JULY 2018

# SYDNEY METRO WEST:
## ACCESSIBILITY MODELLING

Measuring the impact of travel times and station location on job and housing accessibility

The Committee for Sydney

SYDNEY BUSINESS CHAMBER

SGS Economics & Planning | Independent insight.

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# EXECUTIVE SUMMARY

The Committee for Sydney, Sydney Business Chamber and the Sydney Business Chamber, Western Sydney commissioned SGS Economics and Planning to undertake high-level modelling to understand the potential population and job distribution impacts of the Sydney Metro West in the context of Metropolitan strategic planning and transport policy.

Alternative scenarios with different travel time, route and station combinations have been considered in the SGS modelling, which has been undertaken at a Greater Sydney metropolitan level to understand the city-wide impacts of the Sydney Metro West project.

Scenarios focusing on travel times between Parramatta and Sydney CBD of 15, 20 and 25 minutes were assessed. The 15-minute scenario included five core stations along the route. As additional stations are included in the Inner West the route travel times increased.

The modelling identified the potential of each scenario to generate employment and housing uplift along the corridor. The modelling is a 'top down' perspective and did not consider development or built form capacity constraints to accommodate uplift around stations.

The analysis of effective job density and accessibility improvements in the Parramatta to Sydney CBD corridor shows that the project provides a range of benefits depending on the travel time and the number of stations included.

With a fast 15-minute travel time between Parramatta and Sydney CBD (with fewer stations) the benefits of the project are focussed on uplift and improved accessibility to Greater Parramatta and Olympic Park, thereby contributing most significantly to the integration of job-rich centres and the achievement of agglomeration economies supportive of the economic development of Greater Parramatta. This scenario also preserves the potential for a fast connection (e.g. 30 minutes) to Western Sydney Airport from Sydney CBD via Parramatta. As the travel time along the route increases to 20-25 minutes with more stations included, the benefits shift toward uplift and urban renewal opportunities in the Inner West.

Sydney Metro West has the potential to be a city-shaping transport investment supporting the three cities vision of the NSW Government for Greater Sydney, which is about 'rebalancing' jobs and activity concentrations from the eastern Sydney CBD and Eastern Harbour City towards the Central River City focussed on Greater Parramatta and, in future, the Western Parkland City.

Maintaining the fastest possible travel time along the Sydney Metro West route between Parramatta and the CBD is crucial to realise this vision. Although increasing the number of stations along the route will provide benefits, including the urban renewal of inner-western Sydney and help in addressing existing capacity constraints, with more stations included and related slower travel times the city shaping benefits of Sydney Metro West are likely to be diluted.

# 1. INTRODUCTION

**The Committee for Sydney, Sydney Business Chamber and the Sydney Business Chamber, Western Sydney have commissioned SGS Economics and Planning to undertake some high-level modelling to better understand the potential population and job distribution impacts of the Sydney Metro West in the context of Metropolitan strategic planning and transport policy.**

SGS understands that the Sydney Metro team is currently assessing options for the alignment and location of stations. Alternative scenarios with different travel time, route and station combinations have been considered in the SGS modelling, which has been undertaken at a Greater Sydney metropolitan level to understand the city-wide impacts of the Sydney Metro West project.

Several core stations have been identified as well as other potential station locations as discussed in sections 1.2 and 2.1 of this report.

The location and number of stations will have an impact on intermediate and end-to-end travel times on the line and this report details analysis comparing various options for the line.

## 1.2 GREATER SYDNEY PROJECT CONTEXT

The NSW Government's vision for Greater Sydney is laid out in the Greater Sydney Region Plan[1]. It proposes the transformation of Greater Sydney into a metropolis of three cities:

- The Western Parkland City, focused on the future Western Sydney Airport at Badgery's Creek.
- The Central River City, focussed on Greater Parramatta and the corridor between Westmead and Sydney Olympic Park (GPOP).
- The Eastern Harbour City focussed on the Sydney CBD and the Eastern Economic Corridor between Macquarie Park and the Airport.

This vision is consistent with the long held aim for a polycentric city that addresses the imbalance in access to jobs created by the location of the Harbour CBD on the eastern edge of Greater Sydney, where "its concentration of 500,000 jobs is reinforced by its radial rail network and by the concentration of economic activity".[2] The aim to develop 'rebalancing' job and activity concentrations in the Central River City focussed on Greater Parramatta and the Western Parkland City will depend on city-shaping transport investments such as that proposed by the Sydney Metro West. These transport investments can foster enhanced agglomeration economies whereby jobs and business activity are integrated and better linked by much faster travel times and connections. The international literature shows that mass transit services make a fundamental contribution to achieving these agglomeration economies by increasing the 'effective job density' of cities, where more jobs can be accessed through reduced travel times. Business-to-business connections and labour-to-business connections are facilitated with an enhanced productivity dividend. As a result, public transport improvements between Sydney's three cities — the Eastern Harbour City,

1 Greater Sydney Commission (2018) Greater Sydney Region Plan: a Metropolis of Three Cities
2 Ibid, p.6

Central River City and Western Parkland City — are therefore also part of Transport for NSW's Future Transport Strategy 2056.

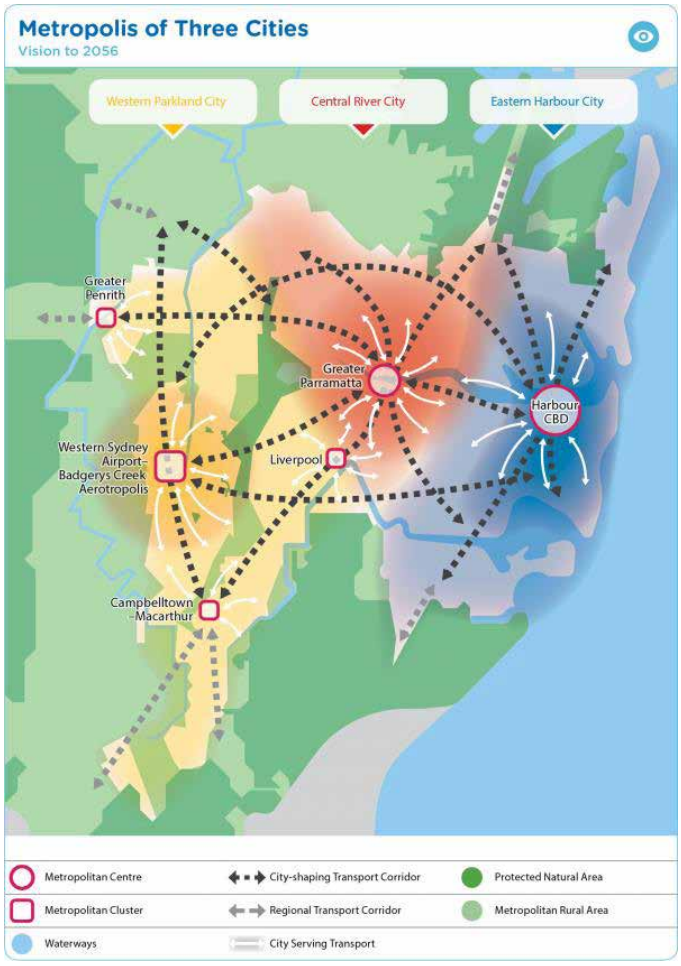
The Future Transport Strategy outlines that planning and investment for Greater Sydney will focus around the three cities. Customers will be able to travel to one of these cities or to their nearest strategic centre within 30 minutes of where they live by public or active transport. This will give people better access to jobs, education and essential services.

The strategy is based on the planning and provision of corridors to support the 30-minute city. Corridors in Greater Sydney are considered in the following hierarchy:

- **City-shaping corridors** — major trunk road and public transport corridors providing higher speed and volume connections between our cities and centres that shape locational decisions of residents and businesses.
- **City-serving corridors** — higher density corridors within 10km of metropolitan centres providing high-frequency access to metropolitan cities/centres with more frequent stopping patterns.
- **Centre-serving corridors** — local corridors that support buses, walking and cycling, to connect people with their nearest centre and transport interchange.

The Sydney Metro West corridor connecting the Sydney or 'Harbour CBD' and Greater Parramatta is one of city-shaping corridors as shown in Figure 1. Sydney Metro West is a committed Greater Sydney initiative under the Future Transport Strategy. It is also supported by projects such as the Parramatta Light Rail to enable travel to access the corridor.

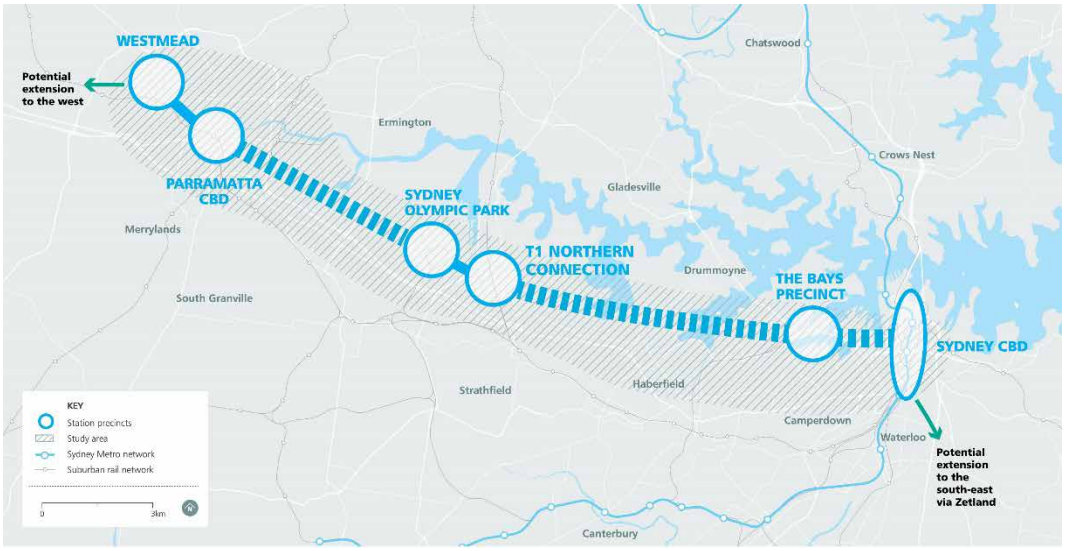
**FIGURE 1: METROPOLIS OF THREE CITIES**




Source: Transport for NSW, 2018

Figure 1 shows a further city-shaping corridor between Parramatta and the Western Sydney Aerotropolis, connecting the main centre in the Central River City with the main centre in the Western Sydney Parkland City. To support this city-shaping corridor, an initiative for investigation in the next 10 years is a rail link between Parramatta and Western Sydney Airport — Badgerys Creek Aerotropolis. Effectively, this link and the Sydney Metro West project provide a direct linkage between the three major centres of each city in the metropolis.

**FIGURE 2: SYDNEY METRO WEST PROJECT CORRIDOR AND CORE STATION LOCATIONS**




Source: Sydney Metro Authority, 2018

## 1.3 SYDNEY METRO WEST PROJECT

Sydney Metro West is the proposed extension to the Sydney Metro Network. It is designed to connect Parramatta and the Sydney central business districts and increase rail capacity and reduce travel times between these centres. Depending on the choice of station locations, the line would provide new high-capacity public transport to areas between Parramatta and Sydney CBD that currently lack easy access to existing Sydney Trains services.

Figure 2 shows the proposed project corridor and the location of key stations.

Currently the following stations are proposed on the line:

- Westmead
- Parramatta CBD
- Sydney Olympic Park
- T1 Northern Connection (either Concord West or North Strathfield stations)
- The Bays Precinct
- Sydney CBD

Further stations are being considered, and locations for these are discussed in the scenario development section of this report.

The line is proposed to connect to the T1 Western Line at either Parramatta or Westmead for transfer to Blue Mountains services and to the T1 Northern Line at the T1 Northern Connection station, to be located at either Concord West or North Strathfield.

The location of the station in the Sydney CBD is to be determined but is likely to align with stations for the Sydney Metro City and Southwest line to allow for interchange.

The line is also being considered for further connections to the south-eastern suburbs of Sydney via Zetland and west towards the proposed Western Sydney Airport.

The stated benefits of the project, again from a transport perspective, according to Sydney Metro are:

- Doubling rail capacity between Parramatta and the Sydney CBD.
- Linking new communities to rail services.
- Unlocking housing supply and employment growth between the two CBDs.[3]

From a land use and city-shaping perspective, as discussed above, the benefits relate to the enhanced agglomeration economies generated by faster connections between key nodes and concentrations of employment, particularly those at Westmead, Parramatta, Sydney Olympic Park and the Sydney CBD. The long-held ambition for the 'River City' of Greater Parramatta to be the 'second CBD' and major business hub for Western Sydney is closely linked to enhancing its accessibility to high value jobs and business services in the Sydney CBD or Harbour City, in turn enabling the creation of high value jobs in Western Sydney.

3 Sydney Metro, March 2018, ***Sydney Metro West Project Overview March 2018, https://www.sydneymetro.info/sites/default/files/document-library/Sydney-Metro-West-Project-Overview-March-2018.pdf***

# 2. SCENARIO DEVELOPMENT

## 2.1 STATION IDENTIFICATION

Based on consultation with the Sydney Metro West project team, and a review of publicly available information (as discussed in section 1) several locations were identified for metro stations.

SGS has allocated the stations into three categories as follows:

- Core Stations
- Tier 2 Stations
- Tier 3 Stations

### Core Stations

Core stations are those considered essential to the project based on the stations identified by the project team and serve major catchment areas along the corridor and are adjacent or connected to existing Sydney trains services. These include:

- Westmead
- Parramatta CBD
- Sydney Olympic Park
- T1 Northern Connection
- The Bays Precinct
- Sydney CBD

### Tier 2 Stations

Tier 2 stations are those initially identified as potential stations in publicly available documentation and those which provide access to predominantly already developed areas with limited public transport access. Tier 2 stations are considered to have an independent catchment to Core Stations and provide additional urban renewal opportunities.

Tier 2 stations are:

- Rydalmere/Camelia
- Burwood North
- Five Dock
- Pyrmont

### Tier 3 Stations

Tier3 stations are those identified as potential stations based on consultation with Sydney Metro that have been raised in public consultation. Like Tier 2 stations, these stations provide access to predominantly already developed areas with limited public transport access. Tier 3 stations have a similar geographic overlap and catchment with Tier 2 stations. Tier 3 stations are in catchments with significant urban renewal opportunities.

Tier 3 stations are:

- Silverwater
- Kings Bay
- Lilyfield

## 2.2 SCENARIOS

Consideration of travel times between Parramatta and CBD is a major factor in scenario development. Three scenarios were developed for this travel time to be 15/20/25 minutes in conjunction with the metro station assumptions.

Scenario 4 is a hybrid scenario involving the provision of all stations along the line with an 'All-Stops' service travel time of 25 minutes operating in conjunction with an express 15-minute service operating at Core Stations only.

A summary of the assumptions around the travel time and associated stations for Scenarios 1-3 is shown in Table 1.

**TABLE 1: SCENARIO STATION SUMMARY**

| | | Scenarios | | |
|---|---|---|---|---|
| Station Name | Station Category | 1. 15-minute Travel Time | 2. 20-minute Travel Time | 3. 25-minute Travel Time |
| Westmead | Core | ✓ | ✓ | ✓ |
| Parramatta | Core | ✓ | ✓ | ✓ |
| Rydalmere/Camelia | Tier 2 | | ✓ | ✓ |
| Silverwater | Tier 3 | | | ✓ |
| Olympic Park | Core | ✓ | ✓ | ✓ |
| T1 Northern Line | Core | ✓ | ✓ | ✓ |
| Burwood North | Tier 2 | | ✓ | ✓ |
| Kings Bay | Tier 3 | | | ✓ |
| Five Dock | Tier 2 | | ✓ | ✓ |
| Lilyfield | Tier 3 | | | ✓ |
| Bays Precinct | Core | ✓ | ✓ | ✓ |
| Pyrmont | Tier 2 | | ✓ | ✓ |
| CBD (Wynyard) | Core | ✓ | ✓ | ✓ |
| No. Stops | | 6 | 10 | 13 |

Source: SGS, 2018

## 2.3 STATION LOCATION AND ROUTE ALIGNMENT

SGS has located stations along the line based on publicly available information on the project as well as assumptions to the best location for further stations under consideration.

These locations and the presumed corridor are shown in Figure 3.

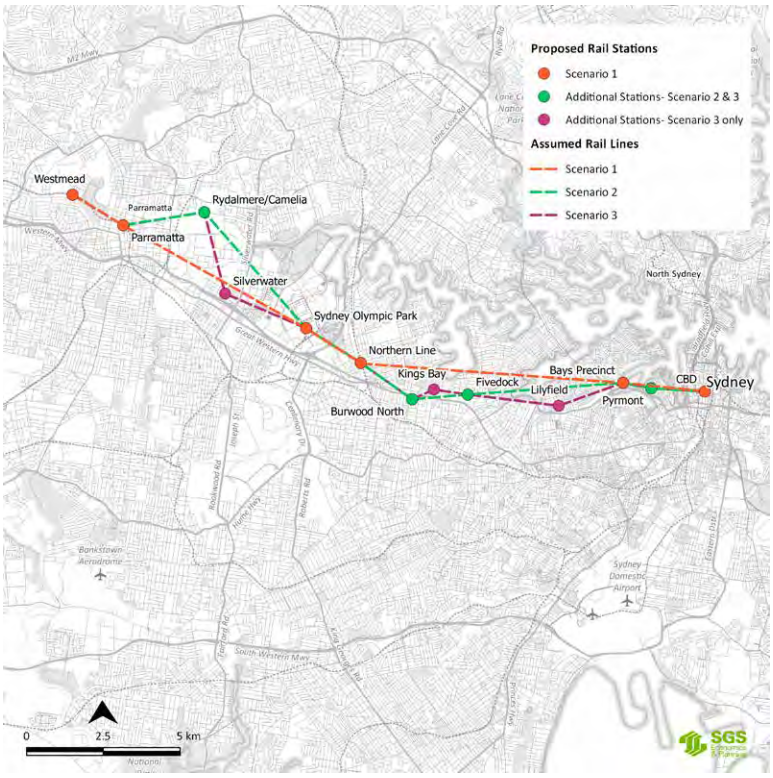



**FIGURE 3: METRO WEST STATION LOCATIONS**

Source: SGS, 2018

## 2.4 TRAVEL TIMES

The key component of the project is the ability to reduce travel times between Parramatta and the Sydney CBD.

Currently, the journey time in the AM peak via the T1 western line is 32 minutes. In addition, the journey time from the T1 Northern Line to the CBD is approximately 25 minutes. A comparison of the current and potential travel times is shown in Table 2. This shows that the Metro project can potentially half the travel time between Parramatta and the CBD and more than half the time between the T1 Northern Line at Strathfield or Concord West.

As shown in Table 2, the average speeds are quite high for a Metro rail system. The straight-line distance from Parramatta to the Sydney CBD is approximately 20km. To complete this journey in 15 minutes this represents an average speed of 80km/h, inclusive of stop time where the trains are stationary.

Assuming an average stop time of 30 seconds, with the 15-minute city travel time, the average running speed would be approximately 90 km/h which is higher than comparable metro rail systems around the world. For example, the Tokyo metro can operate at running speeds of 80km/h, exclusive of stopping time.[4]

A review of the Sydney Metro website specifies a 7-minute journey between Crows Nest and Martin Place for the City and Southwest metro. This represents an overall speed, including stops of 60km/h (assuming a distance of 7km, accounting for track curvature), which is more in line with Scenario 2, or a 20-minute city travel time.[5]

**TABLE 2: JOURNEY TIME COMPARISONS**

| | Current | | Scenario 1 | | | Scenario 2 | | | Scenario 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Speed | Time | Saving | Speed | Time | Saving | Speed | Time | Saving | Speed |
| Parramatta to CBD | 32 | 38 | 15 | 17 | 80 | 20 | 12 | 60 | 25 | 7 | 48 |
| T1 Northern to CBD | 26 | 25 | 8 | 18 | 83 | 11 | 15 | 60 | 15 | 12 | 46 |

Time = mins, Speed = km/h

Source: SGS, 2018, Sydney Trains, 2018

## 2.5 MODELLING ASSUMPTIONS

### Land Use

SGS has used available Transport for NSW land use for the analysis of the Sydney Metro West.

The 2031 forecast year has been chosen as it aligns with the proposed late 2020s opening for Sydney Metro West. The 2031 forecast is based on the Transport Performance and Analytics (TPA) LU16 forecast. Table 3 shows a summary of the Top 10 SA2s by employment in Sydney according to the LU16 data, which shows Sydney well above other SA2s with Parramatta with the second highest number of jobs.

**TABLE 3: 2031 TOP 20 SYDNEY SA2S BY EMPLOYMENT**

| RANK | SA2 | EMPLOYMENT |
|---|---|---|
| 1 | Sydney - Haymarket - The Rocks | 426,709 |
| 2 | Parramatta - Rosehill | 90,685 |
| 3 | Macquarie Park - Marsfield | 71,107 |
| 4 | North Sydney - Lavender Bay | 70,630 |
| 5 | Pyrmont - Ultimo | 47,993 |
| 6 | Homebush Bay - Silverwater | 43,134 |
| 7 | St Leonards - Naremburn | 38,584 |
| 8 | Surry Hills | 36,875 |
| 9 | Chatswood (East) - Artarmon | 35,469 |
| 10 | Baulkham Hills (West) - Bella Vista | 34,848 |

4 https://www.railway-technology.com/projects/tokyo-metro-kanto-japan/
5 https://www.sydneymetro.info/station/crows-nest-station

## Application of Travel Time Savings

Travel time savings have been estimated based on expected timetables for the Sydney Metro West in each scenario. SGS has used travel matrices from TPA for the analysis.

The locations that were considered for improvement were derived from the SA2 areas in which each station is located as well as SA2 areas within a 1km radius of a station. These locations were considered as benefiting from the Metro West. An allowance for walk time to the station was included. A summary of how the travel time was applied is shown in Table 4.

**TABLE 4: MODELLING IMPACTS OF SYDNEY METRO STATION ON ACCESSIBILITY (PUBLIC TRANSPORT)**

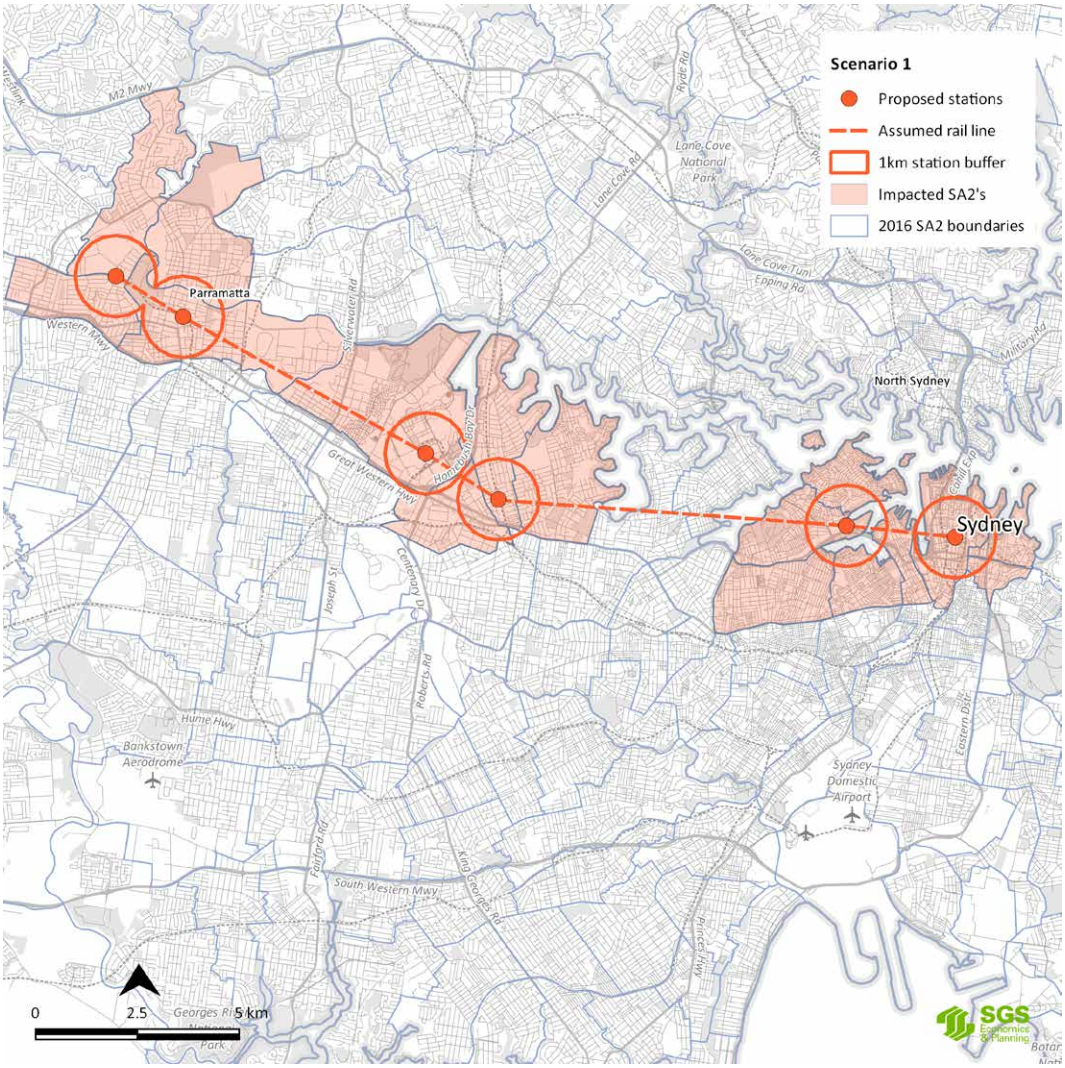
| Origin SA2 | Destination SA2 | Improvement to accessibility | Rationale |
|---|---|---|---|
| Metro Stations | to Metro Stations | Based on Station Travel Time Matrix | Timetabled potential savings |
| Metro Stations | to Metro Stations (within a one-kilometre walking radius) | Based on Station Travel Time Matrix with adjustment for getting to the station | Timetabled potential savings coupled with station access |
| Non-metro locations of Sydney | to Metro Stations | No change | The uplifts would not be significant enough to induce any observable land use changes. |
| Non-metro locations of Sydney | to non-metro locations of Sydney | No change | The uplifts would not be significant enough to induce any observable land use changes. |

The impacted SA2s for each scenario are shown in the following figures. It should be noted that the SA2s impacted changes for each scenario depending on the station provision. With the addition of more stations in the Inner West region in Scenario 3, there are instances of 2 stations existing in the same SA2. The application of savings has been adjusted to provide an appropriate reflection of travel time savings in this case.

A further refinement of the analysis would be to consider follow on effects of the benefits to regions further away from each station, up to a 2km radius with reducing benefits. This has not been undertaken at this stage as the analysis focused on the immediate corridor.

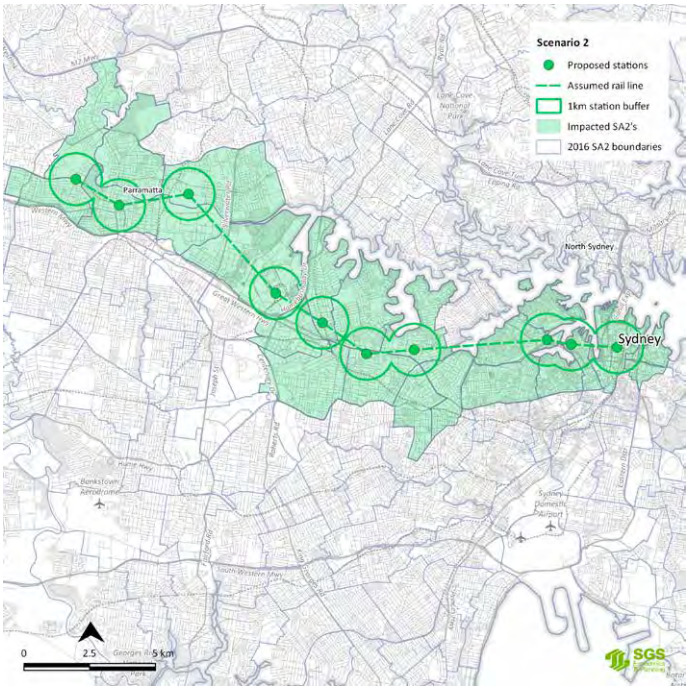
In addition, more detailed information around station locations could assist in refining the travel time assumptions including access time to the station for all areas.

## FIGURE 4: 15-MINUTE TRAVEL TIME IMPACTED SA2S



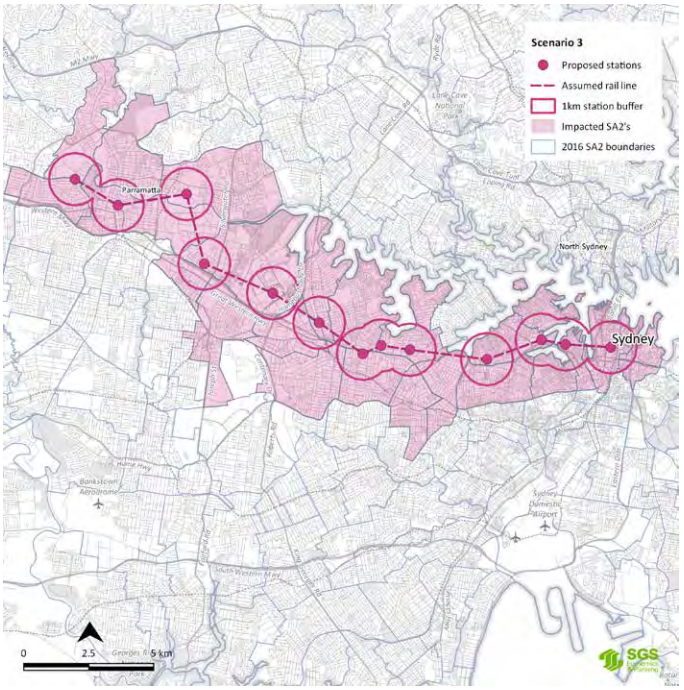

Source: SGS, 2018

## FIGURE 5: 20-MINUTE TRAVEL TIME IMPACTED SA2S




Source: SGS, 2018

## FIGURE 6: 25-MINUTE TRAVEL TIME IMPACTED SA2S




Source: SGS, 2018

# 3. MODELLING METHODOLOGY: ACCESSIBILITY IMPACTS

## 3.1 ACCESSIBILITY CHANGES LAND USE ACTIVITY

SGS has transport and policy experience spanning 25 years. We know that:

- Modern, knowledge-intensive industries benefit greatly from having strong connections and access to other businesses.
- Households **prefer** locating where access to employment opportunity is high.
- Investment in transport infrastructure can influence business and household location decisions, leading to an intensification of land use activity where new stations or arterial roads are constructed.
- In a metropolitan region, an intensification of projected land use activity in one location should be offset by foregone growth in other locations – simply stating that a centre will attract more jobs and dwellings is only part of the story.
- Understanding how employment and housing uplifts interact with each other is important as they can lead to second round impacts that further accentuate growth potential.
- Once this is understood, local planning and economic development initiatives can then help to capitalise on these benefits.
- Additional land use demand generated by increased accessibility also increases the price of land, generating competing interests which need to be carefully managed with zoning, floorspace ratios and other supply side land use controls.

## 3.2 EFFECTIVE JOB DENSITY

SGS has developed, and used for several years, a spatial index of this agglomeration phenomena which is referred to as Effective Job Density (EJD). EJD is a measure of the relative concentration of employment, derived from the density and accessibility of all jobs across a region.
It considers:

- travel time from location a to location b; and
- number of jobs at location b: (sourced from 2011 Census).

$$EJD_{\text{at a}} = \sum_{a}^{n} \frac{\text{Jobs}_{\text{at b}}}{\text{Travel time}_{\text{a to b}}}$$

## SGS Transport Impact Model

The SGS Transport Impact Model is a strategic modelling package specifically designed to forecast land use changes in response to proposed transport infrastructure projects and resultant shifts in accessibility across a city.

Created to inform policy makers on how transport infrastructure can transform land use across the entire city, the model transcends beyond isolated centre-by-centre assessments towards a holistic city-wide approach.

The SGS Transport Impact Model has four components:

1. **Access improvement.** This includes (a) modelling the improved travel times in affected locations where the infrastructure is being constructed and (b) understanding how that improvement changes the relative accessibility of housing and employment opportunities across the metropolitan region.
2. **Employment uplift.** Research has shown that improvements to travel time and accessibility increases the Effective Job Density (EJD) of an area. SGS has quantified this relationship and the employment uplift can therefore be modelled. The shift in jobs can be quantified by job type: Knowledge Jobs, Health and Education, Population Serving and Industrial.
3. **Dwelling uplift.** Similar to employment, households are also attracted to locations where access to employment is strong. This relationship has also been quantified for use in the model. A change in dwellings also produces a secondary effect on population serving jobs.
4. **City-wide redistribution.** Maintaining a constant level of employment and housing city-wide. Any uplift with changes to accessibility is re-distributed from other metropolitan locations.

The accessibility model considers impacts from the EJD changes in two rounds as discussed below. It should be noted that development capacity to accommodate land use impacts is assumed and has not been tested.

### First-round impacts

The following assumptions inform the first-round impacts:

- The SA2s which are expected to be impacted by Sydney Metro West were identified as detailed in section 2. Some manual adjustments were made to ensure anomalous exclusions/inclusions were avoided.
- The improvement to travel time and accessibility was used to calculate EJD (see section 3.2).
- Regressions were conducted to determine how changes in EJD relate to employment (by industry) and household concentration across the metropolis.
- The relationships between EJD, employment and household, as well as subsequent changes were measured using historical data over the periods of 1996, 2001, 2006 and 2011.
- The relationships were quantified using coefficients for every Australian and New Zealand Standard Industrial Classification (ANZSIC) industry as well as for households.
- The model applied those coefficients to TPA LU16 base forecasts.

It is noted that the relationship coefficients between EJD (by industry), households and employment used in the modelling have not incorporated the 2016 census information to date. It should be noted that the TPA LU16 forecasts which are used in the modelling are based on the 2011 census. Updating to incorporate additional data from the 2016 census would be useful but would not fundamentally change the direction or size of any coefficient and hence the results of the modelling.

The trends and behaviours assumed and revealed in the modelling draw from many years of data and are consistent with other research and cities where updated information has been used.

### Second-round impacts

In the second-round impact, more local residents result in more population serving employment in the local area (retail, healthcare, service industry etc.).

In the long term, a greater concentration of people living in an area eventually also attracts more jobs. The second-round impacts were calculated as follows:

- Another correlation was calculated between the number of households in an area and the levels of population serving employment by industry.
- A second round of shifts was applied, which tends to boost health, education type jobs.

# 4. MODELLING RESULTS

## 4.1 EJD ANALYSIS

The outputs of the modelling have been mapped to illustrate the impacts of the respective scenarios.

The EJD uplifts in the impacted SA2s have been capped at the current level of the Sydney CBD. The preliminary EJD analysis showed significant uplift in the Bays Precinct and Pyrmont regions, such that they overtook the Sydney CBD as the most attractive for employment by EJD. While we believe the project is likely to have a significant impact, it is unlikely to shift the public transport centre of Sydney away from the Sydney CBD. In lieu of detailed transport modelling we capped EJD at the Base Case CBD level while allowing the Sydney CBD EJD to increase, maintaining its hierarchy in the transport and employment ecosystem.

Table 5 shows a summary of the EJD by scenario for the major station locations. It shows that the Bays Precinct and Pyrmont both get significant EJD uplift with the provisions of stations in their area. These areas are currently not serviced by high-speed mass transit and therefore received a significant benefit with the project.

With the 15-minute travel time scenario the benefits are centred around Westmead/Parramatta/Sydney Olympic Park and the T1 Northern Line connection. These benefits are reduced as more stations are provided east of the T1 Northern Line in the 20-minute and 25-minute scenario.

The provision of more stations east of the T1 Northern Line increased the attractiveness of the Sydney CBD and refocusses the benefits of EJD to the Sydney CBD area.

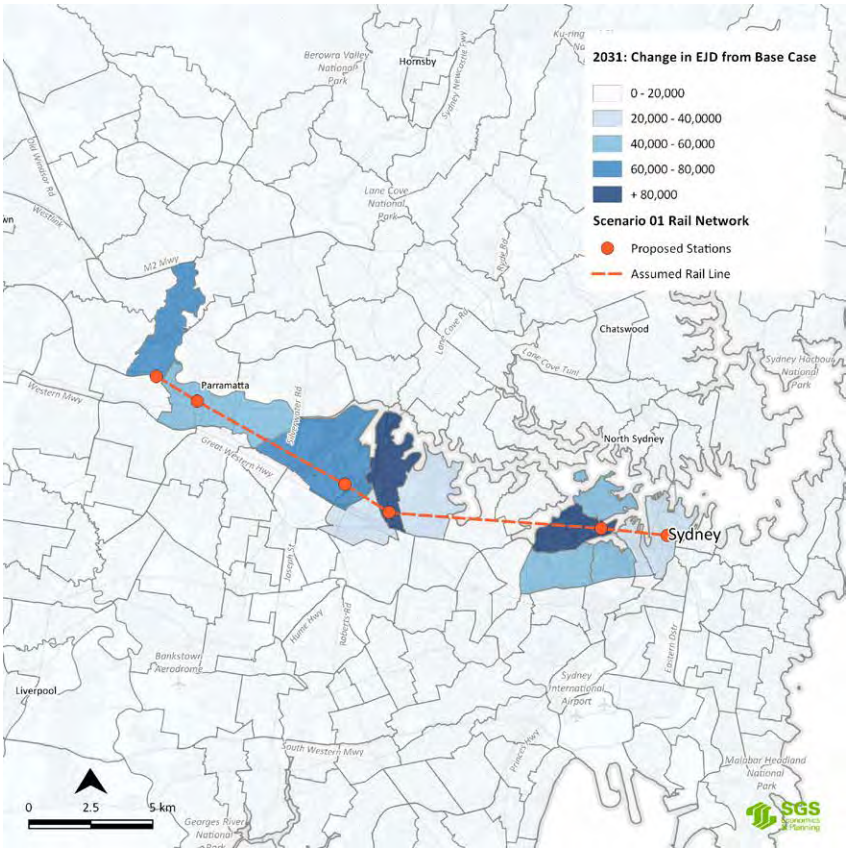
The 15-minute travel time opens the Greater Parramatta area and improves accessibility to the Bays Precinct while the 20/25-minute travel times spread the benefit along the corridor and reduce the benefit to Greater Parramatta.

**TABLE 5: EJD COMPARISON**

| Station | Base Case | 15-Minute Travel Time | 20-Minute Travel Time | 25-Minute Travel Time |
|---|---|---|---|---|
| Westmead | 68,000 | 138,000 | 134,000 | 129,000 |
| Parramatta | 91,000 | 136,000 | 130,000 | 123,000 |
| Rydalmere/Camelia | 65,000 | 65,000 | 135,000 | 124,000 |
| Sydney Olympic Park | 70,000 | 145,000 | 139,000 | 127,000 |
| Northern Line | 80,000 | 161,000 | 156,000 | 142,000 |
| Burwood North | 89,000 | 89,000 | 166,000 | 145,000 |
| Five Dock | 65,000 | 65,000 | 172,000 | 140,000 |
| Bays Precinct | 86,000 | 173,000 | 173,000 | 173,000 |
| Pyrmont | 115,000 | 143,000 | 173,000 | 173,000 |
| Sydney CBD | 173,000 | 197,000 | 219,000 | 215,000 |

Source: SGS, 2018

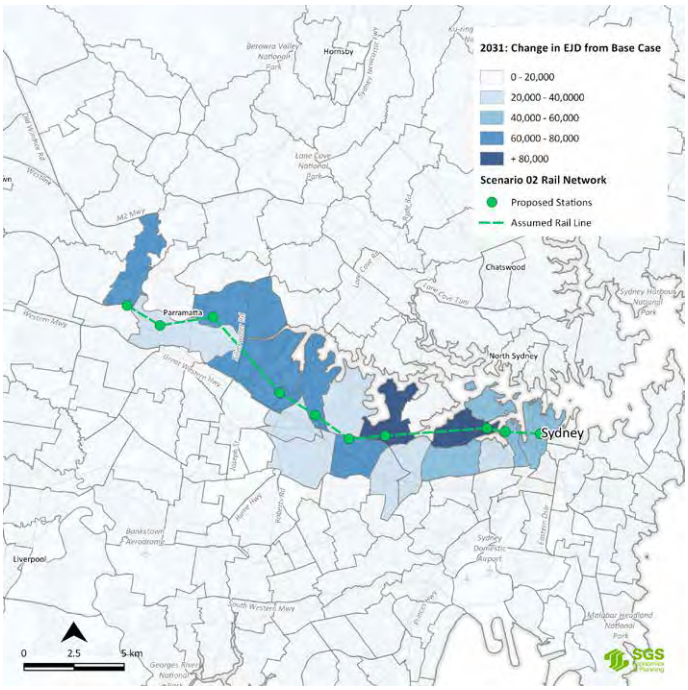
## FIGURE 7: 15-MINUTE TRAVEL TIME EJD




Source: SGS, 2018

Figure 7 shows the change in EJD for the 15-minute travel time which shows the major benefit around Westmead, Sydney Olympic Park and the Bays Precinct (Lilyfield/Rozelle) area.

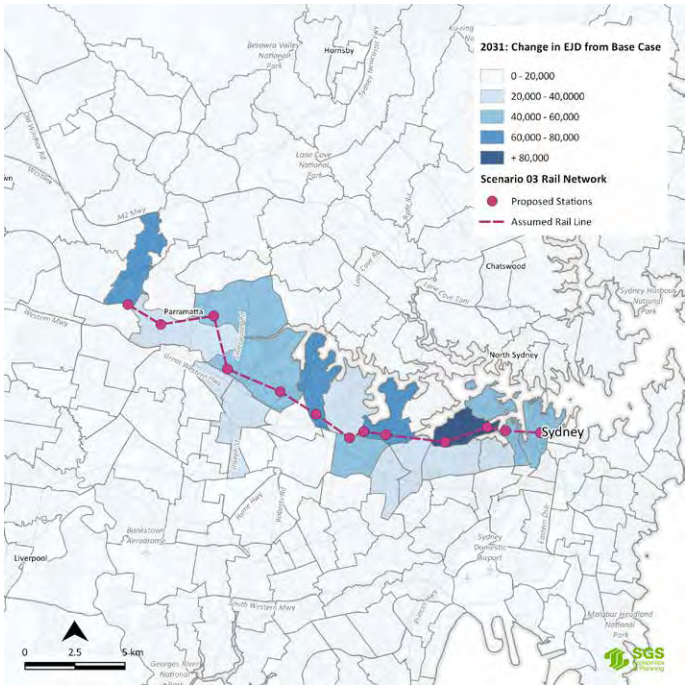
## FIGURE 8: 20-MINUTE TRAVEL TIME EJD




Source: SGS, 2018

Figure 8 shows the change in EJD for the 20-minute travel time which reduces the benefit in the Bays Precinct, shifting into the Inner West around Five Dock and Burwood North as stations are provided there.

## FIGURE 9: 25-MINUTE TRAVEL TIME EJD




Source: SGS, 2018

Figure 9 shows the change in EJD for the 25-minute travel time which spreads the benefit around the Inner West area between the T1 Northern Line connection and the Bays Precinct.

## 4.2 TIM ANALYSIS

Transport Impact Model (TIM) analysis shows the change in employment and dwellings due to the relative change in EJD. Table 6 shows a summary of the relocation of dwellings in the station precincts. It shows that Westmead, Sydney Olympic Park and T1 Northern get a significant uplift benefit with a shorter travel time to the CBD, but these uplifts reduce with longer travel times.

Considering how developed the Bays Precinct, Burwood North, Five Dock and Pyrmont are for residential purposes, the viability of providing additional dwellings in these areas is questionable. No capacity analysis has been undertaken as part of TIM analysis to date. The 20-minute travel time maximises the dwelling forecasts for the corridor.

### TABLE 6: TIM DWELLING COMPARISONS

| Station | Base Case | 15-Minute Travel Time | 20-Minute Travel Time | 25-Minute Travel Time |
|---|---|---|---|---|
| Westmead | 10,000 | 42,000 | 33,000 | 32,000 |
| Parramatta | 27,000 | 44,000 | 34,000 | 32,000 |
| Rydalmere/Camelia | 10,000 | 9,000 | 36,000 | 32,000 |
| Sydney Olympic Park | 21,000 | 56,000 | 45,000 | 41,000 |
| Northern Line | 16,000 | 54,000 | 43,000 | 38,000 |
| Burwood North | 15,000 | 13,000 | 41,000 | 32,000 |
| Five Dock | 11,000 | 10,000 | 54,000 | 40,000 |
| Bays Precinct | 9,000 | 49,000 | 40,000 | 41,000 |
| Pyrmont | 17,000 | 23,000 | 29,000 | 31,000 |
| Sydney CBD | 27,000 | 27,000 | 27,000 | 27,000 |
| **Total** | **163,000** | **327,000** | **382,000** | **346,000** |

Source: SGS, 2018

Table 7 shows a comparison of employment totals for each station in each scenario. The major impact in the 15-minute travel time is a more than doubling of jobs in the Bays Precinct. These uplifts are transferred to Pyrmont in the 20/25-minute scenarios when a station is provided in that area.

Westmead, Sydney Olympic Park and the T1 Northern Line precincts also receive an uplift in employment with a shorter travel time to the CBD compared to no change in the 20/25-minute scenarios. The 20-minute scenario maximises the employment forecast for the corridor with more employment provision in Burwood North and Five Dock.

### TABLE 7: TIM EMPLOYMENT COMPARISONS

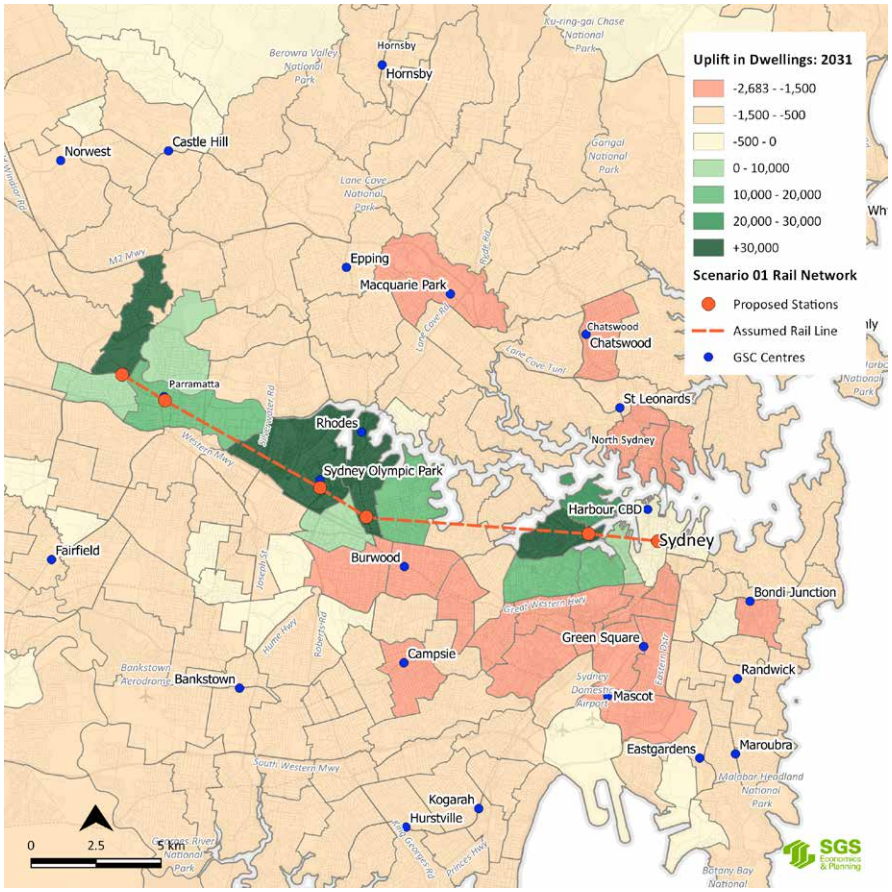
| Station | Base Case | 15-Minute Travel Time | 20-Minute Travel Time | 25-Minute Travel Time |
|---|---|---|---|---|
| Westmead | 28,000 | 40,000 | 37,000 | 36,000 |
| Parramatta | 91,000 | 97,000 | 93,000 | 93,000 |
| Rydalmere/Camelia | 17,000 | 16,000 | 26,000 | 25,000 |
| Sydney Olympic Park | 43,000 | 56,000 | 52,000 | 50,000 |
| Northern Line | 29,000 | 43,000 | 39,000 | 37,000 |
| Burwood North | 19,000 | 19,000 | 29,000 | 25,000 |
| Five Dock | 8,000 | 7,000 | 23,000 | 18,000 |
| Bays Precinct | 15,000 | 30,000 | 26,000 | 27,000 |
| Pyrmont | 48,000 | 50,000 | 53,000 | 53,000 |
| Sydney CBD | 427,000 | 427,000 | 427,000 | 427,000 |
| **Total** | **725,000** | **785,000** | **805,000** | **791,000** |

Source: SGS, 2018

Figure 10 shows the impact on dwellings in the 15-minute travel time scenario, with significant uplift in a small number of areas around Westmead, Sydney Olympic Park and the Bays Precinct/Rozelle. The resulting negative impacts are spread throughout Sydney with greater impacts in the central corridor of the Harbour City through Green Square/Alexandria/Marrickville and the Lower North Shore/ Chatswood and Macquarie Park.

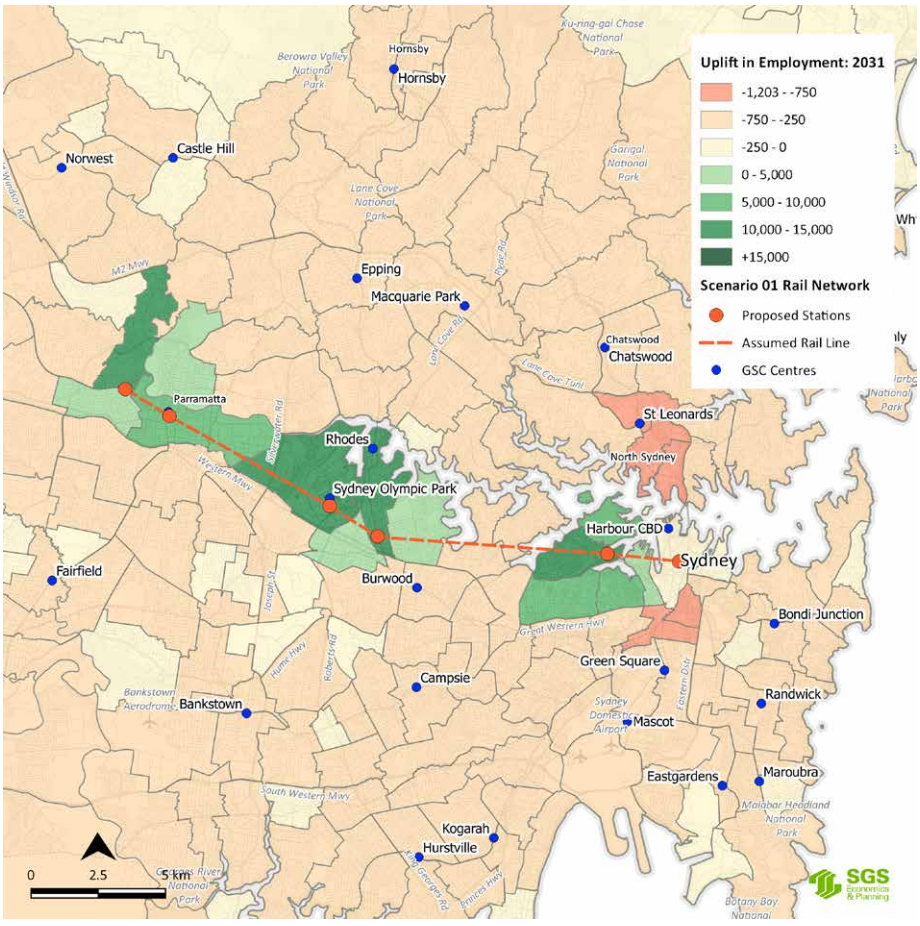
Figure 11 shows the impact of employment with jobs relocating from the southern end of the city and the Lower North Shore relocating into the Metro West corridor.

## FIGURE 10: 15-MINUTE TRAVEL TIME IMPACT ON DWELLINGS 2031



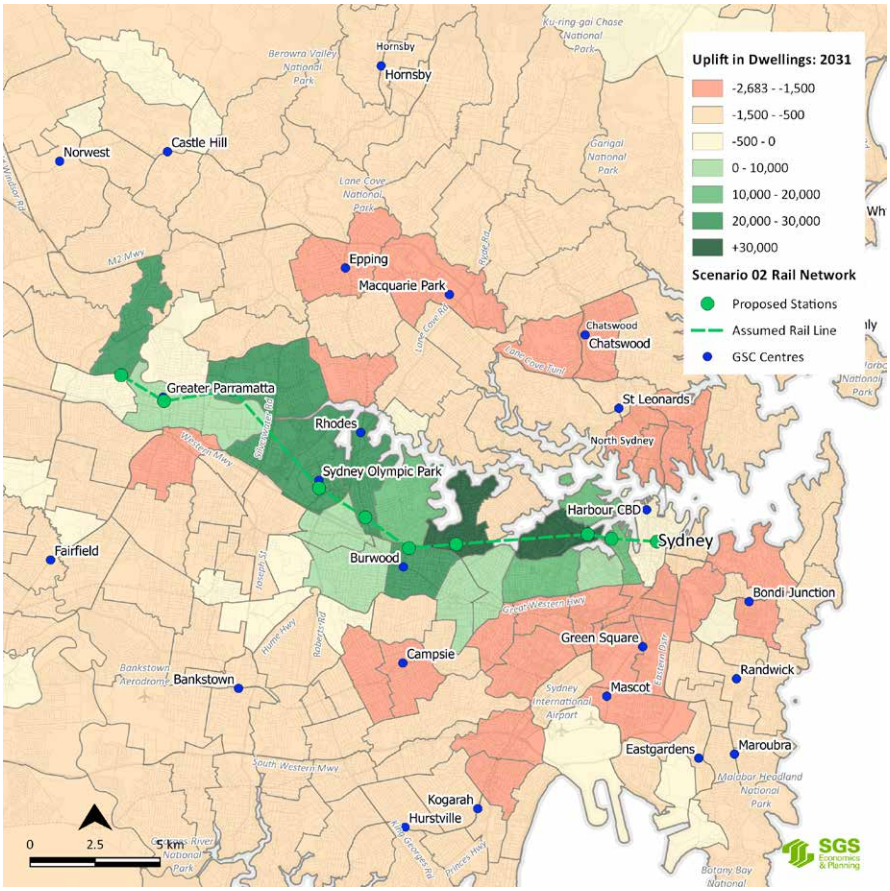

Source: SGS, 2018

## FIGURE 11: 15-MINUTE TRAVEL TIME IMPACT ON EMPLOYMENT 2031



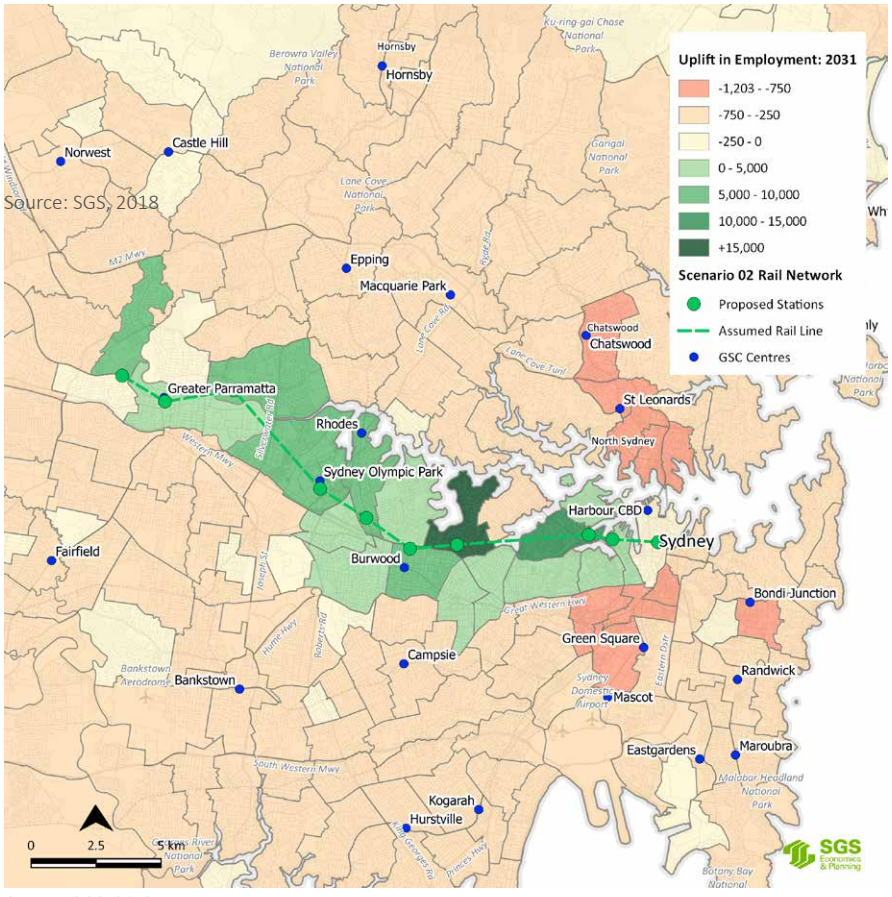

Source: SGS, 2018

## FIGURE 12: 20-MINUTE TRAVEL TIME IMPACT ON DWELLINGS 2031




Source: SGS, 2018

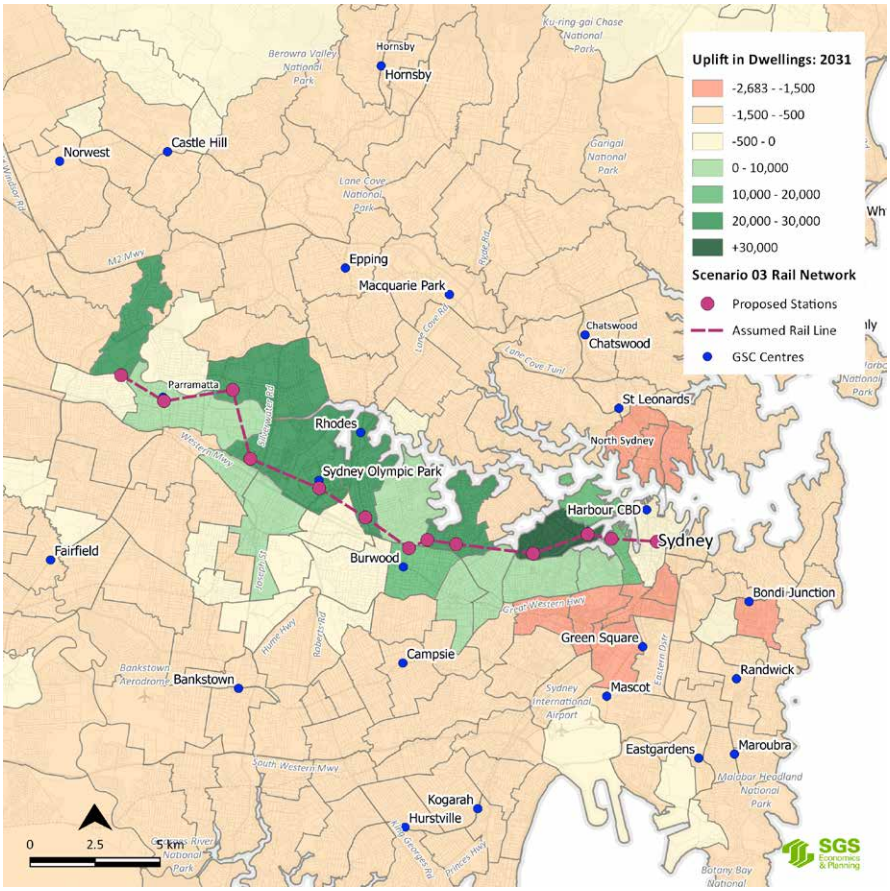
## FIGURE 13: 20-MINUTE TRAVEL TIME IMPACT ON EMPLOYMENT 2031




Source: SGS, 2018

Figure 12 and Figure 13 show the dwelling and employment changes for the 20-minute travel time. The dwelling uplift is focused on Five Dock, the Bays Precinct and Pyrmont with negative impacts spread throughout the north-west corridor and the Marrickville area and surrounds.

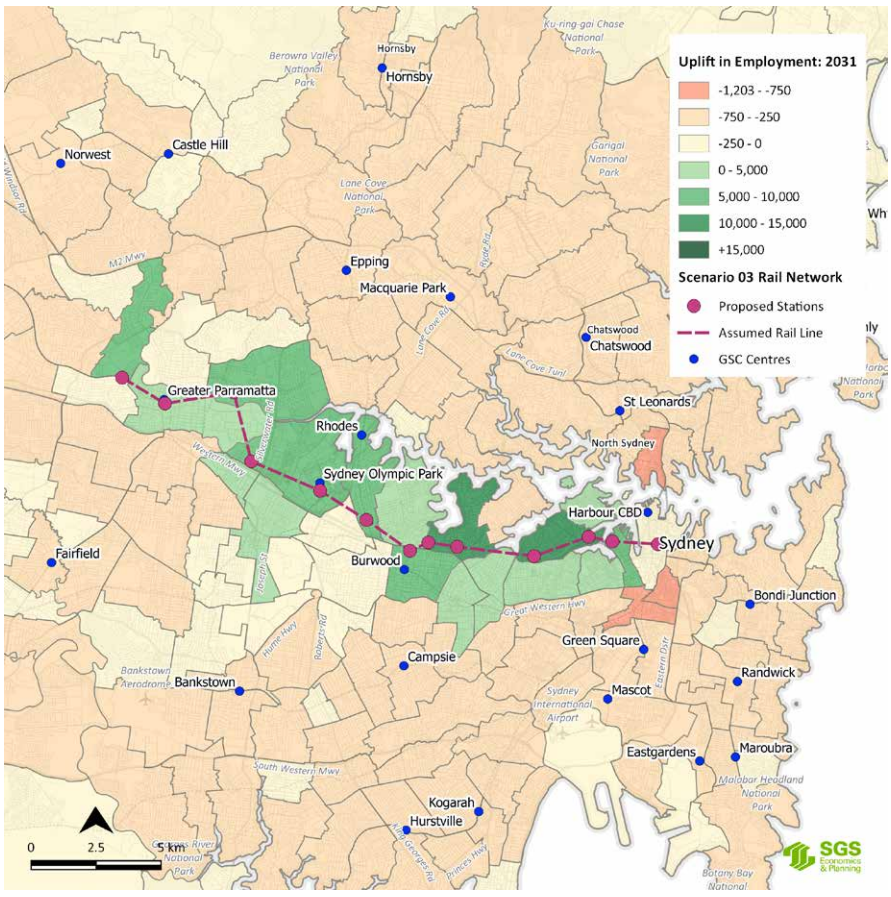
## FIGURE 14: 25-MINUTE TRAVEL TIME IMPACT ON DWELLINGS 2031




Source: SGS, 2018

Figure 14 and Figure 15 show the dwelling and employment changes for the 25-minute travel time. The dwelling uplift is again focused on Five Dock, the Bays Precinct and Pyrmont with negative impacts spread in the central Harbour City corridor and the Lower North Shore. This same pattern is seen in the employment impacts.

## FIGURE 15: 25-MINUTE TRAVEL TIME IMPACT ON EMPLOYMENT 2031




Source: SGS, 2018

## 4.3 QUALITATIVE ANALYSIS

### Geographic Benefit

While all scenarios deliver uplift and related benefits to the corridor (subject to built form capacity existing or being provided), the analysis of EJD and shifts in housing and employment under each scenario show a clear delineation of benefits in specific areas along the Metro West corridor dependent on station provision.

The fewer stations provided, the more benefit is focussed around Greater Parramatta and Olympic Park. As more stations are introduced and the travel time from Parramatta to the Sydney CBD subsequently increases, benefits are shifted into the Inner West area between the T1 Northern Line and the Bays Precinct.

This shift refocusses the benefit of the project from improving accessibility between Parramatta and the Sydney CBD, and delivering on a core strategic and economic aim of better integrating Greater Parramatta with 'global' Sydney or the Eastern Harbour City, and providing a platform for an uplift in housing and jobs between these areas. The 'trade-off' or balance between the two aims is a policy choice.

### Policy Framework

The Sydney Metro West is a city-shaping corridor that connects the two major centres of the Sydney Metropolis. While these centres are already connected, Sydney Metro greatly reduces the travel time between the centres, regardless of which scenario is being considered.

Through its definition as a city-shaping corridor, the corridor is providing a higher speed connection between cities and centres that shape locational decisions. As discussed, where stations are provided along the line there is significant benefit to that station precinct and surrounding area. Each additional station that is provided reduces the overall speed with which people can travel between Parramatta and the Sydney CBD, thus reducing the ability of Sydney Metro West to integrate these centres and contribute to agglomeration related productivity benefits and thereby operate as the city-shaping corridor it is envisaged to be.

The approximate distance of Parramatta to Sydney CBD is 20km, as discussed in section 2.4. The approximate direct distance between the proposed Western Sydney Airport and Westmead, the westernmost station for Sydney Metro West, is 21km.

Therefore, with a 15-minute travel time between Parramatta and the Sydney CBD, it is conceivable that a 15-minute journey could be made between Parramatta and the Western Sydney Airport, with a minimal number of stations.

This would enable a 30-minute travel time between the Western Sydney Airport and Sydney CBD, via Parramatta, travelling between the three major centres of each of the three cities, thereby addressing one of the key objectives of the Greater Sydney Region Plan and Future Transport Strategy 2056 of a 30-minute city — and contributing significantly to the crucial integration of these major concentrations of economic activity.

Each scenario contributes differently to the overall policy objectives of the Greater Sydney Plan and the Future Transport Strategy 2056 through the following:

**15-Minute Travel Time**

- Maximises the potential for agglomeration economies, integration of the Harbour and Central Cities and the growth of Greater Parramatta as a major economic centre.
- Provides a high-speed link between Parramatta and the Sydney CBD, providing significant travel time savings and capacity relief for existing train lines.
- Preserves opportunity for high-speed connection from Sydney CBD to Western Sydney Airport.
- Reinforces the importance of Parramatta as a major centre in Greater Sydney for housing and jobs.

**20/25-Minute Travel Time**

- Relieves capacity on the current train network and reduces travel time and congestion for Inner West commuters to/from Sydney CBD while reducing travel times between Parramatta and the Sydney CBD.
- Promotes urban renewal in Inner West precincts around metro stations and along key corridors.

## Wider Area Benefits

The analysis has not directly considered follow on benefits of station provision of further surrounding areas. Stations are likely to be catalysts for re-development and renewal in a wider geographic area. It is recognised that several other transport projects, such as the Parramatta Light Rail can assist in the functioning of Sydney Metro West. Light rail and improved transport services to/from metro stations assist in extending the benefits of the project into surrounding areas and provide a catalyst for re-shaping and redeveloping not just the area immediately in the station precinct but a broader area.

As discussed in section 1.2, the Sydney Metro West is a city-shaping corridor that is supported by city-serving and centre-serving corridors, these corridors can work together to provide an extension of benefits of accessibility and renewal around the station precincts.

## Hybrid Scenario

The one scenario that was not modelled explicitly from an EJD or TIM perspective was Scenario 4, which involves providing express trains between Parramatta and the CBD alongside a slower train stopping at all stations, effectively a hybrid between the 15-minute and 25-minute travel time scenarios.

This scenario would keep focus for commuting between Parramatta and the CBD while maintaining benefits in Central City District and Greater Parramatta Olympic Park (GPOP) Corridor — while allowing for urban renewal in the Bays Precinct and Pyrmont and improved access to the Inner West.

The 15-minute travel time predicts significant benefits around the Inner West which would be maintained and increased with a hybrid 25-minute service operating in parallel. This scenario offers a tiered service which provides benefits all along the corridor.

Details around how often express trains ran and whether this was purely a peak period undertaking would affect the relative impacts.

# CONCLUSION

The analysis of EJD and accessibility improvements with various travel time and station scenarios for the Sydney Metro West shows that the project provides a significant benefit to the Parramatta to Sydney CBD corridor.

With a fast 15-minute travel time between Parramatta and Sydney CBD (with fewer stations) the benefits of the project are focussed on uplift and improved accessibility to Greater Parramatta and Olympic Park, thereby contributing most significantly to the integration of job rich centres and the achievement of agglomeration economies supportive of the economic development of Greater Parramatta. As the travel time along the route increases to 20-25 minutes with more stations included, the benefits relate more to uplift and urban renewal opportunities in the Inner West.

The differences between a 15-minute travel time and a 25-minute travel time help in identifying what type of project or what kinds of benefits it is intended to provide.

A 15-minute travel time maintains the focus on Greater Parramatta, while alleviating congestion and greatly reducing travel times in the Bays Precinct and Inner West areas.

The more stations that are provided between the GPOP corridor and the Sydney CBD, the focus of the project shifts further east into renewal and benefits for the Inner West around Five Dock. The analysis has not considered development constraints or capacity analysis for potential uplift around stations. This is a key consideration in identifying the optimal location and number of stations along the corridor to maximise the benefits realised.

The 15-minute scenario aligns with the planned city-shaping corridor between Parramatta and the Sydney CBD as well as enabling a complete high-speed corridor between the Western Sydney Airport and the Sydney CBD in the future.

Further analysis can be considered as to the viability of providing a sub 20-minute travel time between Parramatta and the CBD based on reducing the number of stations in the 20-minute travel time scenario between T1 Northern Line and the Bays Precinct to maximise the high order transit and the benefits to Inner West transport.

This analysis can also be refined and updated to incorporate:

- A review of travel times along the corridor with further information from Sydney Metro and consider sensitivity testing of travel times based on expected metro travel speeds and stopping times.
- An extension of the station impact areas to consider second round impacts around stations and benefits to areas within a 2km radius.
- Capacity analysis of dwelling uplift to determine the viability of expected uplift in developed areas.
- Refine station locations.
- Review employment changes by industry type.

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*This is the second edition of the report, with updated figures to the 4.2 TIM Analysis Tables 6 & 7, which were incorrectly swapped in an earlier edition.*