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AUSTROADS RESEARCH REPORT

Australia and New Zealand Road Capability Analysis 2009–2019




Austroads

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Australia and New Zealand Roads Capability Analysis 2009–2019

Austroads

Sydney 2010

Austroads profile

Austroads' purpose is to contribute to improved Australian and New Zealand transport outcomes by:

- providing expert advice to SCOT and ATC on road and road transport issues
- facilitating collaboration between road agencies
- promoting harmonisation, consistency and uniformity in road and related operations
- undertaking strategic research on behalf of road agencies and communicating outcomes
- promoting improved and consistent practice by road agencies.

Austroads membership

Austroads membership comprises the six state and two territory road transport and traffic authorities, the Commonwealth Department of Infrastructure and Transport, the Australian Local Government Association, and New Zealand Transport Agency. Austroads is governed by a Board consisting of the chief executive officer (or an alternative senior executive officer) of each of its 11 member organisations:

- Roads and Traffic Authority New South Wales
- Roads Corporation Victoria
- Department of Transport and Main Roads Queensland
- Main Roads Western Australia
- Department for Transport, Energy and Infrastructure South Australia
- Department of Infrastructure, Energy and Resources Tasmania
- Department of Lands and Planning Northern Territory
- Department of Territory and Municipal Services Australian Capital Territory
- Commonwealth Department of Infrastructure and Transport
- Australian Local Government Association
- New Zealand Transport Agency.

The success of Austroads is derived from the collaboration of member organisations and others in the road industry. It aims to be the Australasian leader in providing high quality information, advice and fostering research in the road sector.

TABLE OF CONTENTS

TABLES AND CHARTS

DEFINITION OF CONCEPTS

Skilled workforce comprises those occupations that require civil engineering and civil engineering related skills, particularly road and bridge design, construction and maintenance, traffic management, project delivery and project management, and road safety.

Existing skilled workforce = current size of the skilled roads workforce. This is estimated from both the 2001 and 2006 Censuses — the two most recent Censuses available at the time of conducting this research. To bring the Census data up to date, we have estimated a 2008/09 size of the skilled workforce by extrapolating from the 2001 and 2006 Censuses, guided by known changes in industry sector activity since 2006.

Current demand for skilled labour = size of the existing workforce.

Future (existing) workforce is the existing workforce over the forecast horizon. It is derived by adjusting the size of the existing workforce to reflect natural attrition through ageing (e.g. retirement and death).

Future demand for skilled labour is a function of expected future levels of construction and maintenance activity as well as the growth in the net capital stock of roads.

Workforce gap = the difference between the demand for future labour and the size of the existing workforce. If the demand for labour exceeds the size of the existing workforce then we have 'positive' workforce gap. A 'negative' workforce gap arises when the size of existing workforce exceeds the demand for skilled labour.

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

Net capability position is the difference between the estimated workforce gap and the supply of additional skilled labour via new graduates. If the net capability position is positive, we refer to it as 'capability shortfall'. The presence of a capability shortfall implies that the roads industry needs to attract additional labour above that expected to be sourced from new graduates — such as through immigration, from other industries, or via other labour supply boosting initiatives (e.g. by increasing productivity or reducing the rate of workforce attrition) — if it is to achieve forecast levels of future roads activity. If the net capability position is negative, it represents a situation of 'capability excess/surplus' i.e. the sector has more than enough capacity to undertake the expected future levels of activity.

EXECUTIVE SUMMARY

Objectives of Study

In 2006, BIS Shrapnel prepared a report for Austroads Incorporated which provided a detailed outlook for road construction and maintenance activity and its implications for workforce capability for member authorities. The report, titled *Australia and New Zealand Road Capability Analysis 2006 — 2016* focussed on the capability of engineering skills, particularly road and bridge design, construction and maintenance, traffic management, project delivery and project management, and road safety. In summary, the report provided an analysis of the capability of the Australian and New Zealand roads workforce to meet infrastructure development requirements over the decade to 2015/16.

In May 2009, BIS Shrapnel was commissioned by Austroads to update the base data and forecasts provided in the initial report to the Austroads. Specifically, BIS Shrapnel was requested to:

- Review and update the Australian and New Zealand road infrastructure development outlook for the period 2009 – 2019 with particular attention being given to proposals to be considered by the Infrastructure Australia taskforce and to Federal and State Government announcements (including Budgets) relating to new transport infrastructure.
- Review and update skilled labour force data and modelling relating to the demand for civil engineering expertise in the roads sector as a result of changes to planned infrastructure, and taking into account any planned changes to engineering degrees/student numbers as well as changes to immigration.
- Provide updated findings and recommendations.

This report represents the key outcomes of the above research agenda. The primary aim of this project is to re-assess the capability of the Australian & New Zealand road industry workforce to deliver expected future levels of road construction and maintenance activity.

There is one other significant differentiation between this report and the earlier study. In this updated study we have modelled the impact and sensitivity of labour productivity to the report's projection of skilled labour demand. That is we have allowed for dynamic usage coefficients i.e. coefficients which change over time. Our baseline model output is based on the national average of productivity growth of 1.5 per cent per annum. However, we also present results for a 1 per cent and 0 per cent productivity assumption. Apart from using these different productivity assumptions for sensitivity testing, they have been specifically chosen as 1 per cent reflects labour productivity growth in the construction sector over the decade to 2009, while 0 per cent reflects the (implicit) productivity assumption of our initial 2006 report.

Methodology

The methodology used in this report involves, firstly, the estimation of a skilled (road) labour usage coefficient per unit of end use sector activity (e.g. a volume of road construction or road maintenance activity, expressed in constant price terms). Then, projections of end use sector activity over the decade to 2019 have been translated, using these coefficients, into forecasts of future skilled labour demand across various occupations. In our model there are three basic drivers of skilled labour demand in the roads sector:

- Road construction activity.
- Road maintenance activity.
- Growth in the net capital stock of roads (as a proxy for growth in the road network).

We then compare the expected demand for skilled labour with our projected levels of existing workforce. The difference between the total labour demand and the size of the existing workforce is referred to in the report as 'workforce gap'. The gap, when positive, will need to be met by additional supply if projected levels of end use sector activity are to be achieved.

The final part of our methodology relates to estimating the potential new workforce supply. This was one of the more difficult components of the projects. While possible sources of labour supply include: new graduates, net migration from overseas, and net movement of skills between industries, only the first source is considered explicitly in this report. Given data on current graduate enrolments and completions in civil engineering and other related disciplines, together with broad assumptions regarding the proportion of graduates who actually enter the roads skilled workforce, projections of future graduate supply have been made. The labour supply curve plots the cumulative total number of new graduates recruited over the forecast period.

The difference between the estimated workforce gap and the supply of additional skilled labour via new graduates is defined in this report as the 'net capability position'. If the net capability position is positive, we refer to it as 'capability shortfall'. The presence of a capability shortfall implies that the roads industry needs to attract additional labour above that expected to be sourced from new graduates — such as through immigration, from other industries, or via other labour supply boosting initiatives (e.g. by increasing productivity or reducing the rate of workforce attrition) — if it is to achieve forecast levels of future roads activity. If the net capability position is negative, it represents a situation of 'capability excess' i.e. the sector has more than enough capacity to undertake the expected future levels of activity.

Key Findings

The capability model described in this report suggests that over the next six years the supply of skilled labour (existing workforce) in the roads sector will be sufficient to cover for the expected demand for skilled labour to be generated by future road construction, maintenance and other road management activity as well as labour lost through workforce attrition. However, beyond the medium term i.e. after the 2014/15 financial year, new skilled labour supply (i.e. new graduates) in Australia will not be enough to meet forecast gap in labour demand and size of the existing workforce or the skilled 'workforce gap' in the roads sector. The gap between the demand for and supply or stock of labour in the second half of the decade implies that, in theory, a capability shortfall scenario will be prevalent in Australia in the four years to 2018/19.

However, in practice there will be no observable capability shortfalls. Either labour demand will fall back to meet the constrained level of labour supply — implying that future roads activity will need to be cut back or foregone — or measures will be put in place that will boost labour supply to meet current expectations of future roads activity.

With respect to the public sector, our expectation is that unlike the total roads sector (which is expected to have a negative workforce gap for most of the next five years due to supply of existing workforce exceeding the demand for labour), this sector will experience a positive workforce gap throughout the forecast horizon. This means that the demand for labour is likely to be greater than the existing supply of skilled labour in the public roads sector over the decade to 2018/19. Rising public sector funded roads activity will be the main driver of skilled roads labour demand growth over the coming decade. Notably in Australia, the expected workforce gap facing the public sector is expected to grow strongly and consistently from 2014/15 and peak at around 3,330 persons in 2017/18. This will be driven by rising construction, maintenance and other road management requirements and accelerating workforce attrition. This gap will need to be met by increasing supply from new graduates, from net migration or net transfer of skills from other industries, or by increasing the utilisation of the private sector roads workforce.

New Zealand, unlike Australia, will have a capability surplus for most of the forecast period. This means that New Zealand will have an excess supply of labour to meet projected labour demand for the decade to 2018/19. The capability surplus is projected to reach a peak of over 400 persons by 2018/19.

The capability shortfall (for the total sector), while differing in magnitude under the different labour productivity assumptions, reaches a peak in the second five year period. To some, this may suggest that the issue of skills shortages is one which can be deferred until this period. In our view, this would be a mistaken interpretation of the model.

A key implication of this study therefore is that while capability shortfalls are not expected to arrive until later in the decade, this is not the time for the roads sector to be complacent. In fact the present times represents an ideal opportunity for state authorities to build up their stocks of competent engineering professionals ahead of the expected boom due to the following reasons:

The demand for skilled labour in the immediate period before the capability shortfall years is most likely understated. While the capability shortfall (for the total roads sector) appears later in this decade, this does not necessarily mean that the shortfalls will be realised contemporaneously. For many occupations the demand for labour will necessarily precede the period where actual road construction or maintenance takes place (for example, the planning and design stage period leading up to the construction phase may already be upon some state authorities).

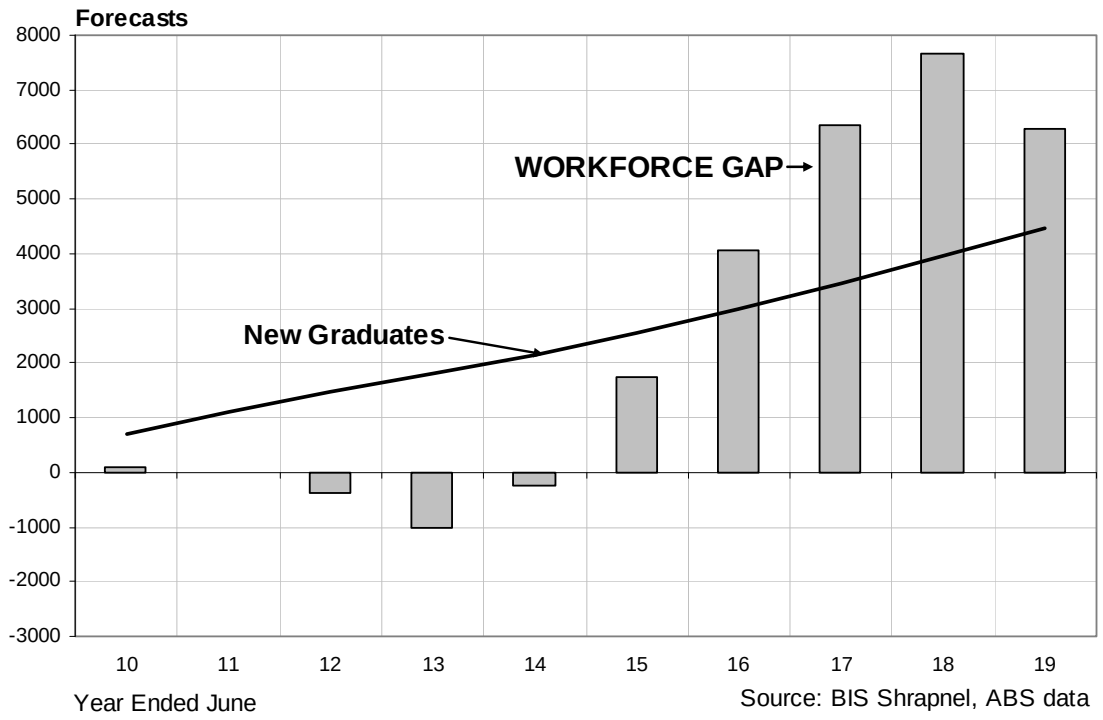
Given the time taken to develop new engineering hires (particularly new graduates) to a point of high capability (typically 4-5 years) the model suggests that hiring should take place well before the emergence of capability shortfalls.

We also note that the global financial crisis has seen many private sector companies curtail their graduate intake programs for 2010. In our view, this is a mistake given future industry demand requirements, but does provide public roads authorities an opportunity to secure potentially higher quality graduates now to meet their future needs. In addition there is a real risk that if careful consideration is not given to the uptake of graduates as they leave university, then students currently considering engineering will opt for alternative careers based on the experience of current graduates. This will enlarge the capability shortfall amplitude in the future.

Caution

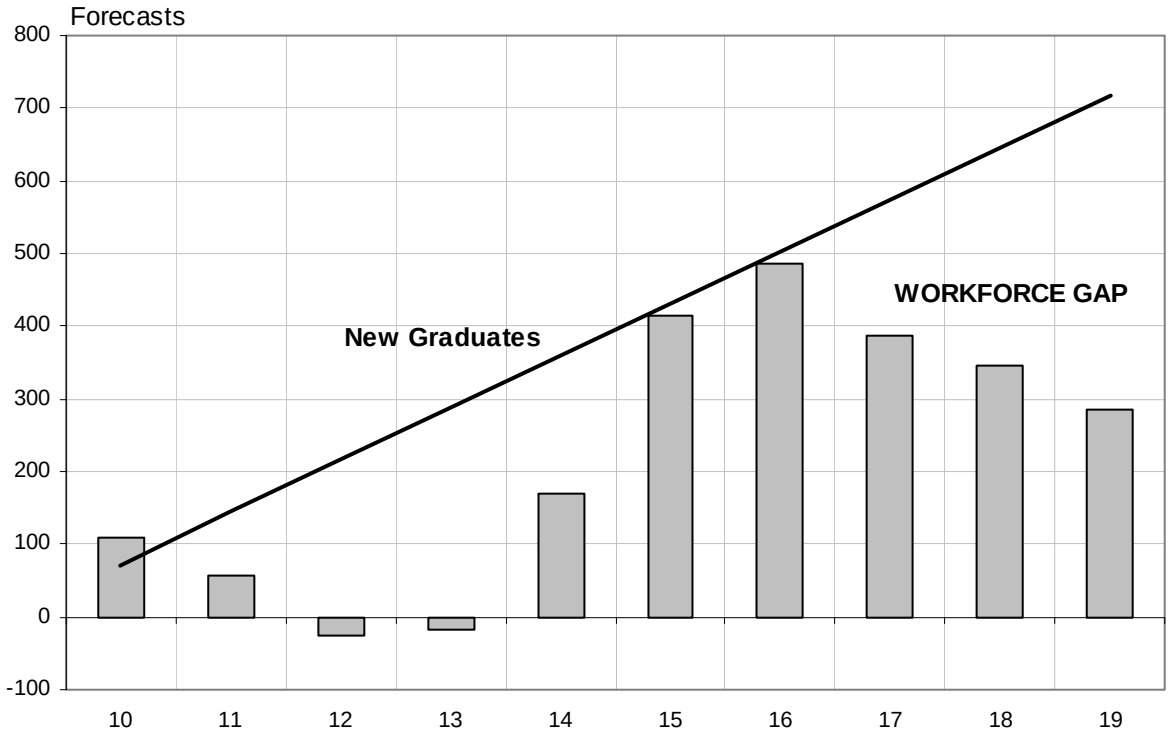
In interpreting this result, it should be noted that the model, as specified, does not consider other potential sources of graduate supply, such as net skilled migration, or a net movement of skills from other industries. However, given the likelihood of strong (and possibly sustained) demand for civil engineering skills from other countries (particularly Australia) over the forecast period, it is quite likely that the capability surplus could even turn into a shortfall if these net transfers were to be included.

Chart 1: Australia
Total Roads Workforce Gap and Graduate Supply (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 2: New Zealand
Total Roads Workforce Gap and Graduate Supply (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

CHAPTER ONE: INTRODUCTION

1. Introduction

Project outline

In 2006, BIS Shrapnel prepared a report for Austroads Incorporated which provided a detailed outlook for road construction and maintenance activity and its implications for workforce capability for member authorities. The report, titled *Australia and New Zealand Road Capability Analysis 2006 — 2016* focussed on the capability of engineering skills, particularly road and bridge design, construction and maintenance, traffic management, project delivery and project management, and road safety. Essentially, the report provided an analysis of the capability of the Australian and New Zealand roads workforce to meet infrastructure development requirements over the decade to 2015/16.

In May 2009, BIS Shrapnel was commissioned by Austroads to update the base data and forecasts provided in the initial report to the Austroads. Specifically, BIS Shrapnel was requested to:

- Review and update the Australian and New Zealand road infrastructure development outlook for the period 2009 – 2019 with particular attention being given to proposals to be considered by the Infrastructure Australia taskforce and to Federal and State Government announcements (including Budgets) relating to new transport infrastructure.
- Review and update skilled labour force data and modelling relating to the demand for civil engineering expertise in the roads sector as a result of changes to planned infrastructure, and taking into account any planned changes to engineering degrees/student numbers as well as changes to immigration. The latter was expected to be achieved through consultation with Dr Bob Birrell from the Centre for Population and Urban research (CPUR) at Monash University.
- Provide updated findings and recommendations.

This report represents the key outcomes of the above research agenda. The report aims to provide independent, detailed, thoughtfully researched and *quantifiable* responses to the following questions:

- What is the size of the skilled engineering profession in the roads sector?
- What is the outlook for the road sector in the decade to 2018/19, in terms of construction and maintenance activity?
- What are the skilled workforce demands implied by these activity forecasts?
- Is there a gap between these workforce demands and the supply of skills?
- What are the implications of this analysis for the roads industry?

As Australia's leading forecaster for the building and construction sector, BIS Shrapnel is well qualified to analyse these issues. BIS Shrapnel maintains unique and unparalleled market intelligence on the roads sector and produces major annual reports such as *Road Construction in Australia 2009-2024* and *Road Maintenance in Australia 2009-2024.* These reports provide detailed data and forecasts covering both road construction and road maintenance activity. BIS Shrapnel also has extensive experience building demand forecasting models and in undertaking employment and labour force forecasting.

This research was overseen by Austroads comprising representatives from roads industry bodies, including all major state road authorities in Australia and New Zealand. BIS Shrapnel would like to thank all who participated in this process, offered comments and provided information. The views expressed in this report, however, are those of BIS Shrapnel.

Structure of this report

Following this Introduction, Section 2 provides a description of the forecasting model used in this report. Chapter 2 also shows how we translate future roads activity into skilled labour demand and how the model is augmented to include supply-side issues such as the ageing of the existing workforce and the supply of new graduates. Concepts used in this report such as 'workforce gaps' and 'capability shortfall or surplus' are defined. Limitations of the forecasting model, and key assumptions made in the analysis, are made also made explicit.

Section 3 then presents a summary of BIS Shrapnel's outlook for the economy and the construction sector, including the roads sector. These forecasts are taken from various BIS Shrapnel reports, and in the model drive our forecasts of skilled labour demand.

Section 4 presents the output of the model for Australia, including a comparison of the total roads industry and the publicly-funded roads sector. A capability shortfall is quantified and implications of the results for the roads industry, and the broader economy, are discussed.

Further detail of the model output by Australian state and territory, and New Zealand, is presented in Sections 5 through to 13. BIS Shrapnel's estimate of the current skilled roads workforce in each state and territory — the effective starting point of the model — is first presented. This is followed by a brief outline of the road construction and maintenance forecast in that state or territory. Finally, model output is presented showing how these forecasts translate into a total requirement for skilled labour in the roads sector, and any workforce gap is identified. Note that, given there is no data on the flow of new graduates into the road sector by Australian state and territory, we do not calculate a capability shortfall (or surplus) for the states or territories.

Chapter 14 of this report provides a summary of findings to come out of the research exercise and suggestions on how the study may be improved in the future.

CHAPTER 2: MODEL STRUCTURE

2. Description of the Forecasting Model

Project scope and methodology

The objective of this report is to quantify the demand for skilled roads labour annually over the decade to 2018/19 — and identify any skills capability gaps in the roads industry — given forecasts of future road construction and maintenance activity.

The methodology used in this report involves, firstly, the estimation of a skilled (road) labour usage coefficient per unit of end use sector activity (e.g. a volume of road construction or road maintenance activity, expressed in constant price terms). Then, projections of end use sector activity over the decade to 2019 have been translated, using these coefficients, into forecasts of future skilled labour demand. In our model there are three basic drivers of skilled labour demand in the roads sector:

- Road construction activity.
- Road maintenance activity.
- Growth in the net capital stock of roads (as a proxy for growth in the road network)

Given the timeframe of the study, attrition of the existing workforce through ageing (e.g. via retirement and death) also becomes an important issue. The existence of workforce attrition means that the total additional skilled labour workforce requirement will end up higher than the total labour demand estimated by changed end use sector activity alone. This is because skilled labour also must be found to replace existing skills lost because of the ageing workforce. The assumptions used by BIS Shrapnel in determining the rate of workforce attrition during the decade to 2019 are discussed in Section 2.4.

In this report, the difference between total labour demand specified by end use sector activity and the existing workforce can be defined as the additional labour workforce requirement. It is referred to here as the ‘workforce gap’. This gap, when positive, will need to be met by additional supply if projected levels of end use sector activity are to be achieved. Possible sources of labour supply include:

- New graduates.
- Net migration from overseas.
- Net movement of skills between industries.

While all of these supply sources are important in meeting future road workforce requirements, only the first source is considered explicitly in this report.[1] Given data on current graduate enrolments and completions in civil engineering and other related disciplines, together with broad assumptions regarding the proportion of graduates who actually enter the roads skilled workforce, projections of future graduate supply have been made.

[1] While more detailed engineering net immigration data for Australia and New Zealand was procured from the Centre for Population and Urban Research (CPUR) for this study compared to the original study in 2006, it is still inadequate for estimating the movement of labour into and from the Roads sector specifically. Consequently, as in 2006, we do not explicitly model net immigration of skilled roads labour in this study.

The estimated workforce gap less the supply of additional skilled labour via new graduates is defined in this report as the 'net capability position'. If positive, it translates into a 'capability shortfall'. Similarly, a negative implies a situation of 'capability excess/surplus'. The presence of a capability shortfall implies that the roads industry needs to attract additional labour above that expected to be sourced from new graduates — such as through immigration, from other industries, or via other labour supply boosting initiatives (e.g. by increasing productivity or reducing the rate of workforce attrition) — if it is to achieve forecast levels of future roads activity.

Providing a quantification of the skills capability shortfall or surplus into the future is a key objective of this report. With the exception of our initial 2006 report, most analyses of capability or skills shortages in the engineering profession in Australia have presented only partial or anecdotal evidence.[2] For instance, Engineers Australia regularly constructs a relative skills shortage index for engineers based on the proportion of graduate engineers seeking full time work compared to graduates as a whole.[3] While this is a very useful exercise in determining trends in 'relative shortages' over time, and between engineering specialisations, it cannot yet provide a meaningful measure of the size of the shortage. It is also unable to posit how this measure may change in the future. Without such data, it is difficult to place the magnitude of the problem in its correct context, and hence to plan and initiate policies to address it.[4]

Defining the current skilled roads workforce

In order to quantify a skills capability shortfall or surplus, it is important to define at the outset the skills being considered, and the size of the defined skilled roads workforce. For this report, BIS Shrapnel has been asked to consider predominantly civil engineering and civil engineering related skills, particularly those associated with road and bridge design, construction and maintenance, but also project delivery and project management, traffic management and road safety.

2.1.1 Defining skilled occupations

Our analysis is concerned with the number of people who are actually working in an engineering or related capacity, not the broader population of persons who have formal engineering qualifications and skills, but who may use them in some other, unrelated way.[5] Consequently, we use the concept of occupation and tasks as defined by the Australian Bureau of Statistics (ABS) in determining the appropriate skills set, not the broader definition of the "Engineering Profession" as used by the peak body for engineering practitioners in Australia, Engineers Australia. This latter definition puts the size of the Engineering Profession at just under 250,000 persons in 2006 (using ABS Census data), of which 57,564 are listed as being employed in "home occupations", around 132,000 in "related occupations" and a further 60,276 in "other occupations".[6]

While there are a range of skilled occupations that operate in the roads sector, we have chosen the following occupations as our defined skill set from the ABS' Australian and New Zealand Standard Classification of Occupations (ANZSCO: 2006):

- Construction Project Managers (ANZSCO 133111).
- Engineering Managers (ANZSCO 133211).
- Civil Engineers (ANZSCO 233200-15).
- Civil Engineering Associate Professionals (ANZSCO 312200-12).

[2] As noted by Kaspura. A (2006) "Survey shows extent of skills shortages", Engineers Australia, February 2006, p36.
[3] Engineers Australia (2009) *The Engineering Profession: A Statistical Overview*, Sixth Edition, pp 88-92.
[4] An example of a more recent, broader attempt to quantify skills shortages is: Department of Education, Science and Training (DEST) (2006) *Audit of Science, Engineering and Technology Skills: Summary Report*, Commonwealth of Australia, July 2006. This report suggested that Australia would face a shortage of 20,000 engineers and scientists over the six years to 2012.
[5] The presence of this broader engineering population may have ramifications for policy aimed at relieving any measured capability deficit, however.
[6] Engineers Australia (2009), ibid, pp23-31. As stated by the author, the breakdown of the engineering profession into these categories requires further research.

- Cartographers and Surveyors (ANZSCO 232200-12).
- Others, including Quantity Surveyors (ANZSCO 233213), Urban and Regional Planners (ANZSCO 232611), Engineering Technologists (ANZSCO 233914), Construction Estimators (ANZSCO 312114) and Building and Engineering Professionals not elsewhere classified (ANZSCO 312999).

Note that this study explicitly excludes the executive management of roads organisations and construction companies (e.g. General Managers), administration and IT managers and staff, tradespersons, labourers and plant and machinery operators.

Note also that in the initial study we chose the relevant skilled occupation set from the ABS' 1997 Australian Standard Classification of Occupations (ASCO). The updated classification of occupations as in ANZSCO 2006 did not have a complete match to all of the classifications used in the previous study. To maintain consistency, we chose (for this study) the occupation set from ANZSCO 2006 which most closely resembled the occupation classifications used in the 2006 report. ANZSCO 2006, however, had an expanded list of various civil engineering related occupations and this resulted in the addition some new occupations to the "Others" category.

For a separate analysis of the roads sector in New Zealand (in Section 14), we have used the same occupation classifications.

Given some potential for overlap in the classification of Construction Managers and Engineering Managers, we have considered both in this study, and refer to both as being 'Project Managers' for the purposes of this report. Engineering Managers are concentrated in industry sectors unrelated to the roads sector (mainly manufacturing), and so only a small proportion of the total occupation population is considered for this report. This is due to the wide definition of engineering which includes non-civil construction applications. However, Engineers Australia notes that it is likely that civil engineers with a bachelor degree, at least five years experience and charged with running a large construction site are likely to be classified as an Engineering Manager by the ABS, so we have included them in our defined skills set for the roads sector.[7]

2.1.2 Defining the road sector

The task of identifying a skilled roads workforce is complicated by the fact that there is no precise ABS definition of a roads industry sector. While ABS Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce.

For instance, civil engineers employed by the large state road authorities (e.g. Main Roads in Queensland) may identify their industry sector as being State Government, while civil engineers employed by councils could list their industry as Local Government. Meanwhile, engineers and project managers working for large private construction companies, whose businesses encompass a wide range of civil construction activity including roads, may identify their industry more broadly as Non-Building Construction. And engineering consultants, who again work across various construction sectors, including roads, would correctly identify their industry as a part of Professional Services.

[7] Ibid, p4.

Consequently, BIS Shrapnel considers that the roads sector not only includes the "Road and Bridge Construction" sector but also a proportion of people employed in State and Local Government, Total Non-Building Construction and Professional Services. We have made reasonable assumptions to estimate these proportions for both the 2001 and 2006 Censuses — the two most recent Censuses available at the time of conducting this research. Finally, to bring the Census data (and our roads industry estimates) up to date, we have estimated a 2008/09 breakdown by extrapolating from the 2001 and 2006 Censuses, guided by known changes in industry sector activity since 2006.

2.1.3 The 2008/09 estimated roads workforce

The 2008/09 estimates of professional employment by occupation for Australia are presented in Table 2.1. We estimate that in that year, the total roads workforce in the specified skilled occupations was close to 18,150 persons. This compares to total occupation population across all industry sectors of just under 156,000.

Most of the skilled roads workforce was made up of civil engineers, followed by the 'Other' category comprising quantity surveyors, urban and regional planners, engineering technologists and construction estimators. There were approximately an even number of civil engineering associates and project managers (engineering managers and building and construction managers) in 2008/09.

Table 2.1: Australia
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**57,445**	**4,545**	**1,217**	**1,105**	**4,391**	**68,702**
Building Construction	47,253	1,543	278	269	2,471	51,815
Total Non-Building Construction	2,488	2,136	636	387	661	6,308
o/w Road & Bridge Construction	1,011	1,210	472	270	244	3,208
General Trade Construction	7,704	866	303	448	1,259	10,579
Public Administration & Safety	**2,312**	**4,128**	**1,541**	**2,269**	**5,856**	**16,105**
Federal Government	97	22	6	123	89	338
State Government	986	1,613	570	1,103	1,320	5,592
Local Government	782	2,275	917	602	3,632	8,209
Other	446	218	47	441	814	1,966
Professional Services	**7,455**	**10,401**	**4,240**	**5,854**	**8,607**	**36,558**
Other Sectors	**14,300**	**2,988**	**1,183**	**2,082**	**13,925**	**34,478**
Total All Sectors	**81,541**	**22,062**	**8,181**	**11,310**	**32,876**	**155,970**
Total Roads Workforce	**2,913**	**7,074**	**2,778**	**1,467**	**3,924**	**18,155**
Public Roads Workforce	**1,537**	**2,725**	**1,118**	**669**	**2,835**	**8,885**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

Of the 18,155 skilled persons employed in the roads sector, we estimate that approximately just under half (8,885) are employed by public sector authorities, such as the state road authorities and local councils, while the other half is employed by the private sector. Comparisons of these results with unpublished workforce data sourced from state road authorities and local government associations indicate that this is a reasonably accurate estimation.[8]

Forecasting future skilled labour demand

The approach taken by BIS Shrapnel to forecast future skilled labour demand is similar to other demand forecasting exercises we have undertaken for clients operating in the building and construction sector. That is, we firstly relate our estimates of 'base year' demand to an appropriate 'base year' activity indicator to derive a 'usage coefficient' per unit of end use sector activity. We then apply this usage coefficient to our forecasts of the activity indicator to derive forecasts of future demand.

In this case:

- Base year demand is estimated skilled employment in the roads sector in 2004/05
- "End use" activity indicators chosen for the roads sector are:
  - Road and road bridge construction activity
  - Road and road bridge maintenance activity
  - Road net capital stock (as a proxy for the growth of the road network).

That is, the model assumes that future changes in demand for skilled labour in the roads sector are driven by changes in road and road bridge construction activity, road and road bridge maintenance activity and the net capital stock of roads. The net capital stock of roads is included in order to capture the demand for skilled labour that is not directly related to construction and maintenance work, but rather depends on the overall size of the road network (e.g. traffic engineers, urban planning and safety).

2.1.4 Activity indicator data sources

End use activity indicator data is drawn from both ABS and National Transport Commission (NTC) road and bridge data, as well as BIS Shrapnel estimates. Forecasts of these data series are produced regularly by BIS Shrapnel.

Road construction data is sourced from the ABS category of engineering construction — roads, highways and subdivisions from the ABS publication, *Engineering Construction Activity, Australia* (Cat. No. 8762.0). This data breaks down road construction by who funds and/or undertakes the work (the private or public sector). Road bridge construction is based on total bridge construction in the same ABS release, with BIS Shrapnel estimates of rail and other non-road bridges excluded.

Forecasts of road and road bridge construction activity to 2019 are sourced from BIS Shrapnel's regular multi-client report, *Road Construction in Australia 2009 to 2024*. This report uses both bottom up (e.g. project lists, Federal and State Budget papers, capital programs of state road authorities etc) and top down approaches to reconcile the forecasts. The top-down modelling ensures the forecasts are consistent with historical levels of investment and with our assumptions of the economic environment, public sector capital expenditure cycle and private investment cycle.

[8] Unpublished survey responses from State Road Authorities as part of this research indicates that the skilled roads workforce at the State Government level is 5,298 persons. Independent, additional information supplied by the Institute of Public Works Engineering Australia suggests that the skilled roads workforce at the Local Government level is 3,340 persons. Combined, this comes to 8,638 persons, which is very close to our modelled estimate of 8,885 persons for the public sector.

Road and road bridge maintenance data is sourced from the regular NTC data collection from state and territory road authorities on a standard template (for highways and arterial roads and road bridge maintenance), and the ABS Local Government Finance Statistics (for local roads). BIS Shrapnel also makes use of research from the Bureau of Transport and Regional Economics (BTRE), State and Federal Budget Papers, Australian Local Government Association (ALGA) reports as well as BIS Shrapnel survey data.

Forecasts of road and road bridge maintenance activity to 2019 are sourced from BIS Shrapnel's regular multi-client report, *Road Maintenance in Australia 2009 to 2024* (currently under production). As with *Road Construction in Australia*, this report uses both bottom-up and top-down approaches to reconcile and forecast road maintenance activity.

Note that BIS Shrapnel defines road and road bridge construction as including road rehabilitation that improves upon the original design standard of the road as well as substantial "one-off" repairs that add considerable value and life to the road asset. Asset renewal and maintenance activity which does not improve on the original design standard is considered maintenance.

Historical road net capital stock figures (to 1996) have been sourced from ABS Australian *National Accounts Capital Stock* data (Catalogue Number 5221.0) which is now discontinued. An extension to this data series — and forecasts to 2019 — have been estimated by BIS Shrapnel for each Australian state and territory using ABS road construction data and subtracting an estimate of depreciation of the road capital stock.

2.1.5 Usage Coefficients

Usage coefficients were derived, firstly, by apportioning the estimated base year roads workforce, by occupation, across the three activity indicators. That is, the model assumes that demand for a set proportion of each occupation of the roads workforce is driven by changes in either road construction activity, or road maintenance activity or changes in the net capital stock of roads (where the sum of all these proportions equals 100 per cent).

For example, demand for tasks such as road and bridge design and construction project management are likely to be driven by changes in road construction activity. Demand for other technical, design, testing and project management skills will be driven by changes in the volume of road maintenance activity. Finally, demand for other road management functions such as traffic management, road safety and urban planning is deemed to be determined by changes in the net capital stock of roads (as a proxy for growth in the road network). The sum of changes in demand for skilled labour across the three end use activity segments provides a measure of the total change in demand for skilled labour in the roads industry.

The proportions chosen by BIS Shrapnel, for all occupations across the private and public roads sector of each state, are shown in the table below. These proportions were determined through a detailed examination of the relative level of private and publicly funded road maintenance and construction activity in each state, consideration of the quality, age and trafficking of the road network in each state, and through consultation with key roads organisations.

Table 2.2: Estimated Skilled Roads Workforce Proportions
Per Cent

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST	NZ
Public Sector										
-- Road Construction	40%	70%	55%	50%	60%	25%	40%	50%	52%	50%
-- Road Maintenance	40%	15%	25%	31%	25%	54%	50%	40%	30%	50%
-- Other Roads Activity	20%	15%	20%	19%	15%	21%	10%	10%	18%	na
-- TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Private Sector										
-- Road Construction	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
-- Road Maintenance	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
-- TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: BIS Shrapnel

It is important to note that changes in the choice of these proportions can affect the size of the perceived capability shortfall or surplus quantified by the model. This is because the choice of proportions changes the degree to which workforce demand is altered by, say, road construction activity (which is relatively volatile from year to year) as opposed to road maintenance work (which exhibits a trend increase over time). A strong and increasing outlook for road construction activity, for example, coupled with a high proportion of workforce demand allocated to road construction activity will drive a stronger overall demand for labour than if the proportion allocated to road construction were lower.

Once determined, the proportions were then used to calculate the estimated number of persons in each occupation for each end use activity. For each occupation in each state and territory, a usage coefficient was calculated for each end use activity by dividing the estimated roads workforce affected by that end use activity segment (via the proportions) by the level of end use segment activity in that year (2008/09). Forecasts of future skilled labour demand are then generated by applying these “fixed” coefficients to BIS Shrapnel’s projections of future activity in each end use activity segment.

Labour Productivity

Note that in this updated study, we have allowed for “dynamic” usage coefficients i.e. coefficients which change over time. Effectively, this means that we have incorporated labour productivity growth assumptions into the model. Our baseline model output is based on the national average of productivity growth of 1.5 per cent per annum. However, we also present results for a 1 per cent and 0 per cent productivity assumption. Apart from using these different productivity assumptions for sensitivity testing, they have been specifically chosen as 1 per cent reflects labour productivity growth in the construction sector over the decade to 2009, while 0 per cent reflects the (implicit) productivity assumption of our initial 2006 report.

Modelling existing workforce attrition

The total skilled roads workforce requirement to meet future roads activity will inevitably be increased by the attrition of the existing workforce through ageing effects; particularly through retirement and death. In order to augment the model to allow for workforce attrition, we include assumptions regarding the approximate age profile of the workforce (based on unpublished road authority workforce data as well as broader ABS data), and the likelihood of retirement or death of persons in each age group (based on various ABS civilian population data series).

The concept of workforce attrition is not restricted to the roads industry. But it is possible that the impact of ageing on the skilled roads workforce will be more severe than in other industries given the relatively high proportion of the skilled workforce in higher age brackets. For comparative purposes, Table 2.3 presents age profiles of the total professionals' workforce from ABS labour force data cubes[9] and the average Australian skilled roads workforce sourced from unpublished state road authority data. Note that we have chosen the latter to represent the skilled roads workforce for this report but with significant differences between states.

Table 2.3: Workforce Age Profiles
Per Cent

Age Bracket	Total Professionals Workforce (Australia)	Estimated Roads Workforce (Australia)
15-24	7.4	6.0
25-34	27.9	21.2
35-44	24.9	22.3
45-54	22.5	28.5
55-59	14.5	13.3
60-64		7.2
65-69	2.4	1.5
70+		0.0
Total	100.0	100.0

Source: BIS Shrapnel, ABS data

As shown, a greater proportion of the roads workforce age profile is aged 55 or higher than for the total professionals' workforce. This is likely because of the higher education requirements of the skilled roads workforce then for the general population and the length of experience required to perform tasks in the chosen occupations. We expect that project managers with many years of roads experience, for instance, would make up an increasing share of the workforce aged 55 or higher. Related causes may include high levels of immigration in the past which boosted supply in younger age groups to the broader construction sector (that were not sustained),[10] and the declining number of university engineering graduates who are Australian citizens.[11]

While data is available for determining an approximate age profile of the skilled roads workforce, there is very little published information regarding how many people retire from the roads workforce each year, cross referenced by age, or alternatively the retirement age intentions of the existing workforce. Nonetheless, we were able to get some distribution of the number of public sector retirements by age profile over the last financial year from the State Road Authorities. We used this data together with aggregate ABS labour force, civilian population and non-labour force data to form our own assumptions regarding the probability of retirement in each age group. The probability of death in each age group was assumed based on the latest available morbidity statistics from the ABS and, for simplicity, we assumed a zero death rate for ages under 60 (the very low morbidity rate for ages under 60 have an insignificant impact on the model results).

[9] ABS *Labour Force, Australia, Quarterly*, Cat. No. 6291.0.55.003, August 2009.
[10] Birell, B. and V. Rapson (2005) "Recruitment and Training in the Civil Construction Industry in Victoria", Centre for Population and Urban Research, Monash University, September 2005, p41.
[11] Engineers Australia (2006) "Submission to the Productivity Commission on the Economic Implications of an Ageing Australia", October 2004, p7.

Both of these assumptions are shown in the accompanying table, and are used uniformly across all states and territories. There will be different rates of workforce attrition across states and territories, however, given different estimates of the skilled roads workforce age profile in each region, based on unpublished road authority workforce data.

Table 2.4: Roads Workforce Attrition Assumptions

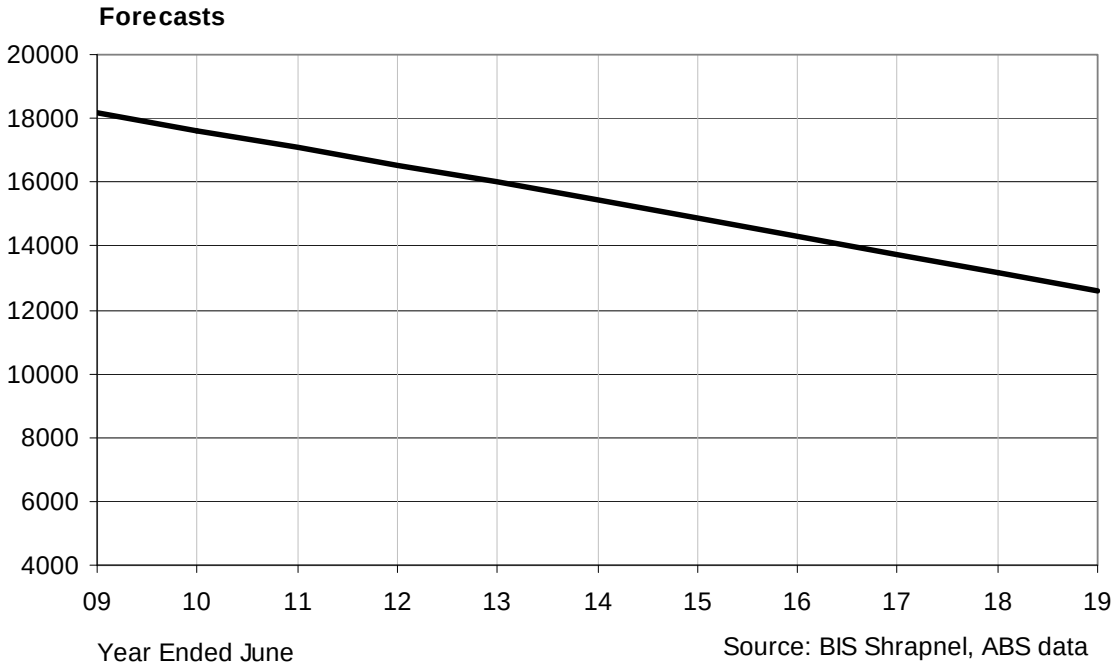
Age Bracket	Proportion of age bracket retired (%)	Death Rate (per 1000)
15-24	3%	0.0
25-34	5%	0.0
35-44	6%	0.0
45-54	10%	0.0
55-59	23%	0.0
60-64	44%	9.3
65-69	80%	15.3
70+	95%	57.4

Source: BIS Shrapnel

The impact of these assumptions on the existing roads workforce is shown graphically in the figure below. As shown, using these assumptions the current skilled roads workforce is expected to decline around 30 per cent between 2008/09 and 2018/19, with the annual rate of decline expected to accelerate beyond 4 per cent per annum from 2016/17 as a higher proportion of persons enter the older age groups.[12] It should be noted that while the existing skilled roads workforce is expected to decline in personnel terms, the measure of skills and experience lost is likely to be far greater given that the retirees will be concentrated in relatively “high skill/experience” occupations. This report does not attempt to quantify this, arguably greater, loss, but acknowledges that it is a key issue facing the roads sector and the broader engineering construction industry.

[12] Engineers Australia (2006: p7) notes that up to 40 per cent of its current members are due to retire in the decade to 2014, although this figure is likely to include engineers working in “unrelated” and “other” occupations such as executive management and administration.

Chart 2.1: Australia
Ageing of Existing Roads Workforce

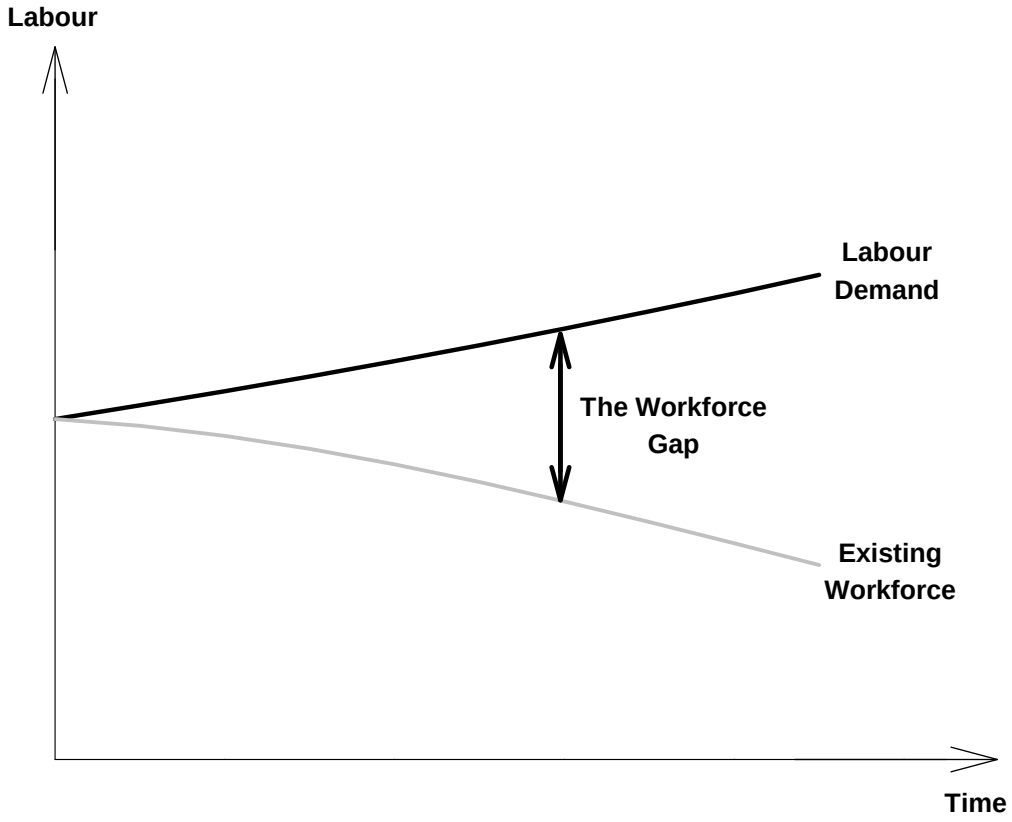


Source: BIS Shrapnel, ABS data

Modelling new graduate supply

The combination of changing demand for roads skills driven by changes in road construction and maintenance activity, and the need to replace personnel lost through workforce attrition, results in an additional labour requirement or “workforce gap”. This is shown conceptually in Chart 2.2.

Chart 2.2: The Workforce Gap



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 achieved. Possible sources of labour supply include:

- New graduates.
- Net migration from overseas.
- Net movement of skills between industries.
- Other labour supply boosting initiatives (e.g. re-training, productivity improving measures, slower rates of attrition etc).

All of these supply sources are important in meeting future road workforce requirements. However, only the first source is considered explicitly in this report. As most of the skill requirements for the chosen occupations are based on engineering and related disciplines, we utilise Higher Education data supplied from the Department of Education, Science and Training (DEST) and published in Engineers Australia's *2009 Statistical Overview*.[13] We also used historical (engineering) education data for Australia and New Zealand provided by Dr Bob Birrell from the CPUR to reconcile some of the education series.

[13] Ibid, pp55-66.

We have chosen to use only data relating to undergraduate enrolments and completions for both domestic and overseas students. Higher degree completions do not add to the supply of engineers, although they are considered to improve the base of knowledge. Forecasts of undergraduate completions for civil engineers and cartographers and surveyors — the key sources of supply for the roads industry — are based, in the near term, on current course enrolments and completion rates. Longer term, we have assumed that the supply of new graduates will stabilise around a historical trend.

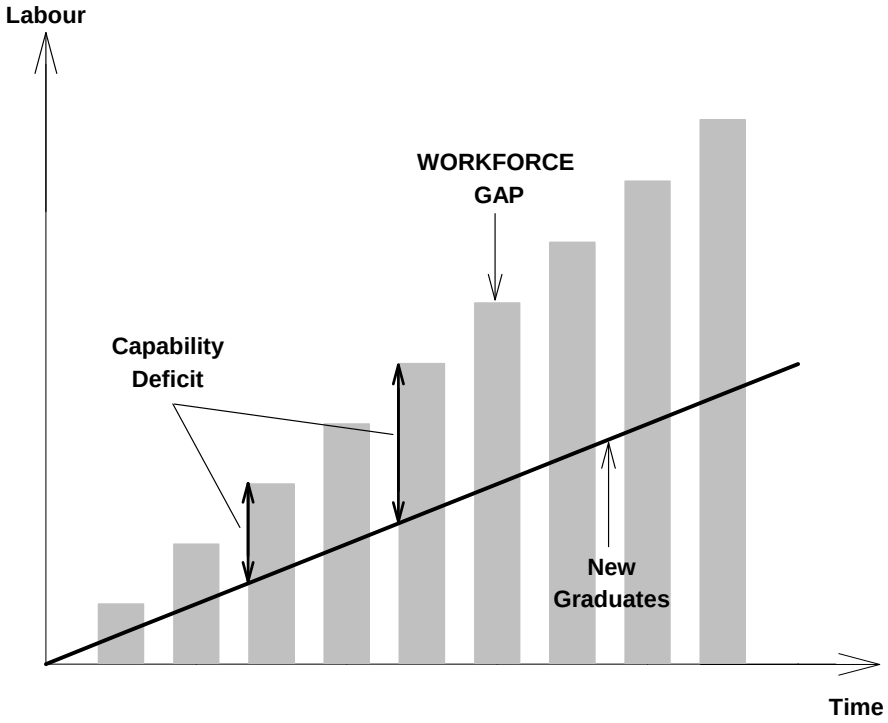
In addition to university graduates, we also consider data on vocational course enrolments and completions. These have been supplied from the National Centre for Vocational Education Research, and are focused on those looking to work as civil engineering associate professionals. As the key qualification for employment as civil engineering associate professionals is Certificate IV or higher, we have only included completion of these qualifications as adding to the supply of civil engineering associate professionals. Our forecast of growth in vocational completions is assumed to follow a similar trend to that of university graduate completions.

A final complication in examining graduate supply is determining the proportion of graduates that will actually work in an engineering or related capacity in the roads sector. This involves making two broad assumptions: firstly, the proportion of graduates that will work directly as engineers or related occupations (instead of working in other unrelated occupations or undertaking further study) and, secondly, the proportion of these that will work in the roads sector. In the first instance, we have assumed that a fixed proportion of university graduates will work directly as engineers or in related occupations through the forecast period. In the second instance, we have assumed that the proportion of engineering and related graduates moving into the roads sector moves directly in relation to our forecast share of road construction activity compared to total engineering construction. We acknowledge that this assumption may not strictly hold on a year-by-year basis (for instance, anecdotal evidence suggests that it was very difficult for road authorities to attract graduates to the road industry during the recent mining boom), but consider this to be a reasonable assumption to make, on average, across the forecast period.

2.1.6 The capability shortfall or surplus

The estimated total labour requirement or ‘workforce gap’ less the supply of additional skilled labour via new graduates is defined in this report as the ‘net capability position’. If positive, it translates into a ‘capability shortfall’. Similarly, a negative implies a situation of ‘capability excess/surplus’. The presence of a capability shortfall implies that the roads industry needs to attract additional labour above that expected to be sourced from new graduates — such as through immigration, from other industries, or via other labour supply boosting initiatives (e.g. by increasing productivity or reducing the rate of workforce attrition) — if it is to achieve forecast levels of future roads activity.

Chart 2.3: The Capability Shortfall (Surplus)



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

However, the quantification of the capability shortfall, although theoretical, provides important insights. First and foremost, it provides a simple measure of how much more labour is required — whether through migration, the net transfer of skills between industries or through education and re-training — to meet current expectations of future road sector activity. Alternatively, a capability shortfall could be used to measure the "cost" of the labour constraint in terms of the value of the road construction and maintenance activity foregone if supply were not augmented. Given the high 'multiplier' effects of construction and maintenance activity — as well as costs associated with the presence of inadequate infrastructure (e.g. congestion, inefficiency, accidents etc) this cost would have even stronger flow-on effects on the broader economy.

Limitations of the model and summary of key assumptions

The aim of the model is to quantify a skills capability shortfall or surplus for the roads sector based on reasonable assumptions regarding the future demand for skills (via forecasts of road construction and road maintenance activity) and the future supply of skills (through new graduates). While BIS Shrapnel has taken care in the specification of the model, and the assumptions used, it is important to note some limitations of the model chosen and to recap the key assumptions that have to be made. Improving upon the specification of the model or the choice of assumptions based on feedback to this report or via new sources of information would be a useful avenue for future research. Ideally, the model used here could be improved upon and run again periodically to assess if the capability outlook has changed. Furthermore, this model could conceivable be extended to consider other sectors of the economy, or other occupations within the roads sector.

In our view the main limitations of the model as specified are:

- **The measurement of requirements in terms of labour or 'personnel', not necessarily skills and experience.** The model used here quantifies a capability shortfall or surplus in terms of the number of persons required across the occupation groups considered. However, this does not take into account 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 from other industries, or via immigration, where existing skills and experience may be higher.

  We note that in the course of this project, BIS Shrapnel made some progress on the development of an "equivalent persons" index. This aim of the index is to convert the "number of persons" measure to a measure of skills and capability. However, we feel that more work is required in this area. In particular, a workable index will require accurate measures of experience earned (e.g. number of years employed in the roads industry for each person, not just age) and some agreement on an appropriate scale that compares people with different measures of experience. For instance, such as 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.

- **The timing of labour demand.** The model as specified quantifies the annual capability shortfall or surplus that is forecast to exist in the roads sector for each year to 2018/19, based on BIS Shrapnel's projections of roads activity in that year. However, for many engineering occupations, the demand for labour will necessarily precede the period where actual road construction or maintenance takes place (for example, in the planning and design stages of major construction projects). In the case of engineering skills, particularly, we believe that hiring should take place around 5 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 and maintenance 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.

- **Treatment of other skills supply sources not explicitly considered.** The model does not explicitly attempt to quantify labour supply sources other than new graduates, such as via immigration or via movement of skills from (or to) other industries. While BIS Shrapnel procured net immigration data for engineers from the Centre of Population and Urban Research (CPUR) in the course of this study, it was felt that this information was still insufficient to estimate labour flows to the roads sector specifically. For the public sector, we note that State Road Authorities have used migrant labour (under the 457 visa program and elsewhere) sparingly, compared to their more substantial graduate intake programs, and even this small contribution has since declined with the advent of the global financial crisis.[14] In future, we believe a proper estimate of the impact of immigration on labour supply for the roads sector would require an extensive survey of both private sector and public sector organisations. In regard to this issue, however, we re-iterate that it is not the primary aim of the model, or this report, to suggest how best to meet any measured capability shortfall, but rather to quantify how large the problem may be.

[14] Based on private correspondence with State Road Authorities.

- **Model does not consider 'under-employment' of labour.** The definition of employment used by the ABS is quite broad, and encompasses persons working as little as one hour a week.[15] This may have particular consequences in our derivation of workforce attrition, which is based on the number of people who have left the workforce entirely in each age group. This means that persons who are working as little as one hour a week will still be considered "employed" by the model. So while the model suggests 30 per cent of the skilled roads workforce will retire by 2019, the reality, in terms of hours of work supplied, may be larger.
- **Existing skills shortages not considered.** An explicit assumption of the model is that there is that the capability gap is zero in the base year. We have taken this approach because of the need to calculate appropriate usage coefficients (based on actual road activity). However, anecdotal evidence and communication with roads authorities suggests that skilled labour shortages not only exist already, but have become much worse over the last 3 years (when the study was originally undertaken), and this should be kept in mind when considering the capability forecasts of the model.

2.1.7 Key assumptions used in the model

As stated, we have had to make several broad assumptions in the construction of the model. Some of these assumptions are more important than others in terms of their impact on the working of the model and the results generated. In our view, the key assumptions are:

- The choice of end use activity indicator proportions (Table 2.2).
- The estimation of the 'base year' skilled roads workforce (Table 2.1), which is also used to derive the usage coefficients used in the model.
- The workforce attrition assumptions (Table 2.3), particularly the "retirement likelihood" assumptions in each age group.
- Assumptions regulating likely graduate supply.
- Assumptions regarding the correct rate of productivity growth.

In addition to these, the results of the model will also hinge on the accuracy of our roads activity forecasts. As discussed earlier, these are based on publicly available information regarding future road construction and maintenance activity by the public and private sector, overlaid by our forecasts for economic activity and cycles in investment and construction. These forecasts are presented in the following chapter.

[15] ABS (1996), Standards for Labour Force Statistics, Cat. No. 1288.0.

CHAPTER THREE: MARKET OUTLOOK

3. Economic and Construction Sector Outlook

This Section presents BIS Shrapnel's forecasts for the Australian economy and the construction sector, including road construction and maintenance, over the decade to 2019. This outlook describes the economic environment in which key investment decisions, including that for the roads sector, are likely to be undertaken.

Our outlook for the economy, and cycles in construction and investment, shape our broad, macroeconomic outlook for the roads sector. In some cases, the links are quite direct, such as the impact of the housing cycle on subdivision road construction, or the impact of the economic cycle on state government finances and capital expenditure plans.

The presentation of the outlook for the various segments of the construction industry — including residential building, non-residential building and engineering construction — also provides a point of comparison with the roads activity forecasts. This may be useful for future consideration of inter-industry skilled labour flows over the decade ahead.

The following commentary is sourced from several of BIS Shrapnel reports including:

- Long Term Forecasts, 2009 to 2024 and an update of this report released in February 2010.
- Building in Australia, 2009 to 2024.
- Engineering Construction in Australia, 2009/10 to 2023/24.
- Road Construction in Australia, 2009 to 2024.
- Road Maintenance in Australia, 2009 to 2024 (forthcoming).

Economic outlook

3.1.1 State of Play and near-term outlook

The headwinds from the GFC early last year have now passed, with the damage not nearly as bad as most feared. The initial demand shock and the subsequent credit squeeze/collapse in confidence/fear of unemployment/ precautionary saving logic led most commentators to predict a major recession for Australia. But that did not materialise. Healthy fundamentals, the swift implementation of the government's stimulus package, steep cuts to interest rates and the strength of Chinese demand all combined to keep Australia out of recession in 2009. The outcome has been GDP growth of around 1% last calendar year.

After having escaped relatively unscathed from the GFC with only a moderate downturn, the economy is now already into a sustainable recovery. Indeed, interest rates have already been raised from the 'emergency' expansionary settings of last year.

Employment continues to be on an upward trend. In January, employment rose by 52,700. With the participation rate unchanged at 65.3% over the month of January, the rise in employment led to a fall in the unemployment rate to 5.3% in January. There are however still significant areas of weakness in the economy and slack to be absorbed in labour markets. The next phase will see employees increase their average weekly hours and some part-time convert to full-time, thus increasing the utilisation of the workforce. We therefore believe that an unemployment rate of below 5%, as predicted by some market economists, will not eventuate soon or be sustained.

Nonetheless, the fact that the labour market continues to display considerable resilience means that there is upside to both employment growth and GDP.

Retail sales dipped in the month of December but recorded reasonably strong growth over the December quarter. In real terms, turnover grew by 0.9% in the quarter and 3.3% through-the-year compared to the December quarter 2008. Business lending has also started to show some signs of recovery. The past two months has seen growth in commercial finance commitments return and may be an indication that credit availability is improving although businesses still face significantly higher interest rates compared to the household sector.

The strength of dwelling approvals across Australia continued throughout December. Overall, dwelling approvals remain on a clear upward trend and this will convert into rising construction activity through 2010. However, first home buyer (FHB) demand has waned and upgrader demand for new dwellings is expected to support the market in the first half of 2010. Nationally, there were 12,054 loans to FHBs, down 16% from December 2008, while loans to upgraders increased 21% compared to the same period.

However, it is not all sweetness and light. Recovery won't be swift. The household handouts have ended, leaving retail sales a little fragile. The build-up of government debt will later transform into a period of tightening affecting public spending—but not during this year with an election due. The high Australian dollar is damaging the competitiveness and viability of domestically produced tradeables industries, particularly manufacturing, tourism and other tradeable services. In addition, some businesses are still unable to access more debt; hence a quick turnaround in private investment is unlikely.

In all, Australia's GDP growth for 2009/10 is forecast to grow in year-on-year terms by 2.7% and will helped by the drivers that kept Australia out of recession in 2009, namely fiscal stimulus package and low interest rates—which are still 'expansionary' despite rising through the year. In addition, it will be supported by very strong economic growth in China and other parts of Asia (boosting Australia's commodity exports and prices) and some major private infrastructure, coal, oil and gas projects.

On the inflation front, underlying inflation remains stubbornly high. Despite the weak demand conditions over 2009, the RBA's indicator of underlying inflation has been declining at a much slower rate—from a peak of 4.8% in the September quarter 2008 to 4.2% in March quarter 2009 and to 3.6% in December. However, inflation is not our problem yet, at least not until capacity and labour constraints again lead to demand-inflationary pressure some years down the track. Meanwhile, the RBA has begun the tightening phase of the cycle, and there are more rate rises to come. Indeed we think interest rates will move to neutral by (or before) mid 2011, with the cash rate moving to 4.75% and the housing variable rate to 7.6%.

3.1.2 Short to medium term outlook

Beyond 2009/10, the outlook is for a solid recovery to get underway led by housing construction, with economic growth strengthening over 2011/12 and 2012/13 as business investment and subsequently employment and consumer demand regain momentum. Numerically, we are predicting Australia's GDP to grow by 3% in 2010/11, accelerating to 3.8% in 2011/12 and 2012/13 before slowing to 2.5% in 2013/14. The key developments underpinning our medium term forecasts are provided below.

Dwelling construction to lead the next upswing, driven by pent-up demand.

Despite a fairly mild, ‘soft-landing’ in most residential property markets over 2005 to 2007 (with Sydney the main exception), a substantial rise in the underlying demand for housing in Australia has seen the emergence of considerable pent-up demand. The substantial increase in immigration—mostly driven by skilled labour shortages—has pushed up the underlying demand for dwellings in recent years.

This pent-up demand is now being unleashed, but with the deficiency of dwelling stock now equal to almost one year of demand (well over 1 ½ year in NSW)—and with high immigration to continue—a massive amount of dwellings needs to be built. Despite the issues of affordability and high household mortgage debt, we expect strong rises in dwelling building (including alterations and additions activity) over 2010/11 and 2011/12, before high interest rates curtail the upswing in 2013.

Dwelling construction has significant multiplier effects, drawing heavily on local labour and locally produced upstream inputs, plus considerable downstream expenditure on furniture and other fit-out items. These multiplier effects will feed into further spending, investment and employment which will boost activity more generally over 2011 and 2012.

Exports to pick up through 2010/11

Export growth is forecast to strengthen over the next two years in line with the recovery in global economic growth and industrial production. Energy, metals and minerals export volumes will increase as new capacity (from the pre-GFC resources investment boom) is ramped up and some currently idled capacity is brought back on stream. Rural exports should also be sustained in the short term, given healthy crop production in 2009/10 and summer rains in Eastern Australia.

Machinery & equipment investment to strengthen with profits and employment

Between 2002/03 and 2007/08, we witnessed an exceptionally strong period of investment in machinery and equipment, with strong growth registered across most industries. There were a number of factors which contributed to this strong growth phase. Firstly, a period of weak investment through the 1990s, which created significant replacement demand and also underpinned a strong phase of capacity building investment. Falling world prices for capital goods, an appreciating A$, strong wages growth, weak labour productivity growth and skilled labour shortages also influenced decisions to mechanise.

Machinery & equipment investment declined in 2009 and is projected to decline further in 2010. Major expansions to capacity have been either abandoned or deferred through a lack of financial feasibility, lack of finance or weak demand. The credit crisis has seen criteria for accessing both working capital lines of credit and those for obtaining finance for investment tighten. Together with weakening demand and profits, this has also seen more 'generalised' investment postponed. Meanwhile, weakening demand has also seen hiring decisions deferred and employment is a major driver of machinery & equipment investment, particularly in the services sectors.

However, as employment and profits regain momentum from 2011/12, generalised machinery & equipment expenditure will firm. And as excess capacity is increasingly absorbed, the upswing in non-dwelling building and mining investment activity from 2012/13 will stimulate demand for associated machinery & equipment.

In summary, we expect investment to strengthen over 2011/12 and 2012/13 as business investment troughs and the housing upswing gains momentum. A recovery in consumer spending and an easing in financial conditions will help encourage the release of pent-up demand for machinery & equipment investment, while a recovery in profits, employment and rising capacity utilisation will underpin a period of capacity building investment and associated machinery & equipment expenditure starting from 2012/13 and building over the second half of the decade.

Absorption of overhang in world mining capacity to see investment recover from 2011/12.

The commodity price boom and subsequent bust was inevitable, but an oversupply, as opposed to a collapse in demand, had been considered the more likely catalyst. Commodity price falls in the final six months of 2008 mirrored drops in other financial asset prices. Prices for some base metals had already started to fall through the first half of 2008 as new capacity—a response to the high prices—started to come on-stream. However, prices for base metals (excluding gold) halved over the second half of the year. This was an overshoot and reflective of the panic that swept financial markets and saw investors fly to fixed income safe havens. Oil, which had been used as a hedge against the US$, saw its price fall by 75% between its July high and its trough in December.

Subsequently, as confidence firmed following coordinated efforts by governments and central banks to boost liquidity, risk aversion abated and prices recovered some of their losses. An increase in Chinese demand, as that country's massive infrastructure program geared up, also helped buoy sentiment. However, the rally is not expected to extend through 2009/10. The extent of the drop in industrial production and the increase in world capacity, even with the mothballing of some high cost operations, means that the demand-supply fundamentals won't justify further significant gains in the near term.

Constraints on financing are only expected to ease gradually and further market consolidation is likely as high cost production is progressively decommissioned and profitable, but debt-straddled, operations are taken over by competitors. The combination of strong domestic demand in industrialising Asia and resource-intensive fiscal stimulus packages will help underpin solid growth in demand from 2009/10, but the overhang in capacity is likely to be temporarily exacerbated by new production that was under construction prior to the collapse in demand.

However, prices are expected to recover from 2011/12 as sustained strong demand from industrialising Asia and a period of exceptionally weak investment sees capacity utilisation levels start to rise. Engineering construction is expected to strengthen over 2012/13 and 2013/14.

Lift in commodity prices will enhance terms of trade and spending capacity.

With the rebound in commodity prices through 2009 and into 2010 outstripping the rise in import prices, Australia's terms of trade will rise in 2010/11 after the sharp fall in 2009/10. A modest rise in 2011/12 is then expected to be followed by a solid increase in 2012/13 before stabilising. The rise in the terms of trade will help lift national income and spending. In particular, the recovery of commodity prices and global demand will encourage the next round of mining and related infrastructure investment to pick up pace from 2011.

Non-Dwelling building activity turns around in 2011/12.

The GFC both accelerated and exaggerated the downturn in commercial and industrial non-residential building, effectively halting the upswing before the cycle had a chance to run its course and significantly oversupply property markets. With that overbuilding now effectively prevented and demand solidly recovering, it won't take long to absorb any excess supply. It will become logical to invest again in these markets and—assuming finance availability improves—we expect a turnaround in non-residential building during 2011/12 and solid growth over 2012/13 and 2013/14. A boom in this sector later this decade is a distinct probability.

Rebound in employment and confidence will lift household spending.

The combination of the 2009/10 drivers of economic activity has underpinned a resilient labour market, boosting consumer and business confidence, ultimately leading to a rebound in household spending and employment. Indeed, the rebound in employment over the second half of calendar 2009 has more than wiped out the 62,200 jobs lost from the previous October 2008 peak to the June 2009 trough. Private consumption expenditure (PCE) has picked up in tandem since mid-2009 and is expected to strengthen over 2010/11, increasing by 2.7%.

The strengthening in total investment, exports and the overall economy is expected to lead to a marked strengthening in employment over 2011/12 and 2012/13, in turn leading to stronger consumer spending, With unemployment falling and the labour market tightening, wages growth will also accelerate, with faster growth in household incomes encouraging households to lift spending, because households increased precautionary savings and payed down debt in 2008/09, household finances will also be in a much healthier position with additional scope to lift spending. We expect a considerable amount of pent-up demand (built up over previous years of delayed expenditure) to be unleased. PCE is forecast to increase 4.2% in 2011/12 and 3.9% in 2012/13. However, with the government unlikely to cut taxes while it is still in deficit, and with higher interest rates pushing up mortgage payments, growth in PCE will outpace real household disposal income.

Rising interest rates through 2012 to slow growth in 2013/14.

Interest rates and the availability of finance are important influences on the strength of investment. The higher interest rates are, the greater the opportunity cost of investment. As a consequence of the credit crisis, financial flows have been disrupted and heightened risk aversion has meant that only the most financially feasibly projects are receiving funding. It is unclear when normal market activity will resume. However, Australian companies have had considerable success in equity raising to recapitalise in 2009, which has reduced the need to offload assets to reduce debt levels and this will limit further downward pressure on prices.

The RBA has started to gradually unwind its expansionary monetary policy setting. Interest rates are expected to be back at a neutral setting by (or before) mid 2011, with the cash rate moving to 4.75% and the housing variable rate to 7.6%. Interest rates are expected to peak at 6.25% by mid-2013 as the RBA moves to head off an escalation in price pressures. Domestic demand is projected to be growing close to 5% through 2012, as strong growth in consumer demand and an upswing in business investment coincides with a further strong year of dwelling activity.

The persistence of high household debt levels means that households remain interest rate sensitive and disposable income growth will weaken through 2012/13. Consumer spending is also expected to weaken and, subsequently, housing activity is expected to enter a mild downturn as a result of affordability issues and also a lack of demand following a strong growth phase. GDP growth is forecast to moderate from 3.8% in 2012/13 to 2.5% in 2013/14.

Generalised business investment will moderate through 2013/14 in line with weakening profits, but non-dwelling construction activity will be largely unaffected. As excess capacity is increasingly absorbed and the hangover from the financial crisis eases, the conditions for a recovery in non-residential markets will be set and activity is expected to regain momentum from 2014/15.

3.1.3 Long term outlook

Over the 2014 to 2019 period, GDP growth is forecast to average 3.2 per cent per annum, faster than the projected rate for the 2009 to 2014 period. GNE growth is forecast to average 3.4 per cent, significantly higher than the 2.6 per cent average projected for the five years to 2014.

A recovery is projected to get underway in 2014/15, following the slowdown in domestic demand and employment growth through 2013/14. With demand easing and the unemployment rate rising back over 6%, wage and inflationary pressures are expected to recede, providing scope for interest rates to be cut further during 2014.

Lower interest rates will stimulate an upswing in dwelling investment from 2015/16. The exceptional levels of pent-up demand for dwellings that will have built up by the time the dwelling cycle finally regains momentum in 2010 will be sufficient to avoid the emergence of a significant oversupply by the time the cycle turns down in 2013/14. Another factor which will have constrained the ability of developers to overbuild is the lingering effects of the credit crisis on funding availability, with the bulk of the extra supply expected to be in house construction.

Private non-dwelling building activity is also expected to strengthen over the 2014 to 2019 period. The cycles that had been truncated by the credit crisis are expected to resume as domestic demand regains momentum from 2011/12, provided credit conditions are accommodative. However, excess supply in a number of markets and regions means that not all markets will experience a strong growth phase in the first half of the decade. The markets which do experience an upswing when domestic demand regains momentum won't have time to overbuild by the time rising interest rates precipitates a mild downturn. Consequently, a synchronised upswing is anticipated over the second half of the decade.

On the other hand, private sector engineering construction activity is expected to turn down as a mid-decade phase of minerals and metals investment is completed. It is likely that this will be offset to an extent by an upswing in public sector infrastructure activity, once government budget deficits have been successfully brought into check.

The economy will emerge from the current downturn with considerable slack in labour markets. This slack will be progressively absorbed as demand regains momentum between 2009/10 and 2012/13 and during the 2014 to 2019 period the re-emergence of capacity constraints are expected to drive a fresh round of business investment, which in tangent with an upswing in dwelling activity is expected to stretch the construction sector. We anticipate the resulting build up of inflationary pressures will be met by a significant interest rate tightening phase through 2016/17, with domestic demand subsequently turning down sharply through 2018.

Over the 2019 to 2024 period, GDP growth is forecast to average 2.7 per cent per annum. Economic growth in this period will be constrained by the available supply of labour and the long-run growth in productivity. Productivity growth is projected to average 1.6 per cent per annum in the five years to 2023/24, while employment growth is forecast to average 1.2 per cent per annum.

Weaker economic growth, which will impact on immigration quotas, as well as the ageing of the population and the workforce, is predicted to slow the growth in the labour force to 1.1 per cent per annum on average, compared to 1.6 per cent per annum over the past decade. However, we caution that this projection for both labour force and employment growth may be optimistic. Our forecast will require appropriate long run policies to achieve even this growth. If these policies are not pursued, GDP growth could be closer to 2.0 per cent in the long run.

Construction outlook

3.1.4 Construction supported by fiscal stimulus, but upswing coming

Total construction work done – lead by private construction – was booming prior to the onset of the Global Financial Crisis (GFC) and had been a key driver of Australia's prolonged period of economic expansion. However, the escalation of the GFC in late 2008 led to a sharp credit squeeze which affected the availability and cost of finance. This adversely impacted on privately funded construction. But Australia did not experience the precipitous downturn in construction that was widely anticipated. Swift implementation of the government construction stimulus offset the weaker private sector activity, with public sector activity rising strong from already high levels.

Fiscal stimulus saved the construction sector from the worst of the effects of the GFC.

The Federal government is funding about $14.7 billion worth of school building over two years, nearly $6.4 billion on public housing and an additional $1 billion on roads, as part of its construction stimulus packages. The importance of the fiscal stimulus was evident in the December 2009 quarter construction work done figures. Construction work done reached a record high of $40.1 billion in the December quarter, driven by a 14.4 per cent surge in public sector activity. Boosted by the massive schools construction program, public non-residential construction work done jumped 58.8 per cent in the December quarter and was 127.1 per cent higher than 12 months prior. The increase in overall public sector activity was more than sufficient to offset a 2.1 per cent decline in private construction. Overall, total construction work done rose by 2.6 per cent in the last quarter of 2009.

. . . but public sector construction will unwind gradually from late 2010.

We believe the construction stimulus is now nearing its peak. Nonetheless, we expect public sector activity to remain elevated through 2010. Public investment is expected to rise by 20.6 per cent over the year to June 2010, with a modest decline (-2.0 per cent) in activity projected over 2010/11 as the stimulus components of the public construction start to unwind from late this year.

3.1.1 Residential building

Recovery in dwelling construction underway and will continue to build momentum

Dwelling construction was not a major contributor to the pre-GFC construction boom. Since the RBA burst the housing price bubble back in 2003, dwelling activity has fluctuated around a low base. Attempts at a recovery in 2007/08 were snubbed out by rising interest rates and, more recently, dwelling activity was affected by the collapse of confidence in the wake of the GFC. However, there are now signs that an upswing in dwelling activity is gaining momentum.

Although residential construction fell 2.9 per cent in the December quarter, due largely to a 3.3 per cent fall in private dwelling construction, there is a considerable pipeline of residential work courtesy of the first home owners boost. There has also been a recent strengthening in finance approvals for upgraders, suggesting that a broad-based recovery is gaining traction. The stock of residential work commenced but yet to be completed rose to $20.6 billion in the December quarter, or close to six months of activity at current levels of work done.

However, finance approvals fell back in the month of January, both for first home buyers and upgraders, which suggest that if the recent deterioration in affordability were to deepen there is a risk that the nascent recovery could be undermined. Affordability deteriorated in the December quarter as a result of rising house prices and rising interest rates. Lingering affordability issues were the major cause of the prolonged period of underinvestment in housing, while a shortage of land released for development was a major contributor to the rise in house prices.

One of the reasons the RBA has acted quickly to bring interest rates back towards a more neutral setting is that it was wary of the risk of homebuyers overextending themselves at unsustainably low interest rates. In essence, there was risk that Australia could create its own subprime problems when interest rates inevitably started to rise. This risk has been mitigated by the tightening in lending standards in the wake of the GFC, but nevertheless the strengthening in house prices and demand over the second half of 2009 would have been a factor in to the decision to front-load interest rate rises.

However, the RBA does not want to snub out the dwelling recovery. The downturn in commencements through 2008/09 will continue to weigh down on private non-residential construction activity in 2010/11. The preconditions for a significant upswing in non-residential activity are not expected to be in place before 2012, with some excess capacity to be absorbed before prices recover. Therefore, with public sector activity expected to peak in 2010, an upswing in dwelling activity would provide the major investment impetus to growth in 2011.

The key point is that we are not building enough housing. 136,000 housing commencements last year does not come close to the 180,000 underlying demand. The stock deficiency is now almost a year's underlying demand. The shortage is worst in Sydney at almost two years underlying demand, but is still bad around Australia's capital cities. It's that shortage that has driven strong rises in rents over the last three years which, in turn, has been a major contributor to CPI inflation. The strength of pent-up demand will drive strong rises in housing prices. And, given that it’s still cheaper to buy existing housing than build, we need those price rises to underwrite new building.

A major construction phase would ultimately take the pressure of both rents and prices and preclude a further significant deterioration in housing affordability. The resilience of employment in 2009 precluded a major correction in house prices, but the high housing debt burden remains a future risk, making households very sensitive to both interest rates rises and periods of rising unemployment. Housing debt is also a major component of the nation’s current account deficit.

We expect that the RBA will now adopt a wait-and-see approach to interest rates now that they are close to neutral, and will be mindful of undermining the dwelling recovery. The upshot is that we expect to see private dwelling building activity continue to recover through 2010. This recovery will eventually build into a boom and will be a key driver of growth from 2010/11. Private dwelling investment is forecast to increase by 1.8% in 2009/10 before strengthening to 6.9% in 2010/11. However, there remains the risk that the dwelling boom will not have sufficient time to come through and will be undermined by house price increases and further rises in interest rates.

3.1.2 Engineering construction

Engineering construction will be the next cab off the rank.

Engineering construction was in its eighth year of boom activity prior to the onset of the GFC. While the escalation of the GFC punctured Australia's minerals-driven boom, the engineering construction segment as a whole escaped relatively unscathed from the GFC and the subsequent world recession. Resilient demand for Australia's main resources exports (which fuelled strong growth in mining and heavy industry construction); a pull forward of large projects where industry capacity and costs have been an issue; very strong contribution from the public sector and a faster than expected thaw in private financing for non-mining projects; combined to push aggregate activity to its highest level on record (~$75 billion in constant prices) in 2008/09. Judging by work done quarter by quarter during calendar 2009, we expect activity to shift higher and peak at over $82 billion in 2009/10.

Despite the better than expected performance of the past year, a softening in engineering construction work will eventually come through, although the decline is now expected to be milder, and later, than previously forecast. A good indicator of future trends in work done are the value of commencements and, through the year to September 2009, commencements are down around 14% in real terms (and down 25% for privately financed commencements).

The decline in commencements (itself a result of the uncertainties and delays caused by the GFC, as well as increased financial pressures) is driving the current slowdown in growth in work done. However, over the next year, we expect work done itself to decline as major projects move to completion without being completely replaced by new work—even though measures of work yet to be done will remain at high levels.

For the public sector, we expect to see some pull-back in commitments to new projects during 2010/11 as State and Federal Governments seek to rein in stimulus funding as economic conditions generally improve. Meanwhile, the next round of private sector projects (mainly concentrated in mining and heavy industry, including the Gorgon LNG) are not expected to all proceed straight away and/or ramp up quickly enough to avoid some overall decline in work done.

The prospect of declining levels of engineering construction (and, particularly mining and heavy industry construction) work done in 2010/11 could be interpreted as a conservative outlook, given the potential for a strong increase in mining investment as captured by the bullish industry expectations in the ABS' December quarter Private New Capital Expenditure Survey (released in February 2010). The latest survey showed that expectations for mining capital expenditure (on buildings and structures as well as plant and equipment) for 2010/11 was 38% higher than that estimated at this time last year for 2009/10.

In summary, we are forecasting engineering construction activity to decline around 6% in 2010/11, before again starting on an upswing from 2011/12. Please see our recently released Engineering Construction in Australia 2009/10 – 2023/24 report for more detailed commentary and forecasts of engineering construction activity. Forecasts are available by state and by sector.

3.1.3 Non-residential building

Private non-dwelling building affected by GFC but, it too, is set for an upswing later in the decade.

Of the three main construction categories, non-dwelling building construction was the hardest hit by the GFC. Financing become more expensive and harder to secure, while many developers were forced to unwind large parts of their portfolios. Subsequently, as economic activity lost momentum, demand for new building also fell away and, as a result, the value of new projects commenced in 2008/09 fell sharply.

The downturn in private non-dwelling building activity, which started in the December 2008 quarter, continued through 2009. However, contrary to earlier expectations we have not seen steep declines in work done. This suggests that some projects may have been put in go-slow mode during the worst of the GFC and global downturn and that remaining work has been staggered.

However, with no pick up in approvals over the second half of 2009, the outlook for the first half of 2010 is for sluggish activity. We expect work done to be flat in the first quarter but fall by 4.9% in the June 2010 quarter. In year-on-year terms, we forecast private non-dwelling building to be 20.7% lower in 2009/10 compared to 2008/09. Over the year to June 2011, work done is expected to fall by a further 1.9%.

So when will private non-dwelling building in particular office markets recover? Certainly bank finance is freeing up. But investors are still cautious and risk averse. The real point is that rents are too low to underwrite financial feasibilities. While there is logic for owner occupiers to build while costs are low, irrespective of current financials, developers need a pretty good reason to build now even if they can get finance. Some can build but most won't.

Given lead times, supply will remain constrained for another three of four years at least. That means as the economy strengthens it won't take long for excess capacity to clear leading to tightening vacancy rates and shortage of stock. Low vacancy rates, tightening leasing markets, strongly rising rents and firming yields in turn will attract investment capital and underpin a further round of investment. Activity is expected to bottom in 2010, with commencements firming from the second half of the year. An upswing in the private non-dwelling construction is expected to commence from the middle of the decade.

3.1.5 Construction upswing to underwrite the economic recovery and future strength

The staggered fiscal construction stimulus right through the GFC period has offset much of the downturn in private construction. The stimulus, which has encompassed infrastructure, schools, dwellings and hospitals programs, will be gradually unwound through the course of this year. But we don't expect to see overall construction contract as a result. We believe Australia is on the cusp on another upswing in construction from 2010/11. Our expectation is that the recovery in dwelling construction will develop into a boom and will take over from the waning public spending as the driver of growth. Engineering construction will be the next cab off the rank followed by private non-dwelling activity.

Numerically, total construction activity in Australia reached a historical peak in 2008/09 at just over $150 billion (in constant prices). This comprised $75 billion of engineering construction, $43 billion dwelling construction and $33 billion of non-residential building construction. Going forward, we expect total construction to rise by 5.3 per cent in 2009/10 before stabilising in the following two years at roughly $160 billion. In 2012/13 and 2013/14 growth is set to average just over 5 per cent per year. All in all, total construction is forecast to reach a new peak of around $175 billion in 2013/14.

Road construction and maintenance

Annual road construction activity increased to $15 billion in 2008/09 from a trough of $6.7 billion in 2001/02, representing 123 per cent growth in real terms over the 7 year period. In 2008/09 alone, activity jumped 26 per cent, with public sector funded work rising a phenomenal 32 per cent to $9.4 billion, while privately funded work rose 16 per cent to $5.6 billion.

By road segment, the largest volume increase in activity over the past 7 years has come from highways and arterials (+$4.1 billion to $6.8 billion in work done in 2008/09) followed by private toll roads (+$1.4 billion), subdivisions (+$1.3 billion) and runways and access roads (+$920 million). Meanwhile, road bridge construction has also surged, rising $600 million since 2001/02, but is down slightly on its record volume of work done in 2007/08 ($1 billion).

In total, we expect that this year's record level of work done will prove to be the peak, after which a four year (to 2012/13) decline is expected. The fall will be very mild at first (around 1 to 3 per cent per annum over the next 2 years), but accelerate over the two years to 2012/13. We are forecasting annual activity to trough in 2012/13 at around $12 billion.

The mild weakening in total road construction work done over the next 2 years will be led, primarily, by significant declines in private sector funded work which will more than offset growth in public works. They completion of the CLEM7 toll road and falling access roads and runways works will be the key here, offsetting growth in public works and a recovery in subdivisions activity by 2010/11.

Public funded work, particularly highways and arterials, has grown strongly in recent years, and is expected to grow further over the next 2 years given the range of projects already underway or committed to. However, a substantial decline in public works is then expected from 2011/12 as 'stimulus' measures come to an end and governments look to re-balancing their budgets (whilst funding alternative infrastructure projects such as rail). Together with further declines in toll road activity, this will see total road construction slip back to $12 billion by 2012/13.

As in the recent cycle, the next upswing in road construction activity will be led by the private sector. We are forecasting the commencement of another record phase of toll road projects from 2013/14 (subject to financing), which will be joined by the peaking of subdivisions, access road and runways works as well as the next (bigger) phase of Nation Building Program (NBP) projects. Overall road construction activity is forecast to average $17.6 billion in the five years to 2018/19, well above the average for the five years to 2013/14 (or any other period).

Given recent volatility in economic conditions it is important to point out the inherent risks in our forecasts. On the downside, there is the risk that our forecasts may yet prove too high if there is another leg to the global economic slump. On the upside, a speedier resolution to the financial crisis may bring forward the financing of major private and public road projects before 2013/14.

In the following discussion, we present the key features of the road system in Australia, the drivers of roads activity and our outlook for the roads sector. We also present our outlook for the roads sector by type of road and by state, showing the key sectors and states that will drive the outlook over the present decade. This commentary is sourced from BIS Shrapnel's more detailed annual road industry reports, *Road Construction in Australia 2009-2024* and *Road Maintenance in Australia 2009-2024* (forthcoming).

Unfortunately, similar data and commentary is not available for New Zealand, but we have developed a historical time series of roading data for New Zealand based on Transfund roading statistics. Meanwhile, our projections for roads activity in New Zealand is based on the latest 10 year plan for roads published by New Zealand's Land Transport Agency. See Section 13 for further commentary of the New Zealand roads sector.

3.1.4 Australian road categories

In our analysis, we break down the roads sector into five major roads categories, each with its own distinct drivers and funding arrangements:

The shift to the National Network has brought significant changes to how funding is arranged for an important portion of **highways and arterials**. In particular, it now means the majority of activity on the National Network is jointly-funded by Federal and State governments. We feel this will lead to a greater tendency for 'pro-cyclical' expenditure, i.e. increased activity in the good times at the expense of the necessary and stimulatory works in the bad.

This certainly appeared to be the case over the past 5 years, as the Federal Government joined the State Governments in using their 'resources-boom boosted' budgets to bring forward and finance a raft of major highways and arterials projects. Between 2003/04 and 2008/09, annual highways and arterials road construction activity rose from $2.5 billion per annum to over $6.8 billion, an increase of 168 per cent in real terms. While this was correcting a long period of underinvestment in highways and arterials through the 1990s, the timing of the increased activity (when the economy was already booming and capacity constraints emerging) also contributed to rising construction cost and price pressures.

During 2008/09, highways and arterials work continued to grow strongly (+42 per cent) despite the economic downturn biting into government revenues. While this was a consequence of projects already in train, it also reflected a desire by Federal and State Governments to maintain or increase public investment in the face of sharp falls in confidence and private investment as the global financial crisis hit. Further out, we believe that governments will claw back their expenditure on major capital works, including highways and arterials, to help improve their financial position as the economy improves. In this sense, we are forecasting a (perhaps temporary) shift back to counter-cyclical funding of highways and arterials work.

In the near term (next 1-2 years) highways and arterials construction activity is set for further growth, albeit at a slower pace to 2008/09. Overall, activity is expected to peak at $7.6 billion in 2010/11 (in constant prices). A large share of the works in the Nation Building Program (NBP) — the road and rail infrastructure program formerly known as *AusLink* (and *AusLink 2*) worth $26.7 billion in the period to 2013/14 — have received fast-tracked funding in the Federal stimulus package and will take place over this period. Similarly, funding from the Building Australia Fund (BAF) will also be directed towards major roads projects.

However, the project pipeline varies substantially in each state — and so do the prospects. While growth in Victoria, Queensland and New South Wales is expected to be significant, activity in South Australia and Western Australia is set to decline sharply as major projects move towards completion.

On a state by state basis, the largest volume of work continues to take place in Queensland where population growth remains the key driver of activity. However, funding from the Queensland Government is expected to be reduced from 2011/12 and will lead to heavy falls in highways and arterials construction out to 2013/14.

In New South Wales, the Hunter Expressway and the Kempsey Bypass will receive $2.1 billion in funding from the NBP and this will play an important role in driving further growth over the next two years. BIS Shrapnel expects road construction activity to start declining from 2011/12 over a two-year period. While most of the major projects to drive the strength in activity over the previous two years will continue, we expect that 2011/12 will be the start of falls in major public sector activity. Specifically, the NSW Government's finances have been average since the mid 2000s, with fairly impressive investment figures being boosted by borrowings. We believe 2011/12 will be the start of a period of several years where they seek to improve their financial situation by postponing some of the next round of works. The catalyst for this may be a change of Government in early 2011, where history suggests that first year governments look to shore up finances with a reasonably tough first-year Budget.

From 2013/14, private road construction will enter into its next upswing starting with the M4 East Project.

The strongest growth in highways and arterials construction will be registered in Victoria where activity is expected to rise by 58 per cent over the next three years to $973 million (in constant prices). This will be boosted by a range of Federal and State Government funded projects including the $2.2 billion Western Ring Road widening, around $1.5 billion in new road construction works along the Western, Princes and Goulburn Valley Highways as well as the $750 million Peninsula Link project (if it is not privately financed).

Following a sharp slump in highways and arterials work between 2010/11 and 2013/14, BIS Shrapnel expects that the next sustained upswing in publicly funded highways and arterials work will be several years away, with a very strong phase of activity forecast for the subsequent 2015-2019 period. This upswing will be in the middle of the next period targeted for Federal funding under the NBP (formerly *AusLink 3*), but is also expected to be a time when State economies will have more or less recovered from the current economic malaise and show an increased willingness to invest in major infrastructure projects.

The main drivers of **local road** activity are the housing construction cycle and trends in local government revenues. However, local roads construction has also been supported in recent years by direct Federal funding through the *Roads to Recovery* program. More recently, local roads work received a boost through Federal Government stimulus funding. Overall, we are forecasting local road construction work done will peak at around
$2.6 billion in 2009/10, up from around $2 billion through much of the 2000s.

Thereafter, the removal of stimulus measures, and continued deterioration in local government finances is likely to see local road work ease back through 2010/11 to 2012/13. The recovery in housing starts and subdivision works is, however, expected to drive a pack-up in local road construction in the 2013/14 to 2018/19 period.

Even given that subdivisions constructers now perform some work previously done by local councils, we feel there is little doubt there is now a substantial backlog of local roads work. While *Roads to Recovery* has helped, other issues relating to local government own finances have been pivotal. Local government revenues took some time to jump after the early decade upturn in many property markets, but the greater issue is the cost of infrastructure construction. Many councils manage ageing assets, where the cost of replacing/maintaining infrastructure is growing quickly. For many, the costs of maintaining and building local roads have outstripped the capacity to finance them. In our view, local government will require increasing contributions from other tiers of government just to sustain the existing level of local road works, let alone to reduce the backlog of work in a major way.

Our forecast is that **private toll road** construction will decline over the next four years. This is almost entirely due to the volume of work being undertaken in Brisbane on the Clem Jones Tunnel, or CLEM7 (formerly known as the North South Bypass Tunnel) and the recent start of the Airport Link project. As these projects move to completion, toll road construction activity will retreat from the forecast $1.4 billion peak in 2008/09. Apart from the Airport Link project, we have also included several hundred million in works relating to the widening of the M2 motorway in Sydney over 2010/11 and 2011/12.

We have timed the next upswing in toll road works to start in 2013/14 and boom over several years, lead by the M5 expansion, the M4 East and F3 to M2 Link in Sydney and the construction of the East West Link (or 'West Gate Alternative' in Melbourne). However, we note that these forecasts are subject to risk, not only regarding the timing of the projects, but their eventual scope of magnitude of work done. Overall, we expect the next peak in toll road construction will be substantially bigger than previous toll road cycles, and will take place in the latter half of the 2010s, with annual work done peaking near $4 billion for this segment alone.

In light of the current increase in dwelling activity, we believe that **subdivisions** construction will remain weak in 2009/10 before starting on an upturn from 2010/11. We expect activity to gain momentum to 2012/13. Overall, subdivisions work is forecast to trough at around $2.9 billion in 2009/10 (the consequence of troughs in detached house commencements in 2008 and early 2009) before rising steadily to a peak of $3.6 billion by 2012/13.

The protracted downturn in the housing market and dwelling construction was a key negative factor in falling subdivisions work in recent years. In our view, dwelling construction in Australia has now fallen to a level where not enough is being built to satisfy underlying demand. This has resulted in a significant deficiency of residential stock, which, in turn, is leading to strong increases in rents. The year through 2009/10 is expected to yield a strong increase in housing starts—as the next upswing begins—which will go some way in absorbing excess supply of subdivisions.

Runway construction is very 'lumpy', jumping when major projects are undertaken and then falling away. Since 2004/05 — when a host of works were needed for the Airbus A380 — runways work crashed but rose again in 2007/08. Projects here included at Sydney Airport, iron ore-related works in Western Australia but also some upgrades of roads around major airports: mostly the Northern Access Road at Brisbane Airport. The ramping up of most of these projects will take activity to beyond the Airbus A380-driven peak in 2008/09. Beyond 2009, activity is expected to fall away as there are no new projects to pick up the slack. We expect activity to remain weak until 2015/16 until the next major project — the proposed $1 billion Parallel Runway project at Brisbane Airport.

Access road construction has increased strongly over the past six years coinciding with the upturn in minerals investment. This was mainly seen in South Australia (with construction of several major projects) but also in Western Australia and Queensland. Looking ahead, weaker minerals investment over 2009/10 and 2010/11 is forecast to see a sharp drop in access road construction, before a recovery to the remainder of the forecast period to 2013/14.

3.1.5 Drivers of Roads Activity

In our analysis, the main drivers of road construction and maintenance activity are:

- **Domestic demand and broader economic growth.** This not only affects roads 'demand' (i.e. trafficking passengers and freight), but the subsequent impact on Federal and State Government finances helps determine the ability to fund major road construction and maintenance programmes. In general, public sector funded roads activity tends to lag the economic cycle, with State

- Governments playing a key role. While Commonwealth roads funding used to be counter-cyclical in intent (so as to boost employment and demand during economic downturns), delays in the timing of projects can end up making road funding rather pro-cyclical in effect. This was certainly true of the *One Nation* and *Bicentennial Roads* funding packages. However the framework and timing of the first *AusLink* plan suggests that Federal Government spending is now becoming more pro-cyclical in its intent.

- **The housing market.** Cycles in housing construction impacts on lot development and the construction of subdivision roads, which is now a very large proportion of total road construction. During an upturn in residential construction, there tends to be some over-building of subdivision lots, as developers misjudge the strength and duration of the upturn. This seems to be particularly evident during the recent housing boom. Indeed, it is likely that strong price increases for land and housing in recent years has led to increasingly speculative subdivision development. Meanwhile, in a downturn, the production of subdivision lots falls further than house building as the excess subdivision stock is slowly absorbed.

- **Timing of large toll road projects.** By tapping into private funding sources, toll road projects allow a large volume of roads works to be compressed into a very short space of time. Australia has so far seen three 'waves' of toll road construction, and each has helped drive a peak in total roads activity.

- **Resources cycles and the need to upgrade airport capacity** are the main drivers of runways and access roads works. Private access roads are related mainly to minerals investment, and the development of mines in remote areas, but also relate to heavy industrial and agricultural development. Note that private airstrips are included in this category of work. Major runways construction is determined mainly by airport capacity relative to demand. Both runways and access roads are lumpy and quite volatile in nature due to the timing of projects.

3.1.6 Recent Trends in Roads Activity

Annual road construction activity increased to $15 billion in 2008/09 from a trough of $6.7 billion in 2001/02, representing 123 per cent growth in real terms. The largest annual increase over the seven year cycle was in 2008/09, when activity jumped 26 per cent. The year through 2008/09 for road construction was unusual in two ways. Firstly, the Federal Government's stimulus package resulted in the fast tracking of roads projects (which had received the requisite government approvals and were 'shovel-ready') worth $700 million across various states. Secondly, there was a 65 per cent increase in private toll road construction mainly driven the start of the $3.4 billion Airport Link project in Queensland.

This 7-year growth phase was driven, initially, by private subdivisions work (including residential and industrial property). This was directly influenced by a sharp upswing in detached housing starts. Between 2002/03 and 2005/06, total road construction activity was also boosted substantially by a boom in private toll road construction work, including several near simultaneous projects in Sydney (the Cross City and Lane Cove Tunnels and the Westlink M7) as well as EastLink in Melbourne.

Publicly funded road construction joined the upswing only later, rising from 2004/05. It is now over double the level it was back in 2003/04. Strong growth in public roads investment over the past five years has been driven by:

- The stronger financial positions of federal and state tiers of government during the recent resources boom.

- A renewed focus on national road (and rail) infrastructure through the *AusLink* 5 year plans (now called the Nation Building Program or NBP).

- The development of longer term plans for infrastructure investment at the state level which recognised previous levels of under-investment.

- Collective efforts by government to modernise urban road infrastructure to help relieve congestion and facilitate further population expansions.

Insufficient spending on public roads over the 1990s simply added to the backlog of projects, many of which are now currently underway. It was the strong economic growth through much of the previous decade that has given the state and federal governments the necessary funds to attack this backlog (especially on the outskirts of expanding cities/ regions and in inner cities where congestion was reaching unacceptable levels).

Publicly funded work increased by 32 per cent over 2008/09, passing $9 billion for the first time (in constant 2006/07 prices) largely due to a 42 per cent jump in highways and arterials construction. The Federal Government's stimulus package was the key reason for this year's spike in work done, as various ready-to-go projects were fast tracked.

3.1.7 Outlook for road construction

In total, we expect that this year's record level of work done will prove to be the peak, after which a four year (to 2012/13) decline is expected. This decline will be mild at first (around 1 to 3 per cent per annum over the next 2 years), but accelerate significantly over the two years to 2012/13. We are forecasting activity to bottom out in 2012/13 at around $12 billion. While about 21 per cent lower than the level of activity in 2008/09, this is still a relatively high volume of work in historical terms (and nearly double the levels of work done experienced through much of the 1990s).

Highways and arterials work has grown strongly in recent years, and is expected to grow further (around 12 per cent over the next 2 years) given the range of projects already underway or committed to. However, a substantial decline in highways and arterials work done is then expected from 2011/12 as 'stimulus' measures come to an end and governments look to re-balancing their budgets (whilst funding alternative infrastructure projects such as rail).

By contrast, the mild weakening in total road construction work done over the next 2 years will be led, primarily, by significant declines in private sector funded work which will more than offset growth in public works. They key segments behind the decline over the next 2 years will be private toll roads, as well as access roads and runways (the latter due to the current pause in mining investment and a dearth of major airport runway works). Later on, over the two years to 2012/13, further sharp declines in toll road works will more than offset the delayed recovery in subdivisions activity. Consequently, the decline in private sector funded works will be extended through to 2012/13 and, along with sharp declines in highways and arterials work, this will drive significant falls in total road construction activity around this time.

BIS Shrapnel believes that the only major private tollway project to get underway over the next four years will be the M2 widening in Sydney, although there is now a good chance that the $750 million Peninsula Link project near Melbourne (which we have included in our figures as a public project) will be developed with private finance. Private tollways have fallen out of favour in recent years because of a series of financial failures with toll roads as well as the impact of the global financial crisis on the availability and cost of funding. This has, for now, effectively driven a pause major toll road projects until financial conditions improve sufficiently and when the PPP model for motorways is structured in a way which makes them workable (for public and private partners).

However, it is important to point out the inherent risks in our forecasts. On the downside, there is the risk that our conservative forecasts for public funded works may prove too high. However, given the amount of major investment still needed, if this does eventuate, it can only mean a stronger period in later years. On the upside, a speedier resolution to the financial crisis (and stronger economic growth) may bring forward the financing of major toll road projects as well as boosting government revenues which could be used to fund new road construction.

BIS Shrapnel is forecasting the next trough in road construction to be in 2012/13, with a very mild (2 per cent) increase in 2013/14. However, from here, road construction activity is expected to grow very strongly again, with another new record peak (around $19 billion) expected late in the decade.

As in the recent cycle, the next upswing in road construction activity will be led by the private sector. As public sector funded works continue to be drawn back in 2013/14, we are forecasting the commencement of the next major round of very large, multi-billion dollar toll road projects including new works on the M5 and M4 expansions and the Sydney Orbital (F3 to M2 Link) in Sydney and the proposed East-West Link in Melbourne. Toll road work is forecast to jump $900 million in 2013/14 alone (offsetting a commensurate decline in publicly funded highways and arterials work), before moving higher again through the next five years (to 2018/19), averaging around $3 billion per annum on average. As well as toll road works, private access roads and runways activity is also expected to be picking up around 2012/13 and 2013/14 on the back of the next minerals investment cycle.

The next cycle in toll road works is expected to be joined later by another cyclical upswing in subdivisions activity and, eventually, another strong increase in publicly funded work, particularly new highways and arterials projects. Most of the proposed projects here have long been earmarked as being necessary to solve congestion issues in almost all capital cities (mostly Sydney, Melbourne and Brisbane) but also include important upgrades to rural highways (such as the Pacific and the Bruce). The re-balancing in government budgets, combined with strong revenue flows from the next resources cycle (driven by LNG, iron ore and coal) is likely to underwrite a range of projects through this period.

The five years to 2018/19 is likely to see the strongest phase of road construction activity, given the need to upgrade freight routes as well as tackling urban congestion issues. The combination (and availability) of private and public sector financing for these projects is expected to compress a large volume of work through this period, subject to labour and product market constraints.

CHAPTER FOUR: AUSTRALIA

4. Australia

Estimate of skilled roads workforce

The table below presents BIS Shrapnel's estimate of the size of the skilled roads workforce in Australia in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (3,208 persons instead of 18,155 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions we have adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 2.1: Australia
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**57,445**	**4,545**	**1,217**	**1,105**	**4,391**	**68,702**
Building Construction	47,253	1,543	278	269	2,471	51,815
Total Non-Building Construction	2,488	2,136	636	387	661	6,308
o/w Road & Bridge Construction	1,011	1,210	472	270	244	3,208
General Trade Construction	7,704	866	303	448	1,259	10,579
Public Administration & Safety	**2,312**	**4,128**	**1,541**	**2,269**	**5,856**	**16,105**
Federal Government	97	22	6	123	89	338
State Government	986	1,613	570	1,103	1,320	5,592
Local Government	782	2,275	917	602	3,632	8,209
Other	446	218	47	441	814	1,966
Professional Services	**7,455**	**10,401**	**4,240**	**5,854**	**8,607**	**36,558**
Other Sectors	**14,300**	**2,988**	**1,183**	**2,082**	**13,925**	**34,478**
Total All Sectors	**81,541**	**22,062**	**8,181**	**11,310**	**32,876**	**155,970**
Total Roads Workforce	**2,913**	**7,074**	**2,778**	**1,467**	**3,924**	**18,155**
Public Roads Workforce	**1,537**	**2,725**	**1,118**	**669**	**2,835**	**8,885**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

Civil engineers comprise just under 40 per cent of the skilled roads workforce with project managers and civil engineering associate professionals making up 15 and 16 per cent of the workforce respectively. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up 70 per cent of the skilled roads workforce.

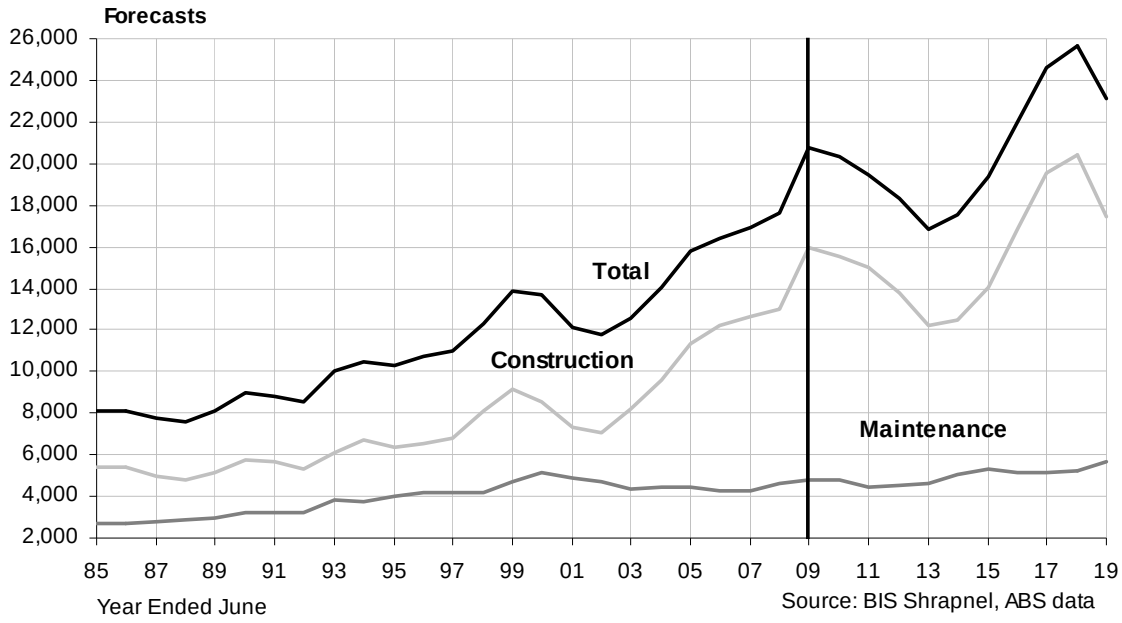
Another feature of the roads workforce is the proportion employed by the public sector. We estimate that in 2008/09, just under half (8,885 persons) of the skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the professional services sector.

As mentioned in Chapter 2, we believe that our estimates of the size of the skilled roads workforce are reasonable, with our modelled public workforce figures very close to independent figures supplied to us from both the State Road Authorities themselves and an estimate of the Local Government engineering workforce supplied by the Institute of Public Works Engineers Australia.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's 10 year outlook for road and road bridge activity is summarised in the graph below.

Chart 4.1: Australia
Road and Road Bridge Activity
$ Million, 2006/07 Prices



Road and road bridge construction activity is expected to fall over the next few years. This decline will be mild at first but accelerate significantly over the two years to 2012/13. We are forecasting activity to bottom out in 2012/13 at around $12 billion. While this is significantly lower than the level of activity in 2008/09, this is still a relatively high volume of work in historical terms (and nearly double the levels of work done experienced through much of the 1990s). However, from here, road construction activity is expected to grow very strongly again, with another new record peak expected late in the decade. As in the recent cycle, the next upswing in road construction activity will be led by the private sector.

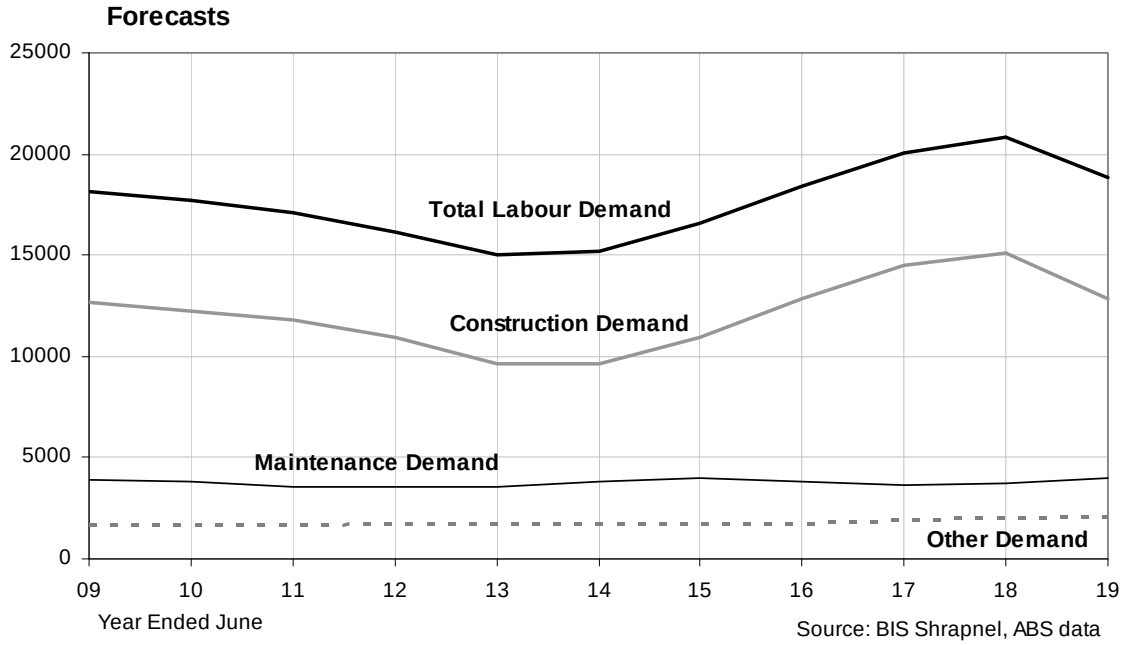
Meanwhile, growth in maintenance work is expected to be mild over the next few years, but should accelerate from 2012/13. Overall, road and road bridge work is expected to fall over the next four years, but move to a higher plane in the second five year period, with a peaking of work around 2017 and 2018. A more detailed summary of the national roads outlook is provided in Section 3.

This outlook for road and road bridge activity translates into falling demand for skilled labour over the next five years before acceleration in activity is expected to see a surge in labour demand. As shown in the following figure (which is based on productivity growth of 1.5 per cent per annum) from an estimate of just over 18,150 employees in 2008/09, skilled roads labour demand is expected to fall to a trough of 14,976 employees in 2012/13 (as construction activity weakens) before rising to a peak of just over 20,800 persons in 2017/18. The demand for labour is expected to ease back to just under 18,850 persons in 2018/19 (i.e. back towards the current size of the workforce).

Under weaker productivity growth assumptions, the demand for labour is correspondingly higher. For 1 per cent per annum productivity growth (matching the experience of the construction industry over the past decade), the trough in employees is 15,282 in 2012/13 before rising to a peak of 21,778 persons in 2017/18. With a zero productivity growth assumption, the trough becomes 15,909 persons in 2012/13, rising to 23,840 in 2017/18 (see chart 4.3).

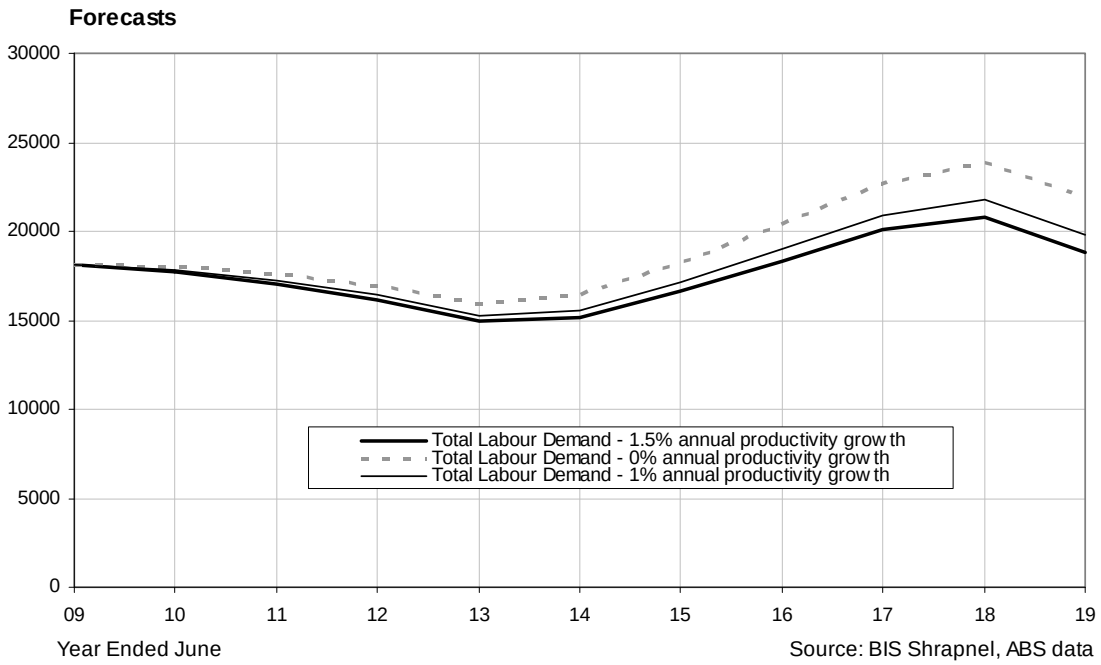
Once again, we would stress that demand for engineering skills is likely to precede demand forecast in this model (which is based on actual construction and maintenance work done).

Chart 4.2: Australia
Forecast of Road Labour Demand (1.5% Productivity Growth)



Source: BIS Shrapnel, ABS data

Chart 4.3: Australia
Forecast of Total Road Labour Demand based on different Productivity Growth Assumptions



Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

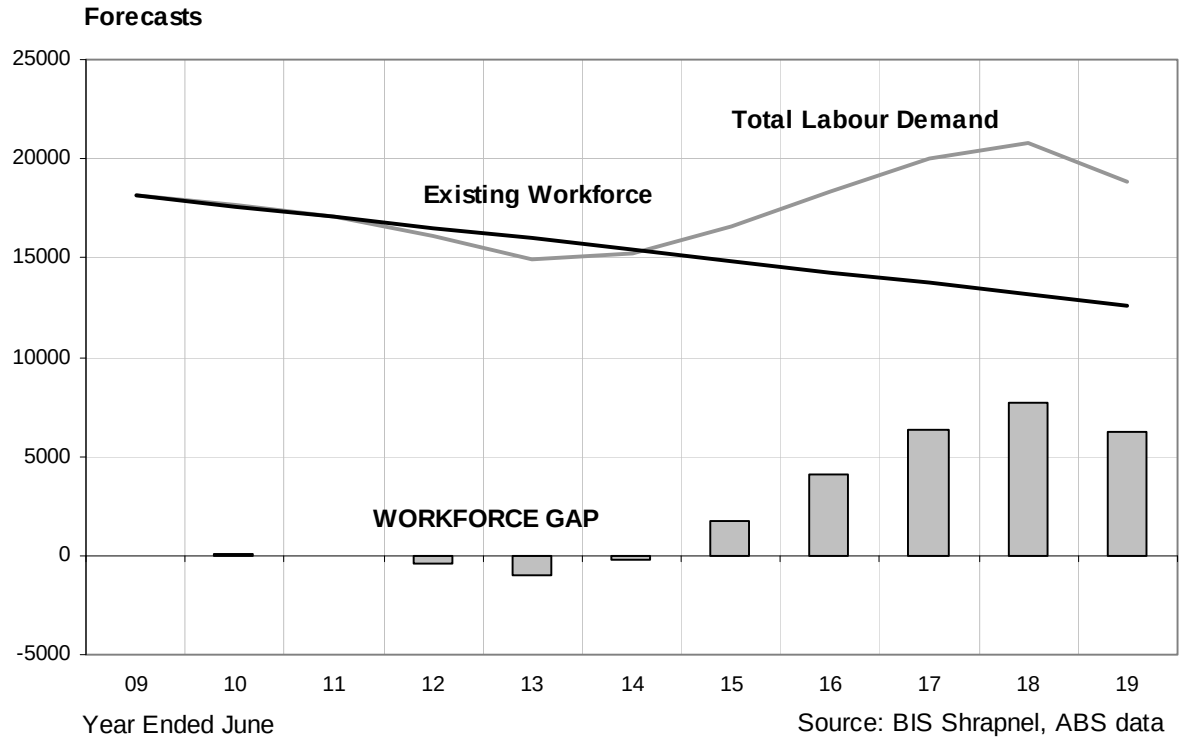
Given the estimated age profile of the current roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 30 per cent over the next ten years from demographic factors alone. In practice, the rate of attrition is likely to be higher than this given the net movement of skills towards faster growing sectors over the decade to 2018/19 (e.g. rail, mining). The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by additional supply if forecast levels of end use road sector activity are to be achieved. Possible sources of labour supply include:

- New graduates
- Net migration from overseas, and/or
- Net movement of skills between industries.

It should be noted again that while the existing skilled roads workforce is expected to decline in personnel terms, the measure of skills and experience lost is likely to be far greater given that the retirees will be concentrated in relatively "high skill/experience" occupations.[16] While BIS Shrapnel has progressed research towards developing a skills index (see Chapter 2) this report makes no attempt to quantify this, potentially greater, loss, but acknowledges that it is a key issue facing the roads sector and the broader engineering construction industry.

[16] Engineers Australia (2006: p7) notes that up to 40 per cent of its current members are due to retire in the decade to 2014, although this figure is likely to include engineers working in "unrelated" and "other" occupations such as executive management.

Chart 4.4: Australia
Total Roads Employment (1.5% Productivity Growth)



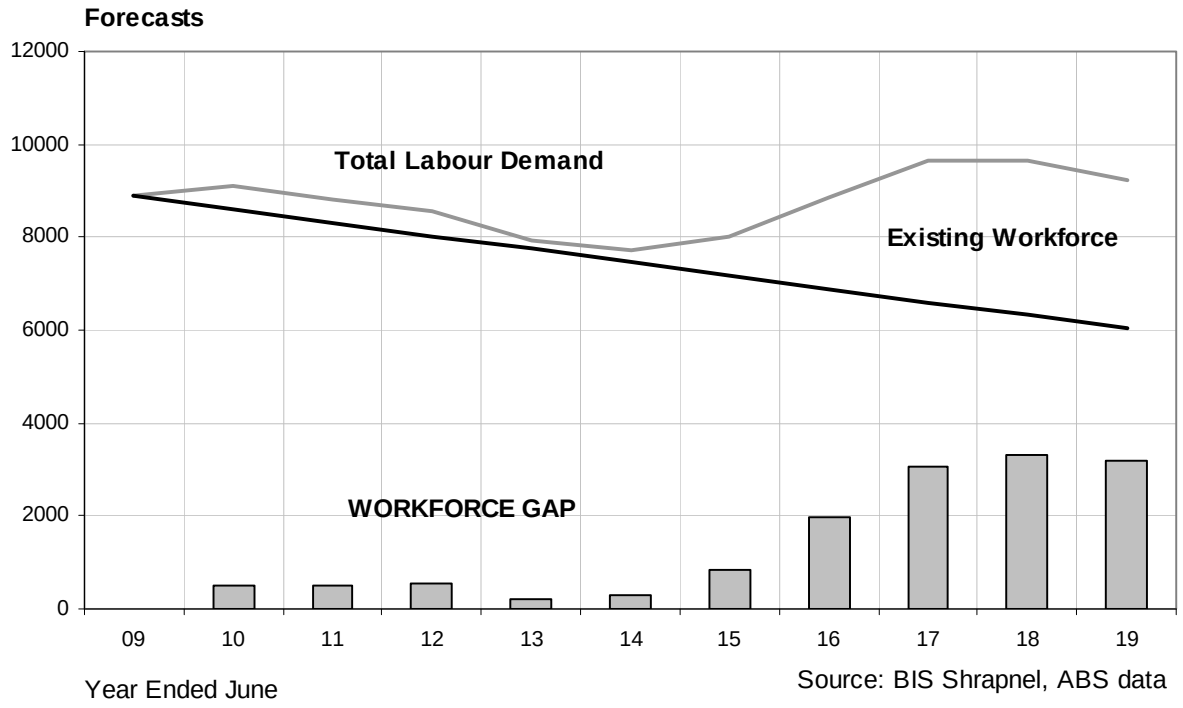
Source: BIS Shrapnel, ABS data

Given the forecast shape of labour demand, and the attrition of the existing workforce, the size of the total road sector workforce gap is expected to be negligible in the next five years but grow strongly in the second half of the decade to be driven by:

- Ongoing (and accelerating) attrition of the existing workforce, and
- Generally rising labour demand.

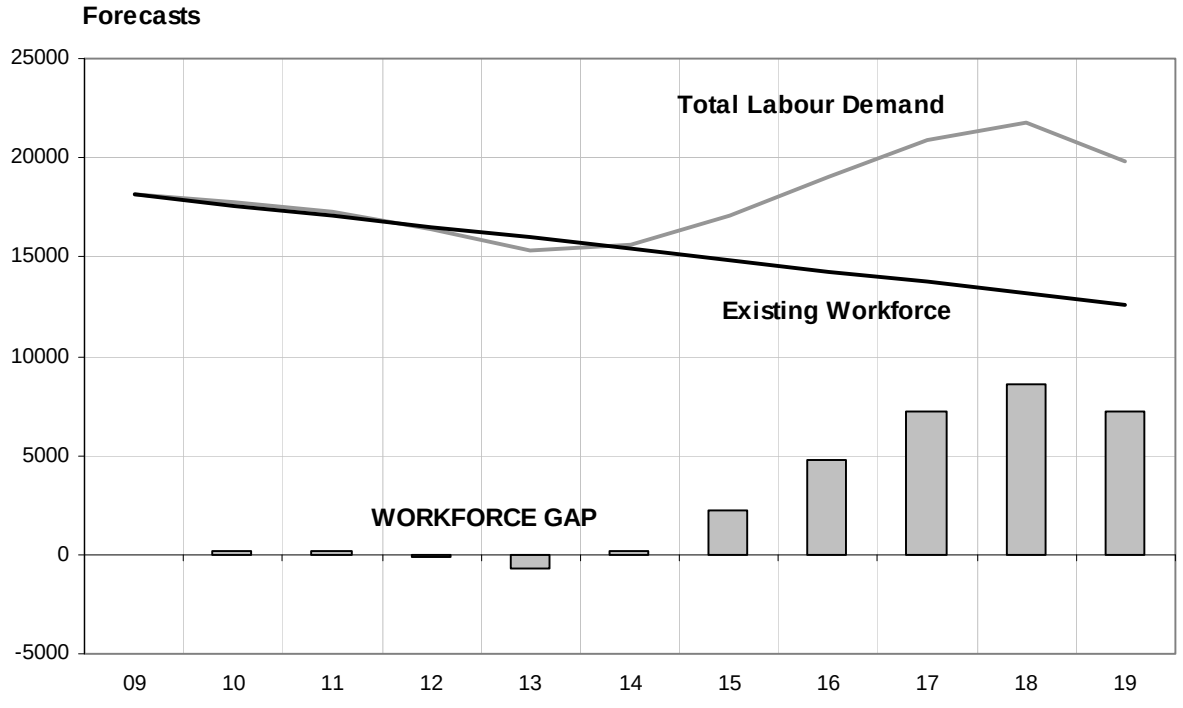
Overall, under the 1.5 per cent labour productivity assumption, the total road sector workforce gap is expected to rise by around 2,000 persons per annum over the four years to 2017/18, peaking at 7,659 persons. With respect to the public sector, strong growth in public sector funded road construction and significant growth in maintenance activity over the coming decade — particularly towards the end of the decade — will drive the public labour demand to a higher plane. This, together with an acceleration in workforce attrition towards the 2020s will lead to the emergence of a sizeable workforce gap for the public sector. We estimate that just under 2,000 additional skilled roads employees will be required by 2015/16 to meet forecast levels of roads activity and to cover the replacement of existing employees. This figure is expected to surge to over 3,000 employees by 2018 and 2019 (see chart 4.5). Under 1 per cent and 0 per cent productivity growth assumptions, the workforce gaps are correspondingly higher as can be seen in charts 4.6 and 4.9.

Chart 4.5: Australia
Public Roads Employment (1.5% Productivity Growth)



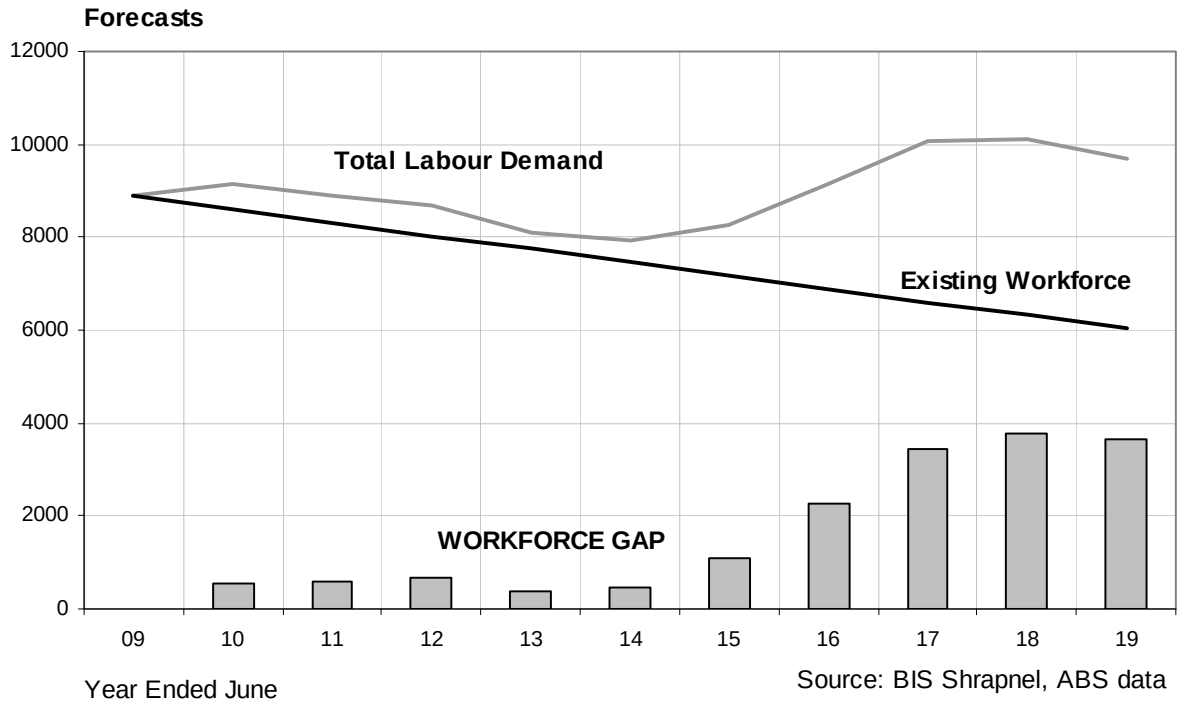
Source: BIS Shrapnel, ABS data

Chart 4.6: Australia
Total Roads Employment (1% Productivity Growth)



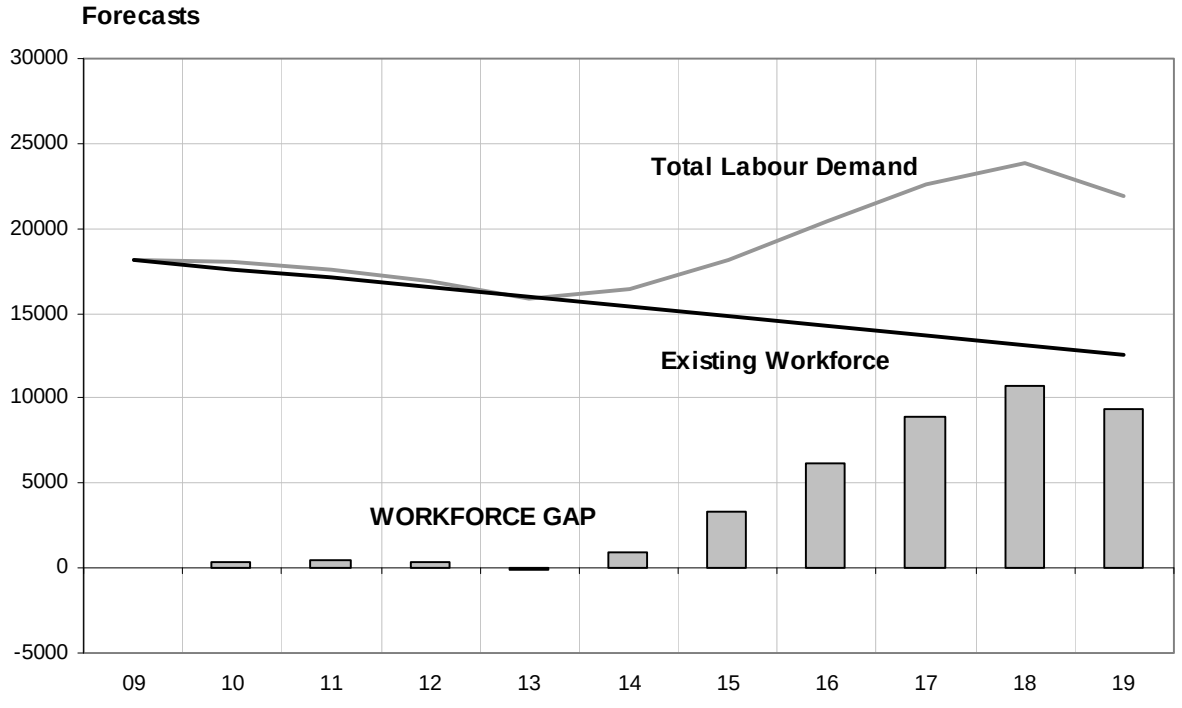
Source: BIS Shrapnel, ABS data

Chart 4.7: Australia
Public Roads Employment (1% Productivity Growth)



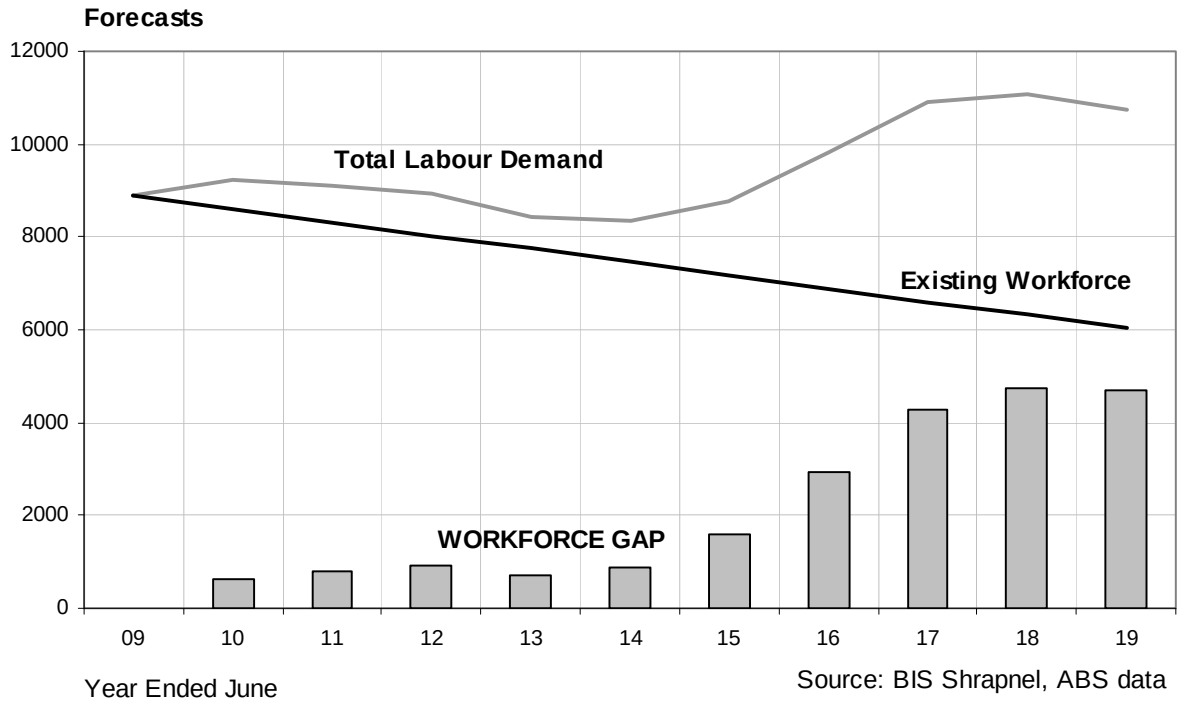
Source: BIS Shrapnel, ABS data

Chart 4.6: Australia
Total Roads Employment (0% Productivity Growth)



Source: BIS Shrapnel, ABS data

Chart 4.7: Australia
Public Roads Employment (0% Productivity Growth)



Source: BIS Shrapnel, ABS data

Graduate supply and the capability shortfall

The total road sector's workforce gap will need to be met by additional supply if forecast levels of road sector activity are to be achieved. Possible sources of labour supply include:

- New graduates.
- Net migration from overseas.
- Net movement of skills between industries.
- Other labour supply boosting measures (e.g. increasing productivity or reducing the rate of workforce attrition).

In the case of the public sector workforce gap, labour could also be sourced from the private roads sector via direct recruitment, increasing the proportion of work contracted out, or making greater use of private/public partnerships.

All of these supply sources are important in meeting future road workforce requirements. In this report, however, we have attempted to quantify only the supply of new graduates to the roads industry. Any positive difference between the total road sector workforce gap and the supply of new graduates represents the capability shortfall in the roads sector.

As discussed in Section 2.5, in quantifying new graduate supply we have chosen to use data relating to Australian domestic undergraduate enrolments and completions in the fields of Engineering, and Cartography and Surveying, as well as Certificate IV and Diploma completions in vocational training that lead to civil engineering associate professional qualifications.

Of the approximately 7,600 undergraduate completions each year in Engineering at universities in Australia, only about 1,000 are in the field of civil engineering and, of these, only a proportion will be employed by the roads sector. Similarly, only a small proportion of the 280 undergraduate completions each year in Surveying, or the 100 or so Certificate IV completions for civil engineering associate professionals will be employed by the roads sector. Indeed, we estimate that, in total, only around 400 new graduates from all of these fields will enter the roads workforce annually, with the remainder taking up positions in other industry sectors ranging from business services, government, law or other construction sub-sectors.

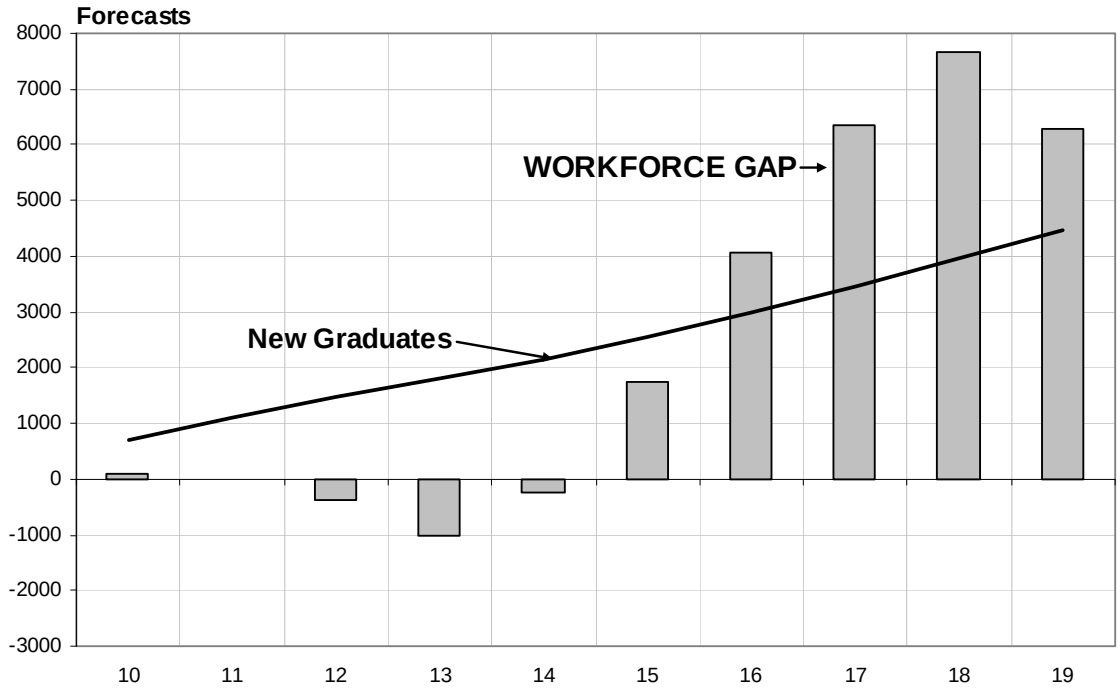
The difference between the stream of graduate supply and the workforce gap is the capability shortfall, which is illustrated in Charts 4.5 and 4.6 (incorporating the base labour force productivity growth assumption of 1.5 per cent). The first chart projects the workforce gap and the graduate supply. The portion of the workforce gap lying above graduate supply is the estimated capability shortfall, which is shown in the second chart.

Given our projections of the workforce gap and graduate supply, we estimate that Australia's 'net capability position' will turn from a surplus situation into a shortfall position from 2015/16. We expect the capability shortfall to widen dramatically, peaking at about 3,860 persons by 2016/17 before easing back marginally over 2018/19. Again, the reasons for the sharp increase in the capability shortfall over the five years to 2018/19 are:

- Another forecast strong phase of road construction and maintenance activity
- Accelerating workforce attrition through ageing, and
- Flat growth in graduate supply.

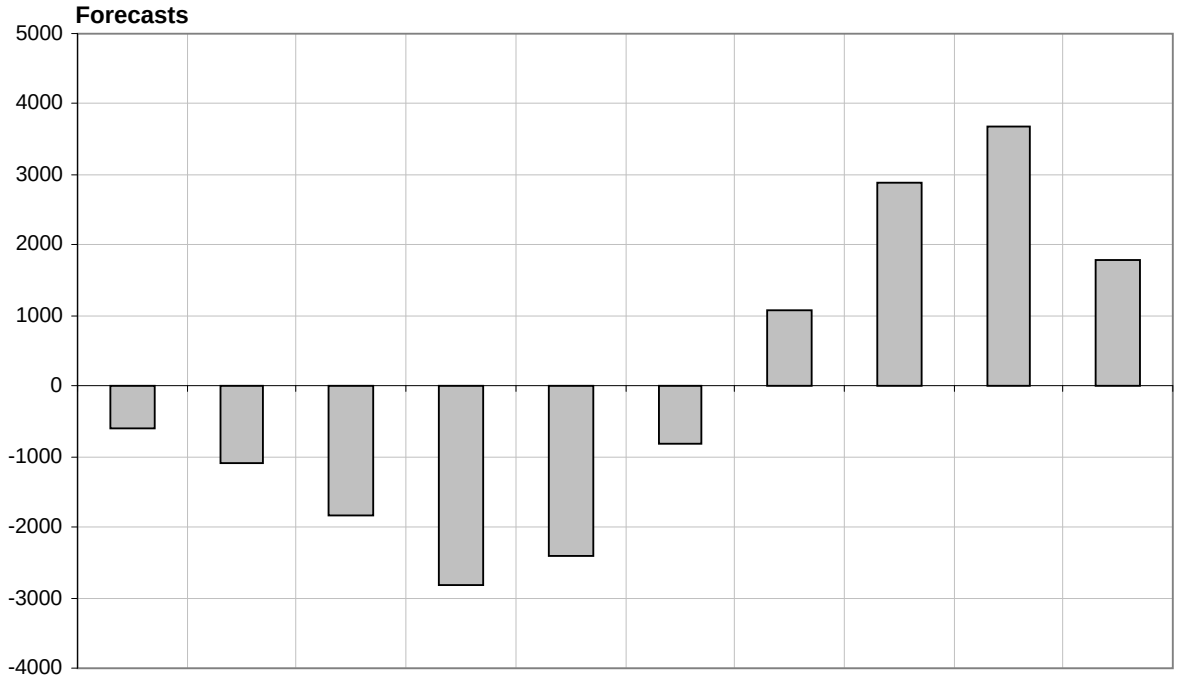
Similar, but larger, capability shortfalls occur under the 1 per cent and 0 per cent labour productivity growth assumptions (see charts 4.12 and 4.13).

Chart 4.10: Australia
Total Roads Workforce Gap and Graduate Supply (1.5% Productivity Growth)



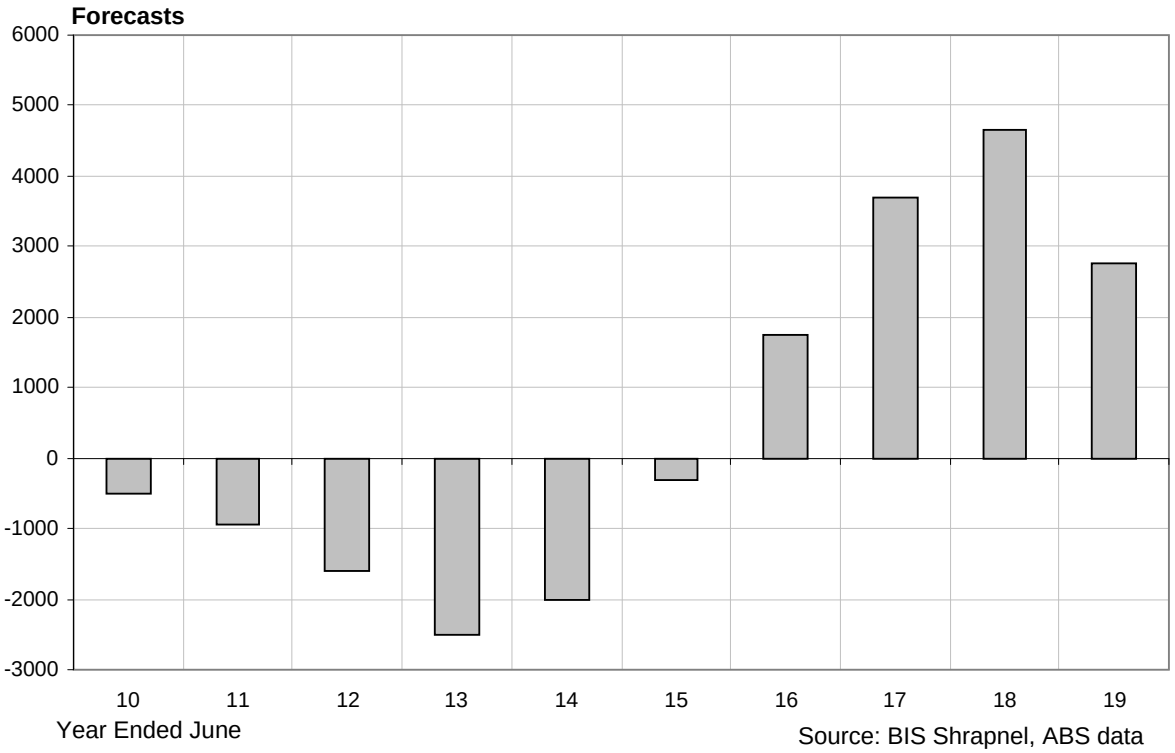
Source: BIS Shrapnel, ABS data

Chart 4.11: Australia
Total Roads Net Capability Position (1.5% Productivity Growth)



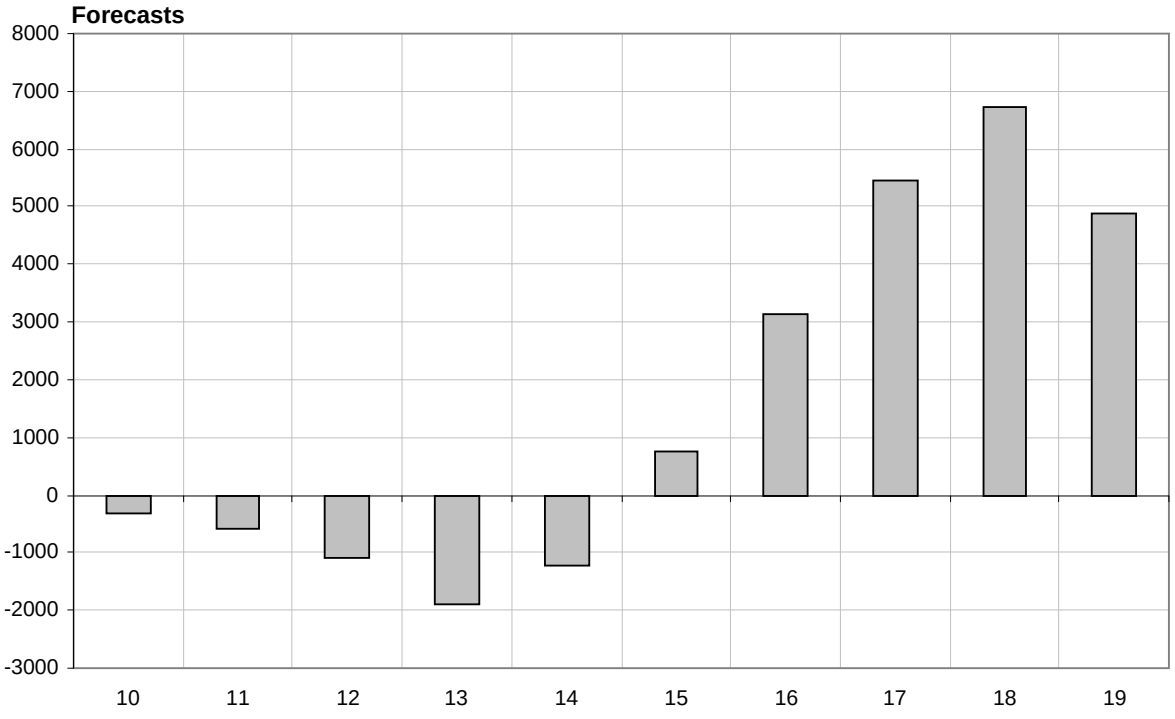
Source: BIS Shrapnel, ABS data

Chart 4.12: Australia
Total Roads Net Capability Position (1% Productivity Growth)



Source: BIS Shrapnel, ABS data

Chart 4.13: Australia
Total Roads Net Capability Position (0% Productivity Growth)



Source: BIS Shrapnel, ABS data

Interpretation of results

The capability model described here suggests that future skilled roads labour supply will not be enough to meet forecast skilled labour demand in the roads sector, based on forecast road construction, maintenance and other road management activity and taking into account labour lost through workforce attrition. As a consequence, in theory, a capability shortfall will arise.

In practice, of course, there will be no observable capability shortfall. Either roads activity, and hence labour demand, will fall back to meet the constrained level of labour supply, or measures will be put in place that will boost labour supply to meet currently expected future roads activity.

In this respect, the quantification of the capability shortfall provides an important insight. First and foremost, it provides a simple measure of how much more labour is required — whether through migration, the net transfer of skills between industries or other supply-boosting measures — to meet forecast demand requirements.

In summary, the key result of the analysis is that Australia faces a shortage of skilled roads labour to meet projected demands from the roads industry over the coming decade. The shortage is expected to become particularly acute in the second five year period to 2018/19, driven by rising levels of construction and maintenance activity, accelerating attrition of the existing skilled workforce through ageing, and only flat growth in graduate supply.

The capability shortfall, while differing in magnitude under the different labour productivity assumptions, reaches a peak in the second five year period. To some, this may suggest that the issue of skills shortages is one which can be deferred until this period. In our view, this would be a mistaken interpretation of the model for several reasons. Primarily, given the time taken to develop new engineering hires (particularly new graduates) to a point of high capability (typically 4-5 years), the model suggests that hiring should be taken now to meet the future capability requirement. This issue becomes more severe when it is also considered that the demand for engineering skills (e.g. design work, testing) tends to precede that of construction and maintenance work done. Finally, we also note that the global financial crisis has seen many private sector companies curtail their graduate intake programs for 2010. In our view, this is a mistake given future industry demand requirements, but does provide public roads authorities an opportunity to secure potentially higher quality graduates now to meet their future needs.

CHAPTER FIVE: NEW SOUTH WALES

5. New South Wales

This Section presents the outlook for New South Wales roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

The table below presents BIS Shrapnel's estimate of the size of the skilled roads workforce in New South Wales in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (508 persons instead of 5,260 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 5.1: New South Wales
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**16,433**	**1,332**	**271**	**353**	**1,096**	**19,485**
Building Construction	13,679	541	72	122	496	14,910
Total Non-Building Construction	614	543	118	111	171	1,557
o/w Road & Bridge Construction	147	222	53	54	32	508
General Trade Construction	2,141	248	81	119	429	3,018
Public Administration & Safety	**791**	**1,525**	**448**	**664**	**1,860**	**5,288**
Federal Government	14	4	3	21	9	51
State Government	391	541	154	294	375	1,754
Local Government	261	925	281	278	1,126	2,871
Other	125	55	10	71	350	611
Professional Services	**2,103**	**2,724**	**764**	**1,578**	**2,195**	**9,364**
Other Sectors	**4,443**	**950**	**301**	**624**	**3,849**	**10,167**
Total All Sectors	**23,771**	**6,531**	**1,784**	**3,218**	**9,001**	**44,304**
Total Roads Workforce	**800**	**2,190**	**610**	**486**	**1,172**	**5,260**
Public Roads Workforce	**485**	**974**	**265**	**277**	**884**	**2,885**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

As can be seen, civil engineers comprise just over 40 per cent of the skilled roads workforce. Moreover, we estimate that there were 800 project managers in the roads sector in NSW in 2008/09. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up around 68 per cent of the defined New South Wales skilled roads workforce.

Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 55 per cent of the New South Wales skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remaining 45 per cent placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

Activity in New South Wales increased in 2008/09 mostly due to the ramping up of major rural and urban highway works (e.g. the Hume Highway duplication and various Pacific Highway upgrades, as well as the F3 upgrade). There was also significant increases in local road construction and a peaking in access road and runways works which helped offset a slump in subdivisions activity.

Chart 5.1: New South Wales
Road and Road Bridge Activity
$ Million, 2006/07 Prices

Our forecast is for road construction activity to increase further over the 2 years to 2010/11, although not at the pace seen recently. The bulk of this growth will come from the continuing massive phase of highways and arterials construction (assisted by the Federal Government's decision to fund the Hunter Expressway and the Kempsey Bypass in its 2009 Budget), with a contribution from the private toll road sector (the M2 widening) and the start of a recovery in subdivisions activity as housing commencements gather pace, absorbing existing stock. Over the subsequent 2 years to 2012/13, road construction activity is expected to decline mainly driven by some winding back in highways and arterials activity (as key projects move to completion) and the completion of the M2 widening works.

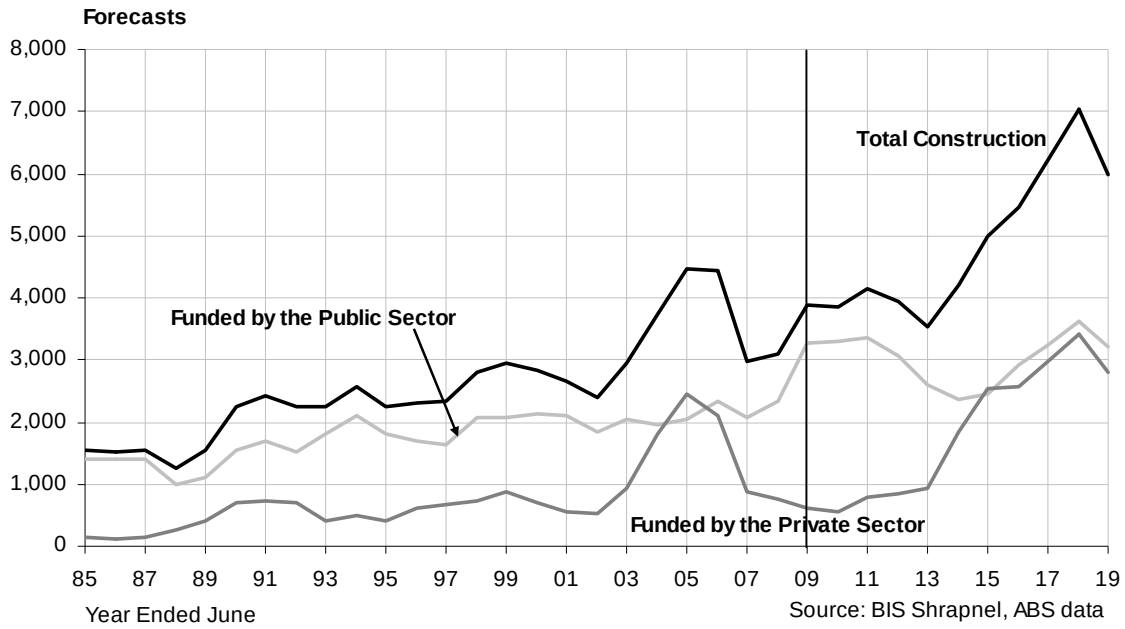
We anticipate a very strong phase of road construction through the five years to 2018/19. With construction expected to start on the M4 East (Port Botany Link) in 2013/14 and the F3 to M2 Link shortly after, private road construction activity will increase sharply. The toll road boom will be joined by a pick-up in publicly funded roads activity, assisted by Federal funding through the NBP.

5.1.1 Road and road bridge construction

Since the first privately built toll road project in Sydney (the Sydney Harbour Tunnel) started in 1987, peaks and troughs in total activity have been linked with construction of toll roads. The completion of the Eastern Distributor in 1999/00 led to total roads activity bottoming out by 2001/02. However, the construction of the Cross City and Lane Cove Tunnels and Westlink M7 in the proceeding years saw overall construction almost doubled to the peak in 2004/05.

Following the completion of the Lane Cove Tunnel in early 2007, the driving force behind road construction has shifted to major public projects (i.e. highways and arterials investment). Since 2005/06, highways and arterials investment has strengthened considerably. Activity was always going to strengthen as the next round of major projects came to fruition, but the magnitude of this upswing was heightened. This occurred since some of these projects were delayed, Federal funding was increased and the effects of past underinvestment necessitated greater State funding and more work than was originally intended.

Chart 5.2: New South Wales
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices



After declining in 2006/07, total roads activity grew through 2007/08 and recorded exceptional growth in 2008/09. This growth was driven by increases to highways and arterials offsetting the ongoing weakness in housing-related roads. The major highways projects were seen on the Hume and Pacific Highways as well as increasing road infrastructure in the growing areas of outer Sydney (the south-west, the Blue Mountains, the Central Coast) and the Illawarra.

Outlook

Despite very strong growth in 2008/09 — where public activity easily reached its highest level on record and total activity recorded its highest level on record in a year where a private toll road project didn't take place — our forecast is for activity to increase further over this year and into 2010/11. The bulk of this growth will, as it did last year, come from the continuing massive phase of highways and arterials, with a small contribution from the private toll road sector.

The majority of the increase in highways and arterials activity is set to come from increased Federal funding, but this will not all be seen under the guise of the Nation Building Program (the new name for the upgraded next five-year tranche of the AusLink program). Two significant, long-awaited projects received somewhat unexpected Federal funding (from the Building Australia Fund) in the 2009 Budget: the Hunter Expressway (the old F3 to Branxton Project) and the Kempsey Bypass (part of the Kempsey to Eungai Project on the Pacific Highway). These projects will receive $2.1 billion in Federal funding and will play an important role in driving further growth in New South Wales road construction over this year and next.

The funding for these two projects was from the Building Australia Fund — which was conceived in the 2008 Federal Budget — and hence probably shouldn't be deemed stimulus funding (as the extra funding made available in the aftermath of the start of the GFC for Black Spots, road maintenance and rail was). However, the fact that these two projects received Federal funding when it was somewhat unexpected means it, for all intents and purposes, is stimulus (unexpected) funding for projects we hadn't expected would proceed for several years.

Federal funding for the NBP is set to be significantly greater (~ 50-60 per cent) than was seen under AusLink to 2008/09 and will also play a key role in driving activity higher to 2010/11. Work on the Pacific and Hume Highways (duplication in southern NSW and widening in Sydney) will form the bulk of work on the NBP in NSW (as it did under AusLink), while continuing work on the Great Western Highway and several minor projects will also contribute.

While the State-funded contributions to the continuing growth in highways and arterials activity are much less than those of their Federal counterpart, they are still quite significant. The main reason for this is the spending of the State Government is above what is indicated by their financial position and the fact they are using borrowings to finance much of this spending.

The volume of State Government work had been insufficient for many years and the spread of their work had also been insufficient. Not enough work had been done in the growth areas of Sydney (the south-west, the Central Coast, Sutherland) or in the Illawarra (where Federal funding is almost non-existent). Other areas to benefit from robust levels of State funding are the Hunter, the North Coast (where the Oxley Highway upgrade is one of the larger State projects in the years ahead) and the inner west of Sydney (the Inner West Busway will include an upgrade to Victoria Road in addition to duplicating Iron Cove Bridge).

Finally, one of Sydney's most chronically congested toll roads — the M2 Motorway — is set to receive a fairly significant upgrade/widening from late 2010. This will be worth $550 million and alleviate (although perhaps only briefly) this bottleneck to the north-west of Sydney.

Overall, our forecast is for activity to record a further jump, mostly in 2010/11, of 8 per cent to a peak not far from the toll road-driven peak of 2004/05.

Declines from 2011/12 as project completions and belt-tightening dominate. . .

BIS Shrapnel expects road construction activity to start declining from 2011/12 over a two-year period. While most of the major projects to drive the strength in activity over the previous two years will continue, we expect that 2011/12 will be the start of a decline in public sector funded activity. Specifically, the NSW Government's finances have been average since the mid 2000s, with fairly impressive investment figures being boosted by borrowings. We believe 2011/12 will be the start of a period of several years where they seek to improve their financial situation by reversing some of the recent strong increases in capital works. The catalyst for this may be a change of Government in early 2011, where history suggests that first year governments look to shore up finances with a reasonably tough first-year Budget.

From 2012/13, the first major completions or projects winding down towards completion — such as Hume Highway duplication, the current tranche of Pacific Highway work (led by Ballina and Bulahdelah Bypasses), the current tranche of Great Western Highway work and the Hunter Expressway — will be seen. In our forecasts, the next round of major projects will largely not begin until the next major infusion of funding: the next round of the NBP from 2014/15 (which we expect to be between 20 and 30 per cent above the tranche to 2013/14).

With the NSW Government still expecting to be focused on their finances, a boost to State funding at this time is considered highly unlikely. As a result, we expect an overall decline in activity in the vicinity of 15 per cent between 2010/11 and 2012/13, almost completely due to highways and arterials construction falling from its record peak.

The next upswing in total activity is forecast to start from 2013/14: this should be a sustained and extremely strong upswing through the middle and towards the end of the 2010s.

BIS Shrapnel anticipates the next upswing will start in 2013/14 (despite our expectation of a further decline in publicly funded activity in that year) driven by a strong increase in private sector activity, specifically the M4 East Project.

The M4 East proposal has been on the drawing board for some time. With finance much more difficult to secure now, we do not expect the private sector will be in a position to come through on this massive ($12 billion in all) project before 2013/14. This will be despite the completion of the Port Botany expansion in 2011 meaning more traffic in the inner east of Sydney and hence a greater need for this project.

5.1.2 Road and road bridge maintenance

Apart from a somewhat anomalous 9 per cent jump in 2004/05, road maintenance in NSW has fallen consistently and markedly since 1999/2000 in real terms. According to the National Transport Commission (NTC) data, in the seven years to 2006/07, activity dropped by a third (although it strengthened significantly in the two years since).

For most of the weak period, the major contributor was local roads maintenance. Strong growth in costs impacted local roads maintenance more than maintenance of major roads due to the weak state of Local Government's finances. However, the advanced age of a greater proportion of roads makes maintenance for NSW councils more difficult, as does cost-shifting. Put simply, most local councils are unable to undertake the requisite work to maintain roads at their current standard. Many councils introduced infrastructure levies to raise necessary funds for maintenance or renewal of a variety of assets, but this has not been enough.

However, 2006/07 also saw a sharp fall in rural highways and arterials maintenance (to its lowest level since 1986/87). The majority of this fall was on the National Network. Federal funding for National Network maintenance in NSW fell slightly in 2006/07, but the major factors here were a much lower 'top-up' from the State Government and a significant portion of the pool of National Network funding was diverted to more heavily trafficked major urban roads.

Persistent, sustained falls in activity since 1999/2000 (at least) in combination with continued growth in the stock of roads, traffic levels and the proportion of roads nearing the end of their working life means a significant backlog of work exists on local roads, major rural roads and major urban roads.

Despite the need for a major increase, we expect road maintenance to be weak for the next four years. This weakness will mainly be seen in Local Government where finances are set to worsen further. The factors affecting Local Government's finances are unlikely to be remedied soon and Councils will take a further financial hit following the failure of investments linked to American sub-prime mortgages. We believe future State Government cutbacks also have potential to adversely affect road maintenance activity.

BIS Shrapnel believes the early 2010s will see a strong recovery in NSW road maintenance, driven by the easing of the credit crunch, a long-overdue upturn in housing construction (boosting revenues) but most importantly the urgent need/ backlog.

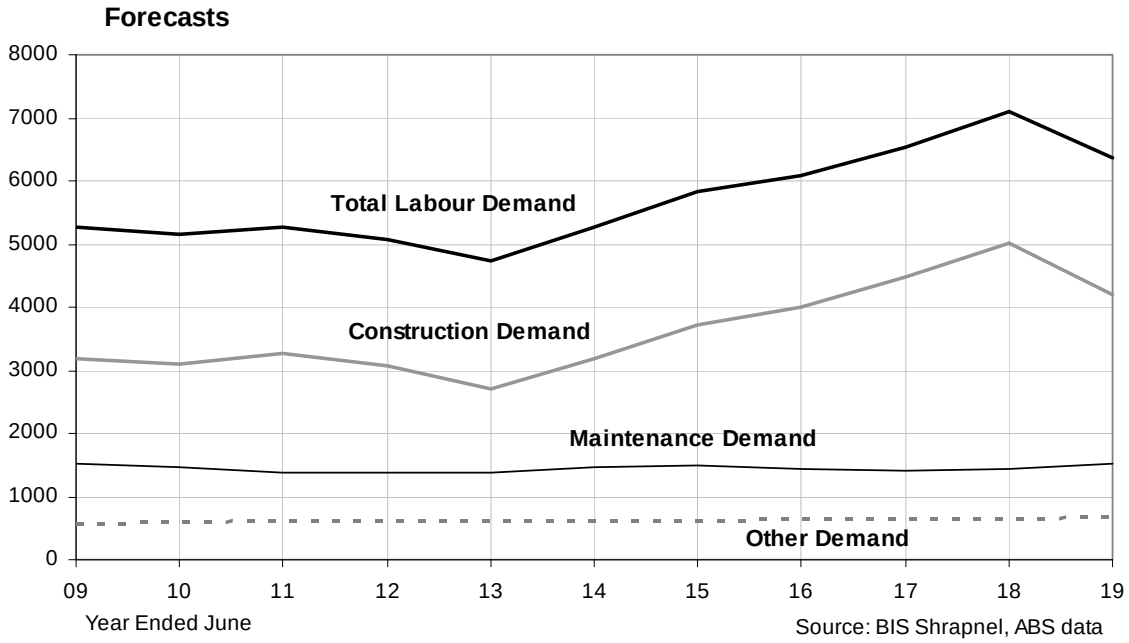
We expect this recovery will be sustained towards the end of the present decade due to: the magnitude of the backlog of work (we believe the backlog in NSW is much larger than in other states), the expected continued growth in population (and traffic levels) and the greater number of older roads (i.e. those nearing the end of their working life) in New South Wales.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in New South Wales translates into demand for skilled labour as shown in the following figure.

From an estimate of 5,260 employees in 2008/09, labour demand is expected to fall to a trough of around 4,720 employees in 2012/13 as activity weakens before accelerating strongly again. Labour demand is expected to peak again in 2018/19 when the demand for skilled labour is expected to nudge over 7,000 persons.

Chart 5.3: New South Wales
Forecast of Road Labour Demand



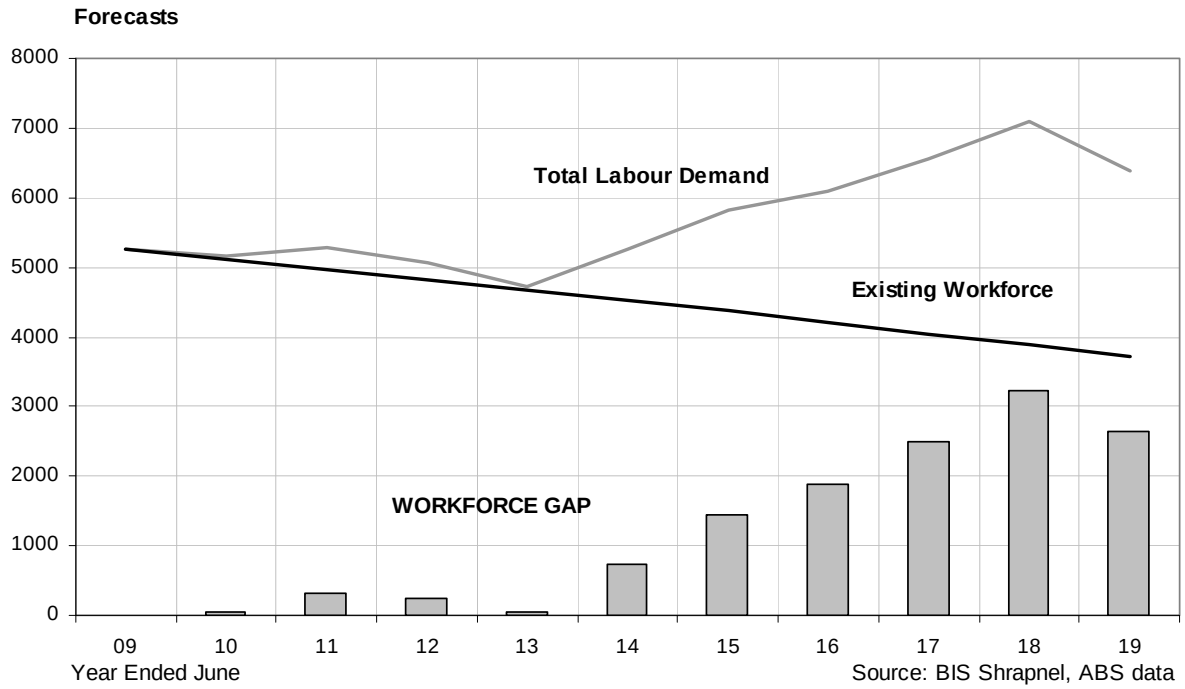
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the New South Wales roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 30 per cent over the next ten years. This is close to the national rate of attrition as presented in Section 4.3. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 5.4: New South Wales
Total Roads Employment (1.5% Productivity Assumption)



For New South Wales, notwithstanding the surge in workforce gap over 2010/11, the total workforce gap is expected to be relatively small during the next four years as the total labour demand curve is not expected to deviate significantly from the existing workforce line. Low levels of private sector funded work is the main reason for this outcome as public sector funded activity is forecast to remain very strong, on average, through to 2012/13. Together these factors are expected to keep overall demand for skilled labour close to the existing workforce, hence keep the workforce gap relatively small.

However, from 2013/14 a much larger positive workforce gap is expected to appear. This will be driven by:

- Ongoing (and accelerating) attrition of the existing workforce, and
- Generally rising labour demand as road construction and road maintenance activity accelerates strongly.

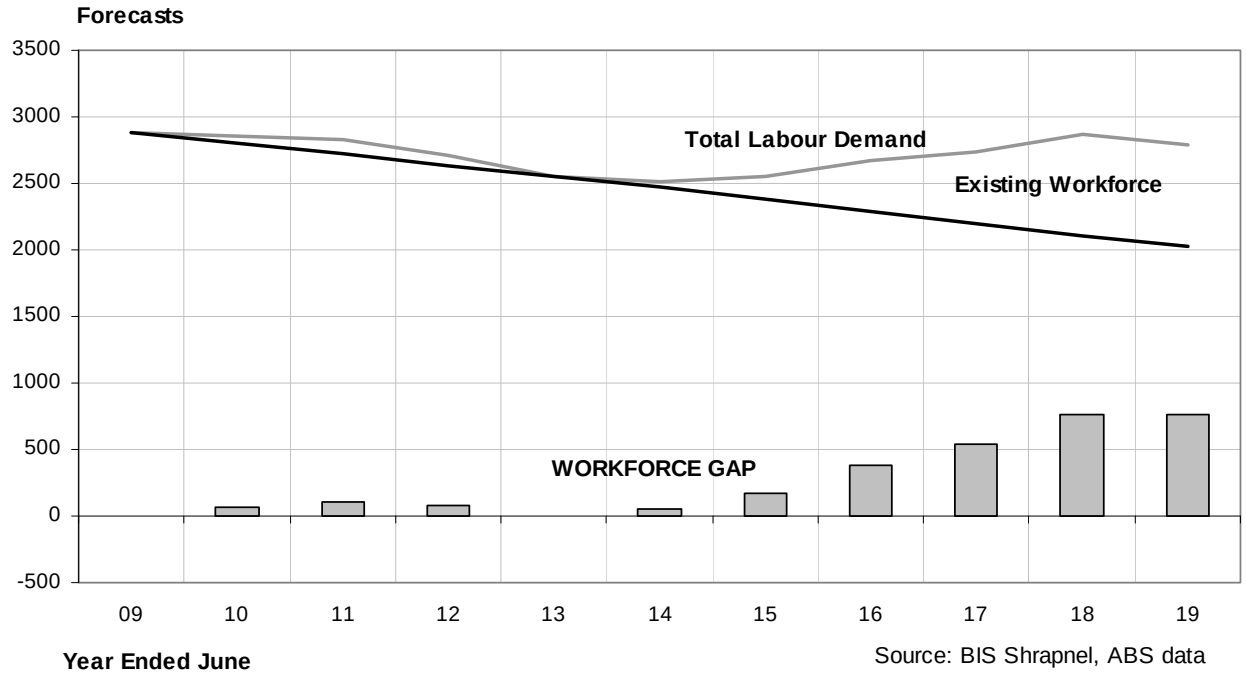
By 2017/18, the workforce gap in New South Wales is expected to jump to over 3,200 persons from 46 persons in 2012/13. The presence of the high, positive workforce gap suggests that skilled labour will be drawn into New South Wales from areas of weaker labour demand through the second half of the decade.

The workforce gap for the public sector in terms of direction, as shown in the following graph, is expected to be similar to the total roads sector. The public sector's role as the key provider of maintenance work and other road management functions is also expected to drive a trend increase in skilled roads labour demand, and the workforce gap, over the second half of the forecast horizon.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

In general, the workforce gap is expected to widen over each year between 2013/14 and 2018/19 inclusive, reaching nearly 770 persons by the end of the forecast period. Initially, the workforce gap will be driven by increasing demand for labour due to higher levels of public sector funded construction activity. In the medium to longer term, the gap is expected to widen as the next tranche of public construction works are joined by a significant lift in real maintenance activity, and as the attrition of the existing workforce accelerates.

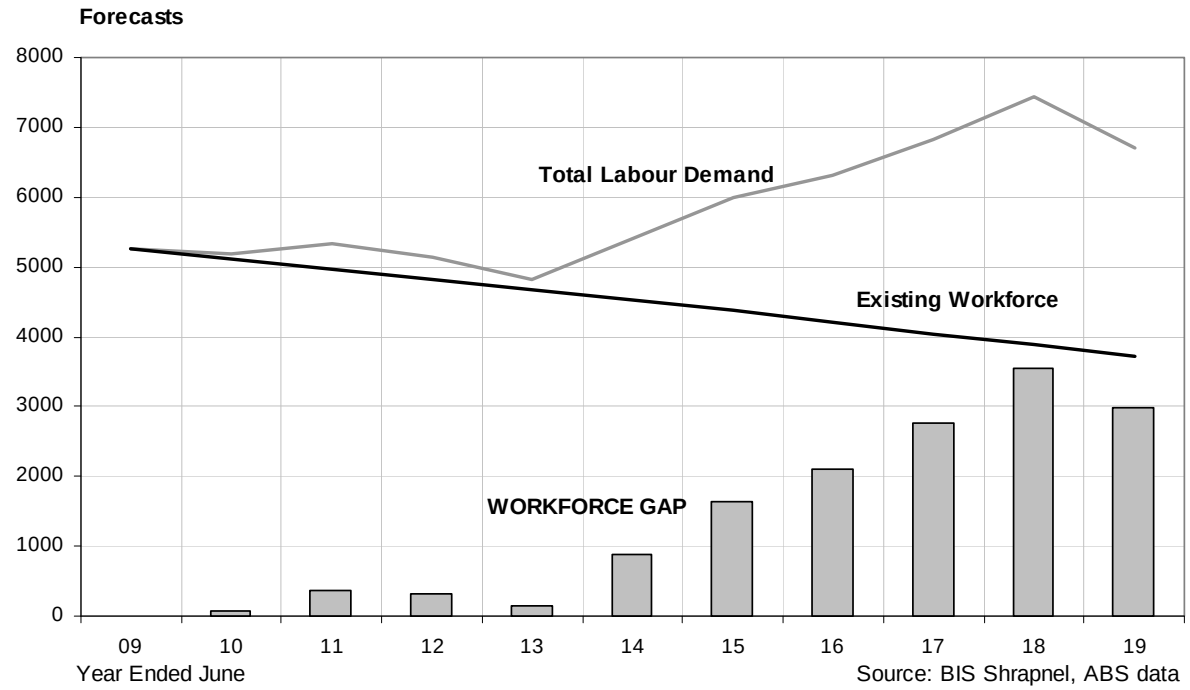
Chart 5.5: New South Wales
Public Roads Employment (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

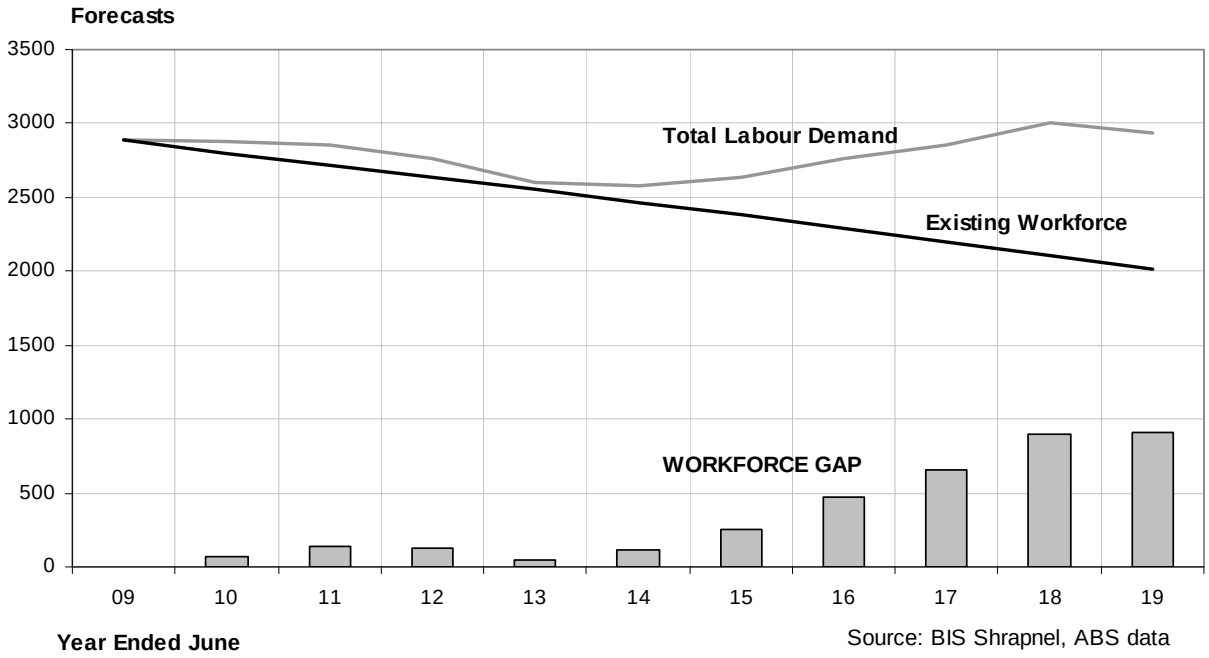
Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 5.6: New South Wales
Total Roads Employment (1% Productivity Assumption)



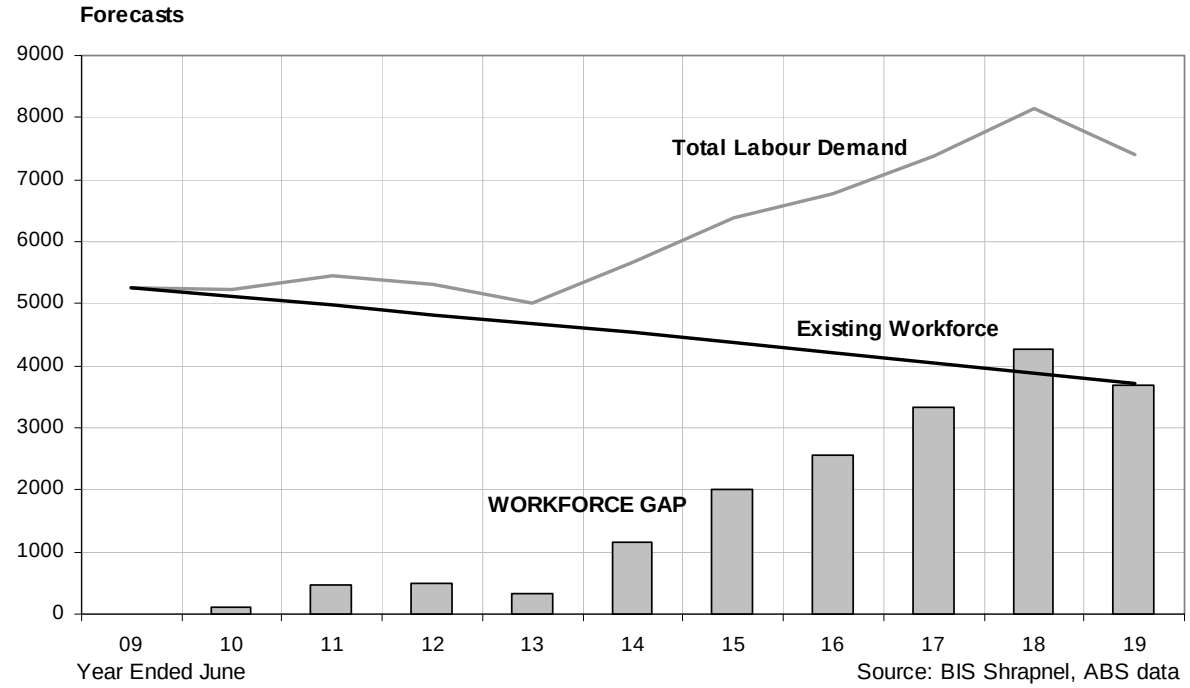
Source: BIS Shrapnel, ABS data

Chart 5.7: New South Wales
Public Roads Employment (1% Productivity Assumption)



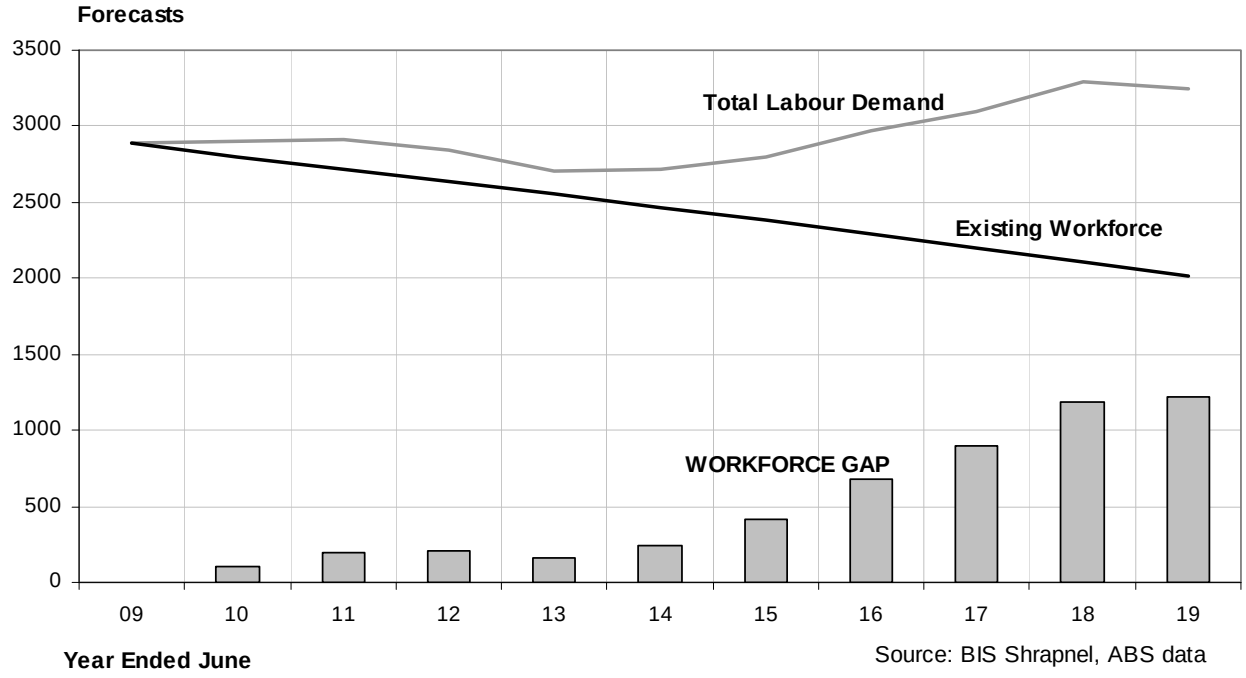
Source: BIS Shrapnel, ABS data

Chart 5.8: New South Wales
Total Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 5.9: New South Wales
Public Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

CHAPTER SIX: VICTORIA

6. Victoria

This Section presents the outlook for Victorian roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

Table 6.1 presents BIS Shrapnel's estimate of the size of the skilled roads workforce in Victoria in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (361 persons instead of 3,328 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 6.1: Victoria
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**15,388**	**935**	**181**	**228**	**964**	**17,696**
Building Construction	13,649	435	61	64	704	14,913
Total Non-Building Construction	356	339	75	63	79	911
o/w Road & Bridge Construction	114	168	41	28	9	361
General Trade Construction	1,383	161	45	102	181	1,872
Public Administration & Safety	**409**	**1,127**	**155**	**295**	**1,413**	**3,399**
Federal Government	44		3	6	22	75
State Government	112	387	56	112	197	863
Local Government	145	679	78	12	1,050	1,964
Other	108	62	18	165	144	497
Professional Services	**1,626**	**2,151**	**605**	**1,102**	**1,718**	**7,202**
Other Sectors	**3,822**	**658**	**183**	**362**	**2,337**	**7,362**
Total All Sectors	**21,244**	**4,872**	**1,123**	**1,987**	**6,433**	**35,659**
Total Roads Workforce	**422**	**1,544**	**342**	**128**	**892**	**3,328**
Public Roads Workforce	**214**	**603**	**80**	**32**	**755**	**1,685**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

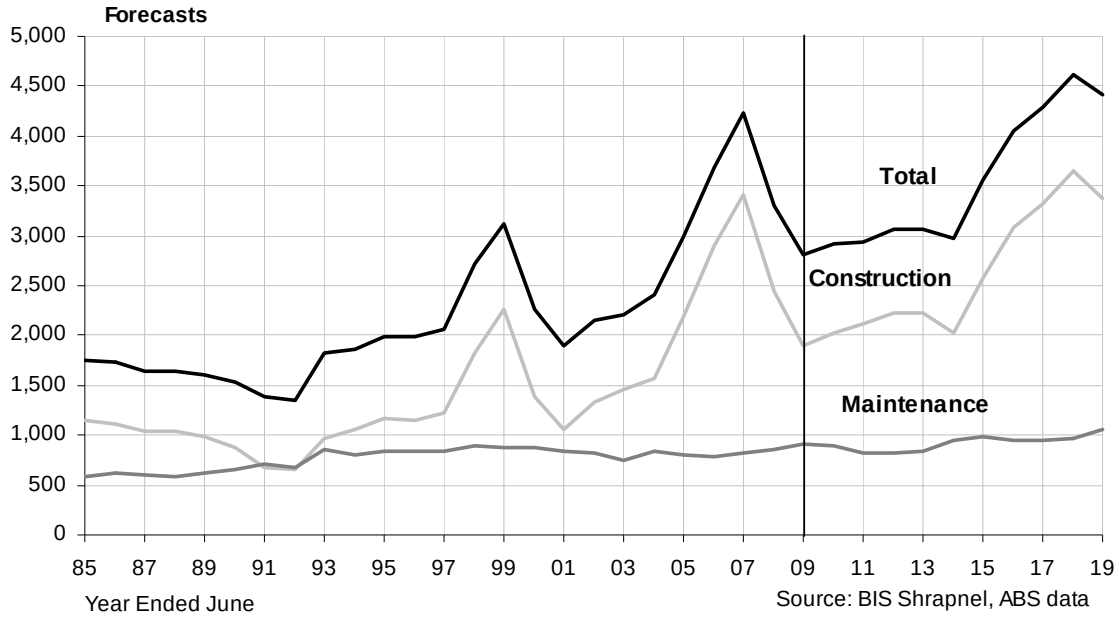
As can be seen, civil engineers dominate the skilled roads workforce, comprising nearly half of the total workforce. Moreover, we estimate that there were 422 project managers in the roads sector in Victoria in 2008/09. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up just under 70 per cent of the defined Victorian skilled roads workforce.

Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 50 per cent of the Victorian skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remaining 50 per cent placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

Total road construction activity in Victoria declined in 2008/09 due to the completion of some major projects. Apart from the completion of the EastLink toll road project, 2008/09 saw the completion or near completion of a major round of highways and arterials projects (including the Deer Park Bypass, the Geelong Bypass and a range of projects along the Calder Highway, the Princes Highway, the Bass and Midland Highways).

Chart 6.1: Victoria
Road and Road Bridge Activity
$ Million, 2006/07 Prices



BIS Shrapnel is forecasting road construction activity will shrug off its recent decline and post mild gains over the next four years, before easing back in 2013/14. In doing so, our forecast is for total activity to reach its highest ever level in a year without a major private toll road project.

The major drivers of the upswing are on the public side. The NBP is now underway for this five-year period (led initially by some works brought forward in the Federal Government's infrastructure stimulus package) and will provide the bulk of funding for major projects in Victoria during this time.

6.1.1 Road and road bridge construction

Road construction activity in Victoria fell over the last two years, but this was preceded by a very strong and sustained upswing since the early 2000s. Led by the massive EastLink private toll road project — but also an important contribution from a significant round of major publicly funded highways projects — activity surged more than two-fold between 2000/01 and 2006/07.

The level of activity in 2006/07 — supported by EastLink, major public projects (such as the Deer Park Bypass) as well as continued robustness in residential and industrial subdivisions construction — was 55 per cent above the previous peak activity level (1998/99 — when CityLink was built). As with the CityLink project, roads activity was destined to fall sharply as EastLink and the major public sector funded projects wound down to completion. As it happened, road construction activity fell almost 45 per cent over 2007/08 and 2008/09.

While the completion of EastLink sent privately funded work back to a more 'normal' level, publicly funded activity was still at its third highest level on record in 2008/09. This was achieved despite the completion or near-completion of the (many) projects which led to the peak in 2006/07. The major new public project to start in Victoria over the last two years has been the Monash WestGate Upgrade but the combined amount of work on smaller projects in Melbourne's outer suburbs (catering for continued population growth and sprawl) has also been important.

BIS Shrapnel is forecasting road construction activity will shrug off its recent decline and post solid gains over the next four years, before easing back in 2013/14. In doing so, our forecast is for total activity to reach its highest ever level in a year without a major private toll road project.

The major drivers of the looming upswing are on the public side. The Nation Building Program (NBP — formerly known as AusLink 2) is now underway for this five-year period (led initially by some works brought forward in the Federal Government's infrastructure stimulus package) and will provide the bulk of funding for major projects in Victoria during this time. It will provide over $2.2 billion for new road projects to 2013/14 — a significant jump over funding received from AusLink 1 from 2004/05 to 2008/09.

However, the Victorian Government's contributions here will also be important, thanks to continuing work on the Monash WestGate Upgrade, their contributions to the NBP as well as the next round of smaller, but still quite important, projects in Melbourne's outer suburbs and in regional areas of Victoria.

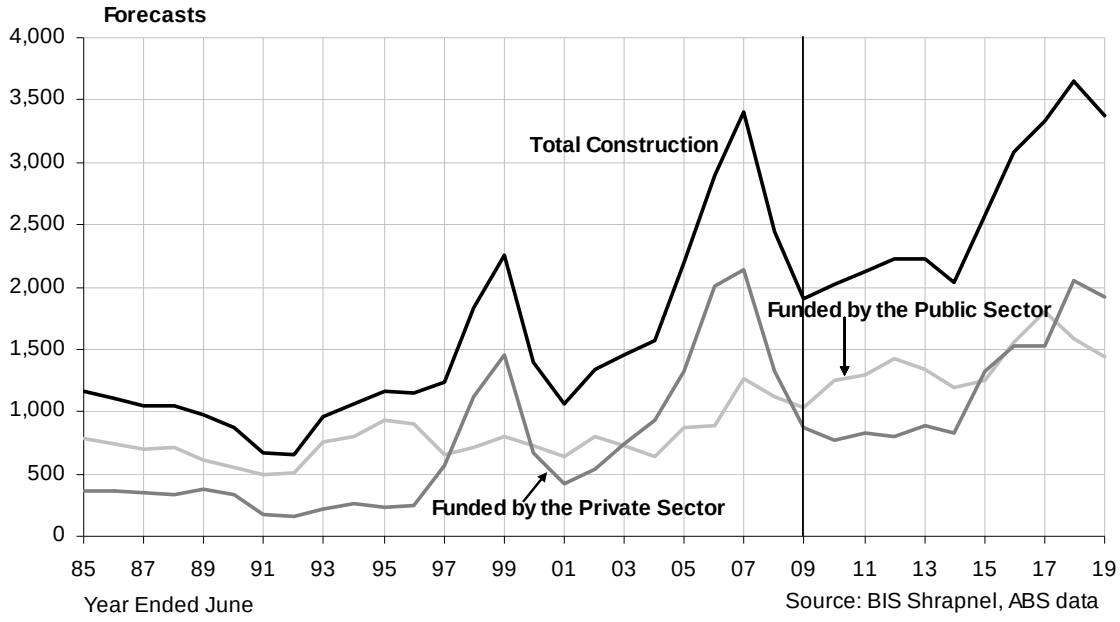
Governments are continuing to 'catch-up' on low investment levels in the roads sector over the past few decades (prior to the mid 2000s). This will be a key factor influencing public activity in the period to 2013/14.

Even so, the most important contribution to activity in the next five years may come from the $750 million Peninsula Link project, which is now slated to be privately funded. This project will link EastLink and the Mornington Peninsula Freeway to the growing outer suburb of Frankston. The Victorian Government has 'started the ball rolling' with the project, pledging $354 million over the next four years (with the possibility of a Federal contribution also) to allow work to start on this project before the private sector contributors to the PPP have been decided. This innovative method of project finance should ensure the private sector's financial involvement and a prompt start to work on this project.[17]

[17] For the purpose of clarity, we have classified Peninsula Link as a public project. However, there is a strong chance it will be considered a private project by the ABS.

Our longer term forecast for public sector activity is for declines to start coming through from 2012/13. The main factors here will be that the peak of work on the NBP is expected to be seen in 2011/12 (i.e. the project pipeline will be again running low; only the Western Ring Road upgrade looks set to be ramping up out of all NBP projects beyond 2011/12) and that the impact of the current economic slowdown will prevent any significant improvement to Government (State or Federal) funding for roads in the near term.

Chart 6.2: Victoria
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices



However, our forecasts include a continuation of the NBP for five years from 2014/15 and that this phase will feature more funding than the current phase (although this growth is expected to be less than that seen from AusLink to NBP).

Our forecasts for public work (and the next NBP) in the five year period to 2018/19 include further work on the Goulburn Valley, Princes and Western Highways, as well as significant upgrades to some Melbourne roads (e.g. the Western Ring Road, Tullamarine and West Gate Freeways), as well as a “solution” for congestion along Hoddle Street. These will be needed to cater for more population growth and sprawl in Melbourne.

6.1.2 Road and road bridge maintenance

Driven by strong increases on state roads (due to Kennett-driven initiatives such as the *Better Roads* fund and Compulsory Competitive Tendering), Federal roads (due to sharp growth in funding for NHS maintenance under the *One Nation* package) and then to local roads, maintenance activity in Victoria grew by 30 per cent between 1991/92 and 1997/98.

Since peaking in 1997/98, road maintenance in Victoria has trended downwards to 2002/03 before being on an upward drift to 2008/09. That said, we believe Victoria has similar road maintenance characteristics to NSW: steady ongoing growth in maintenance of major roads in Melbourne but falling maintenance on major roads in rural Victoria (local roads maintenance is also on a slight downward trend but this is much less severe than in NSW).

However, the most important similarity between road maintenance in Victoria and NSW is the sizeable backlog in both states in more intensive rehabilitation works. It is little surprise that falling maintenance activity on major rural roads (largely due to insufficient Federal funding and the forced diversion of limited funds to more heavily trafficked major urban roads) has resulted in rehabilitation's proportion of activity falling from 40 to 25 per cent over the last seven years. But for major urban roads — where funding has grown solidly — the proportion of activity going to rehabilitation fell from 36 to under 10 per cent during the same period.

Over the medium to long term, our outlook for Victoria is fairly positive. While Victoria has a number of major infrastructure projects on the drawing board in the next few years (which could result in road maintenance being pushed down the list of priorities for the State Government), we believe that road maintenance will climb higher over the longer term. One reason is the backlog in rehabilitation work, most notably on major urban roads (as traffic levels and the number of aging roads continue to increase). Also, the task of road maintenance (and the backlog) is receiving greater public attention: A recent report from the Victorian Auditor-General on road maintenance in rural Victoria highlighted a backlog in activity as well as insufficient funding given out over many years.

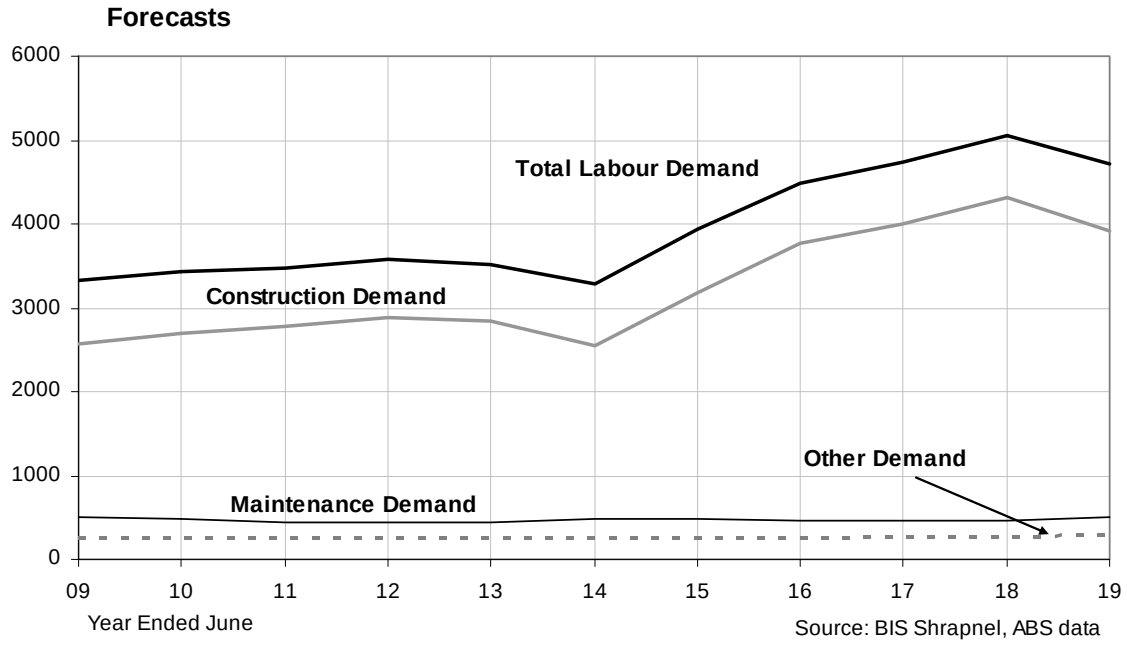
Overall, our forecast is for maintenance activity to remain fairly static over the next three years, before growing steadily from 2012. Much of this growth will be 'catch up', but our expectation of ongoing strong population growth in Melbourne, continued growth in traffic levels of major rural roads and a generally older stock of roads in Victoria (compared to other states) will drive maintenance levels higher over much of the period to 2018/19.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in Victoria translates into demand for skilled labour as shown in Chart 6.3.

From an estimate of 3,328 persons in 2008/09, labour demand is expected to rise to a peak of 3,574 persons in 2011/12. Labour demand is then expected to fall to a trough of around 3,288 persons in 2013/14 as activity weakens before accelerating strongly again. Labour demand is expected to peak again in 2018/19.

Chart 6.3: Victoria
Forecast of Road Labour Demand



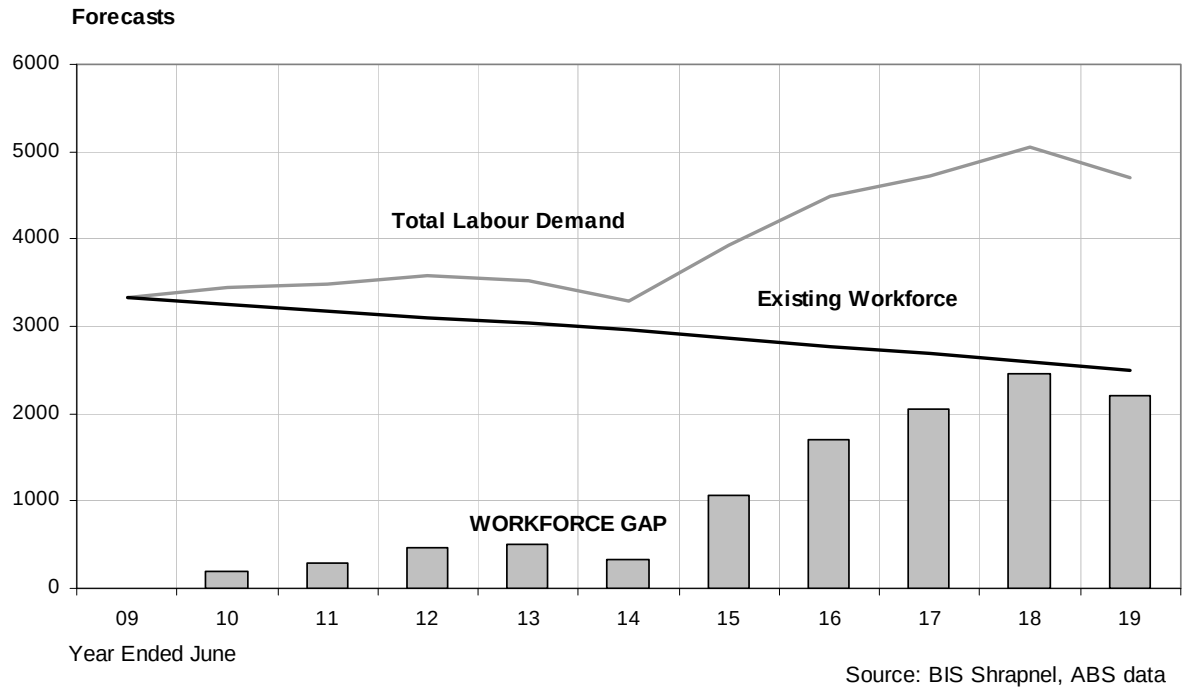
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the Victorian roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 25 per cent over the next ten years which is slightly lower than the national rate of attrition at just over 30 per cent. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 6.4:Victoria
Total Roads Employment (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

For Victoria, our expectation is for the total roads sector workforce gap to turn and remain positive over the whole of the forecast period. The gap is expected to become larger over the second half of the decade and will be driven by:

- Ongoing (and accelerating) attrition of the existing workforce, and
- Generally rising labour demand as roads activity re-accelerates strongly.

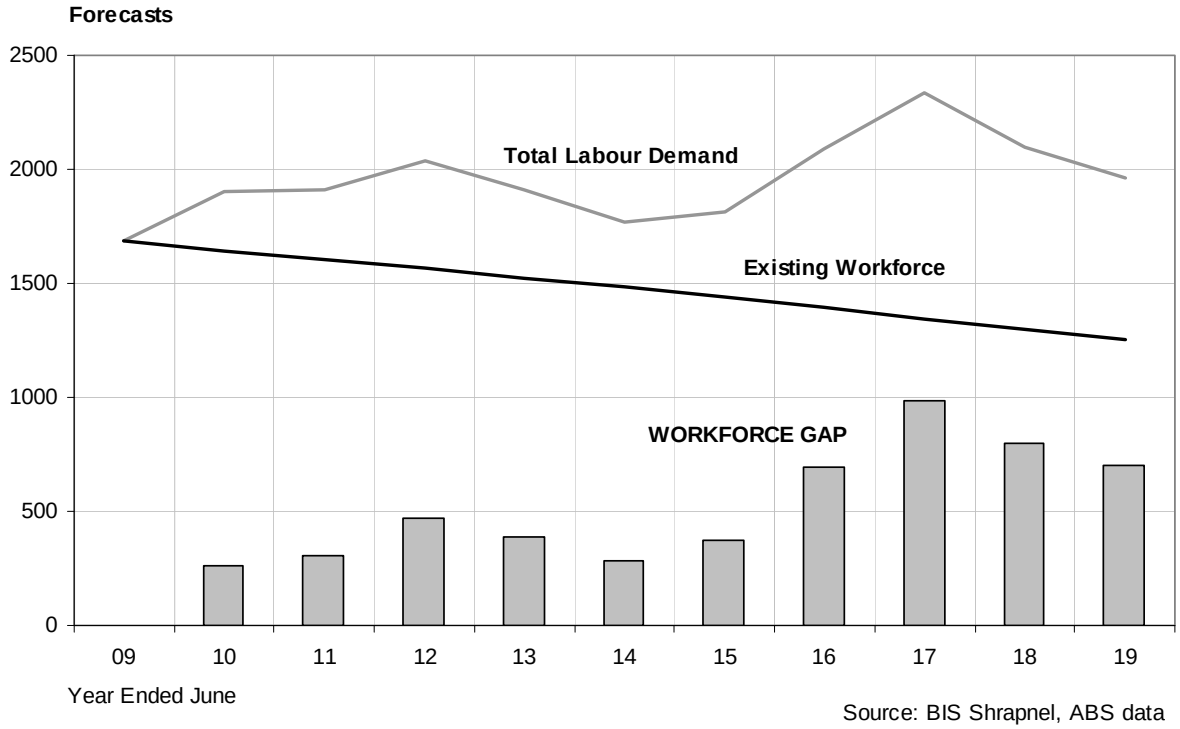
By 2017/18, the total road sector workforce gap in Victoria is expected to peak at around 2,460 persons. The presence of the high, positive workforce gap suggests that skilled labour will be drawn into Victoria from areas of weaker labour demand through the coming decade.

The workforce gap for the public sector, as shown in Chart 6.5, is generally expected to mirror the total roads sector given the relatively robust outlook for public sector funded roads activity. The Victorian public sector's role as the key funder of maintenance work and provider of other road management functions is also expected to drive a trend increase in skilled roads labour demand, and the workforce gap, over time.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

In general, the public sector workforce gap is expected to be positive (driven by increasing public sector funded construction activity) in each of the next 10 years reaching a peak of 986 persons in 2016/17. Over the medium to longer term, the gap is expected to widen as the attrition of the existing workforce also gathers pace.

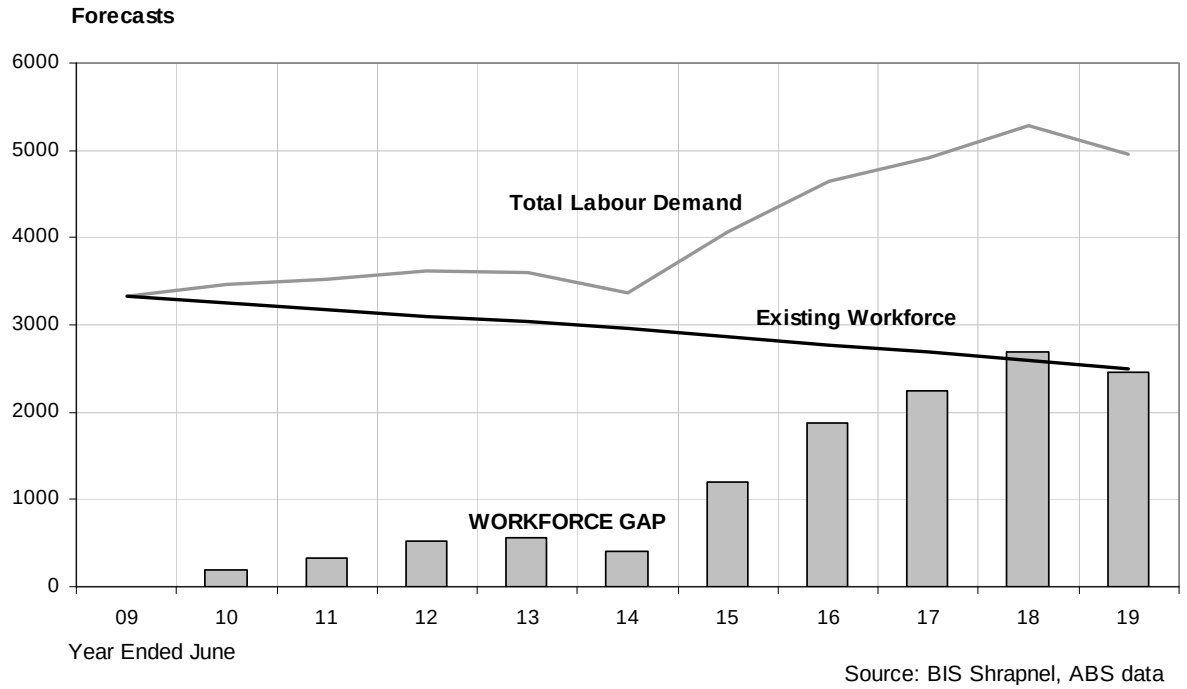
Chart 6.5: Victoria
Public Roads Employment (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

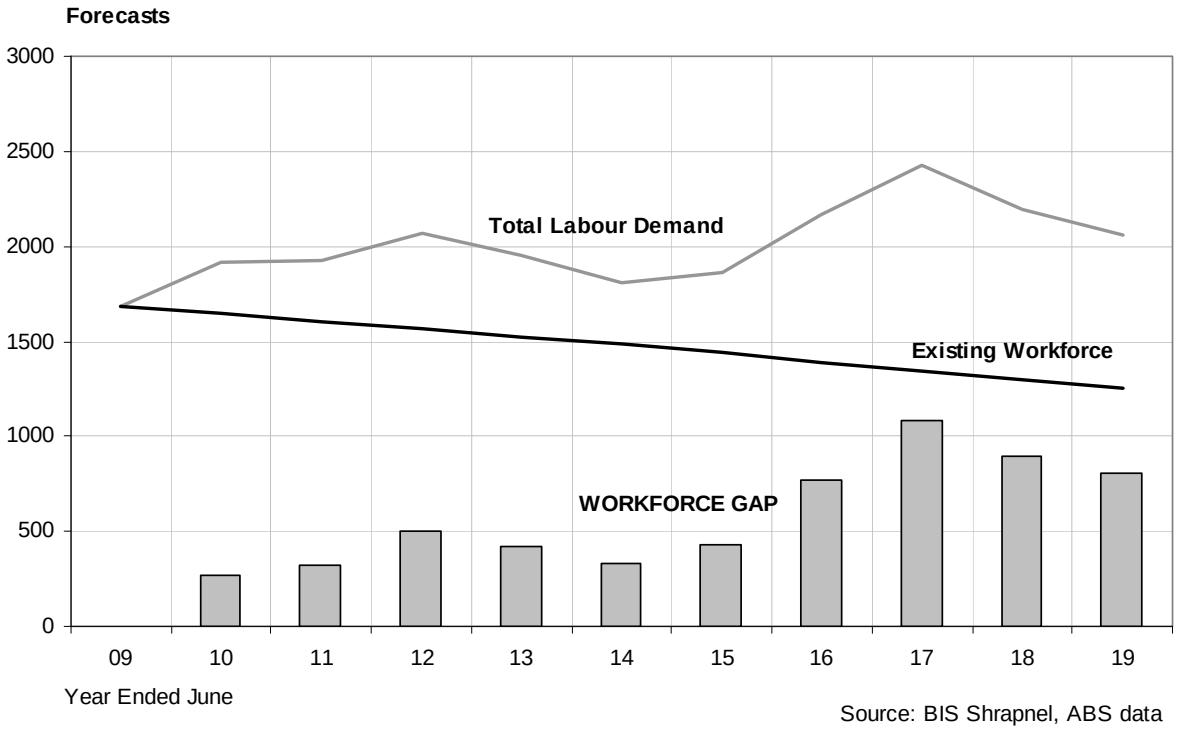
Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 6.6: Victoria
Total Roads Employment (1% Productivity Assumption)



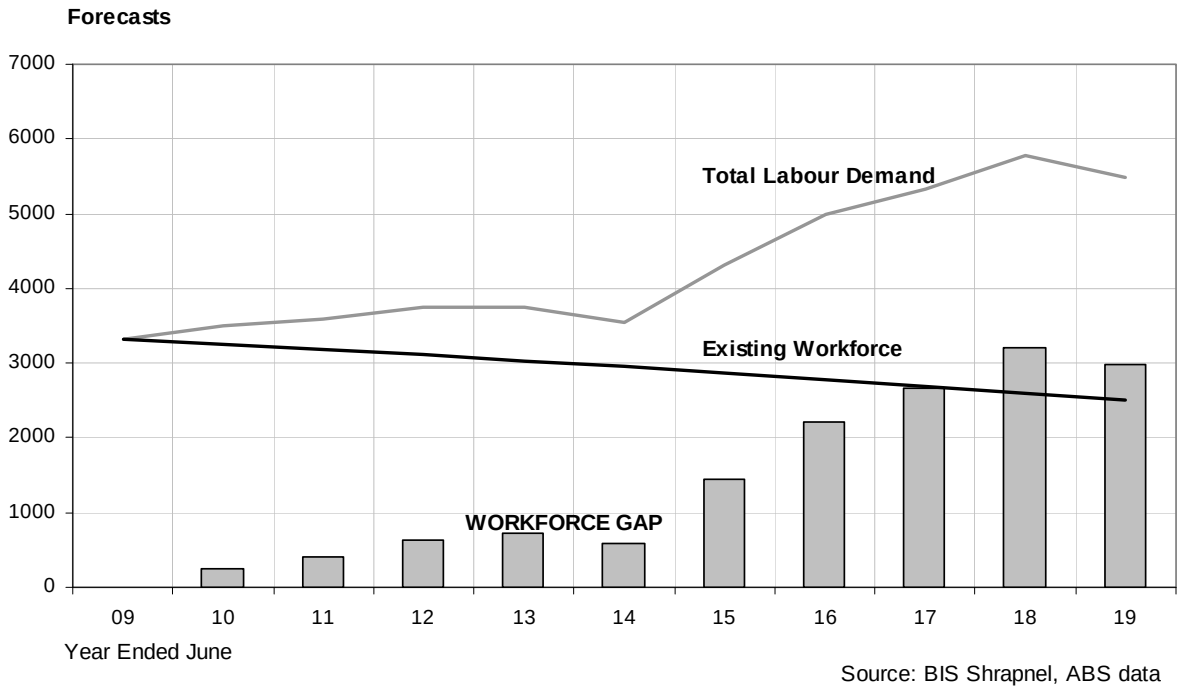
Source: BIS Shrapnel, ABS data

Chart 6.7: Victoria
Public Roads Employment (1% Productivity Assumption)



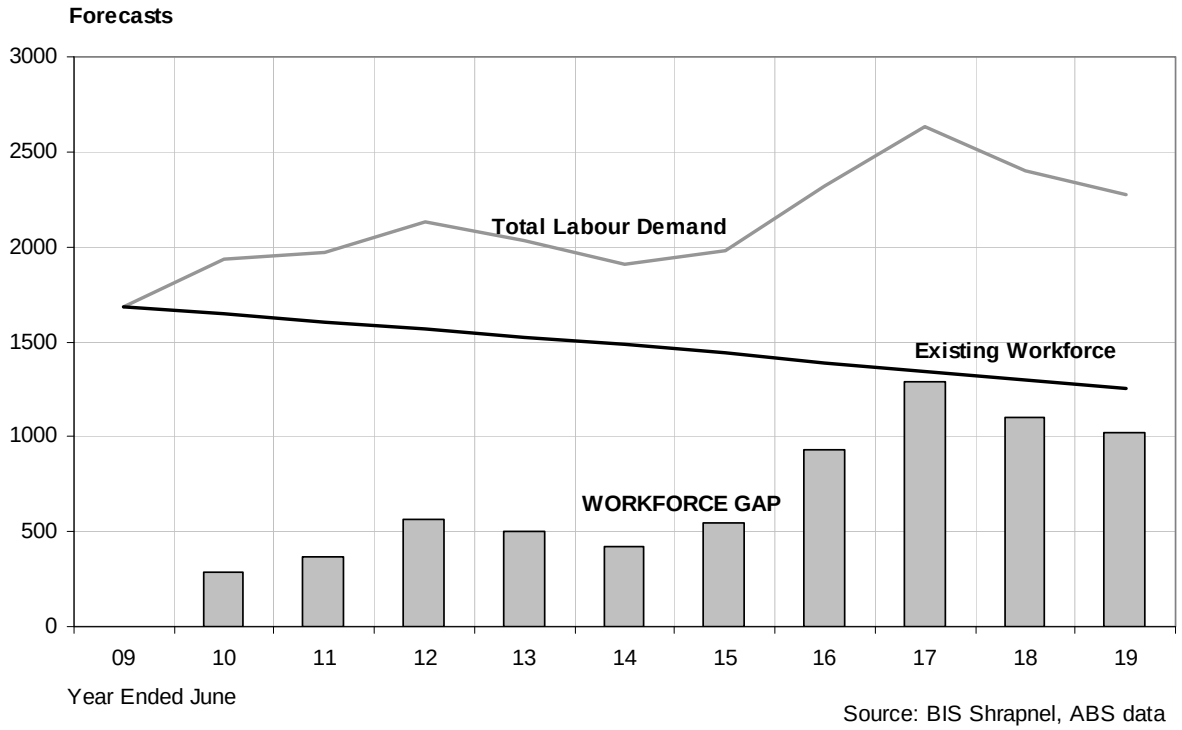
Source: BIS Shrapnel, ABS data

Chart 6.8: Victoria
Total Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 6.9: Victoria
Public Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

CHAPTER SEVEN: QUEENSLAND

7. Queensland

This Section presents the outlook for Queensland roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

Table 7.1 presents BIS Shrapnel's estimate of the size of the skilled roads workforce in Queensland in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (1,564 persons instead of 5,728 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 7.1: Queensland
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**12,604**	**1,275**	**426**	**277**	**1,122**	**15,703**
Building Construction	9,921	317	80	40	553	10,911
Total Non-Building Construction	789	732	266	119	246	2,152
o/w Road & Bridge Construction	533	619	204	48	159	1,564
General Trade Construction	1,894	226	79	118	323	2,640
Public Administration & Safety	**491**	**798**	**434**	**591**	**964**	**3,278**
Federal Government				6		6
State Government	299	434	238	332	353	1,657
Local Government	129	316	196	150	475	1,265
Other	63	48		103	136	350
Professional Services	**1,627**	**2,952**	**1,609**	**1,455**	**2,197**	**9,840**
Other Sectors	**2,682**	**566**	**339**	**413**	**3,020**	**7,020**
Total All Sectors	**17,404**	**5,591**	**2,808**	**2,736**	**7,302**	**35,841**
Total Roads Workforce	**1,018**	**2,178**	**1,120**	**494**	**918**	**5,728**
Public Roads Workforce	**486**	**641**	**364**	**197**	**467**	**2,154**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

Civil engineers dominate the defined skilled roads workforce, comprising nearly 40 per cent of the total. The next largest categories are civil engineering associate professionals and project managers. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up three quarters of the defined Queensland skilled roads workforce.

Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 56 per cent of the Queensland skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

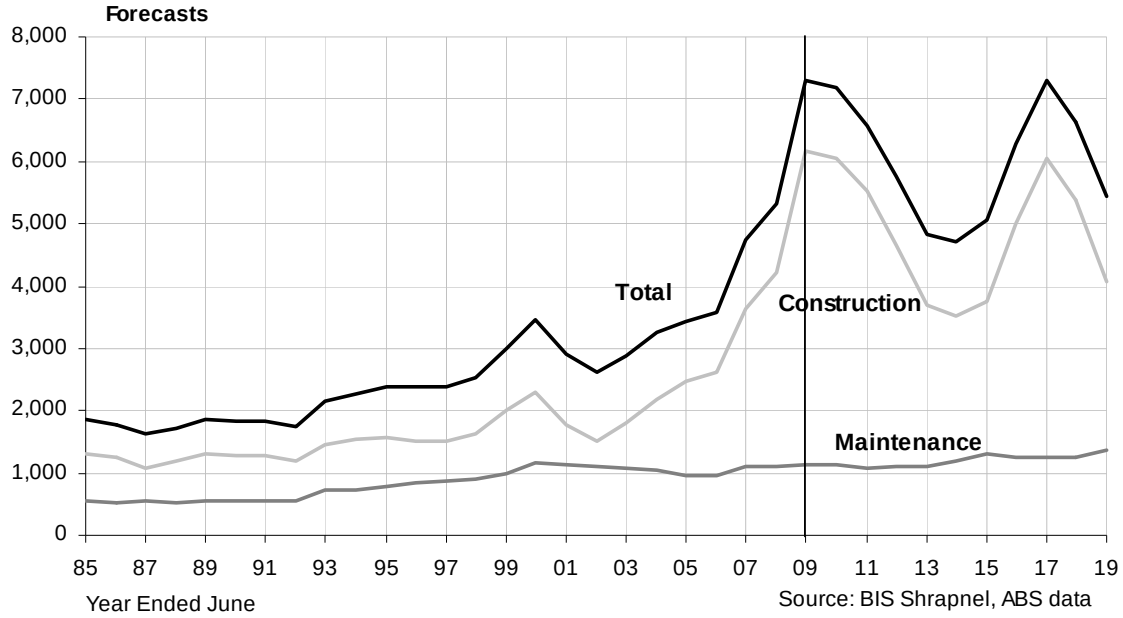
An acceleration in publicly funded works along with work on Queensland's two private toll road projects — the Clem Jones Tunnel or CLEM7 (formerly known as the North South Bypass Tunnel) and the Brisbane Airport link — saw road construction more than double between 2005/06 and 2008/09.

After recording a similar level of work in 2009/10, we expect work done to drop away from record levels. Our forecasts show a decline in 2010/11, quickly giving way to large, double digit falls over 2011/12 and 2012/13. A sharp decline in toll road construction over the next 2 years provides the impetus for the initial declines, offsetting further significant increases in public sector funded works.

From 2010/11, however, we expect that highways and arterials work will decline sharply as current projects move towards completion and the State Government reins in some of its extraordinary infrastructure spending. This decline drives the sharp falls in total roads activity through to 2013/14, despite some pick-up in subdivisions work.

We expect the ongoing need to provide and improve road infrastructure to cater for population growth (and the consequences of this, such as increased traffic congestion) in South East Queensland to be the key driver of activity from the second half of the decade. Rising demand for urban freight corridors (from both the Port of Brisbane and the international airport) and counter-cyclical Federal Government-funded infrastructure spending will also supplement work done in this period.

Chart 7.1: Queensland
Road and Road Bridge Activity
$ Million, 2006/07 Prices



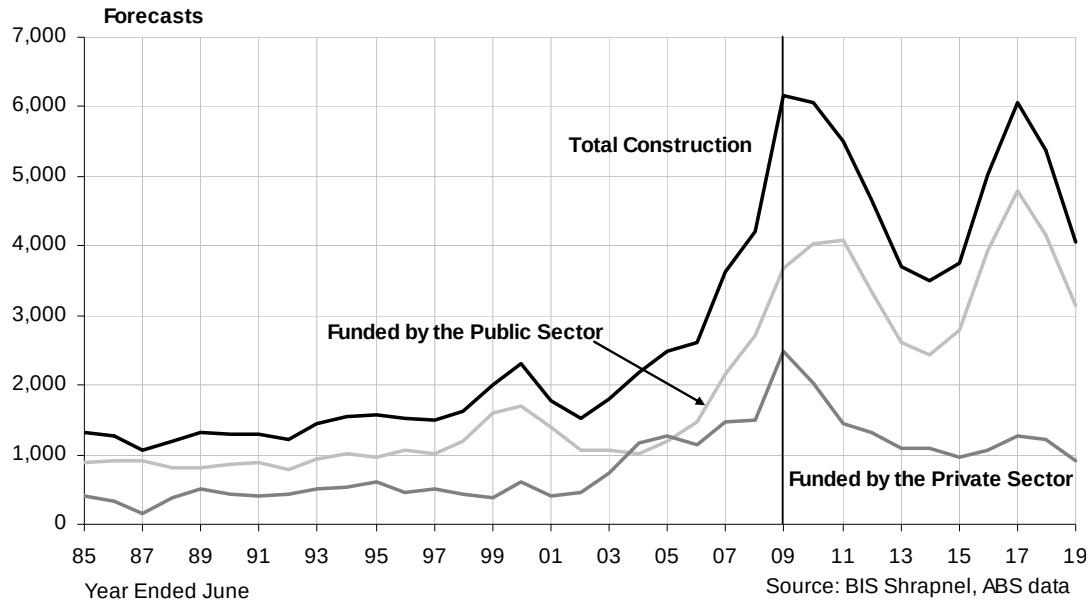
7.1.1 Road and road bridge construction

Road construction in Queensland has climbed steadily since the trough in 2001/02, and in the past three years activity has surged to reach record highs. The first part of the current boom was driven by the private sector; in particular, construction of subdivisions related to the housing boom during the two years to 2003/04. The pace of the upswing slowed over 2004/05 and 2005/06 as subdivision construction eased.

Offsetting these declines were increases in publicly funded highways and arterials work which in 2003/04 had fallen to its lowest level in eight years. However, from 2004/05, the commodity boom had started to gain traction and there was a growing need for upgrades and improvements due to strong levels of net interstate migration (especially in the south east of the state).

An acceleration in publicly funded works along with the commencement of Queensland's first private toll road project — the Clem Jones Bypass Tunnel (formerly known as the North South Bypass Tunnel) — saw work done continue to rise strongly through 2006/07. However, a second, privately funded toll road project — the Brisbane Airport link — then commenced in 2007/08. These two massive projects, combined with the state's largest public roads program ever, boosted work done to a new peak in 1999/2000.

Chart 7.2: Queensland
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices



Outlook

After last year's massive surge in work done we are forecasting a mostly flat year of growth in 2009/10, with total road construction to recede from record levels. This modest decline is a reflection of a slight easing in activity across a number of private and publicly funded road segments. Toll roads and publicly funded urban roads and arterials will continue to be the key driver of activity in 2009/10. We should stress, the 2009/10 forecast level of work done is well above the historical norm for Queensland.

After pausing in 2009/10 we expect work done to begin receding from record levels. Our forecasts show single digit falls in 2010/11 quickly giving way to double digit falls between 2011/12 and 2012/13. A sharp decline in toll road construction will provide the impetus for the initial declines before publicly funded works begin receding from historically high levels in roughly the same period. Meanwhile, a recovery in private subdivisions work will not be sufficient to prevent a further round of decline in 2013/14.

The recent boom in publicly funded road construction work, while representing a 'catch-up' for a lack of investment through the 1990s, has to a large degree been financed by robust State Government finances. Queensland Government revenues have received significant support from the resources sector and strong population inflows from interstate (and their impact on property markets) in recent years. And, despite recent stimulus from the Federal Government, we note that the Queensland Government remains the principal driver of the publicly funded roads programme, with Federal stimulus only modestly affecting our forecasts.

As the current round of large publicly funded road projects move towards completion in and around 2011/12 we expect public funding for road construction to begin falling. Year after year of record state infrastructure budgets has led to an 8 year boom in public funded road works. We expect, after such a significant contribution, the Queensland government will begin easing back funding across a number of sectors including roads. In particular, urban arterials and highways, which have seen much of the government's attention, are expected to begin falling sharply in this period. This is thought to allow the Queensland government to pay down existing debt and rebuild already stretched state government finances.

While there is still some uncertainty attached to the timing of specific projects into the medium term (given deliberations on major projects by *Infrastructure Australia* on project inclusion and funding levels for subsequent phases of the Building Australia Program), projections for further growth in South East Queensland (and the subsequent road works required to cater for expanding cities and further traffic congestion) provide the basis for modest growth in activity over the next five years.

As the project list highlights, there is still a steady line of projects expected between 2014/15 and 2018/2019. And, despite initially weaker state government expenditure on roads in this period, the third tranche of AusLink will ensuring a solid level of activity remains before higher levels of state funding again return boosting overall activity. As aforementioned, continued population growth in the south east will once again provide the impetus for strong state government funding to new road construction.

Some of the major projects slated to occur in the early to middle to late part of the 2010s include the widening of the Centenary Highway and Ipswich Motorway (in addition to a host of other projects in the rapidly growing western area of Brisbane), the Southern Missing Link section of the Gateway Motorway upgrade, works on the Pacific Motorway, stage 2 of Eastern Busway (to Capalaba), expansions on the Northern Busway (to Bracken), further stages of the Port of Brisbane Motorway, the Toowoomba Bypass and a major upgrade of the Bruce Highway (Gympie Bypass, between Cooroy and Curra on the Sunshine Coast).

7.1.2 Road and road bridge maintenance

As was seen in most other states, road maintenance in Queensland fell strongly (almost 18 per cent) between the peak (1999/2000) and the trough (2005/06). However, all of this fall came on local roads maintenance (which fell by a third). This was due to the impact of strong costs growth (more so than in most other states due to surging minerals investment), councils being responsible for more infrastructure (such as water) than councils in other states and the difficulty in securing resources (skilled labour, machinery etc.) in a state which was white-hot with minerals investment projects.

Nonetheless activity has recovered fairly strongly since the trough of 2005/06 although we believe a component of these works became necessary after the major rains early in 2008. The rain-related work carried over into 2008/09 and held activity at a relatively high level. For the next two years we expect maintenance expenditure to be fairly stable at the current levels.

We expect an overdue upturn in housing construction, to create the climate for stronger road maintenance spending from the early 2010s. Initially this will come through in the sector most in need — local roads — but as the decade moves on and the medium-term strength of minerals demand and population growth continues, this will drive stronger activity on major roads too.

We are forecasting maintenance to recover from 2011/12. Much of the initial growth will be a ‘catch up’ from weak levels of activity at various times during the 2000s. This need will be greatest on local roads, but will also be present on major rural roads and possibly even major urban roads (due to the weakness of the late 2000s).

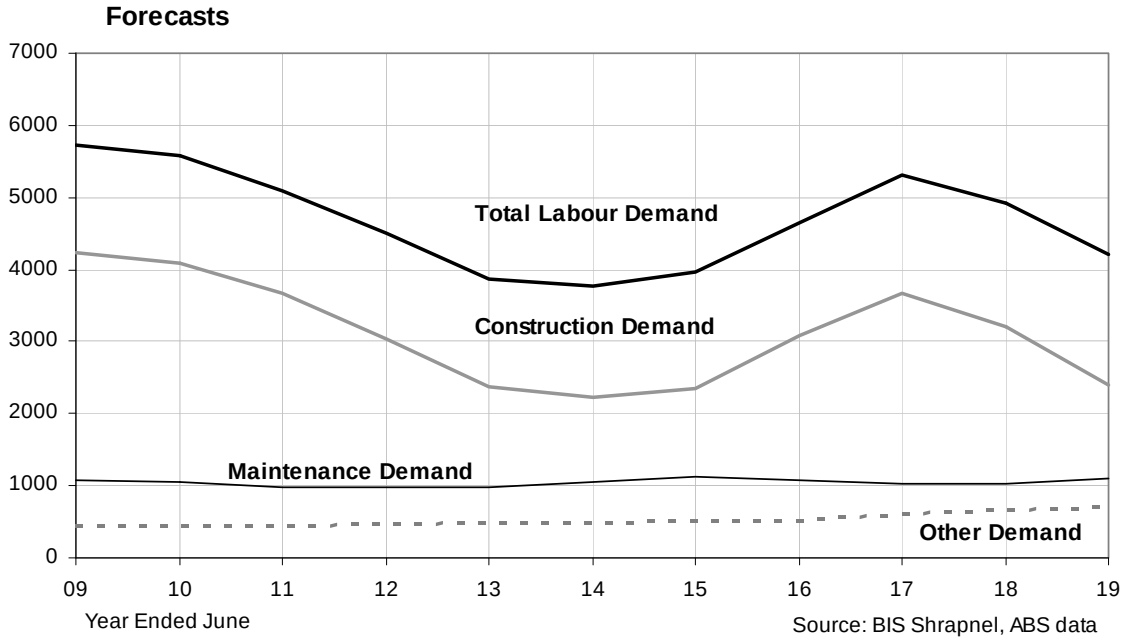
Our forecast is for sustained growth in activity during the 2010s and through to 2018/19 as we expect Queensland’s two recent pillars of economic growth, namely mining and population growth to grow strongly around this time and ensure above-average growth and strong revenues for the state over this period.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in Queensland translates into demand for skilled labour as shown in Chart 7.3.

From an estimate of just over 5,720 persons in 2008/09, labour demand is expected to fall to a trough if 3,771 persons in 2013/14. However, another strong phase of roads activity in the three years to 2016/17 is expected to see labour demand rising to 5,302 persons before easing back towards the end of the forecast period.

Chart 7.3: Queensland
Forecast of Road Labour Demand



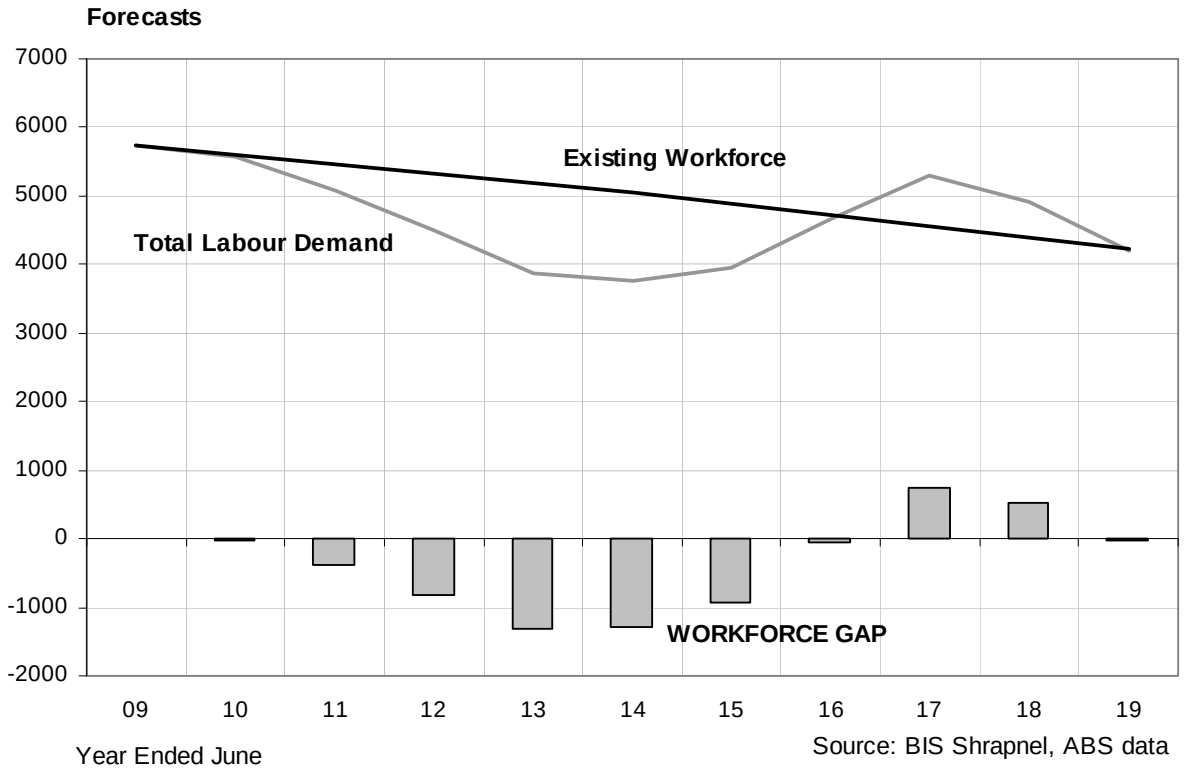
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the Queensland roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 26 per cent over the next ten years. This is slightly below to the national rate of attrition as presented in Section 4.3 given a marginally younger age profile for the defined skilled roads workforce in Queensland. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 7.4: Queensland
Total Roads Employment (1.5% Productivity Assumption)



For Queensland, the total roads sector workforce gap is expected to be negative over the next six years (although small at first) as total labour demand falls below the existing workforce level. Initially, falling private sector activity and later declining public sector funded work is the main reason for this outcome.

However, the negative gap is expected to shrink quickly from 2013/14 and a positive workforce gap is expected to appear from 2016/17 driven by:

- Ongoing (and accelerating) attrition of the existing workforce, and
- Generally rising labour demand as road construction and road maintenance activity accelerates strongly.

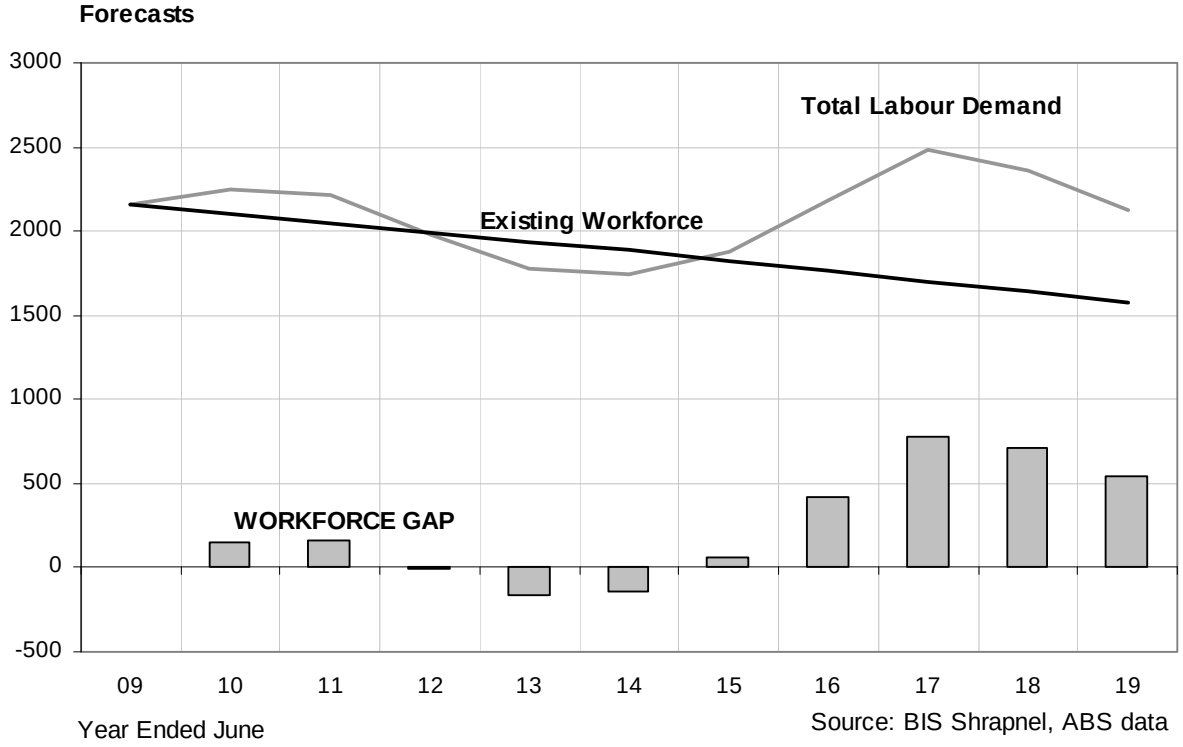
This is a considerably different outlook than for New South Wales or Victoria given that Queensland will see total road construction fall over the next few years due to the completion of some of the major projects. The presence of negative workforce gap over the short to medium term suggests that some skilled labour will possibly move out of Queensland to areas of stronger labour demand as roads activity winds down.

The workforce gap for the public sector (at least over the next three years), as shown in the following graph, is somewhat different to the total roads sector given the relatively stronger outlook for public sector funded roads activity. Over the medium to longer term, the Queensland public sector's role as the key provider of maintenance work and other road management functions is also expected to drive a trend increase in skilled roads labour demand, and the workforce gap.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

In general, the public sector workforce gap is expected to be positive over the next two years (to be driven by increasing public sector funded construction activity) before turning negative over the medium term due to a significant decline in public sector funded work done. However, towards the end of the forecast period, the gap is expected to widen as maintenance activity moves to a higher plane and the attrition of the existing workforce accelerates. We expect the workforce gap to reach peak levels of around 710 persons in 2016/17.

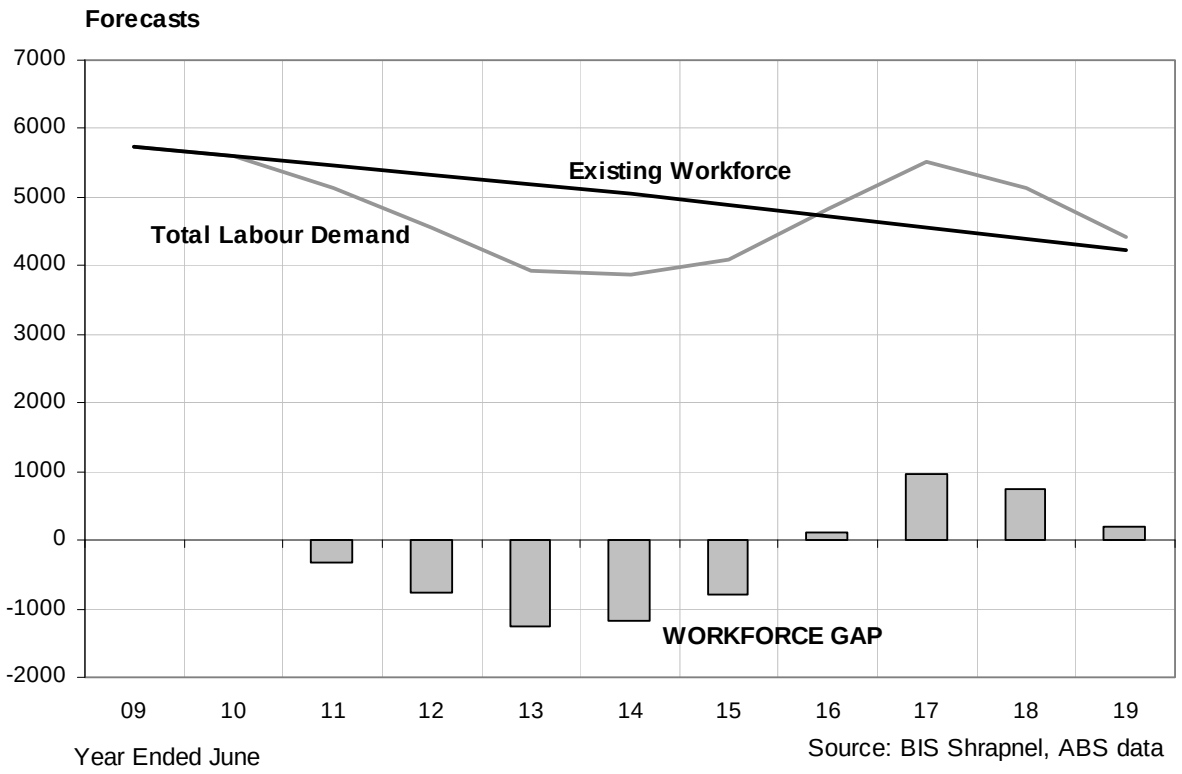
Chart 7.5: Queensland
Public Roads Employment (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

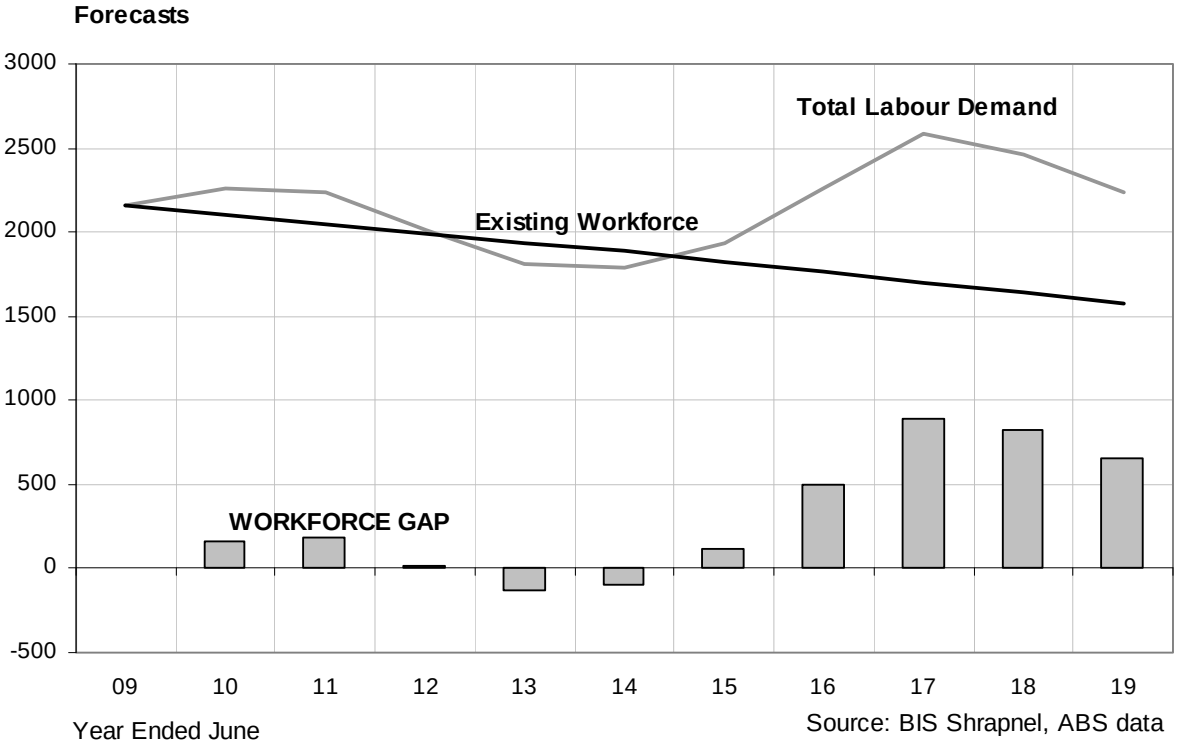
Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 7.6: Queensland
Total Roads Employment (1% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 7.7: Queensland
Public Roads Employment (1% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 7.8: Queensland
Total Roads Employment (0% Productivity Assumption)

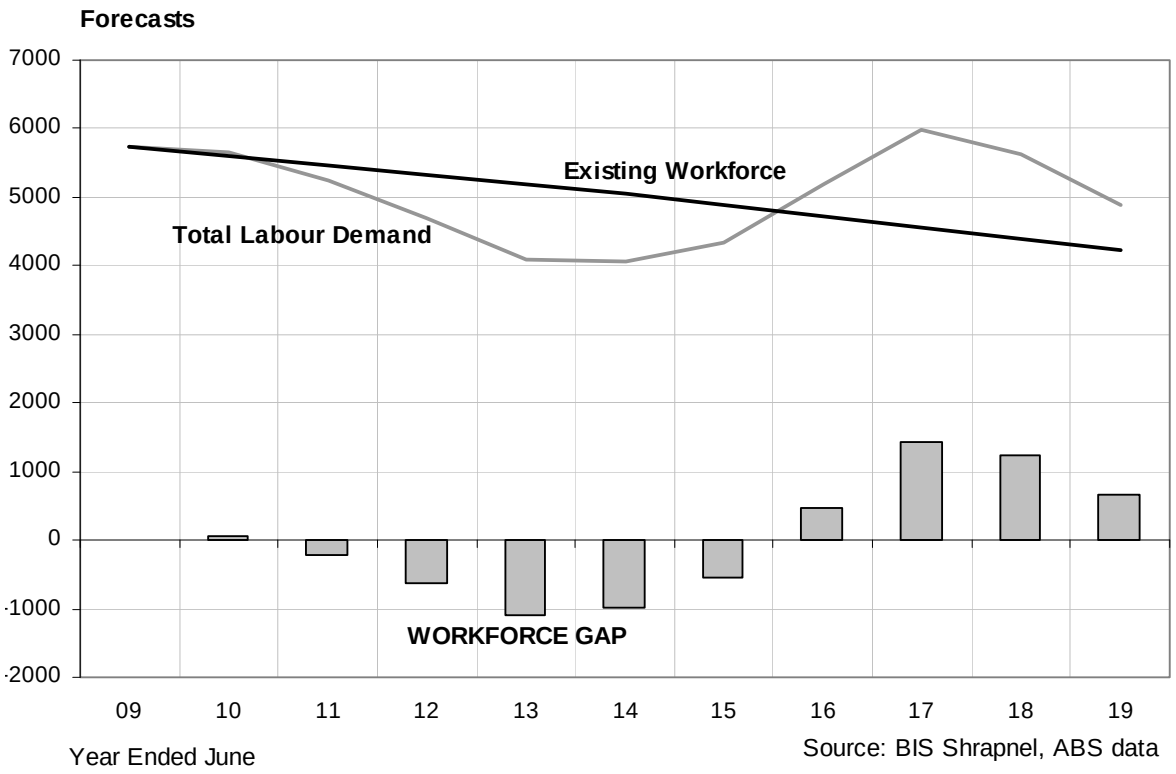
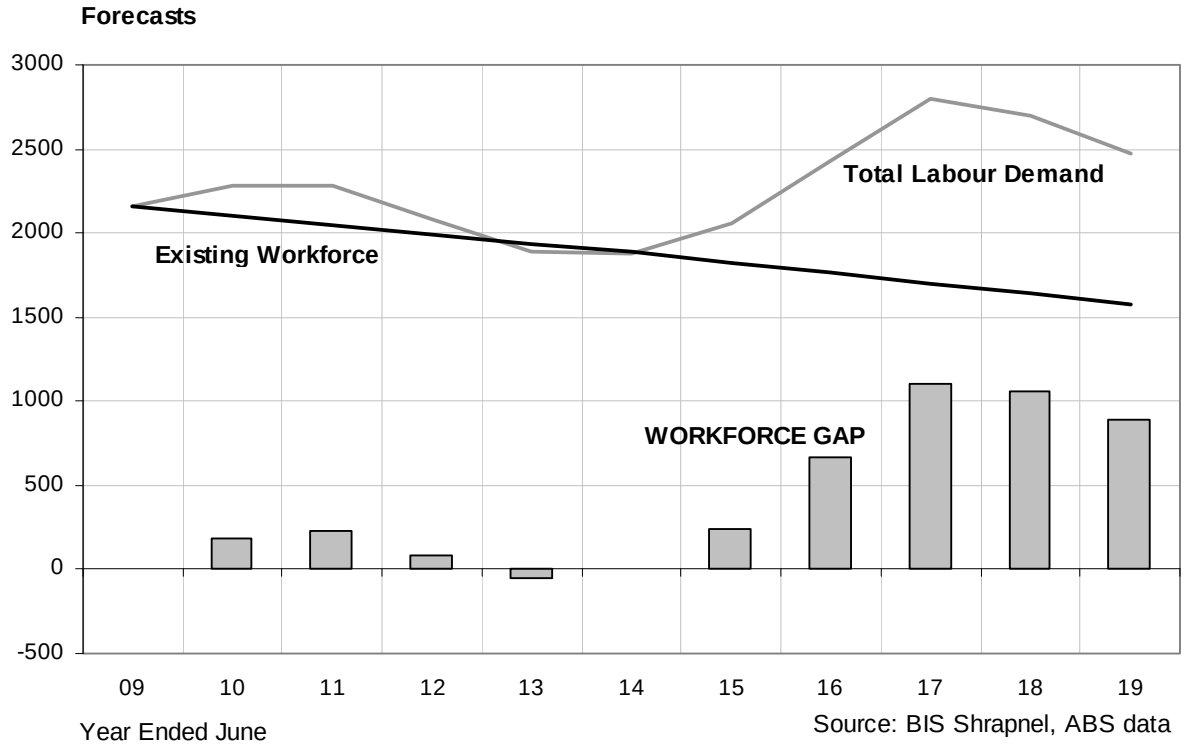


Chart 7.9: Queensland
Public Roads Employment (0% Productivity Assumption)



CHAPTER EIGHT: SOUTH AUSTRALIA

8. South Australia

This Section presents the outlook for South Australian roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

Table 8.1 presents BIS Shrapnel's estimate of the size of the skilled roads workforce in South Australia in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (101 persons instead of 1,110 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 8.1: South Australia
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**4,061**	**182**	**99**	**34**	**320**	**4,695**
Building Construction	3,171	70	21	8	188	3,457
Total Non-Building Construction	127	76	46	8	23	281
o/w Road & Bridge Construction	34	27	29	5	6	101
General Trade Construction	763	36	32	17	109	957
Public Administration & Safety	**173**	**205**	**109**	**175**	**441**	**1,103**
Federal Government	3	10		9	3	27
State Government	71	116	43	115	148	493
Local Government	50	75	58	29	184	395
Other	49	4	9	22	105	189
Professional Services	**500**	**571**	**268**	**358**	**595**	**2,292**
Other Sectors	**1,016**	**177**	**94**	**110**	**971**	**2,368**
Total All Sectors	**5,750**	**1,135**	**569**	**676**	**2,327**	**10,458**
Total Roads Workforce	**192**	**398**	**212**	**96**	**213**	**1,110**
Public Roads Workforce	**104**	**206**	**128**	**42**	**159**	**640**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

As shown, civil engineers dominate the defined skilled roads workforce, comprising 36 per cent of the total. The next largest categories are others, civil engineering associate professionals and project managers. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up around 72 per cent of the defined South Australian skilled roads workforce.

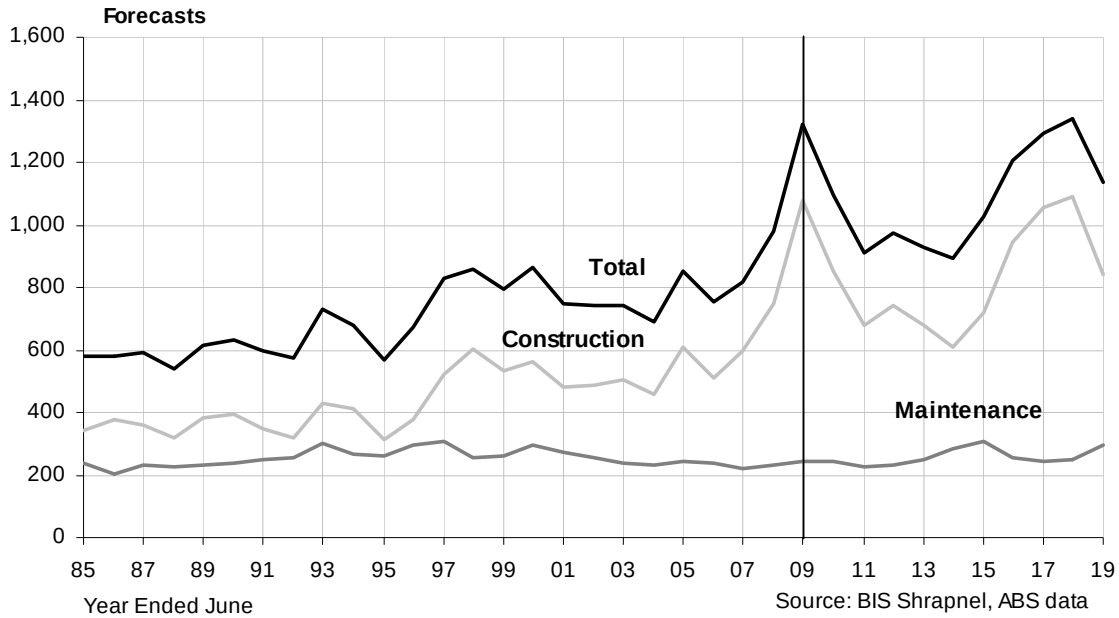
Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 58 per cent of the South Australian skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

In South Australia, road construction work done more than doubled over the two years to 2008/09. Most of this boost was the result of the current round of major publicly funded projects, including the large Adelaide Northern Expressway project and improvements along South Road and the Federally-funded Sturt Highway upgrade. Highways and arterials work done ramped up sharply in 2008/09, resulting in activity for this segment being more than triple that seen in 2007/08 and two and a half times the previous peak of 2004/05.

We expect total road construction activity to enter into its next upswing from 2014/15. In our view, this will be driven by the commencement of the next round of major public projects in addition to a strong pick-up in mining-related access road construction and runways (driven primarily by the Olympic Dam expansion, but also on a host of other minerals projects).

Chart 8.1: South Australia
Road and Road Bridge Activity
$ Million, 2006/07 Prices

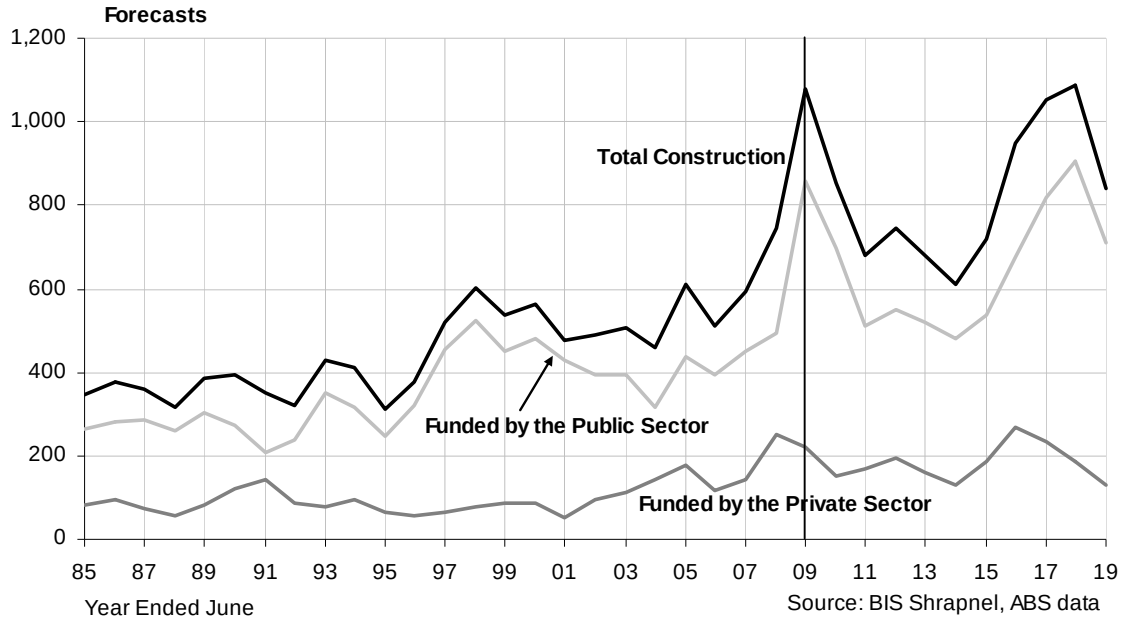


8.1.1 Road and road bridge construction

After edging up steadily over most of the period from the early 1980s to 2003/04, road construction activity in South Australia has since been quite volatile. A sudden jump in 2004/05 to what was a peak in work done (due to the Port River Expressway and Adelaide Airport runway upgrade) gave way to weaker activity levels as these major works finished.

However, over the last two years, activity surged again to unprecedented highs. The record high in 2007/08 (17 per cent above the previous peak of 2004/05) was most likely due to a very strong level of mining-related road construction, but also the start of the current round of major publicly funded projects. These projects ramped up sharply in 2008/09, resulting in activity being almost 50 per cent above that seen in 2007/08 and an incredible 75 per cent above the previous peak of 2004/05.

Chart 8.2: South Australia
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices



The major contributor over the last two years has been the Northern Expressway project. Not only is this project the largest seen in South Australia for many decades, but the pace at which this work has taken place has been faster than originally expected. Other works in this round of public projects have included various upgrades on the Sturt Highway and the Gallipoli Underpass (one of the first stages of what will be a major series of upgrades along South Road and the North-South Corridor).

On the private side, the boost from mining-related roads (most likely access roads for new or expanded mines, but possibly rudimentary runways) has largely finished, but the strength in residential subdivisions construction has continued. This has been largely due to continued strength in population growth, which, in turn, has been driven by an influx of overseas migration and relatively attractive housing affordability (vis a vis the eastern, higher-priced, capitals).

BIS Shrapnel is forecasting significant falls over most of the period to 2013/14, however, these falls will result in activity remaining at very strong levels from a historical perspective.

In addition to the round of major works led by the Northern Expressway, activity was boosted through 2008/09 and into 2009/10 and possibly 2010/11 by the response to what appeared to be (and could still end up being) a major economic downturn sparked by the GFC in late 2008. Governments of all levels threw money at 'shovel-ready' investments to support the economy with the threat of a large decline in private sector investment.

Not surprisingly, the roads sector was (and will be) one of the major beneficiaries, but this stimulus funding will soon come to an end. Also, if economic conditions continue to improve, we expect Governments to use this to start to improving their financial situation i.e. repaying debt and cutting back on spending (such as roads) by delaying some of the next round of projects.

In short, activity leading up to 2008/09 was boosted by a huge project, stimulus roads funding and other works facilitated by a relatively solid funding situation and a desire to invest to relieve bottlenecks (made apparent during the economic strength of the 2000s). In contrast, activity going forward will be diminished by the end of stimulus funding / desire of Governments to improve their financial situation.

However, our outlook is not all negative. By 2013/14 and several years of strong declines, our forecast is for activity to record the 7th highest total on record (i.e. since the mid 1970s). This still-strong outlook is largely due to major investment on upgrades for South Road. The South Road Superway was announced in mid October; this will involve $765 million of elevated roadway, other upgrades to South Road just south of Port Adelaide and upgrades to surrounding local roads.

In combination with an upgrade (most likely involving an underpass) at the South Road/Sturt Road intersection in Adelaide's south (the next plank of the South Road upgrades we expect to be announced), this will contribute more than $650 million (in constant 2006/07 prices) to activity from 2010/11 through to 2014/15. This is about 40 per cent of all highway and arterial road construction in South Australia during this period — a significant number and certainly strong support to activity when other sources of support are expected to weaken.

On the private side, our forecast is for housing demand to stay quite strong in coming years (as the drivers — population growth and relatively attractive affordability — remain in play), supporting robust subdivisions activity. Mining roads (and possibly runways) are set to bounce back with the long-mooted expansion of Olympic Dam set to start from 2011/12. Our forecasts include a weakening in the housing market from 2012/13 as the drivers of South Australia's strength start to weaken (i.e. migrants will tend to favour the eastern States once again and Adelaide's affordability advantage will start to weaken).

We expect total road construction activity to enter into its next upswing from 2014/15. In our view, this will be driven by the commencement of the next round of major public projects in addition to a strong pick-up in mining-related road construction, due to further work on the Olympic Dam expansion, but also on a host of other projects as South Australia's emergence as the next great minerals state continues.

The major public project expected to come through in the time beyond 2013/14 will be the Northern Connector project. This is set to be a $1 billion combined road and rail project, which will further improve the passage of freight between north South Australia and Port Adelaide. While the preferred route for this project has been selected and the final decision for this project could be made in two years, we do not believe it will proceed until at least 2014/15 largely due to difficulties in securing funding, but also in preparing for what will be a quite complex project.

The Northern Connector is another step in construction of the long-awaited North-South corridor. Works in order to facilitate this have included South Road works to date, the Northern Expressway and the Port River Expressway. Our forecast for the period from 2014/15 to 2018/19 includes the bulk of the Northern Connector and the remaining South Road upgrades (expected to involve upgrades, underpasses and widening worth over $1 billion). Not surprisingly, these are the key projects expected in the latter half of the 2010s but also will be vital for South Australia and her economic fortunes for many decades to come.

8.1.2 Road and road bridge maintenance

Road maintenance in South Australia has been on a strong downward trend for much of the past decade. Unlike the eastern states, activity has been weak on major urban roads as well as major rural roads. Local roads maintenance has also fallen sharply since 1999/2000. We believe South Australian local councils have suffered from many of the same problems as councils have in the eastern states (insufficient revenues to deal with an ageing asset base, strong costs growth and cost-shifting from State and Federal Governments).

Although maintenance activity increased slightly over the previous two years our forecast is for activity to stagnate for the next two years before we expect a significant turnaround in maintenance expenditure. The trigger for this action is likely to be the next South Australian State Election (to take place in March 2010) where falling road maintenance activity is likely to be an election issue. Road construction in South Australia is expected to climb to long-term highs before this election takes place; road maintenance is overdue to increase (and will have a massive backlog) by this time.

However, before road maintenance in South Australia climbs back to where it should be, several major construction projects will take place. We believe these major road construction projects will have a two-fold effect on reducing maintenance below what it would otherwise have been for a few years: firstly, funds will have to be diverted from some maintenance tasks to build these projects and secondly, funds which would have gone towards the maintenance of some roads will instead be used on upgrading. Still, we expect overall activity to begin the long road back to necessary levels from 2010/11 with activity to gather pace in the mid 2010s.

This will be due to the combination of many factors: recovery from the economic downturn, the next upturn in housing construction (both of which will boost revenues) and significant (further) development of a potentially very lucrative minerals/commodities sector. Part of this will be the expansion of Olympic Dam, but a host of other projects will drive greater population growth to Adelaide and to mining towns, boosting traffic levels and revenues. Overall, a greater road maintenance need (and revenues to fund this need) will result.

We also expect a resolution/increased assistance for Local Government to overcome their fundamental financial problems, but a shift in the focus of South Australian local councils is also necessary. We believe local roads maintenance fell to its lowest level since 1981/82, but that local roads construction has been on a strong upward trend over the last 15 years. Eventually, something has to give here: local councils must start to show greater concern over maintaining their current stock of roads rather than adding to them.

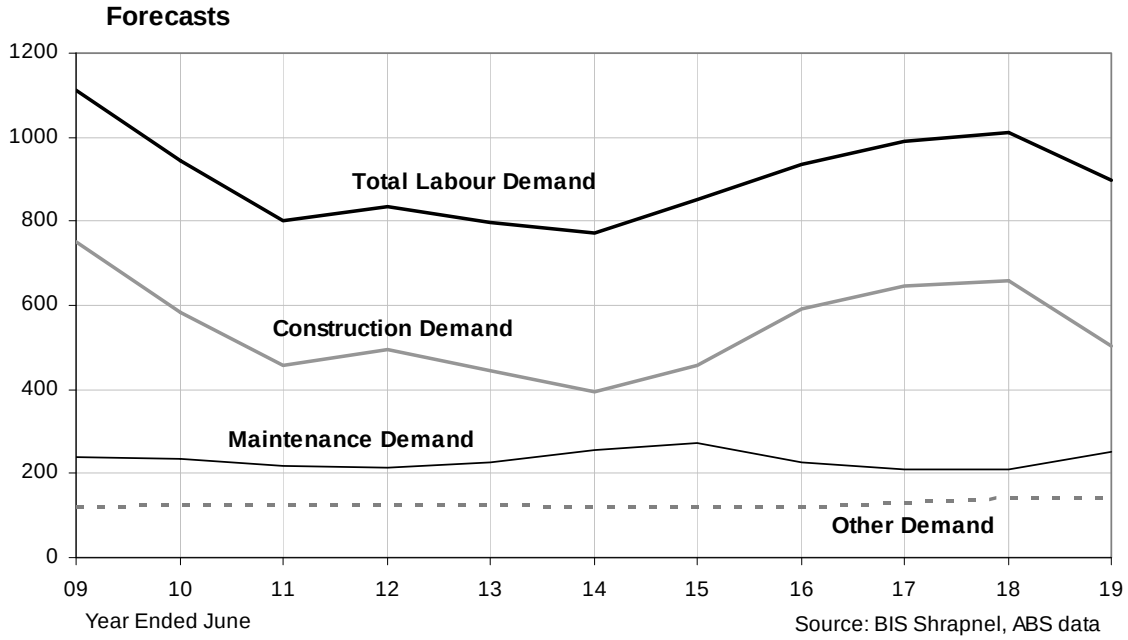
We believe this will kick into gear from the mid 2010s and further support activity through to 2014/15. The upshot is that a backlog built up over so many years takes far longer to eliminate. Nonetheless, our expectation is for activity to wind back to historical average levels in the second half of the decade.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in South Australia translates into demand for skilled labour as shown in Chart 8.3.

From an estimate of 1,110 persons in 2008/09, labour demand is expected to fall to a trough of 773 persons in 2013/14. Labour demand is expected to rise thereafter, reaching a peak of 1,012 persons in 2017/18.

Chart 8.3: South Australia
Forecast of Road Labour Demand



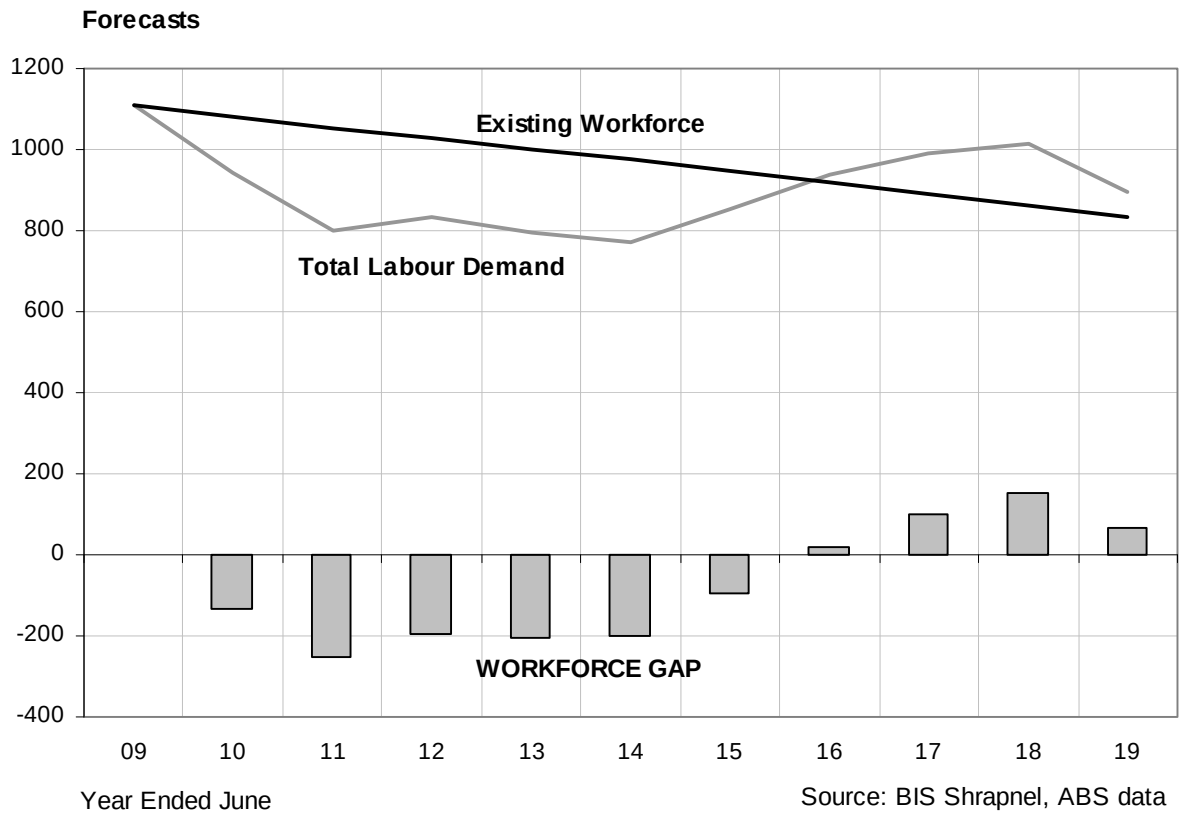
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the South Australia roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 25 per cent over the next ten years. This is below the national rate of attrition as presented in Section 4.3 given a relatively younger age profile for the defined skilled roads workforce in South Australia. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 8.4: South Australia
Total Roads Employment (1.5% Productivity Assumption)



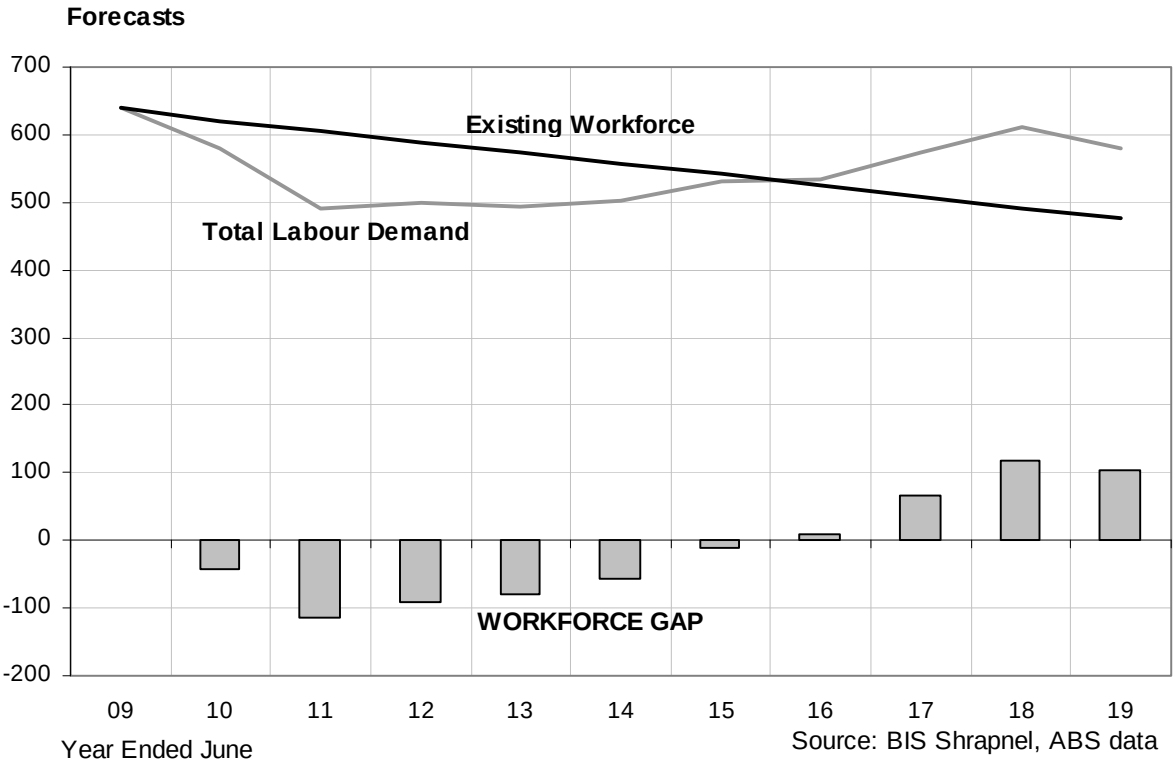
For South Australia, the total roads sector workforce gap is expected to be negative during the first six years as total labour demand falls below the existing workforce level. Falling public sector funded work and to some extent declining private sector activity are the main reasons for this outcome. Nonetheless, we expect a strong increase in the demand for labour through to 2018/19 to be driven by an upswing in public sector funded activity. This together with the likely acceleration in workforce attrition will push the workforce gap into a positive. The workforce gap is expected to reach a peak of 152 persons in 2017/18 before easing back to 64 persons in 2018/19 on the back of falling road construction activity.

The workforce gap for the public sector, as shown in Chart 8.5, is similar to the total roads sector given the dominant role of the public sector in funding roads activity. The South Australian public sector's role as the key driver of maintenance work and provider of other road management functions is also expected to drive a trend increase in skilled roads labour demand, and the workforce gap, over time.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

In general, the public sector workforce gap is expected to be negative each year between 2009/10 and 2014/15 inclusive, before turning positive for the remainder of the forecast horizon. A peak of around 120 persons in expected in 2017/18. The workforce gap is expected to stay above 100 persons in 2018/19 as well.

Chart 8.5: South Australia
Public Roads Employment (1.5% Productivity Assumption)



Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 8.6: South Australia
Total Roads Employment (1% Productivity Assumption)

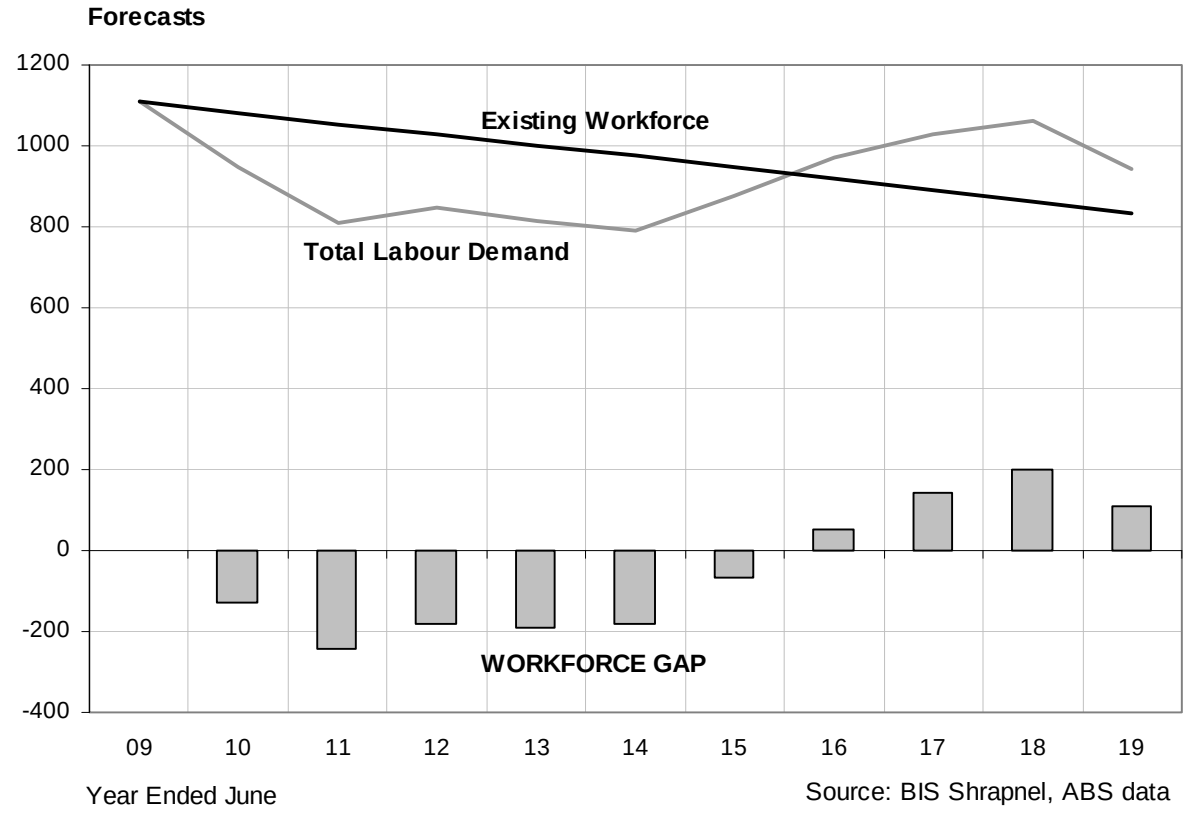


Chart 8.7: South Australia
Public Roads Employment (1% Productivity Assumption)

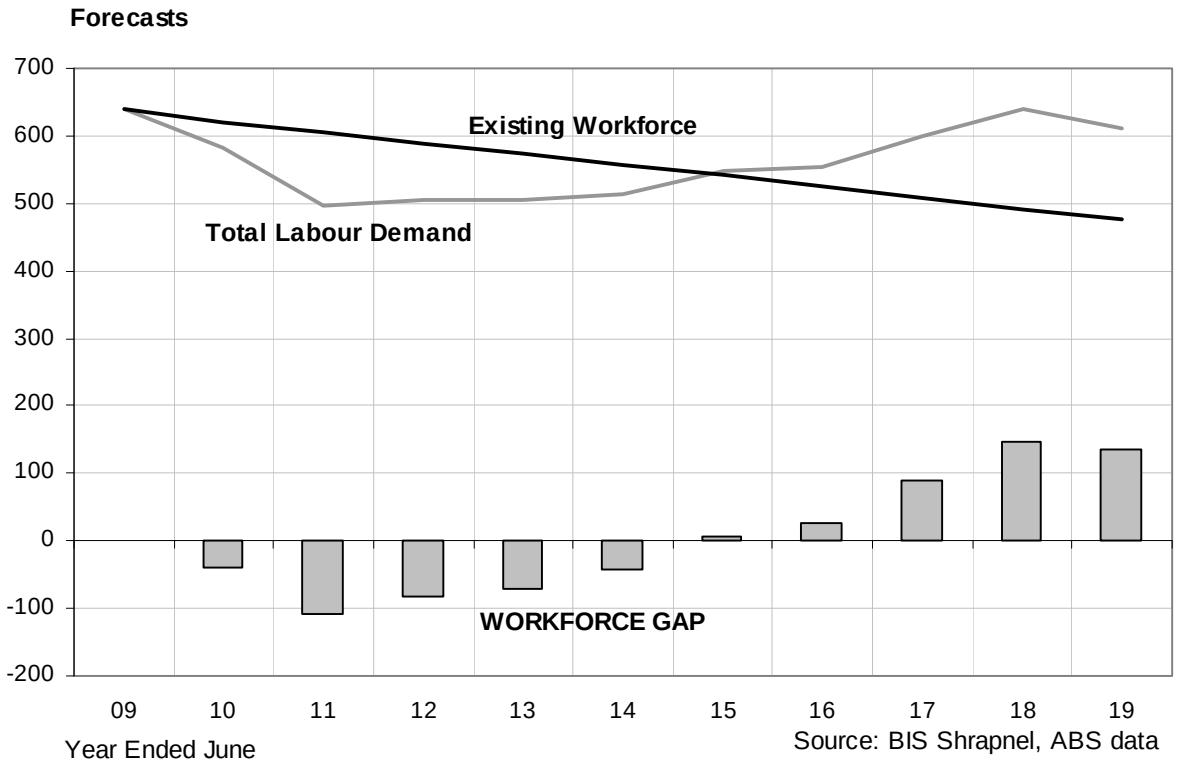


Chart 8.8: South Australia
Total Roads Employment (0% Productivity Assumption)

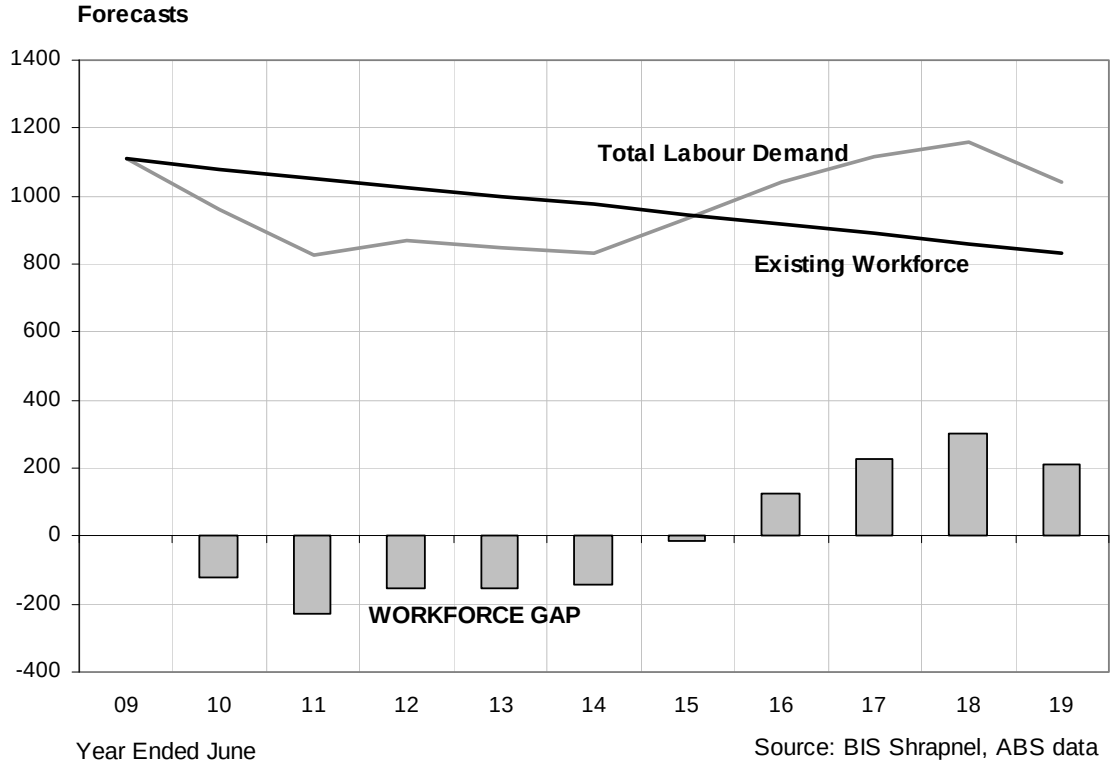
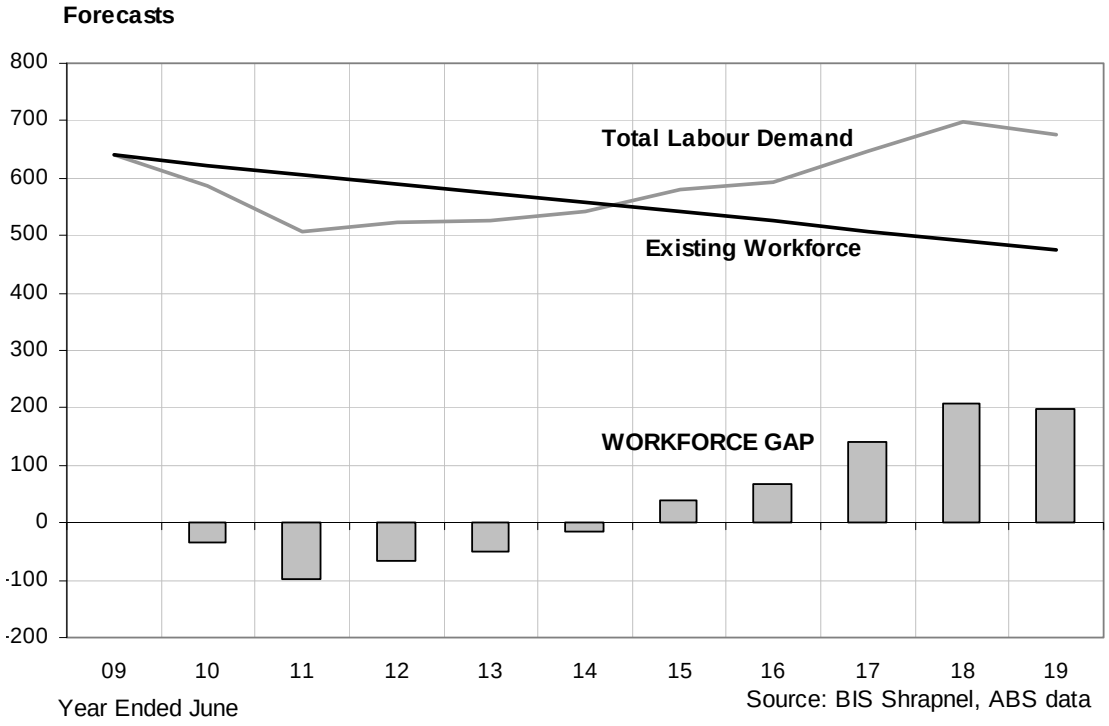


Chart 8.9: South Australia
Public Roads Employment (0% Productivity Assumption)



CHAPTER NINE: WESTERN AUSTRALIA

9. Western Australia

This Section presents the outlook for Western Australian roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

The table below presents BIS Shrapnel's estimate of the size of the skilled roads workforce in Western Australia in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (397 persons instead of 2,265 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 9.1: Western Australia
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**5,624**	**680**	**184**	**195**	**796**	**7,478**
Building Construction	3,929	118	37	30	474	4,588
Total Non-Building Construction	525	382	102	78	130	1,217
o/w Road & Bridge Construction	144	132	40	49	32	397
General Trade Construction	1,171	180	45	86	192	1,673
Public Administration & Safety	**279**	**311**	**297**	**292**	**922**	**2,100**
Federal Government					5	5
State Government	79	84	35	147	146	491
Local Government	163	221	258	101	720	1,463
Other Government	37	5	4	44	51	141
Professional Services	**1,334**	**1,642**	**815**	**1,075**	**1,660**	**6,527**
Other Sectors	**1,764**	**538**	**211**	**458**	**3,210**	**6,181**
Total All Sectors	**9,001**	**3,170**	**1,507**	**2,020**	**6,587**	**22,285**
Total Roads Workforce	**421**	**611**	**368**	**215**	**650**	**2,265**
Public Roads Workforce	**209**	**236**	**204**	**100**	**531**	**1,281**

* Includes other building and construction professionals and para-professionals, and quantity surveyors Source: BIS Shrapnel

As shown, civil engineering degree qualified persons comprising civil engineers, civil engineering associate professionals and project managers dominate the defined skilled roads workforce in Western Australia. Together they make up 62 per cent of the defined Western Australian skilled roads workforce.

Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 57 per cent of the skilled roads workforce in Western Australia was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

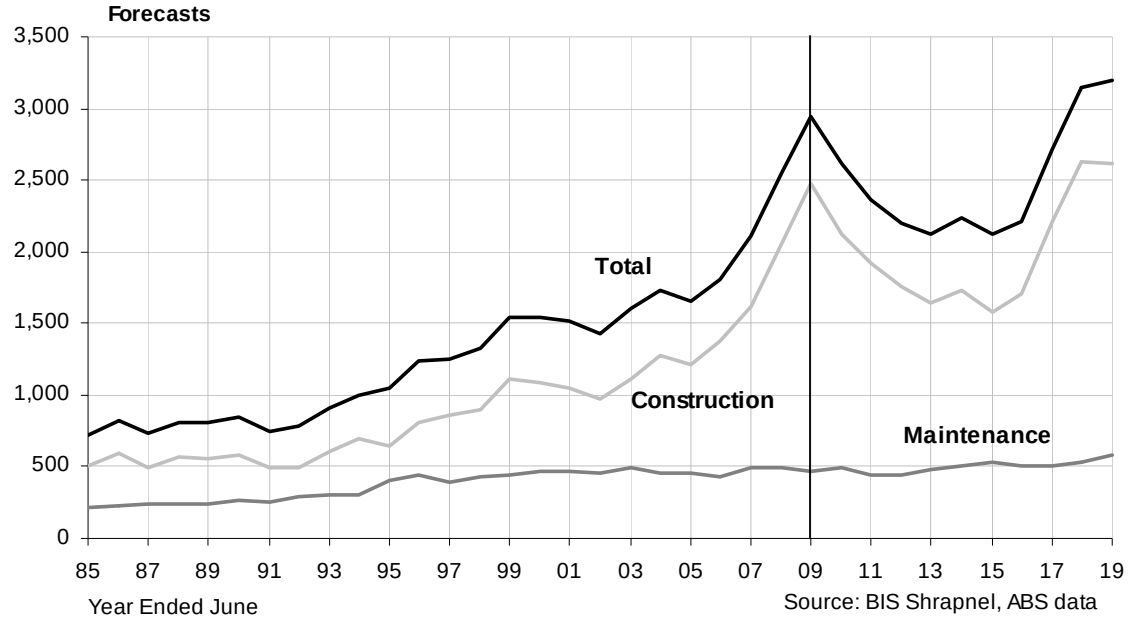
In Western Australia, total roads activity increased significantly in 2008/09. The result for 2008/09 was driven primarily by a solid increase in private roads construction — both subdivisions (driven by strong population inflows) and access roads and runways (driven directly by mining activity as well as a $20 million new apron at Perth Airport). In terms of publicly funded projects, work continued on the Perth to Bunbury Highway section at Forrest Highway, but the completion of several moderately sized projects was not matched by a similar number of starts.

Several factors are in play which will drive a weaker profile for road construction over the coming five years. On the private sector side, the drop off in dwelling commencements over 2007/08 and 2008/09 will lead to a mild softening in demand for residential subdivisions in 2009/10, while fewer mine developments during 2008/09 will weaken the outlook for industrial subdivisions. Moreover, we believe that subdivision work done over 2008/09 was artificially high due to one-off (or at least once every five to ten years) work on industrial zones along the spine of the new Perth to Bunbury

Highway or perhaps mining- related subdivisions work done. Now that the Perth to Bunbury section is complete and mining investment has (temporarily) paused, this should translate into much weaker contributions in access road and regional runway road construction in coming years.

On the public side, our forecast is for activity to enter into a downward trend through to 2013/14. This outcome will initially reflect the drying up of the project pipeline following the completion of the massive Perth to Bunbury Highway project and the reining in of stimulus funding, before later on being an indicator of State Government financial management. In other words, this will involve the State Government looking to cut back on some roads spending in the latter years of the period to 2013/14 to improve their financial status following the current downturn.

Chart 9.1: Western Australia
Road and Road Bridge Activity
$ Million, 2006/07 Prices



9.1.1 Road and road bridge construction

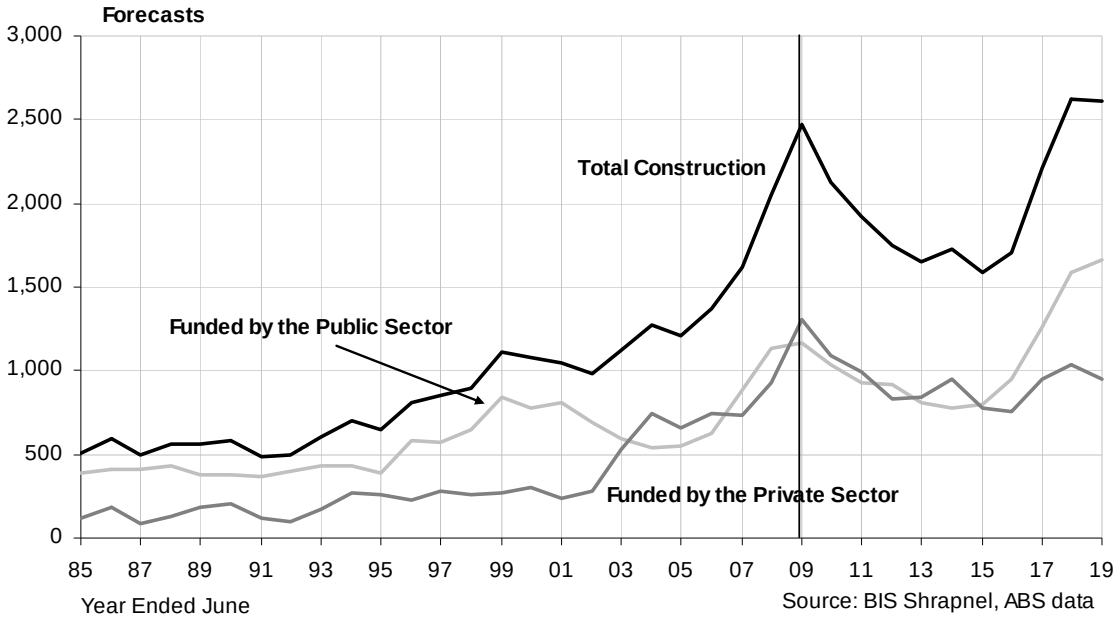
Western Australia has one of the lowest road densities in Australia. It also has an extensive network of unsealed roads, including a significant proportion of Australia's access roads. These roads are mainly access to mine sites but also include roads adjacent to iron ore railways and pipelines in the Pilbara region.

The upward trend in WA road construction through this decade has been largely driven by private works rather than public sector works, particularly in the first five years as the state economy recovered from economic malaise. Private roads work done (mainly subdivisions, but also mining runways) increased decidedly over that period, averaging around double the level of work done for the entire roads sector in the 1990s. The key driver here has been strong housing and industrial-estate construction, driven by the state's buoyant resource-led economy.

However, we believe the surge in subdivision work done over the two years to 2008/09 was artificially too high, due to significant (and, most importantly, largely one-off) development of industrial subdivisions being built within close proximity to the new Bunbury highway happening at the same time as residential subdivision works.

Due to Western Australia's vast endowment of natural resources, the WA state government have benefited strongly through mining revenues, which have more than doubled between 2005/06 and 2008/09. Public roads have been one of the key sectors to benefit from the increasingly prosperous economic conditions, particularly local and major rural roads.

Chart 9.2: Western Australia
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices



Public road construction increased strongly from 2005/06 on the commencement of much needed new major roads in and around Perth (driven by accelerating population growth), as well as various smaller projects. The most notable public projects in recent years included the massive Perth to Bunbury Highway project, but also a series of highways extensions in Perth (Roe, Tonkin and Mitchell Highways), as well as upgrades to the interstate highways (the Great Northern, the Great Eastern and Eyre.

We note the flip side to the state's minerals-driven success has been high local construction costs (relative to most other states) and difficulty sourcing skilled labour and machinery in some instances. The commencement of numerous public roads projects in recent years—in such a high cost environment—reflects the urgent need to facilitate the movement of the new population and freight that has been generated by the state's economic activity.

Overall, total roads activity increased by 19 per cent in 2008/09 to $2.3 billion (in constant prices), which came on top of combined growth of 75 per cent growth over the previous three years. The result for 2008/09 was driven primarily by a 43 per cent increase in private roads construction which more than offset a 0.8 per cent dip in public roads work done. Work continued on Perth to Bunbury, but the completion of several moderately sized projects was not matched by a similar number of starts.

Outlook

Following four years of very strong growth in road construction through to 2008/09, we now expect total activity to fall given the completion of the Perth to Bunbury Highway (and that there is somewhat of a void in the pipeline of major new roads projects), but also that the drivers of privately funded work are pointing to a marked decline.

Several factors are in play which will drive a weaker profile over the coming few years. The drop off in dwelling commencements over 2007/08 and 2008/09 will lead to a mild softening in demand for residential subdivisions in 2009/10, while fewer mine developments during 2008/09 will weaken the outlook for industrial subdivisions. Moreover, we believe that subdivision work done over 2008/09 was artificially high due to one-off (or at least once every five to ten years) work on industrial (along the spine of the new Perth to Bunbury Highway) or perhaps mining- related subdivisions work done. Now that Perth to Bunbury is complete and the mining sector has taken a hit, this will mean much weaker contributions in road construction in coming years.

Nonetheless, we expect overall private roads to record their strongest average annual figure for a five-year period on record in the period to 2013/14, due to robust levels of subdivision work (population growth, while expected to fall somewhat, should remain quite strong) and pockets of strength in minerals (especially iron ore) driving strong access road and runway work.

On the public side, our forecast is for activity to enter into a downward trend through to 2013/14. This outcome will initially reflect the drying up of the project pipeline following the completion of the massive Perth to Bunbury Highway project and the drying up of stimulus funding, before later on being an indicator of State Government financial management. In other words, this will involve the State Government looking to cut back on some roads spending in the latter years of the period to 2013/14 to improve their financial status following the current downturn. This outcome was a key feature of the path of total activity in the early 2000s and we believe this type of thinking will return as economic weakness continues into 2011.

However, it is important to note that public activity will remain at very strong levels from a historic perspective over the period to 2013/14. This is especially the case through this year and towards 2011/12, led by Nation Building Program projects, but also the next round of more minor State Government works.

It was always our belief that public activity in Western Australia would fall back upon the completion of Perth to Bunbury (P2B). This is set to be the case despite the best efforts of Governments to bring work forward to fill the void left by P2B and provide support for the broader economy in the aftermath of the GFC and the fall in private sector investment. Projects such as the Mandurah Entrance Road, various stages of the Bunbury Port Access and Outer Ring Roads, upgrades to the Great Northern Highway at Port Hedland, the Dampier Highway (all from the NBP), as well as the next stages of Indian Ocean Drive, the Geraldton South Transport Corridor and the Reid Highway/Alexander Drive overpass have been brought forward or ramped up, but will not prevent a 10 per cent decline in public activity this year.

This is partly because these projects are not large enough to fill the void of work left from the last two years, but also because the next large projects are still some time away from the construction stage. Most of these are the next major Perth projects: the Great Eastern Highway / Roe Highway interchange, widening of the Great Eastern Highway to 6 lanes (both expected to start in 2011), a number of upgrades to Tonkin Highway and other roads around Perth Airport (to start coming through from 2012) and the controversial Stage 8 of the Roe Highway (possibly from 2013).

Some of these are significant projects, but the fact that they will be somewhat spread out over the period to 2013/14 (and beyond) and that a lot of more minor work is likely to be delayed will be largely responsible for activity falling back in coming years. Still, our forecast is that in 2013/14 (the expected trough of the cycle), public activity will be more than 50 per cent above the previous trough (2004/05) and the ninth highest value on record.

Total activity to strengthen from 2013/14, building momentum through the decade

Our outlook for the Western Australian economy is for minerals and energy investment to rebound from the early 2010s and that this will lead to a boost in minerals and energy production from the early to mid 2010s: this is where the major boost to Western Australian revenues (and, less directly, Federal Government revenues) will kick in.

The improved revenue situation for Governments will combine with several other fortunate factors to lead to an upswing in activity from 2014/15. These include: our forecast of another five-year tranche of the Nation Building Program which will include greater funding (although not as much as the increase from AusLink to the Nation Building Program), our assumption of 2014/15 being about the time of the end of the repair job undertaken by the State Government to their finances (and hence the start of greater spending on major road projects) and the next leg to minerals and energy investment will drive greater construction of mining-related roads.

Another component to our outlook beyond 2013/14 is for a strengthening of population growth. This will be driven by improvements in the outlook for minerals and energy investment and production, but also by Perth's emergence as the next major Australian city. This will eventually translate into significant growth in subdivision activity and then local road construction.

On the public side, our outlook is for these drivers to continue the roughly ten year cycle (from peak to peak or trough to trough) in Western Australian activity. The major projects to benefit will be continuing work on upgrading key roads around Perth Airport, extensions and upgrades of the major highways extending to Perth's north (Mitchell), south (Tonkin), east (Great Eastern Highway) and west (Roe Highway) as well as the next round of major projects on the Great Northern and Eyre Highways as well as port (e.g. Bunbury and Esperance) roads.

We also expect more population growth and general economic activity to be seen in major centres outside of Perth during this period. This will take place in and around the South West and South (in centres such as Bunbury, Collie and Albany), the Mid-West (where Geraldton is set to become the next iron ore hub), the Pilbara and Kimberley.In all, our forecast is for a strong period of growth in road construction to 2018/19.

9.1.2 Road and road bridge maintenance

After peaking in 2002/03 (during a time of weak revenues, cutbacks to other capital expenditure but most importantly low costs growth, enabling the fixed TNCs to drive work levels higher), road maintenance in Western Australia fell almost 13 per cent over the three years to 2005/06, as each of these conditions turned around and maintenance funding weakened. Despite conditions appearing to worsen for road maintenance funding, activity recorded a 14 per cent rebound in 2006/07 although activity remained fairly static in the two years to 2008/09.

In an environment of very strong demand, quite high costs growth and shortages of skilled labour, the level of activity in 2006/07 was a surprising rebound (given the largely fixed nature of the TNCs). We believe the WA Government came to the party with significant 'top-ups' for National Network maintenance, but that rural maintenance on State roads was also bumped up (possibly with extra funding due to "rise and fall"; which provides extra funding when costs growth is too high).

Outlook

Our forecast is for a generally steady next few years, before strengthening from 2010/11. We do not expect the Western Australian Government to continue pumping extra funds into maintenance (either National Network or State Roads) in a climate of still-strong investment and costs growth. We believe this extra funding will come through in enhanced contracts for the next round of highway and arterial maintenance contracts (mostly from 2010/11).

Given the financial crisis and associated economic slowdown, it may seem silly to mention still-strong investment and costs growth, but there are a number of major projects (both mining-related and otherwise) either continuing to proceed, just started or just about to start in Western Australia. These will keep demand for resources, general costs growth and the need for Government funding still quite strong through 2009/10 and possibly into 2010/11.

From 2010/11, we expect a host of factors to drive road maintenance levels higher for a sustained period. Perhaps the most important of these will be the improved next generation of major road maintenance contracts (ISD framework) which we expect to contain greater and more secure funding. We expect minerals demand to bounce back, but not at the pace of the mid to late 2000s, leading to lower costs growth (and less erosion of maintenance funds).

A rebound in housing construction in the early 2010s will boost State and Local revenues and drive a greater need for road maintenance. On local roads, the backlog of work has been growing for many years and will be substantial by the early 2010s. The first part of the upswing in local roads maintenance will have some ‘catch-up’. We also expect the finish of much of this round of major investment projects (mining-related and other, such as the next desalination plant and the Perth Bunbury Highway). This will free up funds and slow costs growth.

In the medium term, we expect strong ongoing levels of demand for WA’s mineral and energy commodities. This in turn will drive robust population growth, especially in Perth, which will further drive its growth and expansion. While we don’t believe there is much of a backlog on major roads — unlike other large states — increased population and traffic levels and more roads nearing the end of their working life will drive the maintenance need ever higher.

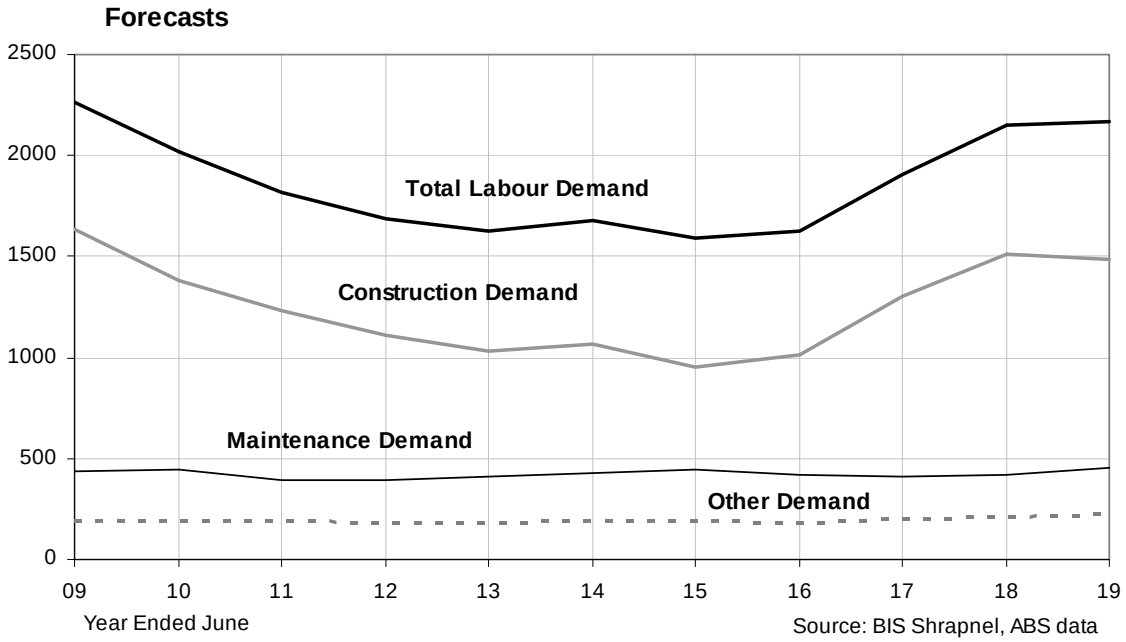
Our expectation is that this requirement and the relatively high priority enjoyed by road maintenance in WA will be the key drivers of growth over the second half of the decade with a new peak in activity predicted in 2018/19.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel’s outlook for road and road bridge activity in Western Australia translates into demand for skilled labour as shown in Chart 9.3.

From an estimate of just over 2,260 persons in 2008/09, labour demand is expected to fall to a low of around 1,620 persons in 2012/13. Labour demand is expected to be fairly stable thereafter before rising from 2014/15 to a peak of 2,170 persons in 2018/19.

Chart 9.3: Western Australia
Forecast of Road Labour Demand



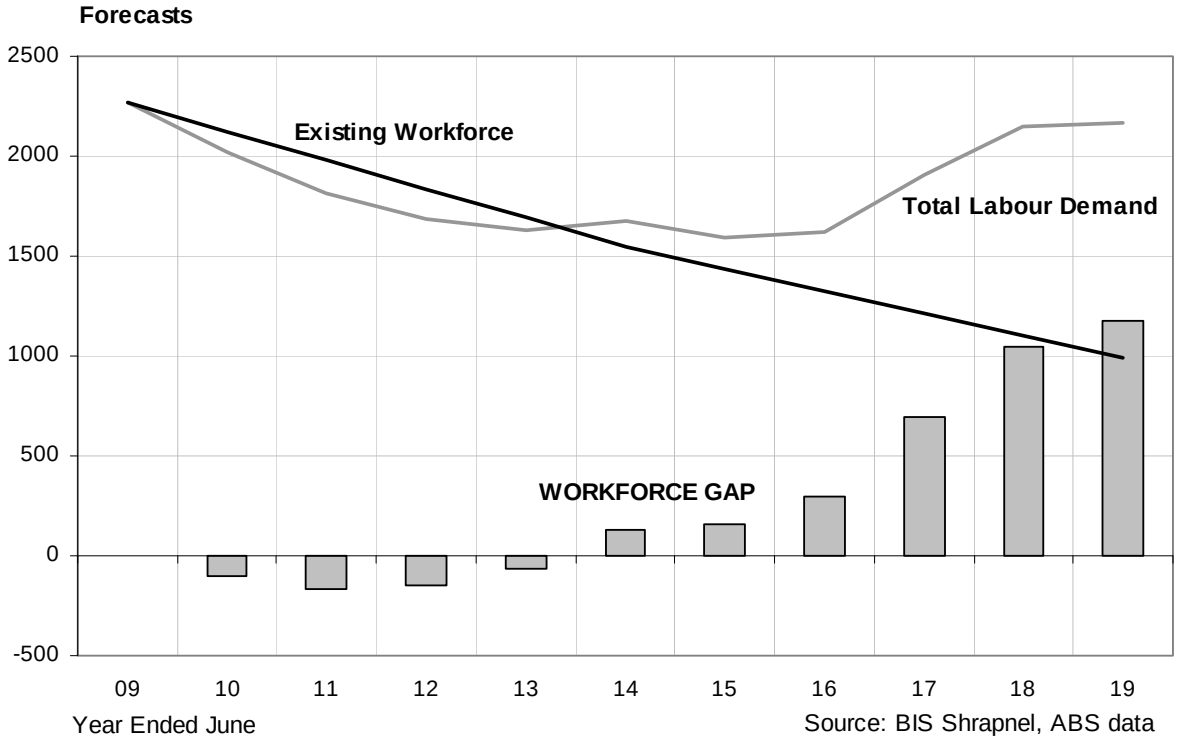
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the Western Australian roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 56 per cent over the next ten years. This is above the national rate of attrition as presented in Section 4.3 given a much older age profile for the defined skilled roads workforce in Western Australia. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 9.4: Western Australia
Total Roads Employment (1.5% Productivity Assumption)



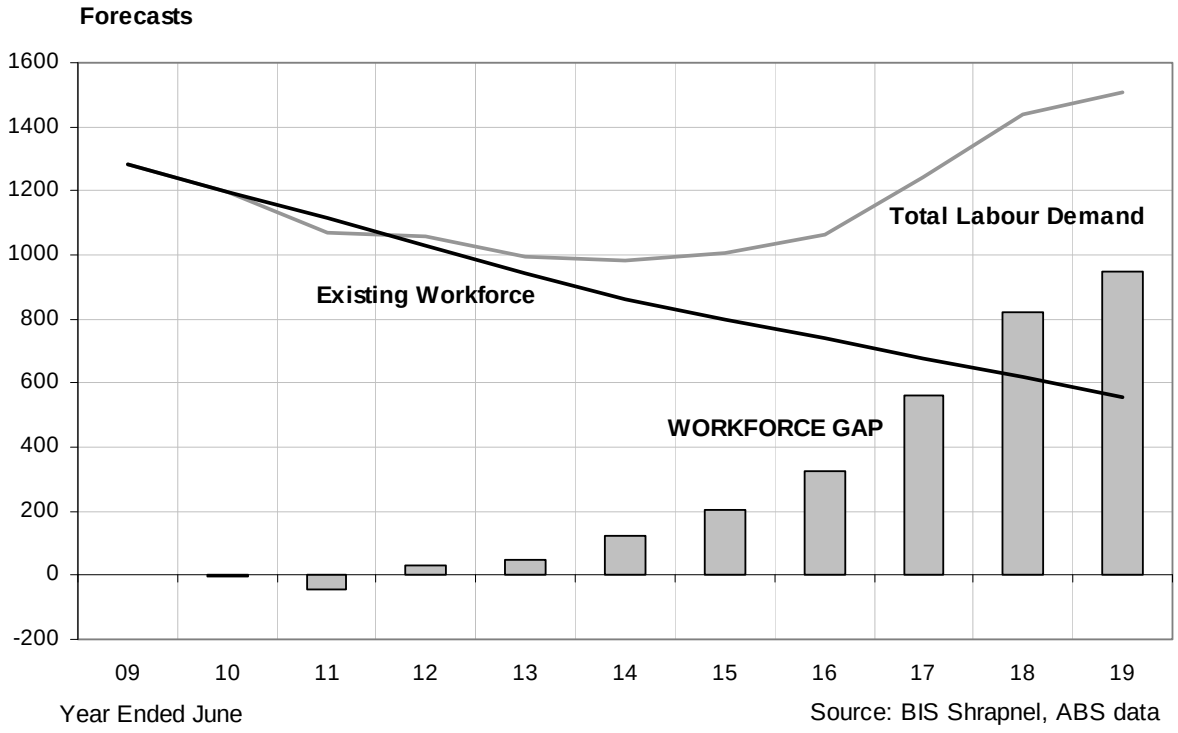
For Western Australia, the total roads sector workforce gap is expected to be negative for the next four years before rising strongly for the remainder of the forecast period driven by our timing of another strong phase in roads activity combined with an acceleration in the rate of attrition of the existing workforce through ageing. The workforce gap is expected to peak in 2018/19 at almost 1,180 persons.

The workforce gap for the public sector, as shown in the following graph, is generally similar to the total roads sector given the importance of public sector funded work in determining total roads activity.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

In general, the public sector workforce gap is expected to be positive each year between 2011/12 and 2018/19 inclusive, reaching a peak level of around 950 persons in 2018/19 Initially, the workforce gap will be driven by increasing public sector funded construction activity. In the medium to longer term, the gap is expected to widen as funded maintenance activity moves to a higher plane and as the attrition of the existing workforce accelerates.

Chart 9.5: Western Australia
Public Roads Employment (1.5% Productivity Assumption)



Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 9.6: Western Australia
Total Roads Employment (1% Productivity Assumption)

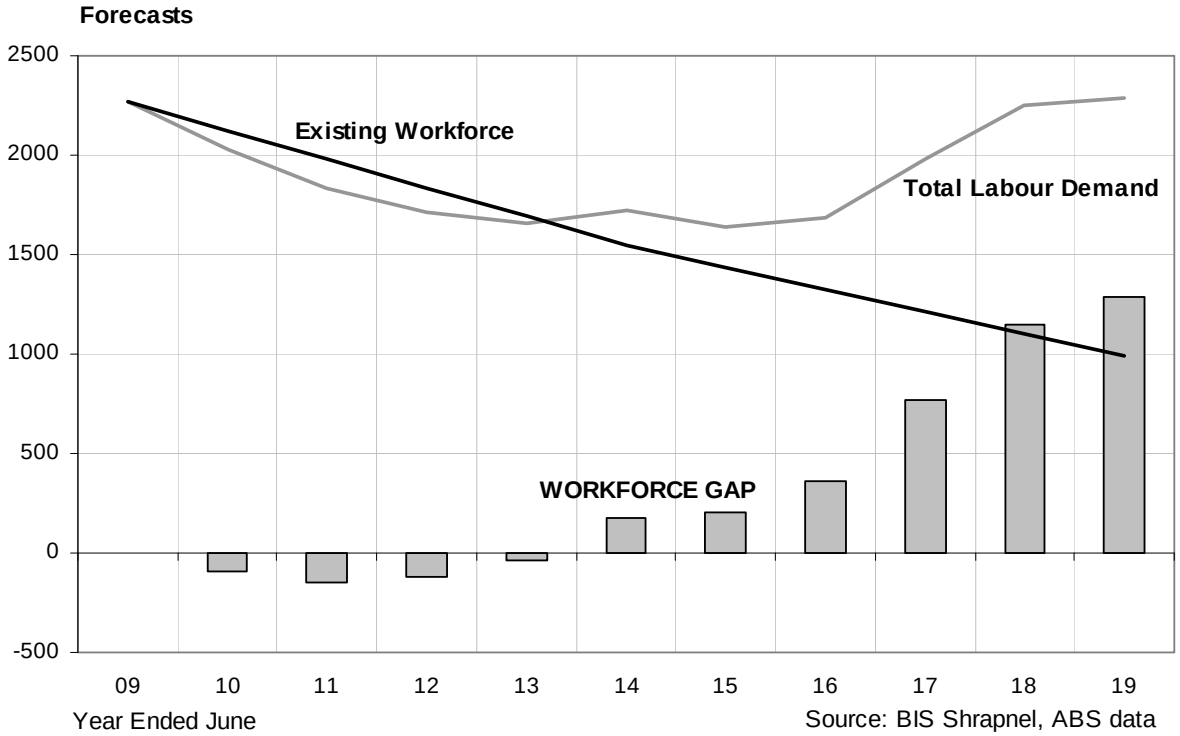
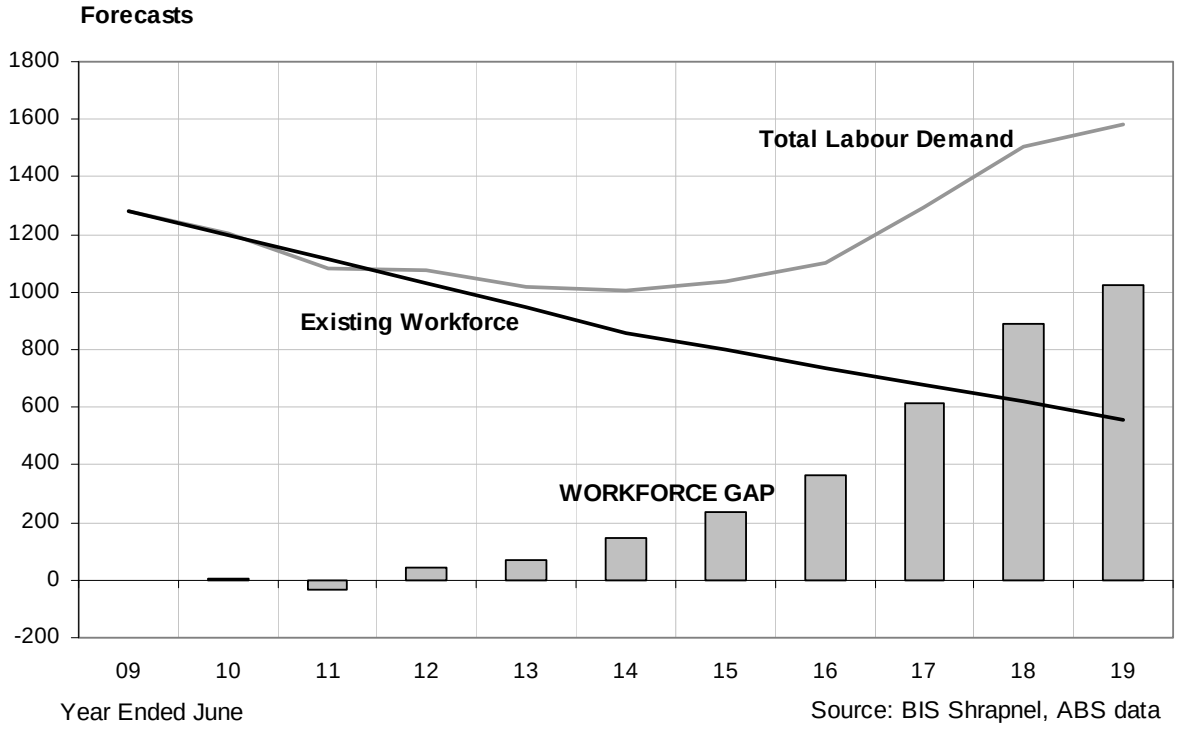
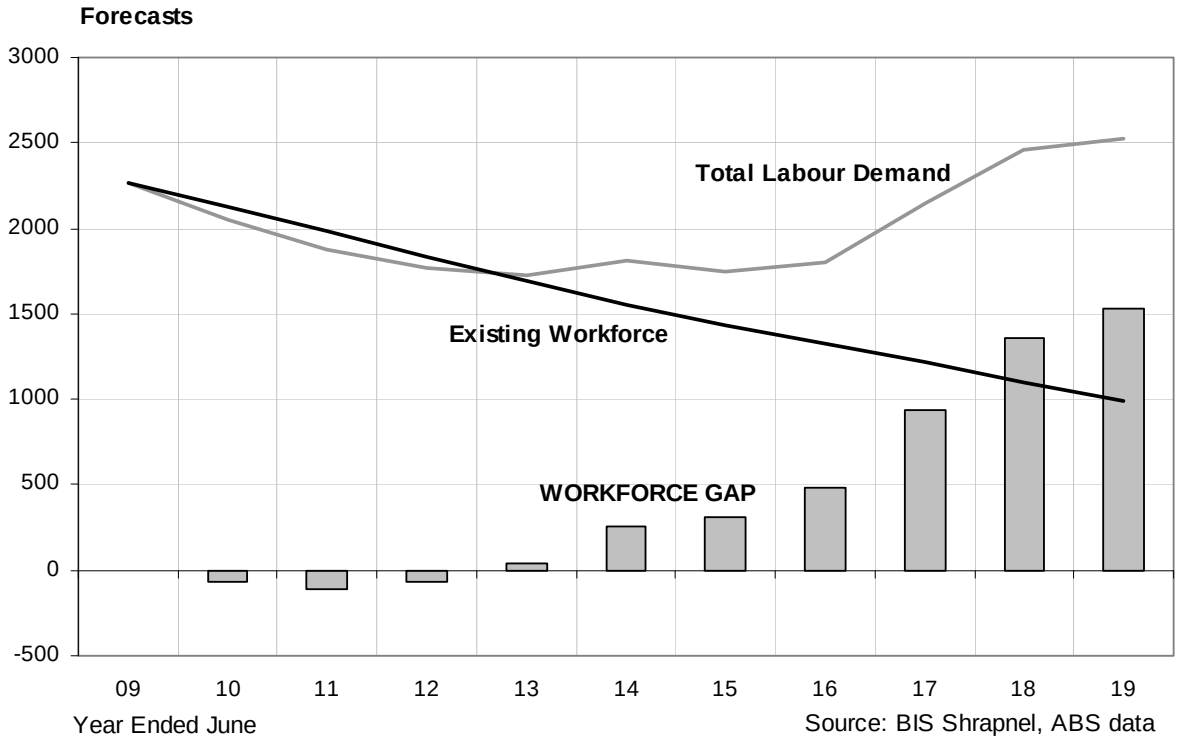


Chart 9.7: Western Australia
Public Roads Employment (1% Productivity Assumption)



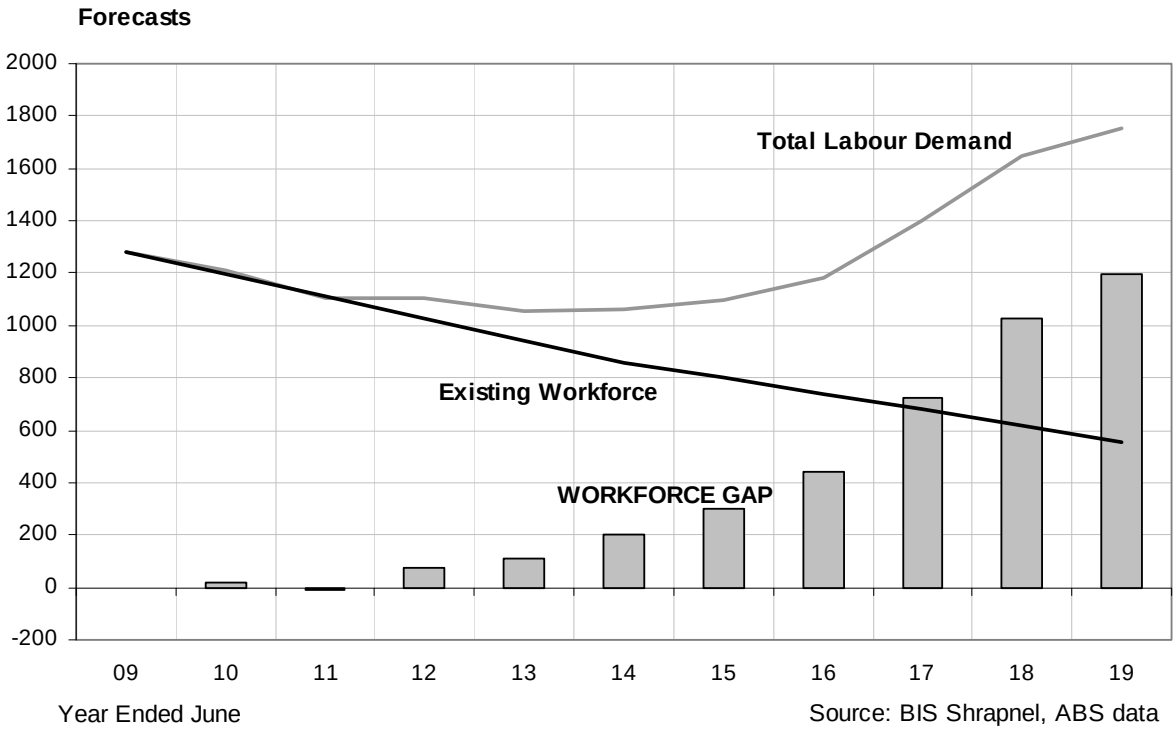
Source: BIS Shrapnel, ABS data

Chart 9.8: Western Australia
Total Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 9.9: Western Australia
Public Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

CHAPTER TEN: TASMANIA

10. Tasmania

This Section presents the outlook for Tasmanian roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

Table 10.1 presents BIS Shrapnel's estimate of the size of the skilled roads workforce in Tasmania in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (44 persons instead of 236 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 10.1: Tasmania
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**1,858**	**34**	**18**	**7**	**45**	**1,963**
Building Construction	1,671	7		5	34	1,717
Total Non-Building Construction	43	20	10	3		75
o/w Road & Bridge Construction	17	16	11			44
General Trade Construction	144	7	8		11	171
Public Administration & Safety	**39**	**78**	**52**	**96**	**114**	**378**
Federal Government	3				4	7
State Government	11	14	7	60	25	117
Local Government	25	58	39	31	72	225
Other		6	6	5	12	29
Professional Services	**70**	**145**	**68**	**113**	**91**	**488**
Other Sectors	**298**	**46**	**33**	**65**	**286**	**728**
Total All Sectors	**2,265**	**303**	**172**	**282**	**536**	**3,557**
Total Roads Workforce	**28**	**61**	**58**	**28**	**60**	**236**
Public Roads Workforce	**16**	**32**	**38**	**7**	**21**	**114**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

We estimate that there were 61 civil engineers in the skilled roads workforce in Tasmania in 2008/09, comprising around 26 per cent of the total. Civil engineering associate professionals and project managers make up 25 and 12 percent of the total skilled roads workforce in the state. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals constitute around 63 per cent of the defined Tasmanian skilled roads workforce.

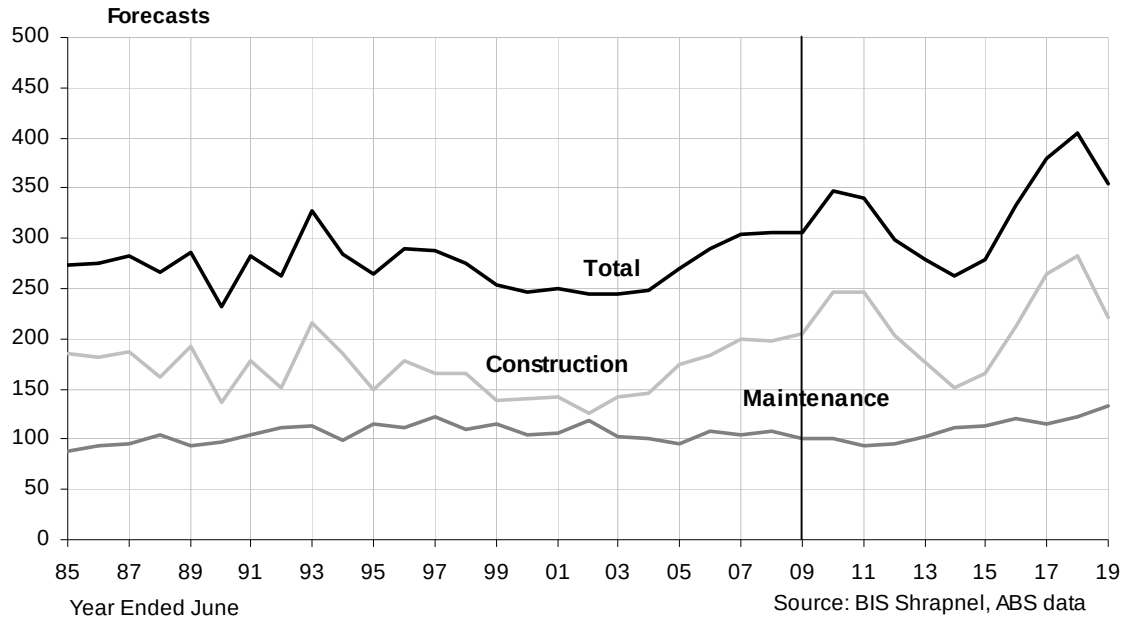
Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 57 per cent of the Tasmanian skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

We expect the recent upswing in activity to continue into 2009/10, before tapering off slightly in 2010/11. The main driver of the strength in activity in this year and next will be further work on this round of major highways projects. This has been made possible by a boost to Federal funding under the expanded NBP, as well as increased funding from the Tasmanian Governments to bring activity forward. The main projects here will be the Brighton, Dilston and Kingston Bypasses, the North-East Freight Roads upgrade as well as a number of smaller but much-needed projects (such as an upgrade to the oft-congested Brooker Highway in north Hobart).

Over the following three years, we expect work done to decline as the current round of major projects conclude. Our outlook to 2013/14 includes an assumption that population growth will weaken (a moderate fall in population inflow from overseas and a net population outflow to other states) and that the State Government will look to cut back on some roads spending in the early to mid 2010s to improve their finances following the current downturn.

Chart 10.1: Tasmania
Road and Road Bridge Activity
$ Million, 2006/07 Prices



10.1.1 Road and road bridge construction

Accompanying an extended period of economic weakness, road construction fell significantly from 1992/93 to 2001/02. The economic malaise restricted revenues available for publicly funded work, while anaemic levels of population growth (made worse by a persistent drain of population to the mainland) meant housing commencements recorded ongoing falls (which significantly impacted upon subdivisions activity).

Since 2002/03, Tasmania's economic fortunes have improved markedly. The turnaround was initially sparked by a strong influx of population from the mainland (due to low interest rates, the First Home Owners' Grant and a significant discrepancy between property prices in Tasmania and the eastern states). This led to a surge in housing commencements (143 per cent between 2000/01 and 2003/04) which drove the first stage of the upswing in road construction: privately funded subdivisions activity leapt more than five-fold over 2002/03 and 2003/04.

By 2004/05, the impact of the rare population inflow fed through to improved economic growth and to increased revenues. This led to publicly funded activity taking over from subdivisions as the key driver of activity and posting its strongest phase of growth since the mid-1990s. This was seen in major projects such as upgrades of the Bass, East Tamar and West Tamar Highways in rural Tasmania, an increasing amount of work in Hobart (including the Lyell Highway upgrade and the start of work on the Brighton Bypass) as well as strengthening local road construction (which is several years behind the boost in housing starts).

This growth largely continued right through to 2008/09, where activity reached $188 million in 2008/09 (in constant prices): the highest mark since 1992/93.

Chart 10.2: Tasmania
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices

Outlook

Looking ahead, we expect the recent upswing in activity to have continued into 2009/10, with this strength continuing into 2010/11. Over the following three years, we expect work done to decline as the current round of major projects concludes and work falls back to a 'normal' level.

Also, our outlook to 2013/14 includes an assumption that population growth will weaken (a moderate fall in population inflow from overseas and a net population outflow to other states) and that the State Government will look to cut back on some roads spending in the early to mid 2010s to improve their finances following the current recession. However, our forecast for 2013/14 is not a weak one. It is well above the levels seen in the early 2000s and 1990s.

The main driver of the strength in activity in this year and next will be further work on this round of major highways projects. This has been made mostly possible by a boost to Federal funding under the expanded (vis a vis its predecessor AusLink) Nation Building Program, as well as a desire by both the Federal and Tasmanian Governments to bring activity forward (where possible) to provide economic support in this potentially perilous post-GFC period. The main projects here will be the Brighton, Dilston and Kingston Bypasses, the North-East Freight Roads upgrade as well as a number of smaller but much-needed projects (such as an upgrade to the oft-congested Brooker Highway in north Hobart).

Local roads and subdivisions to mostly detract from activity in the years ahead.

The boost to the Tasmanian economy and, more particularly, Tasmanian road construction from surprisingly strong population growth is set to wane in the period to 2013/14. BIS Shrapnel believes improved affordability (compared to the pre-GFC peak) in the eastern states, the economic downturn and (slightly) less discrepancy between house prices in Tasmania and those on the mainland will all act to lower population growth in Tasmania in the years to come.

After both subdivisions and local roads construction are boosted through 2009/10 (by a temporary First Home Owners Grant and low interest rate-inspired increase to housing starts and a lagged effect of stronger house starts in the mid 2000s as well as some Federal Government stimulus respectively), activity in housing-related roads construction is set to weaken over much of the period to 2013/14 largely as a result of weaker population growth.

On the subdivisions side, activity will steadily decline after 2009/10 following the expected decline in housing starts. More specifically, we expect housing starts to fall to a level not seen since 2002/03 by 2013/14 — we believe the same will happen with subdivisions construction.

The local roads sector shares many common drivers with subdivisions, but we expect a temporary reprieve in the decline in local roads construction in 2012/13 as a response to the need for work following the jump in starts in 2009/10. However, this will not be sustained due to the generally weak state of the housing market and our expectation that Local and State Governments will be looking to cut — or at least delay — some roads spending in the early to middle 2010s (to improve their finances after the GFC-driven downturn). This will especially so for the State Government, who worked hard to reduce public debt; they will be reluctant to extend themselves further in terms of more roads funding through the early/mid 2010s.

Activity to pick up again through the mid to late 2010s via the next major projects.

The aforementioned major projects in this tranche of the NBP will be largely complete by 2011/12. With the subsequent tranche of the NBP still a few years away and the Tasmanian Government highly unlikely to fill the void with a major state-funded project at a time when we expect them to be cutting back on road spending, total activity will not recover before 2014/15.

However, from 2014/15, we expect activity in Tasmania to enter into an upswing again, led by the next major projects. Not surprisingly, the bulk of this impetus will come from Federal funding and the next tranche of the Nation Building Program and will be led by the next stage of upgrading the Midland Highway (Pontville to Bagdad 4-laning). We have also included the start of 4-laning the remainder of the Midland Highway, as well as upgrades on the Bass Highway.

There is the chance of more East Tamar Highway works as well as a greater amount of 4-laning the Midland Highway but there appears to be more potential projects than available funding under the next phase of the NBP. Also, the recent addition of the Brooker and Tasman Highways to the AusLink Network could see these roads benefit in the mid to late 2010s.

Lastly, road bridge construction should surge with the Bridgewater Bridge replacement. This may not proceed, with minor upgrades or work on alternate links between Hobart and northern Tasmania instead, but if this does go ahead, it will add significantly to the overall outlook.

In all, our forecast is for activity to enter into an upswing from 2014/15 and peak in the late 2010s. We expect average annual activity over the period to 2018/19 will be similar to that seen to 2013/14, but this will mask a stronger period in public activity on the next major projects.

10.1.2 Road and road bridge maintenance

Unlike most other states/territories, road maintenance in Tasmania has remained fairly stable in the previous decade. After climbing in the early 2000s, activity fell back to the middle of the decade but strengthened again in 2005/06 before stabilizing in recent years. The long term weakness in Tasmania is maintenance of local roads, which has been on a downward trend since the mid 1970s and recorded its lowest level on record in 2006/07. Like councils in many other states, Tasmanian councils have struggled to deal with increasing costs and an uncertain revenue base.

Outlook

BIS Shrapnel expects a weaker next two years (despite increased Roads to Recovery funding to support local roads activity after being weak since 2004/05), before bouncing back from 2010/11. This is due to forecasts of greater expenditure from the State Budget (in combination with the DIER's reputation for a very responsible attitude towards maintenance spending), the boost to National Network maintenance with the start of AusLink 2 (in addition to greater 'top-ups' from the Tasmanian Government), but also due to the backlog and hence the strong need for an ongoing boost to local road maintenance funding.

There is a risk of the financial crisis (and the ensuing economic downturn) wreaking havoc with revenues of a small state like Tasmania and hence jeopardising the budgeted increase in activity, but we believe the relatively high priority at which Tasmania values road maintenance, greater Federal funding (including funds to refurbish the Bridgewater Bridge in coming years) and a growing backlog of work (especially on local roads, but also on highways and arterials) will see activity strengthen from 2010/11 even if Tasmania's finances are hit hard.

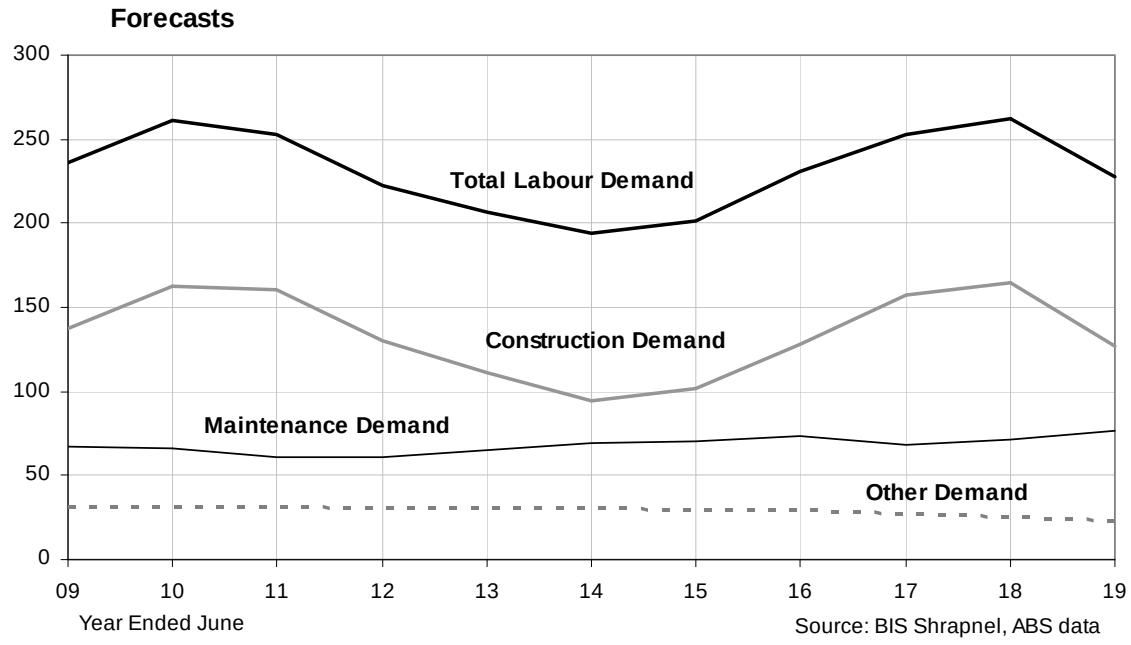
In the medium term, however, our forecast is for activity to stabilise around the $110 million mark, before eventually increasing further towards the end of the decade. We expect Tasmania to (most often) under-perform economically relative to the rest of Australia and for this restrict population growth and lessen revenues and lower the requirement for maintenance. However, as a greater proportion of Tasmania's roads near the end of their working life, as the very strong recent levels of construction activity begin to impact on the stock of roads (and drive the maintenance requirement higher) and given that Tasmanian activity will be overdue for a period of significant increase, we have timed this to come through over the 2016/17 to 2018/19 period.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in Tasmania translates into demand for skilled labour as shown in Chart 10.3.

From an estimate of just under 240 persons in 2008/09, labour demand is expected to peak at 261 persons in 2009/10. Labour demand is then expected to fall to a trough of around 194 persons by 2013/14 before rising again to a fresh peak of 262 persons in 2017/18 to be driven by strong publicly funded construction activity. The demand for labour is expected to ease back to 227 persons at the forecast period to coincide with falling construction activity.

Chart 10.3: Tasmania
Forecast of Road Labour Demand



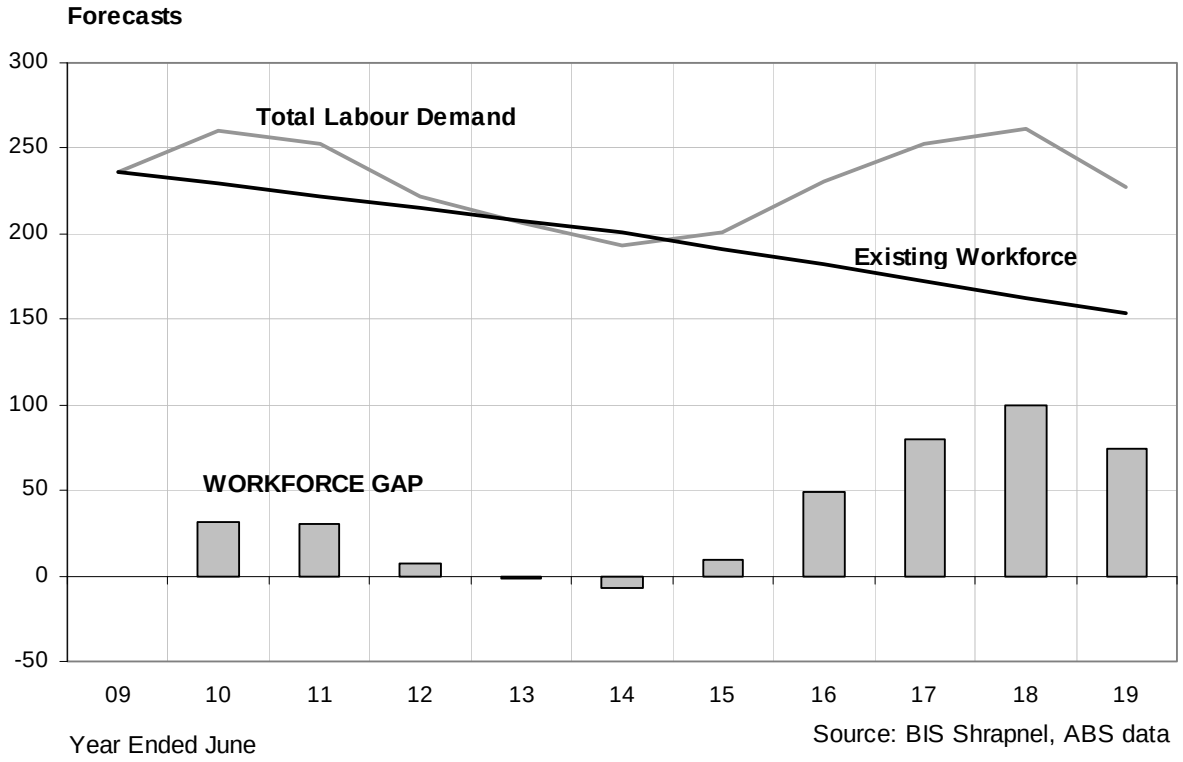
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the Tasmanian roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 35 per cent over the next ten years. This is well above the national rate of attrition as presented in Section 4.3, given an older age profile for the current workforce. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 10.4: Tasmania
Total Roads Employment (1.5% Productivity Assumption)



Source: BIS Shrapnel, ABS data

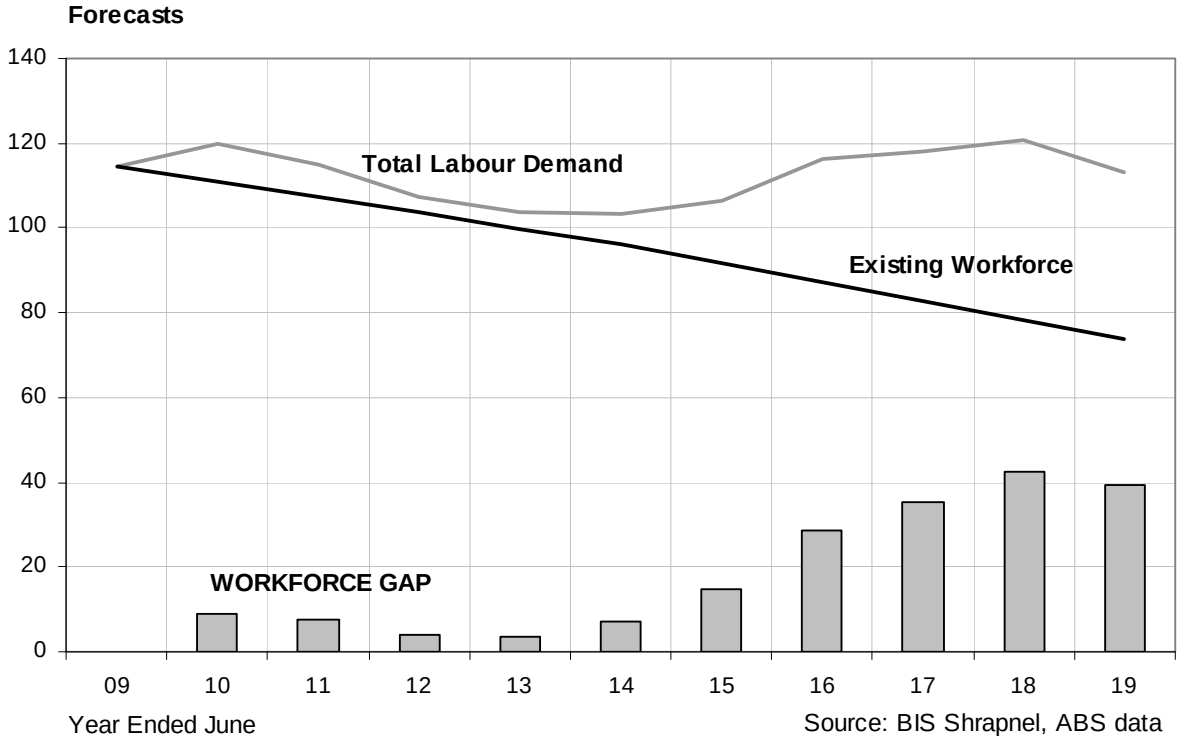
For Tasmania, the total roads sector workforce gap is expected to be positive in 2009/10 and 2010/11 but remain close to zero —on average— over the following four years as roads activity falls to more normal levels. The workforce gap is expected to grow between 2015/16 and 2017/18 (inclusive) due to increasing roads activity and a strong acceleration in workforce attrition through ageing. By 2017/18, the workforce gap is expected to be around 100 persons.

The outlook for the workforce gap for the public sector, as shown in Chart 10.5, is expected to be broadly similar to the total roads sector given the relatively dominance of public sector funded roads activity. The Tasmanian public sector's role as the key funder of maintenance work and provider of other road management functions is also expected to drive a trend increase in skilled roads labour demand, and the workforce gap, over time.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

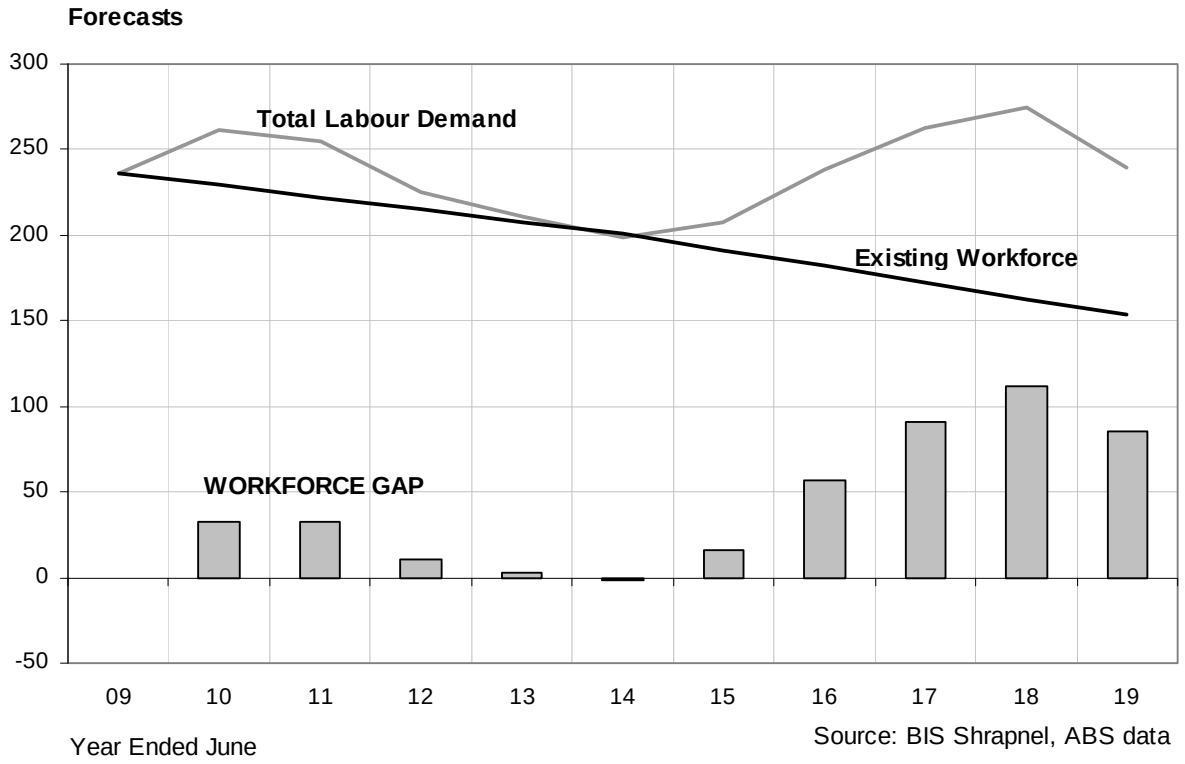
The public sector workforce gap is expected to be positive each year between 2009/10 and 2018/19 inclusive. Initially, the workforce gap will be driven by increasing public sector funded construction activity. In the medium to longer term, the gap is expected to widen as the attrition of the existing workforce accelerates. The workforce gap is expected to reach a peak of around 45 persons in 2017/18.

Chart 10.5: Tasmania
Public Roads Employment (1.5% Productivity Assumption)



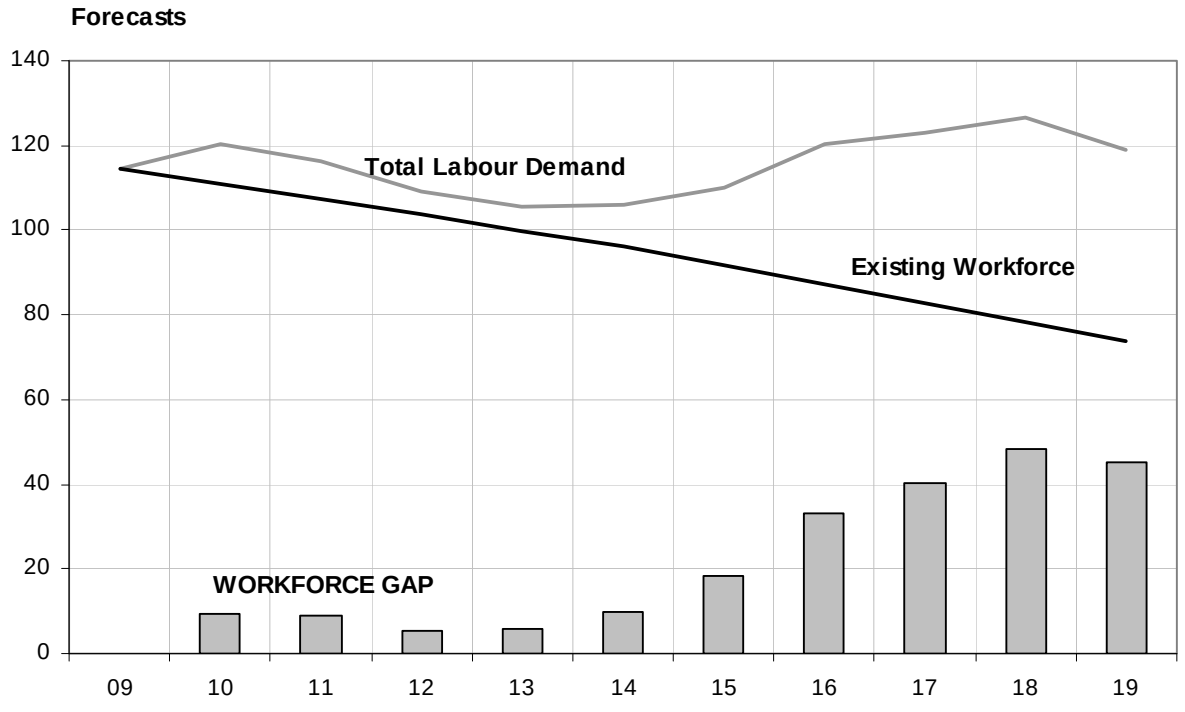
Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 10.6: Tasmania
Total Roads Employment (1% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 10.7: Tasmania
Public Roads Employment (1% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 10.8: Tasmania
Total Roads Employment (0% Productivity Assumption)

Source: BIS Shrapnel, ABS data

Chart 10.9: Tasmania
Public Roads Employment (0% Productivity Assumption)

Source: BIS Shrapnel, ABS data

CHAPTER ELEVEN: NORTHERN TERRITORY

11. Northern Territory

This Section presents the outlook for Northern Territory roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

Table 11.1 presents BIS Shrapnel's estimate of the size of the defined skilled roads workforce in the Northern Territory in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (23 persons instead of 126 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 11.1: Northern Territory
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**516**	**19**	**3**	**3**	**23**	**565**
Building Construction	412	7			10	429
Total Non-Building Construction	16	12	3		7	38
o/w Road & Bridge Construction	11	8	4			23
General Trade Construction	88			3	7	98
Public Administration & Safety	**34**	**34**	**43**	**40**	**29**	**180**
Federal Government					2	2
State Government	15	18	35	33	9	110
Local Government	10	2	8	2	2	24
Other Government	9	14		5	16	44
Professional Services	**51**	**64**	**41**	**53**	**26**	**235**
Other Sectors	**94**	**19**	**3**	**22**	**180**	**318**
Total All Sectors	**695**	**136**	**90**	**118**	**258**	**1,298**
Total Roads Workforce	**21**	**45**	**43**	**11**	**7**	**126**
Public Roads Workforce	**17**	**19**	**24**	**9**	**10**	**78**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

The main occupation categories in the Northern Territory skilled roads workforce are civil engineers and civil engineering associates, which together comprise 70 per cent of the total. The next largest category is project managers. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up around 82 per cent of the defined Northern Territory skilled roads workforce.

Another feature of the roads workforce is the proportion employed by the public sector. We estimate that in 2008/09, 62 per cent of the Territory skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

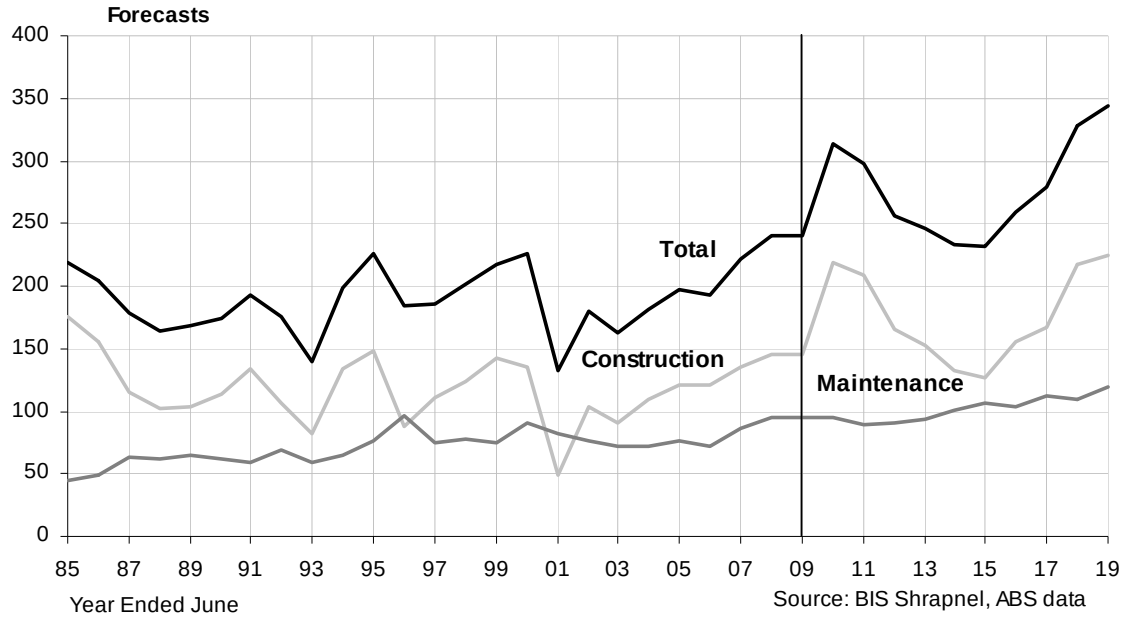
Roads activity outlook

Activity is expected to hit a new peak — and the highest level on record — in 2009/10 on the back of several Federal government funded projects. The main project here is Stage 2 of the Tiger Brennan Drive works, which will also see very high levels of activity sustained into 2010/11.

BIS Shrapnel is forecasting road construction in the Territory to decline over the three years to 2013/14. Initially the fall is likely to be modest: the minor fall in activity expected in 2010/11 will be almost entirely due to the winding down of work on the Tiger Brennan Project. We expect work on rural highways and arterials projects (led by the aforementioned Federal funded packages of work) and housing-related roads to increase and put a floor under activity.

Our medium term outlook for the Northern Territory includes the next major minerals and/or energy projects to come through in the mid to late 2010s (possibly the LNG plant associated with the Ichthys Project or the Sunrise LNG Project). This is expected to drive major road requirements in the Territory, while stronger population growth will also support the construction of housing-related roads such as subdivisions and local roads.

Chart 11.1: Northern Territory
Road and Road Bridge Activity
$ Million, 2006/07 prices

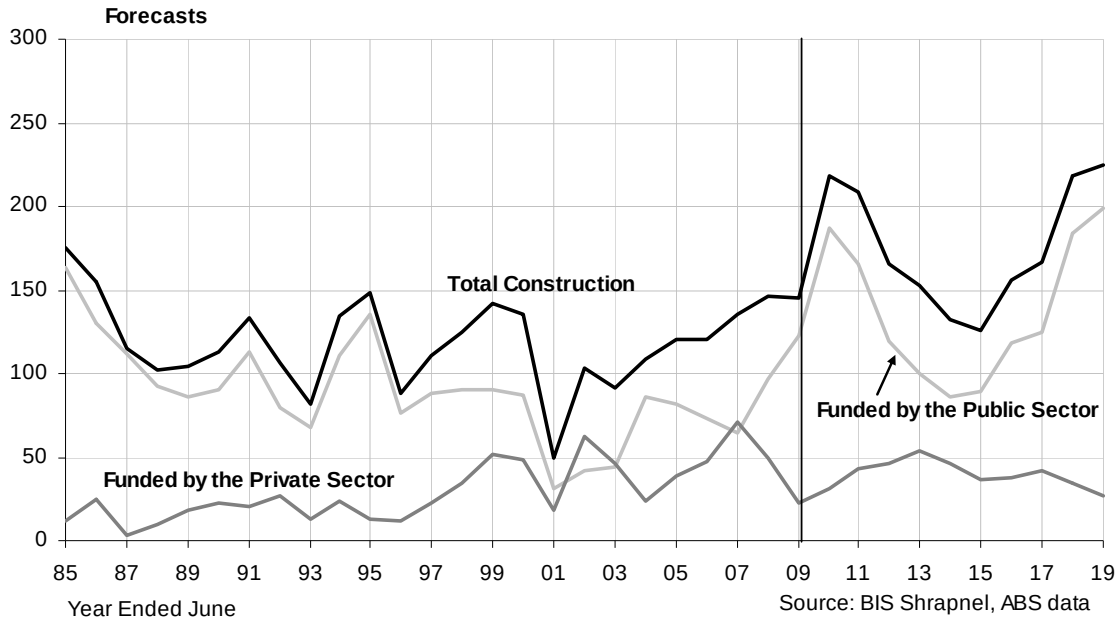


11.1.1 Road and road bridge construction

A small economy such as the Northern Territory is often prone to large movements in activity and this was seen in the early part of the last decade, where construction slumped in 2000/01 (after the double hit of the completion of several significant projects and falling revenues) but rebounded sharply in 2001/02.

This level of activity was largely maintained by a boost in housing-related roads and works related to the Alice Springs to Darwin railway before jumping again in 2004/05: this coincided with the start of the *AusLink* program and a new round of major projects on the Territory's National Network roads (the Stuart, Barkly and Victoria Highways).

Chart 11.2: Northern Territory
Road and Road Bridge Construction Activity by Funding Source
$ Million, 2006/07 Prices



Activity strengthened further to an eight-year high in 2007/08 as ongoing Federal works were joined by stronger activity in almost all other segments. While housing construction tailed off in 2007/08 (subdivisions activity reached an eight-year high in 2006/07 before falling back in 2007/08), the very healthy levels of activity over the previous three years created the need for much more local roads construction. Also, Darwin's continued growth necessitated a variety of runway and road works at Darwin Airport in recent years, while access road construction was also strong in line with a booming mining sector.

Road construction activity fell in 2008/09 to $115.6 million (in constant prices) as the boost to activity from mining and major runways wound down. Overall activity was also weighed down by subdued performance of the subdivisions segment. Activity in the local roads and the highways and arterials sub-sectors however remained solid throughout 2008/09, led by the start of the Tiger Brennan Drive Extension (and associated works),

Outlook

Road construction in the Northern Territory is expected to hit a new peak — and the highest level on record — of $191.6 million in 2009/10 on the back of several Federal government funded projects. The main Federal project in the near term will be continuing work on Stage 2 of the Tiger Brennan Drive works. This work is long overdue and will ease congestion for commuters as well as improve access to East Arm Port.

Other projects will include a number of necessary bridge works on the oft-flooded Victoria Highway ($50 million worth), a series of upgrades on a host of important roads (including Tanami Highway and Plenty Highway) to facilitate improved passage of vehicles for livestock, mining and general community travel ($81 million worth) and another package of works to "Improve Flood Immunity, Road Safety and Productivity" on various highways (worth $160 million). These packages of work will contribute to activity until at least 2013.

BIS Shrapnel is forecasting road construction in the Territory to decline over the medium term. However, initially the fall is likely to be modest: the minor fall in activity expected in 2010/11 will be almost entirely due to the winding down of work on the Tiger Brennan Project. We expect work on rural highways and arterials projects (led by the aforementioned Federal funded packages of work) and housing-related roads to increase and put a floor under activity.

The strength of housing-related roads (subdivisions and local roads) for much of the period to 2013/14 deserves greater scrutiny. Population growth in the Territory can be volatile and is closely linked to jobs prospects and hence the prospects for minerals and energy investment. It fell to just 0.32 per cent in 2002/03 — the lowest level of population growth (apart from 1974/75) in the Territory on record. In this year, the Territory lost 1.4 per cent of her population to other states. Unsurprisingly, the minerals and energy sectors were struggling at this time.

As the prospects for minerals and energy improved markedly (led by the Bayu Undan LNG development) and economic growth in the Territory picked up, so did the population growth. It reached a 12-year high of 2.8 per cent in 2008/09 after strengthening since 2002/03. Not surprisingly, housing starts, subdivisions and local roads activity all came along for the ride.

While our outlook does not contain any projects of the magnitude of Bayu Undan or the Gove alumina refinery expansion, we believe the next round of more moderately sized minerals and energy projects (as well as ongoing production from existing mines / plants) will provide solid enough prospects to maintain strong population growth (at or above 2 per cent) for the period to 2013/14. Hence, we expect housing-related roads construction to remain at very strong levels — including the record high ($95 million) in 2010/11 — over the period to 2013/14.

However, this will not be enough to sustain total activity at or near the levels expected this year and next once the major highways projects wind down towards completion. As mentioned, some of these major projects will continue for the entire period of the NBP but no new Federal money to come in until the subsequent phase of the NBP (2014/15) and the Territory Government very unlikely to fill the void — even if it was a time of strong economic growth and revenues — it is not surprising that we expect activity to fall back some way from 2010/11.

Next upturn in activity predicted from the second half of the decade ahead.

Our medium term outlook includes the next major minerals and/or energy projects to come through in the mid to late 2010s (possibly the LNG plant associated with the Ichthys Project or the Sunrise LNG Project). This should roughly correlate with minerals and energy demand returning somewhere near levels seen during the mid 2000s (driven by China and India's development — as well as stronger demand for LNG through much of the world). As a result, we expect Darwin's growth to continue, so that from the mid 2010s, the next major projects in Darwin will be needed (both highways/arterials and expansions to Darwin Airport).

This positive outlook will help support population growth and hence construction of housing-related roads. This will come through more in local roads in the mid to late 2010s due to the strong levels of housing starts in the early 2010s requiring local roads to service them.

Also, by this time, we expect the need to start replacing ageing roads (local roads and major roads) will be more apparent, while the need to upgrade the National Network Highways every few years will also support activity. Overall, our forecast is for activity to strengthen through the second half of the decade with growth to 2018/19 to be driven by the next major public projects.

11.1.2 Road and road bridge maintenance

The maintenance sector in the Territory is small and volatile, but the trend is an increasing one from the mid-80s. Levels of funding by the Commonwealth or the Territory Government can fluctuate considerably. The peak of activity came in 1995/96, where all areas of activity (National Highways, arterials and local roads): $96 million in constant prices. Apart from a similarly all-round strong year in 1999/2000 — where $90 million of maintenance was carried out — activity oscillated between $71 and $82 million between 1996/97 and 2005/06 before strengthening to $95 million in 2007/08; the strongest level of activity (and the strongest increase in activity) since 1999/2000.

The bulk of this jump came in rural highways maintenance and suggests an acknowledgment from the Northern Territory Government of the importance of road maintenance. Of course, an important ingredient here was stronger revenues. Much of this was from Federal but Territory revenues also grew strongly (with the strength of commodities demand a key factor). We believe Territory revenues contributed to this jump via a significant 'top-up' to National Network maintenance.

Our forecast is for maintenance to be fairly stable over 2009/10 before falling back through to 2010/11. Despite the Territory Government's positive attitude towards road maintenance and the boost to National Network maintenance funding from the Nation Building Program, we believe the Territory's revenues will suffer due to the current economic downturn. As such, funding for maintenance (and for 'topping-up' Federal funds) will take a hit.

From 2011/12, we expect road maintenance in the Territory to return to a solid upward trend over the coming decade. Despite the current episode of weak external demand for commodities, the Northern Territory is well positioned in the medium term to benefit substantially from mining. This will increase both the revenues available to undertake road maintenance but also increase the need to undertake road maintenance (via greater road transport and greater population growth and traffic levels in Darwin).

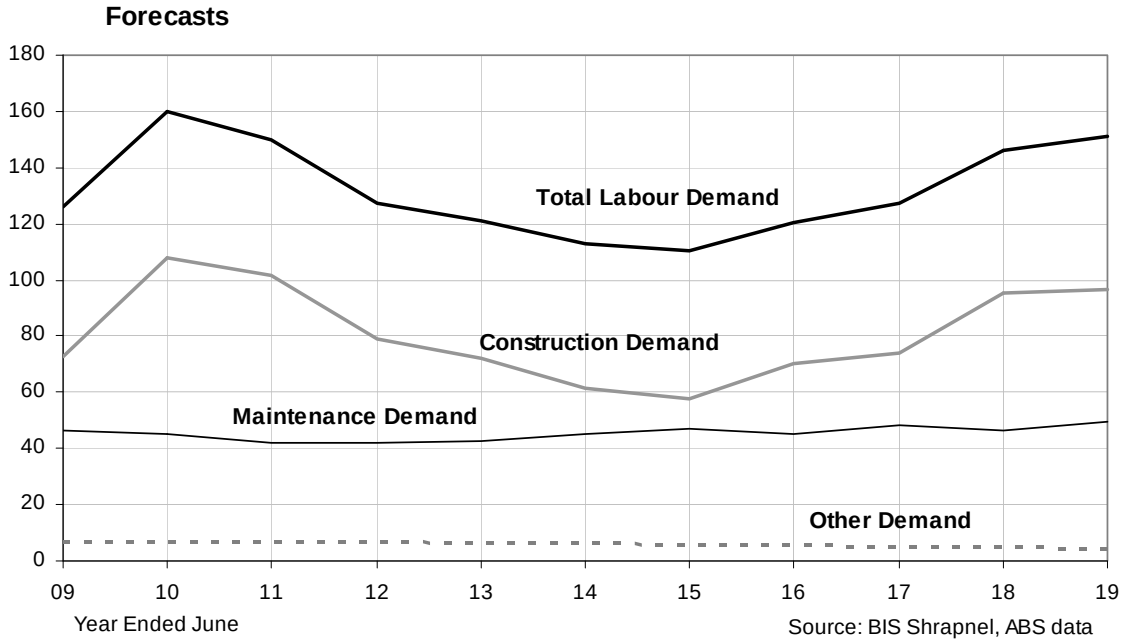
Combined with the Department of Construction and Infrastructure's intentions to make significant improvements to maintenance over the medium term, we believe activity will progress further (albeit slowly, as major new investments — both minerals-related and otherwise — assume a more immediate priority) in the five-year period to 2018/19.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in the Northern Territory translates into demand for skilled labour as shown in Chart 11.3.

From an estimate of just under 130 persons in 2008/09, labour demand is predicted to peak at 160 persons in 2009/10. Beyond this, falling construction activity is likely to see the demand for labour fall to a trough of 110 persons by 2014/15. However, over the second half of the decade, we envisage labour demand to rise once again on the back of the next upswing in publicly funded construction activity.

Chart 11.3: Northern Territory
Forecast of Road Labour Demand



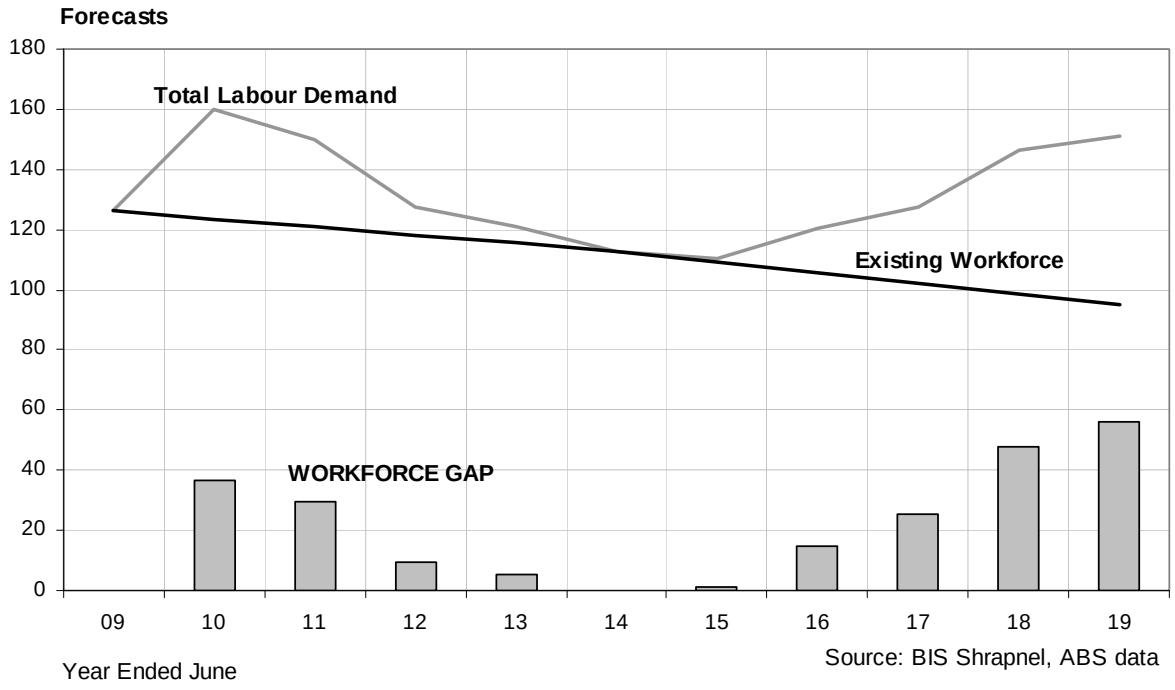
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the Northern Territory roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 25 per cent compared with a national rate of attrition 30 per cent over the next ten years. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 11.4: Northern Territory
Total Roads Employment (1.5% Productivity Assumption)

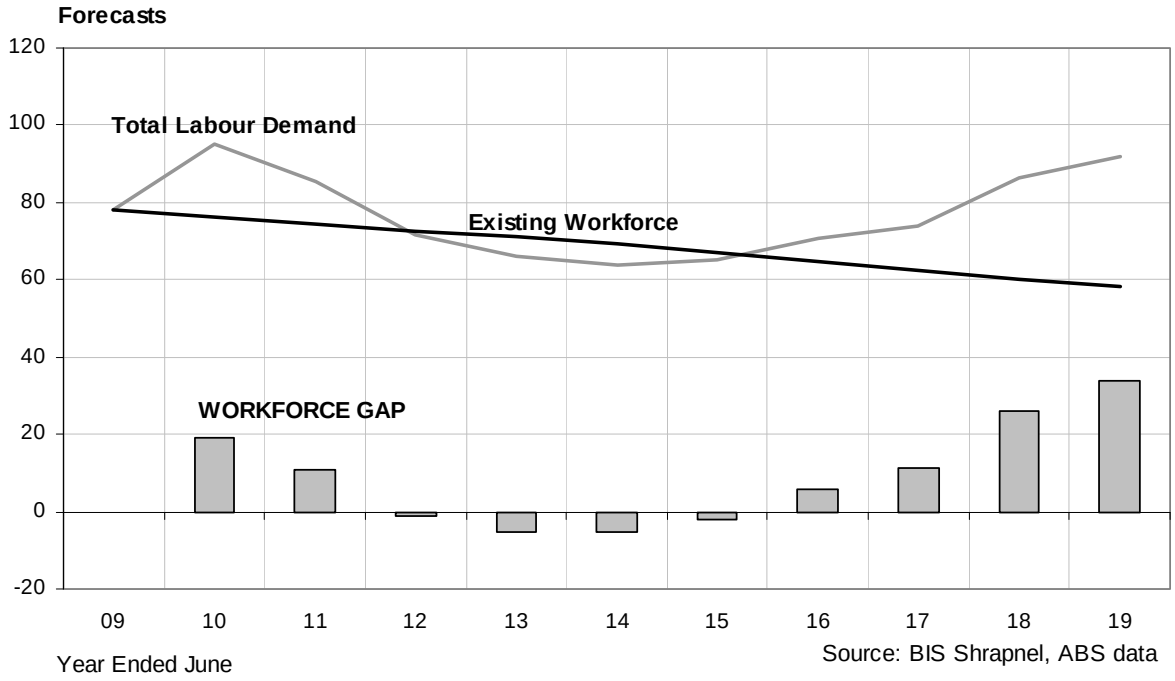


For the Territory, the total roads sector workforce gap is expected to be positive but declining over the next few years. However, a consistent level of roads activity combined with a depleting existing workforce will drive the workforce gap higher from the mid 2010s. By 2018/19, the workforce gap is expected to grow to a peak of around 151 persons.

The outlook for the public sector workforce gap is similar to the total roads workforce, given the importance of the public sector for the funding and delivery of road works. While we are forecasting a small, negative, gap over the 2011/12 to 2014/15 period (inclusive), the consistency of public sector roads activity over the rest of the forecast period, combined with the attrition of the existing roads workforce through ageing, is expected to see the public sector workforce gap expand to around 35 persons by 2018/19.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

Charts 11.5: Northern Territory
Public Roads Employment (1.5% Productivity Assumption)



Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 11.6: Northern Territory
Total Roads Employment (1% Productivity Assumption)

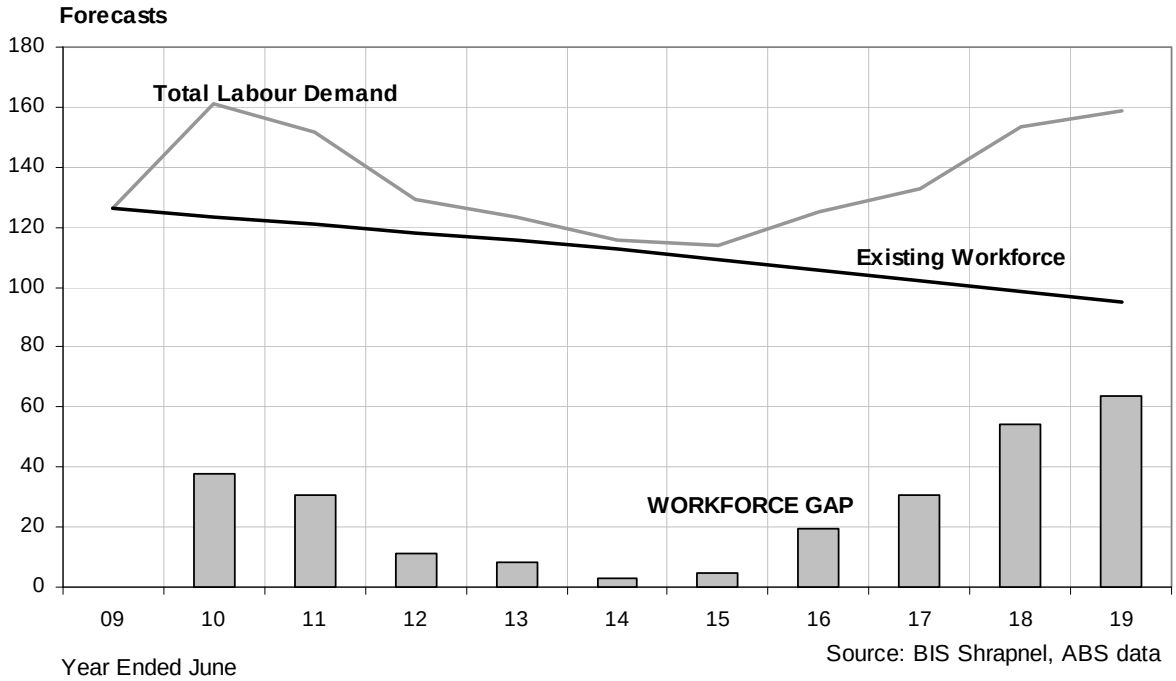
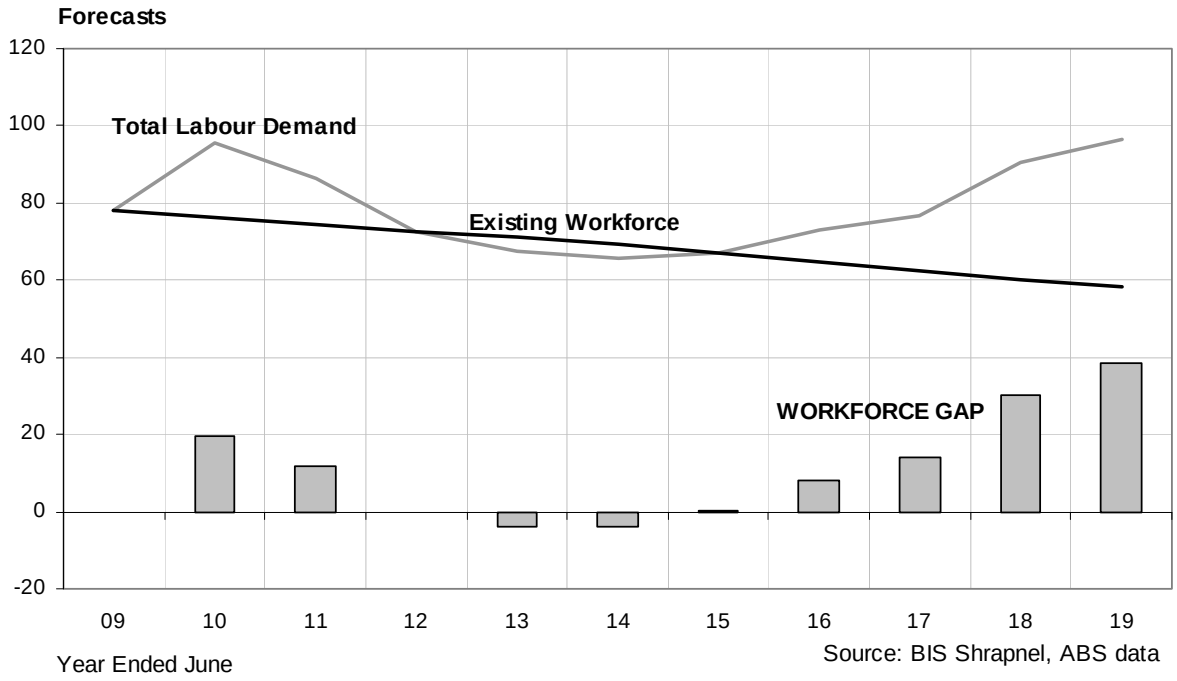
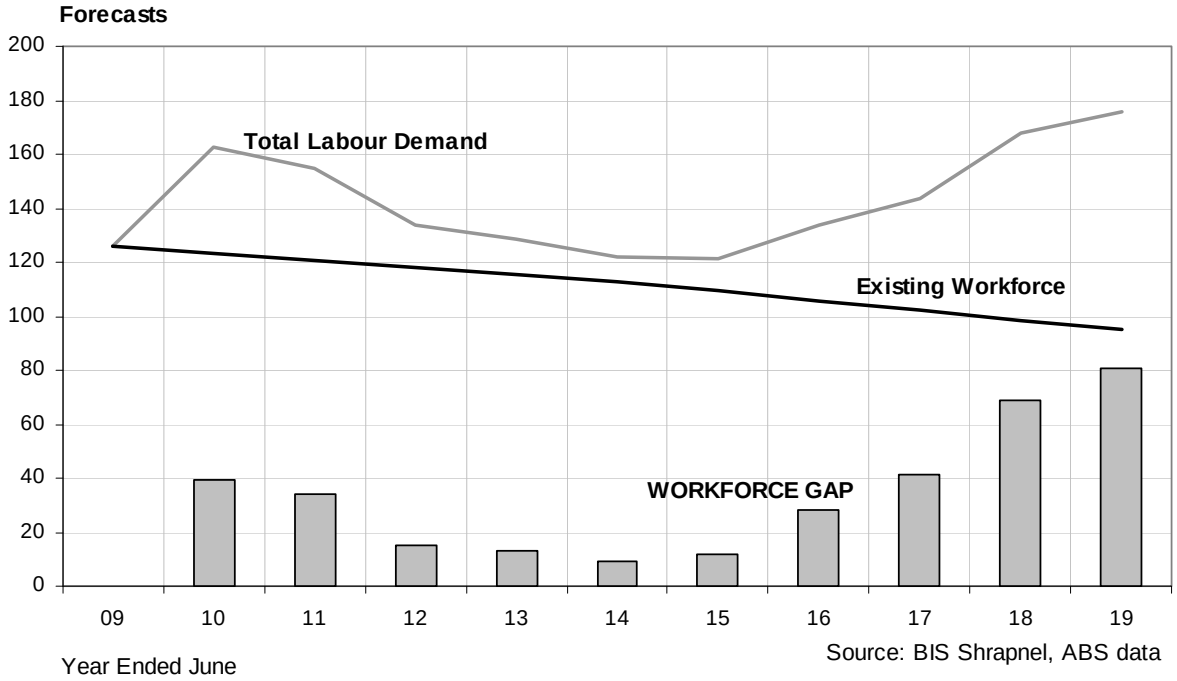


Chart 11.7: Northern Territory
Public Roads Employment (1% Productivity Assumption)



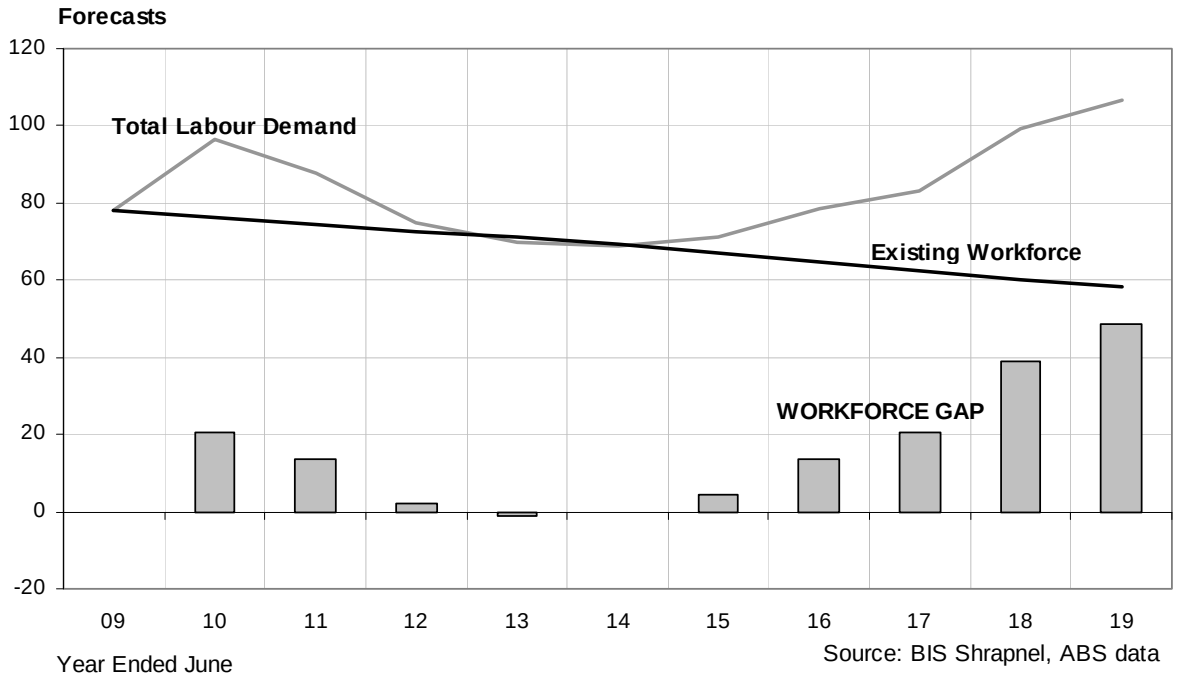
Source: BIS Shrapnel, ABS data

Chart 11.8: Northern Territory
Total Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

Chart 11.9: Northern Territory
Public Roads Employment (0% Productivity Assumption)



Source: BIS Shrapnel, ABS data

CHAPTER TWELVE: ACT

12. Australian Capital Territory

This Section presents the outlook for the Australian Capital Territory's (ACT) roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved.

The skilled roads workforce

Table 12.1 presents BIS Shrapnel's estimate of the size of the skilled roads workforce in the Australian Capital Territory in 2008/09. As discussed in Section 2.2, these figures have been derived from 2006 ABS Census data, and modified according to changes in work done in the intervening period with reference to the higher level employment data by industry and occupation from the ABS Labour Force Survey.

It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data. While Census data does have "road and bridge construction" as an industry category, the reality is that not all persons working in the roads sector will record this as their industry sector on their Census forms. Indeed, using only Census data from this industry sector would, in our view, severely underestimate the size of the skilled roads workforce (43 persons instead of 103 persons).

The estimates of the total and public sector roads workforces have been determined based on assumptions adopted regarding the proportion of persons employed in the "roads" sector from the other industry sectors listed.

Table 12.1: Australian Capital Territory
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**960**	**88**	**35**	**8**	**25**	**1,117**
Building Construction	822	48	8		14	892
Total Non-Building Construction	18	34	16	4	4	76
o/w Road & Bridge Construction	12	18	10		3	43
General Trade Construction	120	7	12	3	7	149
Public Administration & Safety	**96**	**50**	**3**	**117**	**113**	**379**
Federal Government	33	7		81	43	164
State Government	8	19	3	10	67	107
Local Government					3	3
Other	55	24		26		105
Professional Services	**143**	**151**	**71**	**120**	**125**	**610**
Other Sectors	**181**	**34**	**19**	**28**	**72**	**334**
Total All Sectors	**1,410**	**324**	**128**	**273**	**432**	**2,567**
Total Roads Workforce	**10**	**47**	**26**	**8**	**12**	**103**
Public Roads Workforce	**7**	**14**	**14**	**5**	**8**	**48**

* Includes other building and construction professionals and para-professionals, and quantity surveyors

Source: BIS Shrapnel

Civil engineers dominate the skilled roads workforce, comprising 46 per cent of the total workforce. The next largest categories are civil engineering associate professionals and project managers. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up just over 80 per cent of the defined ACT skilled roads workforce.

Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, nearly half of the ACT skilled roads workforce was directly employed by the public sector, with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the business services sector.

Roads activity outlook

For ACT, the completion of some major projects will see activity slide sharply over the 2 years to 2013/14 but, longer term, there are likely to be further large development projects which will keep average road construction activity at historically high levels. This includes the Majura Parkway project to improve access to Canberra Airport, as well as other projects which will provide connections to and between Canberra's growing suburbs.

Chart 12.2: Australian Capital Territory
Road and Road Bridge Activity
$ Million, 2006/07 Prices

12.1.1 Road and road bridge construction

The five years to 2008/09 was a weak period for ACT road construction. It was down almost 20 per cent from the previous five-year period to 2003/04. Underlying the weaker profile was the weak subdivision activity arising out of slower levels of housing construction as well as the cessation of major federal projects.

However, activity was supported in several areas. The largest single contributor here was the Gungahlin Drive Extension (GDE), but there was also a significant amount of runways work (extension, upgrade but also strengthening) at Canberra Airport during this time.

Activity threatened to decline considerably over the past two years as the GDE wound down with little other public activity to fill the void. This was largely due to delays in the next round of projects as persistent growth in costs led to some reluctance from the ACT Government.

However, resurgent private sector activity meant overall work has held its ground over the past two years. This was fuelled by a sharp recovery in subdivisions construction (as improved net interstate and overseas migration numbers boosted underlying demand from 2006) and the start of a major project to upgrade roads around Canberra Airport. While this project is utilising ACT and Federal Government (as well as Canberra Airport) funding, we believe the ABS has classified this project as a private sector project.

Outlook

Our forecast is for overall road construction to record exceptionally strong growth in 2009/10 and then grow further in 2010/11. In fact, activity in 2010/11 is expected to be at the highest level since 1986/87 and the fourth-highest level on record. Activity is forecast to ease back in following 2010/11 as this round of major projects ends before stabilising over 2013/14. Overall, the five year period to 2013/14 is set to see the greatest amount of road work done on average during a five-year period since the early 1990s.

The main driver of the near-term strength in activity is the continued strong population growth in the ACT. This will boost the requirement for road construction due to the spread of this greater population into new suburbs/regions of Canberra as well as the impact of the growing population on existing insufficient road infrastructure in some areas.

There is a risk of ACT Government revenues being harmed to such an extent that some of these projects are at risk, but we believe the Federal Government will both help create the need for these projects as well as (in some cases) ensure their funding. Canberra's status as an administrative city traditionally means it fares relatively well during economic downturns. However, there are also some projects which will receive direct Commonwealth funding such as the Airport Roads Upgrade and Majura Parkway (expected to begin from 2014/15). We believe the Federal Government's commitment to developing infrastructure and stimulating the economy during this downturn will ensure these projects are undertaken.

The key projects to the peak of 2010/11 will be the duplication of Gungahlin Drive (the fact that this is needed so soon after the initial project is an indication of how ACT Government roads investment is lagging the roads requirement of a growing and spreading population), further stages of the Airport Roads upgrade as well as the Kings Avenue/Parkes Way Overpass.

However, we also expect a number of smaller projects during this time, some of which we have classified as local road construction. This not only reflects that these projects are expected to take place on roads running off major Canberra roads, but also that local roads construction activity has been at very low levels in recent years and is overdue for a boost.

Activity will fall back considerably to more normal levels in 2012/13 and 2013/14, but will be supported by the ongoing development of new suburbs in Canberra, with further suburbs being added to the Gungahlin district and also the initial stages of suburbs in the Molonglo district (to the west of Canberra centre).

The development of these districts/suburbs is expected to take place quite quickly due to our forecast of strong rates of population growth in the years ahead. This growth — a likely outcome of expected strong levels of Federal spending due to the weak economy — will lead to a housing construction upswing in the years ahead, starting with a surge in 2009/10. Much of this growth will be in these areas where more subdivisions activity is required.

Road bridge activity is expected to remain at solid levels over the next few years. The major project here will be continuing work on Tharwa Bridge. However, our forecasts have been weakened by the assumption that the Immigration Bridge will be scrapped due to lack of community support. This is proposed to be a $30m footbridge over Lake Burley Griffin but various users of the lake are strongly opposed and support from elsewhere is lukewarm at best.

Activity to strengthen through most of 2010s before jumping again towards 2020.

Our forecast is for road construction in the ACT to grow strongly over the five years to 2018/19. However, activity will be strongest over the middle of this five year period, with work on the duplication of constitution Avenue and the much needed Majura Parkway development pushing activity beyond the previous peak of 2010/11. Our projections of solid growth rates of Canberra's population and the already acute need will ensure that funding for these works by 2014 (from the next Nation Building Program or elsewhere) leading to very strong work done over 2015/16 and 2016/17.

12.1.2 Road and road bridge maintenance

Road maintenance in the ACT has experienced a volatile history. Since the mid 1980s, activity has jumped between $16 and $45 million (in constant 2006/07 prices) but has not experienced an upward trend. Years of surging activity — 1988/89, 1989/90, 1993/94, 2001/02 and 2002/03 — have been followed by years of extreme weakness. These years (including the early and late 1990s) were characterised by sharp downturns in revenue.

Road maintenance in the ACT has fallen back from the highs of the early 2000s to relatively low levels. Funding issues, an emphasis on major construction projects (such as the Gungahlin Drive Extension), continued weakness in the housing market but perhaps most importantly a relatively low priority for road maintenance (partly due to the relatively young age of many ACT roads) have all combined to drive activity down.

Our continued concern over the strength of revenues (especially with the slowing economy) and the ongoing low priority of road maintenance in the ACT will mean further weakness of activity over the next two years. We have timed a spike in road maintenance in 2011/12 (due to the sheer length of time since there was a jump in activity; a major backlog will have developed), but for this spike to give way to a somewhat healthier level of activity in 2012/13 and beyond.

By this time, we expect the housing construction sector to have rebounded (driven by solid population growth and further development of several new suburbs in Canberra) and for the ACT economy to remain fairly strong into the medium term (given its strong links to Government and administration). These factors should combine to drive revenues and also increase the need for ongoing levels of greater road maintenance.

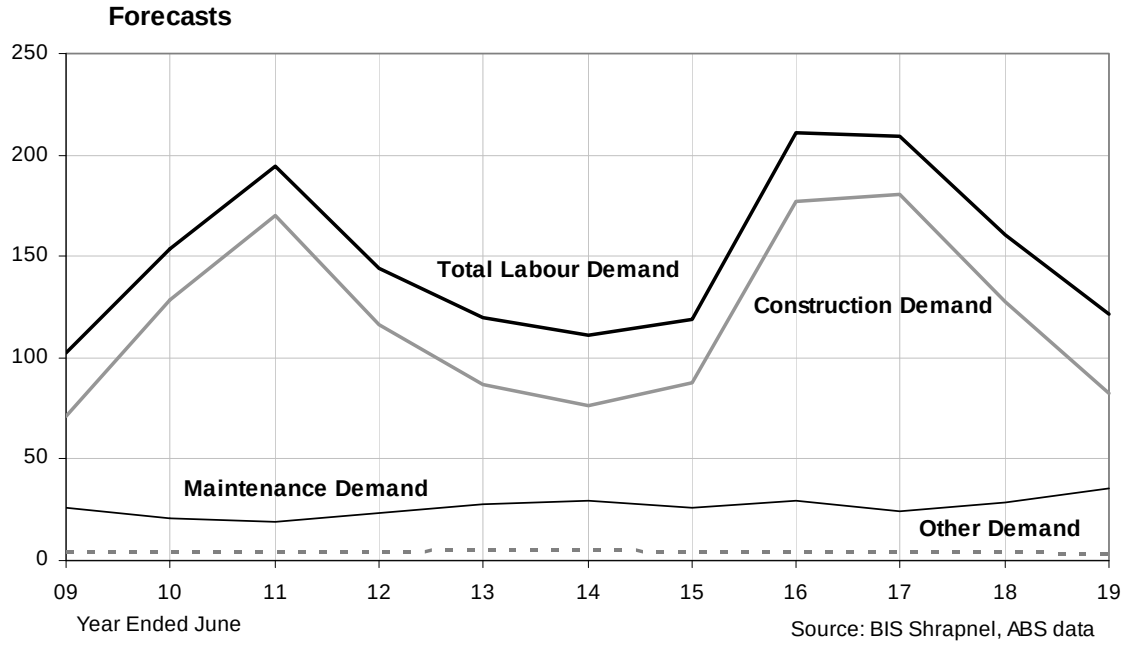
However, despite what will be a significant backlog in local roads maintenance (as well as a less sizeable backlog on major urban roads), we believe a sustained improvement in road maintenance in the ACT will not come through until towards the end of the decade. We do not see a '; a reason for the ACT Government to push road maintenance well up their priority list before this time. The relatively young age of many of the ACT's roads and their greater priorities (of investment in water, electricity but also in the growth / new suburbs of Canberra) will, we believe, stop road maintenance from getting the attention it deserves before the late 2010s.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity as well as growth in the net capital stock of roads. BIS Shrapnel's outlook for road and road bridge activity in the ACT translates into demand for skilled labour as shown in Chart 12.3.

From an estimate of around 100 persons in 2008/09, labour demand is expected to rise to a peak of 194 persons in 2010/11. Labour demand is then expected to fall to a trough of around 110 persons in 2013/14 as activity weakens before accelerating strongly again. The demand for labour is expected to peak again in 2015/16 and 2016/17 at around 210 persons.

Chart 12.3: Australian Capital Territory
Forecast of Road Labour Demand



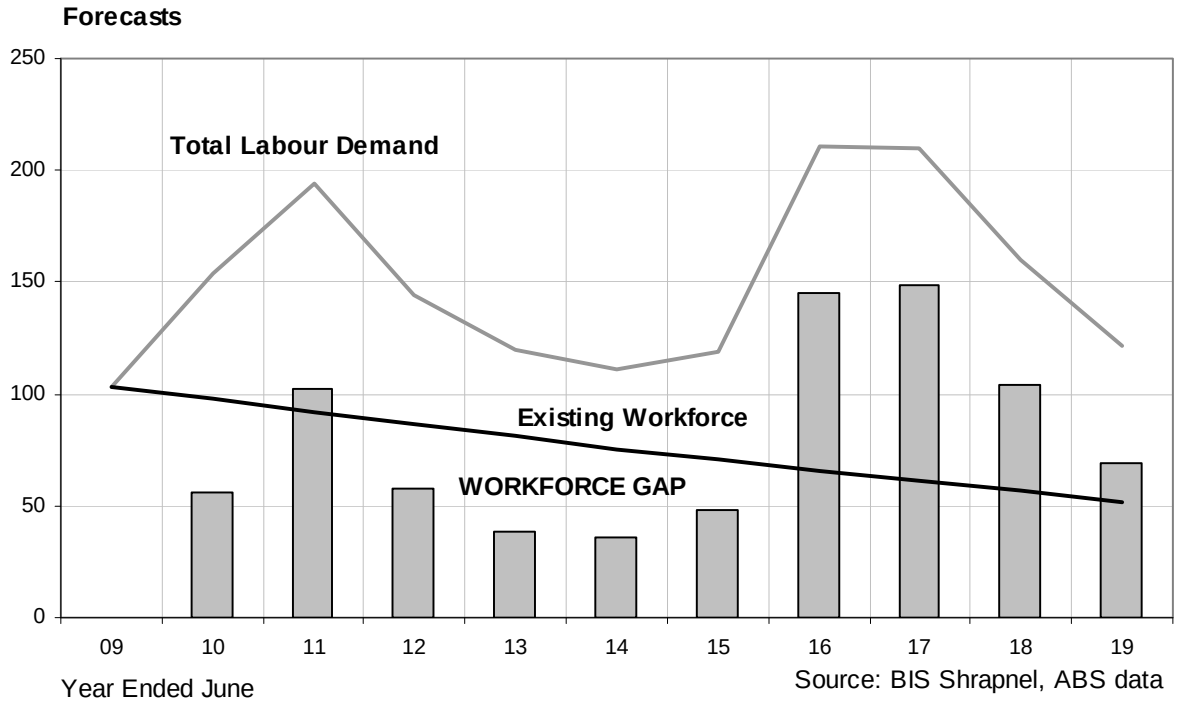
Source: BIS Shrapnel, ABS data

Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the ACT roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 50 per cent over the next ten years. This is well above the national rate of attrition as presented in Section 4.3, given an older age profile for the current workforce. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply if forecast levels of end use road sector activity are to be achieved.

Chart 12.4: Australian Capital Territory
Total Roads Employment (1.5% Productivity Assumption)



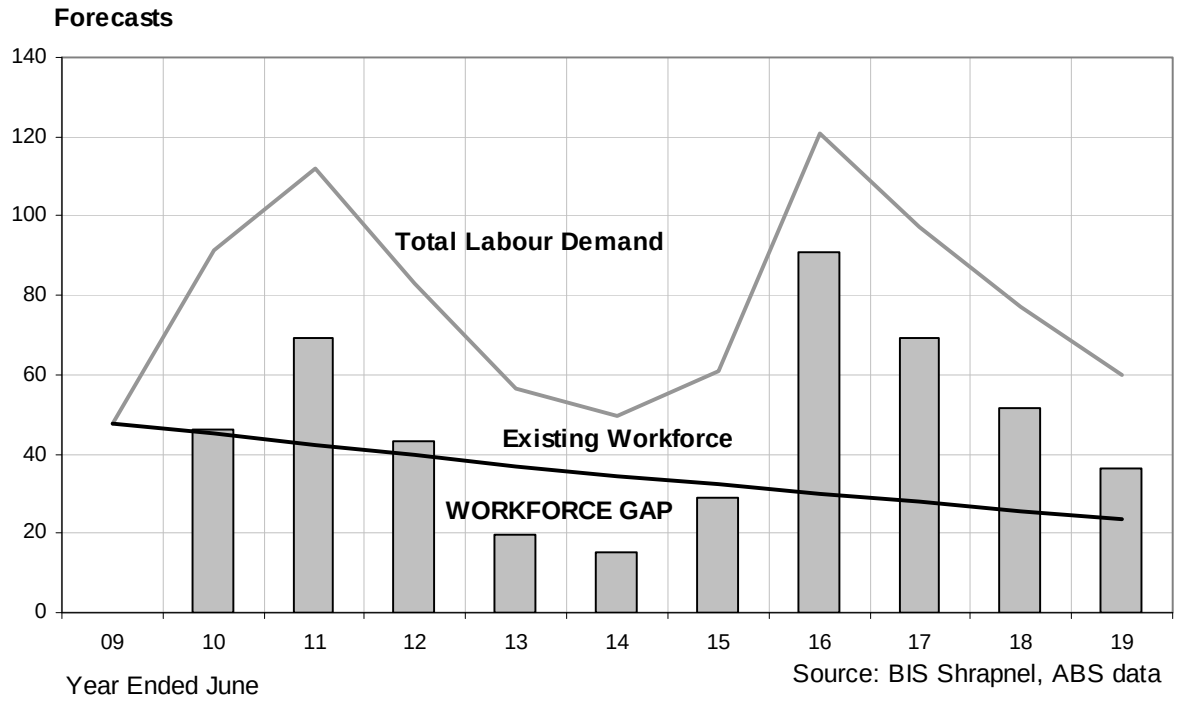
For the ACT, the total roads sector workforce gap is expected to be positive throughout the forecast period as the total labour demand curve is expected to stay above the existing workforce level. The gap is expected to widen appreciably from the second half of the decade ahead due to strong activity and an accelerating rate of workforce attrition.

The workforce gap for the public sector, as shown in Chart 12.5, is expected to be similar to the total roads sector given the importance of public sector funding for total roads activity.

As with the total roads sector, this public sector workforce gap will need to be met by new labour supply (new graduates, net migration, or net transfer of skills from other industries) if forecast levels of roads activity are to be achieved. Unlike the total roads sector, however, the public sector could also boost its labour supply by increasing its utilisation of the private sector roads workforce (i.e. through direct recruitment, increasing the proportion of publicly funded work contracted out, or increasing the use of public/private partnerships).

In general, the public sector workforce gap is expected to be positive in each of the forecast years although we forecast the size of the workforce gap to shrink from 2010/11 as roads activity eases. The increase in public sector funded roads activity between 2013/14 and 2015/16 is expected to drive another increase in the workforce gap around that time.

Chart 12.5: Australian Capital Territory
Public Roads Employment (1.5% Productivity Assumption)



Under weaker productivity growth assumptions, the demand for labour and consequently workforce gaps are correspondingly higher as shown in the following charts.

Chart 12.6: Australian Capital Territory
Total Roads Employment (1% Productivity Assumption)

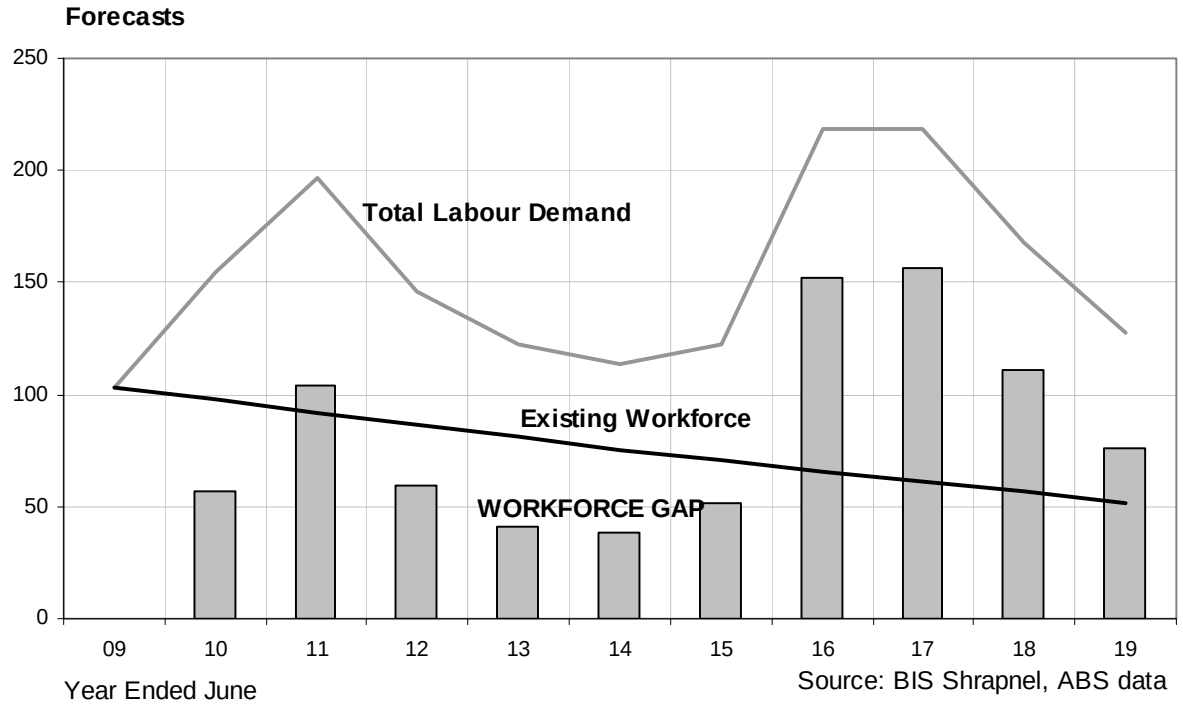


Chart 12.7: Australian Capital Territory
Public Roads Employment (1% Productivity Assumption)

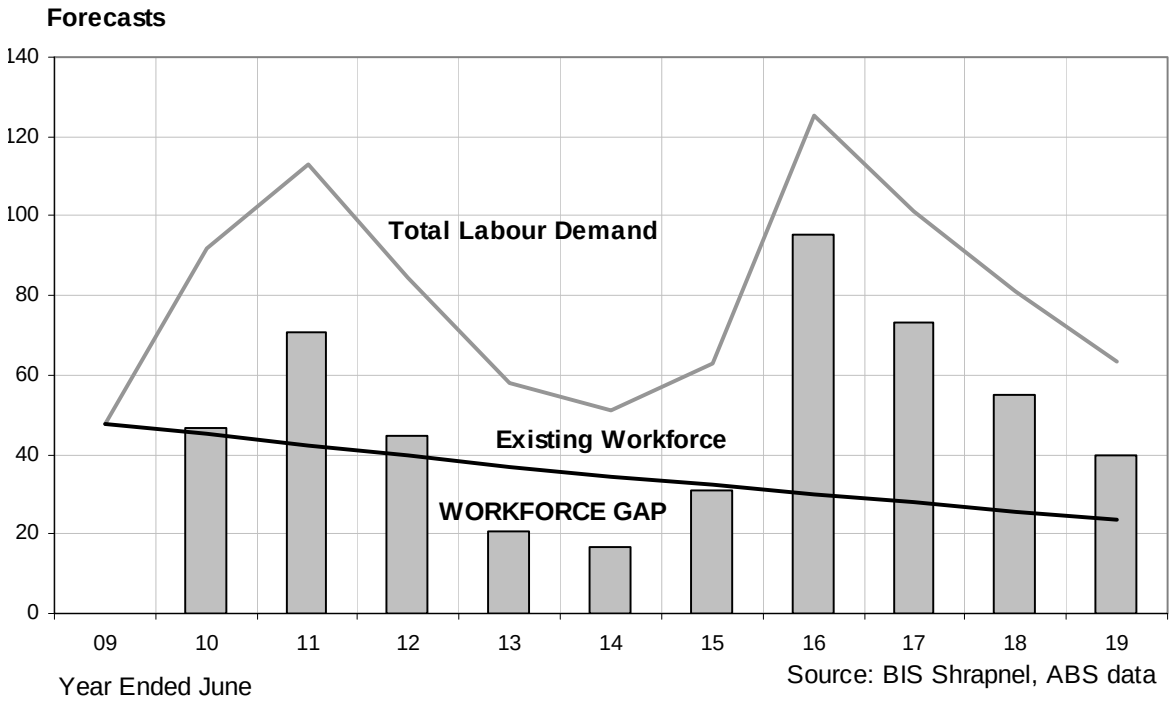


Chart 12.8: Australian Capital Territory
Total Roads Employment (0% Productivity Assumption)

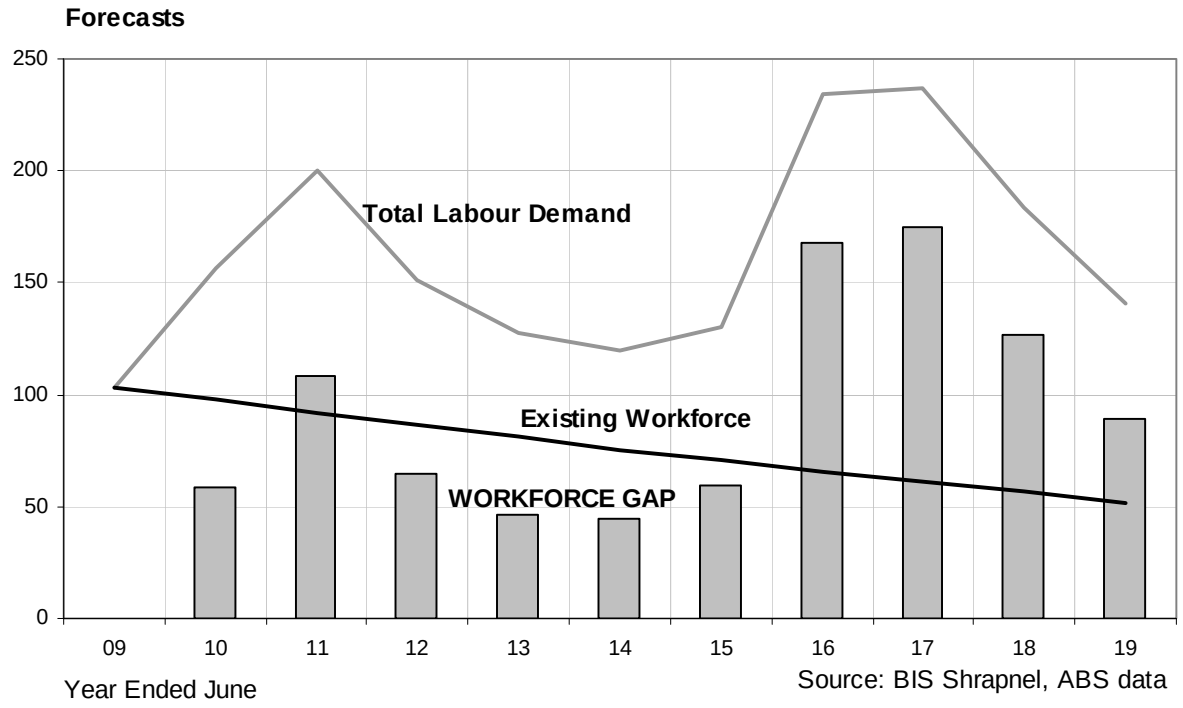
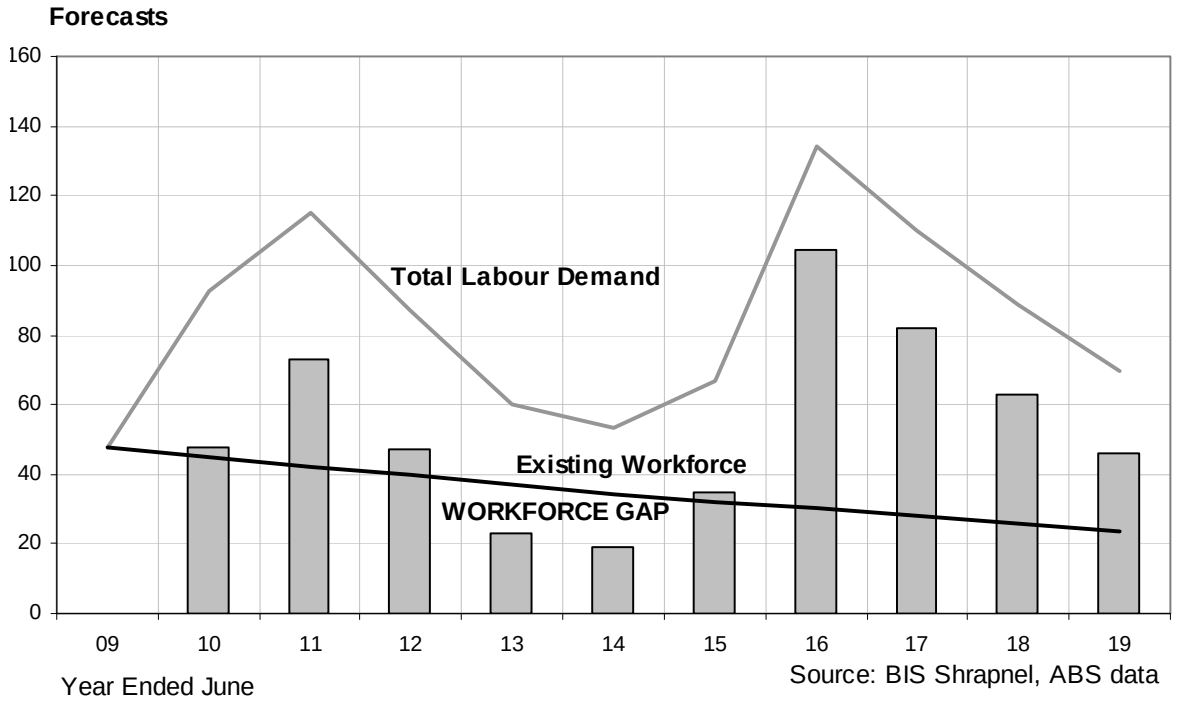


Chart 12.9: Australian Capital Territory
Public Roads Employment (0% Productivity Assumption)



CHAPTER THIRTEEN: NEW ZEALAND

13. New Zealand

This Section presents the outlook for New Zealand roads activity, and how this translates into demand for skilled roads labour. The attrition of the existing workforce through ageing is also presented. The difference between the (declining) existing workforce and labour demand is the workforce gap. This gap will need to be met by new labour supply if forecast levels of road construction and maintenance are to be achieved. We present an estimate of graduate supply to the roads sector in New Zealand — the difference between this supply and the workforce gap is New Zealand's road capability shortfall.

A note on New Zealand data

Where possible, we have tried to use comparable data to that used for Australia to estimate the roads workforce gap and the capability shortfall (or surplus). The occupation data we used to define the roads skills set for New Zealand is described in Section 2.2, and is taken from the New Zealand 2006 Census. This is similar to Australian occupation data however data is only available at the aggregate industry level.

Moreover, unlike the ABS, Statistics New Zealand does not provide a historical time series of road construction activity. Instead, we have taken historical road construction and maintenance data from annual published statistics by Transfund (1999-2004), Land Transport New Zealand (2005-2008) and New Zealand Transport Agency (2009). Our (inflation adjusted) forecasts of road construction and maintenance activity are based on the latest 10 year plan (2009/10 to 2018/19) outlined in the National Land Transport Programme by the New Zealand Transport Agency. In addition to these funding statistics, we have also added:

- An estimate for local authority funded road construction and maintenance work, and
- An estimate of private subdivision construction based on trend and forecast levels of detached house authorisations.

Data on education enrolments and completions have been sourced from both the Centre of Population and Urban Research (CPUR) as well as the New Zealand Department of Labour.[18] This includes all completions in the field of Engineering and Related Technology, from Certificate Level 1-3 to Doctorate level. As our analysis is focused on additions to labour supply, we have focused on Certificate Level 4, diploma and undergraduate completions by domestic students in this field (as per Australia)

The skilled roads workforce

Table 13.1 presents BIS Shrapnel's estimate of the size of the skilled roads workforce in New Zealand in 2008/09. It is important to note that only the bottom two lines are directly relevant here, with the other rows being BIS Shrapnel projections of raw Census data.

As with our Australian estimates, these figures have been derived from 2006 Census data, and modified according to changes in work done in the intervening period. Note that we have based our total "skilled" roads employment in New Zealand on ratios similar to Australia. As with Australia, the NZ Census does not define the "roads" sector exactly, so we have based employment on certain ratios and "rules of thumb" regarding the number of people required per $million of activity.

[18] New Zealand Department of Labour (2008), *Engineers in the New Zealand Labour Market*, Department of Labour.

Table 13.1: New Zealand
Estimated Professional Employment by Occupation
2008/09

Sector	Project Managers	Civil Engineers	Civil Eng. Associates	Surveyors & Cartographers	Other*	TOTAL
Total Construction	**2,580**	**1,181**	**94**	**128**	**1,620**	**5,603**
Total Government	**108**	**513**	**45**	**90**	**825**	**1,581**
Technical Services	**738**	**3,135**	**9**	**1,314**	**3,423**	**8,619**
Other Sectors	**1,839**	**2,154**	**432**	**264**	**3,300**	**7,989**
Total All Sectors	**5,265**	**6,983**	**580**	**1,796**	**9,168**	**23,792**
Total Roads Workforce	**377**	**962**	**354**	**192**	**465**	**2,350**
Public Roads Workforce	**249**	**469**	**182**	**111**	**428**	**1,439**

* Includes quantity surveyors

Source: BIS Shrapnel

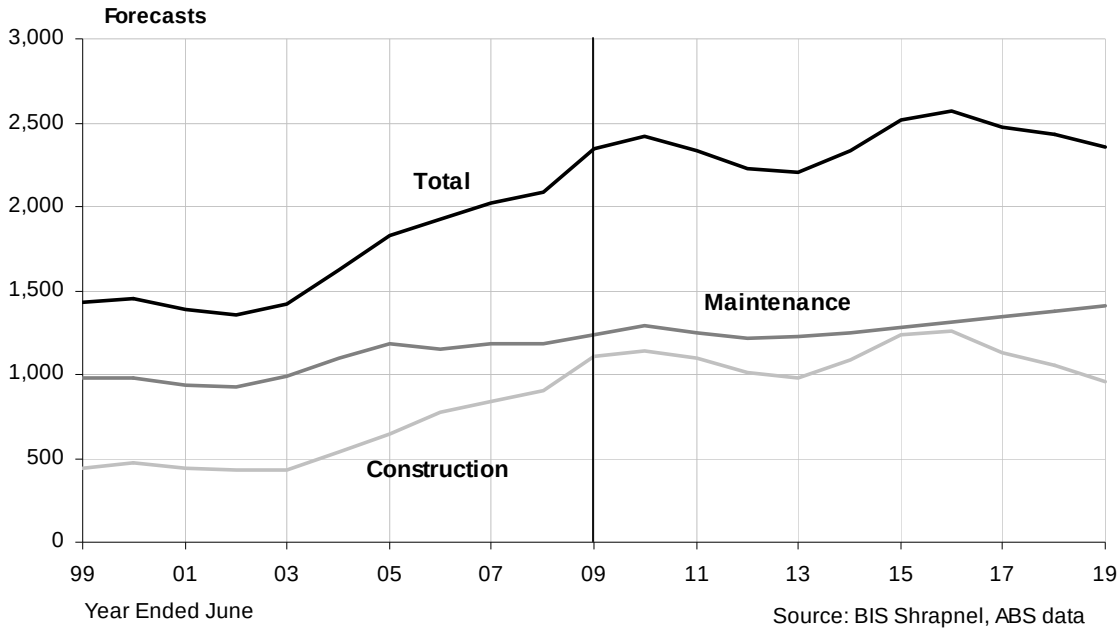
Civil engineers comprise just over 40 per cent of the defined skilled roads workforce, with the next largest category being the ‘others’ category which include predominantly Quantity Surveyors, Urban and Regional Planners, Engineering Technologists and, Construction Estimators. This is followed by project managers and civil engineering associate professionals. However, it is likely that most project managers in the roads industry will also have civil engineering degree qualifications. Combined, project managers, civil engineers and civil engineering associate professionals make up 72 per cent of the skilled roads workforce in Zealand.

Another feature of the roads workforce is the proportion employed by the private sector. We estimate that in 2008/09, around 61 per cent of the skilled roads workforce was directly employed by the public sector (that is, employed by state government or local government authorities), with the remainder placed in the private sector. The private sector roads workforce includes not only road construction and maintenance contractors, but also engineering consultants employed in the technical services sector.

Forecasts of skilled labour demand

Demand for skilled labour is determined by the volume of road and road bridge construction and maintenance activity. We have used the latest 10 year funding plan from Land Transport Agency (2008/09 to 2018/19) in particular the planned expenditure on Roads of National Significance, as the basis of the outlook for New Zealand roads activity, adding our own estimates of locally funded construction and maintenance activity and private construction activity (mainly subdivisions and access roads). We have also deflated this series to take account construction costs.

Chart 13.1: New Zealand
Road Activity
$ Million, 2006/07 Prices



Source: BIS Shrapnel, ABS data

In summary, road activity is expected to continue to grow strongly over the current financial year on the back of real increases in maintenance and still robust construction activity before falling over the three years to 2012/13 as some of the major projects such as the Waikato Expressway conclude.

From 2012/13, roads activity is expected to accelerate sharply once again, driven by a substantial boost to state highway construction funding and a steady growth in maintenance activity. However, following the peak in 2015/16 (projected at just over NZ$2.4 billion in constant 2006/07 prices), activity is expected to ease back as major construction projects on the state highway are timed to completion. Nonetheless, strongly rising real maintenance activity during the latter years of the forecast period is expected to offset falling local road and state highway construction and keep a relatively high floor under roads activity.

This outlook for road and road bridge activity translates into rising demand for skilled labour as shown in the following figure (based on a 1.5 per cent productivity growth assumption). From an estimate of just over 2,300 persons in 2008/09, labour demand is expected to rise to around 2,380 persons in 2009/10, mainly driven by the relatively intensive demands of the construction sector. Lower construction activity (in real terms) beyond 2009/10 is then expected to drive a decline in skilled labour demand, despite maintenance work remaining relatively high. Labour demand overall is expected to rise again from 2012/13 to a peak of 2,340 persons by 2015/16 before easing towards the end of the forecast period as construction activity falls. A demand profile under 1 per cent and 0 per cent productivity assumptions is provided in chart 13.5.

Chart 13.4: New Zealand
Forecast of Road Labour Demand

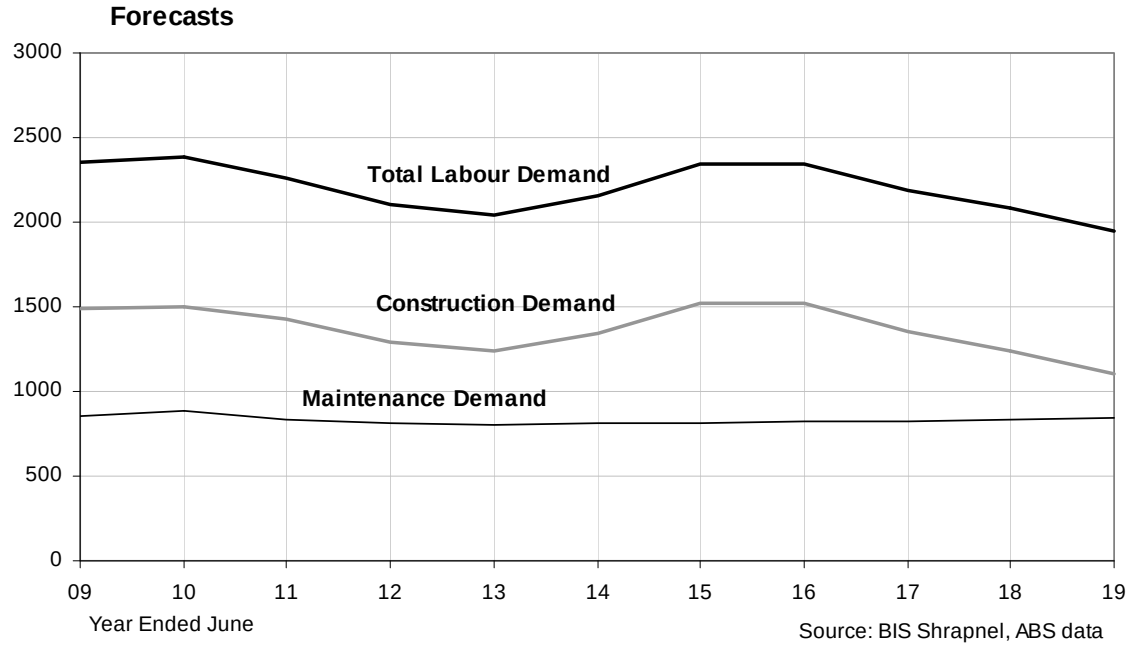
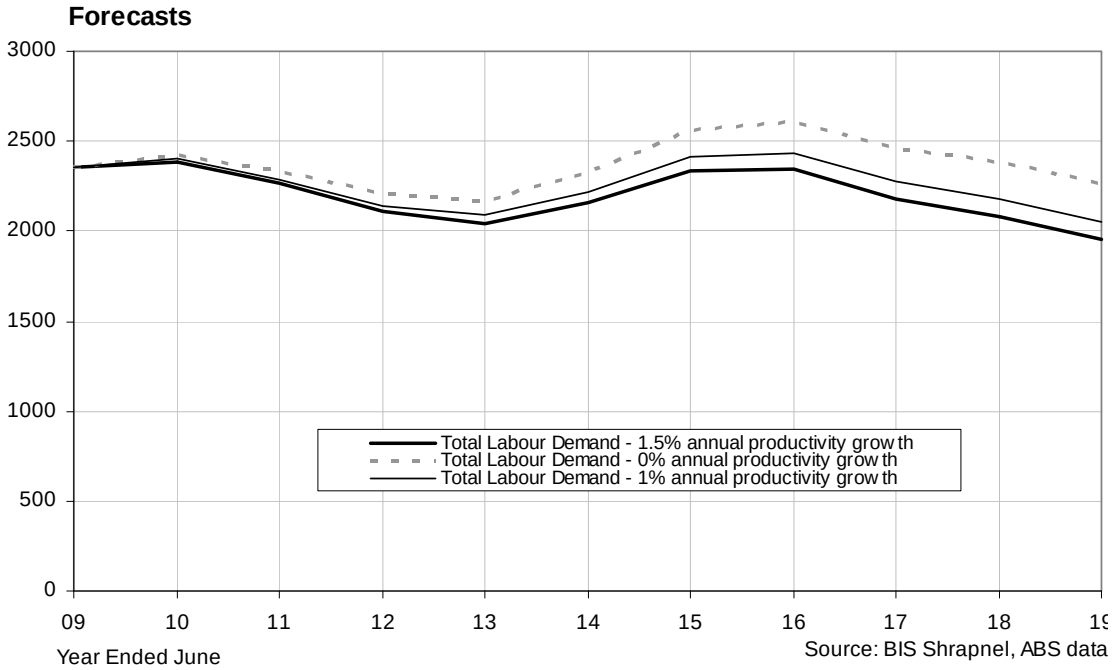


Chart 13.5: New Zealand
Forecast of Total Road Labour Demand under Different Productivity Assumptions



Workforce attrition and the workforce gap

The total skilled roads workforce *requirement* to meet future roads activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons). Our estimate of the age profile of the New Zealand roads workforce is based on our analysis of the Australian roads workforce, in conjunction with consultation with New Zealand roads authorities.

Given the estimated age profile of the current roads workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 30 per cent over the next ten years. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by additional supply if forecast levels of end use road sector activity are to be achieved. Possible sources of labour supply include:

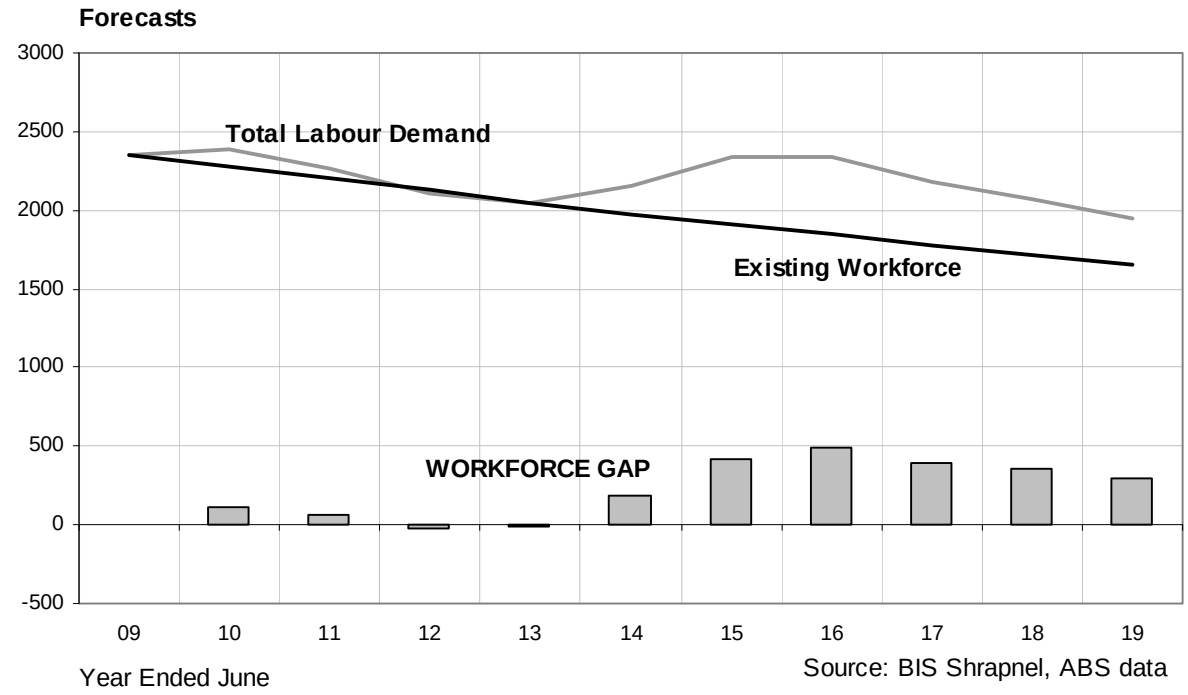
- New graduates.
- Net migration from overseas.
- Net movement of skills between industries.
- Other labour-supply boosting initiatives (e.g. re-training, productivity boosting measures etc).

While the existing skilled roads workforce is expected to decline in personnel terms, the measure of skills and experience lost is likely to be far greater given that the retirees will be concentrated in relatively "high skill/experience" occupations. This report does not attempt to quantify this, arguably greater, loss, but acknowledges that it is a key issue facing the roads sector and the broader engineering construction industry.

We note that, in the case of New Zealand, there is a substantial risk that the loss of the existing workforce from demographic change will be amplified from losses arising as employees move from roads to other industries (as roads work done declines from current peaks) or through net migration flows to Australia (given our forecasts of relatively strong growth in engineering construction activity through the coming decade). In this respect the New Zealand Department of Labour notes that "there is anecdotal evidence to suggest that approximately 30% of New Zealand graduate engineers leave the country within one to three years of graduating".[19] Apart from indicating that official graduate figures may overstate the number of engineers who are actually available to work in the engineering sector in New Zealand, this also suggests that the "attrition profile" we have developed here for New Zealand, based on demographic factors alone, may severely understate the extent of attrition through emigration.

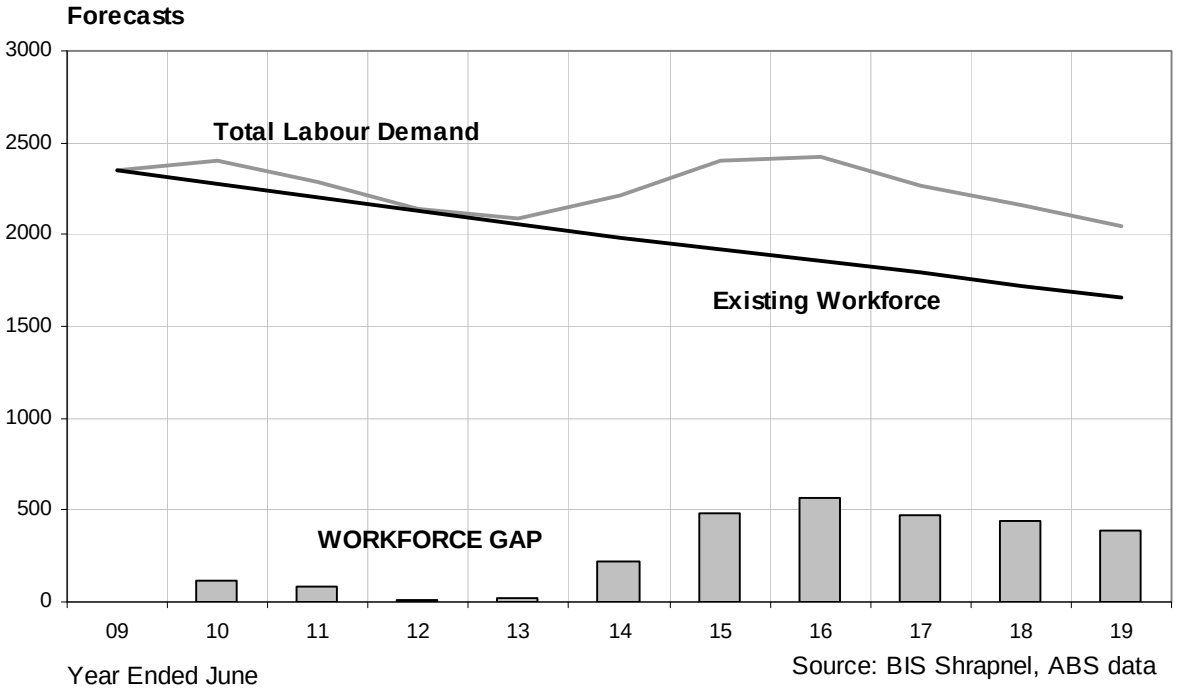
[19] Ibid, p50.

Chart 13.6: New Zealand
Total Roads Employment (1.5 per cent productivity assumption)



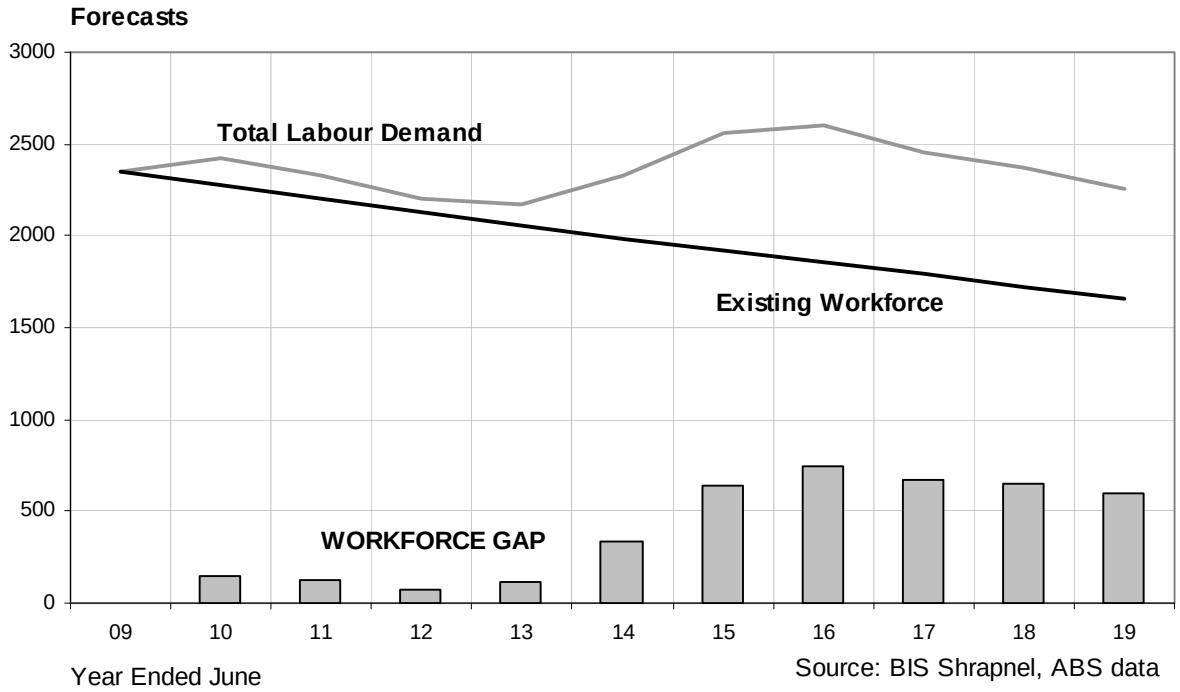
Source: BIS Shrapnel, ABS data

Chart 13.7: New Zealand
Total Roads Employment (1% productivity assumption)



Source: BIS Shrapnel, ABS data

Chart 13.8: New Zealand
Total Roads Employment (0% productivity assumption)



Overall, the workforce gap is expected to experience a trend increase over time driven by:

- Ongoing (and accelerating) attrition of the existing workforce.
- Generally rising labour demand.

For New Zealand, the workforce gap is modelled to rise sharply between 2012/13 and 2015/16 driven by:

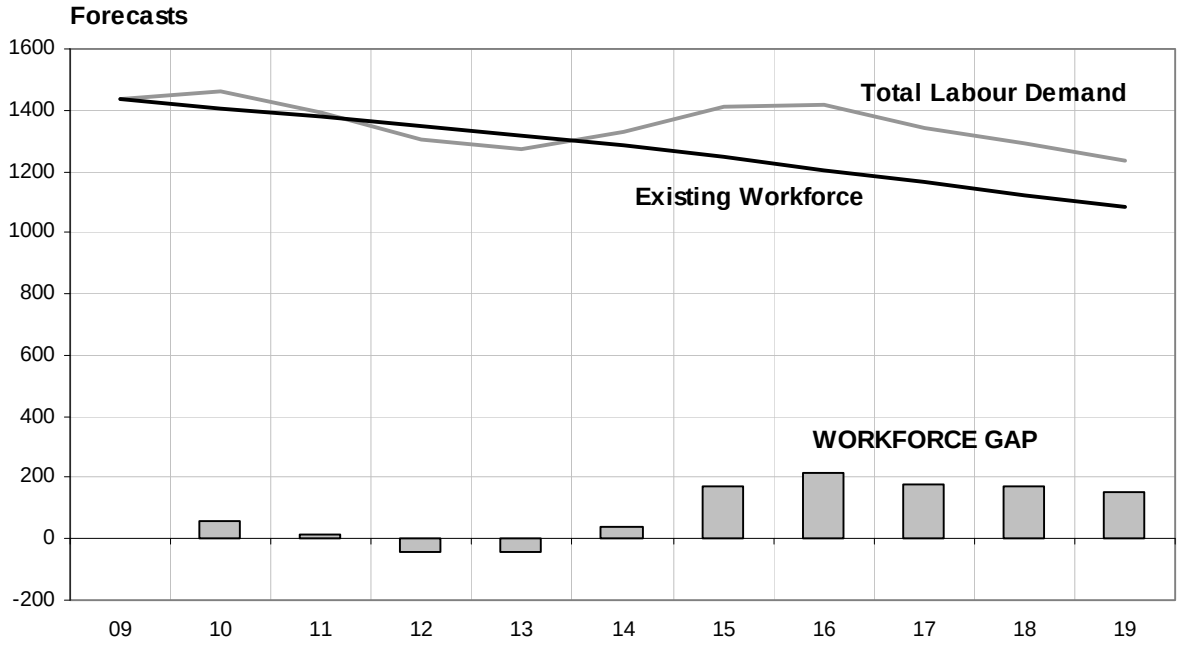
- A strong increase in planned road construction and maintenance activity under New Zealand's Land Transport Agency's current 10 year plan.
- Accelerating attrition of the existing workforce through ageing.

Following a peak in 2015/16 (at around 486 persons), the workforce gap is expected to fall back to roughly 340 persons each year to the end of the forecast period. Under weaker productivity growth assumptions, the workforce gaps become larger (see charts 13.9 to 13.11).

Strong growth in public sector funded road construction and maintenance activity over the coming decade is a key driver of the total roads outlook, with only a small impact expected from privately funded road construction (principally subdivisions and access roads). However, given our estimate of the proportion of work contracted out to the private sector, this is expected to drive demand for both private and public sector roads workforces.

The outlook for public sector workforces (assuming the current rate of contracting is sustained) is shown in Chart 13.6. Again, expected workforce attrition will result from the middle of the coming decade. We estimate that around 215 additional skilled roads employees will be required by 2015/16 to meet the peak of planned roads activity and to cover the replacement of existing employees. This figure is expected to fall back to around 153 persons by the end of the forecast period. Apart from the avenues already mentioned, the public sector could also increase its use of the private sector roads workforce (via direct recruitment, increasing the share of work it contracts out, or increasing its use of private/public partnerships) to achieve its long term skilled labour requirement.

Chart 13.9: New Zealand
Total Public Roads Employment (1.5 per cent productivity assumption)



Source: BIS Shrapnel, ABS data

Chart 13.10: New Zealand
Total Public Roads Employment (1 per cent productivity assumption)

Source: BIS Shrapnel, ABS data

Chart 13.11: New Zealand
Total Public Roads Employment (0 per cent productivity assumption)

Source: BIS Shrapnel, ABS data

Graduate supply and the capability shortfall

The total road sector's workforce gap will need to be met by additional supply if forecast levels of road sector activity are to be achieved. Possible sources of labour supply include:

- New graduates.
- Net migration from overseas.
- Net movement of skills between industries.
- Other labour supply boosting measures (such as increased productivity, reduced rates of attrition etc).

In the case of the public sector workforce gap, labour could also be sourced from the private roads sector via direct recruitment, increasing the proportion of work contracted out, or making greater use of private/public partnerships.

All of these supply sources are important in meeting future road workforce requirements. In this report, however, we have attempted to quantify only the supply of new graduates to the roads industry. Any positive difference between the total road sector workforce gap and the supply of new graduates represents the capability shortfall in the roads sector.

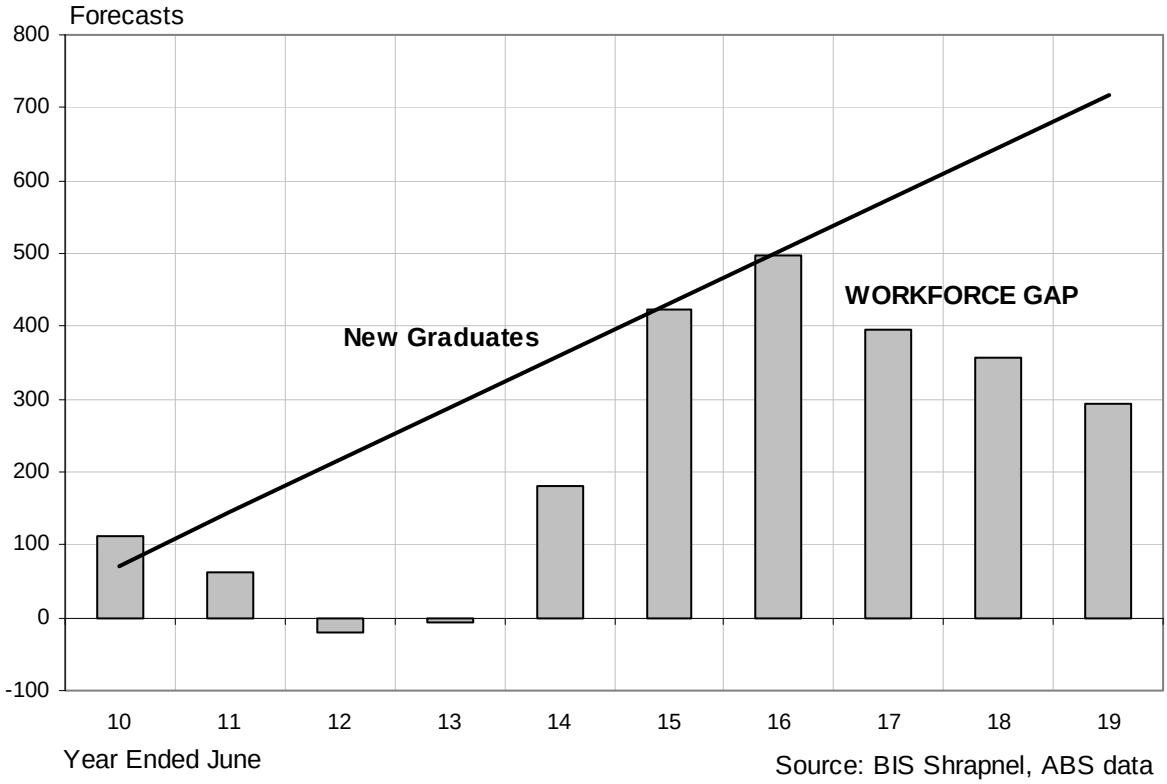
As discussed above, in quantifying new graduate supply we have chosen to use data relating to New Zealand domestic undergraduate enrolments and completions in the fields of Engineering and Related Technology, as well as Certificate IV and Diploma completions in vocational training. Given a lack of data on civil engineering and other roads-related completions within the field of Engineering and Related Technology, we have assumed that the proportion of graduates entering the roads sector is broadly similar to Australia. This equates to roughly 70 persons per annum that enter the defined skilled roads workforce in New Zealand directly from the domestic education system (for both the private and public sectors). We have assumed that this rate of graduate supply continues through the forecast period. Further research on graduate supply is required to identify, more precisely, the number of graduates that currently enter the defined skilled roads workforce, and how this number is likely to change through the forecast period.

The difference between the stream of graduate supply and the workforce gap is the capability shortfall, which is illustrated in Charts 13.7 and 13.8. The first chart projects the workforce gap and the graduate supply. The portion of the workforce gap lying above graduate supply is the estimated capability shortfall, which is shown in the second chart.

Given our projections of the workforce gap and graduate supply, we estimate that unlike Australia, New Zealand will have a capability surplus for most of the forecast period. This means that, under the assumptions used, New Zealand will have an excess supply of labour to meet projected labour demand for the decade ahead. The capability surplus is projected to reach a peak of over 400 persons by 2018/19. Under weaker productivity growth assumptions, the capability surplus is reduced (see charts 13.13 to 13.15). Under a 1 per cent productivity growth assumption, the capability surplus falls to 330 persons in 2018/19, while the surplus becomes 116 employees under a 0 per cent productivity assumption. Note that the shape of the capability shortfall curve also changes under the different growth assumptions. By applying a lower productivity growth assumption to the model, we get a capability shortfall for New Zealand over the 2015/16 to 2016/17 period.

However, we stress that this result depends crucially on the (implicit) assumption that there is no further attrition to the workforce from non-demographic factors; for instance, that demand from Australia for engineers drives a sustained net migration of engineers from New Zealand's roads sector. Net immigration data sourced from CPUR show that over the last two years, New Zealand has been able to balance its loss of architects, engineers and related professionals (predominantly to Australia) via labour from Asia. It will need to maintain this stance over the coming decade to meet workforce requirements, particularly in light of the claimed 30 per cent loss of graduate engineers within one to three years of graduation and our forecasts of relatively strong growth in engineering construction activity in Australia over the coming decade. Given this likelihood, it is quite possible that the capability surplus could turn into a shortfall if these net transfers were to be included.

Chart 13.12: New Zealand
Total Roads Workforce Gap and Graduate Supply (1.5 per cent productivity assumption)



Source: BIS Shrapnel, ABS data

Chart 13.13: New Zealand
Total Roads Net Capability Position (1.5% productivity assumptions)

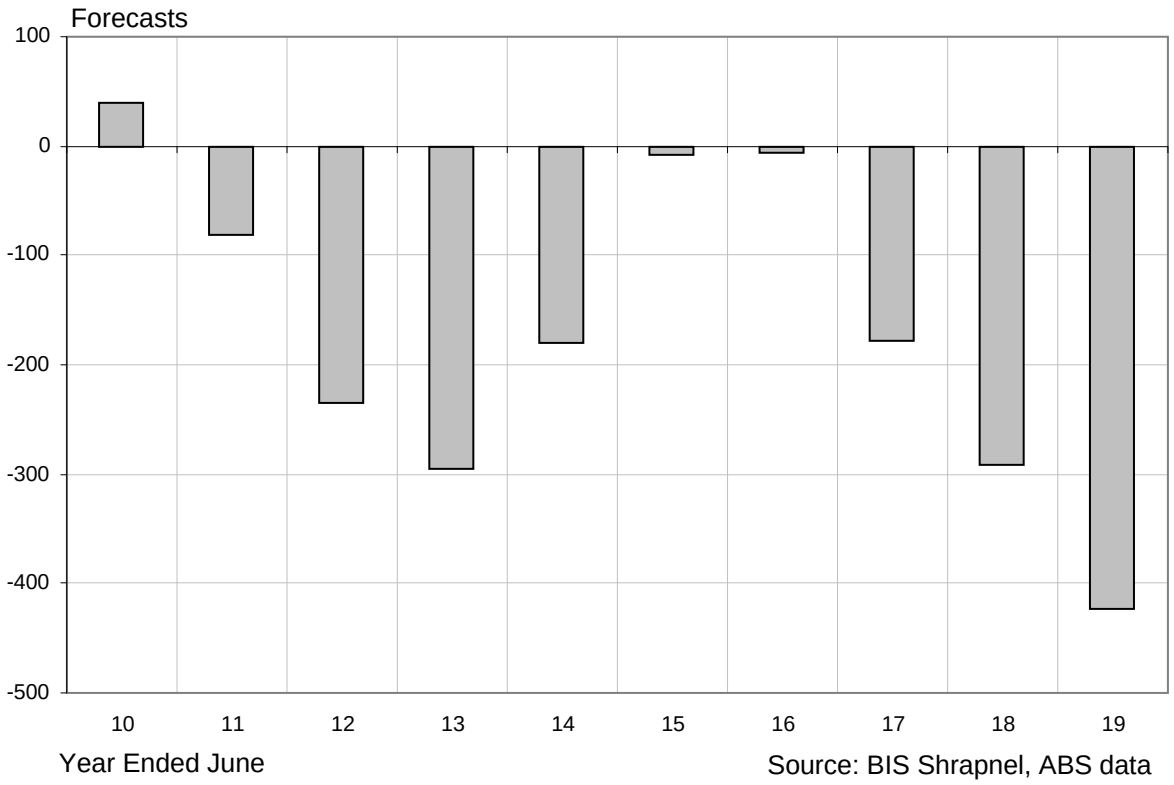
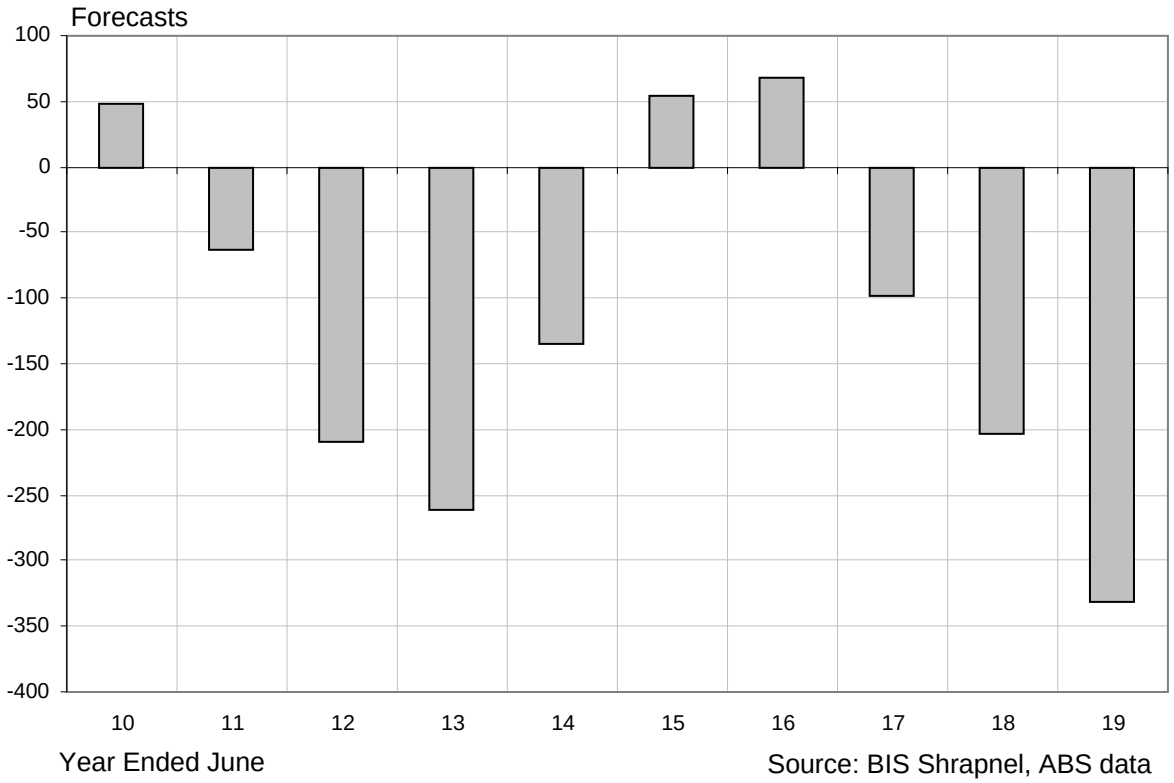
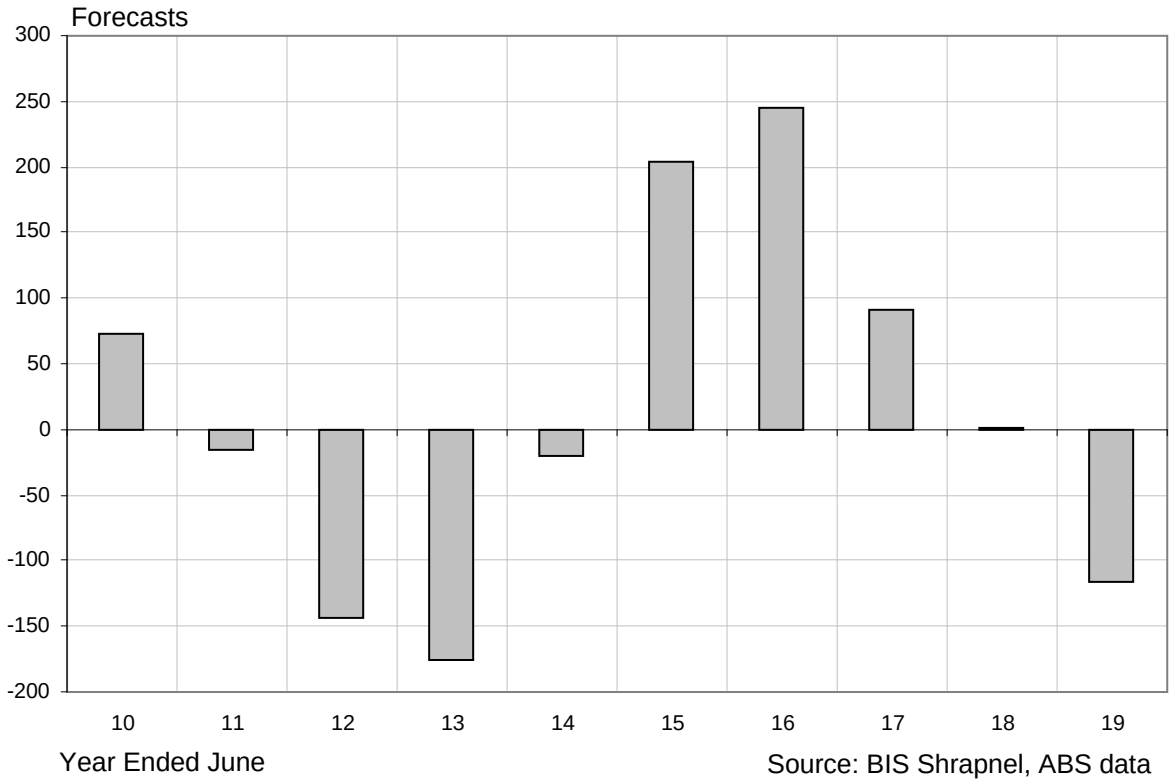


Chart 13.14: New Zealand
Total Roads Net Capability Position (1% productivity assumptions)



Source: BIS Shrapnel, ABS data

Chart 13.15: New Zealand
Total Roads Net Capability Position (0% productivity assumptions)



Source: BIS Shrapnel, ABS data

CHAPTER FOURTEEN: SUMMARY & RECOMMENDATIONS FOR FUTURE RESEARCH

14. Summary & Recommendations for Future Research

Summary

The capability model described in this report suggests that over the next six years the supply of skilled labour in the roads sector will be sufficient to cover for the expected demand for skilled labour to be generated by future road construction, maintenance and other road management activity as well as labour lost through workforce attrition. However, beyond the medium term (i.e. after the 2014/15 financial year) skilled labour supply in Australia will not be enough to meet the forecast skilled 'workforce gap' in the roads sector. The gap between the supply of, and demand for, labour in the second half of the decade ahead implies that, in theory, a capability shortfall will be prevalent in Australia in the four years to 2018/19.

However, in practice there will be no observable capability shortfall. Either labour demand will fall back to meet the constrained level of labour supply — implying that future roads activity will need to be cut back or foregone — or measures will be put in place that will boost labour supply to meet current expectations of future roads activity.

In either case, the quantification of the capability shortfall provides an important insight. First and foremost, it provides a simple measure of how much more labour is required — whether through migration, the net transfer of skills between industries or through other supply-boosting initiatives — to meet forecast demand requirements. Alternatively, the capability shortfall could also be used to measure the "cost" of the labour constraint in terms of the value of the road construction and maintenance activity foregone if supply were not augmented.

It should be noted that the demand for skilled labour in the immediate period before the capability shortfall years is most likely understated. While the capability shortfall (for the total roads sector) appears later in the decade, this does not necessarily mean that the shortfalls will be realised contemporaneously. For many occupations the demand for labour will necessarily precede the period where actual road construction or maintenance takes place (for example, the planning and design stage period leading up to the construction phase may already be upon some state authorities). This means that, ideally, labour hiring should take place well before the emergence of capability shortfalls.

With respect to the public sector in Australia, our expectation is that unlike the total roads sector (which is expected to have a negative workforce gap for most of the next five years), this sector will experience a positive workforce gap throughout the forecast horizon under 1.5 per cent, 1 per cent and 0 per cent productivity assumptions. Rising public sector funded roads activity will be the main driver of skilled roads labour demand growth over the coming decade. Notably in Australia, the expected workforce gap facing the public sector is expected to grow strongly and consistently from 2014/15 and peak at around 3,330 persons in 2017/18. This will be driven by rising construction, maintenance and other road management requirements and accelerating workforce attrition. This gap will need to be met by increasing supply from new graduates, from net migration or net transfer of skills from other industries, or by increasing the utilisation of the private sector roads workforce.

A key implication of this study is that while capability shortfalls are not expected to arrive until later in the decade, this is not the time for the roads sector to be complacent. In fact the present times represents an ideal opportunity for state authorities to build up their stocks of competent engineering professionals ahead of the expected boom.

Primarily, given the time taken to develop new engineering hires (particularly new graduates) to a point of high capability (typically 4-5 years), the model suggests that hiring should be taken now to meet the future capability requirement. This issue becomes more severe when it is also considered that the demand for engineering skills (e.g. design work, testing) tends to precede that of construction and maintenance work done. Finally, we also note that the global financial crisis has seen many private sector companies curtail their graduate intake programs for 2010. In our view, this is a mistake given future industry demand requirements, but does provide public roads authorities an opportunity to secure potentially higher quality graduates now to meet their future needs. In addition there is a real risk that if careful consideration is not given to the uptake of graduates as they leave university, then students currently considering engineering will opt for alternative careers based on the experience of current graduates. This will enlarge the capability shortfall amplitude in the future.

New Zealand, unlike Australia, will have a capability surplus for most of the forecast period. This means that New Zealand will have an excess supply of labour to meet projected labour demand for the decade ahead.

In interpreting this result, it should be noted that the model, as specified, does not consider other potential sources of graduate supply, such as net skilled migration, or a net movement of skills from other industries. However, given the likelihood of strong (and possibly sustained) demand for civil engineering skills from other countries (particularly Australia) over the forecast period, it is quite likely that the capability surplus could even turn into a shortfall if these net transfers were to be included.

Recommendations for Future Research

While the conclusions reached in this report are based on considered and detailed analysis, we have had to make several broad assumptions in the specification of model. This has been necessary because either there has been a lack of adequate data in some areas, or because investigating the assumptions in finer detail would require further research outside the scope of this report.

In this respect, improving upon the specification of the model through the choice of assumptions used would be a useful avenue for future research. Ideally, the model developed here could be improved upon and run again periodically to assess if the capability outlook has changed. Furthermore, this model could conceivable be extended to consider other sectors of the economy, or other occupations within the roads sector.

Based on the work undertaken for this report, we feel that further research in the following areas would yield substantial benefits for the capability analysis:

- **Focus on capability by occupation skills.** As discussed, the model specifies a capability shortfall or surplus in terms of personnel numbers, not skills or experience. In future analysis, it may be useful to focus on skills and experience, especially considering the impact of workforce attrition through ageing. This could be done by establishing an age and experience profile of the workforce (in years) by occupation. With more detailed research, this could then allow the determination of a “skills capability shortfall” by occupation group.

- **Local council skilled workforce.** Our estimate of the current size of the public sector skilled workforce is predominantly based on estimates provided by the various state road authorities and the share of local road construction in total road and bridge construction activity. To get a closer approximation of the size of this workforce, we need to source from the local councils the number of their skilled employees as defined in our set occupation list. Knowledge of this data would allow one to better estimate the size of the existing public sector skilled workforce. We note, however, that our estimates of the public sector workforce seem very reasonable in light of engineering information supplied by State Road Authorities and the Institute of Public Works Engineering Australia (IPWEA).

- **Consider demand from other sectors.** Given time and cost constraints, the model currently does not consider the net flow of labour between the roads sector and other construction sectors or between Australia and New Zealand and the rest of the world. However, BIS Shrapnel does produce detailed forecasts of activity across all other building and construction sectors in Australia, as well as forecasts of economic and construction activity in New Zealand and other countries. Using an expanded fixed coefficient demand forecasting model, it may be possible to model explicitly the net transfer of labour between different construction sectors based on forecast activity.

- **Education data.** Despite making use of CPUR data, we still have not been able to adequately define the number of graduates entering the skilled roads workforce (as defined) each year in Australia or New Zealand. While we have made reasonable assumptions regarding the flow of graduates into the roads sector, the results are sensitive to whatever assumptions are made. In particular, the current method of estimating graduate flows to the roads sector may understate the influence of any booming engineering construction sectors in the medium term (particularly those linked to mining activity) and, consequently, may understate the size of the capability shortfall. In future analysis, it may be useful to include a survey of final year students to better understand the destination sectors of new graduates.

- **Census data.** The current skilled roads workforce is based on a projection from 2006 Census data. Given the gap between the Census year and the timeframe of this analysis, the estimation of the initial roads workforce is subject to error.

- **Immigration data.** While we have utilised statistics from CPUR and elsewhere relating to the number of engineers that move between Australia and overseas, there is relatively little information on the impact of net migration on engineers in the roads sector specifically. This would require further research, but could help determine the feasibility of relying on immigration to fill a growing capability shortfall in the future.

- **Usage coefficients and workforce "rules of thumb".** In determining the demand for labour from roads activity, BIS Shrapnel initially proposed researching and developing industry "rules of thumb" that would specify the quantity of labour by occupation group per unit of construction or maintenance activity. In the model, however, given time and cost constraints we have generated these "rules of thumb" by dividing our estimate of the roads workforce by the volume of measured roads activity, However, in the meantime, some progress has been made on deriving rules of thumb from industry sources. It may be useful, in future analyses, to compare the outcome of the model using these industry sources and to test the sensitivity of the model coefficients used.

- **Extension of the model to other occupations in the roads sector.** Given the project brief, this model was predominantly focused on engineering skills in the roads sector. However, it may be possible, using the same methodology, to extend the model in future to other occupations in the roads sector, including the engineering trades, plant and machine operators and labourers.

- **Extension of the model to other sectors.** Given the relative paucity of supply side data for the roads industry specifically (e.g. education and migration flows), the mobility of engineers between industries, and the developing trend in Australia to merge Roads Departments into wider Transport portfolios, there may be some benefit in broadening the frame of reference for this study to cover more than just road sector demands. In future, it may be worthwhile to embed an outlook for roads within a broader analysis of the civil construction and maintenance market. While this would involve a much larger scope and cost, the outcome of such an analysis would be extremely relevant to a broad range of public sector departments and organisations (e.g. Departments of Transport, Energy and Education) as well as private companies, and would help inform a broader debate on meeting engineering skills requirements across the industry as a whole.

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