Determining the Future Demand, Supply and Skills Gap for Surveying and Geospatial Professionals: 2022 - 2032

January 2023

Prepared by BIS Oxford Economics for Consulting Surveyors National

BIS OXFORD ECONOMICS

THE CONTRIBUTORS

The Association of Consulting Surveyors is the peak body representing businesses who employ surveyors and allied professionals across Australia. Surveyors play a fundamental role in major infrastructure and housing projects across the nation.

Surveyors define, manage and protect the space around us. From the smallest plot to multimillion dollar developments, the world in which we live is organised and legal ownership parameters are determined through the expertise of surveyors.

Registered/Licensed Surveyors are the only practitioners warranted with direct management of our land boundary system. They are the pre-eminent experts in their field and do far more than just measure space. These surveying professionals interpret and navigate legal aspects of land ownership, they provide a comprehensive understanding of land, water and the air above it, its surrounds and its environment; thus protecting development from impediments and unlocking latent value.

The Association of Consulting Surveyors is committed to protecting and ensuring the longevity of the surveying profession by delivering vital statistics and research impacting the industry to its professionals and key stakeholders, including government and education providers.

This report is the fourth study since 2012 into the workforce gap for surveying and geospatial professionals, with the past three inciting change and the development of key initiatives to overcome the issues highlighted in these studies.

In each study, BIS Oxford Economics (previously BIS Shrapnel) was engaged to review the economic drivers for Australia and within each State and Territory to determine the surveying and geospatial skills required to meet the demand in the property and construction sectors.

As a direct result of these studies, work undertaken over the past few years to boost the number of school leavers entering the profession has accelerated. The state-based Surveying Taskforces with Industry Promotion groups which rebranded in 2022 to Surveying Careers has had a real impact on the numbers of young people entering the profession, which is reflected in these latest statistics.

However, with current and predicted future elevated levels of construction, this report also highlights continued national significant skills shortages, especially given the decline in numbers of registered/licensed surveyors.

There is so much more to be done; with a need for industry, government and the education sectors to work cohesively, planning and executing further targeted initiatives aimed at combating shortages. The Association of Consulting Surveyors is committed to supporting our members and partners in this project. We will continue to advocate on their behalf to ensure this work is carried out.

Craig Turner
President

Michelle Blicavs
Chief Executive Officer

BIS OXFORD ECONOMICS

Effective March 1, 2017, UK-headquartered **Oxford Economics**, one of the world's foremost independent global advisory firms acquired a controlling stake in BIS Shrapnel. **BIS Shrapnel**, which had been in continuous operation since July 1, 1964 as a completely independent Australian owned firm with no vested interests of any kind — providing industry research, analysis and forecasting services — merged with the Australian operation of Oxford Economics. The new organisation is now known as BIS Oxford Economics.

Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modelling to UK companies and financial institutions expanding abroad. Since then, we have become one of the world's foremost independent global advisory firms, providing reports, forecasts and analytical tools on 200 countries, 100 industrial sectors and over 3,000 cities. Our best-of-class global economic and industry models and analytical tools give us an unparalleled ability to forecast external market trends and assess their economic, social and business impact.

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1.1 Introduction

The Association of Consulting Surveyors National (CSN) commissioned BIS Oxford Economics (BISOE) to provide an updated workforce capability study utilising the 2021 Census data and the most recent developments across educational completions and labour market indicators. Fundamentally, this report seeks to explain current and future demand and supply of surveying and geospatial professionals based on the following drivers:

- Demand drivers include:
  - End-use sector demands from property
  - End-use sector demand from construction
  - End-use sector demand from mining industries

- Supply drivers include:
  - Education enrolments and qualification completions
  - Demographic ageing of the existing workforce and its impact on retirement within the surveying profession
  - Productivity growth driven by new technologies, practices and systems

Situations where measures of workforce demand exceed currently available supply are referred to as workforce gaps. This report highlights where and when workforce gaps are likely to be observed over the coming decade for each state and territory. Where gaps are unlikely to be filled by new supply at a national level from the education system, a **capability deficit** arises.

1.2 Impact of Workforce Gap and Capability Gap

Workforce gaps create distinct challenges and pressures for the profession that may (at least partially) be resolved through the hire of new graduates through licensing and registration – recognising that graduates cannot replicate the skills and productivity of a retiring surveyor, particularly those licensed and registered, with decades of experience – productivity improvements, or through shifting employment from low to high demand regions.

A capability deficit, however, represents a higher-order challenge. This suggests that there is a more substantial long-run imbalance between workforce demand and supply that will not be easily or quickly resolved. It is important to note that, in practice, capability deficits are not directly observable. Either workforce supply rises to meet the demand challenge (e.g., through an increase in unplanned work effort or productivity) or demand is constrained to the maximum level of available supply (e.g. activities requiring unavailable surveying skills are delayed or the profession is sub-optimally engaged) with consequent negative impacts on end-use sector activity and the broader economy.

BIS Oxford Economics' workforce capability reports inform the work of members of CSN and the broader surveying and geospatial profession who provided input regarding long-term workforce planning and capability building. They also provide data that can be used in working with stakeholders and tertiary education providers in relation to the course structure and student numbers and provide a sound basis for engagement with government agencies, infrastructure bodies and other peak bodies.

1.3 Key Findings of this report

We estimate the current total workforce in Australia of the surveying and geospatial profession to be around 19,000 persons in 2021/22, with 6,300 employed as degree qualified surveyors, 8,500 as spatial scientists and survey technicians, and 4,200 as allied professionals. This represents a 22.5% increase on total employment since the last release of this report in 2017/18. New South Wales, Victoria and Queensland accounted for nearly three-quarters (71.9%) of the total workforce.

Whilst the number of surveyors has increased by an estimated 42.3%, the number of registered/licensed surveyors decreased to just under 2,400 (-7.7%; around 200 professionals). This decrease has been felt across the industry with 95% of responders to the industry survey believing there is currently a skills shortage and of these responders 91% believe the skills gap will get worse over the short to medium term. The surveyed firms also indicated that there are significant difficulties in hiring registered/licensed surveyors – 86% reported severe difficulty in filling vacancies.

Capability gap to reach 1,400 by 2023/24

Infrastructure pipeline and backlog of residential work to drive demand

Total activity is set to increase nationally in the short-term due to a strong pipeline of infrastructure projects and backlog of residential work. This will drive demand for surveyors over the next two years, with an initial peak in demand to occur in 2023/24 at 20,600 professionals nationally. In the same year, the capability gap will reach 1,400 surveyors, surveying techinicians and spatial professionals as new supply from graduates falls short of the increased demand, as outlined in Figure 1.1. In summary, the elevated construction activity across Australia over the next two years will result in demand outpacing current and new supply by 1,400 professionals – around 7.5% of the workforce supply in 2023/24.

Crucially these results assume that the workforce is balanced in the base year (i.e. supply equals demand in 2021/22). However, industry insights suggest that there is already a significant skills shortage across surveyors and geospatial professionals. As such, the shortages forecasted across Australia represent a change on the base – so the forecast deficit across surveying and geospatial professionals would represent an increase in the level of deficits which already exist in the market.

QLD and WA face elevated pressure to increase new supply

Increased construction activity will drive demand over the next decade

Queensland and Western Australia are set for elevated levels of construction activity due to a recovery in mining investment, elevated residential construction, and historically high levels of public funding for infrastructure projects. Accordingly, both states are set to experience the largest workforce gaps over the next decade, as highlighted in Figure 1.2. This equates to, in 2030/31, the two state's combined existing workforce falling over 3,100 professionals short of expected demand.

Figure 1.1: National Workforce Capability Position

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Surveyors & spatial scientists	Deficit					Deficit				
	470	752	485	356	645	924	1014	1011	954	925
Surveying & spatial science technicians	Deficit					Deficit				
	403	656	446	359	620	883	1013	1040	977	911

Across total surveyors and technicians, the capability gap is estimated to reach more than 1800 professionals by 2031/32. In order to eliminate this gap, the forecasted completions need to average around 920 students per year over the next decade. This represents a 117.1% increase on current numbers.

Figure 1.2: State Total Skilled Labour Workforce Gap

State Total Skilled Labour Workforce Gap

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NSW	Shortage							Shortage		
	366	404	163	119	240	373	407	435	449	481
VIC	Surplus							Shortage		
	-11	57	-216	-368	-169	4	102	128	116	127
QLD	Shortage							Shortage		
	432	813	931	865	1057	1299	1415	1392	1326	1267
SA	Shortage							Shortage		
	51	64	-18	-35	19	36	69	42	35	35
WA	Shortage							Shortage		
	297	527	542	776	1096	1398	1561	1729	1818	1844
TAS	Shortage							Shortage		
	31	57	52	29	33	43	48	49	34	35
NT	Shortage							Shortage		
	39	97	129	81	47	19	30	35	39	41
ACT	Shortage							Shortage		

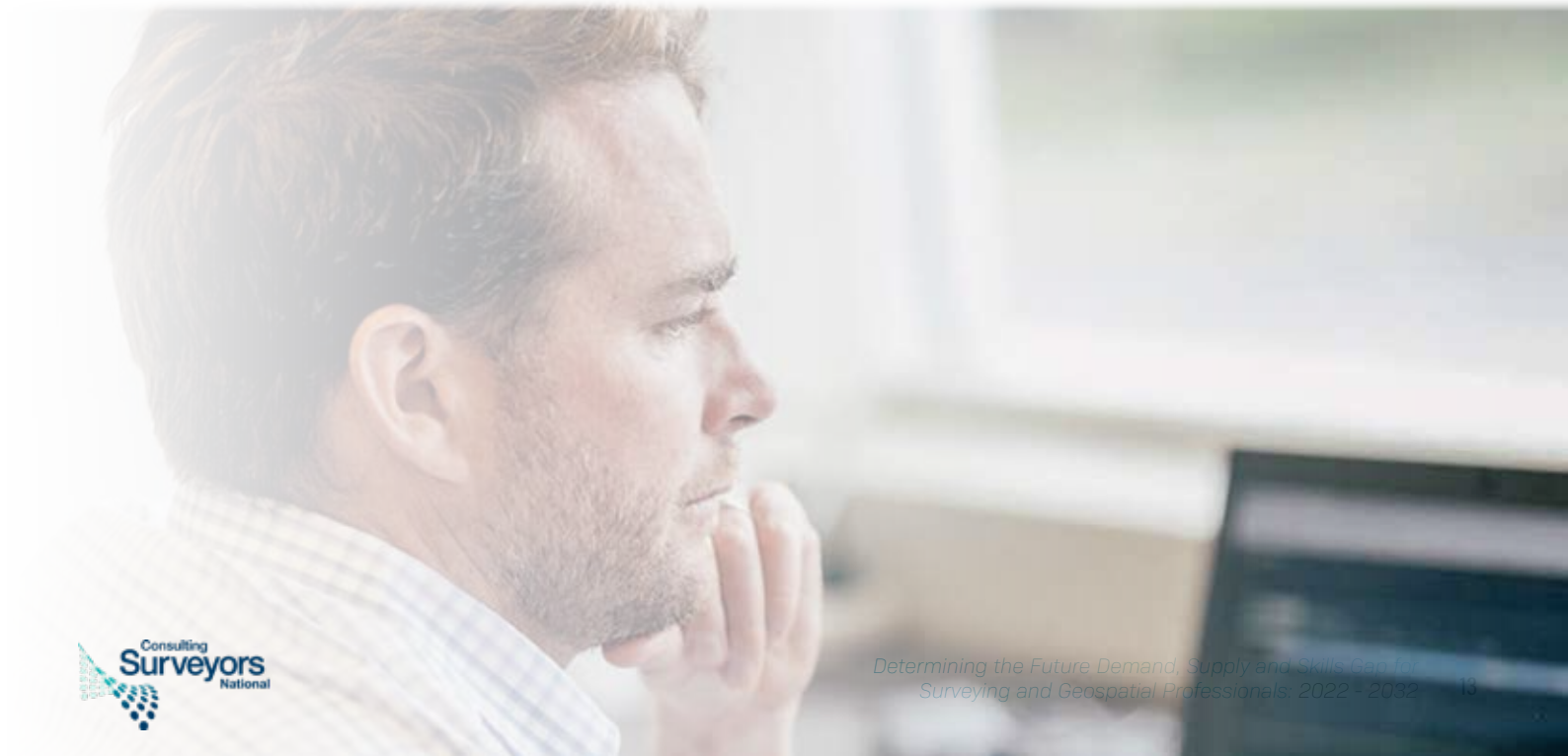
Figure 1.2 reveals that all jurisdictions are expected to face work deficits over the next decade, with differing degrees of severity. Victoria is the exception, wherein the housing construction downturn in the middle of the decade drives a surplus in the workforce. However, we note that the model assumes that the workforce is balanced from the base year (2021/22), while industry sentiment points to severe pre-existing labour shortages and the over-utilisation (greater than 100%) of the current workforce in order to meet demand. Assuming just a gradual (2.5% per annum) reduction in Victorian workforce capacity over the next four years (to correct for potential over-utilisation currently) is enough to eliminate this surplus over the middle of this decade. Similarly, actions that reduce over-utilisation in other states will tend to increase the size of workforce shortages in other states.

1.4 Implications and Recommendations

The surveying and geospatial profession is expected to face a decade of elevated labour demand due to a backlog of residential construction, strong pipeline of public infrastructure and continued mining investment. The majority of surveying firms have signaled that there is currently a workforce gap (i.e., demand higher than supply), and we anticipate that the continued rise in activity over the next two years will place further pressure on the workforce.

A leading result of a capability gap is that the industry will need to increase the output of the workforce to capture all forecasted activity. The primary solution to lessen the deficit reported above, is to attract additional new labour. As reported in this model, the supply of new labour comes from graduates of vocational and higher education surveying and spatial courses, thereby, focus on promotion of the profession amongst younger people will continue to be a pivotal concept for the profession going forward.

However, it is important to note that a capability shortfall is a theoretical construct. In reality there will be no observable capability shortfall. Either labour demand (and construction activity) will fall back to meet the constrained level of labour supply — implying that some future construction activity will need to be cut back or foregone — or measures will be put in place that will boost labour supply to meet projected construction activity.



Therefore, to ensure the later dynamic occurs, the profession will need to focus on measures to ensure a sustainable and increased output from the workforce is achieved.

- **The industry will require a substantial rise in the number of enrolments in surveying and geospatial related educational courses in order to meet future demand for these skills.**

  The most recent year of data indicates 424 number of completions across vocational and higher educational courses, which will need to increase by 117.1% (920 people per year) in order to meet future demand over the next decade. The task of attracting new entrants into the industry, and increasing the educational attainment of those already in the industry has been made more difficult due to the recent declines in enrolments – particularly in the vocational space, where total current enrolments have declined from 593 in 2017 to 408 in 2021 due to relevant courses being removed from TAFE offerings around the country. We note, additional pressures from an early peak activity – the occupation's ability to build up stock of new labour may be limited due to this initial strain on the existing workforce to meet the elevated demand over the next two-three years. This pressure is furthered by the output discrepancy of a new graduate compared to an experienced surveyor.

- **Improving the educational progression across a surveyor's career. For the purposes of this report, we have delineated technicians and surveyors by their educational attainment (i.e., surveyors have a higher education degree).**

  While the roles of a technician or surveyor may be quite similar in practice, the results indicate a substantial proportion of the industry (46.7%, 6,923 people) do not have a higher education degree. The development of additional skills and knowledge amongst those already working in the industry would aid in securing a pipeline of surveyors (with a higher degree) and further registered/licensed surveyors (which have seen a decline in the workforce since 2018).

- **Focusing efforts to improve flexibility in internal labour mobility. An increased ability for surveyors to mobilise in different states and territories could play a critical factor in meeting expected demand.**

  Specifically, due to the increased activity across Queensland and Western Australia, efforts to improve internal labour mobility to these states will aid efforts to avoid capability gaps across these regions. Evident in the need to boost mobility initiatives, around 93.3% of responders to the industry survey believe that the implementation of 'Automatic Mutual Recognition' across the states and territories has not eased the difficulty in hiring new staff. In part, this may be due to the fact that current workforce shortages are being experienced near-universally across the nation, and we are expecting this trend to continue (albeit Queensland and Western Australia are forecast to have the most severe deficits going forward).

- **Utilising technologies and systems to improve productivity.**

  Given the burden set to be placed across the profession, efforts made to increase productivity of the workforce will allow a greater output for the same level of employment.

Consistent terminology for the different type of surveyors and work undertaken as well as qualifications and study. For this report, we have retained the majority of the terminology used in the previous reports (for consistency purposes but acknowledge that it may cause confusion for some readers).We note changes to the following key terms since the last report:

- Cadastral Surveyors are now referred to as Land Surveyors
- Building Surveyors are now referred to as Construction Surveyors
- Higher Education Geomatic Engineering courses are now referred to as Surveying and Spatial Science courses
- Vocational Geomatic Engineering courses are now referred to as Surveying and Spatial Information Courses

1.5 Risks to the Demand Forecast – Demand Drivers and Natural Disasters

BIS Oxford Economics' modelling makes two key assumptions which may lead to the underestimation of demand for the surveying workforce and thus would underestimate the size of the workforce or capability gap for a given state and year.

First, the modelling assumes that the workforce is currently balanced – that is, that the supply of surveyors and other geospatial professionals is currently meeting the level of demand for those same occupations. Current industry sentiment (i.e., from the survey that BISOE has conducted) indicates that this is likely not the case – as previously noted, 95% of the surveyed industry believed that there is currently a workforce gap and a further 91% believe that this will get worse over the short to medium-term. The implication is that the current workforce gap will not be accounted for in our estimates of the future workforce gap, and the size of the workforce gap in forthcoming years would likely be larger than we indicate in this report.

This is particularly relevant for Victoria, which is expected to see a workforce surplus by the middle of the decade. This is driven by a slowdown across both building and civil construction over the next five years (from historically elevated levels). However, if the industry in Victoria is already undergoing a severe labour shortage (as indicated in the survey responses), then our estimated workforce surplus wouldn't eventuate. This implication is that the expected decline in demand over the next five years for Victoria would lead to a decline in the utilisation of the existing workforce rather than a surplus of workers – wherein the existing workforce is currently heavily over-utilised (with industry sentiment indicating that utilisation rates above 100% are the norm).

Furthermore, for simplicity, we have assumed in the modelling that mining investment, construction activity, and property indicators are the sole sources of demand for the surveying workforce over the next decade. Additional sources of demand which are not included in the demand drivers, and which are expected to increase over the next decade, would lead to the underestimation of demand for the surveying workforce and thus an underestimation of the workforce gap. These may include:

- Artificial Intelligence (AI)
- Autonomous Vehicle Guidance
- Building Information Management
- Machine Learning
- Digital Engineering
- Digital Twins
- Drone Technology
- Reality Capture

Notably, we point to natural disasters as a significant source of demand which is not fully accounted for in the model. Currently, the surveying industry is involved in a range of work related to the flooding across the eastern states of Australia and the impacts of climate change are expected to increase the prevalence of these disasters going forward. Whilst the construction forecasts used in the model take into account some direct (and more known) impacts of recent flooding disasters (such as new house builds as well as announced road reconstruction works, flood mitigation and works to improve evacuation routes), it is difficult to accurately account for the work that will come as a result of future disasters across the coming decade. Cyclone Yasi, for example, drove a sharp temporary increase in reconstruction and maintenance works in Queensland. Similar 'spikes' in construction activity from natural disasters cannot be ruled out over the forecast horizon considered for this report. In practice, this means that some reserve contingency or 'surplus' of the surveyor workforce should be targeted and maintained (at least at a national level) to cover rising risks from natural disasters.

1.6 Value of Surveying

Surveyors provide professional advice on a range of construction-related matters. This ranges from ensuring accurate property boundary determination safety and environmental protection, infrastructure development and compliance with regulations. The value of land surveying lies in its ability to provide accurate and detailed information. Accordingly, the value of work undertaken by surveyors often extends beyond the expenditure of surveying on each project. Poor utilisation of surveyors, particularly at the front end of projects, can lead to expensive redesign and reworking costs, as well as project delays or prolongation which can itself be highly costly.

This is important to consider in the context of this report. Any modelled shortage of surveyors to meet current or expected housing, infrastructure and mining activities increases the risk that the profession will not be effectively utilised, in turn increasing the risk of future project delays, failures and higher construction costs. With the national value of construction work done in Australia rising well above $200 billion per annum, even a 1% average increase in project costs that could have been saved from more effective engagement with surveyors can cost industry – and the broader economy – billions of dollars every year. Conversely, shortages of surveyors to meet industry demands is likely to contribute to very large increases in industry costs through the coming decade.

Section 4 of this report provides real world examples of how the surveying profession can provide effective value to specific projects.

INTRODUCTION

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In August 2012, BIS Oxford Economics (BISOE, formerly BIS Shrapnel) was engaged by CSN to undertake research into the workforce capacity constraints that are likely to be faced by the surveying and geospatial industry over a 10-year period from 2011/12 to 2012/22. The report informed the work of members of CSN and the broader surveying and geospatial profession regarding long-term workforce planning and capability building. They also provided data and insights that were used in working with various stakeholders, particularly with education providers of surveying and spatial information courses. Additionally, it provided a sound basis for engagement with government agencies, infrastructure bodies and other peak bodies.

In 2014 and 2018, BIS Oxford Economics undertook the same study on behalf of CSN to update the initial report on skills gap analysis for surveyors and surveying-related professionals. The results suggest that the surveying profession was likely to face a capability shortfall at the start of the next decade (2020 onwards). While this shortfall is partially mitigated by the new supply of surveying workers from local training authorities, we noted that the time delay to develop new graduates to a point of high capability means that the workforce should actively build up their stock of competent surveying professionals while the skills shortage is not as severe.

This update builds on the previous studies in providing an updated analysis and forecast of the labour market for the surveying and geospatial profession. We incorporate the latest Australian Census data (2021), as well as our updated projection of 'end-use' sector activity that drive the labour demand for surveying and geospatial professionals and extend the forecast horizon to 2032. The updated report will help ensure that the workforce planning of members and the profession is informed by the most current data.

This report expands on previous iterations by providing analysis on the economic impact of surveyors and examines factors outside of the typical 'end-use' sectors which drive demand for the surveying and geospatial professions.

Similar to previous research, the aim of this update is to:

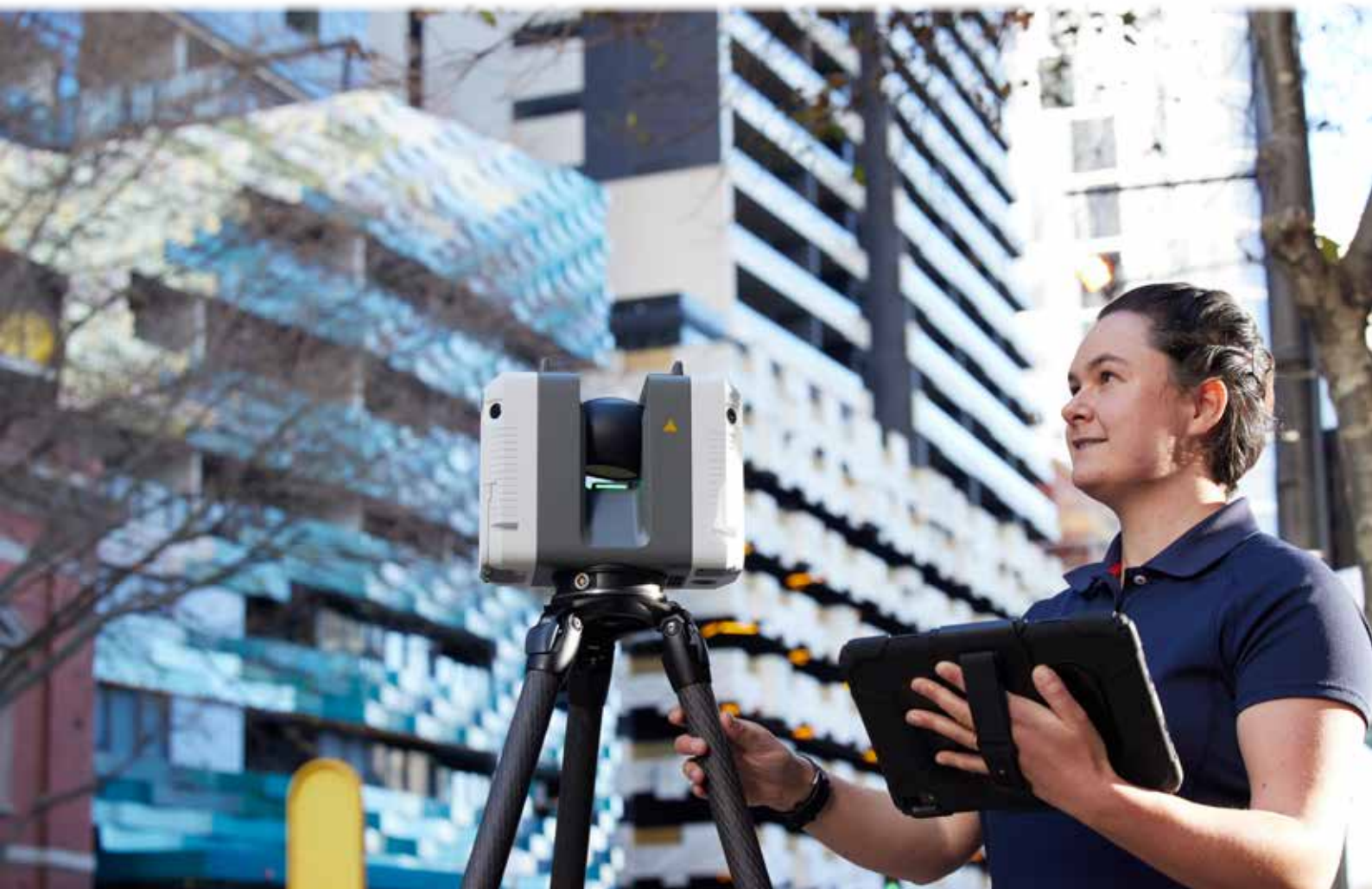
- Estimate the size of the surveying and geospatial professional workforce in 2021/22 based on the most recent Census and labour market data
- Forecast skills demand for the profession based on the outlook of the industries serviced
- Compare the demand forecast for skills against the outlook for the existing workforce to identify potential workforce gaps at the state and national level

- Contrast any measured workforce gaps against the outlook for new skills supply through university and TAFE graduates, which will identify any potential capability shortfall for the profession over the coming decade (2021/22 - 2031/32)

- Highlight the implications of the results for the profession and the broader economic impact, especially if measured capability gaps were to materialise

In Section 3 of this report we discuss the methodology used to examine the current and future trends in the surveying and other geospatial professionals workforce, Section 5 examines the characteristics of the surveying and geospatial workforce in Australia, including employment trends, industries, earnings, education levels, demographic characteristics, and labour mobility. Section 6 then presents findings from the national industry survey which BISOE and CSN conducted.

Furthermore, Section 7 presents the analysis on current and future workforce demand and supply for Australia, which is then followed by the state-by-state outlooks in Sections 8-14. Finally, Section 16 discusses the limitations of the report and presents further areas of future research.



METHODOLOGY

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3.1 BIS Oxford Methodology

This update draws on the same methodology of the previous studies, with some minor revisions, to allow for consistent comparison over time. The methodology involves several steps as described below:

Step 1:
Define and estimate the current skilled surveying and surveying-related workforce

To quantify the skills capability gap we need to first classify and define the skills being considered in the workforce capability study. This report largely adopts the same workforce classification as the previous studies, categorising the overall surveying and geospatial workforce into several occupation groups by main areas of specialisation, level of qualification and other supporting professions in surveying firms.

We note that while we distinguished several key sectoral drivers under the surveyor's occupation group, we acknowledge that surveyors often engage in projects across multiple construction sectors and are not restricted to just one sector. Nonetheless, we devised such categories to form a comprehensive picture of labour demand for surveyors across multiple industry sectors. See Figure 3.1 for a breakdown of the workforce and Table 3.1 for a description of the key occupation groups.

To estimate the size of each occupation group, we first obtained the employment figures of surveyors and spatial scientists, technicians and other surveying-related professions from the 2021 Census conducted by the Australian Bureau of Statistics (ABS). We differentiate the number of surveyors from technicians from the highest level of education attained – those with a Bachelor or higher level of education are classified as surveyors, all others are classified as technicians. This distinction is a new addition in this version of the report – we make a note where historical numbers have been revised. This estimated surveying population was then disaggregated into the pre-defined occupation groups using proportions obtained from our industry survey.

Figure 3.1: Workforce Classification

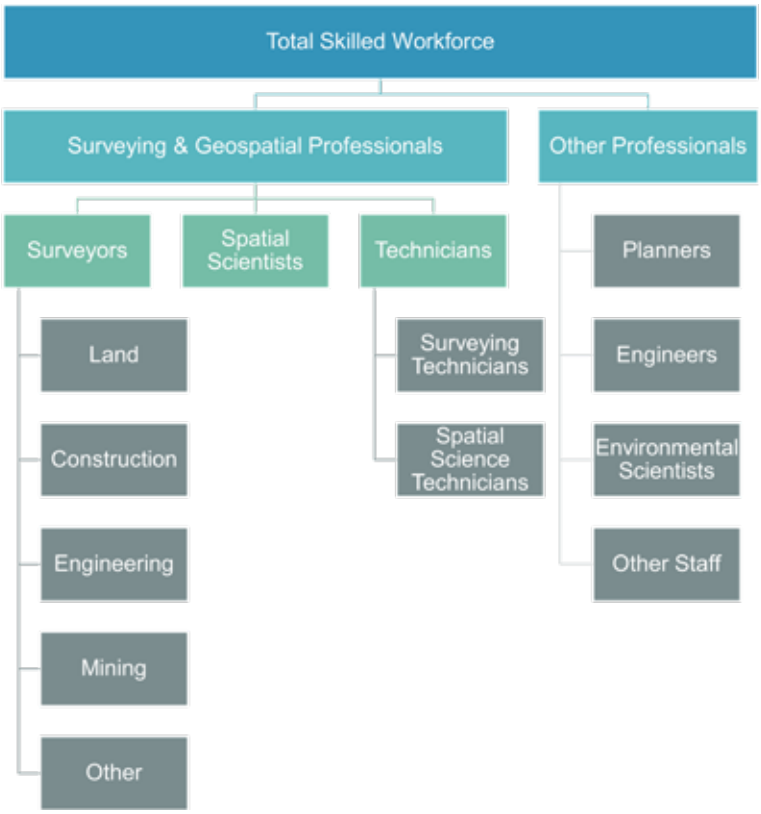


Table 3.1: Description of Key Occupations

Occupation Group	Description
Surveyors	Plans directs and conducts survey work to determine, delineate, plan and position tracts of land, natural and constructed features for the following sectors: • **Land:** boundary surveys relating to land title ownership, new subdivision layout and design. • **Construction:** multi-residential and non-residential building projects including commercial, industrial and institutional building. • **Engineering:** infrastructure projects such as roads, dams, pipelines and harbours. • **Mining:** mining and underground works. • **Other:** other surveying work including geodetic, hydrographic and photogrammetric etc.
Spatial scientists	Acquires, analyses, interprets and distributes information about locations in space and time, and develops related equipment, software and services.
Surveying technicians	Collects, records and evaluates spatial information and prepares databases, maps, charts and plans in support of spatial scientists.
Urban and regional planners	Develop and implement plans and policies for the controlled use of urban and rural land, and advise on economic, environmental and social factors affecting land use.
Engineers	Includes civil engineering professionals, mining engineers and other engineering professionals.
Environmental scientists	Study, develop, implement and advise on policies and plans for managing and protecting the environment, flora, fauna and other natural resources.
Other staff	Other professional staff employed by surveying firms.

Step 2:
Forecast the skilled labour demand for surveyors and surveying-related professionals

We adopt a labour multiplier approach in estimating demand where we assume a relationship exists between end-use sector activity and manpower demand across the occupation groups. This relationship is quantified by 'usage coefficients' which are estimated as the ratio between the estimated workforce size of an occupation group in a given time period and its corresponding end-use sector activity at the same time.

The end-user activity indicators chosen for the occupation groups are as follows:

- Road and bridge, non-residential, house construction and other residential [1] activity for surveyors engaged in the land development sector
- Private multi-residential and non-residential buildings for surveyors engaged in the construction sectors
- Utilities and transport construction for surveyors engaged in engineering construction sectors
- Mining and heavy industry construction [2] plus mining and exploration investment for surveyors in mining sectors
- Total construction (sum of residential, non-dwelling and engineering construction) for surveyors engaged in other sectors, as well as spatial specialists, technicians and other professionals employed in surveying practices.

For each occupation in each state and territory, a 'usage coefficient' is calculated by dividing the estimated size of each occupation group by the pertinent end-use activity level across multiple years. We also allowed for 'dynamic' usage coefficients to incorporate labour productivity growth into our model (assumed at 1.0% per annum) [3].

The model, therefore, assumes that future demand for skilled labour in the surveying and geospatial industry is driven by:

- Changes in the activity of pertinent end-use sectors, and
- labour productivity growth over time.

[1] Other residential activity is total residential activity less house construction (i.e. multi-residential activity)
[2] Less oil and gas sector activity to remove unnecessary volatility.
[3] The long-term productivity growth in the industry is equivalent to approximately 0.7% growth per annum, the 1.0% assumed figure is above this but below the assumption used in previous reports (2.0%).

The forecasts of the key determinants of labour demand are sourced from BIS Oxford Economics' publications, including *Building Work Done Australia, Engineering Construction in Australia, Mining in Australia, Mining in Australia and Road Construction Australia*, as well as other unpublished forecasts and from BIS Oxford Economics internal research.

3.1.1 Risks to the Demand Forecasts

As discussed in Section 1.5, the model makes two key assumptions which may lead to the underestimation of demand for the surveying workforce and thus would underestimate the size of the workforce or capability gap for a given state and year.

First, the modelling assumes that the workforce is currently balanced – that is, that the supply of surveyors and other geospatial professionals is currently meeting the level of demand for those same occupations. Current industry sentiment (i.e., from the survey that BISOE has conducted) indicates that this is likely not the case – as previously noted, 95% of the surveyed industry believed that there is currently a workforce gap and a further 91% believe that this will get worse over the short to medium-term. The implication is that the current workforce gap will not be accounted for in our estimates of the future workforce gap, and the size of the workforce gap in forthcoming years would likely be larger than we indicate in this report.

This is particularly relevant for Victoria, which is expected to see a workforce surplus by the middle of the decade. This is driven by a slowdown across both building and civil construction over the next five years (from historically elevated levels). However, if the industry in Victoria is already undergoing a severe labour shortage (as indicated in the survey responses), then our estimated workforce surplus would not eventuate as expected due to the surplus of workers filling existing deficits in the labour supply.

For Victoria, we put forward a "High Demand Scenario" in which demand is elevated over the next four years in what can be treated as an attempt to alleviate capacity constraints on the existing workforce. Applying an additional 2.5% demand from the end-user drivers each year for the next four years results in an additional 425 professionals demanded across the state by the end of the forecast period. This corresponds to 10.5% increase in the total demand.

Furthermore, for simplicity, we have assumed in the modelling that mining investment, construction activity, and property indicators are the sole sources of demand for the surveying workforce over the next decade. Additional sources of demand which are not included in the demand drivers, and which are expected to increase over the next decade, would lead to the underestimation of demand for the surveying workforce and thus an underestimation of the workforce gap. These may include:

- Artificial Intelligence (AI)
- Autonomous Vehicle Guidance
- Building Information Management
- Machine Learning
- Digital Engineering
- Digital Twins
- Drone Technology
- Reality Capture

Notably, we point to natural disasters as a key source of demand which are not fully accounted for in the model. Currently, the surveying industry is involved in a range of work related to the flooding across the eastern states of Australia and the impacts of climate change are expected to increase the prevalence of these disasters going forward.

Recent events and broader economic research points to the rising costs of responding to natural disasters in Australia. Cyclone Yasi, which struck Queensland in February 2011 (and which followed severe rains and flooding in 2010) severely damaged 7,600 homes, closed major railway lines and impacted over one quarter of the state's road network. The public cost of reconstruction efforts associated with flooding reached $5 billion, with damage to public infrastructure assets estimated at a further $0.8 billion. [4] More broadly, over the decade to 2016, the total economic cost of natural disasters in Australia is estimated to have averaged $18.2 billion per year, equivalent to 1.2% of average gross domestic product (GDP). [5] However, this figure is expected to reach $39 billion per year on average by 2050 (in present value terms), even without considering the impact of climate change. [6]

These figures are based on forecast growth in the population and housing stock, but the total economic cost of natural disasters will likely be greater still when climate change effects are included. Apart from increasing the frequency and severity of natural disasters such as cyclones and flooding, climate change should also see damaged housing and infrastructure assets rebuilt to a higher standard to ensure greater resilience to future severe events. New assets may also need to be built differently (for example, roads and bridges may need to be more elevated in flood-prone areas) and this is likely to be at higher cost. New alignments for transport and utility assets may also be required, all potentially impacting demand for surveyors.

Natural disasters clearly deliver an upside risk to the demand for the surveying workforce. Whilst the construction forecasts used in this model takes into account some direct (and more known) impacts of recent flooding disasters (such as new house builds as well as announced road reconstruction works, flood mitigation and works to improve evacuation routes), it is difficult to accurately account for the work that will come as a result of future disasters across the coming decade. Cyclone Yasi, for example, drove a sharp temporary increase in reconstruction and maintenance works in Queensland. Similar 'spikes' in construction activity from natural disasters cannot be ruled out over the forecast horizon considered for this report. In practice, this means that some reserve contingency or 'surplus' of the surveyor workforce should be targeted and maintained (at least at a national level) to cover rising risks from natural disasters.

[4] Reserve Bank of Australia (2011) Statement on Monetary Policy, May 2011, pp40-42. Accessed at https://www.rba.gov.au/publications/smp/2011/may/pdf/box-b.pdf

[5] Deloitte Access Economics (2017) Building Resilience to Natural Disasters in our States and Territories. Accessed at: http:// australianbusinessroundtable.com.au/assets/documents/ ABR_building-resilience-in-our-states-and-territories.pdf

[6] Ibid.

Step 3:
Model existing workforce attrition

To account for attrition of the existing workforce due to retirement, we estimate the age profile of the workforce in each state using the 2021 Census data and calculated the likelihood of retirement for each age group using ABS' Retirement and Retirement Intentions report.

The retirement assumptions for each age group are shown in Table 3.2 and are used uniformly across all states and territories. The expected workforce attrition will vary in each state and territory according to the size and age profile of the workforce in each region.

Table 3.2 Surveying and Geospatial Workforce Retirement Assumptions

Age Bracket	Proportion intending to retire in their age group (%)
45-54	5%
55-59	3%
60-64	10%
65-69	20%
70+	48%

Source: ABS

Step 4:
Modelling new labour supply

Our forecast of new skilled labour supply is based on the projected number of new graduates from local training authorities and split into two groups:

- **Higher Education**: students completing an undergraduate surveying and spatial degree are assumed to join the surveying and geospatial workforce as surveyors or spatial scientists.

- **Vocational Education and Training (VET):** students completing a Diploma (or equivalent) in surveying and spatial are assumed to join the workforce as surveying or spatial science technicians.

In forecasting the supply of new surveyors and spatial scientists, we utilise the higher education statistics supplied by the Department of Education and Training (DET), particularly enrolment and completion figures for undergraduate surveying and spatial degrees. The forecast for the supply of new technicians is based on enrolment and completion figures of surveying and spatial information vocational courses (diploma or associate degree), supplied by the National Centre for Vocational Education Research (NCVER).

There are three considerations in translating the number of enrolments to the number of completions (and therefore the number of new entrants to the workforce). These include:

- The lag between enrolment in a course and completion of that course – we have assumed that higher education completions lag enrolments by an average of four years, and vocational courses lag enrolments by an average of one year. This is based on research into the average course length of diplomas, bachelor's degrees and other relevant qualification levels.

- The sucess rate (i.e., the proportion of students which commence and then complete the degree) - for the purpose of this model we hold the number of completions equal to the number of commencing students from four years prior for higher education and the number of completions at 47% of total enrolment from the previous year for vocational study (the average rate over the past five years).

- The proportion of students who complete their degree and then enter the surveying workforce – for higher education we assume that 15% of students who complete their study enter the surveying and geospatial workforce and 30% for vocational completions. A lower rate is applied to higher education to reflect the significant share of students who are part of the surveying and geospatial workforce whilst studying. These figures are obtained through industry expertise.

3.2 Data Sources used to construct the model and supporting commentary

To compile this report, we utilise data from a number of public organisations. Below is a list of the data sources use to construct the respective element of the model:

3.2.1 Workforce Population Data

Data sources used to estimate the size of current workforce include:

- ABS Census Data, Australian Bureau of Statistics, 'Census of Population and Housing', 2021, Table Builder.
- ABS Census Data, Australian Bureau of Statistics, 'Census of Population and Housing', 2016, Table Builder.
- ABS Census Data, Australian Bureau of Statistics, 'Census of Population and Housing', 2011, Table Builder.
- ABS Labour Force, Australia, Detailed, Australian Bureau of Statistics, 'EQ06 – Employed persons by Industry group of main job (ANZSIC), Sex, State and Territory, November 1984 onwards', September 2022.
- ABS Labour Force, Australia, Detailed, Australian Bureau of Statistics, 'EQ06 – Employed persons by Occupation group of main job (ANZSCO), Sex, State and Territory, August 1986 onwards', September 2022.

3.2.2 New Labour Supply Data

Data sources used to quantify the level of new labour supply in the surveyor and other geospatial professional workforce include:

- NCVER VOCSTATS, National Centre for Vocational Education Research, 'VET program completions 2003-2021', October 2022.
- NCVER VOCSTATS, National Centre for Vocational Education Research, VET program enrolments 2003-2021', October 2022.
- Higher Education Data Request, Australian Government Department of Education, Skills and Employment, 'Number of Student Enrolments', November 2022.
- Higher Education Data Request, Australian Government Department of Education, Skills and Employment, 'Number of Student Completions', November 2022.
- BP0014 Temporary resident (skilled) visas granted pivot table, Australian Government Department of Home Affairs, 'Pivot Table: Temporary Resident (Skilled) visas granted 2021-22 to June 2022 – comparison with previous years', October 2022.
- BP0014 Temporary resident (skilled) visas holders pivot table, Australian Government Department of Home Affairs, 'Pivot Table: Temporary Resident (Skilled) visas holders in Australia at 2021-22 to 30 June 2022 – comparison with previous years', October 2022.

3.2.3 Workforce Attrition Data

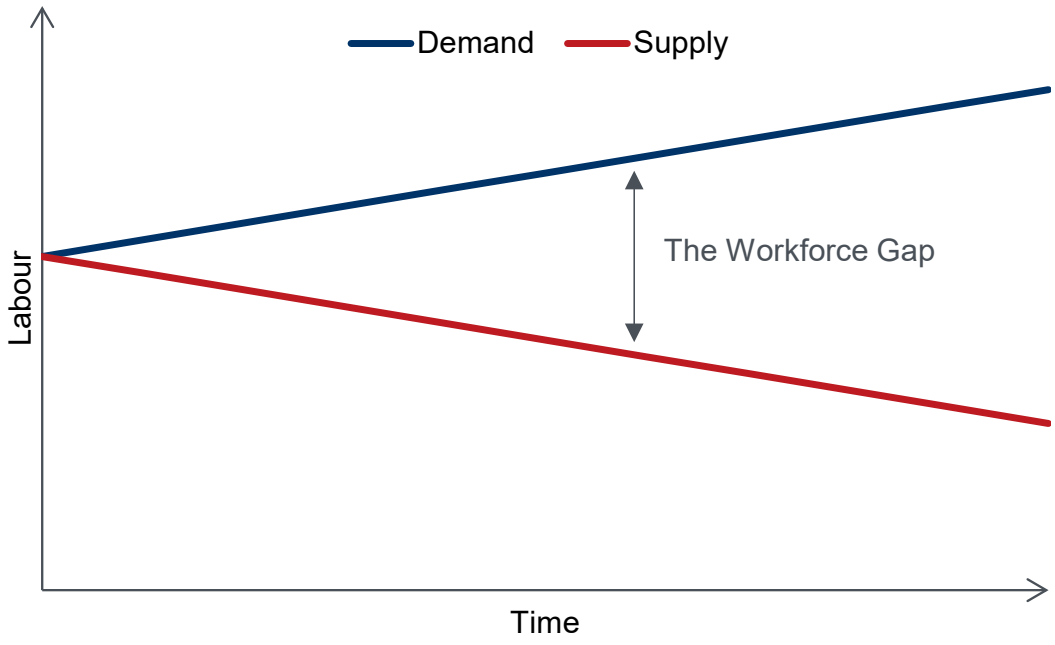
- ABS Retirement and Retirement Intentions, Australian Bureau of Statistics, 'Retirement and Retirement Intentions, Australia, 2018-19', May 2020
- ABS Dataset, Australian Bureau of Statistics, 'Dataset: Deaths, Year of remigration, Age at death, Age-specific death rates, Sex, States, Territories and Australia', October 2022

3.3 Workforce and Capability Gap

3.3.1 Definition of Workforce Gap:

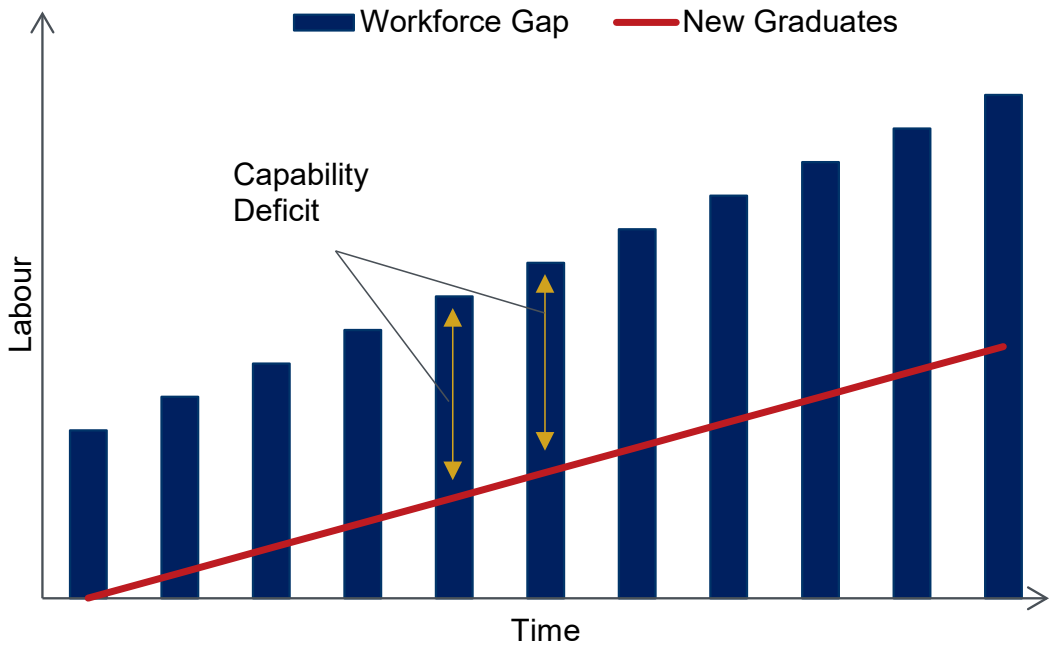
The changing demand for surveying and surveying-related skills (due to changes in end-use sector activity) and the loss of personnel due to retirement will likely result in a "workforce gap", which is defined as the difference between labour demand and the existing workforce.

A positive workforce gap indicates a shortage of skilled labour in meeting demand and vice versa. The workforce gap, when positive, will need to be met by additional labour supply if forecast levels of end-use sector activity are to be met.



3.3.2 Definition of Capability Gap:

A capability gap is defined as the difference between the workforce gap and the supply of additional skilled labour (via new graduates). A positive capability gap implies the presence of a capability shortfall in the future; the surveying and geospatial industry will need to attract additional labour above that expected to be sourced from new graduates if it is to meet forecast levels of future construction activity.



A negative capability gap, on the other hand, implies either the absence of a shortfall or an excess of workers in the surveying and geospatial workforce. In other words, the available skilled labour meets or even exceeds the future labour demand.

It is important to note that the capability shortfall (or surplus) is a theoretical construct. In reality, there will be no observable capability shortfall. Either labour demand (and construction activity) will fall back to meet the constrained level of labour supply — implying that some future construction activity will need to be cut back or foregone — or measures will be put in place that will boost labour supply to meet projected construction activity.

Although a theoretical construct, calculating the capability deficit provides important insights. First and foremost, it provides a simple measure of how much more labour is required through initiatives such as migration, education and re-training to meet current expectations of future construction activity. Alternatively, a capability shortfall could be used to measure the "cost" of the labour constraint in terms of the value of the construction activity foregone if supply were not augmented. Given the high 'multiplier' effects of construction activity — as well as costs associated with the presence of inadequate infrastructure delivery, this cost would have even stronger flow-on effects on the broader economy.

As with previous reports (and due to the interstate mobility of new graduates), we only provide a capability shortfall/surplus analysis on the national level. On the state level, we provide an analysis of potential workforce shortage prior to new labour supply (i.e., up to step 3).

VALUE OF SURVEYING IN THE CONSTRUCTION INDUSTRY

VALUE OF SURVEYING IN THE CONSTRUCTION INDUSTRY

Surveyors provide professional advice on a range of construction-related matters. This ranges from ensuring accurate property boundary determination safety and environmental protection, infrastructure development and compliance with regulations. The value of land surveying lies in its ability to provide accurate and detailed information. Accordingly, the value of work undertaken by surveyors often extends beyond the expenditure of surveying on each project. Poor utilisation of surveyors, particularly at the front end of projects, can lead to expensive redesign and reworking costs, as well as project delays or prolongation which can itself be highly costly.

This is important to consider in the context of this report. Any modelled shortage of surveyors to meet current or expected housing, infrastructure and mining activities increases the risk that the profession will not be effectively utilised, in turn increasing the risk of future project delays, failures and higher construction costs. With the national value of construction work done in Australia rising well above $200 billion per annum, even a 1% average increase in project costs that could have been saved from more effective engagement with surveyors can cost industry – and the broader economy – billions of dollars every year. Conversely, shortages of surveyors to meet industry demands is likely to contribute to very large increases in industry costs through the coming decade.

In order to better capture the value which surveyors provide, this section aims to demonstrate the importance of surveyors in providing efficient, effective outcomes. In preparing this report, BIS Oxford Economics obtained qualitative insights from industry regarding the role of surveyors from two perspectives: the positive impacts of surveyors and negative impacts if surveyors are not properly utilised. Specifically, we considered exemplar projects which have been greatly enhanced by the correct utilisation of surveyors (the Queen's Wharf development in Brisbane and the Kingsborough Community Scheme and Republic multistorey developments in the Australian Capital Territory) and infrastructure projects that have had negative outcomes because of poor utilisation (both involving rail projects). Our attention is focused on completed infrastructure projects where possible.

Surveyors provided a positive impact to the Queen's Wharf development in Brisbane which extended beyond the 'dollar value' of the profession's contribution. Surveyors were engaged to create a spatially accurate digital framework which was utilised across multiple elements of the project enabling accurate data collation, efficient asset management and, due to the scale of the project, this saved time through repeated use. Specifically, surveyors undertook scanning and modelling (i.e., surveys, recorded underground infrastructure and large-scale mapping) which was used to help deliver design elements, construction, titling, asset management, modelling and mapping. Additionally, in the Australian Capital Territory, two major multi-storied developments (namely, the Kingsborough Community Scheme and Republic developments) engaged a surveying firm to navigate the process through unit and community titling required to achieve good long-term management of the complexes. The ACT survey office and titles office was initially opposed to proposals put forward, but when long-term implications of adopting simple titling methods were explained, they agreed that alternative innovative solutions proposed by the surveyors were the more efficient and effective option.

By contrast, poor engagement of surveyors on major infrastructure projects has in many cases resulted in additional redesign and redevelopment costs due to overlooked or missed elements across planning and construction

In Sydney and Melbourne, significant costs were incurred to redesign rail alignments when a rail tunnel went offline. As a result, alignment redesign was required because the client didn't properly manage the project control network and the proper investigation was not performed by the contractor. The tunnels which were misaligned had to be redesigned - the redesign influenced all elements of the tunnel such as the walkway, service, overheads, kinematic envelope, etc. Whilst redesign of the alignment was possible, it is worth noting that this is not always the case and may also result in rework. More broadly, better engagement with surveyors at the front end of major projects can save millions of dollars of project cost

In Brisbane the client had difficulty in installing ground support because they didn't engage the surveyors early enough to perform space proofing during the early stages of construction for redesign, rework and prolongation.

The Canberra Light Rail Stage 1 project represents another example where better early engagement with surveyors would have produced a much more efficient outcome. This project had very high accuracy specification. Surveyors advised that a complete route levelling network was needed to be undertaken to ensure the required accuracy was achieved and to avoid inconsistencies in provided levels of survey control marks. The client, in order to reduce costs, initially insisted on accepting surveys based on benchmark-to-benchmark level network of benchmarks along the route ignoring the inconsistencies between marks as a result of different level methodologies used in their initial survey and the associated times of surveys. Ultimately, if the original advice was acted on, the project would have had more accurate information available earlier to assist with construction.

WORKFORCE CHARACTERISTICS

WORKFORCE CHARACTERISTICS

This section examines the current workforce and surveying demographic trends across Australia based on the 2021 Census and Detailed Labour Force Survey from the ABS.

5.1 Recent Employment Trends

The size of the skilled surveying and geospatial workforce rose from the 2016 census to the 2021 census. The workforce increased by 14.1% to 14,835 people, this increase was driven by a 15.4% increase in the number of surveyors and spatial scientists. This increase is likely a reflection on the 'catch-up' to unmet demand that has resided in the surveying profession since the 2016 census – the value of total construction activity work done has declined 5.3% from 2015/16 to 2021/22.

SURVEYORS & SPATIAL SCIENTISTS

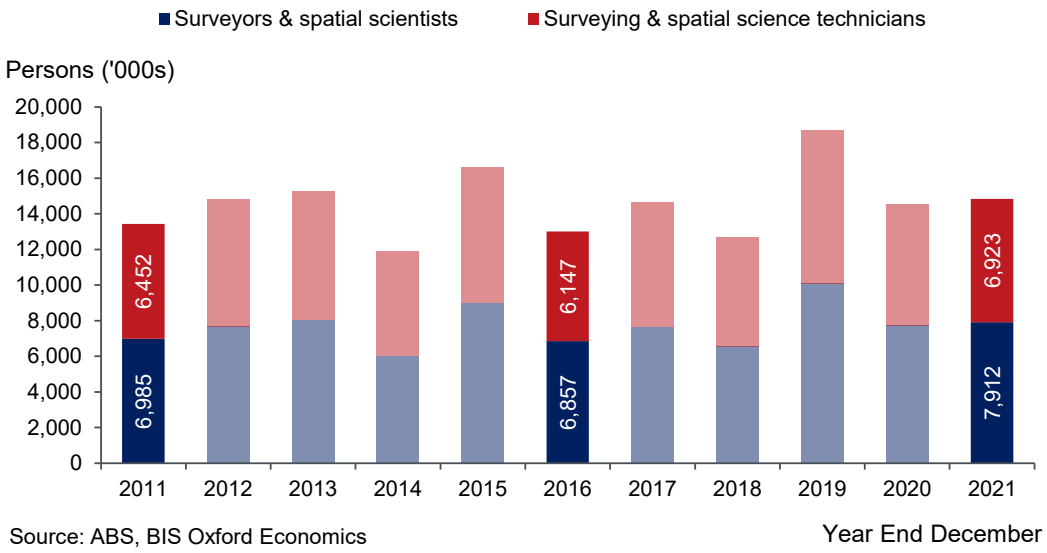
2016 Census: 6,857
▲ 1,055 (+15.4%)
2021 Census: 7,912

SURVEYORS & SPATIAL SCIENCE TECHNICIANS

2016 Census: 6,147
▲ 776 (+12.6%)
2021 Census: 6,923

We differentiate the number of surveyors from technicians from the highest level of education attained – those with a Bachelor or higher level of education are classified as surveyors, all others are classified as technicians. This distinction is a new addition in this version of the report – we make a note where historical numbers have been revised.

Figure 5.1: Employment of Surveying and Geospatial Professionals



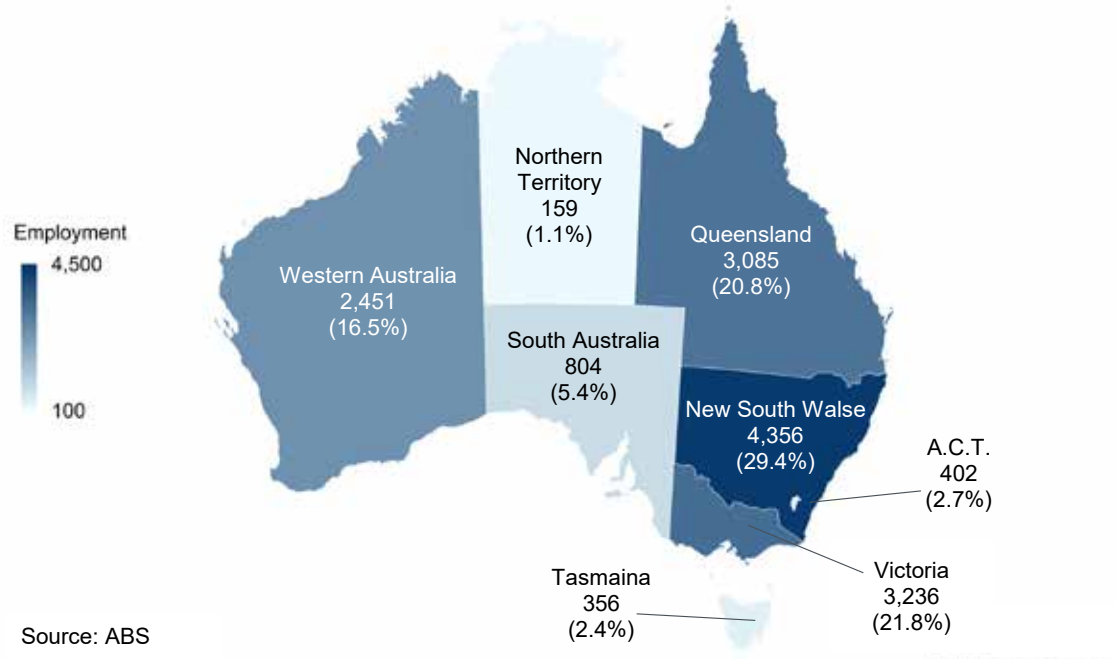
As shown in Figure 5.1, the level of employment of surveying and geospatial professionals has been quite volatile since the 2016 Census Data[7] .

5.1.1 State Breakdown

The major east-coast states (Queensland, New South Wales and Victoria) employed 71.9% of the total skilled surveying and geospatial workforce with New South Wales accounting for 29.3% of total employment. This closely reflects the construction activity levels across the states – the major east-coast states accounted for around 75.1% of total construction work done in 2021/22. The distribution of surveyors and cartographers and Surveying or spatial science technicians was largely proportionally distributed to the total employment – of note was New South Wales accounted for 35% and Victoria only 19% of technicians.

[7] Interpolation of the level of employment in years is calculated based on annual weighted growth in the labour force quarterly data from the ABS. The level of employment has been shaded to reflect the accuracy of the survey which captures data on approximately 50,000 people (~0.32% of the civilian population aged 15 years and over). Therefore, these figures should be treated as an estimation of the level of employment.

Figure 5.2: Breakdown of Skilled Surveying and Geospatial Workforce by State

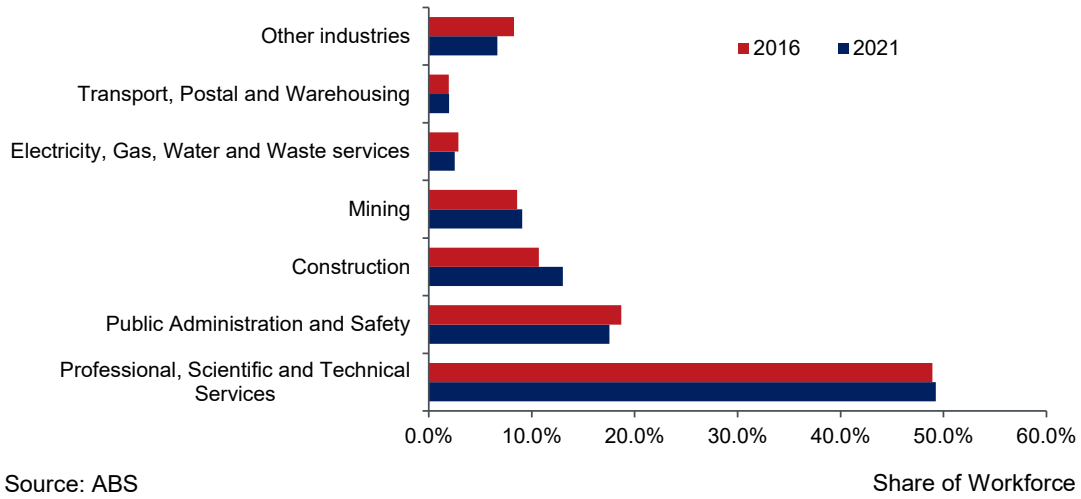


5.1.2 Industry Breakdown

In the 2021 Census, nearly half of the skilled surveying and geospatial workforce was employed in Professional, Scientific and Technical Services (49.3%), with the majority employed in Architectural, Engineering and Technical Services. As was the case in the 2016 Census, Public Administration and Safety was the second largest employing industry (17.5%), followed by Construction (13.0%) and Mining (9.1%).

However, it is important to note that Professional, Scientific and Technical Service (and Public Administration and Safety) is likely overrepresented as it functions as a catchment category for surveyors when they complete the census (i.e., selected as industry of work as no other option was an accurate reflection or they work across multiple industries). This is where the industry survey distributed by CSN allows BISOE to disaggregate census data.

Figure 5.3: Breakdown of Skilled Surveying and Geospatial Workforce by Industry

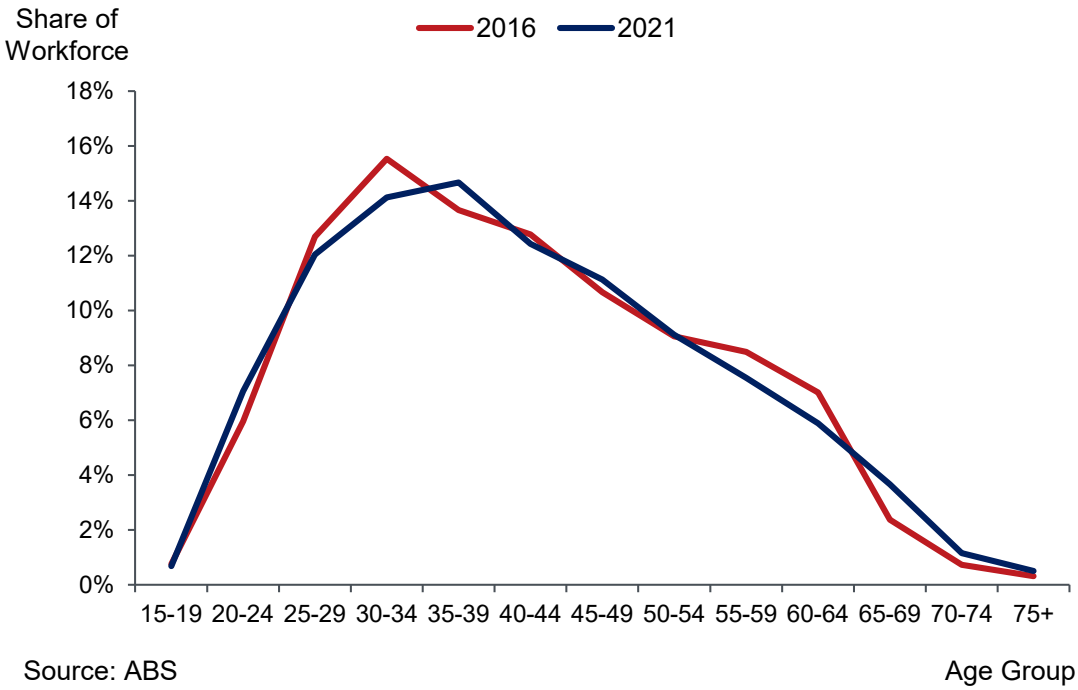


Source: ABS

In the 2021 Census, the average age of the surveying workforce was 41.7 years old – 0.1 years older than the average age from the 2016 Census. This was 5-years younger than the average age of all occupations (46.7 years old). Similar to the 2016 census, the average age of the surveying workforce was slightly (0.1 years) older than the average age of all professionals. Of note was a shift in the age profile of the surveying workforce; the share of 30–34-year-olds decreased from 15.5% to 14.1%.

Although this reflects the 2016 Census share of surveyors transitioning into the older age group, the implication is that more surveyors are transitioning than those entering the workforce (focusing on 'new graduates' in the younger age groups). To combat a capability deficit, there would need to be a greater share of younger surveyors joining the workforce due to increased enrolments in relevant courses.

Figure 5.4: Age Profile of Surveyors and Spatial Scientists

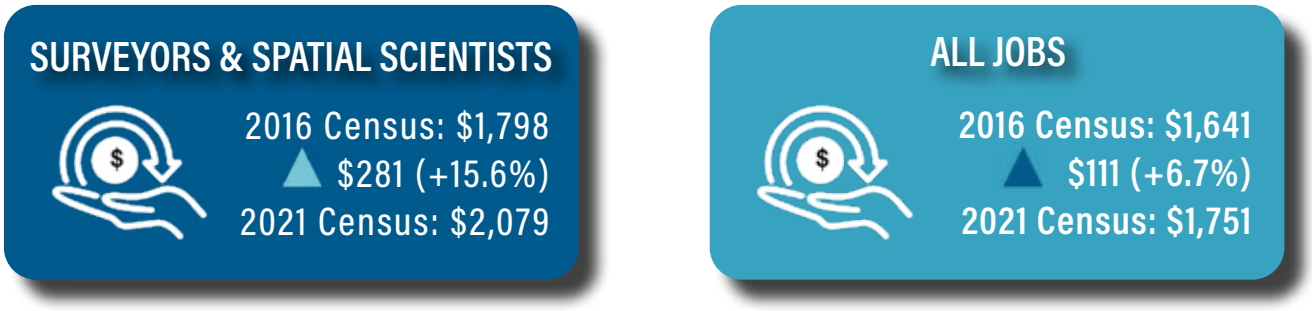


5.2 Earnings

The average surveyor and spatial scientist earned 1.9% more than the average individual working in all other occupations.

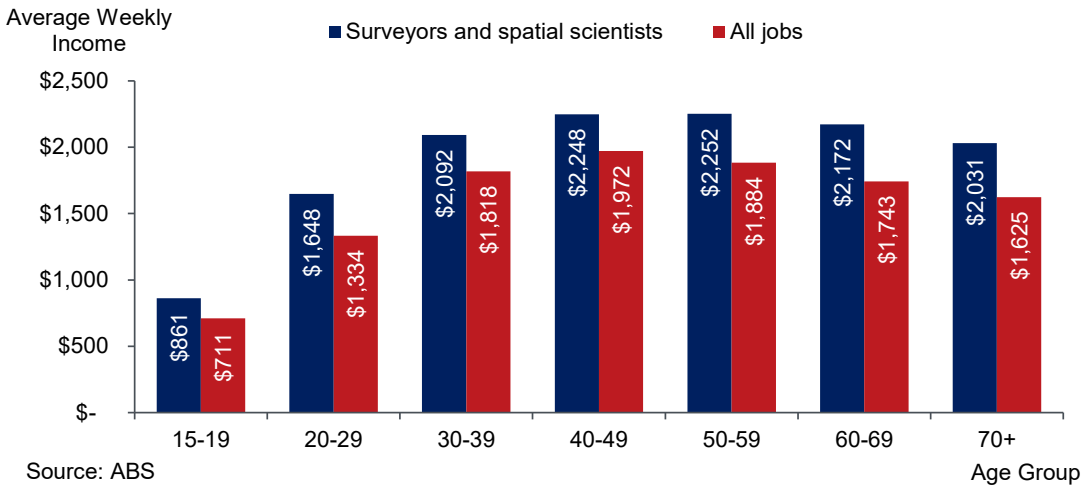
The average weekly earnings of full-time employed surveying and spatial scientists was $2,079 (~$108,00 per annum) according to the 2021 census. This corresponds to a 15.6% increase from the previous Census data. This significant increase can be leveraged to attract young professionals to the industry.

Of note, is a greater disparity in earnings of those in the older age groups (60-69 and 70+) relative to all other occupations; both age groups earnt on average a quarter more per week than all occupations (60-69 age group; +24.6%, 70+ age group; +25.0%). This represents a shift from the results in the 2016 Census where the younger age groups were the relative stronger earners - in 2016, younger surveying professionals (age 15-29) earnt 30.5% more on average than their peers in all other occupations. They do, however, continue to earn significantly more than their peers, the average earnings were 22.4% higher in 2021.



The higher earnings of the older age brackets further indicates that a significant time is needed to increase the workforce's overall capabilities. As indicated earlier, the skills and productivity of older surveyors cannot be replicated by new graduates.

Figure 5.5: Average weekly income of surveyors and spatial scientists and all jobs



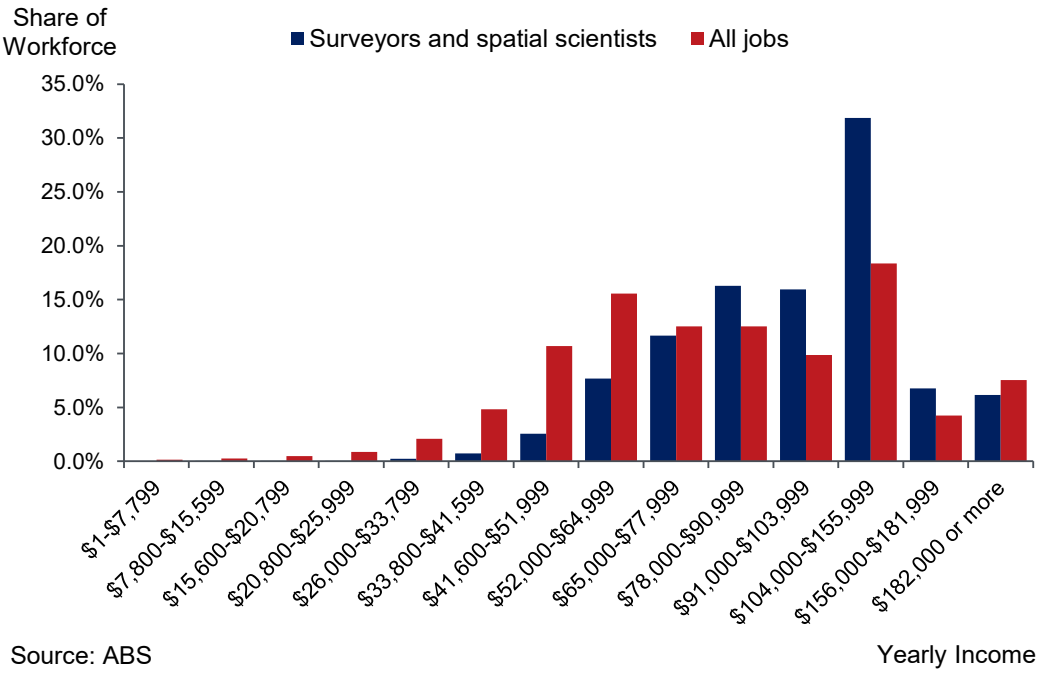
Similar to the discussion on the income of the older age groups, the distribution of earnings for surveyor and spatial scientists is skewed towards the higher income brackets as opposed to a more even distribution for the rest of the economy – 64.1% of surveyors and spatial scientists earned between $78,000 and $155,999 compared to 40.4% for all other jobs. This was largely driven by nearly a third (31.9%) of surveyors and spatial scientists earning between $104,000 and $155,999. The largest income bracket from all other jobs was $52,000-$77,999 which accounted for 15.4% of all individuals.

77% of Surveyors

earned $78,000 or more per year, compared to 52% for all jobs

In addition to the income profile of surveyors enabling higher recruitment prospects for younger professionals, the distribution of earnings also reflects the time spent receiving the necessary education. The below section discusses the educational attainment of the surveying profession in greater detail.

Figure 5.6: Distribution of Annual Full-time Earnings



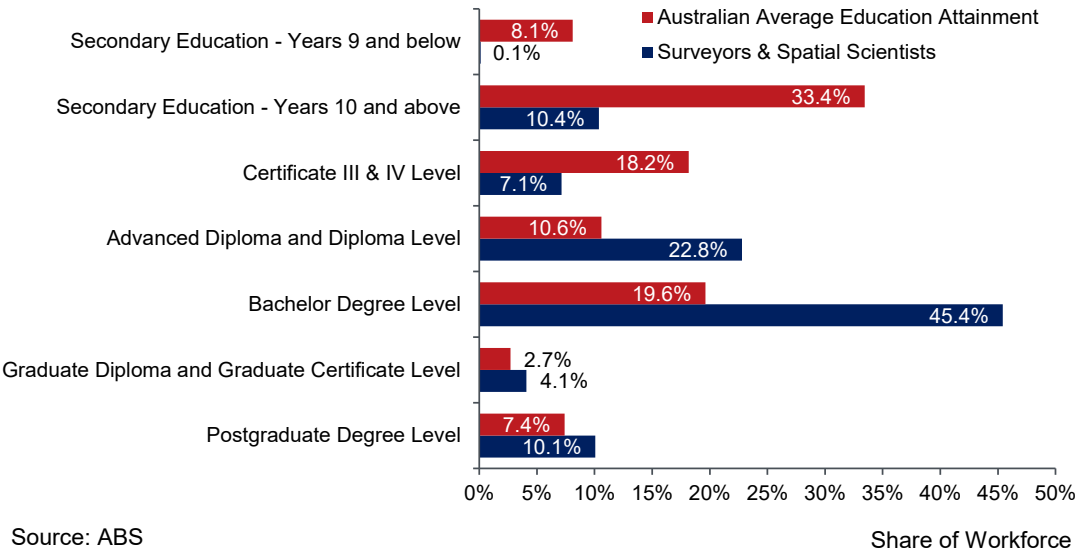
Source: ABS

5.3 Education Attainment

A greater share of surveyors and spatial scientists achieved a higher level of education than the average for all other occupations – in the 2021 Census, 89.5% of surveyors and spatial scientists had at least completed the highest level of secondary school (i.e., Year 12), compared to 58.5% for all occupations. Just over 45.4% of surveyors and spatial scientists attained a bachelor's degree as the highest level of education, and 22.8% achieved an advanced diploma and diploma level compared to 19.6% and 10.6% for all other occupations respectively.

The higher level of education means an earlier intervention is needed in order to increase the supply of new labour through graduates - with most diplomas and bachelors requiring 2 years of full-time education, focus on future capability gaps can be addressed through enrolment levels in the preceding years.

Figure 5.7: Level of Highest Education Attainment



Source: ABS

5.4 Labour Mobility

Labour mobility can play a critical role in capturing unmet demand and is a key driver of economic efficiency. Long-term mobility can assist longer-term developments and structural changes amongst surveying industries. However, interstate mobility should be treated with caution as the surveying industry has historically experienced limited levels of mobility. It is worth nothing that, from the industry survey, around 93.3% of responders believe that the implementation of 'Automatic Mutual Recognition[8]' across the states and territories has not eased the difficulty in

[8] Under the 'Automatic Mutual Recognition', across participating regions, there is no need to obtain a local license in a second state or territory or pay any licensing fees, as long as there is a home state licence in force.

hiring new staff. It is worth noting that Queensland does not recognise the AMR (i.e., workers from Queensland cannot work in another state under AMR and vice versa).

Theoretically, geographic labour mobility is an important element of a well-functioning labour market. It is an important mechanism for adjusting to the demographic, structural and technological forces that are shaping the surveyors and geospatial occupation.

Interstate Migration

Over the last 5-years to the 2021 Census, 5.4% of the total surveyors and spatial scientists workforce relocated interstate. Victoria experienced the largest positive net interstate migration from 2016 to 2021 with the workforce increasing by 2.1% (57 workers), driven by 170 surveyors and spatial scientists relocating to the state. Conversely, New South Wales saw the largest negative net instate migration, with the workforce decreasing by 74 employees, around 2.0% of the state's total workforce.

Of significant note was a net 26 surveyors and spatial scientists migrating out of the Northern Territory – this accounted for 18.7% of the state's workforce. A significant decrease, given no other state experienced a net change greater than 5.0%. However, it is worth noting that the territory experienced a net increase of 15 workers in the 5-years to the 2016 Census.

Table 5.1: Flow of Surveyors and Spatial Scientists by State (2016 to 2021)

State	Total Inflow	Total Outflow	Net Interstate Migration
NSW	173	247	-74
VIC	170	113	57
QLD	193	150	43
SA	47	63	-16
WA	89	90	-1
TAS	36	32	4
NT	16	42	-26
ACT	55	42	13

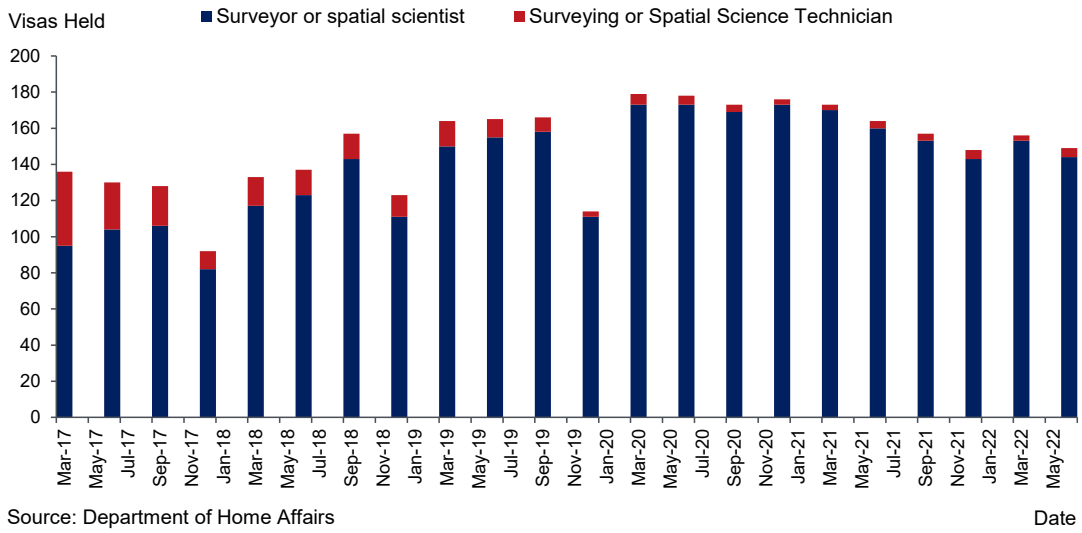
Source: ABS

Temporary visas for skilled surveying and geospatial workers

Similar to interstate mobility, temporary skilled visas can help relieve pressures from labour shortages, as such the number of visas held (and granted) can allow supply to 'scale-up' to meet demand if a workforce gap exists. The employment of overseas skilled surveying labour accounted for around 1% of the total national workforce.

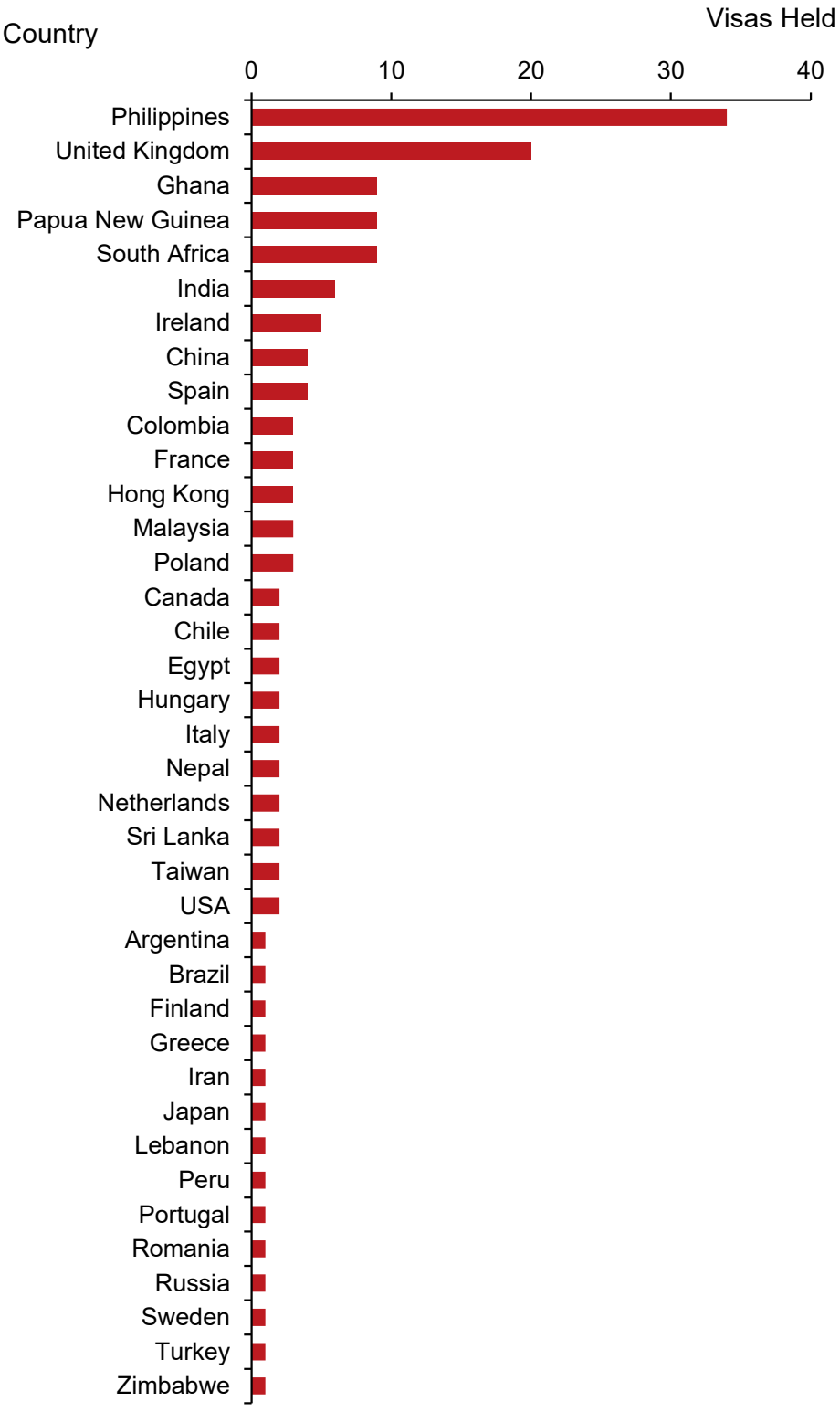
COVID-19 had a negligible impact on the number of visas held – in terms of visas held through either Temporary Skill Shortage (subclass 482) visa or Temporary Work (subclass 457) visa, following a decline from elevated levels of temporary visa holders in 2013, the number of holders has averaged 147 since 2016, with 97.6% classified as surveyors or spatial scientists. If any, the most recent divergence from trend has been a more stable position throughout the year where previously we experienced a drop in visas held during the December quarter. From 2013 to 2019, the December quarter experienced the lowest number of visas held over the calendar year, however, in 2020 numbers remained consistent (176 against an average of 176.5 for the calendar year).

Figure 5.8: Visas Holders



Source: Department of Home Affairs

Figure 5.9: Visa Holders by Country



Source: Department of Home Affairs

KEY SURVEY RESULTS

KEY SURVEY RESULTS

In this section of the report, we present the key results from the industry survey. The survey, which is distributed by CSN to their members and contributing partner organisations across the profession, allows insight into various workforce characteristics not available in the census data. It also enables targeted commentary on the current market conditions experienced by surveying companies, namely, is there a current capability gap. The following section captures the responses to this survey and presents the key results.

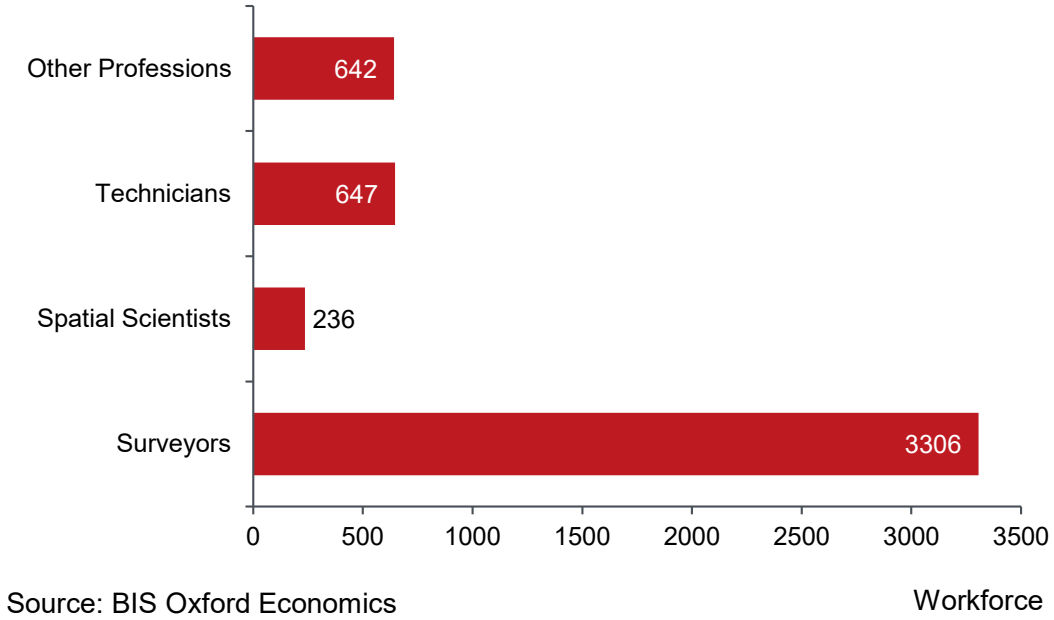
6.1 Survey Responses

In the latest industry survey, BISOE received a total of 137 responses, with the majority of responses submitted from New South Wales, Victoria and Queensland (75.9% of total responses). This volume of responses allows for an accurate reflection of the industry, in particularly we are able to obtain a clearer picture on the characteristics not captured in the ABS Census Data – particularly around the age profile and occupation groups composition.

Figure 6.1: Surveys Responses by State

From the responses, 4,831 people were employed across the various occupations with 68.4% of the workforce employed as surveyors. This represents, collectively, around 30% of the surveying and geospatial profession as according to the 2021 Census.

Figure 6.2: Total Current Workforce by Occupation



Source: BIS Oxford Economics

6.2 Key Results

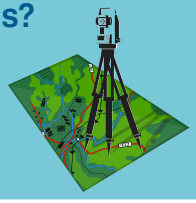
Majority of surveying firms believe there is a pre-existing skills shortage

The industry survey allows us to provide commentary on the perceived current market conditions - **over 95% of responding companies believe there is a skills shortage in the surveying and geospatial occupations**. Of these responders, 91% believe that the shortage will worsen over the short- to medium-term. In both questions, this represents a statistically significant proportion of responders and highlights a perceived current capability gap.

Additionally, nearly 90% of responders selected either severe or moderate difficulties in filling surveying and geospatial positions (severe difficult – unable to fill vacancies satisfactorily; moderate difficulty – able to fill vacancies only after extensive effort). Of note is the reported difficulty in hiring registered surveyors – 86.1% reported severe difficulty in filling vacancies.

Do you perceive there is a skills shortage in surveying and geospatial occupations?

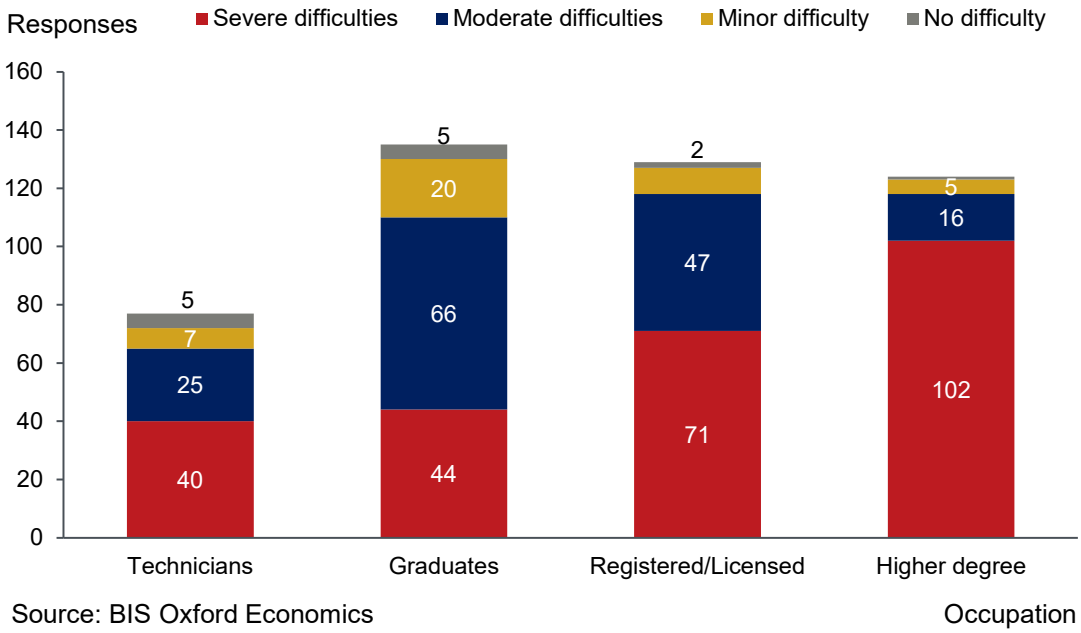
95% - YES



If yes, do you expect the skills shortage to worsen over the short- to medium-term?

91% - YES

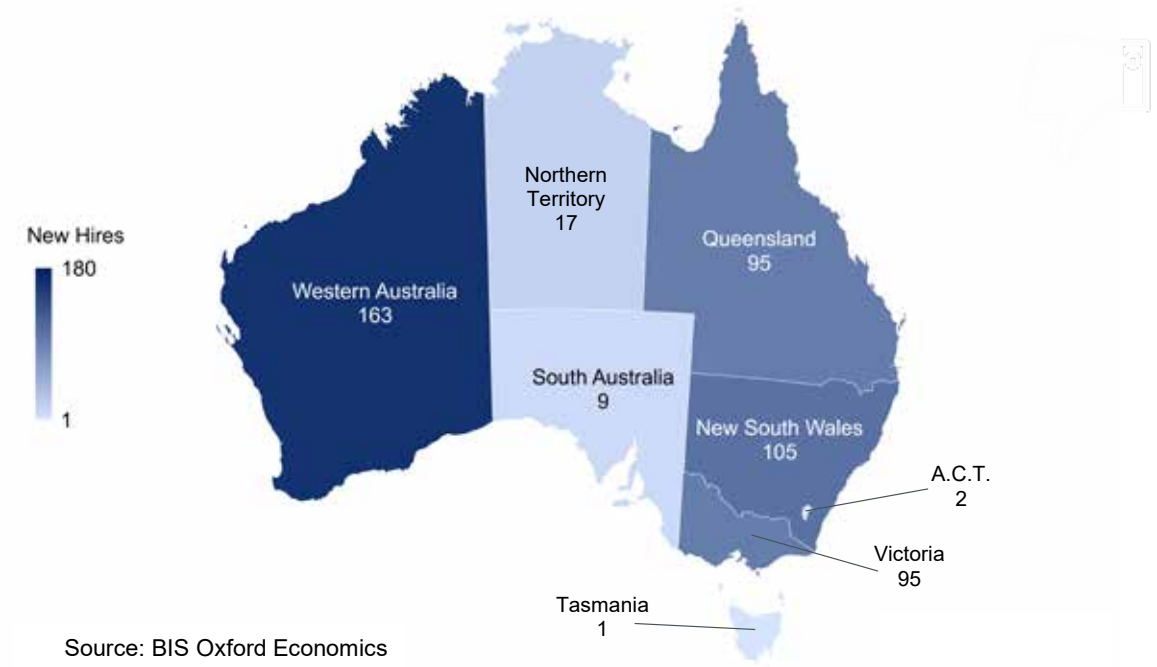
Figure 6.3: Hiring Difficulty by Occupation



Nearly 500 New Hires Expected in 2023

Over the next 12 months, Western Australia is expecting to hire a total of 163 new surveyors – driving the national total to 487 new hires in 2022/23. This would increase the number of recorded surveyors and geospatial technicians by 10.1%. This is a slight increase on the percentage increase reported in 2018, with 9.3% of the total workforce expected to be hire over the next 12 months (209 persons).

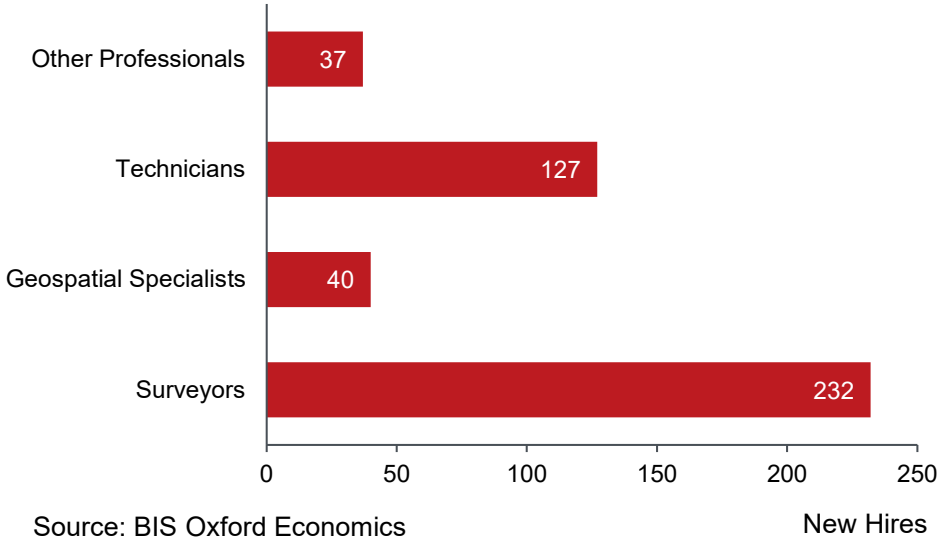
Figure 6.4: Survey Results: New Hires by State in Past Year



Source: BIS Oxford Economics

Unsurprisingly, surveyors are expected to account for the largest share of new hires by occupation, accounting for 53.2% of all hires. However, 127 new hires across the technician occupation represents 19.6% of the reported technician workforce (with number of new hires expected to account for 7.0% of reported total workforce).

Figure 6.5: Survey Results: New Hires by Occupation in Past Year



Source: BIS Oxford Economics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FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR AUSTRALIA

Forecast of Labour Demand & Workforce Gap for Australia

7.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across Australia and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin demand for surveyors and geospatial professionals.

Recent Economic Trends

Overall, economic activity in 2019/20 remained at close to constant levels due to COVID-19 related impacts.

Household consumption has recovered since the initial impacts of COVID-19 were felt across the economy with the largest states experiencing the greatest boost. Labour supply and materials disruptions delayed the realisation of the large pipeline of residential construction work to be done. Higher-than-usual rainfall also impacted construction work in some regions.

In the two most recent financial years, economic activity has increased as positive returns to domestic demand has outpaced an offset from net exports. In 2020/21 an increase in domestic demand (+2.6%) was offset by a decline in net exports (-1.6%) - overall Gross Domestic Product (GDP) rose 1.6%. A similar trend continued in 2021/22, with domestic demand further strengthening (+5.1%) despite disruptions from further lockdowns and then severe flooding in the eastern states, lifting GDP growth to 3.9%.

Household consumption and public investment has driven GDP growth in the recent quarter, providing momentum to construction work done. Specially, household consumption has driven GDP growth in the June quarter (Q2), 0.9% q/q, while net exports also contributed strongly. Public machinery and equipment investment increased, while private, construction-related investment fell, due to rain, flooding and capacity constraints. As noted previously, there is an up-side risk to natural disasters – increased construction activity may be required to recover from any damage caused.

There is a strong pipeline of work to be done in both dwellings and non-residential construction. But capacity constraints due to labour and materials shortages are delaying the realisation of this investment by extending construction times. Growth across the regions has converged in recent quarters, unwinding some of the stark differences that emerged during the pandemic. Notwithstanding the volatile Northern Territory economy, each other region has grown by 7.7-9.3% since the end of Q4.

Further, the higher-cost environment is threatening the viability of future projects. Mining investment pick up over 2020/21 and 2021/22. With prices for a number of commodities expected to remain at healthy levels over the medium term and strong demand for renewable energy-related minerals (such as Lithium), we expect further investments to get underway and mining investment to continue to rise and remain strong well into the middle of the decade.

Economic Outlook

Fiscal policy is now moving from supportive to tightening, nevertheless, public infrastructure spending is set to remain strong over the short-to-medium term. The immediate outlook remains positive but rising inflation and higher interest rates will hamper potential new construction projects in the medium term. Nonetheless, there is a large pipeline of transport and other projects to complete, which were brought forward as part of the COVID-19 stimulus, response. Residential has strengthened out of COVID-19 due to grants (direct grants for individuals to put towards dwelling construction or major alterations and additions) but the forward outlook is quite variable amongst the states.

With the initial rebound from the pandemic likely to be over by late 2022, overall, the pace of activity growth will naturally slow, with increased interest rates, construction costs and capacity constraints to bite over the medium-term of the outlook. Overall, we are forecasting both GDP to ease to 2.2% in 2023/24 and 2.7% in 2024/25, hampering the potential work done in the construction industry. Although the pace of growth will ease through 2022/23, growth is coming off a high base and is not expected to slow sharply. Public investment is expected to peak in 2023/24, but remain at elevated levels in 2024/25, as a large pipeline of transport infrastructure and social and institutional building projects come through.

Table 7.1: Key Economic Indicators

Year Ended June	2017	2018	2019	2020	2021	2022	Forecasts 2023	2024	2025	2026	2027	Average 2023-27
Selected Expenditure Categories												
Private Investment												
– Dwelling Construction	2.6	0.6	-0.8	-8.1	3.4	3.0	3.0	0.1	-6.6	-4.1	4.5	-1.6
– New Non-Dwelling Construction (+)	-5.8	10.1	-2.1	3.8	-11.1	4.8	1.6	4.2	0.2	-0.3	2.1	1.5
– New Engineering Construction (+)	-16.5	5.2	-12.6	-4.9	-1.2	3.5	6.7	16.9	7.3	-7.0	-1.5	3.5
Total New Private Investment (+)	**-1.9**	**3.6**	**-2.8**	**-3.4**	**3.6**	**6.0**	**1.6**	**4.6**	**1.6**	**-1.0**	**0.9**	**1.5**
New Public Investment (+)	8.5	11.3	4.7	0.1	4.2	6.6	6.6	4.1	-0.8	-3.0	-1.9	-0.4
Gross National Expenditure (GNE)	**2.3**	**3.5**	**1.4**	**-1.2**	**3.7**	**5.0**	**3.6**	**2.0**	**2.7**	**1.7**	**1.8**	**2.0**
GDP	**2.3**	**2.9**	**2.2**	**-0.1**	**2.2**	**3.7**	**3.5**	**2.0**	**2.6**	**2.3**	**2.5**	**2.4**
Inflation												
CPI (Yr Avg)	1.7	1.9	1.6	1.3	1.6	4.4	6.3	3.5	2.7	2.6	2.4	2.7
Wage Price Index (Jun on Jun)	1.9	2.1	2.4	1.7	1.8	2.6	3.7	3.9	3.8	3.6	2.9	3.6
Wage Price Index (Yr Avg)	2.0	2.1	2.3	2.1	1.5	2.4	3.4	3.8	3.9	3.6	3.2	3.6
Average Weekly Earnings (Yr Avg) ^	2.0	2.4	2.7	3.9	2.7	1.9	3.7	4.3	4.3	4.0	3.7	4.1
Employment												
Employment Growth (Yr Avg)	1.5	3.0	2.4	0.5	0.6	3.2	3.0	2.0	1.8	1.6	0.8	1.6
Employment Growth (May on May) (%)	2.1	2.6	2.8	-5.6	8.3	3.0	1.9	1.9	1.8	1.3	0.9	1.5
Unemployment Rate (May) (%)	5.5	5.4	5.2	7.0	5.1	4.0	3.6	3.5	3.6	3.8	4.1	3.7
Non-farm Labour Productivity Growth	0.6	0.0	0.0	-0.3	0.5	0.2	0.5	0.5	0.9	0.6	1.5	0.9
Exchange Rates												
US$ per A$ (Yr Avg)	0.75	0.78	0.72	0.67	0.75	0.73	0.68	0.71	0.77	0.79	0.74	0.74

Source: ABS, Reserve Bank of Australia, Haver Analytics, BIS Oxford Economics

+Expenditure on new assets (or construction work done). Excludes sales (or purchases) of second hand assets.

^ Average Weekly Ordinary Time Earnings, Adult Persons

7.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 3,481 employees since 2017/18 to 18,954 persons in 2021/22.

This growth has been underpinned by a 42.3% increase in the number of surveyors – an additional 1,865 surveyors have been employed across the nation[9]. All surveying sectors have experienced growth since 2017/18 despite a decrease in total construction activity over the same time period. Construction activity has fallen by 13.1% between the reported years, although non-residential and house construction has increased since 2017/18 offsetting the impact to the surveying industry through increased activity across land surveyors (7.1% and 4.6% increases respectively).

The aggregate figures for surveyors, spatial scientists, technicians, and other professionals, as shown in Table 7.2, are sourced from the 2016 and 2021 Census data and, for 2017/18, scaled according to the changes in the labour market[10]. The numbers are disaggregated into various occupation groups based on the results of the industry survey and education level attained.

Technicians are estimated to comprise 36.5% of the total skilled workforce with surveyors comprising 33.1%. Of note, is the national decrease in the number of registered/licensed surveyors despite the number of surveyors increasing – the number of registered/licensed surveyors decrease by 7.7% to 2,369 persons. This reflects the reported hiring difficulties from the industry survey for registered/licensed surveyors – 91.5% of responders stated either severe or moderate difficulties in hiring registered/licensed surveyors.

[9] This increase is based on the revised 2017/18 workforce breakdown methodology
[10] Data provided from the ABS' Labour Force, Australia, Detailed, Quarterly

Table 7.2: Estimated Size of Skilled Surveying and Geospatial Workforce in Australia

Occupation Groups	2017/18*	2021/22		
Surveying sectors				
Land	2,201	3,217	▲	1016
Construction	792	1,038	▲	246
Engineering	763	1,143	▲	380
Mining	402	423	▲	21
Other sectors	248	450	▲	202
Total surveyors	**4,406**	**6,271**	▲	**1865**
Registered/Licensed Surveyors	*2,567*	*2,369*	▼	(198)
Total spatial scientists	**1,374**	**1,641**	▲	**267**
Surveying technicians	5,226	5,905	▲	679
Spatial technicians	1,049	1,018	▼	(31)
Total technicians	**6,275**	**6,923**	▲	**648**
Total skilled surveying & geospatial workforce	**12,055**	**14,835**	▲	**2780**
Planners	1,098	1,253	▲	155
Engineers	1,316	1,444	▲	128
Environmental Scientists	421	430	▲	9
Other staff (include Architects)	583	992	▲	409
Total other professionals	**3,418**	**4,119**	▲	701
Total Skilled Workforce	**15,473**	**18,954**	▲	**3481**

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

7.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

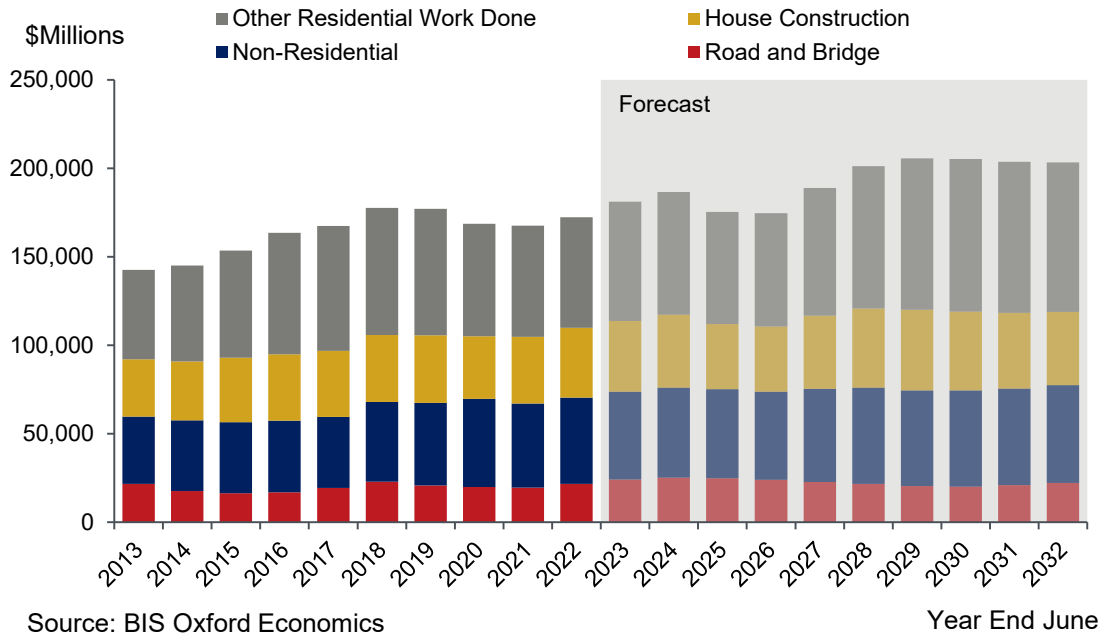
7.3.1 Land Development Sector Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Driving the increase in land surveyors since 2017/18 has been the activity of house, non-residential, other residential and road & bridge construction which have remained at historically elevated levels as shown in Figure 7.1. Despite cooling slightly since 2017/18 (-2.9%), the total level of activity across these drivers has grown by 21.0% since 2012/13 to $172.4 billion.

House construction rose 5.1% off the back of HomeBuilder to reach $39.5 billion in 2021/22. Delayed construction due to COVID-19 impacts has further drawn out the realisation of projects across the country, keeping house construction at elevated levels over the past few years. Total non-residential building activity is estimated to have increased 2.4% to $48.7 billion for 2021/22 off the back of a strong pipeline of public infrastructure projects.

Demand for land surveyors has also received a boost from increased Road and bridge activity - construction was $21.7 billion in 2021/22, up 10.5% from the previous year. Similar to non-residential activity, the increase was supported by publicly funded activity, offsetting a minor decrease in private road and bridge investment.

Figure 7.1: Land Development Drivers Value of Work Done – Australia



Overall activity amongst land surveyors is set to increase over the short-term as residential construction continues to grow and the pipeline of non-residential work remains at historically high levels.

In relation to residential construction, the outlook is for continued growth over 2022/23 and 2023/24 following record land sales in 2021 (a leading indicator of total house construction) and project 'catch-up' from delays caused by widespread shortages. The outlook is for an initial peak in house construction in 2023/24 at $41.3 billion. As such, demand for land surveyors from residential work will rise in the short-term.

Over the medium-term, the increased pace of property price falls, higher build costs, and rising borrowing costs will drag house construction down. These forces will squeeze profit margins for developers, while also dragging on buyers' confidence and purchasing power. New dwelling sales have weakened recently, a trend that will likely continue into 2023, however the impact of this in annualised terms will be felt more in 2024/25. Thus, a cooling in house construction will dampen demand for land surveyors across 2024/25 and 2025/26.

Across non-residential activity, a modest increase is expected for 2022/23 (+1.8%) and 2023/24 (+2.8%) taking work done to $50.9 billion. The major project pipeline across both government and private sectors remains healthy, the lead from approvals is solid, and there is cause for optimism with the rapid return of migration supporting hospitality and education investment. This will ensure a strong base for demand for land surveyors over the next few years.

Collectively, strong growth is expected over the coming years, driven by infrastructure stimulus and a strong pipeline of projects already planned, thus boosting demand. However, the boom in activity remains cautious, with a downside risk to the procurement and the capacity constraints among contractors in the transport sector. Moreover, the surging construction costs, coupled with supplies and skills shortages have added to the downside risks over the recent years. These forces will likely be realised in 2024/25 and 2025/26 resulting in a decline in activity. As these constraints ease and population growth returns upward pressure on dwelling demand and infrastructure projects, total construction will begin to recover and stabilise over the long-term outlook. Therefore, the long-term demand outlook for land surveyors remains elevated.

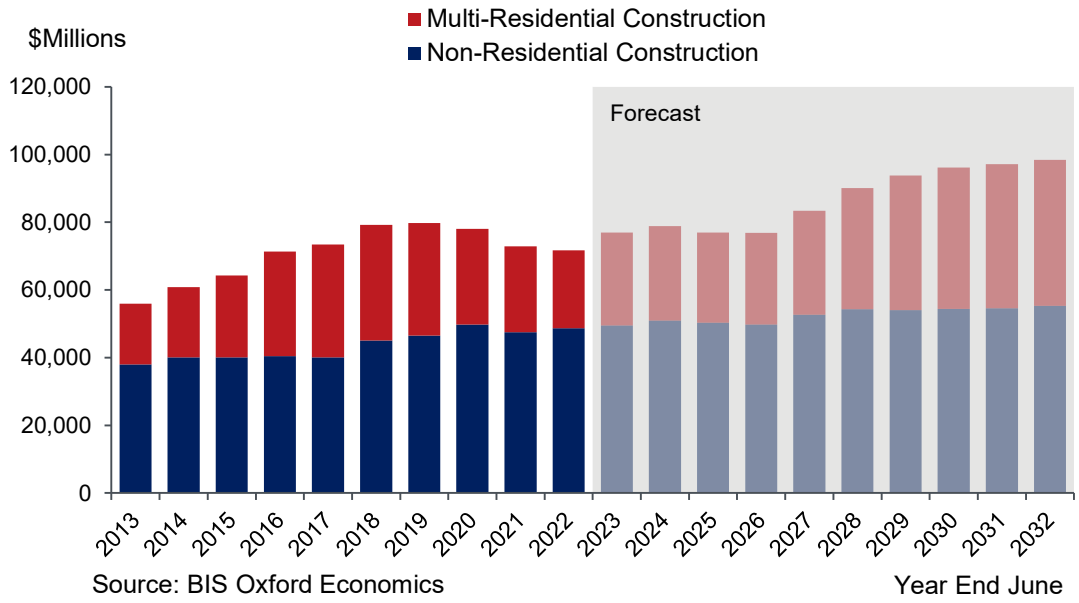
It should be noted that only registered/licensed surveyors can undertake certain works with the role of land surveying, such as boundary definition/ redefinition and they are the only professionals registered/licensed by the government in each jurisdiction to sign the plans for lodgement with the Land Title's Office. Since 2017/18 the number of registered/licensed surveyors has decreased from 2,567 to 2,369 (-7.7%) which is causing significant pressure on the registration/licensing program within each jurisdiction and causing current registered/licensed surveyors to work well past retirement to meet the demands of land development across the country.

7.3.2 Construction Sector Recent Trends and Outlook– Non-Residential & Multi-Residential Construction

Supporting the increase in the number of construction surveyors since 2017/18 (+31.3%) has been elevated levels of non-residential and multi-residential dwelling[11] activity. Despite a cool-down since 2017/18 (-9.5%), work done remains well above that of nearly a decade ago –2021/22 levels were 28.2% above 2012/13 output. In addition to a potential 'catch-up' in the employment across the construction surveyor workforce since 2017/18, these elevated levels have promoted employment increases across most of the regions.

The historically high levels of multi-residential activity between 2016/17 and 2017/18 were underpinned by changing investment preferences and costs which pushed investors towards apartment dwellings. However, the outlook for apartment development remains moderate with numerous projects initially expected to be completed in 2021/22 being delayed due to capacity constraints, stretching into 2022/23. The outlook beyond this remains considerably mild over the mid-decade with recent poor data for apartment presales and approvals. Rising interest rates and falling prices are feeding investor concern with higher building costs adding to the challenges for build-to-sell development feasibility. As such, a moderate short-term outlook for multi-residential activity will limit demand growth for construction surveyors.

Figure 7.2: Building Construction Activity Value of Work Done – Australia



[11] Multi-residential dwelling activity includes private medium- and high-density construction activity

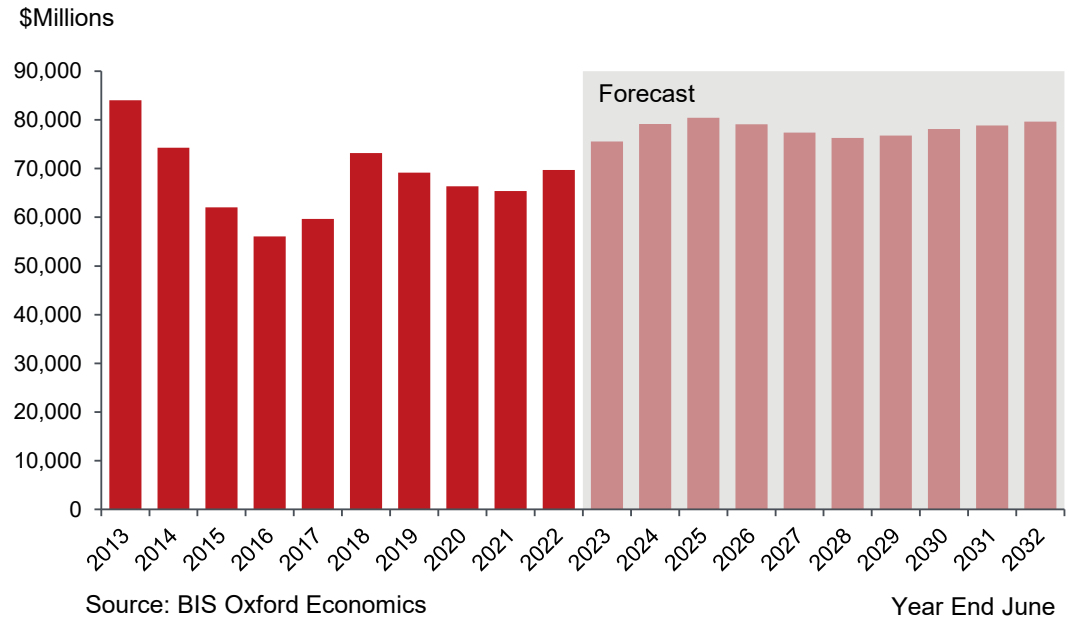
The strong pipeline of infrastructure projects will drive the increase in non-residential activity across the nation – total non-residential building is expected to increase marginally in 2022/23 to $49.5 billion (+1.8%). This momentum is expected to be maintained through 2023/24 to peak at $50.9 billion. As such, the short-term demand for construction surveyors is set to grow over the first two years of our forecast.

As the pipeline cools, non-residential activity is set to stabilise over the mid-decade keeping the demand for construction surveyors at relatively consistent levels. However, the long-term outlook is for considerable growth from 2026/27 onwards – driven by work across Queensland and Western Australia, activity is set to continue to increase, reaching $55.3 billion in 2031/32. This will see demand for construction surveyors surge over the later years of our forecast.

7.3.3 Engineering Sector Recent Trends and Outlook– Utilities and transport engineering construction

Driving the significant increase in the number of surveyors (+49.8%) in the engineering occupation group since 2017/18 has been the strong utilities[12] and transport[13] engineering activity across the country. As depicted in Figure 7.3, following a number of subdued years after the boom in the early 2010s, engineering construction recorded its second largest activity level since 2014/15 with an estimated $69.7 billion work done in 2020/21. Although this represents a 4.8% decrease from the 2017/18 level, activity in the sector remains 6.9% higher than the average since 2014/15.

Figure 7.3: Utilities and Transport Engineering Construction Value of Work Done - Australia



[12] Utilities engineering activity includes the construction of water, sewerage, electricity and telecommunications assets.
[13] Transport engineering activity includes the construction of roads, bridges, railways and harbours, which collectively amounted to $9.5 billion over the June 2022 Quarter, up 1.6%.

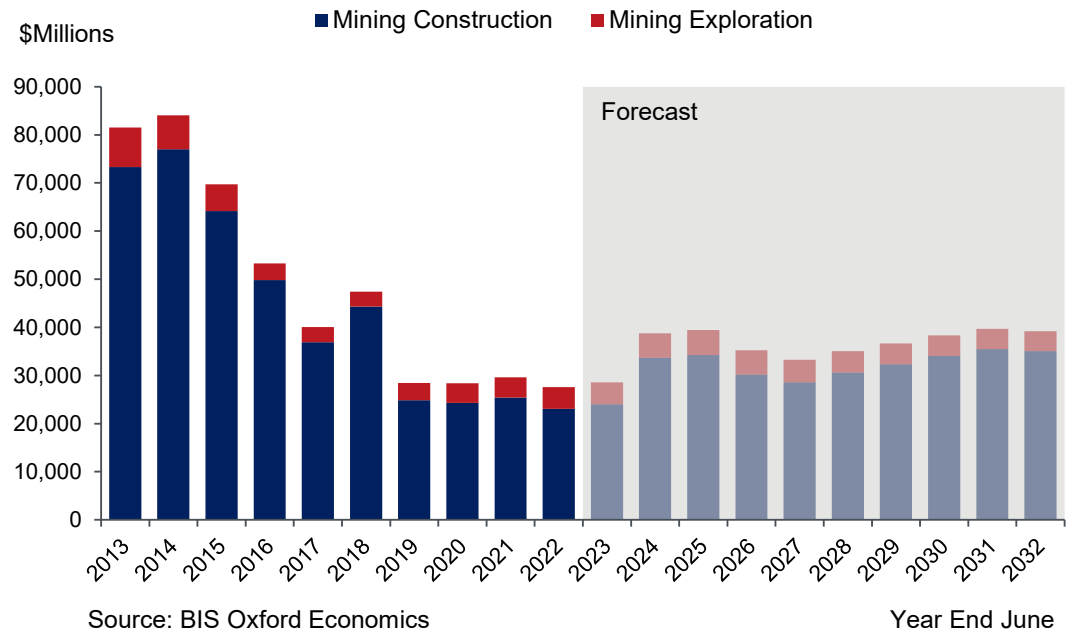
The government funded infrastructure boom continues to support engineering construction activity. Publicly funded transport construction work increased 13.9% over 2021/22 to $25.3 billion, the largest financial year total on record and work is expected to rise. This will continue the current momentum in the industry over the next three years – engineering activity is set to peak at $80.5 billion in 2024/25. Therefore, demand for engineering surveyors to increase over the short- to medium-term.

Following this initial boom, on the back of increased construction costs and an easing of the current pipeline, activity will cool and stabilize over the remaining years of the forecast – from 2026/27 activity will average $77.9 billion. However, this represents an 11.7% increase on current activity levels. Accordingly, demand for engineering surveyors, in the long-term, will remain stable but at elevated levels relative to current demand.

7.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

As reflected in the more modest increase in mining surveyors since 2017/18 (+5.2%) relative to the other surveying occupations, activity in the mining sector across Australia has bottomed-out over over the past four years. The value of mining and heavy industry (MH&I) construction and mining exploration has averaged $28.5 billion over the four years to 2021/22, 45.8% lower than the previous four-year average as shown in Figure 7.4.

Figure 7.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – Australia



This decrease was driven by a fall in mining investment across Australia – investment was in decline from the peak in the mining boom in 2012/13 to 2018/19 as several major oil and gas projects transitioned from construction to production. However, a recover in mining investment has begun to materialise, with investment growing by 1.2% in 2020/21 on the back of soaring commodity prices.

Mining construction and exploration activity is set to increase over the short-term before cooling. The current recovery in mining investment is set to maintain the sector's momentum over the next few years, with activity to peak in 2025/26 at $39.4 billion. Therefore, the demand for mining surveyors in Australia will increase over the next three years.

Capacity constraints, including labour shortages, will hinder long-term progress across the sector as it causes widespread delays – key projects such as Barossa project, the Equus Gas Field, Crux FLNG and the Dorado project remain poised for construction setbacks. However, longer-term, we forecast a rebound in mining activity, particularly from the private sector investment, that will ensure activity remains stable over the later years. This will maintain demand for mining surveyors remains at relatively stable levels of the long-term.

7.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

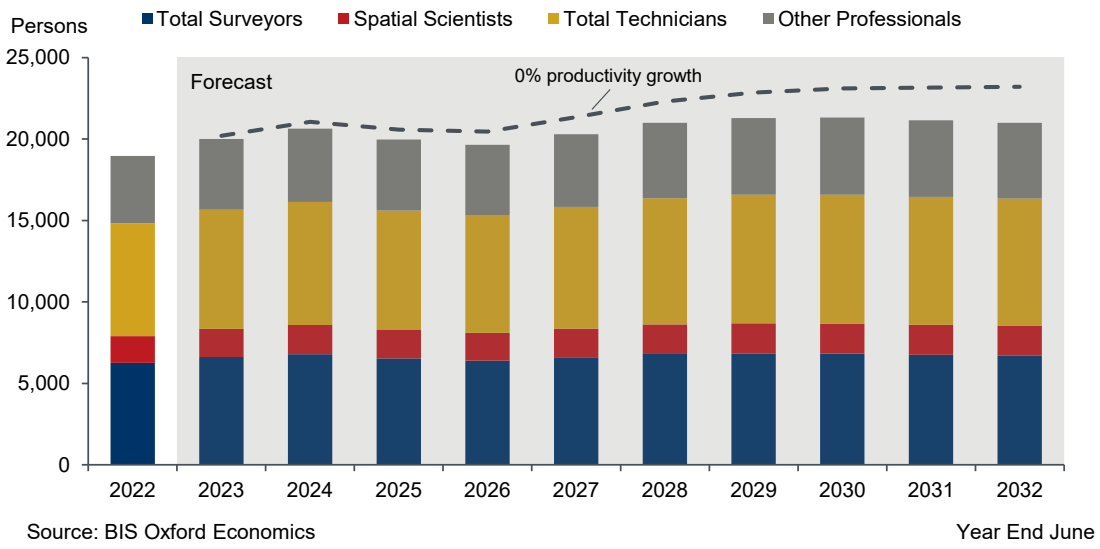
7.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

National demand for surveying and geospatial professionals over the forecast period is set to increase over the shorter-term before cooling over the mid-decade as total construction activity dips (as shown in Figure 7.5). This initial increase will be driven by increases in publicly funded pipeline of infrastructure projects and a backlog of residential activity. This will drive demand for all professionals to increase by 5.5% by 2022/23 to just over 20,000 before reaching an initial peak in 2023/24 at 20,600 professionals.

Demand for surveying and geospatial professionals to initially peak in 2023/24 before cooling

Figure 7.5: Forecast of Total Demand for Skilled Labour – Australia (1.0% Labour Productivity)



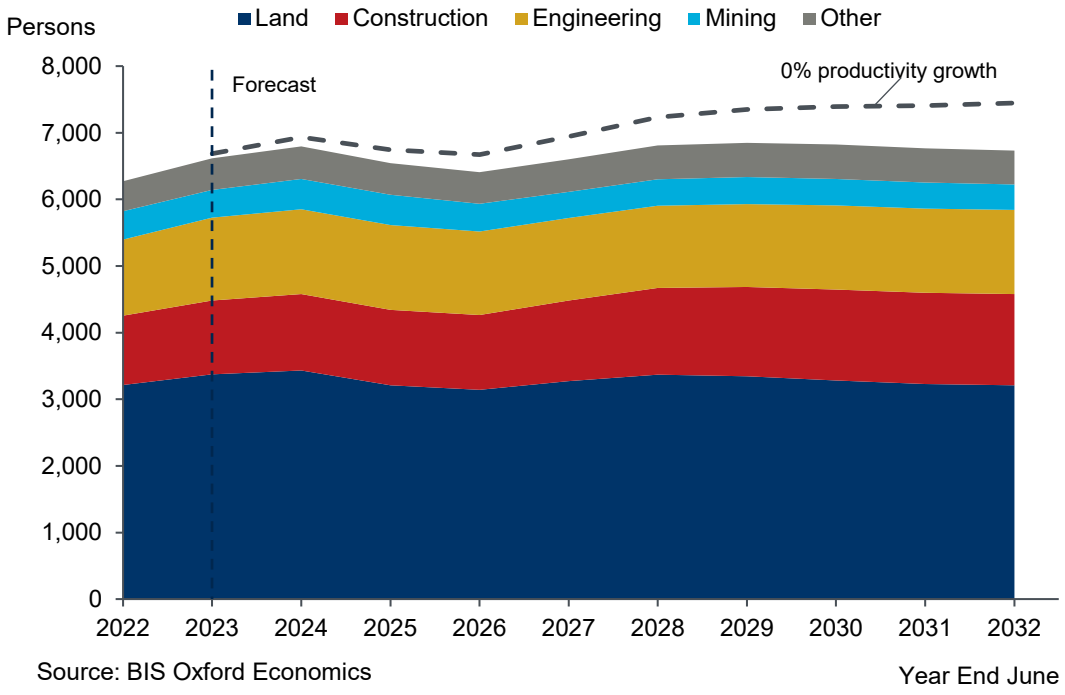
A key feature of the national outlook is the same directional and magnitude change in demand for all groups each year over the next decade – the end-user demand drivers are expected to face similar profiles over the next decade as market conditions are dominated by key macroeconomic projections. That is, a strong pipeline of projects across multiple industries, further emphasised due to recent project delays from supply constraints, will boost activity over the short-term for most surveying groups.

Following the initial peak, demand is expected to decline. Driven by the conclusion of the current strong pipeline of activity, reduced residential activity as increases in borrowing and increased construction costs, work done will be hampered and expected to decline over the mid-decade. Therefore, we expect demand for all professionals to decline over this period as total activity declines, troughing at 19,600 in 2025/26.

As mentioned in Section 1, potential improvements to productivity can alleviate stress on the existing workforce. Evidently, if the surveying and geospatial industry experiences no improvements to productivity, total national demand would exceed 23,000 professionals at the end of our forecast period. The 1.0% assumption of increased labour productivity will result in 2,200 less professionals required in 2031/32.

Focusing on the demand for surveyors, we anticipate a similar growth profile as mentioned above – the initial peak of demand in 2023/24 will nearly reach 6,800 professionals before dipping over the following two years. The level of total demand experienced during this initial peak will be reached again in 2027/28. Beyond this, demand will average 6,800 surveyors over the remaining years of the forecast. Additionally, we do not anticipate any substantial changes to the share of type of surveyor demand – the demand for each type of surveyor is forecast to follow a similar trend over the next decade.

Figure 7.6: Forecast of Demand for Surveyors by Sector – Australia (1.0% Labour Productivity)

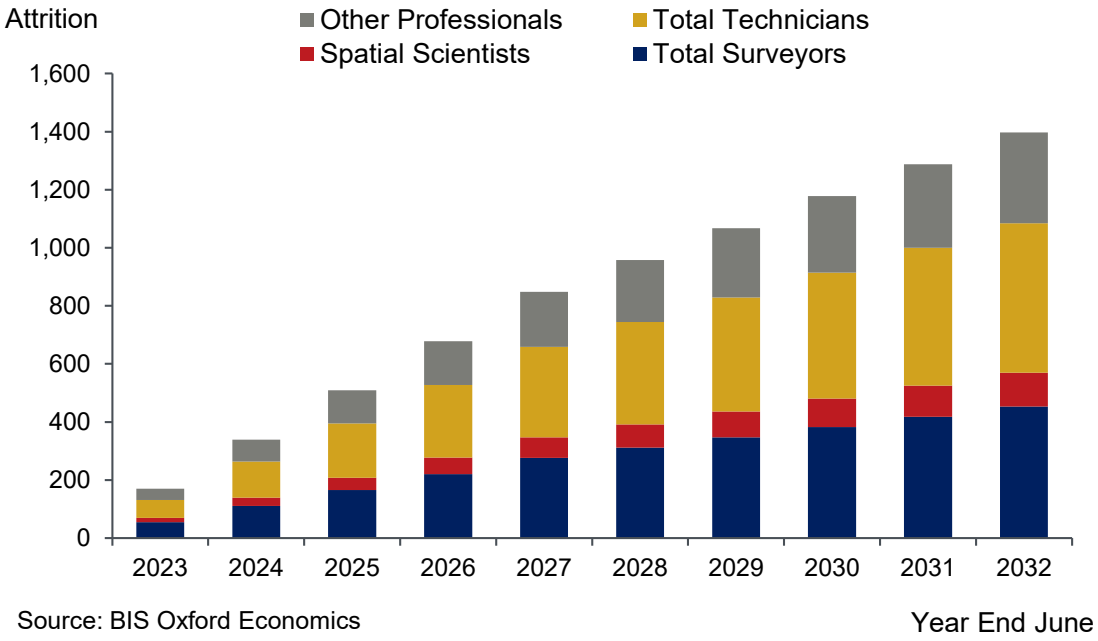


7.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current workforce will increase gradually over the next decade to reach around 7.4% of the 2021/22 workforce (attrition 2031/32; 1,400 persons). This accounts to an average yearly attrition of 140 professionals, roughly 0.7% of the current workforce. Importantly we do not anticipate any of the major occupation groups to experience a disproportionately large (or small) attrition. This implies each group has a similar age distribution; accordingly, the four major groups are forecasted to have an aggregate attrition between 7.1-7.6% of the current workforce (Spatial Scientists; 7.1%, Other professionals; 7.6%).

Figure 7.7: Forecast of Aggregate Workforce Attrition – Australia



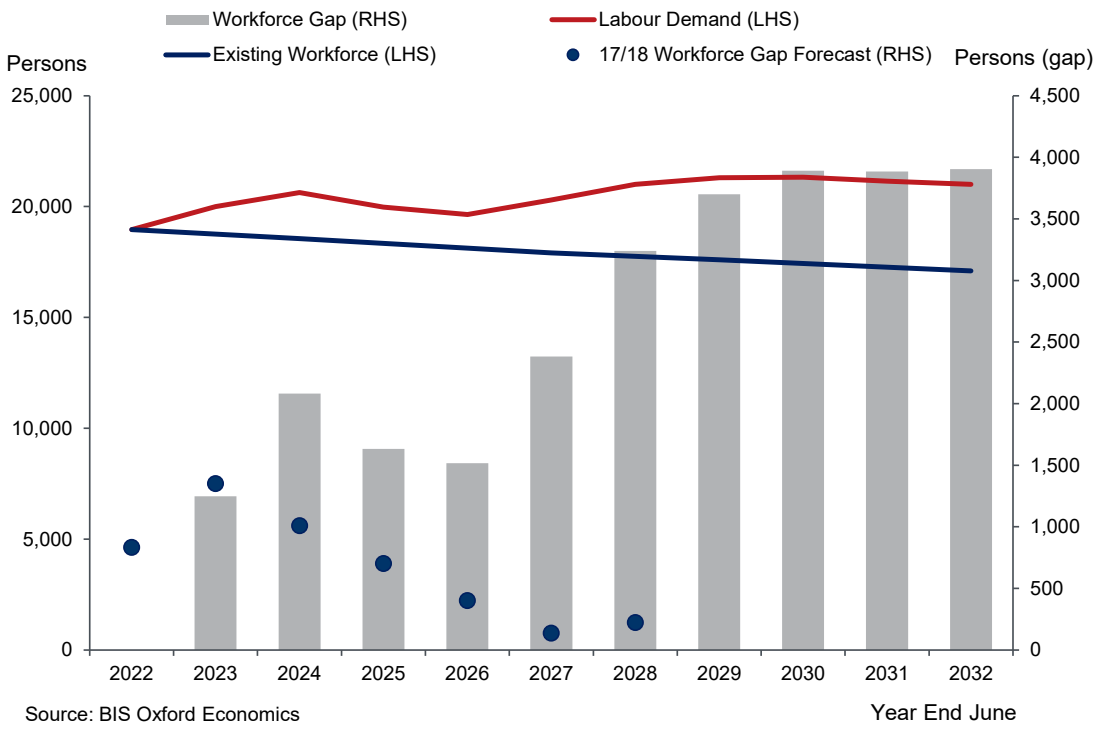
7.4.3 Forecast of Workforce Gap

Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for Australia.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in Australia from 2022/23 onwards. The gap, driven by the immediate uptick in end-user demand drivers, will increase to 2,000 persons over the next two-years but will reach 3,900 persons by the end of the forecast period (Figure 7.8). This corresponds to 20.6% of the current workforce and will represent 22.8% of the existing workforce in 2031/32.

During the near term, surveyors will account for a relatively larger proportion of the workforce gap, driven by the increased demand sensitivity to residential construction. However, as residential activity reverts closer to historical proportions, technicians will comprise the largest share of the workforce gap. By 2031/32, technicians will account for 39.7% of the workforce gap compared to 27.4% for all surveyors.

Figure 7.8: Forecast of Workforce Gap for Total Skilled Workforce – Australia



7.5 New Supply of Surveyors, Spatial Scientists and Technicians for Australia

In order to avoid a capability gap, the workforce gap described above will need to be met by the supply of new skilled surveying and geospatial professionals. Given the model holds productivity growth constant (at 1.0%), comparison of the workforce gap against new labour supply determines if surveyors and geospatial professionals will experience a capability gap. New skilled labour supply is based on the projected number of new graduates from local training authorities which is split into two groups:

- **Higher Education:** a share of students completing an undergraduate surveying and spatial science degree are assumed to join the surveying and geospatial workforce as surveyors or spatial scientists.

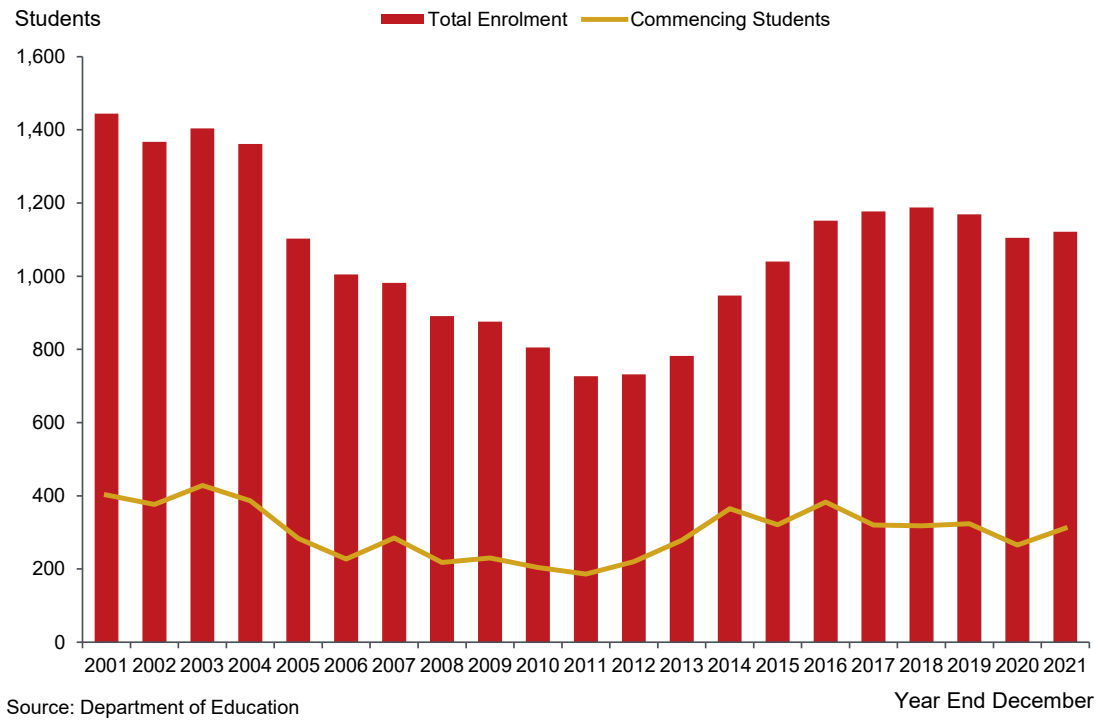
- **Vocational Education and Training (VET):** a share of students completing a Diploma (or the equivalent) in surveying and spatial information are assumed to join the workforce as surveying or spatial science technicians.

7.5.1 Higher Education – Bachelor of Surveying or Spatial Science

The level of total current student enrolments in surveying and spatial science undergraduate degrees has increased in recent years following a steep decline during the early 2010s but remain below the historically high levels of the early 2000s. As illustrated in Figure 7.9, total enrolments have increased steadily since the 2011 education year (ignoring minor decline across the two most recent years). Accordingly, in the 2020 academic year, 1,105 students were enrolled in undergraduate surveying and spatial science degrees – representing a 52.0% increase against the trough experienced in the 2011 academic year but remains 23.5% lower than the record levels in 2001.

Completions, which lag the number of commencing students, have had a similar increase in recent years following a decline through the early 2010s. Although the number of completions were 43.3% higher in 2020 than the low of 2013 (2020; 192 completions vs 2013; 134 completions), the completion rate (completions against commencing students from four-years prior) has remained relatively stable – rates have averaged 61.2 since 2003 and have only averaged slightly higher over the six most recent academic years at 65.7%.

Figure 7.9: Number of Total Student Enrolments and Commencing Students in Undergraduate Surveying and Spatial Science Degrees



Source: Department of Education

7.5.2 Higher Education Enrolment and Completion Outlook

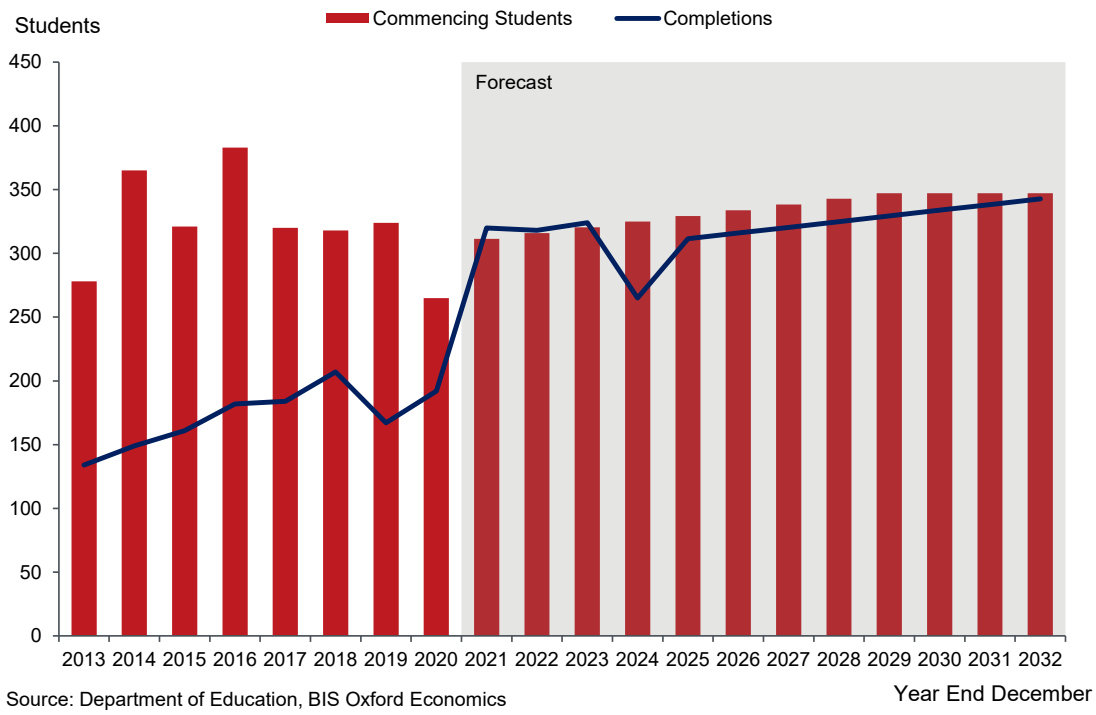
Broadly, we have assumed an uplift in higher education enrolments, wherein the enrolment levels will return to pre-GFC levels (~1250 persons per year) by the end of the decade. This assumes that total enrolments per year will increase by approximately 150 persons per year from current levels. This corresponds to an average of 334 commencing students each year over the forecast period, slightly above the average number of commencing students since 2014 (328 students).

The dip in completions in the 2024 academic year is a result of the drop in the number of commencing students in 2020. It is worth noting that despite an assumed up-tick in higher education enrolments over the forecast period, a significant capability gap in the surveying professions over the next decade is estimated.

Given the older age profile of surveyors, we forecast the total supply of surveyors and spatial scientists to decrease marginally over the forecast period as new labour supply struggles to replace retirees in the workforce. As seen in Figure 7.11, by 2032, we anticipate a net loss of 284 professionals – a 3.6% decrease in the surveying and spatial scientist workforce.

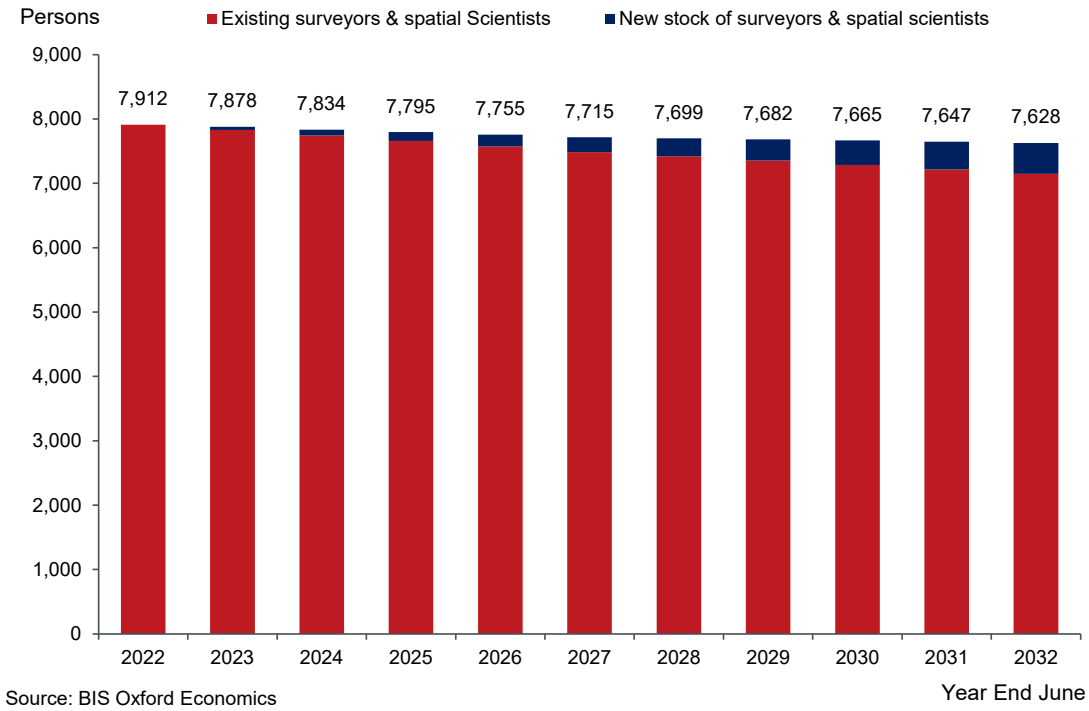
The new stock of surveyors and spatial scientists will account for 6.3% of the total forecasted stock. It should be further noted that graduates cannot directly replace the skills and productivity of retirees in the surveying workforce (with decades of experience). Therefore, the true impact of the attrition of the existing workforce is beyond what the model can estimate.

Figure 7.10: Forecast Number of Commencing Students and Completions in Undergraduate Surveying and Spatial Science Degrees



Source: Department of Education, BIS Oxford Economics

Figure 7.11: Forecast of Existing and New Stock of Surveyors & Spatial Scientist



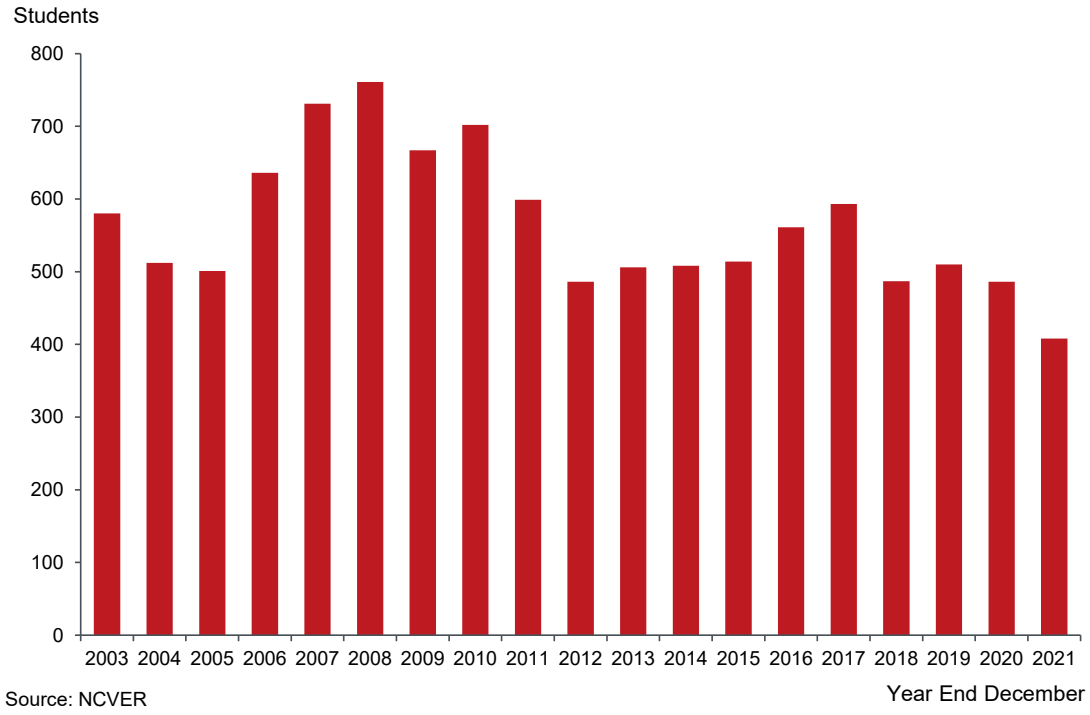
Source: BIS Oxford Economics

7.5.3 Vocational Education and Training – Diploma or Advanced in Surveying and Spatial Information

The number of students enrolling in VET Surveying and Spatial Information courses (Diploma or above) has decreased significantly over the last three years. The 2021 academic year saw 408 students enrolled which represents a 20.0% decrease compared to enrolment levels in 2019. Moreover, the average for the past five years is 3.5% lower than the five years prior to the 2017 academic year (2017-2021 average; 497 enrolments vs 2012-2016 average; 515 enrolments).

Current enrolments sit 46.4% lower than the historically high level in the 2008 academic year (761), however, completions currently sit above the levels recorded in the late 2000s. Completions peaked in 2016 at 311 but have since declined by 32.8% to 209 students in the most recent academic year. The recent downward trend in the number of students enrolled is the result of training capacity constraints. That is, the closing of a number of training facilities across various states has capped the number of students that can study surveying or spatial information courses.

Figure 7.12: Number of Total Student Enrolments in VET courses



Source: NCVER

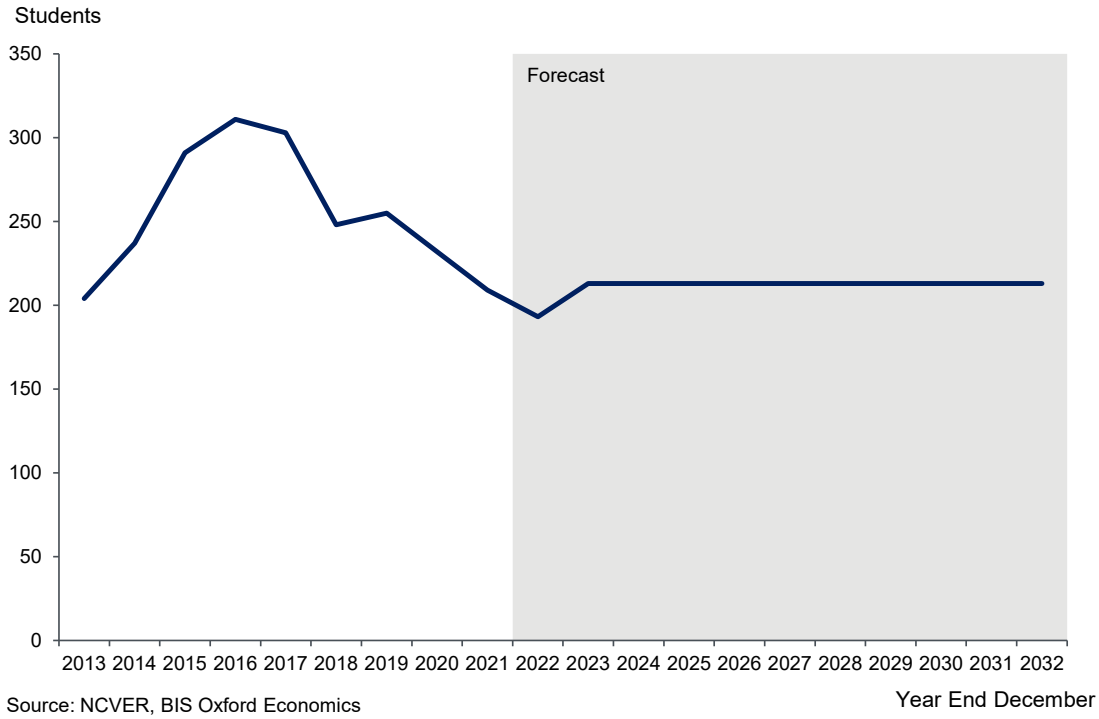
7.5.4 VET Enrolment and Completion Outlook

Vocational enrolments will increase slightly to 450 students over the next two-years and hold constant over the remaining years of the forecast. The modest increase in enrolments is underpinned by the capacity constraints of institutions currently offering surveying and spatial information courses – there is limited room to increase current enrolments.

Accordingly, we forecast the number of students enrolled to reach 450 students in 2022 and remain constant over the next decade. This corresponds to completions reaching 213 students in in 2023 and 63 students entering the workforce each year. This attrition comes as a result of the large share of enrolled students already engaged in the surveying and geospatial workforce – the 'new supply' to the workforce only captures those entering the workforce for the first time, those already working have been captured through the existing workforce statistics.

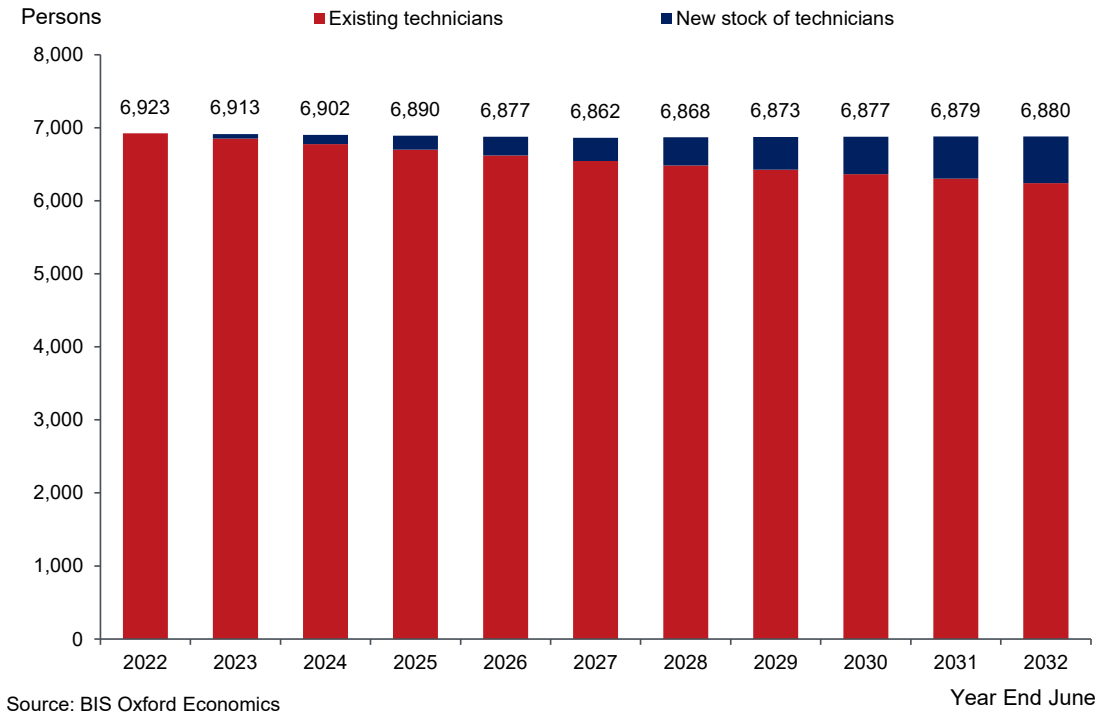
As a result of the forecasted completions, we anticipate the total supply of technicians to decline over the forecast period. By 2032, we anticipate a net loss of 42 technicians as the new labour supply fails to keep up with the level of workforce attrition. Over the next decade 639 new technicians are expected to enter the workforce. As shown in Figure 7.14, the new stock of technicians will account for 9.3% of the total forecasted stock.

Figure 7.13: Forecast Number of Student Completions in VET courses



Source: NCVER, BIS Oxford Economics

Figure 7.14: Forecast of Existing and New Stock of Surveyors & Spatial Scientists

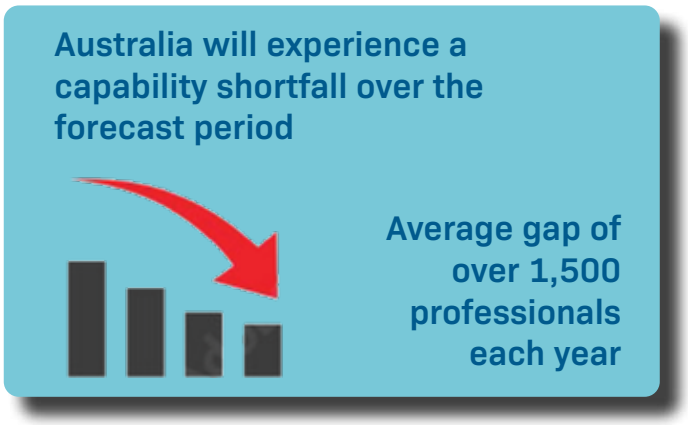


Source: BIS Oxford Economics

7.6 Australian Surveyors, Spatial Scientists and Technicians Capability Gap

Given our projections of the workforce gap and graduate completions, **Australia will experience an aggregate capability shortfall of surveyors and geospatial professionals over the forecast period.**

The average shortfall over the next decade will be nearly 1,500 professionals. Starting with an estimated shortfall of more than 800 professional in 2022/23, the shortfall is expected to increase to just over 1,400 in the following year before decrease to around 700 in 2025/26 as construction activity cools as seen in Figure 7.15.



Following this, as activity picks up, the capability shortfall will increase to over 2,000 and average over 1,900 persons over the final five years of our forecast. Focusing on surveyors and spatial scientists, the capability gap is estimated to reach more than 900 professionals by 2031/32.

To eliminate this gap, the forecasted commencing students need to average around 940 students per year over the next decade. This represents a 169.9% increase on current forecasted numbers.

As for technicians, the capability gap will exceed 900 professionals by 2031/32 after peaking at more than 1,000 professionals two years earlier.

For the new supply of technicians to keep up with demand and attrition, completions would need to average 517 students each year over the next decade. This could represent a 167.5% increase on the forecasted levels. A detailed breakdown of each occupation group's forecasts are presented in Table 7.3.

Figure 7.15: National Workforce Capability Position

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Surveyors & spatial scientists			Deficit					Deficit		
	470	752	485	356	645	924	1014	1011	954	925
Surveying & spatial science technicians			Deficit					Deficit		
	403	656	446	359	620	883	1013	1040	977	911

Table 7.3: Forecast of Labour Demand and Workforce Gap – Australia (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**6271**	**6618**	**6797**	**6545**	**6408**	**6603**	**6808**	**6851**	**6824**	**6767**	**6734**
Land	3217	3372	3432	3209	3143	3272	3370	3344	3281	3231	3211
Construction	1038	1109	1144	1130	1123	1211	1303	1343	1367	1367	1368
Engineering	1143	1244	1277	1273	1254	1237	1231	1244	1260	1261	1261
Mining	423	418	451	455	417	394	396	403	398	395	386
Other sectors	450	476	492	478	472	489	507	516	517	513	508
Registered/Licensed Surveyors (a)	*2369*	*2500*	*2567*	*2473*	*2421*	*2494*	*2572*	*2588*	*2578*	*2556*	*2544*
Spatial Scientists	1641	1730	1790	1734	1704	1758	1815	1846	1852	1834	1819
Total Technicians	6923	7316	7558	7336	7235	7482	7751	7886	7917	7856	7791
Total Surveying & Geospatial Workforce	**14835**	**15665**	**16144**	**15616**	**15347**	**15842**	**16374**	**16583**	**16593**	**16457**	**16344**
Other Professionals	4120	4336	4487	4357	4298	4454	4624	4712	4730	4693	4653
Total skilled labour demand	**18955**	**20001**	**20631**	**19973**	**19645**	**20296**	**20997**	**21295**	**21323**	**21150**	**20997**
Existing Workforce (b)											
All Surveyors	**6271**	**6205**	**6139**	**6071**	**6001**	**5931**	**5880**	**5827**	**5774**	**5719**	**5663**
Land	3217	3183	3148	3113	3077	3041	3014	2987	2959	2931	2902
Construction	1038	1027	1016	1004	993	981	973	964	955	946	937
Engineering	1143	1132	1120	1108	1096	1083	1074	1065	1055	1046	1036
Mining	423	418	414	409	405	400	397	393	390	386	382
Other sectors	450	446	441	436	431	426	422	418	415	411	407
Registered/Licensed Surveyors	*2369*	*2344*	*2319*	*2293*	*2267*	*2241*	*2221*	*2201*	*2181*	*2160*	*2139*
Spatial Scientists	1641	1624	1607	1589	1572	1553	1540	1526	1513	1498	1484
Total Technicians	6923	6849	6774	6698	6621	6543	6485	6426	6365	6304	6241
Total Surveying & Geospatial Workforce	**14835**	**14679**	**14520**	**14358**	**14194**	**14027**	**13905**	**13779**	**13652**	**13521**	**13389**
Other Professionals	4120	4075	4029	3982	3935	3887	3852	3816	3780	3743	3705
Total skilled labour	**18955**	**18754**	**18549**	**18341**	**18129**	**17915**	**17757**	**17596**	**17432**	**17264**	**17094**
Workforce Gap (c)											
All Surveyors	**0**	**413**	**658**	**475**	**407**	**671**	**928**	**1023**	**1050**	**1048**	**1071**
Land	0	189	284	96	66	231	356	357	322	300	309
Construction	0	82	129	126	130	230	330	379	413	421	431
Engineering	0	112	157	165	159	153	157	179	204	216	225
Mining	0	(1)	37	45	12	(6)	(1)	10	9	9	4
Other sectors	0	30	51	42	41	63	85	98	103	102	102
Registered/Licensed Surveyors	*0*	*156*	*249*	*179*	*154*	*254*	*351*	*387*	*397*	*396*	*404*
Spatial Scientists	0	106	183	145	132	204	275	319	340	335	335
Total Technicians	0	467	783	638	614	939	1266	1461	1551	1552	1550
Total Surveying & Geospatial Workforce	**0**	**986**	**1624**	**1258**	**1153**	**1815**	**2469**	**2803**	**2941**	**2935**	**2956**
Other Professionals	0	261	458	374	363	567	772	895	950	950	947
Total skilled labour	**0**	**1247**	**2083**	**1632**	**1516**	**2382**	**3241**	**3699**	**3891**	**3885**	**3903**
New stock of surveyors & spatial scientists (c)	0	49	88	135	182	231	279	329	379	429	481
New stock of technicians (d)	0	64	128	192	256	320	383	447	511	575	639
Surveyors & spatial scientists capability	0	470	752	485	356	645	924	1014	1011	954	925
Technicians capability shortfall (e)	0	403	656	446	359	620	883	1013	1040	977	911

Source: BISOE, ABS, CRSBANZ

(a) Registered surveyors are included in the total number of surveyors.

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce.

(d) New stock of surveyors and technicians are shown as annual increments.

(e) Capability shortfall is derived by subtracting new supply from workforce gap. Positive number implies a shortage of labour; bracketed numbers imply an excess of supply.

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR NEW SOUTH WALES

Forecast of Labour Demand & Workforce Gap for NSW

8.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across New South Wales (NSW) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpins demand for surveyors and geospatial professionals.

8.1.1 Recent Economic Trends

NSW endured a tough 2019/20 due to continued COVID-19-related lockdowns but recovered in line with most other states and territories in 2020/21.

Specially, State Final Demand (SFD), a measure of total economic activity, declined -2.0% in 2019/20, much worse than the national average of -0.9%. NSW suffered the largest contraction in output in the initial COVID-19 shock, suffering among the worst of the impacts from the COVID-19 epidemic. However, over 2020/21, SFD increased 3% – close to the national equivalents. SFD growth strengthened further to 3.5% in 2021/22, despite lockdowns in the second half of 2021 and floods in the first half of 2022.

Recently, NSW has been boosted by strong household consumption and increased investment in machinery & equipment. Household consumption grew by 2.5%, boosted by sharp increases in spending on transport services (35.6% q/q). Investment activity rebounded during the quarter, driven by spending on machinery & equipment (9% q/q) and a recovery in public investment.

Dwelling investment and employment growth has been modest due to restricted improvements in bottlenecks and new jobs respectively. Dwelling investment was flat, with supply constraints thwarting the progress of the sizeable pipeline of work to be done, while the slowing housing market contributed to a sharp fall in transfer cost (-7.7% q/q). Employment growth slowed during the previous quarter, adding only 15,000 extra jobs over the period. However, the labour market is in a remarkably tight position, with the unemployment rate at 3.4% and the participation rate near a record high at 66%. The very tight labour market will likely spur wage growth in the coming quarters, supporting household income growth, and employment is forecasted to grow by 4.1% in 2022 calendar year.

8.1.2 Economic Outlook

NSW will receive a boost over the short-term from the ongoing normalisation of travel flows. The return of international tourists and students will disproportionately benefit NSW and support the services sector. The lower Australian dollar will further bolster these services exports. Against this, some of the headwinds facing the Australian economy will bite a little harder in NSW.

House price falls will be larger in Sydney than in other capital cities, which will reduce turnover and associated retail spending in the near term while also weakening the outlook for dwelling investment further out. Moreover, larger average mortgage sizes mean rising interest rates may have stronger impact on consumption in NSW.

Despite increased borrowing costs and declining house prices, dwelling activity will remain elevated, driven by investors returning to the attached dwelling construction sub-sector, recovering population flows and strong levels of detached dwelling construction. Total residential building work is forecast to grow a further 5.4% in 2022/23. Despite a large pipeline of work still to be done, activity is expected to decline -6.6% in 2023/24 and a further -8.5% in 2024/25 in the wake of higher interest rates.

Public transport projects will continue to boost construction activity in the short- to medium-term for NSW. Business investment is expected to show modest increases over the next three years of around 5% per annum, underpinned by higher non-residential building, engineering construction and equipment investment. Public investment is expected to show solid growth over the next two years, before plateauing in 2024/25. Driving this will be a strong program of public transport projects, backed by state and federal government stimulus in road and rail infrastructure, as well as increasing levels of investment in renewable energy generation assets and associated transmission network development. Additionally, the recovery in mining investment will boost mining activity in NSW over the next 3-4 years.

8.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 49 employees since 2017/18 to 5,266 persons in 2021/22 for New South Wales.

Growth across the various occupation groups for NSW has varied significantly compared to the other east-coast states. The number of surveyors and spatial scientists has increased by 101 persons since 2017/18. As seen in Table 8.1, despite declines in the engineering and mining surveyors, a significant increase in land employment has resulted in the number of surveyors increasing since the last report. A unique result for NSW has been an increase in the number of registered surveyors who increased by 13.2% to over 1,000 persons despite the national employment decreasing by 7.7%.

The increase in surveyors and spatial scientists has been offset by a large decline in the number of technicians – employment of technicians in NSW has fallen by 282 professionals since 2017/18. This corresponds to a 11.9% decrease in technician workforce. Additionally, total other professionals have increased by 128 professionals (+16.4%). In aggregate, this has resulted in a moderate increase in the state's total workforce – NSW has experienced a 0.9% increase in its total skilled workforce since 2017/18.

Surveyors are estimated to comprise 35.9% of the NSW total surveying and geospatial workforce, with spatial scientists and technicians accounting for 7.3% and 39.5% respectively. Importantly, the total surveyors from NSW still comprises the largest share of the national surveying employment (30.2%).

Table 8.1: Estimated Size of Skilled Surveying and Geospatial Workforce in NSW

Occupation Groups	2017/18*	2021/22	
Surveying sectors			
Land	977	1,123	▲ 146
Construction	344	350	▲ 6
Engineering	223	218	▼ (5)
Mining	98	81	▼ (17)
Other sectors	75	119	▲ 44
Total surveyors	**1,717**	**1,891**	▲ **174**
Registered/Licensed Surveyors	*924*	*1,048*	▲ 124
Total spatial scientists	**357**	**386**	▲ **29**
Surveying technicians	2,029	1,847	▼ (182)
Spatial technicians	332	232	▼ (100)
Total technicians	**2,361**	**2,079**	▼ **(282)**
Total skilled surveying & geospatial workforce	**4,435**	**4,356**	▼ **(79)**
Planners	331	315	▼ (16)
Engineers	284	329	▲ 45
Environmental Scientists	73	84	▲ 11
Other staff (include Architects)	94	182	▲ 88
Total other professionals	**782**	**910**	▲ 128
Total Skilled Workforce	**5,217**	**5,266**	▲ **49**

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

8.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers is fundamental to the surveying landscape over the next decade. As such, we provide an update for:

- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

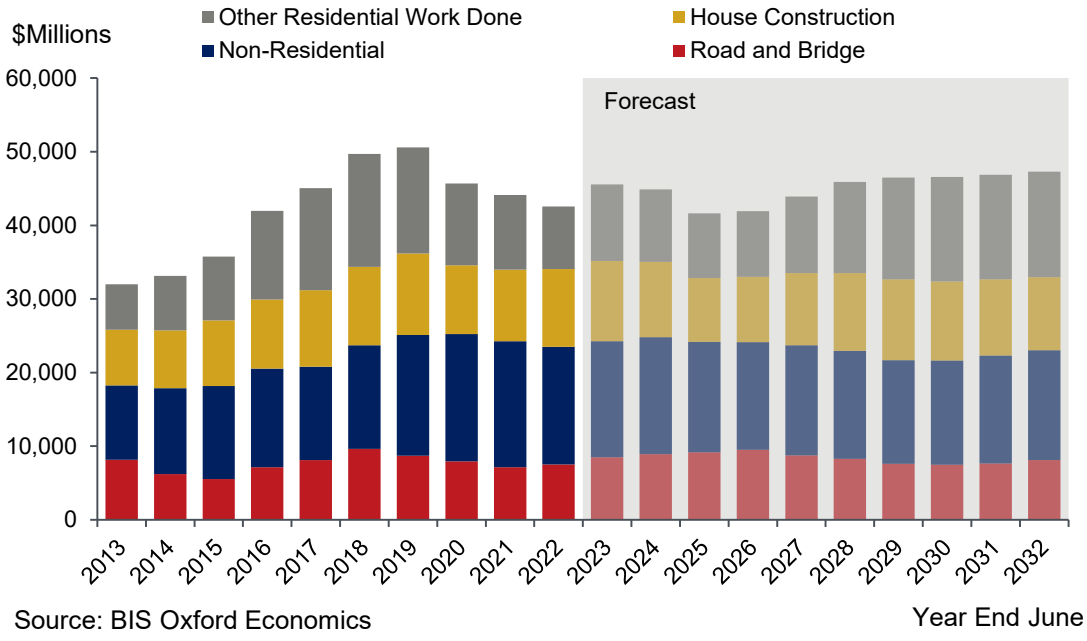
8.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Increased employment across land surveyors in NSW has been supported by elevated levels of land development activity. House construction, non-residential, other residential and road & bridge activity, has remained at elevated levels since 2017/18. Total activity has averaged 23.2% higher in the five years to 2021/22 than the five years prior (2017/18-2021/22 average; $56.9 billion vs 2012/13-2016/17 average; $46.2 billion).

This elevated level of activity has been boosted by strong non-residential activity which accounted for $16.0 billion worth of activity in 2021/22, representing a 13.6% increase since 2017/18. It is worth noting that non-residential activity peaked in 2019/20 at $17.3 billion and has since cooled slightly.

Other residential activity has countered the elevated levels of the other driver performance falling 44.7% since 2017/18 to just over $8.5 billion. This level of activity has not been experienced since 2014/15.

Figure 8.1: Land Development Drivers Value of Work Done – NSW



Following the initial increase in activity, we expect to see a cool down in activity over the medium-term for residential construction. It is forecasted that residential activity will ease 6% in 2023/24 and 11% in 2024/25. Longer-term, with sustained pressure on dwelling stock, easing interest rates in 2024, and the return of price growth, growth in total work done is forecast to rise from 2025/26. As such, we will see demand for land surveyors increase over the next year before decreasing until 2026/27 when growth will return.

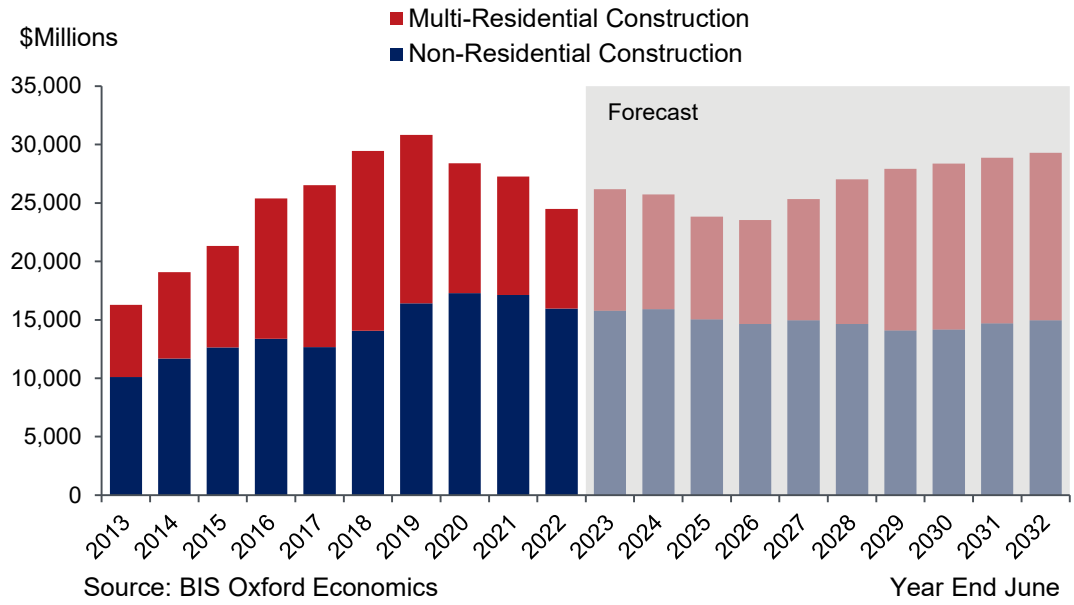
Reflecting its higher level of household indebtedness, Sydney is leading the nation in residential property price declines as interest rates rise. This is negatively impacting both buyer and developer confidence. The impact to construction is further prolonging development, and despite an improving economy and recovering population flows, residential activity will decline over the medium-term due to rising borrowing costs, land constraints in Sydney and the acceleration of building costs.

NSW road activity is expected to grow further in the near-term with the ramp up of works on Sydney Gateway and M6. Mega projects including the Western Harbour Tunnel & Beaches Link, are forecast to drive road construction activity to renewed heights. As a result, we forecast a peak in in total road construction at $9.5 billion in 2025/26, thus driving demand for land surveyors over the short- to medium-term.

8.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

Growth in employment across construction surveyors has been limited by the level of building construction activity in the state. Total construction activity has fallen 16.9% since 2017/18 to $24.5 billion with multi-residential work falling 16.2% in 2021/22 alone to $8.5 billion (-44.7% since 2017/18). Additionally, the state has seen non-residential work declined 6.7% to $16.0 billion in 2021/22. The Omicron outbreak and inclement weather were responsible for on-site disruptions in the first half of 2022, causing further delays to projects.

Figure 8.2: Building Construction Activity Value of Work Done – NSW



NSW non-residential building is expected to remain relatively constant in 2022/23 as projects are slowly completed after delays from COVID-19 and inclement weather. This result is expected to play through broadly, with both commercial & industrial, and social & institutional activity holding relatively stable. Health building is set to pick up strongly, with the $330 million Nepean Hospital Redevelopment – Stage 2 getting underway.

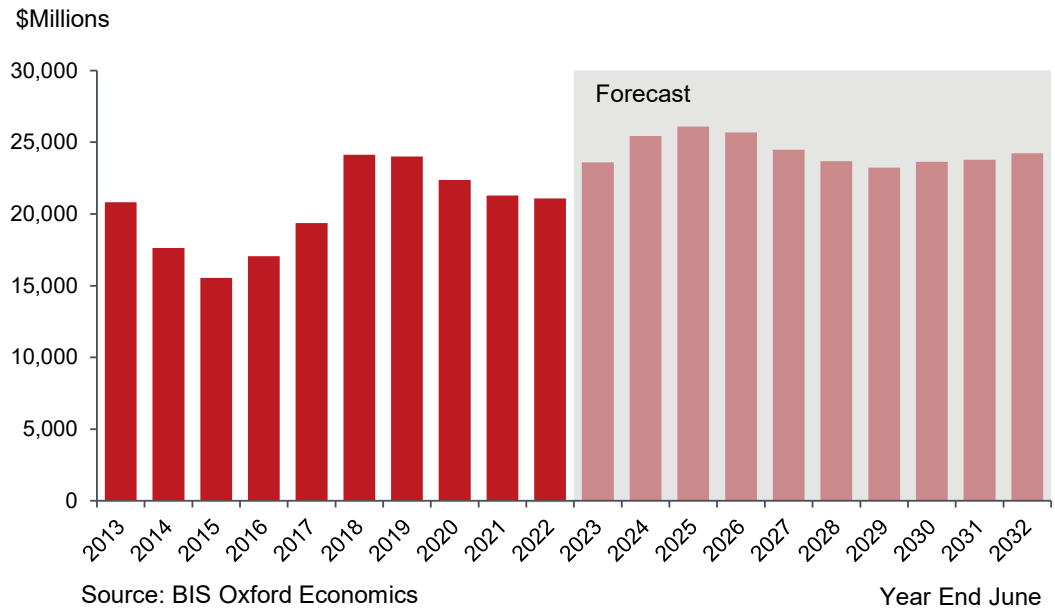
Total activity is expected to stay mostly flat over 2023/24, as seen in Figure 8.2, with social & institutional activity beginning to drift upwards. A fall back in non-residential work done is anticipated as declining private investment cannot be offset by moderate growth in public spending. The largest project expected to break ground is the $1 billion New Bankstown-Lidcombe Hospital. Therefore, after a few years of constant demand for construction surveyors, we expect to see a decline over the medium-term before positive growth returns in 2026/27.

8.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Driving a decline in engineering surveyor employment across NSW has been a 12.7% decrease in engineering construction activity over the past five years. Since 2017/18, engineering activity has cooled by $3 billion to $21.1 billion.

Despite a downturn in activity over the past five years, the forecast for engineering activity is for strong growth over the coming years. A strong pipeline of major transportation projects is set to drive demand for engineering surveyors, with activity set to peak in 2024/25 at $26.1 billion, a 23.8% increase on 2021/22 activity levels.

Figure 8.3: Utilities and Transport Engineering Construction Value of Work Done - NSW



Following the peak in activity over the coming years, as shown in Figure 8.3, we anticipate a decline in activity over the remaining final years in our forecast. This comes on the back of a number of key projects set to be completed over the coming years, however, total activity is set to remain at historically high levels.

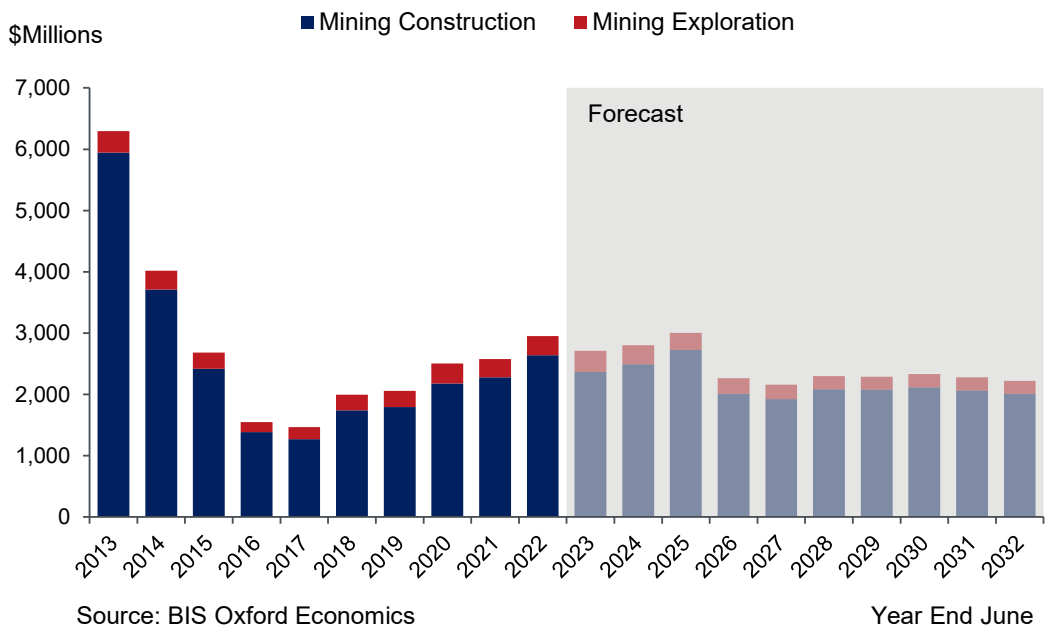
8.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

Despite a downturn in the number of mining surveyors since 2017/18, mining activity has steadily increased on the back of surging coal prices and strong global demand. Mining construction work done in NSW has rebounded over the past decade on the back of a broad pick-up in activity across the board underpinned by coal exploration. Since 2017/18, total mining activity has increased by 47.8% to $3.0 billion.

A key commodity for NSW mining is coal and accordingly the outlook for coal related activity significantly shapes our outlook. Coal mining maintenance spending is set to grow 2.2% in 2022/23, propped up by increasing coal production and works relating to the flooded mines in NSW. The surge in coal prices over the past year, and the recent spike caused by the Ukraine-Russia conflict, is expected to extend the period of extremely high coal prices, and thereby support maintenance activity over the short-term. We expect Australian coal production to increase over the next few years, supported by strong global demand for coal.

Activity in NSW will remain at relatively stable levels in part due to ageing coal operations that will require new investment to sustain production capacity. However, a global shift away from thermal coal, echoed at last year's Glasgow climate conference, and a weaker outlook for prices are expected to keep further coal investment muted over the longer-term. Therefore, we can expect to see demand for mining surveyors in NSW remaining constant over the short-term before cooling slightly over the reaming forecast years.

Figure 8.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – NSW



8.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

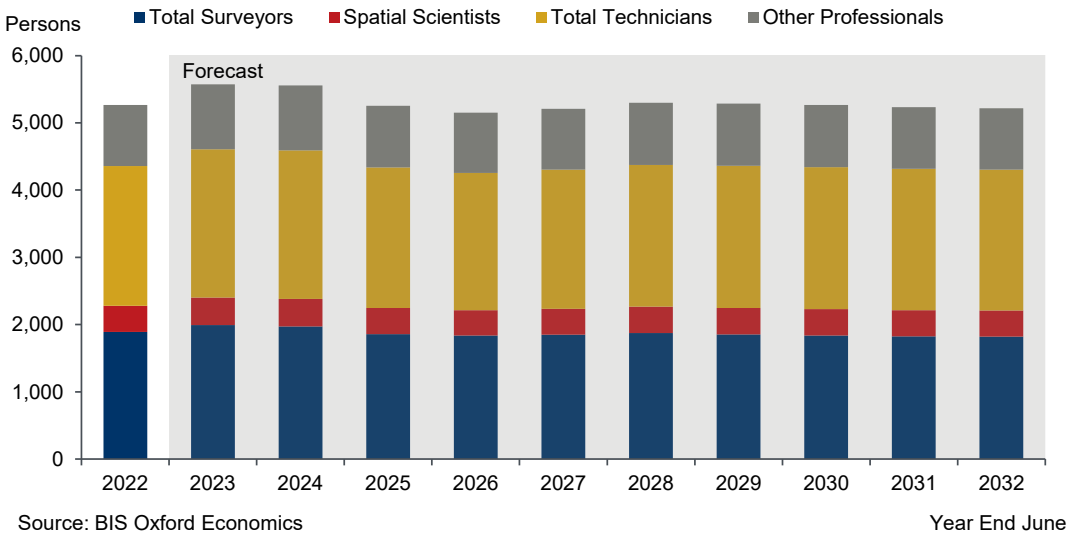
8.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals to initially peak in 2022/23 before cooling

Demand for surveying and geospatial professionals in NSW is set to increase over the short-term before decreasing over the following years. As seen in Figure 8.5, demand for all professionals will peak in the first year of our forecast at nearly 5,600. This represents a 5.9% increase on the current estimated workforce. However, on the back of a decrease in construction activity, demand is set to fall back to below current levels in 2024/25 and will average just over 5,200 for the remaining years of the forecast.

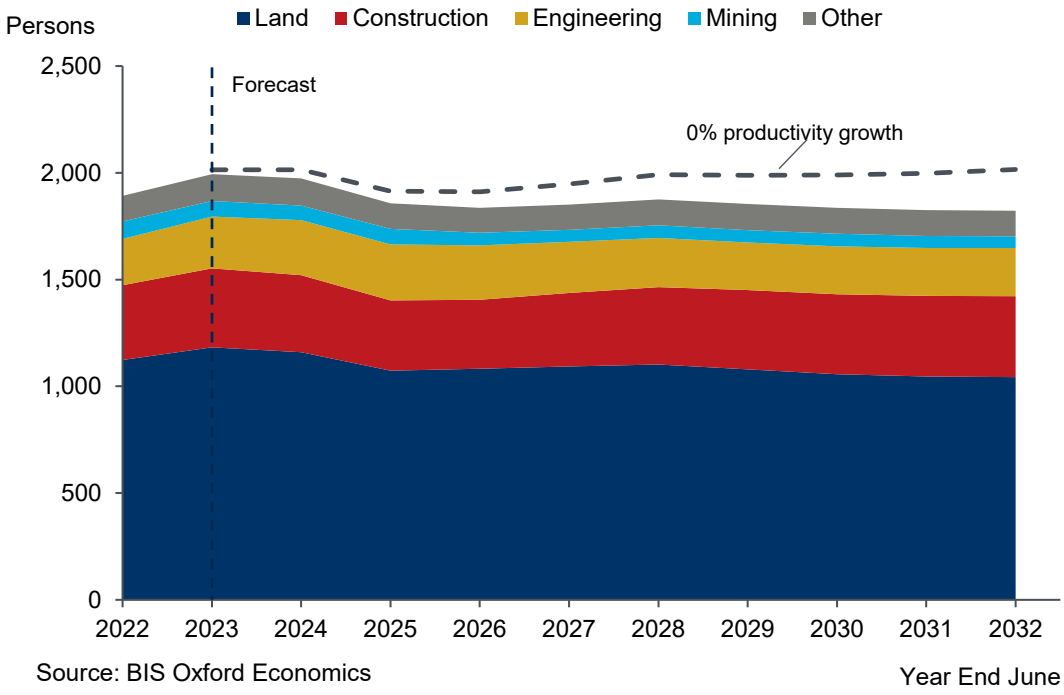
Figure 8.5: Forecast of Total Demand for Skilled Labour – NSW (1.0% Labour Productivity)



Similar to the national outlook, all occupation groups are set to experience a common profile over the next decade. Surveyors, spatial scientists, technicians and other professionals will all undergo a peak in demand in the first year of our forecast and have relatively consistent demand from 2024/25 onwards. The share of demand for each occupation group will accordingly remain stable, with total surveyors expected to account for 1.0 percentage points less by 2031/32, a difference captured by the other three groups.

Regarding the different surveyors, demand will peak in 2022/23 at nearly 2,000 professionals before averaging around 1,800 from 2024/25. Of note is a later peak in the demand for construction surveyors – demand is set to peak in 2031/32 at nearly 400 professionals. This corresponds to an 8.2% increase on the current workforce and a 17.1% increase on the trough forecasted to occur in 2025/26. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 200 professionals. This would account for around 10.6% of the expected workforce demand in 2031/32.

Figure 8.6: Forecast of Demand for Surveyors by Sector – NSW (1.0% Labour Productivity)

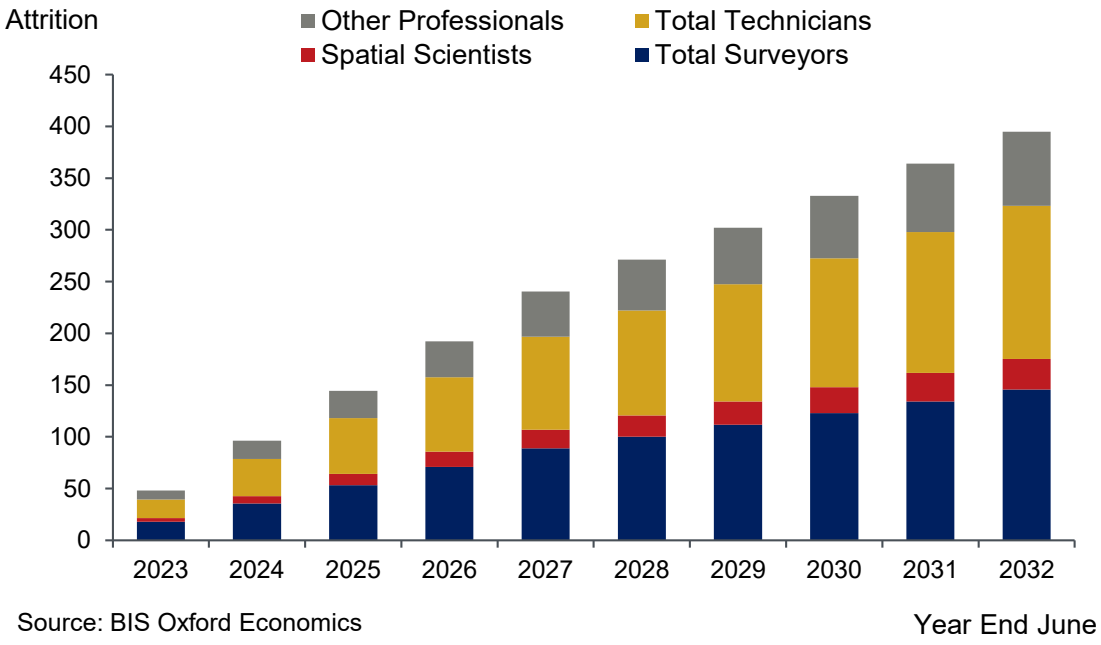


8.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current NSW workforce will increase over the next decade to reach 7.5% of the 2021/22 workforce (attrition 2031/32; 395 professionals). This accounts to an average yearly attrition of 39 professionals, roughly 0.7% of the current workforce, right on the national average attrition rate (national share; 0.7% each year).

Figure 8.7: Forecast of Aggregate Workforce Attrition – NSW



The key implication of the workforce attrition is that no individual occupation group will be placed under increased strain as a result of having on older workforce and as a result a significant share of retirements over the next decade. Therefore, the key factor in any workforce gap will be the underlying demand for the occupation from the end-user drivers.

8.4.3 Forecast of Workforce Gap

Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements? This section of the report presents the results of the workforce gap for NSW.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in NSW from 2022/23 onwards. The gap, driven by the immediate uptick in end-user demand drivers, will exceed 400 persons over the next two-years but will eventually reach nearly 500 persons by the end of the forecast period (see Figure 8.8). This maximum workforce gap corresponds to 9.1% of the current workforce and will represent 10.1% of the existing workforce in 2031/32.

Mining surveyors are set to experience a supply surplus, or negative workforce gap, on the back of a restricted forecast due to a lower demand for coal production in the longer-term and gradual decrease in maintenance and upgrade work. As illustrated in Table 8.2, mining surveyors will have a negative workforce gap every year of the forecast period.

Figure 8.8: Forecast of Workforce Gap for Total Skilled Workforce – NSW

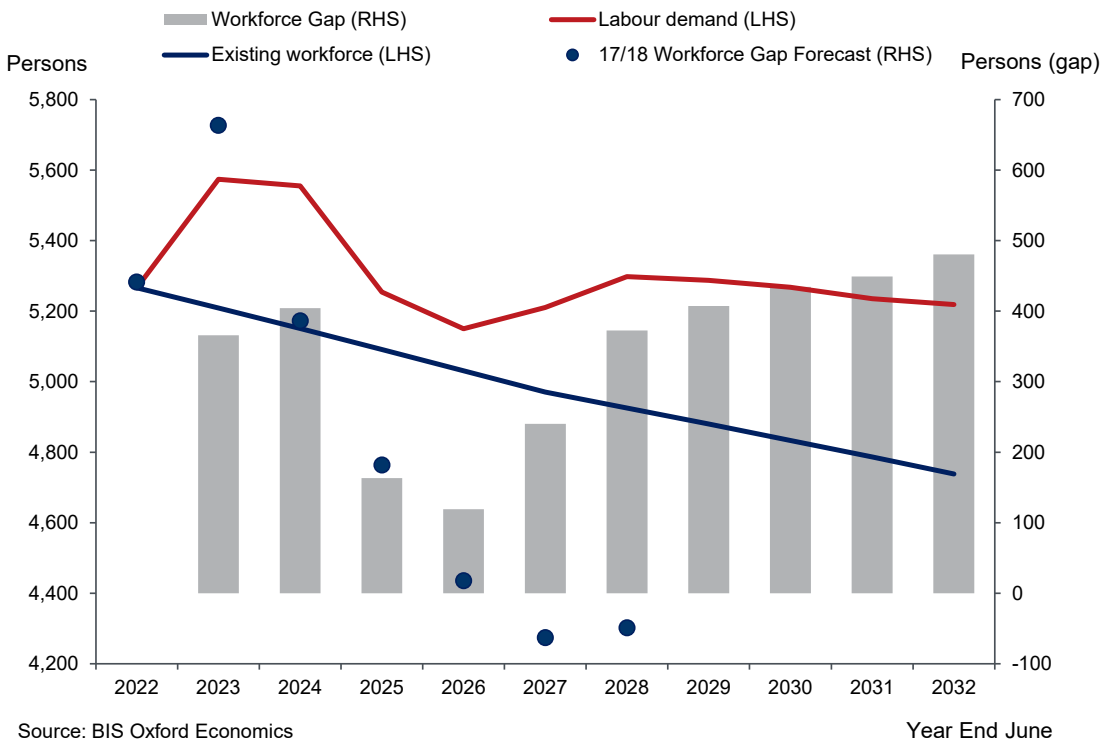


Table 8.2: Forecast of Labour Demand and Workforce Gap – NSW (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**1891**	**1994**	**1973**	**1857**	**1836**	**1851**	**1875**	**1853**	**1835**	**1824**	**1822**
Land	1123	1183	1161	1073	1082	1092	1102	1079	1057	1047	1043
Construction	350	370	360	330	323	344	363	371	374	377	378
Engineering	218	241	258	262	255	240	230	224	225	224	226
Mining	81	73	68	73	59	55	58	57	58	56	54
Other sectors	119	127	127	120	117	119	121	122	121	121	120
Registered/Licensed Surveyors (a)	*1048*	*1105*	*1094*	*1029*	*1017*	*1026*	*1039*	*1027*	*1017*	*1011*	*1010*
Spatial Scientists	386	410	410	389	379	384	392	393	393	390	388
Total Technicians	2079	2206	2206	2093	2041	2069	2109	2115	2115	2101	2092
Total Surveying & Geospatial Workforce	**4356**	**4609**	**4589**	**4339**	**4257**	**4305**	**4375**	**4362**	**4342**	**4316**	**4303**
Other Professionals	910	966	966	916	894	906	923	926	926	920	916
Total skilled labour demand	**5266**	**5574**	**5555**	**5255**	**5150**	**5211**	**5298**	**5287**	**5268**	**5235**	**5218**
Existing Workforce (b)											
All Surveyors	**1891**	**1870**	**1848**	**1826**	**1804**	**1781**	**1764**	**1747**	**1730**	**1712**	**1694**
Land	1123	1111	1098	1085	1071	1058	1048	1038	1028	1017	1006
Construction	350	346	342	338	333	329	326	323	320	316	313
Engineering	218	215	213	210	208	205	203	201	199	197	195
Mining	81	80	79	78	77	76	76	75	74	73	73
Other sectors	119	118	117	115	114	112	111	110	109	108	107
Registered/Licensed Surveyors	*1048*	*1036*	*1024*	*1012*	*1000*	*987*	*978*	*968*	*959*	*949*	*939*
Spatial Scientists	386	382	377	373	368	364	360	357	353	350	346
Total Technicians	2079	2058	2036	2014	1992	1970	1953	1936	1919	1901	1883
Total Surveying & Geospatial Workforce	**4356**	**4309**	**4262**	**4213**	**4164**	**4114**	**4077**	**4040**	**4002**	**3963**	**3923**
Other Professionals	910	900	889	878	867	856	848	840	832	823	815
Total skilled labour	**5266**	**5209**	**5151**	**5091**	**5031**	**4970**	**4926**	**4880**	**4833**	**4786**	**4738**
Workforce Gap (c)											
All Surveyors	**0**	**124**	**125**	**31**	**32**	**70**	**111**	**106**	**105**	**112**	**128**
Land	0	72	63	(12)	11	35	54	41	29	30	37
Construction	0	24	19	(7)	(10)	15	37	49	54	60	65
Engineering	0	26	45	51	47	35	27	22	26	27	31
Mining	0	(7)	(11)	(6)	(18)	(21)	(17)	(17)	(16)	(17)	(19)
Other sectors	0	9	10	5	3	6	10	11	12	13	13
Registered/Licensed Surveyors	*0*	*69*	*69*	*17*	*18*	*39*	*61*	*59*	*58*	*62*	*71*
Spatial Scientists	0	28	32	16	11	21	31	36	40	41	43
Total Technicians	0	148	170	78	49	100	156	179	196	200	209
Total Surveying & Geospatial Workforce	**0**	**300**	**328**	**125**	**93**	**191**	**298**	**321**	**341**	**353**	**379**
Other Professionals	0	66	77	38	26	50	75	86	94	97	101
Total skilled labour	**0**	**366**	**404**	**163**	**119**	**240**	**373**	**407**	**435**	**449**	**481**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.


WEST SIDE PLA

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR VICTORIA

Forecast of Labour Demand & Workforce Gap for VIC

9.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across Victoria (VIC) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpins demand for surveyors and geospatial professionals.

9.1.1 Recent Economic Trends

VIC proved to be remarkably resilient through the pandemic, however, total construction activity has dipped in recent years. Victorian construction activity is also well diversified between building and engineering construction, although residential construction represents a higher proportion of total construction relative to other major Australian states. The Victorian economy was hardest hit by the pandemic, which saw overall construction fall 5.3% in 2020/21 (after six years of solid growth prior).

VIC's most recent SFD was steady at 1% q/q in Q1. As with NSW, consumption growth was strong at 2.3% q/q, boosted by travel and hospitality spending. Health services also increased notably with the normalisation of elective procedures following the Omicron wave. Investment activity was mixed. Labour and materials shortages continue to disrupt construction related activity, while spending on machinery & equipment increased sharply in the quarter.

Non-residential and residential building activity experienced strong upward trending growth from 2014/15 to 2019/21 (averaging 7.1% annual growth), driven by a pickup in dwelling construction in the middle of the decade, and sustained out to 2019/20 by rising non-residential construction activity. With COVID-19 impacting private investment and amplifying an oversupply of high-density dwellings in Melbourne's core, 2020/21 saw growth in building construction contract, falling 5.3%. Activity has plateaued in 2021/22 at an estimated $36 billion although the short-term outlook remains positive. Further to this point, dwelling commencements, as a leading indicator to overall housing construction activity is estimated to have lifted slightly to 67,800 in 2021/22. Results by segment were mixed, with houses down 11%, while attached dwellings gain 27%.

The unemployment rate is historically low at 3.7%, although it fell as low as 3.1% in July. Employment growth in the state has slowed considerably as the market is at or beyond full capacity. Further, employment growth was brisk in 2021 calendar year, which has contributed to softer momentum this year. The participation rate has largely tracked sideways at around 67% in recent months. Softer economic momentum and tighter policy settings will test the resilience of the labour market, and we expect relatively subdued employment growth of 2.1% in 2022.

9.1.2 Economic Outlook

On the back of record land sales on Melbourne's fringe and strong pipeline of public infrastructure, VIC construction activity will be maintained over the short-term. It is forecasted that dwelling commencements will ease a cumulative 23% to 52,000 over the three years to 2024/25. Record land sales on Melbourne's fringe over 2021, combined with capacity constraints will slow the descent in 2023.

The medium-term outlook for the construction sector remains positive given the strong run of land sales and building approvals in the state. However, we expect this cycle will be more protracted, with labour and materials shortage delaying the speed at which work can be done. This will lead to a lower demand for surveyors in the medium-term as activity slows.

A strong pipeline of transport infrastructure, along with a slight uptick in residential building activity will see slight growth in construction activity in 2022/23 (0.5%) and 2023/24 (2.3%) – with work done to peak at $56.6 billion – followed by significant declines in activity over 2024/25 and 2025/26 led by falling building work. Social housing through the State Government's 'Big Housing Build' and considerable build-to-rent investment, will provide support to the attached dwellings segment – significantly more so than other states. While rising dwelling completions and sustained interstate migration losses will ease pressure on the dwelling stock, this will largely be offset by the return of overseas migrants.

Total building activity is forecasted to pick up modestly in 2022/23 and 2023/24, held up by growth in residential construction, though a housing downturn coupled with a tapering pipeline of projects will see an annual average decline of 6.9% in 2024/25 and 2025/26, with total residential and non-residential building activity across VIC to trough at $32.4 billion. Subsequently, this decline in end-user drivers will pull down demand for surveyors and geospatial professionals in VIC more dramatically than the other states.

9.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 1,372 employees since 2017/18 to 4,287 persons in 2021/22 for Victoria.

The number of total surveyors is estimated to have increased by 90.6% to around 1,400 persons. This result has come on the back of an increase in the employment across all surveying occupation groups, but a double in employment of land surveyors helped drive overall numbers to such a dramatic increase. It is worth noting that the number of licensed surveyors has decreased since 2017/18, with numbers falling 21.6% to just over 400 persons – licensed surveyors make up 29.0% of total surveyors. This result furthers the previous discussion in Section 6 – the hiring of registered/licensed surveyors proves to be a challenge for firms.

Surveyors are estimated to comprise 32.9% of the VIC total workforce, with spatial scientists and technicians accounting for 8.8% and 33.6% respectively. All major occupation groups experienced an increase in numbers since 2017/18, with environmental scientists the only minor group estimated to have seen a reduction in employment.

Table 9.1: Estimated Size of Skilled Surveying and Geospatial Workforce in Victoria

Occupation Groups	2017/18*	2021/22	
Surveying sectors			
Land	380	779	▲ 399
Construction	138	238	▲ 100
Engineering	158	271	▲ 113
Mining	22	30	▲ 8
Other sectors	43	94	▲ 51
Total surveyors	**741**	**1,412**	▲ **671**
Registered/Licensed Surveyors	*523*	*410*	▼ (113)
Total spatial scientists	**246**	**378**	▲ **132**
Surveying technicians	870	1,270	▲ 400
Spatial technicians	148	170	▲ 22
Total technicians	**1,018**	**1,440**	▲ **422**
Total skilled surveying & geospatial workforce	**2,005**	**3,230**	▲ **1225**
Planners	171	175	▲ 4
Engineers	510	510	
Environmental Scientists	83	72	▼ (11)
Other staff (include Architects)	146	300	▲ 154
Total other professionals	**910**	**1,057**	▲ **147**
Total Skilled Workforce	**2,915**	**4,287**	▲ **1372**

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

9.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

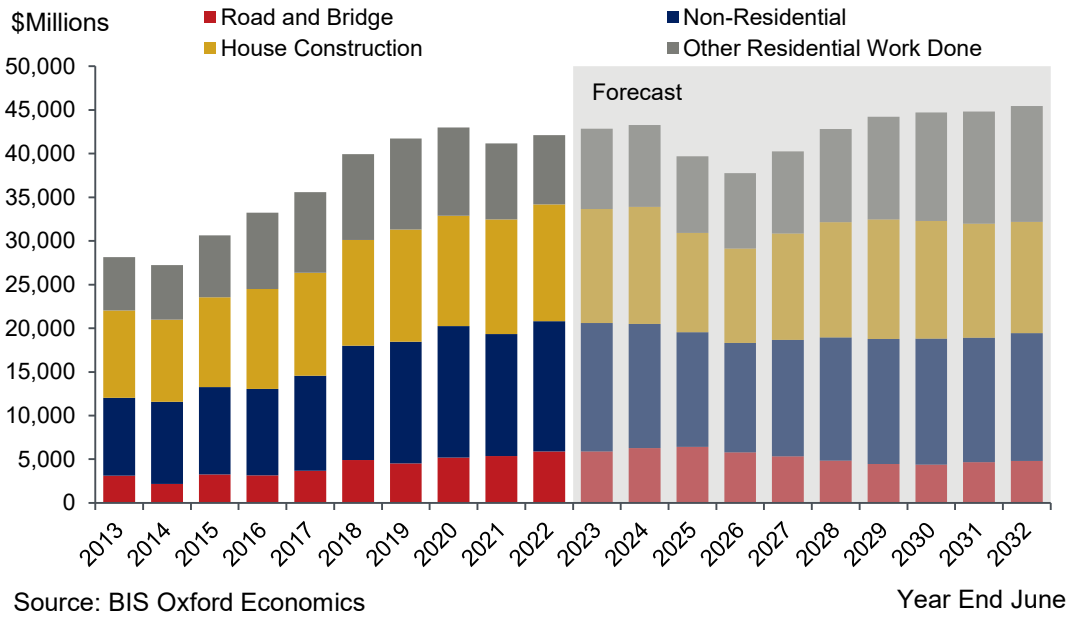
9.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Boosting the increased number of land surveyors in VIC has been consistently elevated levels of construction over the previous few years. Over the past five years the land development driver's activity has averaged $41.6 billion against an average of $31.0 billion the five years to 2016/17. This persistent level of activity has helped drive the 105.0% increase in land surveying employment across VIC between reporting years.

Road and bridge activity has increased by 19.7% to $5.9 billion since 2017/18, helping drive the demand for land surveyors. Also driving demand has been increases in non-residential and house construction activity, with the drivers increasing by 12.8% and 10.6% respectively. Collectively, these indicators have contributed an additional $4.1 billion worth of activity in 2021/22 against the levels of 2017/18 as seen in Figure 9.1.

Running against the trend of increased activity has been other residential construction, which has fallen 21.7% in the last two years alone. Although this decrease has not been enough to offset the dramatic increases across the other land end-user drivers.

Figure 9.1: Land Development Drivers Value of Work Done – Victoria



The momentum of the past few years, coupled with a strong pipeline of infrastructure projects and backlog of development, will maintain construction activity over the short-term. Activity is forecasted to hold largely unchanged in 2022/23, with bourgeoning retail factory construction set to support recovering commercial & industrial activity in 2022/23. Total activity is set to peak at $43.3 billion in 2023/24, a 2.7% increase on 2021/22 levels. As such, demand for land surveyors should remain at constant levels over the short-term.

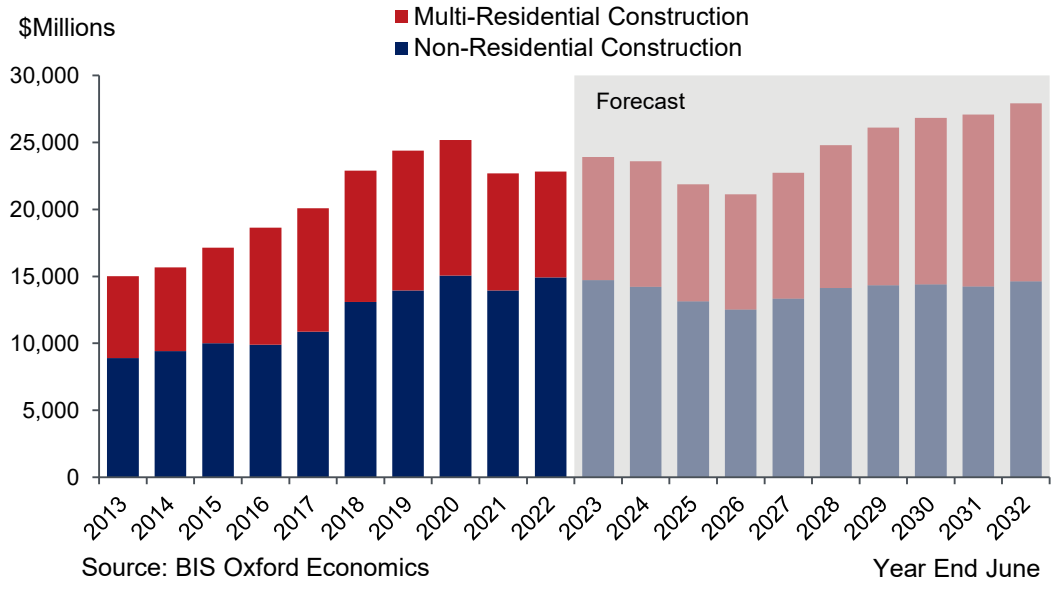
The outlook for the medium-term is more pessimistic with a decline in activity expected. After two stable years, total activity is set to retreat over the following two years to 2025/26, before stabilising over the longer-term. A drop in private investment, with rising interest rates and construction costs biting, are key factors behind this decline. Warehouses are expected to undergo a weaker run after the current development rush finishes.

Following this decline, on the back of a return to normal migration trends, activity growth should begin to return in the longer-run. However, it is worth noting that the oversupply of high-density dwellings, labour and material shortages in combination with the protracted land sales will see VIC have a more aggressive cool down over the medium-term than the other states. This will see a lower demand for surveyors and geospatial professionals in VIC over our forecast period, relative to the other Australian states.

9.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

A strong pipeline of activity and backlog of projects has helped maintain building construction activity, underpinning the increased employment of construction surveyors in VIC. Total building construction activity has averaged $23.6 billion over the five years to 2021/22, 36.3% higher than the five-year average to 2016/17. Although activity has decreased by 9.3% since peaking at $25.2 billion in 2019/20, largely due to pandemic restrictions and difficult weather conditions.

Figure 9.2: Building Construction Activity Value of Work Done – Victoria



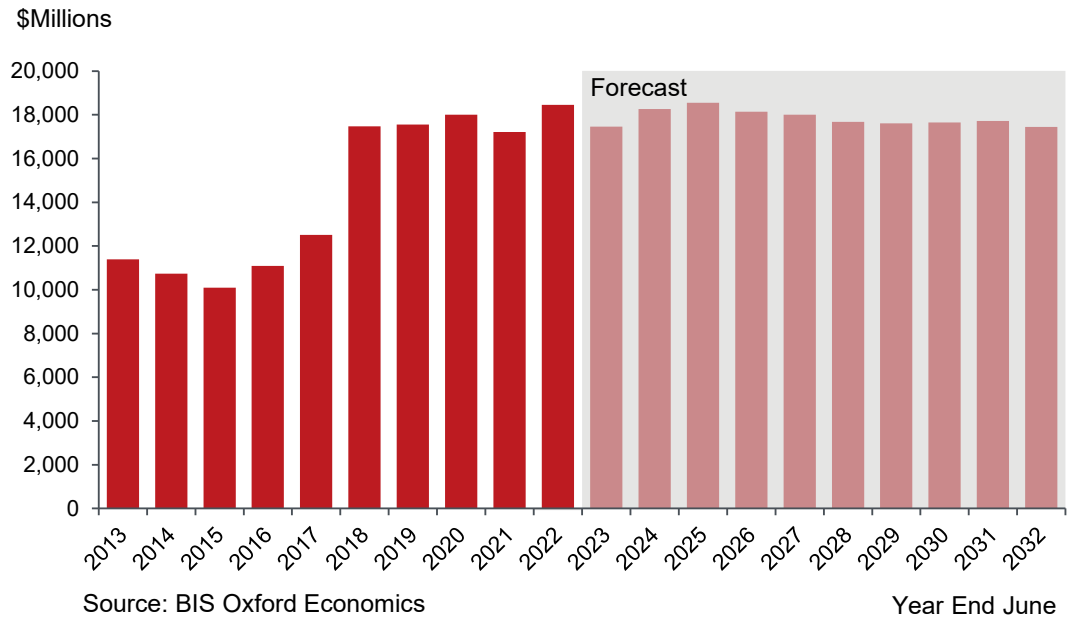
The outlook for VIC building activity follows a similar profile to the overall profile of VIC activity. A current strong pipeline of activity will continue to maintain development over the next two-years before declining to trough in 2024/25. The tapering pipeline of non-residential pipeline will see activity decline to $21.1 billion in 2024/25, an 11.7% decrease in activity from the expected peak in 2022/23. Therefore, in the short- to medium-term, we can expect to see demand for construction surveyors decline after two-years of stable demand.

As seen in Figure 9.2, long-term growth looks positive as VIC recovers from migration losses both domestically and international. Additionally, with interest rates set to fall from late 2024, non-residential investment will receive a boost as confidence returns.

9.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Engineering activity in VIC reached historically high levels in 2021/22 driving employment in the engineering occupation group to a 66.7% increase since 2017/18. Despite the surge in global commodity prices in recent times, VIC has benefited from a publicly funded infrastructure boom. Projects such as the Melbourne Metro Rail ($975 million), West Gate Tunnel Project ($700 million) and North-East Link ($675 million) has maintained these elevated levels of activity. Accordingly, engineering construction work done reached $18.5 billion in 2021/22, the highest level over the recorded history.

Figure 9.3: Utilities and Transport Engineering Construction Value of Work Done - Victoria



Activity is forecast to remain at a historically high level over the coming years, supported by major transportation projects. Additionally, an enhanced profile to electricity construction due to a higher level of investment in the transmission network, plus delayed ramp up of key projects (such as Kipper gas field – stage 2), will ensure activity levels remain at raised levels.

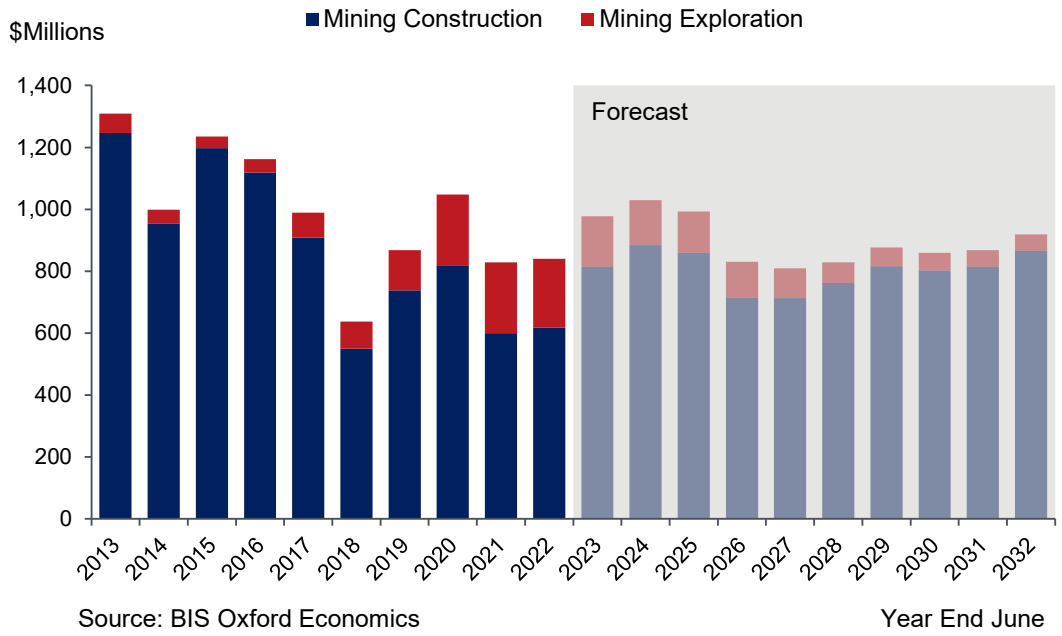
Although growth is set to decline from 2025/26 onwards, the engineering forecast is for more stable activity than the other drivers. Therefore, demand for engineering surveyors is set to remain at high and consistent levels over the forecast period.

9.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

Despite the VIC mining and heavy industry and mining exploration investment operating at a lower base than the other major states, a 31.9% increase in activity since 2017/18 has driven employment in mining surveying up 34.2%. It is worth noting that the VIC mining surveyors only comprise 7.1% of national employment compared to all other surveyors from VIC accounting for 22.5% of national employment.

The outlook for mining activity in VIC, despite the limited contribution to national production, follows a similar profile to national activity. With elevated levels of investment, particularly from the private sector, activity is set to peak in 2023/24 at $1.0 billion, a 22.5% increase from 2021/22 activity. VIC will also benefit from coal mining to service local power generation facilities – with coal prices set to ease on the back of contracting global steel production in 2021/22, short-term activity maybe further hindered. Thereby, demand for mining surveyors in VIC should increase slightly in the short-term before reverting to levels close to current demand, as seen in Figure 9.4.

Figure 9.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – Victoria



9.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

9.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

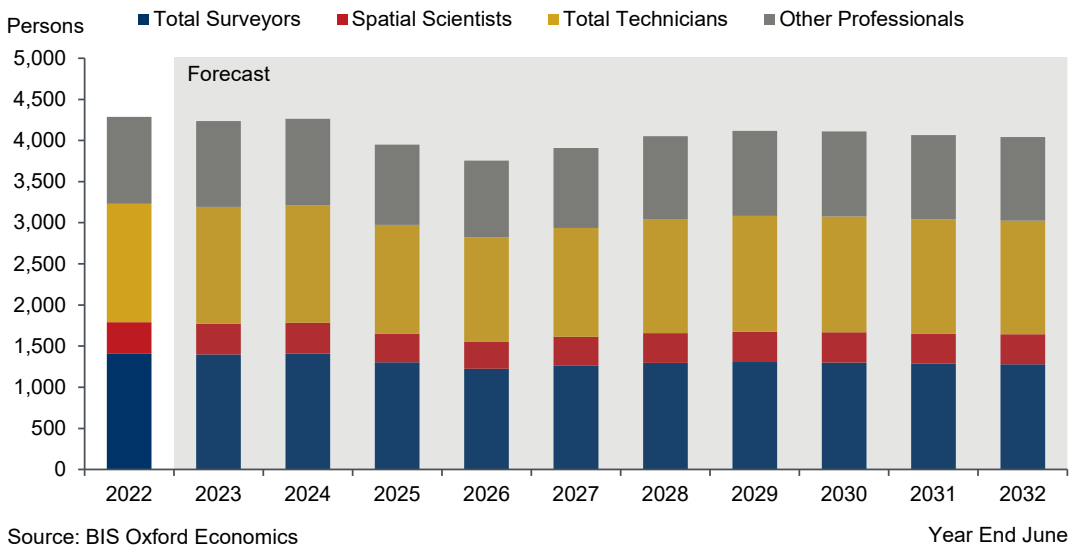
Demand for surveying and geospatial professionals to remain constant in the short-term before decreasing

Demand for surveying and geospatial professionals in VIC is hold at constant levels in the short-term before decreasing from 2024/25. As seen in Figure 9.5, demand for all professionals will remain at relatively constant levels over the next two years at around 4,300 professionals, before declining.

From 2024/25, with the current pipeline of publicly funded infrastructure moving to completion and residential & non-residential construction slowing, the demand for surveyors across VIC is set to decline, averaging 4,000 professionals, 6.7% lower than current demand.

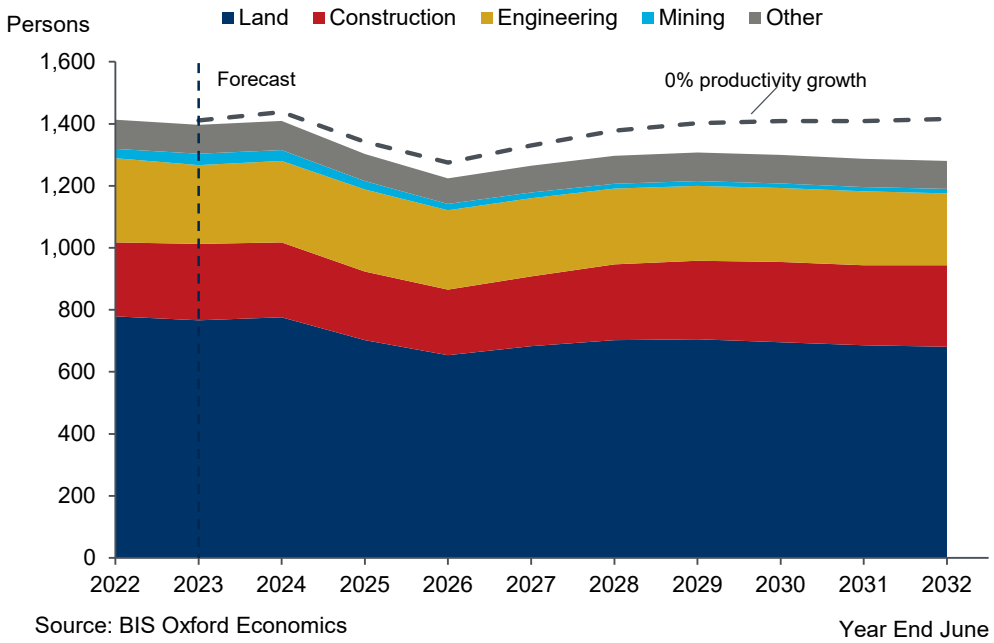
Similar to the national outlook, all occupation groups are set to experience a common profile over the next decade. Spatial scientists, technicians and other professionals will all undergo a peak in demand in 2023/24, with total surveyors demanded expected to be 0.3% lower than current demand in the same year. The share of total surveyors is set to decrease by 1.3 percentage points to 31.7% by 2031/32.

Figure 9.5: Forecast of Total Demand for Skilled Labour – Victoria (1.0% Labour Productivity)



Regarding the different surveyors, demand will average just over 1,400 professionals over the next two years before declining to below 1,300 over the remaining years of the forecast, as illustrated in Figure 9.6. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 140 professionals. This would account for around 10.6% of the expected workforce demand in 2031/32.

Figure 9.6: Forecast of Demand for Surveyors by Sector – VIC (1.0% Labour Productivity)

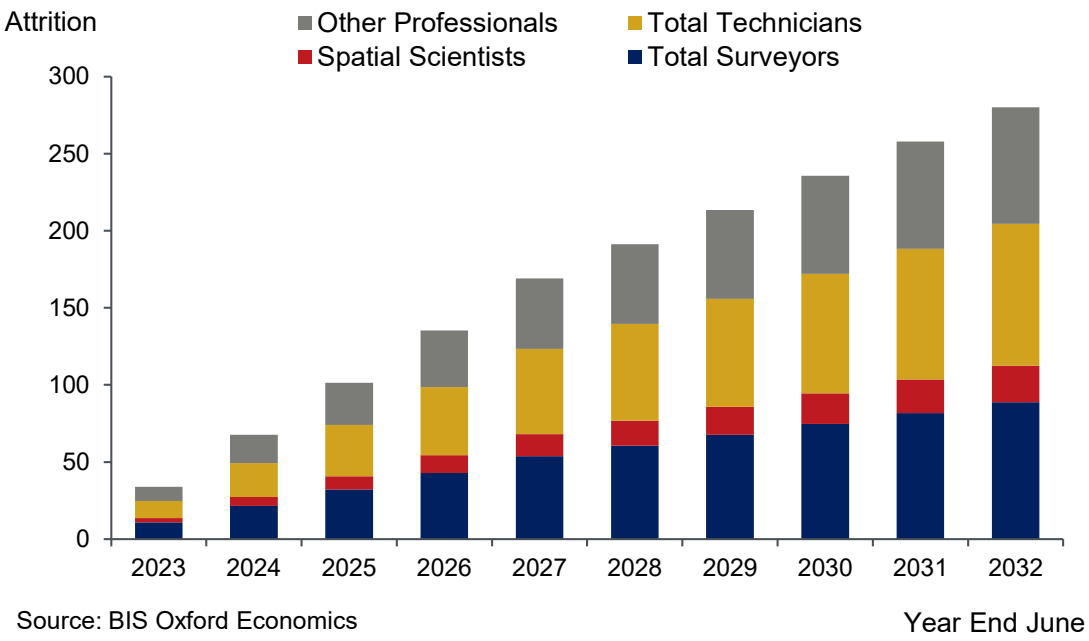


9.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current VIC workforce will increase over the next decade to reach 6.5% of the 2021/22 workforce (attrition 2031/32; 280 persons – see Figure 9.7). This accounts to an average yearly attrition of 28 professionals, roughly 0.7% of the current workforce, on par with the national average.

Figure 9.7: Forecast of Aggregate Workforce Attrition – Victoria



Despite the minor increase in other professional attrition, no individual occupation group will be placed under increased strain as a result of having on older workforce and as a result a significant share of retirements over the next decade. Therefore, the key factor in any workforce gap will be the underlying demand for the occupation from the end-user drivers.

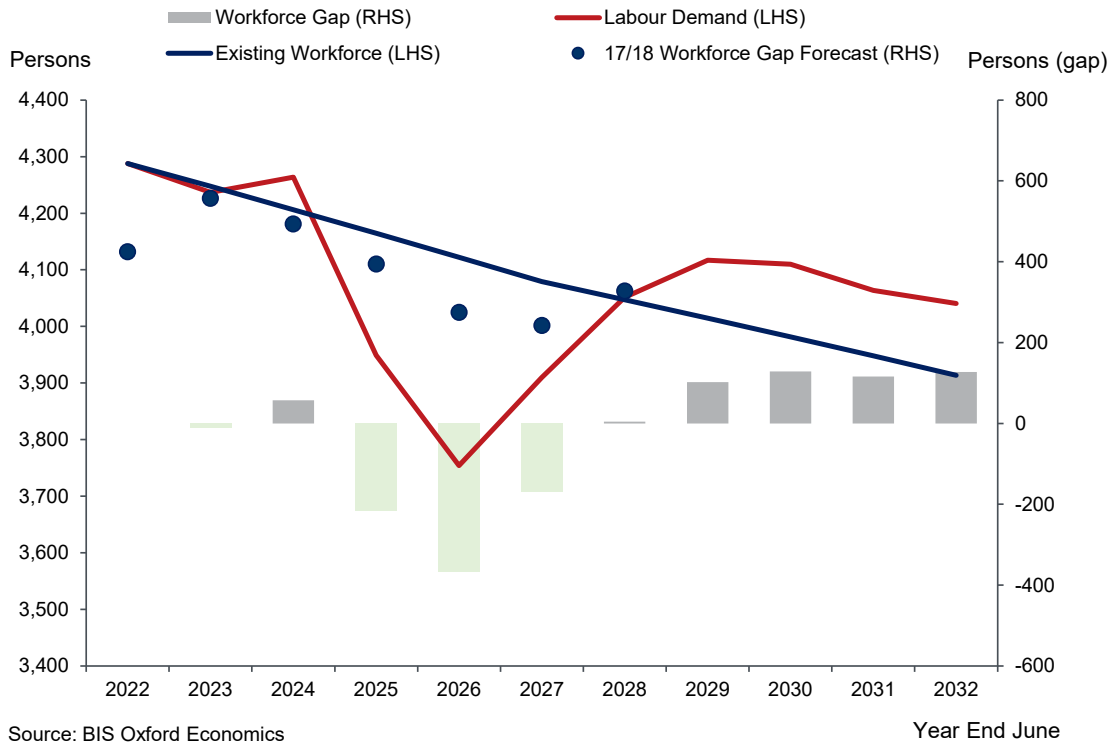
9.4.3 Forecast of Workforce Gap

Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for VIC.

We forecast there to be a negative workforce gap (surplus) over the short- to medium-term outlook for VIC as house construction cools. Excluding a shortage in 2023/24, VIC is forecasted to experience a surplus in the number of surveyors and geospatial professionals to 2026/27. As discussed in Section 9.3 above, the momentum in infrastructure and housing development will result in a minor negative workforce gap in 2022/23 before boosting demand to result in a shortage in 2023/24 of 57 professionals. From 2024/25, as the pipeline of work cools, VIC will experience a surplus in the number of surveying and geospatial professionals supplied. As seen in Figure 9.3, the demand for surveyors will remain in a surplus over the remaining years of the forecast. Except for 2023/24, land surveying will support a surplus of surveyors due to a reduced outlook for Victorian house construction.

From 2027/28 onwards, we forecast VIC will experience a positive workforce gap (shortage), reaching 127 professionals by 2031/32. However, the demand for surveyors will remain in a surplus over the remaining years of the forecast. With the exception of 2023/24, land surveying will support a surplus of surveyors due to the reduced outlook for Victorian house construction.

Figure 9.8: Forecast of Workforce Gap for Total Skilled Workforce – VIC



Source: BIS Oxford Economics

Therefore, excluding the first two years of the forecast, VIC will only require a relatively minor increase in supply from new graduates to meet demand. As seen in Table 9.2, the total skilled labour workforce gap will nearly reach 130 persons by 2031/32 – this will account for 3.2% of the existing workforce in the same year.

9.4.4 Exploring the impact of current workforce shortages on the outlook for the Victorian workforce

Victoria is the only jurisdiction which is estimated to experience a measured surplus of workers at some point over the next decade – noting that a housing construction downturn in the middle of the decade is driving lower demand for surveyors and thus generating this surplus. However, as previously mentioned in this report, the model assumes that the workforce is balanced from the base year (2021/22), while industry sentiment points to severe pre-existing labour shortages and the over-utilisation (greater than 100%) of the current workforce in order to meet demand.

To demonstrate the impact of this we have generated a scenario wherein we assume a reduction in the capacity of the Victorian surveying workforce of 10% over the next four years (i.e., a decline of 2.5% per year). The loss of utilisation in the workforce leads to a significantly different outlook for the workforce, wherein Victoria enters a larger workforce deficit over 2022/23 and 2023/24, which leads to a near balanced workforce in 2024/25 and 2025/26 (albeit still in a small deficit) as opposed to the base scenario wherein there is an estimated surplus in those same years.

Figure 9.9: High Demand Scenario – Forecast of Workforce Gap for Total Skilled Workforce – VIC

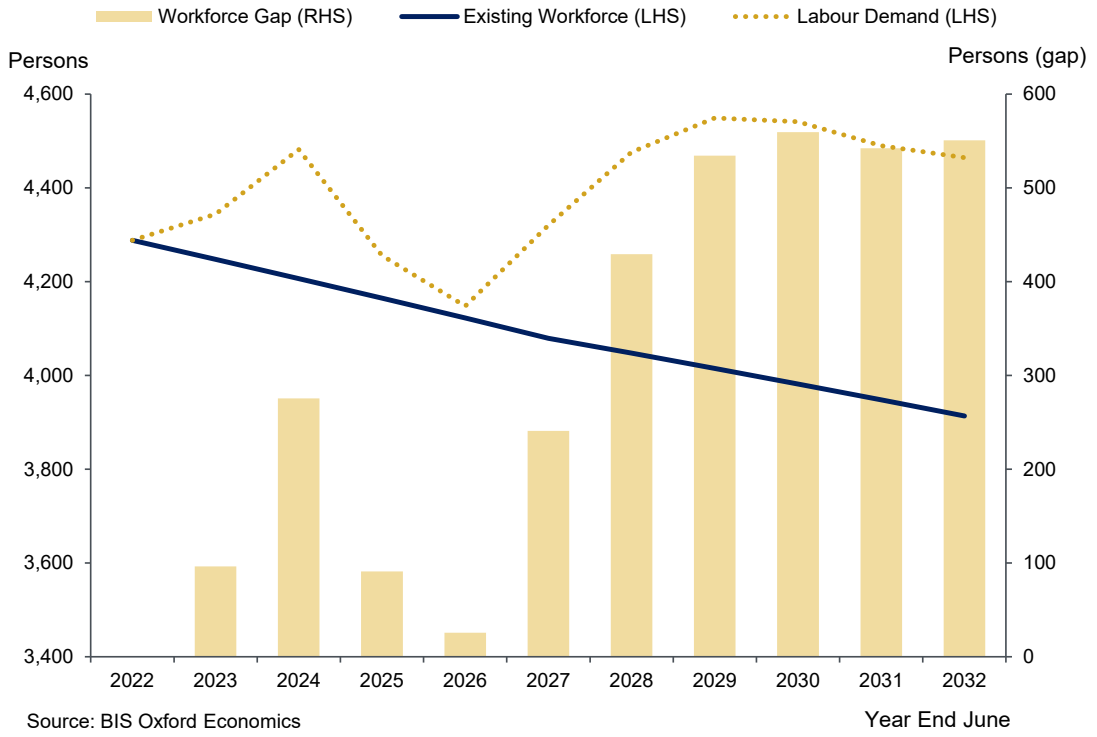


Figure 9.10: High Demand Scenario – State Skilled Labour Workforce Gap – VIC

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Surveyors & spatial scientists	Deficit					Deficit				
	32	94	30	(7)	51	97	118	121	118	121
Surveying & spatial science technicians	Deficit					Deficit				
	31	89	28	13	91	162	203	214	206	208

Table 9.2: Forecast of Labour Demand and Workforce Gap – VIC (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**1413**	**1397**	**1409**	**1302**	**1224**	**1265**	**1297**	**1307**	**1300**	**1287**	**1281**
Land	779	766	776	702	653	683	703	705	696	686	680
Construction	238	247	241	222	212	226	244	254	258	258	264
Engineering	271	254	263	265	256	252	245	241	239	238	232
Mining	30	37	35	27	20	18	16	15	15	14	14
Other sectors	94	93	94	87	83	87	90	92	92	91	90
Registered/Licensed Surveyors (a)	*410*	*405*	*409*	*378*	*355*	*367*	*376*	*379*	*377*	*373*	*372*
Spatial Scientists	378	373	375	348	333	348	362	369	369	365	363
Total Technicians	1440	1422	1430	1325	1267	1325	1379	1407	1407	1391	1382
Total Surveying & Geospatial Workforce	**3231**	**3193**	**3214**	**2976**	**2824**	**2937**	**3039**	**3084**	**3077**	**3043**	**3026**
Other Professionals	1057	1044	1050	973	930	973	1013	1033	1033	1021	1015
Total skilled labour demand	**4288**	**4237**	**4264**	**3949**	**3754**	**3910**	**4052**	**4117**	**4110**	**4064**	**4041**
Existing Workforce (b)											
All Surveyors	**1413**	**1400**	**1387**	**1374**	**1360**	**1346**	**1336**	**1326**	**1315**	**1305**	**1294**
Land	779	772	765	757	750	742	737	731	725	719	713
Construction	238	236	234	232	229	227	225	224	222	220	218
Engineering	271	269	266	264	261	258	257	255	253	250	248
Mining	30	30	30	29	29	29	29	28	28	28	28
Other sectors	94	93	92	92	91	90	89	88	88	87	86
Registered/Licensed Surveyors	*410*	*406*	*402*	*399*	*395*	*391*	*388*	*385*	*382*	*378*	*375*
Spatial Scientists	378	375	371	367	364	360	357	355	352	349	346
Total Technicians	1440	1427	1414	1400	1386	1373	1362	1352	1341	1330	1319
Total Surveying & Geospatial Workforce	**3231**	**3202**	**3172**	**3141**	**3110**	**3079**	**3056**	**3032**	**3008**	**2984**	**2959**
Other Professionals	1057	1046	1035	1023	1012	1000	991	983	974	964	955
Total skilled labour	**4288**	**4248**	**4206**	**4165**	**4122**	**4079**	**4047**	**4015**	**3982**	**3948**	**3914**
Workforce Gap (c)											
All Surveyors	**0**	**(3)**	**22**	**(71)**	**(136)**	**(81)**	**(39)**	**(19)**	**(15)**	**(17)**	**(13)**
Land	0	(6)	12	(55)	(96)	(60)	(34)	(26)	(30)	(33)	(33)
Construction	0	11	7	(10)	(18)	(1)	18	30	37	38	45
Engineering	0	(15)	(3)	1	(5)	(7)	(12)	(13)	(13)	(12)	(16)
Mining	0	7	5	(2)	(9)	(10)	(13)	(13)	(14)	(14)	(14)
Other sectors	0	(0)	1	(5)	(8)	(3)	1	4	4	4	4
Registered/Licensed Surveyors	*0*	*(1)*	*6*	*(21)*	*(39)*	*(24)*	*(11)*	*(5)*	*(4)*	*(5)*	*(4)*
Spatial Scientists	0	(1)	4	(19)	(31)	(12)	5	15	18	16	17
Total Technicians	0	(5)	16	(75)	(120)	(48)	17	56	66	61	63
Total Surveying & Geospatial Workforce	**0**	**(9)**	**43**	**(165)**	**(286)**	**(142)**	**(17)**	**52**	**69**	**59**	**67**
Other Professionals	0	(2)	15	(50)	(82)	(28)	21	51	60	57	60
Total skilled labour	**0**	**(11)**	**57**	**(216)**	**(368)**	**(169)**	**4**	**102**	**128**	**116**	**127**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.


Tri-Max

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR QUEENSLAND

Forecast of Labour Demand & Workforce Gap for QLD

10.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across Queensland (QLD) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin the demand for surveyors and geospatial professionals.

10.1.1 Recent Economic Trends

QLD has benefited through the pandemic from strong interstate migration and limited exposure to COVID-19 compared to NSW and VIC. The state's strong performance over the past two years has been partly driven by a rise in interstate migration, which has provided both additional demand for goods and services and additional supply of workers.

SFD growth has picked back up over H1 2022, with growth of 1% q/q in Q2. Spending on hospitality, recreation & culture, and transport services drove 2.2% q/q growth in household spending. Construction-related investment fell back during the quarter due to supply factors affecting the whole country and higher-than-usual rainfall disrupting work. An increase in machinery & equipment investment provided some offset.

Total construction in QLD has been more reliant on the engineering construction sector over the last decade due to the importance of mining and associated infrastructure. A downturn in both engineering construction and building drove total construction work done to a trough of $37.6 billion in 2020/21. Activity picked up in 2021/22 (+4.0%) and the forecast is for continued growth over the next two years.

QLD total dwelling commencements fell 2% to just over 39,000 in 2021/22. Further softening is forecast for 2022/23 (-6%) with severe capacity issues continuing to impact the state. While a lot of new apartment and land sale deposits were placed over 2021, on-site progress has been slow. Considerable pressure on construction inputs is evident in the state, with the average approval cost to build a house in QLD shooting up 17% over the year to October 2022.

10.1.2 Economic Outlook

Growth in the QLD economy in the short-term will be hampered by rising interest rates, rising construction costs and capacity constraints. With dwelling commencements operating as a lead indicator to overall house construction, as industry capacity gradually adjusts and builders progress on a significant backlog of new orders, it is forecast that growth will return in 2023/24, with total activity lifting 7% to 39,200 dwelling commencements. While rising interest rates and significantly higher new build costs are now dragging on new dwelling sales, the impact of this in annualised terms should be felt more in 2024/25 (-3%).

Beyond current challenges, the outlook is favorable for QLD. With national leading population growth forecast, a sizeable dwelling stock shortage is set to persist in the state. The 2032 Olympics and associated infrastructure should provide an enduring boost to developer and buyer optimism from mid-decade. The abandoned proposed land tax on interstate property holdings in QLD no longer represents a threat to investment demand. Therefore, we can expect the long-term forecast for construction activity in QLD to be positive.

Mining investment has been subdued recently, but the near-term outlook is better given firms' positive intensions to replace existing capital capacity. Higher commodity prices in the short-term will help facilitate this expenditure, but the increase in investment will be smaller than the previous boom, and QLD's exposure to thermal coal will limit the upside for the mining sector in the long run. This will provide a solid base for mining construction activity in QLD albeit with a more modest long-term prospect than the previous investment boom.

10.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 1,216 employees since 2017/18 to 3,960 persons in 2021/22 for Queensland.

The number of total surveyors is estimated to have increased by 77.2% to around 1,400 persons. This increase has come as a result of an increase in the employment across all surveying occupation groups, but over a double in employment of land surveyors helped drive total employment. It is worth noting that, similar to VIC, the number of registered/licensed surveyors (with cadastral endorsement) has decreased since 2017/18, with numbers falling 11.8% to around 440 persons. Once again, this result further confirms the previous discussion in Section 6 – the hiring of cadastral endorsed surveyors proves to be a challenge for firms.

Surveyors are estimated to comprise 34.4% of the QLD total workforce, with spatial scientists and technicians accounting for 7.6% and 36.0% respectively. Following the same trend as VIC, all major occupation groups experienced an increase in employment boosting overall surveying and geospatial employment in the state up 44.3%. Of the largest individual occupation groups, both land surveyors and surveying technicians experienced significant increases in employment since 2017/18, with 68.5% and 36.0% growth respectively.

Table 10.1: Estimated Size of Skilled Surveying and Geospatial Workforce in QLD

Occupation Groups	2017/18*	2021/22		
Surveying sectors				
Land	343	578	▲	235
Construction	133	241	▲	108
Engineering	115	286	▲	171
Mining	110	142	▲	32
Other sectors	67	114	▲	47
Total surveyors	**768**	**1,361**	▲	**593**
Registered Surveyors (Cadastral Endorsed)	*500*	*441*	▼	(59)
Total spatial scientists	**224**	**299**	▲	**75**
Surveying technicians	910	1,238	▲	328
Spatial technicians	192	186	▼	(6)
Total technicians	**1,102**	**1,424**	▲	**322**
Total skilled surveying & geospatial workforce	**2,094**	**3,084**	▲	**990**
Planners	280	327	▲	47
Engineers	205	296	▲	91
Environmental Scientists	54	78	▲	24
Other staff (include Architects)	111	175	▲	64
Total other professionals	**650**	**876**	▲	226
Total Skilled Workforce	**2,744**	**3,960**	▲	**1216**

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

10.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

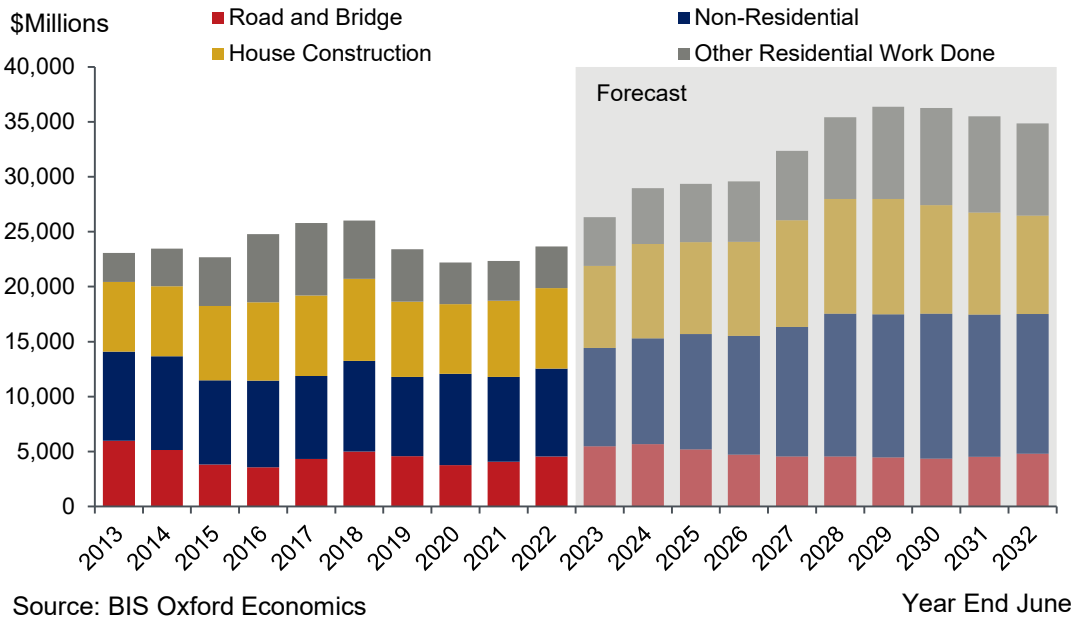
- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

10.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Despite the significant increase in land surveyor employment in QLD, total land development activity has dropped in recent years. Total activity of land surveying indicators has averaged around half a billion less over the last five years compared to the five years to 2016/17 (2017/18 – 2021/22 average; $23.5 billion, 2012/13-2016/17 average; $24.0 billion). Employment has been able to avoid this decline largely due to strong performance from house and non-residential construction – which combined as averaged $14.9 billion over the last five years against $14.7 average over the five years to 2016/17.

Figure 10.1: Land Development Drivers Value of Work Done – QLD



Following the discussion in the Economic and Industry Outlook, the short-term outlook for house construction in QLD will be restricted by severe capacity constraints. In addition, the 17% increase in the cost to build a house will add downward pressure to activity levels. However, on the back of strong migration and elevated investment demand, total activity is forecast to increase by 22.5% to $29.0 billion over the next two years.

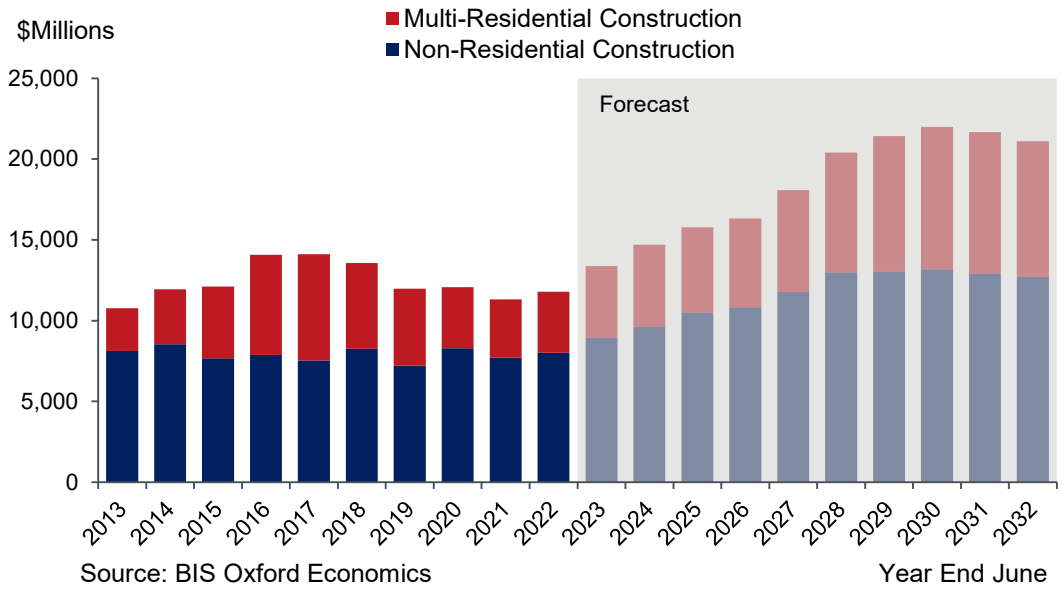
Road construction in Queensland is forecast to accelerate markedly in the coming years with major upgrade projects taking place on the Coomera Connector (Second M1) and Bruce Highway projects. This upswing is forecast to peak at $5.7 billion in 2023/24.

As immediate capacity and cost concerns ease, the medium- to long-term outlook for QLD is favourable for increased levels of activity. Therefore, QLD is set to avoid a decline in activity over the mid-decade that many of the other states (including NSW and VIC) are set to experience. This will lead to a strong demand forecast for land surveyors as total activity increases by 53.7% by 2028/29.

10.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

Despite an increase in construction employment across QLD since 2017/18, activity across the relevant drivers has cooled by 13.1% to $11.8 billion. Underpinning this decline has been a fall in multi-residential activity – since peaking at $6.6 billion in 2016/17, activity has fallen 42.5%. Offsetting this fall has been a minor increase in multi-residential activity, which increase by 6.2% over the same time period to just over $8.0 billion.

Figure 10.2: Building Construction Activity Value of Work Done – QLD



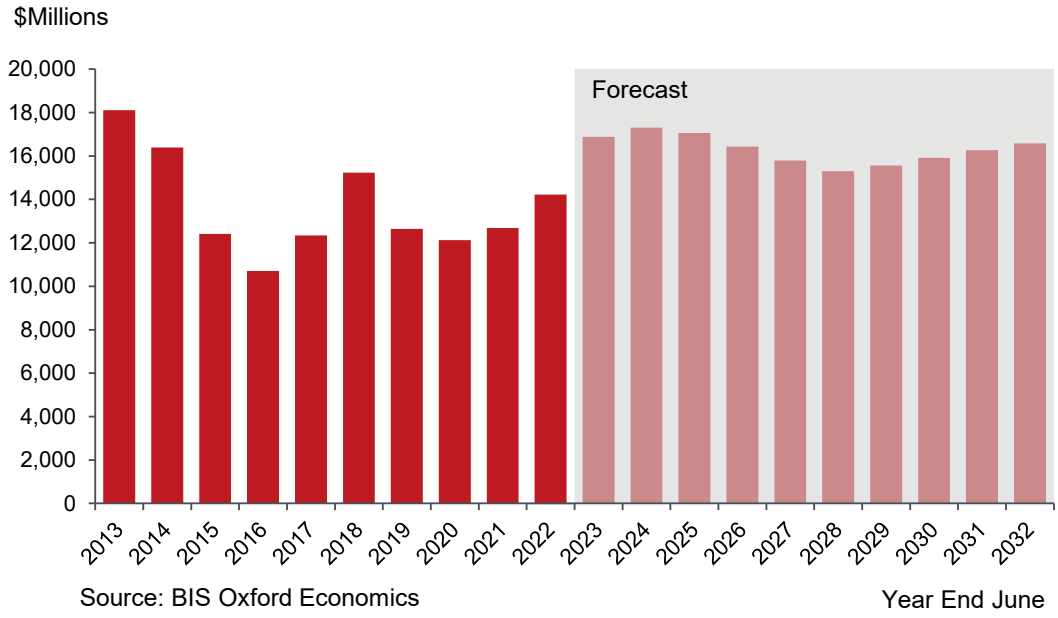
The construction outlook for QLD shares a similarly positive profile to the overall economy – despite current concerns, the outlook for the forecast period is favourable. As interest rates fall, capacity constraints ease and construction costs taper, building activity is set for consistent growth to 2029/30 –total activity is expected to increase by 86.6% to $22.0 billion. As such we expect demand for construction surveyors to increase strongly over the next decade.

10.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

A recovery in investment in mining and transport has seen QLD engineering construction activity record positive growth in 2021/22 after relatively low activity since 2018/19. Engineering activity grew by 12.2% in 2021/22 to $14.2 billion but this remains below the level of 2017/18 ($15.2 billion). Employment of engineering surveyors has been able to undergo a significant increase since 2017/18 despite the cooling over the recent years.

The extensive scale of mining and heavy industry projects in QLD has historically driven trends across the entire engineering construction segment (with mining and heavy industry construction accounting for 70% of total engineering construction at its $35 billion peak in 2013/14).

Figure 10.3: Utilities and Transport Engineering Construction Value of Work Done - QLD



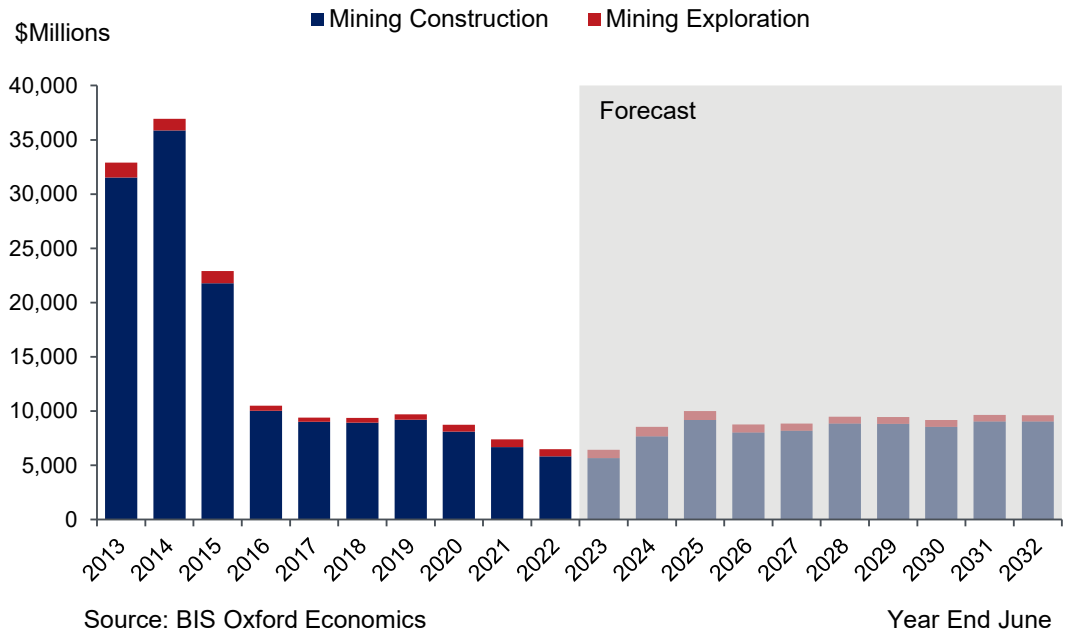
Significant growth in the transport and electrical sectors – and recovering mining and heavy industry investment – will drive strong short-term growth in QLD's engineering construction market – with work done rising 18.7% in 2022/23 and 2.5% in 2023/24. Accordingly, short-term demand for engineering surveyors should continue the strong employment trend of recent years.
Despite the peak in engineering construction set to occur in 2023/24, activity is set to remain at levels above current output over the forecast period. Activity is expected to average above $16.3 billion over the next decade – compared to $13.7 billion over the past decade. Therefore, demand for engineering surveyors in QLD will remain above current levels over the medium- to long-term.

10.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

Against the increase in employment of mining surveyors in QLD, mining activity has cooled significantly in recent years following a decline in investment. Mining activity fell a further 12.3% in 2021/22 to $6.5 billion, taking the total decline since 2017/18 to 30.8%. This also represents an 82.4% decline from the historical highs of 2013/14. However, recent expenditure on exploration in QLD was the nation's biggest driver of growth in mining exploration, supported by the pickup in iron ore as well as copper. Recent expansions in production of silver, lead and zinc have also prevented further falls in mining construction.

Mining activity will be boosted in the short-term by expenditure on maintenance on ageing coal operations. QLD was the largest state with $1.6 billion in 2021/22 and this momentum is set to maintain activity levels over the next few years. Activity will also be boosted by global demand for LNG – operations such as the Curtis Island facility will keep QLD mining construction and exploration at stable levels. Thereby, demand for mining surveyors in QLD is expected to remain stable over the outlook.

Figure 10.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – QLD



10.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

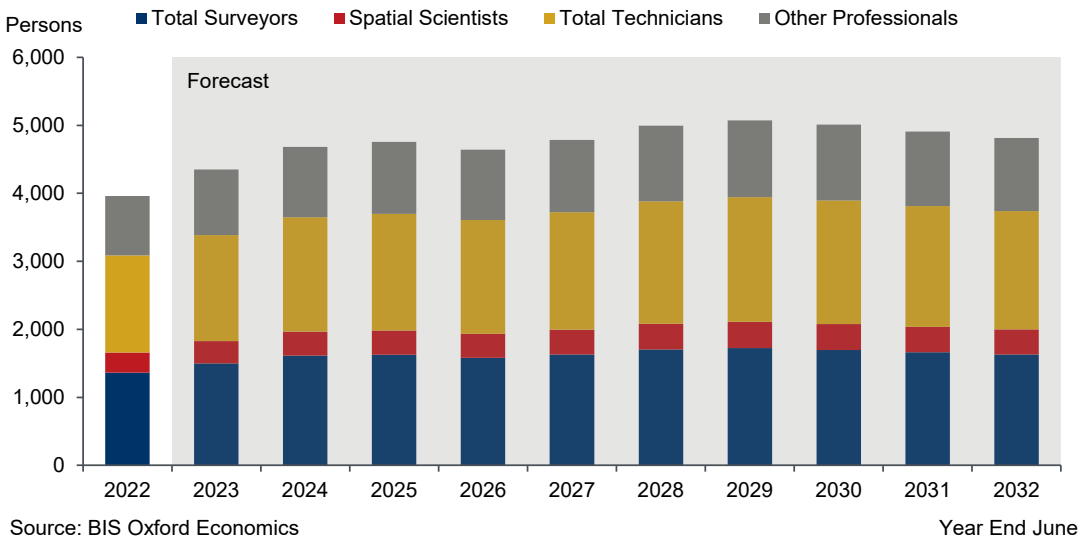
Demand for surveying and geospatial professionals to increase from 2022/23

10.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals in QLD is set to increase from 2022/23 before softening over the mid-decade. As seen in Figure 10.5, demand for professionals will increase over the next three years to initially peak at just under 4,800 professionals in 2024/25. From 2025/26, demand will undergo a modest decrease as infrastructure pipeline and house construction eases. However, this cooling will be relatively mild with a rebound in activity set to occur from 2026/27. Overall demand will peak in 2028/29 at over 5,000 professionals.

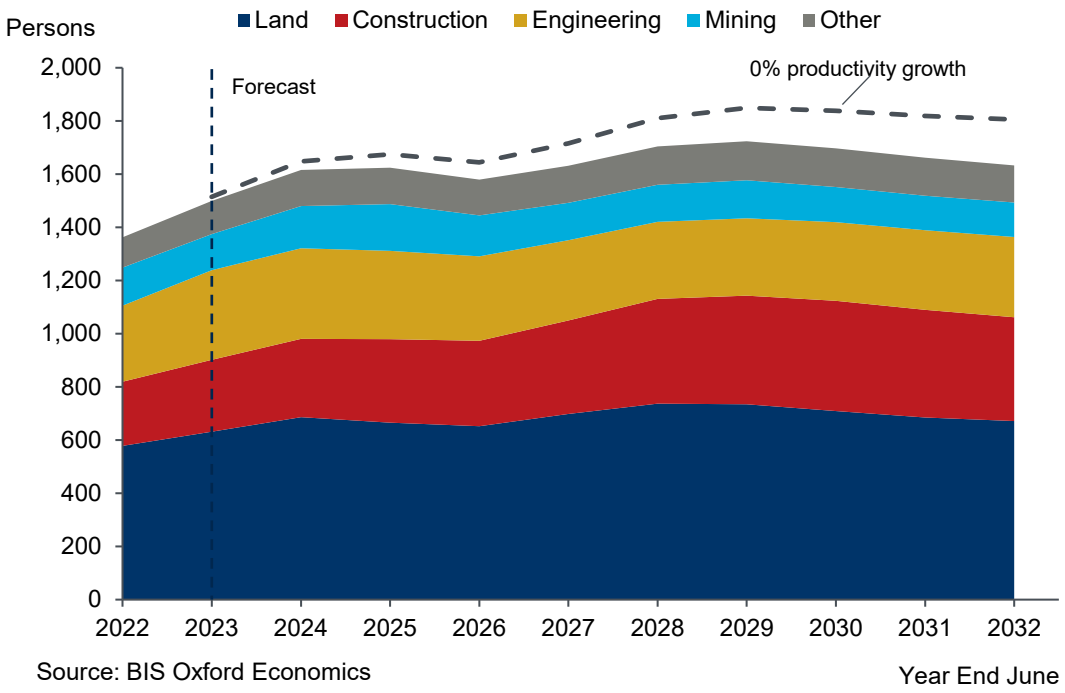
Figure 10.5: Forecast of Total Demand for Skilled Labour – QLD (1.0% Labour Productivity)



Similar to the national outlook, all occupation groups are set to experience a common profile over the next decade. All professions will all undergo an initial peak in demand in 2024/25 before cooling the following year. The modest downturn over the following year before demand reverts to positive growth is, importantly, unique to QLD and WA as the other states face greater down turns in activity as current pipeline of infrastructure eases. Therefore, QLD (and WA), faces a prolonged challenge to meet demand over the next decade due to elevated levels of construction activity.

Regarding the different surveyors, demand will reach over 1,600 professionals in 2023/24 before decreasing to 1,500 in 2025/26, as illustrated in Figure 10.6. However, demand for all surveyors will peak at over 1,700 persons in 2028/29. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 170 professionals. This would account for around 10.6% of the expected workforce demand in 2031/32.

Figure 10.6: Forecast of Demand for Surveyors by Sector – QLD (1.0% Labour Productivity)

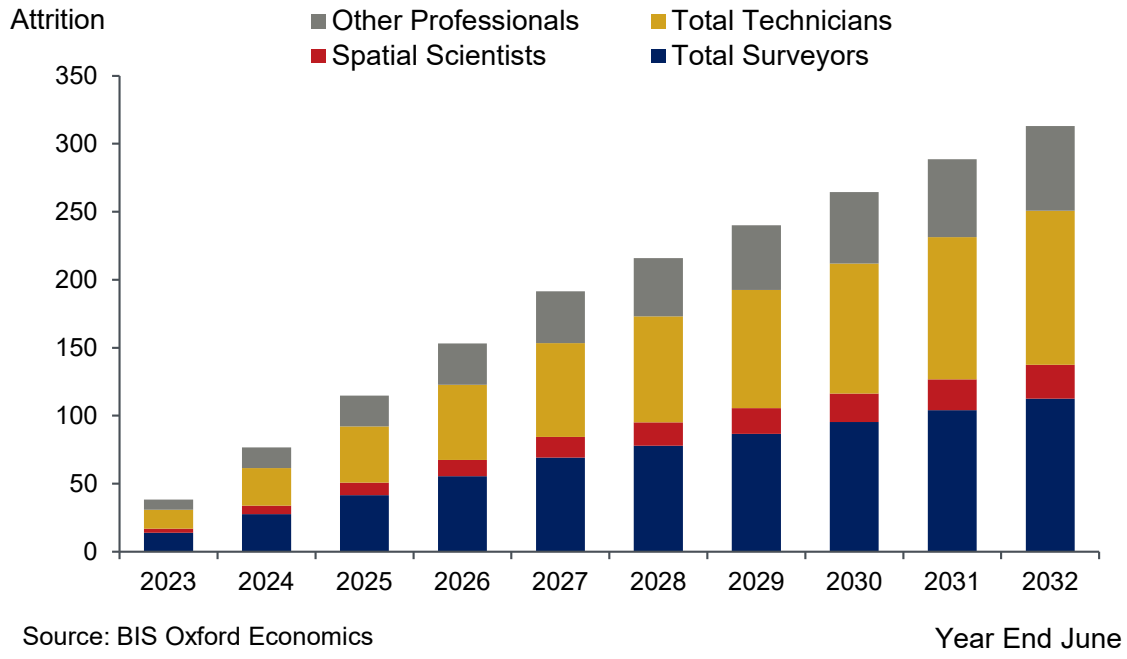


10.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current QLD workforce will increase over the next decade to reach 7.9% of the 2021/22 workforce (attrition 2031/32; 313 persons – see Figure 10.7). This accounts to an average yearly attrition of 31 professionals, roughly 0.8% of the current workforce.

Figure 10.7: Forecast of Aggregate Workforce Attrition – QLD



10.4.3 Forecast of Workforce Gap

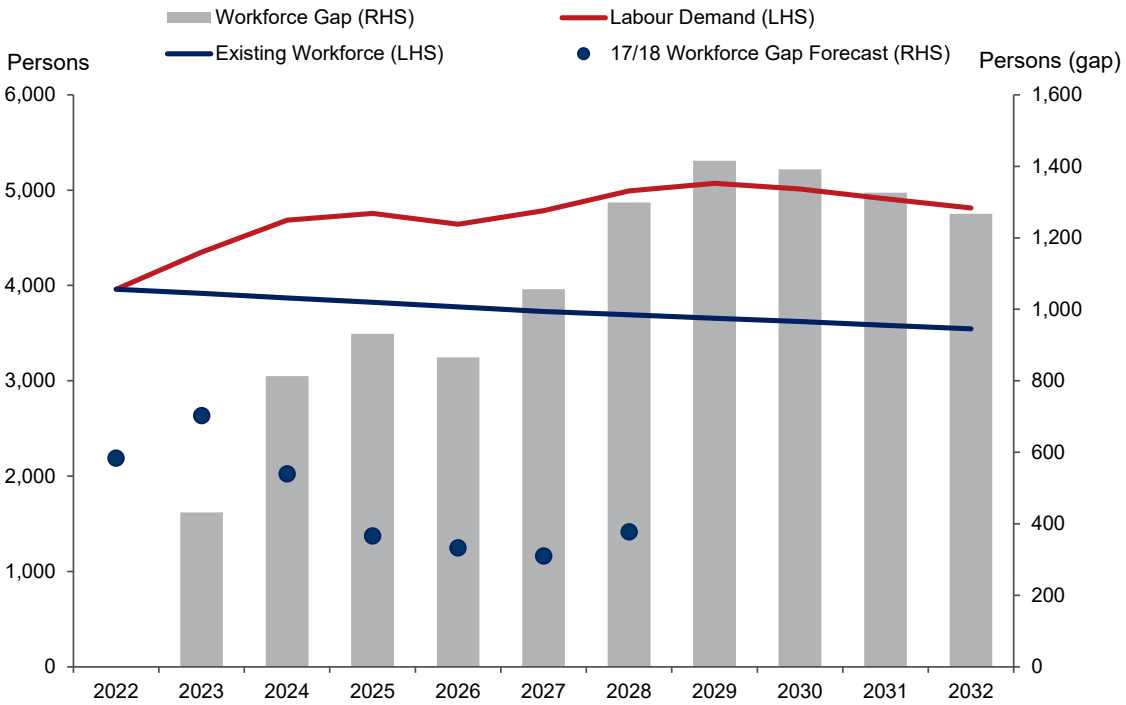
Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for QLD.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in QLD from 2022/23 onwards. As discussed in Section 10.3 above, the economic outlook for the key drivers in QLD is set to be overwhelmingly favorable, as such a workforce gap is an expected result. Furthered slightly by increased attrition rates, in 2022/23, we anticipate a workforce gap of over 430 persons, 10.9% of the current workforce. As seen in Figure 10.8, the workforce gap will peak at over 1,400 persons in 2028/29 – the total workforce gap at its peak will be 38.6% of the existing workforce in the same year. That is, QLD will need a new labour supply from graduates to comprise over a third of the existing workforce in 2028/29 in order to meet expected demand.

Importantly, the workforce gap for all occupation groups will be negative for the entire forecast period. Excluding a slight surplus in mining surveyors in the first year of the forecast (5 persons surplus in 2022/23), all groups will rely on new labour supply in order to meet demand over the forecast period.

Therefore, QLD will have an increased need to boost surveying and spatial science enrolments in order to meet demand over the next decade. As seen in Table 10.2, the total skilled labour workforce gap will nearly reach 1,300 persons by 2031/32 – this will account for 35.7% of the national workforce gap.

Figure 10.8: Forecast of Workforce Gap for Total Skilled Workforce – QLD



Source: BIS Oxford Economics

Table 10.2: Forecast of Labour Demand and Workforce Gap – QLD (1.0% Labour Productivity)

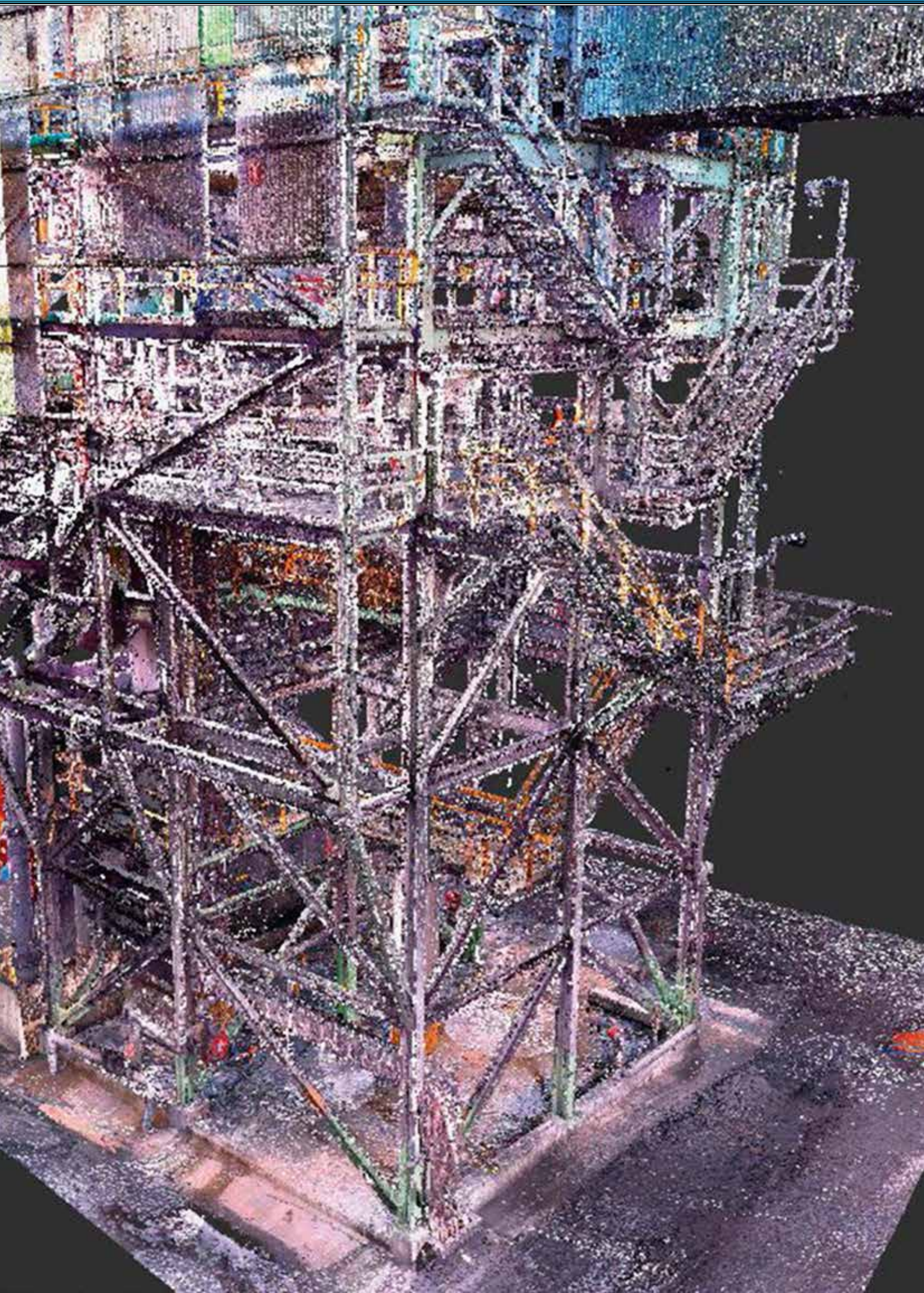
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**1362**	**1499**	**1615**	**1625**	**1580**	**1631**	**1704**	**1724**	**1697**	**1661**	**1632**
Land	578	631	686	665	652	698	737	734	709	685	672
Construction	241	271	295	313	320	351	393	408	415	405	390
Engineering	286	336	341	333	317	302	290	292	295	299	302
Mining	142	136	159	175	155	141	139	142	132	130	129
Other sectors	114	125	135	138	135	139	145	147	146	143	140
Registered/Licensed Surveyors (a)	*441*	*485*	*523*	*526*	*511*	*528*	*552*	*558*	*549*	*538*	*529*
Spatial Scientists	299	328	353	360	352	363	379	386	382	374	366
Total Technicians	1424	1561	1681	1715	1678	1728	1802	1835	1817	1779	1742
Total Surveying & Geospatial Workforce	**3085**	**3388**	**3649**	**3700**	**3610**	**3722**	**3884**	**3944**	**3895**	**3814**	**3740**
Other Professionals	876	960	1034	1055	1032	1063	1108	1129	1118	1095	1072
Total skilled labour demand	**3961**	**4348**	**4684**	**4755**	**4642**	**4785**	**4992**	**5073**	**5012**	**4909**	**4812**
Existing Workforce (b)											
All Surveyors	**1362**	**1346**	**1329**	**1312**	**1295**	**1277**	**1265**	**1252**	**1238**	**1225**	**1211**
Land	578	571	564	557	550	542	537	531	526	520	514
Construction	241	238	235	232	229	226	224	222	219	217	214
Engineering	286	283	279	276	272	268	266	263	260	257	254
Mining	142	141	139	137	135	134	132	131	129	128	127
Other sectors	114	113	111	110	109	107	106	105	104	103	102
Registered/Licensed Surveyors	*441*	*436*	*430*	*425*	*419*	*414*	*409*	*405*	*401*	*397*	*392*
Spatial Scientists	299	296	292	288	284	281	278	275	272	269	266
Total Technicians	1424	1408	1391	1374	1357	1340	1327	1314	1301	1288	1274
Total Surveying & Geospatial Workforce	**3085**	**3049**	**3012**	**2975**	**2937**	**2898**	**2870**	**2841**	**2811**	**2781**	**2751**
Other Professionals	876	867	858	849	840	830	824	817	809	802	794
Total skilled labour	**3961**	**3916**	**3871**	**3824**	**3777**	**3728**	**3693**	**3657**	**3621**	**3583**	**3545**
Workforce Gap (c)											
All Surveyors	**0**	**153**	**286**	**312**	**285**	**354**	**439**	**472**	**458**	**437**	**422**
Land	0	60	121	108	103	155	200	203	183	165	158
Construction	0	33	59	81	91	125	169	187	196	188	176
Engineering	0	53	62	57	45	34	24	29	35	42	47
Mining	0	(5)	20	38	20	8	7	11	2	2	3
Other sectors	0	12	23	28	26	31	38	42	42	40	38
Registered/Licensed Surveyors	*0*	*50*	*93*	*101*	*92*	*115*	*142*	*153*	*148*	*141*	*136*
Spatial Scientists	0	32	61	72	68	82	101	111	110	105	100
Total Technicians	0	153	290	341	320	388	474	520	515	492	468
Total Surveying & Geospatial Workforce	**0**	**339**	**637**	**725**	**673**	**824**	**1014**	**1103**	**1083**	**1033**	**990**
Other Professionals	0	93	176	206	192	233	285	312	308	293	277
Total skilled labour	**0**	**432**	**813**	**931**	**865**	**1057**	**1299**	**1415**	**1392**	**1326**	**1267**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.



FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR SOUTH AUSTRALIA

Forecast of Labour Demand and Workforce Gap for SA

11.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across South Australia (SA) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin the demand for surveyors and geospatial professionals.

11.1.1 Recent Economic Trends

SA benefited from internal migration inflows and backlog of residential activity in 2021/22 to return a record level of residential commencements. SA is the smallest of Australia's major states in terms of construction activity. The SA construction market is dominated by engineering construction work done, which has consistently represented 50% to 60% of total work done within the state.

SA reached a record 14,400 dwelling starts in 2021/22 (+7%), a positive indicator for house construction over the short-term. The state's long-running internal migration outflow has turned into an inflow and overseas migrants are now returning, adding meaningfully to the state's dwelling requirements. Property prices have rebased 35% since pre-pandemic and have only just started to taper marginally in response to interest rate hikes.

Total building construction has seen sustained growth since 2016/17, driven by public and private investments in non-residential building (namely in the office and education sectors), and upward trending residential construction activity. With strong residential construction activity in 2021/22 (8.9% growth) as the state's long-running internal migration outflow turned into an inflow, total building construction grew 6.8% to reach $6.6 billion.

11.1.2 Economic Outlook

Overall construction activity is forecast to peak in 2023/24 at $14.7 billion as activity picks up in residential building, non-residential building and transport construction. A downturn in residential and non-residential activity due to rising borrowing and construction costs will see a slight downturn in overall construction activity in 2024/25 (-5.0%) and 2025/26 (-4.5%) to $13.4 billion (as seen in Figure 17.6).

The outlook for SA is heavily weighed down by affordability constraints and rising construction costs. With worsening affordability now weighting heavily on new dwelling sales, it is forecast that total dwelling starts will taper gradually over 2022/23 (-7%) and 2023/24 (-6%) but remain above 12,500. This is set to materialise in house construction activity over 2024/25 and 2025/26 – house construction is forecast to fall 18.8% between 2023/24 and 2025/26.

Construction activity is set to benefit from a significant backlog of residential work, along with a strong pipeline of office and hospital non-residential building projects. Total building activity is forecast to rise 7.3% in 2022/23 and 5.3% in 2023/24 to reach $7.4 billion. Rising borrowing and construction costs, and easing of dwelling stock deficiency will drive downturn over 2024/25 and 2025/26, with activity falling an average 6.0% p.a. to reach $6.5 billion in 2025/26.

11.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 166 employees since 2017/18 to 1,060 persons in 2021/22 for South Australia.

The number of total surveyors is estimated to have increased by 29.0% to around 300 professionals. This increase has come as a result of a rise in the employment of land surveyors, whose numbers increased by 52.9% to nearly 160 professionals - 56.8% of total surveyors. It is worth noting that, similar to most states, despite the increase in total surveyor employment, the number of registered surveyors has decreased since 2017/18, with numbers falling 14.1% to around 120 persons. Once again, this result furthers the previous discussion in Section 6 – the hiring of registered/ licensed surveyors proves to be a challenge for firms.

Surveyors are estimated to comprise 26.4% of the SA total workforce, with spatial scientists and technicians accounting for 13.1% and 36.3% respectively. This corresponds to a slightly larger share of surveyors across the total skilled workforce, relative to the east-coast states. The only major occupation group to experience a decline in numbers since 2017/18 was spatial scientists – who experienced a 3.8% decrease in employment across SA.

Table 11.1: Estimated Size of Skilled Surveying and Geospatial Workforce in SA

Occupation Groups	2017/18*	2021/22	
Surveying sectors			
Land	104	159	▲ 55
Construction	28	33	▲ 5
Engineering	41	40	▼ (1)
Mining	24	21	▼ (3)
Other sectors	20	27	▲ 7
Total surveyors	**217**	**280**	▲ **63**
Registered/Licensed Surveyors	*135*	*116*	▼ (19)
Total spatial scientists	**144**	**139**	▼ **(5)**
Surveying technicians	216	238	▲ 22
Spatial technicians	125	147	▲ 22
Total technicians	**341**	**385**	▲ **44**
Total skilled surveying & geospatial workforce	**702**	**804**	▲ **102**
Planners	100	116	▲ 16
Engineers	35	51	▲ 16
Environmental Scientists	27	27	
Other staff (include Architects)	30	62	▲ 32
Total other professionals	**192**	**256**	▲ 64
Total Skilled Workforce	**894**	**1,060**	▲ **166**

Source: BIS Oxford Economics, ABS, CRSBANZ
** 2017/18 workforce breakdown revised as outlined in methodology section*

11.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

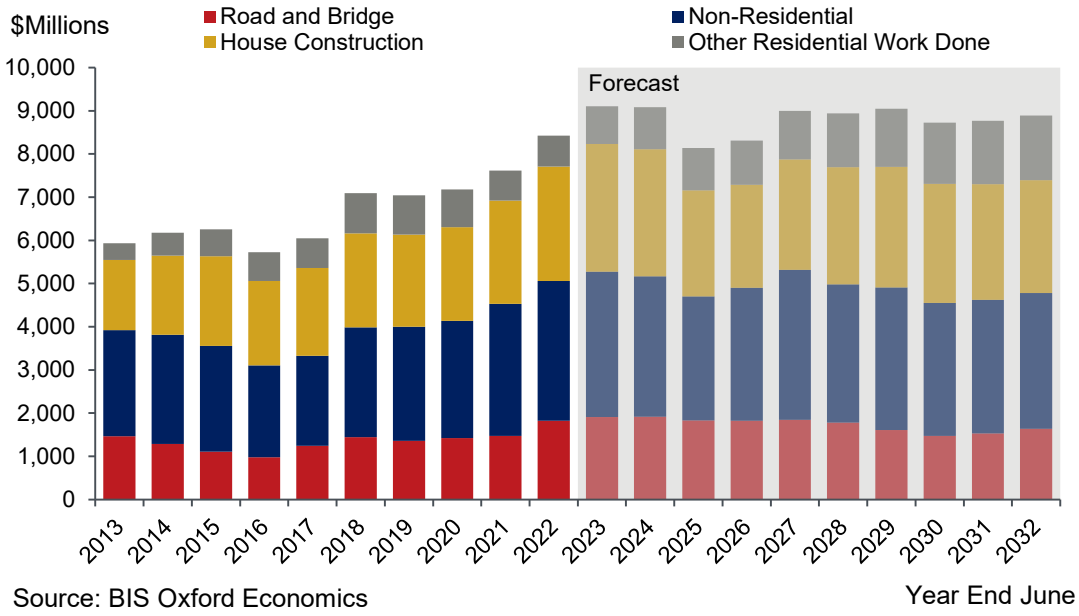
- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

11.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Following the increase in employment of land surveyors, total activity across the land development drives has steadily increased since 2015/16. In 2021/22, total activity of the land surveying indicators increased by 10.7% to $8.4 billion – the highest level over the recorded history. This result comes on the back of internal migration inflow (as opposed to the historical outflow) and elevated levels of investment in non-residential construction (office and education sectors). This increase has seen non-residential activity account for 38.5% of total activity, the largest driver of land surveying in SA.

Figure 11.1: Land Development Drivers Value of Work Done – SA



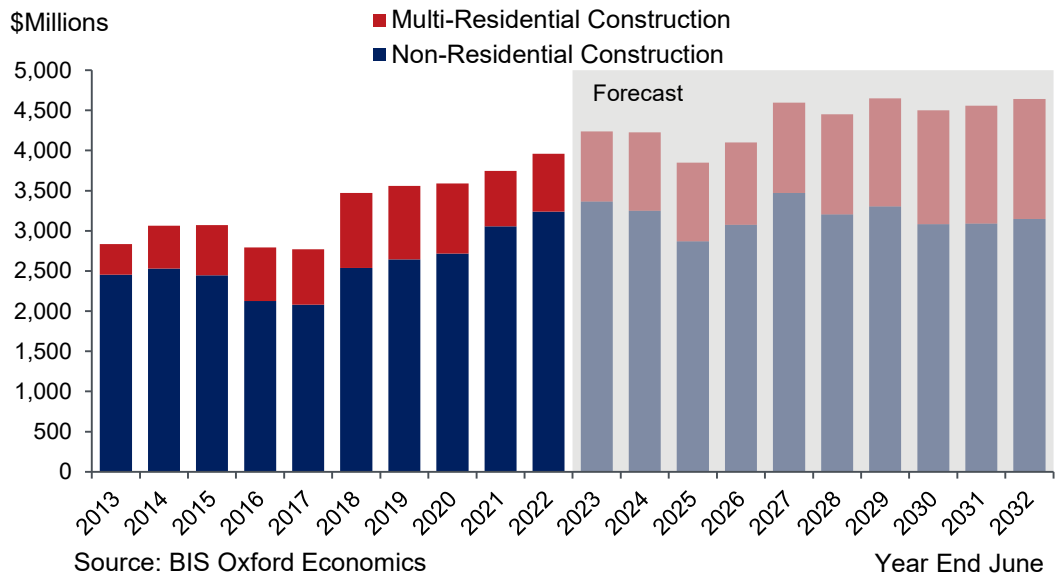
Following on the discussion above, the short-term outlook for land development drivers is positive given the increased dwelling demand from internal migration and increased transport construction. Total activity is set to peak in 2024/25 at $9.1 billion, a 7.8% increase on 2021/22 activity levels. This will boost demand for land surveyors over the first two years of the forecast.

Following this peak, activity is set to taper over the remaining years of the forecast due to affordability constraints and increasing construction costs. In combination with an easing of dwelling stock deficiency, total activity will remain relatively constant over the rest of the decade, average just below $8.7 billion. Accordingly, demand for land surveyors will remain relatively constant over the medium- to long-term albeit at levels slightly lower than that expected in 2022/23 and 2023/24.

11.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

A boost in non-residential activity from investment in office and education sectors, has seen building construction reach record levels in 2021/22. The increased public and private investment drove total building construction activity to nearly $4.0 billion, an increase of 14.1% from the levels in 2017/18. It is therefore little surprise SA saw an increase in construction surveyors. However, it is worth noting the lower number of construction surveyors and base activity levels in SA relative to the major east-coast states.

Figure 11.2: Building Construction Activity Value of Work Done – SA



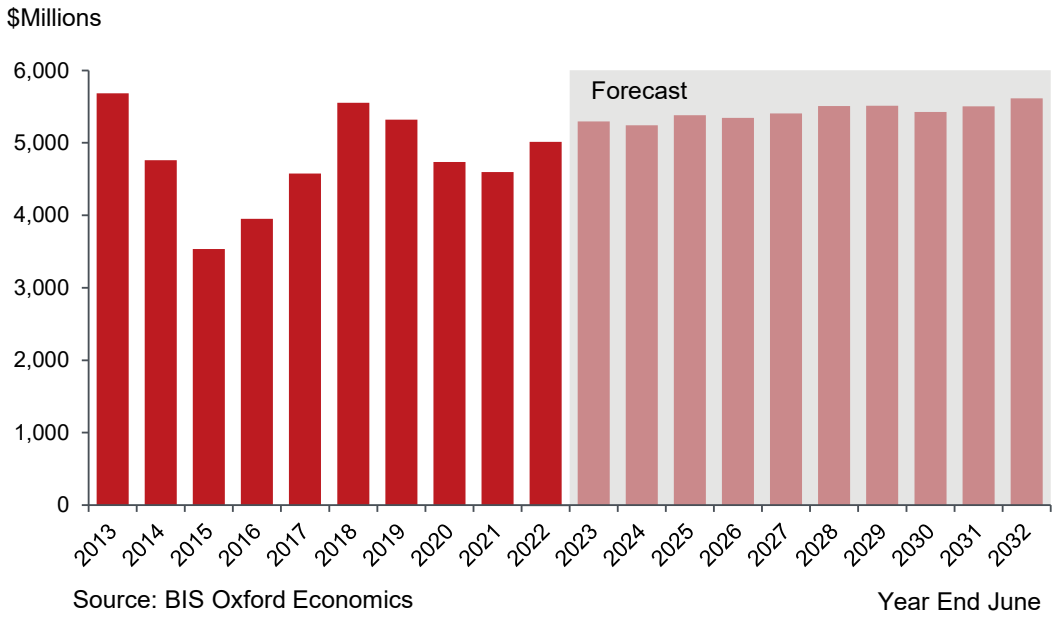
The current moment in construction activity is continue for the next two years before rising borrowing costs and construction costs weighing heavily on the forecast. Total building activity is set to decline from 2022/23 reaching a trough of $3.8 billion in 2024/25, a decrease of 2.8% from the levels in 2021/22. This cooling in construction activity is relatively moderate so whilst demand will damp, levels won't fall far from current demand for construction surveyors.

Following this decline, activity is set to begin to return to positive growth from 2026/26 as pressure from increased construction costs begin to ease. By 2031/32 much of the pulldown in activity will be captured as total activity is set to hit $4.6 billion, however, multi-residential construction will drive much of the recovery on the back of increases in population growth and subsequent dwelling demand. Therefore, following the short-term cooling in demand for construction surveyors, demand should gradually increase over the medium- to long-term.

11.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Engineering activity benefited from increased investment in transport infrastructure, offsetting a fall in utilities related activity. Total engineering activity increased by 9.1% to pass $5.0 billion in 2021/22, however, this remains 9.7% lower than the reported level in 2017/18. As such, the number of engineering surveyors has fallen slightly since then (2017/18; 41 engineering surveyors, 2021/22; 40 engineering surveyors).

Figure 11.3: Utilities and Transport Engineering Construction Value of Work Done - SA



The outlook for SA engineering is for stable growth over the next decade as population growth supports demand for infrastructure projects across the state. Engineering activity is forecast to average $5.4 billion each year over the next decade and is set to avoid the decline in activity in between 2025/26 and 2027/28 set to national activity levels. Therefore, demand for engineering surveyors will remain stable over the forecast period.

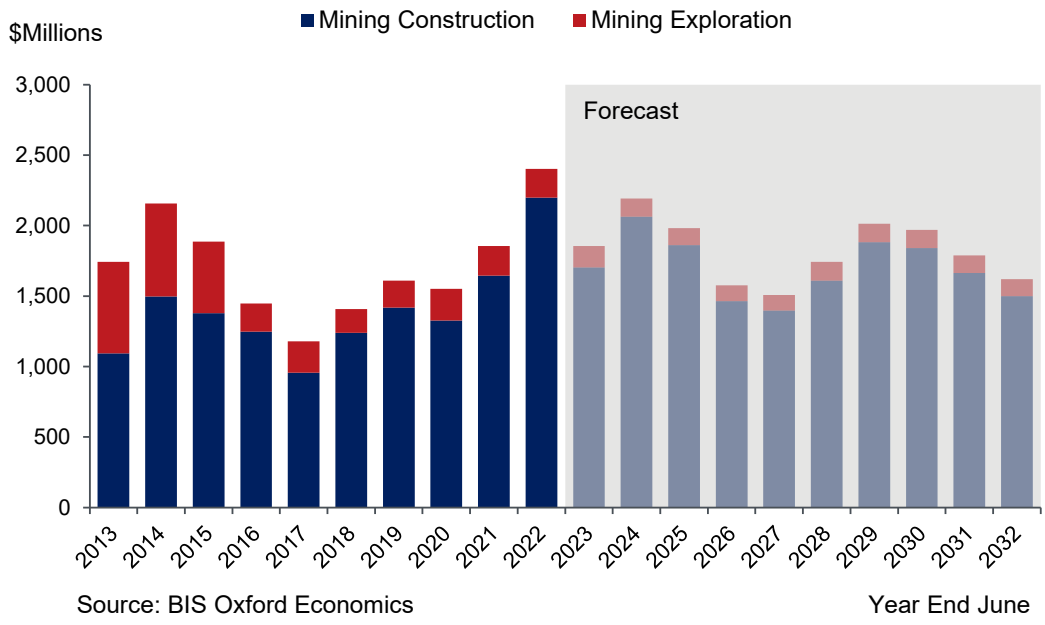
11.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

On the back of record-highs in commodity prices, mining activity reached record levels since 2012/13 – total mining activity exceeded $2.4 billion in 2021/22, 70.6% growth since 2017/18. Soaring iron ore prices triggered substantial increase in activity, particularly in exploration expenditure, and, whilst the major exploration occurred in WA, SA benefited from increased activity. Domestically SA hosts over 60% of Australia's copper resources and the state benefited from an increase copper mining maintenance.

Iron ore prices declined sharply in 2021/22 and the positive momentum in exploration is expected to wane as a result. The ongoing recovery in Brazilian supply and weakening Chinese demand are likely to reduce output as the market begins to revert to more 'normal' conditions. Additionally, copper mining maintenance spending is expected to steadily increase over the next few years, buoyed by elevated copper prices and rising production. The outlook for copper production in the long-term remains positive. Copper issued for the production, distribution and transmission of power, the electrification of transport and in wind and solar renewable energy solutions. Growth in these sectors will drive copper mining, which will also lead to increased maintenance activity.

As a result, the forecast for mining activity in SA is for an initial decline in activity in 2022/23 as markets revert to more stable conditions. Following that activity will increase as demand for copper increases before cooling mid-decade. Activity will peak in 2023/24 at $2.2 billion before falling to $1.5 billion in 2026/27. Accordingly, demand for mining surveyors will fall from their current levels – over the forecast period demand will peak in 2023/24 before declining further over the following years.

Figure 11.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – SA



11.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

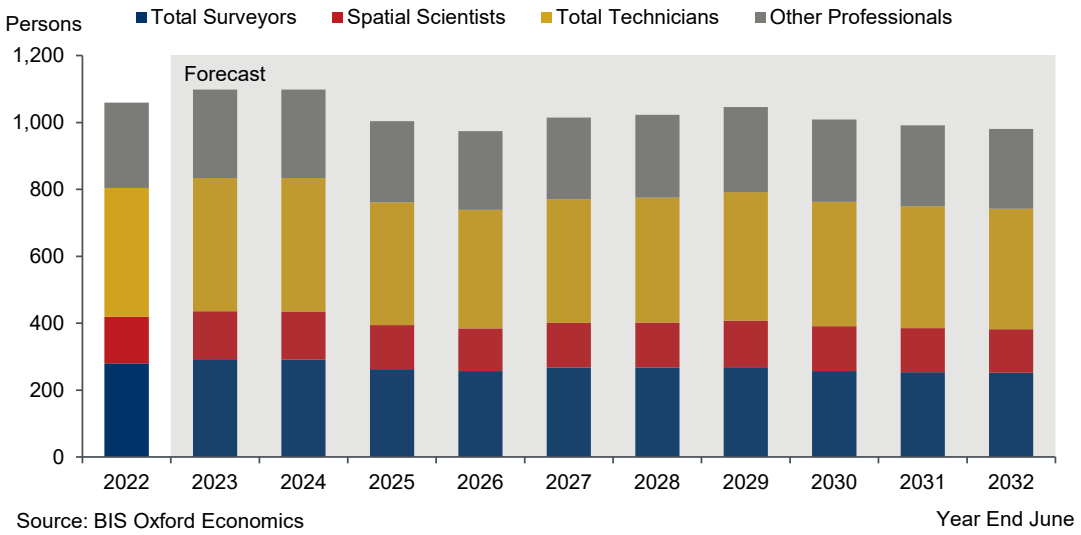
11.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals to increase from 2022/23 before declining over the mid-decade

Demand for surveying and geospatial professionals in SA will increase from 2022/23 before softening over the mid-decade. As seen in Figure 11.5, demand will increase over the next two years on the back of a strong pipeline of infrastructure projects and elevated dwelling demand to peak at nearly 1,100 professionals in 2023/24. From 2024/25, demand will undergo a decline as the pipeline cools and construction costs weigh construction activity. In line with the national profile, demand will cool over the mid-decade, with a trough expected in 2025/26 at less than 1,000 persons.

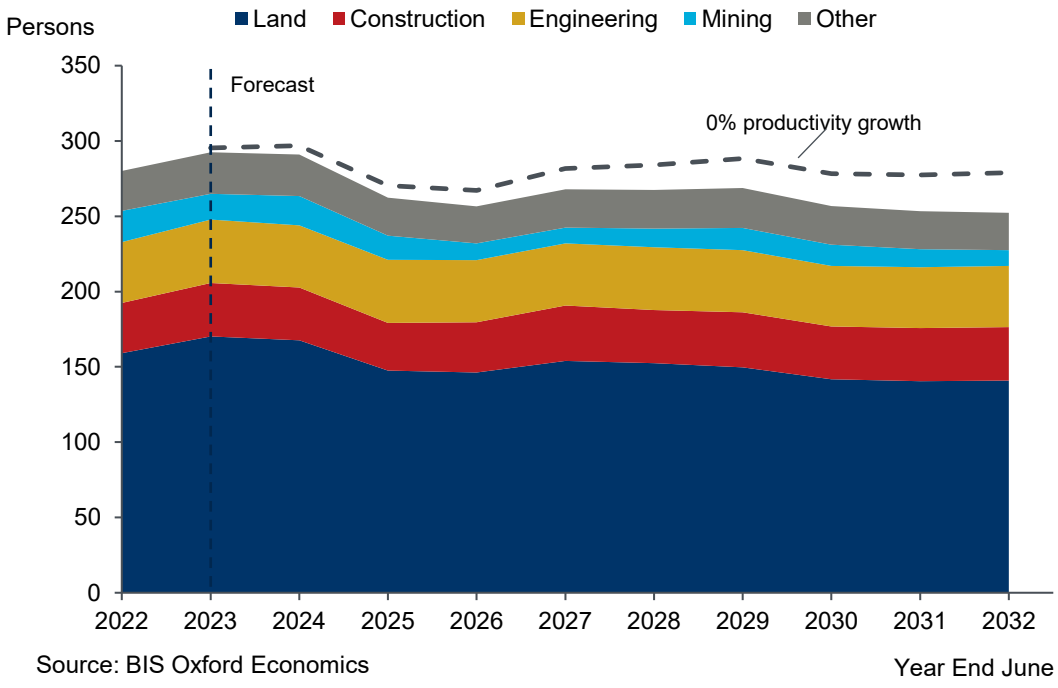
Figure 11.5: Forecast of Total Demand for Skilled Labour – SA (1.0% Labour Productivity)



Following the national outlook, all occupation groups are set to experience a common profile over the next decade - all major occupation groups are anticipated to reach a peak in demand within the first two years of the forecast. These levels are not expected to be surpassed over the remaining years of the forecast. A slight increased in over the later years of the decade will still fail to see demand surpass 2023/24 levels (2028/29; total demand of just over 1,000 persons). Similar to the other states, the share demand of each occupation group is expected to remain stable over the forecast period.

Regarding the different surveyors, demand will nearly reach 300 professionals in 2022/23 before decreasing to less than 260 in 2025/26, as illustrated in Figure 11.6. However, the further decline in activity over the later stages of the forecast period will see demand fall to nearly 250 persons in 2031/32. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 30 professionals. This would account for 10.6% of the expected workforce demand in 2031/32.

Figure 11.6: Forecast of Demand for Surveyors by Sector – SA (1.0% Labour Productivity)

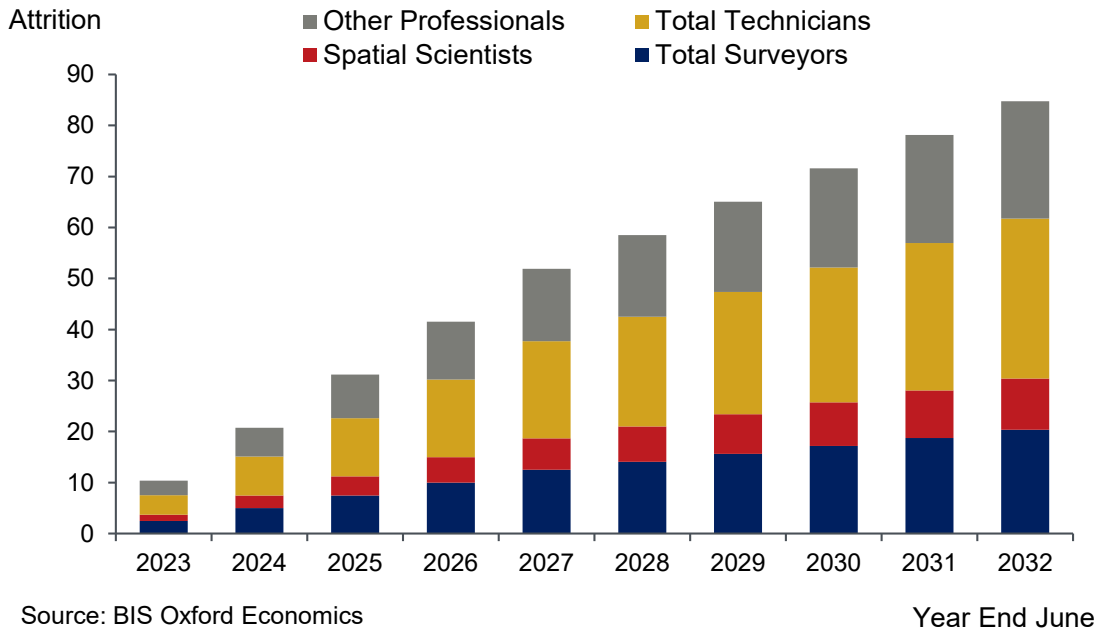


11.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current SA workforce will increase over the next decade to reach 8.0% of the 2021/22 workforce (attrition 2031/32; 85 persons – see Figure 11.7). This accounts to an average yearly attrition of 8 professionals, 0.8% of the current workforce. This attrition rate is slightly above the national average of 7.3% by 2031/32.

Figure 11.7: Forecast of Aggregate Workforce Attrition – SA



11.4.3 Forecast of Workforce Gap

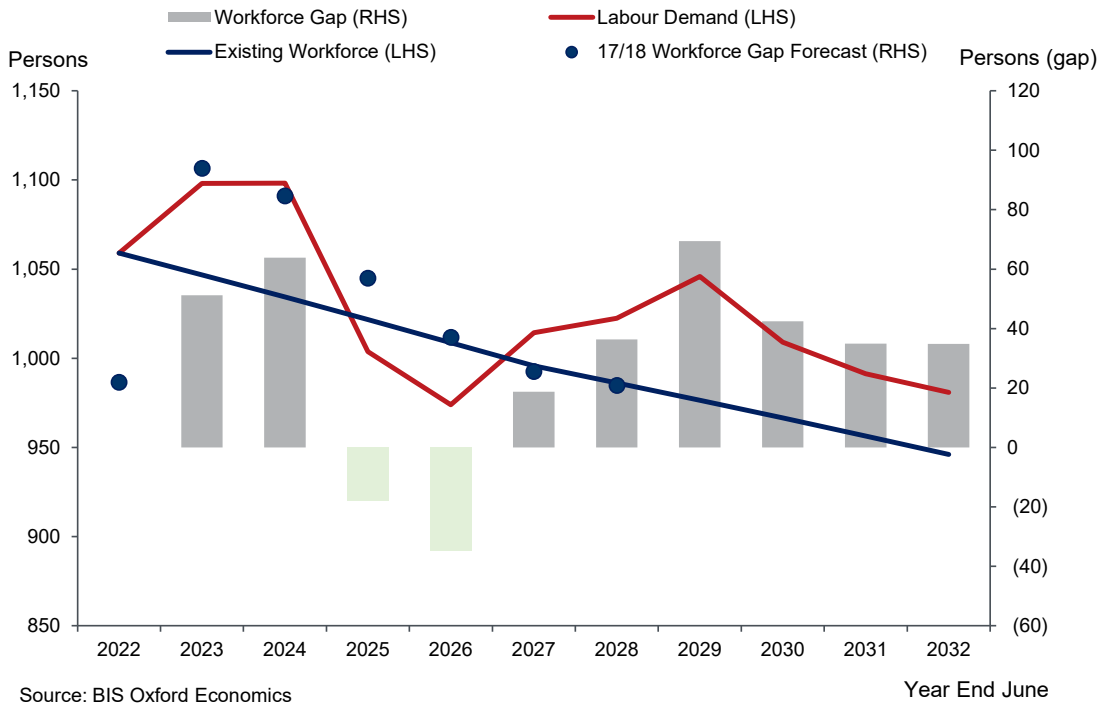
Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for SA.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in SA for 2022/23 and 2023/24 before the slowdown in construction activity results in a surplus in the mid-decade. As discussed in Section 11.3 above, the cool down of activity across SA due to increased borrowing and construction costs, in combination with the easing in the infrastructure pipeline, will result in a smaller workforce gap than the majority of the other states as the second-wind in construction activity fails to lift demand above the short-term boom (excluding 2028/29). We anticipate a workforce surplus in 2025/26 and 2026/27 before the gap reverts to a shortfall – by 2031/32, the workforce gap is expected to reach around 40 professionals.

In the more immediate-term, in 2022/23 we anticipate a workforce gap of just over 50 professionals –4.8% of the current workforce. As seen in Figure 11.8, the workforce gap will exceed 60 persons in the subsequent year before the profession experiences a surplus of nearly 40 professionals in 2025-26.

Whilst most of the major occupations face a similar profile over the next decade, a reduced residential outlook and decline in mining activity will reduce the demand for surveyors down over the outlook, as see in Table 11.2. Accordingly, SA faces a lesser burden on surveying and spatial science enrolments relative to many other regions due to a more subdued construction outlook over the long-term.

Figure 11.8: Forecast of Workforce Gap for Total Skilled Workforce – SA



Source: BIS Oxford Economics

Table 11.2: Forecast of Labour Demand and Workforce Gap – SA (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**280**	**292**	**291**	**262**	**257**	**268**	**268**	**269**	**257**	**253**	**252**
Land	159	170	168	148	146	154	152	150	142	141	141
Construction	33	35	35	32	33	37	35	37	35	35	35
Engineering	40	42	41	42	41	41	42	41	40	40	41
Mining	21	17	19	16	11	10	12	15	14	12	10
Other sectors	27	28	28	25	25	25	26	27	26	25	25
Registered/Licensed Surveyors (a)	*116*	*121*	*120*	*109*	*106*	*111*	*111*	*111*	*106*	*105*	*104*
Spatial Scientists	139	144	144	132	128	133	135	138	134	132	130
Total Technicians	385	398	399	366	355	369	373	384	372	365	360
Total Surveying & Geospatial Workforce	**804**	**834**	**834**	**761**	**739**	**770**	**775**	**791**	**763**	**750**	**742**
Other Professionals	255	264	264	243	235	244	247	254	246	242	239
Total skilled labour demand	**1059**	**1098**	**1098**	**1004**	**974**	**1014**	**1022**	**1046**	**1009**	**991**	**981**
Existing Workforce (b)											
All Surveyors	**280**	**277**	**274**	**271**	**268**	**265**	**263**	**260**	**258**	**255**	**253**
Land	159	157	156	154	152	150	149	148	146	145	144
Construction	33	33	33	32	32	32	31	31	31	30	30
Engineering	40	40	39	39	39	38	38	37	37	37	36
Mining	21	21	20	20	20	20	20	19	19	19	19
Other sectors	27	26	26	26	25	25	25	25	24	24	24
Registered/Licensed Surveyors	*116*	*115*	*114*	*112*	*111*	*110*	*109*	*108*	*107*	*106*	*105*
Spatial Scientists	139	137	136	134	133	131	130	129	128	127	125
Total Technicians	385	380	376	371	366	362	358	355	351	347	343
Total Surveying & Geospatial Workforce	**804**	**795**	**786**	**777**	**767**	**758**	**751**	**744**	**736**	**729**	**721**
Other Professionals	255	252	248	245	241	238	235	233	230	227	225
Total skilled labour	**1059**	**1047**	**1034**	**1022**	**1009**	**996**	**986**	**976**	**967**	**956**	**946**
Workforce Gap (c)											
All Surveyors	**0**	**15**	**17**	**(9)**	**(12)**	**3**	**5**	**9**	**(1)**	**(2)**	**(1)**
Land	0	13	12	(6)	(6)	3	3	2	(5)	(4)	(3)
Construction	0	2	2	(1)	1	5	4	6	4	5	5
Engineering	0	2	2	3	3	3	4	4	3	4	4
Mining	0	(3)	(1)	(4)	(9)	(9)	(7)	(5)	(5)	(7)	(8)
Other sectors	0	1	2	(0)	(1)	0	1	2	1	1	1
Registered/Licensed Surveyors	*0*	*6*	*7*	*(4)*	*(5)*	*1*	*2*	*4*	*(0)*	*(1)*	*(0)*
Spatial Scientists	0	6	8	(2)	(5)	2	4	10	6	5	5
Total Technicians	0	18	23	(5)	(12)	7	15	30	21	18	17
Total Surveying & Geospatial Workforce	**0**	**39**	**48**	**(16)**	**(28)**	**12**	**24**	**48**	**26**	**21**	**21**
Other Professionals	0	12	16	(2)	(7)	7	12	22	16	14	14
Total skilled labour	**0**	**51**	**64**	**(18)**	**(35)**	**19**	**36**	**69**	**42**	**35**	**35**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR WESTERN AUSTRALIA

Forecast of Labour Demand and Workforce Gap for WA

12.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across Western Australia (WA) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin the demand for surveyors and geospatial professionals.

12.1.1 Recent Economic Trends

The current momentum in the WA economy has tapered recently as labour constraints weigh on capacity and residential activity cools. The WA economy is showing a few signs of scarring as a result of its very strict COVID-19 travel restrictions. This is largely due to the relative isolation of the state's economy from the rest of the country.

SFD in WA was broadly unchanged in Q2, with momentum falling back after a strong Q1. Consumption growth was strong at 1.4% q/q. Machinery & equipment investment again made a strong contribution to growth (6.7% q/q), with miners looking to maximise current capacity.

Dwelling activity in WA has benefited from recent stimulus in the form of HomeBuilder which saw dwelling activity surge 72% in 2020/21. This large jump in activity exacerbated capacity constraints, with acute trade labour shortages significantly extending project timelines. Drawing out the delivery of HomeBuilder projects, total dwelling commencements normalised by just 9% to just over 21,300 in 2021/22.

Historically, construction in WA has been centered around the mining and heavy industry segment of engineering construction. Having peaked in the midst of the resource investment boom in 2012/13 ($64.7 billion), total construction activity collapsed to a trough of $25.8 billion in 2018/19. With the upswing in construction investment (mainly through the mining and heavy industry) total construction activity has increased by 5.4% since the trough to $27.2 billion in 2021/22.

Employment has plateaued in recent months following very strong growth over 2021 and H1 2022. The labour market is currently in a very tight position, with the participation rate at 69.3%, and the unemployment rate at 3.1%. Accordingly, employment growth and/or further falls in the unemployment rate will be modest from here.

12.1.2 Economic Outlook

The WA economy is set to benefit in the short-term from mining investment materialising, with total activity set to strengthen over 2022/23 and 2023/24. We anticipate growth in total construction activity of 11.6% and 22.6% respectively to peak at $37.2 billion over the next two years before plateauing.

Dwelling construction is set to be hindered by materials and labour shortages which are set to delay the realisation of current demand. Dwelling investment has disappointed over the past few quarters to be 10.6% lower than a year earlier. A strong pipeline of work generated by the HomeBuilder program is still to be completed. The latest approval data, which leads total activity, for the state is weak and stock of projects approved but not yet commenced has normalised. Combined with weaker demand from rising interest rates and the sharp acceleration of build costs, this is set to pull total dwelling commencements down a further 20% to 17,000 in 2022/23.

Our outlook is for momentum to remain strong in the WA economy, underpinned by smaller-than-usual migration flows out of the state in the short-term. Therefore, the outlook for the WA economy is for strong growth over the next decade – this will result in increased demand for surveyors across all occupation groups.

12.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 420 employees since 2017/18 to 3,253 persons in 2021/22 for Western Australia.

The number of total surveyors is estimated to have increased by 25.8% to around 1,000 professionals. This increase has come as a result of a rise in the employment of land and engineering surveyors, whose numbers have collectively increased by 34.7% to over 600 persons. Of note again is, similar to most states, despite the increase in total surveyor employment, the number of registered surveyors has decreased since 2017/18, with numbers falling 15.0% to around 190 persons. Once again, this result further to the previous discussion in Section 6 – the hiring of licensed surveyors proves to be a challenge for firms.

Surveyors are estimated to comprise 29.6% of the WA total workforce, with spatial scientists and technicians accounting for 7.7% and 38.0% respectively. These numbers are in line with the national share of employment – the decrease in mining surveyors since 2017/18 has helped bring WA closer to national representation. The impact of the cyclical downturn experienced by WA over the past few years was limited across construction surveyors, with an estimated stable level of employment to 2017/18.

Table 12.1: Estimated Size of Skilled Surveying and Geospatial Workforce in WA

Occupation Groups	2017/18*	2021/22		
Surveying sectors				
Land	247	320	▲	73
Construction	133	134	▲	1
Engineering	208	293	▲	85
Mining	143	140	▼	(3)
Other sectors	35	77	▲	42
Total surveyors	**766**	**964**	▲	**198**
Registered/Licensed Surveyors	*227*	*193*	▼	(34)
Total spatial scientists	**210**	**251**	▲	**41**
Surveying technicians	918	1,007	▲	89
Spatial technicians	192	229	▲	37
Total technicians	**1,110**	**1,236**	▲	**126**
Total skilled surveying & geospatial workforce	**2,086**	**2,451**	▲	**365**
Planners	181	267	▲	86
Engineers	236	190	▼	(46)
Environmental Scientists	161	130	▼	(31)
Other staff (include Architects)	169	215	▲	46
Total other professionals	**747**	**802**	▲	55
Total Skilled Workforce	**2,833**	**3,253**	▲	**420**

Source: BIS Oxford Economics, ABS, CRSBANZ
** 2017/18 workforce breakdown revised as outlined in methodology section*

12.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

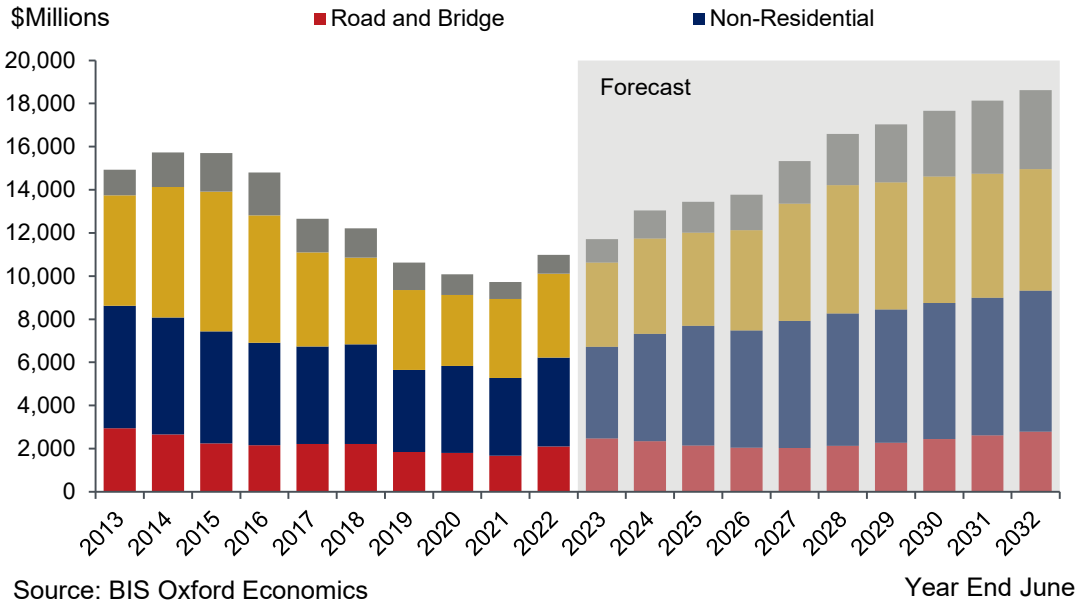
- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

12.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

On the back of stimulus, activity in WA has rebounded after a slump in investment over the past few years. Total driver activity increased by 12.9% to $11.0 billion in 2021/22 following a trough in construction in 2020/21. This was the first year of positive growth since 2013/14, when activity peaked at $15.7 billion. Whilst all drivers have undergone a decrease since then, house construction has experienced a particularly sharp downturn in activity – with activity declining 49.0% to trough at $3.3 billion in 2019/20.

Figure 12.1: Land Development Drivers Value of Work Done – WA



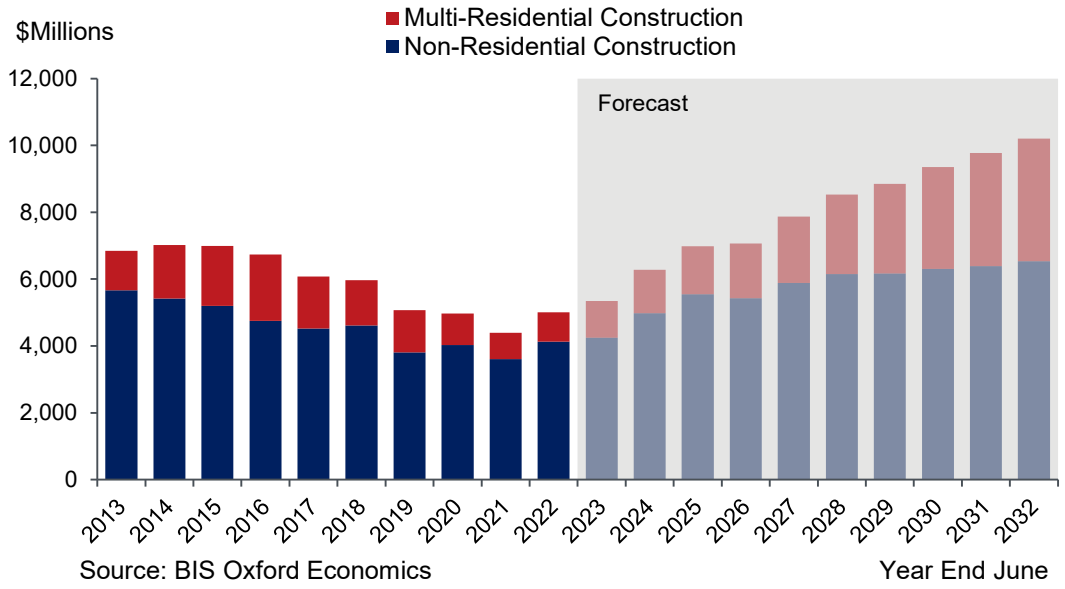
The upswing in activity is expected to continue into 2022/23 with total activity set to climb 6.7% to $11.7 billion. The current capacity constraints are set to linger over the next few years plateauing activity from 2023/24 to 2025/26. Labour and material shortages triggered by the sudden ramp-up in activity will significantly delay the delivery of HomeBuilder projects well into 2022/23, supporting an extended delivery of projects.

The longer-term outlook for WA is for strong growth on the back of housing and non-residential activity. Transport and entertainment are slated for enormous growth, reinforcing building investment as the wider outlook for the WA economy continues to firm, broad-based growth is expected out to the end of the horizon, with the recent surge in commodity price shoring up the investment outlook. Accordingly, the outlook for WA activity, similar to QLD, is consistent growth over the forecast period. The land development drivers are set to avoid the decline in activity over the mid-decade that much of the nation is facing, therefore we anticipate strong growth in demand for land surveyors over the next decade.

12.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

Following a slowdown in building activity over the historical series, activity in the building sector picked up in 2021/22 due to a strong pipeline of activity. Activity increased 13.8% in 2021/22 to exceed $5.0 billion. Boosted by health work done which surged 162% with the $220 million Joondalup Health Campus Expansion getting underway, total activity returned to levels on par with 2018/19. However, building activity still remains significantly (-26.9%) below levels from a decade ago (2012/13; $6.8 billion). Growth would have been stronger if not for severe material and labour shortages.

Figure 12.2: Building Construction Activity Value of Work Done – WA



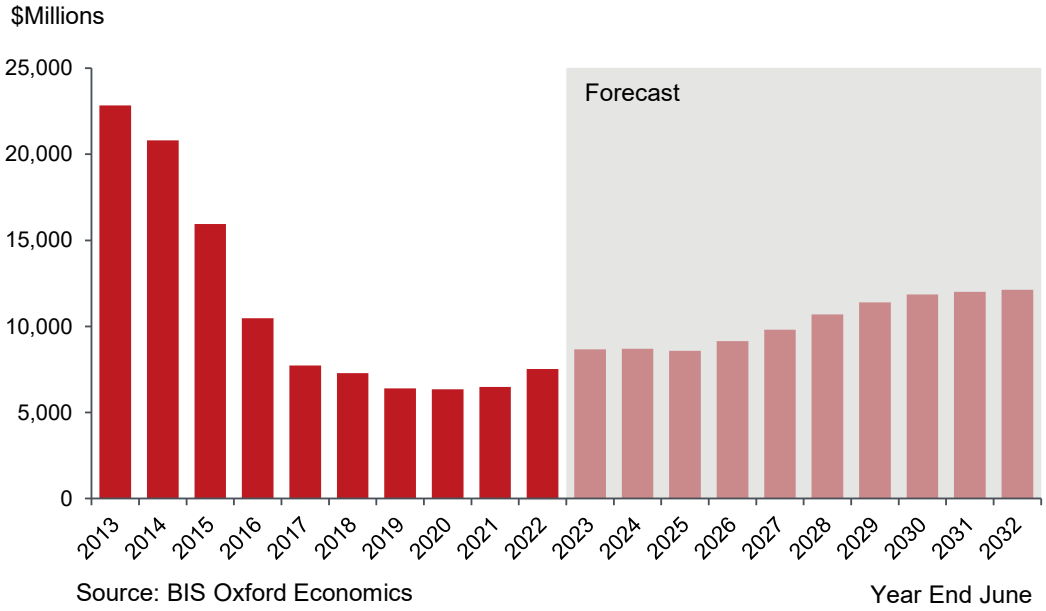
The outlook for WA building activity is favourable due to easing capacity constraints and broad-based growth across the entire economy. As the WA economy firms, non-residential and multi-residential activity is set for a decade of consistent growth. In the short-term, activity is set to rise significantly over the next three years, reaching $7.0 billion in 2024/25.

Following a year of stable activity in 2026/27 as the current pipeline cools, the long-term outlook is for consistent growth over the remaining years of our forecast. Work done is set to exceed $10.2 billion by 2031/32, over double current levels. Thereby, demand for construction surveyors in WA is set to surge over the next decade on the back of consistent growth driven by a strong economic outlook.

12.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Engineering activity picked up in 2021/22 to exceed $7.5 billion following a decade of declining work done. Engineering construction activity across WA has historically been boosted by related activity in the mining and heavy industry as well as construction in associated sectors such as railway and harbours. In turn, a trough in engineering activity was endured in 2019/20 at $6.4 billion following declines in related industries in the years prior. However, following renewed investment, engineering work done rose 16.0% in 2021/22 to the highest level since 2016/17.

Figure 12.3: Utilities and Transport Engineering Construction Value of Work Done - WA



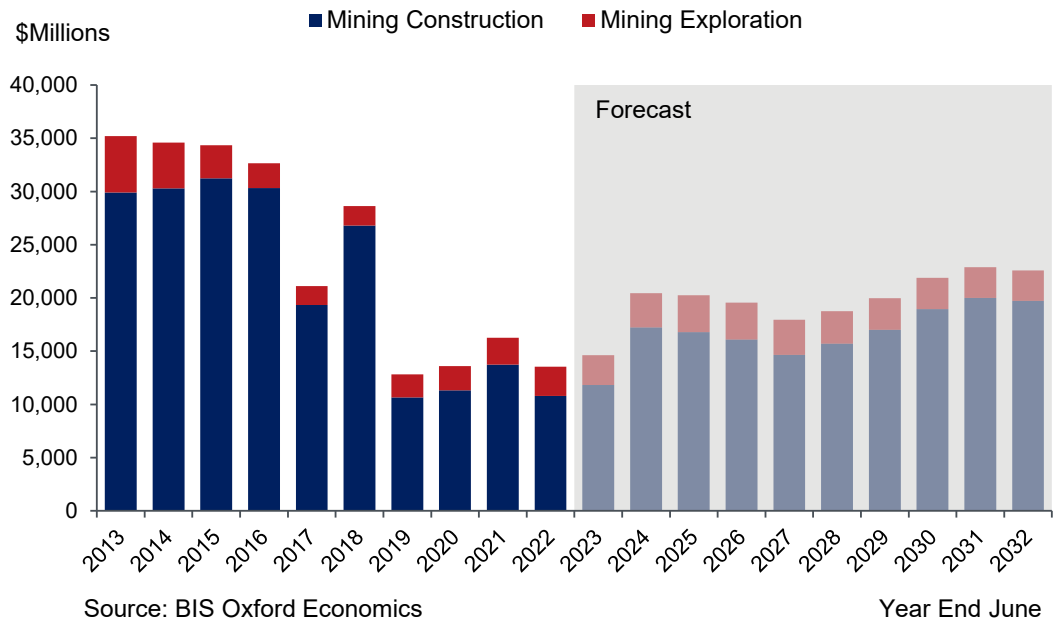
With commodity prices rebounding in 2020/21, mining investment has picked up, resulting in renewed engineering activity. This momentum is set to be accelerated over the next two years, lifting activity to $8.7 billion, a 15.4% increase on current levels. Engineering activity is set to follow a similar profile to other sectors of the WA economy – work done is set to grow continuously over the next decade, with total engineering activity eclipsing $12.1 billion by 2031/32. Therefore, demand for engineering surveyors will be consistently growing over the next decade across WA.

12.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

The mining boom saw total mining investment (including mines, oil and gas facilities, and associated rail, ports and pipeline infrastructure) rise from $7.5 billion 2000/01 to a peak of $106.5 billion in 2012/13 nationally. The additional resource capacity coming online – following significant investment in Australia and overseas – led to downward pressure on prices, driving steep decline in mining investment. This resulted in a dramatic decline in WA mining activity in 2018/19 (-55.2%), however, since then, activity has remained relatively constant, averaging $14.1 billion each year as investment has begun to slowly recover.

On the back of elevated commodity prices, investment in mining, in order to boost capital capacity, is set to grow over the next two years. Activity is set to nearly hit $20.5 billion in 2023/24 before slowly cooling through 2026/27 at $17.9 billion as global commodity prices revert to more stable levels.

Figure 12.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – WA



Mining investment is set to grow robustly over the later years of the forecast. Although we do not expect the next round of resources projects to be as big as the previous mining boom, mining investment will be helped by increased spending on sustained capital. Longer-term, the need to undertake capital replacement projects (either expansions or new projects) for depleting iron ore, coal and metal mines will underpin overall mining investment. This will be supported by a growing global demand; therefore, we expect strong demand for mining surveyors in WA for the next decade.

12.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

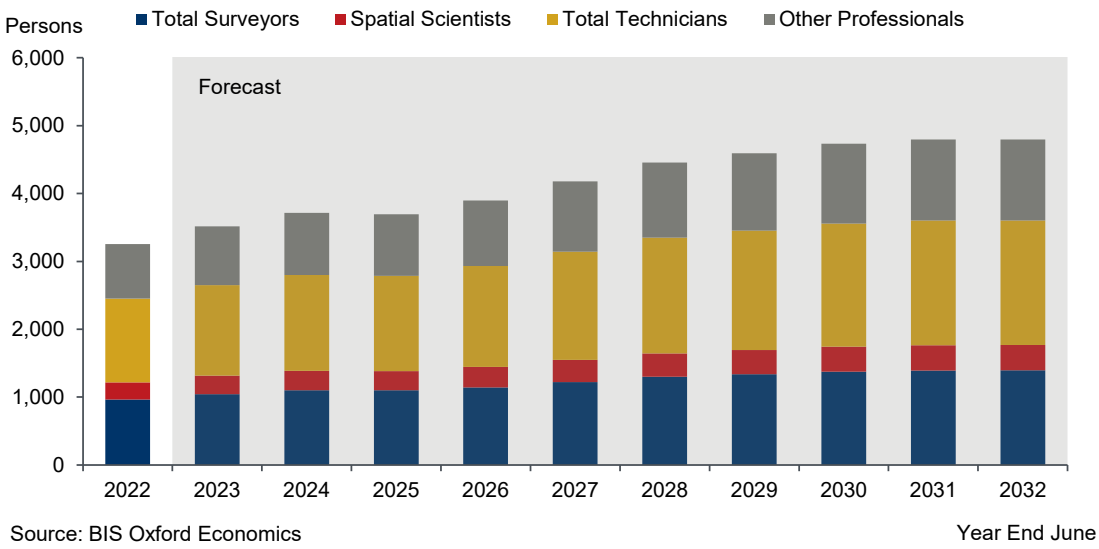
12.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals to increase from 2022/23 grow over the next decade

Demand for surveying and geospatial professionals in WA will increase from 2022/23 and remain at elevated levels over the forecast horizon. As seen in Figure 12.5, demand for professionals will increase over the next two years on the back of a strong economic outlook for WA to peak at more than 3,700 professionals in 2023/24. Following a slight decrease in 2024/25 (-0.5%) as infrastructure pipeline cools, demand is set to climb over the remaining years of the forecast – we anticipate total demand will nearly reach 4,800 professionals in 2031/32, a 47.4% increase from current demand. This dramatic increase is unique to WA and QLD and, as a result, places greater tension on existing capacity concerns.

Figure 12.5: Forecast of Total Demand for Skilled Labour – WA (1.0% Labour Productivity)

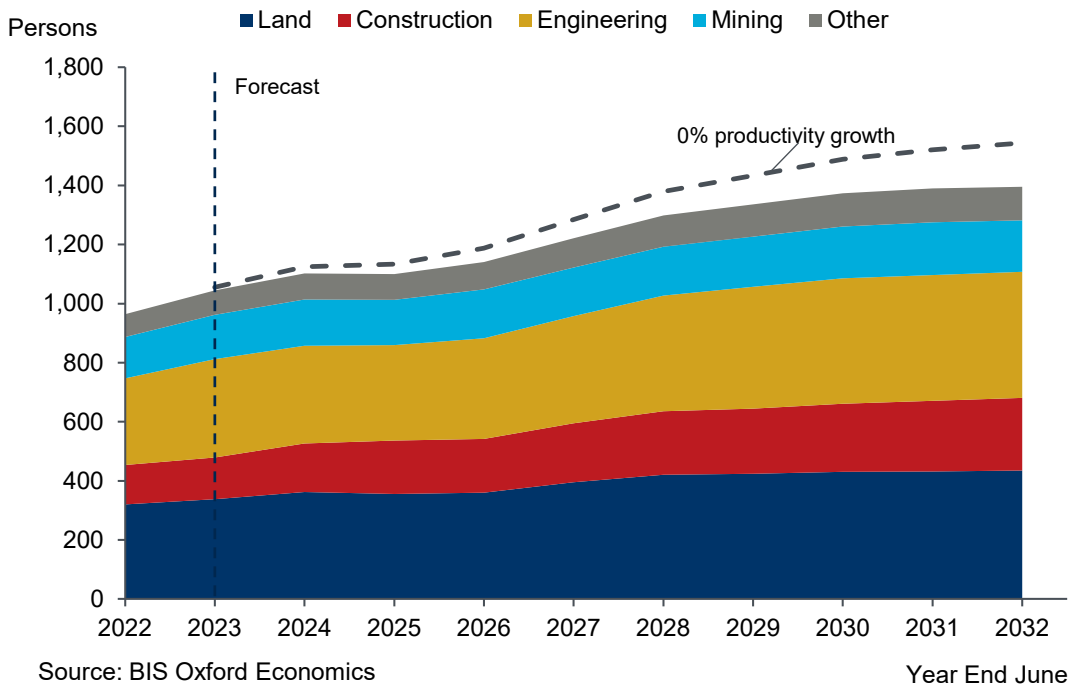


Similar to the national profile, all occupation groups are set to experience a common profile over the next decade - all major occupation groups will continue to increase in demand over the next decade. Importantly, the share demand of each occupation group is expected to remain stable over the forecast period – there will be a universal need to boost enrolment in higher education and vocational surveying and spatial science to meet to expected demand in WA.

Regarding the different surveyors, total demand will peak initially in 2023/24 and remain stable the following year as declining house construction activity is offset by non-residential activity, as illustrated in Figure 12.6. Demand for construction and mining surveyors is expected to drive demand over the mid-decade, ensuring WA avoids the cooling the rest of the country is set to experience.

With a strong economic outlook, demand for each surveying occupation group will consistently rise from 2025/26, with total demand set to peak in 2031/32 at nearly 1,400 professionals. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 150 professionals. This would account for 10.6% of the expected workforce demand in 2031/32.

Figure 12.6: Forecast of Demand for Surveyors by Sector – WA (1.0% Labour Productivity)

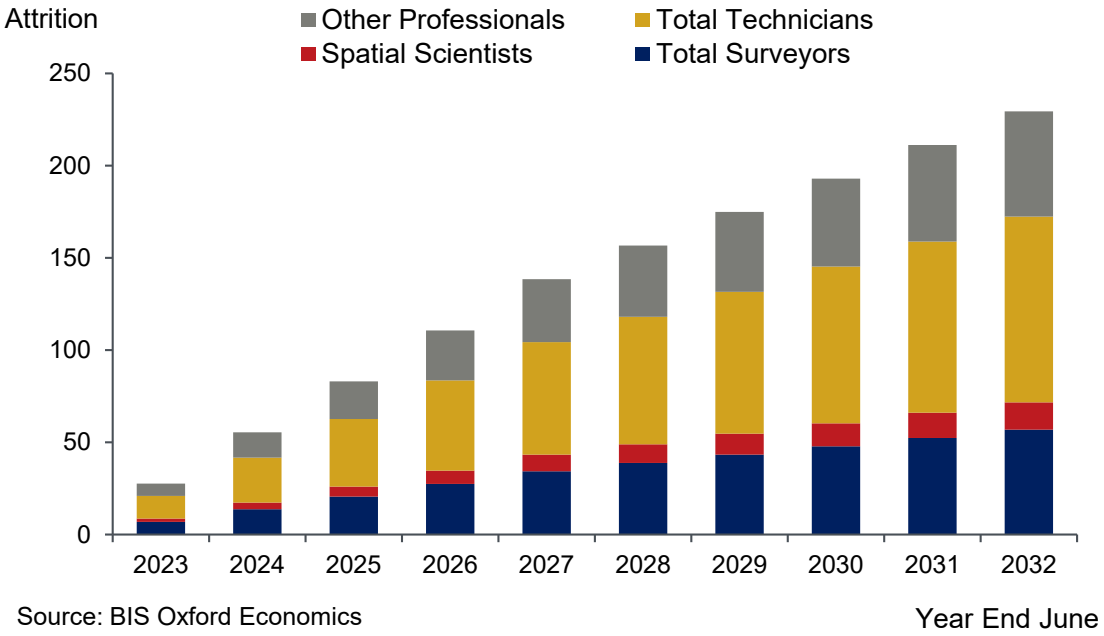


12.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current WA workforce will increase over the next decade to reach 7.0% of the 2021/22 workforce (attrition 2031/32; 229 persons – see Figure 12.7). This accounts to an average yearly attrition of 23 professionals, 0.7% of the current workforce. This attrition rate is below the national average of 7.3% by 2031/32 – an important result given the enhanced demand profile facing WA over the forecast period.

Figure 12.7: Forecast of Aggregate Workforce Attrition – WA



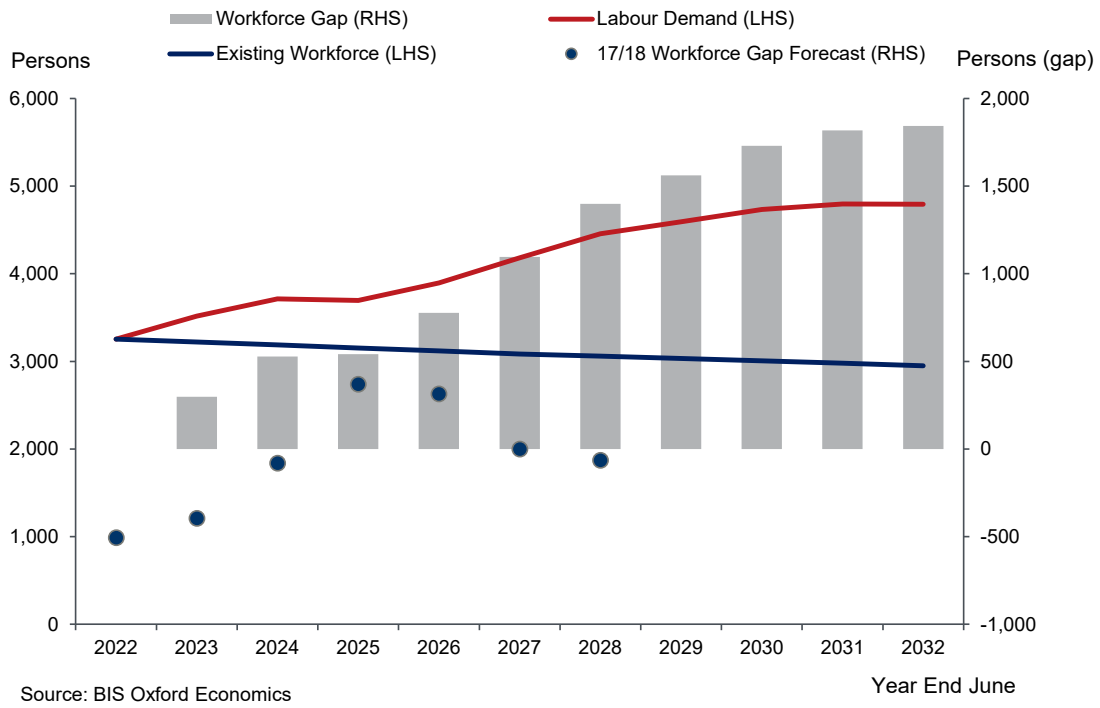
12.4.3 Forecast of Workforce Gap

Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for WA.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in WA from 2022/23 onwards. As discussed in Section 12.3, the heightened construction activity in WA across all key drivers is set to drive demand to levels well above supply from the existing workforce.

In 2022/23, we anticipate an initial workforce gap of nearly 300 professionals, 9.1% of the current workforce. As seen in Figure 12.8, the workforce gap will continue to rise over the next decade – by 2031/32, the workforce gap will exceed 1,800 professionals – 62.5% of the estimated existing workforce in the same year. That is, WA faces the largest workforce gap of all the states over the next decade – the workforce gap in WA, across all professionals, will account for nearly half of the national workforce gap in a decades time (47.2% of total national skilled workforce gap in 2031/32). As seen in Table 12.2, demand will continue to rise across the occupations as the existing workforce fails to meet demand.

Figure 12.8: Forecast of Workforce Gap for Total Skilled Workforce – WA



Source: BIS Oxford Economics

Table 12.2: Forecast of Labour Demand and Workforce Gap – WA (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**964**	**1045**	**1102**	**1100**	**1141**	**1222**	**1299**	**1336**	**1374**	**1390**	**1396**
Land	320	338	362	355	360	395	421	424	430	432	434
Construction	134	141	164	181	181	200	215	220	230	239	247
Engineering	293	333	331	323	341	363	391	412	425	426	426
Mining	140	149	157	153	165	165	166	170	175	178	174
Other sectors	77	83	88	87	93	99	106	109	113	114	114
Registered/Licensed Surveyors (a)	*193*	*209*	*221*	*220*	*228*	*245*	*260*	*268*	*275*	*278*	*280*
Spatial Scientists	251	271	287	285	302	325	347	357	369	374	373
Total Technicians	1236	1335	1410	1401	1487	1597	1705	1759	1815	1839	1835
Total Surveying & Geospatial Workforce	**2451**	**2651**	**2799**	**2786**	**2930**	**3144**	**3350**	**3452**	**3557**	**3602**	**3604**
Other Professionals	802	866	915	909	965	1036	1106	1141	1178	1193	1191
Total skilled labour demand	**3253**	**3518**	**3714**	**3695**	**3895**	**4180**	**4456**	**4593**	**4735**	**4796**	**4794**
Existing Workforce (b)											
All Surveyors	**964**	**956**	**948**	**939**	**931**	**922**	**916**	**910**	**903**	**896**	**889**
Land	320	318	315	312	309	307	304	302	300	298	296
Construction	134	133	131	130	129	128	127	126	125	124	123
Engineering	293	290	288	285	283	280	278	276	274	272	270
Mining	140	139	138	137	136	134	133	132	131	131	130
Other sectors	77	76	76	75	74	74	73	73	72	72	71
Registered/Licensed Surveyors	*193*	*191*	*190*	*188*	*186*	*185*	*183*	*182*	*181*	*179*	*178*
Spatial Scientists	251	249	247	245	243	240	239	237	235	234	232
Total Technicians	1236	1221	1207	1192	1177	1161	1150	1138	1126	1114	1102
Total Surveying & Geospatial Workforce	**2451**	**2426**	**2402**	**2376**	**2350**	**2324**	**2305**	**2285**	**2265**	**2244**	**2223**
Other Professionals	802	794	785	777	769	760	754	747	741	734	727
Total skilled labour	**3253**	**3220**	**3187**	**3153**	**3119**	**3084**	**3058**	**3032**	**3005**	**2978**	**2950**
Workforce Gap (c)											
All Surveyors	**0**	**89**	**154**	**160**	**210**	**299**	**383**	**427**	**471**	**493**	**506**
Land	0	20	47	43	51	89	117	122	130	134	139
Construction	0	9	33	51	52	72	87	94	105	114	123
Engineering	0	43	43	38	59	82	113	136	151	154	156
Mining	0	10	19	16	30	30	33	37	44	48	45
Other sectors	0	7	12	12	18	26	33	37	41	43	43
Registered/Licensed Surveyors	*0*	*18*	*31*	*32*	*42*	*60*	*77*	*85*	*94*	*99*	*101*
Spatial Scientists	0	22	40	40	60	84	108	120	133	140	141
Total Technicians	0	114	204	209	311	436	555	620	688	725	733
Total Surveying & Geospatial Workforce	**0**	**225**	**397**	**410**	**580**	**820**	**1045**	**1167**	**1292**	**1358**	**1381**
Other Professionals	0	73	130	132	197	276	353	394	437	459	463
Total skilled labour	**0**	**297**	**527**	**542**	**776**	**1096**	**1398**	**1561**	**1729**	**1818**	**1844**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR TASMANIA

Forecast of Labour Demand & Workforce Gap for TAS

13.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across Tasmania (TAS) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin the demand for surveyors and geospatial professionals.

13.1.1 Recent Economic Trends

The recent economic performance of TAS has trailed other regions as the state battels increased transport costs and lower dwelling investment. Momentum in the state trailing off after a strong bounce back after the pandemic. Private investment was broadly flat in the most recent quarter. Non-residential construction and machinery & equipment investment were firm recently, but these gains were offset by weakness in dwelling investment. Public demand fell back due to a fall in current consumption – which had been elevated throughout the pandemic.

TAS, with a greater exposure to transport costs, has seen it struggle in the current environment of high and rising fuel costs, which are expected to persist for some time. Further, demand for high value produce is being challenged by trade tensions with China (a major export market). Regardless, most exporters have managed to find alternative markets, and the weaker Australian dollar will provide some support.

The TAS labour market has performed relatively well over 2022 considering the underperformance of output growth. Employment has tracked higher over the year to date, although momentum has receded in recent months. The participation rate remains especially volatile but has not broken through its pre-COVID-19 level of 61%-62%. The participation rate is structurally lower than the rest of the country due to the relatively older population. Accordingly, employment growth and/or further falls in the unemployment rate will be modest from here.

13.1.2 Economic Outlook

The economic recovery in TAS will be a relative underperformance over the next two to three years. As an increased cost profile continues to hamper activity, a softening in fiscal support will weigh on residential construction. Nonetheless, a persistent undersupply of dwellings, along with social housing developments targeting the average delivery of 1,000 homes per annum, are forecast to offset some of these negative constraints. Accordingly, dwelling construction is expected to hold close to this level over the next few years.

The strongest growth in anticipated for attached dwellings, which are set to make up an increasing share of the dwelling mix in Hobart. Coupled with a normalising of transport and construction costs, the longer-term outlook for TAS is for a stable, albeit moderate, construction work done over the next decade.

13.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 226 employees since 2017/18 to 496 persons in 2021/22 for Tasmania.

The number of total surveyors is estimated to have increased by 160.6% to around 185 professionals. This increase has come as a result of an increase in the employment of land surveyors (+188.9%) following elevated housing development from the HomeBuilder program. Similar to nearly every state, despite the increase in total surveyor employment, the number of registered surveyors has declined since 2017/18. The number of registered/licensed surveyors in TAS has fallen 20.9% to 68 persons – furthering the previous discussion in Section 6; hiring of registered/licensed surveyors proves to be a challenge for surveying firms.

Surveyors are estimated to comprise 37.3% of the TAS total workforce, with spatial scientists and technicians accounting for 10.9% and 22.8% respectively. These shares reflect a lower proportion of technicians relative to the national average with surveyors and other professionals capturing the majority of the difference (national average share of technicians; 36.5%).

Table 13.1: Estimated Size of Skilled Surveying and Geospatial Workforce in TAS

Occupation Groups	2017/18*	2021/22	
Surveying sectors			
Land	45	130	▲ 85
Construction	10	17	▲ 7
Engineering	9	16	▲ 7
Mining	4	8	▲ 4
Other sectors	3	14	▲ 11
Total surveyors	**71**	**185**	▲ **114**
Registered/Licensed Surveyors	*86*	*68*	▼ (18)
Total spatial scientists	**31**	**54**	▲ **23**
Surveying technicians	72	88	▲ 16
Spatial technicians	20	25	▲ 5
Total technicians	**92**	**113**	▲ **21**
Total skilled surveying & geospatial workforce	**194**	**352**	▲ **158**
Planners	20	37	▲ 17
Engineers	23	44	▲ 21
Environmental Scientists	16	31	▲ 15
Other staff (include Architects)	17	32	▲ 15
Total other professionals	**76**	**144**	▲ **68**
Total Skilled Workforce	**270**	**496**	▲ **226**

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

13.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

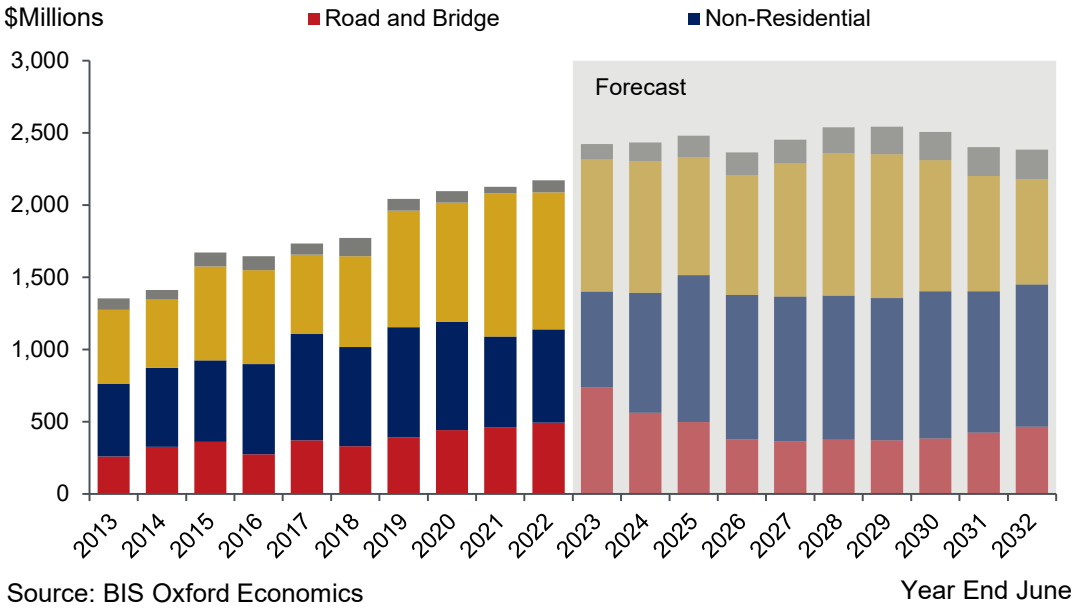
- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

13.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Land development activity has consistently increased across TAS over the past decade, underpinned by elevated house construction work as a result of the HomeBuilder program. Total activity reached historically high levels in 2021/22 at $2.2 billion – a 22.4% increase on the levels experienced in 2017/18 with house construction increasing 51.0% alone. This increase in residential activity has resulted in house construction now accounting for 43.7% of total activity compared to 35.4% in 2017/18. However, declining non-residential activity has offset some of these gains, following a peak in activity in 2018/19, activity has fallen 15.4% to $646 million as public investment cooled.

Figure 13.1: Land Development Drivers Value of Work Done – TAS



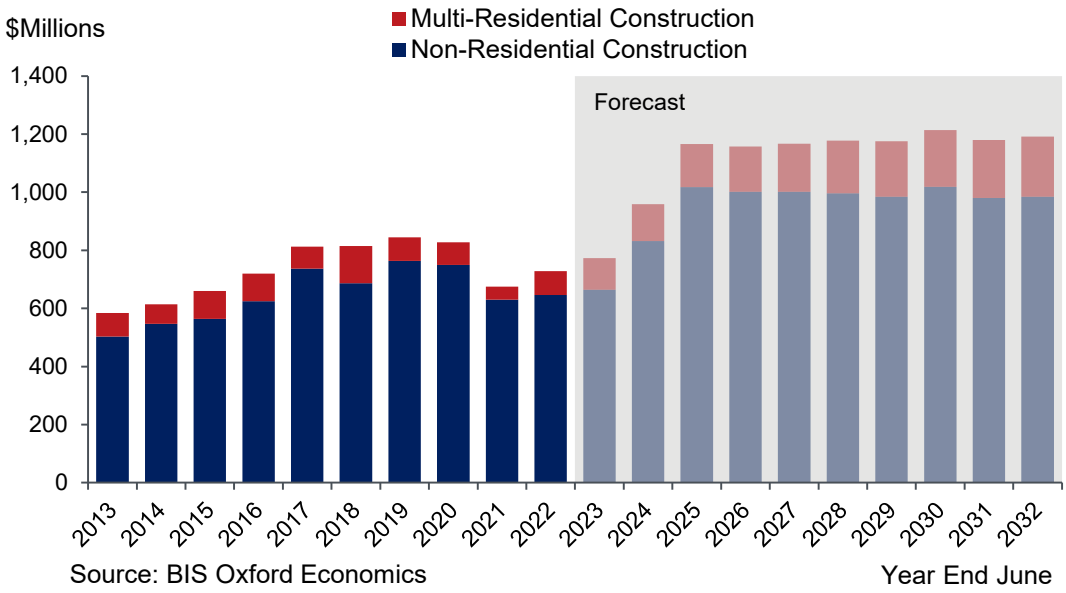
The current momentum across the land development drivers is set to continue over the next three years as dwelling demand and public infrastructure investment underpins elevated activity. Development from the HomeBuilder program is set to persist over the short-term as capacity constraints extended projects across the immediate outlook. Additionally, the historic undersupply of dwellings will drive demand for dwelling construction (particularly across Hobart) and the 'Roads of Strategic Importance Initiative' will boost road and bridge development in 2022/23 (+49.5%).

Following a slight pickup in non-residential activity in 2021/22 from increased public investment, non-residential activity is anticipated to increase a cumulative 60% over the next three years as several sectors run hot. Further development of the +$200 million North Tasmania Prison will alleviate the fall expected in 2025/26 (-12%), before activity bounces back in 2026/27 (+5%). Therefore, the outlook for TAS land development activity is set to reach historic high in 2024/25 before cooling over the remainder of the forecast period.

13.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

Underpinned by recovering public investment, TAS building construction activity bounced back following a steep downturn in 2020/21. Total building activity increased 7.9% in 2021/22 to $729 million with non-residential building work taking a small step up, rising 2.7% to $647 million and muti-residential growing 83.2% to $83 million despite capacity concerns.

Figure 13.2: Building Construction Activity Value of Work Done – TAS



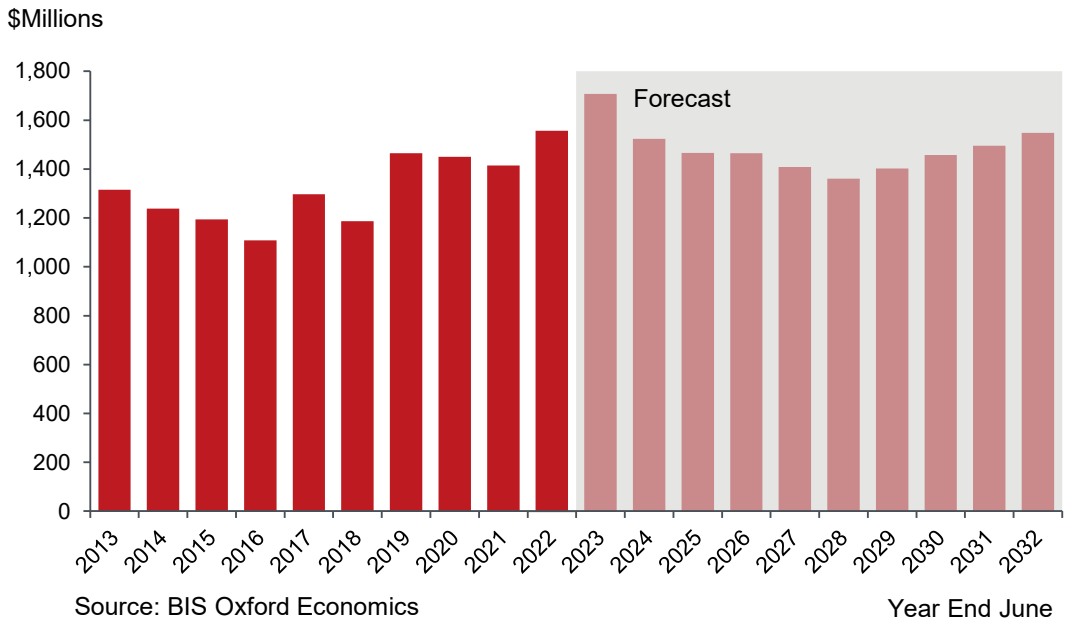
As mentioned previously, non-residential activity is set to maintain its momentum over the next three years as numerous underlying sectors continue to ramp up. Elevated dwelling demand is also set to drive multi-residential activity over the short-term. Activity is set to stabilise from 2025/26 for the remaining years of the forecast. An uptick in multi-residential work in 2029/2030 will see building construction peak at $1.2 billion. The strong outlook for building construction will drive demand for construction surveyors over the next decade.

13.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Engineering activity across TAS reached a historic high level in 2021/22 as it nearly reached $1.6 billion following two years of declining work done thanks to renewed private investment. Engineering construction activity has historically been driven by activity in the mining and heavy industry as well as construction in related sectors such as railway and harbours. In turn, a trough in engineering activity was endured in 2019/20 at $6.4 billion following declines in related industries in the years prior.

Activity is forecast to grow through 2022/23 (+9.7%) to $1.7 billion, supported by the work on the New Bridgewater Bridge. Additionally, activity on the QuayLink, Macquarie Wharf Redevelopment and Burnie Export Gateway will underpin activity over the next few years. As the current pipeline moves towards completion, activity is expected to decline to trough in 2027/28 at $1.3 billion. Thereby, demand for engineering surveyors is set to peak in 2022/23 before slowly declining as the current pipeline of engineering projects begins to ease.

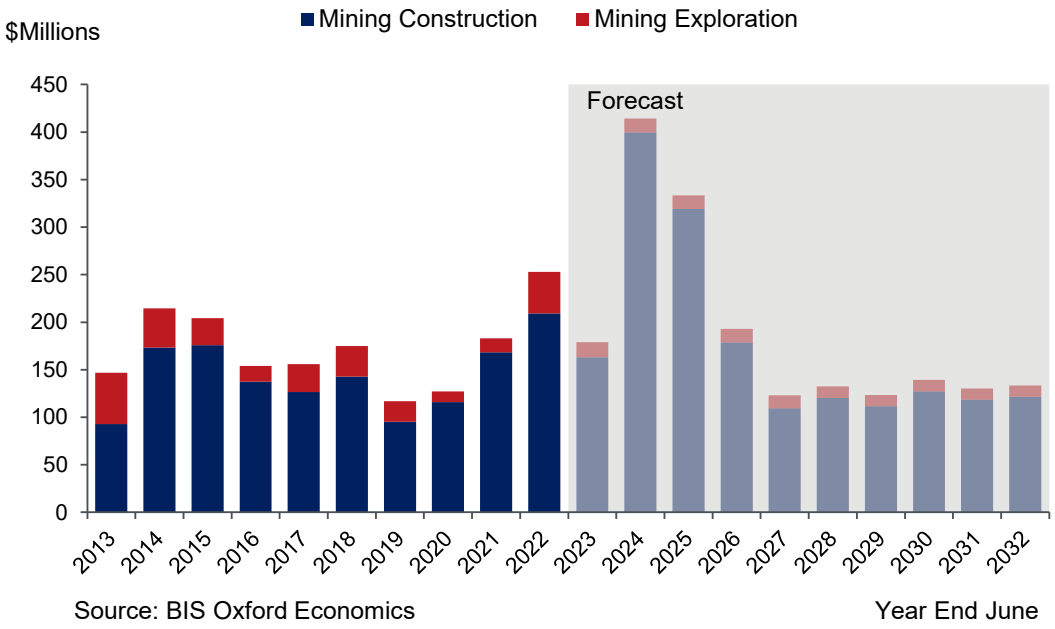
Figure 13.3: Utilities and Transport Engineering Construction Value of Work Done - TAS



13.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

Mining activity in TAS, although a lower base compared to other states and territories, is focused on both underground and surface operations associated with the extraction and processing of base metals, iron ore and coal. Mining activity is focused on the West Coast, the Northwest and Northeast of TAS, as such, the upturn in global commodity prices and private investment saw mining construction and exploration increase by 38.3% to $253 million.

Figure 13.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – TAS



Much of the gains from 2021/22 are set to be lost through 2022/23 as high fuel and transport costs limit activity across the sector in TAS. Accordingly, we expected to see activity decline 29.3% to $179 million in 2022/23. Due to the lower base of activity, the outlook is set for volatile growth over the next few years as a few key projects materialise – activity is set for historic highs in 2023/24 at $414 million before reverting to more normalised levels by 2026/27. Therefore, demand for mining surveyors is to increase over the short-term before trending towards current levels longer-term.

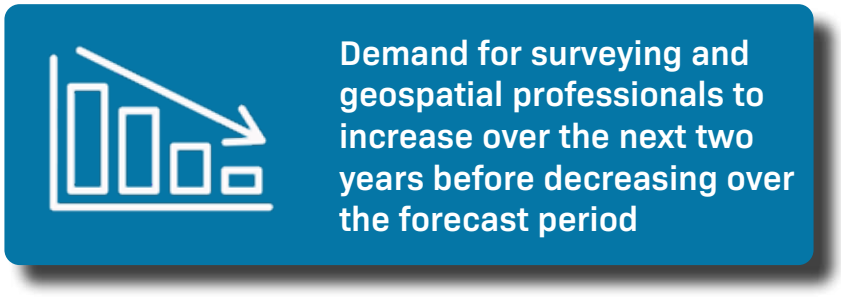
13.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

13.4.1 Forecast of Skilled Labour Demand

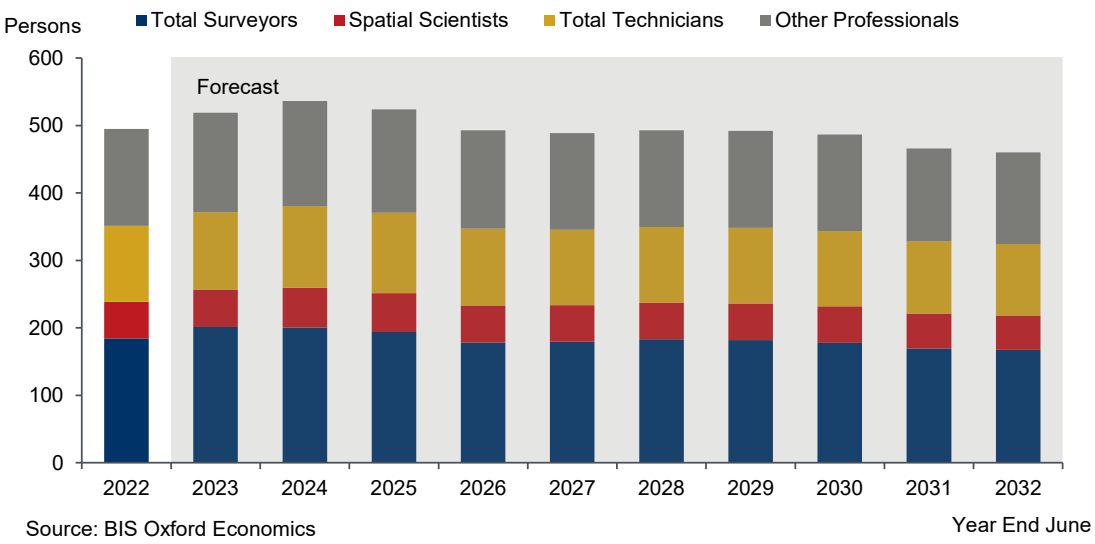
In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals in TAS will increase over 2022/23 and 2023/24 before declining as construction activity cools. As seen in Figure 13.5, demand for professionals will increase over the next two years on the back of a strong growth in house construction and non-residential work to peak at over 500 professionals in 2023/24. Following this peak, demand is set to gradually decline over the remaining years of our forecast, dragging demand to average less than 490 professionals over the rest of the decade. Whilst most other states and territories are set to undergo a decline in activity over the mid-decade, TAS is expected to continue cooling over the remaining years of the forecast.



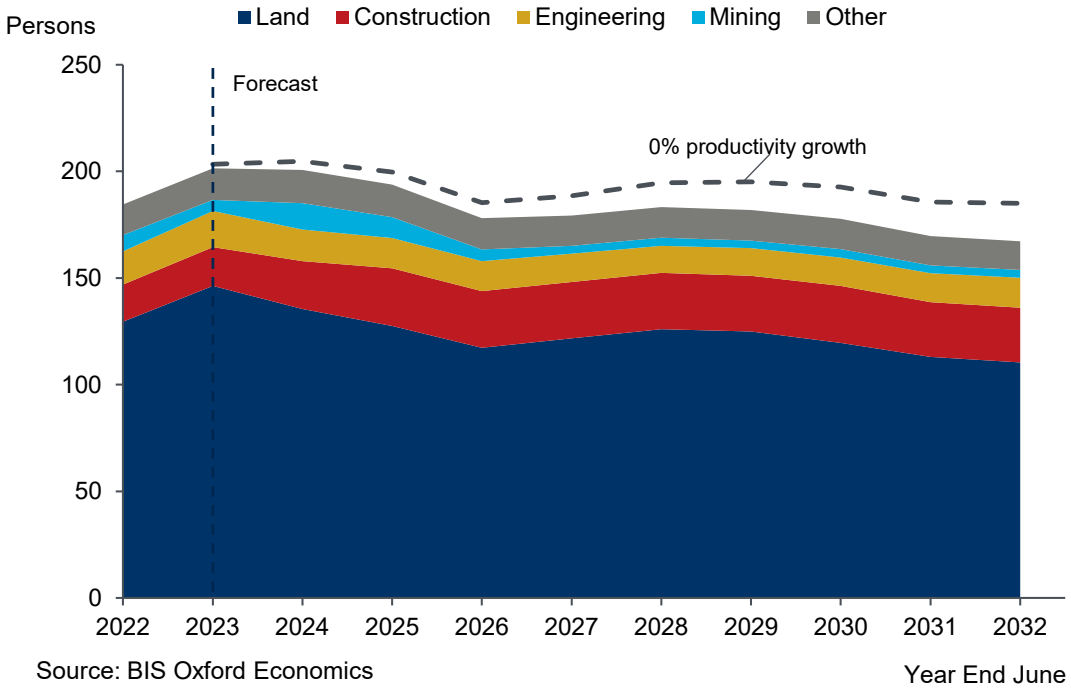
Each occupation group is set to undergo similar profiles over the next 10 years. However, we do note a slightly higher share of surveyors over the first two years of the forecast as residential construction increases proportionally greater than other drivers (boosting underlying demand for land surveyors – surveyors share of total demand). Importantly, despite the slightly greater increase in surveying demand, the share demand of each occupation group is expected to remain relatively stable over the forecast period – there will be a universal need to boost enrolment in higher education and vocational surveying and spatial science to meet to expected demand in TAS.

Figure 13.5: Forecast of Total Demand for Skilled Labour – TAS (1.0% Labour Productivity)



Regarding the different surveyors, demand will nearly reach peak initially at just over 200 surveyors in the second year of the forecast before cooling from 2024/25, as illustrated in Figure 13.6. Despite a minor increase in the number of mining surveyors between 2023/24 to 2024/25, the demand profile for each type of surveyor is set for a similar outlook. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 20 professionals. This would account for 10.6% of the expected workforce demand in 2031/32.

Figure 13.6: Forecast of Demand for Surveyors by Sector – TAS (1.0% Labour Productivity)

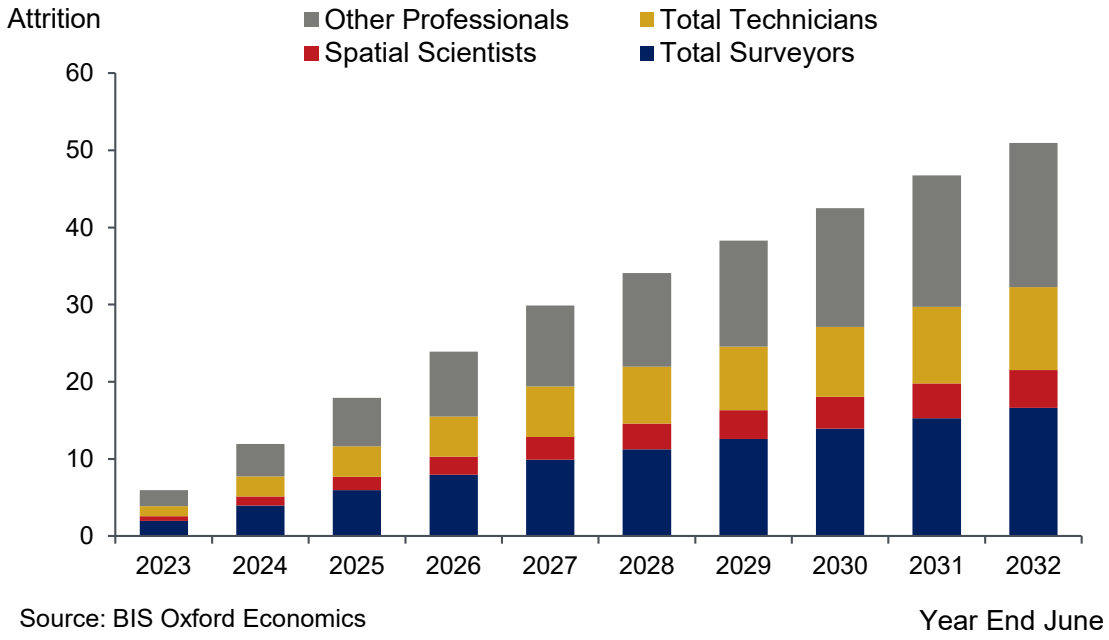


13.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current TAS workforce will increase over the next decade to reach 11.1% of the 2021/22 workforce (attrition 2031/32; 51 professionals – see Figure 13.7). This accounts to an average yearly attrition of 6 professionals, 1.1% of the current workforce. This attrition rate is above the national average of 7.3% by 2031/32 – although this represents a greater weight on supplying new labour through new graduates, the lower workforce of TAS eases the strain on enrolments.

Figure 13.7: Forecast of Aggregate Workforce Attrition – TAS



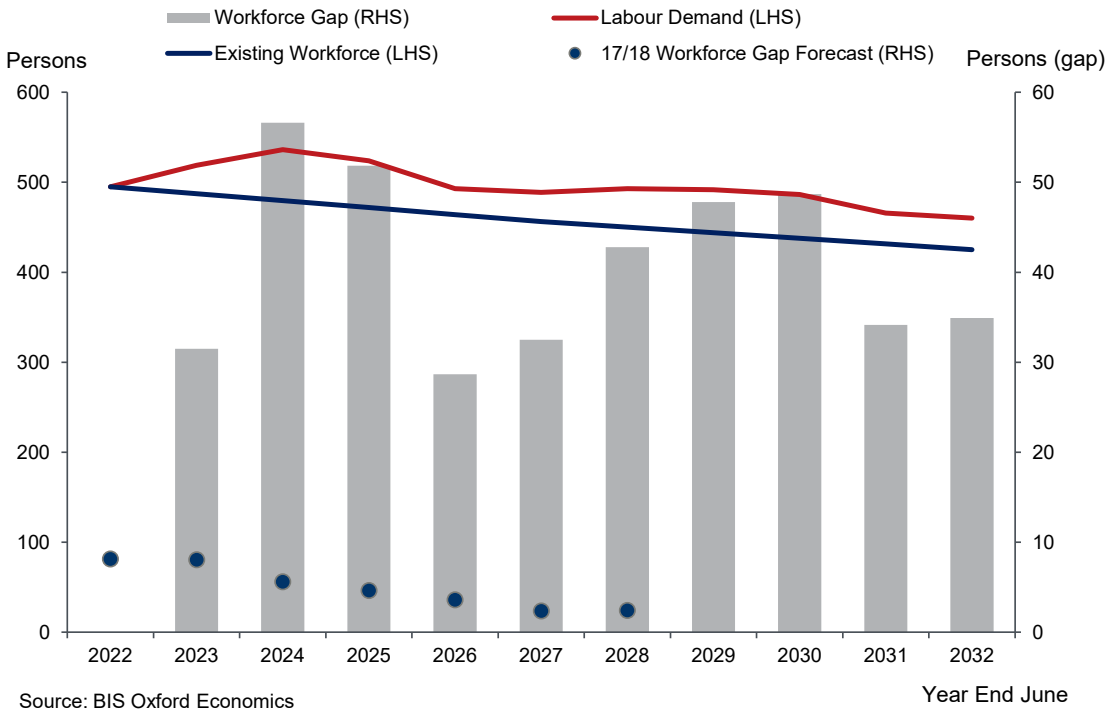
13.4.3 Forecast of Workforce Gap

Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for TAS.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in TAS from 2022/23 onwards. As discussed in Section 13.3, elevated house construction and non-residential activity over the first two years of the forecast will see the workforce gap peak at nearly 60 professionals in 2023/24 – accounting for 11.8% of the existing workforce in the same year. As seen in Figure 13.8, the workforce gap will dip over the mid-decade as activity cools before peaking over the longer-term outlook as the attrition of the existing workforce outpaces stabilising demand – by 2031/32, the workforce gap (nearly reaching 40 professionals) will equate to 8.2% of the estimated existing workforce in the same year. As such, TAS faces a relatively lesser strain on higher education enrolments as the workforce gap is forecast to be more moderate on the back of tempered activity over the later stages of the forecast.

Given the profile for all key drivers of demand across TAS, all major occupation groups are to experience a shortage of professionals each year from 2022/23 onwards. However, as shown in Table 13.2, declines in engineering and mining activity plus a cool down in residential activity, will see numerous surveying occupation groups experience a surplus over much of the outlook.

Figure 13.8: Forecast of Workforce Gap for Total Skilled Workforce – TAS



Source: BIS Oxford Economics

Table 13.2: Forecast of Labour Demand and Workforce Gap – TAS (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**184**	**201**	**201**	**194**	**178**	**179**	**183**	**182**	**178**	**170**	**167**
Land	130	146	135	128	117	122	126	125	120	113	110
Construction	17	18	22	27	27	26	26	26	27	26	26
Engineering	16	17	15	14	14	13	13	13	13	14	14
Mining	8	5	12	10	6	4	4	3	4	4	4
Other sectors	14	15	16	15	15	14	14	14	14	14	14
Registered/Licensed Surveyors (a)	*68*	*74*	*74*	*71*	*66*	*66*	*68*	*67*	*66*	*63*	*62*
Spatial Scientists	54	56	59	58	55	54	54	54	54	52	51
Total Technicians	112	115	121	119	114	112	112	112	112	107	106
Total Surveying & Geospatial Workforce	**351**	**372**	**381**	**371**	**347**	**345**	**349**	**348**	**343**	**328**	**324**
Other Professionals	144	147	156	153	146	143	144	144	143	137	136
Total skilled labour demand	**495**	**519**	**536**	**524**	**493**	**489**	**493**	**492**	**486**	**466**	**460**
Existing Workforce (b)											
All Surveyors	**184**	**182**	**179**	**177**	**174**	**172**	**170**	**168**	**166**	**164**	**162**
Land	130	128	126	124	123	121	119	118	117	115	114
Construction	17	17	17	17	16	16	16	16	16	15	15
Engineering	16	15	15	15	15	14	14	14	14	14	14
Mining	8	8	7	7	7	7	7	7	7	7	7
Other sectors	14	14	14	14	14	13	13	13	13	13	13
Registered/Licensed Surveyors	*68*	*67*	*66*	*65*	*64*	*63*	*63*	*62*	*61*	*60*	*60*
Spatial Scientists	54	54	53	52	51	51	50	49	49	48	48
Total Technicians	112	111	109	107	106	104	103	102	100	99	98
Total Surveying & Geospatial Workforce	**351**	**346**	**341**	**336**	**332**	**327**	**323**	**319**	**315**	**311**	**307**
Other Professionals	144	141	138	135	133	130	127	125	123	120	118
Total skilled labour	**495**	**487**	**480**	**472**	**464**	**456**	**450**	**444**	**438**	**432**	**425**
Workforce Gap (c)											
All Surveyors	**0**	**19**	**21**	**17**	**4**	**8**	**13**	**14**	**12**	**6**	**5**
Land	0	18	9	3	(5)	1	7	7	3	(2)	(3)
Construction	0	1	6	10	10	10	10	10	11	10	10
Engineering	0	2	(0)	(1)	(1)	(1)	(2)	(1)	(1)	(0)	0
Mining	0	(2)	5	3	(2)	(4)	(3)	(3)	(3)	(3)	(3)
Other sectors	0	1	2	1	1	1	1	1	1	1	1
Registered/Licensed Surveyors	*0*	*7*	*8*	*6*	*1*	*3*	*5*	*5*	*4*	*2*	*2*
Spatial Scientists	0	2	6	6	4	4	4	5	5	4	4
Total Technicians	0	4	12	12	8	8	9	10	11	8	8
Total Surveying & Geospatial Workforce	**0**	**25**	**39**	**34**	**15**	**19**	**27**	**29**	**28**	**17**	**17**
Other Professionals	0	6	17	18	13	14	16	19	20	17	18
Total skilled labour	**0**	**31**	**57**	**52**	**29**	**33**	**43**	**48**	**49**	**34**	**35**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR NORTHERN TERRITORY

Forecast of Labour Demand & Workforce Gap for NT

14.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across the Northern Territory (NT) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin the demand for surveyors and geospatial professionals.

14.1.1 Recent Economic Trends

The NT economy has historically been very volatile and this has continued in recent months – the NT economy contracted by 0.5% in Q2 2022, wiping out some of the very sharp growth in Q1. Growth in household consumption was commensurate with other regions, again boosted by travel and hospitality spending.

NT's long-running dwelling oversupply has evaporated following a prolonged period of reduced dwelling commencements. Total investment increased by 5% q/q, with very sharp growth in dwelling investment more than offsetting a fall in machinery & equipment spending. There was a very sharp 6.2% q/q decline in government consumption due to a fall in COVID-19-related spending. Employment and participation in the NT have been volatile in recent months but have broadly tracked sideways.

In recent years, the economic fortunes of the NT have been closely linked to the mining sector. The construction of the Ichthys LNG installation was a major driver of activity, and its completion in 2017 resulted in a sharp fall in demand, with the Territory entering a deep demand recession in Q4 2017. There were some tentative signs that conditions were starting to improve towards the end of 2019, with demand broadly holding steady and several mining sector projects announced, to further expand natural gas mining capacity.

14.1.2 Economic Outlook

Given the NT economy's dependence on the mining industry, the outlook remains more uncertain than pre-COVID-19 as shifts in policy and concerns about climate change continue to cloud long-term investment. As a result, the oil and natural gas sector face headwind not expected to go away for some time. Many projects have been put on pause, and we expect investment will be significantly lower in the medium term. The recent spike in the terms of trade has not changed the outlook materially. Some offset will be provided by government spending, with the Federal government currently undertaking several projects to expand the number of military installations in the region.

Following the recent sideways racking of employment, we expect a further pickup in the short-term, with the employment-to-population ratio still somewhat below its previous peak. Although the outlook for mining investment is not as promising as pre-COVID-19, the government's investment in the territory will drive employment growth, and we expect the labour market to perform well over the next two years.

14.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 9 employees since 2017/18 to 199 professionals in 2021/22 for the Northern Territory.

The NT experienced a mixed employment growth since 2017/18 across the major occupation groups. Surveyors experienced an increase in numbers (+18.2%) on the back an increase in engineering employment, however, this was offset by a decline in the number of spatial scientists and technicians (-20.0% and -8.2% respectively). Unsurprisingly, the number of registered surveyors decrease by 26.1% to 68 persons furthering the previous discussion in Section 6 – the hiring of registered/licensed surveyors proves to be a challenge for firms.

Surveyors are estimated to comprise 26.1% of the NT total workforce, with spatial scientists and technicians accounting for 14.6% and 39.2% respectively. This represents a smaller share of surveyors than the national share of employment. Despite the decline in the number of spatial scientists, they still account for a relatively large share of the workforce, as seen in Table 14.1 (NT share; 14.6%; National average share; 8.7%).

Table 14.1: Estimated Size of Skilled Surveying and Geospatial Workforce in NT

Occupation Groups	2017/18*	2021/22	
Surveying sectors			
Land	41	37 ▼	(4)
Construction	1	1	
Engineering	1	13 ▲	12
Mining	1	- ▼	(1)
Other sectors	-	1 ▲	1
Total surveyors	**44**	**52** ▲	**8**
Registered/Licensed Surveyors	*92*	*68* ▼	(24)
Total spatial scientists	**36**	**29** ▼	**(7)**
Surveying technicians	68	66 ▼	(2)
Spatial technicians	17	12 ▼	(5)
Total technicians	**85**	**78** ▼	**(7)**
Total skilled surveying & geospatial workforce	**165**	**159** ▼	**(6)**
Planners	6	8 ▲	2
Engineers	11	13 ▲	2
Environmental Scientists	5	6 ▲	1
Other staff (include Architects)	3	13 ▲	10
Total other professionals	**25**	**40** ▲	15
Total Skilled Workforce	**190**	**199** ▲	9

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

14.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work donea
- **Mining surveyors:** mining & heavy industry and mining exploration work done

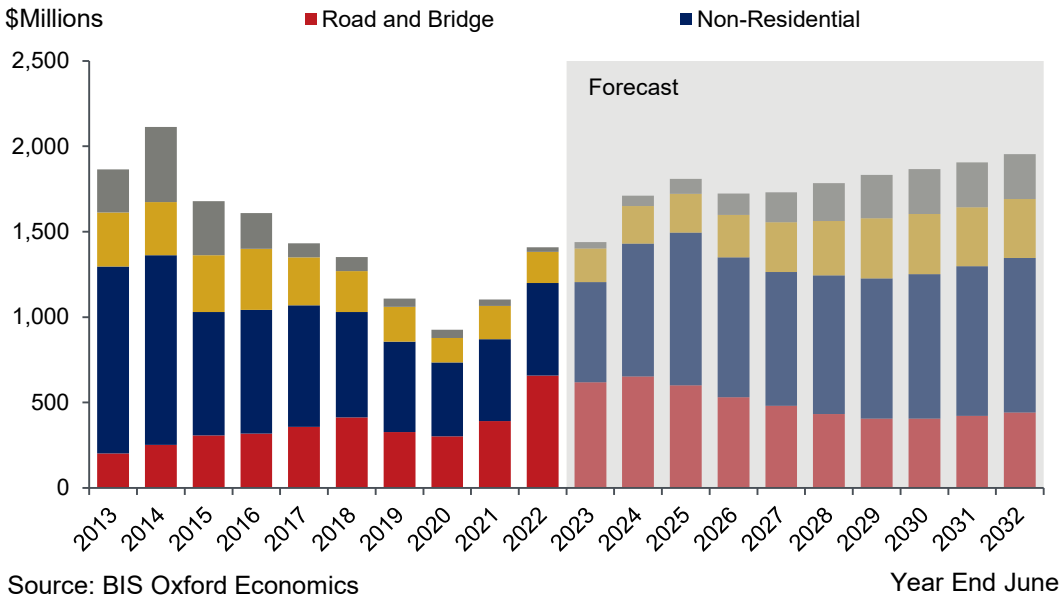
All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

14.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Activity across the land development drivers has increased over the past two years following an increase in investment in dwelling construction and road & bridge work. Total work done increased by 27.8% in 2021/22 to $1.4 billion, the highest total level since 2016/17. Following a trough in 2019/20 at $0.9 billion, activity has recovered in recent years on the back of increased public investment. Road & bridge work increased by 118.3% over the past two years to $658 million in 2021/22 driven by projects funded under the 'Roads of Strategic Importance Initiative'.

Residential construction has been moderate over the past few years, with house construction averaging $181 million since 2017/18. Although it is worth noting that the NT's historic dwelling oversupply has been reduced significantly in recent years – a key factor for the demand outlook. Offsetting this lower housing activity, non-residential work done also took a significant step up in 2021/22 (+12.8%) on the back of increased defence building to $541 million.

Figure 14.1: Land Development Drivers Value of Work Done – NT



In addition to the current major defence work and increased investment, house construction work is set to be boosted by the Darwin City Deal, feeding a positive economic outlook. The NT saw dwelling commencements, a leading indicator for house construction work done, slump 43% to 520 in 2021/22, however, with the Territory's long-term dwelling over supply dwindling, investment is set to drive commencements over the short-term. Growth in commencements is set to reach 33% and 19% in 2022/23 and 2023/24 respectively.

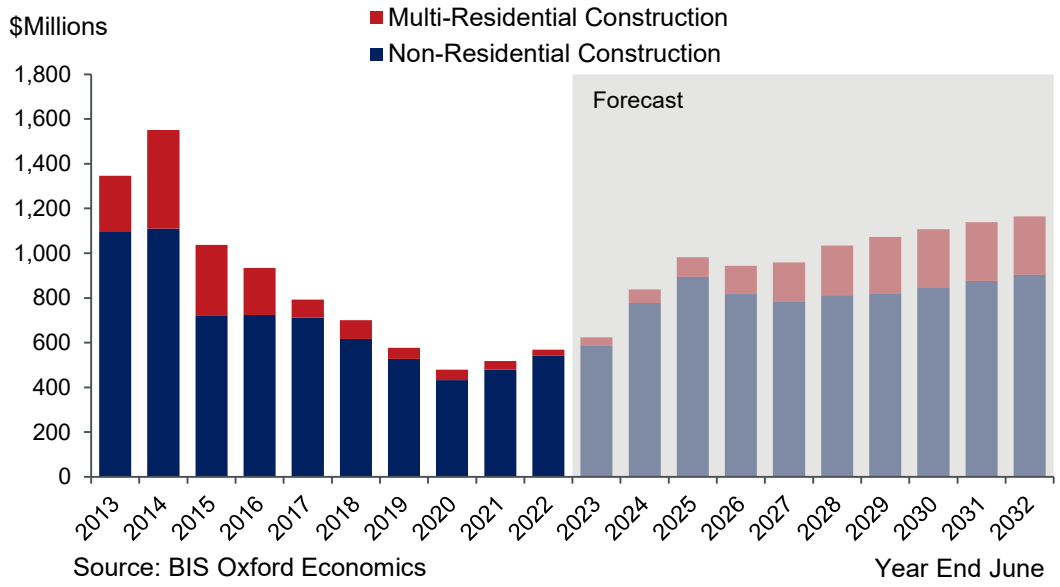
The short-term outlook for road and bridge remains positive with the stock of work yet to be done still at remarkably high levels. Namely, nearly $740 million worth of construction activity for the RAAF Base Tindal is set to be completed over at least the next three years left. Additionally, activity will be boosted by other major publicly funded work – the commencement of the Central Arnhem Road Upgrade and the Buntine Highway Upgrade.

Non-residential work is also set to increase over the next few years to peak at $894 million in 2023/24. The surge over the next two years is largely supported by the commencement of more than $1 billion work of defence building. Work done is then expected to normalise over the remainder of the forecast years, with activity pulling back in subsequent years as the pipeline of major defence and Darwin City Deal projects reach completion. Therefore, the demand for land surveyors is set to increase over the short-term before stabilising over the remaining years of the forecast.

14.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Activity

Building activity has begun to recovery in recent years as public investment drives key projects across the territory. Total building work done increased by 9.7% in 2021/22 to $569 million following increased investment in defence building projects. However, activity remains 18.8% lower than levels in 2017/18 and 63.3% below the peak in 2013/14.

Figure 14.2: Building Construction Activity Value of Work Done – NT

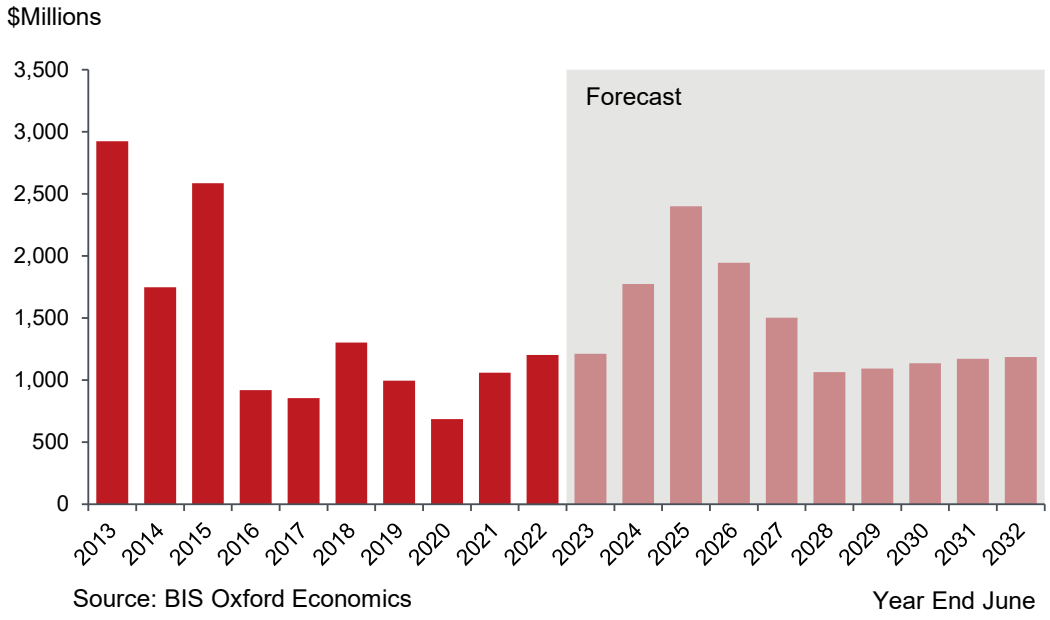


As mentioned previously, non-residential activity is set to be boosted by increased spending from defence and the Darwin City Deal projects. This strong pipeline of activity is set to boost activity over the short-term, with total activity set to initially peak in 2024/25 at nearly $1.0 billion. As the projects in the pipeline begin to move to completion, activity will cool in following years before gradually increasing on the back of strong population forecasts. Thereby, demand for construction surveyors is set to increase over the next few years before remaining at elevated levels over the long-term.

14.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Building activity across the engineering sector in NT has been strongly linked to overall mining activity, accordingly, work done in the utilities and transport industries has been relatively subdued in recent years. Follow a trough in activity in 2019/20 at $687 million, activity has picked up by 74.9% to $1.2 billion in 2021/22 as investment recovers, although this remains 58.9% below the peak in activity from the mining boom in 2012/13.

Figure 14.3: Utilities and Transport Engineering Construction Value of Work Done - NT

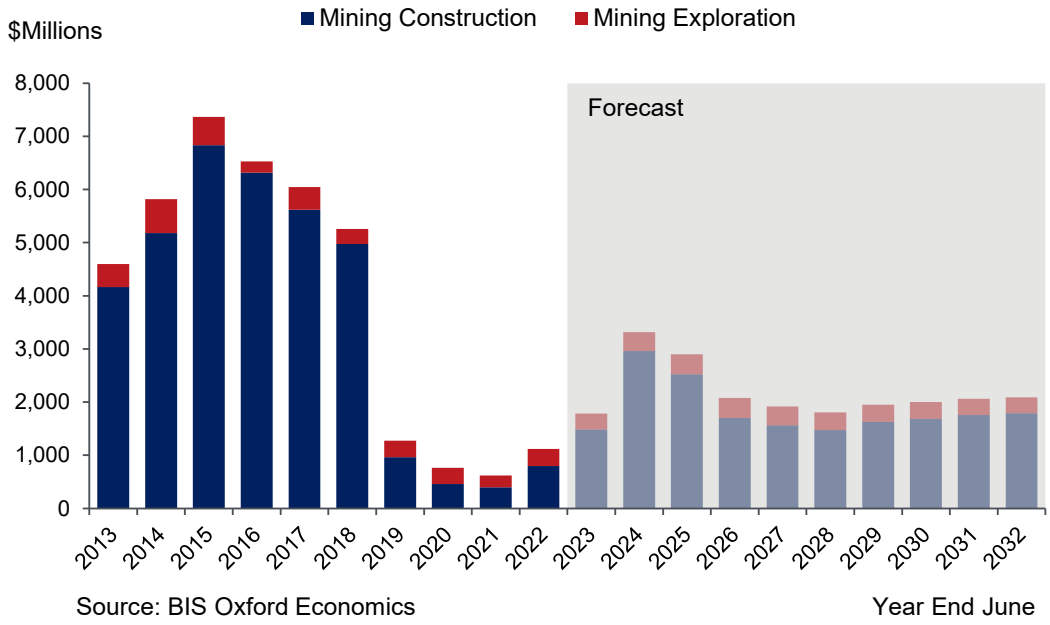


We expect activity to grow strongly over the coming years, supported by a rebound in mining investment. Activity is forecast to peak in 2024/25 at $2.4 billion, a slightly delayed peak relative to other sectors and peaks across the regions. Activity in the short-term will be driven by the ramp up in key mining projects following disruptions and delays – namely, the disrupted work at the Barossa gas field in response to the Federal Court overturning previously granted approvals. Work done will also be boosted by the Westport development and the expanding oil and gas works in the NT (and WA) and the Barossa subsea pipeline. Therefore, demand for mining surveyors is set to increase rapidly over the next three years before declining. Activity, and thus demand, is to normalise from 2027/28 onwards.

14.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

Following the boom in oil and gas investment from the peak in 2013/14, mining and heavy industry construction has fallen dramatically in recent years. After a few years of momentum from the boom, activity plummeted in 2018/19, falling 75.8% to $1.3 billion. Activity has since remained at historically low levels, averaging less than $1.0 billion over the past 4 years. However, a recovery in investment and global surge in commodity prices drove activity above $1.1 billion in 2021/22 as key projects across the Territory began to ramp up.

Figure 14.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – NT



The uptick in mining investment is set to drive activity over the short-term, with a peak expected in 2023/24 at $3.3 billion. This represents a 195.9% increase on current work – thus driving demand for mining surveyors across NT. Following this peak, activity is set to cool, averaging just under $2.0 billion for the remainder of the forecast. As such, demand for mining surveyors in NT over the long-term is set for consistent performance above current levels.

14.4 Forecast of Surveying and Geospatial Workforce

This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

14.4.1 Forecast of Skilled Labour Demand

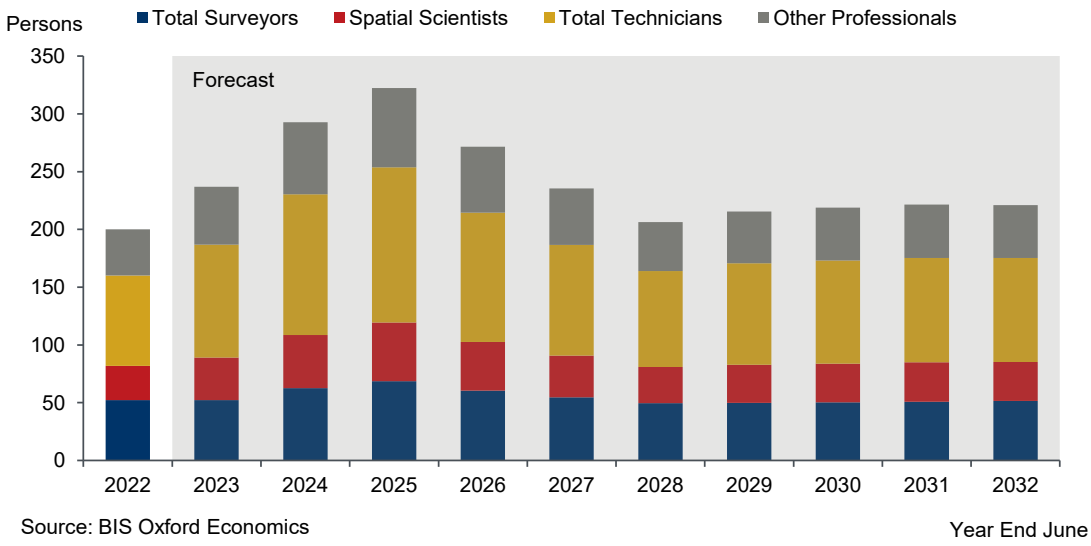
In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals in NT will increase over the next few years before peaking in 2024/25. As seen in Figure 14.5, demand for professionals will increase over the next three years on the back of a strong growth in house construction and mining work to peak at over 320 professionals in 2024/25.

This initial peaks places increased pressure on labour across NT – increased efforts on enrolment will have minimal impact on meeting the initial peak in demand due to the time taken to complete the respective courses. Additionally, we note that new graduates will largely have a lower output than the existing workforce as experience and knowledge cannot be easily replaced. Normally, NT could focus on interstate labour mobility to fill the workforce gap, however, with all states set to face an increased demand over this period, there is little room to quickly 'scale-up' the workforce from the domestic market.

Following this peak, demand is set to gradually decline over the next three years before averaging just below 220 professionals for the remaining years of the forecast.

Figure 14.5: Forecast of Total Demand for Skilled Labour – NT (1.0% Labour Productivity)

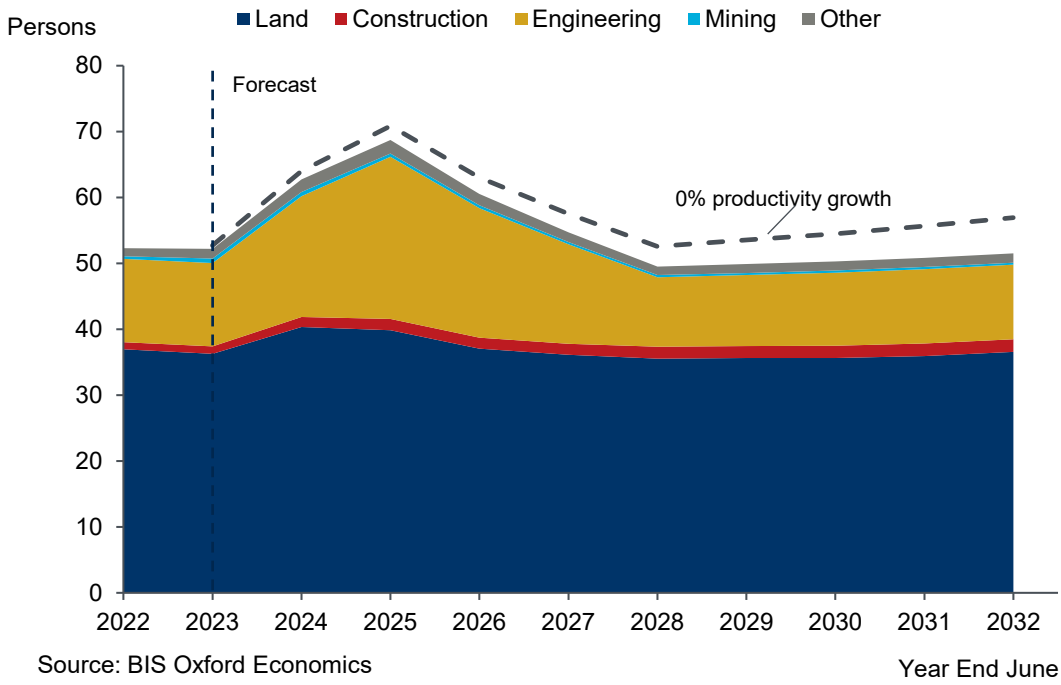


Similar to the national profile, all occupation groups are set to experience a common profile over the next decade - all major occupation groups will continue to increase in demand over the next three years to peak in 2024/25. Importantly the share demand of each occupation group is expected to remain stable over the forecast period – there will be a common need to boost enrolment in higher education and vocational studies to meet the expected demand in the NT.

Regarding the different surveyors, demand for all surveying groups will peak at nearly 70 professionals in 2024/25, as illustrated in Figure 14.6. A significant underlying result of this peak is the dramatic demand increase for engineering surveyors – on the back of increased mining investment and demand for utilities infrastructure, engineering surveyors will increase by 93.9% from 2021/22 employment to nearly 30 professionals – to account for 35.7% of total demand in 2024/25 (currently account for 24.2% of total surveyors in 2021/22). Following this peak, demand for engineering surveyors is set to revert to longer-term trends (22.0% of the total surveyors in 2031/32).

Following the profile for all surveying and geospatial professionals, after the peak in 2024/25, numbers are forecast to decline as mining investment activity cools. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by around 5 professionals. This would account for 10.6% of the expected workforce demand in 2031/32.

Figure 14.6: Forecast of Demand for Surveyors by Sector – NT (1.0% Labour Productivity)

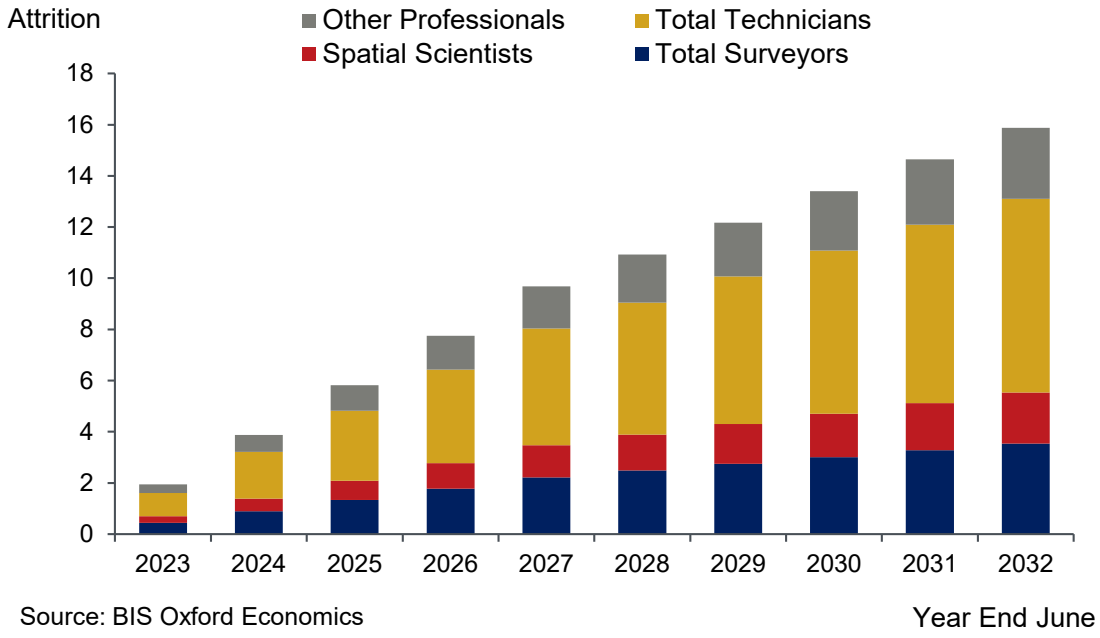


14.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current NT workforce will increase over the next decade to reach 10.7% of the 2021/22 workforce (attrition 2031/32; 11 persons – see Figure 14.7). This accounts to an average yearly attrition of 2 professional, 1.1% of the current workforce. This attrition rate is slightly above the national average of 7.3% by 2031/32 – however, with a smaller workforce base, the Territory does not face an increased pressure to replace the existing workforce with new graduates.

Figure 14.7: Forecast of Aggregate Workforce Attrition – NT



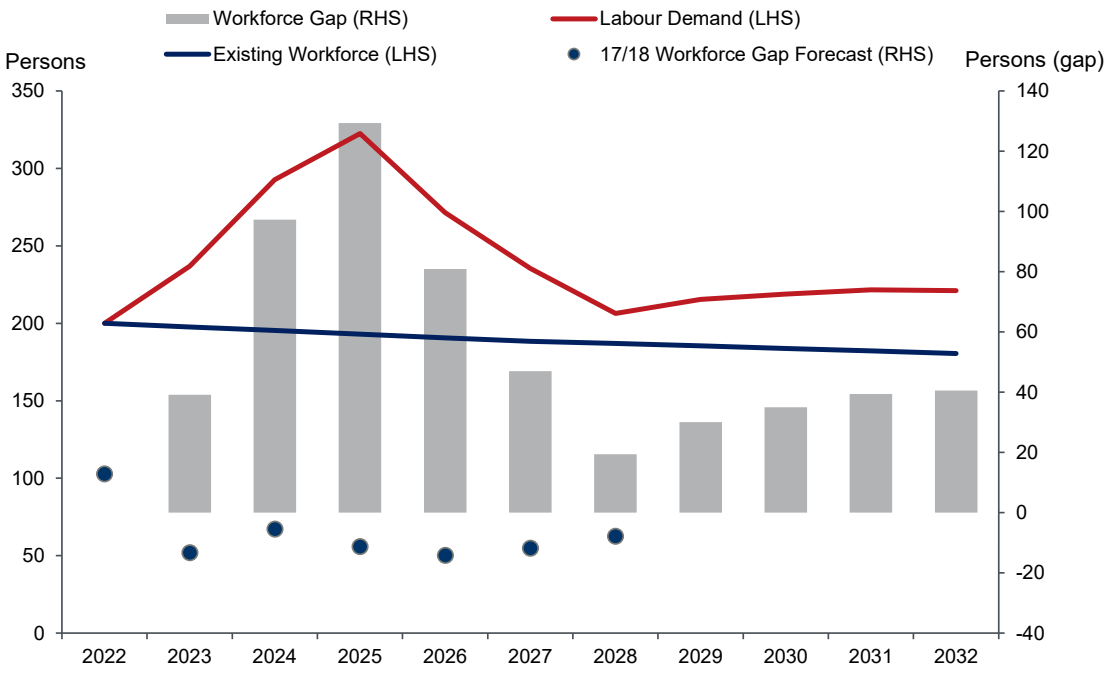
14.4.3 Forecast of Workforce Gap

Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for the NT.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in NT from 2022/23 onwards. As discussed in the Section 14.3 above, the elevated mining and utilities activity over the first three years of the forecast will see the workforce gap peak at 129 persons in 2024/25 – this will account for 67.0% of the existing workforce in the same year.

As seen in Figure 14.8, the workforce gap will dip in over the mid-decade as activity cools and remain relatively stable over the longer-term outlook – by 2031/32, the workforce gap (41 persons) will equate to 22.5% of the estimated existing workforce in the same year. **That is, NT faces a significant workforce gap in the short-term before demand declines to more normalised levels in the long-term. This places increased strain on the existing workforce due to the time taken to convert increased enrolments to the workforce.**

Figure 14.8: Forecast of Workforce Gap for Total Skilled Workforce – NT



Source: BIS Oxford Economics

Table 14.2: Forecast of Labour Demand and Workforce Gap – NT (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**52**	**52**	**63**	**69**	**61**	**55**	**49**	**50**	**50**	**51**	**51**
Land	37	36	40	40	37	36	36	36	36	36	37
Construction	1	1	2	2	2	2	2	2	2	2	2
Engineering	13	13	18	25	20	15	11	11	11	11	11
Mining	0	1	1	1	0	0	0	0	0	0	0
Other sectors	1	2	2	2	2	1	1	1	1	1	1
Registered/Licensed Surveyors (a)	*37*	*37*	*44*	*48*	*42*	*38*	*35*	*35*	*35*	*36*	*36*
Spatial Scientists	29	37	46	51	42	36	31	33	34	34	34
Total Technicians	78	98	122	134	112	96	83	88	89	90	90
Total Surveying & Geospatial Workforce	**160**	**187**	**230**	**254**	**214**	**187**	**164**	**171**	**173**	**175**	**175**
Other Professionals	40	50	62	69	57	49	42	45	46	46	46
Total skilled labour demand	**200**	**237**	**293**	**322**	**272**	**235**	**206**	**216**	**219**	**222**	**221**
Existing Workforce (b)											
All Surveyors	**52**	**52**	**51**	**51**	**50**	**50**	**49**	**49**	**49**	**48**	**48**
Land	37	37	36	36	36	35	35	35	34	34	34
Construction	1	1	1	1	1	1	1	1	1	1	1
Engineering	13	13	12	12	12	12	12	12	12	12	12
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	1	1	1	1	1	1	1	1	1	1	1
Registered/Licensed Surveyors	*37*	*36*	*36*	*36*	*35*	*35*	*35*	*34*	*34*	*34*	*33*
Spatial Scientists	29	29	29	29	28	28	28	28	27	27	27
Total Technicians	78	77	76	75	74	72	72	71	70	69	68
Total Surveying & Geospatial Workforce	**160**	**158**	**156**	**154**	**152**	**150**	**149**	**147**	**146**	**144**	**143**
Other Professionals	40	40	39	39	38	38	38	38	38	38	38
Total skilled labour	**200**	**198**	**195**	**193**	**191**	**188**	**187**	**185**	**184**	**182**	**181**
Workforce Gap (c)											
All Surveyors	**0**	**0**	**11**	**18**	**10**	**5**	**0**	**1**	**2**	**3**	**4**
Land	0	(0)	4	4	2	1	1	1	1	2	3
Construction	0	0	0	1	1	1	1	1	1	1	1
Engineering	0	0	6	12	8	3	(1)	(1)	(1)	(0)	(0)
Mining	0	0	0	0	0	(0)	(0)	(0)	(0)	(0)	(0)
Other sectors	0	0	1	1	1	0	0	0	0	0	0
Registered/Licensed Surveyors	*0*	*0*	*8*	*13*	*7*	*3*	*0*	*1*	*1*	*2*	*3*
Spatial Scientists	0	8	17	22	14	8	3	5	6	7	7
Total Technicians	0	21	46	60	38	23	12	17	20	22	22
Total Surveying & Geospatial Workforce	**0**	**29**	**74**	**100**	**62**	**36**	**15**	**23**	**27**	**31**	**33**
Other Professionals	0	10	23	30	19	11	4	7	8	8	8
Total skilled labour	**0**	**39**	**97**	**129**	**81**	**47**	**19**	**30**	**35**	**39**	**41**

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.

FORECASTS OF LABOUR DEMAND AND WORKFORCE GAP FOR AUSTRALIAN CAPITAL TERRITORY

Forecast of Labour Demand & Workforce Gap for ACT

15.1 Economic and Industry Outlook

In this section we provide an overview of the recent macroeconomic trends across the Australian Capital Territory (ACT) and the outlook for the key indicators over the next decade. The broader economic outlook helps inform the end-user activity drivers which underpin the demand for surveyors and geospatial professionals.

15.1.1 Recent Economic Trends

Home to the vast majority of the Australian Public Service, the ACT's economy is based around service delivery and public administration – as a result the territory was relatively immune to the initial stages of the pandemic, and has charted a steady, albeit unspectacular recovery since. SFD, a measure of overall economic activity, increased by a steady 0.6% q/q in Q2 2022.

More specially to the construction industry, growth in dwelling investment was strong during the quarter at 6.5% q/q, bucking the national trend in part due to a concentration of work in apartments and townhouses rather than detached dwellings – boosting the outlook for residential construction.

Strength in non-residential construction (positive growth of 1.9% q/q) helped offset a decline in business investment in machinery & equipment. Activity related to the Federal election campaign and subsequent government transition would have boosted SFD in recent months due to higher visitor numbers and fly-in, fly-out traffic.

The ACT typically enjoys a structurally lower unemployment rate than the national average. Employment in the ACT has tracked lower over most of 2022, notwithstanding a bounce in August. Nevertheless, the unemployment rate has fallen to 2.8%.

15.1.2 Economic Outlook

Following the election of the Albanese government, there is some upside to employment growth in the Australian Public Service, although the magnitude will be limited due to incoming government's focus on the task of budget repair. We expect the ACT economy will grow by 4.2% in 2022, slowing to 1.1% in 2023.

In the long-term, the territory should experience a relatively robust recovery, although momentum will be dampened by the inevitable fall back in government activity as the pandemic is controlled and related spending is unwound. Employment growth will continue to be underpinned by population growth and a high participation rate – the second highest of the states and territories after the NT.

15.2 Estimate of Existing Surveying and Geospatial Workforce

The total skilled workforce for surveying and geospatial professionals is estimated to have increased by 22 employees since 2017/18 to 431 persons in 2021/22 for the Australian Capital Territory.

The number of total surveyors is estimated to have increased by 55.7% to 123 persons, driven by increases in land (+45.2%) and construction (+360.0%) surveyors – underpinned by growth in residential and non-residential construction activity. Of note again is, similar to most states, despite the increase in total surveyor employment, the number of registered surveyors has decreased since 2017/18, with numbers falling 68.8% to 25 persons – this result further emphasizes the previous discussion in Section 6; the hiring of registered/licensed surveyors proves to be a challenge for firms.

Surveyors are estimated to comprise 28.5% of the ACT total workforce, with spatial scientists and technicians accounting for 24.1% and 39.0% respectively. Despite the downturn in the number of spatial scientists (-16.5%), as seen in Table 15.1, the occupation accounts for a relatively large share of the territory's total employment relative to the national share (14.8%). Given the relatively lower levels of residential activity across the territory compared to other regions, it is unsurprising the ACT has a lower share of surveyors and higher share of spatial scientists (and technicians).

Table 15.1: Estimated Size of Skilled Surveying and Geospatial Workforce in ACT

Occupation Groups	2017/18*	2021/22	
Surveying sectors			
Land	62	90	▲ 28
Construction	5	23	▲ 18
Engineering	8	7	▼ (1)
Mining	-	-	
Other sectors	4	3	▼ (1)
Total surveyors	**79**	**123**	▲ **44**
Registered/Licensed Surveyors	*80*	*25*	▼ (55)
Total spatial scientists	**125**	**104**	▼ **(21)**
Surveying technicians	143	151	▲ 8
Spatial technicians	23	17	▼ (6)
Total technicians	**166**	**168**	▲ **2**
Total skilled surveying & geospatial workforce	**370**	**395**	▲ **25**
Planners	8	8	
Engineers	12	11	▼ (1)
Environmental Scientists	4	3	▼ (1)
Other staff (include Architects)	15	14	▼ (1)
Total other professionals	**39**	**36**	▼ (3)
Total Skilled Workforce	**409**	**431**	▲ **22**

Source: BIS Oxford Economics, ABS, CRSBANZ

** 2017/18 workforce breakdown revised as outlined in methodology section*

15.3 Activity Driver Outlook

In this section we focus on the recent trends and outlook for the activity drivers which underpins the demand for surveyors and geospatial professionals. As demand is forecasted as a relationship between manpower required and end-user driver activity levels, the outlook for these drivers are fundamental to the surveying landscape over the next decade. As such, we provide an update for:

- **Land surveyors:** house construction, non-residential, other residential and road & bridge work done
- **Construction surveyors:** non-residential and multi-residential work done
- **Engineering surveyors:** engineering construction work done
- **Mining surveyors:** mining & heavy industry and mining exploration work done

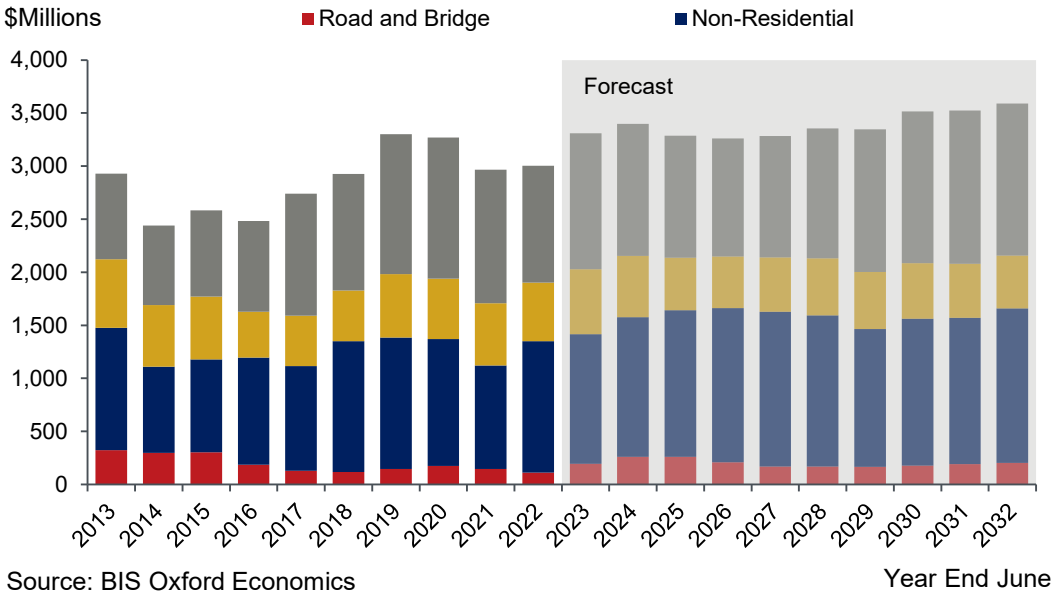
All other occupation groups are based on total construction activity which represents the aggregate work done across residential building, non-residential building and mining & heavy sectors. Accordingly, as the activity levels are captured in the above sectors, total construction outlook can be found in the Section 17.

15.3.1 Land Development Sectors Recent Trends and Outlook – Residential, House Construction, Non-Residential and Road & Bridge Activity

Elevated levels of land development activity has supported the increased employment across the surveying occupation group over the past five years. Total land development activity in the ACT has averaged 17.3% larger in the last five years than in five years to 2016/17 (average 2017/18-2021/22; $3.1 billion, average 2012/13-2015/16; $2.6 billion), the higher base of activity supports the 45.2% increase in land surveying employment.

Despite, a downturn in activity over the past two years following declines in non-residential and other residential work done in sequential years due to pandemic disruptions, total land development driver activity work done remained constant $3.0 billion in 2021/22. Although this remains 9.0% lower than the peak in activity in 2018/19 at $3.3 billion. A key feature of the ACT driver composition is a higher share of work from other residential work done – apartments account for a relatively large share of dwelling development than in other states and territories.

Figure 15.1: Land Development Drivers Value of Work Done – ACT



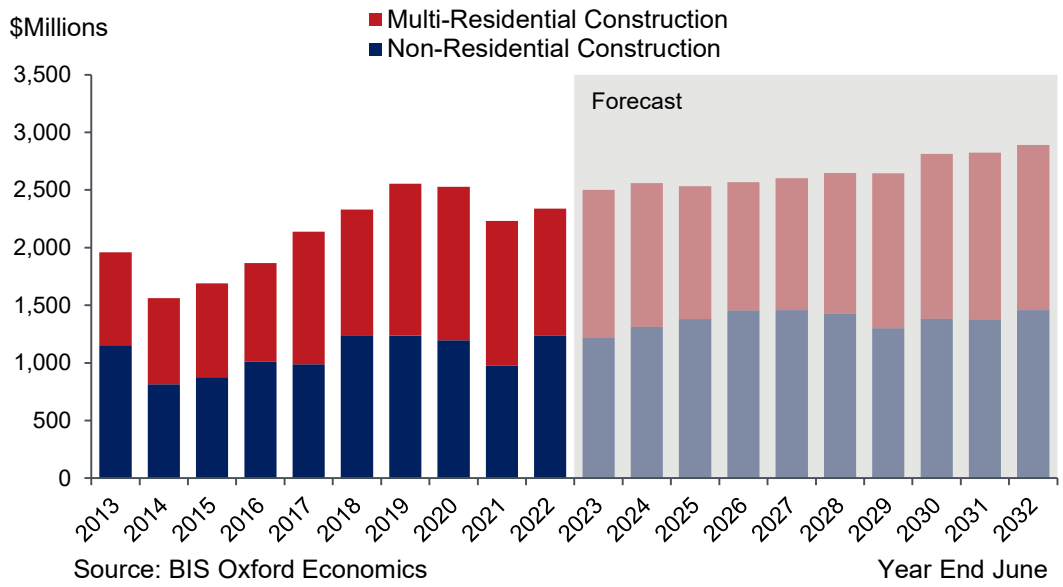
Pressure on the ACT dwelling stock will be sustained short-term by the return of overseas migration and strong public sector hiring, providing a counteract to higher interest rates. Dwelling commencements are forecast to average 4,700 per annum over the two years to 2023/24, proving a strong base for house construction. Apartments are geared to continue dominating the new dwelling mix.

Non-residential work done is set to remain at elevated levels in 2022/23, aided by ongoing growth in health activity, alongside support from the new $200 million Canberra Institute of Technology Campus in Woden. Growth will temper in 2023/24, turning negative from 2027/28. Thereby, we expect to see demand for land surveyors increase over the next two and remain at a stable level over the forecast period.

15.3.2 Construction Sector Recent Trends and Outlook – Non-Residential & Multi-Residential Construction

Similar to the profile for land development drivers, building activity work done has been at elevated levels since 2017/18 despite a downturn in the last two years due to COVID-19 disruptions. Development progress has been slowed by the shutdown of the construction sector in August 2021, along with Omicron delays over the first half of 2022 – dragging multi-residential activity down 12.5% to $1.1 billion in 2021/22. This was offset by a 27.0% increase in non-residential activity as the sector bounced back from major delays due to earlier lockdowns. As a result, total building activity rose 4.7% in 2021/22 to $2.3 billion.

Figure 15.2: Building Construction Activity Value of Work Done – ACT



As mentioned previously, non-residential activity is set to maintain its momentum over the next few years as growth is supported by increased spending from the health and education sectors. Additionally, strong demand from renewed population migration, will drive multi-residential activity as the apartment heavy new dwelling mix offsets increased borrowing rates. Strong population forecasts will drive activity over the long-term forecast, therefore the outlook for ACT construction activity is for strong, consistent growth over the next decade. Accordingly, demand for construction surveyors is set to rise over the forecast period as activity continues to increase.

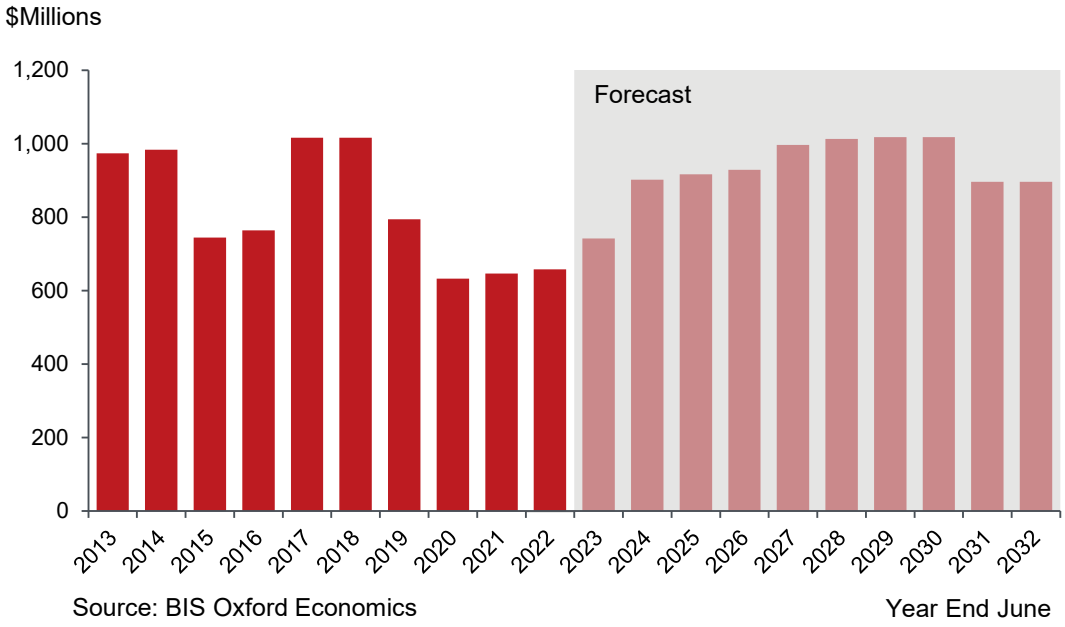
15.3.3 Engineering Sector Recent Trends and Outlook – Utilities and transport engineering construction

Engineering activity has been relatively moderate over the past few years, increasing 1.8% to $658 million in 2021/22. Activity is set to increase over the coming years, supported by work on the Canberra Light Rail. In combination with an increased population growth, engineering activity is set for continued growth until 2029/30 – activity will reach $1.0 billion, a 54.7% growth from 2021/22 levels. Accordingly, demand for engineering surveyors across ACT is set to increase for the majority of the next decade.

Figure 15.3, activity as plateaued in recent years as infrastructure projects has slowed and the construction industry has been hampered by COVID-19 restrictions. Accordingly, this softer activity has driven a decline in engineering surveyor employment (-21.4%) since 2017/18.

Activity is set to increase over the coming years, supported by work on the Canberra Light Rail. In combination with an increased population growth, engineering activity is set for continued growth until 2029/30 – activity will reach $1.0 billion, a 54.7% growth from 2021/22 levels. Accordingly, demand for engineering surveyors across ACT is set to increase for the majority of the next decade.

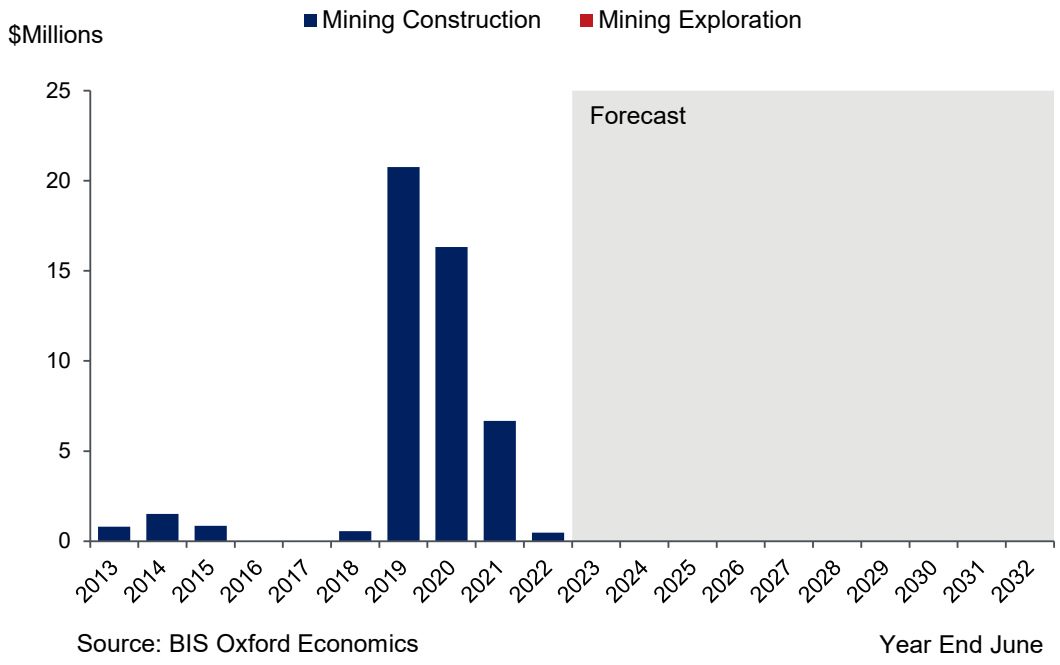
Figure 15.3: Utilities and Transport Engineering Construction Value of Work Done - ACT



15.3.4 Mining and Heavy Industry Sector Recent Trends and Outlook

With a minimal mining sector (and no mining surveyors in the estimated workforce), ACT mining & heavy construction and mining exploration investment accounts for a very minor share of national output. Despite a brief increase in activity between 2018/19 and 2020/21, we forecast no activity over the next decade. Therefore, we do not anticipate any demand for mining surveyors in the ACT.

Figure 15.4: Mining & Heavy Industry Construction and Mining Exploration Investment Value of Work Done – ACT



15.4 Forecast of Surveying and Geospatial Workforce

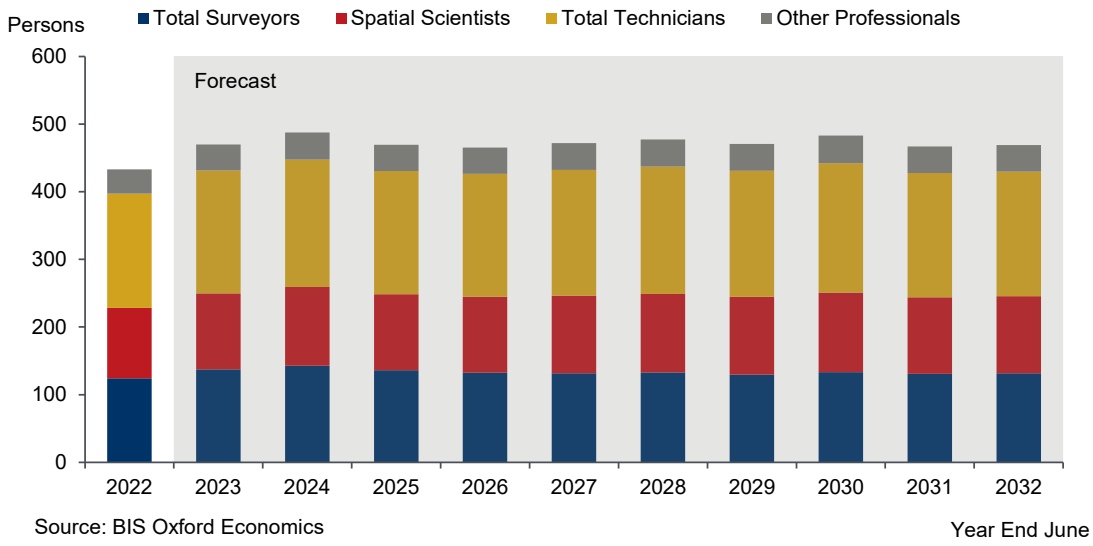
This section examines our expectations for the future levels of demand for the surveying workforce (considering the end-use activity drivers discussed in the previous section) and the level of workforce attrition (i.e., retirements) over the next decade. The relationship between these two series, labour demand and current workforce plus attrition informs the workforce gap in the labour market. Furthermore, we also consider the new labour supply from graduates, which in addition to the two factors above, informs the capability gap.

15.4.1 Forecast of Skilled Labour Demand

In this section we present the results of the forecasted labour demand. As mentioned above, the demand for each occupation group is based on the work done across the occupation's relevant end-user drivers. Therefore, the outlook for each driver dictates the following demand levels.

Demand for surveying and geospatial professionals in TAS will increase over 2022/23 and 2023/24 before declining as construction activity cools. As seen in Figure 15.5, demand for professionals will increase over the next two years on the back of a strong growth in non-residential and multi-residential work to peak at nearly 500 professionals. Following this peak, demand is set to gradually decline over the following years to trough at just over 450 professionals in 2025/26. This profile is not unique to ACT as most regions are set to experience a peak in demand over the short-term before activity cools across the nation.

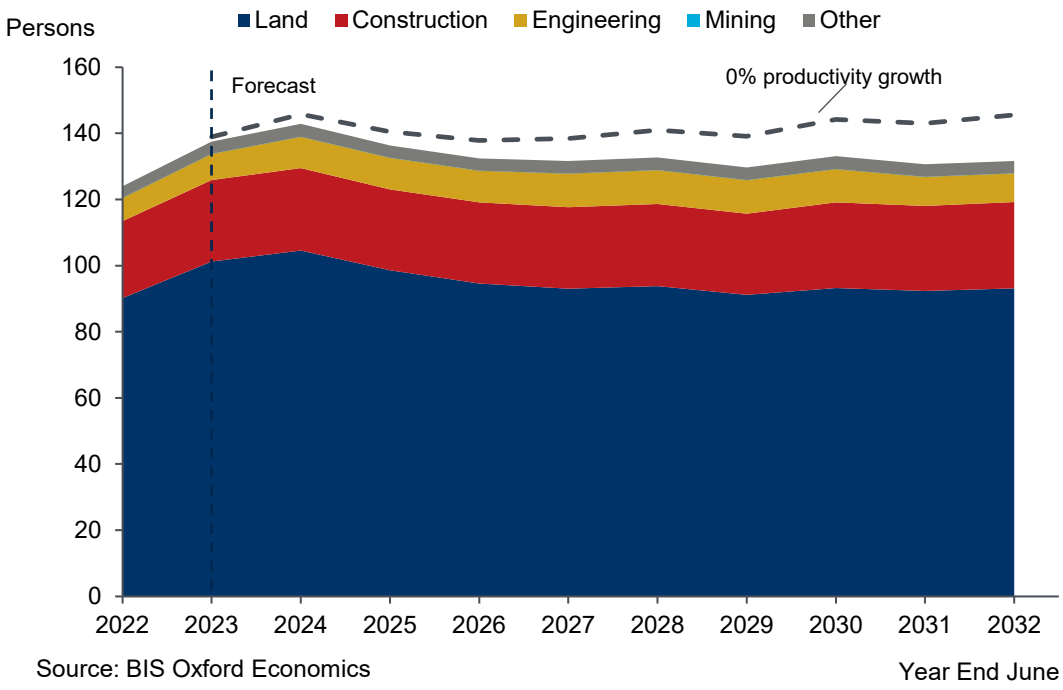
Figure 15.5: Forecast of Total Demand for Skilled Labour – ACT (1.0% Labour Productivity)



Similar to the national profile, all occupation groups are set to experience a common profile over the next decade – all major occupation groups will experience an initial peak in activity in 2023/24. The increased share of spatial scientists is set to be maintained over the next decade as the end-user drivers endure a common outlook. Importantly, given the share demand of each occupation group is expected to remain stable over the forecast period – there will be a universal need to boost enrolment in higher education and vocational surveying and spatial science to meet to expected demand in ACT.

Regarding the different surveyors, demand will nearly reach peak at nearly 150 surveyors in the second year of the forecast before cooling over the remaining years, as illustrated in Figure 15.6. By the end of the forecast period, the 1.0% labour productivity growth will reduce demand by 14 professionals. This would account for 10.6% of the expected workforce demand in 2031/32.

Figure 15.6: Forecast of Demand for Surveyors by Sector – ACT (1.0% Labour Productivity)

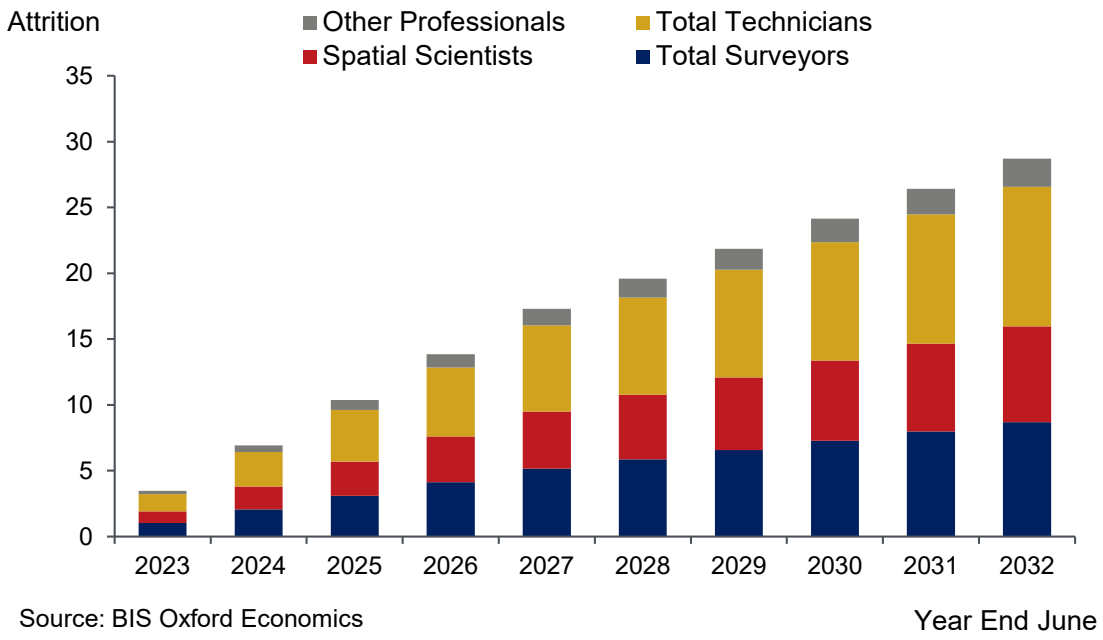


15.4.2 Forecast of Workforce Attrition

Over the next decade, the number of those currently working is expected to diminish due to retirements. Given the estimated age profile of each occupation group, we apply the retirement assumptions determined in Section 3 each year to the current workforce to determine the aggregate attrition.

The aggregate attrition of the current ACT workforce will increase over the next decade to reach 6.8% of the 2021/22 workforce (attrition 2031/32; 29 professionals – see Figure 15.7). This accounts to an average yearly attrition of 3 professionals, 0.7% of the current workforce. This attrition rate is below the national average of 7.3% by 2031/32 – although this represents a greater weight on supplying new labour through new graduates, the lower workforce of ACT eases the strain on enrolments.

Figure 15.7: Forecast of Aggregate Workforce Attrition – ACT



15.4.3 Forecast of Workforce Gap

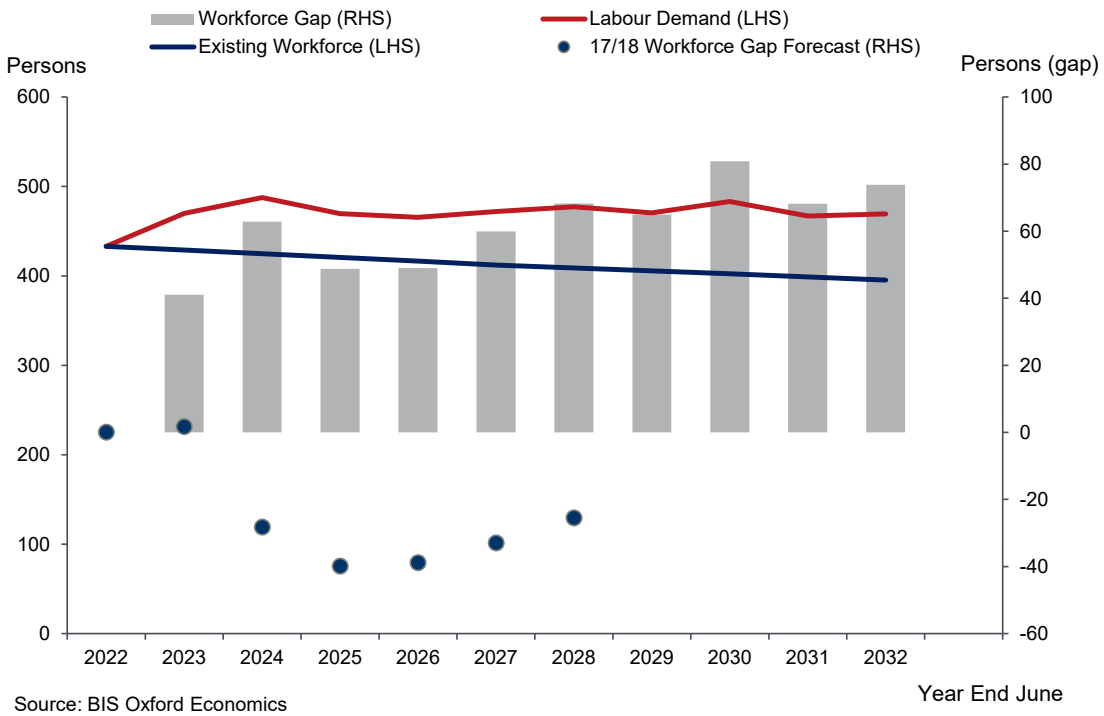
Following the forecast of labour demanded and the attrition of the existing workforce we now focus on determining if a workforce gap exists. That is, does the demand for surveyors and geospatial professionals outpace the current workforce less the attrition from retirements. This section of the report presents the results of the workforce gap for the ACT.

We forecast there to be a positive workforce gap (shortage) in the number of total skilled surveying and geospatial professionals in ACT from 2022/23 onwards. As discussed in Section 15.3 above, the elevated non-residential and multi-residential activity over the first two years of the forecast will see the workforce gap peak at over 60 professionals in 2023/24 – this will account for 14.8% of the existing workforce in the same year.

As seen in Figure 15.8, the workforce gap will dip in over the mid-decade as activity cools before picking over the longer-term outlook – by 2031/32, the workforce gap (nearly 80 persons) will equate to 18.7% of the estimated existing workforce in the same year. That is, ACT faces a relatively large strain on education enrolments as the workforce gap is forecast to be more dramatic albeit against a lower workforce base.

Given the profile for all key drivers of demand across ACT, all major occupation groups are to experience a shortage of professionals each year from 2022/23 onwards. As seen in Table 15.2, demand for land surveyors and spatial scientists will account for 41.4% of the total skilled labour workforce gap by the end of the forecast period.

Figure 15.8: Forecast of Workforce Gap for Total Skilled Workforce – ACT



Source: BIS Oxford Economics

Table 15.2: Forecast of Labour Demand and Workforce Gap – ACT (1.0% Labour Productivity)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Estimates	Forecasts									
Labour Demand											
All Surveyors	**193**	**225**	**234**	**216**	**201**	**199**	**205**	**208**	**214**	**211**	**211**
Cadastral	141	166	172	157	145	142	146	147	151	150	150
Building	36	41	42	38	36	36	37	39	41	41	41
Engineering	11	12	15	15	15	16	16	16	16	14	14
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	5	6	6	6	6	6	6	6	6	6	6
Registered/Licensed Surveyors (a)	*25*	*29*	*30*	*28*	*26*	*26*	*26*	*27*	*28*	*27*	*27*
Spatial Scientists	163	184	191	177	170	173	178	183	188	182	181
Total Technicians	41	46	48	45	43	44	45	46	47	46	46
Total Surveying & Geospatial Workforce	**397**	**456**	**473**	**438**	**414**	**416**	**428**	**437**	**450**	**438**	**438**
Other Professionals	28	31	32	30	29	29	30	31	32	31	31
Total skilled labour demand	**425**	**487**	**506**	**468**	**443**	**445**	**458**	**468**	**482**	**469**	**469**
Existing Workforce (b)											
All Surveyors	**193**	**192**	**190**	**188**	**186**	**184**	**182**	**180**	**179**	**177**	**176**
Cadastral	141	139	138	137	135	134	132	131	130	129	128
Building	36	36	36	35	35	34	34	34	34	33	33
Engineering	11	11	11	11	11	10	10	10	10	10	10
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	5	5	5	5	5	5	5	5	5	5	5
Registered/Licensed Surveyors	*25*	*25*	*25*	*24*	*24*	*24*	*24*	*23*	*23*	*23*	*23*
Spatial Scientists	163	161	159	158	156	154	153	152	150	149	148
Total Technicians	41	41	40	40	39	39	39	39	38	38	38
Total Surveying & Geospatial Workforce	**397**	**393**	**389**	**385**	**381**	**377**	**374**	**371**	**367**	**364**	**361**
Other Professionals	28	27	27	27	27	26	26	26	26	26	26
Total skilled labour	**425**	**420**	**416**	**412**	**408**	**403**	**400**	**397**	**393**	**390**	**386**
Workforce Gap (c)											
All Surveyors	**0**	**34**	**45**	**28**	**16**	**16**	**23**	**28**	**35**	**34**	**36**
Cadastral	0	26	34	20	10	8	13	16	21	21	23
Building	0	5	6	3	1	1	3	5	8	8	8
Engineering	0	1	4	4	4	5	6	6	6	4	4
Mining	0	0	0	0	0	0	0	0	0	0	0
Other sectors	0	1	1	1	0	1	1	1	1	1	1
Registered/Licensed Surveyors	*0*	*4*	*6*	*4*	*2*	*2*	*3*	*4*	*5*	*4*	*5*
Spatial Scientists	0	23	32	20	14	18	25	31	38	33	34
Total Technicians	0	6	8	5	3	4	6	8	9	8	8
Total Surveying & Geospatial Workforce	**0**	**62**	**84**	**53**	**33**	**39**	**54**	**67**	**82**	**74**	**77**
Other Professionals	0	4	5	3	2	3	4	5	6	5	5
Total skilled labour	0	66	89	56	35	41	58	71	88	79	82

(a) Registered surveyors are included in the total number of surveyors.

Source: BISOE, ABS, CRSBANZ

(b) Existing workforce is generated by diminishing the size of the current skilled workforce due to retirement.

(c) Workforce gap is calculated as labour demand less existing workforce. Positive number implies shortage of labour; bracketed number implies excess of supply.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LIMITATION AND FUTURE RESEARCH

Limitation and Future Research

A key limitation of the quantitative model used in this report is that it measures requirements in terms of labour or 'personnel', not necessarily skills and experience. This is important in an industry such as surveying, given that it can take 10 years through training and experience to become a registered/licensed surveyor. The model used here quantifies a capability deficit or surplus in terms of the number of persons required across the occupation groups considered. However, this does not consider the range of skills or experience held by persons, not only between occupations, but within an occupation group. Retirees will always have much more skills and experience than the new personnel that replace them. This is particularly true when supply is focused on new graduates, but the impact may be lessened by the hiring of personnel via immigration, where existing skills and experience may be higher.

As mentioned in earlier studies, an *"equivalent persons"* index may be developed. This aim of the index would be to convert the "number of persons" measure to a measure of skills and capability. This index will require accurate measures of experience earned (e.g., number of years employed in the surveying and geospatial industry for each person, not just age) and some agreement on an appropriate scale that compares people with different measures of experience. The scale will explicitly reflect the pace at which people develop once hired and reach "high" levels of capability, and the point at which they reach a maximum contribution. We feel this is a valid area for further enquiry and development in future studies but note that it would affect the comparability of results between studies.

A second limitation of the model is its assumptions regarding the timing of surveying demand. The model as specified quantifies the annual capability shortfall or surplus that is forecast to exist in the surveying and geospatial industry for each year to 2031/32 and is based on BIS Oxford Economics' projections of construction activity in that year. However, for many surveying occupations, the demand for labour will necessarily precede the period where actual construction takes place (for example, the necessary design, measurement, calculations, plan and document presentations occurs well before the construction phase). In the case of engineering skills, particularly, we believe that hiring should take place around 4-6 years before anticipated increases in skills demand to allow time for appropriate professional development that will meet workforce requirements. Together, this means that, ideally, labour hiring should take place several years before any anticipated peaks in the measured capability shortfall (which is based on construction work done). Even so, we suspect that the quantified capability shortfall or surplus provides a reasonable estimate of the true labour requirement, on average, across the forecast period.

A third limitation is the way retirement is modelled – we estimate retirements against a total national workforce retirement rate for a specified age group. This has had the impact of reducing the number of retirements from the existing workforce compared to previous studies, which we consider to be a more realistic outcome. However, there is still considerable scope to improve the estimation and forecasting of retirement across the surveying population. Here, we could improve accuracy in the retirement model by undertaking closer study (through a survey) of retirement behaviour specifically amongst surveying and geospatial professionals. The results of this survey could provide a more realistic attrition rate over time.

The model is also limited in terms of its accounting for career progression. So far, the model assumes workers to remain within their skill level throughout the 10-year forecast horizon. However, from engaging with key stakeholders it was apparent that it is quite often for technicians to obtain higher level of qualifications and progress to working as a qualified surveyor, and likewise from a candidate surveyor to a registered/licensed surveyor. Capturing the multiple stages of career progression in the model may improve the realism of our forecasted results. Adding this dimension can better inform workforce planning.

Finally, we believe that there needs to be a more consistent terminology adopted for the surveying profession across the states and territories and embedded within the data that is then collected by the ABS and education sector. For this report, we have retained the terminology we have used in previous reports (for consistency purposes) for describing different types of surveying work as well as qualifications but acknowledge that it may cause confusion for some readers. We express our hope that future updates of the workforce capability position for the surveying industry will be agreed on a single terminology that describes the surveying profession and the roles within it.


Australian
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APPENDIX A

17.1 Key Term and Conventions

Surveying and geospatial workforce: surveyors, spatial scientists, and surveying and spatial technicians.

Total skilled workforce: skilled surveying and geospatial workforce plus the number of planners, engineers, environmental scientists and other staff employed at consulting surveying firms.

Existing skilled workforce: the current size of the skilled workforce. This is adjusted for natural attrition through ageing over the forecast horizon.

Demand for skilled labour: based on BIS Oxford Economics' forecasts of the key determinants of skilled workforce.

Workforce gap: the difference between the **demand for labour** and the **size of the existing workforce.** If labour demand exceeds the size of the existing workforce, then we have 'positive' workforce gap. A positive workforce gap implies that the existing workforce will be insufficient to cover for expected future demand. Conversely, if the size of existing workforce exceeds the demand for skilled labour, then a 'negative' workforce gap arises, implying that the existing workforce will more than cover for the expected future skills demand.

New labour supply: the additional labour supply from new graduates, net migration from overseas and other labour supply boosting initiatives (re-training, productivity improving measures, slower rates of attrition etc.). Only the first source is considered explicitly in this report.

Net capability position: the difference between the estimated **workforce gap** and the **new supply of skilled labour** via new graduates. If the net capability position is positive, we refer to it as a 'capability shortfall'. This implies that the surveying and geospatial industry needs to attract additional labour on top of expected levels of new graduates if it is to achieve forecast levels of construction activity. Conversely, a negative capability position reflects a 'capability surplus' which implies the industry has more than enough capacity to undertake the expected future levels of activity.

17.2 Temporary Visas for Skilled Surveying and Geospatial Workers

The national number of visa grants has plateaued from the 2014/15 with the visa grants in skilled surveying and geospatial occupations, either through the Temporary Skill Shortage (subclass 482) visa or Temporary Work (subclass 457) visa, averaging 17 per quarter, as seen in Figure 17.1: Visa Grants. Despite a dip during the initial stages of COVID, the number of grants has remained close to long-run trend, with the number of grants for surveyors or spatial scientists recovering from the trough of 4 in Q4 of 2019/20 to 27 Q4 2022. The number of visa grants for technicians has historically accounted for a very minor share of total visas, with an aggregate of 13 granted since Q4 2018/19.

Since 2016/17, NSW has accounted for nearly half (49.7%) of all visas granted. As shown in Table 17.1, NSW, VIC and QLD have accounted for 83.4% of all visas granted over the same time period.

Figure 17.1: Visa Grants

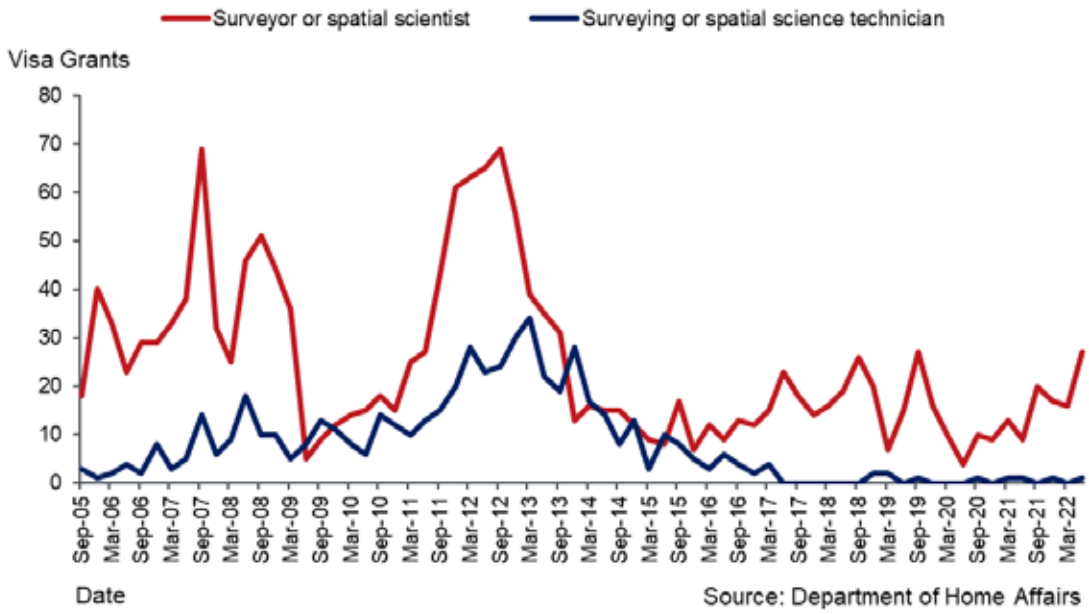


Table 17.1: Visa Grants by State, 2016/17-2020/21

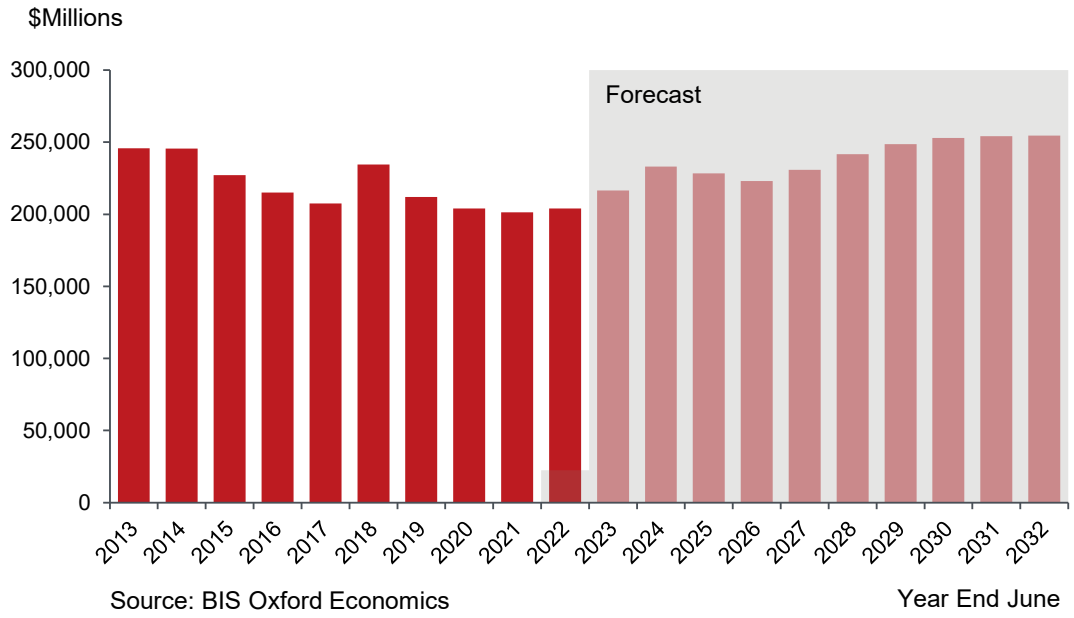
State	2017	2018	2019	2020	2021
NSW	40	38	35	22	21
VIC	7	13	21	13	13
QLD	10	12	8	9	0
SA	0	1	1	1	1
WA	11	2	5	10	6
TAS	1	0	0	0	0
NT	1	0	1	0	1
ACT	3	1	1	3	2

17.3 Total Construction Activity

Total construction activity has plateaued over the past few years as the boom in residential construction has been offset by a decline in engineering activity. As seen in Figure 17.2, total construction work has declined from a recent peak of $234.5 billion in 2017/18 to $204.0 billion in 2021/22.

Total construction activity is set to grow strongly over the two years to 2023/24, as the upswing in engineering construction activity coincides with an upturn in building activity. Non-oil and gas construction activity is expected to surpass its previous peak, reached during the mining boom. We anticipate engineering construction activity to account for around 47% of total construction activity.

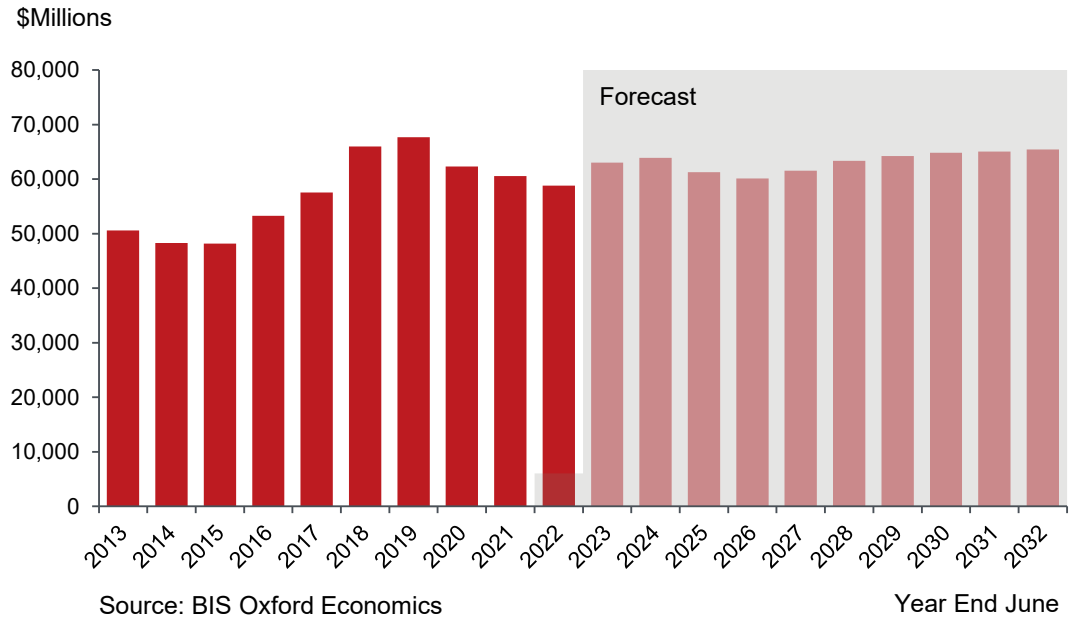
Figure 17.2: Total Construction Value of Work Done – Australia



17.3.1 New South Wales Total Construction Outlook

The NSW construction industry is relatively more diverse than Australia as a whole, with activity more evenly split between engineering and building construction, compared to the resource rich states (WA and OLD). A backlog of residential activity and publicly funded engineering construction projects will push total construction activity up over the next two years, as seen in Figure 17.3, rising from $58.8 billion in 2021/22 to $63.9 billion in 2023/24 – an 8.7% growth. Higher borrowing and construction costs, and the completion of major transport projects coming into the middle of the decade will see overall activity wind back moderately to $60.6 billion by 2025/26.

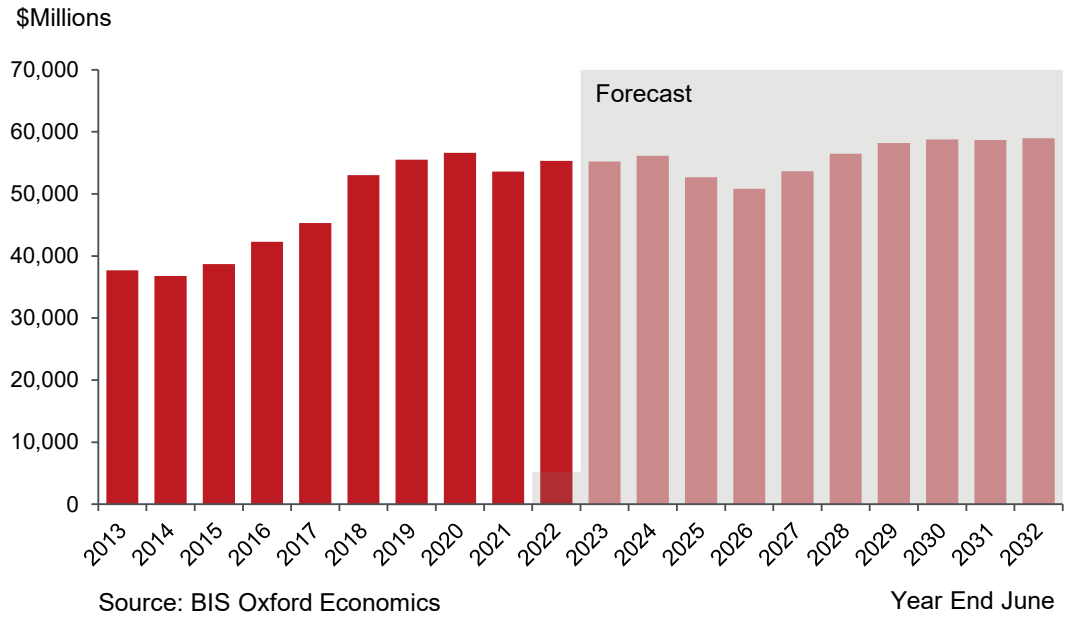
Figure 17.3: Total Construction Value of Work Done – New South Wales



17.3.2 Victoria Total Construction Outlook

Victorian construction activity is also well diversified between building and engineering construction, although residential construction represents a higher proportion of total construction relative to other major Australian states. VIC's economy was hardest hit by the pandemic, which saw overall activity construction activity fall 5.3% in 2020/21, after six years of solid growth prior. A seen in Figure 17.4, a strong pipeline of transport infrastructure, along with a slight uptick in residential building activity will see slight growth in construction activity in 2023/24 (+1.7%) – with work done to peak at $56.1 billion – followed by a decline in activity over 2024/25 and 2025/26 led by falling building work.

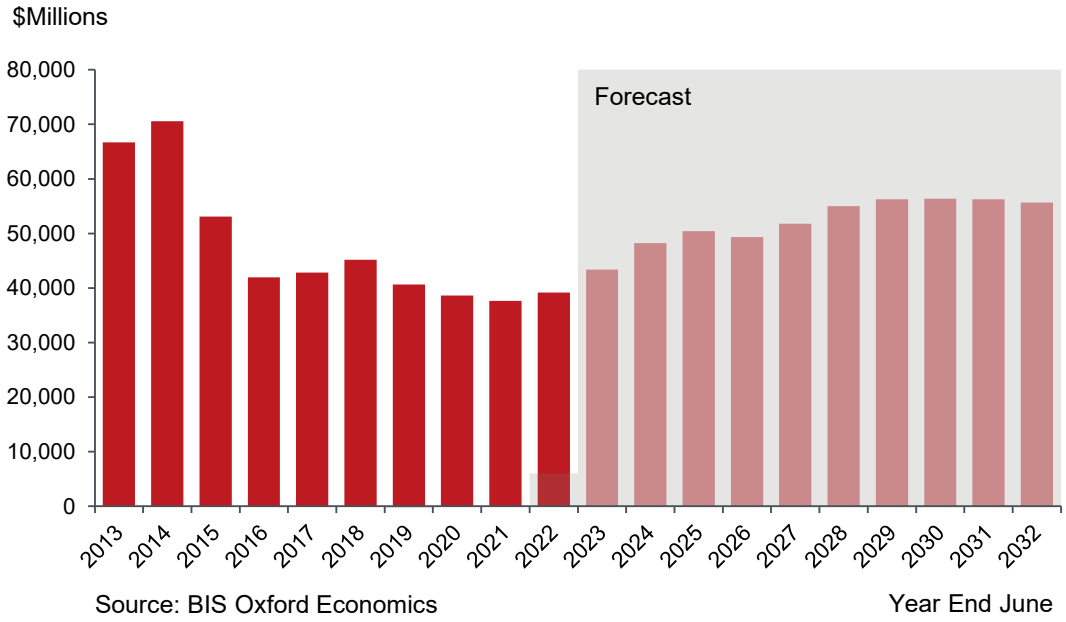
Figure 17.4: Total Construction Value of Work Done – Victoria



17.3.3 Queensland Total Construction Outlook

Total construction in QLD has been more reliant on engineering construction sector over the last decade due to the importance of mining and associated infrastructure. A downturn in both engineering construction and building drove total construction work done down to a trough of $37.6 billion in 2020/21. As illustrated in Figure 17.5, activity picked up in 2021/22 and is forecast to see strong growth over the next two years (10.8% in 2022/23 and 11.3% in 2023/24), seeing activity initially peak at $50.4 billion in 2024/25.

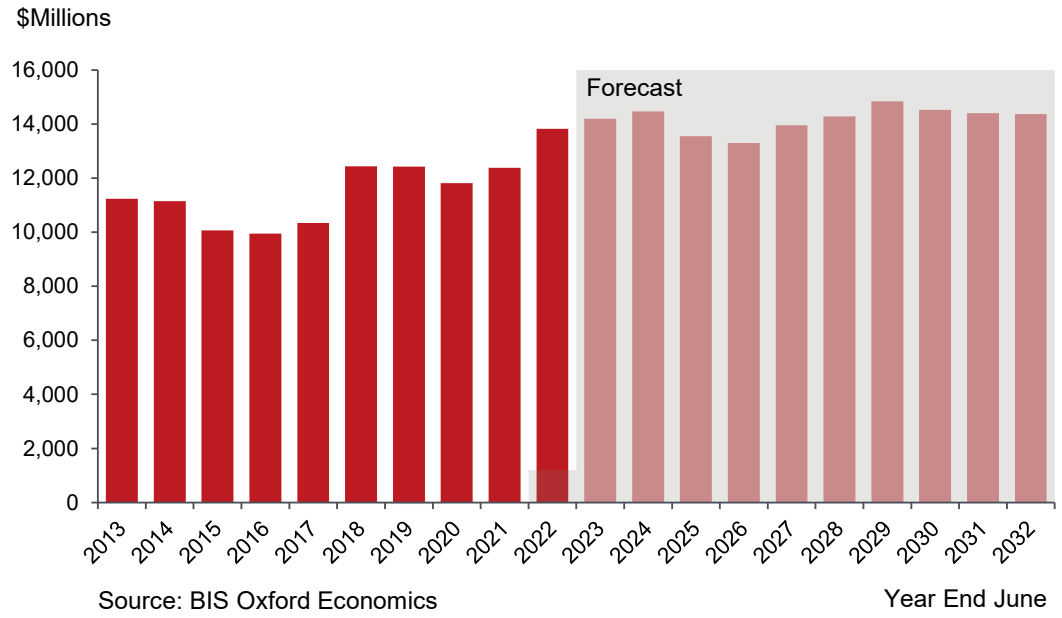
Figure 17.5: Total Construction Value of Work Done – Queensland



17.3.4 South Australia Total Construction Outlook

The SA construction market is dominated by engineering construction work, which has consistently represented 50% to 60% of total work done within the state. As seen in Figure 17.6, overall construction activity is forecast to peak in 2023/24 at $14.5 billion as activity picks up in residential, non-residential building and transport construction. A downturn in residential and non-residential building and non-residential building activity due to rising borrowing and construction costs will see a slight downturn in overall construction activity in 2024/25 and 2025/26 (-6.3% and -1.9% respectively) to $13.3 billion.

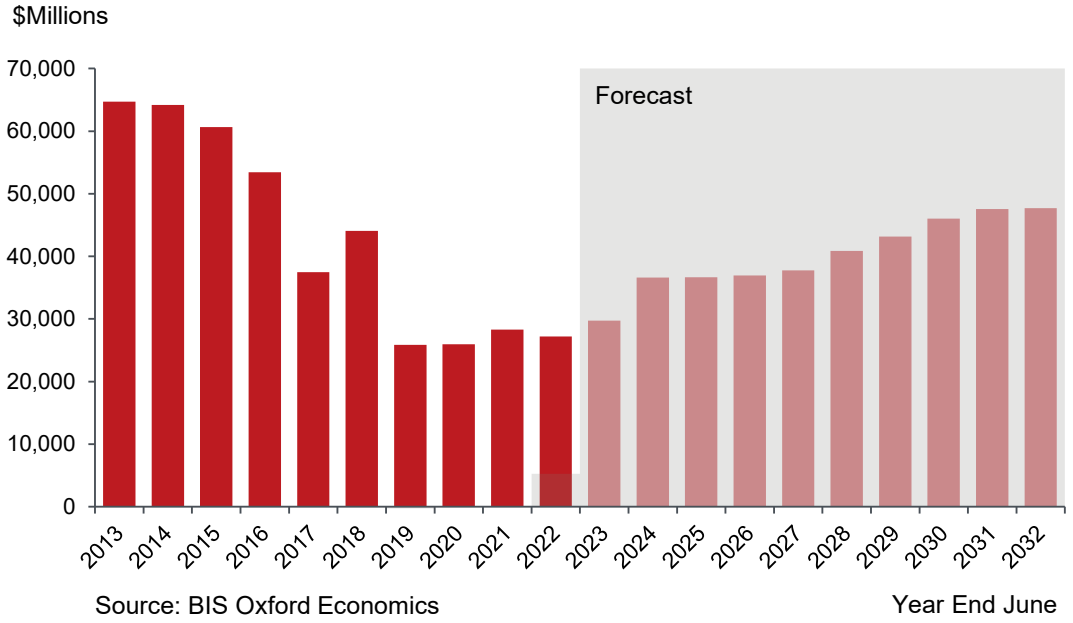
Figure 17.6: Total Construction Value of Work Done – South Australia



17.3.5 Western Australia Total Construction Outlook

Historically, construction in WA has been centered around the mining and heavy industry segment of engineering construction. Having peaked in the midst of the resource investment boom in 2012/13 ($64.7 billion), total construction activity collapsed to a trough of $25.8 billion in 2018/19. With the next cyclical upswing in mining investment materialising, total construction activity has picked up in recent years, as seen in Figure 17.7, and is forecast to strengthen considerably over the next few years, with growth of 9.2% in 2022/23 and 23.3% in 2023/24. Total activity is set to continue to increase over the rest of the forecast period, albeit more moderately, reaching $47.7 billion in 2031/32.

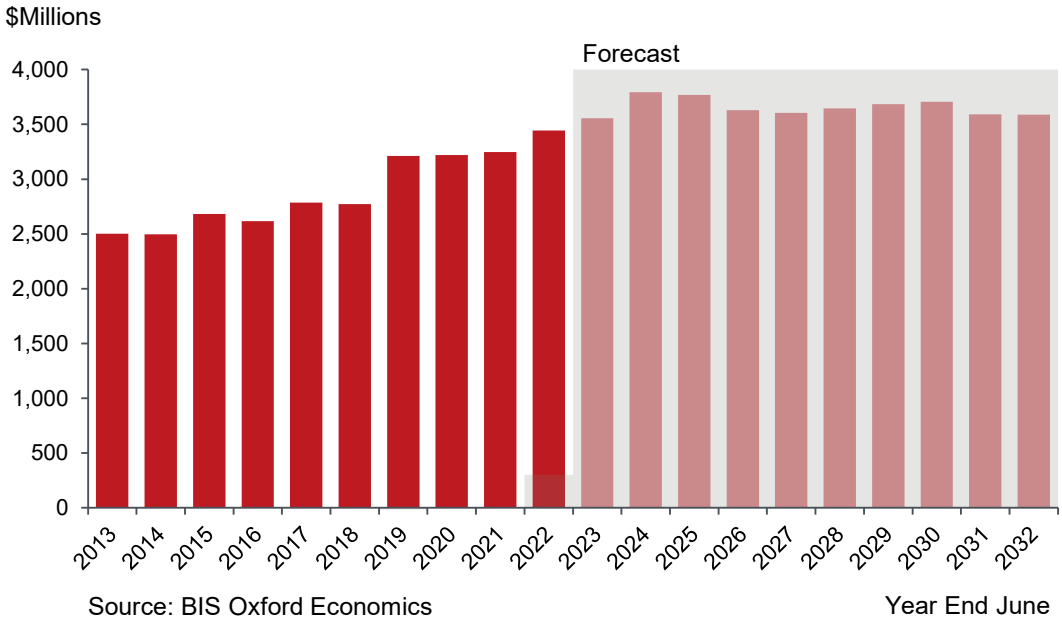
Figure 17.7: Total Construction Value of Work Done – Western Australia



17.3.6 Tasmania Total Construction Outlook

Total construction activity has been gradually rising in TAS over the past decade to reach a peak in 2021/22 at $3.4 billion. Strengthened activity from residential construction, driven by the HomeBuilder program, has underpinned this sustained growth. As shown in Figure 17.8, the current momentum in the TAS construction sectors is set to be sustained over the next two years as residential construction continues to battle historic undersupply across the state. Total activity is set to peak at $3.8 billion in 2023/24 before cooling as residential activity drops following increased borrowing and construction costs.

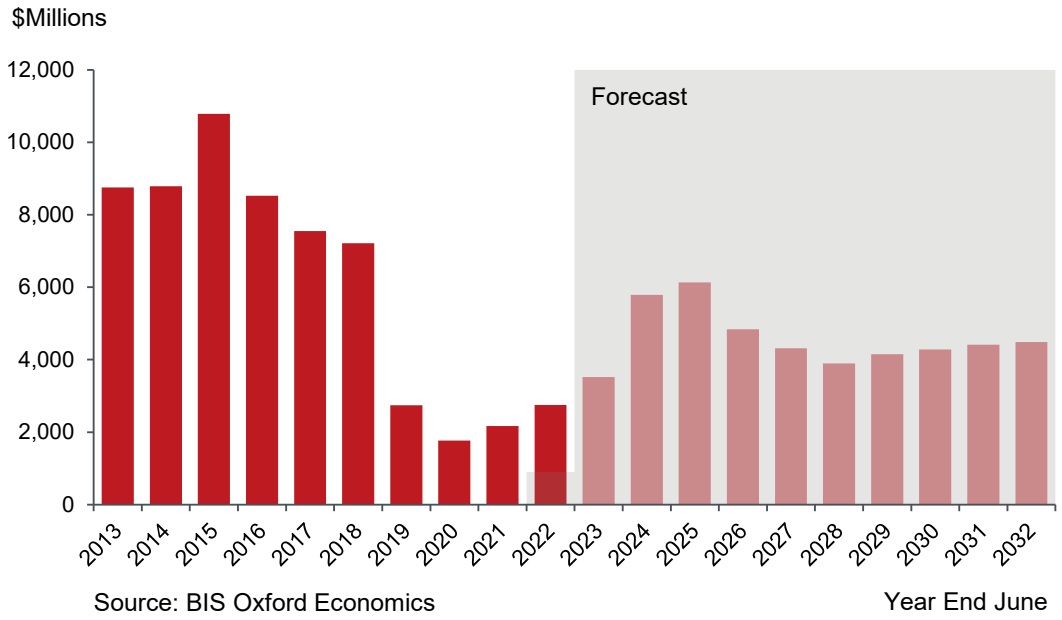
Figure 17.8: Total Construction Value of Work Done – Tasmania



17.3.7 Northern Territory Total Construction Outlook

Total construction activity has recovered in recent years in the NT as mining investment materialises and public stimulus has supported residential construction. As illustrated in Figure 17.9, after the peak in investment from the mining boom in 2014/15, activity troughed in 2019/20 at $1.8 billion but has since improved to $2.8 billion in 2021/22. On the back of a wave of mining investment, total construction activity is set to grow over the next three years to peak $6.1 billion in 2024/25 before cooling over the remaining years of the forecast.

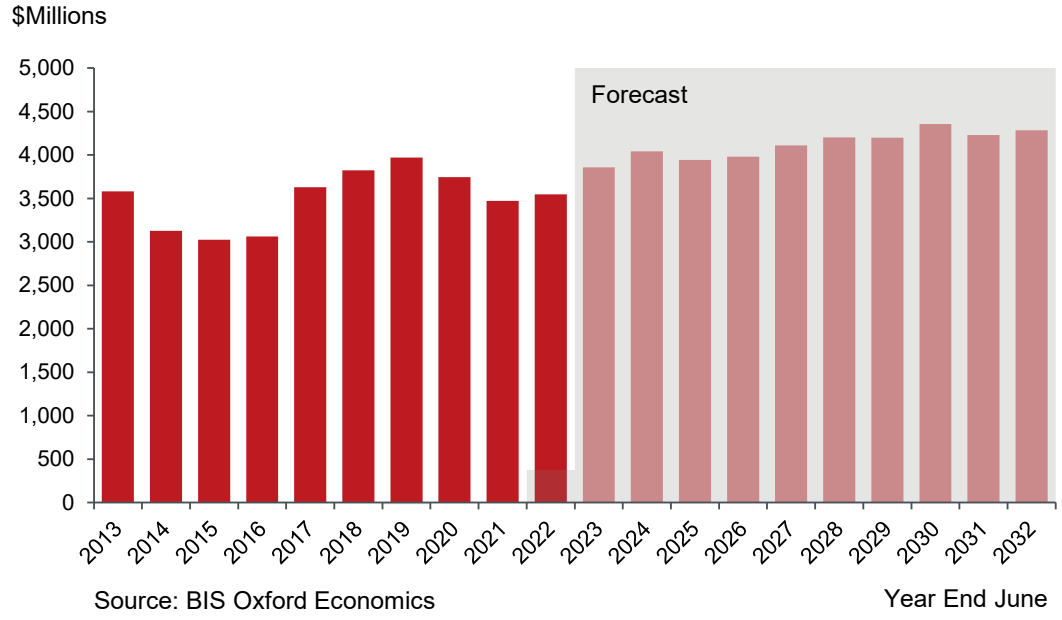
Figure 17.9: Total Construction Value of Work Done – Northern Territory



17.3.8 Australian Capital Territory Total Construction Outlook

Total construction activity in the ACT has been relatively shielded from COVID-19-related disruptions due to the territory's high reliance on service delivery and public administration. Activity rose 2.2% in 2021/22 to $3.5 billion as growth in dwelling investment picked up. As seen in Figure 17.10, total construction activity is set to continue its growth as dwelling investment continues to drive residential activity. Following consecutive years of growth in 2022/23 (+8.7%) and 2023/24 (+4.8%) activity will peak at $4.0 billion in 2023/24 before cooling over the following years as government activity declines as the COVID-19 pressures control budget spending – although activity is set to remain above current levels.

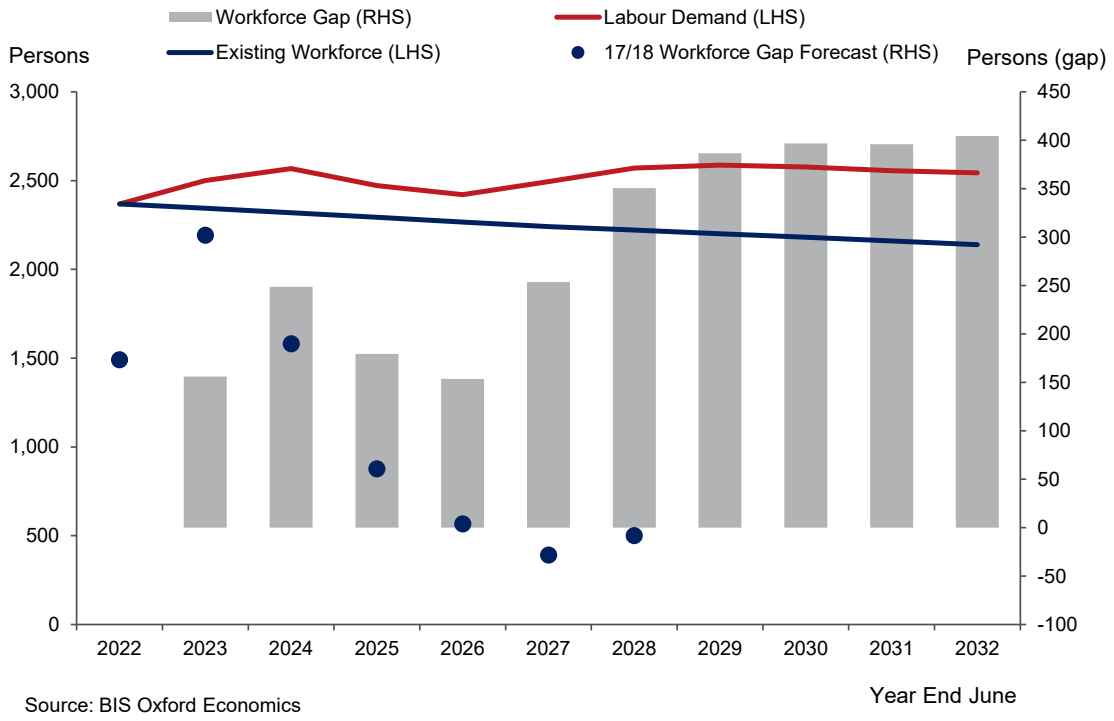
Figure 17.10: Total Construction Value of Work Done – Australian Capital Territory



17.4 Workforce Gap – Australia

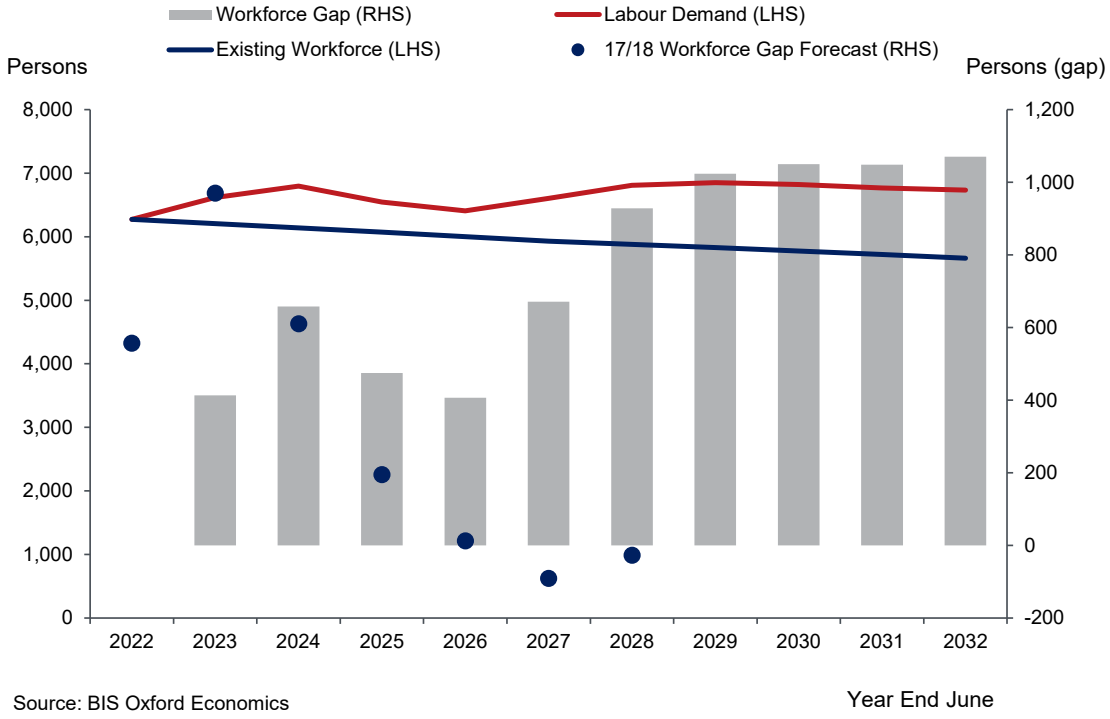
In Section 7.4.3, we focus on the workforce gap for the total skilled workforce – we forecast a gap of 1,247 persons in 2022/23 before increasing to 3,903 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 7.3 and discussed in prior commentary.

Figure 17.11: Forecast of Workforce gap for Registered Surveyors – Australia (1.0% Labour Productivity)



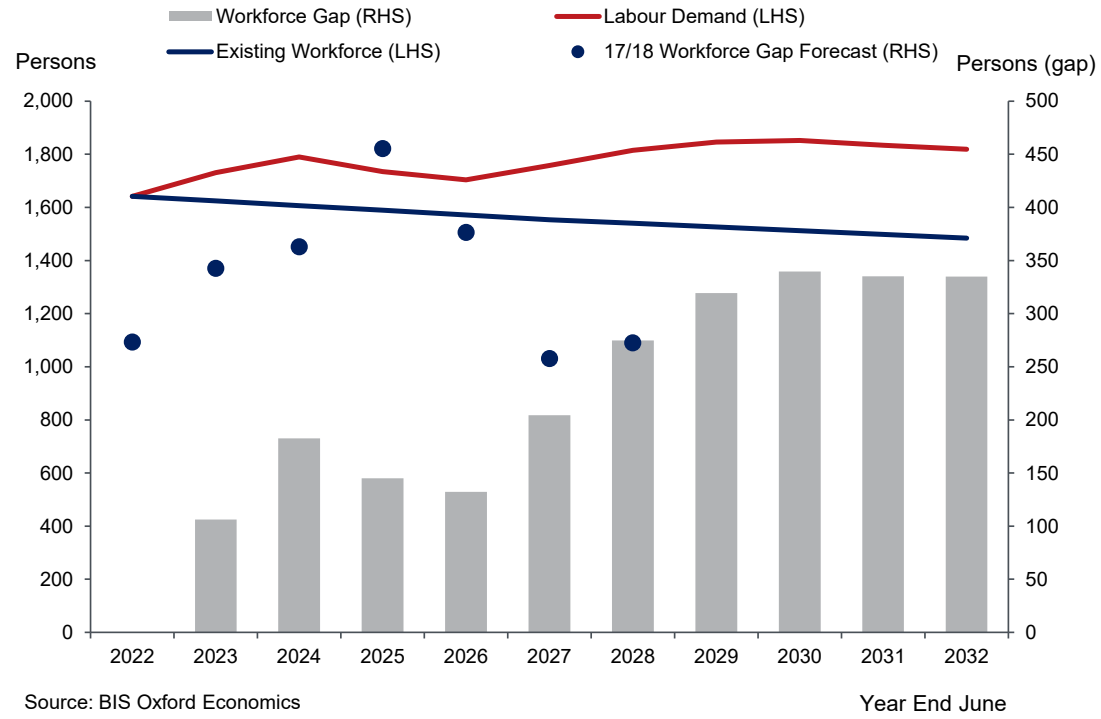
Source: BIS Oxford Economics

Figure 17.12: Forecast of Workforce gap for Total Surveyors – Australia (1.0% Labour Productivity)



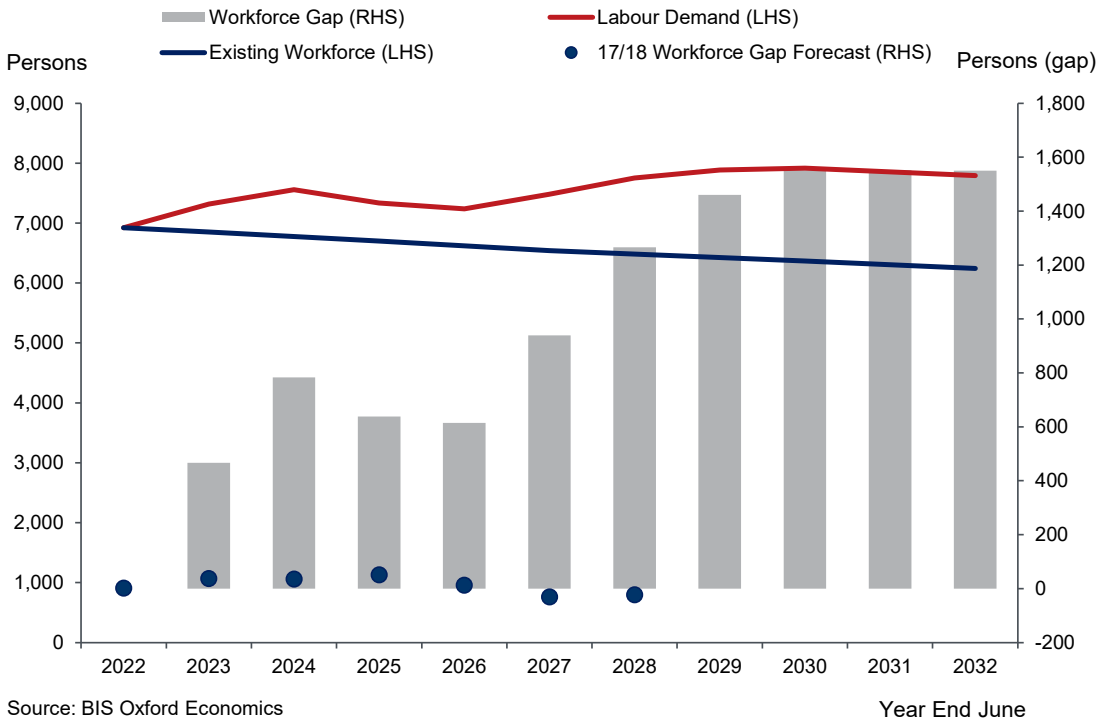
Source: BIS Oxford Economics

Figure 17.13: Forecast of Workforce gap for Spatial Scientists – Australia (1.0% Labour Productivity)



Source: BIS Oxford Economics

Figure 17.14: Forecast of Workforce gap for Total Technicians – Australia (1.0% Labour Productivity)



Source: BIS Oxford Economics

17.5 Workforce Gap – New South Wales

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 8.3.

We forecast the workforce gap for the total skilled workforce to reach 366 persons in 2022/23 before increasing to 481 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 8.2 and discussed in prior commentary.

Figure 17.15: Forecast of Workforce gap for Registered Surveyors – New South Wales (1.0% Labour Productivity)

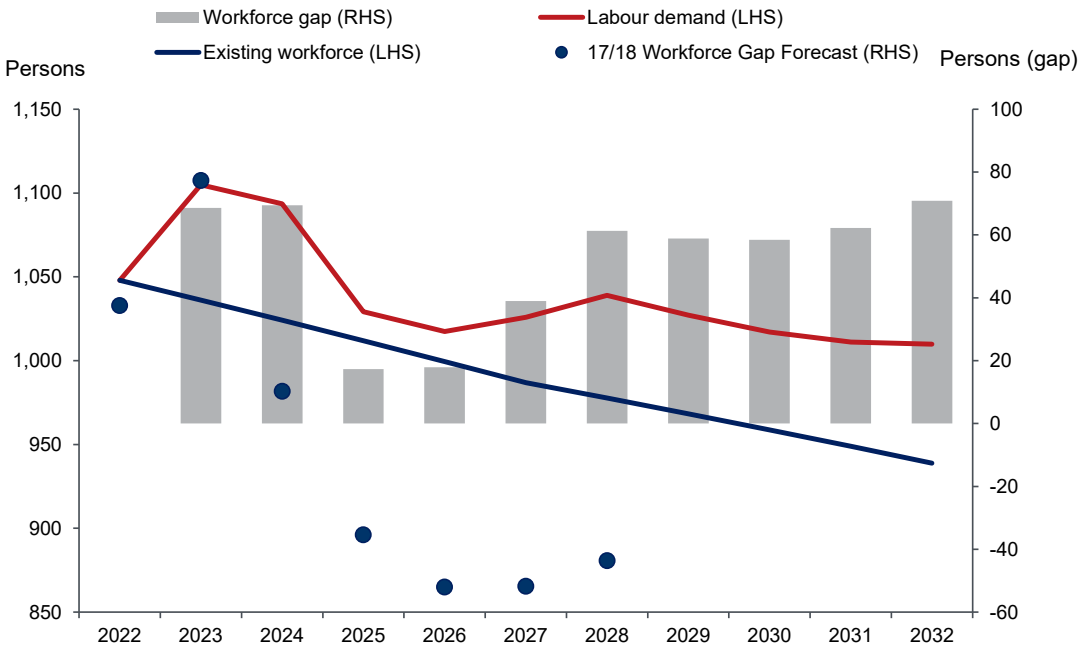


Figure 17.16: Forecast of Workforce gap for Total Surveyors – New South Wales (1.0% Labour Productivity)

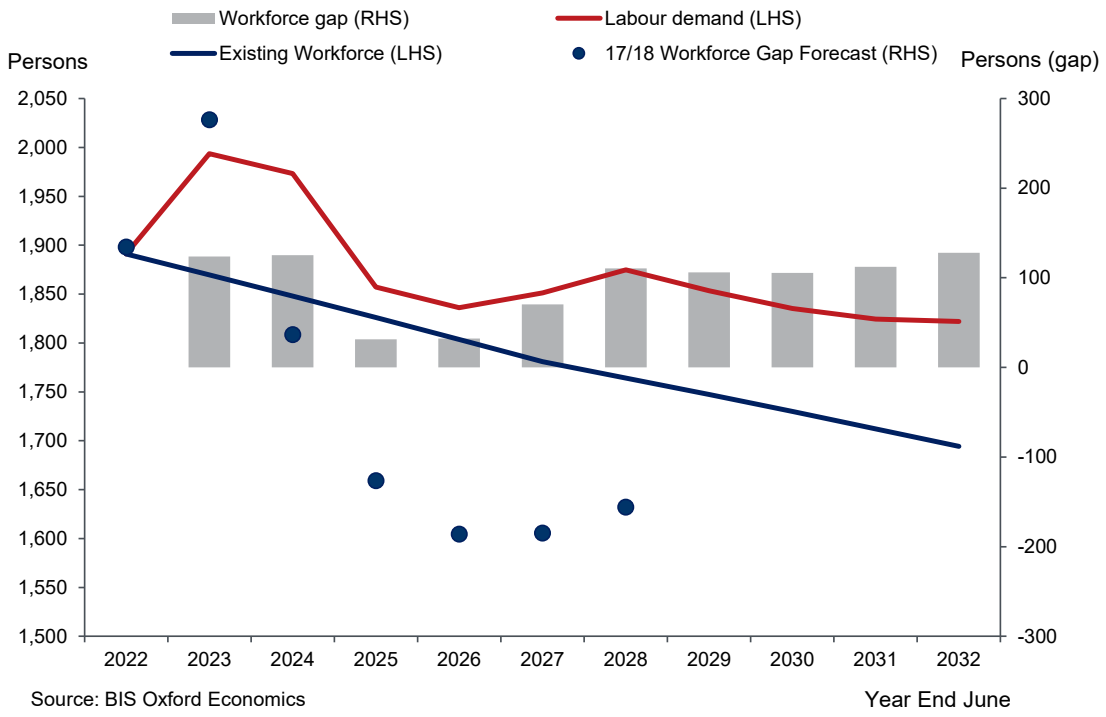


Figure 17.17: Forecast of Workforce gap for Spatial Scientists – New South Wales (1.0% Labour Productivity)

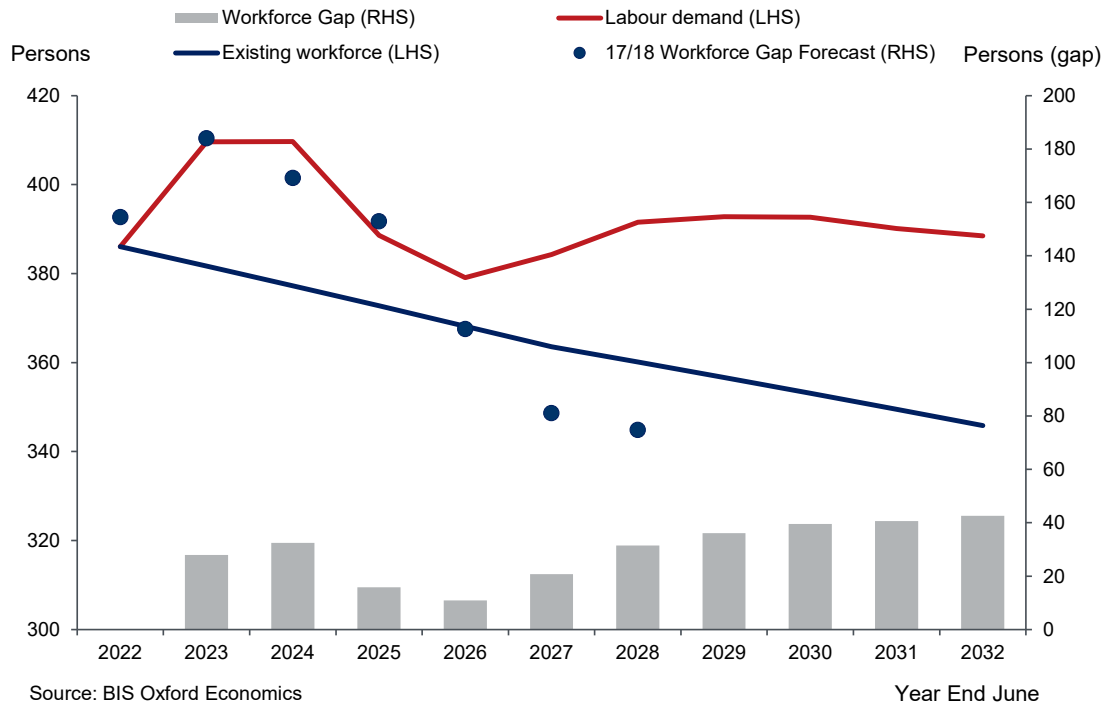
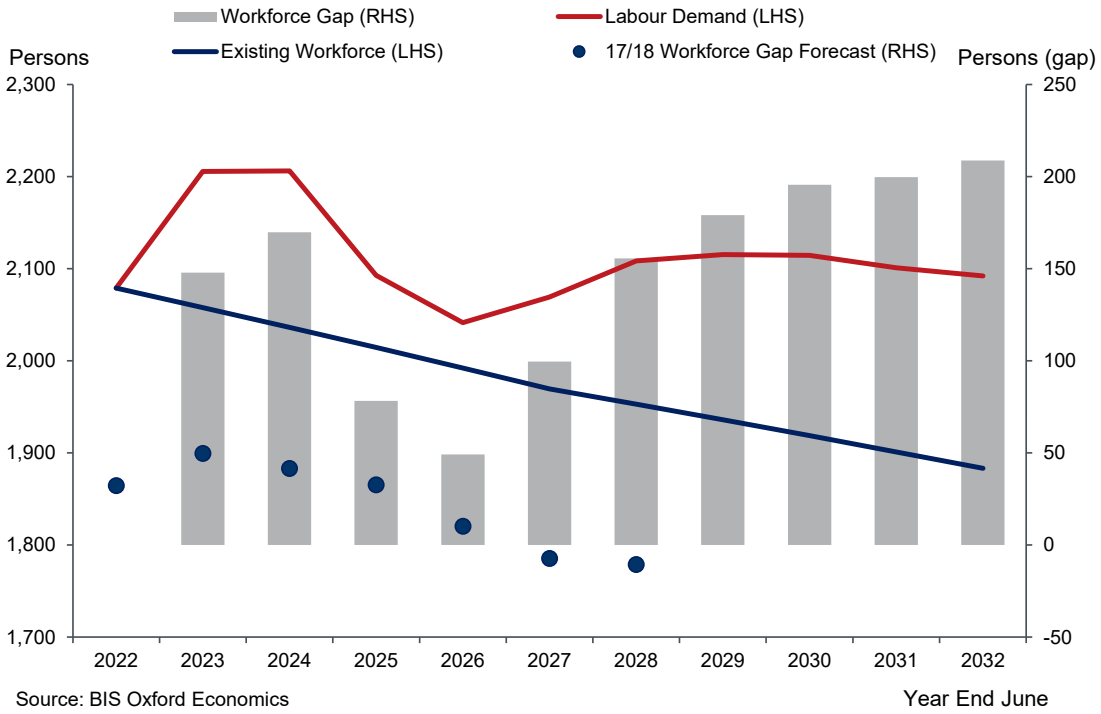


Figure 17.18: Forecast of Workforce gap for Total Technicians – New South Wales (1.0% Labour Productivity)

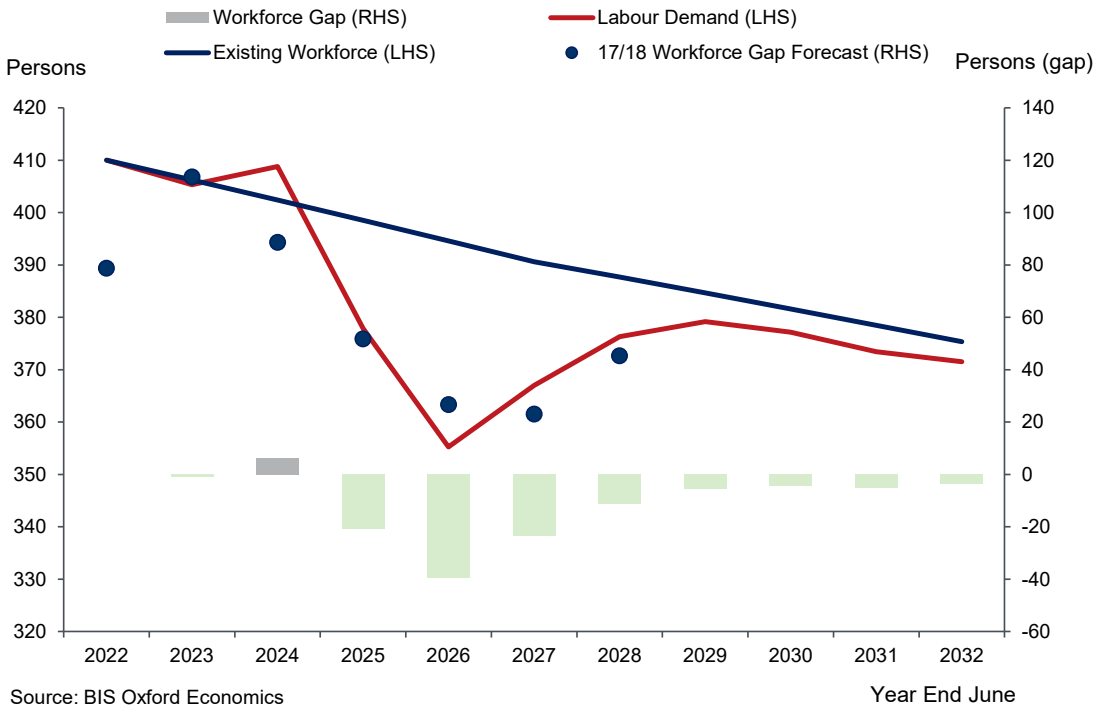


17.6 Workforce Gap – Victoria

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 9.3.

We forecast the workforce gap for the total skilled workforce to reach a surplus of 11 persons in 2022/23 and experience a peak surplus in 2025/26 at 368 persons. The workforce gap is then set to revert to a shortage from 2027/28 onwards, reaching 127 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 9.2 and discussed in prior commentary.

Figure 17.19: Forecast of Workforce gap for Registered Surveyors – Victoria (1.0% Labour Productivity)



Source: BIS Oxford Economics

Figure 17.20: Forecast of Workforce gap for Total Surveyors – Victoria (1.0% Labour Productivity)

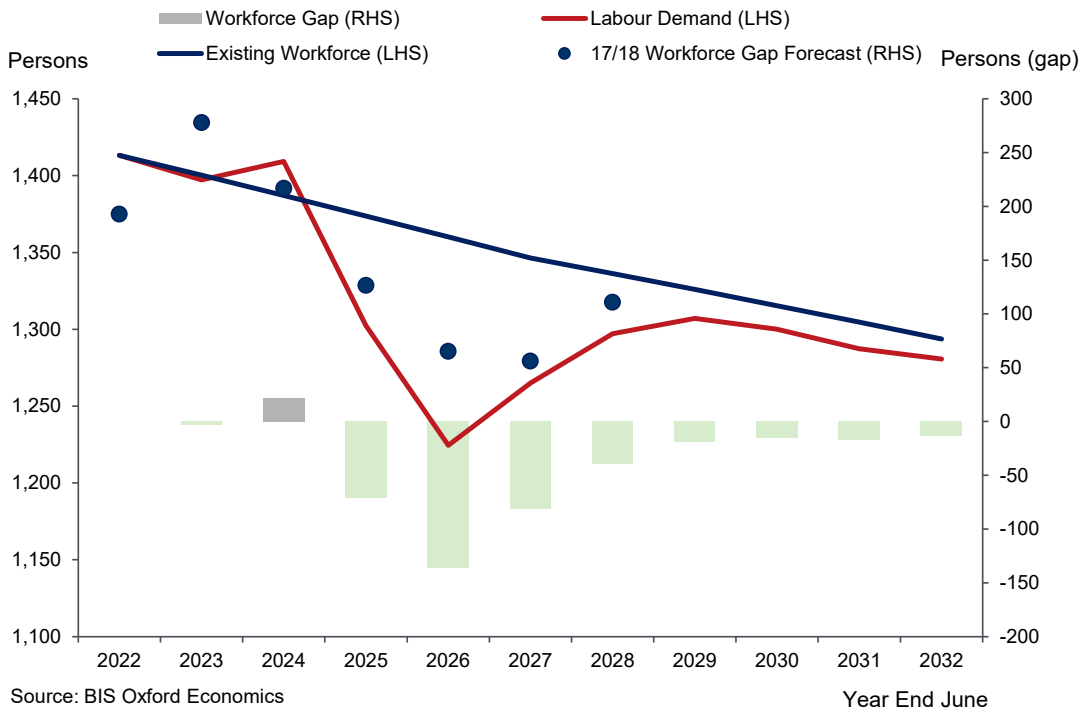


Figure 17.21: Forecast of Workforce gap for Spatial Scientists – Victoria (1.0% Labour Productivity)

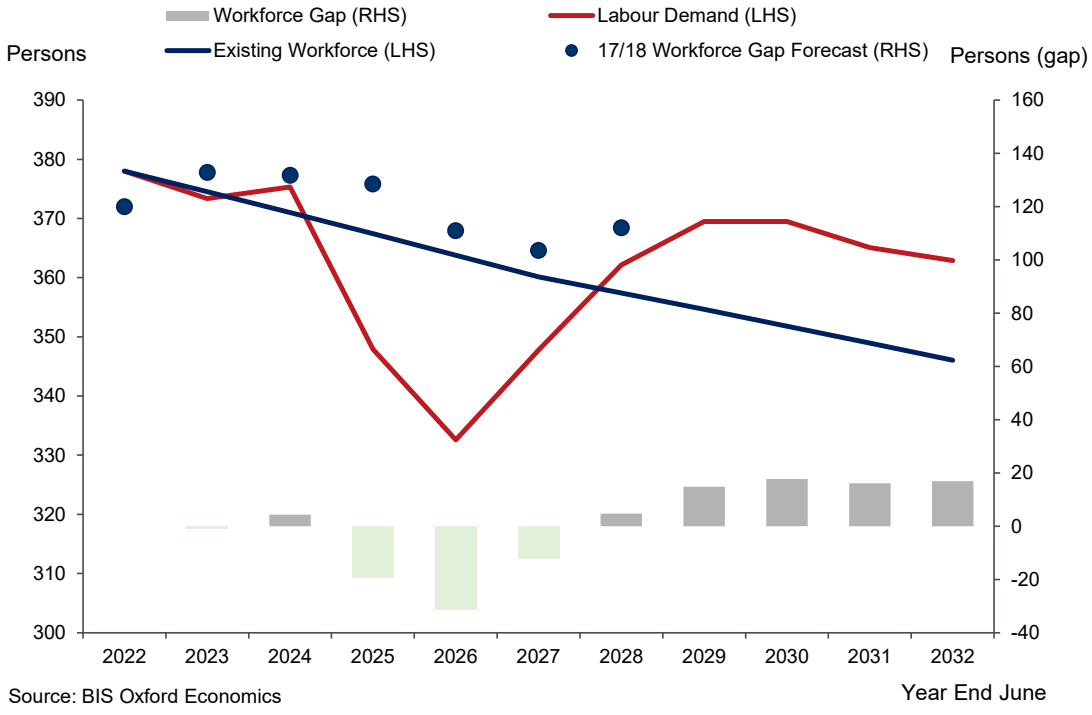
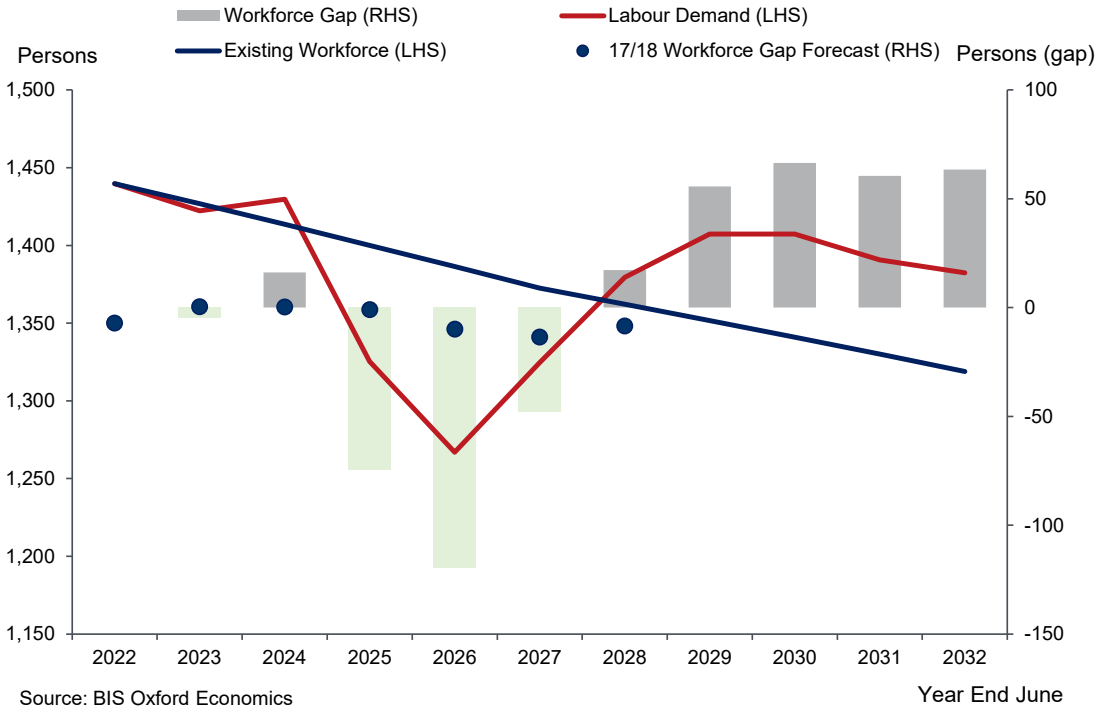


Figure 17.22: Forecast of Workforce gap for Total Technicians – Victoria (1.0% Labour Productivity)



Source: BIS Oxford Economics

17.7 Workforce Gap - Queensland

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 10.3.

We forecast the workforce gap for the total skilled workforce to reach 432 in 2022/23 before consistently increasing to 1,267 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 10.2 and discussed in prior commentary.

Figure 17.23: Forecast of Workforce gap for Registered Surveyors – Queensland (1.0% Labour Productivity)

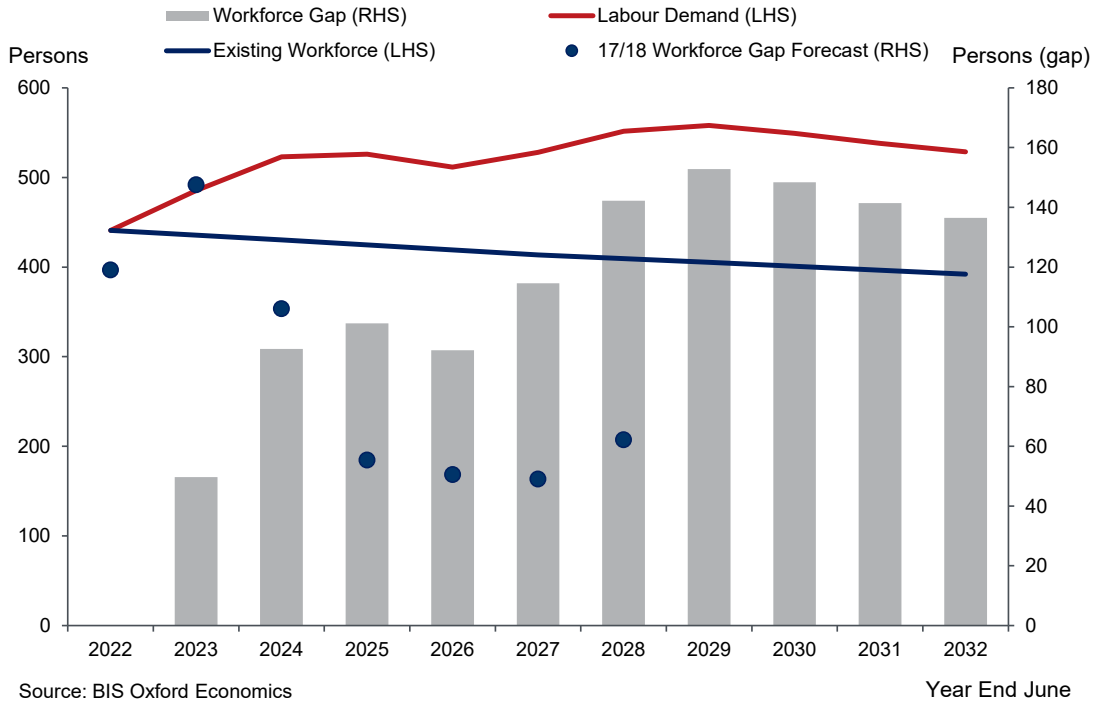


Figure 17.24: Forecast of Workforce gap for Total Surveyors – Queensland (1.0% Labour Productivity)

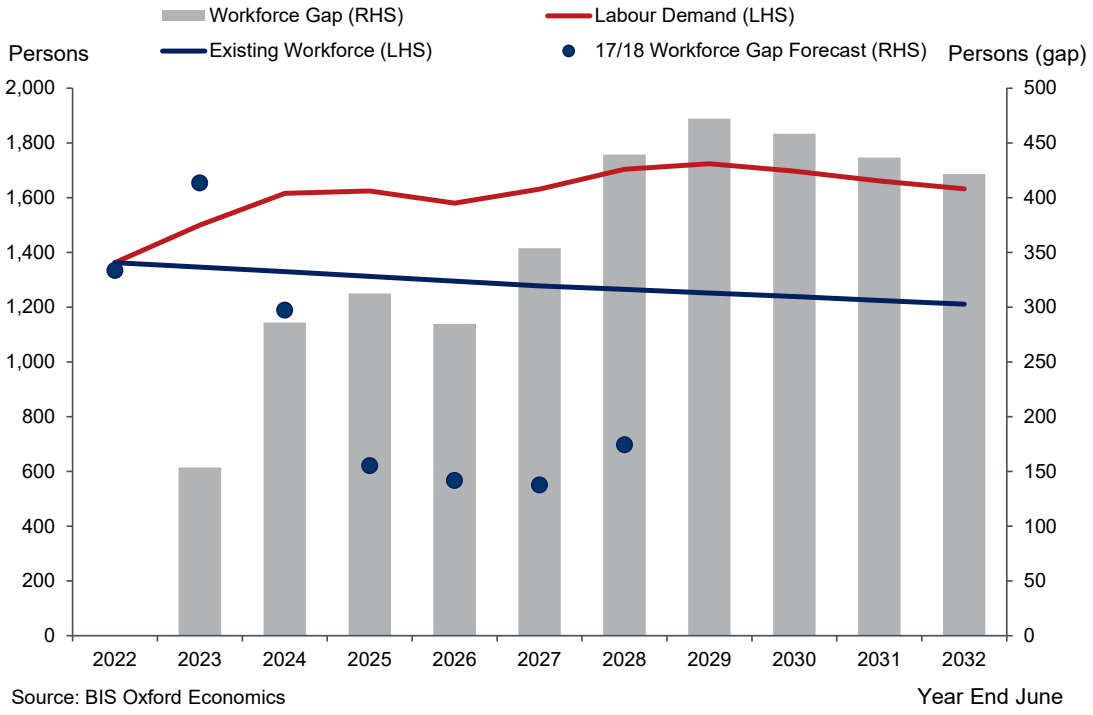


Figure 17.25: Forecast of Workforce gap for Spatial Scientists – Queensland (1.0% Labour Productivity)

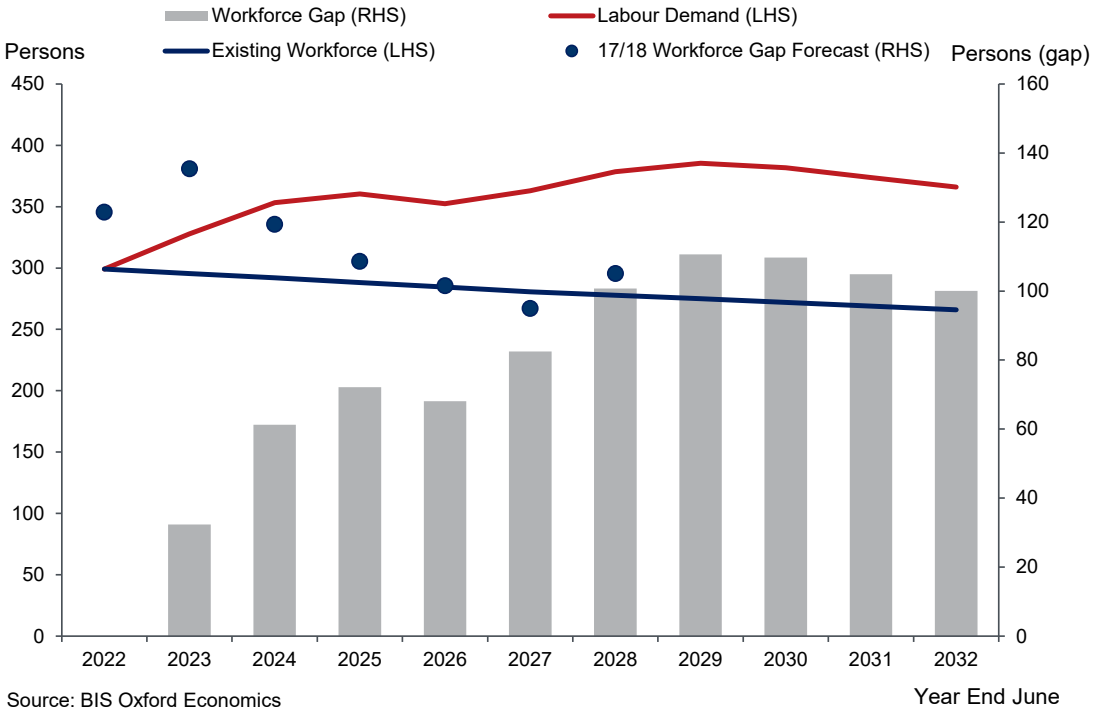
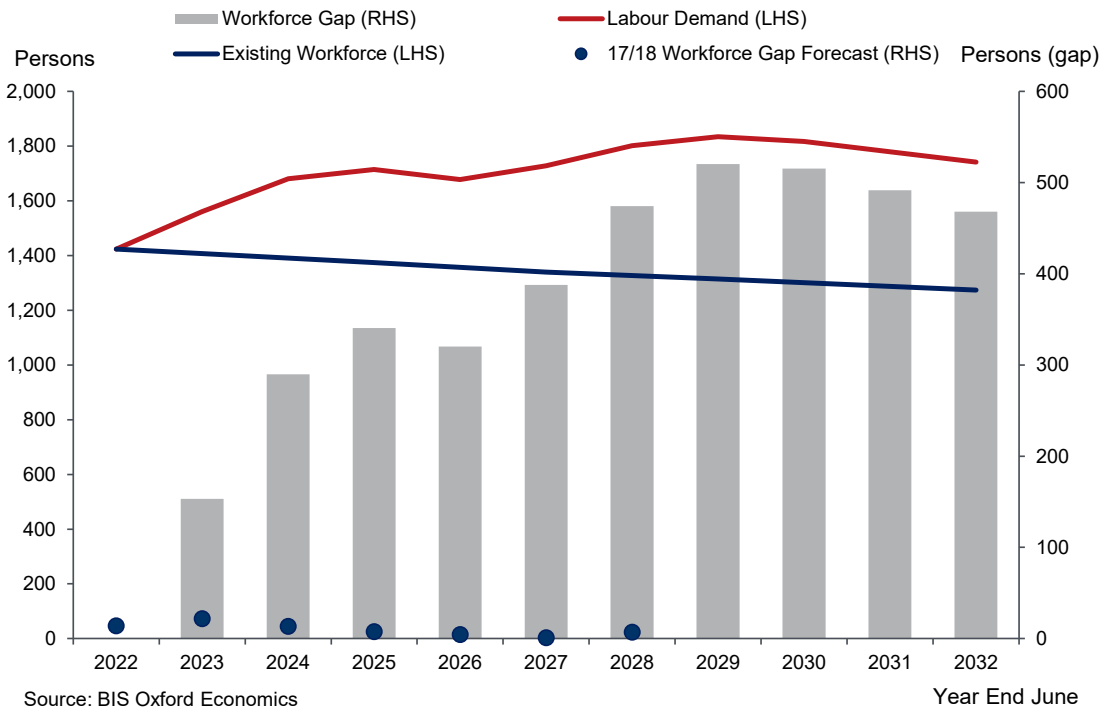


Figure 17.26: Forecast of Workforce gap for Total Technicians – Queensland (1.0% Labour Productivity)



Source: BIS Oxford Economics

17.8 Workforce Gap – South Australia

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 11.3.

We forecast the workforce gap for the total skilled workforce to reach 51 persons in 2022/23 before turning to a surplus from 2025/26 and 2026/27. The workforce gap is set to gradually increase from then to reach 35 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 11.2 and discussed in prior commentary.

Figure 17.27: Forecast of Workforce gap for Registered Surveyors – South Australia (1.0% Labour Productivity)

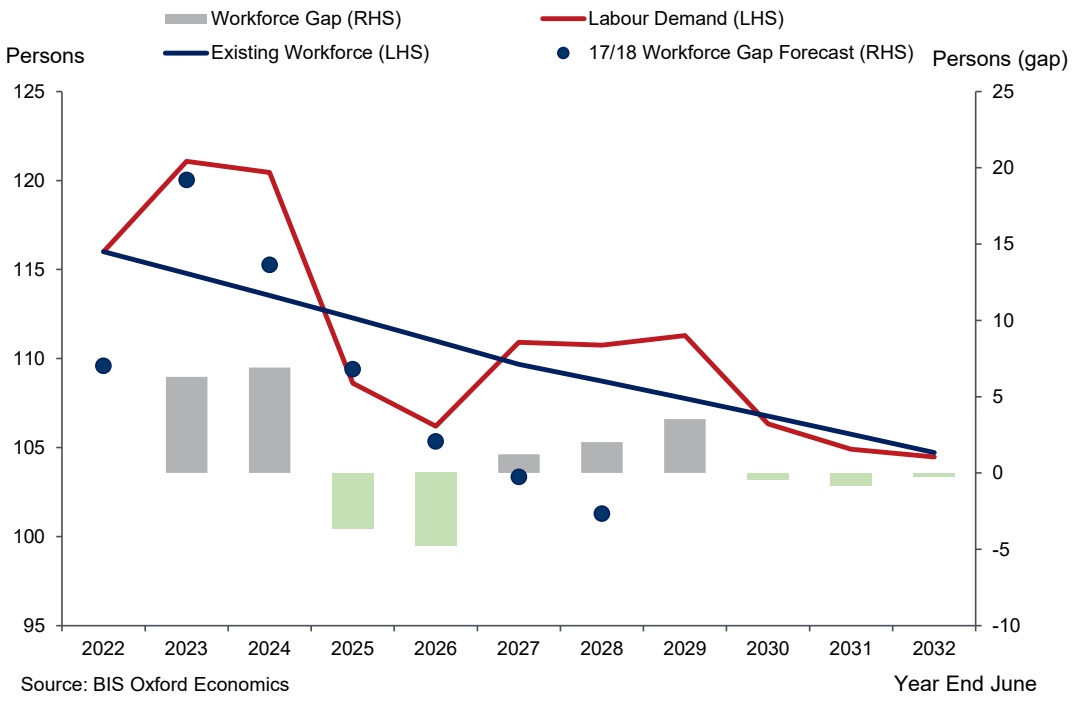


Figure 17.28: Forecast of Workforce gap for Total Surveyors – South Australia (1.0% Labour Productivity)

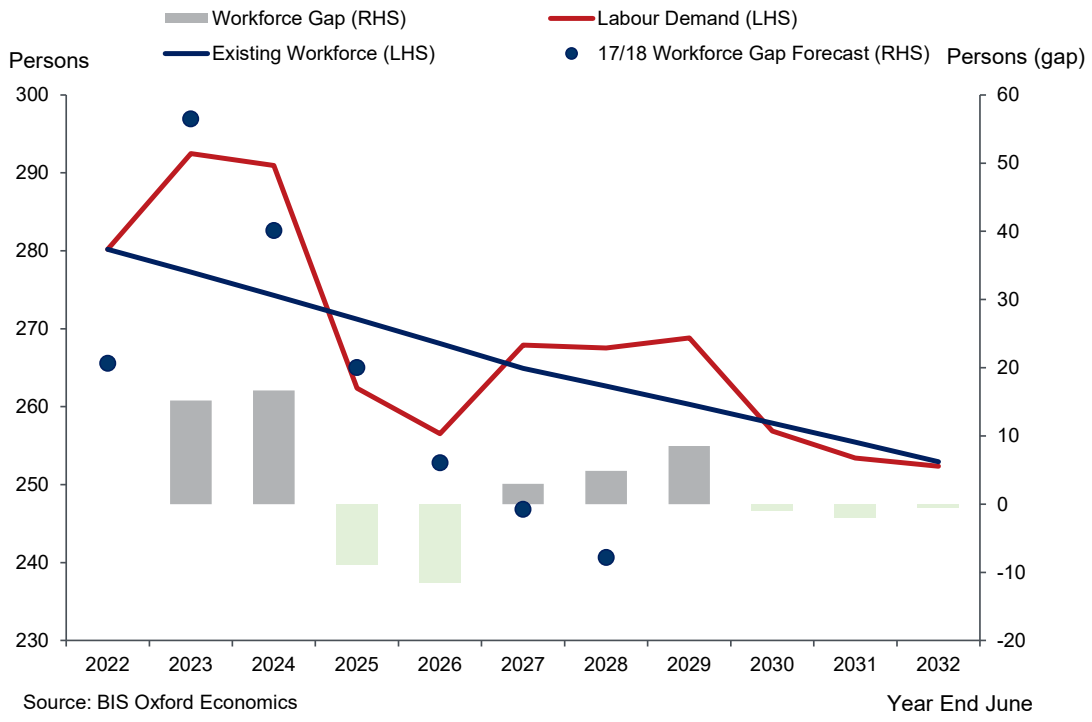


Figure 17.29: Forecast of Workforce gap for Spatial Scientists – South Australia (1.0% Labour Productivity)

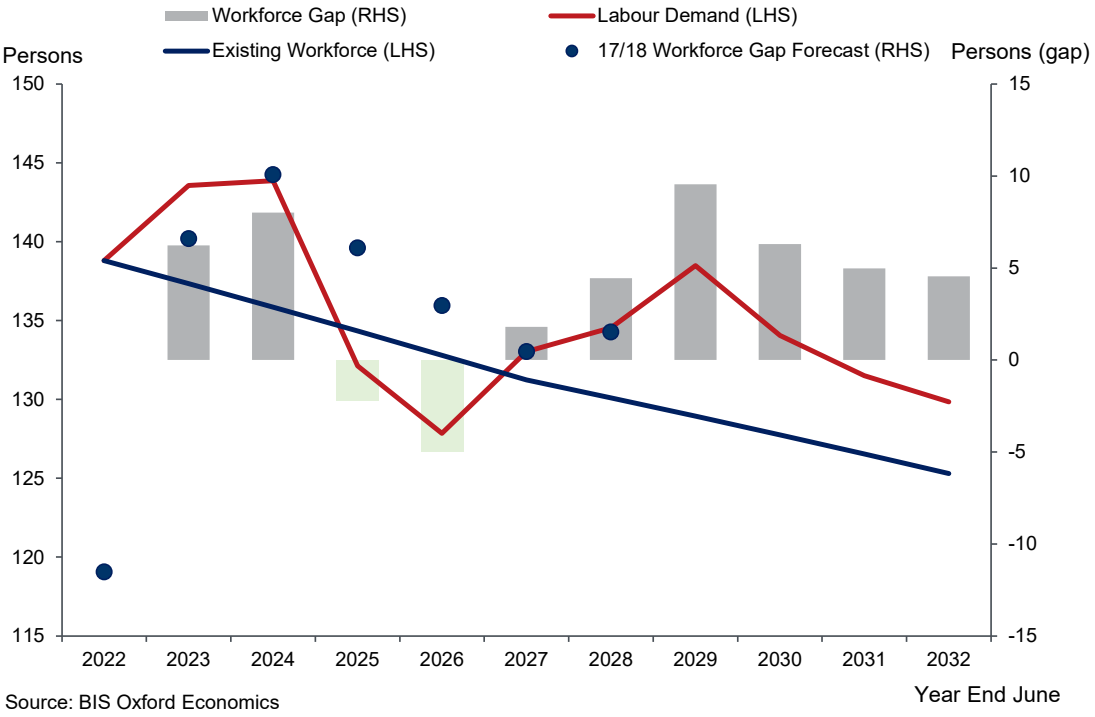
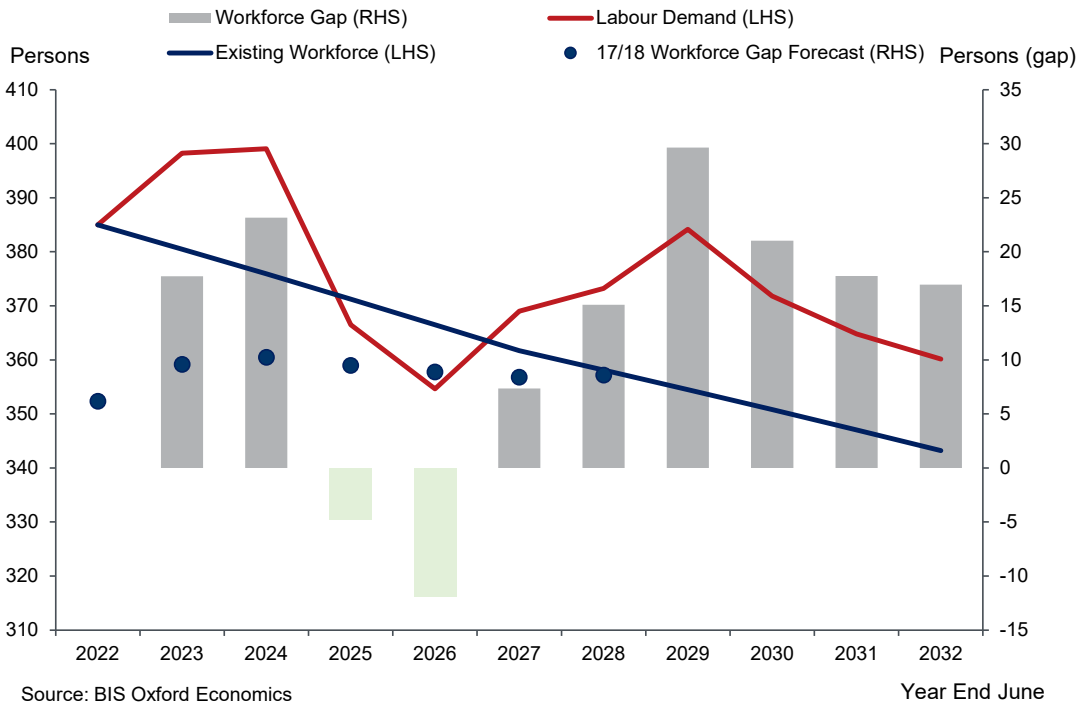


Figure 17.30: Forecast of Workforce gap for Total Technicians – South Australia (1.0% Labour Productivity)



Source: BIS Oxford Economics

17.9 Workforce Gap – Western Australia

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 12.3.

We forecast the workforce gap for the total skilled workforce to reach 297 persons in 2022/23 before increasing to 1,844 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 12.2 and discussed in prior commentary.

Figure 17.31: Forecast of Workforce gap for Registered Surveyors – Western Australia (1.0% Labour Productivity)

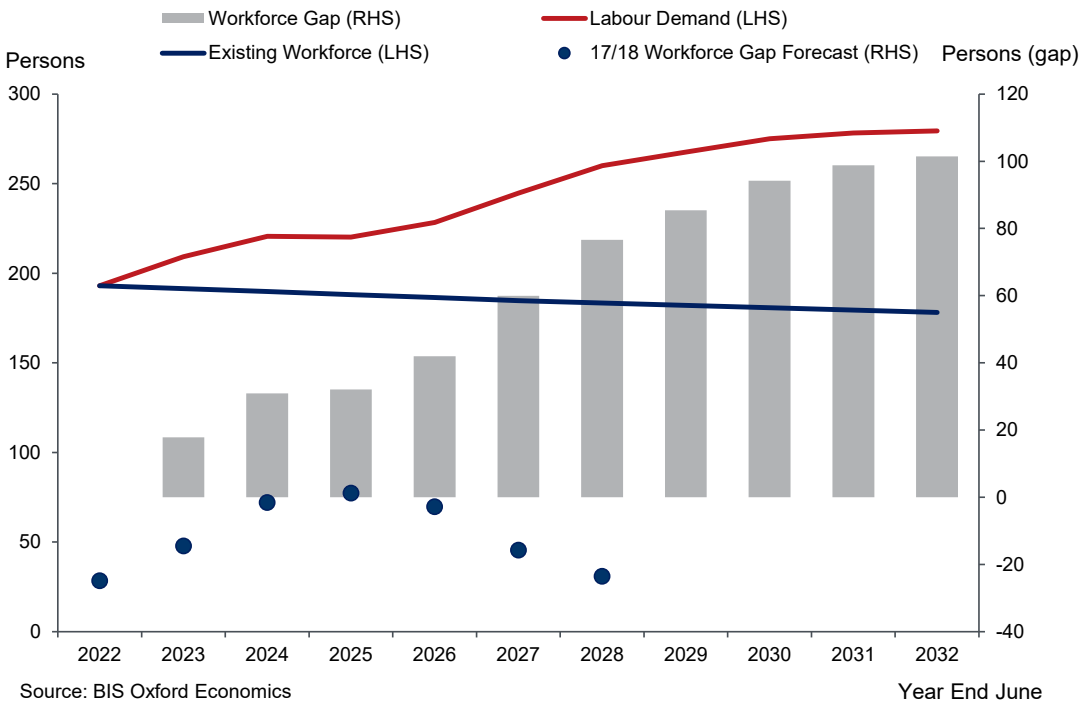
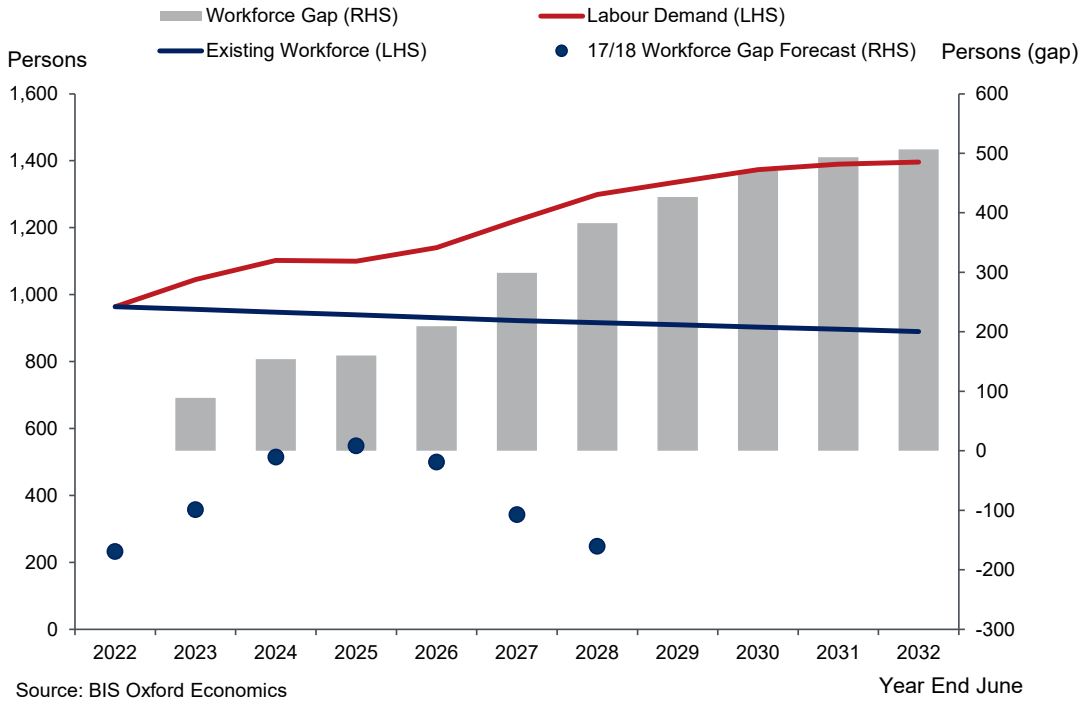
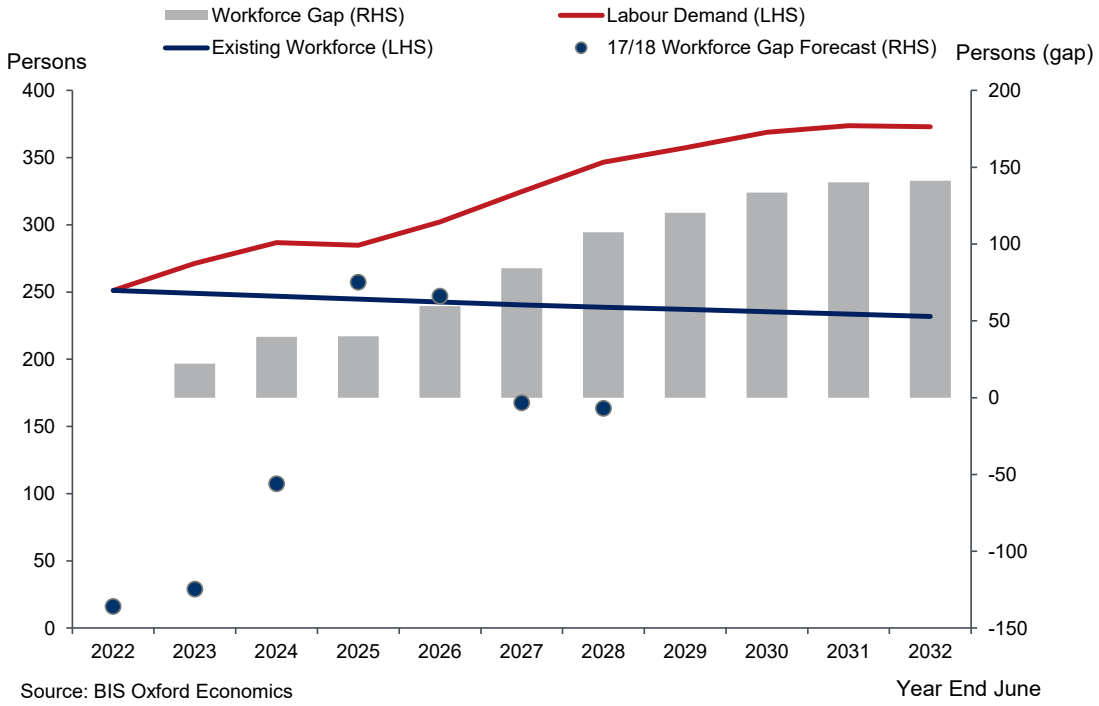


Figure 17.32: Forecast of Workforce gap for Total Surveyors – Western Australia (1.0% Labour Productivity)



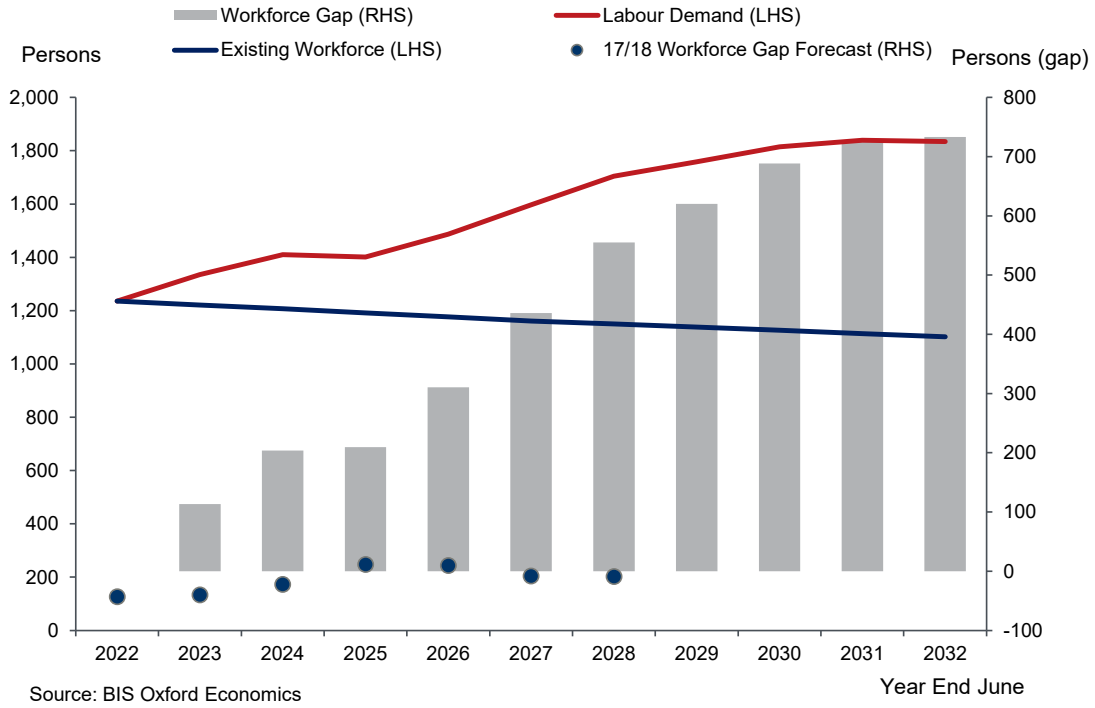
Source: BIS Oxford Economics

Figure 17.33: Forecast of Workforce gap for Spatial Scientists – Western Australia (1.0% Labour Productivity)



Source: BIS Oxford Economics

Figure 17.34: Forecast of Workforce gap for Total Technicians – Western Australia (1.0% Labour Productivity)



Source: BIS Oxford Economics

17.10 Workforce Gap – Tasmania

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 13.3.

We forecast the workforce gap for the total skilled workforce to reach 31 persons in 2022/23 and remain stable over the forecast period, reaching 35 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 13.2 and discussed in prior commentary.

Figure 17.35: Forecast of Workforce gap for Registered Surveyors – Tasmania (1.0% Labour Productivity)

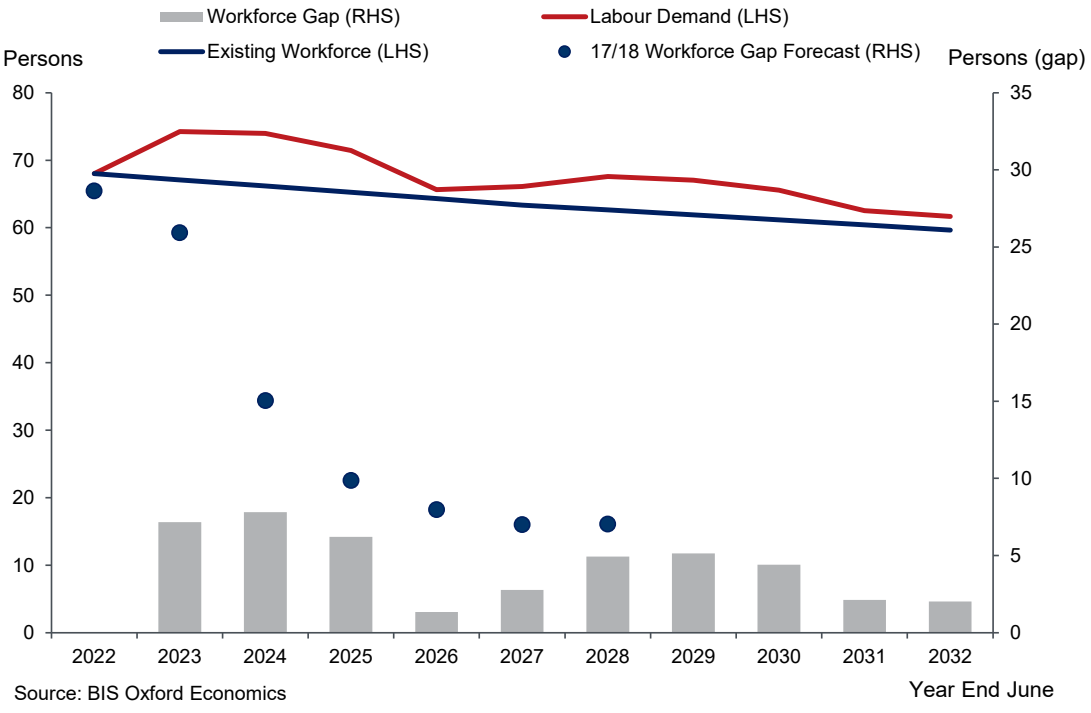


Figure 17.36: Forecast of Workforce gap for Total Surveyors – Tasmania (1.0% Labour Productivity)

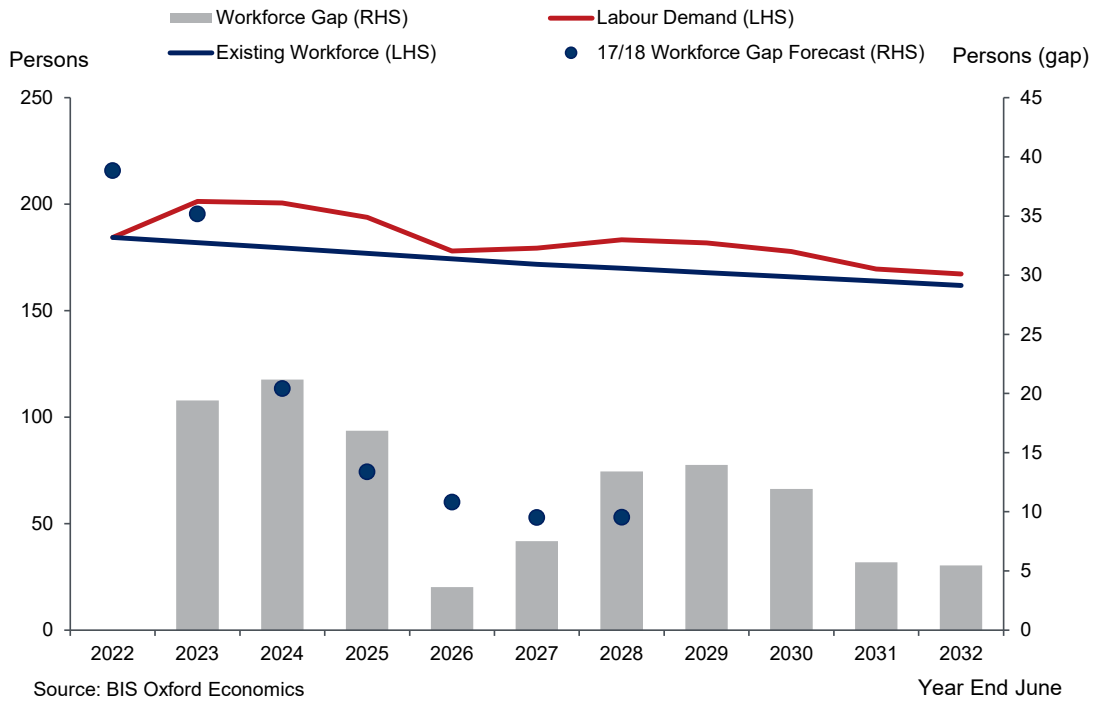


Figure 17.37: Forecast of Workforce gap for Spatial Scientists – Tasmania (1.0% Labour Productivity)

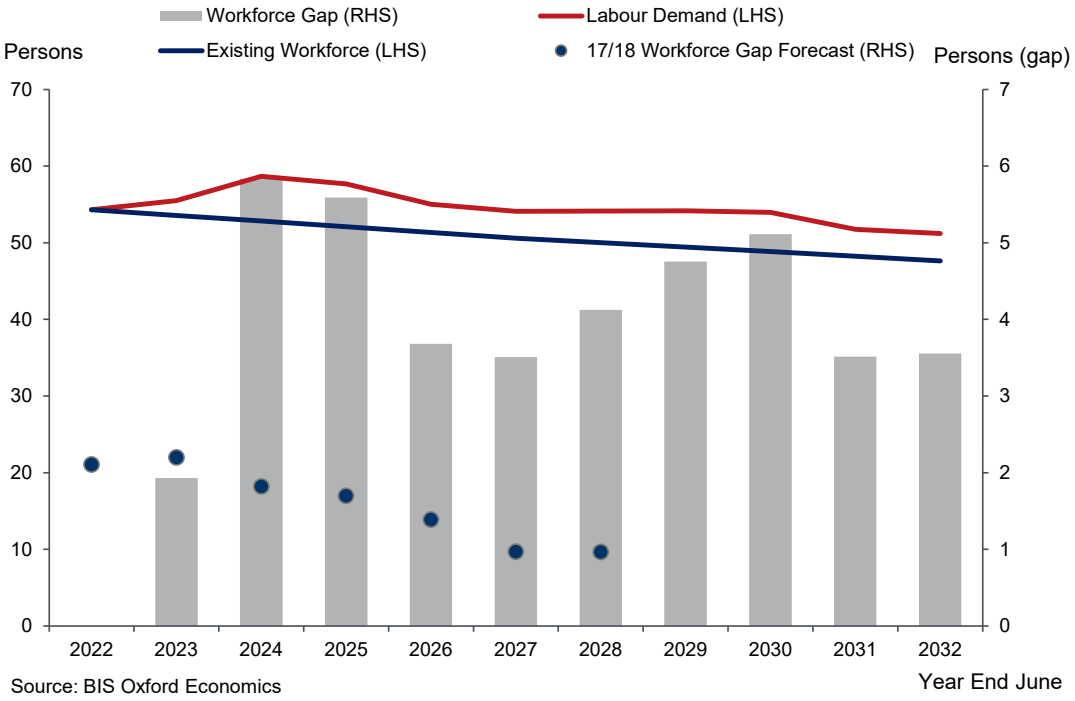
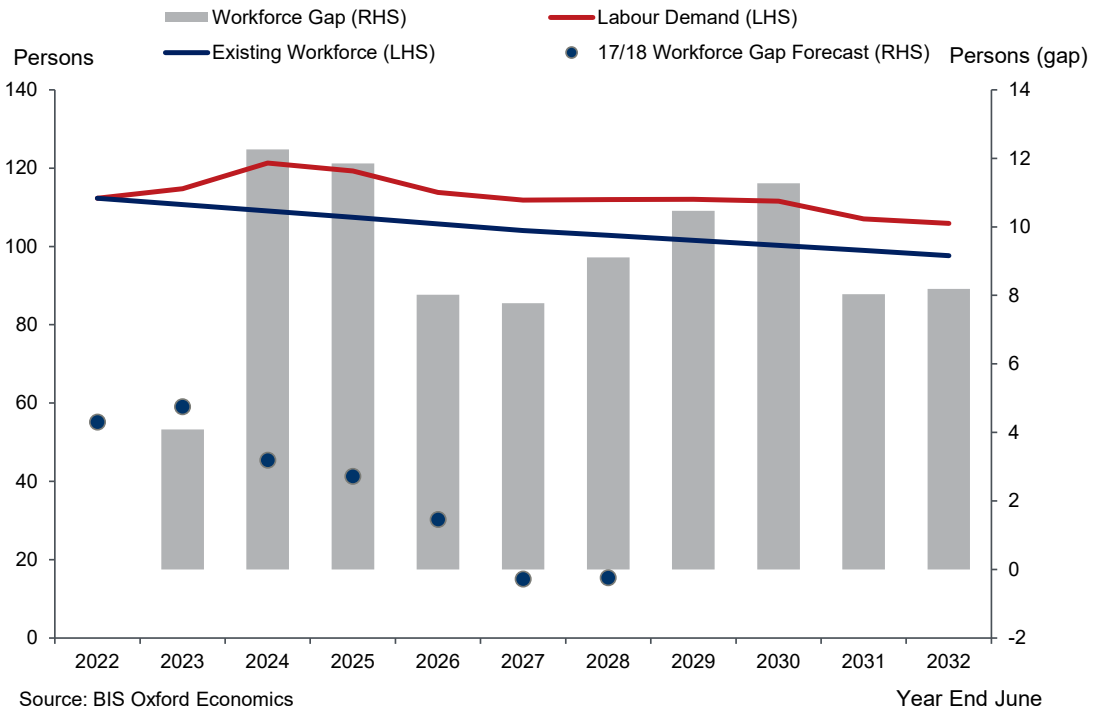


Figure 17.38: Forecast of Workforce gap for Total Technicians – Tasmania (1.0% Labour Productivity)

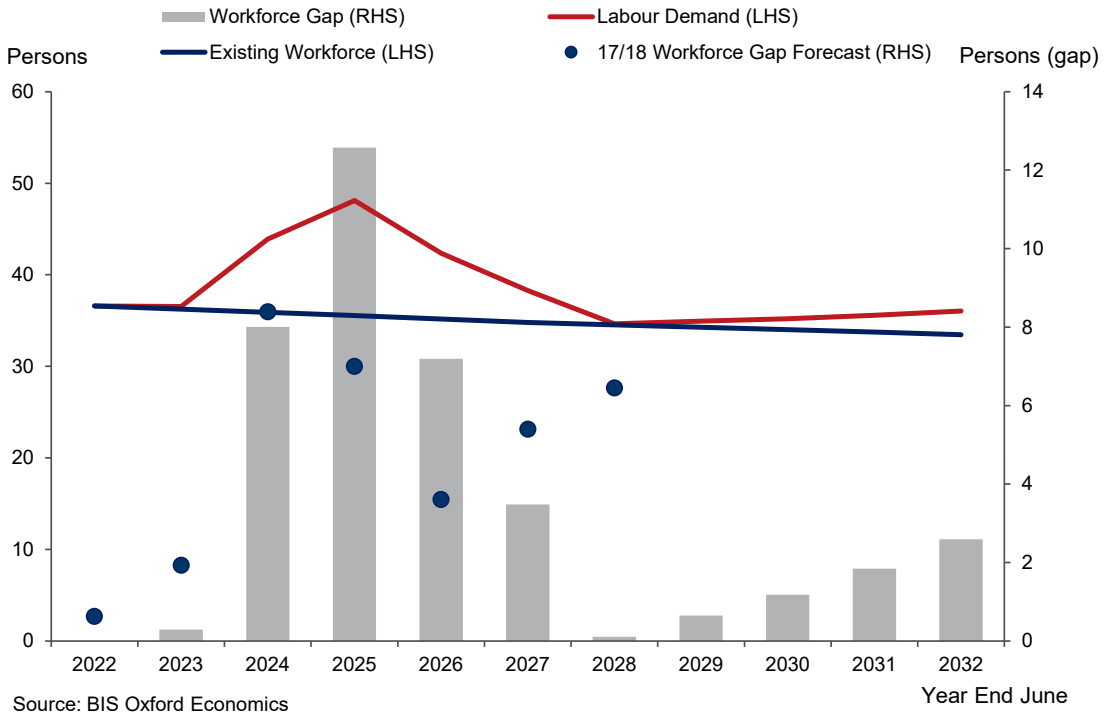


17.11 Workforce Gap – Northern Territory

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 14.3.

We forecast the workforce gap for the total skilled workforce to reach 39 persons in 2022/23 and remain stable over the forecast period, reaching 41 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 14.2 and discussed in prior commentary.

Figure 17.39: Forecast of Workforce gap for Registered Surveyors – Northern Territory (1.0% Labour Productivity)



Source: BIS Oxford Economics

Figure 17.40: Forecast of Workforce gap for Total Surveyors – Northern Territory (1.0% Labour Productivity)

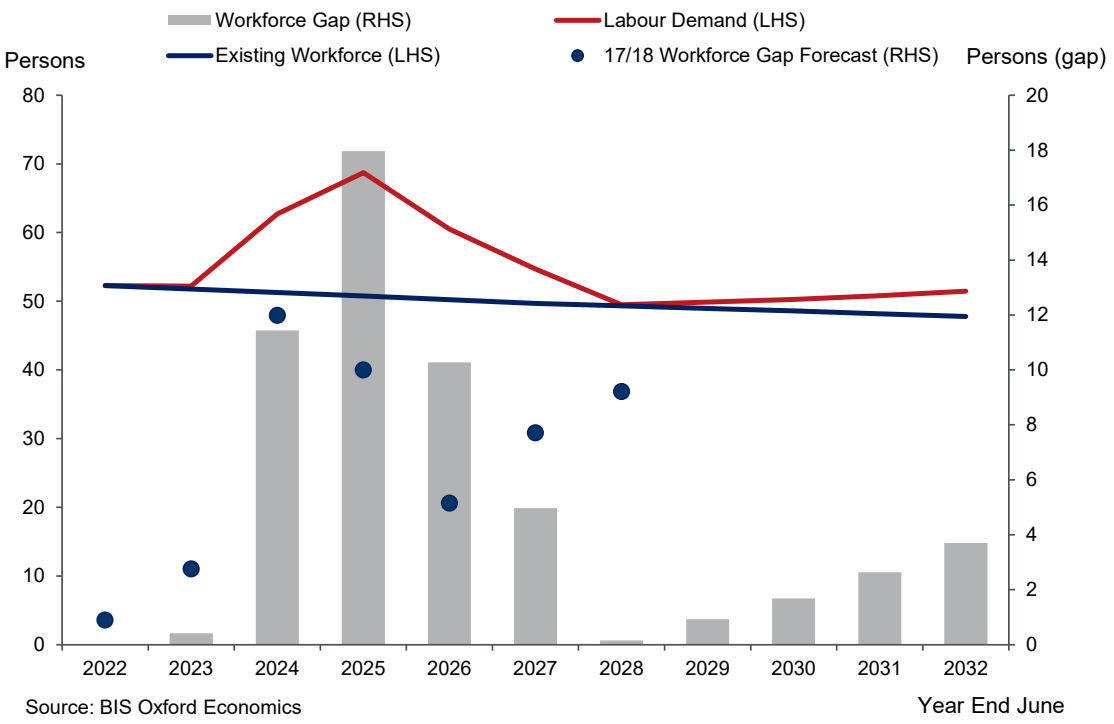


Figure 17.41: Forecast of Workforce gap for Spatial Scientists – Northern Territory (1.0% Labour Productivity)

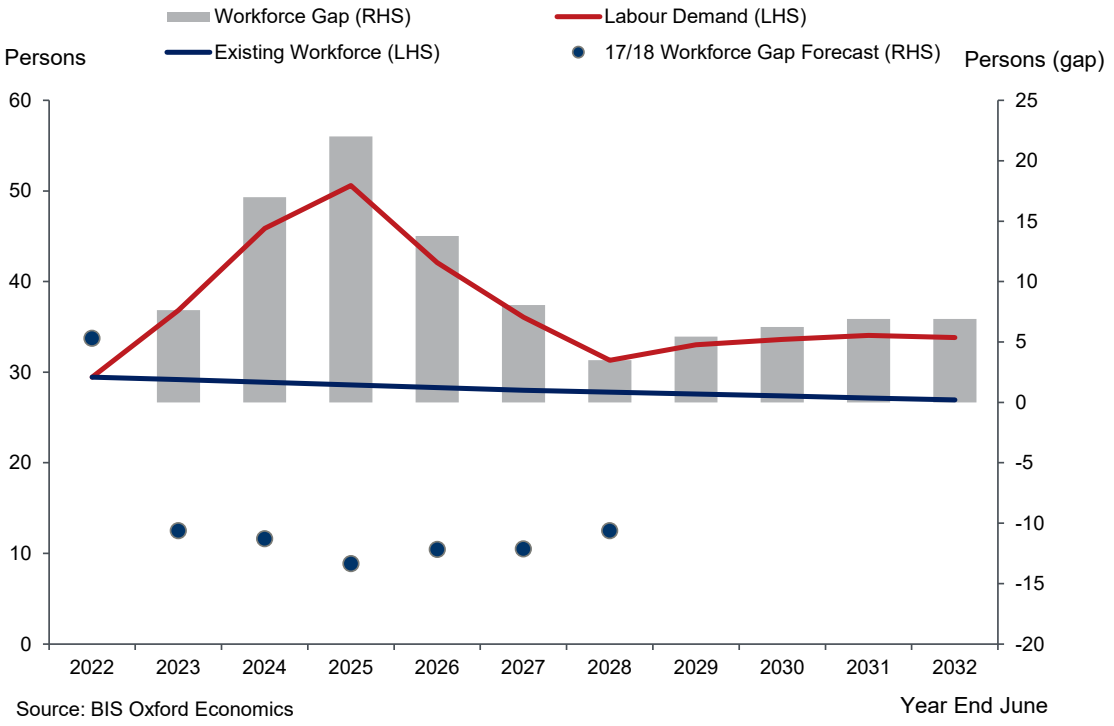
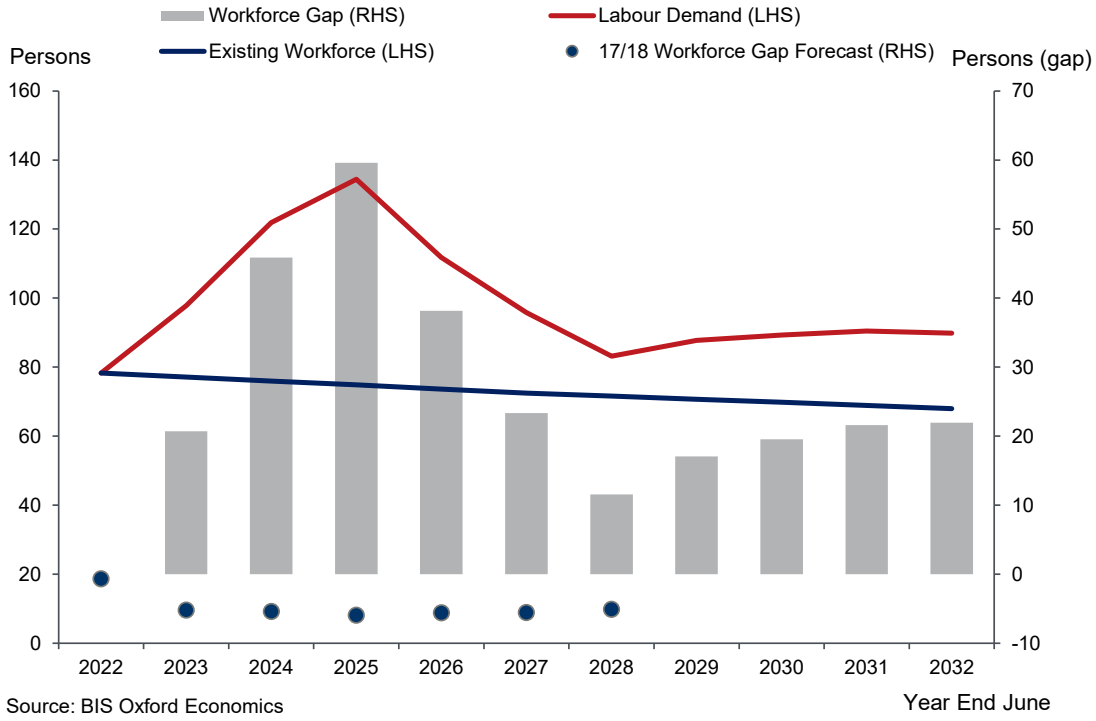


Figure 17.42: Forecast of Workforce gap for Total Technicians – Northern Territory (1.0% Labour Productivity)



Source: BIS Oxford Economics

17.12 Workforce Gap – Australian Capital Territory

The workforce gap for each specific occupation is presented below. The existing workforce is the current workforce less the aggregate retirements and underpinning the demand profile for each occupation is the respective end-user driver. Accordingly, the profiles presented below are reflective of the outlook for the relevant drivers as defined in Section 15.3.

We forecast the workforce gap for the total skilled workforce to reach 41 persons in 2022/23 and remain stable over the forecast period, reaching 74 persons by 2031/32. The following results provide a detailed breakdown on the workforce gap for registered surveyors, total surveyors, spatial scientists and total technicians. Note, this information is captured in Table 15.2 and discussed in prior commentary.

Figure 17.43: Forecast of Workforce gap for Registered Surveyors – Australian Capital Territory (1.0% Labour Productivity)

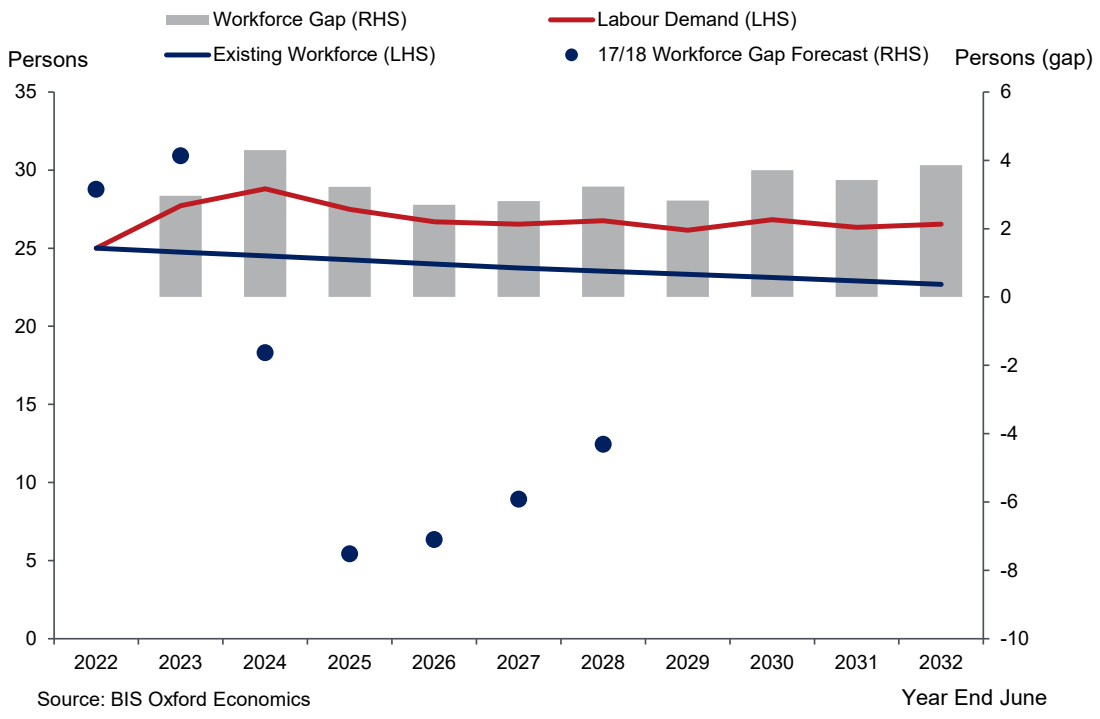


Figure 17.44: Forecast of Workforce gap for Total Surveyors – Australian Capital Territory (1.0% Labour Productivity)

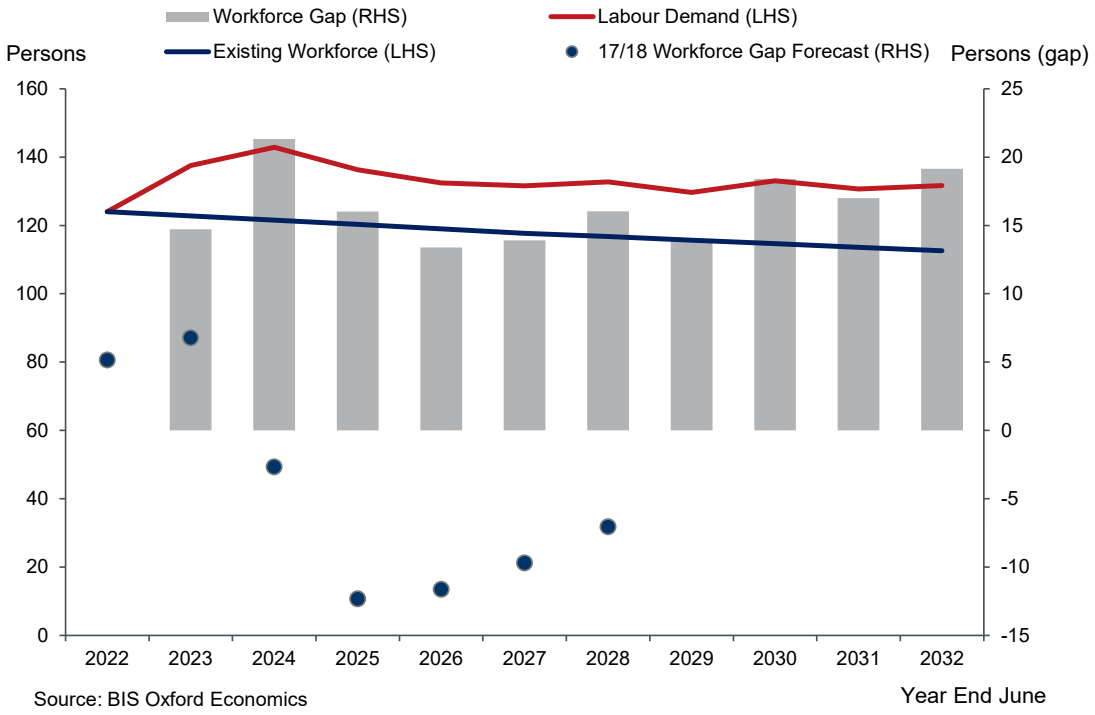


Figure 17.45: Forecast of Workforce gap for Spatial Scientists – Australian Capital Territory (1.0% Labour Productivity)

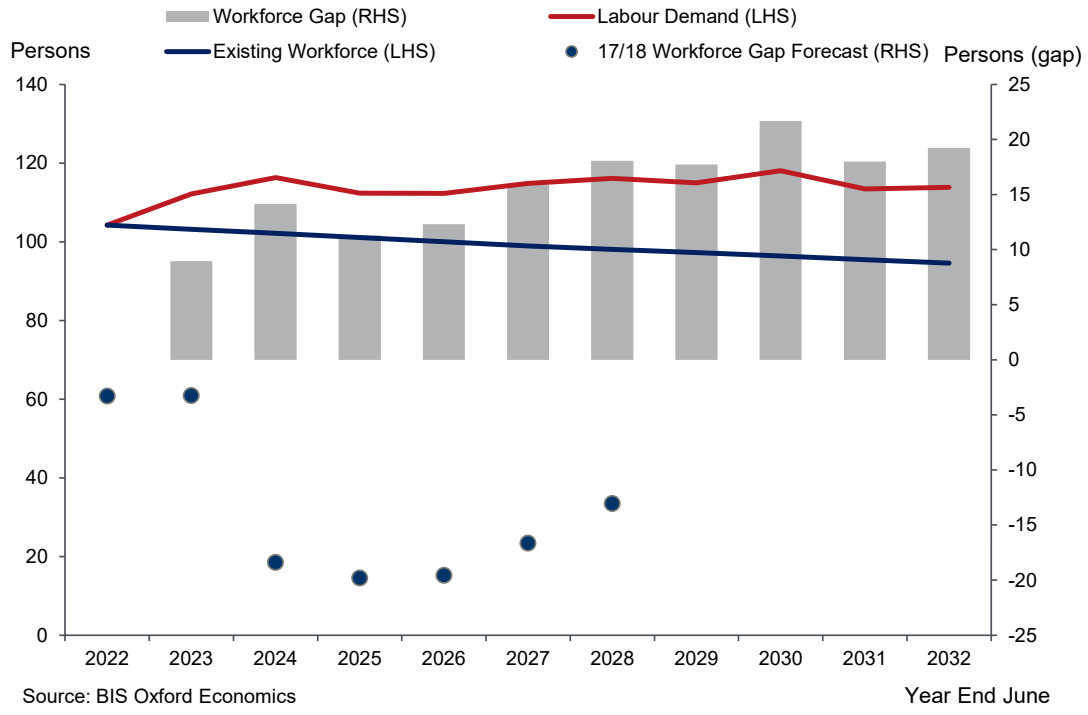
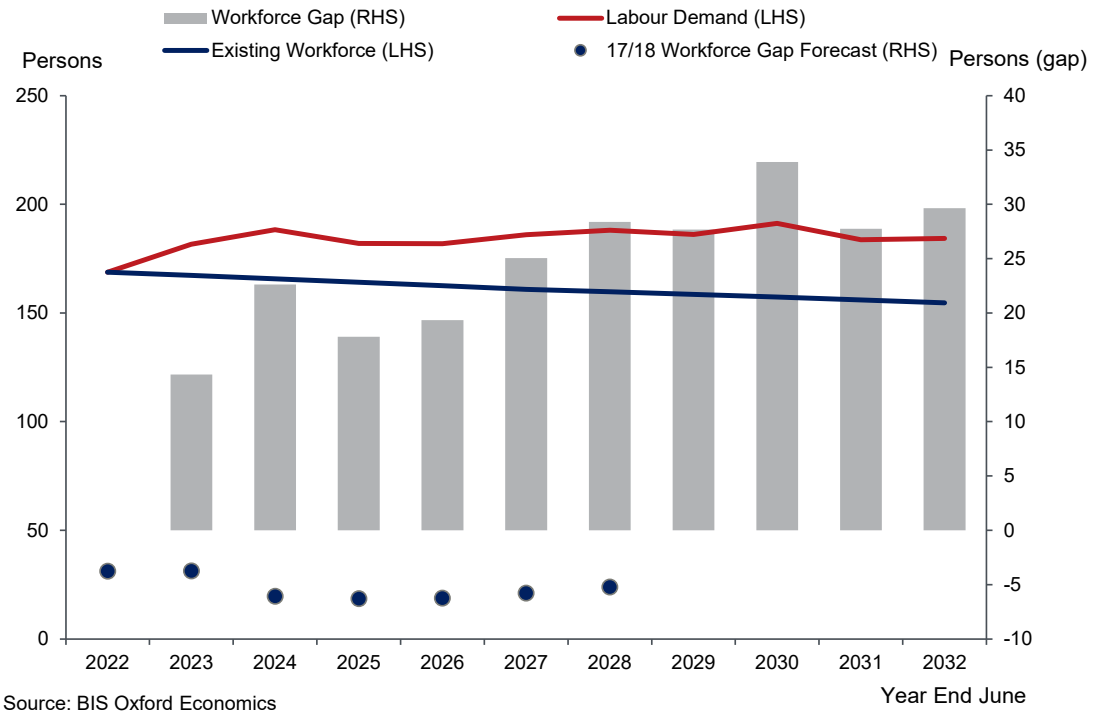


Figure 17.46: Forecast of Workforce gap for Total Technicians – Australian Capital Territory (1.0% Labour Productivity)



Source: BIS Oxford Economics

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