



RAIL CORRIDORS STRATEGY

SYDNEY to WOLLONGONG

Released Under NSW GIPA Act 2009



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EXECUTIVE SUMMARY

This paper outlines a Strategy for improving travel times from Wollongong to Sydney Central. The intent of the Strategy is:

“... to reliably reduce travel times between Sydney and Wollongong to under seventy minutes without disadvantaging current users...”

The existing express travel time between Wollongong and Sydney Central is 89 minutes. The Strategy will reduce the travel time to reliably less than 65.5 minutes by progressively developing and implementing an integrated series of improvements. These comprise:

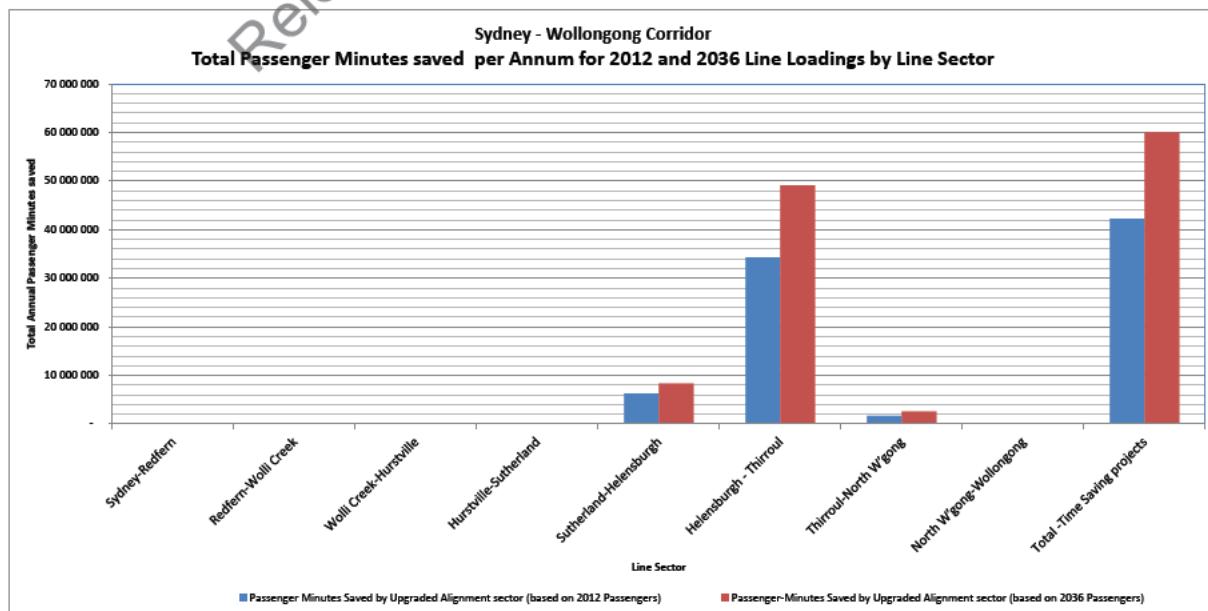
- Operational (new stopping pattern, driver training, dwell time management);
- rolling stock (train performance and reliability); and
- infrastructure upgrades (track re-alignment, new stabling and maintenance, passenger information systems).

The current travel time and paths between Sutherland and Sydney Central are potentially impacted by the implementation of Rapid Transit, which will force all Cronulla, Waterfall and South Coast rail traffic onto a single set

of twin tracks. When the number of trains increases, average speeds reduce, causing travel time in this section to increase.

“It is proposed, therefore, that the Sydney’s Rail Future team implement Infrastructure projects to protect the current travel time in the section for regional services.”

The proposed improvements to the Sydney - Wollongong Corridor have been assessed and developed in conjunction with the major stakeholders in TfNSW, through use of a staged multi-criteria analysis process, and are strongly evidence based.



EXECUTIVE SUMMARY

The proportion of travel time saved by each element is shown below.

| Route Section | Rolling Stock Improvement | Timetable Improvement | Minimum Required from Infrastructure |
|---------------------|---------------------------|-----------------------|--------------------------------------|
| Sydney - Wollongong | 9 min | 1 min | 13.5 min |

The new rolling stock likely to be acquired will be a double deck Electric Multiple Unit (EMU) train, and will need to have at least 10kW/ton traction power, and be capable of operating at 160km/h. The train will be capable of being assembled in variable lengths to suit operation to both different corridors within the Sydney Metropolitan area (longer trains to the Terminal and shorter trains to Bondi Junction). The new rolling stock will allow the Standard Working Timetable to be improved to reduce built in recovery time to 5% and reduce variability in travel time between stations.

The proposed future travel times of the express pattern are shown in the table below.

| Travel Time (min) | Sydney | Wolli Creek | Hurstville | Sutherland | Helensburgh | Thirroul | North Wollongong | Wollongong |
|-------------------|--------|-------------|------------|------------|-------------|----------|------------------|------------|
| Sydney | - | 12 | 21 | 33 | 46 | 56 | 64 | 66 |
| Wolli Creek | | - | 9 | 21 | 34 | 44 | 52 | 54 |
| Hurstville | | | | 12 | 15 | 25 | 33 | 35 |
| Sutherland | | | | | - | 23 | 31 | 33 |
| Helensburgh | | | | | | - | 18 | 20 |
| Thirroul | | | | | | - | 8 | 10 |
| North Wollongong | | | | | | | - | 2 |
| Wollongong | | | | | | | | - |

The majority of travel time improvement is enabled via a single project between Waterfall and Thirroul – the Thirroul Tunnel which in the various forms investigated provides a higher speed rail crossing of the Illawarra Escarpment. This tunnel will considerably cut the travel time from Wollongong to Sydney, bettering the required saving of 17 minutes to a total saving of 21.5 minutes. 81% of this is achieved through construction of Thirroul Tunnel.

Many smaller enabling projects are also required, such as the closure of level crossings and the upgrades of Thirroul and Waterfall stations.

In addition to the travel time saving projects, there are a series of major projects required to allow the introduction of new rolling stock on the Corridor. The longer intercity fleet that is mandated for use in this corridor by the Long Term Transport Master Plan, will require a new stabling yard, probably at Kembla Grange, and other associated infrastructure.

The major new infrastructure projects are shown in the diagram below.



EXECUTIVE SUMMARY

A larger version of this figure together with commentary on the proposed time saving projects in the corridor is shown in [Table 5](#). While there are alternatives which, by being smaller projects enable staging, these do not deliver the reductions in travel times sought.

These projects, when combined with the new rolling stock and express travel pattern, will provide up to 23 minutes travel time saving between Wollongong and Sydney. All of these projects are capable of being delivered in time for introduction of the 2031 timetable.

“However their value will be greatly diminished if regional trains travelling between Sydney Terminal, Wollongong and beyond do not have scheduled, fast and reliable paths through the metropolitan sector”

The following table shows the estimated value in terms of passenger minutes estimated to be saved each year – based on actual 2012 and forecast 2036 passenger line loadings – if the proposed upgrades are in place.

| Sector | Passenger Minutes Saved (Millions) | Cost per Total Annual Passenger - Minute saved (\$2014) | Passenger - Minutes saved (Millions) | Cost per Total Annual Passenger - Minutes saved (\$2014) |
|---|------------------------------------|---|--------------------------------------|--|
| Based on 2012 Passengers | | Based on 2036 Passengers | | |
| Sydney-Redfern | - | \$0 | | \$0 |
| Redfern-Wolli Creek | - | \$0 | | \$0 |
| Wolli Creek-Hurstville | - | \$0 | | \$0 |
| Hurstville-Sutherland | - | \$0 | | \$0 |
| Sutherland-Helensburgh | 6.3 | \$14 | 8.3 | \$10 |
| Helensburgh - Thirroul | 34.3 | \$85 | 49.0 | \$60 |
| Thirroul-North W'gong | 1.7 | \$38 | 2.5 | \$25 |
| North W'gong-Wollongong | - | \$0 | | \$0 |
| Total Investment in time saving projects | 42.3 | \$73 | 60.0 | \$51 |

In addition, there is additional \$1.363 billion in costs – that enable the service but do not save time – associated with improving bus connectivity; adding track capacity, track quadruplication, station upgrades, and new stabilising facilities. Some of this cost is properly attributed to projects other than regional rail service improvements.

The major alignment reconstruction proposed between Waterfall and Thirroul to achieve a similar 15 minute time saving is commensurately on a similar scale to that required across the Hawkesbury River in the Sydney-Newcastle Corridor. It is estimated to deliver 81% of the total time saving able to be achieved in this corridor.

It is important to note that many of the projects shown in this Strategy are related to the implementation of new intercity rolling stock, as outlined in the Long Term Transport Master Plan, and do not necessarily achieve a travel time saving on their own.

The estimated cost and implementation schedule for all projects required, based on a cash flow of \$500 million per annum, proposed to meet future timetable is shown in the table following.

EXECUTIVE SUMMARY

| Corridor | [REDACTED] | Time Saving (min) | Delivered by: |
|---|------------|-------------------|---------------|
| Waterfall to Sutherland curve easing | [REDACTED] | 2 | 2019 |
| Erskineville crossovers | [REDACTED] | 0 | 2023 |
| Coniston to Austinmer curve ease (and level crossing removal) | [REDACTED] | 3 | 2023 |
| Coledale Curve Easing | [REDACTED] | 0.5 | 2023 |
| Waterfall Station upgrade | [REDACTED] | 0 | 2026 |
| Thirroul Station Upgrade | [REDACTED] | 0 | 2026 |
| Coniston Grade Separation | [REDACTED] | 0 | 2026 |
| Dapto Duplication (and Kembla Grange Stabling Yard) | [REDACTED] | 0 | 2026 |
| Level Crossing Removal | [REDACTED] | 0 | 2026 |
| Thirroul Tunnel | [REDACTED] | 18.5 | 2031 |
| Total | [REDACTED] | 23.5 | 2031 |

The timing on the above projects is planned to dovetail with the implementation of the new rolling stock, and to counteract the risk of travel time losses caused by the implementation of Rapid Transit.

“Because the Sydney – Wollongong regional rail corridor is relatively short, runs mostly on infrastructure in the Sydney Metropolitan area which is common with Sydney Trains and then over very difficult terrain across the Illawarra Escarpment, there are very few opportunities to achieve significant travel time savings other than to build a new alignment across that Escarpment. The time saving cannot be achieved without the Thirroul Tunnel.”

Further assessment is required to determine the engineering and geotechnical issues associated with potential development of the Thirroul Tunnel.

1. BACKGROUND

1.1 Purpose of this Document

This paper outlines the Strategy for improving travel times from Wollongong to Central and / or Sydney Terminal. The intent of the Strategy is:

“... to reliably reduce travel times between Sydney and Wollongong to under seventy minutes without disadvantaging current users...”

An integrated approach to improvements in train operations, operation of new rolling stock and a series of (new) infrastructure projects will achieve the reliable travel time of 65.5 minutes, while not impacting either regional passenger or freight services.

This Strategy principally focuses on changes to the Corridor between Sutherland and Wollongong, noting that Sydney's Rail Futures programme and the Rapid Transit Project (conversion of the Illawarra main to Rapid Transit) will both have significant impacts on this Strategy.

This document assumes these projects will not adversely affect travel time/access for regional trains in the section of track.

1.2 Consultation Process

A series of meetings and workshops has been held with stakeholders within Transport for New South Wales (TfNSW) in order to ensure that all relevant issues relating to the Corridor have been addressed.

The consultation process included a series of one on one meetings with various groups, followed by a series of three workshops to look at criteria for assessment and the projects that were identified as having an impact on travel time.

After undertaking travel time assessments on the 80 possible projects identified during the course of the programme of their ability to contribute to travel time savings, a total of seven major projects were chosen to deliver the final time saving.

The core feedback that was received was that there was serious risk of degradation in travel time within the Sydney Trains operational boundary. Timetabling and Freight Divisions within TfNSW were also consulted several times to ensure that this regional trains strategy did not detract from planning works being undertaken by others.

There is still some discussion required with the rolling stock acquisition team to ensure that the procurement process takes this Strategy into account.

2. PREVIOUS INVESTIGATIONS

This Corridor has been the subject of several previous investigations aimed at reducing travel times. In those studies, it became evident that travel times in the corridor could be significantly reduced by a combination of faster, more powerful rolling stock and new railway alignments that reduced the route length or enabled higher sustained running speeds and preferably a combination of both.

In developing this Strategy, this finding was confirmed by undertaking reanalysis of some of those prior alignment proposals as well as some more contemporary ideas. In addition, by using a spectrum of rolling stock types of varying maximum speed – from 120km/h to 200km/h – and installed power – from 5 kW/tonne to 15kW/t, from the existing ‘V’ set stock to rolling stock representative of those which might be considered for operation on this Corridor.

Figure 1 shows the results of this analysis and from this it can be concluded that increasing rolling stock speed and power alone will not achieve a 17 minute time saving (the green curve) but this can be achieved by a combination of rolling stock capable of 160 km/h and having installed power to weight ratio of 10kW/tonne on new and upgraded alignments (the blue and red curves).

The blue curve is based on using a series of short tunnels to link elements of the existing alignment in order to achieve shorter alignment. However, this multiple short tunnel alignment has steeper ruling gradients of up to 1:50 and typically 800 metre radius curves.

The red curve is based on an upgraded alignment which uses a very long tunnel – about 11 kms - from south of Waterfall to Thirroul. The single long tunnel has a long continuous ruling gradient of 1:60 but with shallow horizontal curvature.

Summary:

Rolling stock alone will not deliver the required time saving.

Infrastructure changes could deliver the time saving but at greater cost.

The optimum strategy is to use a combination of rolling stock and infrastructure upgrades to meet the travel time savings

Table 1 shows the time savings contribution targets for each element of the Strategy. A travel time of at least 23.5 minutes can be achieved by a combination of rolling stock that can operate at 160km/h and which has installed power of around 10 kw/tonne operating on an alignment of a similar standard to the long tunnel proposed previously.

This confirms that, on the assumption that current travel times between Central and Sutherland will be timetabled to remain unchanged, a major project between Sutherland and Thirroul is required to achieve the majority of the travel time saving sought in this Corridor.

PREVIOUS INVESTIGATIONS

Figure 1 Train Power required for Time Savings.

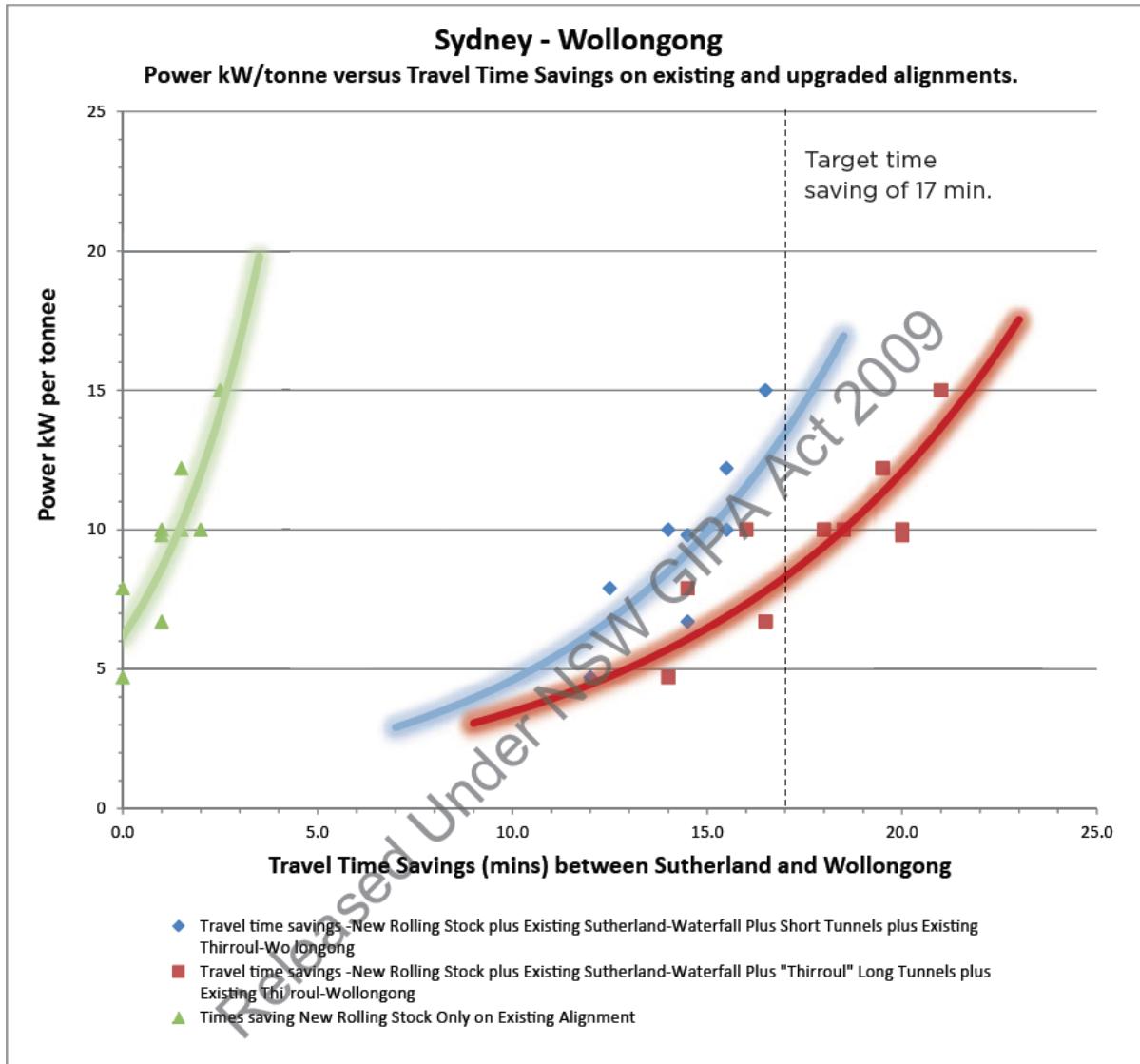


Table 1 Indicative Time Saving by Source of Improvement

| Route Section | Rolling Stock Improvement | Timetable Improvement | Minimum Required from Infrastructure |
|---------------------|---------------------------|-----------------------|--------------------------------------|
| Sydney - Wollongong | 9 min | 1 min | 13.5 min |

3. LAND USE AND PLANNING IN THE SYDNEY – WOLLONGONG CORRIDOR

The Sydney – Wollongong Corridor passes through the Sutherland Shire and Wollongong Local Government Areas (LGAs).

3.1 Sutherland Shire

3.1.1 Growth

For the purposes of this Strategy, the Sydney to Wollongong corridor commences at the station of Waterfall which is located in the southern extent of the Sutherland Shire. The Sutherland Shire is located on the southern boundary of metropolitan Sydney. The population of the Sutherland Shire in 2011 was 223,192¹. The forecast population in 2036 is 255,500 which is a growth rate of 12%. The majority of population growth is forecast to be the result of a high fertility rate and an old population age profile. Sutherland Shire's population is predominantly dispersed across the northern part of the shire as the southern part is dominated by the Royal National Park.

3.1.2 Regional transport and the existing rail alignment

Transport infrastructure in the Sutherland Shire is funded by Federal, State and local governments. The network includes an arterial road system with major highway and freeway links to the adjoining regions, rail links, bus networks, and pedestrian and bicycle networks.

A bus and rail interchange is located at Sutherland. The Sutherland Interchange is currently being upgraded and will increase bus capacity and provide additional car parking.

The commuter car park at Waterfall Station was upgraded in 2010. It included the expansion of the existing at-grade car parking facility by approximately 100 spaces, including space for seven disabled drivers and bicycle facilities to provide for a total of 207 parking spaces.

Works are currently underway for the Waterfall station Easy Access Upgrade including raising of platform for level access to trains; reconstruction of station toilets into family accessible and disabled access toilets and installation of new lift and concourse. The rail corridor dissects the western and eastern portions of the Sutherland Shire and runs in a north - south orientation. The corridor provides the only rail link between metropolitan Sydney and the Illawarra region.

Cabinet-in-confidence

3.1.3 Employment lands

The Sutherland Shire LGA has a total of 605ha of land zoned as employment lands, including 371ha at Kurnell. A total of 140ha of the zoned employment lands is currently undeveloped and 135ha of this is located at Kurnell, remote from the Corridor.

3.1.4 Environmental Assets

Between Waterfall and Helensburgh, the Corridor immediately adjoins the Royal National Park (located to the east). Heathcote National Park is located to the west of the Corridor, west of the Princes Highway. The Corridor traverses a number of creeks including Haslem Creek and Cawleys Creek (approximately 1.5km north of Helensburgh). This section of the Corridor is not located in a designated mine subsidence district.

3.2 Illawara

3.2.1 Growth

Wollongong LGA is part of the Illawarra Region which has been identified as one of the high growth areas in NSW. Wollongong is the region's principal city and the third largest in NSW. The long term plan for the region is to concentrate growth around existing centres with a limited number of new urban developments. West Dapto has been identified as an area of new urban development with 19,350 new dwellings to be released. Wollongong City Centre will also be revitalised with the construction of a number of high density apartments.

Wollongong LGA had a total population of 205,600 in 2011 and the forecast population in 2036 is 242,900, a growth of 18%. The majority of population growth is predicted to be a result of positive net overseas migration and an old population age profile. The ageing population profile will impact the types of public transport services that are required in the future.

LAND USE AND PLANNING IN THE SYDNEY – WOLLONGONG CORRIDOR

Figure 2 Major towns and centres in the Illawarra region



3.2.2 Regional transport

Transport infrastructure in the Wollongong LGA is funded by federal, State and local governments. The network includes an arterial road system with major highway and freeway links to the adjoining north, west and south regions, rail links, bus networks, and pedestrian and bicycle networks. The Port of Port Kembla is located in the Wollongong LGA and freight transport and the management of freight and passenger transport is an important issue for the region.

Private car use is the primary mode of transport in the region and the primary mode for journeys to and from work both within the region and out of the region. There is a government commitment (set out in NSW 2021) to reduce the dependence on private car use and increase the share of commuter trips made by public transport. Improving the public transport system by reducing travel times and modal connections will help to achieve this target.

In the Wollongong LGA in 2011 the majority of daily journey to work trips to Wollongong originated from Thirroul in the north and from Albion Park in the south and Dapto in the west.

3.2.3 Existing rail alignment

The rail corridor enters the Wollongong LGA approximately 1.5km south of Waterfall and traverses through the Garawarra State Conservation Area. The rail alignment in this location is constrained by topography and winds back on itself twice before proceeding along the Illawarra Escarpment to Helensburgh.

From Helensburgh the alignment continues to wind through Garawarra State Conservation Area and crosses to the southern bank of the Hacking River about 1km north of Otford. After passing through the town of Otford the rail alignment traverses the western boundary of Stanwell Park entering in and out of the escarpment through a number of short tunnels.

LAND USE AND PLANNING IN THE SYDNEY – WOLLONGONG CORRIDOR

The alignment continues to wind around and through the small coastal villages and towns on the escarpment including Coalcliff, Clifton, Scarborough, Wombarra, Coledale, Austinmer and Thirroul.

The urban density on either side of the existing alignment increases as the rail line proceeds through the northern suburbs of Wollongong and into Wollongong itself. From Coniston, north of Port Kembla, the rail alignment heads south west to Unanderra and through Kembla Grange. From Kembla Grange the rail alignment traverses medium density mixed use land to the west of Lake Illawarra through Dapto and onto Oak Flats.

3.2.4 Environmental Assets

From Helensburgh to Austinmer, the Corridor immediately adjoins the Royal National Park and further south, the Garawarra State Conservation Area and Dharawal State Conservation Area.

From Helensburgh to Wollongong, the Corridor traverses a number of creeks including Wilsons Creek, Camp Creek, Hacking River, Hargrave Creek, Stanwell Creek, Flanagans Creek, Hewitt Creek, Slacky Creek, Wartons Creek, Fairy Creek, American Creek, Allan's Creek and Mullet Creek.

A number of State listed heritage items exist within the Corridor including the Lilyvale railway tunnels, Stanwell Park Rail Viaduct over Stanwell Creek, and the Railway Station Groups of Helensburgh, Scarborough, Austinmer, Thirroul, Bulli and Wollongong.

From Helensburgh to Wollongong the Corridor is underlain by significant resources evident by historical areas worked for coal mining and the large number of petroleum titles. The status of these titles includes both active mining and exploration.

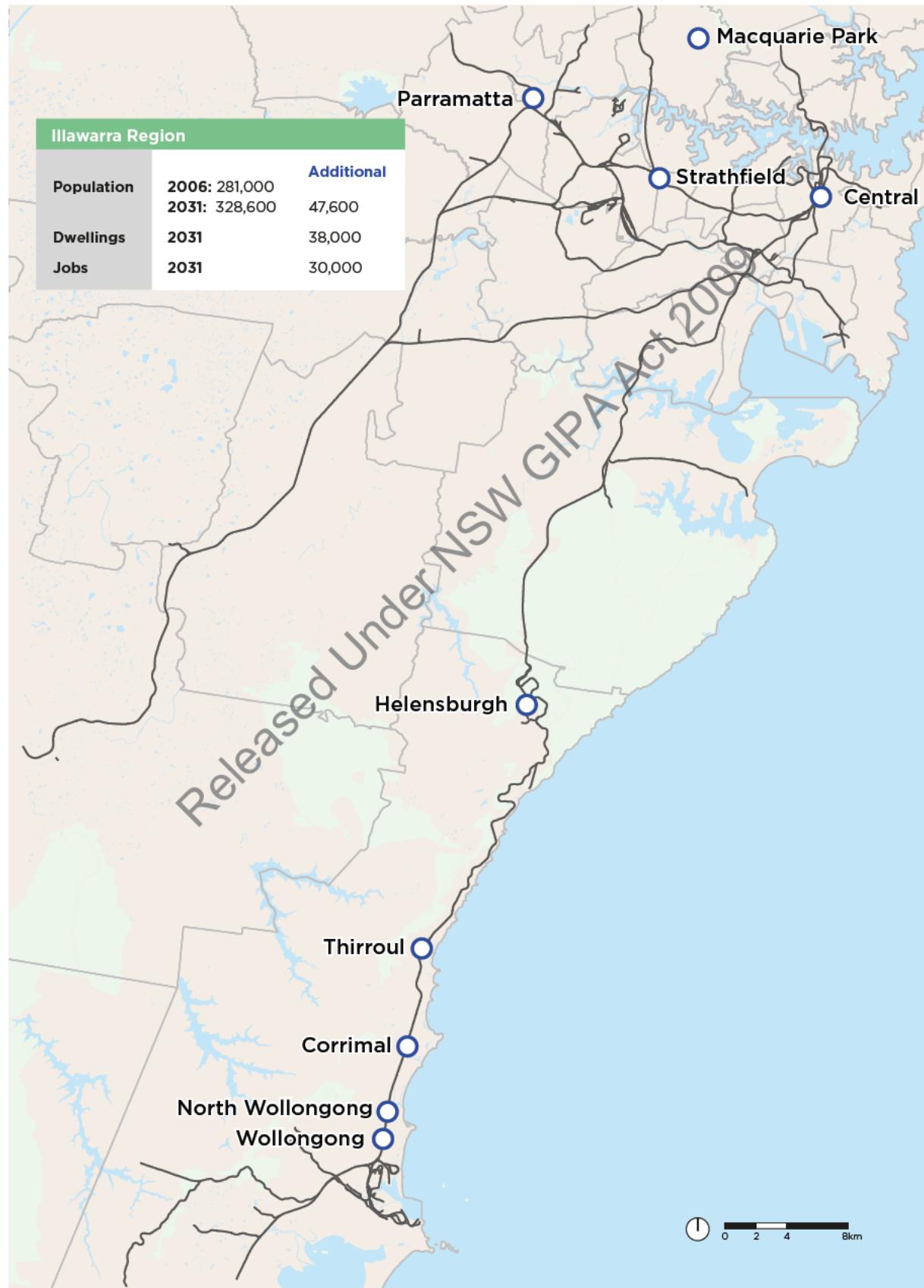
This section of the Corridor is not located in a designated mine subsidence district.

3.2.5 Employment lands

The Illawarra Regional Strategy outlines opportunities to create a total of 30,000 new jobs in the Wollongong LGA in the next 25 years. Employment lands that have been identified to provide this job creation include Wollongong City Centre, the Port Kembla precinct, the University of Wollongong and the Innovation Campus, Kembla Grange industrial lands and the Tallawarra Power Station site. In addition, a total 478 hectares of existing vacant zoned employment lands in the Wollongong LGA have been identified and will be protected to help achieve this growth. Efficient public transport to link regional centres will be critical in achieving this growth in job creation.

LAND USE AND PLANNING IN THE SYDNEY – WOLLONGONG CORRIDOR

Figure 3 Current and Future Growth in the Illawarra Region



4. THE RAIL CORRIDOR

4.1 Physical Constraints

Like all the regional rail corridors, this railway also has to climb over the rim of the Sydney Basin. As shown in [Figure 4](#), the most obvious alignment feature of the Sydney-Wollongong Corridor is the very difficult terrain between the Georges River and the base of the Illawarra Escarpment near Thirroul. The Corridor climbs at a maximum gradient of 1:40 southbound towards Waterfall at the summit of the Illawarra Line and the metropolitan rail service boundary. While the Corridor climbs at a lesser gradient of 1:75 northbound to Waterfall, it does so on very restrictive curvature, as evidenced by the speed limits. The original line was built to 1:40 gradients in this area but still at restrictive curvature, so there would be no benefit in reverting to it.

The horizontal and vertical alignment is more favourable south of Thirroul for the 12 kilometres into Wollongong.

4.2 Patronage

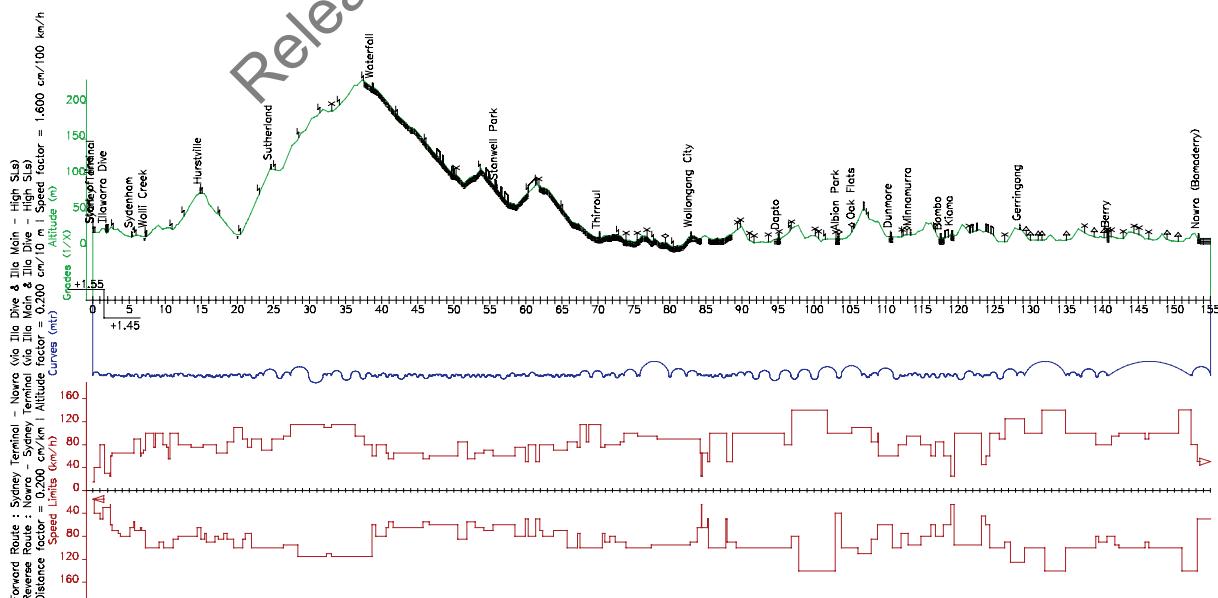
[Figure 5](#) shows the current origin and destination data for all modes of travel in the Sydney - Wollongong Corridor.

Thirty percent of the maximum line load² of approximately 2.7 million passengers up and down per annum at Sutherland is achieved by the time trains reach Wollongong Station. Wollongong and North Wollongong then add a further 12%, to 42%. At this point line loads are approximately 1 million passengers up and down per annum.

The next significant step in line loading occurs at Thirroul where there is major increase to 64%, or about 1.73 million, of the maximum line load at Sutherland. A further step change to 84%, or about 2.25 million, occurs at Helensburgh.

[Figure 6](#) shows the current and 2036 forecast passenger line loading over the South Coast and Illawarra Lines from Bomaderry through to Woll Creek for Intercity trains. Current line loads build at low levels of usage from Bomaderry through to Oak Flats but start to increase once Albion Park at the station of the southern-most part of the Illawarra coastal plain is reached.

Figure 4 Profile of the Sydney Nowra Rail Corridor



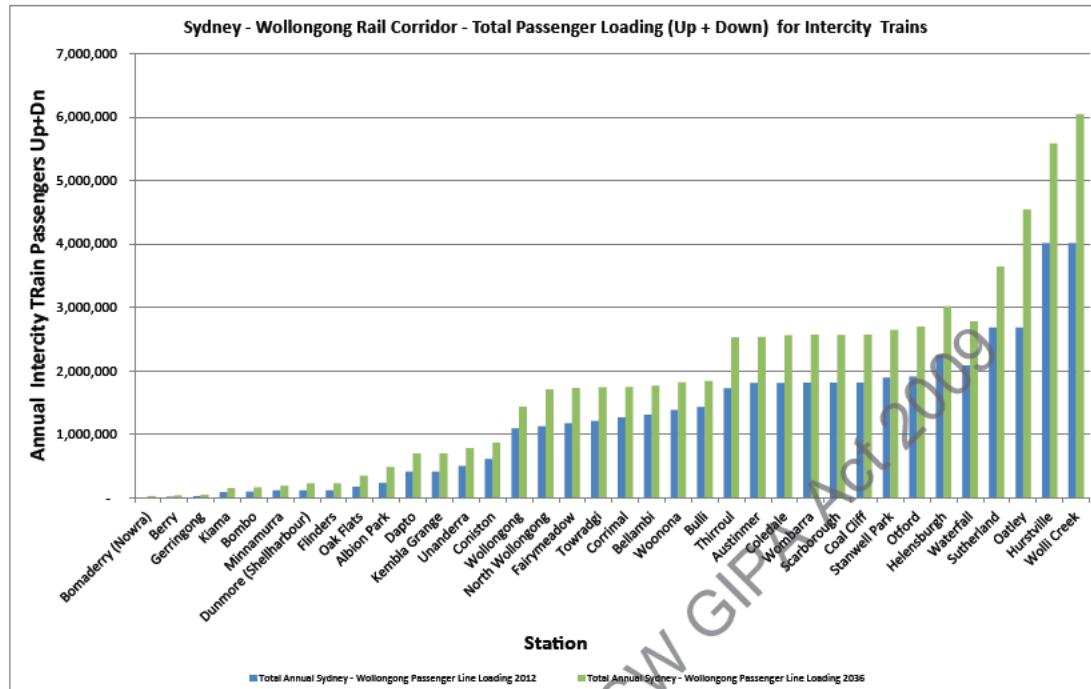
THE RAIL CORRIDOR

Figure 5 Annual Rail Passenger Origins and Destinations



THE RAIL CORRIDOR

Figure 6 Total Annual Passenger Line Loading



Source: Intercity Line Loading Volumes Morning Peak One Hour and "Enhanced Train Crowding Model", 2013 and "Country Link Forecasts 2036"

North of Sutherland, line loading increases significantly through metropolitan Sydney to 4.01 million at Hurstville and beyond. However, no time saving projects are proposed in this sector of the Corridor although projects which avoid losing time may be required.

Forecast passenger line loading in 2036 follows a similar pattern. However, growth rates – averaging 216% – south of Wollongong are expected to be much higher than to the north – where they average 139%, albeit from a small base in absolute numbers.

By 2036, the maximum line load at Sutherland is forecast to be 3.65 million passengers per annum. At Wollongong, it is forecast to be 1.44 million and, with a greater than average lift, at North Wollongong to 1.71 million. At Thirroul, the forecast is for an above average uplift of 2.53 million, and at Helensburgh a below average uplift to 3.02 million. North of Sutherland line loading is forecast to be 5.59 million at Hurstville and 6.09 million at Woll Creek.

This 2036 forecast is reflective of the anticipated greater urban development expected to occur in the southern part of the Illawarra and does not include demand for rail services which can be expected as a result Cabinet-in-confidence

of reduced travel times from Wollongong to Sutherland and beyond into metropolitan Sydney, as contemplated in this Strategy.

It is evident, then, that in seeking to offer the maximum travel time benefit to the greatest number of all current and likely future rail users in this Corridor, a significant proportion of the overall travel time target of a 17 minute reduction in travel time to Wollongong should be sought to be achieved in the sector of the corridor between Thirroul and Waterfall.

4.3 Current stopping pattern and travel times

Wollongong services currently run from Bondi Junction via Hurstville on the Illawarra Mains. These services share the Illawarra Line with Blue Mountains coal trains to Port Kembla Inner Harbour. There is a large amount of residential development south of Wollongong, and this is an opportunity to improve travel patterns. Shellharbour station is the newest station on the network and is currently under construction.

Table 2 shows the section running times of the current Standard Working Time Table (SWTT) between the stops on the express pattern.

THE RAIL CORRIDOR

Table 2 Sectional Travel times taken from the 2014 Standard Working Time Table (SWTT) - Express

| Travel Time (min) | Sydney Terminal | Wolli Creek | Hurstville | Sutherland | Helensburgh | Thirroul | North Wollongong | Wollongong |
|-------------------|-----------------|-------------|------------|------------|-------------|----------|------------------|------------|
| Sydney | - | 12 | 21 | 33 | 53 | 78 | 86 | 89 |
| Wolli Creek | | - | 9 | 21 | 41 | 66 | 74 | 77 |
| Hurstville | | | - | 12 | 32 | 57 | 65 | 68 |
| Sutherland | | | | - | 20 | 45 | 53 | 56 |
| Helensburgh | | | | | - | 25 | 33 | 36 |
| Thirroul | | | | | - | - | 8 | 11 |
| North Wollongong | | | | | | - | - | 3 |
| Wollongong | | | | | | | | - |

4.4 Freight Traffic

In common with all of the rail corridors which link regional NSW to metropolitan Sydney, the South Coast and Illawarra lines are multiuser railways, carrying both significant passenger and freight traffic. The issue of rail freight into and out of the Illawarra was examined in a recent report for TfNSW³. On the proposed Maldon Dombarton Rail Link.

Freight carried over the South Coast and Illawarra lines is derived from or bound for locations both within the Illawarra Region itself and outside the region.

An example of the former is the coal traffic from Metropolitan Colliery near Helensburgh while an example of the latter is the western coal trains that travel via the Metropolitan Goods Line and Illawarra Line to the Port Kembla Coal loader.

Currently, there are 30 timetabled freight paths each way on the Illawarra Line north of Waterfall and extending south to Wollongong of which 19 each way are used daily. These paths are timetabled to be outside the peak passenger traffic periods.

The future levels of freight to be carried on the Illawarra line depends not only on the future levels of freight generated within the Illawarra Region and elsewhere in NSW but also on the

availability of track capacity on the Illawarra Line and the extent to which any of that freight could be carried on alternative pathways into and out of the Illawarra region such as the Unanderra - Moss Vale Line and the proposed Maldon to Dombarton Rail Link.

The Freight Access Plan provided an assessment of what freight could be efficiently carried on which of these lines. However, in the absence of a commitment to build the Maldon to Dombarton Rail Link, it must be assumed that freight which could be assigned to it from the Illawarra Line would remain on the Illawarra Line. Table 3 from the Freight Access Plan shows the forecast 2031 demand for freight paths on the Illawarra Line and Unanderra - Moss Vale Line and in the absence of a Maldon to Dombarton Rail Link.

In addition, coal is railed over the Illawarra line from Metropolitan Colliery near Helensburgh. Assuming current production is maintained up to 3 paths each way are required.

As can be seen, and on the assumption that freight retains its allocated 30 paths per day each way, future freight paths of 26 per day each way can be accommodated. This assumption must be confirmed by taking into account other projects under consideration by TfNSW such as Rapid Transit.

Table 3 Freight Access Plan - Total Daily Train Paths

THE RAIL CORRIDOR

| Freight Access Plan - Option 1 Base Case Demand (Do Nothing) (Total Daily Trains paths) | | | | | | | |
|---|-----------------------------|--|---------------------------------|------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Source / Destination | Freight Type | Illawarra Rail Line (north of Waterfall) | Unanderra - Moss Vale Rail Line | Maldon - Dombarton Rail Line | F6/Princes Highway | Picton Road/F6 | North Illawarra Highway |
| Outer Harbour | Containers | | | N/A | Stay in Botany or Carry on Road | Stay in Botany or Carry on Road | Stay in Botany or Carry on Road |
| Outer Harbour | Cement | 2 | | N/A | Stay on Road | Stay on Road | Stay on Road |
| Outer Harbour | Western Ores | 4 | | N/A | | | |
| Outer Harbour | SW Ores | | 2 | N/A | | | |
| Outer Harbour | General freight/ break bulk | | | N/A | Stay on Road | Stay on Road | Stay on Road |
| Inner Harbour | Coal - Western | 18 | | N/A | | | |
| Steelworks | Coal - Hunter | 4 | | N/A | | | |
| Inner Harbour | Coal - Tahmoor | | 8 | N/A | | | |
| Inner Harbour | Coal - Helensburgh | ✓ | | N/A | | | |
| Inner Harbour | Coal - Appin | | | N/A | | Stay on Road | |
| Inner Harbour | Coal - NRE No 1 | | | N/A | Stay on Road | | |
| Inner Harbour | Coal - Wongawilli | ✓ | | N/A | | | |
| Inner Harbour | Grain - Western | | 2 | N/A | | | |
| Inner Harbour | Grain - South Western | | 8 | N/A | | | |
| Inner Harbour | Cars | | | N/A | Stay on Road | Stay on Road | |
| Steelworks | Limestone | | 2 | N/A | | | |
| Steelworks | Steel products | 8 | | N/A | And stay on Road | And stay on Road | |
| Bombo | Ballast | 4 | | N/A | | | |
| Dunmore | Aggregates | 4 | | N/A | | | |
| Manildra | Grains | 2 | 2 | N/A | | | |
| | Total | 46 | 24 | N/A | | | |
| | Maximum Capacity | 60 | 24-28 | | | | |
| | Free Paths | +14 | ~0 to +4 | | | | |

5. PLANNING INITIATIVES

The NSW government planning initiatives to which this Strategy responds and supports are:

- Long Term Transport Master Plan (LTTMP), and the regional transport plan that supports it:
 - The Illawarra Regional Transport Master Plan;
- The Regional Rail Services Strategy;
- Metropolitan and Regional Planning Strategies, and
- State Infrastructure Strategy.
- This corridor strategy responds to all three main strategy documents endorsed by the NSW Government. The strategies and their relevance area described below.

5.1 Long Term Transport Master Plan

The NSW Long Term Transport Master Plan sets the framework for the NSW Government to deliver an integrated, modern transport system that puts the customer first.

The NSW Long Term Transport Master Plan will guide the NSW Government's transport funding priorities over the next 20 years, providing the overall framework for how the transport system develops, whether it is the services that are delivered or the infrastructure that underpins them.

The Master Plan includes 220 short, medium and long term actions that are focused on the government's commitment to transform the transport system over the next 20 years.

The high level actions from the LTTMP that are relevant to this paper are:

- **Action 1:** Develop a fully integrated transport system, where customers move seamlessly across modes and between services, supported by the Opal ticketing system.
- **Action 8:** Connect regional communities through major highway upgrades, improved NSW Trains services including better connections with bus services, more community transport services, and protecting regional flights to Sydney Airport.

- **Action 9:** Improve freight efficiency and productivity through major investments and efficiencies in the road and rail freight networks and at ports, airports and intermodal terminals, and through the Bridges for the Bush.
- **Action 12:** Preserve future transport corridors to ensure that as demand increases the transport networks can be expanded, covering 19 corridors in Greater Sydney and others across regional NSW, including a possible Outer Sydney Orbital route (the M9), the Bells Line of Road (B59) serving the Central West, the Maldon-Dombarton rail line, as well as a potential north-south high speed rail corridor.

In the region specific sections, one action stands out:

“...Future inter-city train services will focus on the needs of longer distance customers rather than modifying short distance trains...”

This drives the need to replace existing Metropolitan rolling stock with new intercity rolling stock, which is more comfortable for the longer journey time and better suited to operate on the alignment and reduce travel times.

5.2 Regional Transport Master Plans

The transport challenges facing regional NSW are

- Delivering better transport links to and within regional cities;
- Improving accessibility through a better mix of transport options available across regional NSW; and
- Providing convenient, reliable and safe travel by getting the best use out of our transport networks and providing better road connections, rail passenger services and public transport within and between regional centres.

PLANNING INITIATIVES

Again the Regional Transport Master Plan (RTMP) states the need for Intercity Rolling stock (page 16). It goes on further to state:

- Transport services will be provided as early as possible in new development areas, with an appropriate level of bus service provided to West Dapto. This will support and reflect our vision for connected regional communities (page 17).

The Action to improve passenger rail services (on page 23) is assumed to be a short term goal based on current services, and while it is not specifically addressed by this strategy, this Strategy will deliver this improvement.

5.3 Regional Rail Services Strategy

The Long Term Transport Master Plan defines certain actions (on pages 237 and 238) for regional rail services, including;

- Enhance regional passenger services through timetable, fleet, and targeted track improvements;
- Deliver regional station upgrades and access improvements; and
- Improve and Strengthen transport in Regional areas.

The Regional Rail Services Strategy responds to the LLTMRP by defining the strategy for all passenger rail services in NSW, focussing on trips that do not include metropolitan services, based on the above actions. This includes interstate, regional and local intercity services.

The Regional Rail Services Strategy has identified a need to compete with current car journey times for local regional centres around Sydney. These are:

- Sydney to Newcastle in less than 2 hours;
- Sydney to Wollongong in less than 70 min; and
- Sydney to Canberra in less than 3 hours.

This paper answers the Sydney to Wollongong need.

5.4 Sydney Rail Futures

Regional rail services to the Illawarra must use common track, between Sydney Central and Waterfall, with Sydney Trains which provide the metropolitan rail service. Accordingly this Strategy has been developed in consultation with relevant TfNSW staff responsible for planning development of the metropolitan network and to take account of key issues such as the timing of when a second harbour crossing and Rapid Transit are brought into operation. Given that Rapid Transit proposed to operate on part of the track infrastructure now used by regional services, it will be essential that Rapid Transit plans and allocated funding to maintain adequate track capacity for all corridor users.

5.5 NSW Freight and Ports Strategy

The NSW Freight and Ports Strategy⁴ provides specialist freight and logistics input to the NSW Long Term Transport Master Plan. The Strategy's key aim is to "provide a transport network that allows the efficient flow of goods to their market".

The Strategy comprises 3 strategic actions programs (SAPs):

- **SAP1 - Network Efficiency** with 8 subsidiary actions and 24 tasks. Those of particular relevant to the Sydney - Wollongong Corridor are:
 - **Action 1E** "improve the productivities of the Rail freight Network",
 - » **Task 1E2** – "secure current and future freight capacity on the shared network";
- **SAP2 - Network Capacity** with 7 subsidiary actions and 15 tasks. Those of particular relevant to the Sydney - Wollongong Corridor are:
 - **Action 2A** "Identify and protect strategic freight corridors";
 - » **Task 2A-1** "Establish corridors to meet the long term freight needs of NSW"
 - **Action 2C** "Develop and maintain capacity for freight on the rail network"

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- » **Task 2C-1** “Separate passenger and freight movements with network enhancements and rail alignments”
- **Action 2G** “Develop and maintain projects to support network capacity”
 - » **Task 2G-1** “Evaluate freight infrastructure through an investment framework”
- **SAP3 – Network Sustainability** with 4 subsidiary actions and 10 tasks. Those of particular relevant to the Sydney - Wollongong Corridor are:
 - **Action 3A** “Embed freight requirements in planning schemes”
 - » **Task 3A-1** “Integrate land use planning and freight logistics”
 - » **Task 3A-2** “Enable efficient freight access”

Task 2C-3 outlines the issue facing freight on the Illawarra Line by saying

“Coal services travelling from the Western and Southern Coalfields to Port Kembla have no option but to travel on the Sydney Trains network. The number of train paths currently available to coal services is constrained by the statutory requirement placed on Sydney Trains to give priority to passenger services.....given the forecast increase in demand for passenger services, the issue of train paths is set to worsen.”

While there are no other specific actions which address the Sydney - Wollongong Corridor directly, the strategy does refer under Task 2D-3 to developing a Port Kembla Growth plan.

The manner of providing for freight access to Port Kembla and the Illawarra Region was investigated in the “*Maldon to Dombarton Rail Link Freight Access Plan*”⁵ and the impact of the future freight demand on available capacity analyses as described elsewhere herein.

Relevantly, and unlike the Northern Sydney Freight Corridor, there are no proposals to augment the Illawarra railway specifically for freight. It could be considered that the proposed Maldon to Dombarton Rail Link represents the effective adding of freight capacity for Port Kembla. However, it is only effective as an alternative to the Illawarra line for some freight, such as western coal. However, like quadruplication projects in this corridor and other corridors, such projects which will provide capacity for freight will not facilitate significantly reduced travel times for passenger travel – though they may prevent the further worsening of travel times by effectively separating slower freight trains from faster passenger trains or by removing such trains entirely from the corridor.

On the other hand, some of those infrastructure projects outlined in this Strategy will act to effectively separate freight and passenger trains on very long sections of the corridor thereby adding capacity. Freight will be able to access those sources and destinations in the corridor for freight⁶ that are already established and enabling travel time reductions for passenger services.

However, for the reason outlined elsewhere in this Strategy, such projects which will provide capacity for freight will not facilitate significantly reduced travel times for passenger travel – though they may prevent the further worsening of travel times by effectively separating slower freight trains for faster passenger trains.

On the other hand those infrastructure projects outlined in this Strategy will act to effectively separate freight and passenger on very long sections of the corridor thereby separating freight and passenger services, adding capacity, leaving freight able to access those sources and destinations in the corridor for freight⁷ that are already established and enabling travel time reductions.

PLANNING INITIATIVES

5.6 State Infrastructure Strategy

Infrastructure New South Wales has released a State Infrastructure Strategy that defines improvements to the state owned and run assets, looking to the future. In this strategy is the Restart Programme, aimed at identifying infrastructure programmes to help NSW to restart the economy.

The Sydney to Wollongong Corridor Upgrade is proposed as a new addition to the Restart Programme, to help drive improvements in the economies of the Illawarra Local Government Area, through better public transport and freight access.

In addition, Wollongong is separately recognised by Infrastructure New South Wales as a region for additional help, with a fund of \$100m allocated to various infrastructure and healthcare projects to help develop the region and create jobs in the local economy.

Released Under NSW GIPA Act 2009

6. THE RAIL CORRIDORS STRATEGY FOR SYDNEY - WOLLONGONG

6.1 Overall Strategy

This Strategy is based on achieving reliably faster travel times than are current from Sydney Central to a terminus in Wollongong or potentially Dapto.

In seeking to achieve a reliable reduction in travel times to less than 70 minutes - i.e. requiring a saving in the order of 17 minutes - a number of linked strategies are needed addressing matters such as:

- Operational (new stopping pattern, driver training, dwell time management);
- rolling stock (train performance and reliability); and
- infrastructure (track re-alignment, new stabilising and maintenance, Passenger Information systems).

These improvements have been assessed and developed in conjunction with the major stakeholders in TfNSW, through use of a staged consultation process and those improvements which now are in this strategy are strongly supported by evidence and by those stakeholders.

They can be described broadly as follows:

- **Do not lose time** – impediments to reliable running times such as Track Speed Restrictions, level crossings, poor platform management of dwell times, loss of timetabled time on entry and exit from the Sydney and similar need to be actively eliminated. Projects such as track amplification in the Hurstville to Como sector will assist in ensuring reliable passenger train pathing as would future quadruplication⁸ of the track between Como and Sutherland;
- **Gain time** using technology solutions – foremost amongst these is introduction of faster, more highly powered rolling stock as well as introduction of ATP systems, and operation to XPT speedboards;
- **Gain time** using tactical solutions such as junction rearrangement and easing of restrictive curvature within or closely within the existing railway alignment; and
- **Gain time** by straightening and flattening the railway using major deviations and realignments thereby enabling new rolling stock to operate at maximum speed over sustained sections of the corridor.

6.2 Proposed Rolling Stock Upgrade

Based on the policy statements, analysis of previous corridor improvement proposals and the current analysis, it is clear that new rolling stock to provide express service in the Sydney - Wollongong Corridor will need to have, amongst other more technical attributes:

- a maximum permitted speed of up to 160 km/h;
- a power : weight ratio of not less than 10 kW/tonne in order to operate on 1.25% gradients at a sustained 160 km/h;
- an ability to be able to run in each direction between Sydney and Wollongong over the projected final realignments with a 5% performance margin and with ~4 intermediate stops, each of 60 seconds, in no more than 71 minutes ;
- an ability under tare (AW0) to crush (AW3) conditions to accelerate at a minimum of 0.8 m/s² from rest to at least 50 km/h;
- an average full service braking rate from 160 km/h to zero of at least 1.0 m/s² under all laden conditions and an ability to achieve this under blended dynamic and pneumatic and wholly pneumatic braking;
- dual electric traction power capability trains for running under either 1500 V DC and 25 kV AC catenaries;
- a ride quality up to 160 km/h at least as good as that of the existing 'V' set when operated at 120 km/h or XPT trailer cars with NHA bogies when operated at 160 km/h, whichever is more demanding;
- an ability for individual trains to run as single, double or triple units so that the same train technology can operate from different platform lengths such as at Sydney Terminus and Bondi Junction;
- an ability to be rapidly coupled and uncoupled to allow merging and demerging of trains; and
- a fit within the NSW Trains Medium Electric Loading Gauge thereby enabling it to operate on existing infrastructure until new alignments are constructed or in locations not bypassed by new infrastructure.

New trains will be provided with facilities for the easy storage of luggage and carry on equipment such as strollers and will be fully Disability Discrimination Act (DDA) compliant. Vestibules and door widths will be proportioned to enable easy and speedy boarding and alighting in order to minimize dwell times.

6.3 Proposed Corridor Improvements – Sutherland to Dapto

6.3.1 Major Alignment Improvement Projects

The curve easing, deviation and speed improvement projects proposed to be a part of this express service route have been determined to be:

- Loftus curve easing to provide a faster alignment and optimise track curvature north and south of Loftus Station;
- Heathcote curve easing to provide a faster alignment and optimise track curvature north of Heathcote Station;
- Some form of the “Thirroul Tunnel” deviation to reduce travel distance, eliminate sharp curvature and significantly reduce time for passenger rail traffic between Waterfall and Coledale;
- Coledale curve easing to provide a faster alignment and eliminate sharp track curvature between Coledale and Austinmer;
- Thirroul to Bellambi track realignment to provide a faster alignment and eliminate sharp track curvature south of Thirroul and optimise track curvature further south to Bellambi; and
- Removal of level crossings on the South Coast Line between Thirroul and Dapto.

The station upgrade projects to be part of the corridor improvements have been determined to be:

- Waterfall station upgrade to provide two new platforms in addition to the existing two platforms, to enable cross platform interchange for passengers interchanging between all stop and limited stop services in both directions; and

- Thirroul station upgrade to provide a new fourth platform in addition to the existing three platforms, to enable cross platform interchange for passengers interchanging between all stop and limited stop services in both directions

The complementary projects required to increase reliability and capacity of the South Coast Line include:

- Coniston to Unanderra track amplification (as part of the proposed Maldon to Dombarton Rail Link) to enable freight and passenger services to operate on separate tracks through Unanderra;
- Coniston Grade Separation to remove the at grade cross road south of Coniston Station;
- Unanderra to Dapto duplication to increase track capacity for increased level of service to Dapto; and
- New train maintenance and stabling facility between Kembla Grange and Dapto to replace the existing stabling and maintenance facilities at Wollongong and Port Kembla.

6.3.2 Proposed Level Crossings

There are sections of route where higher speed are not possible because of level crossings. In the Austinmer to Coniston section several level crossings have forced train speeds to be reduced from 115 km/h to 85 km/h because the level crossing predictor technology is not adequately able to deal with bi-directional railway operations.

In order to safely operate at 160km/h it is proposed that all level crossings be closed, or grade separated, and that no further level crossings are allowed to be built. The level crossings requiring closure and, potentially, grade separation include;

- Clifton 61.8km at Clifton School Parade – Close. New underpass to provide a new road crossing of the railway;
- Woonona 73.9km at Park Road – Close. Campbell Street overbridge located further north provides a grade separated road crossing of the railway. A new footbridge is required;

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Princes Highway Level Crossing



- Bellambi 75.5km at Bellambi Lane – Close. Rothery Street overbridge located further south provides a grade separated road crossing of the railway. A new footbridge is required;
- Corrimal 76.9km at Railway Street – Close. Towradgi Road overbridge located further south provides a grade separated road crossing of the railway. A new footbridge is required;
- Unanderra 89.4km at Nolan Street – Close. New overbridge at Princes Highway further south to provide a grade separate road crossing of the railway. Access to properties will be via Orange Grove Avenue and Doyle Avenue;
- Unanderra 89.8km at Princes Highway – Close. New overbridge to provide a grade separated road crossing of the railway;
- Kembla Grange 91.7km at West Dapto Road – Close. New overbridge to provide a grade separated road crossing of the railway;
- Wongawilli 93.7km at Darkes Road – Close. New grade separation at Kembla Grange further north or Dapto further south to provide crossing of the railway;
- Dapto 95.1km at Bong Bong Road - Close. New overbridge to provide a grade separated road crossing of the railway;
- Dapto 96.9km at Avondale Road – Close. Huntley Road overbridge located further south provides a grade separated road crossing of the railway.

6.4 Proposed Operational Changes

As discussed previously in Section 6.1, most operational changes will act to prevent time being lost but will not actively gain time. To this end, the following steps are likely to be taken to help improve the reliability of the travel time.

6.4.1 Timetable Rationalisation

Future timetables for Sydney's Rail Future will be written to provide fast reliable paths for regional services through the metropolitan network, with excess recovery times removed.

6.4.2 Dwell Time Management

Management of dwell times will be achieved through:

- Clearer messaging on trains warning customers of the approach and side of the next stop, and asking passengers to get ready to alight;
- Clearer indications on the platform through announcements and Passenger Information Display Systems (PIDS) to help passengers get ready to board; and
- KPI measurement of train drivers and guards at stations.

6.4.3 Driver Training

Upgraded driver training with KPI measurement systems will assist to standardise and improve the quality and consistency of train drivers' skills. The use of European Train Control System (ETCS) level 2 will progress this significantly, as the system can actively tell drivers what speeds they should be selecting on different sections of the route, and when to apply the brakes.

6.5 Proposed New Bus Services

In 2026, when the trains have moved to the proposed new Maintenance and Stabling Centre between Kembla Grange and Dapto, the Port Kembla Branch line will be closed and replaced by a bus service. Peak demand (worst case) is currently 73 people in an hour (PM peak), so a minimum equivalent of two bus services is required in an hour (54 passengers / vehicle).

Two standard capacity vehicles (58 passengers; 43 seated; 15 standing) operating together will allow interchange to existing northbound services originating from Port Kembla with increased opportunity to connect with additional Wollongong Services. Based on the travel time of the service, the buses would offer 10 services an hour in the peak, as opposed to 7 train services today.

6.5.1 Thirroul to Helensburgh

In order to improve travel times between major stations in the Wollongong - Sydney Corridor; it is proposed to bypass or cease stopping the rail services at many of the smaller stations between Austinmer and Helensburgh. A new bus route from Thirroul to Helensburgh will service this corridor, stopping at Thirroul, Austinmer and Helensburgh Stations. This will allow passengers on this section to interchange with the express rail service at the existing Helensburgh station prior to 2031, and the relocated Helensburgh station after 2031.

A smaller 21 seater bus would operate out of Otford, in order to navigate the steep gradients into the village centre.

These bus services would start in 2019.

6.5.2 West Dapto

In response to development of the West Dapto release area and new housing under construction on the south side of Lake Illawarra at Shellharbour, local transport infrastructure is being upgraded, including a new train station at Oak Flats and an upgrade of Shellharbour Station. All buses from the southern peninsula of Lake Illawarra are currently routed via Shellharbour; so it would be appropriate to consider extending the duplicated track

further south to Shellharbour. This potential rail duplication extension could be supplemented by an upgraded station and transport interchange at Shellharbour, offering the best location for bus and rail interchange in the region.

If the single track section is segregated from the twin track operations to improve service reliability, this would potentially force people in the Shellharbour area to interchange twice to get to Sydney. This is not preferable. An alternate solution should be found for this region.

6.6 Proposed New and Upgraded Stations

Some minor station upgrades to all stations will assist in managing train dwell times, such as full platform cover, and PIDS to inform passengers where there is more space on the train.

Upgrades of vertical transportation will also help. These should be assessed on their merits at each station as part of the current Transport Access Program (TAP) projects.

6.6.1 Thirroul Station

South Coast Line services and freight operate on the Down and Up Illawarra tracks through Thirroul. Refuge loops between Thirroul and Austinmer (further north) on both sides of the main line tracks also provide passing opportunities for passenger and freight trains.

Four new platform faces would be required at a similar location to the existing island by converting the Up side platform into an island platform. The existing station footbridge would need to be replaced with a longer bridge, to a new station entrance on the western side of the rail corridor.

This will allow all stopping services to stop in the outer set of platforms, while an express train passes on the main tracks.

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6.6.2 Waterfall Station

Currently, Waterfall Station is the southern terminus for Illawarra Line (Metropolitan Sydney Train) services. Suburban trains servicing the Illawarra Line are also stabled on the Down (eastern) side of the main line tracks at Waterfall. The South Coast Line and freight also operate on the Up and Down Illawarra Mains through Waterfall. Refuge loops through Waterfall on both sides of the main line tracks also provide passing opportunities for passenger and freight trains.

Four new platform faces would be required further north of the existing island platform together with new access from the existing station concourse to the new platforms. Existing No 1 Up Siding and No 2 Up Siding (and PTS 46 and 2B) will be removed to provide space for new platforms 1 and 2.

6.6.3 Car Parks

Thirroul and Waterfall Stations will gain in importance as express stops on the Corridor. As a result, it is expected that car parking and park and ride facilities will need to be upgraded at these two stations.

The at grade car park at Thirroul would suit being converted into a multi-storey car park, with a new covered entry into the station, connecting to the new footbridge required to services the twin island platforms.

At Waterfall, the proximity of the Royal National Park is a challenge. This at grade car park has recently been extended and anecdotal evidence suggests it is already being fully used. This Strategy proposes that the heritage listed (but disused and dilapidated) station master's house and the watering point for steam trains be demolished to make space for extra car parking. In future, a multi-storey structure might be required to service the demand for parking.

6.6.4 Bus Interchanges

New upgraded bus interchanges should be built at:

- Shellharbour
- Dapto
- Wollongong
- Thirroul
- Helensburgh

to provide fast and convenient modal transport.

6.7 Protection of run time within the Sydney metropolitan area

The implementation of Rapid Transit will create a new but independent railway to be built within the rail corridor of the Illawarra Line. This will mean that from Sutherland to Wolli Creek, only one set of tracks is available for intercity, suburban and freight services to share. There is a high probability that the number of trains using this rail line will force the headways to reduce and this will reduce line speed accordingly. This will cause travel time to be lost.

Projects required to avoid losing time or preserve capacity in the Sydney metropolitan area include, as a minimum:

- New Erskineville Crossovers⁹ to enable trains to cross tracks between the Illawarra Mains and the Illawarra Locals near Erskineville. This will remove conflicts at Erskineville Junction between trains accessing Sydney Terminal via the Illawarra Dives (and Illawarra Mains) and trains accessing Bondi Junction via the Eastern Suburbs Railway.
- Hurstville to Mortdale Quadruplication to replace the existing two tracks proposed to be utilised for Rapid Transit operations between Central and Mortdale.

It is possible that express trains will need to bypass freight and metropolitan services at some point between Sutherland and Central. The bank between Como and Jannali just south of the Georges River is a likely location for bypassing freight, and Rockdale to Kogarah is likely for metropolitan services.

It is proposed as part of this Strategy that the TfNSW Sydney's Rail Future team undertaken detailed train modelling of the twin track section and provide relief where required in order to protect the current travel times.

6.8 Capital Costs

A summary of the strategic planning level costs for the major infrastructure upgrades described in Section 6.3.1 for the Sydney - Wollongong Corridor upgrade projects are shown in [Table 5](#).

The costs shown are those that relate to upgrading for operation of services to Wollongong and do not include other costs which may be required as a result of rapid transit operating in the same corridor.

Of these:

- Sutherland-Helensburgh, Helensburgh – Thirroul and Thirroul-North Wollongong Line sectors contain time saving projects;
- Erskineville Crossovers is a capacity enabling project; and
- The remainder are service facilitating projects.

[Table 5](#) Summary of Capital Costs (P90) (Excluding land acquisition)

| Sydney to Wollongong Corridor | | | | | | | | |
|-------------------------------|-------------------------|--------------------------------------|------------------------|---------------------------|--------------------------|--------------------------|-----------------------|---|
| | Erskineville Crossovers | Sutherland to Waterfall Curve Easing | Level Crossing Removal | Waterfall Station Upgrade | Thirroul Station Upgrade | Thirroul Tunnel Option 3 | Coniston to Unanderra | Unanderra to Dapto (incl. Kembla Grange Stabling) |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |

Please see the engineering report for the cost breakdown.

6.9 Operational Outcomes

Operational analysis of the major improvements, as outlined previously, has shown the following average UP and DOWN running times can be achieved, assuming 5% recovery margins (see [Table 6](#)).

[Table 6](#) Travel time savings by improvement project

| Operating Features | Average Sydney Central to Wollongong (4 stops) (mins) | Average Time Saving over a "V" Set operating on the existing alignment |
|--|---|--|
| Standard Working Timetable (SWTT) on Existing Alignment | 88 | 1 minute faster |
| "V" Set operating on Existing Alignment | 89 | Nil |
| "V" Set on Existing Alignment to XPT speedboards | 88 | 1 minute faster |
| 160km/h > 10 kw/tonne train on Existing Alignment to XPT speedboards | 85 | 4 minutes faster |
| "V" Set on Existing Alignment to XPT speedboards plus major deviations | 71.5 | 17.5 minutes faster |
| >160km/h > 10 kw/tonne train on Existing Alignment to XPT speedboards plus major deviations | 65.5 | 23.5 minutes faster |

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While, a “V” Set operating on Existing Alignment with XPT speedboards and the scale of infrastructure upgrade proposed could achieve about a 17.5 minute time saving, the new rolling stock proposed would deliver a further 6 minutes time saving, which may be a useful margin for reliability.

Clearly, this confirms the earlier analyses that faster and more powerful rolling stock alone is insufficient to deliver the required time saving and that a suite of major deviations is required.

The underlying philosophy of the Strategy is to create sections of railway “freeway”, implementable, constructible and commissionable in sections, with no interference to the existing railway operation and able to be brought into service with simple “cutover” procedures.

These projects are summarised in the middle of this strategy paper.

6.10 Thirroul Tunnel

The terrain between Waterfall and Thirroul is not conducive to a high speed railway. Rail operations are constrained at several sections along the existing Illawarra Line by restrictive track alignments, some single line working. The existing track geometry imposes speed limitations to both passenger and freight operations, while sections of the railway corridor were constructed on land that is susceptible to slope movement.

The topography and underlying geology has resulted in high maintenance costs due to unstable slopes and drainage problems. The tortuous alignment and unstable ground has resulted in maintenance costs much higher than on other parts of the network.

The South Coast Railway corridor between Waterfall and Thirroul includes:

- Disused railway alignments between Cawley and Stanwell Park originally built circa 1880 with grades up to 1 in 40 but replaced between 1915 and 1920 with the current alignment with grades typically up to 1 in 75,
- active and potential slope instability in the sections of line south of Helensburgh,

- Stanwell Park Viaduct originally built circa 1920 of masonry construction to span across Stanwell Creek ,
- Double track tunnels at Helensburgh, Metropolitan, Lillyvale, Bald Hill, Stanwell Park and Stanwell Creek,
- A single track at Coal Cliff Tunnel through the headland south of the township of Coalcliff.
- a junction with the currently operational Metropolitan Colliery.

Track deviations along the Illawarra Line between Waterfall and Coledale are proposed to reduce track length and provide a straighter, faster alignment and eliminate sharp track curvature. Previous realignment proposals concentrated on a very long tunnel from south of Waterfall to near Thirroul.

This brought with it fire and life safety issues because of tunnel length. Furthermore, prospective tunnel ventilation issues would most likely preclude running freight trains through a tunnel of this length so that the existing alignment would have to be retained for them at the very least.

In view of this later proposals focussed on a chain of short tunnels to bypass the existing climb down the side of the escarpment. Options for these deviations include different compilations of a series of shorter tunnels with connecting bridges or a long tunnel.

For the “Thirroul Tunnel” deviations (see [Figure 7](#)), options have now been developed for;

- Incremental corridor upgrades involving track deviations that connect sections of the existing corridor with a series of short tunnels up to 1.7km long and connecting bridges up to 500m long, with discrete lengths of deviations compiled on the basis of:
 - Best Travel Time (Strategy 1); or (option 1)
 - Best Value (Strategy 2) (Option 2)
- Option 3 - involving a track deviation in a new rail corridor with a series of longer tunnels up to 4.8km long with connecting bridges up to 1km long;
- Option 4 - Long tunnel - involving a track deviation in a new rail corridor along the surface for 6km and in a new single 11km long tunnel.

THE RAIL CORRIDORS STRATEGY FOR SYDNEY - WOLLONGONG

Existing freight traffic is predominantly diesel locomotive hauled and this poses ventilation, heating and dangerous goods problems in the proposed 11 km long tunnel. It is likely that the existing alignment would have to remain in service. This would also permit the retention of local rail services between Waterfall and Thirroul via Stanwell Park.

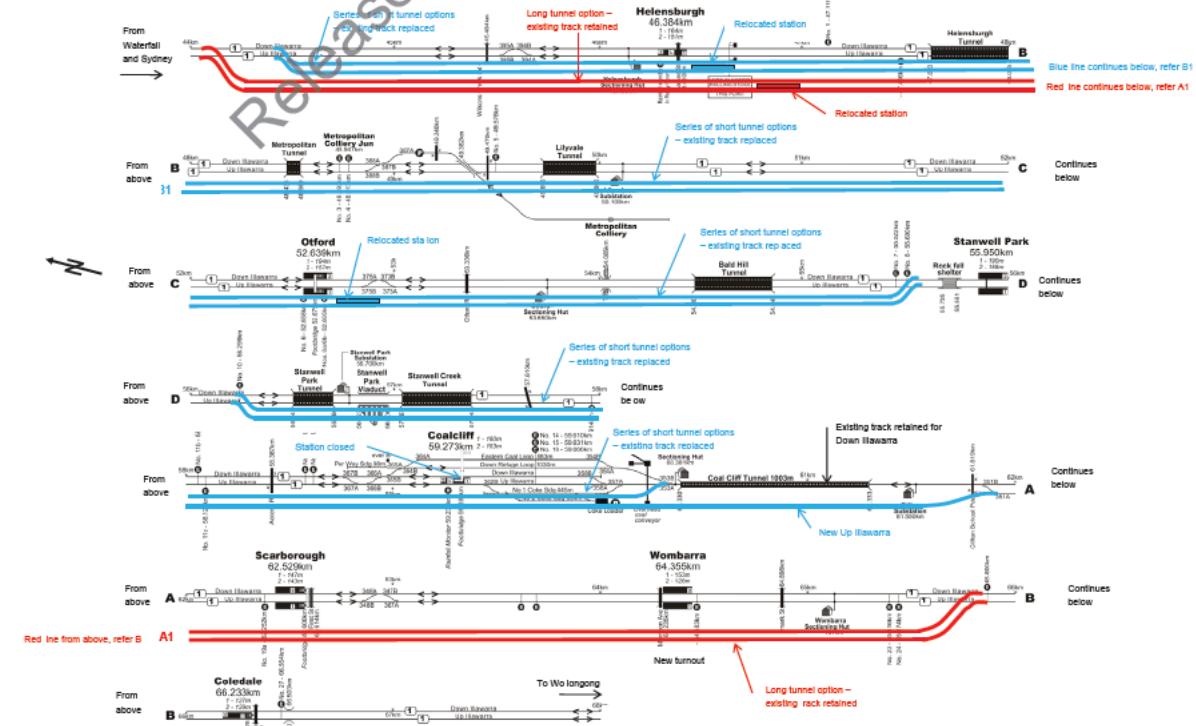
The engineering feasibility of the proposed tunnel also needs further work, as difficult geological conditions and extent of previous mine workings have not been fully investigated.

Proposed new rail configurations between Waterfall and Coledale with a new rail corridor supplementing or replacing the existing corridor are shown diagrammatically below in Figure 8. For the long tunnel option (shown in red), passenger express services would operate on the new alignment and passenger limited stops services and freight would operate on the existing alignment with turnouts at each end connecting new track to existing track. For the series of shorter tunnel options (shown in blue), most of the existing corridor would be made redundant and replaced with a new rail corridor.

Figure 7 Indicative Alignment Concepts



Figure 8 Thirroul Tunnel Rail Configurations



7. SERVICE PLAN FOR A WOLLONGONG - SYDNEY EXPRESS

7.1 Sectional Running Times and Stopping Pattern

Once the new infrastructure proposed in this Strategy is in place, the new sectional running times for an express service between Sydney and Wollongong will be as follows in [Table 7](#). The timetable will vary by year, from 2019 up to 2031 as infrastructure is brought on line until these times are achieved. This plan can be contrasted with the existing sector running times shown in [Table 2](#), showing how a total 23 minute saving is achieved over the full length.

Table 7 Proposed sectional running times in 2031 (Express stops shown)

| Travel Time (min) | Sydney | Wolli Creek | Hurstville | Sutherland | Helensburgh | Thirroul | North Wollongong | Wollongong |
|-------------------|--------|-------------|------------|------------|-------------|----------|------------------|------------|
| Sydney | - | 12 | 21 | 33 | 46 | 56 | 64 | 66 |
| Wolli Creek | | - | 9 | 21 | 34 | 44 | 52 | 54 |
| Hurstville | | | - | 12 | 15 | 25 | 33 | 35 |
| Sutherland | | | | - | 13 | 23 | 31 | 33 |
| Helensburgh | | | | | - | 10 | 18 | 20 |
| Thirroul | | | | | | - | 8 | 10 |
| North Wollongong | | | | | | | - | 2 |
| Wollongong | | | | | | | | - |

7.2 2019 Timetable

For the 2019 timetable, the following assumptions have been made:

- North West Rail Link has opened, forcing Central Coast services to operate down the Main North;
- The planning of Automatic Train Protection (ATP) will be undertaken to allow the Intercity trains to run to the XPT speed boards - the White boards. The White Boards will be increased to 160km/h where the geometry allows;
- The 7.1% factor in the SWTT will be reduced to 5%;
- Only H-Sets are operating on the South Coast Line;
- Curve easings around Heathcote, Loftus and Coledale are completed;
- Port Kembla and Wollongong Yards are still in use. (This drives the service pattern);
- No level crossings have yet been closed (limits white board speeds south of Coniston to 115km/h).

The AM peak hour service pattern will consist of:

- 1 x 8 car equivalent all stopping service from Port Kembla to Thirroul;
- 1 x 8 car equivalent all stopping service from Wollongong to Thirroul;
- 1 x 8 car equivalent all stopping service from Thirroul to Bondi Junction;
- 2 x 8 car equivalent express trains from Dapto to Bondi Junction;
- 2 x 8 car equivalent express from Kiama to Bondi Junction; and
- 2 x 8 car equivalent all stopping service from Waterfall to Bondi Junction (Metropolitan service)

This will result in a 4 minute travel time saving from Wollongong to Bondi Junction, compared to the 2013 timetable.

56 equivalent carriages will operate from Wollongong towards Bondi Junction (no change from the 56 today).

SERVICE PLAN FOR A WOLLONGONG - SYDNEY EXPRESS

7.3 2026 Timetable

For the 2026 timetable, the following assumptions have been made.

- All H-Sets will have been retired from the Corridor and replaced with the new rolling stock. The SWTT can be improved as the H-Sets are no longer the limiting train.
- The installation of Automatic Train Protection (ATP) will be complete to Dapto, and the intercity trains will be allowed to run to the XPT speed boards - the White boards. The White Boards will be increased to 160km/h where the geometry allows;
- Kembla Grange Stabling and Maintenance yard is built to support the new trains (this appears to be required because it appears that the new intercity train will be longer than the sidings in Port Kembla and too long for two trains to fit in each siding at Wollongong).
- Unanderra to Dapto is duplicated.
- The Port Kembla Branch Line is closed for passenger services.
- The Coniston Junction Grade separation is built (DOWN trains to Kiama are grade separated over the Outer Harbour entry road to allow parallel up and down movements to Coniston from Unanderra);
- Coniston to Unanderra track enhancement (as proposed by the TfNSW Maldon - Dombarton Project Team in 2014) is completed;
- The New Erskineville crossovers (Illawarra locals to Illawarra mains) are built, allowing access to / from Sydney Terminal via the Illawarra Locals at Erskineville;
- New Passenger Information Display Systems (PIDS) have been implemented on the Illawarra Line and South Coast Line;
- All level crossings between Waterfall and Dapto have been removed by grade separating the road or footpath from the railway;
- Curve easings between Austinmer and Coniston are complete;
- A new fourth platform at Thirroul has been built;
- New third and fourth platforms at Waterfall have been built.

The AM peak service pattern will consist of:

- 2.5 x 8 car equivalent express trains from Dapto to Sydney Terminal;
- 2.5 x 8 car equivalent express from Kiama to Sydney Terminal;
- 3 x 6 car equivalent all stopping services from Shell Harbour Junction to Bondi Junction;
- 2 x 4 car equivalent all stopping services from Kiama to Wollongong; and
- No metropolitan starter from Waterfall.

The advent of the new rolling stock drives the need for a new stabling and maintenance facility. The service plan is to provide more frequent services further south to meet increased customer demand, therefore stabling further south supports the service plan. Given that Kembla Grange is on a single track section, the track between Unanderra and Dapto will need to be duplicated. The at - grade cross between coal trains heading to the Inner Harbour and passenger trains heading south from Coniston will need to be resolved by building a grade separation.

At this point it is proposed that the all stopping services from Kiama and Nowra terminate on the third platform at Dapto, to segregate the single track services from the ones running to Sydney. This will improve the reliability of services from Dapto to Sydney.

The 8 car equivalent train is too long for Bondi Junction platforms and therefore a shorter version will need to be run. The full length Intercity will therefore be diverted into Sydney Terminal via a new set of crossovers at Erskineville.

This will result in an 8 to 9 minute travel time saving from Wollongong to Bondi Junction, compared to the 2013 timetable.

58 equivalent carriages will operate from Wollongong towards Bondi Junction (compared to 56 today).

SERVICE PLAN FOR A WOLLONGONG - SYDNEY EXPRESS

7.4 2031 timetable

In 2031, it is assumed that a Thirroul Tunnel has been built, in a form equivalent to Option 3.

The AM peak service pattern will consist of:

- 3 x 8 car equivalent express trains from Dapto to Sydney Terminal via the tunnel;
- 3 x 8 car equivalent express from Kiama to Sydney Terminal via the tunnel;
- 2 x 4 car equivalent all stopping services from Kiama to Wollongong;
- 3 x 6 car equivalent all stopping services from Oak Flats to Bondi Junction via the old alignment; and
- Metropolitan starters from Waterfall move to Kembla Grange.

The Thirroul Tunnel will shorten travel times on this route considerably. It is particularly important that travel times for regional services within the Sydney Trains metropolitan area do not suffer degraded travel times.

This will result in a 2 minute travel time saving from Wollongong to Bondi Junction (all stops), compared to the 2013 timetable and a 22 minute travel time saving from Wollongong to Sydney Terminal (Express).

66 equivalent carriages will operate from Wollongong towards Bondi Junction (compared to 56 today).

8. BENEFITS TO CUSTOMERS

Benefit to TfNSW's customers can be judged by the total numbers of rail passengers in the corridor who receive the benefit of travel time savings. [Table 8](#) shows the travel time savings that travellers in a given sector are expected to receive as a result of the faster, more powerful rolling stock and major deviation projects proposed, together with the estimates of the total number per annum of rail passengers in each sector (the sector line loading) currently and in 2036.

Table 8 Travel Time Savings and Line Loading by Sector (No Dwell Times)

| | Sector Distance | Average Sector Travel Time | Cumulative Average Travel Time | Average Sector Travel Time | Cumulative Average Travel Time | Average Travel Time Savings per Sector | Average Line loading by Sector |
|-------------------------|------------------------|---|---|-----------------------------------|---------------------------------------|---|---------------------------------------|
| Sector | kms | Existing Rolling Stock and Alignment (mins) | Upgraded Rolling Stock and Alignment (mins) | | (mins) | 2012 (millions) | 2036 (millions) |
| Sydney-Redfern | 1.3 | 3.0 | 3.0 | 3.0 | 3.0 | 0.0 | 4.01 |
| Redfern-Wolli Creek | 6.0 | 9.5 | 12.5 | 9.5 | 12.5 | 0.0 | 4.01 |
| Wolli Creek-Hurstville | 7.5 | 8.0 | 20.5 | 8.0 | 20.5 | 0.0 | 4.01 |
| Hurstville-Sutherland | 9.8 | 11.0 | 31.5 | 11.0 | 31.5 | 0.0 | 2.68 |
| Sutherland-Helensburgh | 21.8 | 19.0 | 50.5 | 12.0 | 43.5 | 7.0* | 2.09 |
| Helensburgh-Thirroul | 23.8 | 24.0 | 74.5 | 9.0 | 52.5 | 15.0 | 1.73 |
| Thirroul-North W'gong | 11.1 | 8.5 | 83.0 | 7.0 | 59.5 | 1.5 | 1.13 |
| North W'gong-Wollongong | 16 | 2.0 | 85.0 | 2.0 | 61.5 | 0.0 | 1.10 |
| Total | 83 | 85.0 | | 61.5 | | 23.5 | |

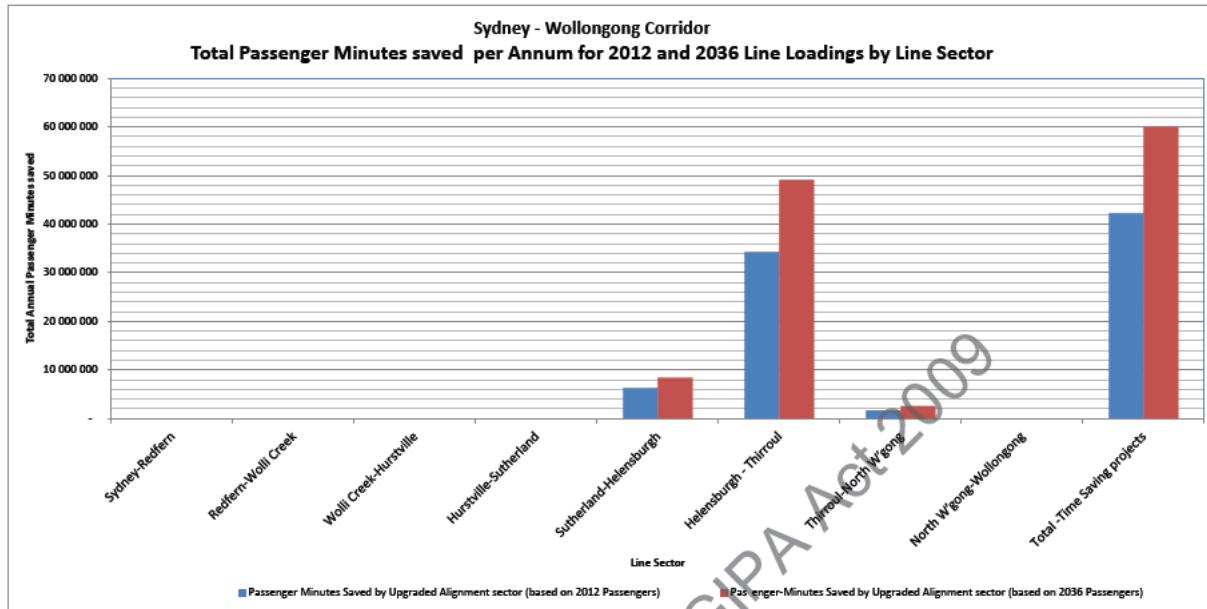
Based on adopting curve easing between Sutherland and Waterfall and major new alignment, mostly in tunnel, between Waterfall and Thirroul, a total of 22 minutes will be saved over the existing alignment. This will involve bypassing a number of stations – Austinmer, Coledale, Wombarra, Scarborough, Coal Cliff, Stanwell Park and Otford – which only make small contributions to patronage compared to Wollongong, North Wollongong and Thirroul. Additionally, 1.5 minutes is expected to be saved by curve easings between Thirroul and North Wollongong, giving a total time saving of 23.5 minutes.

Based on these line loadings and travel time saving, total passenger time savings by line sector are shown in [Figure 9](#). This shows what the saving would be based on today's patronage and in 2036 if the alignment upgrades are in place.

Clearly, the majority of time savings is achieved by a new alignment and upgrading to cross the difficult terrain of the Illawarra Escarpment between Waterfall and Thirroul.

BENEFITS TO CUSTOMERS

Figure 9 Travel Time Saving by Sector



In terms of the value for money and based on the estimates of project cost and of passenger hours saved, the best ranking project is the curve easing between Sutherland and Helensburgh – while, this project delivers a 3.0 minute time saving, it is evident that there is a need to undertake a major project in order to deliver the target 17 minutes time saving.

Table 9 Cost per passenger hour saved per annum by Sector

| Sector | Passenger Minutes Saved (Millions) | Cost per Total Annual Passenger - Minute saved (\$2014) | Passenger - Minutes saved (Millions) | Cost per Total Annual Passenger - Minutes saved (\$2014) |
|---|------------------------------------|---|--------------------------------------|--|
| | Based on 2012 Passengers | | Based on 2036 Passengers | |
| Sydney-Redfern | - | \$0 | | \$0 |
| Redfern-Wolli Creek | - | \$0 | | \$0 |
| Wolli Creek-Hurstville | - | \$0 | | \$0 |
| Hurstville-Sutherland | - | \$0 | | \$0 |
| Sutherland-Helensburgh | 6.3 | \$14 | 8.3 | \$10 |
| Helensburgh - Thirroul | 34.3 | \$85 | 49.0 | \$60 |
| Thirroul-North W'gong | 1.7 | \$38 | 2.5 | \$25 |
| North W'gong-Wollongong | - | \$0 | | \$0 |
| Total Investment in time saving projects | 42.3 | \$73 | 60.0 | \$51 |

BENEFITS TO CUSTOMERS

The major alignment reconstruction proposed between Waterfall and Thirroul to achieve a 19 minute time saving is commensurately on a similar scale to that required across the Hawkesbury River. It is estimated to deliver 81% of the total time saving able to be achieved in this Corridor.

However, at costs ranging from \$60 (2036) to \$85 (2012) per annual passenger - minute, it is nearly three times greater in relative cost than for Hornsby to Woy Woy. This reflects the relatively lower numbers of passengers travelling over this sector who are able to or are predicted to be able to receive this benefit. This cost per minute saved may reduce significantly with further urban growth in the Illawarra and if latent demand is unlocked by reduced travel times to and from Sydney. This may particularly be so if such fast services can be accessed at stations south of Wollongong.

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9. IMPLEMENTATION STRATEGY

The implementation strategy for the Sydney-Wollongong Corridor is focussed around several main elements;

- Metropolitan Infrastructure upgrades required to protect travel time within Sutherland to Central, after implementation of the Rapid Transit;
- The Thirroul Tunnel to provide the backbone of the travel time improvement for the corridor;
- Remove all level crossings
- Kembla Grange, and the new infrastructure south of Wollongong to support introduction of the new Intercity rolling stock; and
- Opportunistic improvements in services to the south of Wollongong.

Each of these four elements can be implemented independently from each other, and all will be required during the time period up to 2031 for Corridor. The timing for implementation of each element depends on many factors, the most important of which is funding.

There is an opportunity to defer the Thirroul tunnel, if the Hurstville quad is undertaken and the other projects to allow H-Sets to run at 160km/h are completed (ATP, curve easings, level crossing removal and the like). Some amount of travel time improvement – say 6 minutes – is possible without the tunnel. If the new rolling stock is introduced on this Corridor will all works except the tunnel completed, then up to 9 minutes might be able to be saved.

Ultimately though, in order to achieve the target travel time saving, the Thirroul Tunnel will be required. This is a complex and expensive task, and more detailed investigations are required to prove that the tunnel is actually constructible and operable.

This total includes both time saving and service enabling project costs.

These projects do not include modifications to Wolli Creek Junction (\$260 million) or Hurstville to Mortdale Quadruplication (\$586 million) as these projects do not save time and are properly a part of other TfNSW projects as a result of the Rapid Transit Project.

A likely programme of works would look as follows:

| Corridor | | Time Saving (min) | Delivered by: |
|---|--|-------------------|---------------|
| Waterfall to Sutherland curve easing | | 3 | 2019 |
| Eskineville crossovers | | 0 | 2023 |
| Thirroul - North Wollongong curve ease (and level crossing removal) | | 1.5 | 2023 |
| Coledale Curve Easing and level crossing removal | | 0.5 | 2023 |
| Waterfall Station upgrade | | 0 | 2026 |
| Thirroul Station Upgrade | | 0 | 2026 |
| Coniston Grade Separation | | 0 | 2026 |
| Dapto Duplication (and Kembla Grange Stabling Yard) | | 0 | 2026 |
| Level Crossing Removal south of Wollongong | | 0 | 2026 |
| Thirroul Tunnel (Option 3 or equivalent) | | 19 | 2031 |
| Total | | 23.5 | 2031 |

10. STRATEGIC RECOMMENDATIONS AND CONCLUSIONS

Faster travel times between Wollongong and the growing urban areas further south around Lake Illawarra are desirable to provide better quality services to current and potential future TfNSW Customers and will be delivered when this Strategy is implemented.

- Integral to delivering such faster travel times will be the introduction of new faster and more powerful rolling stock to replace the current "OSCARS".
- In company with introducing new rolling stock, several management and operational actions are needed:
 - As a matter of equity to all TfNSW customers, regional trains operating to Wollongong and beyond must have scheduled, fast and reliable transit paths through the metropolitan area;
 - Stops between Waterfall and Thirroul must be rationalized (to just Helensburgh) and land transport access reorganised to focus on these stopping points;
 - Excess time beyond 1 minute dwell in the timetables express paths needs to be removed; and
 - The existing alignment, track and systems must be brought up to a standard to allow 160 km/h running – where curvature permits.
- To derive maximum benefit from new rolling stock and to achieve the travel time savings target, a set of major projects are needed to improve the alignment of the rail corridor in order to permit continuous running at maximum speed over long sections of it.
- The projects required to deliver the service to customers are split between those supporting introduction of new rolling stock, and those supporting line speed increases and hence travel time savings.
- Total investment required to deliver new alignments is expected to be of the order of \$3.565 billion (2014 P90). This does not include capacity enabling projects which are needed as a result of Rapid Transit changes to the Illawarra corridor.

- The most significant project in terms of delivering the maximum benefit to all customers travelling in the corridor is to build a new high speed alignment from Thirroul to Waterfall – it is by far the greatest cost but it is also delivers by far the best value to customers in terms of travel time saved.

"The target travel time cannot be delivered without a project of this scale and ability to save time"

- To ensure equity of access to public transport for the commuters whose station will be bypassed, local shuttle rail services to connect with express services and/or well-coordinated regular bus services will be required.
- Notwithstanding that, in terms of value, other projects are not as effective, they are all required in order to achieve the target of an express travel time of less than 70 minutes or a travel time reduction of at least 17 minutes.
- By virtue of the separated track length of many of the proposed projects, effective additional track capacity will be added to the railway which will be valuable in terms of operating services for local commuters and for freight.
- If funding of around \$500 million per annum is available, the entire corridor could be upgraded to coincide with the 2031 timetable, with a major part of it completed in time for the introduction of new rolling stock in or before 2026.
- The scale and complexity of all the projects proposed and the planning, approvals, engineering and construction processes need to deliver them – and especially for Thirroul Tunnel – demands that the next stage of investigations should commence in the immediate future.

ENDNOTES

- 1 Source: DoPE population data, dated 2010. This data will be updated once more up to date information is received.
- 2 Line loading is the total passengers up and down transiting a given line sector.
- 3 "Maldon to Dombarton Rail Link Freight Access Plan" WorleyParsons in association with AkersConsulting 2013 for Transport For NSW
- 4 NSW Freight and Ports Strategy Transport for NSW November 2013
- 5 "Maldon to Dombarton Rail Link Freight Access Plan" WorleyParsons in association with AkersConsulting 2013 for Transport For NSW
- 6 Such as coal loader and unloader loops.
- 7 Such as coal loader and unloader loops.
- 8 Noting that effective quadruplication can be achieved by deviations and continuing to retain the existing alignment
- 9 This project is common to the Sydney – Canberra Corridor

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The Study Team has prepared this Report based on the Client's description of its requirements, exercising the degree of skill, care and diligence expected of a consultant performing the same or similar services for the same or similar study, and having regard to assumptions that the Study Team can reasonably be expected to make in accordance with sound professional principles.

The Study Team undertakes no duty, nor accepts any responsibility or liability, to any third party who may rely upon or use this Report. No other party should rely on this Report or the information contained in it without the prior written consent of the Study Team.

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