

Project business case evaluation summary

Sydney Metro – Western Sydney Airport

Location

Western Sydney, NSW

Geography

Fast-growing cities

Category

Efficient urban transport networks

Capital cost

Pending (see endnote)

Indicative timeframe

Construction Start: 2021

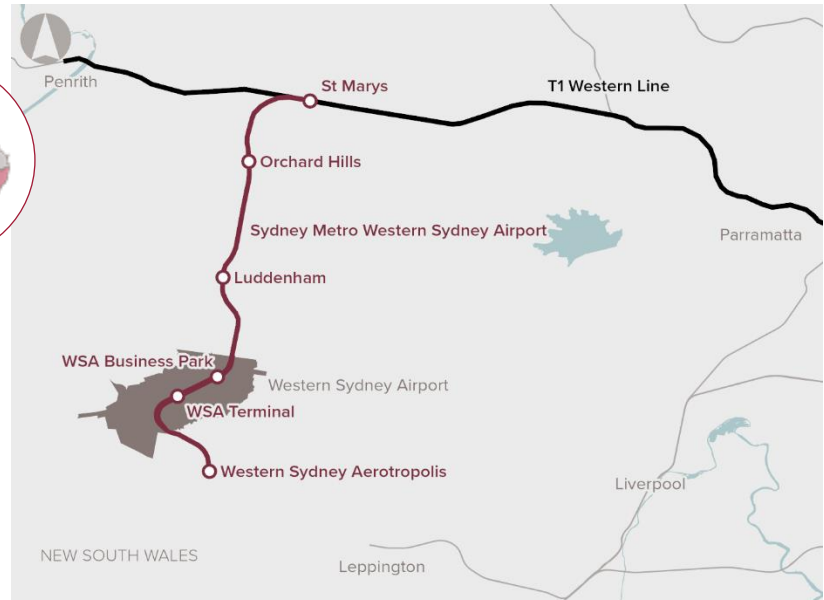
Construction completion by: 2026

Proponent

NSW Government

Evaluation date

18 February 2021



1. Evaluation Summary

The **Sydney Metro – Western Sydney Airport Project** proposes a new metro rail line between St Marys and the Western Sydney Aerotropolis to provide rail services to the new Western Sydney International (Nancy-Bird Walton) Airport once it opens, and to help shape urban land use patterns in the Western Parkland City.

There is a strong strategic case for the project's underlying objectives – improving access to Western Sydney International Airport and encouraging more sustainable development in the Western Parkland City. The project is part of the 2018 *Western Sydney City Deal*, a 20-year partnership between the Australian Government, NSW Government, and eight local governments to transform the Western Parkland City.

Infrastructure Australia recognises the need to provide public transport access to the new Western Sydney International Airport and the Western Parkland City. However, the proponent's business case does not provide sufficient evidence that the proposed project is the best solution.

The business cases states that the capital cost of the project (P90 outturn) would outweigh its benefits by \$1.8 billion when measured in present value terms (excluding wider economic benefits), and our review found that the benefits of the project may be overestimated.

The proponent has estimated that demand for the rail line would be significantly lower than its planned capacity in the initial years of operation, with passengers using less than 40% of the seated capacity in peak periods in 2026. In the longer-term, demand is projected to increase with approximately 80% of the system's total capacity being used by 2056. We recognise that technical limitations may be resulting in demand for the project being underestimated. However, addressing these limitations is unlikely to result in a positive economic case.

Infrastructure Australia strongly supports the development of integrated transport and land use proposals and recognises that this project is intended to deliver substantial land use outcomes. While the business case includes the benefits of a significant change in land use patterns, it does not include the associated investments that would be needed to realise the expected benefits.

Based on the business case and evidence available, Infrastructure Australia has not included the Sydney Metro – Western Sydney Airport project on the Infrastructure Priority List at this time.

2. Context

The Sydney Metro – Western Sydney Airport project is a proposed 23-kilometre, turn-up-and-go, driverless metro rail service. It would include six new metro stations between St Marys and the Western Sydney Aerotropolis at Bringelly, with trains running every five minutes in the peak and future capacity of one train every two minutes. Passengers from the Airport Terminal would be able to board the metro and interchange at St Marys to reach Parramatta in about 38 minutes, or the Sydney CBD in 70 minutes¹.

The Western Parkland City is part of the Greater Sydney Commission's vision for three integrated and connected cities across Sydney – accompanied by the Eastern Harbour City and the Central River City. To achieve this vision, the Commission's *Greater Sydney Region Plan* outlines a path to rebalance development across the three cities, placing housing, jobs, infrastructure and services within easier reach of more residents, no matter where they live.

The population of the Western Parkland City is projected to grow from 740,000 people in 2016 to 1.1 million by 2036, and to over 1.5 million by 2056. At the centre of the city will be the Western Sydney International Airport, scheduled to open in 2026 and currently a High Priority Project on the *Infrastructure Priority List*. The airport is located within the Western Sydney Aerotropolis, and more broadly, an economic corridor that is expected to contain defence, aerospace, freight logistics, advanced manufacturing, health, science and other activities. The business case presents case studies to show that, without mass transit, these industries will fail to catalyse. However, it is not clear to what extent the metro line would drive the relocation of businesses in these industries to the Western Parkland City.

Recent government strategies have set a vision for shaping and accelerating development in the Western Parkland City. The 2018 *Western Sydney City Deal* includes 38 commitments to create jobs, and improve liveability, housing and access to education. These commitments include delivering the first stage of a North-South Rail Link from St Marys to Western Sydney International Airport and Western Sydney Aerotropolis. They also include rapid bus services between metropolitan centres and the new airport and Aerotropolis before 2026 – when the airport is expected to open.

The *Western Sydney Airport Integrated Transport North-South Link Strategic Business Case* (2018) stated that the North-South Rail Link would be a critical part of the future vision for the Western Parkland City. In 2019, the Australian Government and NSW Government committed to delivering rail between St Marys, Western Sydney International Airport and the Aerotropolis (this project), with a joint objective of having rail connected to the Airport in time for its opening.

3. Problem description

Limited transport choices and a relative lack of infrastructure in the Western Parkland City are impacting on residents and leading to a comparative disadvantage with the rest of Greater Sydney. The business case estimates a current deficit of 130,000 jobs in the Western Parkland City, relative to its residential population. Fewer local employment opportunities mean Western Parkland City residents face some of the longest commute times in Greater Sydney. On average, residents travel 26 kilometres, compared with around nine kilometres in Inner Sydney, and spend up to four hours a day commuting, compared with average commute times of 71 minutes across Greater Sydney.

These problems are likely to worsen as the population of the Western Parkland City grows, with a forecast increase of 360,000 people from 2016 to 2036. On a per-capita basis, the Western Parkland City has fewer railway stations, hospitals and university campuses than Sydney's other two cities. An increasing number of Western Parkland City residents will rely on the road and public transport network to travel to work and access key activity centres.

¹ This summary reflects the project as set out in the Business Case (November 2019).

The *Greater Sydney Region Plan* sets out a 40-year vision to address these structural imbalances in Greater Sydney and improve the liveability, productivity and environmental outcomes of the Western Parkland City. The Plan has a vision for '30-minute cities'², which transport plays a key role in. There is significant transport investment already planned for or underway in the region, such as upgrades to Bringelly Road and The Northern Road, planning for a new M12 Motorway, and the More Trains, More Services program. However, the business case states that further investment is needed to support future demand from the Western Parkland City.

The business case forecasts that 54 kilometres of arterial roads in the Western Parkland City will have demand exceeding capacity by 2036, increasing to 177 kilometres of roads by 2056. Demand on 30 bus routes is forecast to exceed capacity in the Western Parkland City by 2036, increasing to 44 routes by 2056. Infrastructure Australia recognises the nationally significant transport needs for the Western Sydney International Airport on the Infrastructure Priority List through a High Priority Initiative for *Corridor preservation for Western Sydney Airport rail connections* and a Priority Initiative for *Western Sydney Airport public transport connections*.

We also recognise that inadequate transport accessibility can be a significant barrier to social inclusion and equitable access to opportunity. Lack of access to essential services and activities, jobs, education, healthcare and leisure, can lead to social isolation, reduced earning capacity, lower levels of educational attainment, and poorer health outcomes. These impacts have been recognised in the business case, but not quantified in the economic appraisal.

The proponent has identified the opportunity to encourage higher-density and more efficient land use and development in the Western Parkland City, which can increase housing supply, choice and affordability. Mass transit, combined with effective precinct design and integrated planning, has the potential to improve the amenity and desirability of locations and help encourage sustainable development.

4. Options identification and assessment

The proposed Sydney Metro – Western Sydney Airport Project would provide a very high level of service and amenity for users, but it is not clear from the options assessment process that this level of investment is needed to address current or future needs in the region.

The potential benefits of a North-South Rail Link were investigated in the 2018 *Western Sydney Rail Needs Scoping Study*. This study outlined how the link could offer city-building opportunities and new possibilities for housing, jobs and investment in the Western Parkland City. It also investigated two additional rail connections for the Western Parkland City: an east–west connection from the Aerotropolis to Greater Parramatta, and a south–west connection from the Aerotropolis to Leppington. The investigations in the *Western Sydney Rail Needs Scoping Study* showed that alternative rail connections from the Western Parkland City could potentially perform better than the North-South Rail Link from an economic, social and environmental perspective. There was insufficient evidence in the 2018 Study that a rail service for the north-south corridor would be the most appropriate option at this time.

The proponent assessed a range of transport options to address the problems facing the study area and the project's objectives, including city-shaping, transport, productivity and value-for-money outcomes. The long list of project options included road pricing policies, investment in road upgrades, and different scales of bus and rail options, as well as active transport investment.

Our review found that the options long list focused on transport solutions, without fully considering other separate or complementary options that could potentially better address the project's objectives. For example, the business case states that a key problem is the jobs deficit in the Western Parkland City, which may be more effectively addressed by non-transport investments in

² A city where people can reach their nearest metropolitan and strategic centres within 30 minutes, seven days a week, by public transport

the region, or an integrated package of solutions. While the Western Sydney City Deal includes commitments for some of these works, such as business hubs and TAFE integration, the business case does not measure their costs and benefits, or how the metro rail line would impact on them.

The proponent undertook a detailed and extensive process to narrow down the long list of options, using a strategic merit test, multi-criteria assessment, and rapid and detailed cost-benefit analyses. The final business case considered the project option (with six train stations) and an alternative option with only four stations. This demonstrated that for a metro-standard rail service, the option with six stations represents greater value for money than the four-station option. The proponent also found that a metro-standard service also offered higher service frequency, faster travel times and higher reliability than a double-decker heavy rail service. The business case found that metro rail would have similar capital costs, but lower operating costs relative to heavy rail.

The proponent explored potential Bus Rapid Transit alternatives, comparing a low-cost on-road option against a fully-dedicated option including tunnelling at the northern end of the alignment, which had a higher out-turn cost than the metro rail option. We consider that a partially-dedicated option could have offered better value for money, and also could have formed part of an integrated package of works, potentially followed by a mass transit solution in the longer term.

5. Proposal

The project would provide a 19-minute connection between Aerotropolis Core and the T1 Western Line, with the following six new stations along the 23-kilometre alignment (ordered from north to south):

- St Marys – providing a connection to the T1 Western Line
- Orchard Hills
- Luddenham
- Airport Business Park
- Airport Terminal
- Western Sydney Aerotropolis.

The rail line would initially operate with 12 driverless trains per hour, providing capacity for 15,500 passengers per hour across both directions. It is capable of running 20 trains per hour (capacity for almost 26,000 passengers), and with additional investment, could run 30 trains per hour with larger trains, giving an ultimate capacity of around 52,000 passengers per hour across both directions.

Upon the Western Sydney International Airport's opening in 2026, the business case estimates that the rail line would have peak line loadings of approximately 880 passengers per hour, or about 11% of the capacity of the metro in one direction. It forecasts peak line loadings growing to 3,200 passengers per hour by 2036 and 6,200 passengers per hour by 2056.

The alignment follows the St Marys to Western Sydney Aerotropolis section of the North-South Rail Link corridor from the *Western Sydney Rail Needs Scoping Study* (aside from a more direct tunnel between Orchard Hills and St Marys). A combination of at-grade, bridge, viaduct, tunnel and open-cut infrastructure would be used to navigate the local environment. It also caters for potential future extensions of the metro rail line north to Schofields and south to Campbelltown-Macarthur, and for connections to other future lines connecting south-east to Leppington and east to the Central River City.

A fleet of fully accessible, single-deck, driverless trains would operate on the new line. The rolling stock presented in the business case is wider than those in service on other metro lines to give more room for passengers and their luggage. The train-to-platform interface would be designed to be as even as possible to enable roll-on and roll-off for customers travelling with prams, wheelchairs or wheeled-luggage.

As the line is planned to operate independently, the rolling stock assumed in the business case would not be interoperable with Sydney Metro Northwest or the Sydney Metro West. This means that customers would be required to interchange with other heavy rail or metro lines, which presents a demand risk if some passengers carrying luggage want to avoid interchanging services.

The proponent has identified place-making opportunities at station precincts to help achieve its desired city-shaping objectives. These include opportunities for developments adjacent to stations, public domain improvements and strategies for activating spaces around the stations.

Infrastructure Australia considers that more than a transport intervention alone is needed to realise the scale of place-making and urban renewal outcomes sought, and that effective and ongoing coordination between Sydney Metro, government, local communities and private entities will be required.

6. Strategic fit

Improving connectivity to the Western Sydney International Airport is a nationally significant issue and is highlighted in several initiatives on the *Infrastructure Priority List*. In particular, public transport connectivity to the Airport will be important for workers and travellers. Further, Infrastructure Australia supports the long-term strategy for developing 30-minute cities in Sydney (as outlined by the Greater Sydney Commission), and recognises the merit in providing sustainable transport choices to improve social equity issues and quality of life.

The broad objectives of the project to improve transport connectivity and land use outcomes strongly align with the NSW Government's long-term strategies, and would support the opening of the Western Sydney International Airport in 2026. The proposed rail solution and north–south alignment are also set out in existing planning documents and strategies for the region, such as the 2018 *Western Sydney Rail Needs Scoping Study* and the *Western Sydney City Deal*.

The current evidence in the business case shows that, while the project would support transport connectivity, only 18% of the stated benefits in the economic appraisal are for public transport users. The proponent's independent economics peer reviewer expected that "...for a transport infrastructure project, the benefits would be predominantly transport-related, and land use related benefits would be smaller than transport benefits". Instead, the majority of benefits estimated from the new rail line are from the value of land increasing (64% of project benefits when wider economic benefits are excluded).

The business case assumes that a significant number of people will settle in the Western Parkland City rather than the Central Coast and Wollongong due to the proposed project being delivered. We consider these assumptions are likely to be overstated, and observed that the infrastructure costs to enable the land use outcomes were not fully included in the project costs.

The business case suggests that boardings from the Western Sydney International Airport and nearby precincts would be relatively low, compared with demand at the northern end of the rail line. The proponent forecasts approximately 1,200 northbound passenger boardings at the Orchard Hills Station in 2036 in the one hour AM peak, which is about 10% higher than boardings from the Aerotropolis Station (approximately 1,100), 85% higher than boardings from the Airport (approximately 650) and 800% higher than the business park station (approximately 150). This suggests a significant portion of people boarding the metro line in the AM peak are from the Orchard Hills area, and using the metro to connect to the broader Sydney rail network. However, as discussed in the following section, these transport modelling findings may be impacted by the technical and methodological limitations we identified in the business case.

Major investment beyond transport infrastructure will be required to address the challenges and long-term economic opportunities for the Western Parkland City. However, the existing business case focuses solely on the metro project, as opposed to an integrated program of works to realise the vision for the Western Parkland City. While this reflects the mandate of Sydney Metro and other agencies in developing discrete business cases for their respective projects, a program business case would better demonstrate the range of investments and policies required to realise this vision, and show how they interact, how they could be staged, and what their costs and benefits are. Without clear coordination of these investments, both across sectors and agencies, there is a risk of over or under-investment in infrastructure and non-infrastructure assets. This could undermine the Western Parkland City vision and the provision of appropriate transport options to the Western Sydney International Airport.

7. Economic, social and environmental value

The proponent's stated benefit-cost ratio (BCR) for the project is 0.75, with a net present value (NPV) of -\$1,839 million when using a 7% real discount rate and P50 capital cost estimate, excluding wider economic benefits.

The largest benefit category for the project is urban development benefits (64% of total benefits), followed by public transport user benefits (18%) and road user benefits (11%). The remainder are social and community-related benefits, such as crash-cost savings and greenhouse gas emission savings, and road user benefits from road de-congestion. The project would also result in additional train crowding from passengers joining the T1 Western Line (a disbenefit of over \$400 million in present value terms).

Our assessment of the economic, social and environmental findings in the business case found that calculation of road user and public transport benefits generally follow with the Infrastructure Australia Assessment Framework. However, we did identify some technical and methodological limitations in other areas of the appraisal, many of which were also raised by the proponent's peer reviewer.

The largest part of urban development benefits is land value increases from rezoning and density changes (\$3.208 billion in present value terms or 64% of total project benefits). Despite the business case finding demand for the metro line being relatively low in its first 15 years of operations, the proponent has assumed very significant and early land use changes in response to the project. For example, the business case estimates that there would be an additional 20,000 dwellings in the corridor by 2036 due to the project, despite fewer than 6,000 daily AM peak boardings at all stations on the metro line in the same year. The proponent's economics peer reviewer found that *"land use changes are about three times larger than what we would expect given boardings"*. Unless the transport demand for the project is significantly higher than what was modelled, these land use benefits could be overstated.

As the methodology and evidence base for land use benefits is still in development and not widely accepted, the Assessment Framework recommends only including transport benefits from land use changes (such as time savings from using the metro service) in the core appraisal results. Other land use benefits (such as land value uplift or infrastructure cost savings) should be reported 'below the line', due to their uncertainty. Applying the standard approach yields a core BCR substantially lower than the proponent's stated results, indicating that a large proportion of the stated benefits are subject to a high degree of uncertainty.

The business case also estimates avoided infrastructure cost savings (such as utilities) from encouraging denser urban development. However, these cost savings have not been estimated or justified using project- or site-specific data, which is recommended by the Assessment Framework.

Infrastructure Australia did identify some potential aspects of the economic appraisal that may be understated. Primarily, the proponent's transport model has challenges estimating demand for a greenfield area undergoing significant land use changes. Technical modelling limitations with zoning and travel behaviour could mean that there is higher demand for the rail than what was included in the business case.

During the evaluation the proponent provided additional sensitivity tests that sought to clarify the impact of the model limitations. These results demonstrated a potential uplift in benefits if travel behaviour at the proposed stations was more closely aligned with behaviours observed at existing stations closer to the CBD. While the proponent noted that these sensitivity tests were less robust than the results provided in the business case, the exercise demonstrated that vehicle and public transport benefits may be understated.

With these issues in mind, public transport patronage has been impacted by the COVID-19 pandemic, with current levels of public transport use below historical trends. The analysis in this business case was prepared prior to the pandemic and did not specifically consider the impact of the pandemic on longer-term travel behaviour.

The project also caters for future extensions of the metro line to develop a comprehensive public transport solution to the Western Parkland City. The proponent modelled a 'full network' scenario (with future Sydney Metro projects included), which suggested the full program would have slightly stronger economic, social and environmental value than this project alone. Infrastructure Australia recognises that this project may enable further benefits to the broader network, but these have not been included in the core analysis. Lastly, the appraisal did not include labour savings from reduced bus operating costs, which would slightly improve benefits.

Taking these findings into account, Infrastructure Australia considers that there is insufficient evidence that the economic, social and environmental benefits of the project would justify its costs. We recognise the nationally significant need to improve transport connectivity for the Western Sydney International Airport and the opportunity to shape growth in the Western Parkland City. However, without complementary and integrated investment into achieving the desired land use outcomes, there is also a material risk that the Western Parkland City vision will not be realised.

The following table presents a breakdown of the benefits and costs as stated in the business case.

Benefits and costs breakdown

Proponent's stated benefits and costs		Present value (\$m, 2019/20) @ 7% real discount rate	% of total
Benefits			
Urban development (land-value uplift, sustainability, avoided infrastructure, option value)		\$3,566	64%
Public transport user benefits (travel time savings, farebox, decrowding, amenity, safety, accessibility)		\$980	18%
Road user benefits (travel time savings, vehicle operating cost savings, parking, tolls)		\$617	11%
Social and community (active travel, road safety, environmental externalities, affordable housing)		\$384	7%
Total Benefits¹		\$5,545	(A) 100%
Total capital costs (P50): see endnote		\$6,772	92%
Operating costs		\$612	8%
Total Costs: see endnote¹		\$7,384	(B) 100%
Core results	Net benefits - Net present value (NPV) ²	-\$1,839	n/a
	Benefit-cost ratio (BCR) ³	0.75	n/a
Wider Economic Benefits (WEBs)		\$546	n/a
Results including WEBs	Net benefits - Net present value (NPV) ²	-\$1,294	n/a
	Benefit-cost ratio (BCR) ³	0.82	n/a

Source: Proponent's business case

(1) Totals may not sum due to rounding.

(2) The net present value is calculated as the present value of total benefits less the present value of total costs (A – B).

(3) The benefit-cost ratio is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).

The proponent's reported capital costs and funding arrangements are presented in the following table.

Capital costs and funding	
Total capital cost	Pending (see endnote)
Australian Government funding committed	\$5.2 billion
Other funding	\$5.2 billion from the NSW Government

The total committed project funding exceeds the estimated capital cost in the business case. The proponent has stated that this reflects a proposal, as part of ongoing project development, to replace the cut-and-cover tunnel under the future second runway with a longer bored (Tunnel Boring Machine) tunnel which would provide for optimal land use outcomes on the airport and Aerotropolis sites.

8. Deliverability

The business case sets out a delivery strategy for the project that was established through an extensive stakeholder and industry consultation process, which identified optimal packaging and contract model options. The contract packages identified by the proponent are:

- Advanced and enabling works (AEW)
- Advanced and enabling civil works (ACW) within Western Sydney International Airport
- Design and construct packages with flexibility for fixed price and risk-sharing components to maximise value for money and respond to key risks and evolving market conditions for Tunnels and station excavations (TSE), and Surface and civil alignment works (SCAW) from Orchard Hills to the Aerotropolis.
- Design, build, operate and maintain contract for stations, systems, trains, operations and maintenance (SSTOM), with an option to procure this package through a public private partnership (PPP)
- Finalisation auxiliary works (FAW).

The business case identifies a broad range of risks associated with project delivery. The key residual risks relate to station and airport interfaces, planning approval and the ability to meet tight delivery timeframes. The proponent has assessed the project's residual risk profile as manageable following the implementation of effective treatment strategies. The proponent also notes that dedicated risk management would be required over the life of the project.

The proponent has commissioned independent reviews of the capital cost estimates, which found that the P50 costs appear robust, but the P90 costs may be understated. These are the basis of the project's total out-turn costs, but the cost estimate process excluded low probability, high impact risks. The P90 contingencies levels are below typical industry benchmarks. Given the current state of the construction industry and the scale of competing infrastructure projects across Australia, Infrastructure Australia recommends higher contingency levels within the P90 cost estimate.

A benefits realisation plan has been developed, which recognises that a coordinated approach from Sydney Metro and planning agencies will be required to realise the integrated land use and transport benefits for the project. The proponent has also identified a series of activities that would need to occur to activate the six station precincts. Several pieces of strategic planning work have already commenced. In the event that the project proceeds, Infrastructure Australia encourages the proponent to undertake and publish a Post Completion Review to assess the extent to which expected project benefits and costs have been realised. This will help to inform the development of future projects, in particular future stages of the metro network.

Consideration of COVID-19

The COVID-19 pandemic has significantly affected the use of infrastructure. Infrastructure Australia has been working collaboratively with the Commonwealth Government to provide advice on a staged response for managing, and recovering from, the impacts of the COVID-19 pandemic.

One critical element of our advice is to maintain a pipeline of nationally significant infrastructure investments. Nationally significant infrastructure projects are long-term investments, typically considering a 30-year view of the project's social, environmental and economic impacts. In making this recommendation, Infrastructure Australia continues to take a long-term view and has also considered the sensitivity of key planning assumptions using the best data available to us.

As noted in the 2019 Australian Infrastructure Audit, we must continue to evolve the way we plan for Australia's infrastructure to embrace uncertainty. There are still many uncertainties regarding the long-term impact of the COVID-19 pandemic on infrastructure use.

We will continue to collaborate with industry, the community and governments at all levels to understand the impacts of the COVID-19 pandemic on infrastructure decisions in Australia.

This evaluation summary has been amended to exclude the capital cost (nominal, undiscounted) as the project is currently in active procurement.