



PROGRAM BUSINESS CASE EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

The Level Crossing Removal Project (LXRP) will remove 50 of Victoria's dangerous and congested level crossings.

The project will also deliver a Metropolitan Network Modernisation Program which includes new train stations, improved public transport access, and improved pedestrian and cycling links.

The project uses high quality urban design to enhance the attractiveness and amenity of communities around level crossings. The project also has a strong focus on improving integrated land use along rail corridors, to create vibrant hubs for local communities.

The project also plays a critical role in enabling other major rail upgrades to occur. On corridors where level crossing removals will separate the road and rail networks, additional rail services can be run without exacerbating road congestion, which allows the benefits of other major rail upgrades to be achieved.

Melbourne is Australia's fastest growing city, heading towards a population of six million by 2031 and more than 7.8 million by 2051. As the city grows, reliable and highly efficient transport networks are essential to moving more and more people and goods around the city, attracting new businesses, residents and jobs, and maintaining Melbourne's liveability and amenity.

Victorian Government policies and plans recognise that without an immediate and major change in the capacity and efficiency of the city's transport system, Melbourne's liveability, accessibility and productivity cannot be sustained. To this end, the Government is investing in road and rail projects designed to ensure the transport system keeps pace with the city's growth into the future.

There are 178 level crossings on Melbourne's metropolitan (electrified) rail network – more than any other Australian city. Each of these crossings represents a major conflict point between rail, road and pedestrian traffic. All of them contribute to some extent to congestion, safety and amenity problems on the city's transport system and many inhibit improvements to the capacity of both the road and rail networks. Level crossings also limit opportunities for urban renewal and development.

It is clear that without some intervention, a significant number of roads across Melbourne, many of which are important commuter and freight routes, will effectively be closed for considerable periods of time if there is an increase in the frequency of train services – causing even longer delays, higher costs, greater frustration and increased safety risks.

Until now, level crossings have been removed one at a time or in pairs, and over a number of years. While this incremental approach goes

some way towards addressing the issues associated with level crossings, the scale of the problem is so big that it calls for a corresponding change in the scale of investment and in the overall strategic response.

For the first time, the Victorian Government has a long-term, strategic plan for removing level crossings to systematically address the problems associated with this outdated feature of Melbourne's transport system. The Level Crossing Removal Project (LXRP) is a coordinated program of unprecedented scale and ambition that will deliver significant change to the transport system, take advantage of economies of scale, positively transform local communities and boost productivity and the broader economy.

The LXRP is a critical enabler of other major rail projects, which includes the Cranbourne-Pakenham line upgrade and the Metro Tunnel. These major projects will transform Melbourne's transport network and are expected to have a significant impact on Melbourne's city structure, by encouraging households and businesses to locate along high capacity rail corridors, due to the significant accessibility improvements these projects provide. This will deliver economic and social outcomes that will benefit the Victorian economy.

The LXP will remove 50 level crossings across Melbourne. This enables additional rail services to occur under the Metro Tunnel project and Cranbourne-Pakenham line upgrade, as shown below.



ALTONA LOOP

- 10 Kororoit Creek Road, Williamstown North

BELGRAVE

- 10 Mountain Highway, Bayswater
- 10 Scoresby Road, Bayswater

CRAIGIEBURN

- 1 Buckley Street, Essendon
- 2 Glenroy Road, Glenroy

CRANBOURNE

- 1 Abbots Road, Dandenong South
- 2 Thompsons Road, Lyndhurst

FRANKSTON

- 10 North Road, Ormond
- 10 Balcombe Road, Mentone
- 10 Centre Road, Bentleigh
- 10 Charman Road, Cheltenham
- 10 Edithvale Road, Edithvale
- 10 Eel Race Road, Carrum
- 10 McKinnon Road, McKinnon
- 10 Seaford Road, Seaford
- 10 Skye Road, Frankston
- 10 Station Street, Bonbeach
- 10 Station Street, Carrum

GLEN WAVERLEY

- 1 Burke Road, Glen Iris
- 2 Toorak Road, Kooyong

HURSTBRIDGE

- 10 Grange Road, Alphington
- 10 Lower Plenty Road, Rosanna

LILYDALE

- 1 Blackburn Road, Blackburn
- 2 Heatherdale Road, Ringwood
- 10 Manchester Road, Mooroolbark
- 10 Maroondah Highway, Lilydale

PAKENHAM

- 11 Centre Road, Clayton
- 11 Clayton Road, Clayton
- 10 Koornang Road, Carnegie
- 10 Murrumbeena Road, Murrumbeena
- 10 Chandler Road, Noble Park
- 10 Corrigan Road, Noble Park
- 10 Grange Road, Carnegie
- 10 Heatherston Road, Noble Park
- 10 Poath Road, Hughesdale
- 10 Clyde Road, Berwick
- 10 Hallam Road South, Hallam
- 10 South Gippsland Highway, Dandenong

SOUTH MORANG

- 10 Bell Street, Preston
- 10 High Street, Reservoir

SUNBURY

- 10 Main Road, St Albans
- 10 Furlong Road, St Albans
- 10 Melton Highway, Sydenham

UPFIELD

- 10 Bell Street, Coburg
- 10 Camp Road, Campbellfield
- 10 Moreland Road, Brunswick

WERRIBEE

- 10 Aviation Road, Laverton
- 10 Cherry Street, Werribee
- 10 Werribee Street, Werribee

WILLIAMSTOWN

- 10 Ferguson Street, Williamstown

* Includes capacity uplift for both Metro Tunnel and Cranbourne/Pakenham corridor upgrade

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PROBLEM

The problems and benefits identified naturally take on varying degrees of importance at different sites. For example, congestion is likely to be the major problem caused by crossings on key arterial roads, while safety and amenity consequences may be important for crossings bisecting busy shopping precincts.

THE LXRP SEEKS TO ADDRESS THREE KEY PROBLEMS.

PROBLEM 1: Conflicting demands of rail, road and pedestrian traffic at level crossings constrain one or more modes, reducing transport efficiency and economic productivity

- More train services means more and longer boom gate closures – At more than half of the 50 level crossings, the boom gates are closing at least 20 times or more in the 2 hour morning peak each weekday and some crossings are closed, on average, for more than 60 per cent of this period. Boom gate closures at many of these sites are expected to increase substantially and a significant number of roads across Melbourne will effectively be closed for considerable periods of time. If level crossings remain in place on key rail corridors with major rail upgrades, such as the Cranbourne-Pakenham Line upgrade and Metro Tunnel, then a significant number of roads across Melbourne will be effectively closed for considerable periods of time due to increased train services.
- Longer boom gate closures mean more delays – On an average weekday, approximately 1 million vehicles cross the 50 level crossings that are part of the Level Crossing Removal Project (LXRP); each one of these vehicles has the potential to be delayed at a crossing. Boom gates closing more often and for longer periods creates significant delays and congestion on the road network. As traffic and train volumes continue to increase, travel speeds around level crossings will decrease, delays will increase and trips will take longer.
- Travel time variability causes inconvenience and higher costs – Variability in boom gate closures features on most rail lines across the metropolitan rail network. Variable and unpredictable closures make travel time on the road network less reliable, causing frustration and inconvenience for road users experiencing unexpected delays, as well as creating additional personal and business costs. This variability is expected to increase as patronage, dwell time at stations (the time taken for passengers to board or alight trains) and the frequency of rail services increases.



- Transport interchanges are a critical component of Melbourne's public transport network – Of the 50 crossings to be removed as part of the LXRP, 34 have adjacent train stations. Thirty two of these stations have interchanges with buses and two have interchanges with trams. Issues associated with level crossings and poor station design can compromise the effective operation of train stations as transport interchanges, undermining the efficiency of the public transport network.
- Less reliable and less punctual bus services – Of the 50 crossings that make up the LXRP, 44 sites have bus routes that either approach or travel over the crossing. Variable speeds through and around level crossings cause delays to bus services. In addition, a significant number of bus routes terminate at level crossings to avoid unreliable travel times. This creates inefficient bus routes and acts as a deterrent to using buses due to passengers having to terminate or change buses at the level crossing.
- Level crossing constraints are impacting Melbourne's freight networks – Variability in travel times due to level crossings located on key freight routes limits the efficiency of freight movements. Reliable and efficient connections to key freight hubs are critical to sustaining the productivity and competitiveness of a number of industries, especially those engaged in exporting.
- Greater vulnerability to faults and incidents, causing further delays – Level crossings make the rail and road networks more vulnerable to incidents and signal and hardware faults. When these occur, they can cause unexpected and sometimes lengthy boom gate closures, delaying rail and road traffic even further, generating additional costs and contributing to risk-taking behaviour by drivers, pedestrians and cyclists.

PROBLEM 2: Rail corridors and excessive boom gate closures reinforce community severance and reduce local amenity

- Greater community severance and dislocation – Level crossings can exacerbate the community severance caused by rail corridors, dividing communities and limiting their ability to access goods and services, jobs, education and housing. Crossings can have a significant impact on local communities through traffic congestion, poor land use, limitations on development and missed opportunities for urban renewal.
- Reduced neighbourhood amenity – Level crossings can reduce neighbourhood amenity and have a significant impact on local communities through noise, poor visual amenity, reduced access to local shops, limited business diversity and rundown and unappealing precincts adjacent to the crossing.
- Reduced walking and cycling connectivity – As the duration of walking and cycling trips tends to be shorter than car trips, the delay to a pedestrian or cyclist caused by a level crossing has a greater impact; the delay they experience is often a greater proportion of their overall trip. Level crossings on Strategic Cycling Corridors limit cycling connectivity to and around major activity centres and discourage people from using active transport.

PROBLEM 3: Motor vehicle driver, cyclist and pedestrian frustration at level crossing delays invites risk-taking behaviour, causing serious incidents

- Risk-taking behaviour, causing serious incidents – Collisions at level crossings in Victoria account for around one third of level crossing collisions between trains and road vehicles, and over half of all collisions between trains and pedestrians, across Australia. In the ten year period between 2005 and 2014, there were 149 collisions between a train and road vehicle or pedestrian along rail corridors across metropolitan Melbourne. Of these incidents, 38 resulted in fatalities and 22 resulted in serious injuries. Over the same period, across the 50 level crossings in this program there were over 60 collisions between a train and a road vehicle or pedestrian, 20 of which resulted in fatalities.
- Potential risk at level crossings –The risk of a serious incident is present at all level crossings to varying degrees. As delays and traffic, pedestrian and train volumes increase at these locations, the risk is likely to escalate unless there is appropriate intervention.





A well-connected and efficient transport network is critical to Melbourne's liveability, but also to its economic activity, productivity and competitiveness. Without action being taken to remove level crossings, the transport network's connectivity and accessibility will be compromised and the problems associated with level crossings will be exacerbated even further.

If we do not remove level crossings:

- journey times and the variability of journey times for private, business and freight vehicles across Melbourne's road network will increase
- vehicle operating costs will increase
- collision costs will increase
- we will be unable to operate higher rail service frequencies in peak periods without extending boom gate closures even further and creating more delays for road users. This will impact on planned rail capacity upgrades, including the Cranbourne-Pakenham Line Upgrade (CPLU) and the Metro Tunnel
- public transport users will experience longer travel times on road-based public transport (buses and trams), overcrowded trains, reduced station amenity and delays to train services
- public transport becomes a less attractive travel option (especially for commuting), with flow-on impacts for the city's road network
- community amenity and local accessibility will not improve
- the connectivity and accessibility of Melbourne's transport network will reduce, eroding the city's liveability
- opportunities for economic development, higher productivity and jobs growth will be limited.

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BENEFITS

The Level Crossing Removal Project has three core objectives.

TO PROVIDE:

1. Improved productivity from more reliable and efficient transport networks

2. Better connected, liveable and thriving communities

3. Safer communities.

In meeting these objectives, the LXR will deliver significant city-wide and local benefits, including:

- Improved travel around Melbourne – for train users, pedestrians, buses, trams, cyclists and drivers
- More reliable roads across Melbourne, enabling people to better predict their travel times
- Significant safety improvements for drivers and pedestrians
- Enabling more trains to run more often and on time
- Improved bus-train interchanges and the creation of better connected, more efficient bus routes
- Stimulating economic growth by creating thousands of jobs during construction
- Improved access to activity centres and National Employment Clusters
- Revitalised local communities, with many areas benefiting from improved station precincts that are more attractive areas in which to live, work, shop and invest.

A Benefit Management Plan has been prepared for the LXR that outlines the key performance indicators that will be used to measure and monitor achievement of the identified benefits.

The LXR is not a stand-alone road project with transport network benefits existing independently of other projects. There are key interdependencies between the LXR and other major rail projects, which make the benefits of each contingent on the others. For example, the LXR is a critical enabling project, in that it enables additional rail services to be run without exacerbating existing road congestion.

If level crossings are not removed, more frequent rail services delivered by the Cranbourne Pakenham Line upgrade (CPLU) and Metro Tunnel would result in substantial increases in boom gate closure times and worsening congestion at level crossings, particularly on the Caulfield-Dandenong corridor.

The LXR makes feasible the Cranbourne Pakenham Line Upgrade (CPLU) Project, and without level crossing removals providing space for increased rail services, the rationale for investing in the Metro Tunnel infrastructure is also diminished.

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THE PROGRAM

The removal of each of the level crossings nominated in the LXP will contribute to addressing the identified problems. However, achieving the full range of potential benefits from the program will require a number of complementary activities that go beyond providing the basic infrastructure required level crossing removals. The LXP supports four broad strategic interventions:

- **Separating road and rail networks at critical junctions** – using infrastructure solutions (including removal of the level crossing) designed for each level crossing site
- **Implementing Metropolitan Network Modernisation Program** – which includes new train stations, improved public transport access, and better pedestrian and cycling facilities
- **Improving the urban amenity and physical integration of activity precincts and communities along rail corridors** – using high quality urban design to make public areas around train stations and level crossings more attractive, accessible and secure
- **Improving integrated land use along rail corridors, to create vibrant community hubs**– exploring opportunities to undertake property development around stations to improve local amenity, make better use of currently under-used land, encourage residential and commercial development around public transport networks and contribute to more efficient patterns of development across the wider city.

ADVANTAGES OF A COORDINATED PROGRAM

Bundling level crossing removals as a coordinated program has advantages over a site-by-site approach, including:

- Delivers better value for money
- Provides the ability to have a well-developed assessment framework that encourages optimising project outcomes and avoids the risks of ad-hoc implementation
- Offers greater flexibility to sequence level crossing removals to match rail capacity investments, road projects or other works, leveraging benefits from coordinated infrastructure delivery
- Provides a better understanding of the information gaps that will de-risk procurement
- Enables costs savings from packaging or bundling sites and from providing a predictable pipeline of work or industry
- Realises benefits that are not possible when removals occur site-by-site – such as greater travel time and other savings generated from augmenting the metropolitan rail network; wider economic benefits from increasing effective density through improved accessibility; and increasing corridor attractiveness for urban renewal
- Enables other major rail upgrades to occur on corridors where level crossing removals will separate the road and rail networks



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PROJECT OPTIONS

A wide range of potential options for removal level crossings are available.

These have been reviewed, assessed and refined to establish a realistic budget for delivering a credible range of options at each level crossing removal site. An Options Assessment Framework has been developed to assess and shortlist a range of options at each site in a consistent manner. This approach will ensure that the assessment of options is cost-effective, defensible, comprehensive, transparent and consistent across all sites.

For the purpose of describing and providing a cost estimate for the LXR in this Business Case, a Reference Option has been identified for each level crossing removal site. Each Reference Option represents a feasible solution for removal of the level crossing (such as Rail over Road or Road over Rail). Each Reference Option also identifies Metropolitan Network Modernisation Program improvements, (such as new train stations, improved public transport access, new pedestrian and cycling links), and amenity improvements to landscaping and streetscape. Opportunities to integrate property development of state-owned land within and nearby existing rail and road corridors have also been considered.

The Reference Options represent a point-in-time view developed in February 2016 of how the LXR could be delivered. Further detailed investigation and public consultation will be undertaken and will inform the recommended solutions. Individual Project Proposals or Works Package Proposals, outlining the recommended solutions have been and will be prepared for each level crossing removal site (or package).

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FINANCIAL ANALYSIS

The first 20 level crossings to be removed have been grouped into five packages for delivery and the remaining 30 sites have been grouped into Reference Works Packages, for the purposes of describing and costing the LXRP in this Business Case. The development of the packaged costs for the remaining 30 sites is based on the Reference Option selected by LXRA for each of the sites.

The estimated net capital cost for the project (P50 escalated cost), comprises of:

- Removal of 50 Level Crossings: **\$6.6 Billion**
- Metropolitan Network Modernisation Program: **\$1.0 Billion**

The total estimated savings from the packaging of individual projects is approximately \$400 million.

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PROGRAM APPRAISAL

The LXR is expected to deliver significant economic benefits to transport users and communities across Melbourne.

Typically, transport projects require a rate of return of 7 per cent, while social projects require a rate of return of 4 per cent. In recognition of the current levels of market rates, and practice in other jurisdictions around the choice of an appropriate discount rate for similar large projects, there are good reasons to consider that a real discount rate of approximately 4 per cent is appropriate for the LXR.

However, to keep in step with the approach adopted by other major transport investments being undertaken by the Victorian Government, the appraisal results for the LXR are shown using the standard discount rate of 7 per cent (real), and also present a sensitivity impact using a lower discount rate of 4 per cent (real).

The core benefits anticipated as a result of the program, include travel time savings, reduced vehicle operating costs, road travel reliability benefits, public transport user benefits and avoided collisions. As a standalone program, the LXR is expected to deliver a Benefit Cost Ratio (BCR) of 0.78 using a 7 per cent discount rate. Using a discount rate of 4 per cent, the BCR is 1.34.

The BCR has been calculated using a standard appraisal methodology. This excludes other significant benefits that the LXR can be expected to deliver, including:

- Wider economic benefits (WEBs), such as agglomeration benefits and additional tax revenue from increased labour supply, which are expected to be \$555 million using a 7 per cent discount rate
- Additional Benefits – such as improved network resilience to incidents, reduced perceived congestion benefits and the related benefits and costs of land use changes occurring as a result of the project – are expected to be \$175 million using a 7 per cent discount rate
- Local amenity benefits, increased activity centre connectivity/consolidation, and benefits for emergency services
- Avoidance of wider social impacts (ie. to families and communities) caused by accidents at level crossings

The LXR plays a critical role in enabling the full benefits of major rail projects such as the Cranbourne Pakenham Line Upgrade (CPLU) and the Metro Tunnel to be achieved. This business case also includes a combined appraisal of these three critically interdependent transport projects. The combined effect of these projects can be expected to deliver large transport benefits and have a significant impact on Melbourne's city structure, by encouraging households and businesses to locate in areas that will benefit from the significant accessibility improvements

that these projects will provide, driving significant employment growth along rail corridors in the south-east, north and west, of Melbourne.

The combined program of LXR, CPLU and Metro Tunnel is expected to deliver a net benefit of \$5.1 billion and BCR of **1.2** using a discount rate

of 7 per cent. When using a 4 per cent discount rate, the net benefit is \$21 billion and the BCR is 2.2.

PROGRAM	7% DISCOUNT RATE	4% DISCOUNT RATE
Benefit Cost Ratio: LXR	0.78	1.34
Benefit Cost Ratio: Combined program of LXR, Metro Tunnel & CPLU	1.2	2.2

The LXR is also expected to make a significant contribution to supporting economic growth and employment in the construction industry and more broadly across the Victorian economy. Through the construction period, the short-term stimulus effect of construction is expected to add moderate amounts to Victorian Gross State Product (GSP). In each year between 2015-16 and 2019-20, the size of the Victorian economy will be around \$200-300 million (up to 0.08 per cent) larger than in the absence of the project. In the short-term, the LXR will drive job growth through the stimulus effects of additional construction expenditure. During the first three construction years, up to 1,750 more people are expected to be employed (across the economy as a whole) than would have been in the absence of the project. By the later construction years (2017-18 to 2021-22), average real wages are expected to grow to levels around 0.15 per cent higher (over the whole economy, not just the road transport industry) due to the project.

In the longer term, the LXR will create additional ongoing incremental benefits to the Victorian economy via improved productivity. By the end of the evaluation period in 2065, real GSP is expected to be around \$275 million (or 0.02 per cent) higher than it would otherwise have been.

The program appraisal includes an overview of the multi-criteria assessment (MCA) of the local amenity and project impacts for the Reference Options selected for the 30 level crossing sites, noting that the other 20 sites had been subject to previous assessments and funding submissions at the time the Reference Options were chosen and the program appraisal conducted in February 2016.



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PROGRAM DELIVERY

The Victorian Government has committed to delivering the program of 50 level crossing removals by 2022, with the first 20 level crossing removal projects to be delivered within its first term in office, or by 2018. A number of level crossings are currently in progress for removal, with construction either well underway or contracts for delivery having been awarded.

Detailed Works Package/ Project Proposals are required to secure the release of funding for further packages of works. These will be developed to align with the LXRP Program Business Case, and submitted progressively to suit the funding requirements of the program.

Governance of the LXRP will be provided through the Major Transport Infrastructure Program Governance Framework.

Procurement objectives and an initial procurement options analysis have been developed for the program, and suitable delivery models have been shortlisted. A Program Packaging and Procurement Strategy has been developed for the North Eastern, North Western and Western rail corridors to further develop the packaging solutions, to consider program-level delivery issues, and recommend delivery models for the rail corridors.

Level crossing removals are often high value, high risk projects that involve substantial rail, road, tram and bus disruptions, as well as impacts on busy commercial centres. Each site will require significant management of a number of stakeholders and affected persons, as well as access to different transport networks managed by different parties. An overarching Communications and Stakeholder Engagement Strategy has been developed for the LXRP and will be further refined throughout the program's development and delivery.

A Risk Management Plan has been developed by LXRA and is being used to guide the assessment of risk for the LXRP.

The LXRA has developed an Urban Design Framework, which sets benchmarks and measures for high quality design outcomes and place making approaches, and a consistent consideration of urban design principles and objectives across the program. The UDF establishes the expectations of the Victorian Government and local governments for high quality, context sensitive urban design outcomes from the LXRP. It aims to achieve a high quality urban design response that enhances urban amenity and minimises any adverse impacts resulting from the proposed project and its associated structures and development.

One of the key objectives of the Transport Integration Act is environmental sustainability in developing and managing the Victorian transport system. As part of its Sustainability Policy the LXRA has adopted four guiding principles:

- Deliver urban design solutions which connect and enhance local communities;
- Manage resources efficiently through embedding energy, water and material saving initiatives into the design and construction of the assets;
- Protect and enhance natural assets by minimising the LXRP's environmental footprints; and
- Future-proof the infrastructure so it is resilient to projected effects from changes in climate.

