Parliamentary Budget Office

Suburban Rail Loop

Cost to build and operate East and North sections

Parliamentary Budget Office

We provide independent fiscal, economic and financial advice to all members of the Parliament of Victoria. Our objective is to inform policy development and public debate in parliament and the community.

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In brief

The Victorian Government plans to deliver the Suburban Rail Loop (SRL) in multiple sections over several decades. SRL East and North is composed of 2 of these sections that the government plans to operate as a single rapid transit rail transport system:

- SRL East – Cheltenham to Box Hill
- SRL North – Box Hill to Reservoir and Reservoir to Melbourne Airport.

Planning began in 2019 and construction on SRL East commenced in 2022. SRL East is scheduled to be completed by 2035, with services commencing in that year. Plans for SRL North are less well defined – according to Option A from the SRL business case, services should commence on the Box Hill to Reservoir subsection in 2043 and on the Reservoir to Melbourne Airport subsection in 2053.

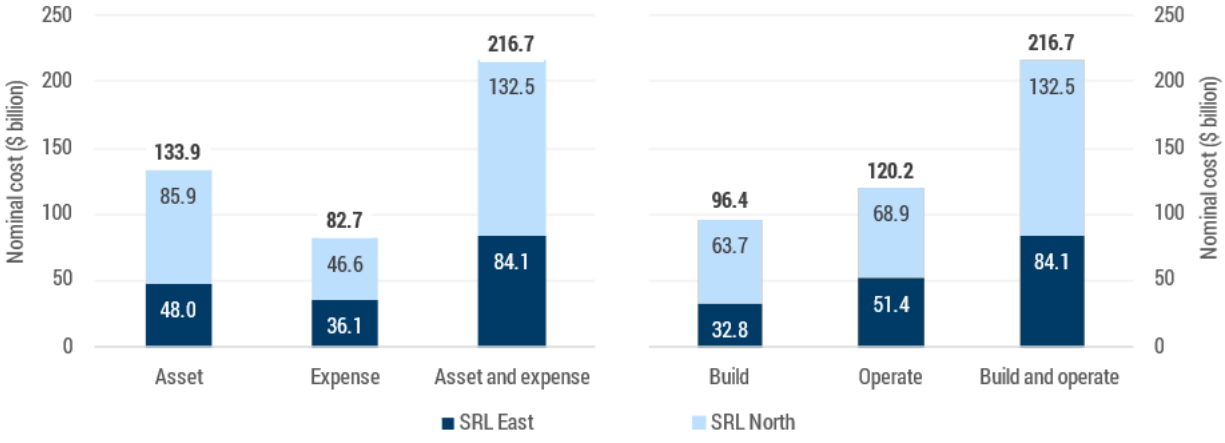
Cost to build and operate SRL East and North

We have estimated the cost to build these sections of the SRL and then operate them until the end of 2084 – 50 years after services commence on SRL East. We report these costs in nominal terms, consistent with how the Victorian Government reports costs and initiative funding in budget papers.

We expect the nominal cost to build and operate SRL East and North will be $216.7 billion across 2019 to 2084. We estimate SRL East will cost $84.1 billion while SRL North will cost $132.5 billion.

Asset works and renewals of $133.9 billion will account for around 60% of the total cost to build and operate SRL East and North. The remaining $82.7 billion is for expenses, including those incurred through the operations and maintenance of the assets, the operations of passenger services, and the activities of the Suburban Rail Loop Authority.

Figure 1 – Cost to build and operate SRL East and North



Notes: For SRL East, the operate costs are for a 50-year period from the completion of construction, specifically from 2035 to 2084. For SRL North, the operate costs are for shorter periods to 2084 – from 2043 for the Box Hill to Reservoir subsection and from 2053 for the Reservoir to Melbourne Airport subsection.

Source: Parliamentary Budget Office.

For each of the SRL sections, we have separately estimated the cost to build the section and the cost to operate services on the section. We expect build costs for SRL East and North will be $96.4 billion, with $120.2 billion to operate passenger services to 2084. SRL East accounts for around one-third of the build costs but more than 40% of the operate phase costs. This is because our evaluation includes a longer operational period for SRL East, which will be built first.

Build costs are primarily asset works, though they also include some expenses such as those incurred in the operation of the Suburban Rail Loop Authority. Conversely, operation costs are largely expenses, though they also include asset investments, such as for the refurbishment and replacement of rolling stock and other rail infrastructure assets, necessary to maintain an operational rail transport system.

Comparison with our previous cost estimates

In 2022, we published advice on the nominal cost to build and operate SRL East and North. In that advice, we estimated the nominal cost to build and operate SRL East and North would be $200.3 billion, consisting of asset works and renewals of $125.0 billion and expenses of $75.2 billion.

In our updated estimates we now expect:

- $16.4 billion (8.2%) higher total cost to build and operate SRL East and North
- $8.9 billion (7.1%) more for asset works and renewals
- $7.5 billion (9.9%) additional expenses.

In our 2022 advice, we did not separately identify the cost to build and cost to operate for the project. For this updated advice, we have undertaken additional analysis to separately estimate the cost to build and cost to operate for each section of SRL East and North.

About this report

Request

On 1 March 2023, Mr John Pesutto MP, Leader of the Opposition, asked the Parliamentary Budget Officer to provide independent advice about the nominal cost to build and operate the East and North sections of the Suburban Rail Loop (SRL).

Scope

In this advice we consider the cost to build and operate SRL East and North, which is composed of:

- SRL East's single section from Cheltenham to Box Hill
- SRL North's 2 subsections:
  - Box Hill to Reservoir
  - Reservoir to Melbourne Airport.

We express the values of our cost estimates in nominal terms. These are the actual costs of the project as they would appear in the year in which they are incurred. This is consistent with how the Victorian Government reports initiative funding and actual and estimated costs in budget papers.

Our evaluation adheres to the Victorian Government's expectations for the commencement of operations. The Victorian Government expects SRL East services to commence in 2035. Under the government's Option A scenario for SRL North, services will extend to the Box Hill to Reservoir subsection from 2043, and services will extend to the Reservoir to Melbourne Airport subsection from 2053.

Our advice considers the cost of 50 years of operations – from the commencement of services on SRL East at the beginning of 2035 to the end of 2084. This 50-year appraisal period is in line with that:

- used in the Victorian Government's *Suburban Rail Loop – Business and Investment Case* (the SRL business case).
- suggested for rail initiatives in the Australian Government's *Australian Transport Assessment and Planning Guidelines*.

Our evaluation includes fewer years of SRL North's operations than the 50 years for SRL East, as services on the SRL North subsections are likely to commence in 2043 and 2053.

We do not consider the cost to build and operate SRL Airport (Melbourne Airport Rail) and SRL West in this advice.

Limitations

Our cost estimate in this advice is not an estimate of the budget impact of delivering the SRL. It is our independent estimate of the cost of building and operating certain sections of the SRL. It includes elements of the SRL project that the Victorian Government has already funded and commenced works on. We do not include financing costs in our cost estimate.

We express the values of our cost estimates in nominal terms. This is consistent with how the Victorian Government reports initiative funding and actual and estimated costs in budget papers.

Nominal costs incorporate the effects of inflation and do not account for the opportunity cost of investing in this project instead of other initiatives. Further, our nominal cost estimates cannot be directly compared to the Victorian Government's cost estimates from the SRL business case, as these have been published in real cost and net present cost terms. Consequently, in *Attachment A – Victorian Government estimates*, we compare our net present cost estimates to the government's.

For some elements of the SRL, such as precinct and complementary projects, there is insufficient publicly available information for us to cost independently. We therefore adopted the aggregate estimates from the SRL business case for these elements.

We estimate costs commencing from 2019 – the first year the Victorian Government allocated specific SRL funding. We estimate costs to the end of 2084 to allow for 50 years of passenger services on the first section scheduled for completion – SRL East. This long appraisal period means that there is greater uncertainty in our cost estimates.

We have separated the costs of building and operating the SRL by section. In some cases, this has involved apportioning project-wide costs to relevant sections, based on other concurrent expenditure.

This cost estimate does not include costs associated with SRL Airport (Melbourne Airport Rail). However, our estimate does include the costs of adding a passenger link between an elevated Melbourne Airport Station that would be built for SRL Airport and an underground Melbourne Airport Station that would be built for SRL North.

Our cost estimate is based on each section and subsection of the SRL having separate build and operate phases. This assumes the Victorian Government would enter into contracts with firms to build SRL infrastructure components, with payments made during and at the conclusion of asset works. The firms building the infrastructure would not necessarily have any role in subsequent SRL operations, maintenance and asset renewal. However, recent commentary has suggested the government will instead enter into public private partnerships (PPPs) for some SRL components, in which the contracted parties will receive payments for infrastructure availability and/or operations over multiple decades. This might result in lower upfront asset expenditure and financing costs for the government during the build phase, but higher expenditure during the operate phase – it would also more closely align project costs to benefits. If the government employs this type of arrangement, then it is possible that PPP availability or service payments might extend beyond 2084, the final year of our analysis.

We prepared this advice on 12 March 2024.

Sensitivities

Projects of this scope and timeline are inherently subject to significant risk, and there are many factors that could affect the final costs of individual components or the project in aggregate. Our cost estimate is sensitive to several factors including:

- the final scope and specifications of the project including any further environmental and geotechnical assessments and community consultation that may warrant changes to the project
- the timing and delivery of project components
- the contract models employed by the Victorian Government and contract terms and conditions
- legal risks that may arise as the project progresses
- the nature and extent of contaminated land impacted by the project and the consequent cost of management and remediation

- changes in construction cost escalation rates
- changes in the Melbourne consumer price index (CPI)
- changes in the Victorian wage price index (WPI).

Background

In this section	This section provides an overview of the SRL, describing: ▪ the project and each of its sections ▪ differences between the rail transport systems that the project will implement ▪ key aspects of the project's financing arrangements.

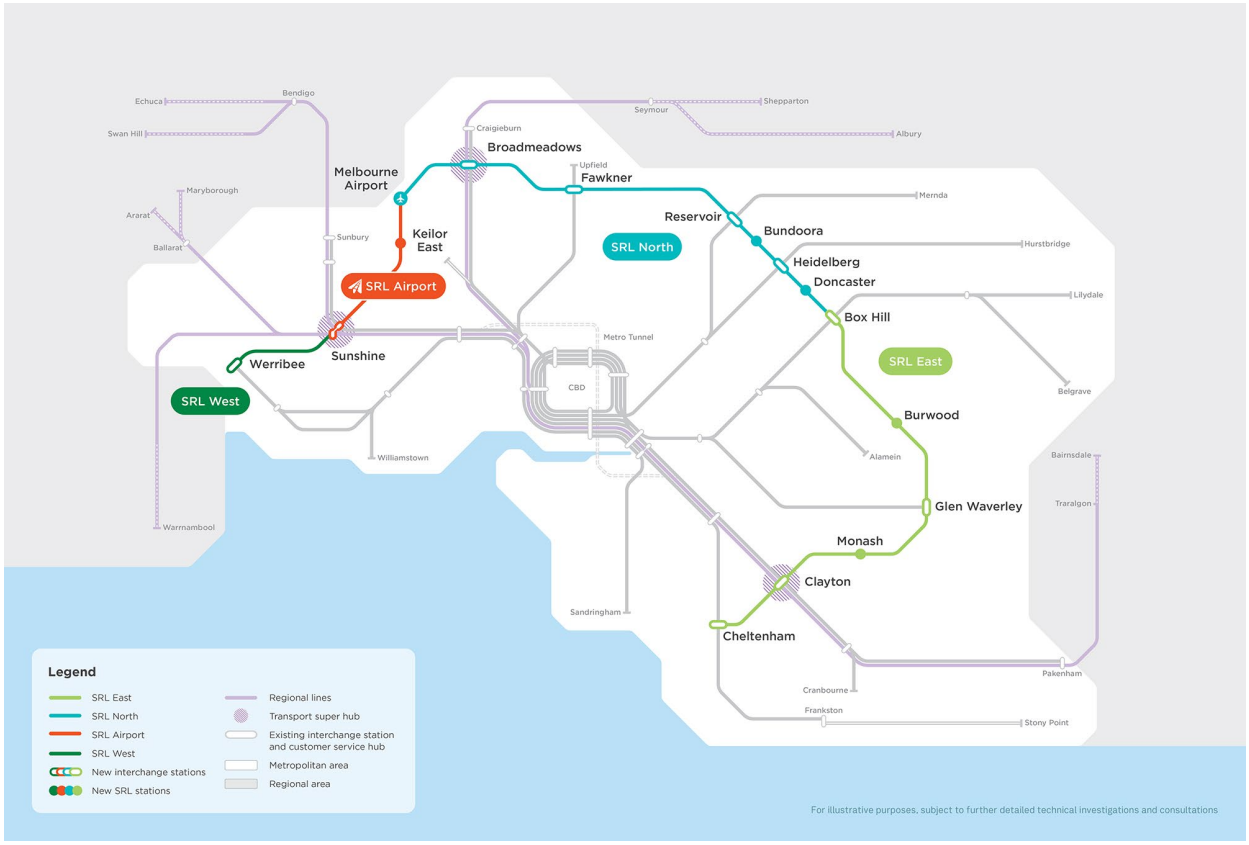
The SRL project

With the SRL project, the Victorian Government aims to build a 90-kilometre orbital railway line connecting major Melbourne metropolitan railway lines from the Frankston Line to the Werribee Line, through Melbourne Airport. The project intends to establish 3 transport super hubs at Clayton, Broadmeadows and Sunshine. These super hubs will connect SRL services with regional services, so passengers outside Melbourne would have less need to travel through the central business district.

The project scope and its staging have evolved over recent years. The SRL currently comprises 4 main sections which the Victorian Government plans to deliver in stages over several decades:

1. SRL East – Cheltenham to Box Hill
2. SRL North
    a. Box Hill to Reservoir
    b. Reservoir to Melbourne Airport
3. SRL Airport – Melbourne Airport to Sunshine
4. SRL West – Sunshine to Werribee.

Figure 2 – SRL network map



Source: Victoria's Big Build.

SRL East

SRL East will connect Cheltenham to Box Hill, via a new transport super hub at Clayton. Construction began in June 2022. The Victorian Government expects first passenger services to operate on this section in 2035.

SRL North

SRL North will initially extend from Box Hill to Reservoir, and then to Melbourne Airport, via a new transport super hub at Broadmeadows. As the Victorian Government does not plan to commence construction of SRL North for some time, there is greater uncertainty around its scope of works and specifications.

The Victorian Government has examined 2 scenarios for SRL North:

- Option A – Box Hill to Reservoir section opening for services in 2043, and the Reservoir to Melbourne Airport section opening for services in 2053.
- Option B – Box Hill to Reservoir section opening for services in 2038, and Reservoir to Melbourne Airport section opening for services in 2043.

The Victorian Government has not confirmed which option it will implement. However, the SRL business case indicated that Option A was likely to have a higher benefit-cost ratio (BCR).

SRL Airport

SRL Airport will extend from Melbourne Airport to a new transport super hub at Sunshine.

The Melbourne Airport Rail (MAR) project proposed to build an electrified broad gauge heavy rail line between Melbourne Airport and south-eastern Melbourne, via Sunshine and the Metro Tunnel. Construction began in 2022, with completion originally targeted for 2029.

The Victorian Government released the *Melbourne Airport Rail Business Case* on 21 September 2022. This business case stated that MAR would be a key part of the SRL, with passengers that intended to pass through rather than terminate at Melbourne Airport interchanging at Melbourne Airport Station. Subsequently, on 30 October 2022, the Victorian Government started referring to the MAR project as 'SRL Airport'.

SRL West

SRL West will extend from the new transport super hub at Sunshine to Werribee. The Victorian Government's 2018 *Western Rail Plan* suggested SRL West would make use of the existing Regional Rail Link/Wyndham Vale Line rail corridor. Alternatively, SRL West could be built as an underground rapid transit rail line that directly links Sunshine and Werribee.

The Victorian Government is yet to publish any information regarding its plans for the commencement of SRL West construction works. The start date for SRL West passenger services is also unknown.

Rail transport systems

When fully completed, the SRL will employ a mix of rail transport systems. SRL East and North will use rapid transit or metro-style technology, while SRL Airport will use heavy rail technology. It is unclear what technology SRL West will employ.

These transport systems will operate independently, with minimal sharing of infrastructure. SRL orbital passengers will need to physically transfer between systems at Melbourne Airport Station (and possibly Sunshine Station).

Rapid transit and heavy rail systems have different characteristics. Heavy rail systems generally operate larger trains less frequently, while rapid transit systems operate smaller trains more frequently.

Figure 3 – Melbourne passenger rail transport systems

	Metropolitan train network (including SRL Airport)	Suburban Rail Loop East and North	Metropolitan tram network
Description	Australia's largest metropolitan railway network, with 16 lines, 998 km of tracks, and scheduled services	An independent orbital rail line providing a 'turn up and go' metro-style service	World's largest tram network, with 25 lines, 250 km of double track, and scheduled services
System type	Heavy rail	Rapid transit	Tram
Similar system types and names	▪ Commuter rail ▪ Suburban rail	▪ Metro-style ▪ Mass rapid transit	▪ Light rail ▪ Streetcar
General system characteristics	▪ Shared network, with multiple operators	▪ Fully segregated network ▪ Short journey focus	▪ Shared corridor with other transport modes ▪ Short journey focus

	Metropolitan train network (including SRL Airport)	Suburban Rail Loop East and North	Metropolitan tram network
	▪ Medium to long distance journeys ▪ Varied calling pattern	▪ Frequent stops ▪ Common calling pattern	▪ Frequent stops ▪ Common calling pattern
Similar networks in other cities	▪ Sydney Trains Network ▪ London Overground ▪ Berlin Stadtbahn	▪ Sydney Metro ▪ London Underground ▪ Berlin U-Bahn ▪ Paris Metro ▪ New York Subway	▪ Sydney light rail ▪ Manchester Metrolink ▪ Cologne Stadtbahn ▪ Saint Petersburg tramway
Power system	▪ Direct current (1500 V DC) ▪ Overhead line	▪ Alternating current (25 kV AC) ▪ Overhead line	▪ Direct current (600 V DC) ▪ Overhead line
Signalling	Mix of 'fixed block' (conventional) and 'moving block' (High Capacity Signalling)	'Moving block' – Communications Based Train Control (CBTC)	Individual tram transponders activating signalised intersections
Interaction with other transport modes	Shares network with freight and regional passenger services, while over 60 road-rail level crossings will remain after the Level Crossing Removal Project is completed in 2030	Fully segregated from all other rail services and transport modes	75% of the network is shared with other road users
Track gauge	Broad (1,600 mm)	To be determined	Standard (1,435 mm)
Rolling stock	Human-driven	Fully automated	Human-driven
Rolling stock example	High Capacity Metro Trains (HCMT) ▪ Cars: 7 ▪ Capacity: 1,380 (502 seated) passengers ▪ Top operating speed: 130 km/h ▪ Length: 160.2 m ▪ Width: 3.04 m ▪ Height: 4.2 m	Medium capacity rolling stock (MCRS) ▪ Cars: 4 ▪ Capacity: 1,008 (188 seated) passengers ▪ Top operating speed: 100 km/h ▪ Length: 93 m ▪ Width: 3.2 m ▪ Height: 4.1 m	E-Class trams (Flexity Swift) ▪ Cars: 1 (3 sections) ▪ Capacity: 210 (64 seated) passengers ▪ Top operating speed: 80 km/h ▪ Length: 33.45 m ▪ Width: 2.65 m ▪ Height: 3.65 m

Sources: Parliamentary Budget Office, Victoria's Big Build, Vicsig, Yarra Trams.

Funding history

The Victorian Government expects the cost to build SRL East to range between $30.0 billion and $34.5 billion, and has committed $11.8 billion funding to date, across multiple budgets:

- The 2019–20 budget allocated $300 million for planning and development
- The 2020–21 budget allocated $2.2 billion for initial and early works
- The 2021–22 budget update allocated $9.3 billion for SRL East main works.

To date, the Australian Government has committed $2.2 billion for SRL East construction works. A Prime Ministerial press release stated that this amount would be invested over 5 years. However, the 2023–24 Victorian Budget, Budget Paper No. 4: State Capital Program, states that this will be invested over 3 years.

The Victorian Government has indicated it will seek additional funding for SRL East through:

- private sector investment
- value capture
- matching contributions from the Australian Government.

The Victorian Government is yet to publish any information regarding its plans for funding SRL North.

SRL East

In this section	This section outlines the Victorian Government's scope of works for building and operating SRL East. It then assesses the nominal cost of: ▪ building SRL East between 2019 and 2035 ▪ operating SRL East between 2035 and 2084 ▪ building and operating SRL East between 2019 and 2084.

Scope of works

SRL East will be a 26 km rapid transit rail transport system built almost entirely underground between Cheltenham and Box Hill. The project's build scope includes:

- twin-bore rail tunnels and track between Cheltenham and a stabling and maintenance facility in Heatherton
- twin-bore rail tunnels and track between the stabling and maintenance facility in Heatherton and Box Hill, travelling beneath Clayton, Monash University, Monash Freeway, Glen Waverley, Burwood, and Box Hill
- six new underground stations in Cheltenham, Clayton, Monash, Glen Waverley, Burwood, and Box Hill, with interchanges to existing railway stations at Southland, Clayton, Glen Waverley, and Box Hill, and to the existing tram network in Burwood and Box Hill
- a facility in Heatherton for SRL train stabling and maintenance, including an operational control centre, and facilities such as a train wash and an electrical substation
- an electrical substation in the vicinity of the new SRL station in Burwood
- an emergency support facility in Mount Waverley, which will include a back-up control centre
- line-wide systems including signalling and control, power and overhead line equipment, communications, and mechanical and fire services.

Our estimate of the cost to build SRL East also includes the costs of:

- project planning and development
- property and land acquisition
- initial and early works
- complementary and associated projects such as precinct development
- new rolling stock
- Victorian Government management and oversight of asset works, primarily by the Suburban Rail Loop Authority (SRLA).

SRL East operations will commence following the completion of the build. Our estimate of the cost to subsequently operate SRL East between 2035 and 2084 includes the costs of:

- operating passenger services

- operating and maintaining fixed rail transport infrastructure
- operating and maintaining rolling stock
- renewing assets, including refurbishment and replacement costs
- Victorian Government management and oversight of SRL operations.

Cost to build

We expect the nominal cost to build SRL East will be $32.8 billion across 2019 to 2035. This consists of asset works of $31.0 billion and expenses of $1.7 billion.

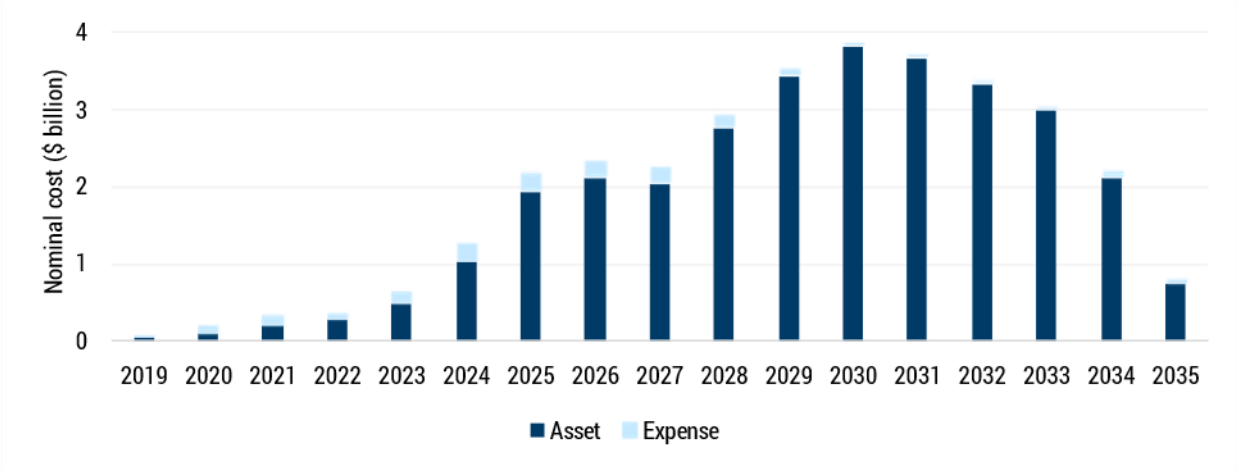
The asset works include:

- project planning and preparatory works, including property and land acquisition
- construction of rail transport infrastructure including tunnels, track, underground stations, stabling and maintenance facilities, electrical substations, and line-wide systems
- acquisition of rolling stock
- development of surrounding precincts.

The expenses include:

- operations and maintenance of electrical substations prior to the commencement of SRL services
- Victorian Government management and oversight of the project, including establishment and resourcing for the SRLA.

Figure 4 – Estimated year-on-year cost to build SRL East



Source: Parliamentary Budget Office.

Our estimated profile of the SRL East build reflects the profile of comparable major transport infrastructure projects. At the start of the SRL East project, most expenditure is for planning and preparatory works. Expenditure will then increase as the Victorian Government signs substantial works contracts and main works commence, with SRL East build expenditure expected to peak in 2030 at $3.8 billion.

Cost to operate

We expect the nominal cost to operate SRL East will be $51.4 billion across 2035 to 2084. This consists of expenses of $34.4 billion and asset renewals of $17.0 billion.

The expenses include:

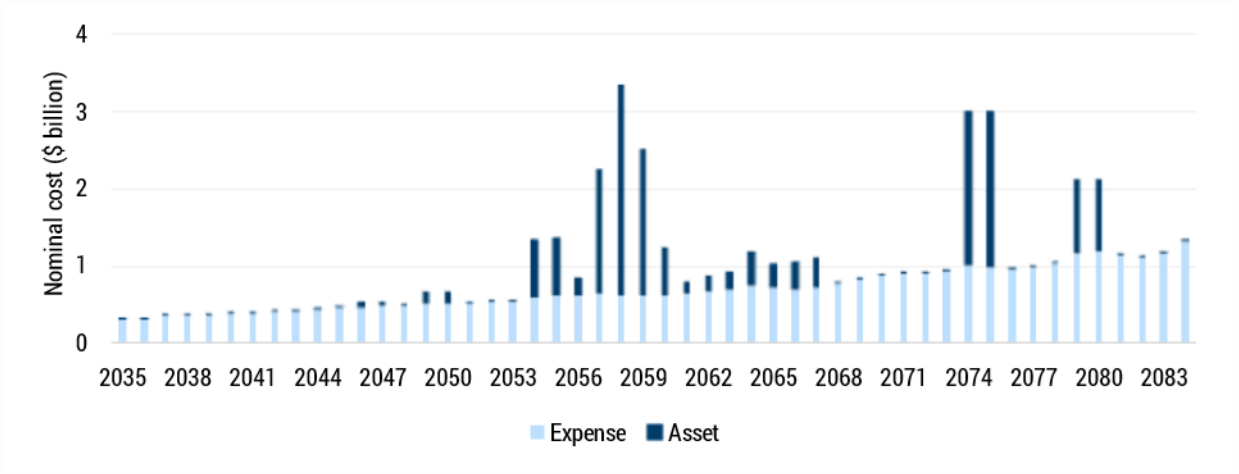
- operations of passenger services
- operations and maintenance of rail transport infrastructure including tunnels, track, underground stations, stabling and maintenance facilities, electrical substations, and line-wide systems
- operations and maintenance of surrounding precinct infrastructure
- operations and maintenance of rolling stock
- government management and oversight of SRL operations.

The asset renewals include:

- refurbishment of rail transport infrastructure including underground stations, stabling and maintenance facilities, electrical substations, and line-wide systems
- replacement of rail transport infrastructure including electrical substations and line-wide systems
- refurbishment and replacement of rolling stock.

Our estimates do not consider any partial offsets to costs from farebox revenue due to increased passenger trips.

Figure 5 – Estimated year-on-year cost to operate SRL East



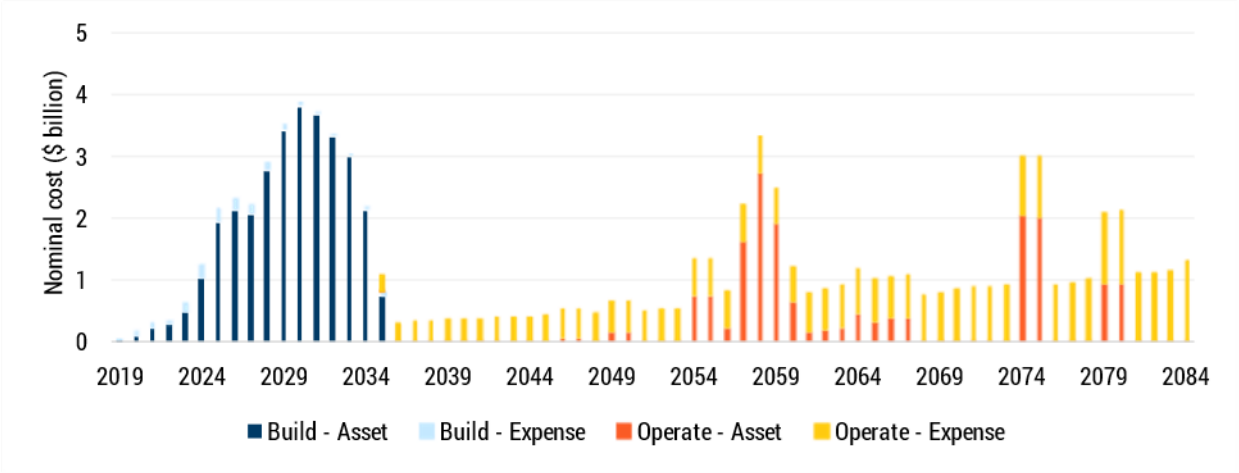
Source: Parliamentary Budget Office.

Our estimate of expenditure during the SRL East operations phase reflects a gradual increase in operations and maintenance expenses, along with peaks in asset renewal expenditure as refurbishments and replacements are required. Expenditure is estimated to peak in 2058 at $3.3 billion, primarily due to the replacement of line-wide systems in advance of 25 years of SRL East operations.

Cost to build and operate

We expect the nominal cost to build and operate SRL East will be $84.1 billion across 2019 to 2084. This consists of asset works and renewals of $48.0 billion and expenses of $36.1 billion.

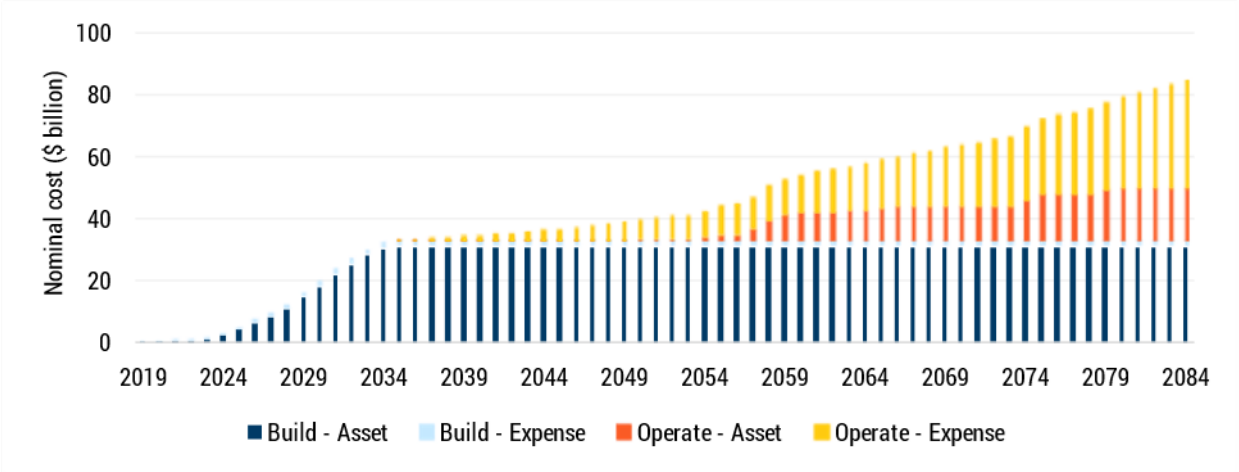
Figure 6 – Estimated year-on-year cost to build and operate SRL East



Source: Parliamentary Budget Office.

Of the estimated $48.0 billion in asset works and renewals for SRL East, 64.7% is associated with the build. The remainder reflects necessary capital works to operate SRL East, such as the replacement of infrastructure and rolling stock. Conversely, just 4.7% of the estimated $36.1 billion in expenses for SRL East is associated with the build, with most expenses being incurred during operations.

Figure 7 – Estimated cumulative cost of building and operating SRL East



Source: Parliamentary Budget Office.

Of the $84.1 billion nominal cost to build and operate SRL East, we expect that:

- build costs would comprise 38.9% of this total cost
- asset works and renewals would comprise 57.1% of this total cost.

SRL North

In this section	This section outlines the Victorian Government's scope of works for building and operating SRL North between: ▪ Box Hill and Reservoir ▪ Reservoir and Melbourne Airport. It then assesses the nominal cost of: ▪ building these SRL North subsections between 2028 and 2053 ▪ operating these SRL North subsections between 2043 and 2084 ▪ building and operating SRL North between 2028 and 2084.

Scope of works

The Victorian Government's scope of works for SRL North is less defined than that for SRL East. The government has stated that the alignment for SRL North is indicative and subject to further options analysis, technical investigations, and consultation.

Box Hill to Reservoir

The Victorian Government's public documentation indicates that SRL North – Box Hill to Reservoir will be a 19 km extension to the SRL rapid transit system, built entirely underground between Box Hill and Reservoir. Based on the government's public documentation and the general requirements for rail transport infrastructure projects, the build scope will include:

- twin-bore rail tunnels and track between Box Hill and Reservoir, travelling beneath Box Hill, Eastern Freeway, Doncaster, Bulleen, North East Link, Heidelberg, Bundoora and Reservoir
- four new underground stations in Doncaster, Heidelberg, Bundoora, and Reservoir, with interchanges to existing railway stations at Heidelberg and Reservoir, and to the existing tram network in Bundoora
- an upgrade of the SRL train stabling and maintenance facility in Heatherton to cater for additional rolling stock
- an emergency support facility, likely to be in Bulleen
- extensions and improvements to SRL line-wide systems including signalling and control, power and overhead line equipment, communications, and mechanical and fire services.

Reservoir to Melbourne Airport

The Victorian Government's public documentation indicates that SRL North – Reservoir to Melbourne Airport will be a 15.2 km extension to the SRL rapid transit system, built almost entirely underground between Reservoir and Melbourne Airport. Based on the government's public documentation and the general requirements for rail transport infrastructure projects, the build scope will include:

- a stabling facility, likely to be between Broadmeadows and Melbourne Airport
- twin-bore rail tunnels and track between Reservoir and the stabling facility, travelling beneath Reservoir, Fawkner, Hadfield, Glenroy, Broadmeadows and Westmeadows

- twin-bore rail tunnels and track between the stabling facility and Melbourne Airport
- three new underground stations in Fawkner, Broadmeadows and at Melbourne Airport, with interchanges to existing railway stations at Fawkner and Broadmeadows and the proposed SRL Airport station at Melbourne Airport
- an upgrade of the SRL train stabling and maintenance facility in Heatherton to cater for additional rolling stock
- an emergency support facility, likely to be in Hadfield
- extensions and improvements to SRL line-wide systems including signalling and control, power and overhead line equipment, communications, and mechanical and fire services.

Box Hill to Melbourne Airport

Consistent with our approach to SRL East, our estimate of the cost to build both subsections of SRL North also includes the costs of:

- project planning and development
- property and land acquisition
- initial and early works
- complementary and associated projects such as precinct development
- additional rolling stock
- Victorian Government management and oversight of asset works, primarily by the SRLA.

SRL operations will extend to include SRL North following the completion of each subsection's build. Our estimate of the subsequent additional cost to operate the SRL between 2043 and 2084 includes the costs of:

- operating additional passenger services
- operating and maintaining fixed rail transport infrastructure
- operating and maintaining additional rolling stock
- renewing assets, including refurbishment and replacement costs
- Victorian Government management and oversight of additional SRL operations.

Cost to build

We expect the nominal cost to build SRL North will be $63.7 billion across 2028 to 2053. This consists of:

- asset works of $60.3 billion – $27.6 billion for the Box Hill to Reservoir subsection and $32.7 billion for the Reservoir to Melbourne Airport subsection
- expenses of $3.3 billion – $1.4 billion for the Box Hill to Reservoir subsection and $2.0 billion for the Reservoir to Melbourne Airport subsection.

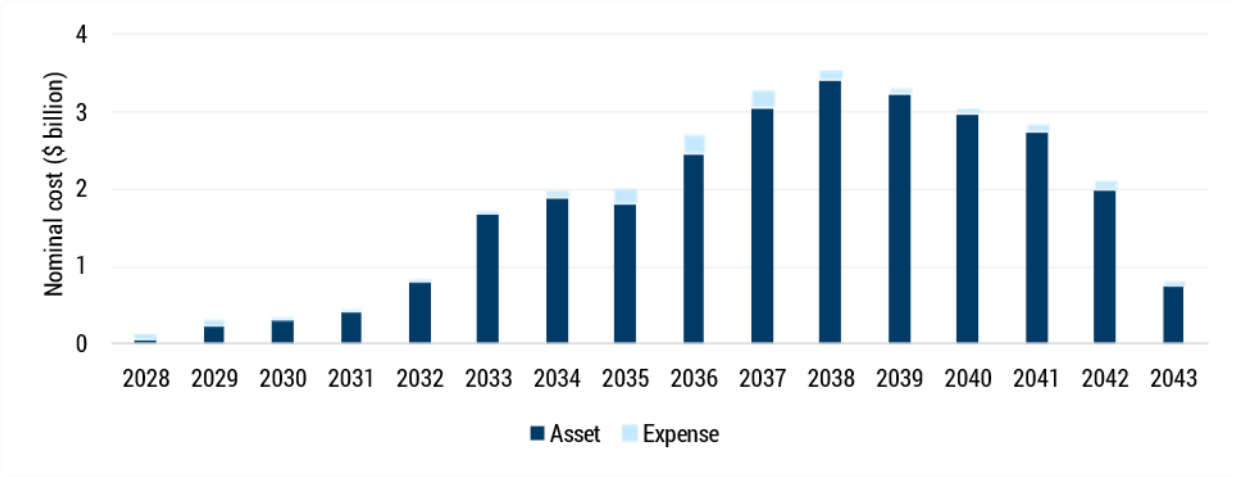
The asset works include:

- project planning and preparatory works, including property and land acquisition

- construction and augmentation of rail transport infrastructure including tunnels, track, underground stations, stabling and maintenance facilities, and line-wide systems
- acquisition of additional rolling stock
- development of surrounding precincts.

The expenses are primarily for Victorian Government management and oversight of the build.

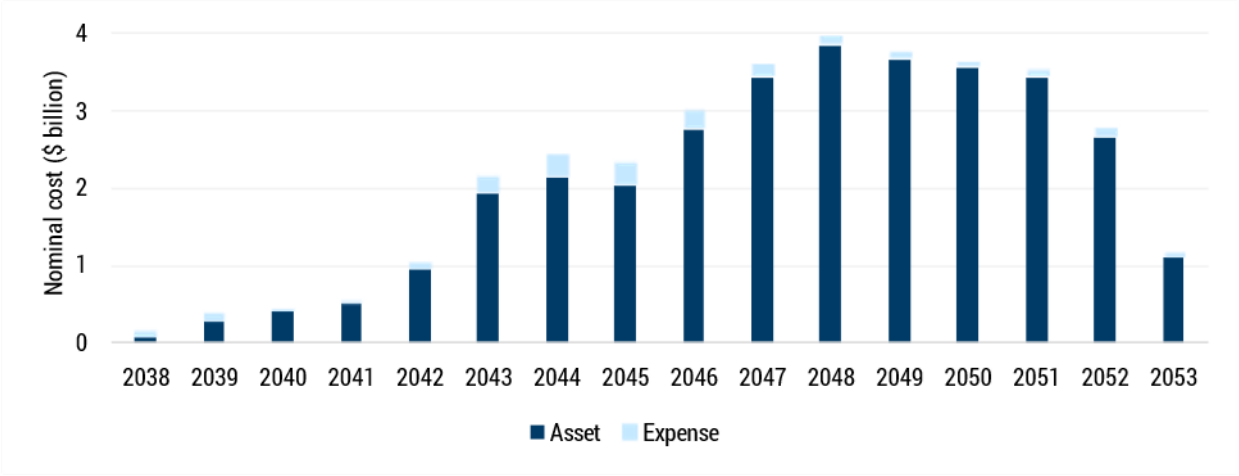
Figure 8 – Estimated year-on-year cost to build SRL North – Box Hill to Reservoir



Source: Parliamentary Budget Office.

Our estimated profile of the SRL North – Box Hill to Reservoir build reflects the profile of comparable major transport infrastructure projects. At the start of the subsection build, most expenditure is for planning and preparatory works. Expenditure will then increase as the Victorian Government signs substantial works contracts and main works commence, with SRL North – Box Hill to Reservoir build expenditure expected to peak in 2038 at $3.5 billion.

Figure 9 – Estimated year-on-year cost to build SRL North – Reservoir to Melbourne Airport



Source: Parliamentary Budget Office.

Our estimated profile of the SRL North – Reservoir to Melbourne Airport build also reflects the profile of comparable major transport infrastructure projects. SRL North – Reservoir to Melbourne Airport build expenditure is expected to peak in 2048 at $3.9 billion.

Cost to operate

We expect the nominal cost to extend SRL operations for SRL North will be $68.9 billion across 2043 to 2084. This consists of:

- expenses of $43.3 billion – $20.4 billion for the Box Hill to Reservoir subsection and $22.9 billion for the Reservoir to Melbourne Airport subsection
- asset renewals of $25.6 billion – $11.8 billion for the Box Hill to Reservoir subsection and $13.8 billion for the Reservoir to Melbourne Airport subsection.

The expenses include:

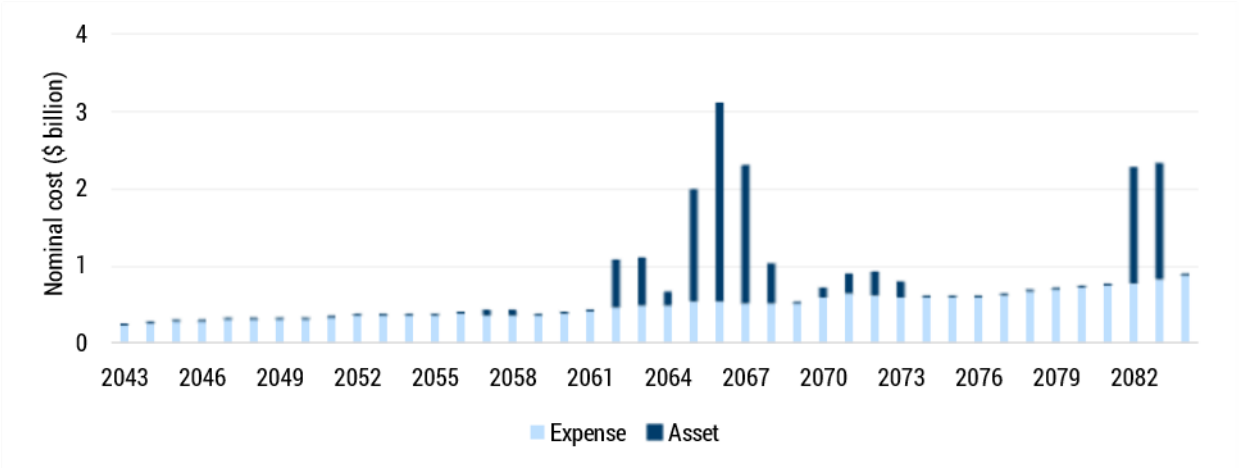
- operations of additional passenger services
- operations and maintenance of rail transport infrastructure including tunnels, track, underground stations, stabling facilities, and line-wide systems
- operations and maintenance of surrounding precinct infrastructure
- operations and maintenance of additional rolling stock
- Victorian Government management and oversight of additional SRL operations.

The asset renewals include:

- refurbishment of rail transport infrastructure including underground stations and line-wide systems
- replacement of rail transport infrastructure including line-wide systems
- refurbishment and replacement of rolling stock.

Our estimates do not consider any partial offsets to costs from farebox revenue due to increased passenger trips.

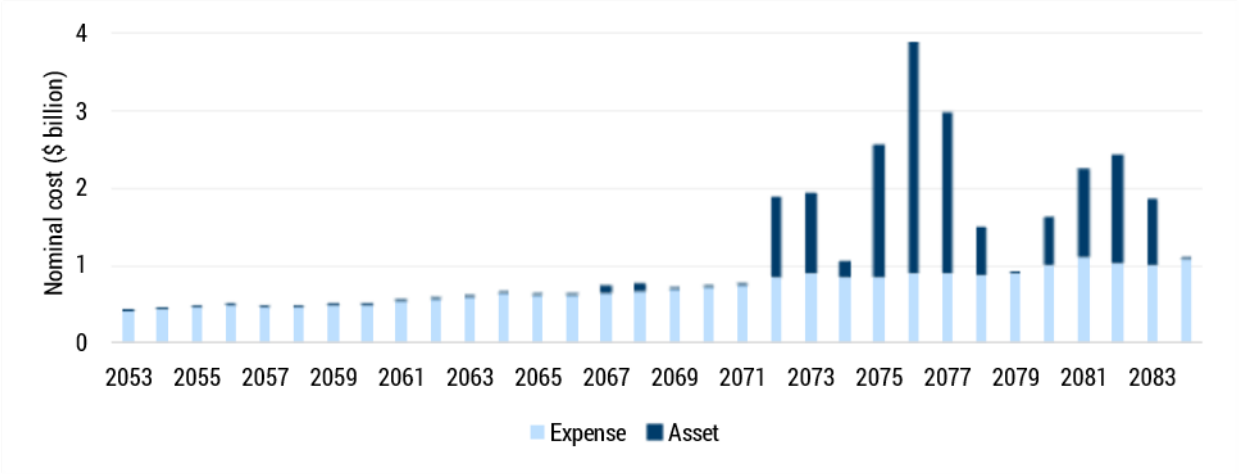
Figure 10 – Estimated year-on-year cost to operate SRL North – Box Hill to Reservoir



Source: Parliamentary Budget Office.

Our estimate of additional expenditure arising from extending SRL operations to SRL North – Box Hill to Reservoir reflects a gradual increase in operations and maintenance expenses, along with peaks in asset renewal expenditure as refurbishments and replacements are required. Expenditure is estimated to peak in 2066 at $3.1 billion, primarily due to the replacement of line-wide systems in advance of 25 years of operations on SRL North – Box Hill to Reservoir.

Figure 11 – Estimated year-on-year cost to operate SRL North – Reservoir to Melbourne Airport



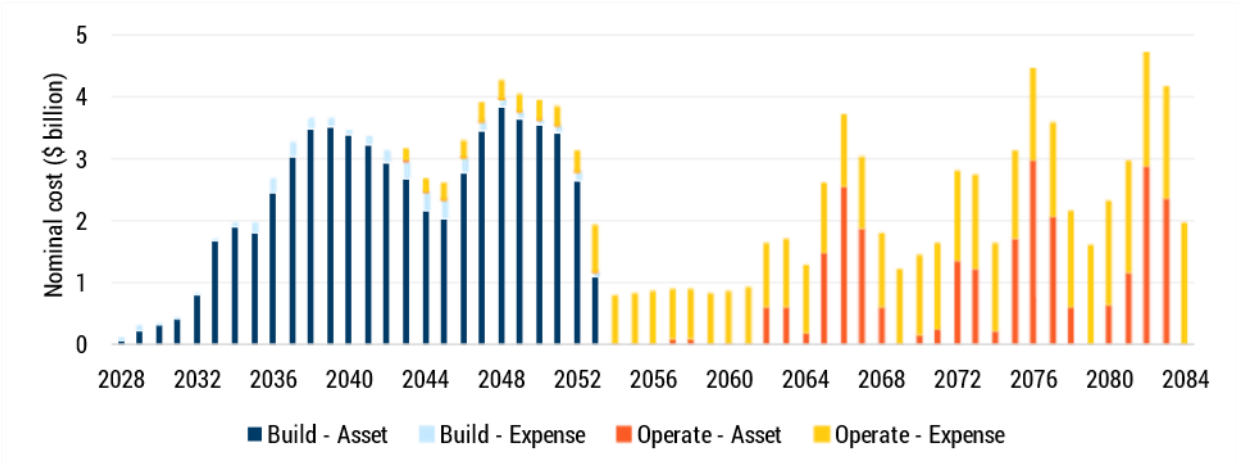
Source: Parliamentary Budget Office.

Our estimate of additional expenditure arising from extending SRL operations to SRL North – Reservoir to Melbourne Airport also reflects a gradual increase in operations and maintenance expenses, along with peaks in asset renewal expenditure as refurbishments and replacements are required. Expenditure is estimated to peak in 2076 at $3.9 billion, primarily due to the replacement of line-wide systems in advance of 25 years of operations on SRL North – Reservoir to Melbourne Airport.

Cost to build and operate

We expect the nominal cost to build and operate SRL North will be $132.5 billion across 2028 to 2084. This consists of asset works and renewals of $85.9 billion and expenses of $46.6 billion.

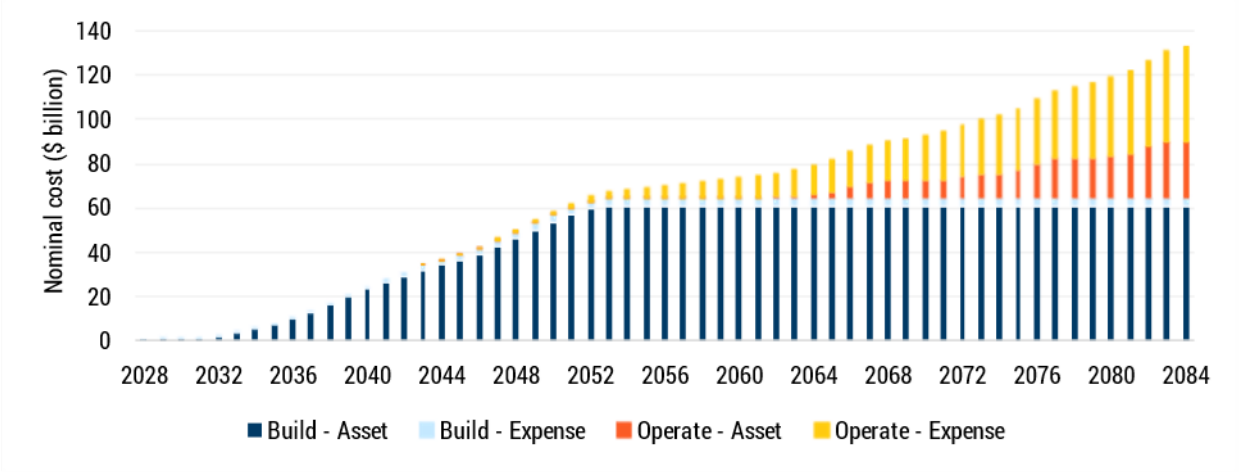
Figure 12 – Estimated year-on-year cost to build and operate SRL North



Source: Parliamentary Budget Office.

Of the estimated $85.9 billion in asset works and renewals for SRL North, 70.2% is associated with the build. The remainder reflects necessary capital works to operate SRL North, such as the replacement of infrastructure and rolling stock. Conversely, just 7.2% of the estimated $46.6 billion in expenses for SRL North is associated with the build, with most expenses being incurred during operations.

Figure 13 – Estimated cumulative cost of building and operating SRL East



Source: Parliamentary Budget Office.

Of the $132.5 billion nominal cost to build and operate SRL North, we expect that:

- build costs would comprise 48.0% of this total cost
- asset works and renewals would comprise 64.8% of this total cost.

SRL East and North

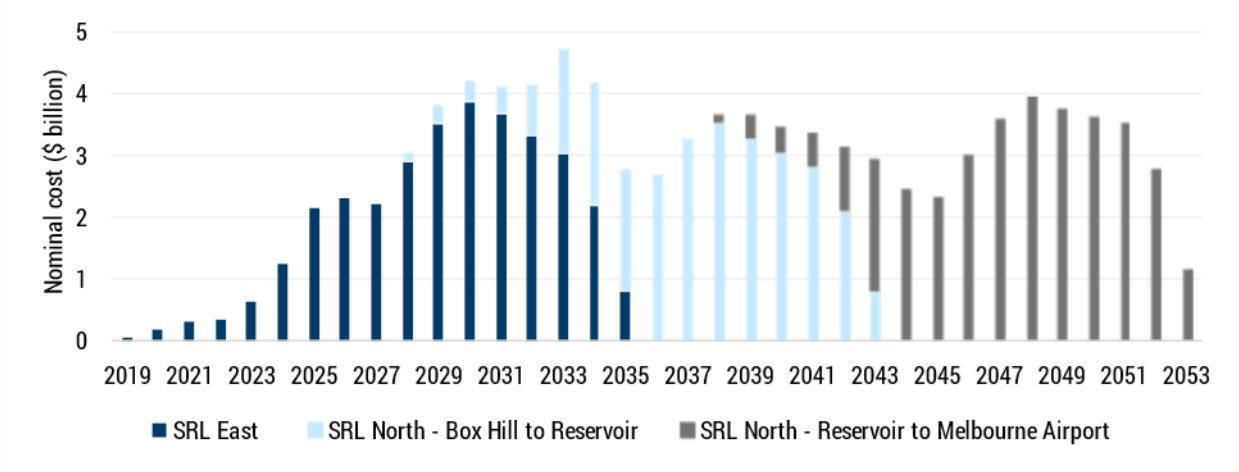
In this section	This section assesses the nominal cost of:
	▪ building SRL East and North between 2019 and 2053 ▪ operating SRL East and North between 2035 and 2084 ▪ building and operating SRL East and North between 2019 and 2084.

Cost to build

We expect the nominal cost to build SRL East and North will be $96.4 billion across 2019 to 2053. This consists of total asset works of $91.4 billion and expenses of $5.0 billion, or alternatively:

- $32.8 billion to build SRL East between 2019 and 2035
- $63.7 billion to build SRL North, comprising:
  - $29.0 billion to build SRL North – Box Hill to Reservoir between 2028 and 2043
  - $34.7 billion to build SRL North – Reservoir to Melbourne Airport between 2038 and 2053.

Figure 14 – Estimated year-on-year cost to build SRL East and North



Source: Parliamentary Budget Office.

Our estimated profile of the SRL East and North build reflects an initial increase in annual expenditure, followed by a relatively consistent rate of expenditure over almost 30 years.

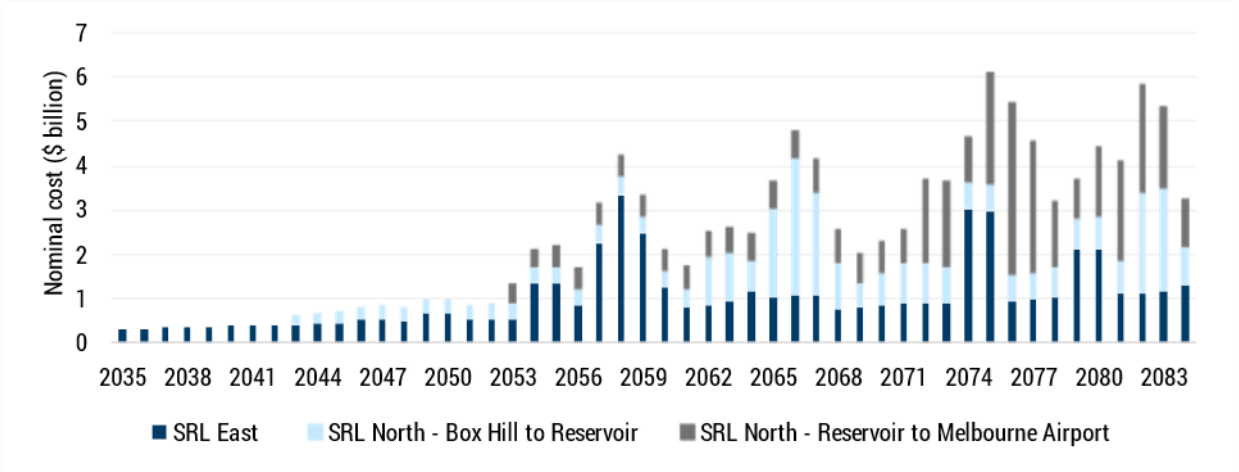
At the start of the SRL project, most expenditure is for planning and preparatory works. Expenditure will then increase as the Victorian Government signs substantial works contracts and main works commence. We estimate that SRL East and North build expenditure will peak in 2033 at $4.7 billion, as the SRL East build nears completion and SRL North – Box Hill to Reservoir main works begin in earnest.

Cost to operate

We expect the nominal cost to operate SRL East and North will be $120.2 billion across 2035 to 2084. This consists of total expenses of $77.7 billion and asset renewals of $42.6 billion, or alternatively:

- $51.4 billion to operate SRL East between 2035 and 2084
- $68.9 billion to operate SRL North, comprising:
  - $32.1 billion to operate SRL North – Box Hill to Reservoir between 2043 and 2084
  - $36.7 billion to operate SRL North – Reservoir to Melbourne Airport between 2053 and 2084.

Figure 15 – Estimated year-on-year cost to operate SRL East and North



Source: Parliamentary Budget Office.

Our estimate of expenditure arising from SRL East and North operations reflects a gradual increase in operations and maintenance expenses, with step changes as services commence on additional SRL sections. Additionally, there are peaks in asset renewal expenditure as refurbishments and replacements are required.

We expect expenditure to peak in 2075 at $6.1 billion, primarily due to major refurbishment works after 40 years of operations on SRL East and asset replacement works in advance of 25 years of operations on SRL North – Reservoir to Melbourne Airport.

Cost to build and operate

We expect the nominal cost to build and operate SRL East and North would be $216.7 billion across 2019 to 2084. This consists of asset works and renewals of $133.9 billion and expenses of $82.7 billion.

Of the estimated $133.9 billion in asset works and renewals, 68.2% is associated with the build. The remainder reflects necessary capital works to operate SRL East and North, such as the replacement of infrastructure and rolling stock. Conversely, just 6.1% of the estimated $82.7 billion in expenses for SRL East and North is associated with the build, with most expenses being incurred during operations.

Figure 16 – SRL East and North nominal cost estimates

($ billion)			Assets	Expenses	Total
SRL East	2019–2035	Build	31.0	1.7	**32.8**
	2035–2084	Operate	17.0	34.4	**51.4**
	2019–2084	**Total**	**48.0**	**36.1**	**84.1**
SRL North	2028–2053	Build	60.3	3.3	**63.7**
	2043–2084	Operate	25.6	43.3	**68.9**
	2028–2084	**Total**	**85.9**	**46.6**	**132.5**
SRL East and North	2019–2053	Build	91.4	5.0	**96.4**
	2035–2084	Operate	42.6	77.7	**120.2**
	2019–2084	**Total**	**133.9**	**82.7**	**216.7**

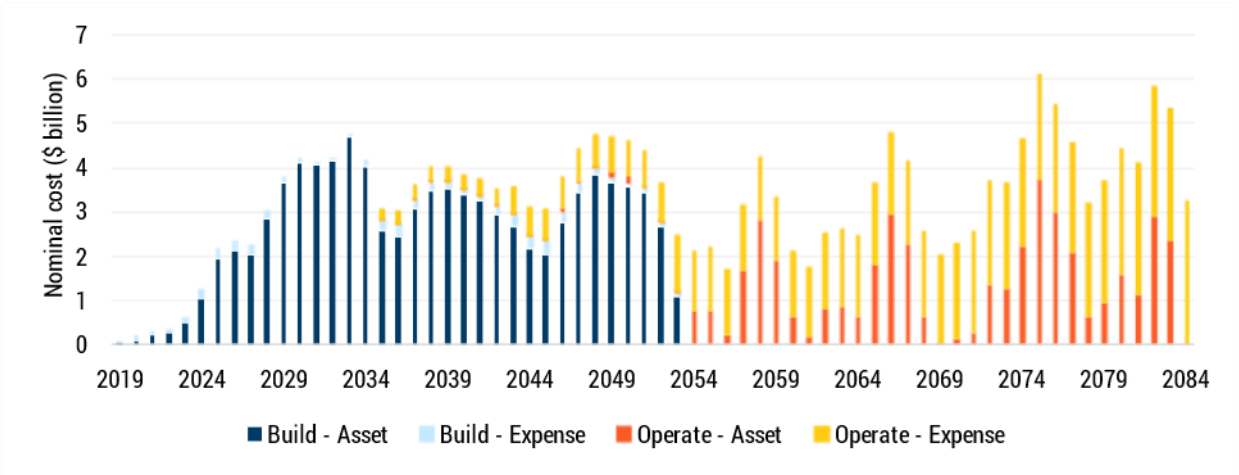
Source: Parliamentary Budget Office.

We expect the total nominal cost to build SRL North to be roughly double that of SRL East – the cost to build each subsection of SRL North will be similar to the total cost to build SRL East. This is due to several factors, including the more extensive scope of works for SRL North and the effects of inflation.

We expect the total cost to operate SRL North will also be substantially higher than the cost to operate SRL East, though less than double the cost. This reflects the relatively longer operational period for SRL East – 50 years, compared to those for SRL North – 42 and 32 years.

Our estimate of expenditure arising from SRL East and North reflects substantial asset works during the build phase of the project, and increasing operations and maintenance expenses in the operate phase of the project. The operate phase also includes peaks in asset renewal expenditure as refurbishments and replacements are required.

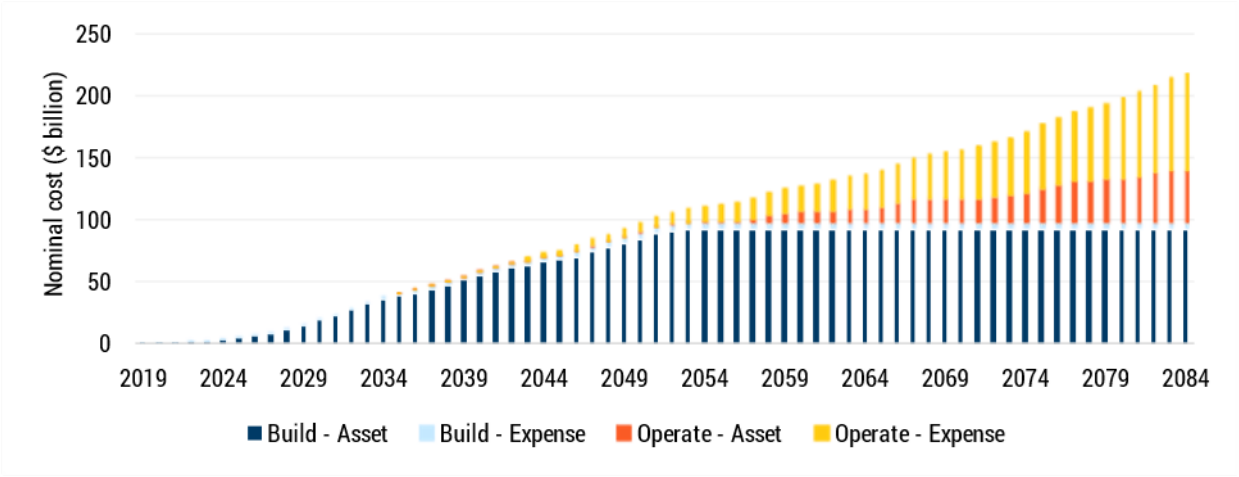
Figure 17 – Estimated year-on-year cost to build and operate SRL East and North



Source: Parliamentary Budget Office.

We expect expenditure to peak in 2075 at $6.1 billion, primarily due to major refurbishment works after 40 years of operations on SRL East and asset replacement works in advance of 25 years of operations on SRL North – Reservoir to Melbourne Airport.

Figure 18 – Estimated cumulative cost of building and operating SRL East and North



Source: Parliamentary Budget Office.

Of the $216.7 billion nominal cost to build and operate SRL East and North, we expect that:

- build costs would comprise 44.5% of this total cost
- asset works and renewals would comprise 61.8% of this total cost.

Attachment A – Victorian Government estimates

In this section	This section considers the Victorian Government's published estimates of the cost to build and operate SRL East and North. It then compares those published cost estimates with our current estimates.

Victorian Government cost estimates

The Victorian Government has published information on costs related to SRL East and North in budget papers and the SRL business case. The government's published estimates of costs have been expressed in different terms, including:

1. Nominal costs
2. Net present costs – these are based on the Victorian Government's real cost estimates, expressed in 2020 dollars, that the government has discounted to a base year of 2022 using the government's chosen real social discount rate of 4%.

Figure 19 – Different bases for expressing cost estimates

Cost terms	Description
Nominal costs	These are the actual costs of a given initiative as they would appear in the year in which they are incurred. This is consistent with how the government reports initiative funding and actual and estimated costs in budget papers. These dollar values incorporate the effects of inflation and can include cost escalation for asset works that exceed more general measures of inflation. Further, these values do not account for the opportunity cost of investing in the given initiative instead of other possible initiatives.
Real costs	These are the nominal cost dollar values of a given initiative that have been adjusted to remove the effects of inflation. Expressing costs in real terms makes it easier to compare the estimated costs that would be incurred during each year of an analysis. While these dollar values have been adjusted to remove the effects of inflation, they still do not account for the opportunity cost of investing in the given initiative instead of other possible initiatives.
Net present costs	These are the real cost dollar values of a given initiative that have been discounted to their value in a base year, using a real social discount rate, and then summed. If only costs and not benefits are being examined, then the results are net present costs rather than net present values (NPV). Discounting future dollar values in this way accounts for the long-term opportunity cost of investing in the given initiative, instead of other possible

Cost terms	Description
	initiatives. The discount rate can be thought of as the minimal acceptable rate of return on an alternative use of the initiative's funds. This method of discounting enables appraisal against project benefits through cost-benefit analysis, and comparisons with other projects and policies on a fair and consistent basis. Higher discount rates result in a greater weighting towards costs incurred earlier in an initiative, and lower net present costs overall. For example, a 7% discount rate will result in future expenditure having a relatively lower present value than it would with a 4% discount rate.

Source: Parliamentary Budget Office.

Nominal cost

In the 2023–24 Victorian Budget, Budget Paper No. 4: State Capital Program, the Victorian Government indicated it expects the cost to build SRL East to range between $30.0 billion and $34.5 billion.

The Victorian Government has not published nominal cost estimates for the:

- cost to operate SRL East
- cost to build and/or operate SRL North
- cost to build and/or operate the combination of SRL East and North.

Net present cost

In August 2021, the Victorian Government released the SRL business case, which made the case for investment in SRL East and North. Appendix C2 of the SRL business case was an *Economic Appraisal Report* prepared by KPMG in February 2021, which detailed the costs and benefits of building SRL East and North and operating those sections for 50 years.

Figure 20 – SRL East and North economic evaluation results

($ billion)	Program Case Option A	Program Case Option B
Capital costs	24.1 to 40.2	27.1 to 45.1
Recurrent costs	6.3 to 10.6	7.6 to 12.6
Total cost	30.7 to 50.5	35.1 to 57.6
Total benefit	48.5 to 58.7	54.7 to 65.8
Net present value (NPV)	3.0 to 22.9	2.4 to 25.2
Benefit-cost ratio (BCR)	1.1 to 1.7	1.0 to 1.7

Notes: Values have been discounted to 2022 using a 4% real discount rate. The value ranges for each line item are based on varying inputs and are not additive. Program Case Option A and B refer to the SRL North scenarios examined in the business case.

Source: KPMG.

These published economic evaluation results explicitly state the estimated net present cost to build SRL East and North – being the capital costs – and net present cost to operate SRL East and North – being the recurrent costs. Assuming Option A was chosen for SRL North and using a 4% real discount rate, the Victorian Government's estimated net present cost to:

- build SRL East and North would be between $24.1 billion and $40.2 billion
- operate SRL East and North, over 50 years, would be between $6.3 billion and $10.6 billion
- build and operate SRL East and North would be between $30.7 billion and $50.5 billion.

Comparison with Victorian Government cost estimates

Nominal cost

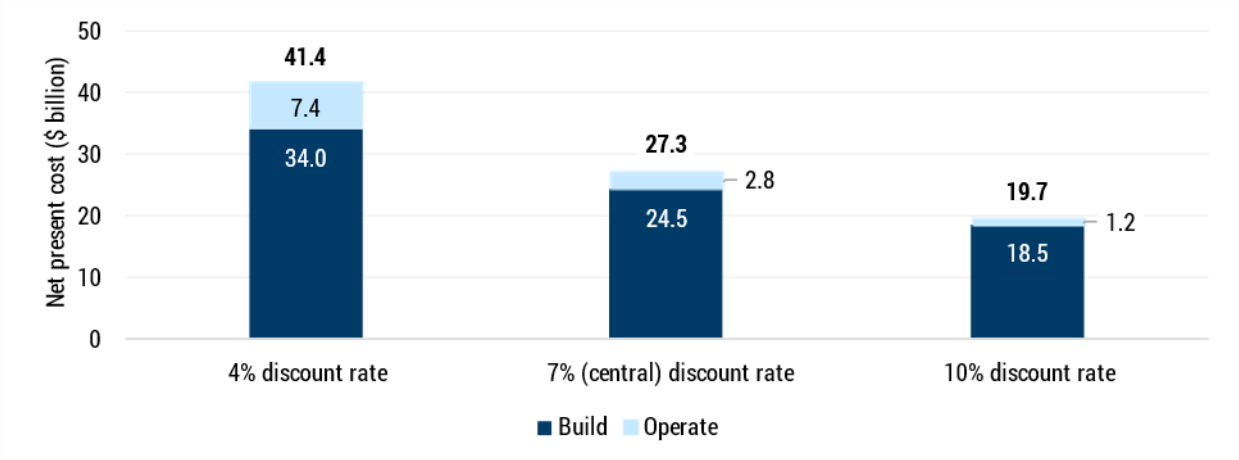
Our $32.8 billion estimate of the nominal cost to build SRL East is just above the centre of the Victorian Government's published cost range of $30.0 billion to $34.5 billion.

Net present cost

We have calculated net present cost estimates for the project based on the nominal cost estimates produced in this advice. Key steps in our net present cost calculations are:

1. converting nominal costs to real costs by removing the effects of inflation – measured by CPI – since 2020
2. excluding costs incurred before 2022, when actual construction works commenced, as those costs are considered sunk
3. discounting the remaining real costs to 2022 using real social discount rates of 4%, 7% (central), and 10%, as recommended by Infrastructure Australia's *Assessment Framework*.
4. summing the results.

Figure 21 – PBO SRL East and North net present cost estimates



Source: Parliamentary Budget Office.

The results of our net present cost calculations reflect a large weighting towards build costs incurred near the start of the project, and the relatively smaller weighting towards operate costs incurred later. This is a feature of discounting long-term multi-generational infrastructure projects. The higher the discount rate, the greater the weighting towards earlier costs, and the lower the net present cost overall.

Choice of discount rate

The choice of social discount rate for assessing public sector projects can be contentious. In Australia, different rates are used, depending on the jurisdiction and project's purpose.

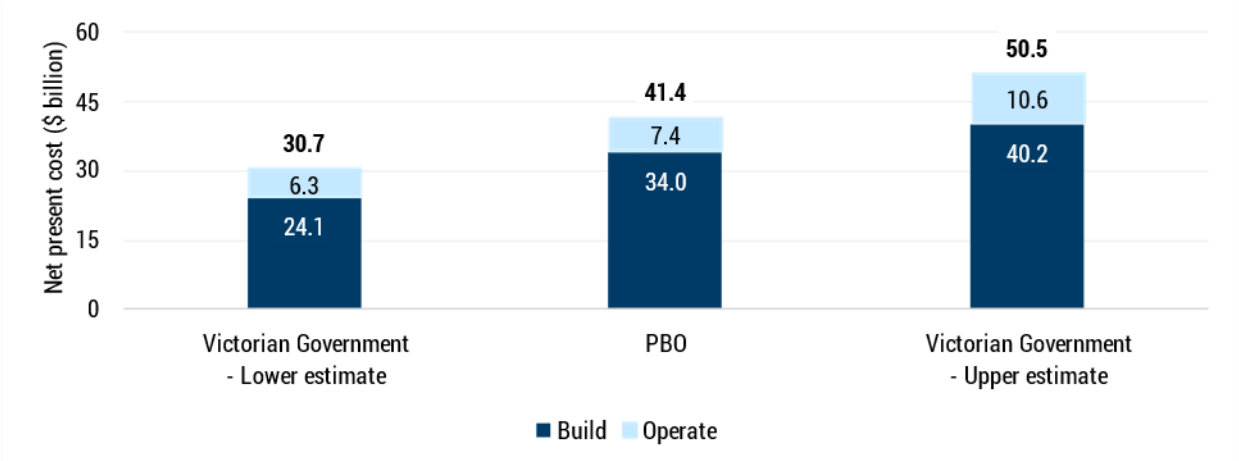
The choice of discount rate affects the net present cost estimate, and ultimately any net present value estimate – the discounted value of the costs and benefits of the project. A lower discount rate reduces future costs and benefits by less, while a higher discount rate reduces them by more.

Employing a lower discount rate will result in higher net present costs but also a higher estimate of the present value of future benefits. Generally, most of the benefits of an infrastructure project flow after its large initial build costs, so a lower discount rate will value those benefits more than a higher discount rate would.

Discount rates allow us to compare the benefits and costs of a project, adjusting for the time value of money. A project in which benefits generally flow after costs are incurred, such as this project, are materially affected by the choice of discount rate. For a project with a benefit-cost ratio of 1 the adjusted benefits and costs are in balance, while a ratio of less than 1 indicates the costs outweigh the benefits. If a project achieves a benefit-cost ratio of 1 using a 4% discount rate, the ratio would be less than 1 using a 7% or 10% discount rate.

While our 2022 advice, Suburban Rail Loop East and North – Value of continued investment, evaluated SRL East and North using a 7% real social discount rate, our updated analysis enables us to compare our latest cost estimates to those of the Victorian Government's, which have been prepared using their chosen 4% rate. We also note that both of these rates, and the 10% rate, are the discount rates recommended by Infrastructure Australia's *Assessment Framework*.

Figure 22 – Comparison of SRL East and North net present cost estimates, 4% discount rate



Note: Net present cost values are based on real costs, expressed in 2020 dollars, that have been discounted to 2022 using a 4% real discount rate. Estimates are for the Option A scenario for SRL North. Victorian Government build and operate estimates will not sum to their total estimate, as the estimates are based on varying inputs and are not additive.

Source: Parliamentary Budget Office.

Using the Victorian Government's chosen 4% discount rate, our estimates of the net present cost to build and operate SRL East and North are within the Victorian Government's published cost range. In net present cost terms, the government's estimated cost to:

- build SRL East and North was between $24.1 billion and $40.2 billion – our estimate of $34.0 billion is just above the centre of this range
- operate SRL East and North over 50 years was between $6.3 billion and $10.6 billion – our estimate of $7.4 billion is within this range, but is closer to the government's lower estimate
- build and operate SRL East and North was between $30.7 billion and $50.5 billion – our estimate of $41.4 billion is just above the centre of this range.

Attachment B – Assumptions and approach

In this section we provide the assumptions and approach we used to determine the total cost of building and operating SRL East and North.

Assumptions

When preparing this advice, we made the following assumptions:

Planning and preparatory works

1. Each SRL section will require detailed planning, including the preparation of business cases, and development activities to be substantially completed before main works construction commences.

Property and land acquisition

2. The SRL project will acquire the property and land necessary for constructing stations, tunnels, power substations, stabling and maintenance facilities, and emergency support facilities.
3. No underground strata acquisition will be required.

Fixed transport infrastructure

4. The costs of works and construction associated with fixed transport infrastructure will be similar to those of comparable transport infrastructure projects.
5. The asset lives and maintenance schedules of fixed transport infrastructure will be similar to those of comparable transport infrastructure projects.

Rolling stock

6. Consistent with the SRL business case:
   - new trains will be required to deliver the service frequencies specified for SRL East, including spare units for maintenance
   - additional trains will be required to deliver the service frequencies specified for SRL East and SRL North – Box Hill to Reservoir, including spare units for maintenance
   - additional trains will be required to deliver the service frequencies specified for SRL East and all of SRL North, including spare units for maintenance
   - each train will have 4 carriages.
7. The asset lives and maintenance schedules of rolling stock will be similar to those of comparable transport infrastructure projects.

Passenger services

8. Consistent with the SRL business case, there will be:
   - 5 peak hours per day on weekdays, and no peak hours on weekends
   - 6 inter-peak hours per day on weekdays, and no inter-peak hours on weekends
   - 9 off-peak hours per day on Monday to Thursday, 13 off-peak hours on Friday, 24 off-peak hours on Saturday, and 20 off-peak hours on Sunday

- when SRL East only is operational, 10 services per hour during peak hours, 6 services per hour during inter-peak hours, and 6 services per hour during non-peak hours
- when SRL East and SRL North – Box Hill to Reservoir is operational, 12 services per hour during peak hours, 6 services per hour during inter-peak hours, and 6 services per hour during non-peak hours
- when SRL East and North is fully operational, 24 services per hour during peak hour, 12 services per hour during inter-peak hours, and 6 services per hour during non-peak hours.

9. In each year, there are:
   - 50 weeks of typical weekdays per year
   - 50 Saturdays per year
   - 65 Sundays or Sunday equivalents (public holidays) per year.
10. Consistent with the government's Option A scenario for SRL North, passenger services will commence for:
    - SRL East in 2035
    - SRL North – Box Hill to Reservoir in 2043
    - SRL North – Reservoir to Melbourne Airport in 2053.

Precincts and complementary projects

11. The precinct costs identified in the SRL business case represent all government costs associated with the development of the precincts.

Suburban Rail Loop Authority

12. Victorian Public Service (VPS) staff salaries are at the median salary point of each VPS grade.
13. The SRLA workforce will increase between 2022–23 and 2026–27 in line with similar agencies and projects to reflect an increase in construction works.
14. Wages of VPS staff will grow:
    - at 1.0% per year to the end of 2023–24
    - at 3.5% per year between 2023–24 and 2029–30 in line with the government's VPS Wages Policy
    - in line with the average of the forecast WPI and CPI from 2030–31 onwards.
15. Professional services costs will grow in line with the forecast CPI from 2030–31 onwards.
16. Labour hire arrangement costs will increase in line with forecast WPI from 2025–26 onwards.
17. The average establishment, shared support services, accommodation, other operating costs, and information and communication technology costs per employee of the SRLA will reflect the average costs of similar agencies and projects.

General

18. The SRL construction profiles and associated assets will be consistent with similar major transport infrastructure projects.

Approach

When preparing this advice, we:

Planning and preparatory works

- estimated the cost of planning and development activities
- estimated the cost of enabling works

Property and land acquisition

- assessed the properties and amount of land that will be acquired for each SRL station and facility
- estimated the value of the required properties and land
- escalated costs consistent with property values and government escalation rates
- calculated the amount of compensation required for the properties and land that would be acquired

Fixed transport infrastructure

- determined the fixed transport infrastructure components that will be required for the SRL, using publicly available information
- estimated unit costs for each component of the infrastructure works, based on commercial information
- escalated capital costs consistent with government escalation rates
- estimated the capital costs and construction profiles of the infrastructure works
- estimated the maintenance and life cycle costs for each fixed transport infrastructure component
- calculated operations costs for the fixed transport infrastructure

Rolling stock

- estimated the amount of rolling stock required to deliver SRL passenger services, including an allowance for spare units to provide for units undergoing maintenance
- identified the type of rolling stock required, based on similar transport systems
- estimated the standard unit cost for the rolling stock
- escalated capital costs consistent with government escalation rates
- estimated the capital costs and acquisition profiles of the rolling stock
- estimated the maintenance and life cycle costs for the rolling stock

Passenger services

- estimated the amount of passenger services that will operate on the SRL during each year of operations
- estimated the average cost of running each service
- calculated the costs of operating the passenger services

Precincts and complementary projects

- adopted estimates from the SRL business case, and then estimated an average cost per precinct

- applied the average cost to the number of precincts per SRL section
- estimated the operations and maintenance costs of the precinct facilities
- calculated the costs of operating and maintaining the SRL precincts' and complementary projects' facilities

Suburban Rail Loop Authority

- identified past and current numbers and composition of VPS SRLA employees
- estimated future numbers and composition of VPS SRLA employees
- estimated the cost of the SRLA workforce, including oncosts
- estimated the value of professional services, labour hire arrangements, shared support services, accommodation and other operating expenses
- estimated the value of establishment and information and communication technology costs
- calculated the costs associated with resourcing the SRLA during the build of SRL East
- calculated the costs associated with resourcing the SRLA during the build of SRL North and the operate phase of the SRL

General

- applied allowances and contingencies to account for known risks and unknown factors impacting project scope, design and delivery
- escalated most operations and maintenance costs by either forecast CPI or WPI
- converted estimated nominal cost cash flows to real cost cash flows by removing the effects of inflation – defined as being the past and forecast measures of CPI – since 2020
- discounted real cost cash flows to their value in 2022, using real social discount rates of 4%, 7% and 10%
- calculated net present costs by summing discounted cash flows for costs incurred since 2022.

Attachment C – Data sources

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