including, but not limited to:

- Overly concentrated supply locations;
- Lack of choice in the market;
- Lack of strong supply pipelines to mitigate against demand shocks and reduced perceptions of supply shortages;

- Development feasibility issues, relating to environment, infrastructure and development cost constraints; and
- Lack of a local labour force for both construction and operational phases of development.

These challenges have in part contributed to current supply gaps in select markets (such as Café, Restaurant and Takeaway retail and short-term visitor accommodation), while the responsiveness of other markets has been constrained by uncertainty regarding future demand along with inflexible planning and approvals processes (particularly for larger projects).

Nevertheless the growth in demand for land, floorspace and activities in the Town of Port Hedland, reflects its emergence as a genuine residential population centre, with associated local services, facilities and offerings. This maturity represents the underlying driver of the Pilbara Cities project and will naturally result in increased economic diversification (in the form of increased non-mining employment) and greater residential settlement.

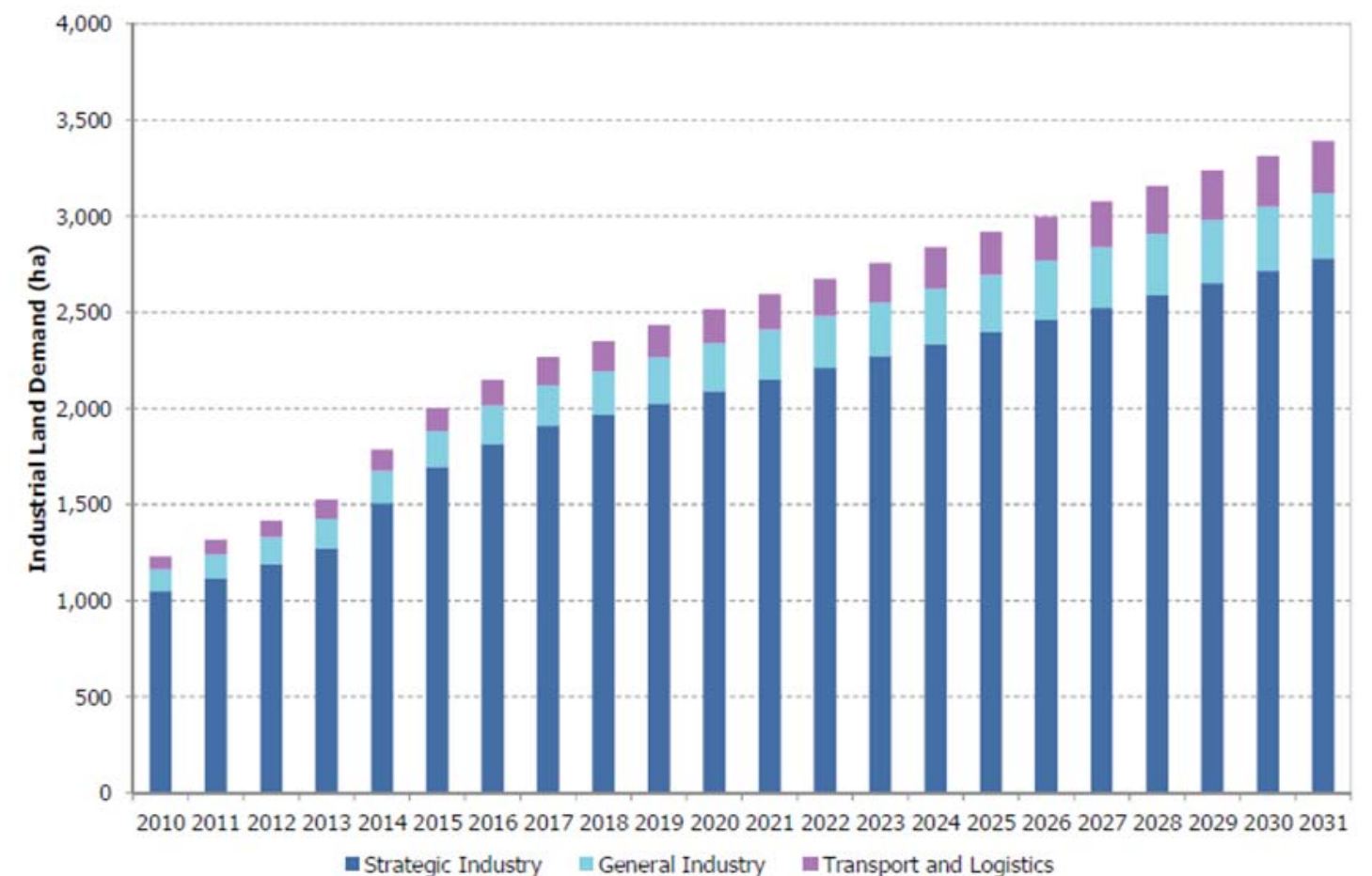


Figure 3.12: Industrial Land Demand 2010 - 2031 (Source - AEC group, 2011)

3.4 LOCAL COMMUNITIES, CULTURAL HERITAGE AND LANDSCAPE CHARACTER

Demographic and Socio-Economic Profile

Port Hedland's socio-demographic profile is consistent with that seen in regional resource towns across Australia. It has a relatively young population, with an average age of 31.2 years, and a high proportion of children (under the age of 15 years) and working aged persons (between 25 and 34 years). Of the estimated 3,089 households (in 2006), the majority are family type households with children. Being a major industrial hub, however, there is also a high proportion of lone person and group households.

Over 80% of Port Hedland's population is Australian born, which is in line with the cultural heritage trends of the broader Pilbara region. Port Hedland has a significant level of indigenous Australian presence (over 15% in 2006) relative to the wider Pilbara region (ABS, 2007). This highlights the importance of considering this significant group of people in the future growth of the city.

Average incomes of Port Hedland residents are well above the

Perth and Regional WA averages (Australian Tax Office, 2010). This is not surprising considering the resource and industrial focus for the economy which generally have higher paying wages to secure specialist and high demand skilled workers. Over the past four years, the distribution of earnings by residents changed significantly, with a much greater proportion of workers earning in the higher wage ranges. This is evidenced by almost 20% of the population earning over \$104,000 a year in 2008 compared to 6% of the population four years ago.

Whilst the income profile of Port Hedland shows increasing levels of high earners and a decreasing proportion of low income earners, there is a widening gap emerging between those who are benefiting greatly from the mining boom (including those high income earners) and those who remain relatively disadvantaged. Levels of relative socio-economic disadvantage (calculated using a combination of indicators such as age, employment, ethnicity, access to services etc) are seen to be particularly high in parts of South Hedland and surrounds, whilst the West End, East End and Pretty Pool areas of Port Hedland are shown to experience relatively little disadvantage. The strong locational correlation

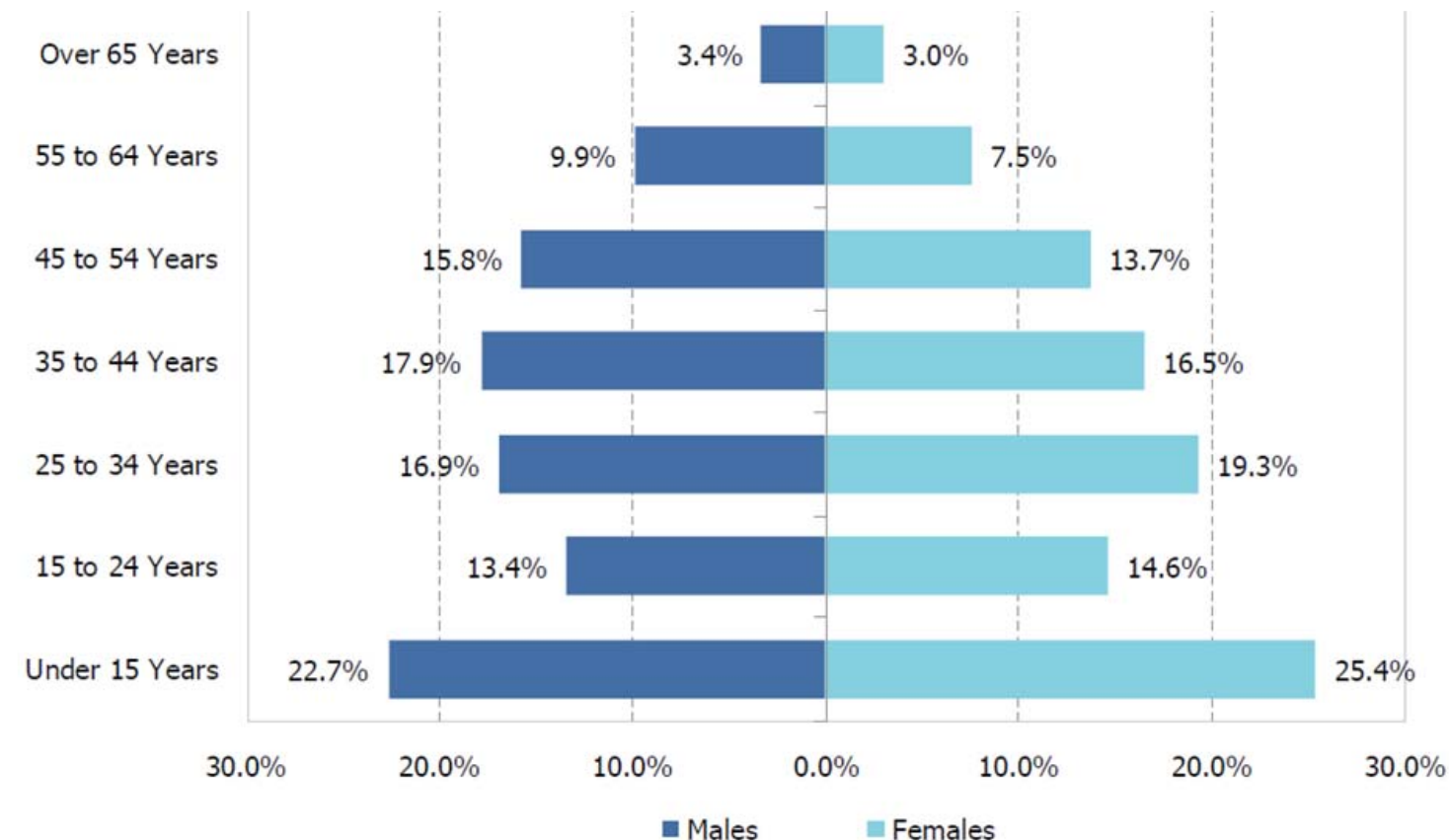


Figure 3.13: Age and Gender, Port Hedland LGA 2009 (Source - ABS 2010a)

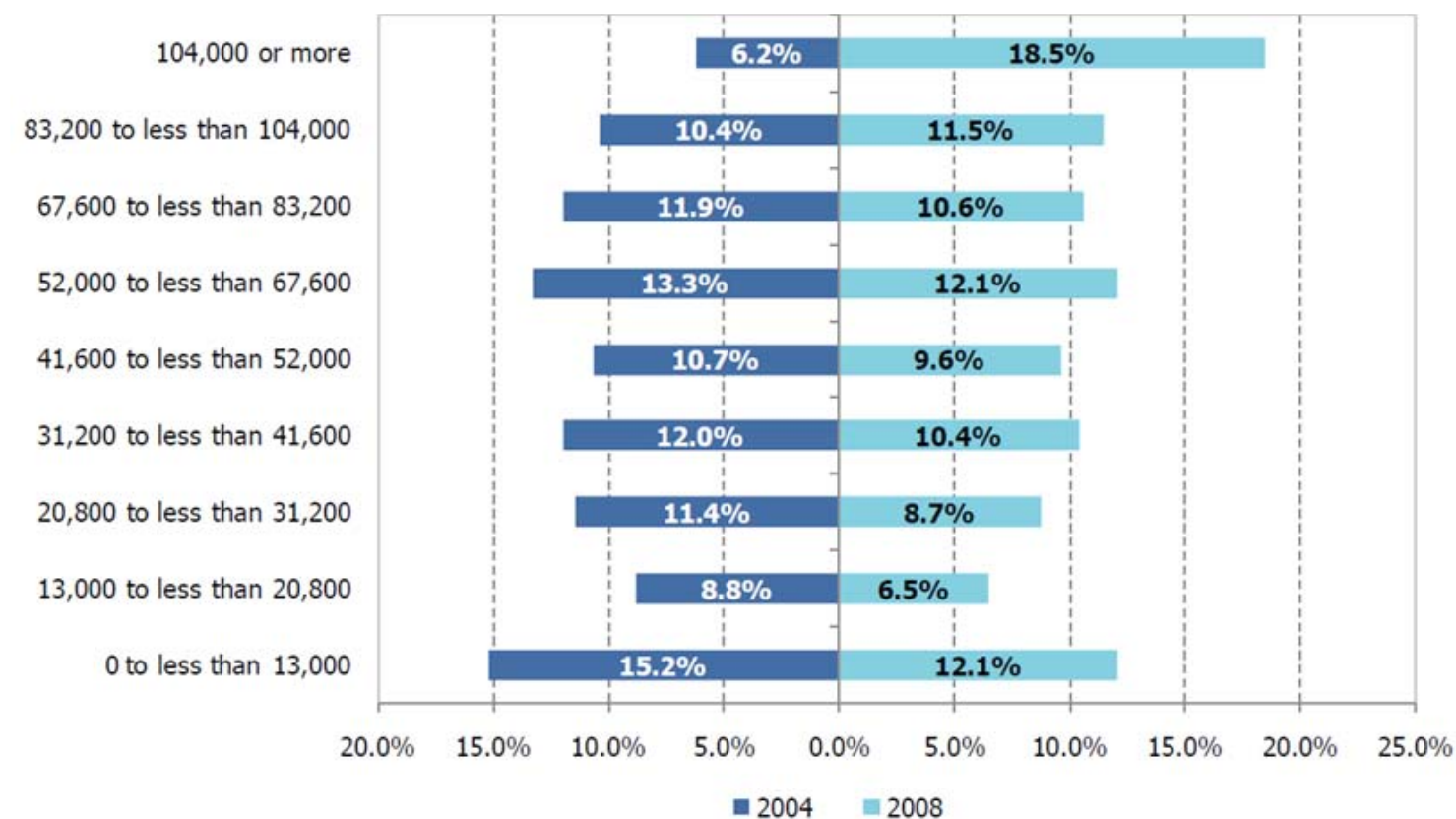


Figure 3.14: Wages and Salaries, Port Hedland LGA, 2004 and 2008 (Source - ABS 2010b)

between levels of relative advantage/disadvantage between the two main settlement areas presents a unique challenge to be considered in planning for future growth and creating a city where people want to live and are proud to call home.

Indigenous Heritage

Port Hedland is the oldest functioning centre in the Pilbara. It has a rich history and culture that extends far beyond its current role as a major port/logistics and resource centre. Port Hedland also has a rich Aboriginal culture extending back over 4,000 years, with the Kariyarra speaking people living in the Port Hedland area and the Ngarla people and Nyamul speaking people living to the north and south respectively.

Port Hedland has significant Indigenous cultural heritage sites such as Two Mile Ridge, Pretty Pool and Twelve Mile Camp. A range of engravings, Thalu, shell middens, artefact scatters, ceremonial, mythological and camp sites are also recorded in the Port Hedland area (McCarthy 1961).

Within the Port Hedland local government area there are 850 sites included on the Department of Indigenous Affairs Register of Aboriginal Sites. A further 448 potential sites are recorded as Other Heritage Places, a category which covers those items yet to be assessed for inclusion in the register.

The Kariyarra name for Port Hedland itself is Marapikurrinya, which references the finger-like formation of the tidal creeks that mark the coastline in the harbour: *Mara* meaning hand, *pikurri* meaning pointing straight and *nya* denotes a place name marker. This traditional name is honoured with a park of the same name that sits at a premier location on the waterfront in Port Hedland's West End.

An integral feature of Port Hedland's Indigenous cultural heritage is connectedness. Sites do not exist in isolation, but in continuity of time and landscape. The limestone ridges that cross the region are often found to contain extensive series of engravings. It is most likely that these limestone ridges, a high point in the landscape, provided a conduit, a camping area, a source of fresh water and a method of easily accessing the mangrove resources.

The limestone ridge engravings, whilst the most readily known indigenous cultural heritage sites in the area, comprise just one facet of a range of site types that reflect the Indigenous use of the area prior to settlement.

Living Legacy

In addition to the many traditional sites and historical heritage, there is a living legacy and continuation of cultures that are an important influence in Port Hedland today. With a greater Indigenous presence in the town than in the broader Pilbara region, a strong cultural and language centre, a growing Indigenous arts community and rich traditions of knowledge to draw from,

it is important that these aspects of Indigenous heritage are also reflected in the Town's planning and development.

This cultural knowledge and experience of the town as it grows has begun to be explored through projects such as the recent exhibition by FORM with the Spinifex Hill Artists, *Before the Town Got Big*. This exhibition and catalogue explored the artists' memories of the region at a time before the town grew to its current state and their experience of that growth.

These sorts of initiatives that tell the stories of the living, growing, adapting cultural heritage are an important part of keeping this intangible heritage a part of the town's identity and rich

cultural asset base. It is through storytelling and fostering the continuance of cultural production that these assets can be sustained. Therefore, it will be important to explore opportunities and programming for celebrating continuing heritage and living cultures as continuance of past – the living legacy.

It is also through these initiatives that more meaningful consultation and understanding of the full extent of heritage assets can be understood. One of the common themes that emerged through consultation as part of programming initiatives is a sense of loss of heritage that stems from interruption to access to key sites or spaces. Equally, heritage can be an important means of developing a sense of renewal and transformation.

These aspects of Indigenous life are important elements to take into account in the planning process.

Initial consultations with the indigenous community have also indicated several areas of priority for the community, including:

- Affordable housing for Aboriginal people and reduction of waiting list time frames

- Funding and amenity support for parents and community members to teach Indigenous singing and dancing (such as through the Youth Centre)
- Demonstrated progress on key projects, with greater coordination of efforts to focus on issues of real import to Indigenous people
- A market place and space for art work sales
- Assistance for Aboriginal people to participate in society
- More community dwellings and caravan parks
- Regular public transport between Port and South Hedland
- Banks in South Hedland
- Expanded Post Office

While the first stage of consultations have been started to begin to inform the growth planning, more in depth consultation process with the Kariyarra people and other indigenous groups of the region will need to be undertaken beyond the Growth Plan process.

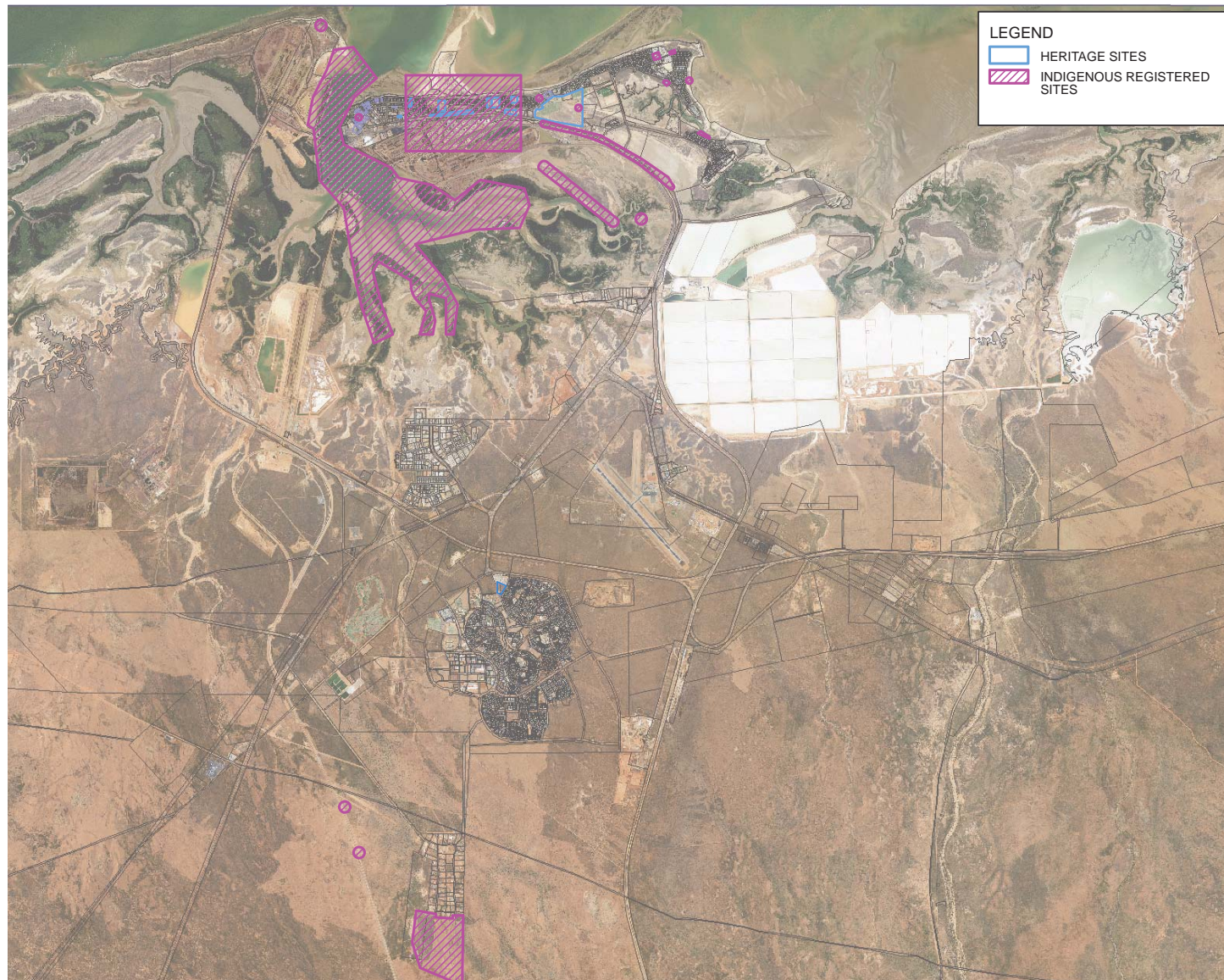


Figure 3.15: Heritage and Indigenous Registered Sites.



Native Title

In August 2011 a South Hedland Native Title Agreement was signed by the Minister for Lands for and on behalf of the State of Western Australia and the traditional owners. The Agreement helps South Hedland move towards the Pilbara Cities Vision and forms the basis of a strong and successful relationship with the Kariyarra people. The area of the Agreement is shown at Figure 3.16 and covers the area needed to grow the town over the coming years. Areas shown for expansion in the medium to long term, in the very south of South Hedland, will need a further agreement in due course, with the timing of any negotiations being linked to demand and supply requirements.

In Port Hedland, Native Title negotiations between the Yamatji Marlpa Aboriginal Corporation and the State Government are also being progressed to reach a similar agreement as that reached in South Hedland.

Indigenous Equality and Inclusiveness

Beyond the value and importance of indigenous heritage and the continuation of cultural knowledge, there remain opportunities to be addressed with regard to indigenous reconciliation and providing better opportunities for local Aboriginal people to access affordable housing and employment.

Whilst many existing residents are currently finding it extremely difficult to secure affordable housing in Port and South Hedland, Indigenous Australians are particularly affected by this issue given other challenges associated with accessing education and employment opportunities. These pressures are forcing many Aboriginal people into sub-standard accommodation arrangements and even homelessness. It is therefore crucial that sufficient levels of public housing and other temporary accommodation solutions are identified and provided to address issues of homelessness in the indigenous community.

In addition to housing and accommodation, gaining access to education, training and employment is another key challenge for local Aboriginal people living in Pilbara's Port City. According to Census data (ABS, 2007), indigenous residents of Port Hedland are far less likely to travel to work by car (as the driver) compared to non-indigenous residents, and are much more likely to travel to work by public transport (bus), by walking or as a passenger in a car. Whilst employment opportunities are being made available to Aboriginal people, they are often unable to be accessed due to a lack of work readiness and/or a lack of affordable and convenient transport options. In addressing this key challenge, alternative forms of affordable transport provision need to be identified, along with other programs and mechanisms to improve Aboriginal education and employment/business opportunities (ideally based on/building on proven and successful initiatives already present in the local community or other regional cities).

Non-Indigenous Heritage

The first known non-indigenous landfall on the East Pilbara coast occurred in 1628 when a vessel commanded by Captain De Witt grounded at Cape Thoun approximately 40 kilometres west of Port Hedland. With the onset of European settlers the settlements of Port Hedland and the Condon Townsite were established in the late nineteenth century. Early development of the area focused on the pastoral and mineral industries together with transport of products through the port facilities. More recently, the city has attracted a rich multicultural community from many different countries worldwide, with 20% of the total resident population born overseas (ABS, 2007).

The non-indigenous heritage items within the Town of Port Hedland are recorded across all levels of government. There are 76 items

registered on the WA Heritage Council database as being located within the Town of Port Hedland local government area, including Boodarie Station Homestead, Condon/Shellborough Townsite, and the Esplanade Hotel. 60 items are also identified within the Town of Port Hedland Municipal Inventory of Heritage Places.

Through the Growth Plan and future planning and development, there exist opportunities at a local level to promote Hedland's unique multi-cultural heritage in an integrated manner, conserving heritage assets and celebrate the diverse range of local cultural and historical elements through the creation of new public spaces. At the regional level there is the opportunity to promote increased awareness and exposure to cultural assets (through tourism for example) in areas such as Condon or on pastoral stations such as Boodarie.

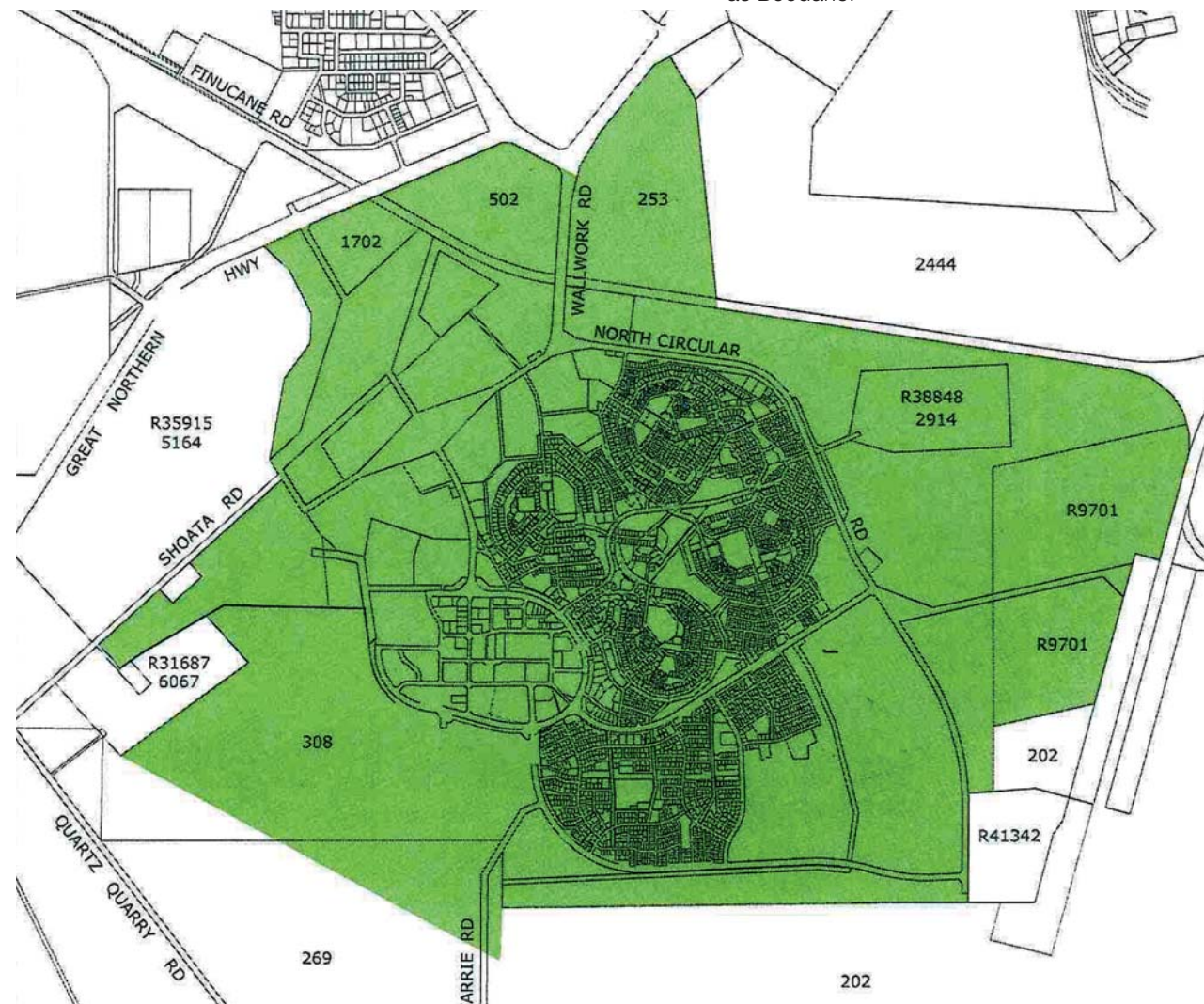
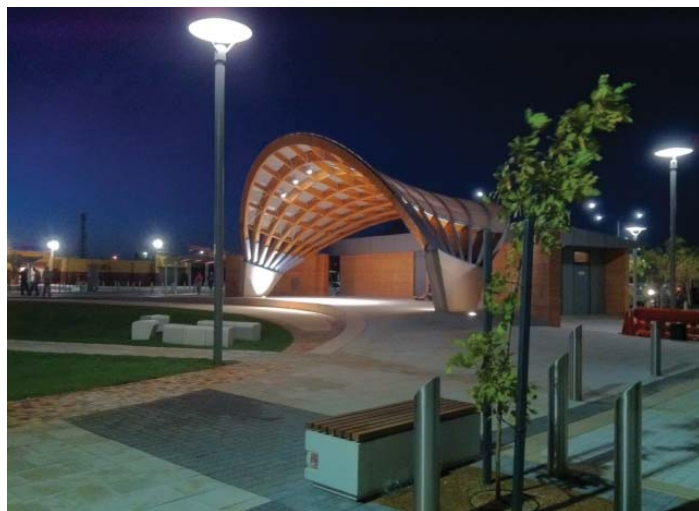


Figure 3.16: South Hedland Native Title Agreement Area





Landscape Character

The relationship between a city's people and its built and natural landscape plays a significant part in defining the character of a place. Port Hedland's unique physical and environmental characteristics influence the way residents and visitors view and experience the landscape character of the area. The following factors play a critical role in the way Port Hedland's landscape is perceived and experienced;

- The experience of the landscape is defined by the spaces between developed areas. This is where long views are possible from highways to the horizon and surrounding Pilbara Landscape;
- In built up areas, views are generally contained to local catchments with a lack of elevated areas that allow outward views (with exception to the coastal dune & railway bunding);
- The coast represents a point of refuge where from the dune views are possible out over the ocean to the North as well to the South over Port Hedland to industry and rail infrastructure;
- Esplanade roads in built up areas offer outward views and a connection to the surrounding landscape;
- Industrial areas and rail infrastructure to the south of Wilson Street create iconic visual elements;
- From the East End of Port Hedland, views to the south are constrained by the railway corridor (south of Wilson Street) but maintain a visual connection to the industry of the region; and
- The mangrove flats of Redbank and coastal areas are a dominant and significant landscape feature of the area.

Community Character and Culture

Community consultation has indicated three particular dimensions that must be addressed in future development. Out of these three challenges arise important guiding considerations that will cut across the themes of the Growth Plan:

- Attachment to Place and Livability
- Distinctiveness and Community Character
- Aspirations

Given the difficulties of a population which currently embodies a high level of transience, engaging loyalty to place and forming long term communities is of central concern to the future of Port Hedland, particularly considering plans for rapid growth and increased residential populations. Therefore, it is vital to consider the factors that attach people to place.

In a recent study of 43,000 people in 26 communities in the U.S.A. over three years, three main qualities were identified that attach people to place: "social offerings, such as entertainment venues and places to meet, openness (how welcoming a place is) and the area's aesthetics (its physical beauty and green spaces)" (*Gallup, 2010*). Moreover, residents rated their communities' availability of arts and cultural opportunities and social community events highest in importance among social offerings. (Social offerings overall include vibrant nightlife, good places to meet people, other people that care about each other, availability of arts and cultural opportunities and availability of social community events).

Port Hedland seeks to grow into a place that offers the things that will sustain its community in the long-term. To achieve this planning must enable social offerings: particularly arts, cultural and social opportunities, a sense of welcoming and inclusiveness, and a quality, attractive environment, in line with the factors influencing attachment.

These elements will be critical for the sense of livability that is articulated as a leading priority across Local and State government policies pertinent to Port Hedland.

Livability as the town grows will also be influenced by the ability to provide a full range of services, facilities and cultural offerings that set cities apart from towns. Given the trends of current lifestyles and economies, people are increasingly seeking convenience, choices, chances to explore and experience a range of things, and access diverse opportunities – to learn, work, contribute and live the life they would like to lead. It will also be necessary to ensure these fundamentals are in line with the local character and behaviours, quality, and with a view to sustainable community.

In addition to providing the range of community and cultural offerings desired, there remains an imperative to provide a strong

economic platform to sustain such activity. As stated in the Gallup study (2010), "...the cities with the highest levels of resident love and passion for their community, or resident attachment, also had the highest rates of GDP growth over time." In this sense, Port Hedland is starting from a position of strength with rapid GDP growth.

In addition to the landscape character of the region, the distinctiveness of place and character of the community is important to factor into planning. The character or personality of place forms a critical basis for growth, building on inherent strengths and maintaining a sense of authenticity that can anchor community growth.

Character also references attitude: the spirit that underlies a region. This spirit is captured in the principles for the Growth Plan, which have been shaped by community input. These reflect the desire to build on the community's resourceful character and make Port Hedland a welcoming home, valuing its diverse strengths and features and embracing its growing international focus.

Through previous community workshops and consultation the community has identified the following characteristics they would like to foster (Source: FORM, 2010):

NOW

Maintain and Nurture Qualities We Currently Have

- Sunny
- Adolescent
- Hard working
- Open
- Calming
- Inner Beauty
- Child Friendly

FUTURE

- Well-balanced
- Big hearted
- Has its own identity
- Organised
- Self assured
- Tolerant
- Proud
- Welcoming
- Matured
- Honest
- Self Reliant
- Sense of human
- Innovative
- Effervescent





In consultations carried out as part of the Growth Plan, one of the clearly identified sources of pride for the community was the perception that Port Hedland was the friendliest place among competitor towns in the Pilbara region. Another characteristic that was highly valued was a perceived sense of humour and quirky character, exhibited for instance through small artworks or humorous displays placed on the salt flats.

In distinguishing between the two towns that will become the Twin Cities of the Pilbara, it is also often cited among community members and stakeholders that Karratha has a greater foothold as the commercial and retail centre in the Pilbara, however Port Hedland is identified as a greater cultural hub. These distinguishing characteristics offer points of difference that can be nurtured for the benefit of the town. These are examples of the characteristics that will define the place.

Grounding growth and identity in such characteristics of place is critical for more than passing reputational benefit. These factors become attractors for residents and visitors alike and build 'place brand' value. In a study of '36 Hours' (CEO's for Cities, 2008), a reporting series on tourism attractions in different towns and cities, four key place attributes were identified that were common attractors to visitors and a source of positive visitor experiences: Variety, Superlatives, Authenticity and Distinctiveness.

First, cities must have a range of options in terms of price, quality, and type of offering - Variety. Superlatives matter, with an attraction indicated for places described as the 'first', 'best' or 'only' in the region, country, or world in some respect. Distinctiveness is also important, with reporters for the 36 Hours series seeking out places and experiences that stand out when compared to the surrounding options, but that also typify a place. Authenticity is also clearly indicated with visitors wanting to be among locals, doing the things locals like to do.

In terms of tourism attraction these attributes are important guides, making community and landscape character and distinctive experiences vital. As Port Hedland looks to tourism as one of the leading planks of economic development strategies, these attributes of place are reinforced through the experiences Port Hedland offers.

Finally, the aspirations of the community must guide the town's development. The Growth Plan is a prime opportunity to signal the aspirations of the community and its leadership. For that reason, the quality of built form and the urban environment, accessibility through connections and neighbourhood activity, and concentration of activity to build a sense of vibrancy must be taken into account.

Key Challenges and Opportunities

- Catering for the large and growing proportions of families and increasing birth rates, particularly in the areas of child services and associated social and community infrastructure to support young families;
- Meeting the requirements of a large and transient indigenous population, particularly with regard to affordable housing, accommodation, education and access to employment opportunities;
- Ensuring that the benefits of economic growth and increased prosperity are shared across the municipality;
- Ensuring development is carried out in sympathy with, and to enhance, existing heritage items (good practice examples include the sympathetic rejuvenation of towns such as Newcastle and Kalgoorlie);
- Develop links and connectedness between Indigenous and non-indigenous heritage through sites such as Two Mile Ridge and Pretty Pool; Old Port Hedland Cemetery; Boodarie Landing; Twelve Mile Camp with particular regard to tourism;
- Celebration of cultural heritage in areas outside the Port Hedland and South Hedland town sites, such as Condon with particular regard to tourism;
- Continue to progress native title resolution requirements where city growth requires and cultural heritage provides;
- Creation of new rest stops and landmark sites/points of interest which celebrate unique aesthetic qualities, cultural heritage assets and the industrial character of Port Hedland with particular regard to tourism;
- Opportunities to create new pathways and connections between places of interest and key community facilities (e.g. connecting Cooke Point and Pretty Pool with the West End);
- Managing the visual impact of new development along key highway corridors and entry points into town site areas with particular regard to tourism;
- Improvement in streetscape character and quality through new plantings, footpaths, minimization of front fencing etc;
- New open space opportunities adjacent to road corridors by providing fitness or recreational assets in large road reserves, pocket parks and unused land; and
- Planned and managed delivery of community and civic facilities at the local level through to regional city wide needs as growth pressures continues.

3.5 CLIMATE AND ENVIRONMENT

Climate

The Pilbara region of Western Australia experiences a hot, semi-arid climate. Summers (October to April) are very hot with an average maximum temperature average of 31.8 °C (and maximums close to 40 °C) and winters are generally mild with temperatures ranging from a minimum of 17.2 °C to an average maximum of 26.8 °C (BOM, 2011). Winds are characterised by the dominant westerly winds that occur throughout summer and prevailing easterly winds in the winter.

Most of the annual rainfall occurs during the summer period from scattered thunderstorms and tropical cyclones, with Port Hedland being located in one of the most cyclone prone areas in Australia.

Flooding and Coastal Processes

Major flooding events in Port Hedland are typically associated with storm and cyclonic activity and coastal storm surge. Heavy rainfall in interior locations can lead to localised flooding along the major river systems of the De Grey, Turner and Yule, which has the potential to impact low-lying areas.

The effects of a changing climate, especially in regard to the issues of sea level rise, the expected increased frequency and intensity of extreme storm events, such as cyclones, and increases in average temperatures have been identified as issues which will require ongoing adaptive management.

The recent Port Hedland Coastal Vulnerability Study (Cardno,

2011) was carried out to identify development opportunities and key constraints for Port Hedland and South Hedland as it continues to grow in population, and inform future planning and development decisions in the region. Specifically, the study used a comprehensive model to investigate the combined effects of elevated ocean levels and local surface water catchment flooding and their impacts on the City.

The study found that Port Hedland is vulnerable to tropical cyclone impacts from ocean and catchment flooding, with several key infrastructure elements at particular risk to damage or loss of function during major cyclone events, including wastewater treatment facilities and key roads. It also identified key challenges for new development areas, particularly in the East End of Port Hedland where recommended design water levels for new

development are provided (based on a 100 year planning period).

The findings and recommendations of the Coastal Vulnerability Study will form key considerations for any future development proposals in Port Hedland, particularly with regard to coastal setback distances, the preparation of emergency response plans and protection/planning of existing and proposed key infrastructure corridors. Provided at Figure 3.17 is flood level mapping for the Port Hedland area during major rainfall and storm surge events (allowing for climate variation and sea level rise over a 100 year planning period). The identification of appropriate design responses to such flooding and coastal inundation events consistent with state planning and environmental policies (including Statement of Planning Policy 2.6: State Coastal Planning Policy) presents a key challenge for the future sustainable development of Port Hedland.

Landform, Topography and Geology

The coastal areas of the Port Hedland consist of flat sandy lowlands, with broad areas of intertidal mudflats and mangroves, which are periodically inundated by sea water during storm events or particularly high tides. The interior is made up of river flood plains and the Pilbara Block, characterised by a low-lying, flat, and featureless landscape with sparse scrub.

The soils of the Port Hedland are generally comprised of deep red, often calcareous sandy soils over sandy loams. South Hedland soils are best described as being composed of predominantly red sandy loams.

The risk of encountering Acid Sulfate Soils (ASS) is highest in the coastal lowlands with the coastal mangroves, tributaries and identified flood plains of Stingray, Pretty Pool and Four Mile Creeks being mapped as containing high to moderate risk of ASS occurring within 3 m of the natural soil surface. South Hedland is identified as being of no known risk of encountering ASS within 3 m of the natural soil surface.

Hydrology

The most important groundwater resources for Port Hedland are in the alluvial aquifers along the major rivers from the Ashburton to the De Grey. These groundwater resources generally range from fresh in the interior through to brackish as proximity to the coast increases. Port Hedland relies upon the De Grey and Yule river aquifers to supply potable water to the town.

Surface water is present as coastal estuaries and numerous tributaries including Stingray, Pretty Pool and Four Mile Creeks. The ephemeral rivers of the interior which flow into the coastal estuaries are dry for the majority of the year however significant run-off is generated after heavy rainfall to provide water to these river systems.



Figure 3.17: Port Hedland Coastal Vulnerability Study Model Results(Cardno, 2011)

Biodiversity, Flora and Fauna

Port Hedland lies within the Interim Biogeographical Regionalisation of Australia region of Pilbara 4 and more specifically within coastal sub-regional bioregion of Roebourne (Thackway and Cresswell, 1995).

The Roebourne sub-region is described as:

“Quaternary alluvial plains with a grass savannah of mixed bunch and hummock grasses, and dwarf Shrub Steppe of Acacia translucens or A. pyrifolia and A. inaequilatera. Resistant linear ranges of basalts occur across the coastal plains. These uplands

are dominated by Triodia hummock grasslands. Ephemeral drainage lines support Eucalyptus woodlands. Samphire, Sporobolus grasslands and mangal occur on the marine alluvial flats and river deltas” (DEC 2002).

The mangroves of Port Hedland comprise a significant component of the coastal landscape and through the provision of habitat for marine and terrestrial organisms and nursery habitats for some commercially important species of fish and crustaceans perform an important ecosystem function. Additionally mangroves fulfil important physical functions, including the stabilisation and protection of shorelines and they contribute to the maintenance of coastal water quality through their action as a nutrient and

sediment sink.

A search of the Department of Environment and Conservation's (DEC's) Threatened (Declared Rare) Flora database, Declared Rare and Priority Flora List and the Western Australian Herbarium Specimen database revealed that there are currently no known Threatened Flora species within Port Hedland.

Four Priority 1, two Priority 2 and two Priority 3 flora species were recorded within Port Hedland.

A search of the DEC's Threatened Ecological Communities database revealed that there are currently no known Threatened or Priority Ecological Communities within Port Hedland.

Within Port Hedland identified key fauna habitats which include mangrove and tidal communities and the coastal dune system are considered likely to sustain a variety of conservation significant fauna including mammals, reptiles and birds. Threatened Fauna species known to occur within Port Hedland include the green and flatback turtles, northern quoll and crest-tailed mulgara.

A search of the Environmental Protection and Biodiversity Conservation Act Protected Matters Search Tool identified a range of migratory birds and other fauna that potentially may be present in the Port Hedland Local Government Area, including 18 threatened species and 55 migratory species.

Dust and Noise

The Port Hedland Air Quality and Noise Management Plan (Department of State Development, 2010), released in March 2010 after being endorsed by State Cabinet, is a comprehensive management plan for the ongoing air quality and noise management in Port Hedland. The Dust Taskforce makes recommendations to manage both issues on a number of fronts:

- Health risk assessment and analysis;
- Land Use Planning;
- Industry initiatives; and
- Governance.

The recommendations of the Dust Taskforce regarding land use planning are particularly relevant to the Growth Plan. Primarily this includes preparation of a plan which:

- Identifies sites for new development in the entirety of Port Hedland;
- Proposes new development in east Port Hedland;
- Identifies appropriate locations in the West End of Port Hedland for redevelopment as additional commercial

premises, entertainment complexes and short stay accommodation facilities;

- Provides greater guidance on residential density, dwelling types and building design for all areas of Port Hedland; and
- Prescribes additional planning controls to address amenity issues associated with living in an area with elevated levels of noise and dust.

Traditionally the policy and land use planning focus has been on preventing the steady encroachment of sensitive land uses in and around major port and freight operations. Port Hedland is unique in the sense that residential development in the West End has been slowly encroached upon by increasing port operations and its associated infrastructure. This has been a result of its changing role over time from an agricultural port to a bulk commodities port.

The changing role of the port has resulted in the need to accommodate its required expansion to support local, state and national economic objectives whilst respecting and balancing the rights of existing landowners and preserving the areas historic and cultural significance. Historically, this has not been the case, with industry being forced to implement strict environmental management control measures through Ministerial Statements.

The Dust Taskforce's essential role was to achieve greater balance between industrial management of potential environmental health risks with a change in the approach to planning and development in the West End.

A number of key issues are considered in relation to the requirement to prepare a development plan for the Port Hedland town site within Pilbara's Port City Growth Plan:

1. Construction of the proposed Outer Harbour was not considered in the final recommendations of the Dust Taskforce. This future expansion may impact on the capacity to achieve nominated noise and dust targets, including the extent of influence at Taplin Street even with best practice measures being imposed.
2. While modelling shows that recommended targets can be achieved by Taplin Street, it is still a model and there is undoubtedly the possibility of the target being achieved either side of Taplin Street.
3. Achieving the recommended air quality levels closer to the Port will be difficult. BHPBIO's mandate under Ministerial Statement 740 requires the target to be achieved at the Old Hospital site. As such there may be a higher risk in the short – medium term to permanent residential accommodation west of Howe Street
4. The area of assessment was focused on addressing air quality issues with noise being a secondary element. Noise

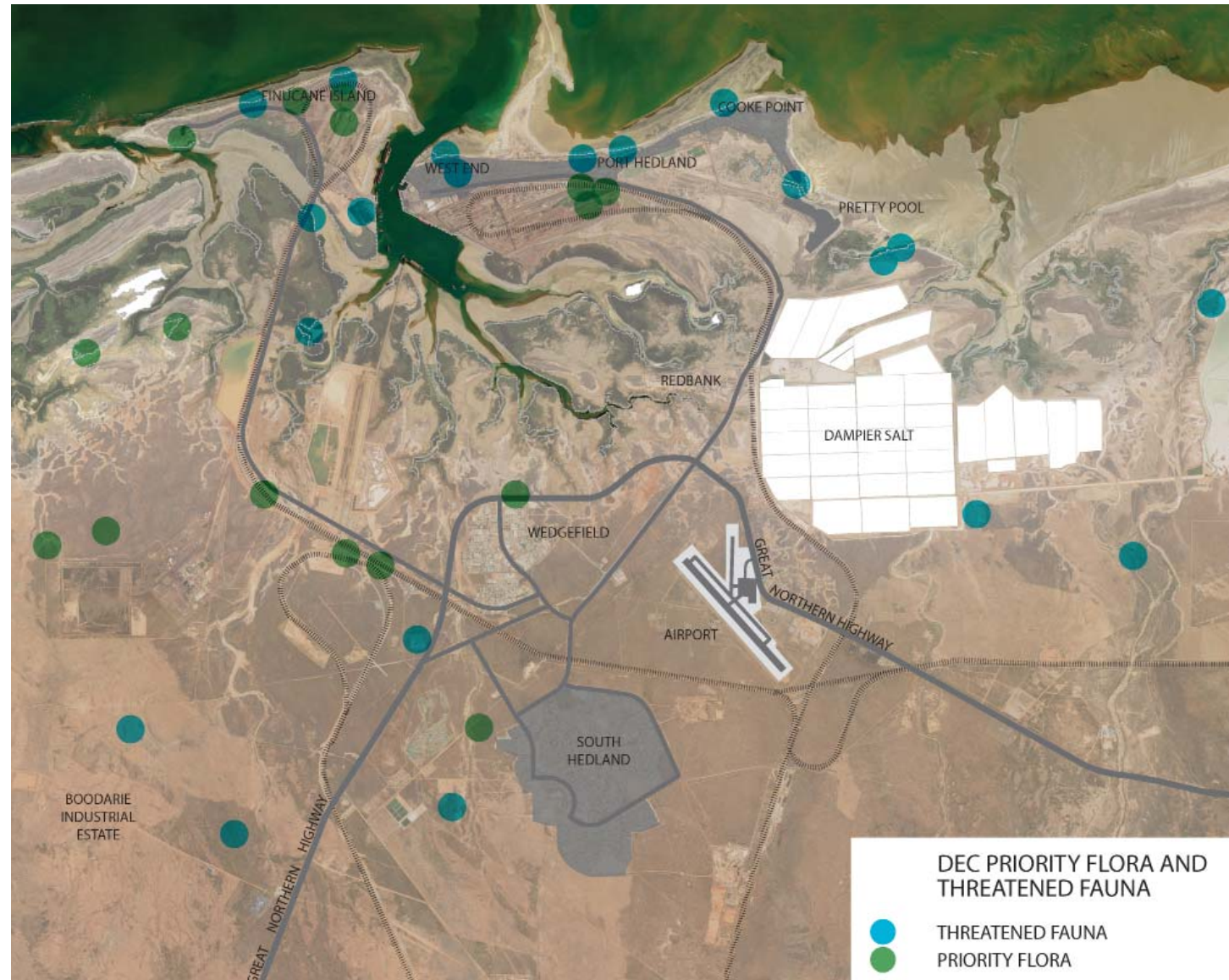


Figure 3.18: Threatened Flora and Fauna (Source - DEC, 2011)

levels, which will also increase with development of the outer harbour and full inner harbour will increase and may affect a broader area.

5. The land use and development restrictions recently imposed through an amendment to Town Planning Scheme No.5 (Amendment No.22, gazetted 27 April 2012) only relate to land zoned Residential rather than all zoned land where residential uses are permitted. Some of the areas not considered are actually closer to port operations and exposed to higher concentrations of dust levels on a more regular basis.
6. Regulating the use of short-stay accommodation by local governments is challenging particularly where they are fully self contained. Measures must be ultimately implemented by the Town of Port Hedland which will ensure that this accommodation is not made available for permanent residential use so to reduce the overall risk of exposure to the population.
7. The West End is experiencing a high level of redevelopment at the present time. This is the result of it being the largest area appropriately zoned to allow for redevelopment. Throughout the remaining areas of Port and South Hedland, there are only limited comparable opportunities for private developers. Similar opportunities for small and medium scale developers need to be made available as soon as possible to attract redevelopment elsewhere.
8. Changes to land use permissibility in the West End will need to consider impacts on land values and development potential, providing further certainty of future land use and development potential while delivering outcomes consistent with the Dust Taskforce recommendations.
9. Land ownership in the West End is dispersed however a number of major land areas are either in the ownership of the State or BHPBIO. Progressing development on these areas with outcomes that appropriately respond to the recommendations of the Dust Taskforce can influence the type of development momentum that will continue.
10. Land use planning will be one element in achieving the vision for the West End. Activation and place making will similarly form an important role in changing this area from residential to the new cultural and commercial centre of Port Hedland.

Contaminated Sites

Historical review, analysis of current document and site visits have identified the following areas of potential contamination in Port Hedland:

- Seven registered DEC Contaminated sites;
- Heavy industry including port activities and extractive

industries;

- Light industry including storage facilities;
- Some residential land uses;
- Utilities including the gas power plant, airport, landfill site, incinerator and sewerage treatment plants;
- Petrol stations, hospitals, abattoirs, rifle ranges and cemeteries; and

- Any land on which preliminary and detailed site investigations have been carried out that highlight contamination concerns.

Contaminated, and potentially contaminated sites, along with the presence of potentially contaminating activities, are a key constraint in the future planning and growth of Port Hedland, with site specific assessments and remediation requirements potentially adding significant time and cost to development time frames.

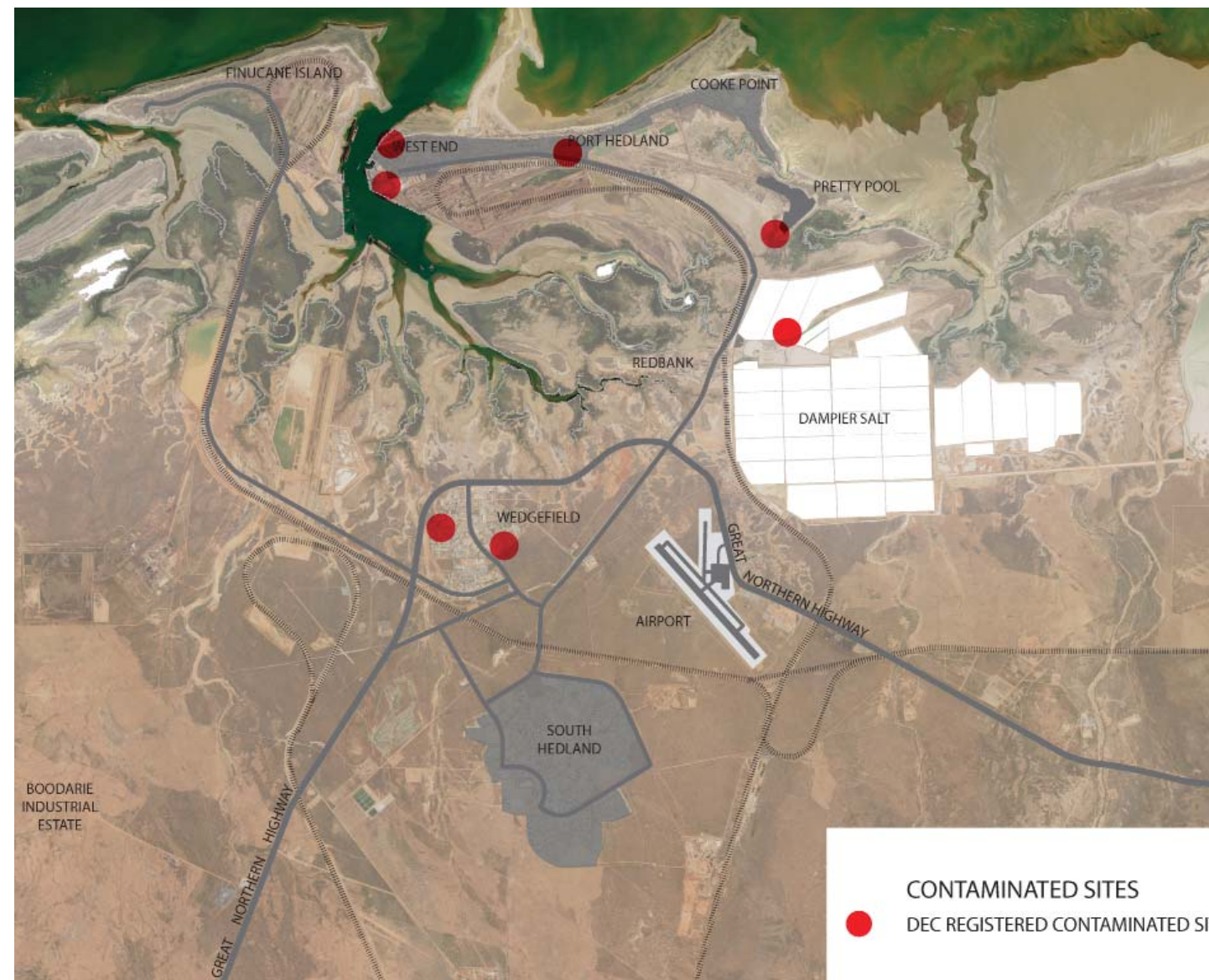


Figure 3.19: Contaminated Sites (Source - DEC, 2011)

Provided within the Environmental Technical Summary at Appendix B is mapping prepared by the Growth Plan consultant team identifying the various potential land use conflicts, areas of influence and best practice buffer areas applicable in Port and South Hedland (RPS, 2011). Whilst not a definitive map of land use exclusion areas, it does illustrate the highly constrained nature of Port and South Hedland given the range of strategic industrial activities and infrastructure present within the town.

Key Challenges and Opportunities

The key environmental factors which are considered likely to present a significant constraint for the future planning and development of Port Hedland include coastal and marine environments, terrestrial flora and vegetation, marine and terrestrial fauna, storm surge and flooding, drainage, contamination, dust and noise and vibration.

Where a future development opportunity is likely to be impacted by any of these factors more detailed site specific investigations will be required to manage any expected adverse impacts.

Key challenges and opportunities include:

- Protecting the coastal and marine environments.
- Protecting the local flora and fauna of the region.
- Mitigating the expected impacts of coastal storm surge and flooding and adapting to the challenges presented by climate change.
- Managing the risks to human health presented by dust, contamination and noise and vibration.
- Ensuring adequate separation distances between industrial and sensitive land uses and/or the implementation of appropriate mitigation actions to manage potential land use conflicts.

3.6 INFRASTRUCTURE

Port Infrastructure

Port Hedland's role in the global iron ore trade is a function of its port facilities. While iron ore mining is increasingly moving into the East Pilbara, there is even greater importance placed on the role of Port Hedland's Port in providing access to global markets.

Total throughput from the Port Hedland Port was approximately 178 million tonnes per annum (Mtpa) in 2009/10 (an increase of 12% on 2008/09 levels) and is expected at more than 200 Mtpa in 2010/11. This makes Port Hedland Port the largest bulk commodity port in Australia, ahead of Dampier and Newcastle.

There are nine ship berths at the port: Two BHPBIO at Finucane Island, three Port Hedland Port Authority public berths near the tug harbour at West End, two BHPBIO berths at Nelson Point and two FMG berth's at Anderson Point. The port also houses ten tugs to pilot the cargo ships into and out of the Port.

The Port Hedland Ultimate Development Plan (PHPA, 2007) predicts that by 2025 iron ore exports from Port Hedland could be as high as 574 Mtpa, with a likely figure of 525 Mtpa. This equates to a total predicted throughput of 536Mtpa in 2025, an increase of 200 percent from its current throughput. The number of vessels is predicted to be approximately 3,400 per year. This increase in port capacity will be achieved through a range of infrastructure upgrades, including:

- Increasing the inner harbour to a capacity of 320 Mtpa;
- Increasing the number of inner harbour berths from 9 to 23;
- Constructing an outer harbour with a capacity of 400Mtpa, including 20 berths; and
- Constructing four off shore bulk liquid terminals.

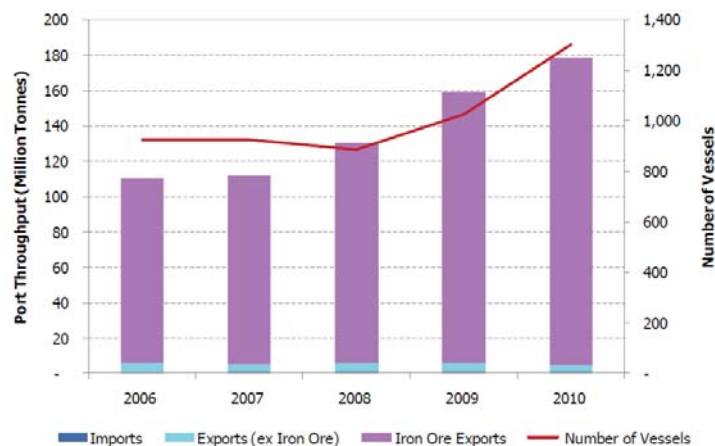


Figure 3.20: Port Activity, 2006-2010 (Source - Port Hedland Port Authority 2010)

The port upgrades have been developed to cater for the predicted increase in port demand. However, the facilities should also cater for container ships to reduce the freight movement by road.

Airport Infrastructure

Port Hedland International Airport is accessed via the Great Northern Highway (Broome Road), and covers an area of approximately 900 hectares, which is predominately owned by the Town. The airport serviced 280,000 passengers in 2010 (a 150% increase from 2005), and is currently serviced by 20,000 flights per year, the majority of which caters for FIFO (fly-in / fly-out) workers in the region. Key destinations include Perth, Brisbane, Melbourne, and Darwin. The airport has two runways: one 2.5 kilometres in length for Regular Passenger Transport and the other one kilometre for General Aviation.

Port Hedland airport is an important freight airport as it is the only one in the north-west that can handle Antonov freight aircraft. The airport also houses the Royal Flying Doctors Service, Polar Aviation, Golden Eagle, Pearl Aviation and Air BP.

The terminal and its infrastructure are struggling to cope with the current number of passengers and international flight requirements (such as customs and immigration). For example, the lack of car parking spaces at the airport was outlined as an issue in the Town's 2010 community survey. This is partly due to transit workers leaving cars at the airport while they are on their break.

Rail Infrastructure

The Town has a well-established, purpose-built and privately operated freight railway network that connects to bulk port facilities from regional mining operations. Diesel trains operate on these railways and currently there are no passenger services. There are two railway lines owned and operated by BHPBIO: Goldsworthy Line and Mount Newman Line. The Goldsworthy Line connects Finucane Island to Yarrie (200 kilometres east of Port Hedland). It is 208 kilometres long and services trains of 600 metre length. The Mount Newman Line connects Newman to Nelson Point. It is one of the longest privately owned rail lines in Australia at 426 kilometres. The railway services trains of 3.75 kilometres in length and it takes approximately eight hours to travel from Newman to Port Hedland.

FMG also operates a railway line into Port Hedland. This line is 280 kilometres long and carries trains of 2.7 kilometres in length. The railway line connects FMG's mines at Cloudbreak and Christmas Creek with their port facilities at Herb Elliot Port (Anderson Point). The trains are operated from Perth and the track carries up to six trains a day. Given the strategic importance of these rail lines to

port and industrial operations it is crucial that future development does not unreasonably encroach upon or potentially restrict the operation of these lines.

Road Infrastructure

The existing road network in Port Hedland is currently affected by the following key issues:

- Limited coastal access;
- Conflict between freight and local traffic around West End (e.g. Wilson Street Port Access);
- Efficiency and safety issues on the Great Northern Highway (Port Hedland Road) between South and Port Hedland;
- Indirect and impermeable street layout in South Hedland; and

- Limited access to surrounding tourist and rural communities due to seasonal flooding of access roads.

Crash Statistics show that the intersections with the highest occurrences of incidence include the four intersections with Great Northern Highway. These comprise a high majority of crashes (84 percent), and the most common type of crash involved right angle collisions, indicating that turning on to the Great Northern Highway poses the highest safety risk for the region.

Traffic volumes along Great Northern Highway are greatest between South Hedland and Port Hedland. Traffic volumes have been growing over the past four years, with average annual growth of 4.7 percent near Wallwork Road and 3.5 percent near Cooke Point Drive. Within this area the Heavy Goods Vehicles representation is in the order of 13 percent.

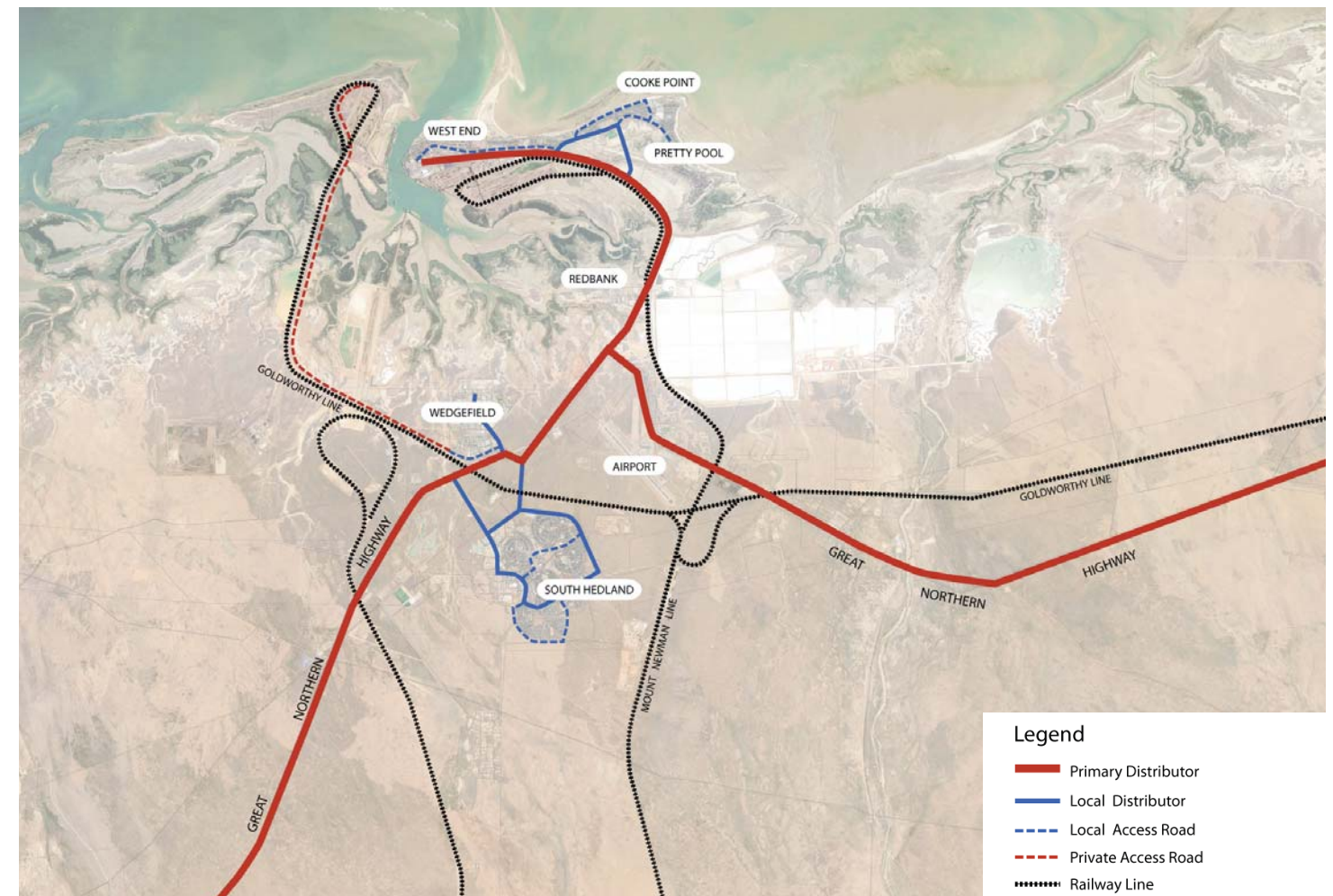


Figure 3.21: Existing Primary Road and Rail Networks (Source - AECOM, 2011)

To the south, the Great Northern Highway recorded 1,323 vehicles per day, with a very high representation of Heavy Goods Vehicles (38.4 percent). Similarly along the Great Northern Highway (road to Broome), the Average Daily Traffic was 1,158 with Heavy Goods Vehicles representing 39.1 percent of traffic.

There are a number of issues affecting the efficiency of the road network in the Town of Port Hedland:

- Travel within the Town is heavily reliant on the private vehicle. Of the 85.8 percent of the population that travel to work, 63.9 percent travelled by car (as driver), truck or motorbike/scooter, 9.4 percent travelled as a car passenger, 0.6 percent as a taxi passenger, 1.0 percent by more than one mode, and just 11.0 percent of the population travelled via walking, cycling, bus or other.
- The mix of tourist, commuter and heavy vehicle traffic along the Great Northern Highway (particularly between Port Hedland and South Hedland) poses a serious risk. The two-lane highway provides little opportunity for cars to overtake trucks, increasing the potential for conflict.
- There is a lack of priority for vehicles travelling along the Great Northern Highway at the problem intersections. This, combined with the number of road-level rail crossings, results in the need to frequently stop on a high speed road.
- The Great Northern Highway / Port Hedland Road intersection has inadequate capacity. It is understood from the MRWA Great Northern Highway Realignment Project Overview, that this intersection is experiencing difficulties due to high levels

of turning vehicles.

- Most of the local roads are operating at level of service and thus are free flowing with significant capacity, although Throssell Road, due to its location in the heart of South Hedland's Town Centre, carries significant traffic and has limited capacity.

Freight & Logistics Networks

Port Hedland's close proximity to substantial mining activity in the Pilbara and its coastal location reinforce its role as a regional transport hub. Goods are transported from the mine sites, by road and rail, to the Port Hedland Port from where they are shipped around the world. This results in a high level of heavy vehicles on the strategic road network connecting the mines to the port.

The main access to the port is via the Great Northern Highway and Wilson Street. Access to the BHPBIO facilities at Finucane Island is via Finucane Island Access Road, and access to the FMG facilities at Anderson Point is via a spur road off Finucane Island Access Road, just west of Wedgefield. Vehicles range from triple road trains down to passenger work vehicles.

The route along the Great Northern Highway and Wilson Street currently has no priority at Port Hedland Road, Wallwork Road and Pinga Street. It also crosses four railway level crossings, reducing safety and efficiency. This route also requires the port traffic to travel through the Port Hedland Town Centre which is causing conflict between port and local traffic. This was highlighted in the 2010 Community Survey (ToPH, 2010). The routes to the port provide no passing opportunities and limited rest stops which

impacts efficiency of traffic movement and safety.

According to Curtin University's *"From Projects to Places"* (Newman, Bilsborough, Reed and Mouritz, 2010), currently only five percent of goods are produced locally with the rest requiring importation. Most of the goods are being transported to Port Hedland by road from Perth (either via the Great Northern Highway or the North West Coastal Highway) due to the reduced economic viability of travelling by sea. Furthermore, the Port Hedland Port does not handle container freight.

The Main Roads designated heavy vehicle routes within the Town include:

- Great Northern Highway.
- BHP Access Road into the Boodarie Industrial Estate.
- The road network in the Wedgefield Estate.
- Wilson Street Port Access Road.
- Finucane Island Access Road extending from the Wedgefield

Estate / Great Northern Highway to Finucane Island.

Public Transport Infrastructure

There are two main privately operated bus services connecting the region to Perth. One operates once a week between Port Hedland, Newman and Perth, and another operates three times a week between Perth, Broome and Darwin. The relative infrequency of these services means that the region is fairly dependent on air travel to connect to Perth and other towns and cities.

Within the Town there are three public bus routes operated by Hedland Bus Lines, and taxi services are provided in both Port and South Hedland through local operators.

BHPBIO, as one of the main employers in the Town, runs a private bus service for employees. This service runs from Finucane Island to Western Yard to South Hedland, Nelson Point to South Hedland, South Hedland to Point Cooke / Pretty Pool and Nelson Point to Point Cooke / Pretty Pool.

An airport shuttle bus is currently provided from the airport to key destinations. This service can be booked on line and meets all



Figure 3.1: Port Hedland Existing Bus Network (Source - AECOM, 2011)

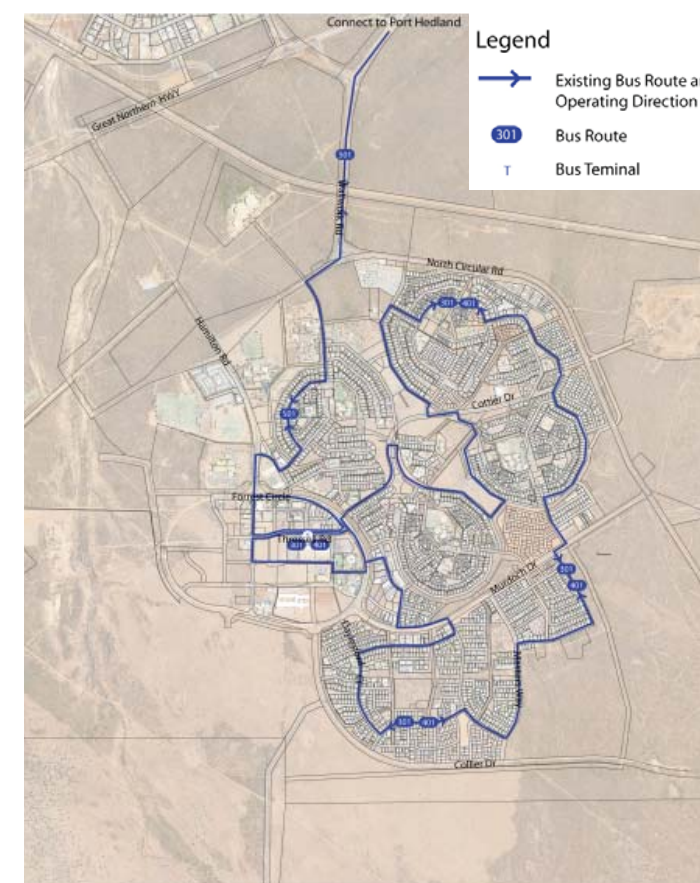


Figure 3.2: South Hedland Existing Bus Network (Source - AECOM, 2011)

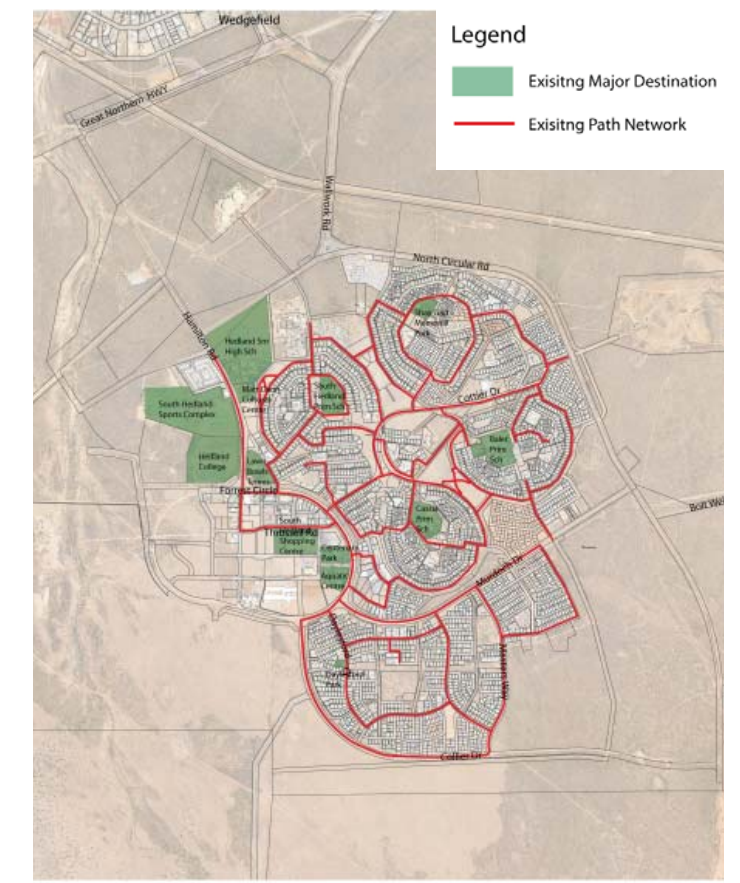


Figure 3.3: South Hedland Existing Path Network (Source - AECOM, 2011)

airport arrivals. The Town also has a community bus which it hires out to community and sporting groups for use.

Further opportunities exist to expand and diversify the public transport/community transport offering in the city, particularly with regard to meeting the needs of the local indigenous population (e.g. through establishment of local transport companies, etc.). Opportunities also exist to improve the offering of driving school services in the city, with only two schools currently operating and difficult to access given high levels of demand. This is particularly important with regard to removing existing barriers for local residents seeking employment and education/training opportunities.

Pedestrian & Cycle Network

There is currently no pathway linking Port Hedland, South Hedland and Wedgefield. The 2010 Port Hedland Community Survey (ToPH, 2010) highlighted this as one of the community's top issues. The community requested that a path be provided to cater for those people who wish to walk or cycle to work at Wedgefield. This complements the high walk to work statistics for the Town.

Within Port Hedland all streets appear to contain verges wide enough to accommodate a pathway. However, most do not currently have a continuous path. Those that do mostly contain a path on one side of the road only. These paths are scattered throughout Port Hedland and in some cases are not linked at all or directly to the rest of the network. The paths are of varying widths,

but mostly do not appear wide enough to cater for both pedestrian and cycle movement (although the verge width appears wide enough). On some streets the location of the path changes sides forcing pedestrians and cyclists to cross the street.

The recently developed shared user path located along the foreshore has proven to be a popular recreation destination for residents, demonstrating the latent demand for such facilities.

The path network in South Hedland is more extensive and continuous than in Port Hedland. However, due to the street layout many routes are less direct than those in Port Hedland.

Water Supply

The supply of bulk potable water to the Town of Port Hedland is provided through the Water Corporation which operates the Port and South Hedland Water Supply Scheme. The scheme is reliant on groundwater extraction from the Yule and De Grey rivers which currently produce 13.5 gigalitres of potable water a year.

The Water Corporation have advised that the 13.5 gigalitres is currently fully allocated, with a further 5 gigalitres per year already met by existing customers. The Water Corporation is investigating a new water source area approximately 200km east of Port Hedland (West Canning Basin), which may present a long term solution to the Town of Port Hedland's water demands for a population base of 50,000 people. Until then, innovative solutions will be required to meet the immediate and short term demand for water.



Figure 3.4: Port Hedland Existing Path Network (Source - AECOM, 2011)

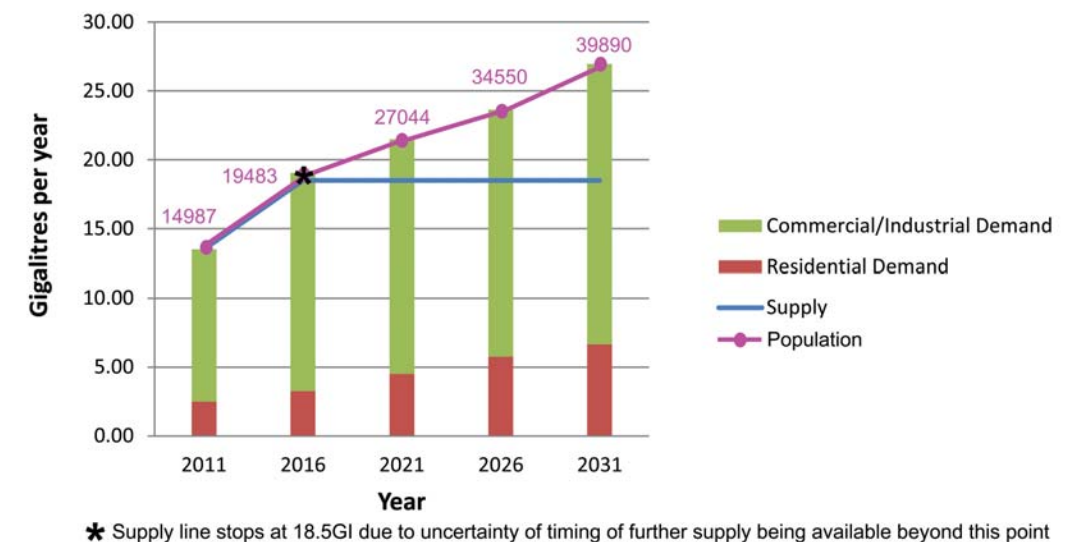


Figure 3.5: Water Supply and Demand for Forecast Population (Source - WGE, 2011)

Wastewater

The treatment and disposal of wastewater within the Town of Port Hedland is undertaken by the Water Corporation. The Water Corporation's wastewater reticulation system currently discharges to one of two wastewater treatment plants, one in Port Hedland and the other in South Hedland. The Water Corporation has advised that the South Hedland wastewater treatment plant is at capacity, while there is some limited additional capacity still available in the Port Hedland wastewater treatment plant.

In January 2011 the Water Corporation received \$106m in funding to relocate the Port Hedland Wastewater Treatment Plant to a combined upgraded facility in South Hedland. The expected completion time for this project is approximately 2014.

Power

Horizon Power is the supply authority operator of the Pilbara power supply grid. This grid is partially interconnected by high voltage power transmission lines owned by both Horizon Power and mining companies. Power supply within the established areas of the Town of Port Hedland are supplied via a high voltage supply scheme network of 22kV which is made up of a combination of overhead lines and underground power cables fed from by one of the three zone substations located within the Town. The substation in Port Hedland has minimal scope for upgrade, while

the substations in Wedgefield and South Hedland still have the ability to be upgraded.

To support further population growth, it is estimated a minimum of an additional three zone substations will be required. Horizon Power have identified strategic locations for zone substation sites and may also undertake a land swap should these sites fall within a proposed development. Horizon Power forecasts for the region suggested an additional 30-45MVA will be required over the next ten years, although demand may be substantially higher than this to achieve the growth rates required under the Growth Plan vision.

Gas

Despite being located in a region that provides a significant proportion of Western Australia's domestic gas supply, Pilbara towns are not provided with a reticulated gas supply network. There are no current plans to provide reticulated gas to the Town of Port Hedland, and this is unlikely to change due to the high establishment costs of installing the initial network. Provision of gas reticulation is typically only viable when provided to a suitable industry, otherwise gas bottles are currently the most feasible option.

Communications

Telecommunications infrastructure throughout the Town of Port Hedland is provided by Telstra. As of 1 January 2011 NBN Co. have been nominated as the future provider of telecommunications to the Town of Port Hedland.

Initial advice from NBN Co. is that for the short term supply of existing areas will be via satellite, however they will be also investigating opportunities to install their equipment in association with other authority works. An example of a potential opportunity to do this would be involvement with Horizon Power and their Pilbara Underground Power Project (PUPP).

Earthworks

Finished lot levels within the Town of Port Hedland are typically dictated by the need to be above the 1 in 100 year flood in South Hedland, with coastal areas (such as Port Hedland, Cooke Point and Pretty Pool) also subject to storm surge and sea level factors. The availability of suitable fill sources within the Town of Port Hedland is quickly becoming exhausted, and the cost to supply suitable import fill material to development sites is approximately twice as expensive (approximately \$40/m³) as it is currently in Perth.

Stormwater

Port Hedland is susceptible to storm surge and flooding given its coastal location in a cyclone prone area. Substantial fill will be required in some areas to ensure developments are above

storm surge and flooding levels or alternatively development sites should be identified where the existing levels are above flood levels.

Due to the intensity of storms, pit and pipe drainage systems are not typically used within the Town of Port Hedland. This is due to the large pipe sizes required for storm events and the high maintenance costs associated with keeping a pit and pipe system clean and operational. Instead, the treatment of stormwater drainage within is typically by the routing of run-off to open drains via the road network which eventually discharge to creeks. Co-ordination of a regional / district water management plan would assist in ensuring planned drainage outcomes are applied across the precincts rather than ad-hoc treatments that simply shift the problems downstream.

Waste Management

An industrial waste incinerator (Tox-Free) is located in the Wedgefield Industrial area and has been operation since 1995. It incinerates industrial waste including chemicals, oil and grease, drilling mud and contaminated soil.

The South Hedland landfill facility comprises 37ha and is located to the south east of South Hedland and accessed via the Outer Ring Road. It is a Class 2 Landfill facility, authorised to accept certain hazardous wastes including asbestos, synthetic mineral fibres and some potentially hazardous industrial materials. There are no recycling services provided at present, which poses a particular challenge for the development of a modern, sustainable regional city.

Key Challenges and Opportunities

- Future development of Strategic Port and Airport assets are supported by long term strategic planning documents including the Port Hedland Ultimate Development Plan (PHPA, 2007) and Airport Master Plan (ToPH, 2011);
- There will always be a requirement for heavy freight movement into the port, placing significant demands on key haulage routes and potential traffic conflicts with local/residential traffic given the port's proximity to existing urban areas;
- Opportunities to improve port access through new port access road improvements (also improving separation of heavy and small vehicles);
- Opportunities for freight consolidation and intermodal improvements to improve network efficiency;
- Traffic growth on local and strategic road networks and resulting congestion/safety issues;
- Opportunities for more flexible public transport options (e.g. DRT) and coordinated transport options for workforce populations; and
- Improvements in local pedestrian and cycle path networks;
- Water supplies currently at capacity, with little additional capacity being made available in the short term;
- Long lead-in time frames associated with identifying and developing new utilities infrastructure (e.g. water, electricity, waste water treatment), potentially limiting population growth in the short term;
- High infrastructure costs providing new infrastructure outside existing developed areas/beyond development front (offset by relatively low infrastructure costs within existing areas);
- Opportunities to reduce use of potable water for domestic (e.g. landscaping) and industrial purposes (e.g. dust suppression) thereby increasing the availability for residential expansion;
- Establishment of West Canning Basin borefield to supply non-residential applications thereby removing the constraint of potable water availability on current population goals;
- Relocation of the Port Hedland Wastewater Treatment Plant to an upgraded South Hedland Wastewater Treatment Plant, providing increased capacity and opening up new developable land area in the East End of Port Hedland;
- Potential for more sustainable methods of power generation to be employed (e.g. solar);

- The current availability of established fill sources is reaching its limit, with no guarantee on the suitability of fill from alternative sources (e.g. dredging operations or mangrove revegetation works); and
- Opportunities to establish a more sustainable and coordinated approach to water management through development of a Regional Water Plan / District Water Management Plan in conjunction with the Department of Water.
- Lack of recycling facilities and services at present. Opportunities for future improvements to local waste management and recycling operations to maximise sustainability principles and resource efficiency.

