australian venture CONSULTANTS PTY LTD

Activating WA's Strategic Industrial Areas

A Focus on Critical Minerals

Chamber of Minerals and Energy of Western Australia

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Section 6 is not-for-publication.

Executive Summary

The nature and purpose of this study

Western Australia's portfolio of Strategic Industrial Areas (SIAs) has been under development for approaching four decades now and over this time have served as a component of various State Government policies designed to support a range of industrial outcomes.

Similarly, across Australia there has been an ongoing decadal conversation regarding the extent to which Australian industry can (or should) extend and expand its participation in minerals and resources supply chains beyond its current global leadership in primary production and mining towards greater value-adding steps in processing, refining, precursors and other derivatives (upstream), or even midstream manufacturing and downstream into final product manufacture.

As such, it is unsurprising that within Western Australia SIAs have again become a key focus of the State Government, industry and commentators in the context of critical minerals supply chains. SIAs form a key pillar of several Western Australian Government white papers and policies, including *Western Australia's Battery and Critical Mineral Strategy 2024 – 2030* (2024), *Western Australia: Powering the global energy transition* (2024), *Western Australia: A Global Battery and Critical Minerals Hub* (2023), and *A World-Leading Resources Sector: Western Australia's mineral and petroleum resources development strategy* (2021). Activation of the SIAs is also a key aspect of the *Western Australian Renewable Hydrogen Strategy* (2019, updated 2021), and the SIAs feature heavily in the *Roadmap* and semi-annual *Prospectus* demonstrating where the State Government feels investment in hydrogen facilities is best aligned. Further, in May 2024 the State Government announced a $500 million 'Strategic Industries Fund' with the stated purpose of 'unlocking' the SIAs to drive major job creation and ensure Western Australia becomes a 'clean energy powerhouse'.[1] This followed the announcement of $160 million in industrial lease fee rebates and rent waivers for selected SIAs in November 2023.[2]

However, Western Australia is far from alone in aspiring to secure a greater presence in upstream, midstream and downstream critical minerals supply chains,[3] or in securing a greater role in hydrogen production and other clean energy sectors, and faces enormous competition from processing, chemical production and advanced manufacturing economies across the globe. If the primary tool in the Western Australian Government's toolkit to achieve this is the SIAs, this naturally begs the question of whether the SIAs are up to the task.

As such, the purpose of this Study is to examine the competitive landscape in which Western Australia's SIAs operate, the extent to which those SIAs are currently fit for purpose, what would be required in order for them to become broadly comparable to other industrial precincts and

[1] In June 2024 the WA Government also released a document titled 'Western Australia's Strategic Industrial Areas: Planned, activated and connected in strategic locations across the State'.
[2] WA Government, *New incentive scheme to attract global-scale clean energy projects*, November 2023.
[3] Upstream activities refer to minerals and metals primary production, recovery, processing and refining and manufacture of typically high purity chemicals that are inputs to the manufacture of precursors for materials used in the manufacture of high-tech products; midstream activities incorporate the manufacture of specialty chemicals and precursors and materials based on those precursors that are used in the manufacture of components of high-tech products and the manufacture of those components; and downstream activity incorporates the assembly of those components and manufacture of the final product based on those components.

parks across the APAC Region and provide a suite of practical and realistic recommendations that might advance the suitability of the Western Australian SIA framework.

Critical Minerals

Geopolitics and international trade have always been heavily influenced by access to resources. The latest iteration of this is a focus on 'critical minerals' – specific minerals that various international jurisdictions have deemed 'critical' because:

- they are non-substitutable inputs to advanced manufacturing processes which are critical to economic prosperity, national security or quality of life; and
- their availability is subject to a degree of supply risk – in short supply or where supply is concentrated in a small number of jurisdiction, constrained by various economic, social or geopolitical factors, or otherwise limited, variable or uncertain.

As well as their broad use in most aspects of modern economies, underpinning everything from national security to consumer goods, a key part of the 'critical minerals' focus is the extent to which they will be required in clean energy transitions. Industry and governments across the globe are all facing growing pressure to reduce greenhouse gas emissions, which in most circumstances means greater electrification sourced from renewable energy generation and energy storage. This, in turn, means greater derived demand for silicon and a range of other elements in solar panels, aluminium and rare earths in wind turbines, platinum in hydrogen electrolysers, lithium, cobalt, manganese and nickel in batteries, copper to wire everything together, and a range of other products of minerals and metals for all manner of applications and processes. This Study takes a broad definition of critical minerals, including but not limited to those included in Australia's published Critical Minerals List and Strategic Materials List.[4]

Western Australia and global critical minerals supply chains

While the products of critical minerals are in demand everywhere, current critical minerals supply chains have developed such that they are overwhelmingly dominated at the upstream (excluding primary production and immediate recovery and processing), midstream and downstream level by the advanced manufacturing economies of Asia. However, that advanced manufacturing is dependent on the significant supply of minerals and metal inputs into the speciality chemicals and materials that are required.

For most Asian nations, natural endowment of most minerals and metals is limited. This has been addressed through the establishment of robust global supply chains, whereby raw materials are sourced from mining and mineral processing across the globe, refined, processed and transformed into chemicals and materials and final products locally, and either consumed by the vast industrial and consumer goods markets of the region or exported as finished goods worldwide. As shown below in Figure 1,[5] the PRC is by far the dominant player in these supply chains.

[4] Department of Industry, Science and Resources, *Australia's Critical Minerals List and Strategic Materials List*, February 2024.
[5] Barron, K.C (2023*), The geopolitics of critical materials and minerals and implications for the low-carbon transition,* April 2023, Resource Efficiency Collective

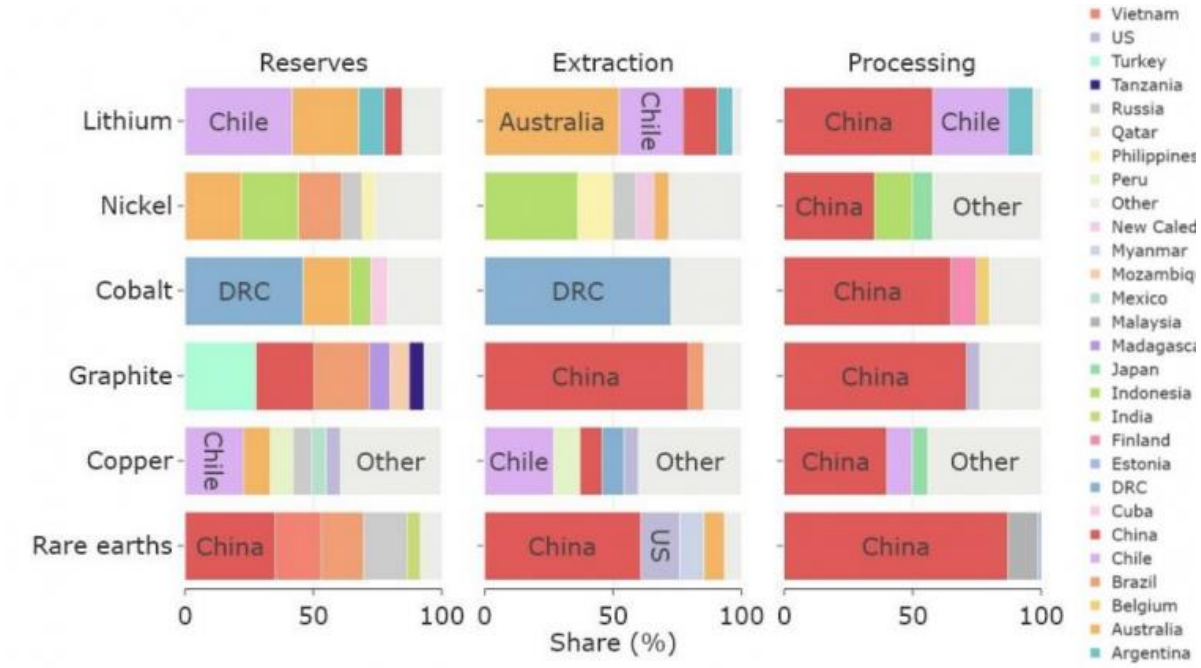


FIGURE 1 – SUPPLY CHAIN PRESENCE, 2021/22, SELECT CRITICAL MINERALS

However, as summarised below in Table 1, in responding to these market dynamics other Asian economies are also increasingly playing a key role in critical minerals supply chains.

TABLE 1 - ASIAN CRITICAL MINERALS-EXPOSED JURISDICTIONS EXAMINED BY THIS STUDY

Jurisdiction	Notable critical minerals exposure	Primary value-chain stage
Vietnam	Rare earth elements – 2nd largest known reserves, although production currently low due to PRC price competition. Tungsten - Nui Phao (Masan Group) largest global supplier, and also significant supplier of copper concentrates. Li-ion – emerging presence in battery precursors, cell and pack assembly.	Upstream and early midstream, emerging presence in processing and manufacture.
Indonesia	Nickel – largest global producer and host to significant proportion of global supply chain participants. Cobalt – second-largest global producer and host to number of producers (typically activated as co-mineralisation with nickel).	Key upstream and early midstream supplier.
Malaysia	Aluminium and manganese – growing globally significant cluster of refining and early midstream processing in Sarawak region (especially for high purity manganese sulphate monohydrate; HPMSM), drawing on domestic and imported ore supply. Rare earth elements – globally significant reserves and historical production (now defunct). Growing early midstream presence in refining and processing based on imported ores. Li-ion – early-stage participation in joint-ventures with established industry partners in precursors, cell and pack assembly.	Regionally significant refining and early midstream.
Republic of Korea (South Korea)	Very limited domestic endowments of any relevant minerals, highly involved in supply chains at midstream and downstream product manufacture for a large number, particularly those associated with li-ion battery ecosystems – nickel, cobalt, lithium, copper, graphite, manganese, aluminium.	Key advanced midstream and downstream.

These existing supply chains and trade relationships, and the concentration of upstream, midstream and downstream processing within Asia, obviously engenders supply risk. Indeed, the dominance of the PRC especially in these supply chains is one of the key aspects which has led to the designation of many minerals as 'critical'. Nations worldwide are reacting to this through a range of policies and other measures aimed at creating greater supply diversity and security and securing their own commercial advantage.

Without question, Western Australia will play a key role in critical minerals trade, with substantial endowments of many of the raw materials needed. These include most prominently lithium, nickel, copper, various mineral sands and light and heavy rare earths, and as shown below in Figure 2,[6] the State is a major supplier of these, in predominantly partially-processed forms, to global markets.

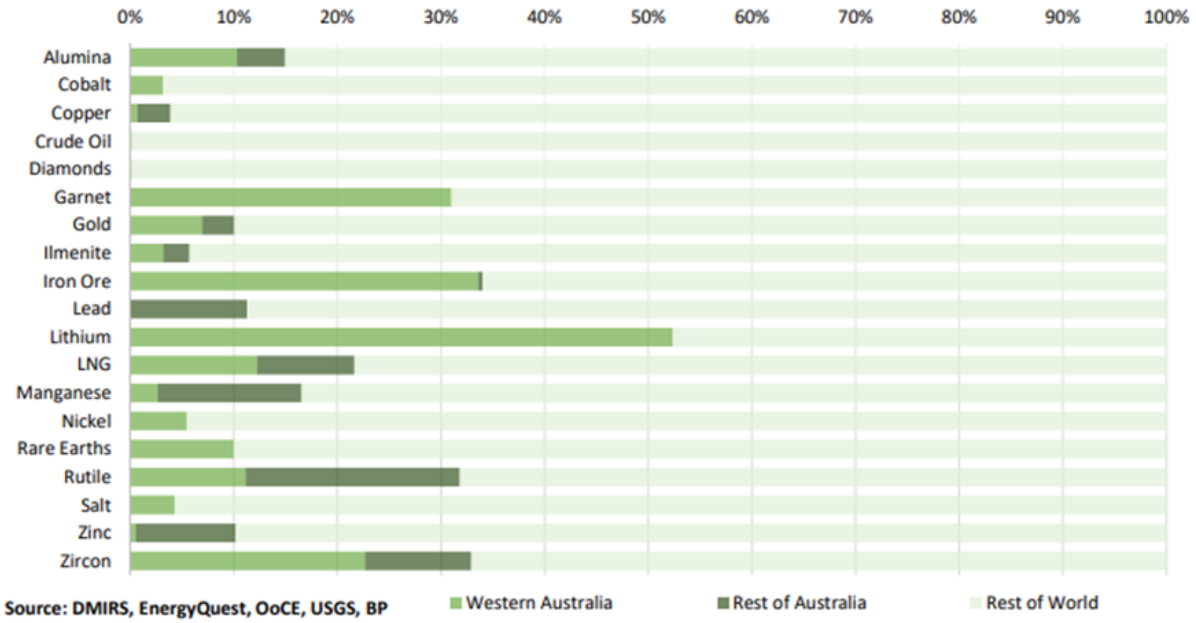


FIGURE 2 - WESTERN AUSTRALIAN SHARE OF SELECT CRITICAL MINERALS PRIMARY PRODUCTION, 2022/23

In seeking to capitalise on the critical minerals opportunity, the Western Australian Government is seeking to encourage domestic value-adding to critical minerals production. Domestic value-adding to minerals primary production more generally has been a long-standing objective of consecutive Western Australian governments even prior to the emergence of the critical minerals opportunity, with evidence of this enshrined in the terms of some of the earliest State Agreements. However, success in this regard has been limited to date, with only a few examples where sustained domestic downstream value-adding extends beyond the immediate stages of minerals processing.

If Western Australia is seeking to increase its participation within critical minerals and clean energy supply chains, it will be competing with other jurisdictions around the world to do so. For a variety of reasons discussed in depth herein but boiling down to comparative cost, Western Australia will likely never compete with the PRC in this regard. Nor could virtually any other nation. However, the geopolitical and economic goal of most nations is not to entirely supplant the PRC, but rather to address and reduce supply risk by building a portfolio of domestic capabilities and alternate international suppliers. In other words, to build greater

[6] Chopping, R./Geological Survey of WA (2024), Battery Minerals Sector in WA, presentation given 4 March, PDAC, Toronto Canada

diversity and security of supply outside of the PRC to both complement supply from the PRC and build a differentiated domestic product offering which carries product attributes that render it competitive on metrics other than pure cost, such as a stable and predictable political environment, low sovereign risk, and strong environmental, labour and community welfare controls. In Western Australia's case, these factors may, over time, increasingly support the competitive advantage its industry hopes to build.

The clean energy and emerging hydrogen sector

As already noted, critical minerals will also be critical for clean energy transitions and global efforts to decarbonise industry, whether through electrification or through transition to alternate zero- or low-emissions fuels, such as renewable or low-carbon hydrogen. Much has been written[7] on Western Australia's potential role in this regard, and a detailed analysis of this lies outside the scope of this Study.

Whatever the future industry profile looks like, however, it will have a significant intersection with SIAs – the energy-intensive industries that SIAs seek to host will be a key demand source for renewable energy (as is already the case), a demand base that has massive growth potential, but which can only achieve that potential if the SIAs are aligned with industry needs.

The importance of Strategic Industrial Areas (SIAs)

Turnkey SIAs can play a key role in supporting the development of critical minerals, clean energy and other strategic industries by reducing capital costs, lowering project risk, reducing time to market and efficiently linking industry to overseas markets, thereby making private investment more attractive. To effectively attract investment, SIAs should provide common-user infrastructure such as utility connections (water, gas, electricity, waste and recycling) and transport infrastructure (road, rail and access to constructed multi-user ports). To further ensure speed to market all land should be subject to appropriate tenure arrangements and cultural, heritage, development and environmental approvals (including native vegetation clearing) should be in place to the maximum extent possible. While not all industries will have identical needs, the competitiveness of individual SIAs will also be determined by their proximity to a skilled local workforce, upstream materials supply, such as resource deposits and sources of chemicals, reagents and other inputs.

The APAC landscape of industrial precincts and parks

Towards this end, this Study has examined the production environments of six Asia-Pacific and North American nations – the United States, Canada, Vietnam, Malaysia, Indonesia and the Republic of Korea (South Korea) – that are seeking to build an internal critical minerals processing and value-adding capability, and clean energy technologies, to illustrate the challenges Western Australia will face in seeking to build a competitive advantage and attract upstream, midstream and downstream industry presence.

As noted, the modern Asian economies have been built on the region's comparative advantage in manufacturing. While the PRC dominates critical mineral oriented and clean energy production supply chains, almost all other Asian jurisdictions are supporting domestic growth and pursuing foreign direct investment (FDI) along these same supply chains.

[7] Eg. Australian Venture Consultants (2021), *Western Australia's Competitiveness in the Hydrogen Economy*, October 2021, for Chamber of Minerals and Energy of Western Australia

Presently, and increasingly, the overwhelming majority of upstream, midstream and downstream capacity for critical minerals and clean energy technologies is located in the Asian chemical and manufacturing economies. In addition to their structural cost advantages, trade policy flexibility and large consumer and business markets, central to the dominance of these Asian supply chains has been a longstanding policy framework that incorporates special economic zones and associated fit-for-purpose turnkey industrial parks and precincts that substantially pre-dates the rise of critical minerals and renewable energy. Designed to attract the Foreign Direct Investment (FDI) necessary to activate these zones, parks and precincts, the policy framework has become entrenched as a key advantage in operating upstream, midstream and downstream facilities in the Asian economies and continue to be used to successfully attract critical minerals-dependent supply chains.

The economic and fiscal attractiveness of these precincts and parks are also typically supported by often highly significant financial and regulatory incentives. This is not only the case for the more established processing and manufacturing economies of Asia, but such policies are also an FDI attraction tool of choice for most developing economies in Asia. As illustrated in Table 2 below, these combine with globally competitive pricing structures to dramatically advantage production in these areas. Further, several of these jurisdictions present business and investment environments that are comparable to Australia, if not better (Australia's Doing Business score is 81.2, for a global rank of 14th place).

TABLE 2 - ASIAN SPECIAL ECONOMIC ZONES (SEZ) EXAMINED BY THIS STUDY

Jurisdiction	Special Economic Zones	Notable minerals & resources SEZ tenants	World Bank Doing Business rating	Incentives and policies	Indicative input pricing ($USD)
Vietnam	Very significant development tool – over 560 areas declared to date, in 62 of 64 provinces. Number of different types, designed to facilitate different industry sectors. Examined by this Study: Dinh Vu-Cat Hai Industrial Zone; Vung Ang Economic Zone.	VinGroup, LG Chem, Pan Asia Metals, Gotion HighTech, Formosa Steel, other petrochem majors	69.8 (70th globally)	Corporate tax exemptions (typically 2-4yrs post-product.) followed by negotiated lower rates, land tax exemptions / reductions, customs / excise and import controls eased, streamlined or 'preapproved' regulatory approvals.	Elec: 0.08/kWh (19% renewable, 7% gas) Ptrl: 0.94/L Gas: 1.63/GJ Water: 0.14-0.71/m3 (varying by take)

Jurisdiction	Special Economic Zones	Notable minerals & resources SEZ tenants	World Bank Doing Business rating	Incentives and policies	Indicative input pricing ($USD)
Indonesia	Relatively recent tool but growing – 20 areas announced since 2014 with 12 operational. Central government oversight/input into management and control. Examined by this Study: Galang Batang KEK; Gresik KEK	Freeport Indonesia, Bintan Alumina, Nanshan Group, Tianshin Aluminium, DPI World, Xinyi Solar Glass	69.6 (73rd globally)	Corporate tax exemptions (typically 10-20yrs), accelerated depreciation, VAT exemptions, import and customs duty exemptions, local / regional tax reductions, tax-advantageous leasehold provisions, streamlined and 'preapproved' regulatory approvals.	Elec: 0.08/kWh (21% renewable, 14% gas) Ptrl: 0.62/L Gas: 13.47/GJ Water: 0.16-0.51/m3
Malaysia	Very significant development tool – over 600 to date with 250 of significant scale. Specific types for different sectors. Examined by this Study: Samalaju Industrial Park; Malaysia-China Kuantan Industrial Park	Press Metal, Pertama Feroalloys, Xin Wu'an Steel Group, Latrobe Magnesium, LONGi Malaysia, OCIM Polysilicon, Alliance Steel, Guangxi Investment Group, NewOcean Energy, Bosai Minerals	81.5 (12th globally)	Corporate tax exemptions (typically 10-15yrs), stamp duty exemptions, import / customs duty exemptions, negotiated reductions / exemptions to regional taxes, strong lead-agency support by MIDA through regulatory approvals.	Elec: 0.08/kWh (4% renewable, 39% gas) Ptrl: 0.43/L Gas: $13.63/GJ Water: varying by region
Republic of Korea (South Korea)	Relatively mature tool, with 9 FEZs operating since 2022. Generally operated as partnership between provincial and central government and one or more *chaebol* major private industry partners. Examined by this Study: Pyeongtaek-Poseung FEZ; Gwangyang Bay Area FEZ	Samsung, SK Hynix, Ssangyong Motor, LG Chem, Donghee Auto, Hyundai, POSCO, major petrochems.	84 (5th globally)	Corporate tax exemptions (typically 5yrs), stamp duty and other acquisition tax exemptions for 15yrs, property tax reductions for 15yrs, negotiated reduced regional / local taxes and levies, in some instances negotiated but sizeable cash grants or co-investment, strong lead agency support by MOTIE through regulatory approvals.	Elec: 0.16/kWh (2% renewable, 18% gas, 15% nuclear) Ptrl: 1.24/L Gas: 13.63/GJ Water: varying by region

While arguably not as prolific or efficient as their Asian counterparts, similar general and sector-specific industrial precincts and parks are common features of other major economies, including those which are more structurally similar to Australia such as the North American economies. Again, whilst generally not as robust as their Asian counterparts, these North

American precincts and parks enjoy access to substantial Federal, State and County incentives, as broadly summarised below in Table 3.

TABLE 3 – NORTH AMERICAN INDUSTRIAL ZONES EXAMINED BY THIS STUDY

Jurisdiction	Special Economic Zones	Notable minerals & resources SEZ tenants	World Bank Doing Business rating	Incentives and policies	Indicative input pricing ($USD)
United States of America	Some defined Federal zone types exist (mostly associated with ports and import/export areas), but primarily State-declared industrial areas implemented at policy-level. Examined by this Study: Detroit Regional Partnership	General Motors, LG Chem/Energy Solutions, Ford, Toda America, BASF, Graphex, Gotion HighTech, EmChem	84 (6th globally)	Federal: Bipartisan Infrastructure Law sectoral funding, America COMPETES sectoral funding, CHIPS Act sectoral funding, Inflation Reduction Act sectoral funding and tax credits. State of Michigan: large number of grant streams and regional property tax exemptions / reductions for qualifying large industrial projects, pre-approvals and other regulatory easements.	Elec: 0.08/kWh (9% renewable, 35% gas, 10% nuclear) Ptrl: 1.10/L Gas: 0.28/GJ Water: 0.91 - 1.64/m3 (varying by take)

Jurisdiction	Special Economic Zones	Notable minerals & resources SEZ tenants	World Bank Doing Business rating	Incentives and policies	Indicative input pricing ($USD)
Canada	Collaborative approach between Federal and Provincial governments to determine broad priority development areas, then supported by mix of Federal and Province-level support. Examined by this Study: South Ontario region of 'Canada Innovation Corridor'	LG Energy Solutions, Stellantis, Volkswagen, Umicore, Electra, Vale, Canada Nickel, Avalon Advanced Materials, Nano One	79.6 (23rd globally)	Federal: Critical Minerals Infrastructure Fund, Geoscience Data Initiative, and Research and Development Programme, Indigenous Natural Resource Partnerships Programme, Canda Growth Fund, various State-backed lenders, specific funding to assist critical minerals projects to speedily obtain regulatory approvals. Province of Ontario: approvals guaranteed through Investment Ready Certified Site programme, Critical Minerals Innovation Fund co-funding, various other credits/rebates for eligible industrial projects.	Elec: 0.06 – 0.46/kWh (varying by time of use; 16% renewable, 40% gas; 9% nuclear) Ptrl: 1.22/L Gas: 5/GJ Water: 2.25-3.21/m3 (varying by take)

The Western Australian SIA framework: not industrial precincts or parks

The need for dedicated industrial precincts to attract investment to and facilitate processes downstream from raw minerals production has not been lost on Western Australian Governments. The Strategic Industrial Area (SIA) framework was established during the mid-1980s for this specific purpose. However, almost half-a-century since the introduction of the SIA framework, few if any of the 12,[8] SIAs across Western Australia are comparable to the industrial parks or precincts that can be found across the APAC Region, and require significant improvements to approximate the facilitation and efficiencies offered by these competing jurisdictions. Furthermore, where incentives are available, they are well below the scale of

[8] There are presently 12 gazetted SIAs that meet the heavy industry zoning and tenure criteria on which the SIA framework is based. Australian Venture Consultants notes that, at some point in July during the preparation of this Study, the Western Australian Government has in some public-facing materials begun to describe the existing Rockingham Industrial Zone (RIZ; also discussed in this Report) as a Strategic Industrial Area. However, the RIZ is currently zoned, for the most part, for 'service commercial' and 'general industrial' purposes only, with significant areas set aside for parks, recreation and public open space and restrictive landscaping, vegetation preservation, public access, 'streetscaping' and other amenity controls. There is no information in the public domain that indicates that the RIZ meets the criteria of a SIA, or that any process is in place to convert zoning or tenure to enable the kinds of strategic and heavy industrial activities which an SIA would need to service.

investment required to activate projects at most SIAs and the incentives that can be attained elsewhere.

As summarised in the following Figure 3, only the Kwinana SIA could be described as potentially comparable to other parks and precincts in the APAC Region and it is approaching capacity and fundamentally land constrained. Further, the capital cost of fully activating a selection of SIAs – Kemerton, Oakajee, Ashburton North, Anketell and Boodarie – is estimated to be in the order of AUD $36 billion, excluding seaport activation, which is required in most cases. These figures are provided to highlight the significance of the costs of full activation and are clearly not an expectation of upfront investment by the Western Australian Government alone. However, what the quantum clearly does illustrate is the need for clear government signals (State and Federal) such as early 'no regrets' investment in preliminary and core infrastructure requirements, as well as a more commercial approach to working with proponents to deliver enabling infrastructure.

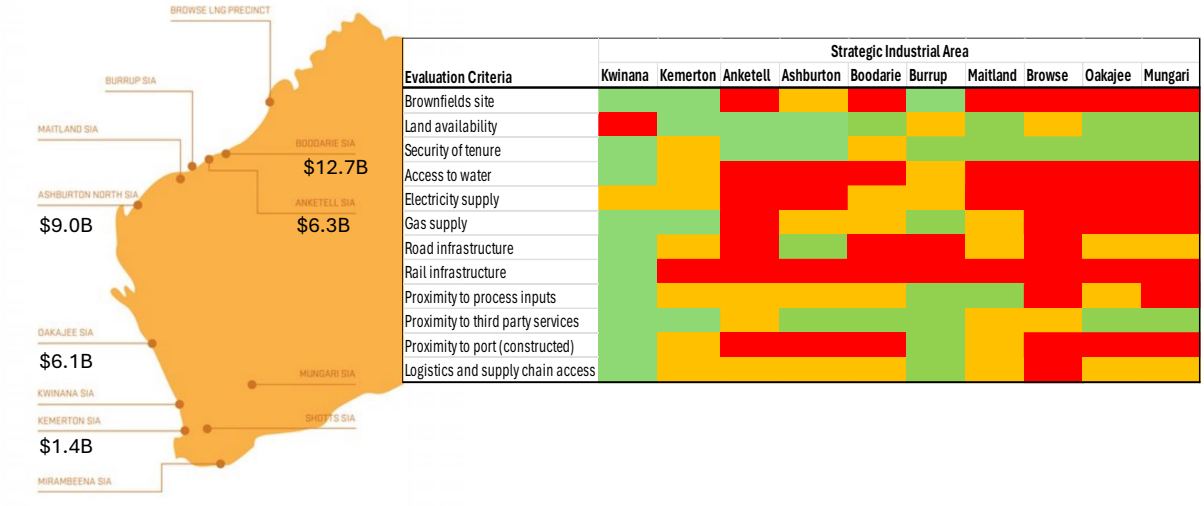


FIGURE 3 - SIA ANALYSIS AND ACTIVATION SUMMARY

From the horse's mouth: on-ground views and input from industry

Consultation with project proponents with both SIA tenancy or tenancy aspirations has identified a number of significant deficiencies with respect to the SIA framework. These are detailed in the body of this Study, however in summary include:

- **SIAs are not comparable to parks and precincts in other APAC jurisdictions**: there is insufficient incentivisation, derisking or common-user infrastructure, local industrial ecosystems are limited, permitting processes are uncertain and protracted, land use flexibility is limited, and there is no single function in government through which investment can be efficiently progressed.
- **Absence of competitive SIAs is a significant policy dilemma for Western Australia:** Western Australia faces strong global competition to establish value-adding industry including critical minerals production, and while by virtue of natural endowments industry must mine in Western Australia, project proponents have a multitude of location options for further value-adding. Any investment that may occur in Western Australia as a means of mitigating regional geopolitical tensions is limited by the extent those tensions impact well entrenched and competitive supply chains and other jurisdictional competition for that investment. SIAs are also an important potential source of demand for new industries. Low levels of State Government investment in SIAs

over recent decades has sent a disappointing message to supply chain participants in the APAC region.

- **Significant reform is required:** The recent announcement by the Western Australian Government that it will invest AUD $500 million in SIAs is recognised by industry as a step in the right direction and a welcome sign that attitudes may be starting to shift. However, given the likely quantum of investment needed to make them turnkey this figure is unlikely to stretch very far. Strategic use of these funds will be critical, including supporting the significant investment required in processes that facilitate SIA activation and operation, including ensuring optimal approvals and permitting is in place prior to proponent engagement and that there is a genuine lead-agency framework for engagement. This needs to occur quickly or WA risks losing potential investment in upstream, midstream or downstream value-adding to critical minerals to other APAC jurisdictions.
- **The fiscal task is significant and will likely require co-contribution by the Commonwealth:** While significant monetary and regulatory incentives have been a central feature of the trade and investment policies of Asian economies for decades, the recent significant incentives introduced by the United States Federal Government have initiated an investment attraction race across the major and emerging processing and manufacturing economies of the world. Delivering turnkey SIAs can play an important part in Western Australia's efforts to compete.

  The fiscal task to deliver common-user infrastructure across WA's SIAs is significant, and while early and strategic 'no regrets' investment in enabling infrastructure must be WA Government led, there will likely be a role for co-contributions by the Commonwealth in order to optimise the likelihood that Western Australia's future minerals and clean energy sectors reach their full potential.

Towards this point, it is notable that the Commonwealth Government has offered a range of broad-based industry supports, including Production Tax Incentives (PTIs) for critical minerals and hydrogen production, various low-cost finance instruments such as the Critical Minerals Facility, the Northern Australia Infrastructure Facility (NAIF), the National Reconstruction Fund and others, and has provided some matched grant funding support for feasibility studies into critical minerals processing via various funding streams as well as funding for feasibility studies into critical minerals hubs that may ultimately result in further Commonwealth funding. However, as identified by this Study, the underlying state of Western Australian industrial land tenure, availability and suitability remains a barrier to industry growing to its full potential.

Recommendations:

1. Targeted support for priority SIAs:
    a. Immediate industry-led prioritisation of the announced Strategic Industries Fund. The Kemerton SIA should be a high priority for funding due to 'overflow' pressure from the lack of land availability in Kwinana, along with key northern SIAs including Ashburton, Boodarie, Burrup and Oakajee.
    b. Develop ongoing processes to inform further near- and longer-term Western Australian and Commonwealth Government investment in SIAs.
2. Address internal Western Australian Government limitations and barriers to SIA activation:
    a. Create a structure within Government to deliver comprehensive and transparent SIA business cases in consultation with industry.
    b. Improve the lead agency model to deliver genuine single-contact project facilitation services.

   c. Reform and adequately resource relevant Western Australian Government Trading Enterprises and Agencies to deliver turnkey common-use SIA infrastructure.
3. Develop new approaches to deliver global standard 'turnkey' experiences:
   a. Ensure all land within SIAs is subject to tenure arrangements that enable intended land uses and leasing to industry on appropriate commercial terms.
   b. Ensure SIA common-user infrastructure planning and zoning is fit-for-purpose.
   c. Fund and complete cultural heritage surveys for all SIAs and negotiate appropriate and equitable Indigenous Land Use Agreements (ILUAs) where relevant.
   d. Secure SIA-wide State and Commonwealth environmental approvals and land clearing permits and ensure expedited processes for any residual specific environmental approvals.

1. Background

1.1. Critical minerals and global trade

Typically, minerals are classed as 'critical',[9] when their use as an input to products of advanced manufacture cannot be easily or cost-effectively substituted, and their supply is concentrated in or constrained by a small number of jurisdictions.

A significant contributor to the escalation in demand for critical minerals over the past medium term is the decarbonisation efforts of governments and corporations across the globe. Achieving the International Energy Agency's (IEA's) Net Zero Emissions by 2050 Scenario will require at least six times more critical mineral inputs in 2040 compared to 2020.[10] Adding to this demand pressure, the International Monetary Fund (IMF) notes that geopolitical trade tensions could drive an additional price increase of 300 percent for selected critical minerals and lead to 30 percent lower investment in solar panels, wind turbines and electric vehicles (EVs) needed for the energy transition.[11]

The mineral resources of Western Australia include almost all the minerals on Australia's critical minerals list, and, far more importantly, many of the minerals on the critical minerals lists of the world's manufacturing economies, together with other commodities that will support the energy transition (see Figure 4).[12]

[9] The United States Geological Survey (USGS) includes 50 minerals on their current list of critical minerals whilst the European Union includes 30 minerals on theirs.
[10] EA, The Role of Critical Minerals in Clean Energy Transitions , May 2021, p 8
[11] International Monetary Fund, A critical matter, Finance and Development feature article, vol 60, iss 4, published 30 November 2023
[12] Department of Jobs, Tourism, Science and Innovation

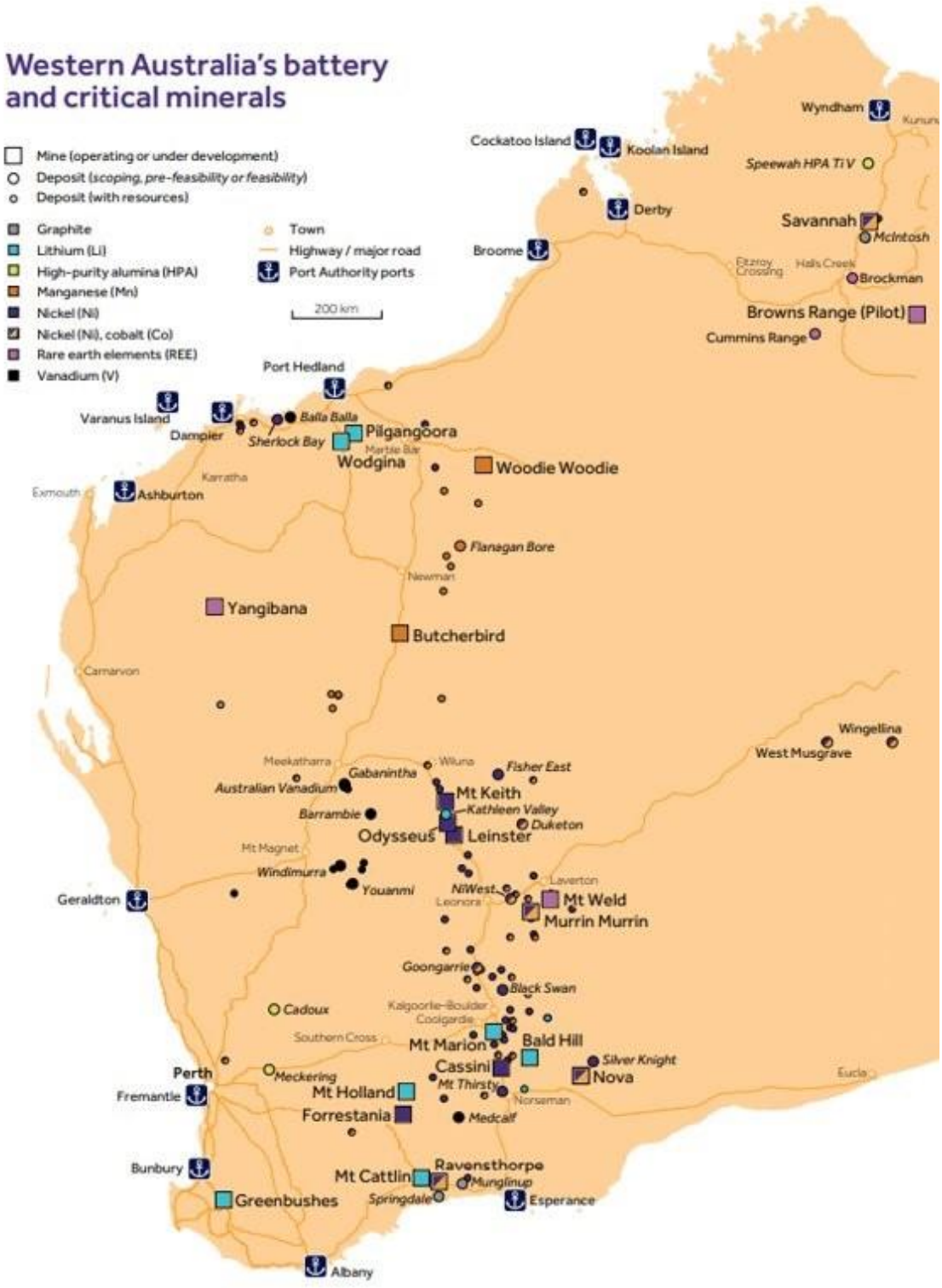


FIGURE 4 - WESTERN AUSTRALIA'S CRITICAL AND BATTERY MINERALS

As indicated in Figure 4, Western Australia is a significant primary producer of several critical minerals, particularly lithium mineral concentrate, nickel concentrates and Class 1 product, copper concentrates, rare earth mineral concentrates and refined cobalt.

1.2. Upstream, midstream and downstream

When assessing supply chains, a variety of terminology can be used in different industries and contexts to describe each stage from primary production through to a finished product in the consumer's hand. Throughout this Study, broad international consensus terminology is used to describe critical minerals supply chain stages:

- Upstream: broadly incorporating those components of the supply chain involved in the primary production, recovery and concentration of raw (mineral and metal) material inputs to the production of high purity chemicals and the manufacture of those high purity chemicals.
- Midstream: broadly incorporating more advanced specialty chemical manufacture, manufacturing of precursor chemicals used in the manufacture of specialty materials that are used in the manufacture of high-tech products and the manufacture of those specialty materials.
- Downstream: assembly of speciality materials and other inputs into the various components of the high-tech product and assembly of those components into the product.

Appendix 1 contains high-level schematics for supply chains pertaining to lithium-ion NMC batteries, wind turbines and photovoltaic solar cells.

In terms of progressing along the value chain, Western Australia has had limited success to date, and where there has been progress it is limited to upstream stages of critical mineral dependent supply chains. Value-adding to Western Australia's battery and critical minerals primary production by activating domestic upstream, midstream and downstream capacity is a priority of the State's economic diversification agenda. This is recognised in the State's economic development framework,[13] and targeted industry development plan.[14]

Recent capital investments by industry in processing and refining of critical minerals concentrates into the early-stage specialty chemical products that serve as feedstock for advanced manufacturing supply chains has made some progress in this regard – lithium hydroxide monohydrate conversion, battery grade nickel sulphate conversion, rare earth chemical concentrate manufacture and by 2025, rare earth element separation capacity. However, despite it being a specific policy objective, as well as ample evidence of industry investment in further value-adding to critical minerals raw materials production, Western Australia's competitive participation beyond upstream specialty chemicals manufacture remains aspirational.

1.3. Western Australia's minerals industry in context

By virtue of its comparatively high multifactor cost structure, small local markets and proximity to the world's most competitive downstream processing and manufacturing economies in Asia, it is very difficult to produce value-added products in Western Australia that are competitive in domestic or international markets.[15]

One significant advantage that almost all jurisdictions with established downstream industries have is 'turnkey', fit-for-purpose industrial parks and precincts, that are optimised with respect to access to adequate services such as water and energy supply, chemical inputs, transport logistics and port capacity. Further, these facilities typically have optimal 'pre-approvals' in

[13] Department of Jobs, Tourism, Science and Innovation, Diversify WA
[14] Future Battery Industries Cooperative Research Centre (2023), Future State: Accelerating Diversify WA
[15] Australian Venture Consultants (2018), *WA's Future on the Lithium Battery Value Chain,* Chamber of Commerce and Industry Western Australia, Chamber of Minerals and Energy Western Australia, BHP, City of Kwinana and NeoMetals

place which operate to give investors a very high degree of certainty in deploying capital, with many of these parks and precincts optimised for upstream, midstream and downstream critical minerals chemical and materials manufacture.

Western Australia has a network of SIAs across the State, most of which have the stated intent of supporting investment in the downstream processing of Western Australia's critical minerals resources and other strategic industrial activities,[16] and some of which the Western Australian Government has identified as potential hubs for critical minerals value-adding.[17]

With the arguable exception of Kwinana, however, Western Australia's Strategic Industrial Areas do not fit the definition of a 'turnkey', fit for purpose critical minerals processing industrial park. Further, the Kwinana-Rockingham SIA is approaching capacity, while as indicated in Figure 4 critical minerals deposits and projects are distributed across Western Australia's vast geography. (Because critical mineral concentrates can comprise up to 94 percent waste materials and upstream specialty chemical products typically require purities in the range of 99 percent, there is a case for locating value add processing facilities in reasonable proximity to mine-gate.)

A long standing, key recommendation of the CME,[18] other industry peak bodies and industry more generally,[19] has been for the Western Australian Government to de-bottleneck industrial land and develop strategic, turn-key ready industrial hubs to improve Western Australia's investment attractiveness. In light of the significant regional cost competitive disadvantages that Western Australia faces as a manufacturer of specialty chemical products, it is imperative that the development of SIAs for the purposes of specialty chemical manufacture is optimal, such they are able to leverage from the advantages that Western Australia does present in some less cost sensitive markets for critical minerals derived specialty chemicals.

This study evaluates each of Western Australia's SIAs with respect to suitability as a hub for the manufacture of upstream critical minerals chemicals used in advanced manufacture supply chains, identifies the investment required to adequately activate those SIAs and assesses their future competitiveness in the broader Asia Pacific Region (APAC) Region.

[16] Department of Jobs, Tourism, Science and Innovation, Western Australia's Critical Minerals Strategy – Stakeholder Consultation Paper, November 2023
[17] Department of Jobs, Tourism, Science and Innovation, Western Australia's Critical Minerals Strategy – Stakeholder Consultation Paper, November 2023
[18] Chamber of Minerals and Energy (2023), Accelerating opportunities in Western Australia's critical Minerals Sector
[19] Australian Venture Consultants (2018), *WA's Future on the Lithium Battery Value Chain,* Chamber of Commerce and Industry Western Australia, Chamber of Minerals and Energy Western Australia, BHP, City of Kwinana and NeoMetals

2. Asian special economic areas

As identified in several previous studies into Western Australia's competitiveness in processing and manufacturing industries, Western Australia will likely never be able to compete with key Asian jurisdictions for Foreign Direct Investment (or even domestic sourced investment). The various well established structural characteristics of the Asian economies and their trade relationships has resulted in these industries, particularly those that revolve around critical minerals, now firmly centred on Asia – not just in the People's Republic of China (PRC), Republic of Korea (ROK) and Japan, but most of the established and emerging Asian chemical and manufacturing industries.

Furthermore, geopolitical tensions short of a superpower major kinetic conflict are unlikely to disrupt this now well entrenched phenomenon.[20]

In order to reinforce this fact and to establish a baseline for the analysis this section provides an overview of Asia's dominance in critical minerals oriented supply chains and by way of example, identifies and discusses several critical minerals oriented industrial parks in Vietnam, Indonesia, Malaysia and Republic of Korea.

2.1. Critical minerals trajectories and landscape

2.1.1. Asian economies are intrinsically linked to critical minerals supply chains

With the rise of technological innovation, the 'Fourth Industrial Revolution', digital economies, clean energy imperatives and other known megatrends, critical minerals will increasingly become a required input to virtually all segments of economic activity, but none more so than in products of manufacturing. As such, a critical determinant of the trajectory of supply chains for critical minerals will be the actions and policies of the manufacturing powerhouses of Asia.

Advanced manufacturing has always relied on significant volumes of minerals and metals inputs. While the nature of those inputs may change over time, manufacturing economies and individual actors within those economies will seek to ensure that they have continued access to and certainty of supply of those inputs to protect their national and commercial interests respectively. In some economies this will revolve around domestic supply (such as Indonesian nickel), although the sheer scale of production would leave very few economies totally self-sufficient, while in others (such as the land- and resource-poor Republic of Korea and Japan) this will require securing inbound supply chains of most key inputs. Regardless, minerals and metals production, refining, midstream processing and downstream manufacturing value chains have become intrinsically linked with the region as a whole, and have underpinned a rapidly increasing population, industrial base and overall development. By way of example, the global share of selected critical minerals production from selected Association of South-East Asian Nations (ASEAN) economies is shown below in Figure 5.[21]

[20] Australian Venture Consultants (2023), Geopolitics and climate change: drivers of a shift in the competitiveness of Western Australia's domestic downstream minerals processing, Chamber of Minerals and Energy Western Australia
[21] Reproduced from Figure 5 in Bilek, P. et al (2023), *Scoping study on critical minerals in ASEAN*, ASEAN-IGF, May 2023. Notably this does not include the highly significant proportion of critical minerals produced by non-ASEAN Asian economies, such as the PRC (discussed further herein).

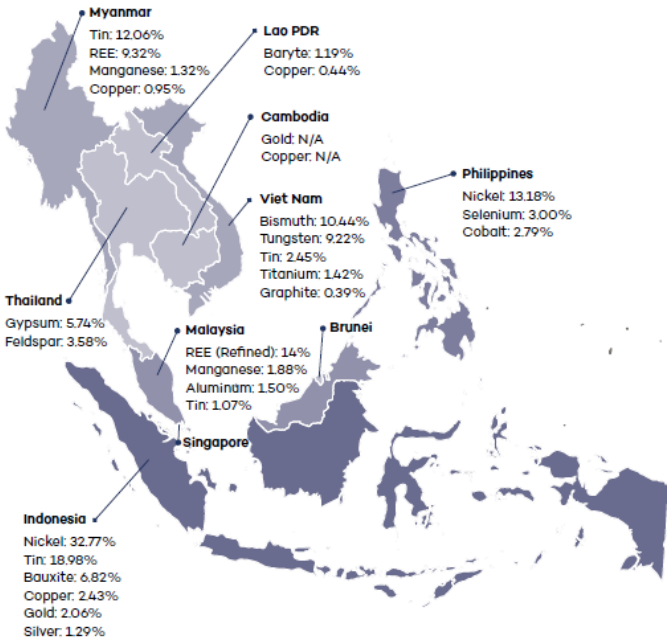


FIGURE 5 - SHARE OF GLOBAL PRODUCTION OF SELECT CRITICAL MINERALS - KEY ASEAN NATIONS

For many if not most nations (albeit at differing levels and stages of development) across the region, a key feature of their domestic economies is thus that they possess a range of structural advantages that apply across many stages of the value chain for these key inputs. Among other matters, these include:

- basic underlying cost structures (especially in the fields of labour, energy, process inputs and environmental/regulatory overheads);
- highly developed industrial ecosystems permitting efficient servicing of industry clusters;
- geographic proximity to key supply chains and final product markets; and
- industrial, environmental, labour, governance and other regulatory policies applying to industrial processing and minerals refining which are typically conducive to low-cost operations.

As a result, the share of downstream processing of critical minerals has increased across the region in recent years. Analysis commissioned by ASEAN, reproduced in the below Figure 6, again demonstrates this increase for a small number of regionally significant critical minerals,[22] while Figure 7 (overleaf), based on UN trade data,[23] extends this analysis across the whole product value chain of a key critical minerals-exposed product class - lithium-ion batteries - for a number of key regional economies.

[22] Reproduced from Figure 7; *ibid*
[23] Derived global trade data sourced United Nations, Comtrade database. Expressed by value, $USD, 2021 figures. Due to data limitations, 'Lithium-bearing ores' (HS253090) is primarily comprised of spodumene but also incorporates some rare earths, arsenics, earth colours and other miscellaneous mineral products.

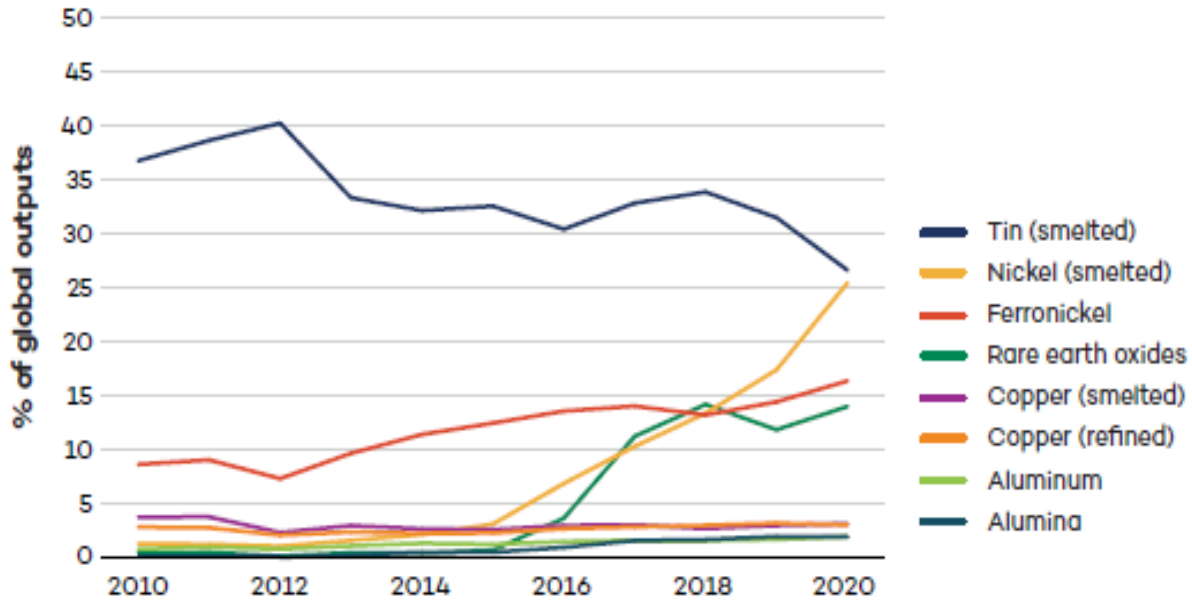


FIGURE 6 - SHARE OF GLOBAL MIDSTREAM SELECT CRITICAL MINERALS PROCESSING - ASEAN BLOC TOTAL

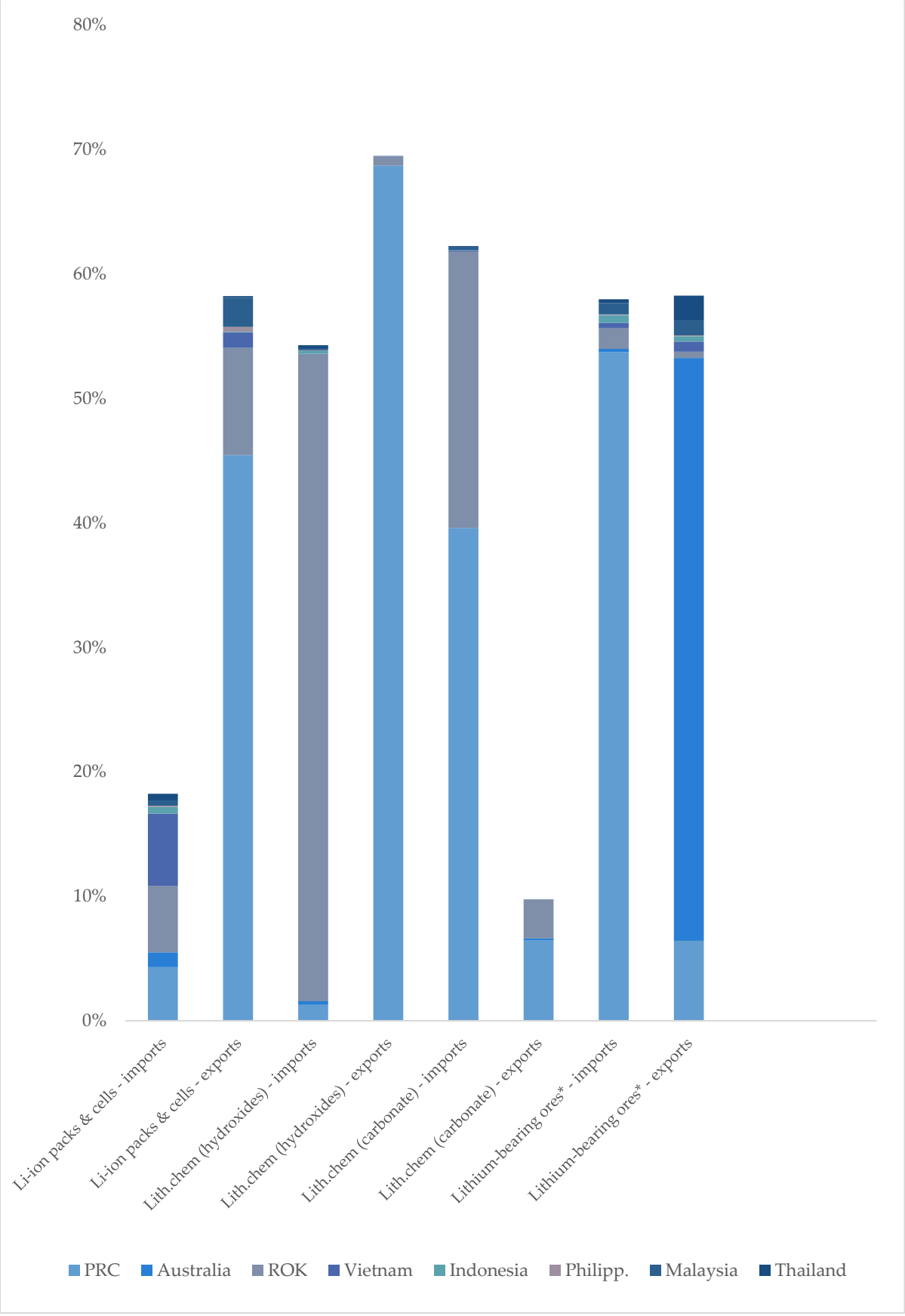


FIGURE 7 – SHARE OF GLOBAL TRADE IN LITHIUM-ION BATTERY SUPPLY CHAIN, BY PRODUCT STAGE AND VALUE, SELECTED NATIONS

For the purposes of this Study, analysis has focused on four jurisdictions emerging as key players in critical minerals-exposed supply and value chains and with a current or emerging presence in early-stage and midstream minerals processing and refining, as summarised in Table 4 below.

TABLE 4 - ASIAN CRITICAL MINERALS-EXPOSED JURISDICTIONS EXAMINED BY THIS STUDY

Jurisdiction	Notable critical minerals exposure	Primary value-chain stage
Vietnam	Rare earth elements – 2nd largest known reserves, although production currently low due to PRC price competition. Tungsten - Nui Phao (Masan Group) largest global supplier, and also significant supplier of copper concentrates. Li-ion – emerging presence in battery precursors, cell and pack assembly.	Upstream and early midstream, emerging presence in processing and manufacture.
Indonesia	Nickel – largest global producer and host to significant proportion of global supply chain participants. Cobalt – second-largest global producer and host to number of producers (typically activated as co-mineralisation with nickel).	Key upstream and early midstream supplier.
Malaysia	Aluminium and manganese – growing globally significant cluster of refining and early midstream processing in Sarawak region (especially for high purity manganese sulphate monohydrate; HPMSM), drawing on domestic and imported ore supply. Rare earth elements – globally significant reserves and historical production (now defunct). Growing early midstream presence in refining and processing based on imported ores. Li-ion – early-stage participation in joint-ventures with established industry partners in precursors, cell and pack assembly.	Regionally significant refining and early midstream.
Republic of Korea (South Korea)	Very limited domestic endowments of any relevant minerals, highly involved in supply chains at midstream and downstream product manufacture for a large number, particularly those associated with li-ion battery ecosystems – nickel, cobalt, lithium, copper, graphite, manganese, aluminium.	Key advanced midstream and downstream.

2.1.2. Special economic zones have been a key tool to attract investment and underpin regional competitiveness

While an examination of the historical factors which have given rise to this is beyond the scope of this Study, this state of affairs is not new, and there is little political appetite evinced in any jurisdiction to significantly alter it.

As such, while the specific minerals of interest may have changed since the Cold War when the stage first became set for the rise of the various Asian Tigers and their neighbours, the legacy of this development has broadly speaking resulted in the existence of large, highly efficient clusters of industry, well serviced by infrastructure and logistics links, operating in a comfortable and conducive regulatory environment. In seeking to compete to attract industry, in many (although not all) instances a key tool of national and sub-national jurisdictions across Asia used to attract these clusters has been specific regulatory measures that apply to a defined geographic area, and offer various exemptions, subsidies and other incentives.

Given the importance of foreign capital to enabling development of large-scale industry in nations which at the time (albeit to a greater or lesser degree) still exhibited agrarian or subsistence economies, many of these special economic areas were structured along a 'free trade' basis, aimed specifically at attracting key suppliers along international supply chains to base operations within that jurisdiction. Naturally, these clusters of industry have then attracted and supported the growth of broader sectoral ecosystems and created the current shape of many international supply chains, as noted below in Table 5 below.

TABLE 5 – OVERALL STRUCTURE OF SPECIAL ZONES IN KEY ASIAN JURISDICTIONS

Jurisdiction	Structure	Intensity
Vietnam	Three-tier system: Key Economic Regions, guiding central economic planning, within which sit defined Industrial Zones, Coastal Economic Zones and Bordergate Economic Zones, and at a smaller level still Industrial Parks, Export Processing Zones, High-Technology Zones and Eco-Industrial Zones, which are designed to facilitate specific sectors of industry.	Over 560 areas have been declared to date, found in 62 of the country's 64 provinces.
Indonesia	Special Economic Zones (Kawasan Ekonomi Khusus; KEK) developed in partnership with local authorities but to a large extent centrally controlled/planned by the National Council for Special Economic Zones. Tool used to accelerate/implement nation-wide planning process designed to diversify productive capacity away from central Java and encourage development of specific regional economic clusters.	20 declared KEKs across the nation, with 12 currently operative.

Jurisdiction	Structure	Intensity
Malaysia	Five different types of zoning exist and are established under different local laws – Free Zones (Commercial or Industrial), Industrial Parks, Licensed Manufacturing Warehouses and Special Border Economic Zones. Sitting over the top of these is the central planning lens of Economic Growth Corridors, under which sit Key Economic Regions. These are designed to create clusters of specific industry types and coordinate government and foreign capital investment.	Over 600 established to date, of which nearly 250 are 'major' facilities in scale developed in partnership with key government instrumentalities (State and Regional Economic Development Corporations/Authorities, port authorities and municipal government)
Republic of Korea (South Korea)	Free Economic Zones established to activate and encourage economic diversity and accelerate ROK presence across high value supply chains. With each declared FEZ (which will have a broad focus area) will sit multiple sub-districts, zones, parks etc, developed and operated by joint-ventures and consortiums between public and private entities.	Nine currently established headline FEZs, each of significant size and scale, with the largest (Incheon) covering some 210 square kilometres. Approximately 15% of all ROK-registered companies based within an FEZ.

This cycle continues to apply to critical minerals supply chains, with many Asian nations actively and aggressively promoting defined special zones to attract key actors and suppliers within these industries for many years. This is occurring both through a national security lens, with governments recognising stable supply chains as a key strategic imperative, and to underpin economic growth. Indeed, so successful has this strategy been that the dominance of some of these jurisdictions – especially the People's Republic of China, as noted below – in current critical minerals supply chains has been one of the very factors that has resulted in the relatively recent Western-centric designation of these minerals as 'critical' and subject to supply risk in the first place.

As noted above, there are a range of inputs and factors on which the competitive advantage of industry within these nations is built, and which governments seek to capitalise on in establishing a presence in current and emerging critical minerals supply and manufacturing chains. This includes economy-wide factors and underlying structural advantages, but also those more specific to a particular zone or region. These last can include both efficiencies of scale, proximity to infrastructure and logistics channels, energy availability and so on, and also specific incentives, exemptions and other support offered by government and regulators. For the four key Asian economies examined in this Study, these are summarised and examined in more detail in the following Sections.

2.1.3. The case of the PRC and the race for second place

As noted above, the PRC is by far the dominant force in global manufacturing, and so too is it the dominant force in most critical minerals supply chains, particularly in the upstream stages of minerals processing, refining and chemical precursor manufacture and midstream materials manufacture. Indeed by way of example, as shown below in Figure 8,[24] analysis by the

[24] International Energy Agency (2023), *Critical Minerals Market Review,* July 2023

International Energy Agency demonstrates that the PRC has captured the vast majority if not virtually all of key critical minerals supply chains associated with renewable energy generation and battery manufacture, such as those that revolve around rare earths, lithium, cobalt and graphite raw material inputs

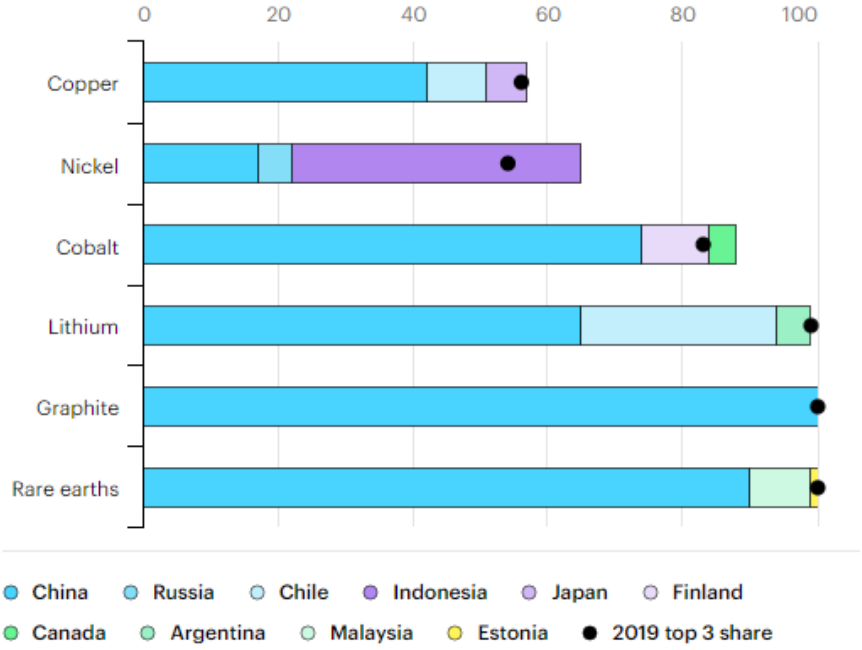


FIGURE 8 - SHARE OF GLOBAL PROCESSING OF SELECT CRITICAL MINERALS (2022) - TOP THREE NATIONS

Further, this dominance is not limited to only those minerals naturally founded in abundance within the PRC itself. As illustrated below in Figure 9,[25] the share of minerals processing within the PRC for many critical minerals is vastly above its endowments of those minerals. Expressed differently, global supply chains have evolved to a position where the large majority of critical minerals processing occurs within the PRC, drawing from raw ores imported from other nations.

[25] Barron, K.C (2023*), The geopolitics of critical materials and minerals and implications for the low-carbon transition,* April 2023, Resource Efficiency Collective

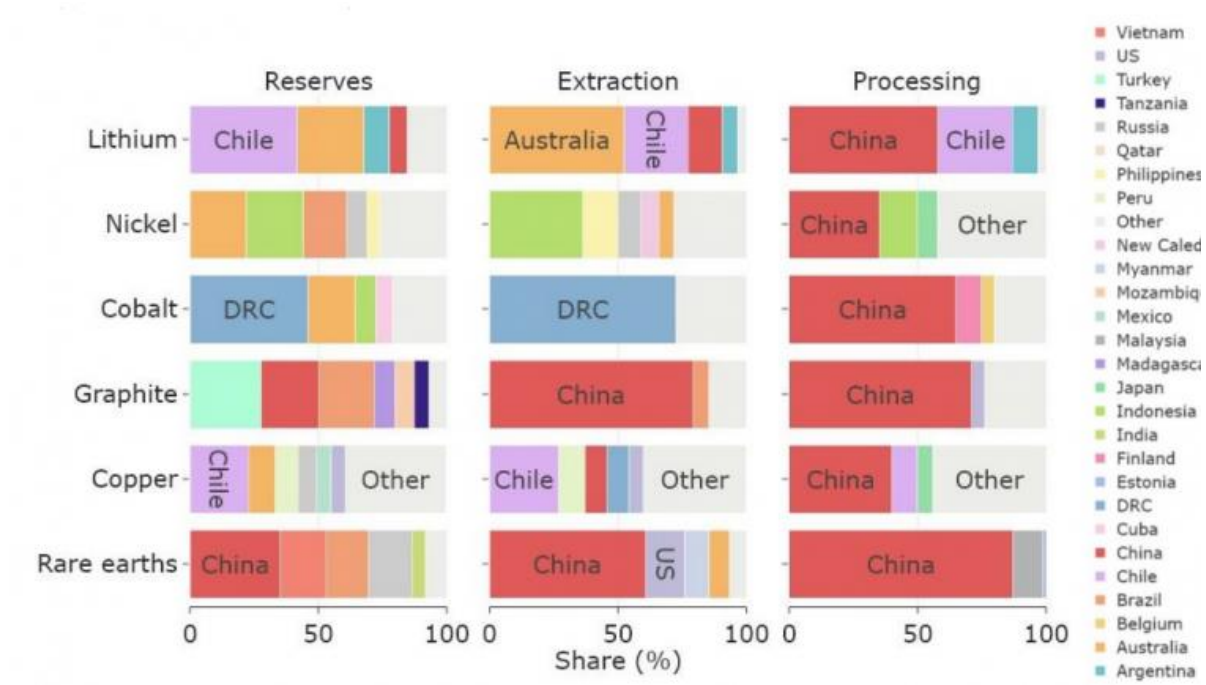


FIGURE 9 - SUPPLY CHAIN PRESENCE 2021-22, SELECT CRITICAL MINERALS

Very clearly, supply chain participants are responding to market realities and making commercially rational decisions to predominantly base their minerals processing within the PRC. As these participants include both those based on private capital and with normal commercial profit motives, those deploying (wholly or in part) government funding but primarily seeking commercial profit, and those acting in response to non-commercial imperatives – and sometimes all three at once - the reasons for the dominance of the PRC are multifactorial. However, from a commercial perspective, as touched on above they include underlying cost structures, development stage and sheer concentration of local industry clusters, logistics and supply chain proximity, and regulatory environment.

As a result, not only is the PRC a dominant force in domestic processing and refining of critical minerals, it is also one of the largest consumers, using up the products of minerals refining and processing as key inputs to its vast advanced manufacturing output, and increasingly has deployed outbound investment to secure supply of raw materials through offtake agreements and vertical integration. A full exploration of the domestic midstream and downstream sectors of the PRC and their international exposure is beyond the scope of this Study, but for present purposes this is well illustrated by the significant volume of existing analysis and commentary devoted to the lithium-ion supply chain, shown in the following in Figure 10,[26] Figure 11,[27] Figure 12,[28] and Figure 13.[29]

[26] International Energy Agency (2022), *Global Supply Chains of EV Batteries*, July 2022
[27] Snoussi-Mimouni, M.; Averous, S. (2024), *High demand for energy-related critical minerals causes supply chain pressures,* January 2024, World Trade Organisation
[28] Sebastian, G., Goujon, R., Meyer, A. (2024), *Pole Position: Chinese EV Investments Boom Amid Growing Political Backlash,* 29 February 2024, Rhodium Group
[29] International Energy Agency (2023), *Critical Minerals Market Review,* July 2023

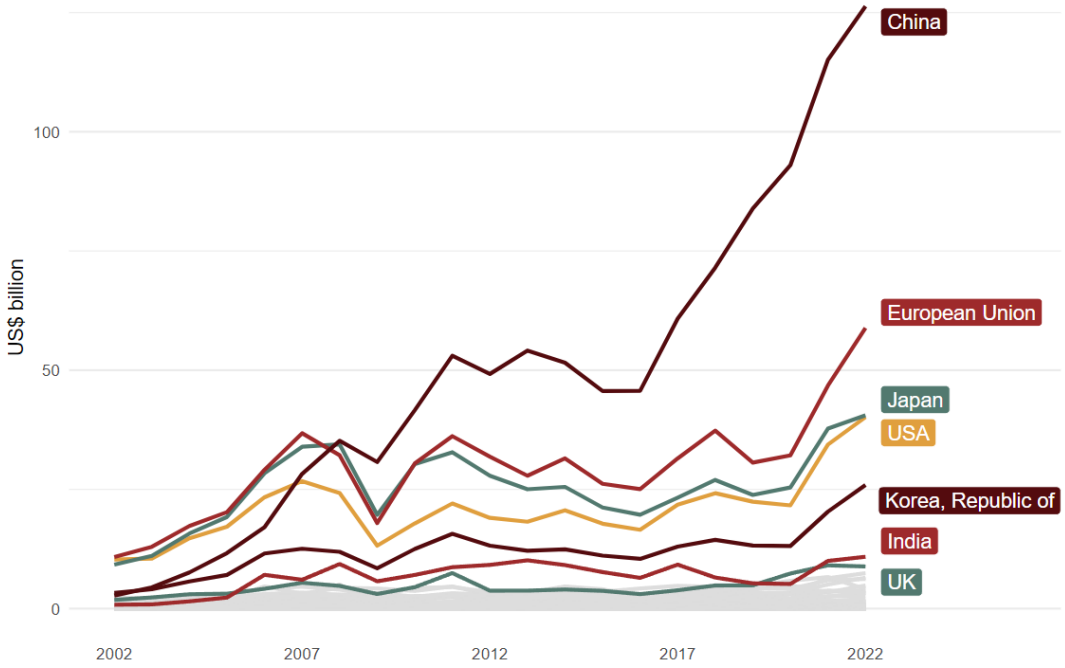


FIGURE 10 – NATIONAL SHARE OF CRITICAL MINERALS IMPORTS BY VALUE, 2002-2022

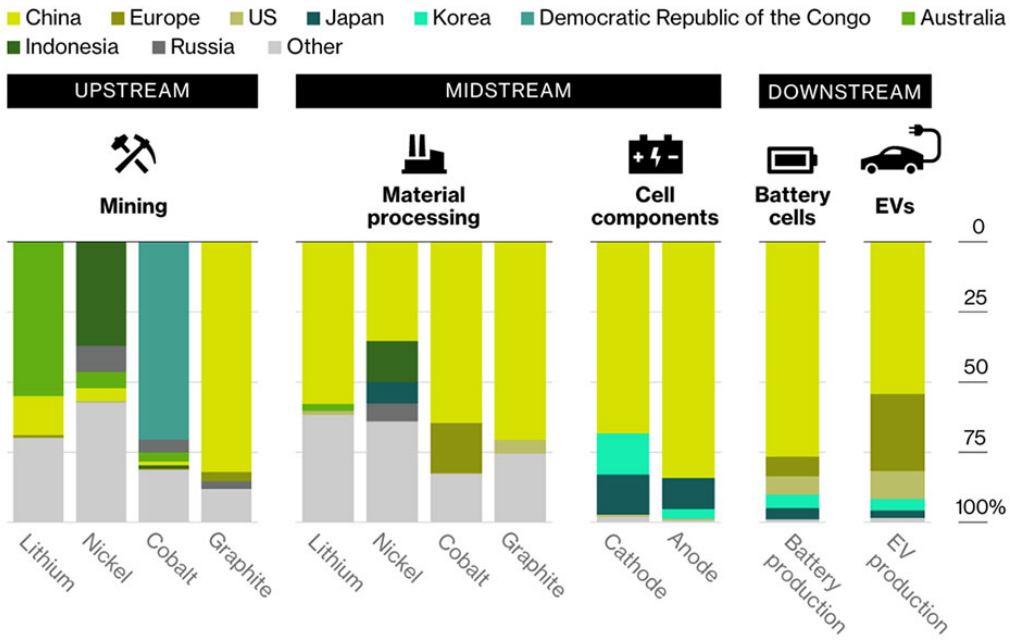


FIGURE 11 – NATIONAL SHARE OF EV LITHIUM-ION BATTERY SUPPLY CHAIN STAGES (2022)

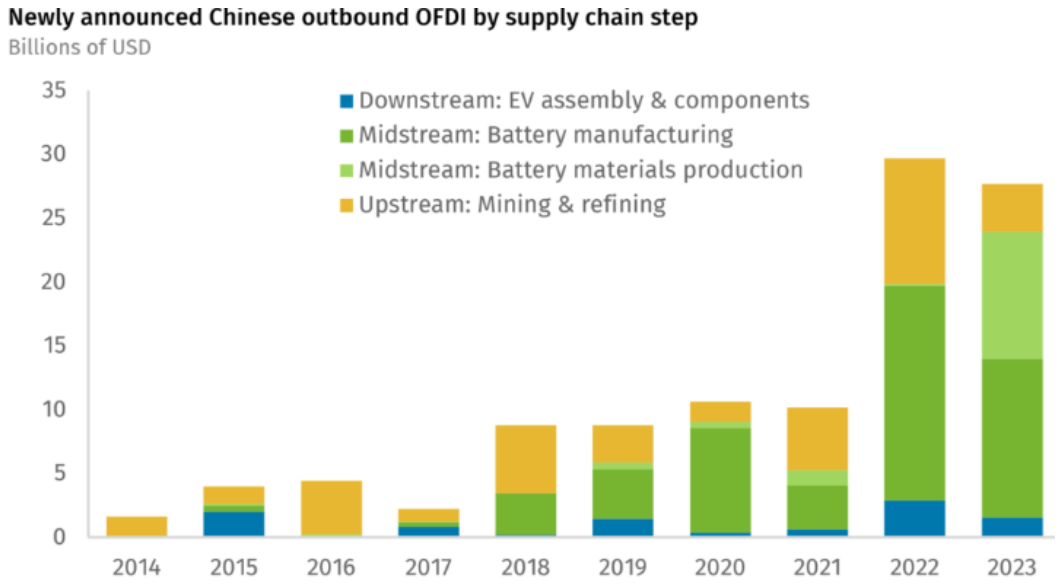
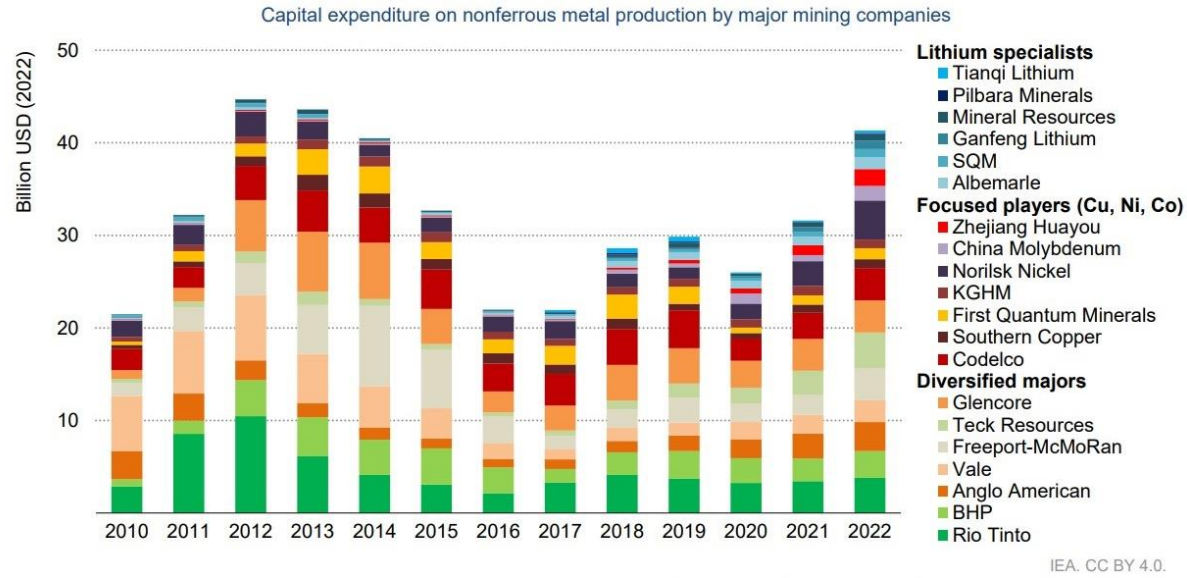


FIGURE 12 - EX-PRC OUTBOUND INVESTMENT BY PRODUCT STAGE (2014-2023)



Notes: Co = cobalt; Cu = copper; Ni = nickel. For diversified majors, capex on the production of iron ore, coal and other energy products was excluded.
Source: IEA analysis based on company annual reports and S&P Global.

FIGURE 13 - CAPITAL EXPENDITURE ON MINERALS PRODUCTION BY MAJOR RESOURCES SECTOR (2010-2022)

For present purposes, there are four key takeaways.

First, it is apparent that despite significant domestic endowments of a number of critical minerals, from a purely commercial perspective Western Australia will never compete on an equal footing with the PRC in minerals processing and other value-added upstream and midstream stages, let alone downstream final product manufacture. The PRC is the largest single market for many critical minerals and products and an integral part of the supply chains that service them, has very significant structural advantages which have been entrenched over decades (labour costs, logistics, industry ecosystems, ESG compliance burden, etc), permissive environmental, planning and land access policies, and a hugely facilitative regulatory and business promotion environment strongly advantaging domestic enterprises in good standing with the ruling regime.

Second, under current and all likely future regulatory and policy settings, Western Australia cannot match the competitiveness of the PRC's internal minerals processing environment. Nor, arguably, should it – this would require compromising on several aspects of the State's own inherent competitive advantages (such as sovereign risk rating) and derived and embedded product attributes which are valued by international markets (such as high ESG standards).

Third, with appropriate policy and regulatory settings it may well be achievable for Western Australia to *complement* the PRC as a minerals processing and value adding jurisdiction, aligning with 'friendshoring' and 'China+1' policies and procurement strategies seeking to address supply chain risk. Among other matters, this would rely on inherent production environment advantages, Australian-sourced minerals products eligibility for EU and particularly US incentives (such as IRA credits), and potential vertically integrated efficiencies achievable as a result of domestic endowments of raw minerals.

Fourth, however, it is important to note that in the 'race for second place', Western Australia will also be competing on the global stage with other minerals production, manufacturing and key supply chain participant jurisdictions. As detailed herein, these nations will also be seeking to advance their own national interest and secure a greater share of the emerging market opportunity, and as discussed herein are at a more advanced stage in doing so.

2.2. Vietnam

Formally the Socialist Republic of Vietnam, the nation nonetheless has significant form in seeking to attract inbound foreign investment, and has utilised various policy measures since the late 1980s to encourage sustained deployment of external capital in many economic sectors. As summarised above in Table 5, Vietnam is now host to a large number of defined special economic zones and industrial areas found across the nation. Due to central government spending controls and statutory debt limits, a notable feature of these has been the dominance of public/private partnership development models, with private industry partners (including consortiums, joint ventures and other collaborative instruments as well as single entities) working with central and local government to deliver common-user infrastructure and services.

The following sections broadly outline particular aspects of the Vietnamese economy and regulatory environment, followed by an overview of two particular SEZs as an example of areas likely conducive to critical minerals processing - the Dinh Vu-Cat Hai Industrial Zone and the Vung Ang Economic Zone.

2.2.1. Regional business climate and broad incentives

As summarised below in Figure 14,[30] independent assessment of the overall business and investment climate in Vietnam places it at a middling ranking at international scale, although with some highlights across project construction, operations and securing key process inputs.

[30] World Bank (2021), *Doing Business 2020 – Vietnam*, https://archive.doingbusiness.org/en

FIGURE 14 - VIETNAM - WORLD BANK DOING BUSINESS RANKINGS

At a headline level, under the Basic Law of Investment of 2020 additional regulatory approvals will apply to foreign investment into projects in priority sectors (including chemicals, minerals and industrial precursors, and mining and exploration). However, at a practical level, the central government Ministry of Planning and Investment plays an important role in negotiating relatively bespoke investment attraction packages. This is particularly the case with regards to projects which align with broad 'high tech enterprise' and other 'future industries' aspirations under various planning strategies (such as the 2021 Ten Year Economic Strategy). These can include accelerated concessional tax rates or tax holidays, accelerated depreciation and other fiscal incentives, and access to credit and support for R&D activities. Specific to SEZs, typical incentives usually include:

- corporate income tax exemptions for 2 to 4yrs (sometimes with reference to first production), followed by variable lower rates for defined period up to the lifetime of the project;
- land tax exemptions or rate reductions; and
- customs excise and other import controls exemptions for key inputs where SEZ proximate to import channels.

Given the public/private nature of most SEZ operators, a further compelling competitive advantage is that in most cases environmental, development and other regulatory approvals required for new projects are either 'pre-approved' or subject to a streamlined process. The exact nature of this will differ based on the particular area and the relationships between operators and central and local regulatory authorities.

2.2.2. Input pricing and energy security

While regionally variable, and subject to other factors affecting delivery (such as particular supply contracts negotiated by park operators), headline pricing for key process inputs is summarised in Table 6,[31] below.

TABLE 6 - VIETNAM - HEADLINE INPUT PRICING

Process input	Pricing and period
Electricity	$USD 0.08/kWh (Q4 2023)
Petrol/gasoline	$USD 0.94/L (Q1 2024)
Natural gas	$USD 1.63/ GJ (Q1 2024)
Process water	(as at Q1 2023) Grade 1 cities: price range $USD 0.14/m3 – $0.71/m3 Grade 2 – 5 cities: price range $USD 0.12/m3 - $0.59/m3 Rural: price range $USD 0.08/m3 - $0.43/m3

Notably, energy pricing is subject to a high degree of state control, with SOE Electricity Vietnam heavily subsidising average retail prices to below the cost of production, at an estimated cost of $USD 1.3 billion in 2022.[32] While this has resulted in overall lower power prices in comparison to other regional economies, the combination of suppression of outside investment and relatively unsophisticated incentives paired with overly ambitious approvals have seen a mass deployment of solar in the central and southern regions which has exceeded the capacity of the local grid to safely handle, creating its own stability issues.

As shown below in Table 7 and Figure 15,[33] Vietnam has seen energy security and reliability worsen over time, with an increased reliance on imported fuel oil and a smaller but growing share of LNG. Vietnam also directly imports energy via grid transmission from neighbouring Laos and the PRC.

TABLE 7 - VIETNAM - ENERGY GENERATION & SUFFICIENCY

	2015	2020
Energy generation		
Renewable generation (TJ)	870,913	862,519
Renewable share of total gen. (%)	26	19
Non-renewable generation (TJ)	2,423,569	3,721,802

[31] Data sourced English-language public domain sources including Trading Economics, Global ClimateScope, Statista and in-country regulators. Currency of estimates as noted. Pricing assumes standard industrial tariff rates on standard connection basis on non-congested, non-contested distribution networks and is not inclusive of infrastructure contributions, special pricing regimes, pre-purchase arrangements, bulk discounts, etc.
[32] Xavier, H-D.M (2023), Vietnam Initiative for Energy Transition. 2023. Vietnam's energy security in 2023:Global coal and LNG markets, March 2023, Vietnamese Initiative for Energy Transition, Vietnam
[33] Derived International Renewable Energy Agency (2023), *Energy Profile – Vietnam*, 8 August 2023, www.irena.org

	2015	2020
Energy trade		
Imports (TJ)	862,329	2,3247,324
Exports (TJ)	517,852	353,973
Self-sufficiency (%)	93	56

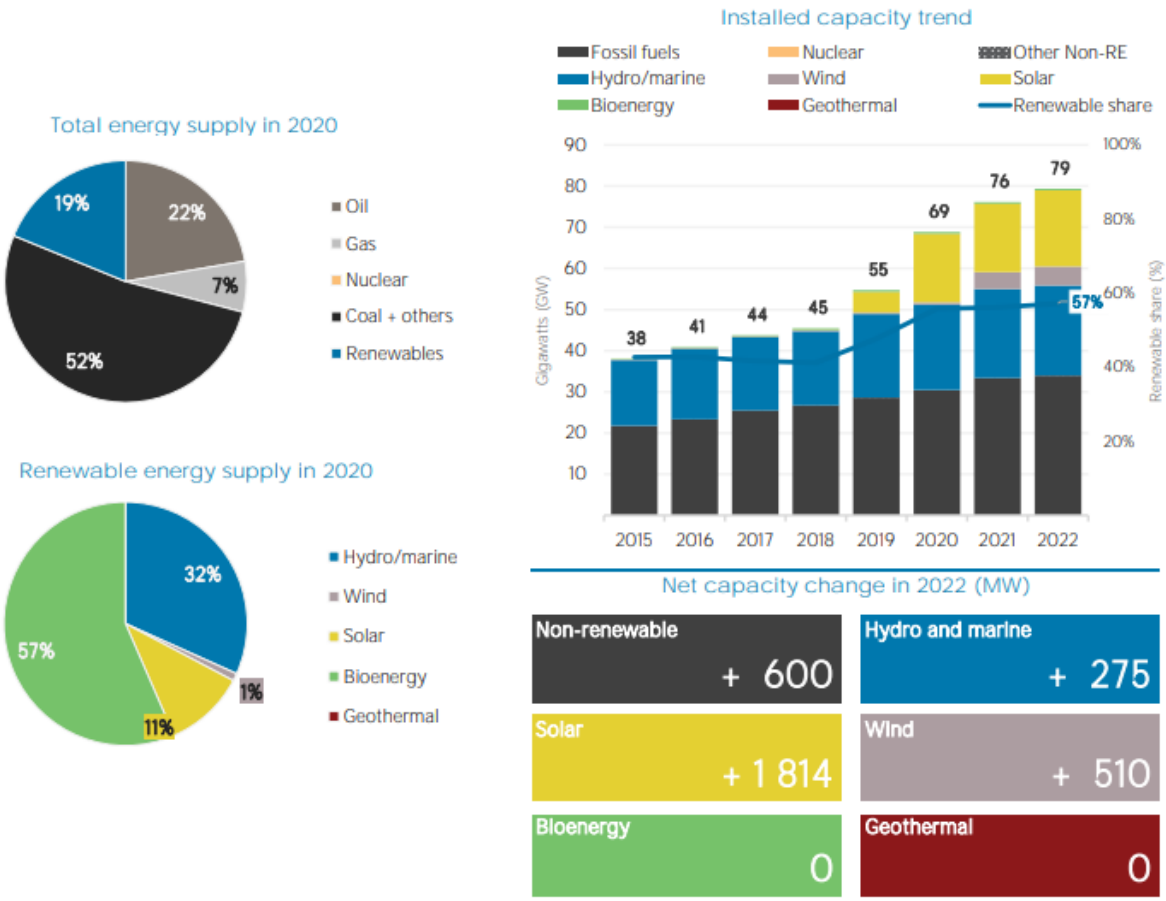


FIGURE 15 - VIETNAM - ENERGY GENERATION PROFILE

Specific aspects of energy supply and security and other key services for particular SEZs are summarised below.

2.2.3. Dinh Vu-Cat Hai Industrial Zone

Shown below in Figure 16, the Dinh Vu-Cat Hai Industrial Zone is a mature industrial area located in the north of Vietnam, constructed around and adjacent to the port and city of Hai Phong. Key operational details are summarised in Table 8.

Located within the North Key Economic Region, with a central government planning focus on advanced manufacturing, 'high technology products' and a growing green technology sector, the IZ is conceptually highly aligned with national aspirations for critical minerals supply chains. Further, the region is host to a highly significant existing chemicals, precursors, electronics and automative manufacturing sector across both national and multinational actors. Most recently, Vietnamese major VinGroup has announced joint ventures with ROK-

based LG Chem to construct a sizeable lithium-ion battery manufacturing plant to service the existing VinFast EV and e-scooter manufacturing plant,[34] while an MoU has been signed with ASX-listed Pan Asia Metals to explore the construction of a 20-25,000tpa lithium carbonate and/or hydroxide facility located 'close to VinGroup battery plant'.[35]

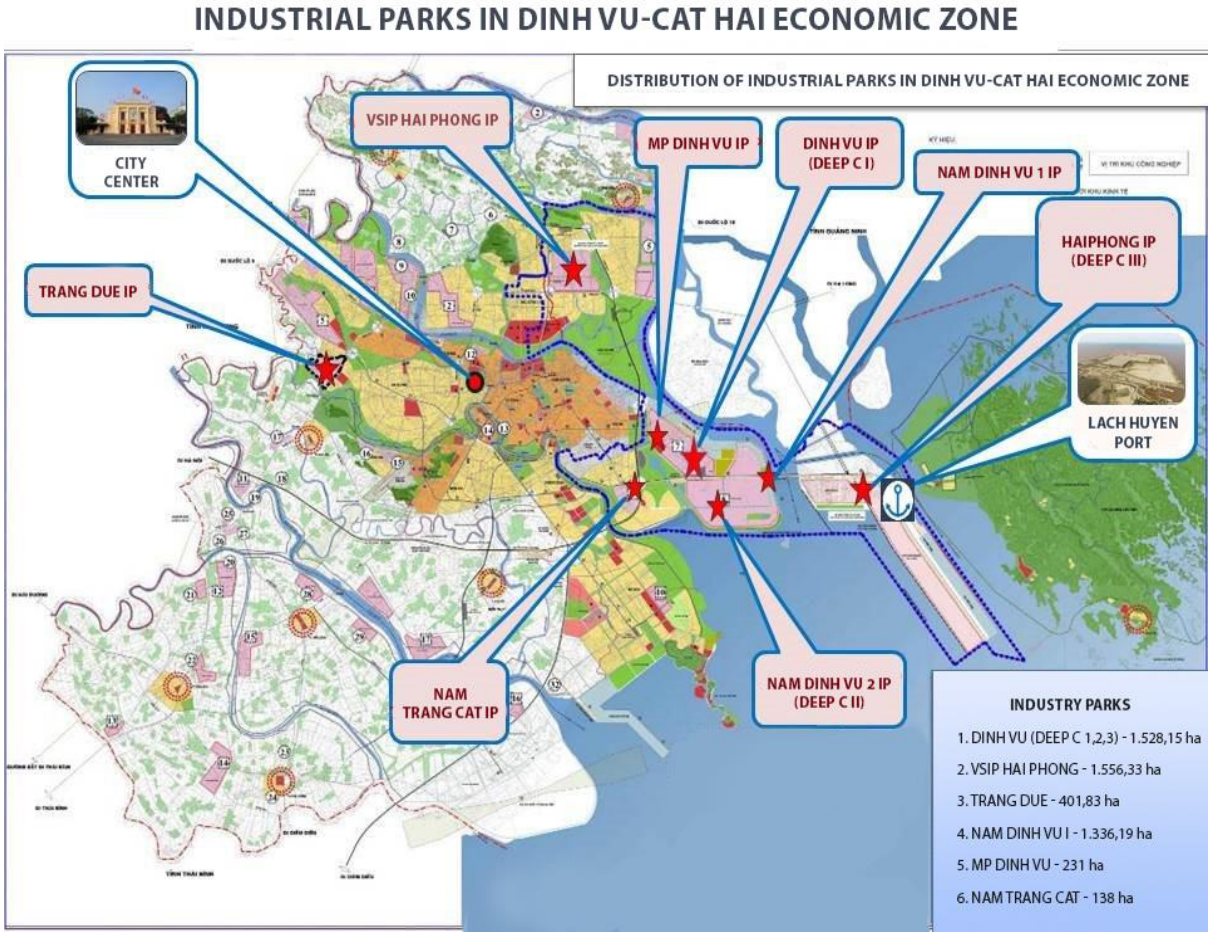


FIGURE 16 - DINH VU-CAT HAI INDUSTRIAL ZONE – SITE OVERVIEW

TABLE 8 – DINH VU-CAT HAI INDUSTRIAL ZONE – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	22.1k ha total land zoned within IZ. No English-language public domain material appears available as to specific occupancy, however reportedly this is at >80% across North KER.
Energy supply & mix	Local grid primarily dependent on coal-fired generation (Uong Bi, Hai Phong power stations, tot. appx 1GW generation). 4.5GW Hai Phong LNG Power Plant (ExxonMobil) at permitting stage. Hai Phong Offshore Wind Farm and Hong Phong Solar Farm at permitting stages, expected to add appx. 1GW.

[34] Eg. VinGroup (2019), *Vinfast And Lg Chem Co-Operate For Battery Production*, press release 8 April 2019
[35] Eg. PanAsia Metals (2023), *Pan Asia Metals and VinES sign non-binding MOU to conduct a feasibility study for a standalone Lithium Conversion Facility*

Metric/aspect	Commentary
Energy reliability	Consistent issues with reliability across North Vietnam. High number of approvals of grid-connected solar currently straining grid. National grid overall highly dependent on energy imports from Laos and PRC.
Other services	Limited English-language public domain material available. Proximity to existing industry cluster and urban area suggests waste, wastewater and other industrial services achievable. Proposed Northern LNG storage/import terminals to be constructed at Port circa 2026, although limited details available, and new Hai Phong – Thai Binh pipeline announced in Petroleum Infrastructure Master Plan.
Logistics	Generally good. Very significant maritime capacity through Hai Phong and good rail and road links to key logistics and freight routes nationally and to neighbouring PRC.

2.2.4. Vung Ang Economic Zone

Shown below in Figure 17, the Vung Ang Economic Zone is located on the central Vietnamese coast to the south of Hai Tinh province. Built around the Son Duong port complex, one of the nation's largest deepwater ports and a regional logistics hub, key operational details are summarised in Table 9.

Although near its southern border, the Vung Ang SEZ is also located within the North Key Economic Region, and hence falls within the central government planning focus on advanced manufacturing, 'high technology products' and a growing green technology sector. More traditionally associated with minerals refining, located within and proximate to the SEZ is a significant industry ecosystem of heavy industry and refining, including the Thach Khe iron mine, Son Duong steel refinery complex, and a significant petrochemicals refining sector. The region is also host to a growing lithium battery ecosystem, including the 12.6ha VinES Battery Complex sited within the SEZ itself, and is proximate to Vietnam's first battery 'gigafactory', a 5GWh LFP chemistry-based facility jointly developed by PRC-based major Gotion HighTech and VInGroup.

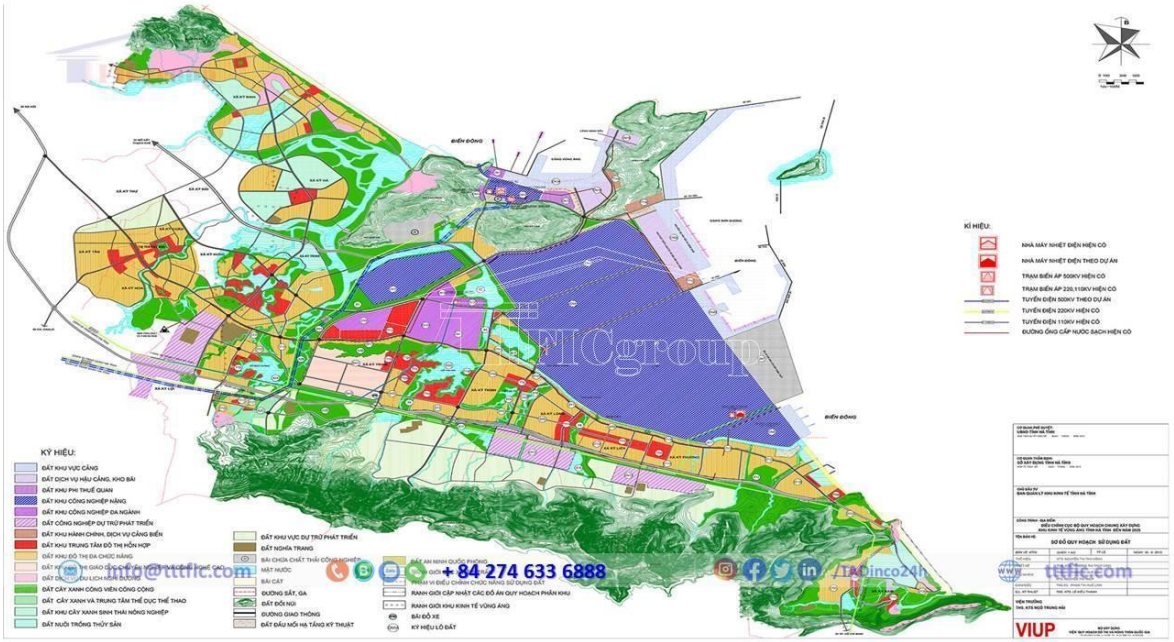


FIGURE 17 – VUNG ANG ECONOMIC ZONE – SITE OVERVIEW

TABLE 9 – VUNG ANG ECONOMIC ZONE – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	22.8k ha total land zoned within EZ. No English-language public domain material appears available as to specific occupancy, however reportedly this is at >80% across North KER.
Energy supply & mix	Very significant proximate fossil-fuel assets with mix of private and State operators (Vung An coal, Ha Tinh Formosa Steel coal) tot. apx 900MW, planned future LNG (Quang Trach 1.5GW; Vung Ang 3 3GW) to commence supply 2030, Hbre Ha Tinh Wind Farm (120MW) at approvals stage.
Energy reliability	Consistent issues with reliability across North Vietnam. High number of approvals of grid-connected solar currently straining grid. National grid overall highly dependent on energy imports from Laos and PRC.
Other services	Limited English-language public domain material available. Proximity to existing heavy industry and minerals refining cluster and urban area suggests waste, wastewater and other industrial services achievable. PCG Phu Vinh attained approvals to develop LPG/LNG network servicing EZ area as of 2019. Current project status unclear from English-language material. Proposed Northern LNG storage/import terminals and accompanying distribution system to be constructed to north, at Port of Hai Phong, circa 2026 and likely to service region.

Metric/aspect	Commentary
Logistics	EZ bult around Son Duong port complex, deepest in nation and regional logistic hub. Close proximity to Dong Hoi international airport. Acceptable to good heavy haulage roads.

2.3. Indonesia

Although the concept of special economic zones (Kawasan Ekonomi Khusus; KEK) is relatively new to Indonesia, dating to the first election of the Widodo government in 2014, they have become an important tool in managing and encouraging regional development and economic diversification, with around 20 KEKs announced and 12 operational. As summarised above in Table 5, Indonesia is host to a large number of defined special economic zones and industrial areas found across the nation. Planning and business attraction/encouragement is undertaken in partnership with local and regional authorities, but is managed and overseen by the National Council for Special Economic Zones, as are the focus areas and desired enterprise types to be fostered within each KEK.

The following sections broadly outline particular aspects of the Indonesian economy and regulatory environment, followed by an overview of two KEKs as an example of areas likely conducive to critical minerals processing – the Galang Batang KEK and the Java Integrated Industrial and Port Estate of the Gresik KEK.

2.3.1. Regional business climate and broad incentives

As summarised below in Figure 18,[36] Indonesia generally ranks poorly on most measures of ease of doing business and overall regulatory environment. Further, the ease and ability to do business across Indonesia differs markedly, with provinces, regencies and municipalities each electing their own governments and a further eight Special Autonomous Regions exercising varying levels of independence. In general and at a practical level, however, where major resources projects are considered aligned with central government priorities, the Investment Coordinating Board of the Ministry of Investment (Badan Koordinasi Penanaman Modal; BKPM) is notably able to serve as a highly effective lead agency in assisting to navigate approvals and other regulatory processes.

[36] World Bank (2021), *Doing Business 2020 – Indonesia*, https://archive.doingbusiness.org/en

FIGURE 18 - INDONESIA - WORLD BANK DOING BUSINESS RANKINGS

As of March 2023 and the entry into force of the 2020 Omnibus Law on Job Creation and related instruments, foreign investment into Indonesia is greatly simplified, and in particular a number of sectors are classified as Investment Priorities, opening up eligibility for a range of fiscal and non-fiscal incentives for projects which are export-oriented, capital intensive and which utilise 'advanced technologies'. Broadly, for projects located within a KEK which are aligned with the declared overall theme, these can include:

- corporate income tax exemptions for 10-20 years;
- accelerated deprecation and amortisation schedules,
- VAT and luxury goods tax exemptions;
- import and customs duties exemptions;
- local and regional taxes reduced or in some cases waived; and
- advantageous property ownership and leasehold provisions.

Due to regulatory structures applying to KEKs, many aspects of business licensing and regulatory approvals are also streamlined, with the KEK Administrator entity instead responsible for securing these and hence in many instances allowing 'pre-approvals' for developments.

2.3.2. Local regulatory factors – resource nationalism

While the overall investment climate in Indonesia has notably improved under modern regulatory settings, it should be noted that the resources sector in particular is subject to some politico-regulatory concerns. Very briefly, while the minerals and resources sector is nominally open to investment as with all other sectors, Indonesia's treatment of the sector has caused some concerns over the past medium term, ranging from past part-nationalisation and border controls imposed on the nickel industry, without compensation, export controls and bans on the coal sector, and other interventions are worrying, as are comments by the Indonesian government which suggest export bans could be extended to include copper, bauxite and other 'minerals of national interest'. Finally, under the Mining Law, foreign-owned resources

operations must gradually divest a controlling stake to Indonesian-based parties (or the Indonesian government) within 10 years. Further, a variety of companies have reported increasing difficulty in operations due to inconsistent and increasingly onerous resource sector related regulation.[37]

2.3.3. Input pricing and energy security

While regionally variable, and subject to other factors affecting delivery (such as particular supply contracts negotiated by park operators), headline pricing for key process inputs is summarised in Table 10,[38] below.

TABLE 10 - INDONESIA - HEADLINE INPUT PRICING

Process input	Pricing and period
Electricity	$USD 0.08/kWh (Q3 2022)
Petrol/gasoline	$USD 0.62/L (Q1 2024)
Natural gas	$USD 13.47/GJ (Q1 2024)
Process water	$USD 0.16 – $0.51/m3 (Q3 2022)

As shown below in Table 11 and Figure 20,[39] Indonesia is a significant regional energy supplier, primarily in the form of coal and natural gas. While in-country aspirations of emissions reduction are mooted in planning documents and the latest National Energy Policy, ambitious petrochemicals exploration by SOEs and other entities has seen its overall reliance on fossil fuel sources increase over the past medium term. The unique archipelagic geography of Indonesia also complicates power and process energy supply - with many thousands of islands and atolls, many inhabited, both grid stability and power availability are often problematic. Indonesia does not have any international oil or gas pipeline connections, despite its membership of the Trans ASEAN Gas Pipeline project, and as shown below in Figure 19,[40] domestic infrastructure is chiefly concentrated on the islands of Java, Sumatra and Kalimantan. It is therefore highly reliant upon maritime links to distribute energy supplies across the nation.

[37] Eg. Department of State (2023), *2023 Investment Climate Statements: Indonesia*, United States Government
[38] Data sourced English-language public domain sources including Trading Economics, Global ClimateScope, Statista and in-country regulators. Currency of estimates as noted. Pricing assumes standard industrial tariff rates on standard connection basis on non-congested, non-contested distribution networks and is not inclusive of infrastructure contributions, special pricing regimes, pre-purchase arrangements, bulk discounts, etc.
[39] Derived International Renewable Energy Agency (2023), *Energy Profile – Vietnam*, 8 August 2023, www.irena.org
[40] Derived Figure 3: Indonesia's gas infrastructure, in Natural Gas World (2018), *Powering Indonesia*, 2 August 2018

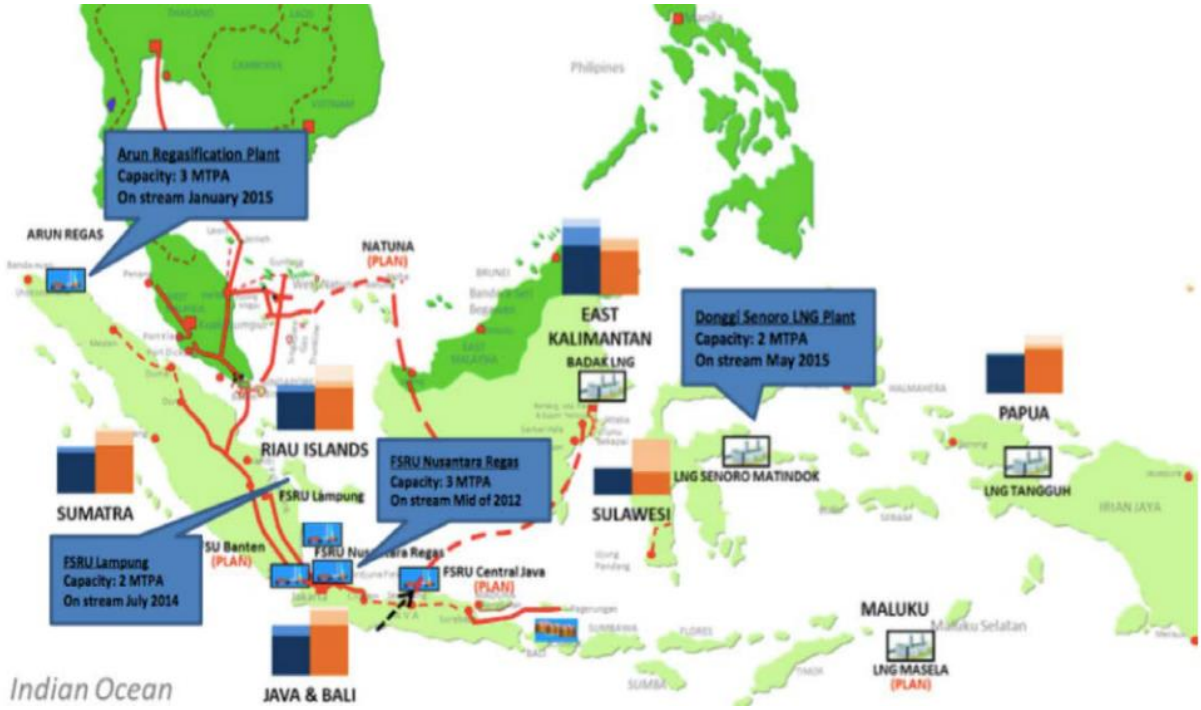


FIGURE 19 - INDONESIAN GAS DISTRIBUTION NETWORK

TABLE 11 – INDONESIA - ENERGY GENERATION & SUFFICIENCY

	2015	2020
	Energy generation	
Renewable generation (TJ)	2,086,331	2,221,260
Renewable share of total gen. (%)	24	21
Non-renewable generation (TJ)	6,701,169	8,228,173
	Energy trade	
Imports (TJ)	2,279,511	1,778,517
Exports (TJ)	10,888,567	11,554,622
Self-sufficiency (%)	198	197

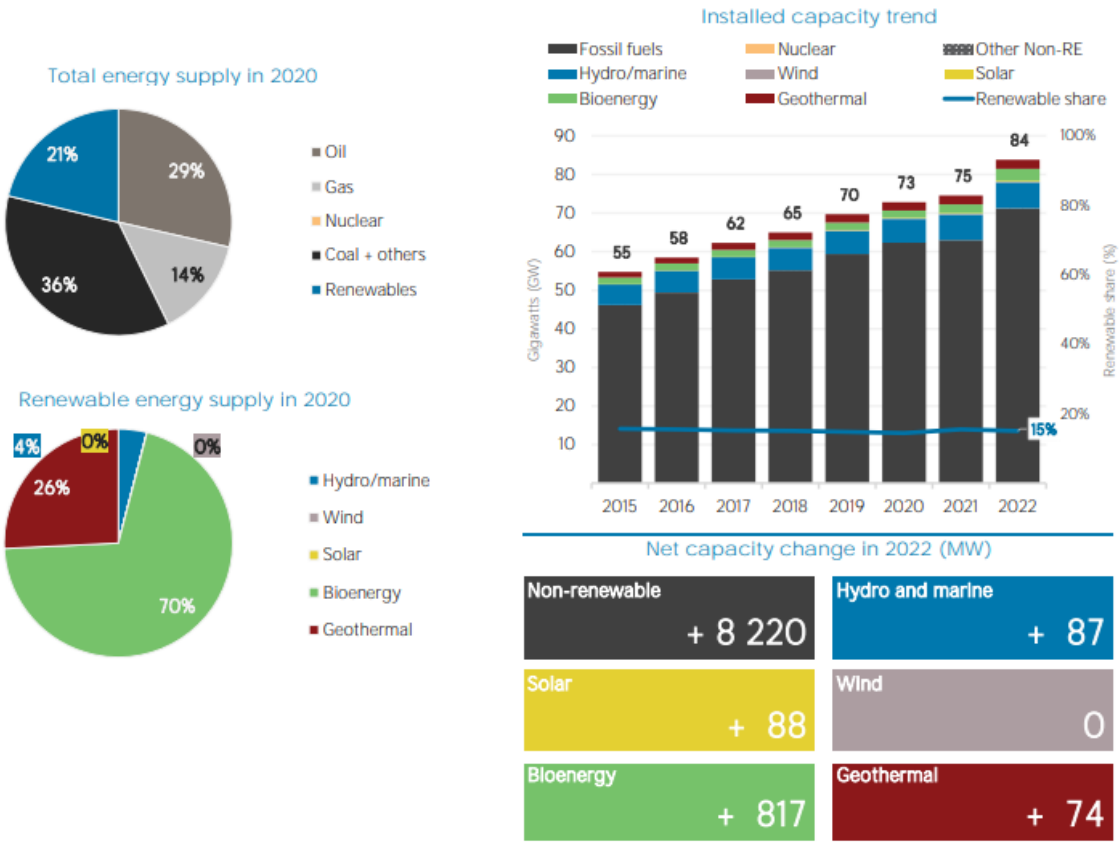


FIGURE 20 - INDONESIA - ENERGY GENERATION PROFILE

Specific aspects of energy supply and security and other key services for particular KEKs are summarised below.

2.3.4. Galang Batang KEK

Shown below in Figure 21, the Galang Batang KEK is a further development of the Barang Barang Special Economic Area, and is located on the eastern edge of Bintan Island, in the Riau Island chain. Relatively recently declared, the KEK is primarily focused on metals refining and processing, with foundational tenant PT Bintan Alumina constructing a 1Mtpa bauxite smelting and aluminium refining complex and reading first production in 2021, to be scaled to 2Mtpa over the medium term.

On the basis of significant future power availability plans, including proposals to derive increasing proportions of renewable energy from generative capacity being built by SOE energy provider PLN in nearby Sumatra, the operating entity PT GBKEK Industri Park plans to develop the KEK as a minerals processing industry centre. Other minerals processing proximate the KEK include the PRC-based Nanshan Group and Tlanshin Aluminium smelters, both at around 2mtpa, and a larger pool of multinationals and SMEs across the Riau Islands operating in the electronics and digital tech supply chain, especially in semiconductors, circuit boards, sensors and related products.

Key operational details of the KEK are summarised below in Table 12.

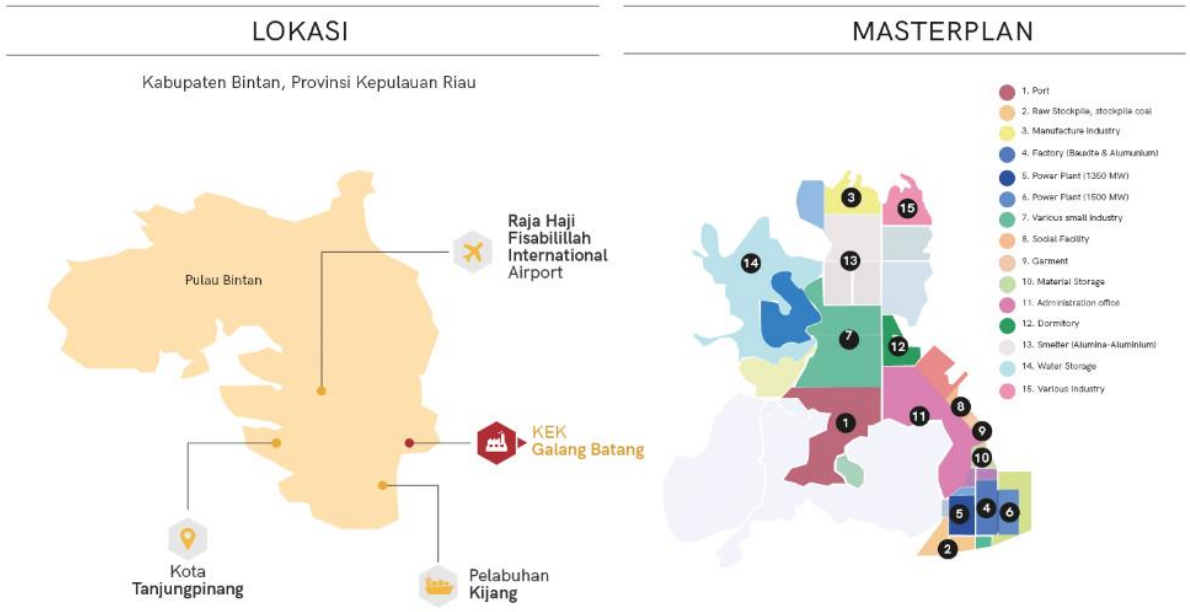


FIGURE 21 – GALANG BATANG KEK – SITE OVERVIEW

TABLE 12 – GALANG BATANG KEK – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	2,300 ha total land zoned within IZ. No English-language public domain material appears available as to specific occupancy.
Energy supply & mix	Current local generation low by industrial standards, 150MW coal plant (Nanshan Industrial). However, significant additional generation under construction or at approvals - major site utiliser PT Bintan Alumina Indonesia understood to have signed MoU with SOE energy provider PLN to provide additional 1.3GW by 2030, primarily intended to be provided via renewables, and 1GW Batam Bintan Karimun Solar Farm expected to commence construction in 2024.
Energy reliability	Riau Islands subject to significant reliability issues. MoU signed between PT Bintan Alumina and local police as of 2024 to 'safeguard supply facilities' and understood that future transmission and elec infrastructure works in progress associated with future planned generation.
Other services	Gas supply: PT Bintan Alumina has constructed coal gasification plant with total output appx. 1.9b cubic metres. Process water: Reservoir under construction, expected capacity 7.5 million cubic metres, expected to supply totalling 20m cubic metres per annum to users.
Logistics	Reasonable maritime (Port of Kijang, on-site wharf facilities, appx 900m wharf length, 120,000teu capacity), proximate to Raja Haji Fisabilillah airport. Road networks of varying quality, but good bridges to across regions support freight transfers.

2.3.5. Java Integrated Industrial and Port Estate District, Gresik KEK

Shown below in Figure 22, the Gresik KEK is also a relatively new industrial area, located in east Java, just north of the major city of Surabaya. While still evolving, the initial focus of the JIIPE KEK is on metals refining and related industries primarily aimed at export, with an announced 'anchor tenant' PT Freeport Indonesia constructing of a copper smelter and related plant, with a total capital investment of $USD 3 billion, expected to be operational by end of 2024. To support the smelter and other expected users, a significant expansion of the existing Gresik/Surabaya port complex is under way, with a joint venture of DPI World and Canadian CDPQ developing a $USD 1.2 billion maritime logistics terminal and related common user infrastructure. Hong Kong-based Xinyi Glass is also in the process of constructing a quartz sand processing and glass manufacturing presence in the JIIPE, with an initial investment of $USD 700 million in 2022 expected to scale to $USD 11 billion to expand photovoltaic (PV) manufacturing across Indonesia.[41] Key operational details of the KEK are summarised below in Table 13.

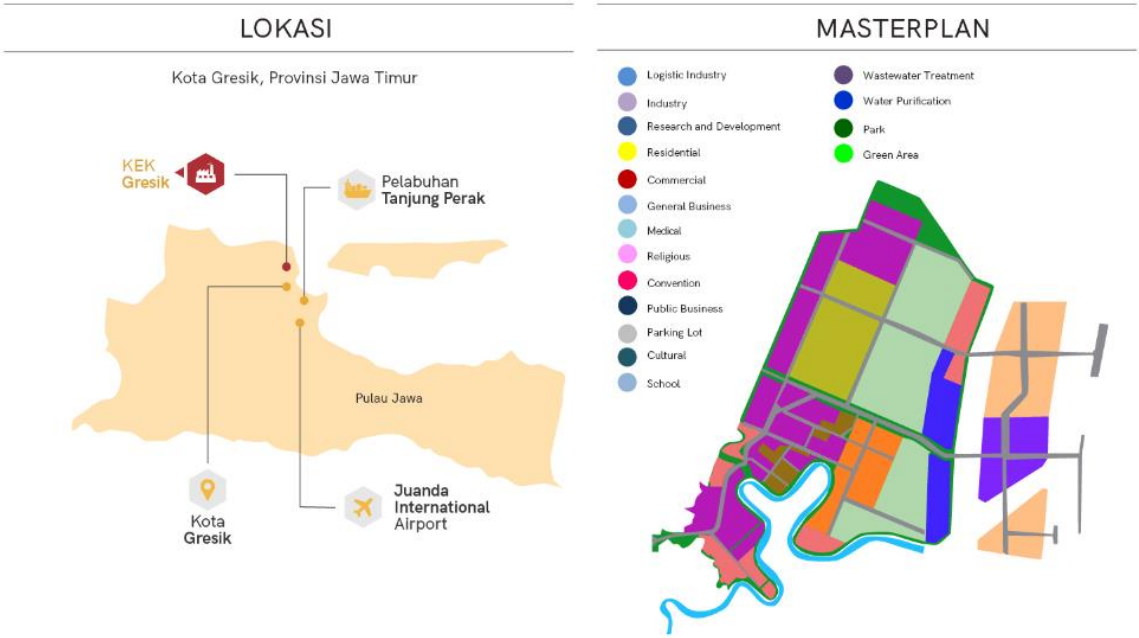


FIGURE 22 – JAVA INTEGRATED INDUSTRIAL AND PORT ESTATE DISTRICT, GRESIK KEK – SITE OVERVIEW

TABLE 13 – JAVA INTEGRATED INDUSTRIAL AND PORT ESTATE DISTRICT, GRESIK KEK – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	Planned 'fully integrated' residential, port and industrial estate – appx 1,300ha industrial estate, 400ha port facilities and associated logistics. Specific occupancy data unavailable, however the area was only recently declared hence likely low.
Energy supply & mix	Very significant local fossil-fuel assets (4.7GW Paiton thermal coal, Gresik oil/gas 200MW, Gresik Akr Estate oil/gas 500MW). Further generation planned (Jawa-3 oil/gas 800MW planned to commence 2030).

[41] Reporting eg. Business Indonesia (2023), *Indonesia secures US$11.5 Bn Investment for glass, solar panels,* 2 August 2023

Metric/aspect	Commentary
Energy reliability	Acceptable, Java grid improved following post-COVID uptick in investment and industry commentary that specific local grid upgraded to meet Freeport smelter requirements.
Other services	Gas supply: Good, connected to Gresik-Semarang pipeline. Water supply: Seawater osmosis plant and treated/recycled, currently appx 4,000m3/day, expansion to appx. 100,000m3/day in progress.
Logistics	Good. Adjacent to Gresik/Surabaya ports, very good freight road and rail connectivity.

2.4. Malaysia

Malaysia has long pursued an open trading policy and sought to accelerate inbound foreign investment, with its first Free Industrial Zone established in the early 1970s. At present, there are more than 600 defined economic zones, of which around 250 are of significant scale, developed in partnership with various government agencies and instrumentalities, such as the state economic development corporations (SEDCs), regional development authorities (RDAs), port authorities, and municipalities. Broadly, the development and activation of these zones is guided by the Malaysian Investment Development Authority (MIDA) under an Economic Growth Corridor central planning lens, although subject to significant Sultanate (State) and local government input. Most relevant for present purposes are Free Industrial Zones (FIZs) and Industrial Parks (IPs), which are designed to facilitate specific types of industrial, manufacturing and refining activities, including minerals processing, refining, smelting and export.

The following sections broadly outline particular aspects of the Malaysian economy and regulatory environment, followed by an overview of two particular IPS as an example of areas likely conducive to critical minerals processing - the Samalaju Industrial Park and the Malaysia-China Kuantan Industrial Park.

2.4.1. Regional business climate and broad incentives

As summarised below in Figure 23,[42] Malaysia ranks quite highly on international scales of ease of doing business and overall regulatory climate, although with some barriers to enterprise creation. Most metrics have also improved over the past medium term, reflecting a concerted effort on the part of the central government and individual Sultanates to reduce red tape and encourage enterprise formation to boost national growth.

[42] World Bank (2021), *Doing Business 2020 – Malaysia*, https://archive.doingbusiness.org/en

FIGURE 23 – MALAYSIA - WORLD BANK DOING BUSINESS RANKINGS

At a headline level, since 2009 repeal of the Foreign Investment Committee restrictions on foreign ownership, Malaysia is a highly open jurisdiction for inbound investment. However, with no strong overarching central government controls, the Ministerial Functions Act of 1969 provides the government of the day with broad ambit powers and discretion over approvals and encouragement of projects, issues of required permits, etc. As such, incentives, concessions, requirements and so on are in many cases bespoke to the particular project or proponent. Examples have included:

- corporate income tax exemptions in the region of 10-15yrs;
- stamp duty exemptions;
- import and customs duties exemptions; and
- other negotiated exemptions or reductions of applicable local government fees and charges.

As noted above, MIDA generally plays an important investment attraction and regulatory facilitation 'lead agency' role, actively assisting project proponents to navigate approvals and other regulatory processes.

2.4.2. Input pricing and energy security

While regionally variable, and subject to other factors affecting delivery (such as particular supply contracts negotiated by park operators), headline pricing for key process inputs is summarised in Table 14,[43] below.

[43] Data sourced English-language public domain sources including Trading Economics, Global ClimateScope, Statista and in-country regulators. Currency of estimates as noted. Pricing assumes standard industrial tariff rates on standard connection basis on non-congested, non-contested distribution networks and is not inclusive of infrastructure contributions, special pricing regimes, pre-purchase arrangements, bulk discounts, etc.

TABLE 14 - MALAYSIA - HEADLINE INPUT PRICING

Process input	Pricing and period
Electricity	$USD 0.08/kWh (Q1 2022)
Petrol/gasoline	$USD 0.43/L (Q1 2024)
Natural gas	$USD 13.63/GJ ((Q1 2024)
Process water	Location specific data given below.

Malaysia is a significant energy exporter, with exports of oil, gas and coal together comprising over a third of national GDP. It is one of the largest suppliers of natural gas in the APAC region. Power distribution and retail is state controlled, although split between three entities, servicing peninsular Malaysia and the Sabah and Sarawak regions of the island of Borneo respectively. Natural gas is the most important domestic energy source, and in very general terms, LNG is shipped from Sabah and Sarawak to regassification terminals on mainland Malaysia and distributed to end users via pipeline.

Following reforms in the late 1990s and early 2000s, and the breaking of gas distribution monopoly by SOE Petronas in 2017, the Malaysian wholesale energy and generation market is relatively open, with the majority of grid energy now produced by third parties and sold to the SOE retailers, either at spot pricing or under PPAs. As a result of this sustained investment, the Malaysian grid is by regional standards fairly robust, although less so in Sabah and Sarawak.

Malaysian energy production is summarised below in Table 15 and Figure 24.[44]

TABLE 15 - MALAYSIA - ENERGY GENERATION & SUFFICIENCY

	2015	2020
Energy generation		
Renewable generation (TJ)	121,499	166,883
Renewable share of total gen. (%)	4	4
Non-renewable generation (TJ)	3,325,741	3,711,296
Energy trade		
Imports (TJ)	1,912,047	2,304,450
Exports (TJ)	2,155,842	2,225,787
Self-sufficiency (%)	109	99

[44] Derived International Renewable Energy Agency (2023), *Energy Profile – Malaysia*, August 2023, www.irena.org

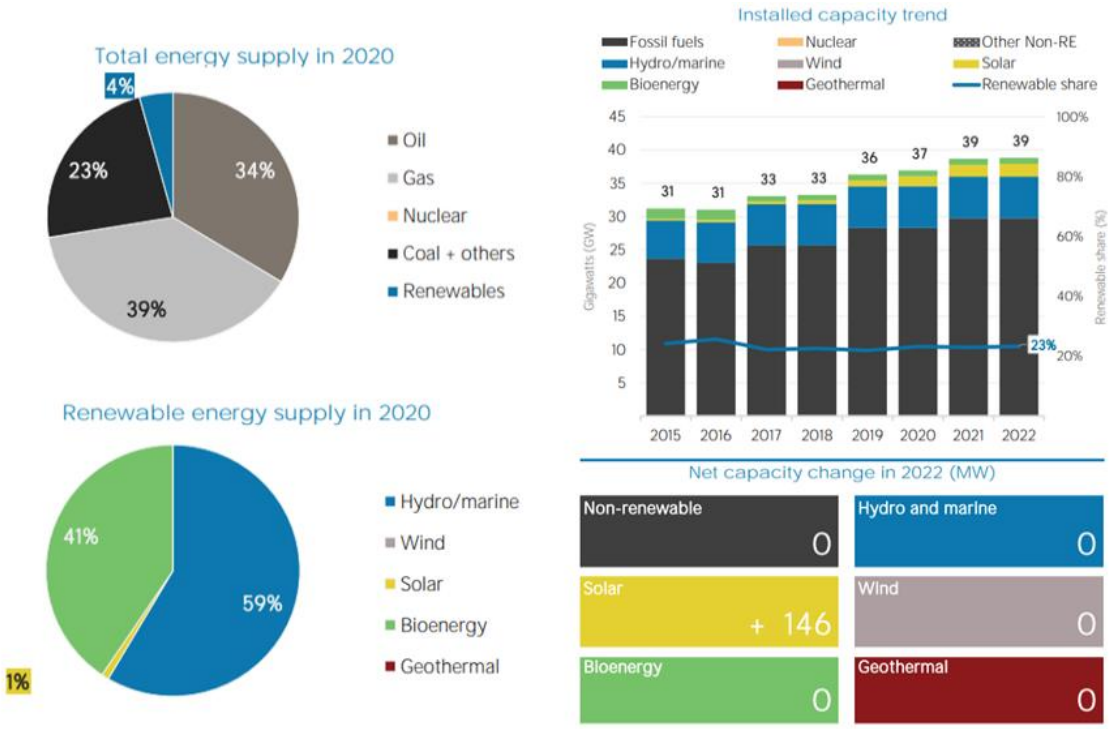


FIGURE 24 - MALAYSIA - ENERGY GENERATION PROFILE

Specific aspects of energy supply and security and other key services for particular SEZs are summarised below.

2.4.3. Samalaju Industrial Park, Sarawak Corridor of Renewable Energy

Shown below in Figure 25, the Samalaju Industrial Park is a relatively new industrial area and part of the broader 'Sarawak Corridor of Renewable Energy' zone, occupying the northern half of the island of Borneo. The Sarawak region is Malaysia's largest renewable energy provider, primarily through hydro-electric, and together with its endowments of natural resources the Malaysian government seeks to capitalise on this to encourage the growth of energy-intensive sectors of metals refining (with a focus on aluminium and steel), midstream processing and other value-adding to rare earths, silica sand, and broader 'green technology' and advanced manufacturing.

Located 60km from Bintulu town, Samalaju Industrial Park (SIP) itself is a dedicated industrial park for energy-intensive and heavy industries such as aluminium smelting, iron and steel, oil refining, silica-based industries, marine engineering, and a wide range of industrial and supporting services. Samalaju IP is already host to a very significant manganese and ferroalloys sector - Press Metal operate 1.1mtpa aluminium refinery and smelter, Pertama Feroalloys a manganese alloy, ferrosilicon and micro silica production plant at around 434,000tpa, Sakura Ferroalloys further manganese products (160,000tpa), Wenan Steel (locally-owned subsidiary of PRC-based Xin Wu'an Steel Group) constructing refinery and steelworks (tonnage not stated) and ASX-listed Latrobe Magnesium Ltd announced in March 2023 that it had selected SIP as the location for its 100,000tpa magnesium processing plant.[45] Samalaju is also host to an emerging polysilicon/solar panel cluster - OCIM Sdn.Bhd operates polysilicon production

[45] Latrobe Magnesium 2023, 'Latrobe Magnesium selects Malaysia for its 100,000tpa magnesium plant', ASX announcement, 27 March 2023

facility (35,000tpa), Adam Digital is constructing a large-scale facility (tonnage not stated), and LONGi Malaysia finalising 6GW pa solar panel output from a newly commissioned production plant. Key operational details of the IP are summarised below in Table 16.

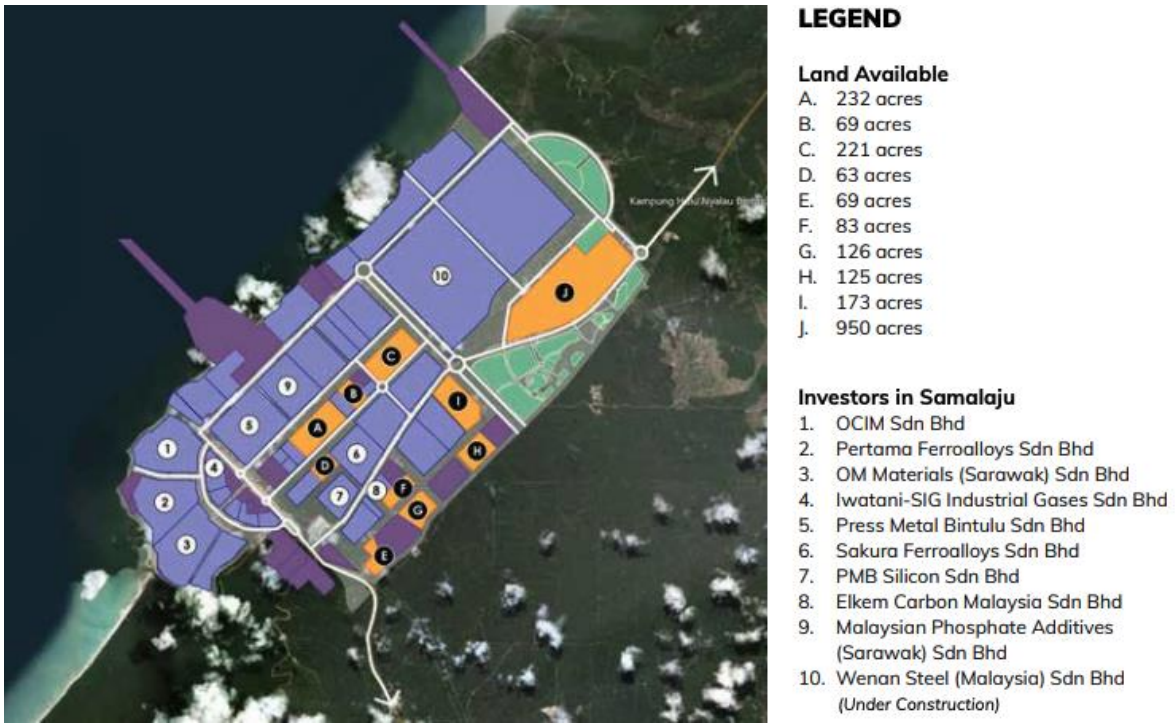


FIGURE 25 – SAMALAJU INDUSTRIAL PARK – SITE OVERVIEW

TABLE 16 – SAMALAJU INDUSTRIAL PARK – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	Appx. 8,000ha zoned within Park; 1,270ha available as of Q3 2023.
Energy supply & mix	Around 1GW availability through local fossil-fuel sources (Tanjung Kidurong Power Station, 420MW oil/gas, Mukah Power Station, 135MW coal, Balingian Power Station, 300MW coal). Bakun Hydroelectric Plant under construction (est 2027), around 2.4GW. Very significant additional hydro potential under exploration (est appx 28GW)
Energy reliability	Middling. Sarawak grid less developed than other regions, although investment accelerating to accommodate 'Corridor of Renewable Energy' aspirations (especially hydro).
Other services	Gas supply: Bintulu-Samalaju gas pipeline currently under construction, completion est. late 2025. Water supply: currently at appx 80 million litres per day, growing to 200 million litres/day by end 2026.
Logistics	IZ build around Samalaju Port, with appx 18mtpa cargo handling capacity, two wharfs, 8,000DWT at 160m/7m. Planned future expansion to Handymax (250/13.5m) at 50,000DWT. Good rail infrastructure and access, links to East Coast Rail Line, roads average to good.

2.4.4. Malaysia-China Kuantan Industrial Park

One of the higher profile parks in Malaysia, the MCKIP was launched in 2013 along with its sister park China-Malaysia Qinzhou Industrial Park under the Belt and Road Initiative, advertised at the time as forming a new model of "Two Countries, Twin Parks". Located in the Gebeng Industrial Area in the Pahang capital of Kuantan, it was the first industrial park to be accorded National Industrial Park status in Malaysia, and is a joint venture between a consortium of Malaysia (IJM Land Berhad, Sime Darby Property and the Pahang State Government) and PRC-based investors (Guangxi Beibu, a state-owned logistics company, and Qinzhou Investment Development Co Ltd).

The park has seen a staged development model over time, with three distinct areas as shown below in Figure 26, and the planned development of the Malaysia-China Kuantan International Logistics Park (MCKILP) in MCKIP 3 being developed by China Harbour Engineering Company. The MCKIP is home to a now very significant metals refining and midstream processing sector, with Alliance Steel (the first tenant in park, a JV of Guangxi Beibu and Guangxi Shenglong Metallurgical Co) operating a 3.5mtpa steel mill currently in the process of expanding to 10mtpa. In addition, the MCKIP is seeing further investment in aluminium, petrochemicals and precursors, with Guangxi Investment Group committed to aluminium refinery, Bosai Minerals aiming to construct 1mtpa smelter and NewOceanEnergy announcing a USD $1.2 billion petrochemicals refinery complex, although construction timeframes remain unclear. Future inbound PRC investment is understood to focus on solar panel manufacture, metals refining and ferrochemicals. It should also be noted that the MCKIP is located just north of the Gebeng Petrochemical Complex and associated industry ecosystem.

Key operational details of the IP are summarised below in Table 17.

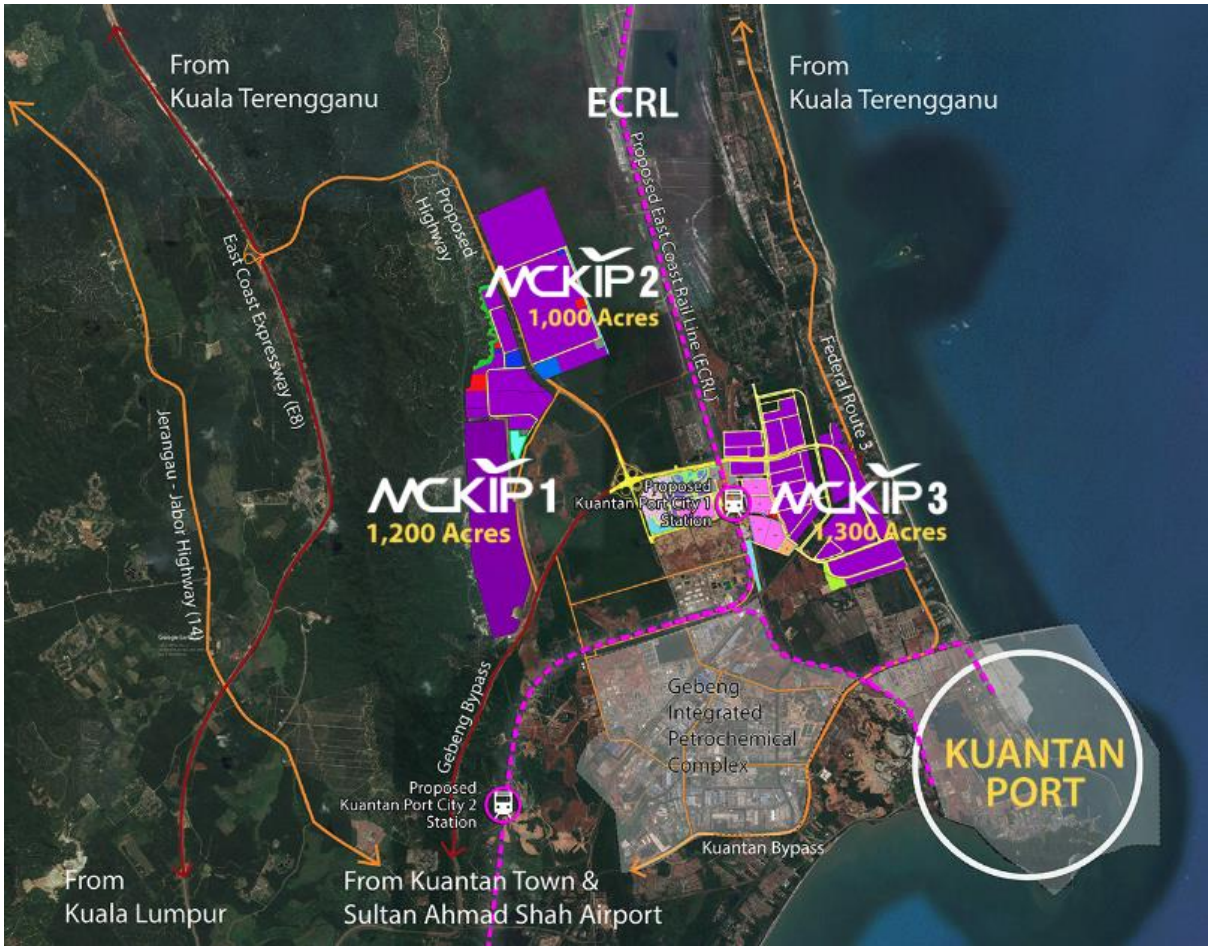


FIGURE 26 – MALAYSIA-CHINA KUANTAN INDUSTRIAL PARK – SITE OVERVIEW

TABLE 17 – MALAYSIA-CHINA KUANTAN INDUSTRIAL PARK – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	MCKIP 1 (480ha) and MCKIP 2 (410ha) cater for heavy and medium industries, MCKIP 3 (530ha) recently rescoped to focus on battery manufacturing, petrochemicals refining and catalyst manufacture. MCKP1 >90% sold, MCKP2 >20%, no specific figures released for MCKP3 but understand that around 50% of total area taken up by integrated logistics park development.
Energy supply & mix	Since decommissioning of Sultan Ismail station in 2017, reduced local generation footprint, primarily reliant on HV transmission from western coast. Approximately 150MW solar generation proximate to region (Gebeng Solar Farm, Teluk Kalong Solar Farm, UITM Solar Farm, Mukim Bebar Solar Farm). Sultain Ismail plant to be repowered by 2030 as reduced-emissions combined-cycle natural gas and hydrogen plant, with around 1.4GW designed capacity.
Energy reliability	Very good by regional standards.

Metric/aspect	Commentary
Other services	Gas supply: 'virtual pipeline' trucked compressed gas from Gebeng. Water supply: recent expansion, approximately 90m litres/day process water.
Logistics	MCKIP constructed just north of Kuantan Port, currently undergoing deepening and expansion – planned 52mtpa handling capacity. 22 berths, 11.2m draft at up to 40,000DWT vessels, to be increased to 200,000DWT by completion of expansions. East Coast Rail Line spur extension expected completed by 2027, and integrated logistics park under construction in MCKIP3 by China Harbour Engineering Co.

2.5. Republic of Korea (ROK)

One of the most industrialised nations in the region (if not globally), the Republic of Korea (ROK; South Korea) has been very active in seeking to foster industry clusters and attract inbound investment for over two decades through its system of Free Economic Zones, commencing with the Incheon FEZ founded in 2002. Intended to help transition underdeveloped areas of the ROK away from fisheries, agriculture and other industries towards higher value-added sectors of production, the ROK's policies in this regard are broadly overseen by the Ministry of Trade, Industry and Energy (MOTIE) under the "Free Economic Zone 2.0: 2030 Vision and Strategies" initiative, with an overall aim to attract KRW 60 trillion in investment into these regions, see 4,000 additional companies commence operations and create 200,000 full time equivalent jobs. As highlighted above in Table 5, this has been highly successful, and MOTIE estimates that around 15 percent of all businesses registered in the ROK primarily operate within a declared FEZ.

The following sections broadly outline particular aspects of the ROK economy and regulatory environment, followed by an overview of two particular FEZs as an example of areas likely conducive to critical minerals processing - the Pyeongtake-Poseung District of the Gyeongggi FEZ, and the wider Gwangyang Bay Area FEZ.

2.5.1. Regional business climate and broad incentives

As summarised below in Figure 27,[46] the ROK ranks highly by global standards on most measures for ease of doing business and overall regulatory climate.

[46] World Bank (2022), *Doing Business 2020 – Korea, Republic of*, https://archive.doingbusiness.org/en

FIGURE 27 – ROK - WORLD BANK DOING BUSINESS RANKINGS

In general, since regulatory reform in the late 1990s and foreign exchange reform in 2017, foreign investment into the ROK is relatively open and supported by a range of incentives. MOTIE generally plays an important investment attraction and regulatory facilitation 'lead agency' role, actively assisting project proponents to navigate approvals and other regulatory processes and particularly in 'high technology' supply chains (which would generally capture much of the critical minerals exposed sectors) working to customise incentive packages. Examples have included:

- corporate income tax exemptions for 5 years;
- exemptions on stamp duty and other acquisition taxes for up to 15 years;
- negotiated reductions on local levies;
- property tax reductions as negotiated for up to 15 years; and
- in some instances, negotiated cash grants or co-investment.

Specific to the lithium-ion critical minerals supply chains, as of April 2023, the ROK government has announced a co-investment fund of KFR 20 trillion ($USD 15.1 billion), in partnership with domestic battery makers LG Energy Solutions, Samsung SDI and SK On, which collectively control more than a quarter of the global EV battery market.[47] The aim is to quadruple domestic production of cathode materials, and tripe exports of other battery components.

Earlier in March, a separate co-investment funding pool of KRW 551 trillion (USD $422 billion) was announced, more broadly supporting 'high tech' sectors of national leadership, including 'future cars' and 'batteries'. The ROK has also actively sought to secure overseas supply chains of critical minerals, including an MoU signed between the ROK and Australia in February of 2022 as part of the broader Australia-Korea Comprehensive Strategic Partnership. By 2020, around $AUD 32 billion had been invested in the Australian resources sector by ROK interests,

[47] Reported eg. Yang, H. (2023), *South Korea announces $15 bln investment in advanced battery technologies*, 20 April 2023, Reuters

while over the period 2020-2022, approximately $AUD 500 million has been invested in Australian critical minerals suppliers by South Korean entities, predominantly in lithium, graphite, nickel and cobalt.[48]

Finally, as a signatory to a free trade agreement with the United States, ROK-based production of EV battery components qualifies for *Inflation Reduction Act* incentives. In combination with high tariff rates placed on ex-PRC production, this provides ROK-based production with a material cost advantage over Chinese exports into the lucrative United States market and has resulted in increased joint-venture interest on the part of PRC investors seeking to partner with ROK-based ventures in investigating alternate routes to market.

2.5.2. Input pricing and energy security

While regionally variable, and subject to other factors affecting delivery (such as particular supply contracts negotiated by park operators), headline pricing for key process inputs is summarised in Table 18,[49] below.

TABLE 18 - ROK - HEADLINE INPUT PRICING

Process input	Pricing and period
Electricity	$USD 0.16/kWh (Q1 2023)
Petrol/gasoline	$USD 1.24/L (Q1 2024)
Natural gas	$USD 13.63/GJ ((Q1 2024)

Energy security is and has remained a significant concern for the ROK for many years. With its sole land border shared with the Democratic People's Republic of Korea (DPRK; North Korea), no connectivity to international oil or natural gas pipelines, and minimal domestic endowments of fossil fuel resources, the ROK is almost wholly reliant upon a combination of imported oil and gas, nuclear power, and an emerging renewable energy sector (principally bioenergy and solar), summarised below in Table 19 and Figure 28.[50]

TABLE 19 – REPUBLIC OF KOREA - ENERGY GENERATION & SUFFICIENCY

	2015	2020
	Energy generation	
Renewable generation (TJ)	172,331	257,067
Renewable share of total gen. (%)	2	2
Non-renewable generation (TJ)	11,261,208	11,306,869

[48] Austrade (2023), *Opportunities in Korea for Australian critical minerals*, April 2023, Australian Trade and Investment Commission, Commonwealth Government, Canberra ACT
[49] Data sourced English-language public domain sources including Trading Economics, Global ClimateScope, Statista and in-country regulators. Currency of estimates as noted. Pricing assumes standard industrial tariff rates on standard connection basis on non-congested, non-contested distribution networks and is not inclusive of infrastructure contributions, special pricing regimes, pre-purchase arrangements, bulk discounts, etc.
[50] Derived International Renewable Energy Agency (2023), *Energy Profile – Korea*, August 2023, www.irena.org

	2015	2020
	Energy trade	
Imports (TJ)	12,564,537	12,412,236
Exports (TJ)	2,632,616	2,588,947
Self-sufficiency (%)	19	19

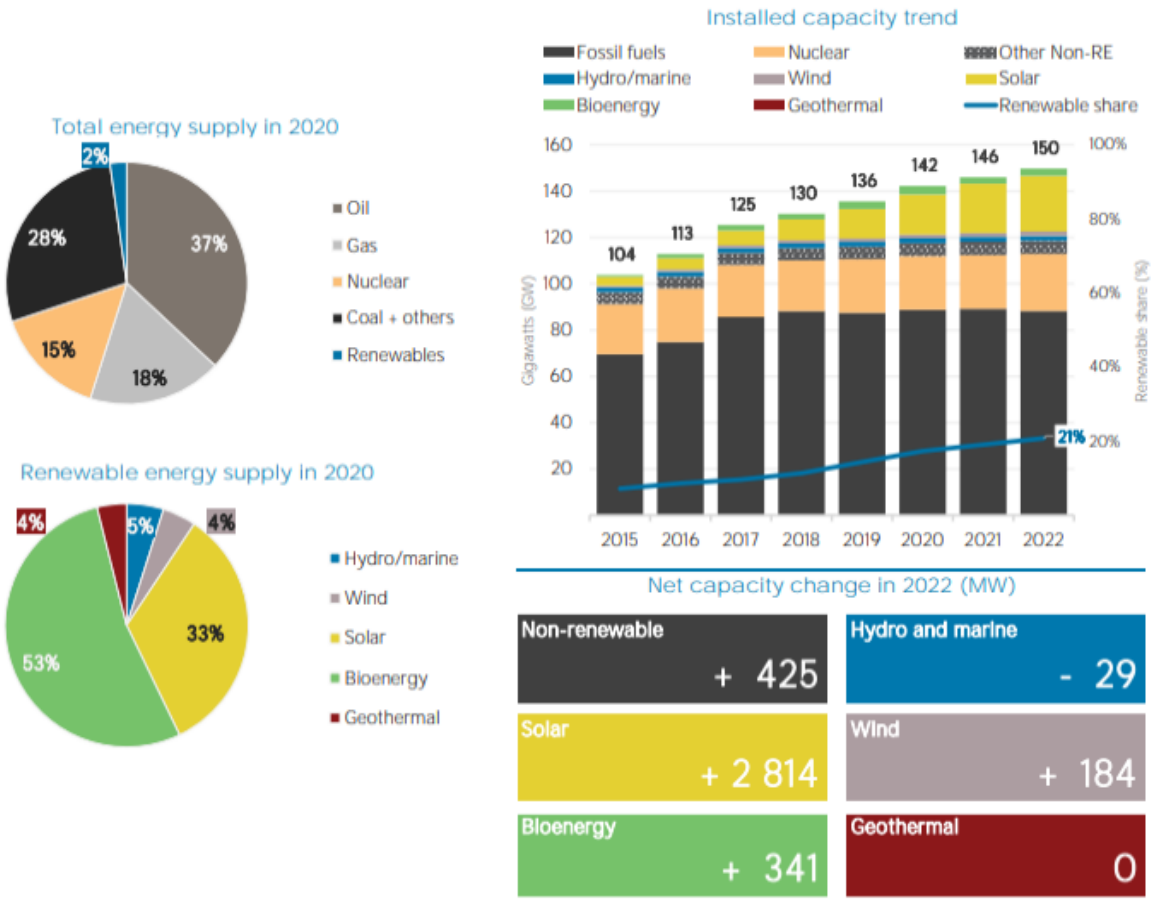


FIGURE 28 - REPUBLIC OF KOREA - ENERGY GENERATION PROFILE

Specific aspects of energy supply and security and other key services for particular FEZs are summarised below.

2.5.3. Pyeongtaek-Poseung District, Gyeonggi FEZ

Shown below in Figure 30, the Pyeongtake-Poseung District is adjacent to the city of Pyeongtaek and part of the Gyeonggi Free Economic Zone, sited on the west coast of the ROK. As part of a broader strategy to develop 'Eco-Friendly Future Mobility Production Clusters', the Gyeonggi FEZ (founded in 2008) sits in a cluster of advanced manufacturing and other high-technology industry closely associated with critical minerals supply chains, with MOTIE estimating that around 300 large multinational/conglomerate entities have established business presences in or around the FEZ, representing 40 percent of the ROK's total 'knowledge-based' manufacturing output (that is, sectors such as integrated circuitry and other electronics, semiconductor devices, mechatronics, automobile and high-precision parts,

chemical manufacture, industrial precursors and so on). As shown below in Figure 29,[51] this is particularly evident in the EV, lithium-ion and semiconductor industry supply chains.

FIGURE 29 - AUTOMOBILE AND SEMICONDUCTOR CLUSTERS ADJACENT TO THE BIX

Within the FEZ as a whole, the Pyeongtake-Poseung District is particularly notable as it is specifically earmarked for heavy industry, including chemicals manufacture, refining, automobile manufacturing and other such industries. Key operational details of the District are summarised below in Table 20.

[51] Invest Korea (2021), *Pyeongtaek-Poseung District Lot Division Information,* Republic of Korea Government

Housing	Commerce	Industry	Distribution	Public use	Etc.
3.9%	0.8%	38.2%	27.2%	25.6%	4.3%
79,000 ㎡	16,000 ㎡	782,000 ㎡	556,000 ㎡	525,000 ㎡	88,000 ㎡

FIGURE 30 – PYEONGTAEK-POSEUNG DISTRICT, GYEONGGI FEZ – SITE OVERVIEW

TABLE 20 – PYEONGTAEK-POSEUNG DISTRICT, GYEONGGI FEZ – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	Approximately 240ha total zoned land in District, of which 80ha set aside for relevant industrial processing. Occupancy rate unclear from public domain material.
Energy supply & mix	Local grid supported by Pyeongtaek Thermal Power Plant (1.4GW gas turbine), Oseong Combined-Cycle Plant (800MW gas CHP) and Incheon Power Station (1.4MW gas CHP). Additional 3GW HVDC interconnector to link local demand with generation further to north and east coast nuclear plants under construction.
Energy reliability	Very good.
Other services	Gas supply: District proximate to Pyeongtaek LNG Import Terminal (appx 30mtpa handling capacity) and hence supply good. Water supply: serviced by K Water as part of Soeul Metropolitan Area water system, drawn from Paldang Dam (max supply capacity 8.28 million m3/day).

Metric/aspect	Commentary
Logistics	Very good. Adjacent Port of Pyeongtaek is one of the largest in the ROK, with an annual capacity of over 1 million TEU and capable of handling vessels up to 240 meters LOA and 30,000 DWT. Road and rail links mature, although some congestion at peak periods.

2.5.4. Gwangyang Bay Area FEZ

One of the earliest and larger FEZs established, the Gwangyang Bay Area FEZ at the southern edge of the ROK, shown below in Figure 31, now comprises 6,000ha across six specialised zones containing seventeen individual complexes servicing different industry sectors. It has become one of the densest clusters of heavy industry and minerals refining in the nation, famously host to the world's largest steelmill, POSCO Gwangyang Steelworks, and the ROK's largest petrochemical plant, the Yeosu National Industrial Complex. The area is also home to the steelmaking and engineering arms of the Hyundai group, and numerous other domestic Korean, ex-PRC and ex-Japanese firms establishing local operations to service other parts of vehicle chain. Other notable critical-minerals exposed industries include POSCO investments in Li-ion midstream battery precursors, with Jeollanam-do cathode material plant (90,000tpa), and is expanding this presence to meet a goal of 1mtpa by 2030. POSCO has also committed to transitioning elements of its steelworks to electric and hydrogen reduction technologies. In similar vein, the Jeollanam-do provincial government has recently signed an MoU with a consortium led by Greek ECOLOG to develop a 'hydrogen cluster' with associated manufacturing around Gwangyang.[52]

Key operational details of the FEZ are summarised below in Table 21.

[52] English-language reporting eg. Čučuk, A. (2024), *Deal signed for new hydrogen industry cluster in South Korea*, 2 April 2024, OffshoreEnergyBiz

FIGURE 31 – GWANGYANG BAY FEZ – SITE OVERVIEW

TABLE 21 – GWANGYANG BAY FEZ – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	FEZ comprised of number of smaller sub-sites, including existing established and greenfields. Yulchon 1st Industrial Complex - Significant areas of industrial-zoned land recently made available. Haeryong Industrial Complex - Reasonable availability of industrial-zoned land. Sepung; Hwanggeum; Daesong Industrial Complexes - Appear to be greenfields sites under development
Energy supply & mix	Very significant local supply, Gwangyang (1GW, KEPCO, gas turbine), Yulchon (1.5GW, CGN Yulchon , combined cycle gas), Hadong Thermal (3GW, KEPCO, supercritical coal), with 345kV grid backbone.
Energy reliability	Very good.

Metric/aspect	Commentary
Other services	Gas supply: Gwangyang LNG Import Terminal located at port, handling appx 3mtpa. Water supply: industrial-specific supply by K-Water from Sueo dam, growing investment by heavy water users in FEZ (eg. POSCO Steelworks) in desalination plants for private usage.
Logistics	Very good. Adjacent Port of Yeosu-Gwangyang is one of the largest in the ROK, with an annual capacity of over 1.5 million TEU and just under 100 wharf berths servicing numerous specialised loading needs (bulk, LNG, etc).

3. North American responses to critical minerals

While the notion that Western Australia could compete with Asian economies for critical minerals upstream chemical manufacturing investment is clearly unrealistic, it has been proposed that Western Australia may be in a stronger competitive position with respect to economies that are slightly more structurally similar, namely the North American economies.

While on a different trajectory to the manufacturing powerhouses of Asia, the economies of North America – Canada and the United States of America – are no less important to critical minerals supply and demand and the resulting impact on global supply chains. While a full analysis of this is beyond the scope of this Study, a brief overview of the trends and policy developments in these jurisdictions most impactful to critical minerals processing is given below in the following Sections

> "…We've seen what happens when we become dependent on other countries for essential goods like computer chips...China has spent years cornering the market on many of the materials that power the technologies that we rely on...
>
> China controls most of the global market in these minerals. And the fact that we can't build a future that's made in America if we ourselves are dependent on China for the materials that power the products of today and tomorrow."
>
> Joe Biden, President, United States
>
> 22 February 2022

Notwithstanding, the limitations to the geopolitical case for investment in critical minerals processing and chemical manufacturing in Western Australia,[53] this case is founded in historical and contemporary strategic relationships and the significant policy effort of the United States to attract to divert investment in advanced manufacturing from the Asian economies (particularly the PRC) to the United States, the efficacy of which is yet to be demonstrated.

However, as demonstrated in this Section 3, there is a very significant gap between the competitiveness of established industrial parks and precincts in both the United States and Canada and Western Australia's SIAs.

3.1. United States of America

The United States is the largest economy in the APAC Region and in the world and one of the wealthiest on a per capita basis. Compared to many other APAC economies, it is not as trade dependent, with trade representing only 17.5 percent of GDP. Its main exports are petroleum products, products of advanced manufacture, chemicals and agricultural produce. Its main imports are also products of advanced manufacture.

Driven by both a strategic and economic imperative, the recent policy actions taken by the United States in attempt to secure significant critical minerals supply chain activity within its borders (and to a lesser extent borders of its allies) will play to its competitiveness for capital investment in upstream and midstream critical minerals supply chains.

[53] Australian Venture Consultants (2023), Geopolitics and climate change: drivers of a shift in the competitiveness of Western Australia's domestic downstream minerals processing, Chamber of Minerals and Energy Western Australia

Despite global perceptions of the United States as the bastion of the free market, policy in this regard is not without precedent and includes the *Strategic and Critical Materials Stockpile Act* of 1979, the *Strategic and Critical Minerals Act* of 1990, and the *U.S. Minerals* Security Act (National Defence Stockpile Program) of 2015. More recently, the Trump Administration decreed via Executive Orders the *Federal Strategy for Ensuring the Security and Reliable Supply of Critical Minerals* (2017) and the *Order on Addressing the Threat to Domestic Supply Chains from Critical Minerals Dependent on Foreign Adversaries and Supporting Domestic Mining and Processing Industries* (2020), while one of the first actions of the incoming Biden Administration was to issue the *America's Supply Chains* executive order of 2021, under which a 100-day review was ordered of supply chain risk in critical minerals, resulting in the multi-departmental *Building Resilient Supply Chains, Revitalizing American Manufacturing, And Fostering Broad-Based Growth* report of 2021.

Building on the 100-day review, the Biden administration established the Supply Chain Disruptions Task Force, under the guidance of which a large proportion of the executive government (including the Departments of Defence, Homeland Security, Commerce, Energy, Health & Human Services and Transportation) have each published intra-agency reports and plans containing defined actions to reduce vulnerability of United States supply chains within their area or remit, as well as opportunities to align economic development with overarching national supply chain strengthening.

Emerging from this extended whole-of-government review process, together with a broader COVID-19 pandemic economic recovery agenda, are a number of government policies and legislation which taken together represent a significant investment in American critical minerals supply, the most prominent recent-term examples of which are summarised below in Figure 32,[54] with Figure 33,[55] providing an overview of the specific grants streams under the Inflation Reduction Act as they pertain to critical minerals processing and Table 22 broadly summarising key legislation.

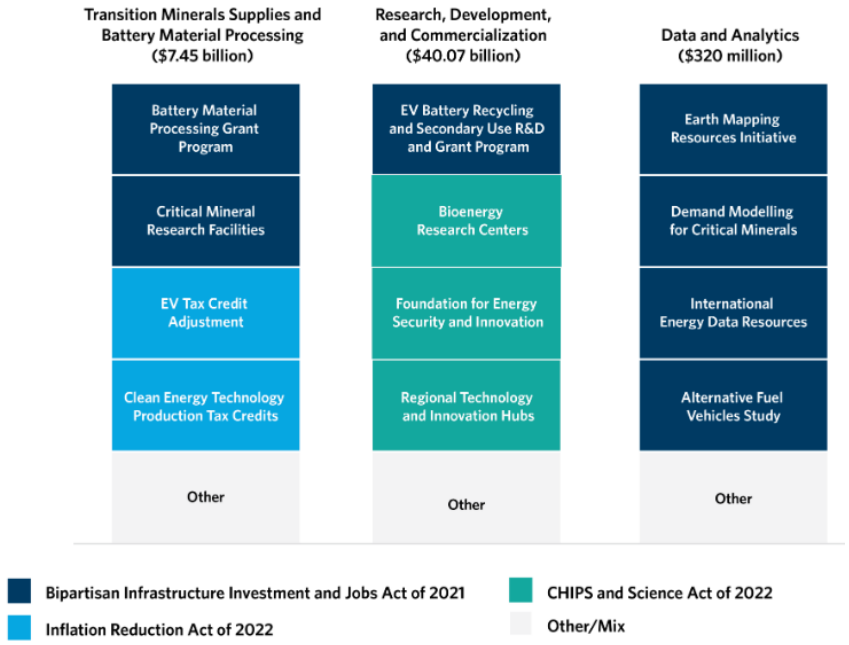


FIGURE 32 - US CRITICAL MINERALS INCENTIVES AND INITIATIVES

[54] Usman, Z. (2023), *Can Africa Participate in U.S. Clean Energy Supply Chains?*, October 2023, Carnegie Endowment
[55] Moors, C. (2023), *IRA at 1: Speed of mining investments surprises experts*, 10 August 2023, S&P Global

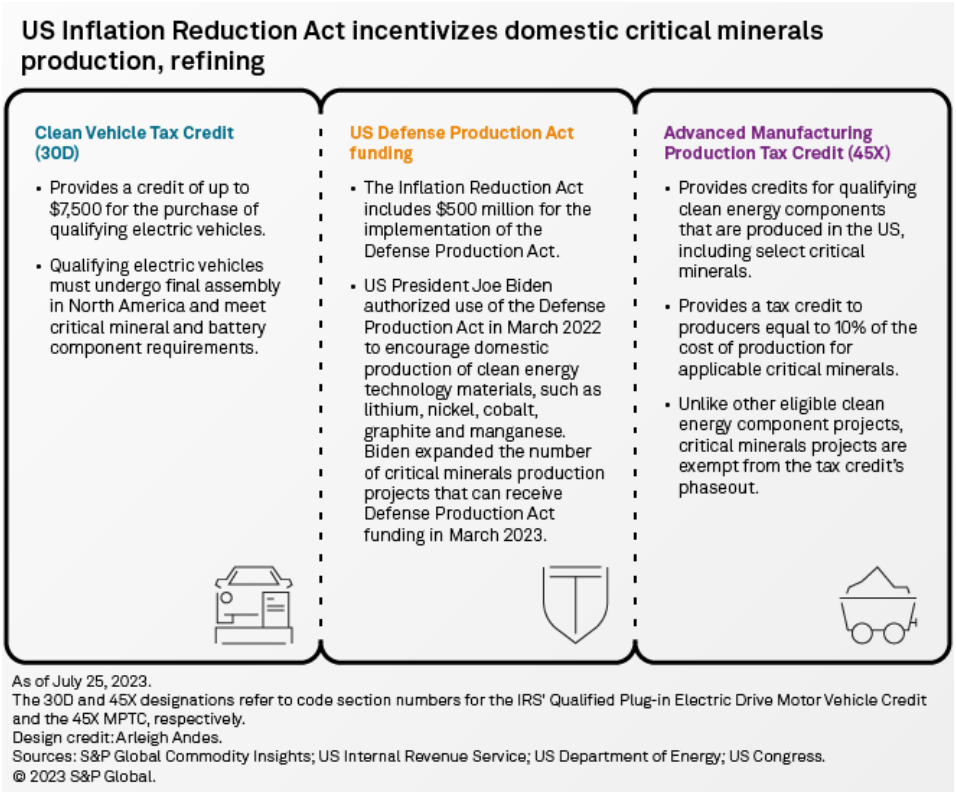


FIGURE 33 - SUMMARY OF IRA EFFECTS ON DOMESTIC CRITICAL MINERALS MINING AND REFINING

TABLE 22 – UNITED STATES CRITICAL MINERALS-RELEVANT GOVERNMENT POLICY AND LEGISLATION

	Year	Scope
Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act)	2021	Flagship programme to address perceived inadequacies in basic United States infrastructure in logistics, transit, power delivery, environment etc. Generational-scale investment in large number of areas exposed to critical minerals, including USD $60 billion in funding for clean energy infrastructure and deployment, $39 billion in transit modernisation (including focus on zero-emissions vehicles), $25 billion on port and airport modernisation (including decarbonisation) and $7.5 billion to build out a national network of EV chargers. Further specific funding allocations to develop domestic capabilities to meet these needs, including $3 billion in grants funding to support domestic midstream and downstream manufacture of EV and BESS battery systems and components, and $44 million in grants under the Mining Innovations for Negative Emissions Resources (MINER) Program to boost domestic production of critical minerals.
America Creating Opportunities for Manufacturing, Pre-Eminence in Technology, and Economic Strength (COMPETES) Act of 2022	2022	Deliberately 'anti-China' rhetoric framing broad-based domestic competitiveness and supply chain measures. Critical-minerals relevant measures include Funding pool of USD $52 billion to provide federal assistance to incentivise domestic fabrication, assembly etc of advanced semiconductors, additional $10 billion for requirements unique

	Year	Scope
		to US Defence needs, $2.5 billion for semiconductor supply chain resilience. Creation of Supply Chain Resilience and Crisis Response Office within US Dept Commerce, authorises Office to administer USD $45 billion in grants and loans to expand domestic manufacturing and supply of critical minerals; USD $2.4 billion fund to boost domestic manufacturing of solar components, specifically aimed at reducing reliance on PRC; Large number of provisions specifically framing US reliance on PRC as harmful and PRC actions towards US as problematic, providing funding for US government and businesses to reduce reliance, greater US diplomatic efforts to counter rising PRC especially in Study Region and re economic coercion.
Research and Development, Competition, and Innovation Act; Supreme Court Security Funding Act of 2022 (CHIPS Act)	2022	Total spend of USD $106 billion to encourage domestic manufacture of semiconductors. Includes numerous provisions, tax credits and funding allocations towards R&D, supply chain security, upskilling and other measures relevant to competitiveness of domestic critical minerals midstream and downstream manufacturing.
Inflation Reduction Act	2022	Amongst other aspects related to broader inflation reduction efforts, includes spending of USD $391 billion on energy security, energy transitions and climate change mitigation. Includes tax credits and grants for number of energy transition areas including $128 billion on renewable energy generation, battery storage, home energy supply and other matters. Most relevantly, establishes New Advanced Manufacturing Production Credit providing tax credit of 10% of costs of domestic production/manufacturing of/for critical minerals. The Act also introduces new tax credits at point of sale on purchases of EVs, up to $7,500 for new vehicles and $4,000 for used. However, to qualify, final assembly must take place within the US, and more importantly from 2024 onwards at least 50% of battery pack and components must be manufactured within the US (or a nation with which the US has an operative free trade agreement, which includes Australia and the ROK but *not* the PRC). This requirement increases by 10% each year until reaching 100% in 2029.

3.1.1. An example of industrial zones – the Detroit Regional Partnership

Long associated with manufacturing, the automotive sector and other heavy industry, the Detroit region of the State of Michigan stands as a good example of areas that the United States is seeking to activate to boost domestic participation in critical minerals supply chains.

Notably, the State is home to one of the United States' few domestic critical minerals sources and has a history of minerals processing, with the Eagle copper/nickel mine feeding ore to the

Humboldt concentrator facility presently the only domestic nickel source, and the Tilden magnetite/haematite mine incorporating an on-site pelletisation plant and making Michigan one of only two States supplying domestic iron. Other developing and prospective minerals projects in the region include the Copperwood copper project, White Pine North copper/silver project, and the Back Forty polymetallic (zinc-copper-lead-gold-silver) prospect.

Further downstream, as noted above Michigan and particularly the Detroit region is responsible for around one-fifth of total domestic automotive production, home to a large number of manufacturers and supply chain participants, and is seeking to position itself as a leading EV producing region.[56] As shown in Figure 34,[57] below, the US Department of Energy tracks 84 individual critical minerals projects, suppliers and industry participants in the lithium-ion battery ecosystem alone based in Michigan, with a notable cluster around Detroit (found at lower right of the State).

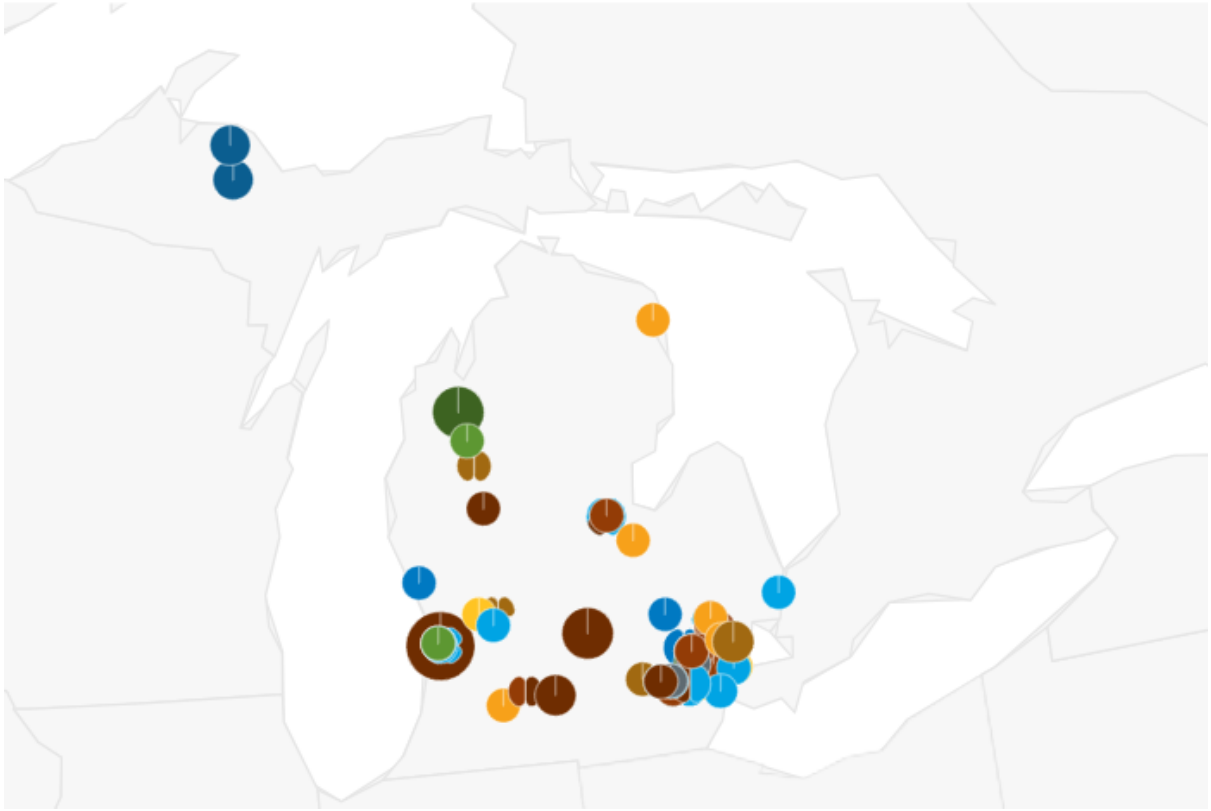


FIGURE 34 - LITHIUM-ION BATTERY SUPPLY CHAIN PROJECTS AND PROSPECTS - MICHIGAN

Notable recent developments include:

- construction ongoing on Ultium Cells (a JV of General Motors and LG Chem) Lansing Plant, a $USD2.6 billion, 41GWh battery manufacturing facility expected to hit commissioning by end of 2025;[58]
- construction commencing on Ford's BlueOval Battery Park, a $USD 3.5 billion LFP battery manufacturing facility expected to hit first production in 2026;[59]

[56] Eg. Seals, C. (2023), *Extract Michigan's raw materials to boost our EV future*, 6 March 2023, Bridge Michigan News
[57] National Renewable Energy Laboratory (2204), *NAATBatt Lithium-Ion Battery Supply Chain Database*, February 2024 update, US Department of Energy
[58] Ultium Cells (2024), *Ultium Cells Lansing Surpasses 2 Million Construction Build Hours*, press release 18 March 2024
[59] Ford (2023), *Ford Taps Michigan For New LFP Battery Plant; New Battery Chemistry Offers Customers Value, Durability, Fast Charging, Creates 2,500 More New American Jobs,* press release 13 February 2023

- LG Energy Solutions' ongoing work to significantly expand its Holland battery plant, with a $USD 1.7 billion expansion announced in 2022 followed by a further $3 billion to develop cell lines specifically for use by Toyota;[60]
- the award of $USD 10.6 million in Federal government grants to a partnership between Michigan Technological University and Eagle Mine to optimise its nickel output streams and investigate tails recovery to better serve critical minerals supply;[61]
- announced joint venture between BASF, Nanotech Energy and Toda America to transition Toda's existing Michigan pCAM plant from virgin ore to use of recycled battery materials;[62]
- securing of approvals by Graphex for a $USD 60 million, 15ktpa graphite spherification plant;[63]
- announced first production (October 2023), expansion and securing of further offtake by Our Next Energy for its 'ONE Circle' LFP-based gigafactory, including $USD 220 million in direct grants from the State of Michigan;[64]
- the acquisition of XALT and expansion of its existing Michigan lithium-ion plant with a 'double digit millions' sum by Freudenberg Group, as part of an announced partnership with LG Energy Solutions to supply specialist commercial electric vehicle battery cells across North America;[65]
- a proposed $USD 2.4 billion, 400ktpa Big Rapids LFP CAM battery plant by a United States subsidiary of Gotion, although currently mired in political turmoil;
- an announced $USD 41 million expansion of Samsung's Auburn Hills battery manufacturing plant, approximately doubling output;[66]
- announced expansion of Emchem's North American electrolyte plants, with the Michigan factory to roughly double to around 60ktpa output by 2026;[67] and
- numerous other smaller-scale prospects supported by Federal government funding.

As shown in Table 23 and Table 24 below, the region has access to economically competitive process inputs, and is generally well served by essential infrastructure, which has supported this growth of industry.

TABLE 23 – DETROIT, MICHIGAN - HEADLINE INPUT PRICING

Process input	Pricing and period
Electricity	Commercial: $USD 0.09 kWh (2024) Residential: $USD 0.11 kWh (2024) Industrial: $USD 0.08/kWh (2024)
Petrol/gasoline	Regular: $USD 0.96/L (Q2 2024) Mid-grade: $USD 1.10/L (Q2 2024)

[60] Eg. Michigan Economic Development Corporation (2023), *Michigan Wins $3 Billion Investment Powering New EV Production by LGES, Toyota,* press release 16 October 2023
[61] Michigan Tech University (2022), *Michigan Tech and Eag le Mine Partner for EV Battery Recycling Innovation and Climate Sustainability*, press release 29 November 2022
[62] BASF (2023), *Partnership between BASF and Nanotech Energy will enable production of lithium-ion batteries in North America with locally recycled content and low CO2 footprint*, 11 September 2023
[63] Graphex (2023), *Graphex Technologies Receives Environmental Permit And Provides Updates On Michigan Developments*, press release 6 June 2023
[64] Our Next Energy (2023), *Our Next Energy (ONE) Raises $300 Million in Series B Equity, Valuing the Company at Over $1 Billion*, press release 1 February 2023
[65] Freudenberg (2023*), Freudenberg e-Power Systems and LG Energy Solution sign long-term supply partnership for battery cell modules,* press release 2 February 2023
[66] Reporting eg. Williams, C. (2023), *MEDC OKs $5M grant for $41M Samsung expansion, 368 new jobs in Auburn Hills*, 26 September 2023, Detroit News newspaper
[67] Kim, H. (2022), *Enchem to more than double electrolyte production in US*, 28 November 2022, Korea Economic Daily newspaper

Process input	Pricing and period
	Diesel: $USD 1.01/L (Q2 2024)
Natural gas	Commercial: $USD 0.32/GJ (Q1 2024) Residential: $USD 0.36/GJ (Q1 2024) Industrial: $USD 0.28/GJ (Q1 2024)
Process water	Block 1 (less than or equal to 16.99m^3): $USD 0.91/m^3 (Q3 2023) Block 2 (greater than 16.99m^3): $USD 1.64/m^3 (Q3 2023) Plus a monthly fixed cost depending on metre size

TABLE 24 – DETROIT, MICHIGAN – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	Land availability generally still good, with significant remaining vacant/disused land throughout area and notable new construction starts on industrial property given demand by major projects and tenants, although down from pandemic peaks. Pricing as at Q1 for serviced industrial sites reportedly around $USD 68 per square foot ($USD 7.3 million per hectare).
Energy supply & mix	Electricity supply managed as part of interconnected grid system by Midcontinent Independent System Operator (MISO), connecting Michigan to 14 other States and Territories, as well as interconnects to the Canadian Province of Ontario. Michigan as a whole is a significant net importer of energy, with domestic generation primarily sourced from natural gas, coal and nuclear. Some local concerns regarding reliability of supply, with accelerating decommissioning of local coal-fired generation. However, recent State policy has devoted significant funding to accelerating uptake of renewables, particularly wind and grid-scale batteries. As of end 2022, around 30GW of total domestic generation capability – 13.3GW natural gas, 6.2GW coal, 3.3GW nuclear, 3.1GW wind, 2.1 hydro, balance other biomass, solar, oil etc.
Energy reliability	Generally good, although capacity curtailment and adverse weather events can cause interruptions during winter periods.
Other services	Gas/petroleum supply: Very good. Largest natural gas storage capacity in US and significant quantity of known US reserves. Multiple interstate pipelines, five US-Canada natural gas pipeline border crossings. Water supply: Very good. Michigan largest user of Great Lakes water, historical overinvestment in water treatment infrastructure paired with shrinking overall population has resulted in significant underutilised capacity.

Metric/aspect	Commentary
Logistics	Varying by region, generally very good. Across State, nine airports (five proximate to Detroit metro region), three ports, eight bulk railyards, eleven interstate highways. Detroit Port third-largest minerals (steel) export port in US,

Together with the very significant Federal government schemes under the IRA and other avenues, strongly contributing to the region's competitiveness in attracting critical minerals projects has been the notable grants and other programme support offered by the Michigan State Government through the Michigan Economic Development Corporation and other administrative entities. Most relevantly for minerals processing, these include:

- **Michigan Strategic Fund (MSF)** – a broad funding pool designed to promote economic development and create regional employment, and with a track record of supporting critical minerals project through several grants streams (detailed below).
- **Critical Industry Program** – a funding stream under the MSF specifically intended to 'deal-close' and attract and retain domestic capabilities in response to technical shifts. Recent investments have included $USD 600 million in finance to support General Motors' Orion EV manufacturing plant and the Ultium battery plant.
- **Industrial Facilities Exemption/PA 198 program** – provides industrial property tax reductions for up to 12 years for the construction, refurbishment or expansion of industrial plants, with a particular focus on high technology operations. Concordance of the relevant local government body is required to qualify.
- **Business Development Program -** Grants to support businesses to locate operations within Michigan that operate in defined 'innovation' sectors. As an example of the quantum available, over 2022/23, $USD 5 million was provided to Samsung to expand their Oakland battery plant, $10 million to indie Semiconductor to establish advanced automotive control systems manufacturing at Oakland, and $10 million to Nel Hydrogen for a Plymouth production facility.
- **Strategic Outreach and Attraction Reserve (SOAR) Fund –** create in 2021 with an initial $USD 1.5 billion funding pool, and 'topped up' several times since, the Fund aims to specifically attract large-scale, economy-building projects. By way of example, while the project did not proceed, Stellantis was reportedly offered a total of $USD 1 billion in incentives to locate an EV battery manufacturing plant within Michigan[68].
- **Strategic Site Readiness Program** – a $USD 100 million funding round, concluding January 2024, to develop turnkey, investment-ready sites for economic development across Michigan, including provision of utilities, environmental studies, logistics, groundworks and other blockers. 18 sites have been selected to date. Reportedly, a $USD 250 million further grant is being sought to develop a 'megasite' located near Flint.
- **EGLE Brownfield Redevelopment Program** – funds repurpose/reuse of existing brownfields industry sites which may have been abandoned, are contaminated or otherwise obsolete, including grants, tax incentives and no-cost environmental assessments.
- **Good Jobs for Michigan Program** – closed to new applications as of Q1 2020, the Program incentivised job creation through taxation rebates tied to number of positions created. While now closed, payments continue as projects proceed, with high-profile supported projects including a $USD 26 million allocation towards jobs created at Ford's Dearborn industry cluster site and a $USD 100 million allocation towards those created at Stellantis' Detroit operations.

[68] Reporting eg. Nagl, K. (2023), *Michigan's $1B offer for EV battery plant couldn't sway Stellantis*, 13 November 2023, Crain's Detroit Business News

3.2. Canada

With a long history of minerals production and a growing manufacturing sector, Canada is seeking to position itself as a significant player in global critical minerals supply chains. As shown below in Figure 35,[69] there are a large number of known critical minerals deposits, mines, smelters/refineries and advanced projects scattered across the nation. As part of its 2022 Critical Minerals Strategy, the Federal government is seeking to incentivise and accelerate industry at all stages of the supply chain. However, in particular over the near term and as part of the 'Accelerating Responsible Project Development' pillar, Canada is seeking to provide financial and administrative support to accelerate strategic projects in critical minerals mining, processing, recycling and advanced manufacturing, and under the 'Building Sustainable Infrastructure' pillar seeks to invest in energy, transportation and other infrastructure to 'unlock' critical minerals deposits for commercialisation.[70]

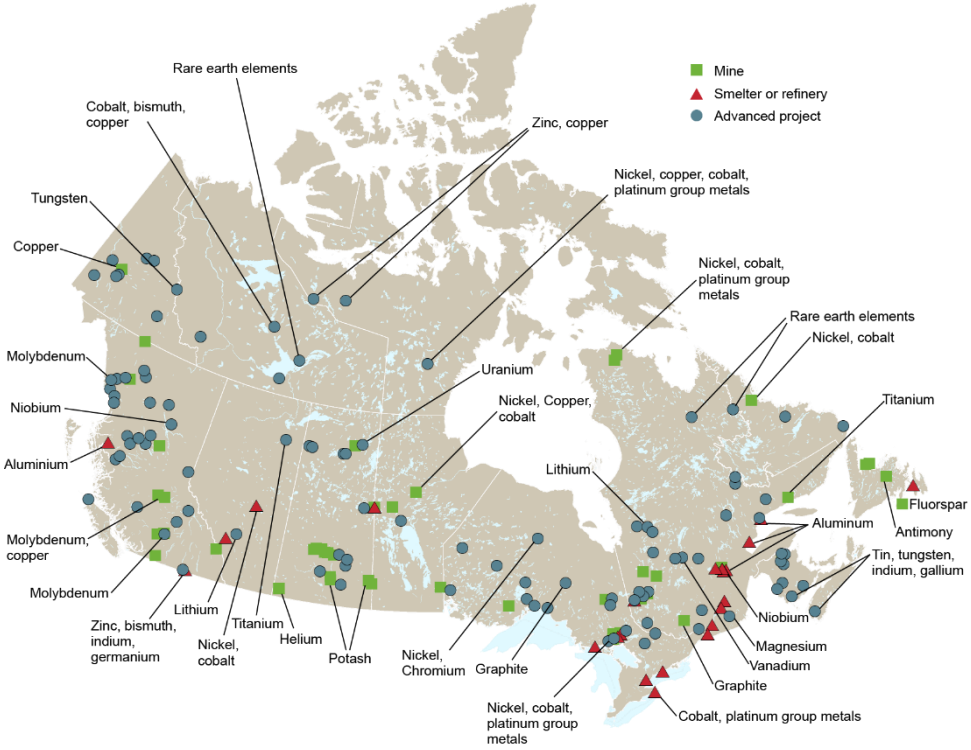


FIGURE 35 - CANADIAN CRITICAL MINERALS MINES, PROCESSING FACILITIES AND PROJECTS (2023)

3.2.1. Critical Minerals initiatives, grants and funding

While a detailed analysis of the Strategy and other Federal Government initiatives is outside the scope of this Study, some key initiatives already deployed include:

- **Critical Minerals Infrastructure Fund** - a $CAD 1.5 billion funding pool over 7 years under the existing Strategic Innovation Fund, designed to support clean energy, transportation, logistics, communications and other infrastructure necessary to reduce costs of activating known minerals reserves and de-risk project implementation.

[69] Natural Resources Canada (2023), *Critical Mineral development across Canada*, updated November 2023, available https://www.canada.ca/en/campaign/critical-minerals-in-canada/critical-minerals-an-opportunity-for-canada.html
[70] Canadian Government (2022), *Critical Minerals Strategy*, December 2022

- **Critical Minerals Geoscience and Data Initiative**, a matched grant programme (up to $CAD 500,000) available to project proponents undertaking geoscience data work scoping critical minerals deposits.
- **Critical Minerals Research, Development and Demonstration Program**, a $CAD 192 million funding pool to be expended by end 2024 on a competitive basis to support commercial demonstration facilities, trial programmes and other critical-minerals focused RD&E activities.
- **Indigenous Natural Resource Partnerships Program**, a $CAD 80 million funding pool to increase the participation of Canadian First Nations in resources projects, of which $25 million was earmarked for critical minerals projects. The programme is to run out to 2027 but was heavily oversubscribed, with applications paused as of May 2023.
- Encouragement for critical minerals projects to apply for other sources of government funding, including the $CAD 15 billion **Canada Growth Fund** administered by the Canada Development Investment Corporation, seed funding via **Scientific Research and Experimental Development**, competitive finance via **the Export Development Bank Canada, Canada Infrastructure Bank or Business Development Bank of Canada**, and eligibility for up to 35 percent corporate income tax credits under the **Scientific Research and Experimental Development** initiative.
- A number of specific measures taken under the 2022-23 and following Federal Budgets, including a direction that the **Critical Minerals Centre of Excellence** utilise its $CAD 21.5 million extension funding allocation to assist project developers navigate regulatory processes and federal support measures and an allocation of $CAD 40 million to accelerate the ability of government agencies to speedily and efficiently undertake reviews, permitting and other regulatory processes.

In addition to these Federal level measures, various Province/Territory governments are also enacting their own supports and other measures to accelerate critical minerals processing within their jurisdictions, as outlined below.

3.2.2. An example of industrial zones – the South Ontario cluster

As may be seen from the above Figure 35, while critical minerals prospects and projects are distributed across Canada, there is a clear emerging concentration of industry, particularly in the midstream stages, found in the centre and south of Ontario. Sitting within a declared 'Canada Innovation Corridor', while not a formally declared and geographically bounded 'zone' as such, this area has been recognised as a national priority development region due to the concentration of advanced manufacturing, steel and other ferrometals refining, automotive and particularly EV manufacturing, and specific critical minerals industry.

As shown below in Figure 36, there have been a number of significant recent developments in the critical minerals sector in the region.

FIGURE 36 - SOUTHERN ONTARIO EMERGING CRITICAL MINERALS CLUSTER

These include the:

- $CAD 5 billion 45GWhpa NextStar Energy (a JV of LG Energy Solutions and Stellantis) EV battery manufacturing plant in Windsor, Canada's first large-scale factory and reaching first production in March 2024;[71]
- $CAD 7 billion 90GWhpa PowerCo (wholly owned by Volkswagen) battery manufacturing plant in St Thomas commencing construction in Q1 2024, with a projected first production in 2027;[72]
- $CAD 2.1 billion 35GWhpa-equivalent Umicore high-nickel cathode active material and precursors (CAM and pCAM) plant in Loyalist, expected to complete construction by end of 2024 and commission in 2025;[73]
- 'Battery Materials Park' development by Electra, a $USD 200 million integrated development expanding a cobalt sulfate refinery initially refining virgin ore with a later pivot to recycling of lithium-ion batteries to supply pCAM and CAM;[74]
- ongoing $CAD 945 million expansion of Vale's Copper Cliff iron/nickel/cobalt mine and associated plant, with Phase 1 completed in 2022 and near doubling output to roughly 10ktpa contained nickel;[75]
- commencement of FEED in April 2024 for Canada Nickel Company's Crawford nickel sulphide project, with first production expected by 2027;[76]

[71] LG Energy Solutions (2024), *Celebrating Two Years: NextStar Energy Hits Another Milestone in Windsor, Canada*, press release 26 March 2024
[72] Volkswagen Group Technology (2023), *Volkswagen-backed PowerCo SE reaches significant milestone in St. Thomas gigafactory project*, press release 12 December 2023
[73] Umicore (2023), *Umicore confirms expansion of its EV battery materials production footprint with CAM and pCAM plant in Ontario, Canada*, press release 16 October 2023
[74] Electra (2024), *Electra Battery Materials – Supporting the Onshoring of North America's Battery Supply Chain*, investor presentation April 2024
[75] Reporting eg. Mining.com (2022), *Vale opens first phase of $684 million copper complex expansion in Canada*, 14 October 2022
[76] Canada Nickel Company (2024), *Canada Nickel Commences Front End Engineering Design at Crawford Nickel Sulphide Project*, press release 11 April 2024

- purchase of a 150ha industrial site at Thunder Bay by Avalon Advanced Materials, to host a $USD 800 million lithium hydroxide plant, drawing on lithium mined by its JV with Sibelco at its Ontario prospects of Kenora and Fort Hope;[77] and
- announcement by Nano One that a feasibility study had commenced into expanding its Canadian presence from an existing pilot plant located immediately across the Ontario-Quebec border to a 25,000tpa LFP chemistry battery plant, to be sited in Ontario or Quebec and with discussions with both governments ongoing.[78]

As shown in Table 25 and Table 26 below, the region benefits from relatively cheap input pricing and is generally well served by essential infrastructure, which has supported this growth of industry.

TABLE 25 – ONTARIO, CANADA - HEADLINE INPUT PRICING

Process input	Pricing and period
Electricity	Variable by time of use and season, ranging from $USD 0.06/kWh - $0.46/kWh (Q4 2023)
Petrol/gasoline	$USD 1.22/L (Q2 2024)
Natural gas	Price regulated by Ontario Energy Board, which must reflect wholesale pricing passed through with no markup. Approximately $USD 5/GJ as at Q2 2024, inclusive of transport/delivery costs and carbon pricing.
Process water	$USD 3.21/m3 for first 5,000m3, after which $2.25/m3 (Q2 2024)

TABLE 26 – ONTARIO REGION – OPERATIONAL DETAILS

Metric/aspect	Commentary
Land availability	Land availability generally good, although given very high development interest over period since 2020 supply down from former peaks. Pricing for large-scale purchases variable by proximity to infrastructure, logistics etc, but reportedly around $CAD 1 million per acre ($USD $1.8 million per hectare).
Energy supply & mix	Ontario operates as part of an interconnected grid with neighbouring Quebec and Manitoba, as well as the US States of Minnesota, Michigan and New York. Statewide generation capacity is over 38GW, primarily comprised of nuclear (13.14GW), hydro (8.9GW), natural gas (10.5GW) and wind (4.8GW). Baseload power is primarily derived from nuclear (53%) and hydro (25%), with gas primarily used to meet peaking needs. Ontario is thus generally a net exporter of primarily low-emissions energy, exporting 17 TWh in 2023 to its neighbours.
Energy reliability	Very good.

[77] Reporting eg. CBC News (2023), *Federal ministers tour what could be Ontario's first lithium processing plant in Thunder Bay*, 13 October 2023
[78] Nano One (2024), *Feasibility Study: First Commercial LFP Plant & "Design-Once-Build-Many" Growth Strategy*, press release 27 February 2024

Metric/aspect	Commentary
Other services	Gas/petroleum supply: Very good. TransCanada Mainline, Enbridge Line 9 and TransNorthern Pipeline all cross region, plus number of smaller pipelines and distribution networks. Water supply: Very good. Large hydroelectric power footprint, over 400 dams regulated across Ontario.
Logistics	Varying by region, generally very good road and rail links across south and central Ontario. Maritime freight primarily handled by Port of Hamilton-Oshawa.

However, equally important in encouraging the development of this industry cluster has been the range of incentives offered not only by the Canadian Federal Government (detailed above), but also those specific to the Province itself. Most relevantly for minerals processing, these include:

- **Ontario's Investment Ready: Certified Site Program** – pre-qualifies investment properties. Each site guaranteed to be fully serviced or readily serviceable (electricity, gas, waste, wastewater, telecommunications) and free of major development constraints; have completed assessment due diligence, including environmental site assessments and archaeological assessments; and come with detailed site information, including ownership and title, property survey, zoning, road and rail access, utilities and servicing letters, topographical maps of the developable area, and a community profile.
- **Critical Minerals Innovation Fund** (CMIF) - provides funding to projects that help strengthen Ontario's critical minerals sector. The CMIF will provide a maximum of 50 percent of eligible project costs, up to $500,000 per eligible project.
- **Clean Energy Credit Registry** - proceeds from the sale of Clean Energy Credits held by the IESO and OPG will be directed to the government's Future Clean Electricity Fund.
- **Northern Energy Advantage Program** - supports largest industrial electricity consumers located in northern Ontario with a rebate of two cents per kilowatt hour used in eligible industrial production.
- **Comprehensive Electricity Plan** – now closed to new entrants, encouraged takeup of renewable energy by funding the above-market cost of Ontario's approximately 33,000 renewable energy power purchase contracts signed between 2004 and 2016.
- **Southwestern Ontario Development Fund** – competitive grants pool, covering up to 15 percent of costs of expansion/construction of eligible significant local enterprise development.
- **Ontario Innovation Tax Credit** – rebates between 8 to 12 percent of RD&E costs accrued in-jurisdiction.

4. Assessment of Western Australian Strategic Industrial Areas

First implemented in the mid-1980s, the Western Australian Strategic Industrial Area (SIA) framework operates as a land management and planning tool that seeks to encourage industrial development of particular parts of the State. A key intent of SIA framework was to provide industrial project proponents with some of the certainty that is provided under the Western Australian State Agreement framework,[79] while avoiding the significant obligations that State Agreements place on both the State and its project proponent counterparty.

Broadly, SIAs are areas of Crown and fee simple (freehold) land in locations that are deemed to be industrially strategic that are quarantined for use by industry – including downstream processing and heavy industry – associated with the State's primary production, principally minerals, and oil and gas. In more recent times, this has extended to prospective use of SIAs for renewable energy infrastructure and other 'new economy' applications such as green hydrogen.

While the SIAs are intended to represent a 'whole-of-government' approach, it should be noted that some bifurcation of portfolio responsibility remains. It is understood that Development WA (previously Landcorp) manages lands associated with SIAs, including leasing arrangements, while the Department of Jobs, Tourism, Science and Innovation acts as the lead agency for the holistic development of the portfolio of SIAs. Further, for regional SIAs (i.e. all but Kwinana), it is intended that the relevant Regional Development Commission perform a promotional role, with SIAs within their jurisdiction typically forming a core component of each Regional Development Commission's development ambitions. However, industry proponents report that in most instance this occurs at only a superficial level.

Presently, there are 12,[80] SIAs operating, under development or reserved for future development. As illustrated in Figure 37, these are oriented around key areas of primary industry in Western Australia, with all but two located on coastal areas in proximity to port infrastructure of varying capacity. Consistent with the overall development ethos, most are also well served by road transport links and, in some cases, rail freight infrastructure.

This Chapter explores the development-readiness of WA's SIAs against the key ingredients required for an effective SIA: established common-user infrastructure including utility connections (water, gas, electricity, waste and recycling) and transport infrastructure (road, rail and access to constructed multi-user ports); appropriate land tenure arrangements and cultural, heritage, development and environmental approvals, including for SIA transport and

[79] Almost unique to Western Australia in the scales of their use, State Agreement are an agreement between the Government of Western Australia and one or more proponents of a major project that is ratified by an Act of the Western Australian Parliament and which sets out the rights and obligations of the State and project proponents with respect to the development and operations of the specific project.

[80] There are presently 12 gazetted SIAs that meet the heavy industry zoning and tenure criteria on which the SIA framework is based. Australian Venture Consultants notes that, at some point in July during the preparation of this Study, the Western Australian Government has in some public-facing materials begun to describe the existing Rockingham Industrial Zone (RIZ; also discussed in this Report) as a Strategic Industrial Area. However, the RIZ is currently zoned, for the most part, for 'service commercial' and 'general industrial' purposes only, with significant areas set aside for parks, recreation and public open space and restrictive landscaping, vegetation preservation, public access, 'streetscaping' and other amenity controls. There is no information in the public domain that indicates that the RIZ meets the criteria of a SIA, or that any process is in place to convert zoning or tenure to enable the kinds of strategic and heavy industrial activities which an SIA would need to service.

infrastructure corridors; third party services; reagents and chemicals; and upstream materials supply, such as resource deposits.

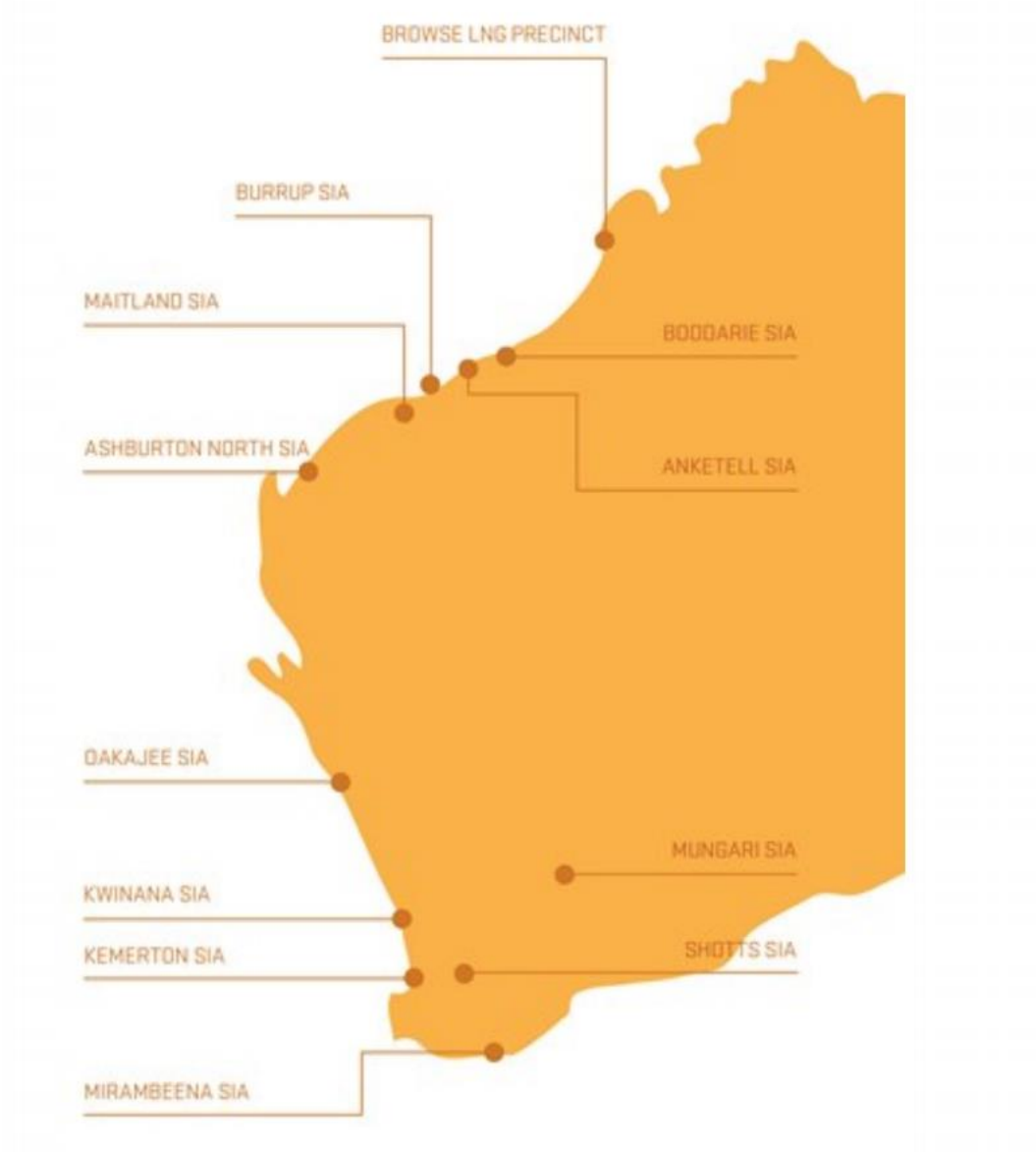


FIGURE 37 – LOCATION OF SIAS

As demonstrated in the following subsections, with the arguable exception of the Kwinana SIA which was an industrial ecosystem prior to the implementation of the SIA framework, objectively few of the WA SIAs could be said to be comparable to the industrial parks and precincts discussed in Sections 2 and 3 above. For the most part they provide land zoning for industrial use without any area-specific policy incentives. Further, and crucially from a development and investment appetite perspective, most approvals, headworks and other activation investments are the responsibility of tenants, creating significant project timeframe and commercial uncertainty.

As such, whilst in most cases undoubtedly preferable to a pure greenfields site, in the context of competing for critical minerals processing and upstream chemical manufacturing capital

with other jurisdictions in the broader APAC Region, Western Australia's SIAs are, on the whole, deficient, with several demonstrating characteristics more akin to a greenfields site.

4.1. Perth Metropolitan – Western Trade Coast

Covering 3,900 hectares between Munster and Rockingham, the 'Western Trade Coast' (WTC) includes the Kwinana Industrial Area (Kwinana Strategic Industrial Area), Rockingham Industry Zone, Australian Marine Complex and Latitude 32.

The Kwinana Industrial Area and Rockingham Industrial Zone accommodate a cross-section of industries including:

- storage and distribution of imported fuels and chemicals;
- grains storage and export;
- small-to-medium scale fabrication, manufacturing and engineering facilities;
- mineral and mineral product processing, refining and export across alumina, nickel and titanium; and
- most recently, with particular reference to the subject matter of this study, upstream critical minerals chemical manufacture for lithium hydroxide monohydrate and nickel sulphate hexahydrate.

Figure 38,[81] (overleaf) illustrates the contextual location of the WTC industrial zones. Land in the Rockingham Industrial Zone is now fully allocated, with future development beyond the remaining available land in the Kwinana Industrial Area to be within the newer Latitude 32 Industrial Land precinct. The Australian Marine Complex (AMC) at Henderson is a small-scale marine manufacturing and repair and maintenance facility that is utilised by the Royal Australian Navy submarine and surface fleet, as well as private builders of small-to-medium size vessels, with development constraints potentially flowing from that national security nexus.

These individual areas are discussed in more detail in the following subsections.

[81] Western Trade Coast Organisation, *KIC Westport Existing Precincts Map,* available https://westerntradecoast.com/maps/, website accessed July 2024

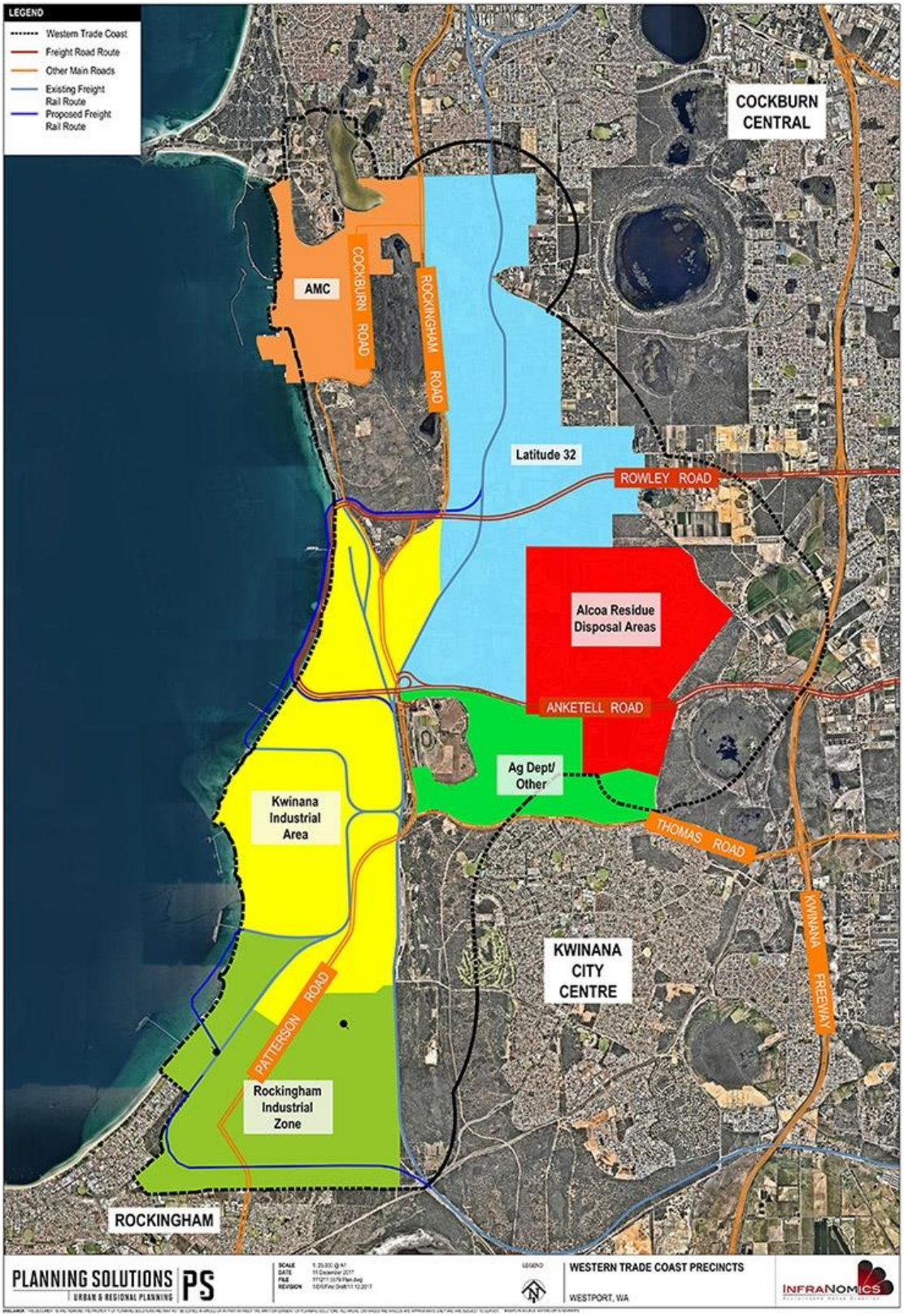


FIGURE 38 - WESTERN TRADE COAST INDUSTRIAL ZONES

4.1.1. Kwinana SIA

The KSIA is one of the State's oldest industrial complexes, and has long provided strategically important industry with access to serviced, well-buffered and appropriately zoned land in close proximity to Fremantle Port. With logistics connectivity to much of the State and Eastern States via established road and rail networks and immediately adjacent to the Fremantle Port's deep-water bulk materials facilities, the KSIA is a key location for important Western Australian strategic industries.

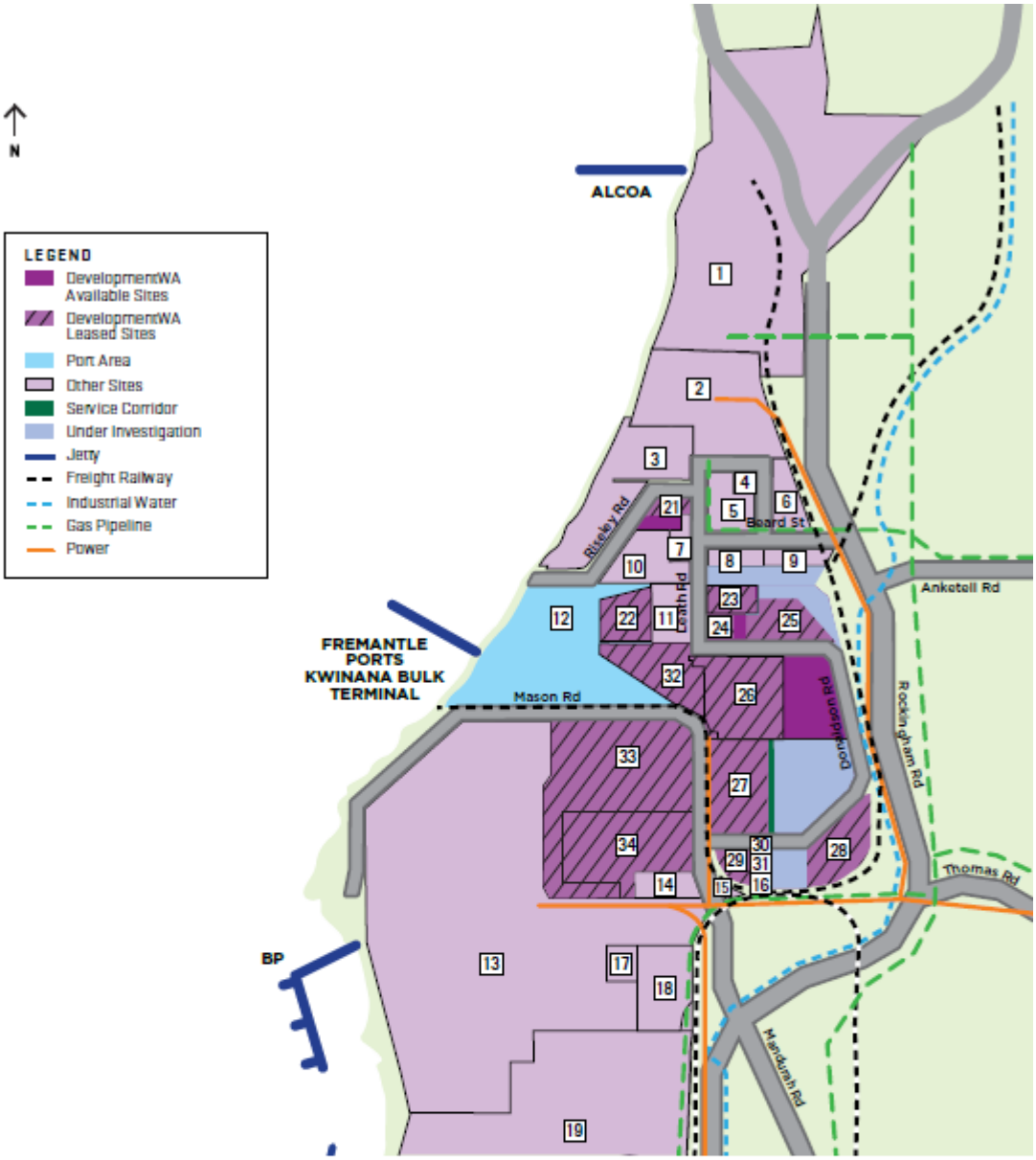
The well-buffered industry presence within the KSIA is predominantly based on the mineral refining, fuel and chemical storage and distribution sectors, with key tenants being Alcoa, BP, CSBP, Wesfarmers LPG, Tianqi Lithium Australia, Western Energy, Cockburn Cement, Coogee Chemicals, Synergy, Newgen Power, Tronox, Air Liquide, BOC Gases, BGC, Kwinana Energy Transformation Hub (KETH). Importantly to the subject matter of this Study, it has the highest concentration of existing, under development and proposed critical minerals chemical manufacturing facilities of all the SIAs –Tianqi's lithium hydroxide monohydrate plant and BHP Nickel West's nickel sulphate hexahydrate plant, as well as Covalent Lithium's under-construction lithium hydroxide monohydrate facility. The only other SIA to host a critical minerals chemical manufacturing plant is Kemerton (see Section 4.2.1)

In addition to these, the KSIA is fringed out to a distance of roughly 8 kilometres to the north and south by a belt of secondary industries, servicing fabrication, construction, engineering and maintenance requirements of their heavy industry neighbours.

Location and Tenure

Illustrated in Figure 39,[82] the Kwinana SIA is located 30 kilometres south of the Perth Metropolitan region and 15 kilometres south of Fremantle and the Fremantle Port. Presently, 270 hectares of land in the Kwinana SIA has been divested to Development WA for the purposes of leasing to tenants.

[82] Development WA/Industrial Land Authority (2023), *Kwinana/Rockingham SIA map*, WA State Government, December 2023



1 Alcoa
2 Synergy
3 Water Corporation (Desalination Plant)
4 Sammut Rodney
5 BGC
6 Boom Logistics
7 Ausplow Property
8 Shinagawa Refractories
9 Tutt Bryant Group
10 Steel Mains
11 Cockburn Cement
12 Fremantle Ports
13 BP
14 Western Power Substation
15 Toxfree
16 DBNGP
17 Water Corporation (Waste Water Recycling Plant)
18 Tronox
19 Wesfarmers CSBP
20 Coogee Chemicals
21 BGC
22 Cockburn Cement
23 Kwinana Waste to Energy Plant
24 Solenis
25 BGC
26 Tianqi Lithium
27 Wesfarmers LPG
28 Sims Group
29 Western Energy
30 BMT
31 BMT
32 Tianqi Lithium - Option
33 Covalent Lithium
34 Covalent Lithium - Option

FIGURE 39 - KWINANA SIA LOCATION MAP

Planning

Located within the City of Kwinana, the Kwinana SIA industrial core is zoned 'industrial' under the City's Town Planning Scheme and the Department of Planning, Lands and Heritage's Metropolitan Region Scheme.

Land Availability / occupancy

The existing Kwinana SIA area is well developed and approaching capacity, with minimal unallocated land. Future industrial development in the area is proposed at the adjacent Latitude 32 industrial land zone.

Infrastructure and Services

Water

The Kwinana SIA is serviced with industrial water, wastewater and potable water.

Power

The Kwinana SIA is a major electricity generation hub within the South West Interconnected System (SWIS), and includes gas-fired generation, co-generation (gas/distillate), and a SWIS-connected 200 megawatt battery energy storage facility (BESS) that sources and stores both solar and wind generated electricity.

Natural Gas

Gas is supplied via the Dampier to Bunbury Natural Gas Pipeline (DBNGP) which flows directly to the Kwinana SIA.

Telecommunications

The Kwinana SIA is serviced by metropolitan telecommunications infrastructure.

Road Infrastructure

The Kwinana SIA is well serviced by established road infrastructure, however as the SIA has approached capacity, road freight congestion is increasingly cited as a concern by SIA tenants.

Rail Infrastructure

A modern rail terminal enables the use of rail for transporting freight to and from the Fremantle Port and connects to the State and ultimately, national rail network.

4.1.2. Latitude 32 Industry Zone

Comprising approximately 1,400 hectares, Latitude 32 encompasses six distinct development areas, each at different stages of development.

Location and Tenure

Latitude 32 is situated adjacent to the KSIA and Australian Marine Complex, extending across the jurisdictions of the City of Cockburn and the City of Kwinana. It has been planned to complement the existing industrial estates within the Western Trade Coast through provision of general additional available industrial land, and also key freight and logistics links to support

the neighbouring strategic, heavy and special industrial projects. Figure 40,[83] illustrates the locality of the Latitude 32 Industrial Zone with respect to other industrial estates within the Western Trade Coast.

Land availability/occupancy

The initial land release, the Flinders Precinct, is now completely allocated, with general industrial lots available in the Orion Precinct.

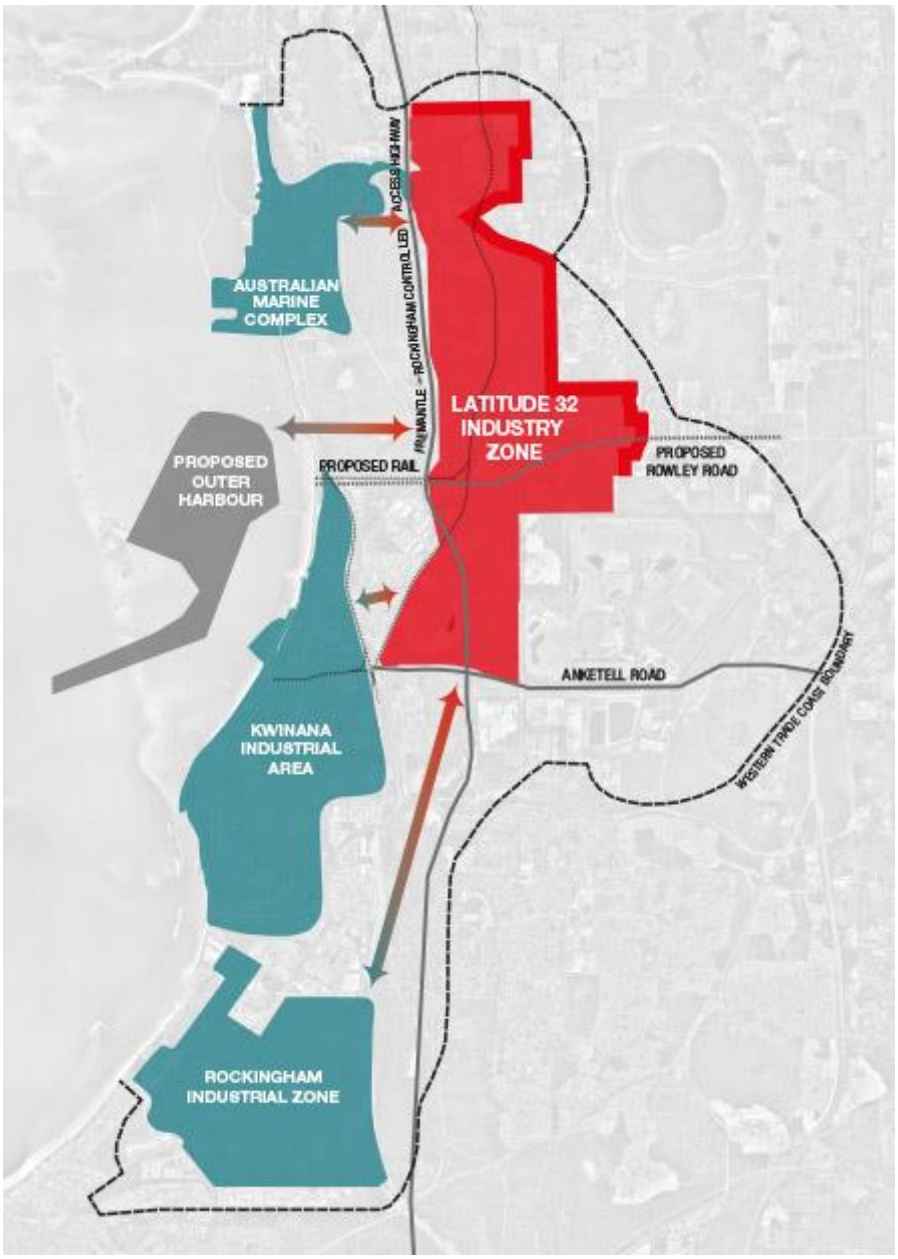


FIGURE 40 - LATITUDE 32 INDUSTRIAL ZONE

[83] Development WA/Industrial Land Authority, *Industrial synergies within the Western Trade Coast,* available https://developmentwa.com.au/projects/industrial-and-commercial/latitude-32-industry-zone/overview, website accessed July 2024

Planning

As required under the *Hope Valley-Wattleup Redevelopment Act 2000* (WA), the Hope Valley-Wattleup Redevelopment Project Master Plan was approved by the WA Planning Commission and sets out the land use and development requirements for the Zone. Under the master plan, the Latitude 32 Industrial Zone is zoned into 'Light Industrial' and 'General Industrial' land use areas, the implication of which is that heavy and extractive industries are not permitted uses within the Latitude 32 Industrial Zone.[84, 85]

Infrastructure and services

By virtue of its proximity to the KSIA, Latitude 32 benefits from access to the same road, rail and sea transport networks.

Port Access

The Kwinana SIA and Latitude 32 are served with existing and proposed deep water port operations. The operations of Fremantle Port are located at Fremantle (inner harbour) and further south at Kwinana (outer harbour).

Fremantle Inner Harbour

The Inner Harbour, protected by land and seawalls, provides sheltered water and port facilities within the mouth of the Swan River. Designed by Western Australia's first Engineer in Chief, CY O'Connor, and opened in 1897 it has been expanded, deepened, strengthened and modernised over time and is currently the fourth largest container port in Australia. The Inner Harbour provides berths and landside facilities for handling of:

- container trade
- non-containerised cargo
- livestock exports
- motor vehicle imports
- cruise ships
- visiting naval vessels.

Figure 41,[86] below illustrates the Fremantle Inner Harbour.

[84] Western Australian Land Authority (Development WA) (2005), Hope Valley-Wattleup Redevelopment Scheme Master Plan, Updated in 2022
[85] Unless the WA Planning Commission exercises its discretion to grant planning approval
[86] Fremantle Ports (2023), *2023 Annual Report*, tabled 20 September 2023, Legislative Assembly, Western Australian State Parliament

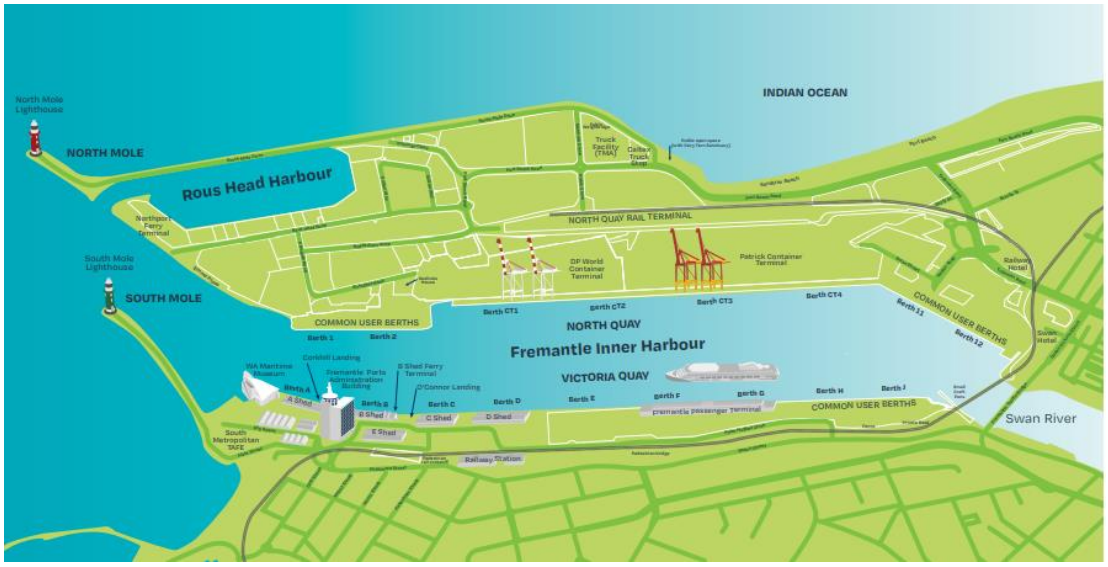


FIGURE 41 - FREMANTLE INNER HARBOUR

Fremantle outer harbour

The Outer Harbour is one of Australia's major bulk cargo ports, handling among other commodities petroleum products, iron ore, wheat and other grains, alumina, clinker, fertilisers, mineral sands and chemicals.

In terms of infrastructure, the Outer Harbour operations are facilitated by the Kwinana Bulk Terminal and Kwinana Bulk Jetty, which are owned and operated by the Fremantle Port Authority, as well as a three privately operated facilities, namely Alcoa Alumina Refinery Jetty, BP Refinery Jetty and CBH Group's Kwinana Grain Jetty, as shown below in Figure 42.[87]

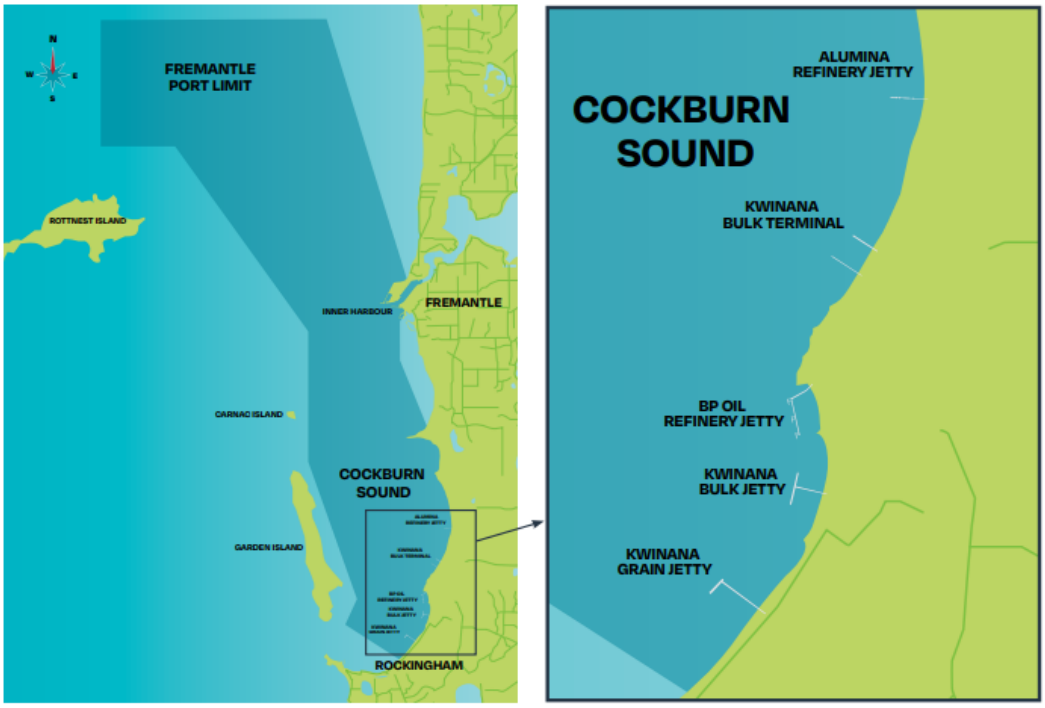


FIGURE 42 - FREMANTLE OUTER HARBOUR

[87] *Ibid*

Westport

The proposed Westport development represents the State Government's planning program to move container trade from Fremantle to Kwinana, directly adjacent to the Kwinana SIA. This includes specific new maritime freight port facilities, as well as connected and servicing freight road, rail, and logistics operations.

As it presently stands, the design includes a new port in Kwinana between the end of Barter Road and the end of Mason Road, with a new freight corridor along Anketell Road and Thomas Road, and road upgrades along Anketell Road, the Kwinana Freeway and Roe Highway. Ultimately the Anketell-Thomas Road Freight Corridor is intended to connect the port with Tonkin Highway in Byford. Upgrades to the existing freight rail network between Kwinana and Cockburn will further connect the proposed new port with multimodal logistics hubs in Kenwick, Kewdale and Forrestfield. A new shipping channel is proposed to accommodate larger ships expected in the future. Figure 43 illustrates the proposed Westport development and enabling infrastructure.[88]

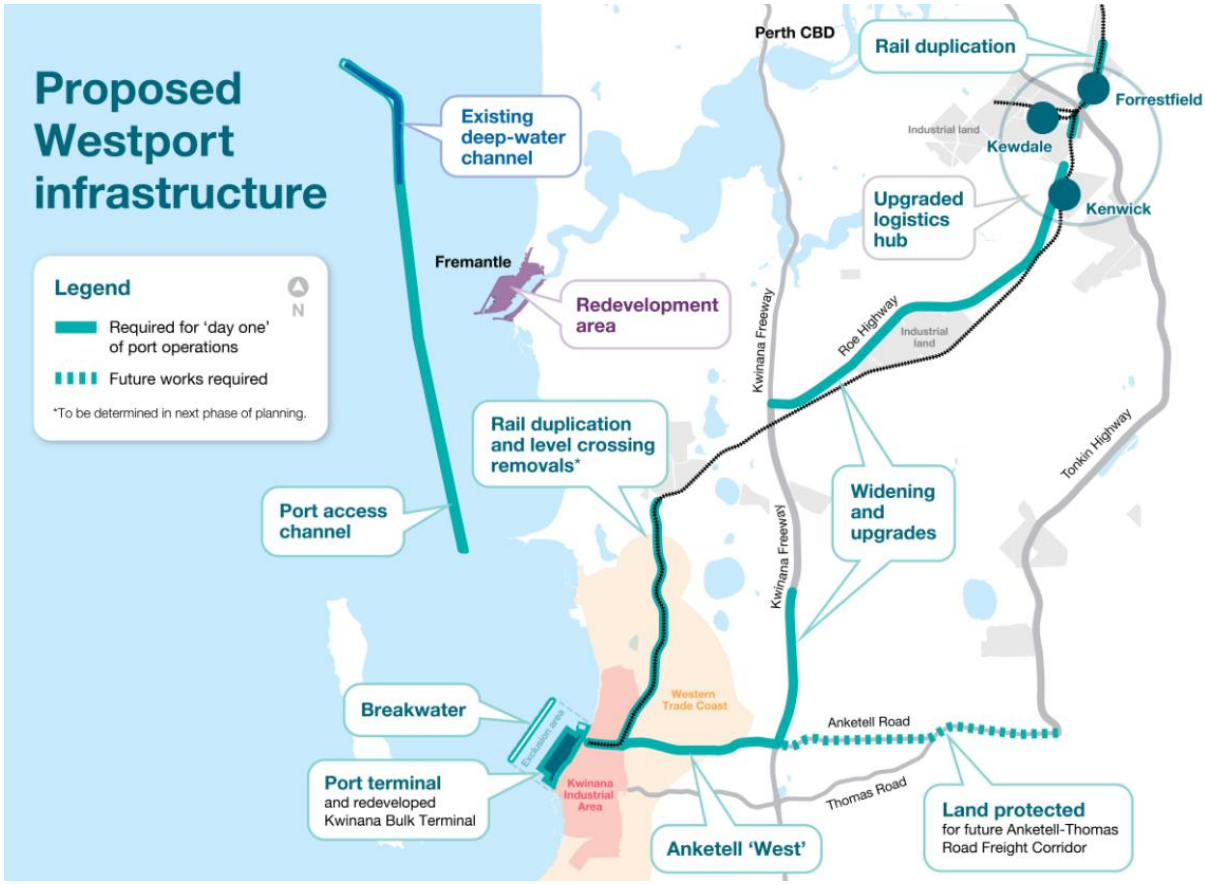


FIGURE 43 - PROPOSED WESTPORT INFRASTRUCTURE

[88] Westport/Western Australian State Government (2023), *The Proposed Design of the new Kwinana Port and supply chain*, December 2023

4.2. South West

4.2.1. Kemerton Strategic Industrial Area

The Kemerton SIA, also known as the Kemerton Industrial Park, is the largest heavy industrial area in the South West region of Western Australia, with links to Bunbury Port by road and land reserved for a future rail connection.

Intended to serve a major hub for strategic and heavy industry associated with the South West Region's minerals industry, present tenants include Kemerton Silica Sand, Simcoa Operations, Tronox Pigment Australia (formerly Cristal Pigment Australia),[89] Coogee Chemicals, Cockburn Cement and Tesla Holdings.[90] Most relevantly to the subject matter of this Study, Kemerton is the only SIA other than KSIA to host a critical minerals chemical manufacturing plant – Albemarle's lithium hydroxide monohydrate facility – and which is the only new major investment at Kemerton in three decades.

Location and Tenure

The Kemerton SIA is situated approximately 17 kilometres north-east of Bunbury and 160 kilometres south of Perth, encompassing a total land area of approximately 7,510 hectares. This is comprised of the 2,024 hectare 'Core' Strategic Industry Zone, a 284 hectare Ancillary Industry Zone,[91] and 5,200 hectares of Kemerton Industry Buffer Zone. Figure 44,[92] illustrates the contextual location of Kemerton SIA.

[89] ABN Lookup, Historical details for ABN 50 008 683 627
[90] A Western Australian operator of peaking power facilities not to be mistaken with the United States electrical vehicle manufacturer of similar name.
[91] Ancillary to heavy industry in the Core – 'ancillary' meaning that the proposed development must demonstrate that the major portion of the source material, finished product, or services provided are oriented within the Kemerton area.
[92] TPG (2017), *Kemerton Strategic Industrial Area Structure Plan*, updated 2022, published DevelopmentWA

FIGURE 44 - KEMERTON STRATEGIC INDUSTRIAL AREA

The vesting of land at the Kemerton SIA is unique among the SIA portfolio: Development WA holds approximately 57 percent of the SIA within the Kemerton Strategic Industry Zone and approximately 24 percent within the Kemerton Industry Buffer Zone. However, approximately 10 percent of the Strategic Industry Zone and 44 percent of the Buffer Zone is vested with the Department of Biodiversity, Conservation and Attractions, principally to manage biodiversity and conservation values that are in proximity to the Kemerton SIA. Local Government Authorities and private entities also have interests the Kemerton SIA land.

Figure 45 below illustrates the fragmented land tenure footprint of the Kemerton SIA.[93]

[93] *Ibid*

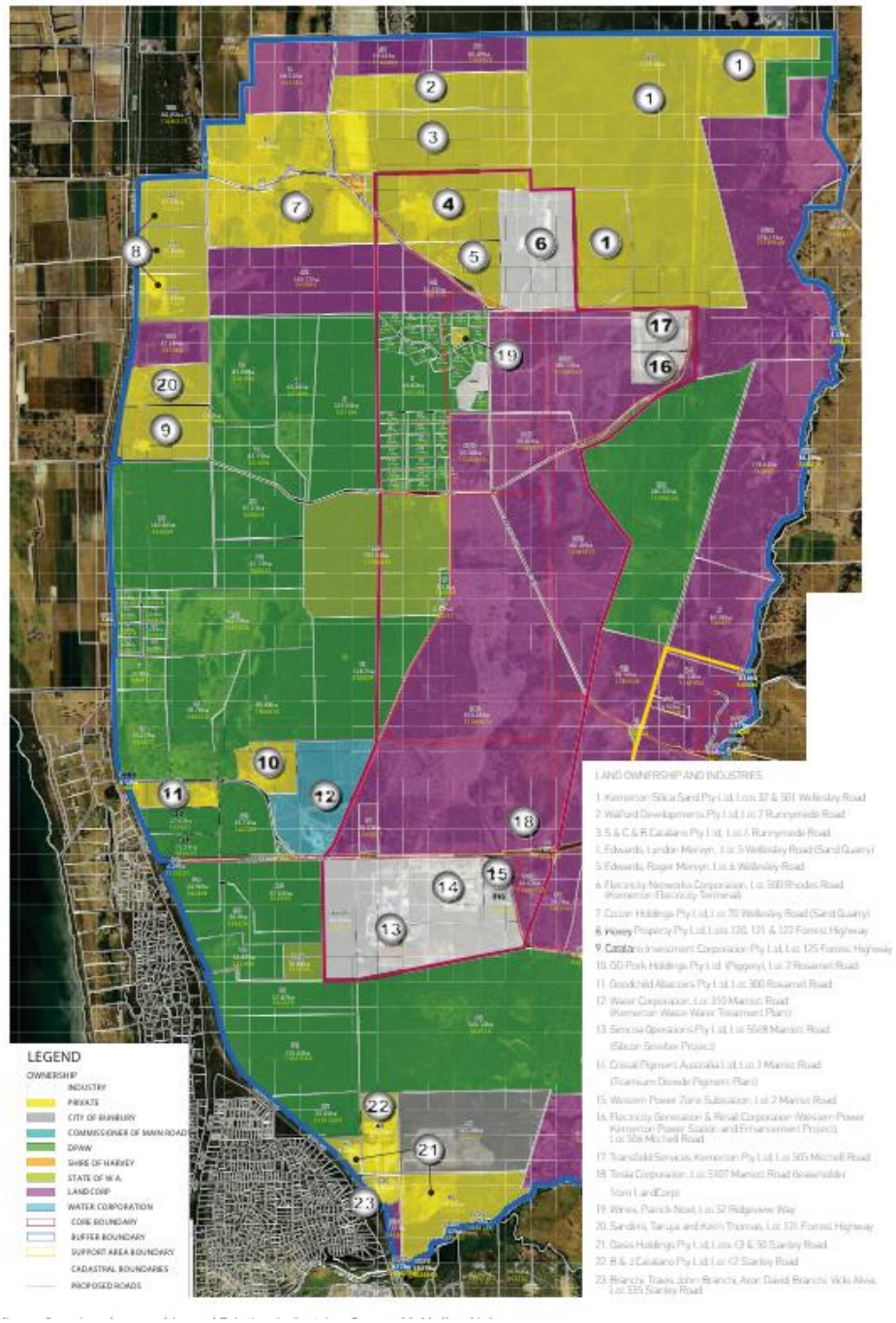


FIGURE 45 - LAND OWNERSHIP WITHIN THE KEMERTON SIA

Planning

Located within the Shire of Harvey, the majority of the Kemerton SIA Core and Buffer is zoned 'strategic industry' under the Shire's District Planning Scheme No.2 (DPS2), with additional restrictions pursuant to Special Control Area No 2 within the SIA, which is administered by the Department of Planning, Lands and Heritage.

The Kemerton Strategic Industrial Area Structure Plan was prepared to enable the coordinated delivery of heavy and industrial development. Adopted in 2017, it sets out the planning framework to guide development of the SIA, as illustrated overleaf in Figure 46.[94]

Land availability/allocation

Aside from the existing industrial tenants outlined above, the majority of the land within the Kemerton SIA core remains unallocated, with the indicative concept subdivision identifying lots ranging from approximately 5 hectares to 71hectares in size in the SIA Core.[95]

Environmental approvals to clear vegetation are the most significant constraint for the Kemerton SIA.[96] Unlike in the case of the Kwinana SIA, there is currently no 'fringe' of serviced, general industrial land near the Kemerton SIA heavy industrial core for industries whose business operations support the large-scale proponents.[97]

[94] *Ibid*
[95] *Ibid*
[96] Development WA (2021), Industrial Lands Steering Committee, Industrial Lands Strategy
[97] Eco Logical for Development WA (2022), Kemerton GIA Environmental Overview Document

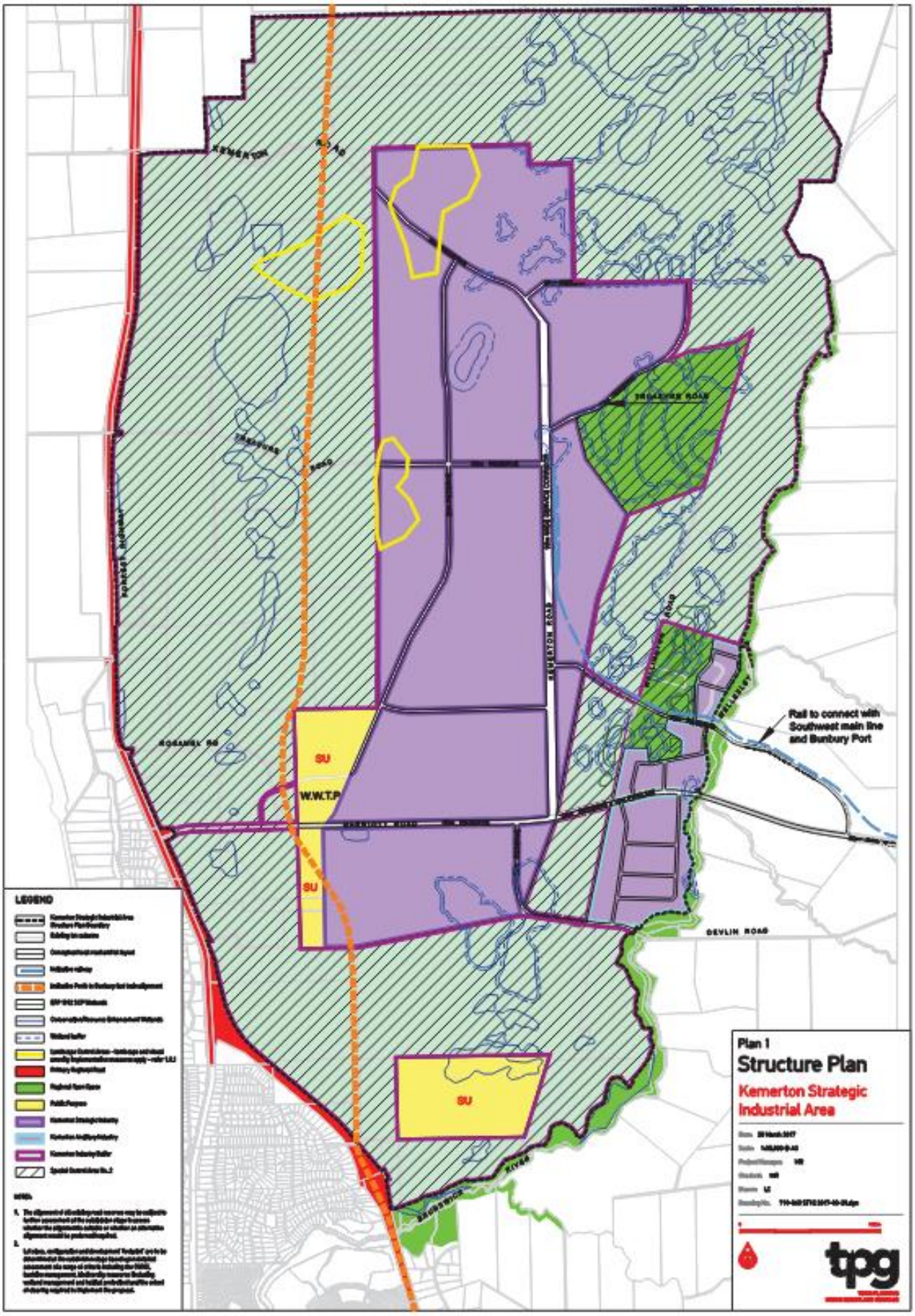


FIGURE 46 - KEMERTON SIA STRUCTURE PLAN

Infrastructure and Services

Water

The Kemerton SIA does not fall within an existing or proposed Water Corporation water reticulation service area. The existing industries at the SIA can seek to extract water for process and potable water requirements from unconfined and confined aquifers. However, this is not always permitted, with Albemarle's Lithium Hydroxide facility at Kemerton required to import water via Harvey Water. A wastewater treatment plant is located directly adjacent to the core on Marriot Road, albeit the plant does not have adequate capacity to service new tenants or the entirely of the existing tenancy.

The nearest potable water supply is located on Forrest Highway, north of the intersection with Wellesly Road. This supply is conveyed through a DN300 pipeline from the Water Corporation's integrated Water Supply Scheme and serves the local Binningup townsite and surrounding areas, but has insufficient capacity to supply the SIA. A number of water supply and demand studies have been undertaken to assess short and long term supply and demand options for the SIA. Table 27 summarises the estimated supply and demand balance based on existing water supply sources under a range of scenarios.[98]

TABLE 27 - KEMERTON SIA ESTIMATED WATER SUPPLY AND DEMAND BALANCE[99]

	Current Supply/Demand (GL)	Prospective Demand and Supply 2016 (GL)	High Demand and Supply (GL)	High Demand, Low Supply (GL)
Kemerton Water Supply	19	26	26	19
Kemerton Water Demand	10	17	40	40
Shortfall	N/A	N/A	14	21

The assumed maximum supply of 25 gigalitres is based on existing groundwater supplies together with recycled wastewater from the Kemerton Water Treatment Plant, and groundwater from the Cattamarra Coal measures.

Additional prospective water sources identified in the study include: [100]

- Binningup Desalination Plant
- future SIA on site water recycling initiatives
- integrated water supply scheme (Potable)
- Wellington dam (Potable and process)
- recycled water from the Synergy pipeline (Process)
- recycled water from the Kemerton Water Treatment Plant (Process)
- recycled water from the Millennium inorganic chemicals treatment plant (Process).

It should be noted that the assumptions underpinning the supply-demand estimates described in Table 27 were developed in 2011, preceding some of the current water-intensive developments at the Kemerton SIA.

[98] TPG (2017), Kemerton Strategic Industrial Area Structure Plan, updated in 2022
[99] The assumptions underpinning the supply-demand estimates described in Table 27 were developed in 2011 preceding some of the current water-intensive developments at Kemerton SIA, including Albemarle's lithium hydroxide plant.
[100] TPG (2017), Kemerton Strategic Industrial Area Structure Plan, updated in 2022

In 2014, a civil servicing and engineering report,[101] further concluded that the most logical short-term solution for a reliable supply would be the Wellington Dam via the Collie North and Cactus Channels to a pump station near the intersection of Marriott and Wellesley Roads, and a pipeline to a series of holding dams within the Kemerton SIA. From there, individual lot owners would be required to install the necessary infrastructure to convey water from the dam(s) to their facility and provide the necessary treatment to suit their own potable/process water needs, with the option of purchasing bottled drinking water. In the longer term, a combination of water supply options may need to be considered, including the establishment of an expandable and comprehensive water factory.

Power

The Kemerton SIA is adjacent to Western Power's Marriot Road substation, Kemerton Terminal and a major 330 kilovolt transmission line. The SIA is connected to the SWIS via a 132-kilovolt double circuit transmission line, and the site hosts several three-phase and single phase 22 kilovolt distribution lines.

Western Power has completed a feasibility study for the SIA which identified that initial power supply to the development would come from Western Power's existing Marriott Road zone substation via existing feeder circuits. The feasibility considered a minimum of two new zone substations and several new main-line HV distribution feeders will be required as SIA development progresses, with individual proponents required to provide suitable sites for the future zone substations, each a minimum of 1.44 hectares.

Capacity and reliability of the electricity supply at the Kemerton SIA is becoming increasingly constrained, with frequent blackouts reported by SIA tenants. Reliability aside, the Kemerton SIA does not have adequate installed power for any future proponent nor to support the expansion plans of one of its existing tenants. That tenant will use up to approximately 30 percent of a proposed new 132 kilovolt transmission line, but it is having to fund 100 percent of the biodiversity survey and other approvals and planning related costs, as well as approximately 40 percent of the capital costs. The same tenant is also required to fund 100 percent of the biodiversity offset costs for this shared infrastructure, which will likely equate to multiple millions of dollars.

Natural Gas

The existing Dampier to Bunbury Natural Gas Pipeline (DBNGP) Kemerton Lateral traverses the Kemerton SIA and is owned and operated by Australian Gas Infrastructure Group. The DBNGP corridor is proposed to be widened from 15 metres to 50 metres, with additional supply most likely coming from the existing Kemerton Meter Station located in Devlin Road via a Pressure Reducing Station and reticulated gas mains designed and installed by ATCO Gas and funded by the developer or individual industries, depending on demand. In the case of high gas users, gas may be taken directly from DBNGP via individual lateral pipelines. It is likely that the existing capacity of the Kemerton Meter Station may be exceeded as development of the SIA progresses, requiring the meter station to be upgraded to suit.

Current practice within the SIA is for industries that require a gas supply to negotiate directly with ATCO Gas for installation of gas mains to suit their own individual requirements.

[101] Wood and Grieve (2014), Kemerton SIA Civil Servicing and Engineering Report

Telecommunications

The Kemerton SIA is connected to the main metropolitan telecommunications network. Telstra has a network building located at the Kemerton wastewater treatment plant site on Marriot Road. This site is connected to the main network via optic fibre to the Bunbury-Mandurah link, and the building contains transmission equipment capable of supporting a range of communications services. Optic fibre cables extend west from this site to services at least five customer sites in the Marriot Road area with wideband and/or data products.

The SIA structure plan identifies that major telecommunications infrastructure upgrades may be required to service future needs of the SIA, and may require capital contributions from individual proponents.[102]

Road Infrastructure

The main road access through the Kemerton SIA is serviced by Kemerton Road which traverses the site in a north-south direction. Marriott Road and Treasure Road also traverse the SIA in an east-west direction, connecting the SIA to the Forrest and Southwest Highways.

Project proponents report safety concerns with respect to the Forrest Highway – Marriott Road and South West Highway – Marriott Road intersections, which are the main Kemerton SIA entry and exit points for industry and are also used by the local community to commute between their residences on the coast and work locations in Harvey and Collie areas. When the Albemarle lithium hydroxide plant is operating two trains at full capacity there will be an estimated total of 64 b-double truck movements each day in addition to those required by other operations at the Kemerton SIA. The safety challenges associated with these intersections will only continue to escalate as the Kemerton SIA is further developed, an issue that has been identified by Main Roads.

Rail Infrastructure

Integration of the Kemerton SIA with the State's rail network has been a key component of the narrative seeking investment in Kemerton from the outset, provide heavy haulage productivity not only between Kemerton SIA and Bunbury port, but also linking it to Kwinana activating Kemerton as a satellite extension for the relatively established Kwinana SIA.

The Kemerton SIA Structure Plan,[103] identifies that the provision of rail access to the SIA would significantly improve its utility as an efficient strategic industrial area and achieve long term compatibility between transport activity, land use planning, the community and the environment. Illustrated below in Figure 47,[104] a planned rail spur connecting the Kemerton SIA to Bunbury Port on the Bunbury to Perth line, just north of Brunswick Junction,[105] has yet to be constructed.

[102] TPG (2017), Kemerton Strategic Industrial Area Structure Plan, updated in 2022
[103] TPG (2017), Kemerton Strategic Industrial Area Structure Plan, updated in 2022
[104] GHD for LandCorp (2015), Kemerton Strategic Industrial Area Sidings and Spur: Rail Design Report
[105] GHD for LandCorp (2015), Kemerton Strategic Industrial Area Sidings and Spur: Rail Design Report

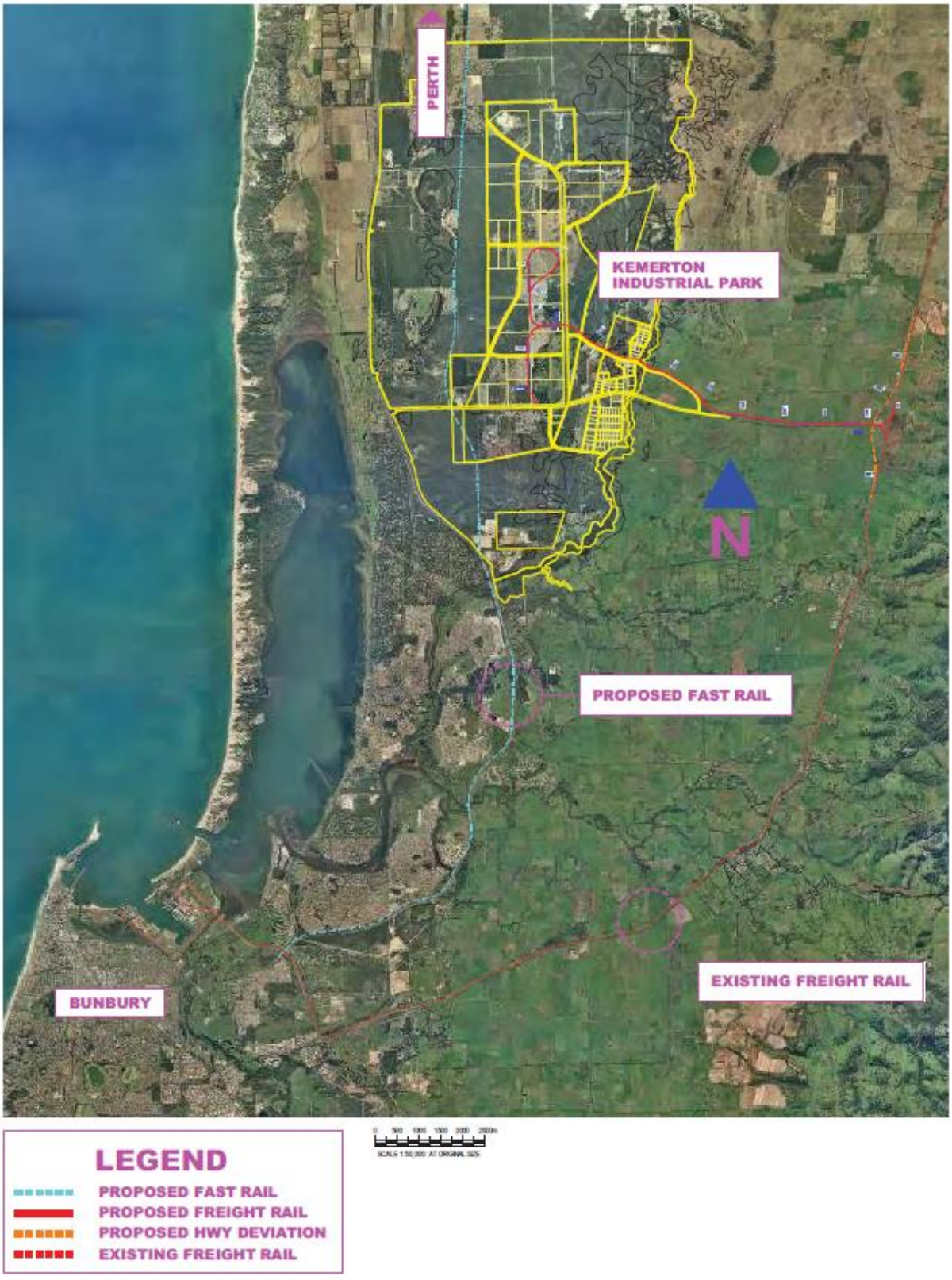


FIGURE 47 - PROPOSED RAIL ALIGNMENT FROM KEMERTON SIA TO BUNBURY PORT

Albemarle recently committed to the expansion of its lithium downstream processing plant at the Kemerton SIA, which when complete, will see a significant increase in truck movements – potentially over 170 per day – for spodumene ore deliveries, tailings disposal, final product and co-product transport and importation of reagents. Rail access to Kemerton SIA would

substantially reduce future truck traffic associated with the Kemerton SIA, reducing safety risk, emissions and community impacts. This is particularly the case if the Greenbushes to Bunbury rail line is recommissioned, the feasibility of which is currently under assessment,[106] and linked to rail access to Kemerton SIA.

Port Access

The Kemerton SIA is located approximately 22 kilometres from the Bunbury Port. The Kemerton SIA Structure Plan assumes that rail freight infrastructure will be developed to connect the SIA to Bunbury Port. However, Bunbury Port does not currently support container handling facilities at commercial scale. As such, exports of value-added mineral product from Kemerton SIA, as well as imports of process inputs, are currently transported approximately 170 kilometres by road freight to and from Fremantle Port. The Bunbury Port Master Plan currently contemplates the development of an additional berth and container infrastructure over the medium term.[107]

Environment and Heritage

Native Title

The Kemerton SIA is situated within the area of the Gnaala Karla Boodja Indigenous Land Use Agreement, which is an operative component of the South West Native Title Settlement between the Western Australian Government and the Noongar Nation. An Aboriginal Heritage Survey of the Core was conducted in 2011, and a report was prepared for the South West Aboriginal Land and Sea Council on behalf of Development WA's predecessor, LandCorp.

As a result of consultations with nominated members of the Gnaala Karla Booja WC98/58 Native Title Claim group no ethnographic sites of significance, as defined by section 5 of the *Aboriginal Heritage Act 1972* (WA) were identified. One registered archaeological site was confirmed to occur within the Core; Department of Aboriginal Affairs (DAA) 4887 Marriott Road consisting of artefact scatters. The site is located on the south-western side of the river in an exposed yellow sandbank at the junction of Wellesley River and Devlin Road. No other archaeological sites were found.[108]

4.3. Pilbara

Despite sometimes being referred to as the 'Nation's economic powerhouse', with the exception of the Burrup SIA (which like the Kwinana SIA was the subject of significant industrial activity prior to being declared an SIA) the five Pilbara SIAs remain relatively underutilised. This is in part a function of the limited value-add nature of the Pilbara's keystone industry of iron ore. However, recent developments in critical minerals and interest in renewable energy projects in the Pilbara may see increased demand for SIA tenure across the Region.

4.3.1. Anketell

The Anketell Strategic Industrial Area revolves around the Anketell Port, a new multi-user deepwater port, which when fully developed is expected to have an export capacity of approximately 350 million tonnes of iron ore per annum.

[106] Minister for Regional Development and Minister for Transport (2023), 'Detailed feasibility study into recommissioning of Greenbushes to Bunbury Railway Line to begin', *Media Release*, (14 July), Western Australian Government, Perth
[107] Southern Ports (2023), Port of Bunbury Master Plan
[108] Brad Goode and Associates, KSIA Aboriginal Heritage Management Plan

Location and tenure

The total Anketell Project area including the port, industrial areas, multi-user infrastructure corridors and buffers is approximately 6,750 hectares. Of this, the SIA itself consists of 1,250 hectares, including most relevantly 1,000 hectares set aside for heavy or strategic industrial use and 175 hectares for general industrial use. The SIA is situated within the City of Karratha, approximately 5 kilometres west of Wickham and 9 kilometres north-west of Roebourne. Figure 48,[109] illustrates the Anketell SIA's contextual location.

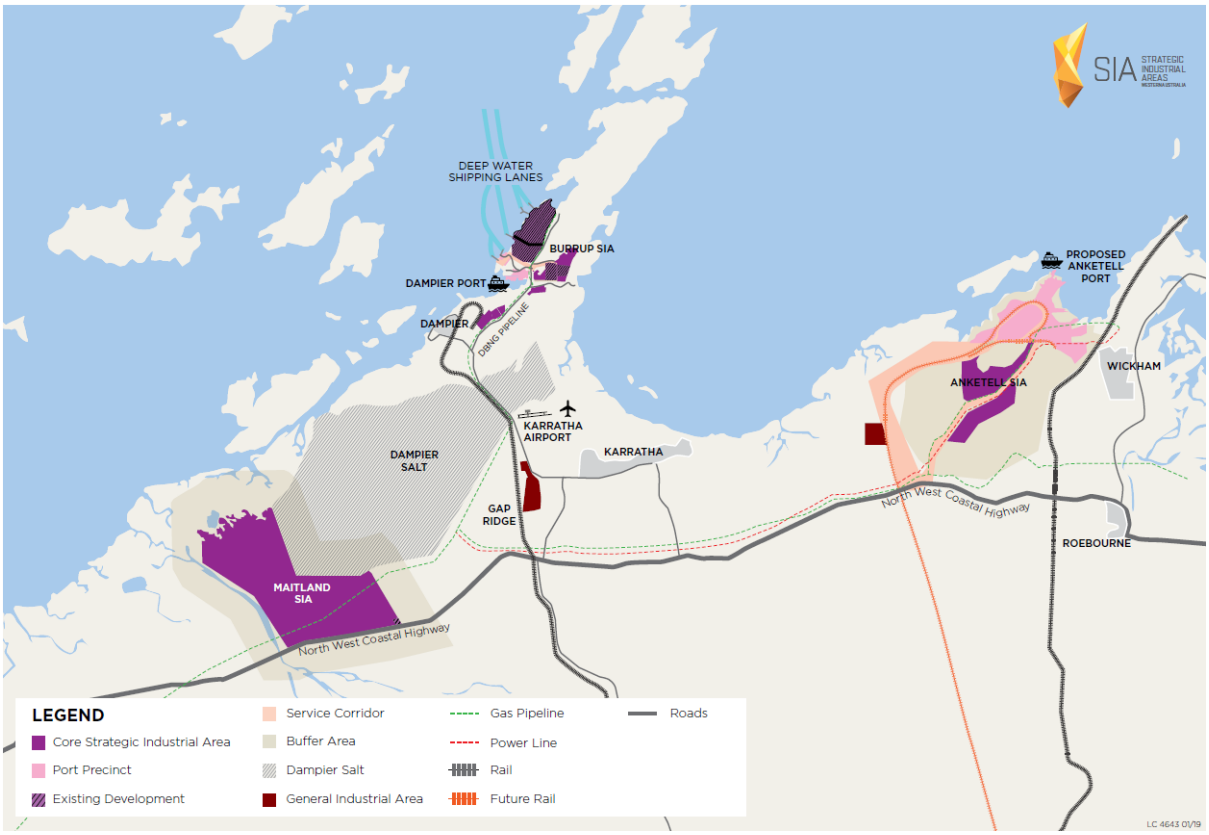


FIGURE 48 - ANKETELL STRATEGIC INDUSTRIAL AREA

Planning

Anketell SIA is administered by the Department of Planning, Lands and Heritage, pursuant to the Anketell Strategic Industrial Area Improvement Scheme.[110]

The Scheme is now operational and replaces the City of Karratha's Town Planning Scheme No. 8 as the land use planning instrument for the area. The Scheme Text, Scheme Map and Guide Plan set out the guiding principles for development in the Anketell SIA. Figure 49,[111] illustrates the Guide Plan for SIA development, including existing infrastructure and services proximal to the site.[112]

[109] Development WA/Industrial Land Authority (2019), *Karratha SIA Mud Map*, October 2019, WA State Government
[110] Western Australian Planning Commission, Anketell Strategic Industrial Area Improvement Scheme No.1, Gazettal date: 7 November 2017
[111] Western Australian Planning Commission (2021), Anketell SIA Improvement Scheme No.1 – Guide Plan, July 2021, WA State Government
[112] *Ibid*

Land availability/occupancy

Land is available for immediate lease however the greenfields estate requires major investment into enabling infrastructure to activate the Anketell SIA.

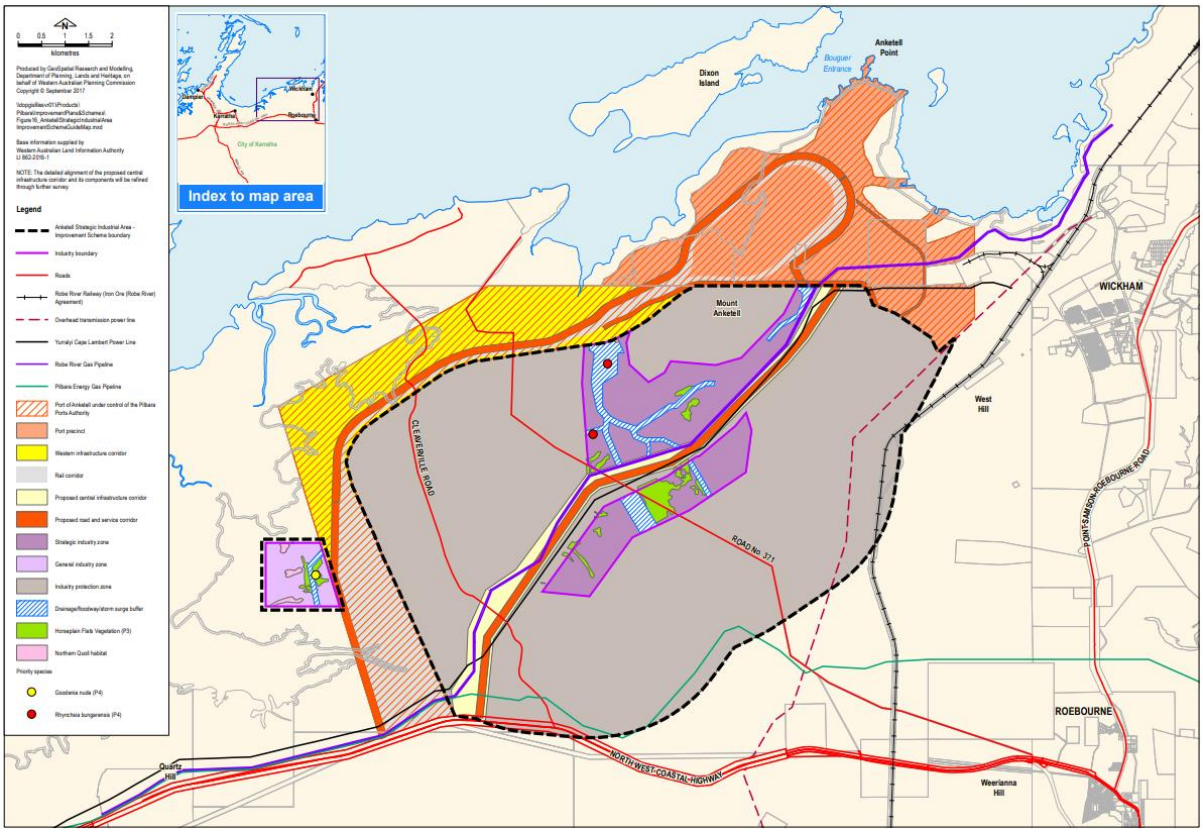


FIGURE 49 - ANKETELL SIA SCHEME GUIDE PLAN

Infrastructure and Services

Water

The West Pilbara scheme supplies the towns of Karratha, Wickham, Dampier, Roebourne, Point Samson and the industrial areas of Cape Lambert and the Burrup Peninsula. Water is sourced from Harding Dam and Millstream borefield, with Rio Tinto contributing from the Bungaroo borefield (owned and operated by Rio Tinto) to meet their operational demand.

Some industrial customers on the Burrup Peninsula are also supplied water for industrial use by the Water Corporation Burrup Seawater Supply Scheme.[113] Figure 50, [114] illustrates the existing Water Corporation West Pilbara scheme.

[113] Water Corporation, *West Pilbara water source planning*, https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/West-Pilbara-water-source-planning, website accessed July 2024
[114] *Ibid*

FIGURE 50 - WATER CORPORATION WEST PILBARA SCHEME

An industrial ecology strategy,[115] prepared approximately a decade ago identified an indicative water input/output assessment, which divides forecast water usage in the SIA into three categories:

- potable Water;
- high Quality Industry Feed Water, and
- low Quality Industry Feed Water

The various areas within the SIA are forecast to require significant quantities of water, as detailed in

Table 28 below.

[115] Reproduced from Wood and Grieve Engineers (2016), Anketell Strategic Industrial Area, Engineering Services and Infrastructure Plan Report, GHD (2013), Anketell Strategic Industrial Area – Industrial Ecology Strategy

TABLE 28 - ANKETELL SIA PRELIMINARY WATER DEMAND ESTIMATE

SIA Area	Potable Water Usage (p.a.)	High Quality Industry Feed Water Usage (p.a.)	Low Quality Industry Feed Water Usage (p.a)
HIA 1 and HIA 2	90 ML	8,257 ML	16,817 ML
GIA	16 ML	460 ML	486 ML
Total	**106 ML**	**8,717 ML**	**17,303 ML**

The Department of Water and Environmental Regulation have advised that availability of groundwater in the area is limited, with water availability from Harding Dam and Millstream borefield forecast to decline as a result of climate change and the reduction in allocation from the Millstream aquifer by the Department of Water and Environmental Regulation (DWER).

The Water Corporation is currently licensed to take up to 15 gigalitres per annum from Harding Dam, however this relies on the source being recharged regularly through cyclones or heavy prolonged rainfall events. Water Corporation is also licensed to take 9 gigalitres from the Millstream aquifer annually, reducing to 6 gigalitres annually before the end of the current decade under the direction of DWER. Current scheme demand is 82 percent of the reliable water available from these two sources.[116] Water availability may also be reduced though Indigenous Land Use Agreement negotiations, recognising traditional and cultural requirements at these sites.

The Water Corporation has advised that it is currently planning for an additional water source which can supply between five to thirteen gigalitres annually, citing a seawater desalination plant as the preferred option. During the planning process, the Water Corporation assessed the potential to access any unallocated groundwater source but was unable to identify a high yielding, sustainable groundwater source.[117]

While water supply services are provided to the surrounding towns, there is no existing water supply infrastructure in the vicinity of the SIA, and the Water Corporation has advised that there is no water supply planning covering the SIA.

Given that neither scheme water nor sufficient groundwater is available for use in the SIA, privately owned facilities will be required to meet the forecast water demands. The majority of feedwater for the facilities must be sourced from a combination of seawater and industrial effluents.[118]

[116] This excludes Rio Tinto Iron Ore's component of scheme demand as this demand is met from their Bungaroo Borefield
[117] Water Corporation
[118] Wood and Grieve Engineers (2016), Anketell Strategic Industrial Area, Engineering Services and Infrastructure Plan Report

Power

Power in the vicinity of the SIA is distributed by the Pilbara Independent System Operator (ISOCo) and is generated at multiple power stations.

The Industrial Ecology Strategy,[119] analyses the predicted power demand and generation of potential ancillary services and industry which may be housed in the SIA. The estimated power demand for the SIA is shown in Table 4.[120]

TABLE 29 - ANKETELL SIA ESTIMATED POWER DEMAND

Potential Industry	Power Demand
HIA 1 and HIA 2	373 MW
GIA	19 MW
Total	**392 MW**

It is likely that a hybrid of renewable energy, storage and gas-fired power generation will be required to meet this demand. To minimise infrastructure costs it would be preferable to install the proposed power station in proximity to the prospective load centres.

Natural Gas

The estimated gas demand for the SIA is illustrated in Table 30.[121]

TABLE 30 - ANKETELL SIA ESTIMATED GAS DEMAND

Potential Industry	Gas Demand (TJ/d)	Gas Demand (TJ/p.a.)
HIA 1 and HIA 2	739.9 TJ/d	270,081 TJ/p.a.
GIA	2.6 TJ/d	956 TJ/p.a.
Total	742.5 TJ/d	271,037 TJ/p.a.

Privately operated gas supply mains exist in the vicinity of the SIA: Cape Lambert Lateral Pipeline, which runs immediately west of the Proposed Central Infrastructure Corridor, and the Pilbara Energy Pipeline, which runs roughly parallel with North West Coastal Highway.

Generally, gas is provided via extension or upgrading of ATCO Gas's distribution network, which is connected to privately owned and operated main natural gas pipelines such as the DBNGP or the PEPL, via meter stations (installed by the private gas carrier) and pressure reducing stations (installed by ATCO Gas). For industries with very high gas demands such as smelters, refineries and power stations, gas supply is generally negotiated with a private gas carrier and taken directly from a main pipeline via a dedicated lateral pipeline, thus bypassing ATCO Gas's distribution network.

[119] GHD 2013, Anketell Strategic Industrial Area – Industrial Ecology Strategy

[120] GHD 2013, Anketell Strategic Industrial Area – Industrial Ecology Strategy amended to incorporate revised HIA1 area estimated on a pro-rata area basis by Wood and Grieve Engineers, May 2016

[121] GHD 2013, Anketell Strategic Industrial Area – Industrial Ecology Strategy amended to incorporate revised HIA1 area estimated on a pro-rata area basis by Wood and Grieve Engineers, May 2016

However, it should be noted that the estimates provided in

Table 28, Table 29 and Table 30 were identified in 2013 and updated in 2016, and are therefore likely to be significantly underestimated. This is principally due to the assumptions of the potential industrial processing that would be established at the SIA – at the time this was predicated on traditional mineral processing activities such as downstream processing of iron ore, gas and petrochemicals, but did not include the value-add processing of critical minerals or production of hydrogen, which are particularly energy and water intensive. These estimates are therefore likely to be significantly understated.

Telecommunications

There is existing Telstra infrastructure within North West Coastal Highway to the south of the Anketell SIA. Although no information is available to quantify the communications infrastructure requirements for SIA, future operations within SIA will require a reliable communication infrastructure.

Road Infrastructure

Main Roads Western Australia (MRWA) maintains and operates North West Coastal Highway (NWCH), which lies to the south of SIA and provides links to Geraldton in the south and Port Hedland to the north. NWCH is a sealed single carriageway road, and is primarily utilised for access between Karratha and Port Hedland. Cleaverville Road is to the west of SIA, severing both the Proposed Central and Western Service Corridor, and there is an unsealed access track linking NWCH to the coast at Cleaverville (west of the planned Anketell Port site). There are also numerous informal tracks throughout the SIA region.

Jacobs Group (Australia) has completed traffic modelling for the Anketell Port and SIA, and has provided advice on the following infrastructure treatments and upgrades:[122]

- A proposed single lane two way road servicing the SIA from NWCH within the Western Corridor will have sufficient capacity for projected traffic volumes.
- The proposed right turn onto NWCH from the Western Corridor is predicted to operate at a level of service C, which is acceptable, whilst other movements are predicted to operate at a level of service A or B.
- A link road from the Proposed Central Infrastructure Corridor to NWCH is therefore not required in terms of capacity.
- Single lane two way roads will connect to the Western Corridor road to provide access to each of the SIA land parcels.
- A section of the proposed Central Infrastructure Corridor will be constructed to provide an access link between HIA1 and the Port. Alternatively this Central Infrastructure Link Road could be located within the SIA boundary to form a central spine road.
- A secondary road, which could be unsealed, is recommended as an emergency access/egress route between the Central Infrastructure Link Road and NWCH utilising the Central Infrastructure Corridor and the southern section of Cleaverville Road.
- Cleaverville Road is to remain open until the Western Corridor Port Access Road is operational, then it is recommended that the existing central section of Cleaverville Road be closed.
- At the northern end of the SIA at the interface with the Port, it is recommended that sufficient land be retained for potential future road infrastructure linking the causeway

[122] Jacobs (2016), Anketell SIA Transport – Transport and Traffic Planning Report

to the SIA to accommodate general traffic, high wide loads (HWLs) and a heavy haul road.
- It is not anticipated that there will be sufficient demand, if any, that necessitates the Eastern Corridor route between Wickham and the Port and the SIA. The existing Pannawonica rail line to Cape Lambert is a constraint that would need to be addressed if such a demand was to eventuate.
- Projected traffic volumes generated by the Port and SIA do not trigger a need to upgrade NWCH to a dual carriageway between Karratha and Wickham.

Rail infrastructure

Rio Tinto operates the Pannawonica railway line to the east of the SIA. This rail is independent of the SIA and port development. No other rail infrastructure exists in the vicinity of the SIA.

Rail lines will be used primarily for the transport of bulk freight, such as raw materials and minerals and products to and from the Anketell Port from the surrounding mine sites. The Western Corridor will provide the primary rail access to the SIA and Port area. While the majority of future rail requirements in the Western Corridor will be at the discretion of mining proponents, allowance for rail to serve the proposed iron ore processing precinct is considered necessary. It is anticipated that one rail line with a turnaround facility will be required for the SIA, and allowance should be made for a potential second line within the SIA.[123] The rail infrastructure treatments and provisions recommended in preliminary studies are summarised as:[124]

- Main Roads WA has advised that a grade separated railway crossing is required where the proposed railway crosses the North West Coastal Highway.
- Once the Western Corridor Port Access Road is operational, it is recommended that Cleaverville Road be closed south of the Port Access Road.
- A railway crossing will be required on the access road constructed from the Western Corridor Port Access Road to heavy industry area HIA1.

Stormwater infrastructure

The area surrounding SIA is subject to intense rainfall associated with severe cyclonic activity, typically occurring from November through to April each year. This combined with the high soil clay content in the area results in extreme stormwater runoff flow rates, and makes the Anketell SIA susceptible to storm surge and flooding. The proposed stormwater drainage strategy as outlined in the associated environmental study is summarised below:

- Open drains and swales will be used as the principal stormwater conveyance mechanism.
- Lots will be required to retain the first 15mm of rainfall (as a minimum) through appropriate landscaping, to improve the quality of stormwater discharging from lots.
- Lots will be required to implement stormwater management systems to provide a suitable level of stormwater quality control depending on the specific industrial land use, processes and materials present on the site.
- Road pavements will be flush kerbed, discharging flows to open drains located within road reserves.
- Road pavements will be designed significantly lower than surrounding lots to provide flood protection to properties.
- Open drainage channels will be sized so that the 5 year ARI event top water level (TWL) is 300mm below the level of the road shoulder, and designed to maintain low flow velocities to minimise erosion and sediment transportation.

[123] GHD 2013, Anketell Strategic Industrial Area – Industrial Ecology Strategy

[124] Jacobs (2016), Anketell SIA Transport – Transport and Traffic Planning Report

- Road reserve drains will be used in conjunction with arterial drainage corridors throughout the development to convey stormwater flows from lots to downstream drainage reserves or discharge points.
- Open drains will be designed to contain 100 year ARI event flows.
- Arterial drainage corridors will utilise the existing surface topography and natural drainage features as much as possible to retain the pre-development hydrological regime and minimise earthworks requirements.
- Erosion and sediment transport will be minimised by reducing flow velocities through the use of detention basins, drop structures, pitching and vegetation of drainage channels.

Port access

A masterplan for the Anketell Port was developed in 2014.[125] However, to date the port proposed to be associated with the Anketell SIA has not been constructed.

Environment and heritage

Native Title

In 2005, in accordance with the *Native Title Act 1993* (Cth) (NTA), the Federal Court of Australia made a determination of native title over most of the land areas comprising the port precinct, infrastructure corridor and industrial land areas in favour of the Ngarluma people. Accordingly, there will be ongoing interaction with the Ngarluma people, represented by the Ngarluma Aboriginal Corporation (NAC) throughout the life of the port. The State has entered into an Indigenous Land Use Agreement (ILUA) with the NAC that provides for compliance with the future act provisions of the NTA. It also sets out a heritage protocol for undertaking Aboriginal heritage surveys.

4.3.2. Ashburton North

The Ashburton North Project comprises a planned Port area (Ashburton North Port) and associated 8,000-hectare Strategic Industrial Area (SIA) which has the potential to accommodate up to two LNG processing facilities, at least two domestic gas processing facilities and multiple downstream hydrocarbon processing and related support industries. The Ashburton North SIA also includes sites for worker accommodation and general industry.

Current proponents located in the Ashburton North SIA are Chevron Australia (Wheatstone LNG Project) and Woodside (Macedon Domestic Gas Project), while land allocations have been approved for project propnents Equus Energy (a subsidiary of Western Gas Corporation, Fortescue Future Industries and Hasting Technology Metals. A further proposal has been lodged by Onslow Infraco (a wholly owned subsidiary of Mineral Resources Limited) to develop infrastructure to enable the transhipment of iron ore from the Ashburton North Port. This proposal is currently under evaluation by the Environmental Protection Authority (EPA) of Western Australia.[126]

Once constructed, the Ashburton North Port will be administered by the Pilbara Ports Authority, with responsibility for managing lands associated with the SIA vested with Development WA as per other SIAs.

[125] Pilbara Port Authority (2014), Anketell Port Master Plan, Western Australian Government, Perth
[126] Environmental Protection Authority, Ashburton Infrastructure Project, Onslow Infraco Pty Ltd

Location and Tenure

The Ashburton North SIA is located 12 kilometres south of the Onslow town site in the Shire of Ashburton. It has been master planned to accommodate existing and future industries with dedicated infrastructure corridors. Figure 51,[127] illustrates the contextual location of the Ashburton North SIA.

[127] Development WA/Industrial Land Authority (2019), *Ashburton North Strategic Industrial Area Site Map*, WA State Government, December 2019

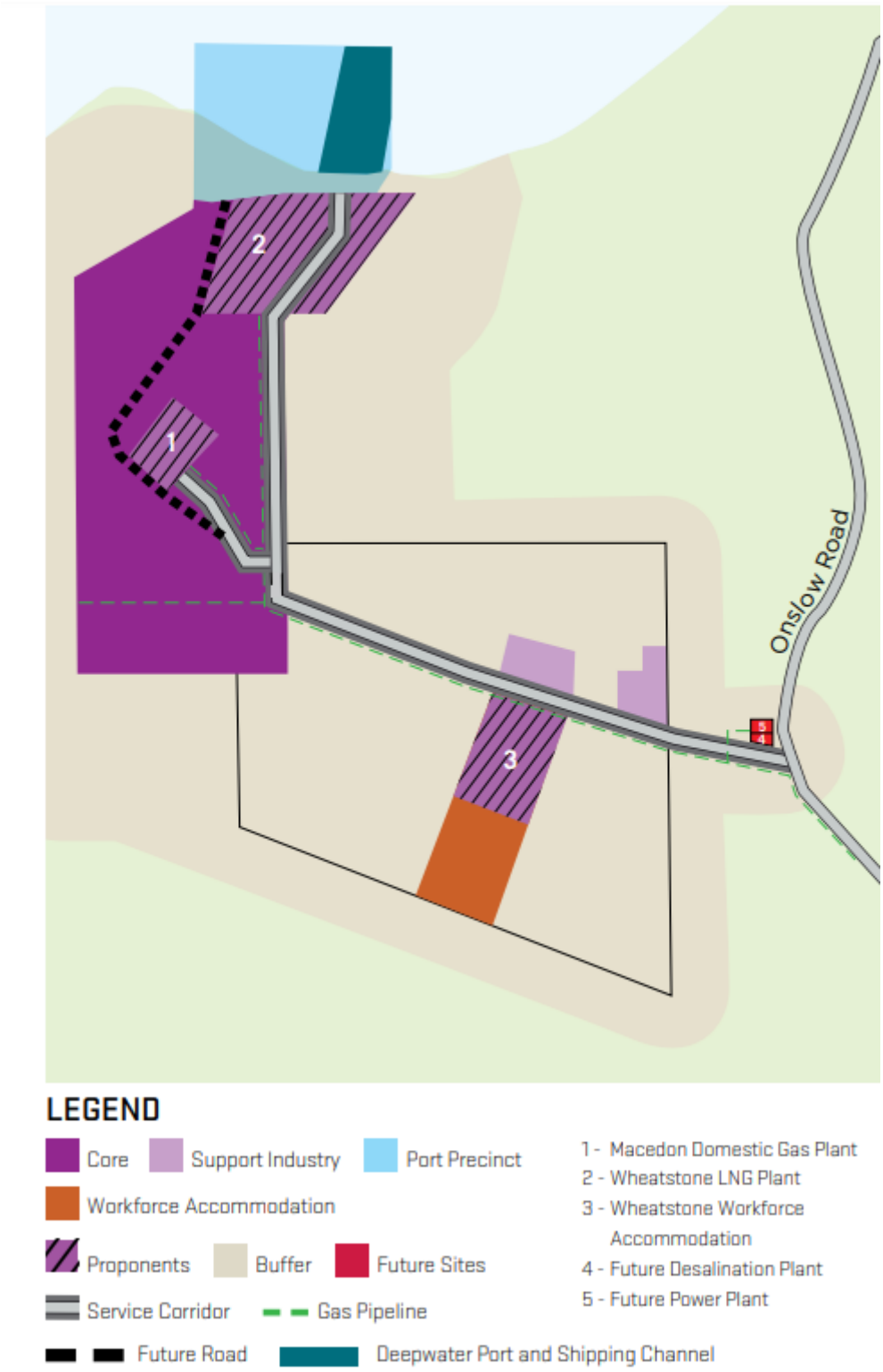


FIGURE 51 - ASHBURTON NORTH STRATEGIC INDUSTRIAL AREA

Planning

The Ashburton North SIA is located within the boundaries of the Shire of Ashburton, however the Ashburton North SIA is administered by the Department of Planning, Lands and Heritage pursuant to the Ashburton North Strategic Industrial Area - Improvement Scheme No 1.

The Improvement Scheme is informed by the following objectives:[128]

- To create a strategic industrial estate comprising major hydrocarbon processing industries and synergistic services and/or facilities with viable port access.
- Ensure the safe and efficient use of land for the long-term industrial development of a strategic industrial area of regional, state and national significance.
- To provide an internationally competitive industrial estate that offers a layout designed to facilitate and encourage industry synergies, functional transport links and where possible, the sharing of infrastructure networks and corridors.
- To minimise and mitigate any adverse impacts on the surrounding land, the terrestrial and marine environment, and the Onslow community.
- To ensure the appropriate preparation and layout of land uses through appropriate internal and external buffers to prevent incompatible or conflicting land uses.

The Scheme Report summarises previous planning over the Ashburton North SIA and documents a list of further technical reports available from the Western Australian Planning Commission (WAPC) on request.

The Scheme is now operational and replaces the Shire of Ashburton Town Planning Scheme No. 8 as the land use planning instrument for the area, and includes the following zones:[129]

- Strategic Industry zone;
- General Industry zone;
- Infrastructure zone;
- Workforce Accommodation zone;
- Industry Protection zone;
- Special Use zone; and
- Discretionary Use zone (Industry – Noxious).

Figure 52,[130] illustrates the Guide Plan for SIA development, including existing infrastructure and services proximal to the site.

[128] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request

[129] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request

[130] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request

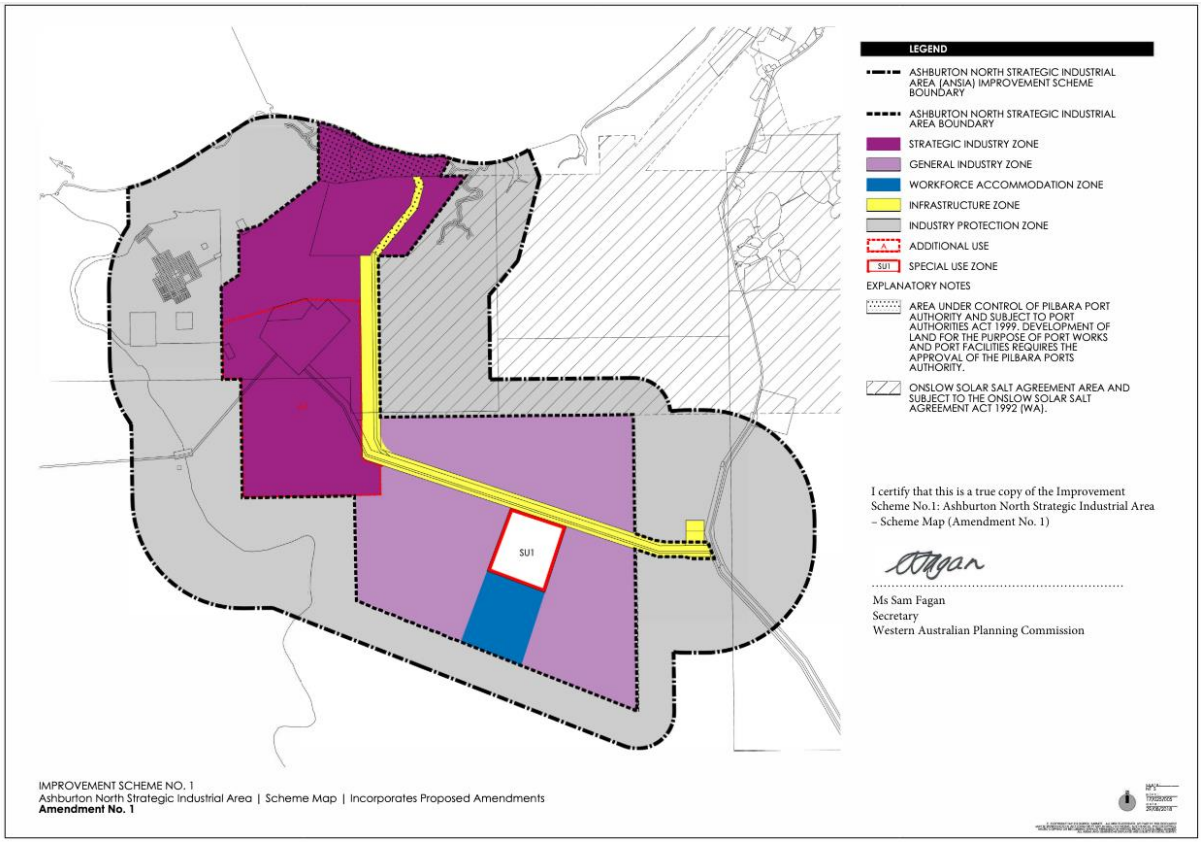


FIGURE 52 - ASHBURTON NORTH STRATEGIC INDUSTRIAL AREA - SCHEME MAP

The Ashburton North SIA currently comprises land designated for strategic industry, general industry, port purposes, workforce accommodation and a multi-user access and infrastructure corridor (MUAIC). The Port of Ashburton is fundamental to the development of the strategic industrial area and the MUAIC provides connectivity between industry sites and the Port.

Given the expansive area of the Ashburton North SIA, the scale and development timeframes, a staged approach to planning and development has been adopted, as illustrated in Figure 53,[131] with the Stage 2 portion of the site being the southernmost section of the SIA, identified in yellow.

[131] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request

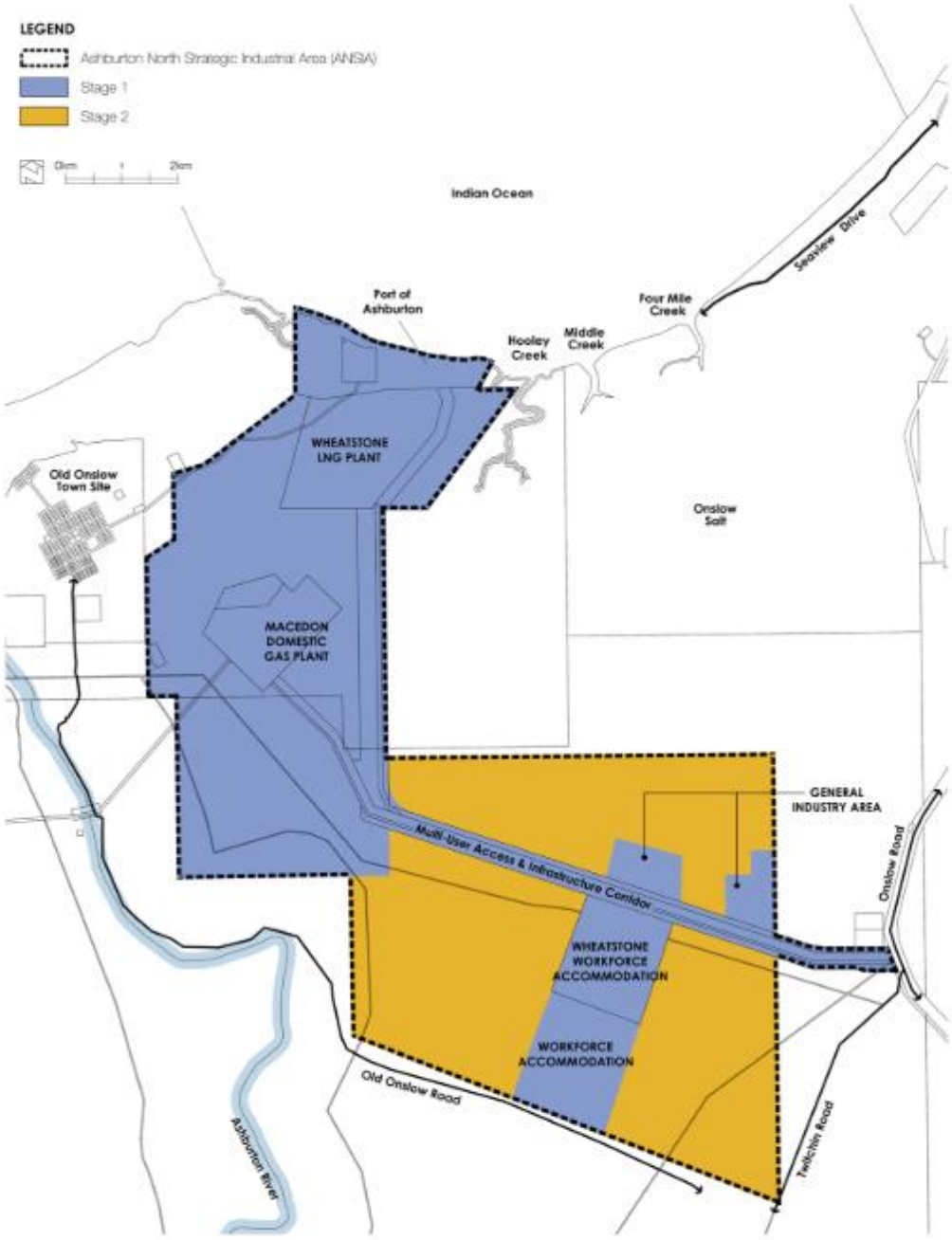


FIGURE 53 - ASHBURTON NORTH STRATEGIC INDUSTRIAL AREA - STAGING APPROACH

The Scheme Text, Scheme Map and Guide Plan set out the guiding principles for development in the Anketell SIA. The Guide Plan was developed based on the following key elements and considerations:[132]

- Utility synergies: shared use of utility infrastructure, mainly revolving around water and energy (e.g. water supply and recovery, cogeneration) and including industrial and general waste recycling and reuse.
- Supply synergies: featuring local manufacturer and dedicated supplier of principal reagents for core process industries (e.g. production of nitrogen for industrial use). The

[132] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request

main supply synergy is the provision of gas from the LNG and domestic gas processing plants.
- By-product synergies: the use of a previously disposed by-product (as solid, liquid, or gas, including heat) from one facility by another facility to produce a valuable by-product. This includes CO^2 for ammonium urea production, heat for desalination or process heat, and inorganic solid waste by products (such as construction and demolition waste).
- Service synergies: sharing of services and activities between industries (e.g. joint training of staff and sharing of maintenance contractors including the common visitor and training centre and general industry area(s).

The guide plan includes strategic industry, workforce accommodation and power station buffers summarised as:[133]

- Strategic Industry Buffer: a 3 kilometre risk, noise and air quality indicative buffer from the strategic industry area.
- Workforce Accommodation and Western General Industrial Buffer: a 1 kilometre 'Land Use Sensitivity' buffer from the boundary of the workforce accommodation sites and the southern boundary of the western general industrial area (GIA) over the Wheatstone workforce accommodation site. The aim of this buffer is to ensure surrounding land uses would not adversely affect health, safety or amenity of the worker's accommodation.
- Power Station Buffer: a 3-kilometre buffer from the proposed Horizon Power station site, including the Water Corporation desalination plant.

Land availability/occupancy

Strategic industrial land in Stage 1 of the Ashburton North SIA is fully allocated. Land is available in Stage 2 of the development, however is currently undeveloped and un-serviced.

Infrastructure and Services

The SIA Stage 2 development suitability has been assessed against infrastructure proximity, both in terms of supplying the proposed developments with typical infrastructure and services (transport, water, power and gas), which are depicted in Figure 54 below.[134]

[133] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request
[134] ARUP for LandCorp (2018) Ashburton North Strategic Industrial Area – Stage 2, Engineering Concept Report

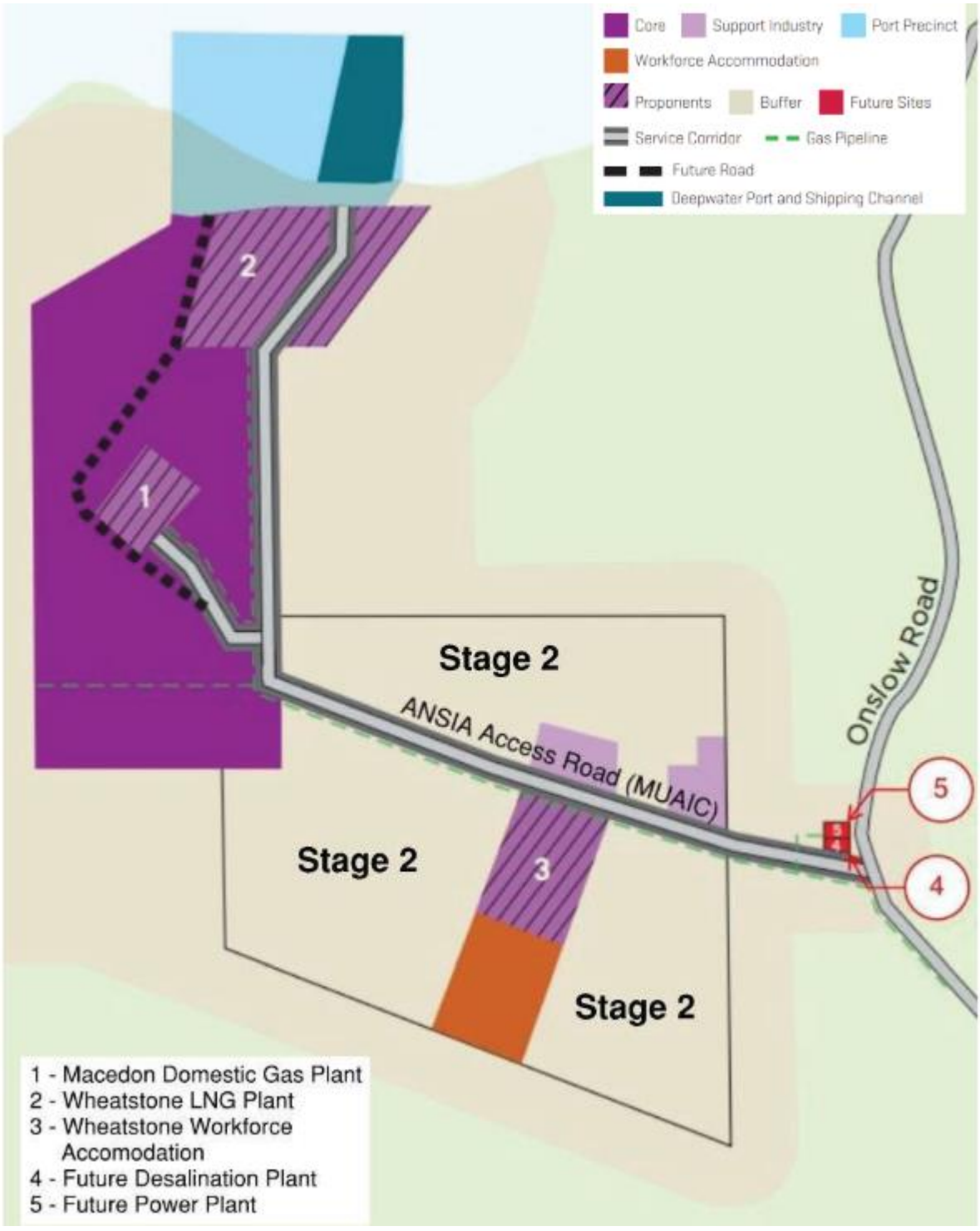


FIGURE 54 - ASHBURTON NORTH SIA - INFRASTRUCTURE AND SERVICES ASSESSMENT

Water

The Ashburton North SIA is situated over the North Carnarvon Basin with underlying hydrogeological formations in descending order of depth being Coastal alluvial aquifers, Trealla limestone aquifer, Yarraloola conglomerate and Lyons group aquifer. The confined Bridrong Sandstone aquifer is the predominant source of groundwater for stock and domestic water supplies in the Carnarvon Basin. The local groundwater directly below the SIA ranges from brackish to hypersaline.

The Water Corporation is constructing a seawater desalination plant to supply potable water to the town of Onslow, funded by Chevron under the Ashburton North State Development Agreement (Wheatstone Project), as depicted in Figure 54 (item 4).[135] The plant will include a reverse osmosis seawater desalination plant, intake and outfall pipelines at Beadon Bay, a water tank and pumping station, and a 2.5 kilometre long underground pipeline to the existing Onslow tanks, where the water will be connected to the town's water supply and integrated with the town's current water source, the Cane River borefield. The construction contract was awarded in August 2023, with construction scheduled to commence in July 2024 and anticipated operational date of late 2026.

However, the proposed desalination plant is intended to service the town of Onslow, and there are no plans to service the future SIA development. Water Corporation has noted that any supply to industries within the SIA would need to be individually negotiated regarding their proposed water demands, the need for additional source and infrastructure upgrades, the point of bulk supply and the charging regime. Any water supply to the SIA, if an additional source could be found, would likely be in the form of a bulk supply point, at or near the boundary of the SIA, while internal service mains and any storage would be owned by the industries.[136]

Power

The Onslow Distributed Energy Resources Management System (DERMS) is a modular power microgrid situated adjacent to the site of the proposed desalination plant at the north-west corner of the intersection between Onslow Road and the Ashburton North SIA Access Road (see Figure 54, item 5), and consists of:[137]

- 1,341 kilowatts of residential solar photovoltaic (261 systems)
- 640 kilowatts of commercial and industrial solar photovoltaic (8 systems)
- 190 kilowatt-hours of residential energy storage (19 systems)
- 361 kilowatt-hours of commercial and industrial smoothing storage (8 systems)
- 1 megawatt utility solar farm
- 500 kilowatt-hours of utility power station battery energy storage system
- 1 megawatt-hour of utility network battery energy storage system
- 8 megawatt modular gas-fired power station

Horizon Power indicates that the modular power system could be expanded to service heavy load requirements and is capable of expanding for future proponents within the SIA to supply future developments within the Stage 2 area.[138] However, the current level of installed capacity falls well short of what would be required to service any single industrial load.

It is anticipated that individual proponents will be required to fund the capital cost associated with installing sufficient generation capacity to meet the requirements of new industrial loads.

Natural Gas

Dampier Development Group (DDG) gas distribution pipelines are located within and adjacent to the SIA Stage 2 development area. It is anticipated that SIA Stage 2 proponents

[135] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request
[136] ARUP for LandCorp (2018) Ashburton North Strategic Industrial Area – Stage 2, Engineering Concept Report
[137] Horizon Power
[138] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request

may be able to enter into private supply agreements with pipeline operators for the provision of raw natural gas.[139]

Telecommunications

The Ashburton North SIA Structure Plan [Stage 1] proposed telecoms within the 20m common utilities corridor on the south side of the MUAIC to include Telstra 36-bit core fibre line. Further telecoms infrastructure was proposed to be provided by proponents on their own land as required. During investigation for the eastern General Industrial Area, it was identified that Chevron had previously negotiated a high-speed telecoms network to the Transient Worker's Accommodation and Wheatstone plant site, and that further negotiations with Telstra for the GIA would be required for new proponents.[140]

Road Infrastructure

The existing MUAIC access road is currently constructed to a sufficient standard to accommodate the heavy vehicle usage associated with the Port and major hydrocarbon industries developed in Stage 1. It is therefore unlikely that any increases in traffic associated with the Stage 2 development will generate the need for additional upgrades to this road. Similarly, a section of Onslow Road was recently upgraded by Main Roads WA, including the Onslow Road and North West Coastal Highway intersection.[141]

Rail Infrastructure

There is currently no rail infrastructure servicing the Ashburton North SIA. The Western Australian Regional Freight Transport Network Plan indicates that investment in rail infrastructure at the Ashburton North SIA is not currently under consideration.[142]

Stormwater Infrastructure

The Ashburton North SIA Stage 2 surface water hydrology is characterised by three main components:

- extreme events resulting from tropical cyclones typically cause a near-shore storm surge which raises the sea level;
- high intensity, widespread rainfall following this causes runoff from the local catchments; and
- flows in the Ashburton River generated by the upper catchment result in breakout flows, which may influence a wide area due to the low separation between sub-catchment topography.

The combined impact of these mechanisms form the design flooding event to be mitigated by engineering solutions.

The area's hydrogeological system has a dynamic nature, making it adaptable to changes presented by the development. However, the large volumes of water involved in flooding events present stormwater management challenges. In response to this, the following measures were recommended:

[139] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request
[140] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request
[141] Taylor Burrell Barnett (2020), Ashburton North Strategic Industrial Area, Improvement Scheme No. 1, Scheme Amendment Request
[142] Western Australian Government, Western Australian Regional Freight Transport Network Plan 2031

- identify preferential surface water pathways, maintain existing major natural waterways, anticipated limited risk of post development flows and velocities increasing significantly; and
- permit as much as possible natural regimes for 1 and 100 year ARI event. Impacts on surface water regimes in adjoining project or common use areas to be avoided.

The Wheatstone Development Plan, adjacent to the Stage 2 site implemented the above measures through rational use of engineered fill to raise vulnerable areas above flooding levels. This involved focussing on the most viable development space at existing higher elevation. A similar raised building pad development approach is identified as the most viable flood protection mechanism for the Stage 2 area. The explicit size and levels of the development pads will be determined during more detailed design stages.

The consideration of natural, existing surface water pathways will be important for areas of Stage 2 in proximity to breakout flows from the Ashburton River. These considerations will need to be addressed by future developers within the Stage 2 SIA site.[143]

Port Access

Maritime logistics connectivity at Ashburton North is comprised of a proprietary LNG export jetty operated by Chevron's Wheatstone operation and a proprietary transhipping operation that is operated by Mineral Resources Onslow Iron project. A small vessel multi-user facility is also located at Onslow, approximately 30 kilometres from the Ashburton SIA.

Environment and Heritage

Native Title

In September 2008, the Federal Court of Australia determined that the Thalanyji people are the Native Title holders for the onshore area around Onslow, including the port (landside) and the strategic industrial estate (National Native Title Tribunal (Commonwealth), 2008). In accordance with the *Native Title Act 1993* (Cth) (NTA), the Buurabalayji Thalanyji Aboriginal Corporation was incorporated to hold Native Title in the Onslow area on trust for the traditional owners.

All development within the Ashburton North SIA will be subject to Aboriginal Heritage surveys being undertaken in accordance with the Aboriginal Heritage Act 1972 (WA). Multiple aboriginal heritage sites are listed in the Ashburton North SIA Development Plan. The Stage 2 protected areas have been identified using the following information sets, and are depicted in Figure 55:

- Land Tenure Reserves;[144]
- Aboriginal Places Registered Sites;[145] and
- Threatened and Priority Fauna.[146]

[143] ARUP for LandCorp (2018) Ashburton North Strategic Industrial Area – Stage 2, Engineering Concept Report
[144] Reproduced from ARUP for LandCorp (2018) Ashburton North Strategic Industrial Area – Stage 2, Engineering Concept Report, extracted from Landgate 29/08/2017
[145] Reproduced from ARUP for LandCorp (2018) Ashburton North Strategic Industrial Area – Stage 2, Engineering Concept Report, extracted from the Department of Aboriginal Affairs 17/08/2017
[146] Reproduced from ARUP for LandCorp (2018) Ashburton North Strategic Industrial Area – Stage 2, Engineering Concept Report, extracted from the Department of Parks and Wildlife 22/04/2016

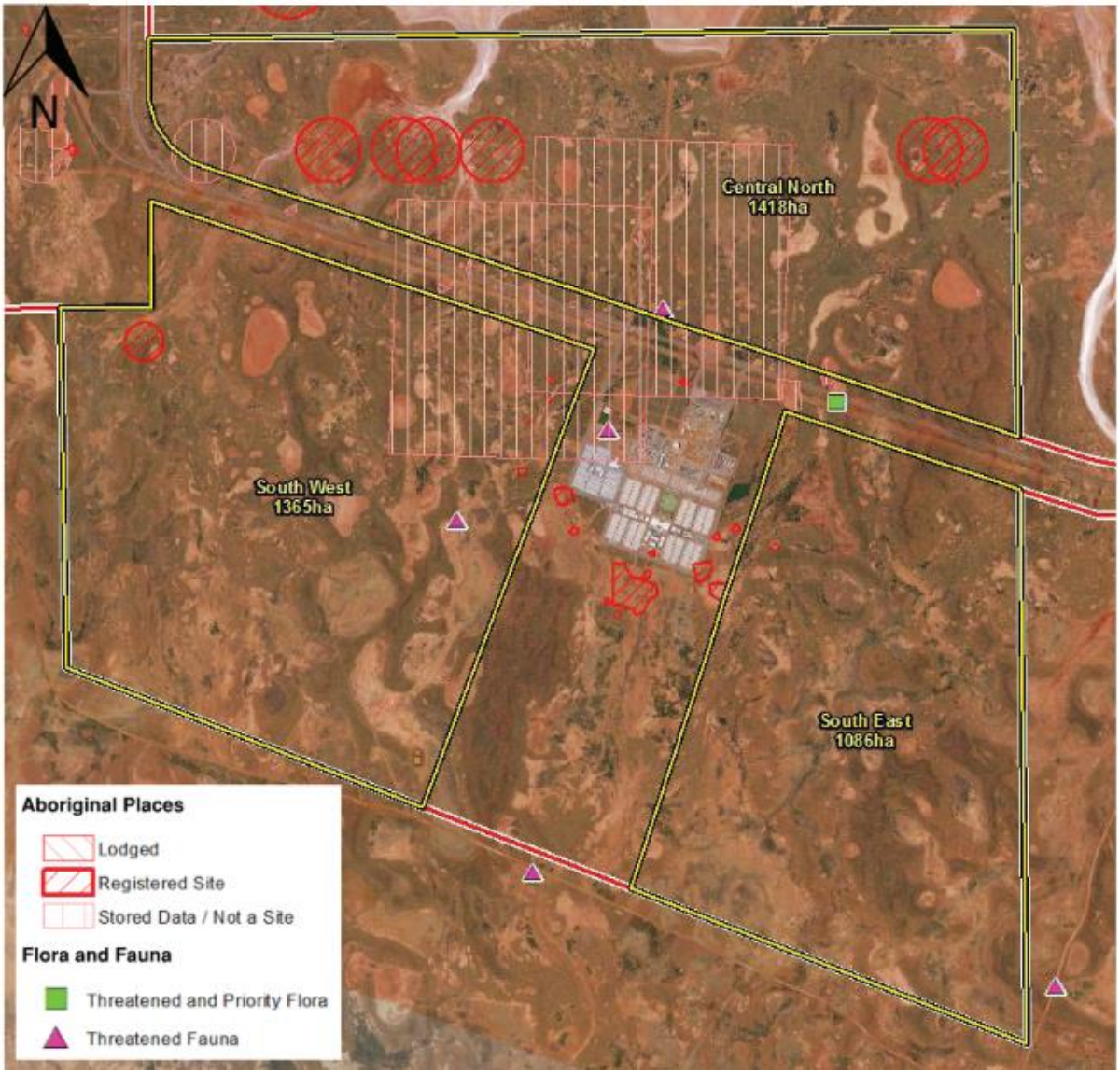


FIGURE 55 - ASHBURTON NORTH STAGE 2 PROTECTED ENVIRONMENTAL SITES

4.3.3. Boodarie

The Boodarie Strategic Industrial Area consists of approximately 4,000 hectares of strategic industry zoned land and has been master planned to accommodate resource processing industries related to the iron ore and gas resources of the region.

While the estate is traversed by regional services infrastructure and the North West Coastal Highway, it remains largely undeveloped and un-serviced, with POSCO, Fortescue Metals Group, Alinta Energy, Tees Valley Lithium and BP being project proponents that have been approved for land allocation within the SIA, and an additional application by Port Hedland Green Steel currently under consideration.[147]

Location and Tenure

The Boodarie SIA is situated approximately 4 kilometres west of the South Hedland townsite, and approximately 10 kilometres south of the Port Hedland townsite. It has been master

[147] EPA, Port Hedland Green Steel Project – Stage 1

planned to accommodate existing and future industries with dedicated infrastructure corridors. Figure 56 illustrates the contextual location of the Boodarie SIA.[148]

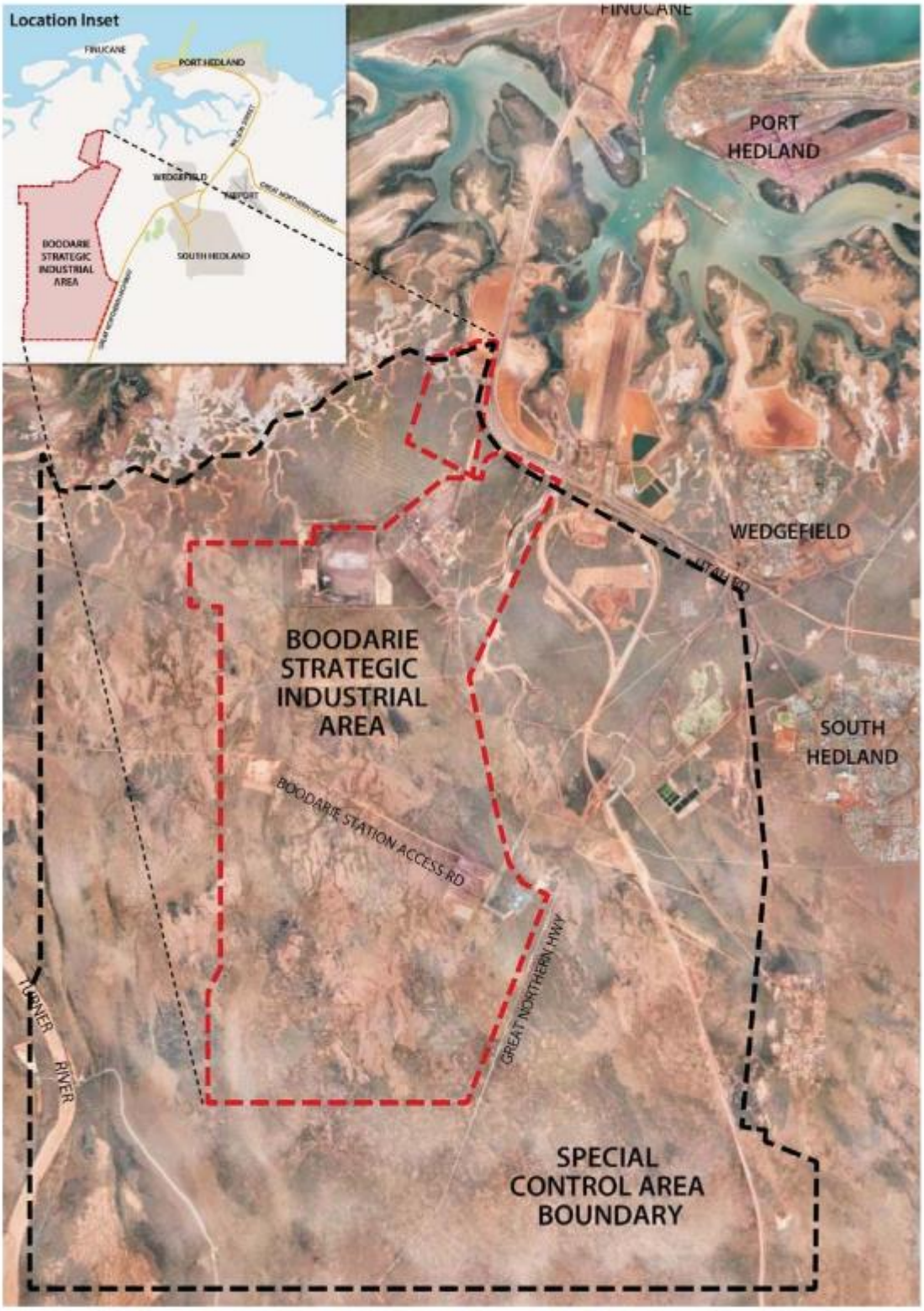


FIGURE 56 - BOODARIE STRATEGIC INDUSTRIAL AREA MAP

[148] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan

There are many leasehold land tenure arrangements within the Boodarie SIA. The majority of land is held by the Crown and is the subject of the Boodarie Pastoral Lease held by BHP, with other allocations including the De Grey - Mullewa stock yard route, a Stock Holding Reserve vested in the Town of Port Hedland and a number of General Purpose and Mining Leases for infrastructure and sand extraction purposes.[149]

Planning

The Boodarie SIA is located within the boundaries of the Town of Port Hedland. Under the Port Hedland Town Planning Scheme No. 5, the Boodarie SIA core is zoned 'Strategic Industry' permitting the development of heavy and other strategic industries. A two to three kilometre 'Special Control Area' surrounds the Boodarie SIA core, acting as a buffer to ensure incompatible land uses to not hinder the development of heavy industries in the estate.

The structure plan,[150] provides the planning framework to guide coordinated development of the Boodarie SIA and future planning approvals, in order to optimise capacity for strategic industrial use. A Traffic report has been completed and informs the Structure Plan, and an Industrial Ecology Strategy has been developed.

The objectives of the Boodarie SIA structure plan are:

- provide a framework to guide coordinated development of the BSIA and future planning approvals in order to optimise capacity for strategic industrial use;
- provide industry with a comprehensive information pack, in the form of this structure plan and associated reports, to facilitate appropriate types and forms of development within the BSIA;
- establish specific infrastructure corridors that provide an essential link between the Port and the BSIA;
- establish Port capacity and access to enable optimal industrial development and export within the BSIA;
- facilitate development through the Town of Port Hedland Town Planning Scheme No.5 (TPS5) and a structure plan process consistent with the WAPC's Structure Plan Framework; and
- recognise the governance structure for the implementation of the structure plan.

The structure plan map depicts the extent and boundary of the structure plan area. The road structure, land requirements and rail network applicable to the structure plan area are identified in Figure 57.[151] The Pilbara Ports Authority (PPA) is the management authority of approvals on Port land depicted within the Structure Plan.

[149] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[150] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[151] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan

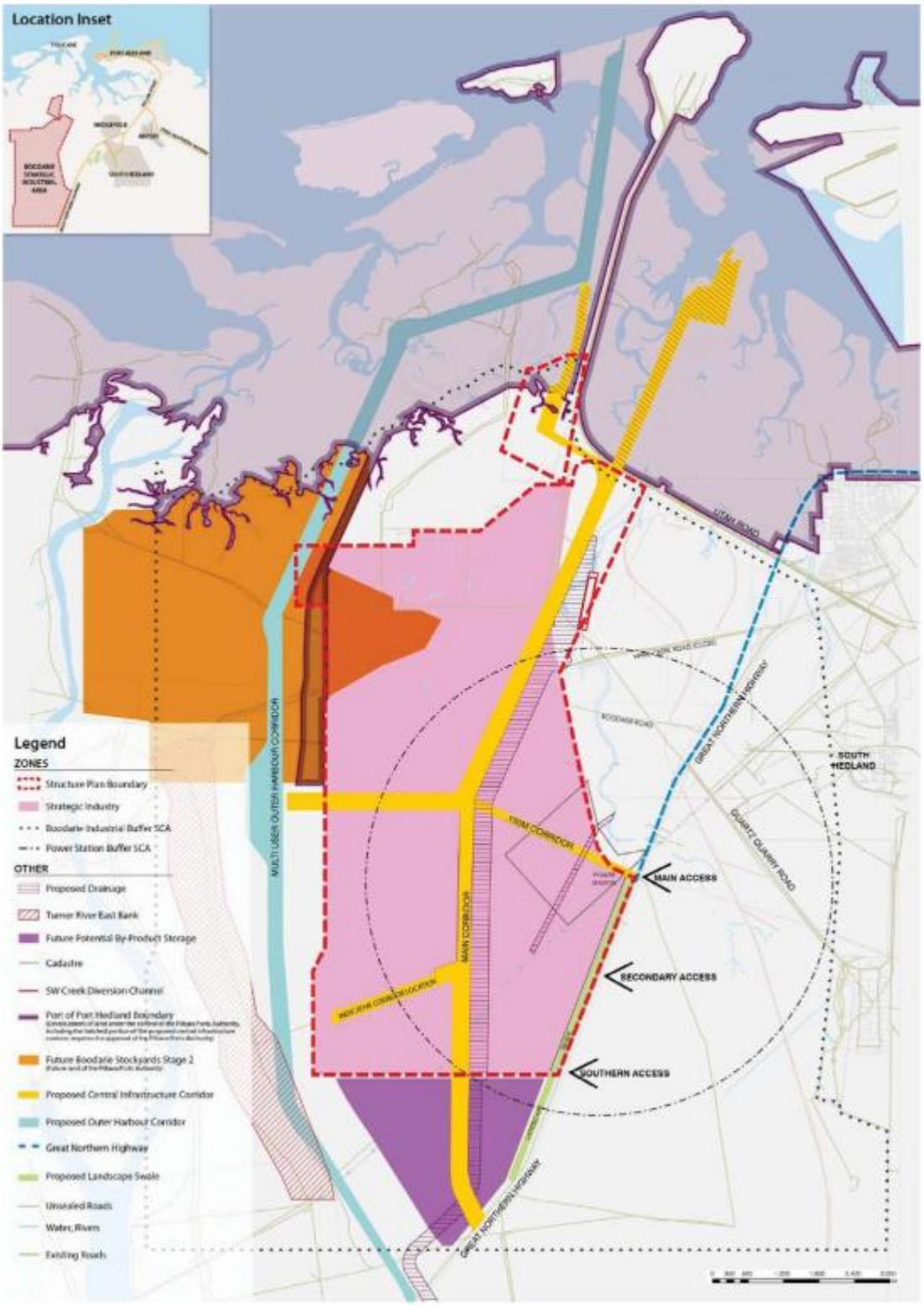


FIGURE 57 - STRUCTURE PLAN MAP

The structure plan defines a precinct plan, shown in Figure 58,[152] (overleaf) to group industrial activities into defined areas within the SIA according to a set of location criteria. Table 31 provides a summary of prospective industry by precinct. [153]

TABLE 31 - SUMMARY OF INDUSTRY BY PRECINCT - BOODARIE SIA

Precinct	Potential Industry types
Port dependent industries	▪ Large scale processing plant (liquids – not defined) ▪ Large scale processing plant (conveyors – not defined)
Downstream iron ore processing	▪ Sintered iron plant ▪ Integrated steel making plant ▪ Ferromanganese production plant ▪ Iron carbide plant
Downstream petroleum and gas processing	▪ Methanol plant ▪ Ammonia / urea plant ▪ Ethane extraction ▪ Sodium cyanide plant
Non-ferrous processing[154]	▪ Industry that deals with the processing of metals other than iron and iron-base alloys
Utilities	▪ Gas fired power station ▪ Waste to energy and material recovery facility ▪ Industry feedwater facility ▪ Energy facility(electricity, steam, heat, chill)
Support	▪ Industry that requires import equipment, parts or products through the port
By product storage	▪ Industrial by-products (both inorganic and organic)

If a proponent demonstrates that an activity should be located in an alternative location to the preferred precinct, this may occur subject to business case approved by JTSI and Development WA. Proponents are required to investigate, fund and implement the specific infrastructure and services they require for their developments (e.g. power, water, telecoms and wastewater solutions).

Land availability/occupancy

Development WA owns approximately 80 hectares of land available for immediate lease, while the balance of the estate requires the resolution of native title, pastoral leases and mining tenure across the strategic industry zone, infrastructure corridors and industry protection zone to be project ready.[155]

[152] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[153] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[154] Non-ferrous metals considered include nickel, aluminium, copper, zinc and lead
[155] Development WA, Industrial Lands Authority (2021), Industrial Land Steering Committee 10-year Industrial Land Strategy

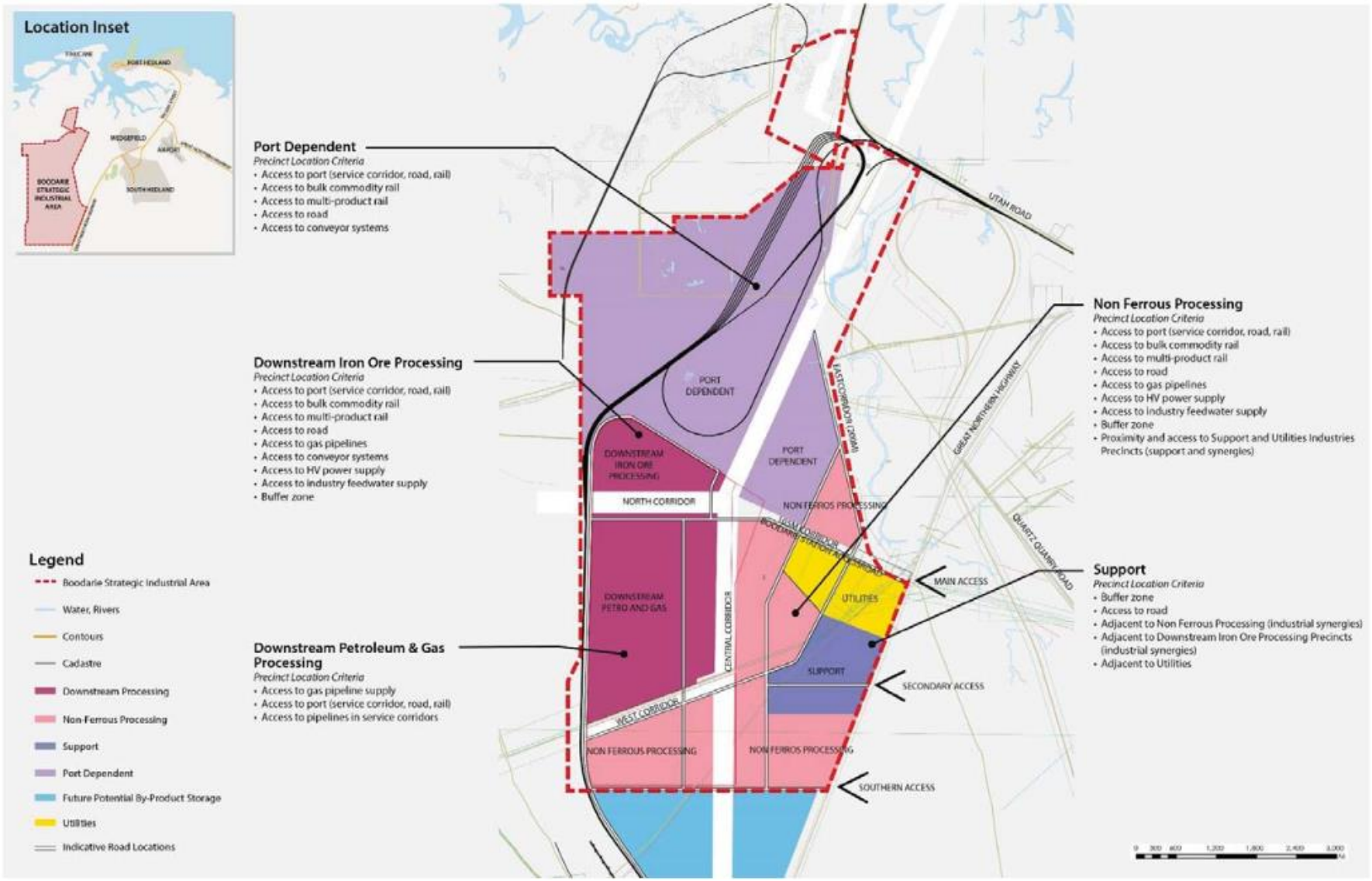


FIGURE 58 - BOODARIE SIA PRECINCT PLAN

Infrastructure and Services

Limited infrastructure and services exist at the Boodarie SIA. The existing and proposed infrastructure and services at the Boodarie SIA are illustrated in Figure 59.[156]

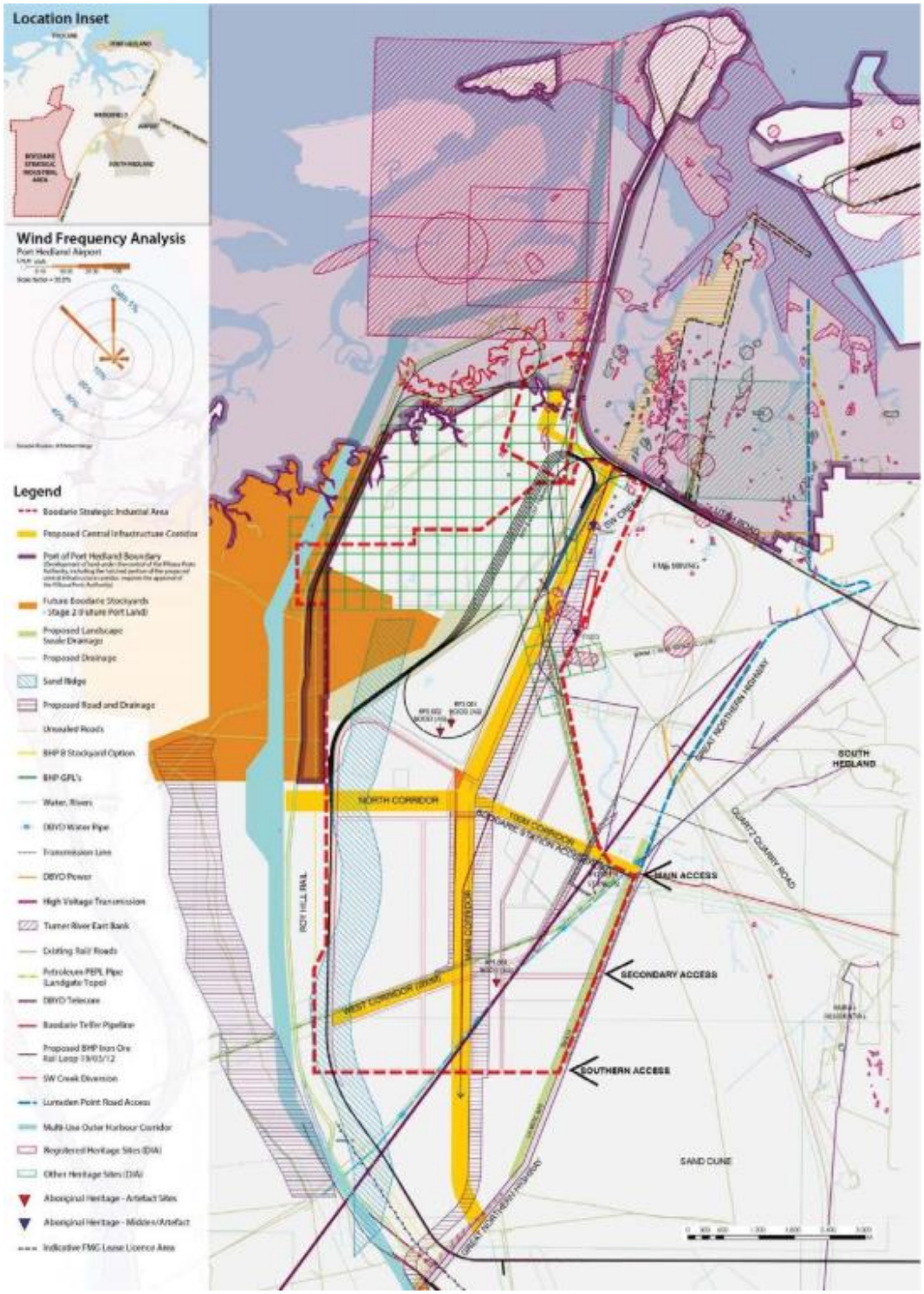


FIGURE 59 - BOODARIE SIA EXISTING AND PROPOSED INFRASTRUCTURE AND SERVICES

[156] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan

Water

An industrial ecology report,[157] assessed that, based on the anticipated industrial uses identified in Table 31, the Boodarie SIA would likely require approximately 58 giga-litres of industrial feedwater, as identified in Table 32.

TABLE 32 - BOODARIE SIA WATER DEMAND FORECAST

Water	Forecast requirement
High quality industry feedwater	21,700 ml/annum
Lower quality industry feedwater	35,800 ml/annum
Potable water	256 ml/annum

The quantity of low- and high-quality feedwater required for the industrial proponents is high and is to be provided from a combination of sources including existing and new borefields and aquifers, desalination, effluent re-use from wastewater, and possible surface water sources.

Untreated water is currently supplied to the Alinta Energy Power Station from the Water Corporation's Yule Borefield pressure main which traverses the Boodarie SIA to the Corporation's South Hedland tank site, with BHPB being directly supplied from that tank site. Existing WaterCorp infrastructure is at or near capacity, with additional supply expected to come from upgraded or new borefields and desalination. Other sources could include the de-activated Turner River Aquifer and surface water harnessing.

Low quality untreated water supply could also include sources from groundwater and desalination, as well as effluent re-use and surface water harvesting. The Water Corporation is currently investigating a non-potable scheme to supply industry in Port Hedland, and will look at all options for supply and demand from potential industry proponents.

If required by proponents, high quality potable water for future development of Boodarie, particularly for the initial development, may be supplied by either direct feed from the Water Corporation's South Hedland Tank Site or from a new tank storage facility potentially located on the higher ground to the south west of the Boodarie SIA, up from the nearby Turner River. The new storage facility would be supplied from the South Hedland Tank Site, or other alternative high quality water sources as and when established.[158]

Consideration in the structure plan has also been given to the establishment of a centrally located industry feedwater facility within the Boodarie SIA to harvest, recycle and produce water from various potential water sources for industrial use. The structure plan allocates approximately 60 hectares in the centrally located Utility Precinct (see Figure 58) for this purpose.[159]

During consultation for the structure plan, the WaterCorp advised that it is the license holder for water supply and wastewater in Port Hedland and South Hedland. The Boodarie SIA is situated partially within the current Water Services Licence Area issued by the Economic

[157] GHD (2011), LandCorp, Report for Boodarie Strategic Industrial Area – Industrial Ecology Strategy
[158] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[159] GHD (2011), LandCorp, Report for Boodarie Strategic Industrial Area – Industrial Ecology Strategy

Regulation Authority (ERA). The central and south-western portions of the BSIA are not covered by the licence area, and should Stage 1 be in this area the proponents would need to submit a formal request to WaterCorp to become the licensed water service provider, and apply to the Economic Regulation Authority (ERA) to extend the licence area.

The preferred proposal would be for water supply via a 150-to-200 millimetre reticulation size main from the vicinity of the Elevated Tank at South Hedland. A less preferable alternative would be an off-take from the bore water main, with either an elevated tank or booster pump near the first stages of development. An agreement in principle would be required from LandCorp, the Town of Port Hedland and Pilbara Cities prior to finalisation of a subdivision agreement. All proposals would need to be fully funded by the proponent.[160]

Power

APA Group currently owns and operates the existing 210 MW dual fuel (gas and distillate) Port Hedland Power Station, which supplies customers in the Port Hedland region. The power station consists of five 42 MW units, of which two are located within the Boodarie SIA, and three at the Port Hedland Power Station. A proposal to add an additional 60 megawatts of natural gas fired generation, together with an option for a 40-megawatt renewable supplied battery energy storage system is currently undergoing assessment by the Environmental Protection Authority of WA (EPA).[161]

Depending upon timing of demand, distribution is expected to consist of a network of high voltage feeders and substations, with reticulation networks supplying individual industries or clusters of lots. To supply the initial stages of development, Horizon Power indicates that a new 33MVA 66/22kV transformer and switchboard would be required to support the load connection at the Wedgefield Sub Station.[162]

Irrespective of the outcome of the EPA assessment, the existing power generation capacity will be insufficient to supply the electricity load requirements of the SIA at full development. The industrial ecology report estimated that the energy requirements of the Boodarie SIA at full capacity would likely require approximately 1,120 megawatts of power generation, as summarised in Table 33.[163]

TABLE 33 - ESTIMATED ELECTRICITY DEMAND - BOODARIE SIA

Power	Demand forecasts
Heavy use industry[164]	1,166 MW
General and noxious industry	42 MW

A land parcel of approximately 60 hectares was identified within the Utility Precinct (collocated with the industry feedwater facility) for the development of a centralised energy facility that could produce electricity, steam, and chilled or hot air to serve projects in its

[160] Urbis for JTSI and LandCorp (2017), Boodarie Strategic Industrial Area - Structure Plan
[161] EPA, Port Hedland Power Station Expansion, Extract of Determination, 13 September 2021
[162] Urbis for JTSI and LandCorp (2017), Boodarie Strategic Industrial Area - Structure Plan
[163] GHD (2011), LandCorp, Report for Boodarie Strategic Industrial Area – Industrial Ecology Strategy
[164] Average estimated capacity requirement per proponent is estimated at 39 MW

proximity. The recommendations include allowances for various fuel sources, including gas, coal, renewables and industrial waste heat. [165]

Natural Gas

The Boodarie SIA is connected to the APA Group Pilbara Pipeline System (PPS), which currently transports gas to BHP and the Pilbara Power Station situated within the SIA, as illustrated in Figure 60.[166]

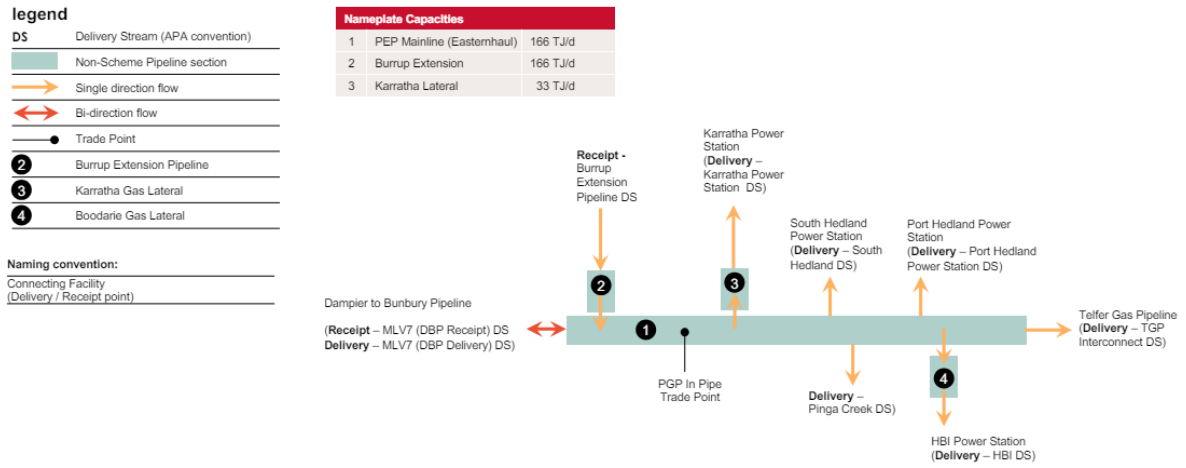


FIGURE 60 - PILBARA PIPELINE SYSTEM

Proponents are required to liaise with APA Group to determine individual gas requirements and servicing if required.

However, the PPS currently has insufficient uncontracted capacity to satisfy the estimated gas supply requirements for an average heavy industry of 14.2 petajoules annually.[167] As of May 2024, total uncontracted gas capacity on the PPS amounted to 72,500 gigajoules (approximately 2.34 terajoules per day), while an average heavy industry user is noted as requiring approximately 38.9 terajoules per day, based on the original modelled fuel mix assumptions.[168]

The entirety of the PPS infrastructure supports a maximum nameplate capacity of 166 terajoules per day. The industrial ecology report for the Boodarie SIA,[169] identifies an annual gas requirement of 410,000 terajoules per annum at full development capacity, which equates to approximately 1,178 terajoules per day.

Telecommunications

There is an optic fibre cable installed to the former BHP Hot Briquetted Iron plant and Port Hedland Power Station. Telstra would require a site for an exchange and possibly further sites

[165] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[166] APA Group (2024), *Pilbara Energy Pipeline*, January 2024
[167] Based on the current reported PPS uncontracted capacity of ~1.047 petajoules in the forthcoming year
[168] GHD (2011), LandCorp, Report for Boodarie Strategic Industrial Area – Industrial Ecology Strategy
[169] GHD (2011), LandCorp, Report for Boodarie Strategic Industrial Area – Industrial Ecology Strategy

for mobile phone towers for SIA development to occur. Reticulation through the SIA would be undertaken through standard pit and pipe networks.[170]

Road Infrastructure

The main access road to the Boodarie SIA is currently the Boodarie Station Access Road. Predominantly unsealed, a small portion of the access road has been sealed near the Great Northern Highway.

Figure 59 sets out the proposed infrastructure corridors to enable development of the Boodarie SIA, which include a central corridor 'spine' leading to the Port, with an additional connection to the proposed multi-user outer harbour (MUOH) corridor outside of the Boodarie SIA. A further two connections between the main corridor of the SIA and the proposed MUOH corridor to the west, allow for changes in direction and transfer stations for the movement of construction materials and goods.

A nominal width of 30 to 40 metres was proposed for road and service corridors to allow for the transportation of industrial plant pre-assembled modules (PAMs), with additional easements to allow for the construction of pipelines, conveyors or transmission lines to facilitate the movement of materials and energy.

Rail Infrastructure

There is currently no shared rail infrastructure connecting the Boodarie SIA to the Port of Port Hedland. Rail infrastructure owned by Roy Hill and Fortescue Metals Group traverses or sits adjacent to portions of the SIA, as well as a planned, but not constructed, BHP rail loop.

Port Capacity and Access

In terms of priority, direct and efficient access to the Port will be a prime objective of many developers with import and/or export requirements. A direct connection is more economical to construct and allows more efficient and effective cargo movements.

The most direct Port access is via the proposed central infrastructure corridor with secondary and less direct connection being provided by a road link to the east to Lumsden Point berths. Infrastructure corridor connections are also provided on an east-west alignment connecting the central corridor within the Boodarie SIA and the outer harbour infrastructure corridor to the west.[171]

The assumptions for prospective industry port users identified in the Boodarie structure plan include those with the following needs:

- typically utilise Panamax size ships or smaller for the majority of trade;
- are not tidally constrained as for iron ore vessels;
- are engaged in bulk liquid and dry bulk trade;
- require dedicated berths to maintain their supply chain reliability and throughput; and
- will have direct linkage via the corridor to the industrial estate.

Based on the assessment,[172] the multi-user berth requirements to support the SIA include three to four berths, including one bulk liquids berth, two dry bulk berths and one heavy load out

[170] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[171] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan
[172] GHD (2011), LandCorp, Report for Boodarie Strategic Industrial Area – Industrial Ecology Strategy

facility to meet PAM requirements. A special purpose mooring or berth for bulk liquid feedstock may also be required.

Given the magnitude of the iron ore industry in the Pilbara region, berth availability is limited within Port Hedland. The original intent was that up to four berths would be made available within South West Creek for Boodarie SIA use, including the export of product and import of feedstock.

The significant growth in the iron ore export potential within the Pilbara region has seen this allocated capacity reduced to two berths and the need for outer harbour capacity to supplement this need:[173]

- Future berths AP6 and AP7 at Anderson Point have been identified for the use of BSIA. This berth capacity is necessary in order to allow throughput for products destined for and originating for the BSIA. It is also important that the land backing and supporting these berths to accommodate corridor alignments and berth approaches also be secured to support the product handling and module load out requirements.

- Boodarie SIA Near Shore Harbour – While bulk products can be handled on exposed offshore berths in the outer harbour, PPA has considered protected harbour basin solutions as many unit cargoes and bulk liquids may require a more protected berth than what is available in exposed conditions.

- The PPA Master Plan identifies the development of a Near Shore Harbour for BSIA in the Outer Harbour. Berths at this harbour would be for liquid bulk, break bulk/container and liquefied gas and other dangerous cargoes. It should be noted that the BSIA Near Shore Harbour would require significant funding to develop and may be difficult to justify in a Phase 1 development for smaller projects. As such, whilst its development possibility must be secured to align with the full development potential of the Boodarie SIA, any first proponent who might also be required to develop other enabling infrastructure might benefit from an inner harbour berth where development costs for Port facilities might help shed some of the establishment costs at the Boodarie SIA. This further reinforces the need to ensure that berths AP6 and AP7 are reserved for the use of Boodarie SIA, and in parallel secure the proposed outer harbour to secure the future development potential.

- Lumsden Point – This location was investigated as a potential option for the transport of modules to the Boodarie SIA. The proposal is that modules of the scale of up to 5,000 tonnes may need to be moved from a berth to the Boodarie SIA. This places significant constraints on the alignment and grade of the proposed haul road alignment. In fact, the preference to keep such large packages outside of general public traffic and the complexity of moving such large items over long distances on public roads including Great Northern Highway limits the applicability of Lumsden Point to bulk construction materials and pieces of smaller size.

Berths AP6 and AP7 at Anderson Point are considered to be the best workable solution for large module transport working with a Lumsden facility for the bulk of other construction materials. The two facilities will work hand in hand to support the construction effort and volumes of materials to be moved. It should also be noted that the facilities at Berth AP6 and AP7 would best be considered as a versatile design which can support module load out along

[173] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan

with product handling. The configuration of the materials handling on the berths was not considered in detail.[174]

Environment and Heritage

Native Title

The Kariyarra People WAD6169/1998 is the registered native title claimants for the area in which the Boodarie SIA is located. Under the *Native Title Act 1993* (Cth), any proponents (government or non-government) are obliged to engage the Kariyarra in any consultations and negotiations that could affect their native title rights and interests. The Kariyarra People must be involved in discussions relating to proposed activities within the Boodarie SIA.

4.3.4. Burrup

The Burrup SIA is a well-established strategic industrial estate in the Pilbara, with land available for the natural gas or petroleum processing and related value-add industries. Existing proponents include North West Shelf Joint Venture, Woodside Energy's Pluto LNG Plant, Yara Fertiliser Plant and Yara Nitrates Plant.

Location and Tenure

The Burrup SIA is located on the Burrup Penninsula, approximately 10 kilometres from Dampier, and 20 kilometres north-west of Karratha. The Dampier Cargo and Material Offloading facility and Bulk Liquids Berth are adjacent to the SIA and connected by the Burrup Service Corridor as illustrated in Figure 61.[175]

[174] URBIS for the Department of Jobs, Tourism, Science and Industry and LandCorp (2017), Boodarie Strategic Industrial Area Structure Plan

[175] Development WA/Industrial Land Authority (2023), *Burrup SIA MNG Map*, WA State Government, June 2023

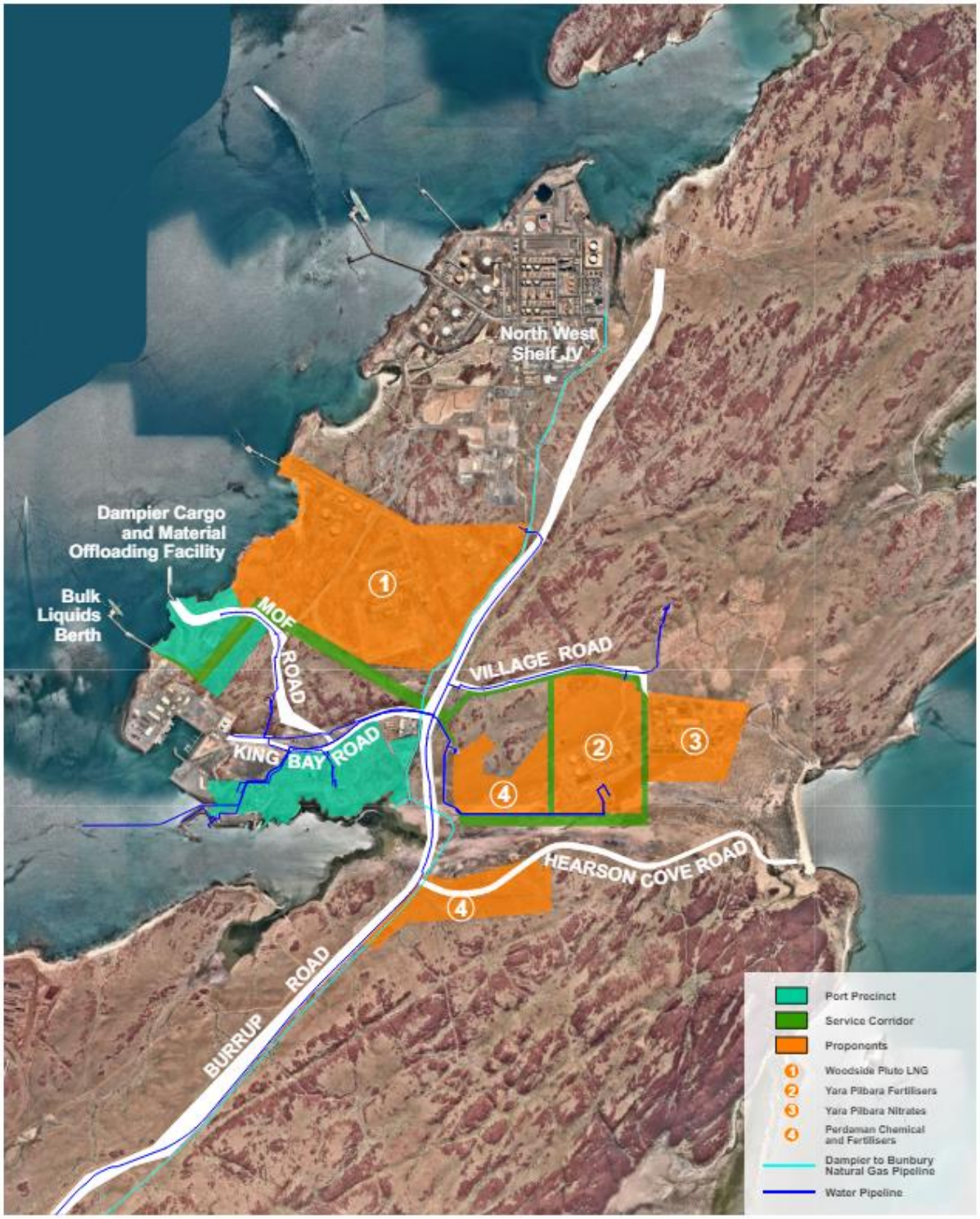


FIGURE 61 - BURRUP STRATEGIC INDUSTRIAL AREA

Planning

The Burrup SIA is located within the City of Karratha and under the City's Town Planning Scheme No. 8, the SIA is zoned 'Strategic Industry', with the following development objectives:[176]

[176] Department of Planning, Lands and Heritage (2000), Local Planning Scheme No. 8, Updated in 2020

- optimises the effectiveness of the zone as a strategic industrial area and utilises major infrastructure, creates symbiosis with other industries or includes resource processing industry;
- is significant to the regional and/or state economies;
- provides goods and services which directly support or complement industries described in a) and b) above; and
- minimises or offsets impacts on local infrastructure, economic and community development.

Land availability/occupancy

As of January 2021, there were 120 hectares remaining across two sites available for development, with three sites under option to lease by proponents.

Outside of the above, the Burrup SIA is increasingly limited for development due to the presence of significant ancient Murujuga rock art.[177]

Infrastructure and Services

Water

Water Corporation's Burrup Seawater Supply Scheme is a common user industrial water supply scheme located within the Burrup SIA. The scheme has been in operation since 2005, continuously providing seawater for cooling purposes to industrial developments and discharging brine and wastewater from the same industrial developments to the King Bay marine environment. The current scheme comprises the following infrastructure:[178]

- seawater intake system, including pumps in caissons, located on a jetty in King Bay;
- 4.5 kilometres of DN1400 seawater supply pipeline from the jetty to Yara Pilbara Fertilisers;
- 2 megalitre seawater surge tank located at the Three Sisters site;
- 2 megalitre brine break tank in the King Bay industrial estate;
- DN1100 brine return pipeline to the brine tank site;
- 450 metres of DN1000 outfall pipe with associated ocean outlet diffuser system in King Bay; and
- 33-kilovolt line.

The scheme is approved to provide up to 280 megalitres per day of seawater and discharge up to 208 megalitres per day of brine or wastewater. Water Corporation supplies seawater to Yara Pilbara Fertilisers for its own desalination plant and then discharges into the brine return line. Woodside Energy Pluto LNG discharges wastewater into the brine return line. The wastewater from commercial customers is delivered via the respective customer connections to the brine return line back to the brine tank in the King Bay industrial estate, with the combined effluent of brine and wastewater then discharged via the outflow pipe and a series of 28 duckbill diffusers into King Bay. The diffuser system is located in 5 to 7 metres of water (Mean Sea Level).

The recently approved Perdaman Urea Project is anticipated to add a further 83 megalitres per day of seawater, and 60 megalitres per day of wastewater discharge to the current scheme, with no increase of water supply or discharge required to connect the project.

[177] Development WA (2021), Industrial Lands Steering Committee, 10 Year Industrial Land Strategy
[178] Environmental Protection Authority (2023), Burrup Peninsula Seawater Supply Scheme Upgrade, Referral Summary

A project is currently under EPA assessment to upgrade the existing Burrup Seawater Supply Scheme, shown below in Figure 62,[179] to include new infrastructure and upgrades to enable the addition of this project, with proposed works including

- jetty extension;
- qadditional pumps at the jetty location to upgrade the pump station;
- duplication of a section of the seawater supply main to improve operational safety;
- additional seawater storage located at the existing seawater supply tank site;
- addition of new customer connection points; and
- upgrade of electrical supply and distribution infrastructure.

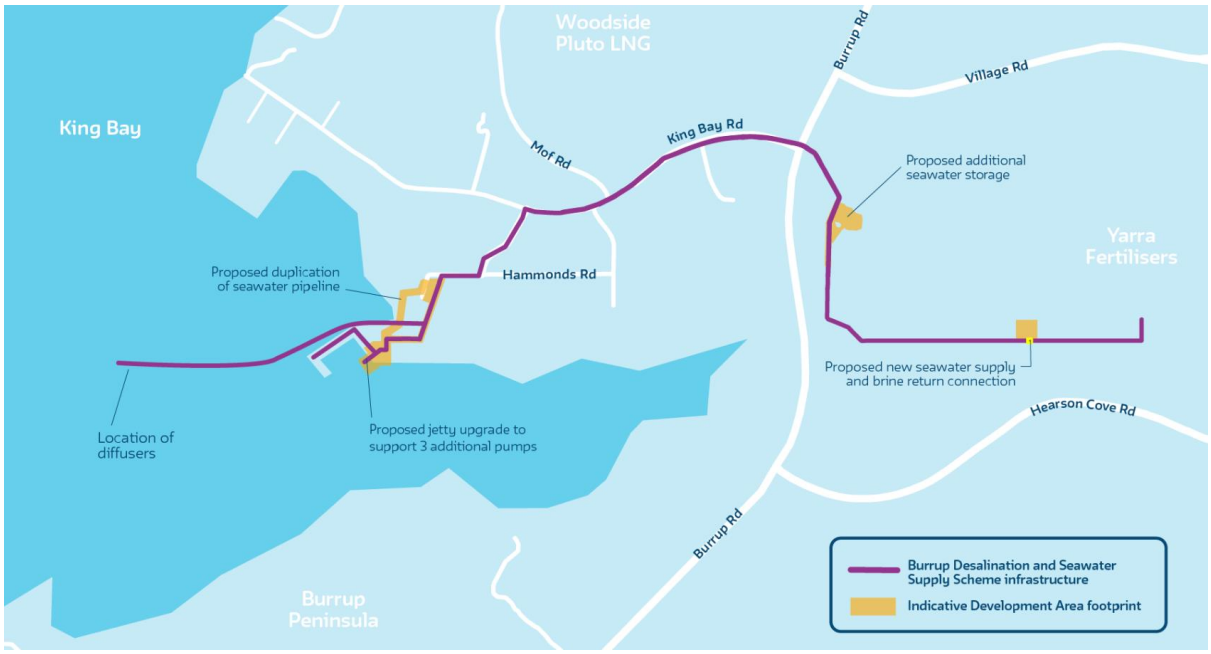


FIGURE 62 - BURRUP DESALINATION AND SEAWATER SUPPLY SCHEME

Water pipeline infrastructure traverses the SIA, with individual proponents required to negotiate access to supply their allocated site.

Power

The Burrup SIA is not currently connected via transmission infrastructure to the North West Interconnected System (NWIS). In 2022, Horizon Power submitted a proposal to the Environmental Protection Authority to expand the NWIS electricity network, by constructing an approximate 7 kilometre long 132 kilovolt overhead transmission line between the existing Dampier substation and the Burrup SIA.

The project will provide common user transmission infrastructure, owned and operated by Horizon Power, a new Burrup substation and the expansion of the connecting Dampier substation. Upon completion the project will be incorporated into the NWIS, and will provide opportunities for tenants on the Burrup to access the higher efficiency generation portfolio, including proposed renewable energy resources available on the NWIS.[180] Industry

[179] Water Corporation, *Planned Works associated with the Burrup Seawater Supply Scheme upgrade,* https://www.watercorporation.com.au/Outages-and-works/Ongoing-Works/Burrup-Seawater-Supply-Scheme-upgrade, website accessed July 2024
[180] Horizon Power (2022), Burrup Common User Transmission Infrastructure, EP Act Section 38 Referral Supporting Document

commentary suggests that current site users are also currently investigating 'behind the meter' renewable installations within their current footprint.

Natural Gas

Gas is supplied to the SIA via the DBNGP, which traverses the SIA, with individual proponents required to negotiate access supply to their allocated site.

Telecommunications

Telstra telecommunications infrastructure exists in the region and traverses the site.

Road Infrastructure

Access to the Burrup SIA is via Burrup Road, with existing road infrastructure and Burrup service corridor connecting proponents to the Burrup SIA port precinct and Dampier Highway.

Rail Infrastructure

There is no existing rail infrastructure at the Burrup SIA.

Port access

The Dampier Cargo and Material Offloading facility and Bulk Liquids Berth are adjacent to the SIA and connected by the Burrup Service Corridor as illustrated in Figure 61. The port is predominantly utilised for the export of iron ore, LNG, salt and condensate.[181]

Environment and Heritage

Native Title

The Burrup SIA is situated on the lands of the Ngarluma Yindjibarndi, Wong-Goo-Tt-Oo and Yaburra people. National Heritage Listing applies to significant parts of the Burrup Peninsula, as illustrated in Figure 63.[182]

In 2002, the WA State Government entered into the *Burrup and Maitland Industrial Estates Agreement Implementation Deed* (the Burrup Agreement) with the three native title claimant groups on the Burrup Peninsula: the Wong-Goo-Tt-Oo, Ngarluma Yindjibarndi and the Yaburara Mardudhunera peoples.

[181] Pilbara Ports, Port of Dampier Fact Sheet

[182] Department of Climate Change, Energy, The Environment and Water, Dampier Archipelago (including Burrup Peninsula), National Heritage List, Commonwealth Government

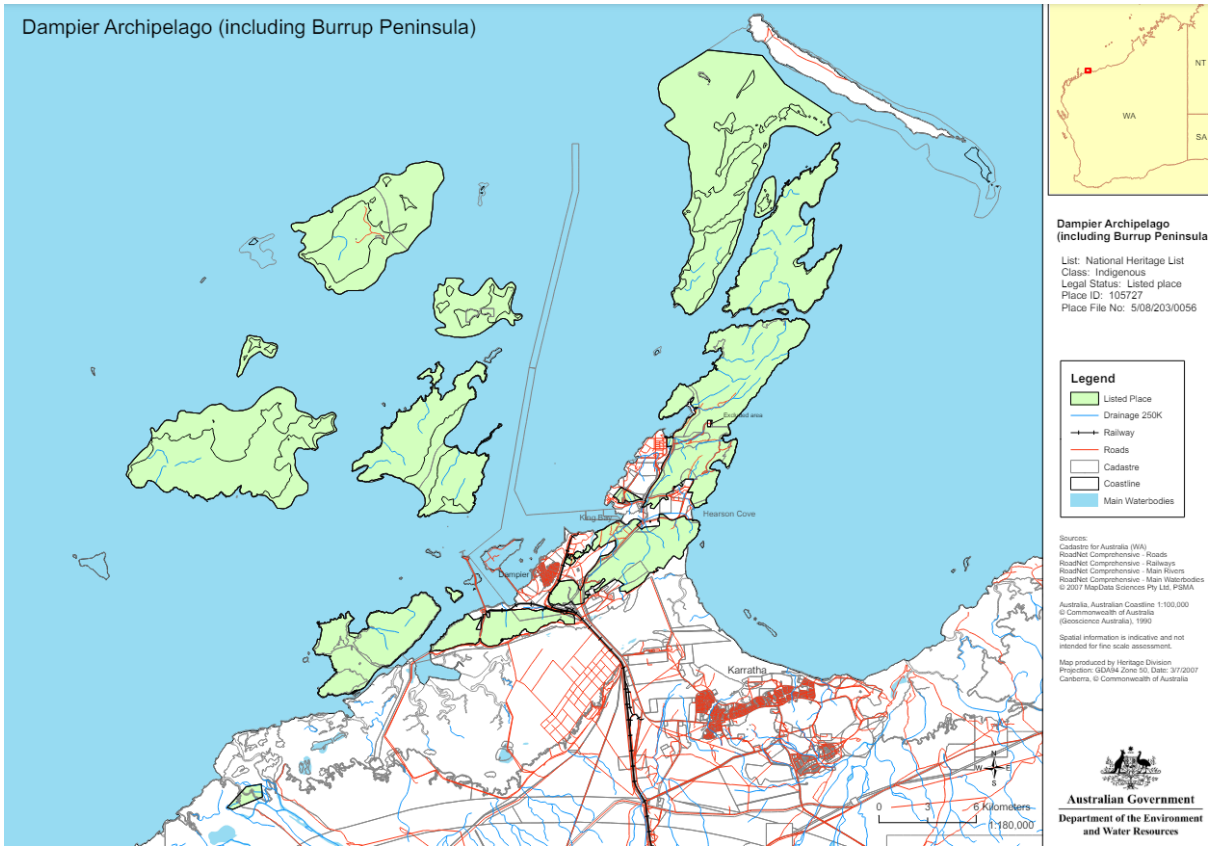


FIGURE 63 - FIRST NATIONS HERITAGE LISTED AREAS - BURRUP PENINSULA

4.3.5. Maitland

The Maitland SIA is a strategic industrial development comprising 2,500 hectares of strategic industry-zoned land identified for the uses of supporting gas or petroleum processing, power production and other associated processing such as urea, ammonia and ammonium nitrate, salt and iron ore.

Energy Developments Limited is the only proponent currently located in the Maitland SIA.[183] Other approved proponents include Fortescue Future Industries, Yara International, Hexagon and Perdaman Chemicals and Fertiliser. The projects approved for land allocations in Maitland will produce hydrogen and ammonia, and generate renewable power, and are proposed to progress the decarbonisation of industrial activities on the Burrup Peninsula.[184]

Location and Tenure

The Maitland SIA is situated approximately 24 kilometres west of the Karratha township, and 39 kilometres south of Dampier Port.

The SIA is proposed to connect with the Dampier Port via a 35-kilometre planned service corridor, which has become physically constrained due to the significance of rock art on the Burrup Peninsula and the proliferation of infrastructure and State Agreement tenure across the Burrup Causeway.

[183] Development WA (2021), Industrial Lands Steering Committee, 10 Year Industrial Land Strategy
[184] WA Government (2023), Media Statements, Land allocation approvals for green industrial precinct in the Pilbara, 15 May 2023

Figure 64,[185] illustrates the contextual location of the Maitland SIA relative to other key industrial infrastructure such as the Dampier Port and Burrup SIA.

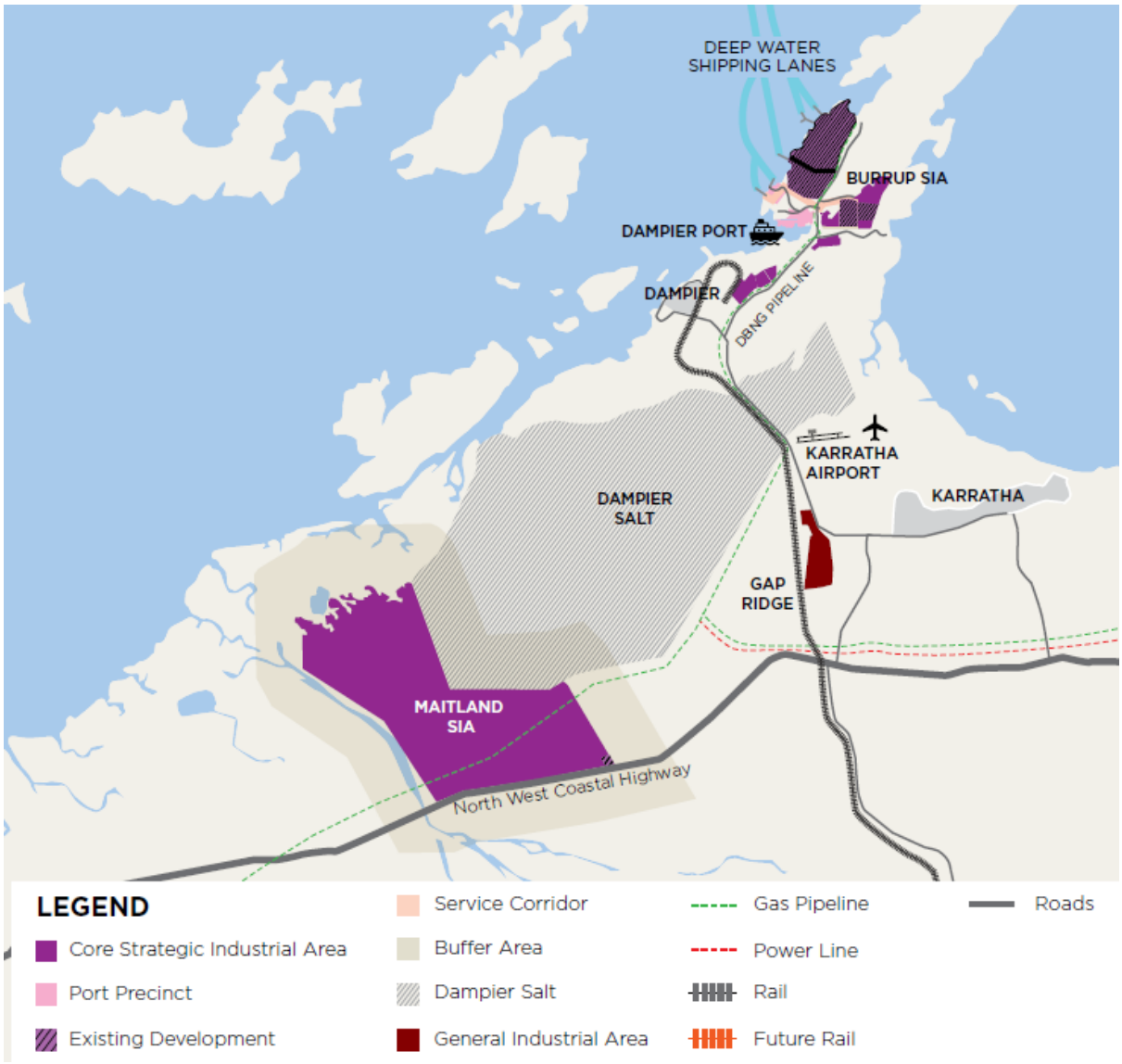


FIGURE 64 - MAITLAND SIA CONTEXTUAL LOCATION

Planning

The Maitland SIA is located within the boundaries of the City of Karratha, whereby under the City's Planning Scheme No. 8, the Maitland SIA is zoned 'Strategic Industry' permitting the development of heavy / strategic industries.

A 2 kilometre 'Special Control Area' surrounds the Maitland SIA core area, acting as a buffer to ensure incompatible land uses do not hinder the development of heavy industries on the estate. The town planning scheme sets out the following development objectives for the Maitland SIA:[186]

[185] Adapted from Development WA/Industrial Land Authority (2019), *Karratha SIA Mud Map*, October 2019, WA State Government
[186] Department of Planning, Lands and Heritage (2000), Local Planning Scheme No. 8, Updated in 2020

a) Protect the access and environmental assets of Miaree Pool from the impacts of surrounding land uses.
b) Facilitate the development of the Maitland Precinct as a strategic industry estate which;
    i. allows the efficient and effective processing of primary resources,
    ii. allows for the development of land uses compatible with and not restrictive to future development of strategic industry,
    iii. does not compromise the lifestyle and tourist assets of the City,
    iv. and has due regard to the environmental and heritage values of the area.
c) Accommodate the development of additional port facilities, including public wharf facilities.

An Improvement Plan / Improvement Scheme is underway to guide development within the Maitland SIA and provide more certainty with regard to proponent project approvals.

Land availability/occupancy

The majority of land in the Maitland SIA remains undeveloped and a substantial portion of the SIA remains unallocated. The estate requires the establishment of infrastructure corridors, the resolution of Native title and pastoral lease interests across the strategic industry zone, service corridor and industry protection zone in order to be project ready.

Infrastructure and Services

Water

The Maitland SIA is currently un-serviced and requires development of process and wastewater infrastructure. The Water Corporation West Pilbara Scheme supplies the town of Dampier with potable water, however there is no intention to develop a connection to the Maitland SIA.

Power

The Maitland SIA is currently un-serviced by power generation and transmission infrastructure. A proposal is currently under consideration by the EPA to construct 132 kilovolt transmission lines from Maitland SIA to the Karratha terminal to enable its connection to the NWIS.[187]

Natural Gas

The Maitland SIA is traversed by the DBNGP and services the EDL mini-LNG gaps plant situated within the SIA, with individual proponents required to negotiate access supply to their allocated site.

Telecommunications

The Maitland SIA is situated within existing Telstra telecommunications infrastructure.

Road Infrastructure

The North West Coastal Highway is aligned to the southern boundary of the SIA, however an SIA access road and intersection has yet to be developed with North West Coastal Highway.

Rail Infrastructure

There is currently no rail infrastructure servicing the Maitland SIA.

[187] Horizon Power (2022), Burrup Common User Transmission Infrastructure, EP Act Section 38 Referral Supporting Document

Port Access

As an effectively land-locked SIA, the Maitland SIA does not have immediate access to a maritime port. The SIA is proposed to connect with the Dampier Port via a 35-kilometre planned service corridor, which has become physically constrained due to the significance of rock art on the Burrup Peninsula and the proliferation of infrastructure and State Agreement tenure across the Burrup Causeway.

Environment and Heritage

Native Title

The Maitland SIA is situated within the lands of the Ngarluma people.

Native title and pastoral lease tenure are required to be resolved across the strategic industry zone, service corridor and industry protection zone with Registered Native Title Body Corporate, Ngarluma Aboriginal Corporation (NAC).

4.4. Kimberley

4.4.1. Browse SIA

Gazetted much later than the other SIAs, the Browse SIA was established in 2010 to support the Western Australian Government and Woodsides proposal to develop a LNG plant, supply base, export terminal and other infrastructure to support the development of the offshore Browse Basin. In its design, the Browse SIA was intended to accommodate a minimum of two, and up to a maximum of four proponents for a maximum LNG production capacity of up to 50 million tonnes per year.

Following a decision not to proceed with the development of LNG facilities at the Browse SIA and a shift in development concept for the Browse Field whereby it is proposed that production gas be piped south to the North West Shelf, the development of LNG facilities at the Browse SIA is no longer contemplated.

Location and Tenure

The Browse SIA is located approximately 60 kilometres north of Broome, as illustrated in Figure 65.[188] The majority of the Browse SIA is Crown land and is leased to Development WA. When the land is required, it will be sub-leased to proponents. The port area has been vested with the Kimberley Port Authority and proponents will require a separate lease for this area.

Land availability/occupancy

The Browse SIA is currently undeveloped and there are no proponents either on site or under application.

[188] Adapted from Development WA/Industrial Land Authority (2019), *Browse LNG Precinct*, December 2019, WA State Government

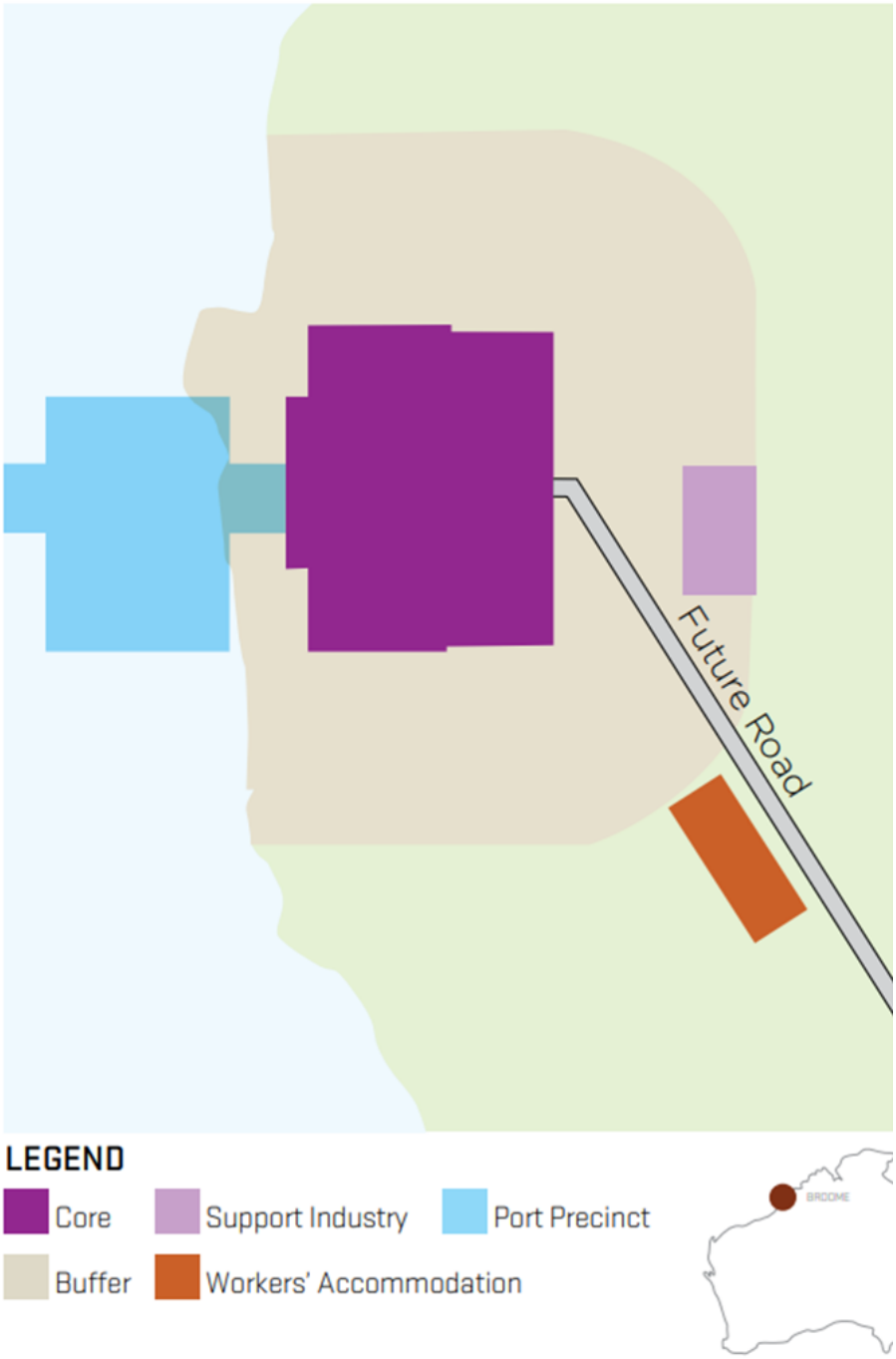


FIGURE 65 - BROWSE SIA CONTEXTUAL LOCATION

Planning

The Browse SIA is located within the boundaries of the Shire of Broome and is currently subject to an Interim Development Order. The Western Australian Planning Commission has initiated an Improvement Plan over the precinct, which requires the preparation of an Improvement Scheme to control development. The Improvement Scheme is currently being prepared.

The area allocated to a port is under the administration of the Kimberley Ports Authority.

Infrastructure and Services

Land assembly is largely complete but there is no infrastructure as the proponents for which the SIA was intended are pursuing other development opportunities. Until further demand for the SIA is identified or approved uses widened, there is no need for further approvals or physical infrastructure.[189]

Environment and Heritage

Native Title

The Browse SIA is situated on the lands of the Goolarabooloo Jabirr Jabirr People and is subject to the Browse LNG Precinct Project Agreement. The agreement area covers approximately 2,500 hectares of unallocated Crown land in the Browse Basin, which is located approximately 425 kilometres off the Kimberley Coast, 60 kilometres north of Broome.

Port Access

A planned deep water port is situated directly adjacent to the Browse SIA.

4.5. MidWest

4.5.1. Oakajee

Initially intended to support an emerging iron ore and magnetite industry in the Mid West, the yet to be developed Oakajee SIA has been a key focus of several Western Australian Governments. Broadly, the suggested focus of the SIA is to create a new heavy industrial area and multi-user deep water port for strategic export-oriented activities, such as magnetite iron ore, value-add processing industries and, more recently, renewable hydrogen export through the future Oakajee Port, as well as supporting industry such as energy generation.

The Oakajee Project comprises a total of 6,400ha in greenfields area, comprising a 1,134-hectare Strategic Industrial Area core, a 4,070 hectare buffer, 196 hectares of planned general industrial areas, and connected to the future 1,000 hectare Oakajee Port via planned infrastructure corridors.

There are no proponents currently occupying the site, however BP, Fortescue Future Industries, Copenhagen Infrastructure Partners, Green LOHC, Kinara Power and Blue Diamond Australia have been allocated land in the SIA.

Location and Tenure

The Oakajee SIA, shown below in Figure 66,[190] is situated approximately 23 kilometres north of Geraldton, and approximately 420 kilometres north of Perth. Partly as a result of its start-stop nature, all of the Oakajee SIA has been converted to freehold and vested with Development WA, despite the absence of any active developers on the SIA.

[189] Development WA (2021), Industrial Lands Steering Committee, 10 Year Industrial Land Strategy
[190] RPS Environment and Planning/Landgate (2012), *Oakajee Industrial Estate Structure Plan,* available Development WA/Industrial Land Authority

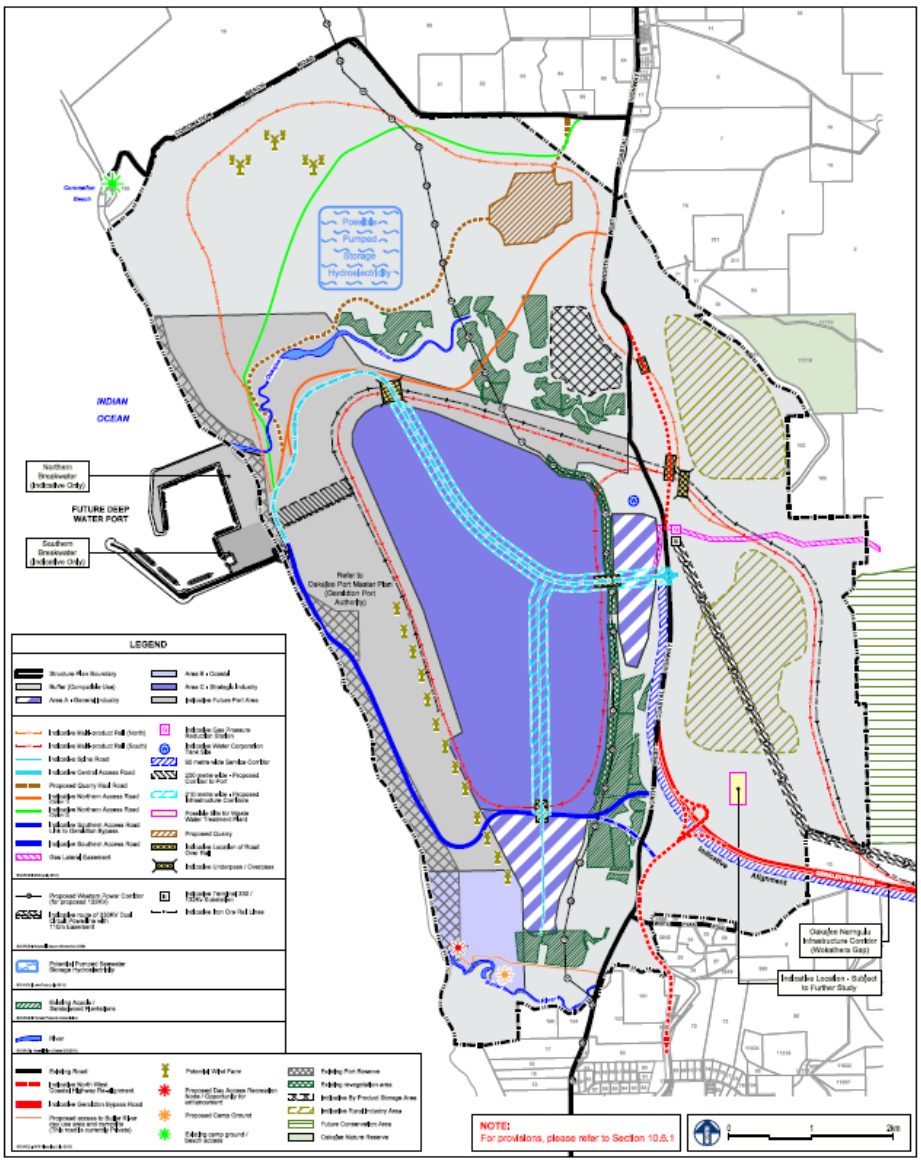


FIGURE 66 - OAKAJEE STRATEGIC INDUSTRIAL AREA

Planning

The Oakajee SIA is located within the boundaries of the Shire of Chapman Valley, under whose Town Planning Scheme No.3, the Oakajee SIA is zoned for Strategic Industry with a Special Control Area (buffer) which prevents the development of sensitive uses.

The Oakajee Industrial Estate Structure Plan Report was approved by the Western Australian Planning Commission on 24 April 2012 and provides future development guidance for the Oakajee SIA. The Structure Plan includes the following Technical Reports:

- Sustainability Report
- Industrial Ecology Report
- Environmental Review Report
- District Water Management Strategy
- Engineering Services Report
- Landscape Report
- Aboriginal Heritage Management Plan Part 1 to 3
- European Heritage Reports Geraldton Northhampton Rail Reserve

- Documentation of places for entry in the register of heritage places – Lime Kilns Howatharra
- Documentation of places for entry in the register of heritage places – Stone Dwelling Howatharra

Land availability/occupancy

While land has been allocated to six proponents, the SIA is currently undeveloped and un-serviced.

Infrastructure and Services

Water

There is no existing water connection. Potable water will likely require infrastructure to connect to the Brown Lane tanks at White Peak. Industrial process water is likely to require the establishment of a seawater desalination plant and wastewater treatment plant, proposed to be located in the SIA buffer.

Power

The existing 33 KV SWIS transmission line to Northampton does not have sufficient capacity to provide power to the SIA. A new 330 KV transmission line would be required to connect to the SWIS. There are currently no on-site electricity generation facilities at the Oakajee SIA.

Gas

There is no existing gas service to the site. An existing easement provides for a future gas lateral from the Dampier to Bunbury Natural Gas Pipeline located approximately 52 kilometres east.

Telecommunications

Telstra is the major telecommunications provider in the Midwest, however there is no existing telecommunications infrastructure within the SIA infrastructure corridor. A fibre optic cable runs in proximity to the SIA, alongside the North West Coastal Highway.

Road Infrastructure

The North West Coastal Highway, which forms part of the coastal link between Perth and the major regional centres traverses the SIA and provides the only viable access route to the Oakajee SIA. The Oakajee Narngulu Infrastructure Corridor has yet to be developed.[191]

Rail Infrastructure

There is no existing rail infrastructure in the vicinity of the Oakajee SIA and Port Precinct. The area was designed primarily for iron ore export proponents that were anticipated to develop the necessary rail infrastructure. However, the proposed rail connecting the mines to a car dumper at the western boundary of the SIA, together with rail maintenance facilities on the northern boundary has not proceeded to date.[192] Figure 67 illustrates the integrated transport network plan that was proposed to provide road and rail connectivity to the Oakajee SIA.[193]

[191] GHD for Landcorp (2012), Oakajee Industrial Estate Structure Plan, Integrated Transport Strategy
[192] GHD for Landcorp (2012), Oakajee Industrial Estate Structure Plan, Integrated Transport Strategy
[193] GHD for Landcorp (2012), Oakajee Industrial Estate Structure Plan, Integrated Transport Strategy

FIGURE 67 - OAKAJEE STRATEGIC TRANSPORT NETWORK PLAN

Environment and Heritage

Native Title

The Oakajee SIA is situated on the lands of the Yamatji People. Native title has been extinguished over the majority of the land within the Oakajee SIA due to its historical alienation as freehold land from the Crown estate. DevelopmentWA has recently agreed native title obligations over part of the Oakajee SIA in the Government's Yamatji Nation Indigenous Land Use Agreement.

Port Access

The planned Oakajee Port has yet to be developed. Under current plans, once constructed, the port facilities are anticipated to accommodate Capesize vessels, with two berths facilitating a start up capacity of 45 million tonnes per annum expanding up to 70 million tonnes per annum of iron ore in the first stage of development, with a third berth planned over the longer term to increase capacity to 105 million tonnes per annum. The planned layout also includes tug pens and a small craft harbour, with a southern breakwater development and reclaim area.[194]

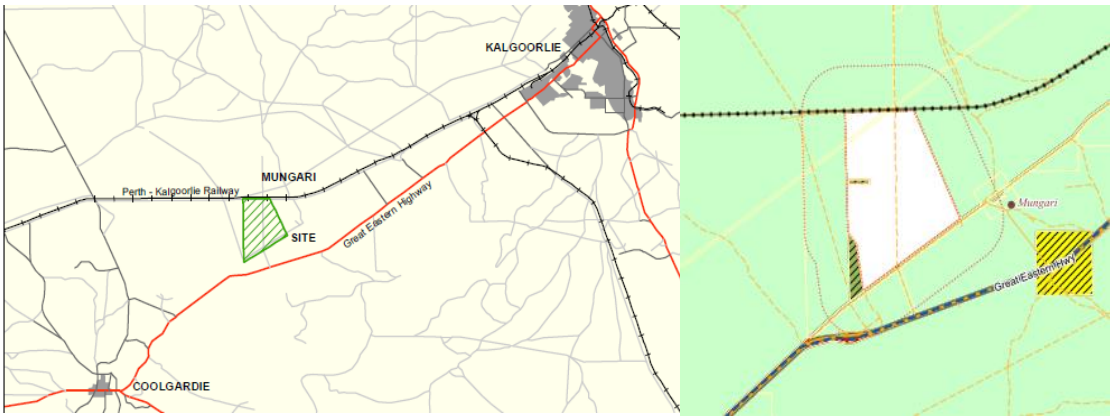
4.6. Goldfields

4.6.1. Mungari

The Mungari Strategic Industrial Area is an un-serviced 696 hectare parcel of industrial land, designed to support the heavy, strategic and value-add processing opportunities such as concentrating, smelting and refining resources such as nickel, lithium and gold, while accommodating other strategic industries.

Location and Tenure

The Mungari SIA is situated on Great Eastern Highway, approximately 26 kilometres south-west of Kalgoorlie, and 13 kilometres north-east of Coolgardie in the Goldfields region. The site is surrounded by a 1-kilometre buffer of unallocated Crown Land that is intended to accommodate renewable energy and other 'non-heavy' industries. Figure 68,[195] illustrates the contextual location of the Mungari SIA.



[194] Midwest Ports (2011), Oakajee Port Master Plan
[195] Australian Venture Consultants (2023), *Mungari Infrastructure Extract,* Shire of Coolgardie

FIGURE 68 - MUNGARI SIA

Planning

The Mungari SIA is situated withing the Shire of Coolgardie, and is zoned 'Special Use' under the Shire of Coolgardie Local Planning Scheme. The buffer is zoned 'Special Control Area' under the Shire of Coolgardie's Town Planning Scheme.

Land availability/occupancy

There are no existing proponents at the Mungari SIA.

Infrastructure and Services

Water

The main supply of potable water to the City of Kalgoorlie-Boulder, Coolgardie, Kambalda and Norseman is the Goldfields and Agricultural Water Supply Scheme (GAWS), illustrated in Figure 69,[196] below overleaf, also known as the C.Y. O'Connor Pipeline. GAWS sources water from Mundaring Weir just east of Perth which is charged by run-off from the Mundaring Weir Catchment Area, as well as from the Kwinana Seawater Desalination Plant. For parts of the Region not serviced by GAWS, locally sourced groundwater is the principal supply.

The Water Corporation-owned Mundaring-Kalgoorlie Pipeline crosses under the Mungari Industrial Park Road at its northern terminus, approximately 1.2 kilometres from Great Eastern Highway. Generally, this potable water pipe is a 750-millimetre diameter steel pipeline, with the section under the road upgraded to a 900 millimetre diameter pipeline.

There is currently no water connection to the Mungari SIA and the SIA does not fall within a proposed Water Corporation water reticulation service area.

Preliminary studies indicate that the activation of the Mungari SIA would require access to an estimated 2,500 megalitres to 3,300 megalitres of industrial process water per annum.[197]

The C.Y. O'Connor Pipeline does not have adequate uncommitted capacity to deliver the required volume of water. It is likely that significant augmentation or duplication of the existing pipeline would be required, together with process water recycling infrastructure.

[196] *Figure 6: Overview map of the Goldfields and Agricultural Water Region* in Water Corporation (2023), *Drinking Water Quality Annual Report,* July 2023, WA State Government
[197] Derived: Australian Venture Consultants (2023), *Mungari Infrastructure Extract,* Shire of Coolgardie

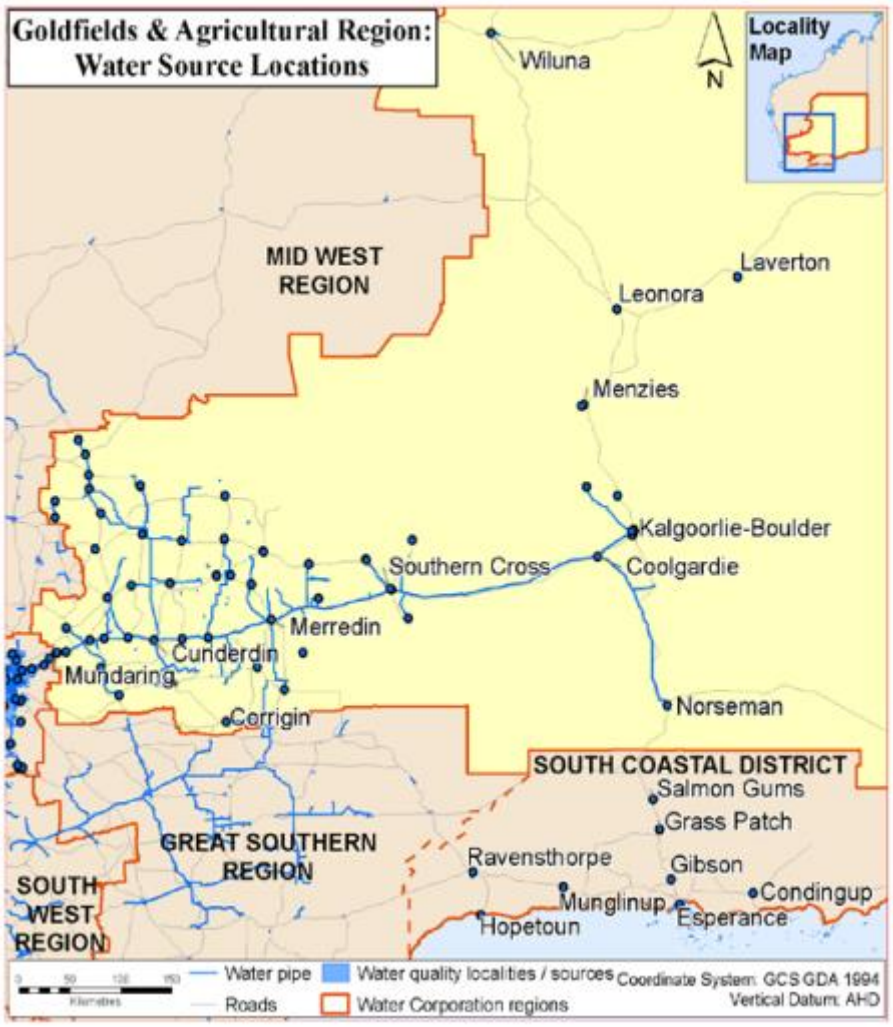


FIGURE 69 - GOLDFIELDS AND AGRICULTURAL WATER SUPPLY SCHEME

Power

The SIA is serviced by a 33 kilovolt (kV) transmission line connected to the State's primary electricity transmission network, the South West Interconnected System (SWIS), which is operated by Western Power. The 220 kV line from Muja to West Kalgoorlie Terminal traverses the site but there is currently no connection at Mungari.

The Western Power network to the west of Kalgoorlie has been extremely limited for some time and is comprised of the following:

- Black flag 132 kV transmission network and substation, including the BKF601 distribution line.
- West Kalgoorlie Terminal that includes distribution line WKT640 that supports Coolgardie and surrounding mines.
- Boulder substation that provides capacity to distribution line BLD619 that supplements Coolgardie loads.

An options assessment conducted by Western Power concluded that a double 132 kV connection is the only viable option to enable sufficient capacity to service just a single proponent at the Mungari SIA.[198]

Gas

There is currently no gas transmission infrastructure servicing the Mungari SIA. The Goldfields Gas Pipeline (GGP), as illustrated in Figure 70,[199] is a 1,378-kilometre transmission pipeline that extends from Yarraloola in the Pilbara region of Western Australia to Kalgoorlie in the Goldfields-Esperance region. The Wiluna Lateral, and laterals to Mt Keith, Leinster and Kalgoorlie Power Station are owned and operated by APA and interconnect with the GGP. The GGP also interconnects with the Eastern Goldfields Pipeline System at Leonora. At its southern extremity, the GGP connects with the Kalgoorlie to Kambalda pipeline for mining and minerals processing and for delivery of gas into the Kambalda to Esperance Gas Pipeline.

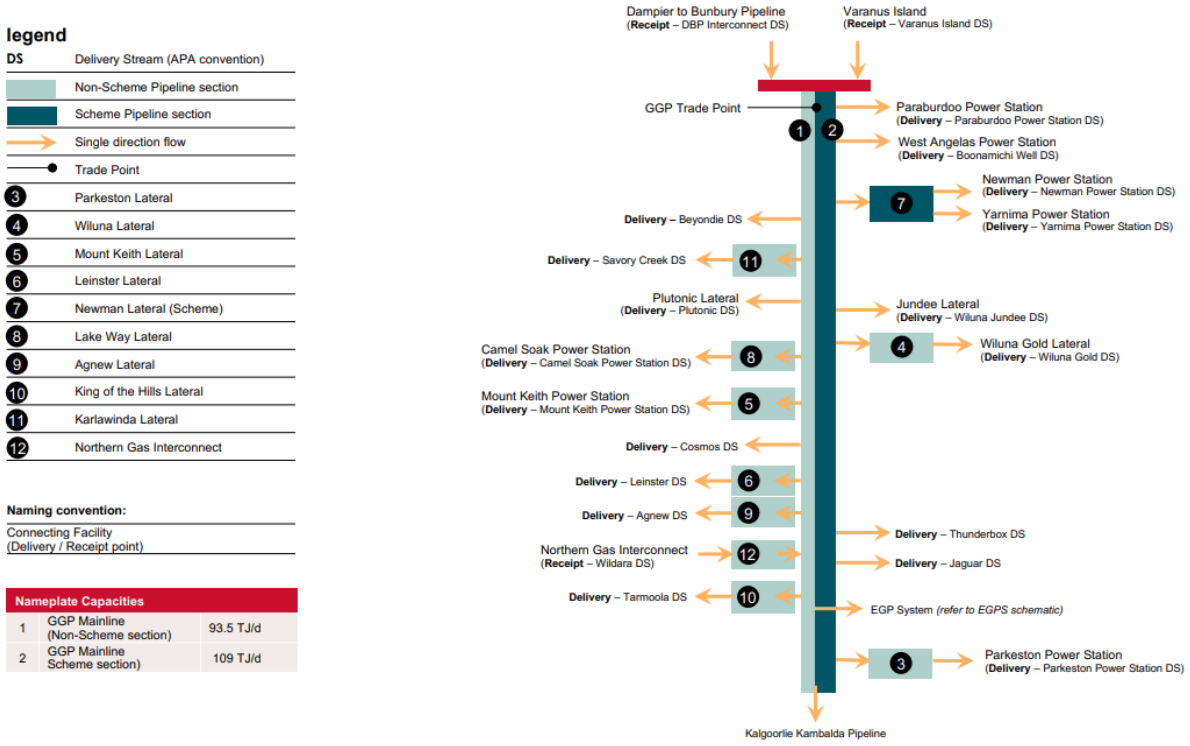


FIGURE 70 - GOLDFIELDS GAS SUPPLY

Industrial proponents seeking to establish operations at the SIA are likely to require process gas, therefore establishment of a new gas supply lateral to connect to Mungari SIA to the GGP will likely be required.

Telecommunications

There is currently no telecommunications infrastructure within the Mungari SIA.

Road Infrastructure

Access to the Mungari site is currently via the 1.2 kilometre-long Mungari Industrial Park Road which is unsealed and unrated. This intersects with the Great Eastern Highway which is rated

[198] The Western Power solution assumes that the general industrial land parcel at Lot 505 Kalgoorlie has been constructed with a 132/33 kV substation with two 132 kV supply circuits connected back to WKT.
[199] APA Group (2024), *Goldfields Gas Pipeline*, January 2024

as a RAV10 (Tandem Drive Network 10) single carriageway. Therefore, development at the SIA would require the construction of a new intersection at Great Eastern Highway and a sealed access road to the northern boundary of the site.

Rail Infrastructure

There is currently no rail connection at Mungari. A north-south heavy railway line that connects the Goldfields to Esperance Port traverses the Mungari SIA boundary. The rail network is operated by Arc Infrastructure under license from the Western Australian Government.

Environment and Heritage

Native Title

Land within the Mungari SIA has been cleared of Native Title, however the majority of the Mungari buffer remains subject to Native Title.

There are two Aboriginal sites of significance within the Mungari core that have been registered with the Department of Planning, Lands and Heritage - Aboriginal Heritage. Numerous Aboriginal heritage surveys have been prepared to date for the Mungari SIA, including:[200]

- Mungari SIA Aboriginal Heritage Survey – 1992
- Mungari SIA Aboriginal Heritage Survey – 1993
- Mungari SIA Ethnographic Heritage Survey – 1997

Aboriginal Heritage surveys will be required for the buffer area surrounding the SIA and an Indigenous Land Use Agreement (ILUA) will be required with the Traditional Owners (TOs).

Port Access

The Mungari SIA is situated approximately 370 kilometres from the Esperance Port.

4.7. Relative Investment Attractiveness of WA SIAs

As detailed above, from the perspective of facilitating critical minerals upstream, midstream or downstream value-adding capacity, the network of SIAs across the State are each at varying stages of commercial and overall project readiness.

While the various factors, discussed above, which might feed into any overall assessment of attractiveness to a project proponent are complex and subject to individual and regional nuance, Table 35 overleaf summarises at a high level the relative investment attractiveness of the SIAs based on the analysis in Section 4. The evaluation criteria used to assess the relative attractiveness of the SIAs are described in Table 34.

[200] https://developmentwa.com.au/projects/industrial-and-commercial/mungari-sia/overview

TABLE 34 – CRITERIA USED TO ASSESS THE RELATIVE INVESTMENT ATTRACTIVENESS OF SIAS

Criteria	Description
Brownfields	The extent to which there is existing development on the SIA.
Land availability	The extent to which development land is available within the SIA.
Security of tenure	The extent to which there is a *prima facie* pathway to securing tenure at the SIA.
Access to water	The extent to which the SIA has access to water supply.
Electricity supply	The extent to which the SIA has access to existing electricity generation capacity
Gas supply	The extent to which the SIA has ready access to a source of natural gas supply.
Road infrastructure	Extent of the internal road network of the SIA and its connectivity to the existing Western Australian road network.
Rail infrastructure	Extent to which the SIA has connectivity to the Western Australian rail network
Proximity to process inputs	Relative proximity of the SIA to established sources of chemical inputs in Western Australia or ports that facilitate chemical importation.
Proximity to third-party services	Relative proximity to a population centre of adequate size to support basic service industries.
Proximity to port (constructed)	Relative distance from the SIA to an established sea port.
Logistics and supply chain access	Assessment of overall access to logistics infrastructure and supply chains that are necessary to give effect to the facility and to service relevant downstream supply chains.

TABLE 35 - WA SIA RELATIVE INVESTMENT ATTRACTIVENESS

	Strategic Industrial Area									
Evaluation Criteria	**Kwinana**	**Kemerton**	**Anketell**	**Ashburton**	**Boodarie**	**Burrup**	**Maitland**	**Browse**	**Oakajee**	**Mungari**
Brownfields site										
Land availability										
Security of tenure										
Access to water										
Electricity supply										
Gas supply										
Road infrastructure										
Rail infrastructure										
Proximity to process inputs										
Proximity to third party services										
Proximity to port (constructed)										
Logistics and supply chain access										

Very broadly, as noted above, from an overall competitiveness standpoint the clear outlier is the Kwinana SIA, which ranks at an adequate to good level across all measures – however is significantly constrained in terms of land availability. By contrast, for all other SIAs there is generally more than adequate land, but the provision of other essential and enabling infrastructure and services ranges from average to non-existent.

5. Estimation of capital investment required to activate the SIAs

Another important and obvious consideration in assessing the SIA and their relative merits is an understanding of the investment required to fully activate them.

With the exception of the Kwinana, Burrup, and to a far lesser extent Kemerton SIAs, the Western Australian portfolio of SIAs is largely undeveloped.

A fundamental input to an assessment of the competitiveness of Western Australia's SIAs compared to industrial parks in Asia and North America is the capital cost associated with activating those SIAs. In some instances, the SIAs can be considered brownfields sites where there has been some activation investment, whereas in other instances such as Oakajee the sites are completely greenfields in nature.

To provide an indication of the investment required, this Study has selected a sample of SIAs where investment is required that are geographically representative as well as representative of both greenfields and brownfields SIAs. The existence of data as a basis for reasonably estimating indicative costs also guided the sample selection. To this end, this Study has developed notional order-of-magnitude estimates of the capital investment required to activate the Anketell, Kemerton, Ashburton, Boodarie and Oakajee SIAs.

The only SIA for which there is a published comprehensive feasibility assessment that includes estimated capital investment requirements is the Anketell SIA.[201] The Anketell SIA has thus been adopted as a reference site for the purposes of this analysis (herein referred to as the 'reference site'). For others, this assessment has drawn on information that is referenced in various structure plans, engineering plans and other scoping reports and applied benchmarked unit costs that are published by various agencies such as CSIRO and AEMO, as well as general quantity surveyor benchmarks. This data and other assumptions are contained in Appendix 3. The cost estimates outlined in Table 36 are notional only and subject to significant uncertainty, and should be read in conjunction with the qualifying assumptions listed in Appendix 3.

The following Table 36 summarises the estimated capital investment required to adequately activate water supply, wastewater management, electricity, natural gas, communications, hinterland logistics and other infrastructure for each of the aforementioned SIAs.

[201] Wood and Grieve Engineers for Landcorp (2016), Appendix C, Anketell Strategic Industrial Area Engineering Services and Infrastructure Plan Report

TABLE 36 – ESTIMATED NOTIONAL ORDER-OF-MAGNITUDE CAPITAL COST TO FULLY ACTIVATE SIAS – ANKETELL, KEMERTON, ASHBURTON, BOODARIE AND OAKAJEE

	Anketell ($m)	Kemerton ($m)	Ashburton ($m)	Boodarie ($m)	Oakajee ($m)
Water supply					
Reticulation	186		335	402	186
Transmission	806		1,451	1,744	806
Desalination	1,456		1,456	2,184	1,310
Treatment	465		465	698	465
Upgrades to water supply infrastructure		320			
Subtotal	**2,913**	**320**	**3,706**	**5,028**	**2,768**
Wastewater management					
Reticulation	118	82	212	255	118
Pump stations	81	56	145	174	81
Treatment & recycling	347	243	347	521	347
Subtotal	**546**	**382**	**704**	**950**	**546**
Electricity					
Transmission upgrades/extensions		50			22
Reticulation	68				
Zone substations and other infrastructure	310		558	671	310
Gas-fired power stations	651		558	671	310
Carbon capture and storage	651	377			651
Solar generation					
Wind generation					
Battery & energy storage system		300			
Subtotal	**1,029**	**699**	**558**	**671**	**983**
Natural gas					

	Anketell ($m)	Kemerton ($m)	Ashburton ($m)	Boodarie ($m)	Oakajee ($m)
Connection of supply to SIA	12		12	12	12
Meter station & associated infrastructure	310		310	310	310
Subtotal	**322**	**0**	**322**	**322**	**322**
Communications					
Telecommunications infrastructure	56		56	56	56
Subtotal	**56**	**0**	**56**	**56**	**56**
Logistics & enabling infrastructure					
Roads	112	10	201	241	112
Rail	149	8	268	322	149
General earthworks	1,128		3,060	4,883	1,128
Stormwater drainage	62		168	268	62
Subtotal	**1,451**	**18**	**3,697**	**5,175**	**1,451**
Total estimated capital cost (AUD $ 2024)	**6,318**	**1,447**	**9,044**	**12,743**	**6,125**

For some SIAs, maritime logistics connectivity will need to be enabled. This can be achieved by constructing land-backed wharf, jetty-wharf or single point offshore mooring infrastructure. The following Table 37 provides a generic estimate along these lines, on the basis of a land-backed loading wharf, breakwater and berthing for two cape size vessels. A potentially more economic option to establish an initial single point mooring facility, to reduce the capital costs associated with establishing mooring berths within the Port common user infrastructure, is also given.

TABLE 37 – ESTIMATED NOTIONAL ORDER-OF-MAGNITUDE COST FOR ESTABLISHING MARITIME LOGISTICS INFRASTRUCTURE ASSOCIATED WITH SIAS

	AUD $m
Port CUI	723
Port PUI	1,647
Rail systems	2,257

	AUD $m
Other/contingency	533
Escalation	35%
Total Port Cost	**7,352**
Single Point Mooring Alternative	25

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[207] Following community consultations the NSW State Government resolved not to proceed with the proposed Williamtown and Narrabri Special Activation Precincts.

7. Recommendations

Recommendation 1: Targeted support for priority SIAs

A: Immediate industry-led prioritisation of announced funding

The Western Australian Government has recently announced funding commitments aimed at increasing the productivity, occupancy and suitability of the SIA network, and thus their attractiveness to industry, including most recently the $160 million fee rebate/rent waiver programme (November 2023) and the $500 million 'Strategic Industries Fund' (SIF) (May 2024). These contributions are welcomed by industry and as evidenced through consultation in the course of this Study, have gone some way toward addressing negative perceptions.

However, the precise full distribution or allocation of the SIF funding is unclear from current public domain material.[208] Further, there remains a perception that the relatively *ad hoc* nature of occasional fee rebate/waiver programmes (while welcome in the moment) may be missing opportunities for greater impact.

As such, the State Government should immediately commence targeted, detailed consultation with industry, including both existing and aspirational users of SIAs, to determine appropriate investment priorities in service to a strategic, coherent vision – one that is clearly articulated, transparent, predictably and sensibly staged, and responsive to the actual on-ground practical needs of industry over the short and medium term. Working within the announced total funding pool (for the purposes of this recommendation), it is critical that the best value be obtained from every dollar available, and that funding is allocated so as to genuinely effect meaningful step-change in particular SIAs, rather than attempting to be all things to all peoples.

While the consultation undertaken by this Study can be no more than illustrative, it is expected on the strength of commentary received to date and desktop analysis herein that such a strategic approach would result in funding flowing to the Kemerton SIA due to 'overflow' pressure resulting from the lack of land availability in Kwinana, with funding also likely to be allocated to northern Western Australian SIAs including Ashburton, Boodarie, Burrup and Oakajee.

Further and more comprehensive industry consultation is required, including greater engagement with sectors beyond critical minerals, hydrogen and renewable energy.

[208] The Western Australian Government's proposed allocation includes $125 million to open new land at Latitude 32, $20 million to open general industrial land in the Karratha and Peel regions and $20 million to unlock land in the Goldfields and South West Regions. Minister for State and Industry Development and Minister for Planning and Lands (2024), '$500 million to unlock industrial areas and create future jobs', *Media Release*, 9 May, Western Australian Government, Perth

B: Develop ongoing processes to inform further near- and medium-term State and Commonwealth Government investment

Moving beyond the immediate announced funding, on the basis of this Study and the findings therein it is abundantly clear that further investment will be required in the SIAs in order to achieve the range of goals they are intended to support. As well as the goals and ambitions of private industry, this also includes the stated policy position of the State Government, contained in *Western Australia's Battery and Critical Mineral Strategy 2024 – 2030* (2024), *Western Australia: Powering the global energy transition* (2024), *Western Australia: A Global Battery and Critical Minerals Hub* (2023), *A World-Leading Resources Sector: Western Australia's mineral and petroleum resources development strategy* (2021) and the *Western Australian Renewable Hydrogen Strategy* (2019, updated 2021).

To achieve these goals and ambitions, and best support the SIAs to deliver on the diversification and growth agenda of Government, a clear long-term strategy is required to activate the SIA network and underpin a decadal programme to adequately resource them so that Western Australia can move toward a globally competitive position. As such, an industry-led instrumentality – roundtable, working group, forum series or similar – should be instituted to clearly articulate and advocate for a comprehensive SIA strategy and additional investment and support for the SIAs in accordance with it.

As an immediate priority, and noting the pace of change in critical minerals supply chains and international investment decisions, this industry-led process should seek to build an evidence basis for the clear prioritisation of further and additional spending by both the State and Commonwealth governments in order to optimally position Western Australian industry and deliver key benefits to the nation as a whole. This should include developing a nuanced understanding of the scope, nature and extent of supporting and enabling industry, potential domestic (and inter-State and inter-national) downstream demand, new industry viability, and multiplier effects likely to be contributed by adequately resourced and strategically sound SIAs.

Recommendation 2: Address internal State Government limitations and barriers to SIA activation

A: Create a structure with Government to deliver transparent SIA business cases and public-private investment frameworks in consultation with industry

Drawing on the outcomes of initiatives undertaken in pursuit of Recommendation 1 and giving consideration to the other Recommendations of this Study, the Western Australian Government should collaborate with industry to prepare sound, evidence-based and detailed business cases for each of the priority SIAs that set out suitable land use zoning, common user infrastructure development plans, logistics and utility connectivity, tenure reform, pre-approvals processes, arrangements with First Nations and development costs that articulate a clear and committed pathway for the development of each of the priority SIAs in accordance with its industry identified uses.

These business cases should then be used to guide policy and Western Australian Government investment in the development of priority SIAs. It is important that this planning process does not become a protracted one.

B: Improve the Lead Agency model

A very clear finding of this Study, backed by strong and consistent industry feedback, has been that the current implementation of the 'Lead Agency Framework'/'Major Project'/'Project of State Significance' model by the State Government is not fit for purpose and in its present form is a barrier to delivering optimal outcomes for industry and the State at large.

Proponents note that the level of service provided under the 'Lead Agency' framework falls well short of global standards. If Western Australia's SIAs are to be competitive with other jurisdictions actively encouraging investment by critical minerals, hydrogen, renewable energy and other focus sectors, a comprehensive overhaul is required of the regulatory framework with which proponents are faced.

While clearly development of an alternate operating framework will require extensive consultation and collaboration with the State Government, and will be informed by policy, legal and machinery-of-government considerations, the key issue which must be addressed is that even at the highest level of current assistance provided, the 'case management' services offered primarily involve informing proponents of their responsibility to seek regulatory approvals from other agencies, monitoring progress, and where appropriate arranging contacts and meetings. There is no 'single source of truth', no single accountable entity, and for an experienced project proponent familiar with the Australian and Western Australian politic-legal system there is little additional value offered. This 'hands off' approach stands in stark contrast to comparable lead agencies internationally.

C: Reform and adequately resource State Government Trading Enterprises and Agencies

In similar vein to Recommendation 2(b), it is also a clear finding emerging from this Study that project proponents face significant difficulties in engaging with State Government Departments, Agencies, Government Trading Enterprises and other instrumentalities. Across multiple points of contact and stages of project assessment, development and construction, proponents are consistently encountering extended delays and difficulties engaging at an appropriate level commensurate with the scale of the proposed development. As detailed above, this is perceived to have come about due to multiple factors, including human resource constraints, technical difficulties, a lack of institutional expertise with modern techniques and development proposals, and particularly an internal policy environment that is risk-averse and not supportive of industry development.

As such, in order to deliver on the stated goals and aspirations of the State Government in respect of the SIAs, it is critical that leadership and cultural reform occur throughout government, and that the machinery of government charged with overseeing and enabling development of these identified key State assets be properly resourced to achieve these aims.

Recommendation 3: Develop new approaches to deliver global standard 'turnkey' experiences

A: Ensure all land within SIAs is subject to tenure arrangements that enable intended land uses and leasing to industry on appropriate commercial terms

Although presented to investors as coherent districts suitable for industrial developments, as evidenced throughout this Study, in reality the SIAs are often comprised of a patchwork of different underlying land tenure models, zonings and secondary and competing interests. The net effect of this legacy is to complicate, and in some cases significantly complicate, project developments by requiring proponents to work with a wide range of stakeholders and cater for a range of interests.

Given the current convoluted state of affairs and the extent to which the sort of industrial development envisaged for the State's SIAs is generally incompatible with other land usage, a 'clean slate' is likely required: the State Government should, on an equitable basis (as noted in Recommendation 3(c)), utilise its plenary powers to compulsorily acquire or otherwise convert all land within the boundaries of a declared SIA to freehold title. Once so converted, land may then be leased, sold or otherwise dealt with by DevelopmentWA, on appropriate and normal commercial terms, providing industry with critical clarity, certainty and confidence to proceed.

B: Ensure SIA common-user infrastructure planning and zoning is fit-for-purpose

As extensively detailed in this Study, there are substantial deficiencies in regard to the infrastructure servicing the SIAs, and hence the ability of the SIAs to cater for industrial developments of the scale and intensity which achieving State Government aims would require. Further, industry has also identified that in many instances there appear to be deficiencies in the strategic planning regarding the use and activation of the SIAs and the degree of alignment between State Government Departments, Agencies and instrumentalities and local government, public and private services infrastructure providers (Synergy, Water Corp, ATCO, AGIG, etc), logistics regulators and providers (Main Roads, ARC, etc) and other necessary aspects of the supporting ecosystem required to optimally activate an industrial area.

Put simply, the SIAs are not currently investment-ready destinations for critical minerals processing, hydrogen production, renewable energy industries or other priority sectors. Industry is unaware of plans to fix this, and in many instances is concerned that the State Government may be unaware of the issue.

As such, the State Government should, at its own cost, undertake or support other appropriate entities to undertake proper and contemporary studies to ensure that the key constraints in servicing the SIAs with the quantity and quality of key inputs required – water, power, gas, wastewater, telecoms, logistics etc – are clearly understood, and full, reasonable and actionable plans are in place to address these.

C: Fund and complete cultural heritage surveys for all SIAs and negotiate appropriate and equitable Indigenous Land Use Agreements (ILUAs) where relevant

In similar vein to the underlying legal land tenure issues identified, this Study has identified that a serious challenge to greater activation and growth of the SIAs is a lack of leadership by the State Government in supporting industry engagement with First Nations and Traditional Owners. Particularly in a post-Juukan Gorge context, project proponents and operators operate in international investment climates and modern business environments in which appropriate, mutually beneficial relationships with First Nations are a critical condition precedent. However, development of significant industrial facilities within Western Australia requires navigating what is by international standards a relatively complex policy and regulatory environment, across Aboriginal Heritage, native title, and other First Nations interests in Country. As such, State Government leadership and support is required to unlock the potential of SIAs, reduce project risk perceptions and deliver better outcomes for First Nations and project proponents. This is not a novel suggestion, and has extensive international precedent as seen in the case of Canada, a nation with a similar Colonial heritage and industry presence in minerals primary production and processing.

At a minimum, the State Government should, at its own expense, ensure that all SIAs are comprehensively surveyed for heritage matters. Once this is completed, in accordance with the principals of Free Prior and Informed Consent, mutually agreeable, appropriate, culturally safe protocols should be agreed and instituted to ensure that, in the event that additional heritage matters come to light during the course of a project, a clear, transparent and equitable process exists for project proponents to follow in proceeding to project completion.

Second, in conversion of underlying land tenure to freehold title (as recommended above), appropriate and equitable ILUAs should be negotiated by the State Government and put in place with Traditional Owners so that project proponents may have certainty as to the conditions on which projects may proceed. Terms of the ILUAs should be based on principles of Free, Prior and Informed Consent and Benefits Sharing.

More broadly, moving beyond what would be considered bare minimum criteria by international standards, the State Government should also consider playing a greater role in fostering and assisting industry and First Nations communities to explore linkages and ways of walking together towards mutual prosperity. Such a role may again look to international examples, such as the Indigenous Grants stream under the Canadian Critical Minerals Infrastructure Fund.

D: Secure SIA-wide State and Commonwealth environmental approvals and land clearing permits and ensure expedited processes for any residual approvals

A clear expectation of investors would be that a 'Strategic Industrial Area' would be suitable for development of strategic and heavy industry.

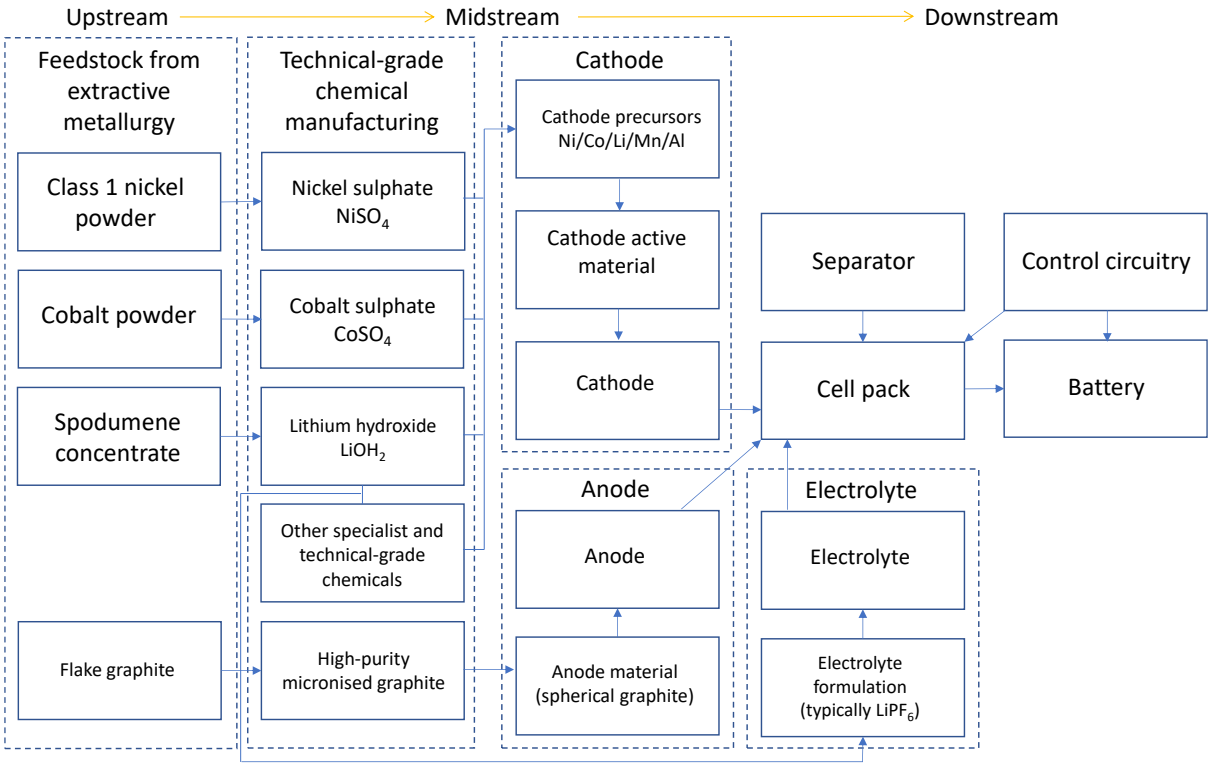
However, as evidenced throughout this Study, in both greenfields and brownfields sites, extensive environmental approvals and land clearing permits are still required. As such, project proponents are left facing significant additional project costs, and very crucially significant additional project uncertainty as to whether their project can proceed. In addition to financial

costs, the nature of the public environmental review process (if triggered) also poses potential reputational, process and other risks.

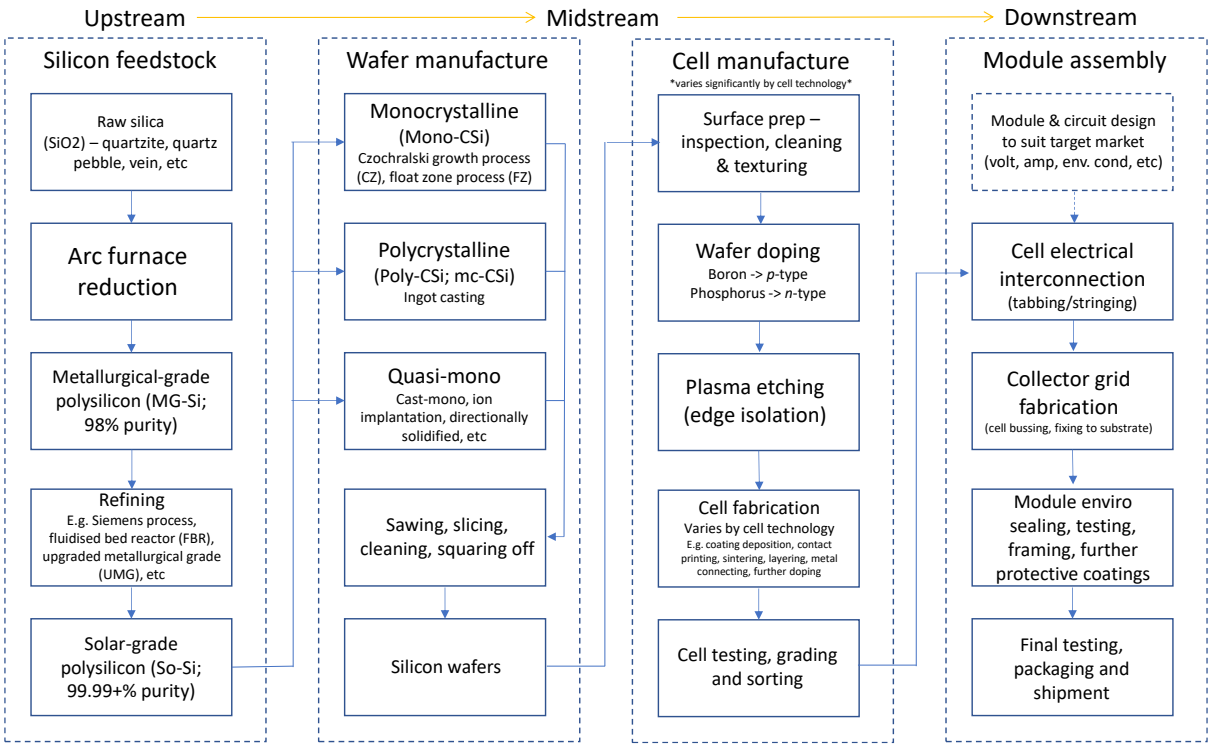
As such, if the Western Australian Government wishes to declare that an area is suitable for large-scale industrial development and market it as such, it should ensure, at its own expense, that area-wide environmental pre-approvals are in place that appropriately cover the forms of industry which it wishes to encourage to operate within that area, including where relevant working with the Commonwealth to address potential Matters of National Environmental Significance. This should be an escalated process that aims to deliver swift outcomes, and 'folds in' existing applications made by current and prospective tenants to ensure maximal equity across all parties. Where any residual project-specific environmental approvals may be required, or where proponents seek to deploy a type of project which does not fit within the Western Australian Government-envisaged area priorities, additional costs should be fairly borne by industry, however the Western Australian Government should again work to ensure that such approvals are transparent, efficient and appropriately prioritised.

Appendix 1: Examples of critical mineral dependent supply chains

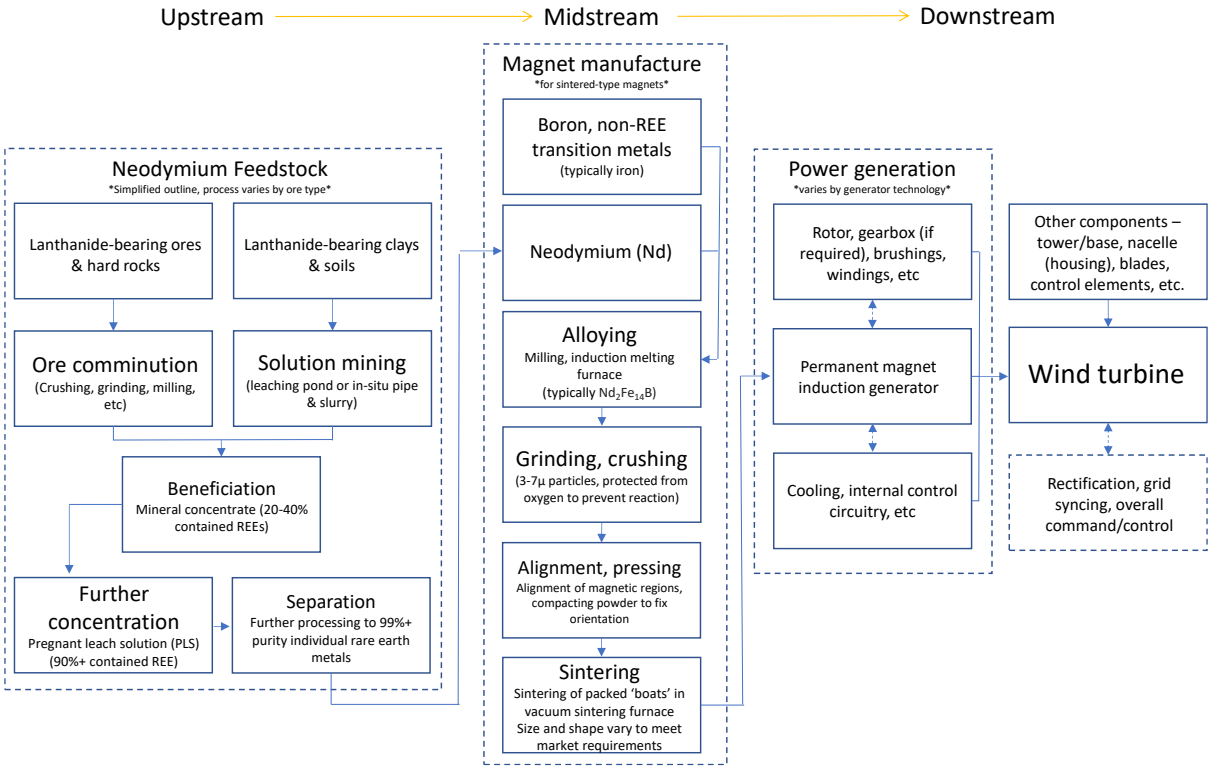
Lithium-ion NMC batteries



Photovoltaic solar cell supply chain



Wind turbine supply chain



Appendix 2 is not-for-publication.

Appendix 3: Assumptions used in Capital Cost Estimation

Baseline assumptions

Estimated costs provided in the draft report represent preliminary order of magnitude costings are based on a number of data sources, including:

- benchmarked infrastructure development unit costs published by agencies such as the CSIRO, AEMO, and quantity surveyors;
- cost estimates derived from historical actual infrastructure development costs;
- cost estimates derived from SIA structure plans, engineering plans and other scoping reports or quotes; and
- feedback from CME members during the consultation process.

The majority of SIAs have undertaken studies to estimate SIA access road requirements, common infrastructure corridors, electricity and gas requirements, potable and process water and wastewater disposal requirements, and communications infrastructure requirements over the lifespan of the SIA development.

These studies are referenced in Section 4 of this report, the parameters for which have been adopted as SIA specific assumptions to inform the modelling.[209]

Where historical cost data or capital cost estimates are aged, these have been indexed according to the Reserve Bank of Australia inflation data to contemporise the assumptions.

Wherever feasible, aged cost estimates from SIA reference sites have been validated utilising contemporary actual or evidence-based benchmark data to account for the non-uniform nature of unit cost escalation with respect to construction materials.

Due to the preliminary nature of the available information, the costs are notional and should be used as an order of magnitude guide only.

Water and wastewater

The majority of SIAs have undertaken studies to estimate SIA potable, high and low quality process water and wastewater disposal requirements over the lifespan of the SIA development. Where water studies have not been undertaken for a greenfields SIA, order of magnitude estimates have been derived utilising estimates for similar SIAs and corresponding industry sectors (i.e. minerals processing as distinct from natural gas and derivatives).

Water supply sources have been validated, where feasible, utilising Water Corporation data, noting that in most cases, SIAs are not covered by Water Corporation schemes, and are required to develop independent water sources.

[209] With the qualification that some historical estimates may not take into consideration the process water or energy intensity of some new industries, including critical mineral value-add processing and hydrogen production, that are currently being targeted for SIA development.

It is assumed that process water will predominantly be sourced from seawater or brackish groundwater sources, and that common use desalination infrastructure will be required. The components of water supply infrastructure that were included in the order of magnitude cost estimates are as follows:

- Water reticulation
- Distribution
- Treatment
- Desalination (Mid-size industrial scale plant ranging between 40 GL to 60 GL, depending on the specific SIA process water requirements identified in Section 4 of this report).

Water reticulation, distribution and treatment have been estimated for each individual SIA based on the SIA size and other water assumption parameters identified in Section 4 of this report, based on the contemporised unit costs identified for the reference site. Desalination plant estimates have been derived through analysis of recent similar scale projects, with regional loading applied, where relevant.

It is further assumed that wastewater recovery and treatment infrastructure will be required. The components of wastewater treatment infrastructure that are included in the order of magnitude cost estimates, derived from contemporised unit costs from the reference site are as follows:

- Wastewater reticulation
- Pump stations
- Wastewater treatment and recycling

Similarly to the above, wastewater reticulation, treatment and recycling infrastructure requirements have been estimated for each individual SIA based on the SIA size and other water assumption parameters identified in Section 4 of this report, based on the contemporised unit costs identified for the reference site.

Electricity supply

The majority of SIAs have undertaken preliminary studies to estimate the anticipated requirements for electricity generation capacity, and transmission requirements to facilitate SIA development.

It is assumed that new generation capacity will be fulfilled by a hybrid of gas-fired generation, renewable sources such as solar and wind, and battery energy storage systems (BESS).

The components of electricity supply infrastructure that have been incorporated into the order of magnitude estimates as follows:

- Transmission upgrades or extension – where SIAs are situated in proximity to, or anticipated to be connected to either the South-West Interconnected System (SWIS) or North-West Interconnected System (NWIS), a gap analysis has been undertaken, and capital costs estimated drawn from recently incurred unit costs and contemporised Western Power detailed quotes to establish new transmission infrastructure.
- Internal Power Reticulation has been estimated utilising contemporised unit costs from the reference site.

- Zone substations and associated infrastructure[210] have been estimated for each individual SIA utilising contemporised unit costs from the reference site.
- Power generation and storage infrastructure based on the following technologies, utilising capital cost assumptions derived from the most recent CSIRO GenCost report as follows:[211]

Generation Technology	Assumed Capex $/kW
Reciprocating gas	$1,886
Large scale solar	$1,454
Wind	$2,938
BESS – 4 hour	$2,112
BESS – 8 hour	$3,680

Natural gas

Gas infrastructure owners advise that heavy and strategic industrial areas (as distinct from general industrial areas, which typically only require a reticulated medium pressure gas network) are generally not reticulated with gas mains, as infrastructure that may be installed during development may be inadequate or sub-optimally utilised due to the nature of gas requirements associated with heavy and strategic industrial usage.

The common practice in heavy industry areas is for individual industries to arrange extension of gas mains to their site to suit their own specific requirements as and when required. In particular, industries with very high gas demands such as refineries and power stations, gas supply is generally negotiated with a private gas carrier and taken directly from a main pipeline via a dedicated high pressure lateral pipeline, bypassing the distribution network.

As a result, the order of magnitude cost estimates *do not include* the extension of gas mains to individual proponents within the SIA core, rather, the estimates include the following enabling infrastructure.

Item	Estimated CAPEX $m (2024)
Meter upgrade	$14
New meter station and associated infrastructure within SIA	$335

Logistics and enabling infrastructure

For each of the greenfield sites, an order of magnitude assessment of the likely order of magnitude costs associated with establishing the basic enabling and logistics infrastructure to activate the site has been derived from a combination of historical planning and engineering documentation from comparable SIAs, together with benchmarked unit costs and cost escalation. Where preliminary engineering studies have not been undertaken, capital costs

[210] To the extent that these can be estimated given lack of confirmed proponents at some SIAs
[211] CSIRO (2024), GenCost 2023-24 Final Report, May 2024

have been estimated based on similar SIA sites. The components of logistics and enabling infrastructure that have been incorporated into the order of magnitude cost estimates for greenfields sites include:

- Earthworks
- Stormwater drainage
- Roads, including access roads and primary intersections
- Rail – SIA loop and spur

In the case of brownfields SIAs, CME member feedback with respect to the adequacy of existing infrastructure and additional infrastructure requirements, and estimates developed according to benchmarked infrastructure costs, or historical estimates as available within the public domain. In the case of Kemerton, the rail estimate incorporated an historical estimate to construct a simple rail siding within the SIA core as outlined in the associated design report, [212] and did not include any capital costs associated with the augmentation of the South West Main Line, due to the level of uncertainty and lack of available data in the public domain.

Communications infrastructure

The analysis undertaken included identification of existing and planned communications infrastructure, as outlined for each specific SIA in Section 4 of this report. For greenfields sites it was assumed that entirely new telecommunications infrastructure would be required, at an associated capital cost in the order of $50 to $60 million.

Port infrastructure

While this report is focused on the costs associated with SIA activation and did not specifically include costs associated with Port development, CME member feedback consistently identifies port congestion within existing industrial Ports as a major impediment, and cite the development of additional proximal port capacity (and accessibility) as a condition precedent to undertaking an investment decision to develop processing infrastructure at WA SIAs.

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