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SOUTH WEST DEVELOPMENT COMMISSION

SOUTH WEST ADVANCED MANUFACTURING AND TECHNOLOGY HUB

Phase One - Preliminary Assessment Report

Version 1.0 | February 2022

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DISCLAIMER: Please note this is the full report and only appendices containing commercial-in-confidence information or may impact privacy obligations have been removed. These appendices will not affect the conclusions as presented

1. EXECUTIVE SUMMARY

This Preliminary Assessment has been prepared to assess the feasibility of the AMTECH in the Bunbury-Geographe region (the Project).

This report presents the outcomes of a two-year investigation into the feasibility of establishing an Advanced Manufacturing and Technology Hub (AMTECH) in the Bunbury Geographe Sub-Region of the South-West. This investigation engaged industry, government, education and workforce training organisations in roundtable workshops, held stakeholder meetings, instigated desktop research, leveraged grant funding allocation, formed industry, education and reference groups, held industry seminars, briefings and appointed consultants.

Based on the extensive feedback and findings to date and the application of seven critical success factors in the development of advanced hubs in Australia and overseas, the report concludes that Bunbury Geographe presents a unique opportunity for the establishment of the AMTECH.

The WA State Government has identified technology and advanced manufacturing as priorities to secure the State's future through creating jobs as well as growing and diversifying the economy. The South West AMTECH will deliver on this commitment by leveraging the South West region's comparative advantages, such as mining, critical mineral resources, recycling and clean energy to capture growth and encourage additional investment.

This Preliminary Assessment identifies that Hubs, which bring together industry, research and training activities, provide opportunity for industry growth and economic development. While there are examples of successful advanced manufacturing Hubs within Australia, the closest example in WA is the Australia Marine Complex in Henderson. This facility operates with a general industrial and manufacturing focus but shows how a collaborative approach can grow an industry. The development of an AM Hub is considered a positive strategy that lowers barriers to commercial growth within the manufacturing industry, driving economic growth across associated industries within WA.

1.1 Key Report Finding

The key finding of the Preliminary Assessment is that Bunbury is uniquely suited to hosting an Advanced Manufacturing Hub. This is driven by Bunbury's:

- Linkage with transport and logistics infrastructure, including access to port facilities;
- Demographics, with a growing population, available workforce and appeal as a liveable destination for potential workers;
- Ability to provide collaborative opportunities in both the training and research areas; and
- Existing manufacturing and related industry activity.

1.2 Report Findings

The findings of the Preliminary Assessment are summarised in the figure below.

Figure 1: Report Findings



1.3 Sectors and Areas of Focus

The success of an advanced manufacturing precinct at Bunbury will be driven by the selection of appropriate sectors of focus. Potential sectors have been identified in this Preliminary Assessment.

While potential sectors have been identified below, there is an underlying need for broader Government direction to underpin investment attraction as well as realise training and research opportunities. It is critical that the AMTECH's selected focus areas are aligned to State Government policy and strategic direction. It is recommended that specific Government objectives be developed to support the inclusion of one or more of the following six potential focus sectors for the AMTECH.

- Renewables – Wind Power
- Renewables – Solar PV
- Hydrogen (Electrolyser manufacture)
- Battery Manufacturing
- Lithium
- Mining and Resources (METS)

Once suitable sectors are identified, announcement and commitment of Government support for the development of that sector through the AMTECH will be a critical component in attracting commitment from industry.

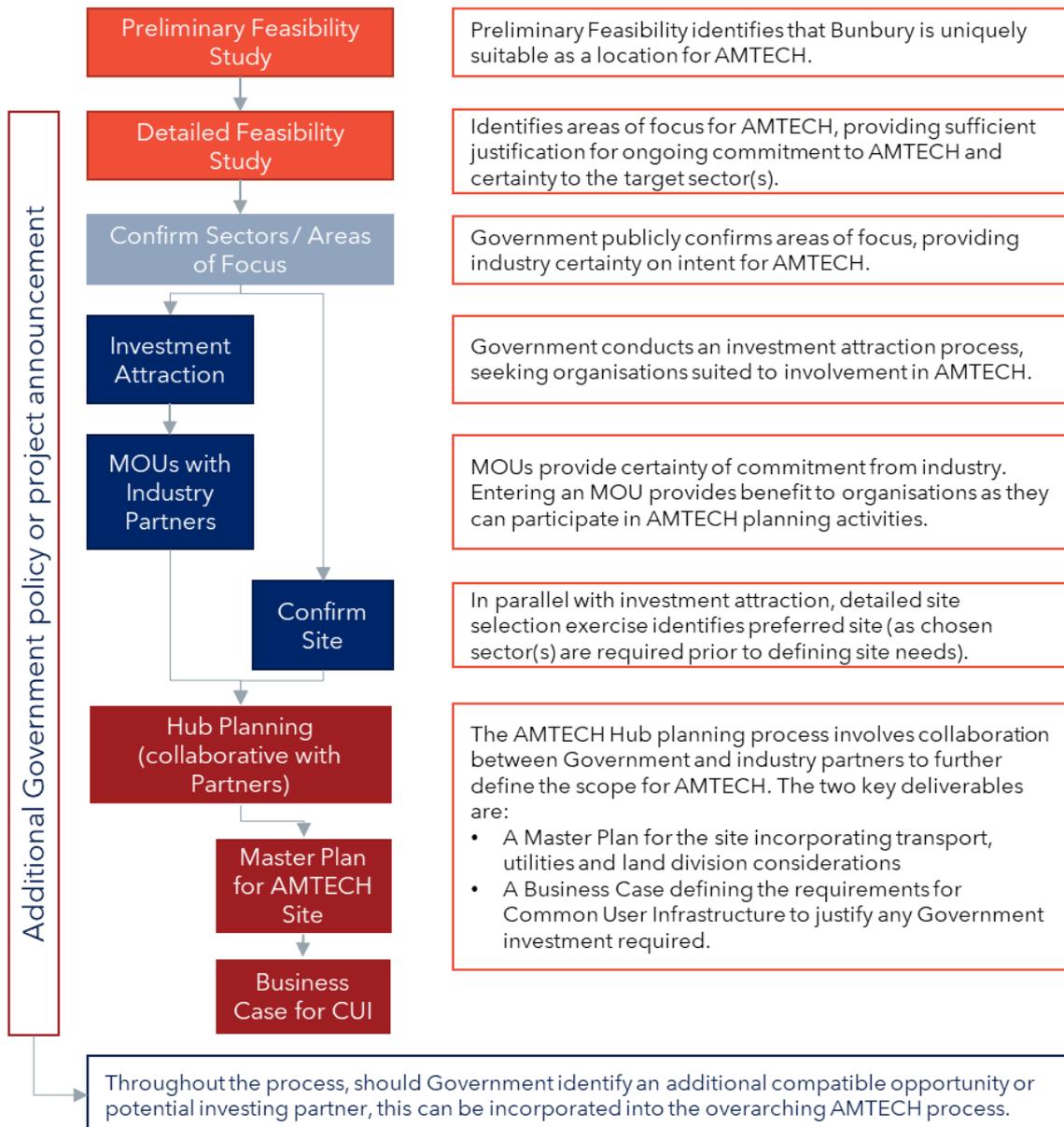
1.4 Next Steps

This Preliminary Feasibility Report identifies that Bunbury is uniquely suitable as a location for an Advanced Manufacturing Hub. This presents two possibilities for further progressing the AMTECH:

1. Where Government identifies an initiative or attracts an organisation seeking to invest, first consideration should be given to Bunbury as the location for this activity. Examples include recent WA Government announcement of Woodside's H2Perth facility, or the Queensland Government's collaboration with Fortescue Future Industries on the Green Energy Manufacturing Centre.
2. SWDC continue to facilitate a process toward industry-led development of AMTECH. This process provides for a level of planning and industry attraction which de-risks the project for Government and facilitates industry investment and involvement. The figure below shows this process.

The industry-led process requires identification of preferred sectors initially, and once this is confirmed detailed work on site identification and planning can progress in parallel with investment attraction. The potential for Government to 'fast track' the project through specific initiatives is indicated by the activity to the left of the diagram, identifying the potential for this to occur throughout the process.

Figure 2: Next Steps



2. INTRODUCTION

The WA State Government has identified technology and advanced manufacturing as priorities which will grow and diversify the economy, creating jobs and secure the State's future. The South West Advanced Manufacturing and Technology Hub (AMTECH) delivers on this commitment by leveraging the South West region's comparative advantages in mining and critical mineral resources to capture growth in the sector and encourage additional investment.

2.1 AMTECH Project Summary

AMTECH is proposed to be a central facility attracting advanced manufacturing investment and development in the Bunbury Geographe region. It would be a multi-purpose facility connecting science, technology, engineering and manufacturing (STEM) research and training with industry.

The region's comparative advantages provide AMTECH with a wide range of opportunities across economic sectors in the State. This Report distils this choice by identifying how the full feasibility study and Business Case could be conducted to progress establishment of the AMTECH.

Irrespective of which areas of focus are ultimately selected, the AMTECH facility could still attract and retain businesses and projects involved with research, design, production, sales and distribution within the region. It is envisaged that the AMTECH could provide common user infrastructure that would service large and smaller manufacturers as well as support collaboration and development of new, high-tech manufacturing supply chains. There would be research facilities that link with training opportunities and qualification for a new generation of highly advanced manufacturers who could complement WA's existing strategic industrial activities.

2.2 Project Delivery

The AMTECH project is led by the South West Development Commission (SWDC) and Department of Primary Industries and Regional Development (DPIRD) and is funded by the Department of Premier and Cabinet.

The SWDC is a statutory authority of the State Government that strives to make the South West an even better place to live, work and invest. SWDC partners with communities, government, business and industry to identify and support projects that benefit the region.

SWDC's objectives include the following, which are aligned with the AMTECH proposal:

- Maximise job creation and improve career opportunities in the region;
- Develop and broaden the economic base of the region;
- Identify infrastructure services needed to promote economic and social development within the region; and
- Encourage, promote, facilitate and monitor the economic development in the region.

While the AMTECH is led by SWDC and DPIRD, it is essential that all other relevant WA State, Regional and Local Government agencies become involved as AMTECH progresses. This includes, but is not limited to, the Department of Jobs, Trade Science and Innovation (JTSI), who have a broader economic development remit and Development WA, as the Agency responsible for developing Strategic Industrial Areas. Engagement with these agencies has commenced.

This report considers the whole-of-Government approach which would be required to successfully progress the AMTECH, particularly due to the likely complexity of scoping and delivery.

2.3 AMTECH Background

Consultation with AMTECH stakeholders commenced with a roundtable discussion and report to gain a greater understanding of the opportunities, issues and capabilities of the manufacturing sector in the region. In 2019, a Leverage Funding Grant application was made to determine the feasibility of developing an advanced manufacturing and technology hub in the Bunbury Geographe region, referred to as the South West AMTECH. The application included formal stakeholder engagement including detailed roundtable discussions and a report involving over 30 industry and government representatives providing the key issues and opportunities. Discussions and feedback focussed on four key topics:

- Training/Education and Research
- Design, Infrastructure, Environment and Supply Chain
- Technology and Innovation
- Production and Distribution

The roundtable discussions included members of the local and regional manufacturing community including operators, contractors, educators and Government. The talks sought feedback from stakeholders to scope the feasibility work required. Several common themes were concluded, with the following key findings identified in the summary report:

1. The necessity for government and industry to provide appropriate training for upskilling of workers (and appropriate facilities). There was a recognition that Advanced Manufacturing requires a more technical skill base and blending of new and renewable technologies.
2. Bunbury's population base, location and proximity to Asia, existing transport infrastructure and facilities export justified review of the Bunbury Port as the location of the proposed Advanced Manufacturing Hub.
3. There was a recognition that Bunbury's existing export industries could benefit from significant value-adding if investment was made to attract and develop synergistic industries.
4. The renewable energy industry was considered to be a prime opportunity with many of the essential inputs being locally available (i.e. lithium). Development of new and growth industries could be capitalised on existing industries and resources.
5. Base infrastructure would leverage off the transport linkages to Bunbury Port and potentially involve enhanced wharf transfer and common use fabrication & staging areas. A minimum level of investment would likely become a catalyst for further investment and staged development.
6. Further feasibility studies are required to define what facilities are necessary for an Advanced Manufacturing Hub (and to define a possible project scope).

Consensus amongst participants of the roundtable found strong justification for an Advanced Manufacturing Hub and that further feasibility studies would be supported by respective organisations of the participants. The Roundtable Summary Report is provided in Appendix C, with notes from a subsequent roundtable in June 2021 included in Appendix D.

In September 2020, the WA State Government announced an allocation of \$465,000 towards a study into the feasibility of an advanced manufacturing hub in the South-West¹ that would build manufacturing capacity in WA, support industry and unlock the jobs of the future. In the lead-up to going to tender, the State Government committed an extra \$2 million towards the feasibility study, on top of the \$485,000 previously allocated.

In January 2021, the inaugural meeting of the South West AMTECH Industry Leaders' Group (ILG) was held and procurement for engaging a consultancy firm to deliver the study commenced.

¹ <https://www.mediastatements.wa.gov.au/Pages/McGowan/2020/09/Study-into-potential-new-advanced-manufacturing-hub-gears-up.aspx>

In April 2021 an Education Research and Innovation Group (ERIG) was formed to inform the project on matters relating to skills, education and research development.

Government, industry, research/education and workforce stakeholders represented through the South West AMTECH ILG, include:

- Government Bodies:
 - Southern Ports Authority
 - Department of Jobs, Tourism, Science and Innovation
 - Development WA
 - South West Development Commission
- Major manufacturers:
 - Siemens
 - Hofmann Engineering
 - Civmec
- Local South West manufacturers:
 - Geographe Enterprise
 - Piacentini and Sons
 - RCR Mining Technologies
 - Prime Supplies
- Educators:
 - Edith Cowan University
 - South Regional TAFE
- Workforce:
 - Australian Manufacturing Workers Union

2.4 Overview of Report

This report provides a preliminary assessment of the feasibility of the AMTECH concept and is structured according to the table below.

Table 1: Report Overview

Part	Description
Introduction	Project Summary, Delivery, Background and Stakeholders
Part A: Advanced Manufacturing Precincts	Provides an overview of the AMTECH concept, introduces the AM industry and the concept of AM Hubs and identifies successful examples of Hubs within Australia and overseas. Based on this benchmarking and analysis, this section identifies a series of success factors; elements which define the ongoing success of an AM Hub.
Part B: Analysis of Success Factors for AMTECH	Each of the success factors identified in Part A is examined in detail, with the analysis focusing on the ability to meet that success factor through delivery of AMTECH within the Bunbury-Geographe region.
Part C: Conclusions and Recommendations	The final section draws conclusions based on the assessment against each success factor and outlines a recommended set of next steps to progress the AMTECH concept.

3. PROJECT VISION AND OBJECTIVES

The vision for the AMTECH is to create a world class Advanced Manufacturing and Technology Hub in the South West region of Western Australia. This has been developed by SWDC, based on the feedback from the ILG and roundtable discussions. This vision reflects the initial intentions of the project, providing direction to the desired outcomes envisaged by SWDC and key stakeholders and is subject to refinement.

The primary objectives of AMTECH include:

- Attracting and retaining best-in-class businesses and projects to the South West region.
- Accessing state-of-the-art common use infrastructure and industry 4.0 technologies including robotic welding, additive manufacturing (3D printing), AI and big data.
- Supporting SME's to form alliances/joint ventures to bid for major projects – through scale.
- Accessing leading research and development that supports local industry and businesses to innovate and commercialise their IP.
- Accessing cutting edge education and training facilities that see's students, apprentices and workers advancing their skills alongside industry researchers and in partnership with TAFEs and universities.

The AMTECH is envisaged to provide universal access to state-of-the-art common use education, training and research facilities based on industry 4.0 technologies, land, utilities and transport infrastructure. Advanced manufacturing is a broad, cross-cutting field including additive manufacturing, high precision technologies and automation. The facility has strong industry and local community support including from Bunbury's large existing manufacturing sector, which is showing the desire to continue to embrace advanced manufacturing methods, whilst recognising that AMTECH:

- Will assist with Collie's transition and growth;
- Could provide outputs to multiple different industries and industrial areas such as Kemerton and Henderson;
- Could potentially link in with future projects of some Cooperative Research Centres (CRC), such as the Future Battery Industry CRC and the Innovative Manufacturing CRC.

The vision is currently publicised through the SWDC's AMTECH webpage, which presents a high-level summary of the vision and the current study process.

It is envisioned a facility in Bunbury Geographe would give manufacturers an edge when competing for work by providing local access to infrastructure, technology, training, education and research.

SWDC (AMTECH Project webpage)

PART A: ADVANCED MANUFACTURING PRECINCTS



4. ADVANCED MANUFACTURING SECTOR

4.1 Sector Overview

Manufacturing markets globally are being transformed by both demand and supply side drivers. Global consumption growth has accelerated, being driven by rising demand from emerging economies alongside demand growth in developed economies. This has led to both developed and emerging economies demanding new products at increasing speed, resulting in increased complexity within the manufacturing sector. Technological advances are delivering new products and services with superior qualities that supply global markets. This drives a need for business evolution that can better differentiate output and value add opportunities.

Advanced Manufacturing (AM) is defined by the Australian Government as “any manufacturing process that takes advantage of high-technology or knowledge-intensive inputs as an integral part of its manufacturing process”.² Australian manufacturers have turned to AM techniques such as technological innovations and methods that improve their competitiveness to compete on value rather than cost.

AM incorporates a high level of technology and expertise applied throughout every step of a value chain, from design and research and development (R&D) to production, distribution and after sales services. More generally, AM encompasses:

- Collaborative R&D and design-led thinking;
- Innovative business models and effective supply chain capabilities;
- The effective use of disruptive technologies, systems and cutting-edge materials;
- A focus on customisation and exports;
- World-best practices and processes;
- New ways to manufacture existing products and the manufacture of new products; and
- The provision of high-value-added services and innovative solutions.

The AM approach is critical to many Australian industries adding significant value across all sectors. The Australian Government released the ‘Make it Happen: The Australian Government’s Modern Manufacturing Strategy’³ in 2020, aimed at assisting Australian manufacturers in becoming more competitive, resilient and providing the ability to scale-up to develop a globally significant supply of manufacturers. Aligned to the strategy is a \$1.3 billion initiative by Government to strategically support projects within six National Manufacturing Priorities, which include:

- Resources Technology and Critical Minerals Processing;
- Food and Beverage;
- Medical Products;
- Recycling and Clean Energy;
- Defence; and
- Space.

The key opportunities and enablers for Australian manufacturers include:

- Specialising in premium bespoke solution markets, to cater for consumer demand for specialised and customised product offerings;
- Investing in innovative sustainable products and processes;

² Advanced Manufacturing Growth Centre Ltd, *Advanced Manufacturing – The Definition for a New Era*, 2018

³ <https://www.industry.gov.au/data-and-publications/make-it-happen-the-australian-governments-modern-manufacturing-strategy>

- Developing capabilities to provide services and experiences to supplement tangible products;
- Expanding into global value chains rather than focusing on local customers; and
- Accepting and investing in enabling science and technology.

4.2 Benchmark Hubs / Precincts

A benchmark analysis was undertaken that identified AM Hubs or similar precincts in Australian and international jurisdictions. These Hubs provide appropriate reference points in developing further project definition and design, as they achieve similar outcomes to those proposed from the AMTECH. Selected AM Hub benchmarks are explored in detail below, with additional domestic and international benchmarks outlined in Appendix A.

Fisherman's Bend, Port Melbourne Victoria

Fisherman's Bend is Australia's largest urban renewal project covering approximately 480 hectares in the heart of Melbourne. Fisherman's Bend consists of five precincts:

- Lorimer: a vibrant, mixed-use precinct close to the Yarra River and connected to Melbourne's CBD, Docklands and emerging renewal areas.
- Montague: a diverse and well-connected mixed-used precinct celebrating its significant cultural and built heritage and network of gritty streets and laneways.
- Wirraway: a family friendly inner-city neighbourhood close to the bay and Westgate Park.
- Sandridge: one of Melbourne's premium office and commercial centres, balanced with diverse housing and retail.
- National Employment and Innovation Cluster (NEIC): Australia's leading design, engineering and advanced manufacturing precinct.

The NEIC precinct is 230 hectares with a key vision to becoming internationally renowned as a centre for innovation in advanced manufacturing, engineering and design. The catalyst for the transformation of the Fisherman's Bend NEIC will be the Government-led redevelopment of the former General Motors Holden site, with \$179.4m of funding committed by the Victorian Government to transform and renew this site.

The NEIC already contains global industry giants including Boeing and Siemens, alongside a major Department of Defence R&D facility. The entity and is also set to welcome the University of Melbourne Engineering and Design innovation campus due to open in 2025. The campus will feature world-class heavy engineering and large fabrication, testing and prototyping facilities, purpose-built for the Faculty of Engineering and Information Technology and the Faculty of Architecture, Building and Planning. By 2050 it is envisaged that the precinct will be home to at least 40,000 jobs and over 20,000 students.

The Western Parkland City AMRF, Western Sydney, New South Wales

The Western Sydney Aerotropolis (Aerotropolis) is a 11,200-hectare area surrounding the Western Sydney International Airport located within the Western Parkland City. The Aerotropolis will become a hub of industry and innovation, attracting local and global companies drawn to the enormous potential of the Western Parkland City and the airport that serves it.

The NSW Government is funding the development of a new city to be located within the Western Sydney Aerotropolis, the new Bradfield City Centre. This involves a proposal for \$1.4 billion in NSW Government funding for infrastructure, buildings, high tech equipment and training programs and a comprehensive attraction package that will offer a clear point of difference compared with other states.

A major aim of the Bradfield City Centre will be to become a world class employment sector for jobs in Aviation, Aerospace Defence industries and Advanced Manufacturing and help drive the creation of 200,000 jobs. To achieve this aim and to ensure early activation of the new Bradfield City Centre, the NSW Government plans to develop a 13,000 square metre Advanced Manufacturing Research Facility (AMRF), due to open in 2026. A render of the proposed facility is shown below

Several key tenants have already indicated an intention to be located within the Bradfield City Centre including CSIRO, National Measurement Institute, Vitex, Hitachi, Northrup Grumman, BAE Systems Australia, Gilmour Space and University of Technology Sydney



Advanced Manufacturing Park, South Yorkshire, England

The Advanced Manufacturing Park (AMP) is a 61-hectare manufacturing technology park in South Yorkshire, England. The Advanced Manufacturing Research Centre (AMRC), a joint venture between University of Sheffield and over a hundred industrial partners in addition to Boeing, was developed in 2004 and is the anchor tenant of the AMP.

Other major facilities and tenants at the AMP include:

- AMP Technology Centre, that houses approximately 40 manufacturing/technology related businesses in its three buildings and provides a combination of first-class office space, workshop facilities and conferencing & meeting room resources.
- Rolls-Royce and its Factory of the Future building, a 6400 square metre facility including workshop, laboratory, office and conference space.
- The Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC), based around an open-plan 5,000 square metre workshop, containing over £35 million – conversion? Aus dollars? worth of state-of-the-art manufacturing equipment tailored for nuclear industry applications. The building also features accommodation over three stories, including laboratory and technical support space, virtual reality facilities, open-plan offices and secure meeting rooms.
- The AMRC Factory 2050, the UK's first state of the art factory, entirely dedicated to conducting collaborative research into reconfigurable digitally assisted assembly, component manufacturing and machining technologies and is capable of rapidly switching production between different high-value components and one-off parts.
- The McLaren Composites Technology Centre (MCTC), a purpose-built facility for research, development and production of innovative lightweight carbon fibre and composites.
- The UK Atomic Energy Authority's nuclear Fusion Technology Facility that develops and tests materials and components in the simulated conditions of a fusion power plant.

As the anchor tenant and flagship facility within AMP, the AMRC provides a network of world-leading research and innovation centres that work with manufacturing companies of any size from around the globe. It provides small amounts of commercial space and access to industry-leading research equipment for experimental production runs. The AMRC specialises in carrying out world-leading research into advanced machining, manufacturing and materials, which is of practical use to industry. It aims to improve the industrial and economic performance of the region by making step changes in productivity, increasing competitiveness, developing new products and processes and training new talent and skills. The AMRC has received approximately £140m of Government and European funding over its lifetime.

4.3 Activity in WA and South West

Advanced manufacturing in Western Australia is currently limited, however there are many traditional manufacturers that utilise advanced elements in their operations.

The manufacturing sector accounted for four percent (\$15.3 billion) of WA's total Gross State Product in 2020-21, providing approximately 83,500 jobs. Of this total, the food product manufacturing (16,500 jobs), machinery and equipment manufacturing (13,900 jobs) and transport equipment manufacturing (7,800 jobs) make up the biggest sub sectors.⁴

WA's manufacturing industry exports valued approximately \$18.43 billion in 2018, representing almost 13.3 per cent of total State export worth. Key exporting sub-sectors in terms of value for this period were:

- Metal and metal product manufacturing (\$8.8 billion);
- Basic chemical, cleaning and polymer manufacture (\$3.7 billion);
- Transport equipment and parts manufacturing (\$2.3 billion); and
- Food product manufacturing (\$1.6 billion).

The South West is a large contributor to WA's manufacturing sector. Mining, construction and agriculture are historically the key industries for economic growth in the region. South West manufacturing contributes approximately 21 percent of the region's economic output, valued at close to \$5.856 billion in 2018 and accounts for 9.2 percent of employment. The industry employs approximately 6,600 people and contributes around \$12.3 billion of value add to the State economy including \$1.1 billion to the South West Regional economy.⁵

Bunbury is the manufacturing centre of the SW region with access to major road, rail and port facilities making it the main distribution centre, servicing industry and community needs. The strong attributes in distribution, sales, servicing in mining, manufacture and related sectors complement the AMTECH.

⁴ WA Government, Western Australia Economic Profile, November 2021

⁵ REMPLAN Economy, *South West Region Economic Profile*, June 2020

5. MODELS FOR ADVANCED MANUFACTURING HUBS

Co-locating AM industry, research and education organisations in precincts or hubs results in beneficial economies of scale, technology transfer and network benefits. These Hubs are clusters of businesses, skills, capital and innovation that stimulate new and higher levels of connectivity, idea sharing, collaboration and innovation, benefitting the broader economy.

The Hubs presented as Case Studies and in Appendix A show the potential benefit of co-located approaches which the AMTECH seeks to emulate. Both Government and industry have key roles in progressing the planning and delivery of an AM Hub.

5.1 The Role of Government

Government has roles in both development and operation of Hubs.

5.1.1 Hub development

The need for Government intervention in developing AM precincts is driven by the following factors:

- **Growing demand for more and higher quality advanced manufacturing** – There is increasing demand for highly specialised products and parts for manufacturing, mining and energy, driven by advances in technology and the need for greater efficiencies in costs, delivery and ongoing operations.
- **A shortfall in local industry investment and capacity**– A lack of investment in local productivity and capability in AM constrains technological advancement, economies of scale and added value in manufacturing. These limitations consequently restrain the achievement of objectives stated in numerous Government economic development strategies and policies.
- **Supply chains are not equipped to support new manufacturing technology** – Major global supply chain disruptions across industries have highlighted the need for greater resilience locally. There is a need to intervene in provision of critical materials and metals used in advanced manufacturing to reduce reliance on imported manufacturing materials
- **Shortage of skilled labour and matching high-value jobs** – Shortages of highly skilled engineers and technical staff demonstrates that the Government needs to support provision a pipeline of highly skilled graduates and apprentices through training and education to avoid labour market failure.
- **High barriers to entry** – The high costs to establish facilities and procure equipment are a barrier to entry for small to medium sized businesses to test and scale R&D activities. This impacts the ability for manufacturers to conduct research, commercialise products or services and overcome technical barriers. This gap in production identifies where government can address areas of market failure and can provide the support so Australia can compete with countries where costs are lower and/or technology is more advanced.

Government involvement in the development of AM Hubs is vital. The overarching role for Government is to provide the policy and planning settings to facilitate collaboration and growth, provide investment attraction and incentives to encourage businesses to locate within the AM Hub.

This can be achieved through the following:

- Facilitate relationships with industry education and training programs (such as the development of the Multiversity at the Western Parkland City).
- Contribute to the design and delivery of shared infrastructure and utilities. This may include funding of infrastructure and utilities to meet specific manufacturing service requirements or acquisition of specialised infrastructure (such as State and Commonwealth investment in the Carbon Nexus).

- Providing industry access to lead users/customers in the public sector and ensuring suitable procurement policies are implemented to encourage use of products delivered.
- Incentivise local companies with suitable 'clustering' initiatives, including collaboration on R&D, innovation, marketing and resources (e.g. Cooperative Research Centres).

Existing Federal Government initiatives that facilitate industry, education, research collaboration and AM hub development include the Modern Manufacturing Strategy, Supply Chain Resilience Initiative and Industry Growth Centres. State and local Governments also have policies for local priorities (such as the State Government's WA Jobs Plan and WA Recovery Plan) which target specific objectives and outcomes for employment, income and economic development.

5.1.2 Ongoing operation

The ongoing role of Government in an operating AM hub is aligned to the refinement of plans and policies assisting ongoing collaboration, innovation and growth.

Policies often share a common objective to drive specific outcomes across different areas of Government, for example regional economic development policy, investment/trade policy, industrial/business policy, science/ technology/innovation policy and higher education policy. This linked policy approach should apply to the Hub objectives. Examples include:

- Assistance to better organise and deliver collaborative business and manufacturing services through industry and science policies
- Targeted investment, especially in research, education and new technologies through investment, science and higher education policies
- Support to encourage and increase networking and learning through business and higher education policy
- Improved access to labour markets and knowledge centres, including partnerships with research and education facilities through business and higher education policy.

5.2 The Role of Training and Research Organisations

There are a range of examples where industry and education/research organisations mutually benefit from collaborating in a Hub environment. Examples including the benchmark hubs outlined above and Deakin University's presence within the Carbon Nexus at Geelong highlight these benefits.

Evidence of training and research organisations co-locating within AM Hubs both domestically and internationally show they can create higher levels of economic growth, innovation and collaboration between business and research communities.

Education institutions can work with industry in the co-creation and development of education and training content to skill the manufacturing workforce. Such collaboration allows education providers to produce job ready graduates and industry to draw on learner cohorts that have relevant and meaningful skills.

Collaboration between businesses and education/research institutions improves knowledge sharing and promotes innovation that takes advantage of the strengths and insights of each party.

5.3 Industry Role

Successful examples of AM Hubs demonstrate early involvement of industry. This includes committing through taking up leases or investing capital, as well as collaboration with research and training organisations in planning their involvement. Government needs to facilitate this involvement, as it is unlikely that industry will initiate such activity without prompting through investment attraction activities.

5.4 Funding

Development of AM Hubs, including the provision of funding, is a collaborative approach between Government and industry. Successful examples of Hubs have been underpinned by an initial Government investment in land, investment attraction and/or infrastructure.

5.4.1 Funding requirements and sources

The development of an AM Hub can be funded by Government, the private sector, or a mix of both. Each approach is nuanced with the amount, type and timing of funding dependent on factors including the infrastructure and tenant mix.

Government funding will play a catalytic role because AM Hubs include expensive technologies, facilities, research and training opportunities which private entities are unwilling or unable to otherwise invest in. Government must address market failures and attract sufficient activity so the Hub can be self-sustaining.

Initial support from federal, state and territory or local Governments is vital. Government funding mechanisms can take several forms, including provision of land, infrastructure, grants and tax incentives.

5.4.2 Government Funding Mechanisms

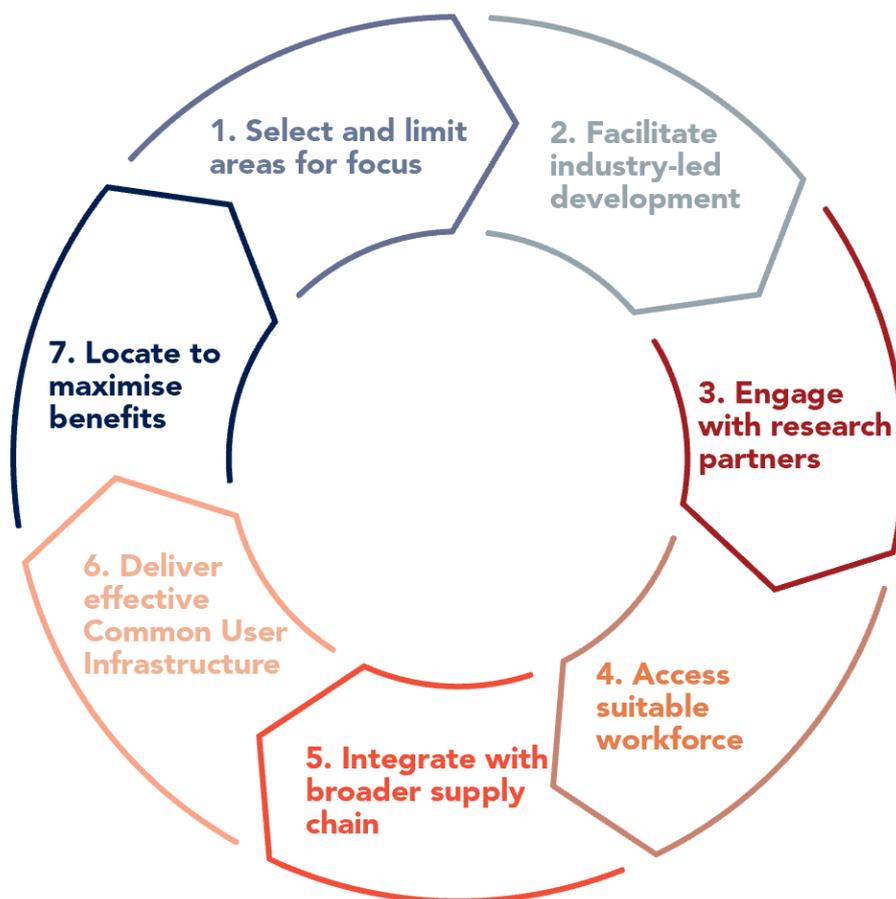
There are several funding mechanisms available to Government to assist in the development of AM Hubs. These include the following opportunities for AMTECH:

- Provision of land – either through the sale or lease of government owned land, acquisition of private land, or facilitation of private land use. Government may also provide favourable lease terms to improve the attractiveness of the AMTECH opportunity for potential tenants.
- Provision of infrastructure – including infrastructure and utilities related to AM (such as large scale factory space, automatic welding equipment, testing facilities etc.) or the provision of supporting infrastructure to provide basic services and facilities to enhance the area (including roads, electricity and communications).
- Grant funding or subsidies – these monetary measures can be awarded to either the industry as a whole or individual businesses with a focus on removing or lowering barriers to growth. These funds would be tied to specific objectives being sought by Government. A common example of the targeted use of grant funding is funding to develop training programs or undertake research activities specific to the sectors prioritised within a Hub.
- Indirect Contribution – This approach generally involves Government forgoing a current or future revenue source, resulting in a lowered cost of entry to an investor in the Hub. Examples can include legislative or regulatory mechanisms such as tax relief, legislation or regulation concessions, or other relevant incentives that help develop the AM Hub.

6. SUCCESS FACTORS FOR ADVANCED MANUFACTURING HUBS/PRECINCTS

Analysing precedent advanced manufacturing hubs and how successful hubs were established seven drivers of success have been identified. These are shown in the figure below. Part B of this report then considers how these success factors apply to Bunbury and AMTECH.

Figure 3: Success Factors



6.1 Success Factor 1: Select and Limit Areas of Focus

As advanced manufacturing covers a range of industries and applications, when developing a precinct it is important to maintain a clear focus for the precinct which existing and potential participants can clearly understand. This clarity directs industry and research organisations toward activities that achieve a preferred outcome, ensuring collaboration opportunities can be clearly identified.

Growth and further investment can be attracted when outcomes linked to a limited number of sectors are understood and communicated. A precinct need not be limited to a single sector, however defining 2 to 4 priority or target sectors allows appropriate scope to attract a variety of activity whilst still providing a clear focus for the precinct.

An example of this clarity of purpose is shown in the development of the Western Parkland City in NSW adjacent to the new Western Sydney Airport. The Western Parkland City Authority (WPCA) identified four focus areas selected on proximate industries and location synergies, being aerospace, defence, agribusiness and logistics. Once the sectors were identified, WPCA began a targeted process of attracting industry partners, encouraging investment prior to progressing plans for a shared facility, the Advanced Manufacturing and Research Facility (AMRF).

A key factor in selecting target sectors for the Western Parkland City was avoiding competition with similar Australian initiatives, as it is considered there is insufficient capacity for competition between specific sectors. In identifying potential sectors for the AMTECH, consideration should be given to potential competing facilities and precincts, such as:

- The successful precinct in Geelong focussed on composites and lightweighting; and
- The developing precinct in Queensland focused on drones and lightweight aviation, underpinned by recent announcement of Boeing's investment.

6.2 Success Factor 2: Facility Industry-Led Development

When establishing a precinct it is critical that industry is an active participant, contributing to scoping and planning considerations. This creates the long-term incentive for industry participants to remain involved and ensures that Government investment into facilities such as common use infrastructure is targeted to real industry needs.

Whilst it is important for industry to play a lead role, this can be facilitated through Government clarifying the proposed intent for a precinct or area and leading investment attraction programs. It is unlikely that industry will develop collaborative or precinct facilities without some initiative being taken by Government, who can incentivise early involvement of industry participants by offering involvement in precinct planning and scoping of key infrastructure.

The importance of industry involvement is evidenced by the sequence of activities undertaken in other successful Australian precincts. Investment attraction and the signing of industry partners is a precursor to investment decisions and delivery of infrastructure. This is evidenced in the examples outlined below.

Western Parkland City: A Memorandum of Understanding was signed with BAE Systems in August 2019, committing BAE to delivering a “new cutting edge research and development facility as part of a university and advanced manufacturing precinct being delivered at the Western Sydney Aerotropolis.” The signing of the agreement was by the NSW Premier at BAE’s global headquarters in London, emphasising the importance of the arrangement.

That agreement, along with the signing of other Foundation Partners, occurred well before physical development at the precinct, with the common user AMRF building only recently being designed.

Geelong: Carbon Nexus, a research facility dedicated to R&D on carbon fibre and its composites operated by Deakin University, opened in 2014 in Geelong. Development of the facility was predated by the reaching of agreement with a number of companies, including international firm DowAksa, which gave certainty to the investment.

This investment then gave impetus to other industry participants to grow the precinct. The Victorian Government in August 2015 announced an investment by carbon fibre and advanced composites manufacturer Quickstep Holdings to relocate jobs and R&D functions to Geelong from Germany, to benefit from collocation within the precinct.

6.3 Success Factor 3: Engage with Research Partners

Where advanced manufacturing precincts have been successful interstate and globally, there has been a strong research and academic focus. This is evidenced by examples such as:

- The Advanced Manufacturing Research Centre (AMRC) in Sheffield, UK, which is focussed on the University of Sheffield's engineering department;
- The Fishermen's Bend precinct in Melbourne, where RMIT have a strong research focus;
- Deakin University's driving of the Carbon Nexus and surrounding Geelong precinct; and
- The incorporation of the Multiversity, a collaborative facility developed through cooperation between four NSW universities and TAFE, as part of the Western Parkland City.

The challenge is achieving true integration as opposed to co-location of research facilities. This is driven through active involvement of university and research partners through investment attraction and infrastructure scoping phases to ensure their focus is on industry needs.

Effective integration with research means that organisations operating within the precinct can benefit from the activities of the research institution and the research institution benefits through exposure to application of research in commercial settings.

6.4 Success Factor 4: Access Suitable Workforce

Success of AM Hubs is heavily influenced by the ability to attract and retain the appropriate skill level and capacity of a workforce. Advanced manufacturing requires a workforce which is highly skilled and trained, and typically is a relatively high employer relative to economic output. Any advantage that could appeal to trained workers or those willing to upskill supports the success of a Hub.

An advantage when establishing a Hub is the liveability and attractiveness of the surrounding area, as this supports attraction of talented workers. This is particularly true where investment from international organisations is being sought. The appeal of a region is likely to be a key focus in pitching to those organisations. For example, both the announcements referenced above (BAE Systems to Western Sydney and DowAksa to Geelong) referred to the opportunities for relocation of staff.

While attracting organisations and staff for relocation is a key consideration, equally important is access to a suitably skilled local workforce. Successful hubs have access to both a reasonable population base and appropriate training pathways to prepare potential workers for participation within the Hub.

Benchmark hubs have taken varying approaches to addressing workforce access issues. A noted example is the AMRC in Sheffield, which runs a program of indentured apprenticeships. Under this program, to access employees trained through the AMRC's apprenticeship and university programs, organisations must be active participants in the programs of the Centre.

6.5 Success Factor 5: Integrate with Broader Supply Chain

The long-term success of an advanced manufacturing hub depends on the ability to attract organisations directly involved in manufacturing and those who feature within the broader supply chain. Typically, where anchor tenants can be attracted, the rest of the supply chain will follow however it is important to consider the nature and location of the precinct to enable this to occur.

A key element to growing the precinct using this strategy is access to transport and distribution networks, not just for output manufactured products but also for necessary inputs and raw materials. This ensures that manufactured products can be delivered in a cost competitive way, which is not achievable where they cannot be provided to market in a timely or cost-effective manner. While supply chain requirements will vary between target sectors, it is likely that for precincts to be successful within Australia, they will need access to port and import facilities, be readily serviceable through wide or heavy load corridors and potentially intermodal transport hubs and have access to communications and technology infrastructure to interface with the supply chain.

6.6 Success Factor 6: Deliver Effective Common User Infrastructure

Common User Infrastructure (CUI) is a critically important component of an advanced manufacturing precinct, as it provides a differentiator when compared to typical industrial land or developments and lowers the barrier to entry into the industry for some organisations. This effect of lowered barrier to entry is driven by the typically high capital cost of elements of advanced manufacturing equipment, such as specialised fabrication or technologically integrated equipment, as well as the cost of accessing workshop and laboratory space for what may be relatively small periods for production runs or pilot manufacturing processes.

By providing access to such facilities in a shared or leased manner, CUI makes access to equipment cheaper for parties and requires less capital investment. For a number of sectors aligned with advanced manufacturing, companies do not need to access equipment year round or on a 24/7 basis, so flexible access arrangements provide a significant differentiator and enabler.

Provision of CUI, where Government has a role in providing that infrastructure, is a tangible demonstration of Government backing for the precinct. The concept of co-investment alongside Government can be a powerful enabler of private sector investment, as it is clear that Government is committed to the concept in a material form. CUI also encourages a collaborative approach from the outset of a precinct, as it is likely to be tied to involvement with research and training activity. For example, a partnering research organisation may have the expertise in operation of specific equipment, necessitating a collaborative approach with all potential users and fostering networks across the precinct.

CUI can typically take two forms:

1. Specialised equipment, including digital technology and infrastructure, generally linked to research and training activities. For example, Carbon Nexus in Geelong provides access to specialised materials processing, testing and measuring technologies which would not ordinarily be accessible to individual organisations; or
2. Access to common enabling infrastructure, such as heavy lift, laydown or transportation infrastructure. This is an approach seen as part of the Australian Marine Complex (AMC) in Henderson, where the common user facility includes elements such as a fabrication hall, floating dock, modular transporters, laydown and assembly areas and wharves, plus all enabling infrastructure and logistics support.

A successful advanced manufacturing precinct is likely to include elements of both, particularly in early stages as industry development is a key focus. It is also critical that an AM Hub consider the ongoing approach to that CUI, including appropriate provision for asset replacement and lifecycle investment to remain up to date.

Consultation with the AMWU has highlighted the potential for comparable CUI to that at the AMC to provide benefit at Bunbury. While this is not aligned with Advanced Manufacturing, there may be elements of similar CUI which would be worthy of consideration once a preferred sector of focus is selected. Lessons learned from the development of the AMC would also be useful to consider in progressing AMTECH.

6.7 Success Factor 7: Locate to Maximise Benefits

The final, overarching, success factor is recognition that location is a critically important consideration for an advanced manufacturing hub. Location brings together a number of factors outlined above, including:

- Access to suitably trained workforce;
- Linkages into supply chain;
- Access to transport and logistics networks;
- Relationships with supply chain and associated industries;
- Access to research and training opportunities;
- Reliable digital and communications connectivity; and
- Clean and continuous energy supplies

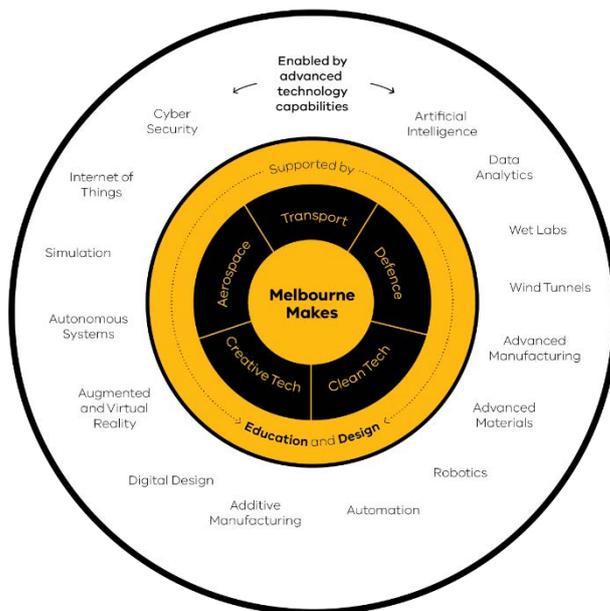
To consider why Bunbury may be an appropriate location for advanced manufacturing, the following section presents each of the success factors identified above and assesses how Bunbury and the AMTECH concept may align with these, ensuring long term success of an advanced manufacturing precinct.

6.8 Use of Success Factors

The successful application of the success factors outlined above can be evidenced through the 'Melbourne Makes' model⁶, which underpins the Fisherman's Bend precinct. This model, shown in the figure below, incorporates success factors in the following ways:

- At the centre of the model is five sectors of interest (Transport, Defence, Clean Tech, Creative Tech and Aerospace), showing focus areas as outlined in Success Factor 1;
- The next ring identifies that those sectors are supported by education and design, incorporating success factors 2 and 3; and
- The final ring incorporates the many advanced technological capabilities provided in the precinct, which are driven by common user infrastructure (success factor 6) or collaboration with research through the presence of Melbourne University (success factors 3 and 4).

Figure 4: 'Melbourne Makes' Model



⁶ Fishermans Bend NEIC, Victorian Government, <https://www.fishermansbend.vic.gov.au/precincts/employment-precinct>

A photograph of two scientists, a man and a woman, wearing white lab coats and safety glasses. They are smiling and looking at a piece of equipment in a laboratory setting. The man is pointing at the equipment, and the woman is holding it. The background is a warm, orange-toned laboratory environment with various pieces of equipment and cables.

PART B: ANALYSIS OF SUCCESS FACTORS FOR AMTECH

7. SECTORS AND AREAS OF FOCUS

The success of AMTECH in Bunbury will be driven by the selection of appropriate sectors of focus. A number of potential sectors have been identified through this feasibility study, informed by:

- Review of relevant Government strategy and policy;
- Market consultation, with detail of sectors raised by specific organisations contained within the market sounding report at Appendix B;
- Benchmarking to other Australian precincts;
- Gap analysis of current and proposed Australian advanced manufacturing precincts; and
- Local research and training capability and priorities informed through consultation.

While these activities inform the identification of potential sectors below, there is an underlying need for broader Government support to underpin investment attraction, support for infrastructure investment, training and research opportunities.

It is critical that sectors selected for the AMTECH align with State Government policy and strategic direction. It is recommended that a broader Government position be developed to support the inclusion of one or more specific sectors within the AMTECH.

The sectors which have been identified as potential areas of specialisation for the AMTECH are:

- Renewables – Wind Power;
- Renewables – Solar PV;
- Hydrogen (Electrolyser manufacture);
- Battery Manufacturing;
- Lithium; and
- Mining and Resources (Mining Equipment, Technology and Services (METS)).

The following sections describe these sectors and their alignment with current State Government policy as well as justifying further investigation within the South West region as part of a Detailed Feasibility Study for AMTECH.

7.1 Selecting Areas of Focus

While this report identifies potential areas of focus, there is a need for a whole-of-Government approach to designate those which would be a focus for AMTECH. This was highlighted in engagement where JTSI identified that a number of potential opportunities within these sectors may be pursued by the State Government in commercial-in-confidence discussions at any time. This opens the potential that sectors of interest may also be under consideration for specific projects or other Government investments in other geographic areas distinct from the AMTECH.

Therefore, while this Preliminary Assessment can identify potential sectors for focus, a dedicated approach from Government will be required to confirm sectors for the AMTECH to prioritise.

7.2 Renewables – Wind Power

Wind power is electricity generated by harnessing the wind commonly using wind turbines located on hilltops or near the ocean. The energy of the wind spins an electric generator producing electricity. Currently around 10 per cent of Western Australia's electricity generation is based on renewable energy, with wind power one of Western Australia's main sources of renewable energy.

The Western Australian Government is committed to improving energy affordability and creating a cleaner, greener energy system for Western Australian, through Western Australia's Energy Transformation Strategy and recommendations of the Energy Transformation Taskforce.

As part of the Government's commitment, there is a need to continue to develop new renewable energy technologies to reduce energy costs and to meet its commitment of net zero emissions by 2050. The contribution that renewable energy facilities make to the reduction in carbon emissions is an important consideration for the growth of the industry, as well as the socio-economic benefits to the State.

Initiatives related to wind power are currently outlined in key Western Australian Government policy and strategy documents including:

- **Diversify WA Supply Chain Development Plan 2021-22** – A framework to guide the Government's efforts to increase the participation of Western Australian businesses in more diversified domestic and global supply chains. The plan outlines the following specific initiative related to wind power:
 - Identify appropriate industrial land for use as a manufacturing hub for wind turbine blades and invest \$10 million to support the development of a wind turbine manufacturing industry.
- **The WA Investment and Trade Plan 2021-22** - A whole-of-government plan reflecting a strategic, cross-agency approach to investment and trade. The plan provides a clear overview of the Western Australia Government's main investment and trade initiatives in key sectors for 2021-22 and outlines the following priority initiative related to wind power:
 - Initiative - Facilitate projects to stimulate the Western Australian renewable energy industry.
 - Objective - Attracting investment into Western Australia's renewable energy industry to develop and grow the sector.
 - Action - develop an action plan in response to the findings of independent feasibility study Wind Farm Supply Opportunities in Western Australia.
- **Western Australia's Mineral and Petroleum Resources Development Strategy** – A strategy outlining the key priorities needed to meet the Governments vision for the resources sector of 'Western Australia is recognised as a world-leader in the sustainable development of its outstanding mineral and petroleum resources'. The following strategic priority is linked to wind power:
 - Strategic Priority 2: An environmentally and socially responsible industry - The resources sector is leading the way in using renewable energy to reduce the carbon footprint of industrial projects in Western Australia, with investment in the development of new technologies to abate carbon emissions. Going forward there are significant opportunities for Western Australia's resources sector to transition to clean energy.

Bunbury is a logical area to develop wind power renewables as the South West region has an abundance of renewable wind resources, is in close proximity to existing Western Australian wind farms and to Western Australia's main electricity network grid (the South West Interconnected System).

Bunbury has good transport connections to service the State, domestic and international clean energy markets and supply chains. Due to the proximity to likely projects, manufacturing of components for wind turbines would be well suited to the Bunbury region.

The State Government has previously considered opportunities for steel manufacturing for blades, while opportunities for more advanced componentry such as electrical and controls parts, gearboxes and bearings may also be suitable opportunities for further exploration.

7.3 Renewables – Solar PV

Solar PhotoVoltaics (PV) is a renewable energy source where solar panels convert sunlight into electricity and is the other main source of renewable energy in WA. Like wind power, there are several initiatives related to solar PV currently outlined in key Western Australian Government policy and strategy documents, including:

- **Diversify WA Supply Chain Development Plan 2021-22** – Fund and deliver 900 stand-alone power systems over 5 years to increase the reliability of power supply, particularly in the regions.

- **The WA Investment and Trade Plan 2021-22** - Facilitate projects to stimulate the Western Australian renewable energy industry with an objective to attract investment into Western Australia's renewable energy industry to develop and grow the sector.
- **Western Australia's Mineral and Petroleum Resources Development Strategy** – Strategic Priority 2: An environmentally and socially responsible industry - Investment from industry in the development of new technologies to abate carbon emissions, with significant opportunities for Western Australia's resources sector to transition to clean energy.

As an area with low cloud coverage and that receives large amounts of sunlight, Bunbury and the South West has one of the best climates for solar PV production. The area has good transport connections to service the Western Australian, domestic and international clean energy markets and supply chains.

In addition, it is located close to some of the State's prominent solar farms and WA's main electricity network grid. This supports further consideration of solar PV technology manufacture as a focus of the AMTECH, potentially including PV cells, electrical componentry or smart controls systems.

7.4 Hydrogen (Electrolyser manufacture)

Hydrogen is a safe, flexible and clean fuel that can be used to power vehicles, generate electricity and produce heat without carbon emissions. Hydrogen is an emerging industry that will play an important part in WA's energy future with the State Government supporting the State's transformation into a significant producer, exporter and user of renewable hydrogen.

The WA Renewable Hydrogen Strategy and Roadmap sets out how this vision will be achieved, with 26 initiatives across the focus areas of exports, transport, remote applications and hydrogen blending in natural gas networks. This renewable hydrogen transformation is backed by a government investment of almost \$90 million in the development of WA's renewable hydrogen industry.

In addition to the WA Renewable Hydrogen Strategy and Roadmap, other hydrogen initiatives within key government policy and strategy documents include:

- **Diversify WA Supply Chain Development Plan 2021-22**
 - Target the growth of downstream activities in the natural gas value chain, particularly the production of petrochemicals and hydrogen from gas; and
 - Drive the development of WA's renewable hydrogen industry and position the state to be a major producer and exporter of renewable hydrogen.
- **The WA Investment and Trade Plan 2021-22**
 - Initiative - Implement the WA Renewable Hydrogen Strategy and Fund.
 - Objective - Support investment in renewable hydrogen projects in Western Australia.
 - Action – Multiple actions related to increasing hydrogen specific capabilities and developing the sector within Western Australia.
- **Western Australia's Mineral and Petroleum Resources Development Strategy** – The resource sector has significant synergies with a renewable hydrogen industry of which the State Government has introduced measures to support and develop.

Western Australia has an abundance of natural resources to make clean hydrogen for its own use, to supply Australia and for export globally. Coastal areas are favourable for hydrogen production due to supply of desalinated water and existing infrastructure (e.g., electricity, ports).

The State Government has recently announced an investment of up to \$117.5 million to attract Federal funding for renewable hydrogen hubs in the Pilbara and Mid-West to drive Western Australia as a global clean energy powerhouse. The State has lodged applications through the Commonwealth Government's Clean Hydrogen Industrial Hubs program for matching Commonwealth funding to develop hubs in the Pilbara and Mid-West.

The Pilbara Hydrogen Hub plan involves development of a hydrogen or ammonia pipeline connecting the Maitland and Burrup strategic industrial areas, creation of a Clean Energy Training and Research Institute based out of both Karratha and Port Hedland and port upgrades to facilitate export opportunities.

The Mid West Clean Hydrogen Hub proposal includes construction of renewable energy and road infrastructure at the Oakajee Strategic Industrial Area, as well as connecting the area to power and water and developing hydrogen refuelling infrastructure.

These are in addition to other announced or conceptual hydrogen projects, including Woodside's planned H2Perth in Kwinana, that will produce up to 1500 tonnes of hydrogen every day to export in the form of ammonia and liquid hydrogen.

While direct hydrogen production projects are focussed on areas other than the South West, there remains an opportunity to support this rapidly developing industry through an AM Hub. Hydrogen projects require a variety of specialised components, notably electrolyzers, which are not currently manufactured in Australia.

The prospect of hydrolyser manufacturing has been proposed by a number of parties and consultation with Woodside highlighted this potential within WA. The H2Perth project will require large volumes of hydrolysers and their regular replacement. These large scale hydrogen projects may be enough to support a feasible local manufacturing industry.

A focus on hydrogen in Bunbury is compelling due to the relative proximity of some major hydrogen projects and producers, and access to port facilities which are closer than existing port facilities in Fremantle.

7.5 Battery Manufacturing

Battery manufacturing comprises the production of modular electric power sources where part or all of the fuel required to produce electricity is contained within the unit. The electric power itself is generated from a chemical reaction.

A wide array of minerals are required for these reactions to take place and WA has vast reserves of battery minerals which justify the drive to develop a world-leading, sustainable and value-adding battery industry. Western Australia is the world's largest producer of lithium, accounting for a massive 49 per cent of global lithium production in 2020. It also houses large reserves of nickel, cobalt, manganese and alumina. Guided by the Future Battery Industry Strategy, Western Australia is growing its battery industry through objectives and pathways:

- Western Australia to be globally recognised as a leading producer and exporter of battery materials, technologies, increasing:
 - Integration in global supply chains;
 - Awareness about Western Australia's capacity;
 - Involvement in global research; and
 - Domestic uptake of battery technologies.
- Improve the competitiveness of Western Australia's future battery minerals and materials industry:
 - Support the reduction of project costs;
 - Streamline project approvals;
 - Differentiate Western Australian production from competitors; and
 - Facilitate technology transfer and innovation.
- Expand the range of future battery minerals extracted and processed in Western Australia:
 - Increase exploration;
 - Engage new mining investors and manufacturers; and
 - Develop mining and processing innovations.
- Increase the scale of processing, manufacturing and service activities across the breadth of the battery value chain in Western Australia:
 - Establish new industrial projects;

- Develop skills;
- Develop mineral processing innovations;
- Accelerate the domestic uptake of EVs and BESSs;
- Develop pro-recycling policies.
- Increase research and development activities focused on the battery materials and high technology energy sectors in Western Australia:
 - Increase investment in research and development;
 - Facilitate local and international collaboration;
 - Develop technology skills; and
 - Accelerate the domestic uptake of BESSs.

The Future Charge Building Australia's Battery Industries Final Report, outlines the following:

- Objective 4 - The battery industries, research organisations and education institutions collaborate to drive growth
- Recommendations - Work with state and territory governments to identify sites for battery materials and manufacturing hubs. The materials hub may be located in WA, taking advantage of WA's existing strength and possibly make use of decommissioned mine sites. The manufacturing hub's location should be determined in consultation with industry

Through the Minerals Research Institute of Western Australia, the State Government has invested \$900,000 in the Future Battery Industries Cooperative Research Centre (FBICRC) Cathode Precursor Production pilot plant project led by Curtin University.

The pilot aims to demonstrate Australia's capability to produce cost-effective, high-quality nickel, cobalt and manganese for producing precursor cathode active materials (PCAM). PCAM is a form of advanced chemical manufacturing and is a key material used in lithium-ion batteries to power electric vehicles.

The pilot plant project identifies the proposed benefit to WA as "The pilot plant will enable WA to not only supply all the commodities required by the battery manufacturing industry, but develop and demonstrate concept processes for commercial scale precursor production plants within Australia. Increasing opportunity for battery manufacturing in Western Australia creates the potential for the state to become a major processing, manufacturing and trading hub, with the associated social, economic and environmental benefits."

While the plant is located at Waterford, its successful pilot operation would open potential for a commercial scale plant as part of AMTECH, attracting complementary supply chain and related manufacturing activities.

Bunbury is a competitive location for battery production due to its manufacturing capability, capable workforce and leading research institutions. These attributes allow for cost competitive extraction and processing of the minerals necessary for modern battery technology. The area also allows for the easy export of products and technologies through highly developed transport networks.

7.6 Lithium

Lithium has a range of uses in both chemical and technical applications. Lithium in various forms, such as lithium carbonate, lithium hydroxide and lithium chloride is used in lubricant greases, pharmaceuticals, catalysts, air treatment and particularly in batteries. The major technical application for lithium is the production of ceramics and glasses. It is also used in fluxes and glazes as it has the highest specific heat of any solid element. Lithium is used in alloys to increase strength-to-weight ratios taking advantage of lithium's tensile strength and light-weight (low-density) characteristics.

Western Australia has been a producer and exporter of lithium for decades. The government is committed to supporting and growing the lithium industry, including the production, manufacturer and export of lithium and its products.

With the rapid uptake of electric vehicles and battery-based energy storage systems across the world, the demand for lithium has increased dramatically. As such, lithium aligns with the Western Australian Future Battery Industry Strategy.

Lithium is already a focus of other areas within WA, notably the Kwinana area where collaborative organisation Lithium Valley WA, is seeking to attract further investment in the area alongside the Tianqi Lithium Hydroxide plant and Covalent Lithium's proposed lithium hydroxide plant.

While the industry is focussed on Kwinana, there is not the same collaborative, research and teaching focus which is achievable within AMTECH, creating an opportunity for complementary manufacturing activity at Bunbury. This is further supported by proximity to the Albermarle Lithium Hydroxide Plant at Kemerton and the Talison Lithium mine at Greenbushes

Bunbury is a logical area to focus on lithium and associated manufacturing opportunities as infrastructure support and port access points to strong potential success in a growing industry. In addition, Bunbury is close to major lithium downstream processing plants within the State, providing benefits of supply chain connectivity.

7.7 Mining Equipment, Technology and Services

The Mining Equipment, Technology and Services (METS) sector, supplies the latest technology, software, equipment and engineering and construction services, required for the mining industry (and other industries) to operate.

The past decade's mining boom has helped develop a sophisticated METS sector in Western Australia which is a key contributor to the state's economy. In addition to reliable supply, the State has strong comparative advantages including advanced technical mining expertise, a leading services sector, an enabling legislative framework and proximity to key Asian markets. There are approximately 1,700 specialised METS companies operating in Western Australia, including most top global companies.

The Western Australian Government is committed to leveraging its strengths to unlock further value-adding activities that meet local and global market demand. METS initiatives within key government policy and strategy documents include:

- **Diversify WA Supply Chain Development Plan 2021-22**
 - Provide fabrication and maintenance services for iron ore rail cars, improving the security of the iron ore industry's logistical supply chain and creating local manufacturing jobs;
 - Grow downstream value-adding activities for critical minerals, including processing and manufacturing downstream products; and
 - Invest in Austmine's WA METS Digital Mining Export Hub to build export capacity, knowledge and opportunities between regional, remote and metropolitan SMEs.
- **The WA Investment and Trade Plan 2021-22**
 - Initiative - Promote WA's capabilities in mining and METS.
 - Objective - Promote WA as an option to fulfil mining industry skills shortages and provide expertise.
 - Action – Activate opportunities and promote the WA METS industry in Asia.
- **Western Australia's Mineral and Petroleum Resources Development Strategy** – Support of the METS sector by State and Commonwealth governments, including through collaborations and connections between regional, remote and metropolitan small to medium enterprises.

With the focus on increasing awareness of the Western Australian METS industry within Asia, Bunbury, with its port facilities, is a compelling choice for any investment into the sector. The port facilities also allow for easy transportation of specialist METS technology and equipment to the State's mining regions with other well developed transport infrastructure integrating with the mining supply chain. This is particularly relevant given the potential to provide dedicated port access as part of AMTECH as many METS components require heavy or large load capacity.

There are specific opportunities which may arise within the METS sector. For example, rail car manufacture has been identified by several stakeholders as a possible focus, with Government establishing the Iron Ore Railcar Wagons Manufacturing and Maintenance Action Group in September 2021.

This focus is further supported by the recent (December 2021) invitation from Rio Tinto to Western Australian manufacturers to submit Expressions of Interest (EOI) for the construction of 100 rail cars for its Pilbara iron ore mining operations. At this volume, market engagement conducted for this Preliminary Assessment suggests that Government would be required to assist through provision of common user facilities. Developing the AMTECH would allow for more rapid response by industry to such opportunities.

8. INDUSTRY-LED PROCESS

This success factor highlights the importance of industry playing a lead role in realising an advanced manufacturing precinct. To underpin this, it must be clear that there is a level of industry interest in advanced manufacturing at a specific location prior to Government independently progressing that concept. To understand industry and market support for the AMTECH concept, a market consultation process was undertaken which engaged with a number of industry parties.

8.1 Overview of Process

8.1.1 Purpose

The purpose of the market consultation exercise was to:

- Discuss the proposed AMTECH concept with selected market participants (Participants) to better understand their broad views towards the Project;
- Understand Participants interest in using common user facilities or moving operations closer to AMTECH;
- Understand the requirements for common user facilities and what Participants would need to be developed at AMTECH; and
- Test with Participants the requirements needed from Government in order for them to make a commitment to AMTECH.

8.1.2 Methodology

The market sounding sessions were conducted through a range of meetings, video calls and telephone calls with over 25 Participants across various industry sectors, Government and education providers. Sessions were conducted by Paxon from October to December 2021.

The notes from individual sessions are contained within the market sounding report provided at Appendix B.

8.2 Key Findings

The key findings from the market sounding process include the following:

- There is a need for clear definition and more effective communication from Government on what AMTECH is, and what it is likely to include, to facilitate further assessment and investment from industry;
- Opinions of the AMTECH from industry were positive, including support for it to be located and developed in Bunbury;
- Interest in common user facilities at AMTECH was high, although many Participants stated that they would need to understand what these common user facilities would actually consist of prior to confirming use;
- Some Participants were open to moving their operations closer to AMTECH, noting the benefits of being located within an Advanced Manufacturing Hub. However other Participants stated that they did not have an interest in having a physical presence at AMTECH, either due to a lack of perceived benefits in moving or due to current facility ownership / lease conditions that are favourable or present barriers to relocation;
- Participants stated the need for further understanding on the AMTECH Project prior to making any commitment, however some suggestions on how Government could attract businesses include:
 - Assistance with lease costs and hire of facilities and equipment at AMTECH;
 - Financial assistance to relocate operations to the area and ensure a business was no worse off;
 - Streamlined planning requirements and the delivery of supporting infrastructure and utilities;

- Education on how advanced manufacturing can benefit business and how it can add value to industry, especially for small business who likely don't have the time or capital to invest in this understanding;
- Assistance with the development of traineeships and apprenticeships, to ensure sufficient skilled workers are developed to sustain industry growth; and
- Support (and financial assistance) for business to develop concepts from idea generation through to commercialisation.

The primary message arising from the market engagement was that clarity was lacking as to the role of Government in AMTECH and the precinct's intended focus. These uncertainties would compromise industry's ability to firmly commit to the project.

There is evidence of strong local industry support for AMTECH, indicating that Bunbury as a location is ideally placed to achieve this success factor.

A greater level of direction from Government, and tangible displays of Government support, will be needed to crystallise this support into firm commitments for industry involvement.

8.3 Approach for Industry Engagement

While there is strong industry support, to progress the AMTECH concept this support will need to be turned into firm commitments of investment from industry.

Drawing on the findings of the market consultation and the examples of successful Australian precincts, a recommended approach has been developed which covers the process to engage with and attract industry participants for an advanced manufacturing precinct.

Figure 5: Recommended Approach to Industry Engagement



The proposed process is premised on a desire to progress an advanced manufacturing hub at a specific location and hence is directly applicable to the AMTECH concept. The process involves the following steps:

1. **Selection of Industries:** A clear focus for the precinct should be established by Government, identifying the industries and sectors which the precinct will focus on. This allows organisations to understand their own alignment with the intended focus of research, training and collaboration activities at the precinct;

2. **Partner Company Identification:** Key participants in those industries and sectors should be identified, to enable investment attraction to focus on appropriate organisations. An Expression of Interest (EOI) process may be useful to allow companies to self-identify, as was conducted for the Oakajee Strategic Industrial Area⁷. Key organisations do not necessarily mean the largest organisations. Consideration should be given to local alignment, involvement in research or collaborative activities and strategic fit within the sector(s) of focus;
3. **Execution of Agreements:** Government should seek to execute a Memorandum of Understanding (MOU) or similar agreement with potential participant organisations. This provides a tangible display of commitment from both Government and industry. The MOU is likely to facilitate collaborative involvement in precinct master planning and development, providing opportunities for organisations who are early signatories to play a role in shaping the precinct, including common user infrastructure;
4. **University and Training Partners:** In parallel with the industry attraction process, Government should seek to attract and execute similar MOU agreements with training and research partners. Early establishment of such agreements provides the opportunity to develop curriculum and research programs which can typically be a lengthy process for a university or other research or training organisation;
5. **Planning:** Once some anchor tenants are engaged and the research and training offering is more clearly defined, a collaborative process can consider the investment in precinct planning, common user infrastructure and enabling infrastructure and services. This may include business cases or funding requests for Government-funded infrastructure or other development activities.

⁷ <https://www.mediastatements.wa.gov.au/Pages/McGowan/2020/09/Global-call-for-EOIs-to-unlock-Oakajees-renewable-hydrogen-potential.aspx>

9. INTEGRATION WITH RESEARCH

A key pillar in attracting industry to an advanced manufacturing precinct is the potential for collaborative activities, particularly involvement in research programs and access to equipment and personnel with specialised focus. Therefore, involving research organisations is a critical success factor.

To understand the potential involvement of research organisations at the AMTECH, engagement has been undertaken with potential participating organisations. Subsequent to this engagement, other tertiary institutions have indicated an interest in future participation in AMTECH, which may be further pursued in subsequent stages.

9.1 Edith Cowan University

Edith Cowan University (ECU) has been a major supporter of the AMTECH project. ECU's South West Campus is situated off Robertson Drive, 5km from the Bunbury CBD and a 13 minute drive from Bunbury Port. Given the proximity of their campus to potential AMTECH sites and ECU's significant interest to date in the project, ECU provide a natural opportunity for the AMTECH to promote collaboration between manufacturing, education and research. In their 2021 letter of intent, ECU stated:

We are enthusiastic about the proposed model which bring industry, researchers and education providers together to ensure that the South West region, and the State of Western Australia, will have the skilled workforce necessary to maximise the advantages inherent in these new markets and products, emerging technologies and innovative ways to manufacture existing products.

Further to our initial contribution to the feasibility study, the University looks forward to participating in the proposed consortia, with other key industry partners, to help bring this visionary concept to fruition. We look forward to developing the detailed governance and commercial arrangements for the AMTECH with the proposed consortia in due course.

ECU believe that a complementary model which leverages ECU's proximity and expertise to provide educational services would be optimal. For example, ECU could provide training, meeting rooms and computer labs at their South West campus and the AMTECH facility could provide the equipment most suitable for organisations in the sector.

ECU were also open to exploring models that involve integrated education and operational facilities at the AMTECH site. Before committing to any capex or development of facilities, ECU would like to have a firmer understanding of the proposed facilities for the AMTECH site.

Preliminary engagement with other WA universities did not demonstrate significant interest, largely as they did not have a physical presence in Bunbury, however this may change as more detail on the AMTECH emerges. The potential for collaboration between universities at a Hub is evidenced by the 'Multiversity' concept developed for the Western Parkland City.

9.2 Training Provider – South Regional TAFE

South Regional TAFE (SR TAFE) have also been a supporter of the AMTECH project to date. SR TAFE have a Bunbury campus located adjacent to ECU's South West campus and provide the same proximity benefits as ECU to the potential AMTECH site.

SR TAFE indicated interested in providing educational and training courses at the AMTECH facility. One of their key recommendations was to ensure that adequate support and education programs were put in place to provide development opportunities to the local populace so as to attract a complementary skilled workforce to the local area. This will assist the AMTECH to become self-sustainable in the longer term.

9.3 Research and Training Potential in South West Region

One of the primary advantages of establishing the AMTECH in the Bunbury-Geographe region is the unique collaboration opportunity mentioned above with established research and training organisations. ECU's proximity and willingness to engage, combined with the other advantages that the Bunbury location provides, results in Bunbury representing a prime location for the AMTECH.

The Bunbury-Geographe region provides unique locational, economic and social competitive advantages that enhance the research and training potential in the region:

- An extensive network of business and industry training, development and networking institutions and organisations;
- Engineering and mining heritage;
- The availability of industrial land, gas and power and clustering of businesses that leverage regional competitive advantages and competencies;
- A diverse, robust and resilient regional economy; and
- A lifestyle that attracts and retains skilled staff.

There is a strong alignment between the AMTECH concept and this success factor, due to its location and ongoing involvement of potential partner organisations in the research and training areas.

10. ACCESS TO WORKFORCE

The South West region presents a unique opportunity to satisfy the success factor around access to an appropriately deep and skilled workforce. Covering an area of nearly 24,000 square kilometres, the South West region is home to more than 180,000, having grown at a rate of over 1.5 per cent per annum over the last decade.

Providing the AMTECH at Bunbury presents two key opportunities in relation to people and the provision of a long-term workforce:

1. Provide a workforce from the current local population; and
2. Use the liveability of the area to attract organisations and workforce.

10.1 Local Workforce Provision

Bunbury and the surrounding areas have a number of positive characteristics in relation to providing suitable workforce to service businesses seeking to participate in the AMTECH or within the aligned advanced manufacturing industry.

There is currently a relatively high level of unemployment in Bunbury, with census data from 2011 to 2016 showing an increase in the unemployment rate from 5.3 per cent to 8.5 per cent (well above the national average) and percentage looking for full time work increasing from 3.2 per cent to 5.3 per cent. These highlight a lack of suitable opportunity for employment locally.

The lack of opportunity is particularly clear in youth unemployment figures. The *State of the Regions 2018-19* report published by the National Economics/Australian Local Government Association identified that the South West and Peel ranked tenth highest in Australia for youth unemployment with 21.6 per cent of people aged 15 to 24 years unable to find a job. Furthermore, the unemployment rate in the South West had increased 6 per cent since 2003, evidencing a lack of opportunity for local youth to find suitable employment in the region.

Developing the AMTECH and integrating training and educational programs through TAFE and universities will provide clear training pathways and a visible opportunity for skill development for local youth. Anecdotally, a lack of suitable opportunity in local areas deters youth in the South West from pursuing trades-based training which would be partially addressed through the growth of the advanced manufacturing sector.

A common theme identified in the industry consultation was the tendency for skilled workers from the South West to seek employment opportunities elsewhere in the State, particularly with fly in/fly out roles, due to lack of opportunity in the local region but a desire to remain living locally.

It is estimated that around 9.6 percent of the South West population, and 11.5 percent of the Bunbury Geopraphe population, travel outside the region for work.⁸ The presence of the AMTECH and growth of associated industry would provide a suitable opportunity for trades and technically trained workers to find suitable employment closer to home in the South West region. This provides a ready source of suitable workforce which may not be otherwise achievable in other regions.

The ability to provide a ready workforce will be strengthened by the recent announcement that the South West will be the eighth region in Australia to enter a five-year Designated Area Migration Agreement (DAMA) with the Commonwealth aimed at ensuring skilled migrants contribute through employment in key roles where Australian workers are not available.

The DAMA allows employers to bring in skilled workers under the labour agreement stream of the Temporary Skill Shortage Visa that may provide a pathway to permanent residency, benefiting the South West region long-term in both business and community (assuming current Covid-related border constraints are removed to facilitate the program's intent).

⁸ REMPLAN Data

10.2 Regional Appeal

Bunbury is a compelling location for an advanced manufacturing hub in part due to the liveability of the broader region. The review of benchmark hubs indicated that having an appealing location is beneficial in attracting interstate and international organisations to emerging precincts. In launching the *Draft Economic Development Roadmap – Phase 1* for the Western Parkland City in NSW, Minister for Jobs, Investment, Tourism and Western Sydney and Minister for Trade and Industry Stuart Ayres affirmed this position, saying “improving liveability not only has a positive impact on the environment but it helps attract world-class businesses and talent.”⁹

The Regional Australia Institute identified six indicators of liveability:

- Health services
- Education services
- Cost of living
- Amenity
- Connection to community, friends and place; and
- Lifestyle and opportunity.

The South West region rates highly against these indicators, which is supported by its rating in the top third of regions for the Ipsos Australian Liveability Index¹⁰. Consultation with local businesses as part of the industry consultation highlighted the appeal for workers in being close to outdoor activities and tourism destinations with access to quality services and infrastructure. This mix is an important differentiator for the region.

The lifestyle benefits of the South West region and the relatively affordable cost of living compared to Perth or interstate metropolitan centres provides an opportunity for the region to attract talent, investment and companies who prioritise a high quality of life and work balance for their people. It is anticipated that the Bunbury and South West regions would provide a selling point in investment attraction activities seeking businesses from interstate or overseas to transfer or grow workforce and activity in the region.

⁹ *Jobs-led growth plan for the Western Parkland City*, NSW Government media release, 2/12/2021

¹⁰ Ipsos, *Understanding liveability across Regional Australia*, 2021

11. LOCATION AND INFRASTRUCTURE

The AMTECH concept strongly aligns with the success factor around location which covers the importance of supply chain, access to logistics and transport networks and proximity to end users of goods produced through advanced manufacturing.

No definitive site has been selected for the AMTECH at this stage, as a greater degree of project certainty is required prior to allocating land. However, meetings and consultations both prior to and during the development of this Preliminary Assessment have identified a number of potential sites.

11.1 Potential Sites

There are several sites within the Bunbury-Geographe region that have been considered as potentially suitable locations for the AMTECH facility, based on their:

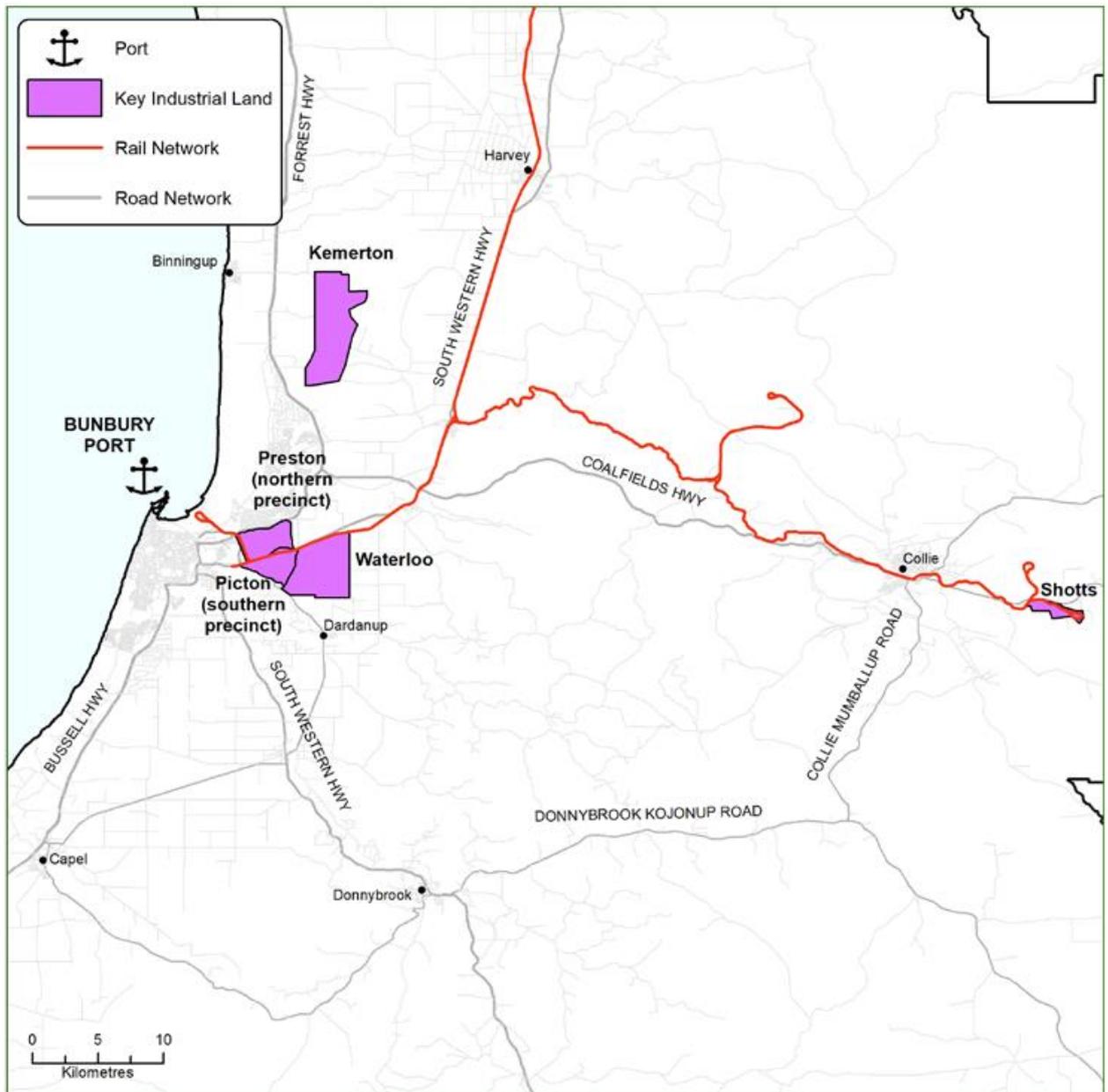
- Ability to provide for industrial and/or educational uses;
- Ownership by State Government Departments and authorities;
- Land availability and
- Proximity to supporting industry, services and infrastructure.

It is noted that the AMTECH may ultimately have features located in separate sites. For example, there may be port-related equipment and facilities located at Bunbury Port, with common use infrastructure and other equipment and facilities located at a nearby precinct with transport links (rail and road corridors) connecting to the Bunbury Port facilities. This would maximise appeal for some of the sectors of focus identified, for instance through providing for ready loading and unloading of large modules associated with the METS sector.

The potential sites considered to date include the Bunbury Port and several nearby industrial parks including Picton, Preston and Waterloo. Figure 6 provides a map of the region including Bunbury Port, the key industrial land sites and the existing rail and road network.

The identification of land was informed by preliminary engagement with DevelopmentWA which indicated that while there is strategic land within the target region suited to industrial purposes there is not an exhaustive list of potential sites. Furthermore, DevelopmentWA would require further direction from Government as to a preferred site and parameters associated with planning and development of the precinct to be actively involved in progression of the AMTECH concept.

Figure 6: Potential AMTECH Sites – Key Industrial Land¹¹



¹¹ Department of Transport, Draft South West Supply Chain Strategy

11.1.1 Bunbury Port

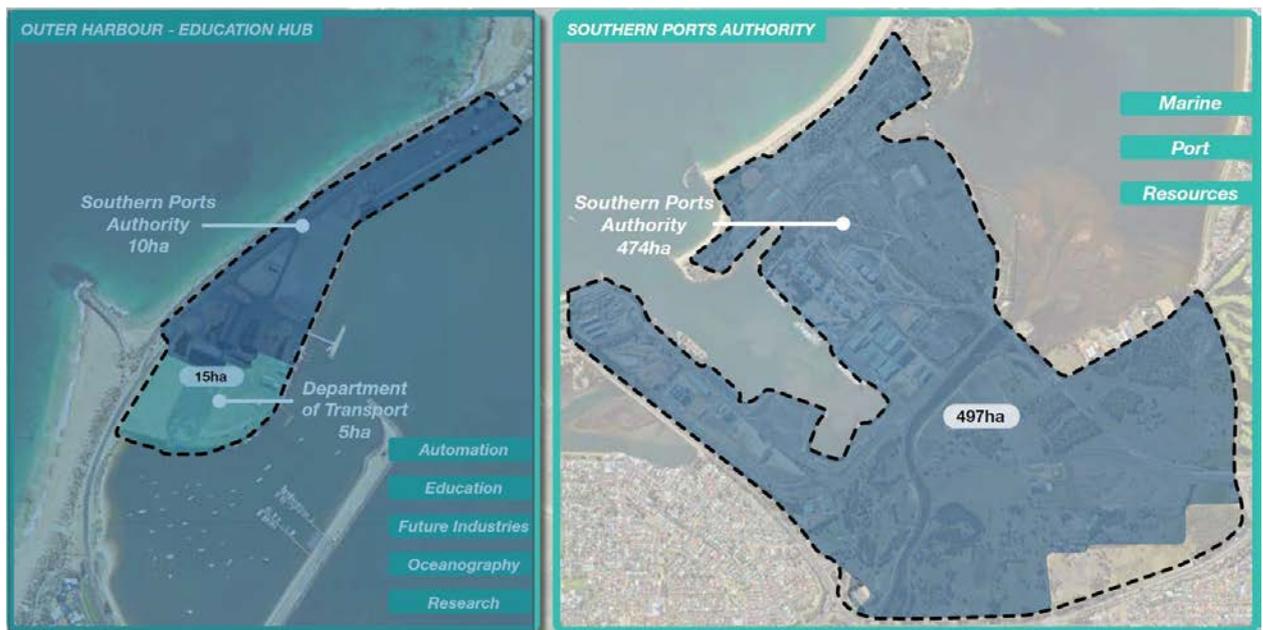
Southern Ports, which is a Government Trading Enterprise, is the custodian of the Bunbury Port. Preliminary consultation was held with Southern Ports as part of this study to inform their involvement in the AMTECH concept.

Southern Ports manage 482 hectares of land at Bunbury and are currently utilising only 55 hectares (11% of total land – Figure 8). The enterprise is required to utilise the land for “port purposes” but have flexibility to determine land utilisation for areas that are not yet required for port purposes.

Southern Ports have been supportive of the AMTECH proposal and are willing to accommodate port-related equipment and facilities on-site, as well as developing the port and port access to facilitate other AMTECH requirements, such as heavy lift facilities, deeper berth/wharf access and improved rail access. Any use of port land for AMTECH must conform with the longer-term master planning of the port. While there may be scope to use some port land that is not currently required for port purposes, the duration may be temporary. Given the Port currently has significant undeveloped land available (over 400 hectares), there may be opportunity to temporarily utilise port land for enough time to meet AMTECH's needs.

Steve Lewis, Southern Ports CEO, considered the preferred site at Bunbury Port for the AMTECH facility (or a component thereof) would likely be on the North-East side of Estuary Drive, although warned that this land was low-lying and may not be suitable to certain facilities without further foundation works being undertaken.

Figure 7: Bunbury Port – Southern Ports Authority¹²



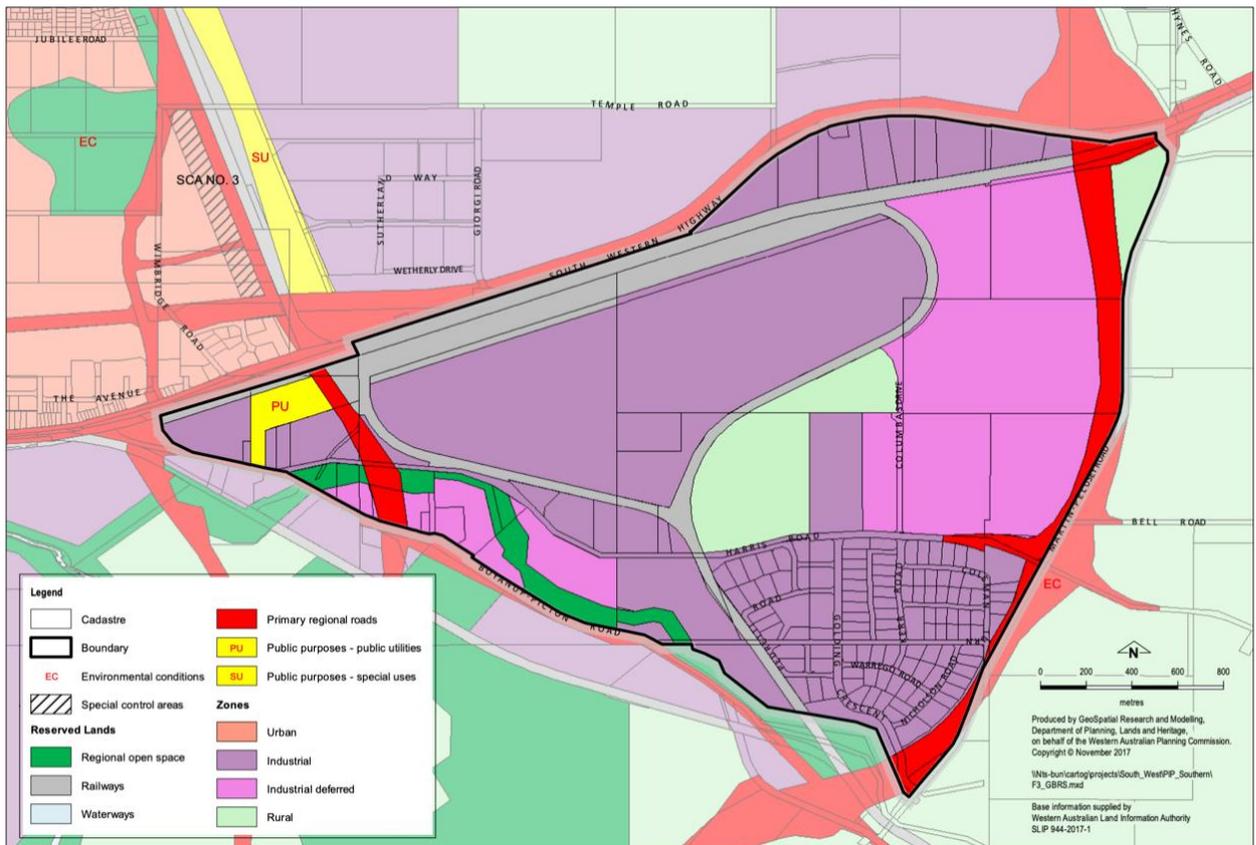
¹² Southern Ports Authority - Southern Ports Site Option.pdf

11.1.2 Picton Industrial Park Southern Precinct

The Picton Industrial Park Southern Precinct (PIPSP) is located east of Picton which is an existing industrial area in the eastern part of Greater Bunbury. The Picton Southern Precinct District Structure Plan (DSP) identifies the precinct for industrial development.

The DSP area (Figure 9) represents relatively flat and low-lying land of approximately 548 hectares with approximately 436 hectares (80%) zoned for industrial uses. The site is well connected to Greater Bunbury including the port, central business district and residential areas. The South Western Highway, Boyanup-Picton Road and Willinge Drive also provide good connectivity to other centres in the South West.

Figure 8: Picton Industrial Park South¹³



Picton has been identified as a potential AMTECH location through early scoping materials developed by the AMWU and SWDC. While the site is suitable for the progression of AMTECH, there is not yet a firm commitment to pursue further investigation of this site.

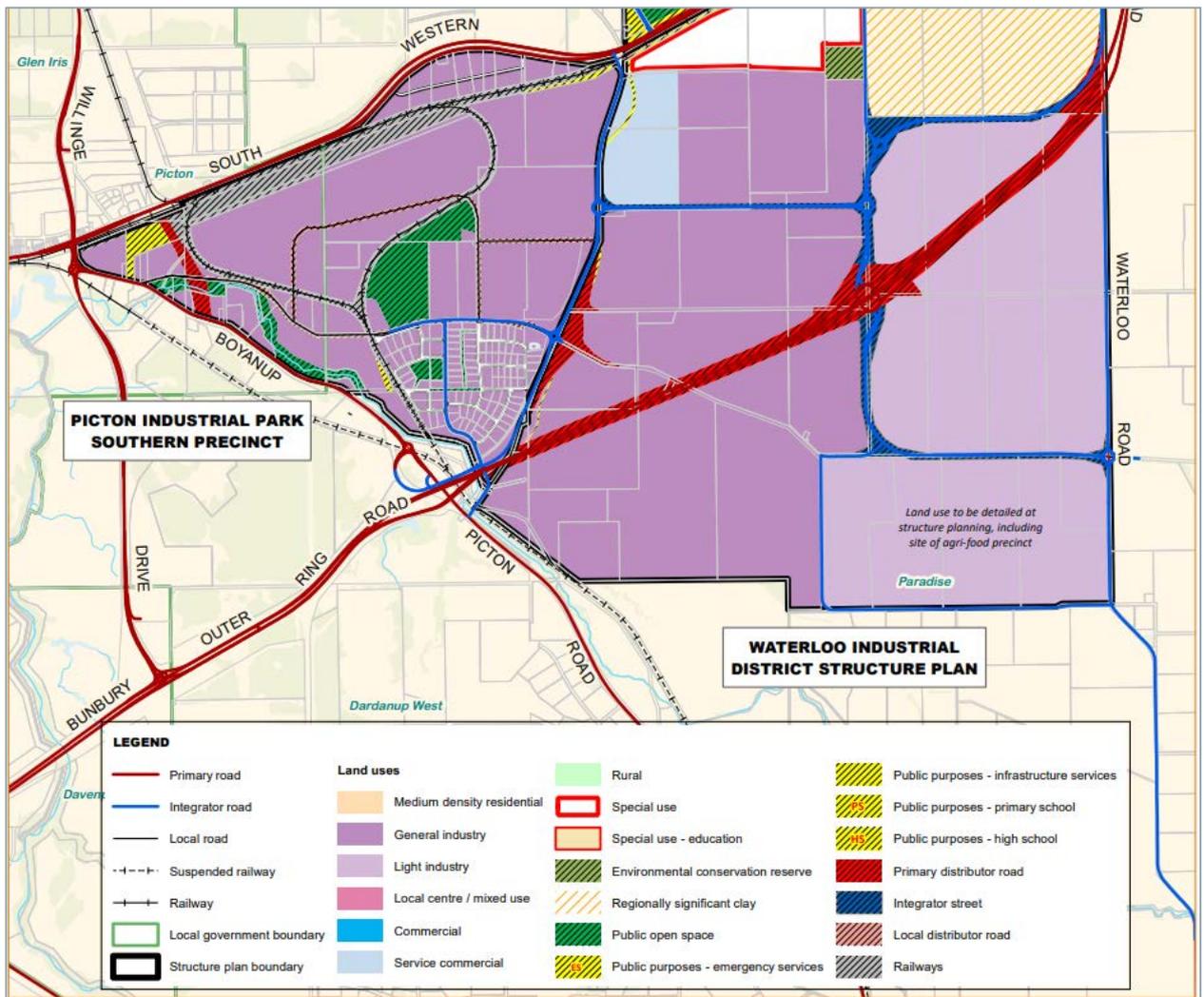
¹³ Department of Planning, Lands and Heritage, Picton Industrial Park Southern Precinct District Structure Plan

11.1.4 Waterloo Industrial Park Precinct

The Waterloo Industrial Park Precinct is located just east of the PIPSP. The precinct covers a total area of 1,356 hectares, with 1,285 hectares (95%) identified as suitable for industrial development. The proposed Waterloo Industrial Park is a joint project between the Shire of Dardanup and West Australian Planning Commission, with a Structure Plan released in February 2020 (Figure 11).

The major advantages of Waterloo are consistent with the other nearby precincts; the proximity to Bunbury Port (11km) and strong transport connections with existing rail and road infrastructure. Notably, the new Bunbury Outer Ring Road alignment will run through the centre of Waterloo, providing access to Perth and the lower South West.

Figure 10: Waterloo Industrial Park Precinct¹⁵



¹⁵ Department of Planning, Lands and Heritage, Waterloo Industrial Park Precinct District Structure Plan

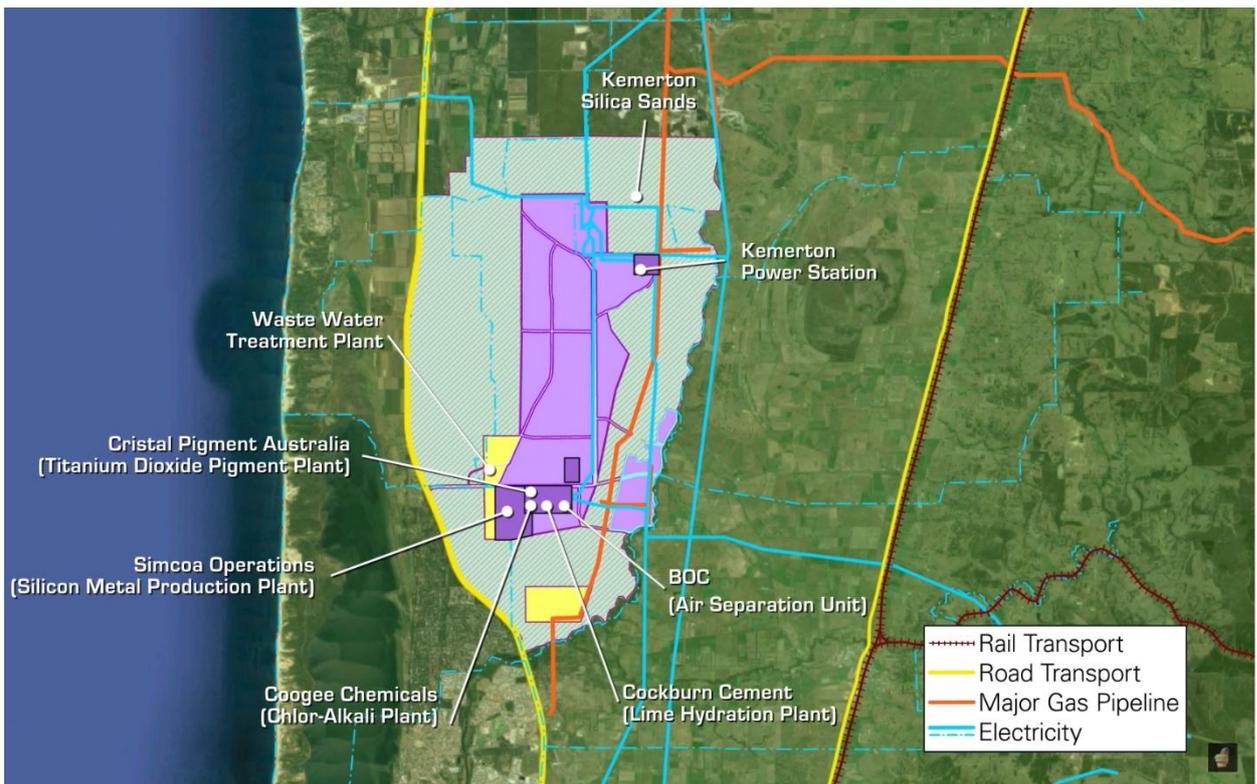
11.1.5 Kemerton Strategic Industrial Area

DevelopmentWA is facilitating development of the Kemerton Strategic Industrial Area (KSIA – Figure 12) for the purpose of industrial and infrastructure development as a strategic proposal. The KSIA is located within the Shire of Harvey, 17 kilometres north of Bunbury.

The KSIA key characteristics are:

- Development of the Kemerton Strategic Industry Zone (Industry Core) which is approximately 2,024 hectares.
- There is an approximate 50-year time period for development.
- Ultimate land use proposed is to be heavy industrial, with other land uses such as raw materials extraction, plantations, or other rural activities to be undertaken in the interim.
- Protection of the Kemerton Industry Buffer Zone (approximately 5,2000 hectares) is proposed, with the majority to be managed by the Department of Biodiversity, Conservation and Attractions in the future. Some of the Buffer Zone may remain in private ownership.
- Kemerton is not as attractive for AMTECH as the other industrial land identified above primarily due to extent of existing/proposed development, greater distance from port and limited rail access. However, it presents an opportunity for activities with a strong industry focus close to Bunbury, providing broader support for having the AMTECH within the region.

Figure 11: Kemerton Strategic Industrial Area¹⁶



¹⁶ Development WA, Kemerton Strategic Industrial Area

11.2 Proximity to Port

The development of advanced manufacturing in the Bunbury-Geographe region presents a unique opportunity given the proximity to Bunbury Port and existing rail and road links. These nodes provide strong State, national and international trading potential. Bunbury Port is a trade gateway to China, South East Asia, the Middle East, Africa, Europe, North America and Australasia. The Port has a direct freight rail link to Perth/Kwinana and Collie, and the State Government supports developing a rail spur into Kemerton Industrial Park for a direct link to Bunbury Port and the main freight network.

11.3 Access to Supply Chain

In addition to access to the deep-water Bunbury Port, the Bunbury-Geographe region also benefits from efficient road networks including a regional highway radiating from Bunbury to Perth and connecting the northern and hinterland areas to the Bunbury Port.

Main arterial road freight highways include Forrest Highway (northern coastal route to Perth), South Western Highway (northern inland route to Perth), the Coalfields Highway (eastern hinterland link) and Bussell Highway (southern Capes area link). Additionally the Bunbury Outer Ring Road (a 27-kilometre free-flowing highway linking Forrest Highway to Bussell Highway) will further enhance Bunbury Port's access to the broader supply chain.

The region benefits from its proximity to the Western Trade Coast, a 3,900 hectare industrial region that has been designed as a gateway to global industry wanting to access the growing economy, secure infrastructure and skilled workforce in WA. The location, facilities and infrastructure make it a strong option for business collaboration with China and South East Asia.

11.4 Summary of Location Assessment

There are a number of potential sites within reasonable proximity of Bunbury which would provide an appropriate location for AMTECH, including surrounding land availability which could facilitate future industry growth. The proximity to port and other transport links is a unique advantage for Bunbury as a location for AMTECH, with the additional advantage of potential land availability at the port for common user infrastructure or dedicated transport and logistics linkages.

These characteristics provide strong alignment with success factors related to location and supply chain, demonstrating the suitability of Bunbury as a location for an AM Hub.

It is not appropriate at this stage to identify a preferred site for AMTECH, as the nature of the site required will be impacted by the chosen focus sector. The sector(s) of focus will impact the required land size, energy and utility requirements and transport connections.

12. PESTEL ANALYSIS

A PESTEL (Political, Economic, Social, Technology, Environmental & Legal) analysis has been conducted to understand opportunities and threats for AMTECH at this stage.

Table 2: PESTEL Analysis

	Factor	Opportunity	Threat
Political	Sovereign demand for production	<ul style="list-style-type: none"> Increased focus on local production supports greater manufacturing focus within WA, given abundance of natural resources 	
	Border closures and labour availability	<ul style="list-style-type: none"> Increased focus on local employment opportunities for skilled workforce 	<ul style="list-style-type: none"> Potential shortage of skilled workforce in short to medium term for development and early operating phases. Reticence of interstate or international organisations to commit to relocation or expansion if border conditions are uncertain.
	Taxation	<ul style="list-style-type: none"> Opportunity for tax incentive or other taxation related inducements to assist in investment attraction process (as seen in other jurisdictions) 	
	State Government policy	<ul style="list-style-type: none"> Focus on economic growth and employment is well aligned with AMTECH objectives 	<ul style="list-style-type: none"> Potential for announcements of competing priorities or investment in alternate geographic areas.
	Federal Government policy	<ul style="list-style-type: none"> Sectoral focus on manufacturing and advanced manufacturing is well aligned with AMTECH development. 	<ul style="list-style-type: none"> Lack of focus on WA limits likelihood of Federal contribution
Economic	Unemployment	<ul style="list-style-type: none"> Opportunity to provide pathway for employment for unemployed, particularly youth, in South West region 	<ul style="list-style-type: none"> Current low unemployment across WA may limit available workforce
	GDP growth in WA	<ul style="list-style-type: none"> Continued strong economic activity in WA provides Government and industry opportunity for investment within AMTECH 	<ul style="list-style-type: none"> Performance of export-based economy limits incentive for public and private sector to focus on value-add activities such as advanced manufacturing
	Interest rates	<ul style="list-style-type: none"> Low interest rate environment is conducive to borrowing for investment within AMTECH 	
	Protectionist economic behaviour – tariffs and subsidies	<ul style="list-style-type: none"> Use of protectionist behaviour by trading partners (such as China) provides incentive to focus on local manufacturing opportunities, particularly for critical supply chain elements 	<ul style="list-style-type: none"> Potential inability to source key technology or raw materials over long term
Social	Demographics in South West	<ul style="list-style-type: none"> Growing population provides opportunity for skilled workforce 	<ul style="list-style-type: none"> Increased population and spread of Bunbury may impact on suitability of manufacturing/industrial use in proximity to port and Bunbury centre.

	Factor	Opportunity	Threat
	Education	<ul style="list-style-type: none"> Trend towards micro qualifications and short courses is aligned to an industry-focused training opportunity within AMTECH 	
	Population Shift	<ul style="list-style-type: none"> Increased prevalence of population movement from major cities to regional areas provides opportunity to relocate skilled workforce for AMTECH, with appeal of South West region providing a strong supporting opportunity 	
	Pandemic (Covid-19)	<ul style="list-style-type: none"> Ongoing pandemic impacts and mitigation of potential future pandemics increases focus on localised supply chain which is strongly enhanced through development of AMTECH 	
Technology	Industry 4.0	<ul style="list-style-type: none"> Increased digitisation within manufacturing drives requirement for access to enabling technologies for small and medium organisations, which AMTECH facilitates 	<ul style="list-style-type: none"> Increased ability to access technological solutions remotely may impact on appeal of collocated facilities
	Wireless technologies	<ul style="list-style-type: none"> Reduced reliance on cable and hard communications connections further enhances appeal of regional location 	
Legal	Enabling legislation		<ul style="list-style-type: none"> Potential requirement for enabling legislation dependent on scope of AMTECH may delay process
	Intellectual Property	<ul style="list-style-type: none"> Increased importance of protecting IP is supported through a collaborative facility where organisations can access expertise on developing and commercialising intellectual property. 	
Environmental	Green Energy	<ul style="list-style-type: none"> Increased investment in renewable energy generation in WA and Australia provides opportunity for AMTECH to support supply chain. Ability for AMTECH to be supported by renewable energy generation provides strong incentive for potential investors or participating organisations 	
	Corporate social responsibility (CSR)	<ul style="list-style-type: none"> Increased focus on CSR provides driver for organisations to participate in collaborative facilities, particularly where AMTECH supports sustainability objectives through practices in energy generation and usage and sustainable manufacturing 	
	Climate change	<ul style="list-style-type: none"> Increased focus on sustainability which supports investment in new, sustainable manufacturing 	<ul style="list-style-type: none"> Impact on potential AMTECH sites, particularly where port space is required, as sea level changes or increased adverse weather events impact on coastal environment

PART C: CONCLUSIONS



13. REPORT FINDINGS

This Preliminary Assessment identifies that advanced manufacturing Hubs provide opportunity for industry growth and economic development. Australia has examples of successful AM Hubs but there are none fully developed within WA.

Developing the AMTECH will help WA drive economic growth and support associated industries. The services the AMTECH is looking to deliver include access to research and training functions, common user infrastructure/equipment and space for organisations to establish advanced manufacturing operations.

13.1 Suitability of Bunbury as Location

The Preliminary Assessment finds that Bunbury would be an appropriate location for an Advanced Manufacturing Hub, as it satisfies the success factors identified for successful Hub development, as outlined in Table 3.

Table 3: Ability of Bunbury / AMTECH to meet Success Factors

Success Factor	Ability to Meet Success Factor
1. Select and Limit Areas of Focus	A number of potential sectors which could form a pillar of the AMTECH have been identified, with a need for Government to provide a strategic decision to designate which of these would become a focus for AMTECH.
2. Industry must play a Lead Role	Industry is supportive of the AMTECH concept and interested in playing a role in its development, however Government must provide clarity on what AMTECH is, and what it is likely to include, and incentivise early involvement for industry participants.
3. Achieve Integration with Research	The Bunbury region has a unique opportunity to collaborate and integrate with research. ECU's proximity and willingness to engage, combined with SR TAFE's interest in providing educational and training courses results in Bunbury representing a prime location for the AMTECH.
4. Access to People	Bunbury and the surrounding areas exhibit several beneficial characteristics in relation to providing suitable workforce to service businesses within the advanced manufacturing industry. AMTECH will also help provide suitable opportunities for local employment, minimising the need for travel outside the region for work.
5. Consider Broader Supply Chain	Bunbury has good access to transport and distribution networks, With the South West's access to major transport infrastructure such as Bunbury Port, rail, major highways, and airports, the area provides benefits from supply chain connectivity. It may be beneficial for Government to identify key organisations within the sectors identified, as attracting an anchor tenant to AMTECH will assist rest of the supply chain following as a natural process.
6. Importance of Common User Infrastructure	The importance of Common User Infrastructure at AMTECH has been reinforced through market engagement with industry and benchmarking studies. Whilst industry advised they would need to have further clarity on what AMTECH is prior to determining the specific Common User Infrastructure required, there was a strong desire for Common User Infrastructure that supports collaboration and removes barriers to entry.
7. Location is Important	Bunbury is seen to be a compelling location for an advanced manufacturing hub due to the liveability of the broader region, with this appeal also assisting in the attraction of interstate and international organisations to the region. Identification of potential sites that would be an appropriate location for AMTECH have been outlined.

In addition to satisfying the critical success factors, Bunbury is uniquely placed to:

- Achieve integration with research, with the location of ECU and their commitment to the AMTECH providing a potential level of integration which other locations cannot deliver;
- Provide workforce, with a suitable demographic and the opportunity for tailored training through proximity to SR TAFE; and
- Meet supply chain and location considerations, where the potential for integration with, or at a minimum access to, Bunbury Port provides a differentiator, with limited industrial land holdings around equivalently sized and equipped Western Australian ports.

13.2 Selection of Areas of Focus

The Preliminary Assessment identifies the following sectors as potentially being suitable for focus within the AMTECH:

- Renewables – Wind Power
- Renewables – Solar PV
- Hydrogen (Electrolyser manufacture)
- Battery Manufacturing
- Lithium
- Mining and Resources (METS)

The selection of one or two areas of focus for AMTECH is a key consideration in its scoping and it is recommended that a detailed feasibility be undertaken to further assess these sectors.

The detailed feasibility will include further consultation with likely training and research partners, SR TAFE and ECU, to understand their planned future activities relating to the potential areas of focus. This will help drive selection of areas of focus where research and training integration can be readily achieved. Other interested tertiary institutions may also be further consulted.

It is noted that selection of these focus areas cannot be undertaken solely by SWDC and DPIRD. There are likely to be concurrent activities undertaken by Government around precinct development and investment attraction which influence the selection of preferred sectors for AMTECH by changing the competitive environment. This is evidenced by the announcement of hubs for automation and robotics¹⁷ and hydrogen¹⁸ subsequent to the commissioning of the Preliminary Report for AMTECH.

Preliminary feedback from JTSI indicates that they would require greater commitment from Government before aligning their investment attraction activities with the AMTECH Project. It is important that Agencies across the State Government are aligned on the proposed approach for AMTECH. It is recommended that State Government feedback is provided to inform the detailed feasibility, particularly to the extent that concurrent activities mean it is not appropriate to focus on one or more of the identified sectors because they are being independently pursued elsewhere.

¹⁷ <https://www.mediastatements.wa.gov.au/Pages/McGowan/2021/10/World-leading-automation-and-robotics-test-facility-coming-to-northern-suburbs.aspx>

¹⁸ <https://www.wa.gov.au/government/announcements/renewable-hydrogen-hubs>

14. NEXT STEPS

Bunbury is considered a uniquely suitable location for the AMTECH, however there remain some obstacles to continued progression of the concept:

- Potential for sectors of focus to be competing with other strategic focuses within WA, such as recently announced hydrogen hubs in the North West;
- Lack of clarity on appropriate pathway within Government to progress the AMTECH; and
- Reluctance to commit to the concept on behalf of industry, due to not fully understanding Government's commitment to a vision for AMTECH.

To address these concerns, it is recommended that the steps outlined below are undertaken. These steps provide for a market led approach that will ensure AMTECH is sustainable. A more detailed description of each of the proposed steps is provided below.

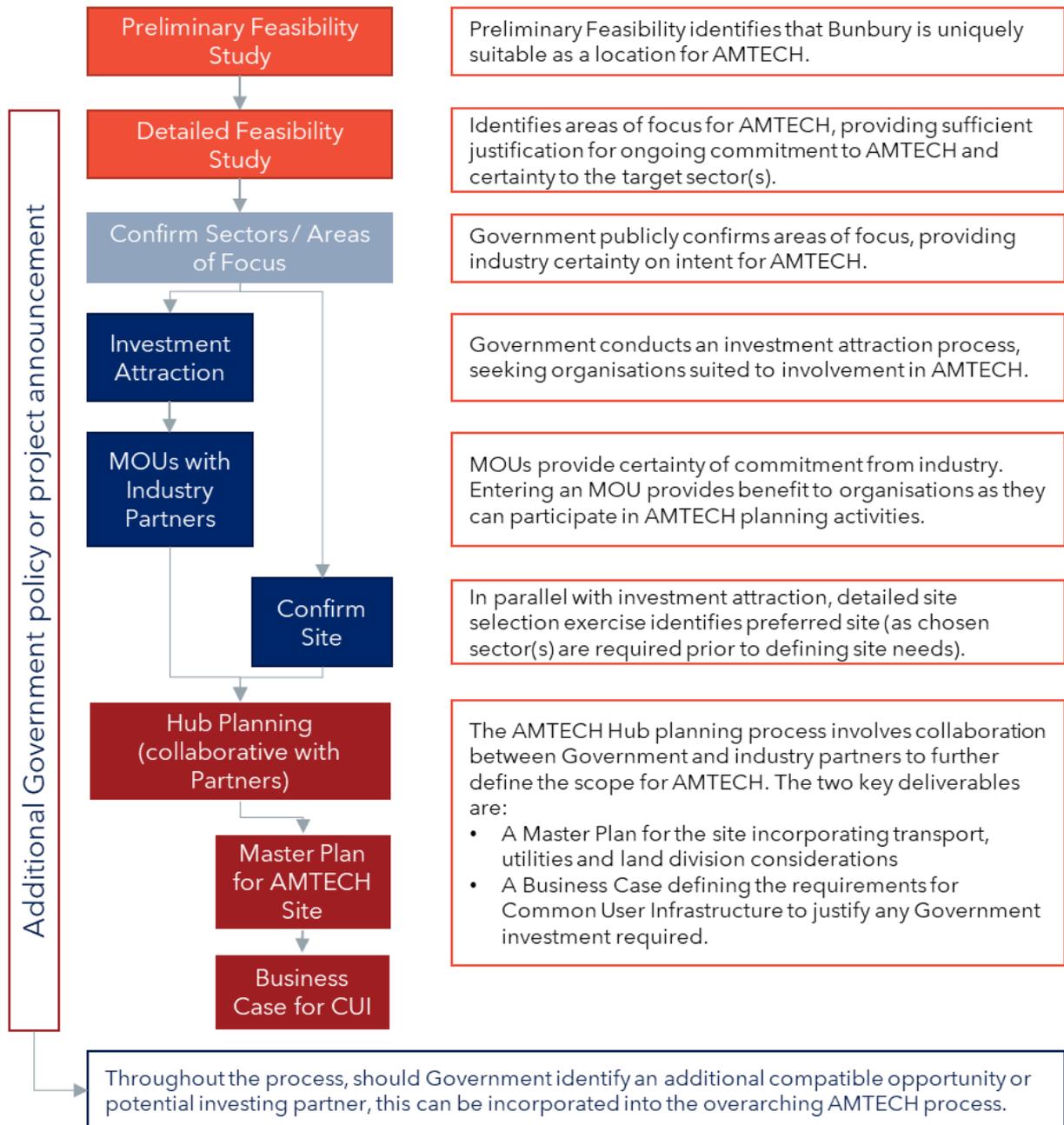
14.1 Pathways to Progress AMTECH

This Preliminary Report presents two possible pathways for further progressing the AMTECH:

1. Where Government identifies an initiative or attracts an organisation seeking to invest, first consideration should be given to Bunbury as the location for this activity. Examples include recent WA Government announcement of Woodside's H2Perth facility, or the Queensland Government's collaboration with Fortescue Future Industries on the Green Energy Manufacturing Centre.
2. SWDC continues to facilitate the process toward industry-led development of AMTECH. This provides a level of planning and industry attraction which de-risks the AMTECH for Government and facilitates industry investment and involvement. Figure 12 (below) shows this process.

The potential for Government to 'fast track' the project through specific initiatives is indicated by the activity to the left of the diagram below, identifying the potential for this to occur throughout the process. For example, should an activity such as rail wagon manufacture or electrolyser manufacture be identified as a Government priority, dependent on timing this could inform the selection of sectors of focus, influence organisations sought through investment attraction, or provide a catalyst for scoping and investment in CUI. This would not be to the exclusion of the market-led process shown, but would provide additional certainty to the market as to Government's intentions through a clear demonstration of commitment.

Figure 12: Process Map



14.2 Description of Next Steps

1. Detailed Feasibility Study

The detailed feasibility will assess the identified potential areas of focus in greater detail and recommend which sectors are most suited to the AMTECH. The primary objective of the detailed feasibility study will be to provide the information needed to grow confidence in the benefit of providing the AMTECH and gain commitments to taking the next steps. This includes certainty around service provision and its target sector(s).

Development of the detailed feasibility will be strengthened to the extent that Government can provide guidance on other activities currently underway across Government which may mean specific sectors are, or are not, suited to the AMTECH.

The detailed feasibility will involve greater consultation with research and training partners (SR TAFE and ECU) to understand intended activities aligned with each potential sector. Industry feedback has made it clear that Government needs to set out its intended role and focus industries for the AMTECH (consistent with the findings of market consultation conducted for this report) prior to further commitment on their behalf.

2. Confirm Areas of Focus

While this report identifies potential sectors and areas of focus, there is a need for a cross-Government approach to designate those which would be a focus for AMTECH. This was highlighted in engagement with JTISI, who identified that potential opportunities within these sectors may be pursued by Government in commercial-in-confidence discussions at any time. This opens the potential that sectors of interest may also be under consideration for specific projects or other Government Investments in areas distinct from the AMTECH.

While this Preliminary Assessment can identify potential sectors for focus, a dedicated approach from Government will be required to confirm sectors for the AMTECH to prioritise.

3. Investment Attraction (MOU's)

Once a Government position has been developed, investment attraction can commence, including the development of Memorandums of Understanding (MOU's) with potential stakeholders. This allows engagement of those parties in the master planning and Hub development process. The incentive for involvement in this process is exemplified by the NSW Government executing MOUs with parties well in advance of delivering the Western Sydney Airport and surrounding Advanced Manufacturing precinct.

4. Confirm Site

There are several sites within the Bunbury-Geographe region that have been considered as potentially suitable locations for the AMTECH facility, including the Bunbury Port and several nearby industrial parks such as Picton, Preston and Waterloo.

Discussions with DevelopmentWA indicated that while they have strategic land within the area that they are looking to develop for industrial purposes, this is not an exhaustive list of potential sites. Furthermore, for DevelopmentWA to be actively involved in progression of the AMTECH concept, they would require direction from Government more broadly as to a preferred site and the parameters associated with planning and development of the precinct.

The preferred site can only be confirmed once the focus sector(s) for AMTECH is confirmed, as this will influence site requirements such as the land area, proximity to transport options, and utilities requirements.

5. Precinct Master Planning and Common User Infrastructure Business Case

The MOU's are likely to facilitate collaborative involvement in precinct master planning and development, providing opportunities for organisations who are early signatories to play a role in shaping the precinct, including Common User Infrastructure. Business Case(s) are likely to be required at this stage, to define and seek funding for CUI and potentially to seek funding for broader precinct development of the Hub if required.

APPENDICES



APPENDIX A: ADVANCED MANUFACTURING HUB BENCHMARKS

Manufacturing Hub	Overview	Location	Size	No. of AM Jobs	Main Industries	Key AM Occupants	Core Facilities	Government Investment
Fishermans Bend	An investment-ready, world-class, advanced manufacturing, engineering and design precinct	Port Melbourne, Victoria	230 hectares	3,195	<ul style="list-style-type: none"> Motor Vehicle Manufacturing Aircraft Manufacturing and Repair Services 	<ul style="list-style-type: none"> Boeing Aerostructures Australia Advanced Composites Structures Australia 	<ul style="list-style-type: none"> The Defence Science and Technology research laboratory Civil aviation manufacturing facilities University of Melbourne's School of Engineering from 2024 	\$179.4m funding committed to support stage one of the Fishermans Bend Innovation Precinct development
Western Industrial Precinct	The Western Industrial Precinct in the west of Hobsons Bay is recognised as a hub for freight, logistics and manufacturing investment	Altona, Brooklyn and Laverton, Victoria	Unknown	2,342	<ul style="list-style-type: none"> Motor Vehicle Manufacturing 	<ul style="list-style-type: none"> Toyota Australia Matthews Brothers Engineering (manufacturers of road making equipment) 	<ul style="list-style-type: none"> Toyota hydrogen production and re-fueling facility Purpose-built road construction equipment facility and manufacturing plant 	\$3.1m from the Australian Renewable Energy Agency for the Toyota hydrogen production and re-fuelling facility
Osborne Naval Shipyard	The Osborne Naval Shipyard is a multi-user ship building precinct	Outer Harbour, South Australia	109 hectares	2,237	<ul style="list-style-type: none"> Ship Manufacturing 	<ul style="list-style-type: none"> Australian Submarine Corporation PMB Defence Naval Shipbuilding College 	<ul style="list-style-type: none"> Production workshops Blast and paint hall Shipyard maintenance and utility building The B22 outfitting hall, designed to house two ships side by side, measures 190-metres long by 90-metres wide and 50-metres high 	Founded on a \$535 million investment by the Australian Government
Assembly Business Precinct	A purpose-built integrated business park located in Melbourne's Northern Suburbs	Campbellfield, Victoria	60 hectares	3,206	<ul style="list-style-type: none"> Motor Vehicle Manufacturing Motor Vehicle Body and Trailer Manufacturing 	<ul style="list-style-type: none"> Innovative Plastics Solutions Ford Motor Company of Australia Procom Plastics Extrusions Pty Ltd Denso Australia 	<ul style="list-style-type: none"> Ford's Asia Pacific Product Development Centre Modern logistics and industrial buildings (Planned) 	None
The Australian Marine Complex (AMC)	The Australian Marine Complex (AMC) is a world-class centre for excellence for manufacturing, fabrication, assembly, maintenance and technology development, servicing the defence, marine, oil and gas and resource industries	Henderson, Western Australia	Over 50 hectares	1,851	<ul style="list-style-type: none"> Shipbuilder and Repair Services 	<ul style="list-style-type: none"> BAE Systems Australia Matrix Composites & Engineering Luerssen Australia 	<ul style="list-style-type: none"> Assembly & Fabrication halls Wharves, including heavy load out facility Floating dock facility capable of lifting vessels up to 12,000 tonnes 	\$200m between 2002 and 2005 \$170m between 2006 and 2008
Macquarie Park	Located 12 kilometres northwest of central Sydney, the city's second largest business district is a highly connected hub that's home to global players across the pharmaceutical, technology, electronics and telecommunications industries	Macquarie Park & North Ryde, NSW	Over 200 hectares	3,143	<ul style="list-style-type: none"> Medical and Surgical Equipment Manufacturing Pharmaceutical and Medicinal Product Manufacturing 	<ul style="list-style-type: none"> Abbott Medical Novartis Australia Interacoustics BAE Systems Australia Medtronic 	<ul style="list-style-type: none"> AstraZeneca manufacturing facility Cochlear's global headquarters and manufacturing operations (located in a purpose built facility on the Macquarie University campus) 	Macquarie Park opened its purpose-built Macquarie University Incubator in August 2017, funded by a \$7 million Macquarie University commitment and a \$1 million NSW Government investment towards the development of a broader Macquarie University Business Innovation Centre

Manufacturing Hub	Overview	Location	Size	No. of AM Jobs	Main Industries	Key AM Occupants	Core Facilities	Government Investment
Norwest Business Park	Norwest Business Park is a thriving business community strategically located with direct access to Sydney's motorway system, providing easy access to the CBD, airport and Sydney's manufacturing and distribution heartland	Bella Vista, NSW	221 hectares	1,437	<ul style="list-style-type: none"> Medical and Surgical Equipment Manufacturing 	<ul style="list-style-type: none"> ResMed Sleepvantage SWEP Australia Global Orthopaedic Technology Circuitwise Electronics Manufacturing PCB Global 	<ul style="list-style-type: none"> 30-acre ResMed innovation and manufacturing centre 	No direct investment however the area has been a major beneficiary in the State Government's infrastructure investments with an \$8 billion Sydney Metro Northwest rail line completed in 2019
Rydalmere Industrial Precinct	The precinct is located three kilometres from the Parramatta CBD and adjoins the University of Western Sydney Parramatta Campus. The precinct is characterised by industrial and business uses ranging considerably in size, industry sector and operation	Rydalmere, NSW	104 hectares	1,270	<ul style="list-style-type: none"> Fixed Space Heating, Cooling and Ventilation Equipment Manufacturing Shipbuilder and Repair Services 	<ul style="list-style-type: none"> SCOTT Automation and Robotics Mitsubishi Electrical Australia Thales Underwater Systems 	<ul style="list-style-type: none"> Mitsubishi Electrical head office ALS food and pharmaceutical lab 	None
Sheffield Advanced Manufacturing Park	Sheffield's Advanced Manufacturing Park is an advanced manufacturing technology park, providing world-class advanced manufacturing technology solutions for industry	Sheffield, United Kingdom	60 hectares	499	<ul style="list-style-type: none"> Materials and structures, covering metallic and composite materials typically used in precision industries including; aerospace, automotive, medical devices, sport, environmental and energy, oil and gas, defence and construction 	<ul style="list-style-type: none"> University of Sheffield's Advanced Manufacturing Research Centre Castings Technology International Sandvik Coromant Welding Institute's Yorkshire Technology Centre Nuclear Advanced Manufacturing Research Centre 	<ul style="list-style-type: none"> The AMP Technology Centre houses approximately 40 manufacturing/technology related businesses Rolls-Royce Factory of the Future building is a 6400 sq. m facility including workshop, laboratory, office and conference space The Nuclear AMRC is based around an open-plan 5,000 sq m workshop, containing over £35 million worth of state-of-the-art manufacturing equipment tailored for nuclear industry applications. The building also features accommodation over three stories, including laboratory and technical support space, virtual reality facilities, open-plan offices and secure meeting rooms. The AMRC Factory 2050 is the UK's first state of the art factory, entirely dedicated to conducting collaborative research into reconfigurable digitally assisted assembly, component manufacturing and machining technologies and is capable of rapidly switching production between different high-value components and one-off parts. 	£140m of Government and European funding for the University of Sheffield's Advanced Manufacturing Research Centre
Research Triangle Park	North Carolina's Research Triangle Park is the largest research park in the United States, which has grown to host more than 200 companies and 50,000 people with expertise in fields such as electronics, telecommunications, biotechnology, chemicals, pharmaceuticals and environmental sciences	Durham, North Carolina, United States	2,800 hectares	12,570	<ul style="list-style-type: none"> Biomanufacturing Agricultural biotech Microelectronics 	<ul style="list-style-type: none"> Caterpillar Inc. ATI Industrial Automation GE Aviation Schneider Electric Teleflex Medical 	<ul style="list-style-type: none"> The Frontier RTP startup campus The Lab, a full-service lab and office space Gene therapy manufacturing facility 	Unknown

Manufacturing Hub	Overview	Location	Size	No. of AM Jobs	Main Industries	Key AM Occupants	Core Facilities	Government Investment
Michigan Advanced Manufacturing Hub	Automation Alley and the World Economic Forum have jointly established the Michigan Advanced Manufacturing Hub (AMHUB), a multi-stakeholder collaborative ecosystem focused on positioning Michigan as a global leader for advanced manufacturing	Michigan, United States	NA	65,000	<ul style="list-style-type: none"> Automotive Aerospace/Defence Agriculture 	<ul style="list-style-type: none"> Ford Motor Company Fiat Chrysler Automobiles General Motors 	<ul style="list-style-type: none"> Automation Alley's International Business Center Fiat Chrysler Automobiles automotive assembly plant General Motors Kettering University Mobility Research Center The UM & Ford Center for Autonomous Vehicles A high-tech manufacturing facility in Detroit's American Axle & Manufacturing plant 	Unknown

APPENDIX B: MARKET SOUNDING REPORT

APPENDIX C: SOUTH WEST ADVANCED MANUFACTURING ROUNDTABLE: SUMMARY REPORT

APPENDIX D: AM INDUSTRY ROUNDTABLE NOTES

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