




100GIG

Bendigo Loddon Campaspe Region BUSINESS CASE

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We respectfully acknowledge that the Loddon Campaspe Region encompasses the traditional lands and waters of the Dja Dja Wurrung, Taungurung, Wurundjeri, and Yorta Yorta people. We pay our respects to them, their culture, and their Elders past, present, and future.

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Program Engagement and Acknowledgements

This Program engaged with a wide range of stakeholders within the BLCR region, as well as the Department of Jobs, Places and Regions (DJPR) Connecting Victoria team, and would like to thank all for their time, collaboration, ideas and contributions.

The list of stakeholders engaged for this Program include:

- Deakin University
- La Trobe University
- Australian National University
- Bendigo Kangan Institute
- Bendigo Senior Secondary College
- Be.Bendigo
- Bendigo Regional Manufacturing Group
- Committee 4 Echuca Moama
- Committee 4 Maryborough
- Don KR Castlemaine
- Eco Thought
- Bendigo Health
- Macedon Ranges Shire Council
- Mount Alexander Shire Council
- Central Goldfields Shire Council
- City of Greater Bendigo
- Loddon Shire Council
- Campaspe Shire Council
- Digital Hub stakeholders at Golden Plains Shire (Smythesdale Well) and SW TAFE (Vector Consulting)
- Future of Work strategy development with Faethm.ai
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- Bendigo Telco for their 100G City business broadband initiative in Bendigo and their contribution to the Program.

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- Michael Smyth, City of Greater Bendigo
- Dennis Bice, former Be.Bendigo

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- Alison McKenzie, City of Greater Bendigo
- Matt Schultz, Gravelroad Group
- Mark Jackson, Bendigo Telco

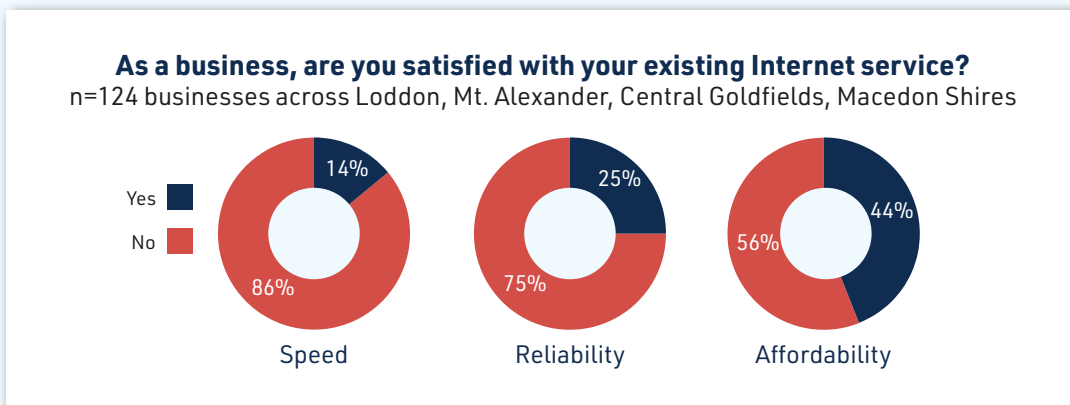


Executive Summary

In 2019 the RDV initiative Connecting Regional Communities Program (CRCP) developed Regional Digital Plans for each of the nine LGA partnerships across Victoria. These Digital Plans captured high-level data that described the fundamental barriers to developing regional Digital Economies, being the lack of telecommunications infrastructure compared to metro locations... hence the term the “digital divide” between metro and regional communities.

In 2021 this RDV Program takes the Digital Plan concept further for the Greater Bendigo and Loddon, Campaspe region (BLCR) of six LGA's from Macedon Ranges Shire through to Campaspe Shire and imagines a “100Gbps telecommunications infrastructure” available to businesses and residents across the region. The vision for this Program is to explore the next barriers to creation of jobs from a thriving regional digital economy as well as to recommend initiatives and key steps toward a blueprint for the region’s success.

While it is relatively easy to imagine a strong telecommunications infrastructure that is both affordable and reliable by looking at how well served metro locations are, this program has found that the region’s demand is unmet.



To facilitate the DJPR Connecting Victoria program GigState initiative for co-funding of NBN locations for telecommunications uplift, this Program surveyed Shires and locations outside of Bendigo and Echuca to better understand the demand. (Bendigo and Echuca being existing NBN Business Fibre Zones (BFZ's)). This “lived experience” data is explored in more detail in Evidence of Connectivity “Lived Experience” for regional Business and Residents.

While the problem statement for telecommunications infrastructure is clear, the post COVID-19 opportunity exists to capture the skills exodus from major cities and to position the BLCR region as a digital economy leader in terms of jobs creation and actions aligned to the digital Future of Work (FoW). The emergence of Innovation Ecosystems to connect the higher education sector, industry and businesses, all levels of government and entrepreneurs to enable ideas to move more seamlessly from inception to impact. The global trend is toward innovation precincts, and the State Government DJPR backed initiative at Cremorne in Melbourne is one that this Program recommends can be realised within the BLCR region.

To respond to the Problem and the Opportunity, this Business Case identifies a range of initiatives to prepare the BLCR region for the digital FoW, and to implement a Blueprint for governance of the investments needed to deliver on the unmet digital needs identified in the RDV regional Digital Plan as well as the additional problem statements and opportunities explored within the concept of a 100-Gig City region.

Implementation of the Program will enable an economic and social transformation agenda by educating citizens, fostering innovation and enabling new ways of working and living.

This business case seeks funding of \$283.4M, including contingency, over the next six years, from 2022/23 to 2028/29, to implement an extensive range of Skilling, Digital Hub and Connectivity projects identified by this Program. This investment is expected to drive benefits estimated at \$2.2B as detailed in Costs and Benefits section.

1 The Case for Change - Business Case Summary

There is a clear case for targeted intervention led by the Region to play a role in improving connectivity in the City of Greater Bendigo and the Loddon-Campaspe Region.

Given its extensive geography and relatively dispersed population outside major cities, Australia has performed well in connecting our citizens and businesses to telecommunications services. However, as the world becomes more digitised, the need for access to competitively available advanced data and digital services is increasing. COVID-19 has forced greater demand on connectivity, with data volume up 80% or more at some points of the pandemic.

Why are regional cities and towns at risk? The possibilities enabled by 5G and IoT require significantly more capital than was the case for the moves to 4G from 3G, or 2G to 3G, principally because 5G cell density is much greater than previous mobile generations. With declining capital returns, telecommunications carriers in Australia have redoubled their focus on CBDs and inner-city areas as the target for profitable new network investment. By contrast, many outer metropolitan cities and regions still lack basic coverage as evidenced in the lived experience data collected from this Program via the collaborative Surveys supported by LGA's. Federal policy has not been able to sufficiently drive market behaviour to address these challenges, meaning in our view, that expert intervention is often needed by local and state government, to identify connectivity needs, competitive optimisation, capital costs and areas where government support is practical and equitable.

A "digital divide" in outer-metro and regional Australia is a real risk, and would limit connectivity for thousands of households, farms, SMEs and communities, dilute new job creation and hamper "regionalisation" at a time when all CBDs face decline post COVID, and public safety and security services have been recently challenged by natural disasters and pandemics.

Our region is responding to unmet digital needs so we can become socially and economically competitive.

Through funding from Regional Development Victoria, the City of Greater Bendigo has explored the concept of a 100 Gigabit City region.

The region is the first in Australia to complete a detailed business case to how the region could become supercharged digitally through targeted investments in the areas of **Skilling**, **Digital Hubs** and **Connectivity**.



1.1 Purpose of this Business Case

The purpose of this project is to develop a clear future vision for a highspeed broadband enabled digital economy (and ecosystem of digital skills supply/demand stakeholders) that helps to revitalise the Bendigo City Centre as well as enables GigTown broadband status (at a minimum) for the Loddon Campaspe Region.

The vision for enabling a digital ecosystem includes but is not limited to:

- Identifying and developing an action plan for the digital connectivity infrastructure gaps by undertaking independent mobile network coverage and bandwidth testing and mapping of existing fibre broadband assets for backhaul and last mile in places where NBN has no further plans to improve its network, including encouragement of next generation fixed and mobile wireless broadband technologies (e.g., public and private 5G).
- Identify the barriers to broadband access whether financial, physical or digital literacy related with recommendations for proposed mitigations in order to accelerate the foundations of 100G BLCR.
- Enabling the concept of “digital hubs” to support business start-ups, relocated digital businesses from metro and the collaboration economy with existing technology businesses, entrepreneurs, startups, scaleups and business associations within the BLCR. Specifically, for Bendigo 100G powered facilities for digital start-ups and relocated metro digital businesses including investigations for a region wide Innovation and Startup / Scaleup Accelerator Hubs.
- Facilitating supply of skills from education and research stakeholders within BLCR with a high level quantification of current and future demand for IT / high tech and digital skills from industry sectors and key business forums and associations.
- Identifying the key industry sectors to focus on with digital enablement initiatives, and with what priority. This prioritisation will be based on current regional competitive advantage, investment required, estimated jobs and value creation and any other inputs determined during the project. Example industry sectors include advanced manufacturing (Manufacturing 4.0), digital agriculture and agriculture services, mining, tourism, health and social services including eHealth technologies, creative industry and arts. In addition, we need to align with initiatives designed to ensuring our sustainability as a region via managing our environment with digitally smart initiatives along with water, waste and energy management.
- Soliciting skills investment and collaboration frameworks from global hyperscale cloud and digital technology providers as well as local best-of-breed innovators and success stories.

Now more than ever it is critical to deliver improved digital connectivity across our region, as the COVID Pandemic has highlighted that the transition and use of digital capabilities has been critical to make real time decisions required to ensure social cohesion and business health and continuity.

1.1.1 Skilling

The following section identifies three key areas for targeted investment formulated to digitally supercharge the region. They being, Skilling, Digital Hubs and Connectivity.

A recent innovation in Skills planning and Human Capital Management (HCM) is a term known as the Future of Work (FoW) which goes beyond modelling of the evolution of work and provides a data and AI based approach to answering fundamental questions about the future readiness of workforces as governments invest in growth industries. It allows for modelling of economic scenarios:

- Prepare for industry growth and decline
- Understand impacts of government action
- Identify and redeploy stranded workforces
- Pre-empt & navigate skills shortages

The Bendigo Loddon Campaspe region needs a Blueprint for how to prepare and reskill its existing workforce as it faces a fundamental shift in the skills required of employees in the digital era. Accelerated digitisation, coupled with remote ways of working, means reskilling and upskilling is required. Prior to COVID-19, 75% of businesses reported they were concerned about shortages of digital skills within their industry.

This Program recommends that a permanent entity that is a "market organiser" be established within Department Jobs, Precincts and Regions with a mandate to provide the necessary oversight for developing the FoW skills Blueprint and coordination of Government investment to drive the Blueprint in collaboration with Industry, the Education sector and State / Local Government stakeholders in order to drive both creation of jobs and elevation of average wages.

For want of a less cumbersome title, it could be known as the Office of Regional Innovation Management for the BLCR Partnership, and serve as a permanent presence and natural successor to the Regional Partnerships concept that drove the initial Digital Planning process and development of this 100G BLCR Business Case. Globally, examples exist such as "InnovationHQ" with MIT in the U.S.

The mandate for the Office of Regional Innovation Management would include:

- Development of the skills Blueprint for guiding investment into the Digital initiatives needed to prepare the region for the digital FOW changes, opportunities and threats. The first step toward this detailed planning would be to engage a 3rd party Digital FoW data and analytics provider to deliver modelling of existing and future economic scenarios for the growth industries that differentiate

the region's competitiveness, being Manufacturing, Agriculture, Health, Mining and Creative. This would then provide inputs in to the development of a Regional Workforce Development Plan which is a critical gap in planning for this region's future prosperity.

- Accelerate the digital skills supply marketplace in BLCR as a regional asset and advocate the attraction of digital economy businesses to the region, help start-ups become scale-ups, aligned to the industries that BLCR will have an advantage in being Manufacturing, Health, Agriculture, Mining. Align the FOW skills supply / demand to the opportunity from the "Fourth Industrial Revolution" of digital technologies, for example IoT, AI/ML, Robots / RPA / Drones, 5G, Cloud/Big Data, 3D printing, AR/VR, etc.
- Create continuous pathways for regional students to regional digital economy jobs (break the cycle of losing young people to metro for the early phases of their working lives). We need to encourage diversity through leveraging local talent that may have previously been shut out from participating in innovation ecosystems due to lack of access to local regional employment opportunities.
- Manage the investment into this Business Case's recommended Digital Hubs concepts that will provide the needed collaboration between Industry and the Education sector to drive and support Innovation on a location basis.
- Monitor existing and future Industry innovation to allow for best practices and learnings to be shared in order to maximise the outcomes and job creation for each. A short but not comprehensive list of current innovation activity includes:
 - The Central Victorian Advanced Manufacturing (CVAM) initiative between the Bendigo Regional Manufacturing Group (BRMG), La Trobe University and ANU
 - Bendigo Health Accelerator
 - Deakin University's Digital Innovation for Small and Medium Business Hub (DISH)
 - Bendigo Tech School's Regional Engineering and Advanced Manufacturing (REAM)
 - Startup Central Victoria
- Provide a feedback loop for the Education sector to ensure that curriculum delivered continues to meet the Industry demand as identified in the skills Blueprint.

The concept of Innovation Ecosystems needs to be encouraged and managed, along the lines of the emerging concept of an inter-ecosystem network whereby a successful ecosystem syncs up with other



such ecosystems, and while we need to go global with innovation, we also need to think local. By facilitating collaboration between existing innovation investments and future, ideas are given the best chance to develop into disruptive outcomes.

There are several initiatives that can be referenced and learned from in order to create this market organising entity:

- Northern Tasmanian Development Corporation
- DJPR Cremorne Digital Hub and Innovation Precinct
- Geelong G21 Alliance
- BLCR Industry / Education sector innovation initiatives

In addition to these examples and potential organisational models, at a minimum the recommended structure of the "market organiser entity" needs to include the following elements:

- a Governance function with representatives

from stakeholders across Regional Development Victoria, Department Jobs, Precincts and Regions, Industry, Education Sector, Local Government Authorities. The Governance of the Regional Innovation Management Office needs to ensure that its effectiveness in jobs creation goes beyond "informal power", and needs to be championed by Industry in order to ensure alignment to market demand.

- a Delivery function that can collaboratively execute on actions i.e. "do the doing"
- an Operational / Run function that supports long term success criteria and can adjust to the inevitable technology evolution and market movements.
- Participants need to have "skin in the game", with co-contribution and a "seat-at-the-table" through funding/co-funding, people, intellectual property or other tangible items to contribute to the innovation ecosystems that will be incubated and scaled.

THE CHALLENGE

Digitisation and Automation are likely to impact important industries in the Bendigo Loddon Campaspe Region.

Build an adaptive workforce that can meet changing shifts in demand for different skills.



THE OPPORTUNITY

Up to \$700 million in benefits through increased economic activity and employment for the region.

1.1.2 Digital Hubs

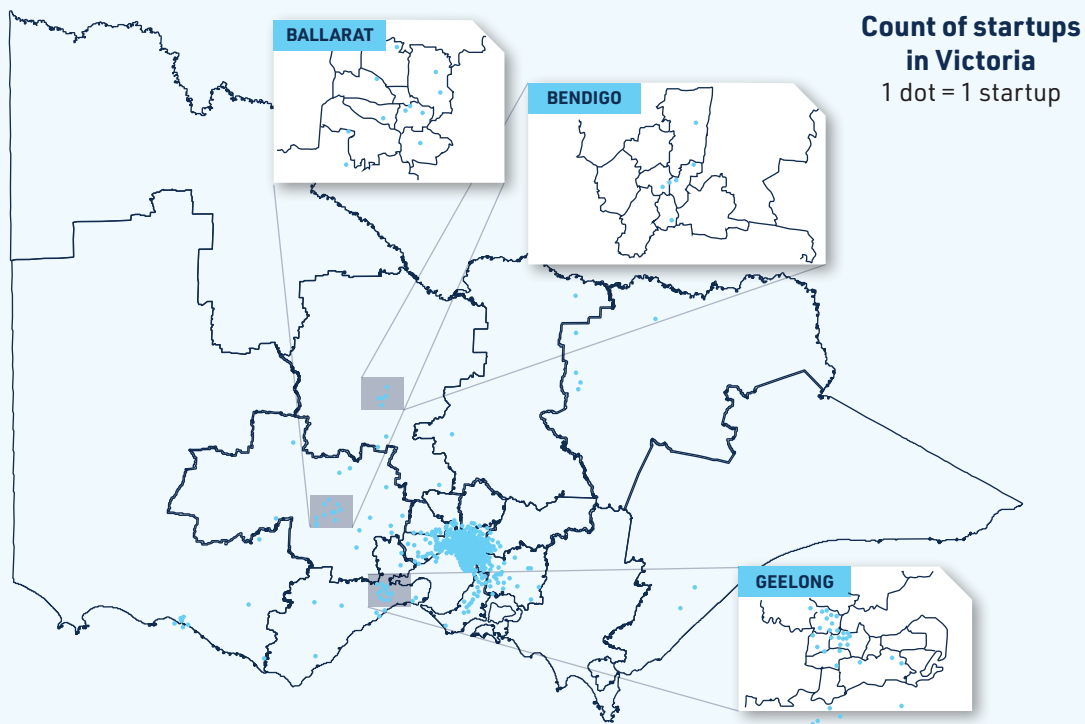
Our region can catalyse the development of a sustainable local digital entrepreneur ecosystem through the creation of flagship Digital 'Hub and Spoke' facilities. Additionally, the provision of practical support to startups and scaleups as they grow to become competitive businesses will be essential.

The nature of work, occupations, skills needed, how businesses grow and expand, and how the workforce and workplace are structured are all changing. While many people work in what could be termed the traditional workplace, new ways of working have emerged and these are driving business development and investment. The gig economy provides flexibility and new opportunities. Increasing numbers of people are working part time by choice, work hours are often

flexible, businesses are finding that many jobs can be partly undertaken by people from home or being highly mobile.

Emphasising local digital technology creation and commercialisation as a driver of economic growth can help our region diversify its economy from mainly traditional industries to knowledge-intensive industries that generate export income and create jobs globally.

The region needs to position itself to retain and attract talent that operates in this space. Innovation and entrepreneurship are key drivers of the emerging economy with startup communities quickly becoming a global phenomenon. Entrepreneurial ecosystems are driving innovation, new business creation and job growth.



Source: Deloitte Access Economics, LaunchVIC Database, ABS Census data 2016, Plan Melbourne 2017-2050

THE CHALLENGE

Our region currently has approximately 1% of the Startups in Victoria.

THE OPPORTUNITY

Up to \$800 million in benefits through increased economic activity and employment for the region.

1.1.3 Connectivity

Our region has some valuable digital connectivity strengths and advantages. The Bendigo CBD is served for business broadband by Telstra, TPG, Bendigo Telco and NBN. As a local differentiator compared to other major regional centres, Bendigo Telco's 100G City initiative leverages the fibre infrastructure previously used to support the head office and national branch network for Australia's 5th largest retail bank, being Bendigo and Adelaide Bank, (and some local large businesses). In 2021 this broadband network is fully productised at commercially competitive rates for any business that is on-net of the fibre.

THE CHALLENGE

Important areas in our region do not have access to connectivity that's fit for current purpose and easily scalable for the future.



THE OPPORTUNITY

Up to \$800 million in benefits through increased economic activity and employment for the region.

Recently in September 2020, NBN announced Bendigo and Echuca as regional “Business Fibre Zones” or “BFZ’s” which provides for NBN’s Enterprise Ethernet business broadband product to be available at metro or CBD Zone level pricing, terms and conditions. NBN continues to evolve its pricing model for Enterprise Ethernet, as well as the number of regional BFZ’s with new announcements in September 2021 that for example reduces the number of pricing zones from 4 down to 2, being “CBD” (or BFZ) and “Zone 1”.

This Program notes however that only two towns across all of the 6 LGA’s within our brief have access to BFZ level pricing (being Bendigo and Echuca), and all others are Zone 1. Noting also that only FTTN served towns qualify as Zone 1 towns and have access to Enterprise Ethernet only within the FTTN boundary. Some examples illustrate common issues for regional businesses:

1. Not all of Bendigo is covered as a BFZ. Much of Kangaroo Flat, Eaglehawk and industrial estates in northern Bendigo do not fall within the Bendigo BFZ and are subject to NBN exception processes for Enterprise Ethernet access, which can result in high “build costs” for additional fibre runs being imposed on businesses.
2. Many other regional towns have industrial estates, factories, schools, medical centres etc outside of the original planned boundaries of towns. These businesses sit outside FTTN access boundaries (which in turn leverage the original Telstra copper access networks, where they exist).
3. Many regional and rural towns do not have FTTN, and therefore have no access to Enterprise Ethernet at all.

This Program collaborated with LGA’s, local business associations and businesses to gather data on the Lived Experience in support of the case for change. The quantitative and qualitative data on business satisfaction with business broadband connectivity options can be found in Section 7.0 – Evidence of Connectivity “Lived Experience” for regional Business and Residents.

Following is a snapshot of powerful qualitative business feedback on their Lived Experience:

For the question **“Please describe any applications, business initiatives or investments that have been deferred because of a lack of connectivity?”**

- “When our internet connection drops out intermittently during the day, we are unable to access our customer database to proceed with customer orders. This results in loss of business and requires staff to work longer hours to catch up
- “I cannot offer Telehealth for my medical clinic, patients cannot pay or transfer between accounts
- “My business is 100% reliant on the internet. I run two businesses a digital marketing agency and a consulting firm. This month alone I have lost over 20 hours due to poor internet connection or no internet. My meetings are all done via ZOOM and quite often I will have to call on mobile instead. Often the mobile network is dreadful at the same time. It's a disgrace. I also run a lot of digital webinars and I have to travel to Moonee Ponds to run them reliably. This has affected my income.

For the question **“How would you measure the business benefit as a result of acquiring your required broadband access?”**

- “In terms of internet downtime and hours wasted on the phone to service providers. Acquiring the required access would minimise loss of billable hours and reduce frustration and stress levels (improve mental health)
- “Lifechanging. I have not been able to make calls today to my customers because the coverage is too poor here and they can’t hear me. One customer said I sounded like a robot
- “Efficiency would increase as many of our employees are deployed in simple data recording, duplication and reporting functions. There would be an upskilling of capability and attractiveness of skilled employees in the Castlemaine and Bendigo region. Our cost competitiveness would improve to put us on a par with our interstate metro area based competitors which should assist in growth opportunities domestically and internationally.

More details on Lived Experience from businesses and residents in the region can be found in Section 7: Evidence of Connectivity “Lived Experience” for regional Business and Residents on page 49.

1.2 Program Options

The following section outlines program options for the 100 GIG Bendigo Loddon Campaspe Region Business Case which covers the 3 key pillars of **Skilling**, **Digital Hubs** and **Connectivity**.



Internet of Things Future Skilling Partnership



PURPOSE

Develop and implement a Future Skilling Partnership for Internet of Things based in the region for the region.

SCOPE

The partnership to be auspiced by DJPR and the Economic Development agencies of the region, delivered by the Universities with a direct interface to relevant major employers and local Startups / Scaleups

SUCCESS CRITERIA

Grow the number of people employed with IoT skills and the number of IoT based businesses within the region to provide sustained economic growth.

Artificial Intelligence Future Skilling Partnership



PURPOSE

Develop and implement a Future Skilling Partnership for Artificial Intelligence based in the region for the region.

SCOPE

The partnership to be auspiced by DJPR and the Economic Development agencies of the region, delivered by the Universities with a direct interface to relevant major employers and local Startups / Scaleups

SUCCESS CRITERIA

Grow the number of people employed with AI skills and the number of AI based businesses within the region to provide sustained economic growth.



Robotics & Automation Future Skilling Partnership



PURPOSE

Develop and implement a Future Skilling Partnership for Robotics & Automation based in the region for the region.

SCOPE

The partnership to be auspiced by DJPR and the Economic Development agencies of the region, delivered by the Universities with a direct interface to relevant major employers and local Startups / Scaleups

SUCCESS CRITERIA

Grow the number of people employed with AI skills and the number of AI based businesses within the region to provide sustained economic growth.



Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)



PURPOSE

Implement and operate Digital Hubs in Bendigo and Echuca (incorporating the recently announced Maryborough facility)

SCOPE

The Digital Hubs will unite existing initiatives in the region under a single program and deliver additional ongoing programs to further develop and grow the innovation, entrepreneurial and digital industry ecosystem for an initial 5 year period

SUCCESS CRITERIA

Realise new economic and employment outcomes through increased numbers of Startups, Scaleups sustained economic growth.

Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote



PURPOSE

Implement and operate Digital Spokes in Castlemaine, Gisborne, Kyneton and Heathcote

SCOPE

The Digital Spokes will unite existing initiatives in the region under a single program and deliver additional ongoing programs to further develop and grow the innovation, entrepreneurial and digital industry ecosystem for an initial 5 year period

SUCCESS CRITERIA

Realise new economic and employment outcomes through increased numbers of Startups, Scaleups and Digital based businesses and activity in the region.

Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth



PURPOSE

Implement and operate Digital Spokes in Castlemaine, Gisborne, Kyneton and Heathcote

SCOPE

The Digital Spokes will unite existing initiatives in the region under a single program and deliver additional ongoing programs to further develop and grow the innovation, entrepreneurial and digital industry ecosystem for an initial 5 year period.

SUCCESS CRITERIA

Realise new economic and employment outcomes through increased numbers of Startups, Scaleups and Digital based businesses and activity in the region.

Extend affordable 100 Gigabit access



Extend Regional Fibre Backhaul Networks

PURPOSE

- The entire extents of the Bendigo CBD to have access to 100 Gigabit connectivity and Fibre optic sensing through a new open access competitor neutral duct network.
- Extend high capacity open access fibre backhaul and interconnect from Bendigo to Echuca, Castlemaine to Maryborough and potentially other areas

SCOPE

- Design, build, own and operate a new duct network to accommodate the extended reach 100 Gigabit connectivity services via at least one service provider
- Engage a partner to design, build, own and operate an extended fibre backhaul network.

SUCCESS CRITERIA

Reduce barriers to entry and increase ease of online access to business, education and health services will increase economic and employment outcomes for the region over the coming decades.

Accelerate 5G rollout for Key Centres



PURPOSE

Accelerate the deployment of full capability 5G in Bendigo, Echuca, Castlemaine and Maryborough through a network of new Smartpoles designed to host 5G Network equipment

SCOPE

Design, build, own and operate a network of new Smartpoles at bus stop locations in the urban extents of Bendigo, Echuca, Castlemaine and Maryborough

SUCCESS CRITERIA

Reduce barriers to entry and increase ease of online access to business, education and health services will increase economic and employment outcomes for the region over the coming decades.

Whole of Region 3G to 4G Uplift



Fixed Wireless & Satellite upgrade to FttP

PURPOSE

- Upgrade 3G network coverage to 4G in the rural and remote parts of the region through a 'neutral host' approach to passive tower, backhaul and active radio network sharing with at least two mobile network operators
- Upgrade the current NBN Fixed Wireless and Satellite towns of Boort, Malmsbury and Newstead to Fibre to the Premise.

SCOPE

- Provide co-investment to a partner to design, build, own and operate a neutral host 4G mobile network.
- Provide co-investment to NBN to upgrade the towns to fibre to the premise

SUCCESS CRITERIA

Reduce barriers to entry and increase ease of online access to business, education and health services will increase economic and employment outcomes for the region over the coming decades.

1.3 Costs and Benefits

A detailed analysis of the costs and benefits across the options was undertaken.

Determining the cost for each Program option considered the following:

- Development of a cost model that includes capital and operating costs. Costs are considered for a thirty-year period.
- Program management and change management costs are included within the capital costs.

- Application of 30% contingency across all costs as consistent with strategic business cases of this nature.
- A summary of the total capital and operating costs (including contingency) are presented in the Table below.

The net present value results of the cost benefit analysis are shown in the table below.

SKILLING

Cost Category	Option 1 (Critical)	Option 2 (Competitive)	Option 3 (Optimal)
Total costs (\$m 2022 PV, 30 years, with contingency)	62.4	126.4	189.5
Total benefits (\$m 2022 PV, 30 years)	443.7	550.8	657.6
Net Present Value (\$m 2022 PV)	109.6	43.5	16.5
Benefit Cost Ratio	7.1	4.4	3.5

DIGITAL HUBS

Cost Category	Option 1 (Critical)	Option 2 (Competitive)	Option 3 (Optimal)
Total costs (\$m 2022 PV, 30 years, with contingency)	68.3	161.9	278.9
Total benefits (\$m 2022 PV, 30 years)	502.8	614.3	756.9
Net Present Value (\$m 2022 PV)	118.3	-5.4	-110.4
Benefit Cost Ratio	7.4	3.8	2.7

CONNECTIVITY

Cost Category	Option 1 (Critical)	Option 2 (Competitive)	Option 3 (Optimal)
Total costs (\$m 2022 PV, 30 years, with contingency)	36.3	52.5	122.5
Total benefits (\$m 2022 PV, 30 years)	408.7	552.9	736.0
Net Present Value (\$m 2022 PV)	100.4	129.5	105.0
Benefit Cost Ratio	11.3	10.5	6.0

1.4 Immediate Funding Requirements

The total funding requirements for the program is outlined in the cost benefit analysis.

This business case seeks funding of \$283.4M, including contingency, over the next six years, from 2022/23 to 2028/29, to implement an extensive range of Skilling, Digital Hub and Connectivity projects identified under the 100 Gig Bendigo Loddon Campaspe region program.

Project	FY2022 CAPEX Funding sought	Potential Funding Partner	2022/23-2028/29 Subsequent OPEX Funding required	Potential Funding Partner	Notes
SKILLING					
Internet of Things Future Skilling Partnership	3.9m	Victoria State Government / Commonwealth Government	9.8m	Universities & Industry	5 Year OPEX commitment required initially
Artificial Intelligence Future Skilling Partnership	5.5m		9.8m		
Robotics & Automation Future Skilling Partnership	4.6m		9.8m		
DIGITAL HUBS					
Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	23.4m	Victoria State Government / Commonwealth Government	7.8m	Councils	5 Year OPEX commitment required initially
Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote	31.2m		8.0m	Councils	
Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth	39.0m		8.0m	Councils	
CONNECTIVITY					
Extend 100 Gigabit to entire CBD extents of Bendigo City	3.6m	Connect Victoria (Gigabit State)	0.7m	Council & Telco Provider	
Regional Fibre Backhaul Network Extensions	27.5m	Connect Victoria (Gigabit State)	4.6m	Telco Provider	
Accelerate 5G rollout for Key Centres	13.9m	Connect Victoria (Mobile Coverage)	2.4m	Council & Telco Provider	
Whole of Region 3G to 4G Uplift	50.0m	Connect Victoria (Mobile Coverage)	8.3m	Telco Provider	
Fixed Wireless & Satellite upgrade to FttP	7.7m	Connect Victoria (Gigabit State)	3.9m	Telco Provider	

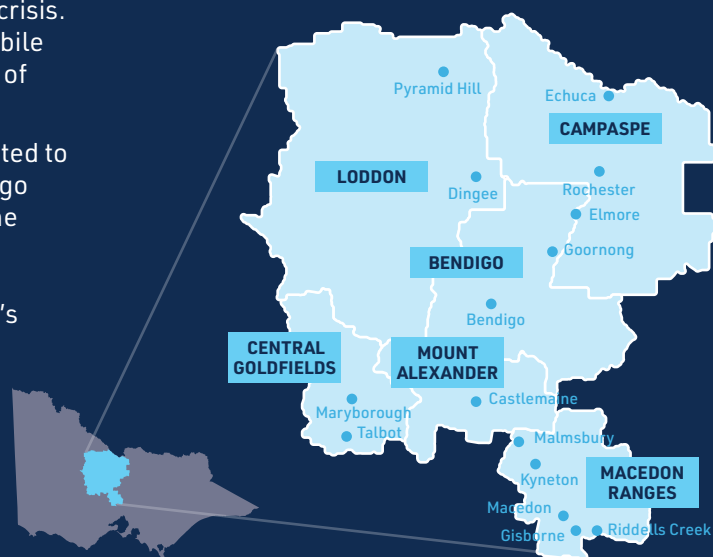
2 Problem Definition

As the world becomes more digitised, the need for connectivity to advanced digital services is ever increasing, as is the risk of a sharp new digital divide.

With COVID-19, we have seen how much we depend on connectivity, with traffic up 80% or more at some points of the pandemic crisis. While all communications are key, mobile capability and coverage is in jeopardy of underinvestment in regions.

The City of Greater Bendigo is committed to improving the lives of people in Bendigo and the Loddon-Campaspe region, one of the key economic driving regions within Victoria and Australia. Digital connectivity is fundamental to people's lives, personally and professionally. The technology sustains and supports the economic and social

development of communities, provides access to education, breaks down barriers of distance and is critical for the communication of information during times of crisis. Outer parts of the region have limited mobile phone voice and data reception and or fixed broadband.



Loddon Campaspe is home to almost 240,000 people. At the heart of the region is Bendigo, a city with approximately 40% of the region's population, with other regional towns including Echuca, Castlemaine, Gisborne, Maryborough and Kyneton. Loddon Campaspe Region is a diverse and growing region located in Central Victoria, and while the region has many existing strengths, it faces challenges in maintaining competitiveness with larger cities.

These challenges are compounded as Australia; moves from a more resource intense-based economy to a more service-based economy; has increasing urbanisation with ageing populations; and deals with the impacts of a changing climate. It is imperative that Loddon Campaspe region leverages existing strengths and creates new opportunities to remain a competitive, vibrant, resilient, and diverse region.

The region has many strengths including key transport and economic corridor(s); air access via the Bendigo Airport; a world leading digital Hospital (Bendigo) and networked health facilities; established education infrastructure including secondary, vocational and tertiary offerings; rich indigenous cultural and historical offerings; moderate to high employment growth; and existing digital infrastructure assets.

A critical component to increase our future competitiveness will be ensuring the region has the digital connectivity suitable to support expectations of businesses, institutions, and community in the 21st century.

While the region has existing digital infrastructure for businesses and households that includes fixed broadband access and mobile access, the quality of this infrastructure is highly variable. Across Australia, regional users face quality, reliability, and price discrepancies compared to major cities like Melbourne and Sydney. The recently released Loddon Campaspe Regional Digital Plan explores place-based supply of and demand for digital services / skills and highlights unmet digital needs across the region.

Government at all levels acknowledges the vital economic value of high speed broadband infrastructure being universally available to business and residential customers. It is also important that competitive services are available as far as possible to support price and service quality competition. Broadband services are now a universal communications medium for voice, video and data services for both business and residential users.

In many parts of Australia, particularly regional and remote areas, economies of scale do not permit the provision of high density services seen in larger metropolitan and urban areas. The National Broadband Network initiative has intended to deliver 21st Century telecommunications broadband services across the country to close the gaps in telecommunications infrastructure and facilitate a competitive retail services market through acting as a wholesaler, however significant telecommunications connectivity issues remain.

Equipping Loddon Campaspe as a 100-Gig City/Region could support existing and attract new businesses, stimulating business generation, stem any outflow of skilled labour, and provide greater, more equitable access to community services such as health and education and key other drivers of the future economy.

The region has existing fibre optic assets (owned by Bendigo Telco and VicTrack), as highlighted in the pre-feasibility study undertaken by Arup in 2019, that could be leveraged to develop a successful, competitive and sustainable model of a “Gig City and Regional Corridor” in Regional Victoria. In addition NBN Co have recently released a suite of investment opportunities that would support future improvements to connectivity. All other telco providers and related partners can also support a citizen focused view for enhanced digital technology and what this can provide the people of Loddon Campaspe region.

Given the existing assets in Bendigo and along the Loddon Campaspe corridor, it is recommended a regional Gig model is developed and implemented, initially in Bendigo as a hub and, and then expanded south along the key transport corridor, then North, and to fill in the gaps throughout the rest of the region.

The digital divide has continued to grow as new broadband technologies, devices, and applications have evolved with unrelenting speed. With the onset of the COVID-19 pandemic, the digital disparity in low-income urban regions and rural communities has been thrust into the spotlight. At the core, the two main barriers are broadband availability and broadband adoption. It has been shown that although high-speed internet may be available, broadband adoption does not necessarily follow suit. Digital literacy, relevancy, among other barriers must be addressed.

Preparing the region for the future includes targeted interventions in the areas of **Skilling, Digital Hubs** and **Connectivity**





2.2 Skilling

The Bendigo Loddon Campaspe region needs to reskill its existing workforce as Australia faces a fundamental shift in the skills required of employees. Accelerated digitisation, coupled with remote ways of working, means reskilling and upskilling is required.

Prior to COVID-19, 75% of businesses reported they were concerned about shortages of digital skills within their industry. While Australia has helped grow its skilled workforce through immigration, we shouldn't rely on this post-COVID-19.

Several measures are required to be put in place, by both industry and governments, to rapidly develop the skills we need to grow post-pandemic. We need the region's workforce to be employed, productive and equipped with the right skills if we want to remain a competitive and prosperous region over the coming decades.

Some experts say that the increasing adoption of automation and other technologies suggests a future where humans are no longer necessary in labour. COVID-19 is thought to have accelerated this trend by wiping out millions of jobs, which may lead us into an era permanently established with digitization happening across industries.

The world is changing rapidly, but the real picture of technology's effect on jobs isn't always clear. Jobs will be lost and created with different technologies in future years. Governments need to understand this as they plan for their futures—so do companies and individuals who want a hand at shaping that near future we all live in!

Recent research by Boston Consulting Group has studied the potential impact of various technologies on jobs in three countries: the US, Germany, and Australia. Using the underlying demographics in each country, detailed scenarios were developed that model the effects of new technologies and consider the impact of the pandemic on GDP growth.

When it comes to the impact of digitization, one key finding is that net number of jobs lost or gained just isn't enough. For example, say there were 10 million people who had their job eliminated and then replaced by a new opportunity—that might not seem like much of an economic disruption but in reality could be devastating for millions of individuals with their livelihoods hanging in the balance.

In general, computers perform well in tasks that humans find difficult or time-consuming to do, but they tend to work less effectively in tasks that humans find easy to do. Although new technologies will eliminate some occupations, in many areas they will improve the quality of work that humans do by allowing them to focus on more strategic, value-creating, and personally rewarding tasks.

The work force in Australia is projected to increase by 20% from 2015-2030.

However, certain sectors of the economy may have a hard time finding enough employees such as computer and mathematics fields where 333,000 more workers will be needed by 2030. The other three job families with significant shortages are management, health care practitioners and technical support positions which comprise nearly one third (32%) of all vacancies currently advertised on SEEK's website for jobs available today; followed closely behind by business operations like financial analysts who need 40%), then community professionals including educationists at 28%.

Australia's workforce has been increasing steadily over the last decade, but it could soon face shortfalls across many industries if hiring does not keep up with demand.

Technology will make the labour market in some sectors worse as Australia's workforce surplus continues to grow. Production workers are expected to stay high at 118,000 by 2030 and office/administrative workers are projected to have a shortage of 180,000 jobs. However, all job family groups with a shortfall can still be summed up 1 million total for those who need work whereas there is only an estimated 0.6 million left without one after consideration of technology encroaching on more repetitive tasks like factory production or administrative duties that may not require human assistance anymore because it would rather replace humans whenever possible due their inability (or lack thereof) perform these jobs efficiently enough which means they'll ultimately lose out when companies choose between them and other candidates vying for position.

Gap between workforce supply and demand (thousands of FTEs)



Job family groups

Architecture and engineering	29	-20	-63	35	10	-27
Arts, design, entertainment, sports, and media	30	4	1	35	25	26
Building and grounds cleaning and maintenance	36	-9	-14	42	17	14
Business and financial operations	33	-35	-66	43	10	-14
Community and social services	2	-25	-47	5	-15	-34
Computer and mathematics	-2	-165	-333	7	-121	-273
Construction and extraction	87	47	4	98	90	55
Educational instruction and library	11	-22	-22	25	16	19
Farming, fishing, and forestry	37	-13	-27	42	3	-9
Food preparation and service	231	90	55	241	145	123
Health care practitioners and technical support	-2	-92	-168	11	-53	-121
Health care support	7	-11	-16	11	1	-2
Installation, maintenance, and repair	48	20	25	53	40	47
Legal	5	-5	-10	7	3	0
Life, physical, and social sciences	6	-10	-17	9	2	-4
Management	173	-66	-214	201	57	-70
Office and administrative support	161	116	180	188	220	288
Personal care and service	42	-22	-44	52	11	-6
Production	112	101	118	125	154	175
Protective service	-1	1	1	2	9	10
Sales and related fields	198	125	175	218	219	277
Transportation and material moving	74	15	9	83	53	49
Total	1,318	24	-473	1,533	898	521

Sources: Faethm; BCG analysis.

Note: Aggregate results calculated by summing all surpluses and shortfalls within the 22 job families. Because of rounding, not all numbers add up to the totals shown.



2.3 Digital Hubs

The Business Case is proposing the development of a cross-sectoral place-based innovation hubs that brings together new and existing incubator and accelerator programs, research and STEM-based programs, youth-based education and the city's 100 GIG Bendigo.

The proposed initiative will build on the region's sectoral strengths, including, but not limited to:

- Advanced Manufacturing
- Regional Health
- Mining
- Food (City of Gastronomy and processing)
- Health
- Agriculture
- Retail

- Creative Industries
- Indigenous
- E-Government – working as a e-Government centre of excellence aligning Federal State and Local government service provision to the Customer experience (2023)

All of these have at their centre, a digital first principles and Industry 4.0 or Gov 3.0 as the drivers of the new economy. In addition to the sectoral-based programs are key innovative organisations such as Bendigo Telco, Coliban Water, La Trobe University, Law Courts, CFA, Bendigo Kangan TAFE and the Bendigo Tech School – all offering opportunities to solve larger, wicked societal challenges around health, education and climate change.

The hub would seek partners to work with to co-design and operate the space and welcome any involvement and opportunities to build on the concept.



Key objectives of the innovation hub include, but are not limited to:

- Developing the increased interest in the regions innovation capabilities by boosting the startup network, including access to space, mentoring, opportunities for commercialisation and access to investment capital
- Working towards a focused, collective impact approach that builds on the sectoral strengths of Greater Bendigo and regional collaborative partnerships
- Strengthening the city's brand and identity as a strong innovative city and seek to secure new markets and services between local business and global networks
- Further promoting STEM and innovation in young people within the region and continue to bridge the gap between education and industry

The Loddon Campaspe region needs to position itself to retain and attract talent that operates in the startup space. Innovation and entrepreneurship are key drivers of the emerging creative economy with startup communities quickly becoming a global

phenomenon. Entrepreneurial ecosystems are driving innovation, new business creation and job growth and the region is well placed to leverage off their existing accelerator programs.

Loddon Campaspe is a diverse region, seen through local people and local knowledge. Diversity is essential in innovation and requires all genders, young and mature, and people from all backgrounds and experiences. The Innovation Hub has the potential to provide a range of initiatives to support and accelerate new and emerging businesses and encourage innovation to thrive.

For Greater Bendigo and the Loddon-Campaspe Region to catalyse the development of a sustainable local digital startup ecosystem through the creation of a flagship facility, the provision of practical support to digital startups as they grow to become competitive businesses will be essential. Emphasising local digital technology creation and commercialisation as a driver of economic growth can entrench BLCR as a leading intelligent community, and in doing so, help BLCR diversify its economy from mainly traditional industries to knowledge-intensive industries that generate export income and create jobs globally.

The technology-driven world in which we live is filled with both promise and challenge. As technologies increase productivity and connectivity, their use will substitute for some work activities currently performed by humans. Simultaneously, these technologies will pave the way for new products, services, work opportunities and industries. Populations that manage the transition proactively from a digital skills and literacy perspective can minimise displacement, disadvantage and inequality, and help their region and its participants harness the economic and social opportunities to improve personal and community resilience.

The benefits of a flagship hub and spoke facility to the community are many. For example, it would increase economic health by catalyzing innovation in sectors like manufacturing or healthcare which is important for job growth in these industries. This means more jobs will be available locally because people can stay close to their home without having to travel long distances as often for work related responsibilities such as meetings and training sessions.

Digital startups are defined as an emerging high-growth company that is using technology and innovation to tackle a large and most often global market. Digital startups operate in any industry in which technology is an enabler of growth, including hardware, engineering, biotech and IT. Many industries are in the process of being transformed by online business models, providing entrepreneurs with an unprecedented opportunity to create economic growth, wealth and jobs.

A new digital skilling, startup and innovation facility will have the objective to be a major focal point for innovation in Bendigo Loddon Campaspe region. The incubator would create an environment that encourages creativity by connecting those with ideas to mentors who can help them turn their visions into realities of success.

The overarching benefit to the community from the Digital Hubs and Spokes is increased economic health and vitality. Specific benefits include:

- Job Creation – incubator companies create new employment opportunities for area residents. Technology companies typically provide higher wage jobs that better match the skill set of local workers, resulting in more full-time employees and less unemployment.
- Reputation Building – the facility is one important element to enhance the city’s image as a

progressive, future-thinking place that supports technology business development.

- Increased Entrepreneurialism – the facility can create awareness of entrepreneurs and stimulates confidence among individuals to consider opportunities for business creation.
- Business Development – established area businesses, especially those that develop relationships with early-stage companies, create long-term business opportunities as incubator companies grow and expand.
- Increased Tax Revenue – new jobs and new businesses in the incubator and those businesses that graduate from the incubator and spin-out into the community would generate a larger, more diverse tax base to support public services and contribute to many facets of community livability and health.

The customer focus of the facility includes all facets of the Bendigo Loddon Campaspe community”. This specifically includes the following targeted segments:

- founders and entrepreneurs
- digital and technology based startups
- SMEs and home-based businesses
- creative industries (graphic design)
- makers, hackers, and
- developers gamers and game developers
- ICT professionals and service providers
- Consultants and freelancers
- corporate teams and executives
- remote teleworkers
- students & educational institutions

The members and local ecosystem will naturally develop over time. Most startups fast-fail within the first six months, and move on to another idea, but will stay connected to the facility. Successful startups typically “graduate” and leave a co-working space once their team hits more than 5 people, which will typically occur anywhere between 6 and 18 months. As founders gain more experience, more other experienced people will also be attracted to the facility, and therefore there should be a natural customer evolution over time.

The facility management should consider new models and methods over time in order to retain those startups that are about to graduate out of the space, such that they remain engaged in the space for longer.

Fundamentally, the facility will deliver significant economic and social impact for the region. This will be achieved by the facility providing the following services to the community:

- Community – a connected sense of community, united by a common interest
- Reputation building – enhancing the reputation of



What the average space offers



Working space



Internet



Printing



Reception



Community Managers



Security



Coffee



Community Events



Meeting Rooms



Snacks & Drinks

- the city and showcasing innovation
- Density – a single location to host all relevant events, meetups, and groups
- Co-working facility – casual, part-time and full-time shared office space
- Events and meetups – including guest speakers, hackathons, and pitch competitions
- Education – including courses, masterclasses, and online delivery
- Mentoring services – access to experienced mentors and subject matter experts
- Event space – an event space for conferences, trade shows, meetups, and groups
- Accelerator programs – over time the facility can deliver startup accelerator programs
- Investment – helping startups to access capital and/or directly investing

The facility will provide new and emerging technology and compatible businesses with an environment that would support their startup phase and increase their likelihood of success. The proposed incubator includes facility space, flexible leases, shared use of common office equipment, direct business assistance and guidance, mentoring, networking to capital, and other technical resources. A network of existing resources in the community would be developed to support member needs.

2.3.1 Potential Key Stakeholders

- City of Greater Bendigo
- Bendigo Health
- AustMine
- La Trobe University
- ACMI
- Dja Dja Wurrung Aboriginal Clans Corporation
- CivVIC Labs - LaunchVIC
- Coliban Water
- Bendigo Telco
- Bendigo Kangan TAFE
- Goldfields Local Learning Employment Network
- Bendigo Tech School
- The Discovery Centre

2.3.2 International Case Study – Forum Virium, Helsinki

Forum Virium is a non-profit limited liability company owned by the City of Helsinki. It was established as a not for profit separate business of the City to genuinely engage and utilise partnerships and collaboration with the private sector, Universities, National Governments (Finnish namely) and the European Union (EU), with a mandate to solve public sector problems.

Forum Virium was established in 2006 by the Helsinki City Government initially as an economic arm of Council to generate Start Up activities and provide applied research and development to City problems. The team has grown over this time to be between 30-40 FTE.

The team works across Helsinki (the entire City) and expanded across European Cities. It works with citizens to define problems and then produce and procure (in a very different way) solutions in partnership with the private sector. It has also expanded due to its role with the EU to other “Lighthouse” Cities with a range of European funding partners.

Forum Virium purpose: “Forum Virium Helsinki is the City of Helsinki innovation company. We co-create urban futures with companies, universities, other public sector organizations and Helsinki residents. We are fortunate to have a European-wide collaboration network. The digital solutions developed through the projects can be seen in Helsinki, Amsterdam and Barcelona alike. Cities around the world will benefit from services built together on shared platforms.”

2.3.3 International Case Study – expectrum, Sweden

At expectrum, students, teachers, companies and organizations gather in a common environment. A mix of people who make expectrum unique. We offer a colorful range of schools, curious meeting rooms and a modern coworking environment for currently about 55 member companies. We create positive clashes between worlds that otherwise do not meet and see the beauty of children and adults being inspired by each other. We encourage students to step into the wonderful world of technology, where anything is possible.

Expectrum's three goals

- To contribute to an increased interest in technology and thus a supply of skills that contributes to the regional recruitment base.
- To contribute to strategic collaborations with the outside world regarding our commercially sustainable innovations.
- To contribute to a strengthened identity of Västerås and the region as a technology and innovation strong center.





2.4 Connectivity

The Bendigo Loddon Campaspe region has a number of valuable digital connectivity strengths and advantages which position the region strongly to be a premier national location for digital connectivity and use.

The region's key population centres are largely aligned geographically, a cost advantage when delivering backbone digital infrastructure across the region. Bendigo already has valuable, high-capacity and underutilised fibre assets serving the city.

The presence of education institutions like La Trobe University, Bendigo Kangan TAFE, Bendigo Tech School and advanced technology users like Bendigo Health, Coliban Water and Bendigo Telco create an important demand and supply of digital skills in the region.

However, there still exist many gaps in the digital infrastructure and services across the region which impede the ability of businesses and citizens to engage effectively with the digital economy. These issues must be addressed, and the worst served areas prioritised.

Name	Population	Connectivity Access			
		NBN	Mobile	Fibre Backhaul	IoT
Bendigo City of Greater Bendigo	~93,000	Business Fibre Zone Fibre to the Premise Fibre to the Curb Fibre to the Node Fixed Wireless Satellite	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	VicTrack Bendigo Telco Telstra Optus Vocus Transgrid AARNET	Ventia LoRaWAN Sigfox
Echuca Campaspe Shire	~19,000	Business Fibre Zone Fibre to the Premise Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	Ventia LoRaWAN
Castlemaine Mt Alexander Shire	~10,000	Fibre to the Premise Fibre to the Node Fixed Wireless Satellite	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack	Ventia LoRaWAN Sigfox
Gisborne Macedon Ranges Shire	~10,000	Fibre to the Premise Fibre to the Node Fixed Wireless Satellite	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack Optus Vocus	Sigfox
Maryborough Central Goldfields	~7,500	Fibre to the Node Fixed Wireless Satellite	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	Sigfox
Kyabram Campaspe Shire	~6,000	Fibre to the Curb Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra Vocus?	
Kyneton Macedon Ranges Shire	~5,000	Fibre to the Premise Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack Optus Vocus	Ventia LoRaWAN
Romsey Macedon Ranges Shire	~3,900	Fibre to the Premise Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	Sigfox

Name	Population	Connectivity Access			
		NBN	Mobile	Fibre Backhaul	IoT
Woodend Macedon Ranges Shire	~3,800	Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack Optus Vocus	
Riddells Creek Macedon Ranges Shire	~3,200	Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack Optus Vocus	
Macedon Macedon Ranges Shire	~2,800	Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack Optus Vocus	
Rochester Campaspe Shire	~2,800	Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	Ventia LoRaWAN
Heathcote City of Greater Bendigo	~1,700	Fibre to the Curb Fibre to the Node Fixed Wireless Satellite	Telstra 4G / 3G Optus 4G / 3G	Telstra	Ventia LoRaWAN
Lancefield Macedon Ranges Shire	~1,500	Fibre to the Premise Fibre to the Node Fixed Wireless Satellite	Telstra 4G / 3G Optus 4G / 3G	Telstra	
Tongala Campaspe Shire	~1,300	Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra Vocus?	
Maldon Mt Alexander Shire	~1,300	Fibre to the Node	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	Ventia LoRaWAN
Rushworth Campaspe Shire	~1,000	Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	
Marong City of Greater Bendigo	~900	Fibre to the Premise Fibre to the Node Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	Ventia LoRaWAN
Boort Loddon Shire	~800	Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G	Telstra	Ventia LoRaWAN
Carisbrook Central Goldfields Shire	~600	Fibre to the Node	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra	
Malmsbury Macedon Ranges Shire	~600	Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G Vodafone 4G / 3G	Telstra VicTrack Optus Vocus	
Newstead Mt Alexander Shire	~600	Fixed Wireless	Telstra 4G / 3G Optus 4G / 3G	Telstra	

To realise the 100GB opportunity for the region, a business model for network implementation is presented below.

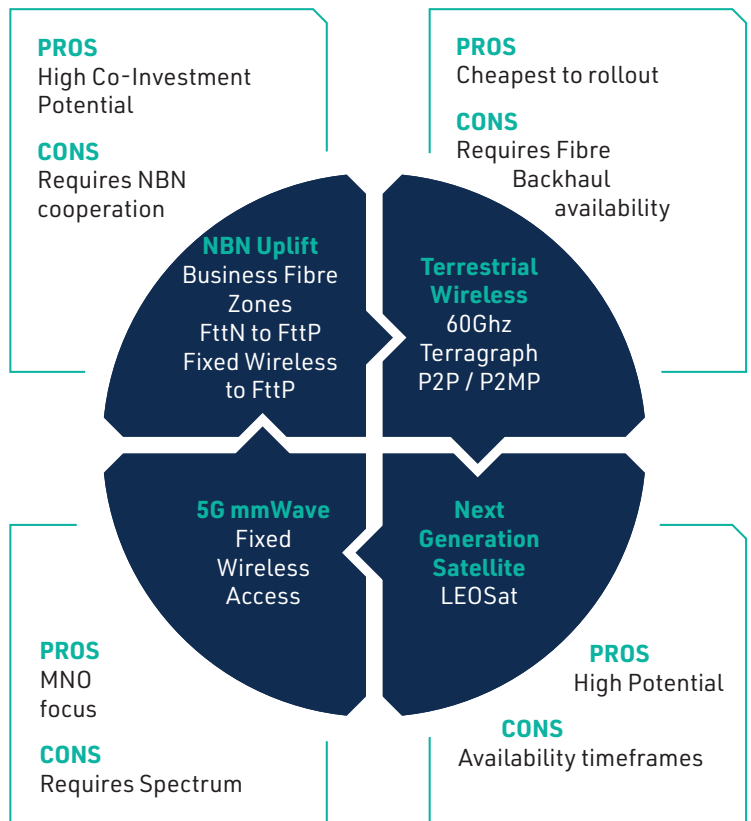
The Business Model for 100 Gigabit City Region Network Implementation

Fibre Backhaul & Interconnect	<ul style="list-style-type: none"> • Provide IP Transit and Capital City / Internet / Cloud interconnect • Providers include Telstra, Vocus, Optus, VicTrack, AARNET • Can be provided over Dark Fibre or Managed Service
Access Networks	<ul style="list-style-type: none"> • Provide last mile broadband over Fibre, Fixed Line, Cellular or Wireless networks • Technologies include Fibre to the Premise / Curb / Node, 5G / 4G / 3G Networks, Terrestrial Wireless (P2P / P2MP / Terragraph), Satellite (GEO / MEO / LEO) and IoT Networks (LoRaWAN, Sigfox) • Providers include NBN, Telstra, Optus, TPG, Bendigo Telco
Retail Service Provider	<ul style="list-style-type: none"> • Provide Internet Services to End Customers either through a Wholesale provision (i.e. NBN) or full end to end service provision (i.e. Telstra 4G) • Providers include Telstra, Optus, TPG, Bendigo Telco

The 100GB BLCR Connectivity Gaps report identified several towns and centres within the region that are served with connectivity infrastructure that is arguably not either fit for purpose or scalable for the demand requirements in the coming decades.

The Matrix below for potential uplift options for these town and centres has been developed to outline uplift treatment options.

Potential Access Network Uplift Matrix



The map below shows a potential feasible hub – spoke fibre backhaul and interconnect network uplift treatment for the region. Usage of Victorian State Government owned network assets (owned by VicTrack) would be required to be utilised to make this potential scenario feasible.

Potential Fibre Backhaul & Interconnect Network Uplift



3 Options Analysis

There is a clear case for targeted intervention led by the Region to play a role in improving connectivity in the City of Greater Bendigo and the Loddon-Campaspe Region.

3.1 Approach to options development

Given the breadth of the Program scope and its potential to span multiple technologies, infrastructure and education sectors and arms of government, a comprehensive approach to determining the scope of the options has been developed.

The high-level phase of this approach are:

- **Input:** Identification of long list of digital connectivity and innovation capability treatments and use cases, leveraging Victorian, national and international sources;
- **Analysis:** Analysis of the long list of digital connectivity and innovation capability treatments use cases against scope areas and program levers, to create a long list of options;

- **Outputs:** Assessment of the long list of options and preliminary screening to determine resulting shortlist for further analysis.

To help target the analysis and develop the options, these interventions have been categorised into two levers, as shown below, geographic area covered by extent of digital initiatives. Within the bounds of potential options, from 'Base Case' to 'Optimal Solution', the long list of options will be developed by considering different levels of intervention and initiatives that can be applied within which each of these levers.

Common levers are considered in the development of the options for the 100G BLCR Business Case which include geographic coverage of the proposed initiatives and the extent of digital infrastructure, innovation capacity development and future skilling initiatives.

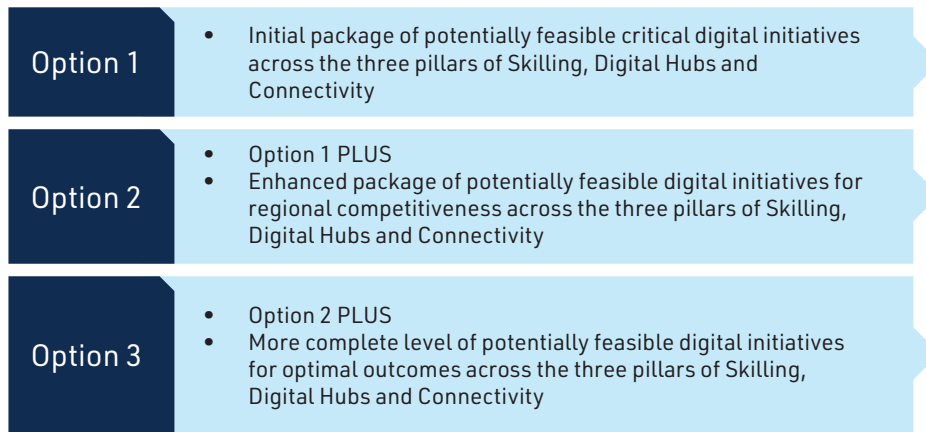


Within the bounds of potential options, from 'Base Case' to 'Optimal Solution', the options were developed by considering different levels of intervention that can be applied within the geographic and digital initiative levers. The section below shows the considerations for the geographic and digital initiative levers.

- Geographic area covered: The Bendigo Loddon Campaspe Region includes five LGAs. The geographic area contains a mixture of key urban

centres, rural, regional, greenfield and brownfield sites.

- Digital initiatives and capabilities considered: Recognising the potential for the digital initiatives to contribute across various desired outcomes for the region, the focus areas for the Program were divided across three digital uplift packages based on the key challenges to be addressed and service needs in the Bendigo Loddon Campaspe region.



The options build upon each other. For example, Option 1 provides critical enabling functionality that could deliver an early outcome for the region, where Option 2 and Option 3 provide more benefits.

The list of options was subjected to an initial screening process against the Program objectives and high-level

feasibility considerations. This process was used as a means for eliminating options to allow detailed analysis to be prioritized on only the shortlist of options provided. The table below, summarises the initial options screening process:

Option	Shortlist?	Justification for progression / elimination
Base Case : Do Nothing <ul style="list-style-type: none"> • Skilling • Digital Hubs • Connectivity 	<input checked="" type="checkbox"/>	Highly limited – Base case 'do nothing' scenario minimally meets some program objectives but does not address the key challenges nor meet the associated service need. However, this base case is shortlisted for the purpose of this Business Case, as it provides a counterfactual scenario against which the performance of other shortlisted options will be measured
Base Case : Do Minimum (Regulation / policy intervention only) <ul style="list-style-type: none"> • Skilling • Digital Hubs • Connectivity 		Not feasible - The Base case 'Do minimum scenario' is not considered for further analysis as again lacks in addressing the key challenges or meeting the service need. In addition, by introducing regulatory interventions with no associated supporting government investment, will set up the councils for failure as they will not have sufficient funding to meet the requirements.
Option 1 <ul style="list-style-type: none"> • Skilling • Digital Hubs • Connectivity 	<input checked="" type="checkbox"/>	Potentially feasible - The Option is shortlisted as it potentially addresses identified needs and meet Program objectives, however it is limited in geographic location
Option 2 <ul style="list-style-type: none"> • Skilling • Digital Hubs • Connectivity 	<input checked="" type="checkbox"/>	Potentially feasible - The Option is shortlisted as it potentially addresses identified needs and meet Program objectives
Option 3 <ul style="list-style-type: none"> • Skilling • Digital Hubs • Connectivity 	<input checked="" type="checkbox"/>	Potentially feasible - The Option is shortlisted as it potentially addresses identified needs and meet Program objectives
Complete Rollout		Not feasible - The Option is not considered for further analysis as it presents a high level of risk, high levels of uncertainty around the feasibility of implementation, and a low potential for value for money.

3.2 Initiatives considered

The Digital Initiative options considered across the three pillars of Skilling, Capacity and Connectivity are:

- A. Base Case – Do Nothing
- B. Option 1 (Critical)
- C. Option 2 (Competitive)
- D. Option 3 (Optimal)

3.2.1 Base Case

A base case option has been included as a counterfactual scenario in this options analysis. This is so that the base case can be used as a point of comparison against which other options' costs and benefits can be contrasted. Typically, the base case is defined as a 'business as usual' or 'do nothing' situation to ensure that existing technology and infrastructure is maintained to a level that allows current operations to be catered for at the same levels of service. For the purpose of the 100G BLCR Program, the base case is maintaining existing digital policy, infrastructure and capacity building arrangements currently committed across the region.

Under this option, the following principles apply:

- No additional investment is made in policies and regulation aimed at addressing the service need, over and above existing regulation and policy framework and government commitments
- No new Victorian State Government investment is made except for existing commitments and digital initiatives

3.2.2 Shortlisted Options (options 1, 2 and 3)

The scope of the shortlisted options were developed based on the following:

- Identification of a series of digital initiatives and use cases based on:
 - Loddon Campaspe Regional Digital Plan
 - Policies, strategies and plans at a federal, state and local level
 - Engagement with LGA Economic Development leads across Macedon Ranges, Mount Alexander, Central Goldfields, City of Greater Bendigo, Loddon and Campaspe Shires.
 - Engagement with regional business associations including Committee 4 Maryborough, Committee for Echuca/Moama, Be.Bendigo and Bendigo Manufacturing Group.
 - Engagement with the Education Sector including Deakin University, La Trobe University, Australian National University, Bendigo Kangan TAFE and Bendigo Senior Secondary School.
- Engagement with regional businesses such as Don KR Castlemaine (Advanced Manufacturing), EcoThought (Digital Agriculture) and Bendigo Health (eHealth innovation).
- Engagement with other reference points such as SW TAFE Digital Hub (Vector Consulting), Smythsdale Well Digital Hub (Golden Plains Shire).
- Proven international digital connectivity and capacity building practices and examples
- Gravelroad Group Knowledge Base
- Identified digital technologies and initiatives are aligned to Program Objectives and jointly maximising economic, social and environmental outcomes

All shortlisted options will provide economic, social and environmental outcomes across the technology focus areas. The extent of the outcomes is projected based on the scope, scalability and geographic location.

3.2.2.1 Option 1

Option 1 contains the following initiatives (assuming the region's NBN requirements for future proofed upgrades is not required due to the Victoria Digital Futures Now program):

	SKILLING	DIGITAL HUBS	CONNECTIVITY
	Internet of Things Future Skilling Partnership	Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	Extend affordable 100 Gigabit access Extend Regional Fibre Backhaul Networks
PURPOSE	Develop and implement a Future Skilling Partnership for Internet of Things based in the region for the region.	Implement and operate Digital Hubs in Bendigo and Echuca (incorporating the recently announced Maryborough facility)	<ul style="list-style-type: none"> The entire extents of the Bendigo CBD to have access to 100 Gigabit connectivity and Fibre optic sensing through a new open access competitor neutral duct network. Extend high capacity open access fibre backhaul and interconnect from Bendigo to Echuca, Castlemaine to Maryborough and potentially other areas
SCOPE	The partnership to be auspiced by DJPR and the Economic Development agencies of the region, delivered by the Universities with a direct interface to relevant major employers and local Startups / Scaleups	The Digital Hubs will unite existing initiatives in the region under a single program and deliver additional ongoing programs to further develop and grow the innovation, entrepreneurial and digital industry ecosystem for an initial 5 year period	<ul style="list-style-type: none"> Design, build, own and operate a new duct network to accommodate the extended reach 100 Gigabit connectivity services via at least one service provider Engage a partner to design, build, own and operate an extended fibre backhaul network.
SUCCESS CRITERIA	Grow the number of people employed with IoT skills and the number of IoT based businesses within the region to provide sustained economic growth	Realise new economic and employment outcomes through increased numbers of Startups, Scaleups	Reduce barriers to entry and increase ease of online access to business, education and health services will increase economic and employment outcomes for the region over the coming decades.

3.2.2.2 Option 2

	SKILLING	DIGITAL HUBS	CONNECTIVITY
	Internet of Things Future Skilling Partnership	Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	Extend affordable 100 Gigabit access
	Artificial Intelligence Future Skilling Partnership	Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote	Accelerate 5G rollout for Key Centres
PURPOSE	Develop and implement a Future Skilling Partnership for Artificial Intelligence based in the region for the region.	Implement and operate Digital Spokes in Castlemaine, Gisborne, Kyneton and Heathcote	Accelerate the deployment of full capability 5G in Bendigo, Echuca, Castlemaine and Maryborough through a network of new Smartpoles designed to host 5G Network equipment
SCOPE	The partnership to be auspiced by DJPR and the Economic Development agencies of the region, delivered by the Universities with a direct interface to relevant major employers and local Startups / Scaleups	The Digital Spokes will unite existing initiatives in the region under a single program and deliver additional ongoing programs to further develop and grow the innovation, entrepreneurial and digital industry ecosystem for an initial 5 year period	Design, build, own and operate a network of new Smartpoles at bus stop locations in the urban extents of Bendigo, Echuca, Castlemaine and Maryborough
SUCCESS CRITERIA	Grow the number of people employed with AI skills and the number of AI based businesses within the region to provide sustained economic growth	Realise new economic and employment outcomes through increased numbers of Startups, Scaleups and Digital based businesses and activity in the region	Reduce barriers to entry and increase ease of online access to business, education and health services will increase economic and employment outcomes for the region over the coming decades.

3.2.2.3 Option 3

	SKILLING	DIGITAL HUBS	CONNECTIVITY
	<p>Internet of Things Future Skilling Partnership</p> <hr/> <p>Artificial Intelligence Future Skilling Partnership</p> <p>+</p> <p>Robotics & Automation Future Skilling Partnership</p>	<p>Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)</p> <hr/> <p>Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote</p> <p>+</p> <p>Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth</p>	<p>Extend affordable 100 Gigabit access</p> <hr/> <p>Extend Regional Fibre Backhaul Networks</p> <hr/> <p>Accelerate 5G rollout for Key Centres</p> <p>+</p> <p>Whole of Region 3G to 4G Uplift</p> <hr/> <p>Fixed Wireless & Satellite upgrade to FttP</p>
PURPOSE	Develop and implement a Future Skilling Partnership for Robotics, Automation and Cyber Security based in the region for the region.	Implement and operate Digital Spokes in Wedderburn, Rochester, Woodend and Rushworth	<ul style="list-style-type: none"> Upgrade 3G network coverage to 4G in the rural and remote parts of the region through a 'neutral host' approach to passive tower, backhaul and active radio network sharing with at least two mobile network operators Upgrade the current NBN Fixed Wireless and Satellite towns of Boort, Malmsbury and Newstead to Fibre to the Premise.
SCOPE	The partnership to be auspiced by DJPR and the Economic Development agencies of the region, delivered by the Universities with a direct interface to relevant major employers and local Startups / Scaleups	The Digital Spokes will unite existing initiatives in the region under a single program and deliver additional ongoing programs to further develop and grow the innovation, entrepreneurial and digital industry ecosystem for an initial 5 year period	<ul style="list-style-type: none"> Provide co-investment to a partner to design, build, own and operate a neutral host 4G mobile network. Provide co-investment to NBN to upgrade the towns to fibre to the premise
SUCCESS CRITERIA	Grow the number of people employed with Automation / Security skills and the number of Automation / Security based businesses within the region to provide sustained economic growth	Realise new economic and employment outcomes through increased numbers of Startups, Scaleups and Digital based businesses and activity in the region	Reduce barriers to entry and increase ease of online access to business, education and health services will increase economic and employment outcomes for the region over the coming decades.

4 Whole of Life Cost Analysis

4.1.1 Cost Planning, Contingency and Management

This section reports the total cost proposed for each option as well as provides an outline of the considerations taken to arrive at the cost estimate.

Costs for the Program represent the financial outlay required to deliver smart technologies and associated capabilities and services that will enhance the Bendigo Loddon Campaspe region. Cost planning outlined in this section is in alignment with the following government requirements, policies and guidelines:

- Department of Treasury & Finance Victoria – Investment lifecycle and high value risk guidelines
- DJPR – Guidance on undertaking economic assessment

As part of cost planning, the cost analysis has been undertaken to develop robust and realistic cost model. The cost analysis consists of top down and bottom up approach that includes understanding of both costing of technology initiatives/use cases and each technological component of the initiative/use case.

The key assumptions supporting the cost planning are outlined below.

In line with the approach outlined above, a cost model has been built to provide the costs associated with the Program implementation. Both capital and recurrent costs were considered within the cost model.

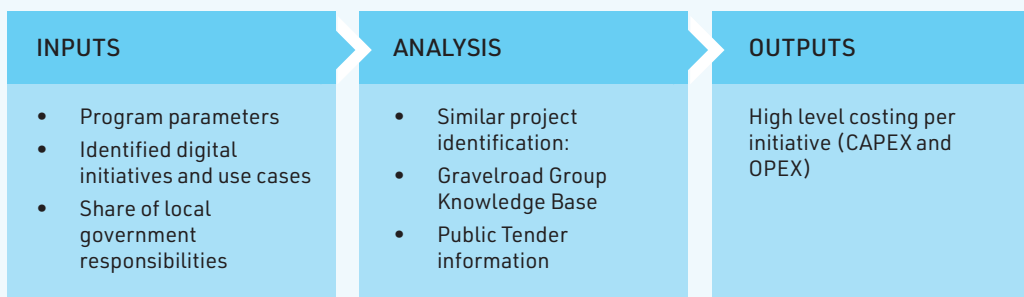
The cost model reflects the known input costs of procurement, design, development, delivery, and project/program/change management of the investment at current rates for work.

The cost estimates comprise:

- Capital costs – costs associated with establishing and commissioning smart technologies and initiatives under each focus area, as well as replacement capital costs (based on asset life for the specific technology)
- Operating costs - recurrent costs associated with operations and maintenance
- Program management and change management costs

The capital and operating cost estimates within the cost model have been developed by Gravelroad Group.

Assumption	Description
Price Year	FY2022
Real discount rate	7%
Inflation	2.5%
Cost planning timeline	30



4.1.1.1 Contingency

Contingencies account for unexpected cost increases associated with the delivery of the Program. Within the cost planning, contingencies have been allowed for the Program and Project level.

Given the Program is in early stages of development, a 30% contingency was applied to all capital costs line items (including Program and change management costs). The 30% contingency amount was consistently applied across all options.

4.1.1.2 Management

Program Management costs include Program Office and Change Management costs as 5% of total Capex, Procurement and Vendor Management as 1% of total Program cost and Final Business Case cost as 1% of total Program cost. These costs are intended to cover the requirements of the proposed Regional Innovation Management office including the initial Skills FOW Blueprint for the region (estimated at \$500K).

Within the cost line items applied to each technology project, a 20% project management is included.

4.1.1.3 Capital Costs

The overall capital costs for the Program comprise the full implementation costs against all of digital initiatives, and include including procurement, design, development and installation. Capital costs are developed for the thirty year period across the three shortlisted options. Procurement, planning and design activities of the proposed digital initiatives, as well as establishment of a Program Office, is scheduled to start in Year 1, with the substantial investment in the digital initiative implementation in Year 2.

The costs were built up using the base rate per unit cost and an assumed quantity that was identified. Capital costs for the infrastructure components (e.g. broadband) have been developed using per dwelling/building/site connected and per km unit case.

The total capital costs across each option and focus area are shown in the table below, in nominal, real and Present Value terms.

Total 30y capital costs (\$m)

SKILLING				
	CAPEX (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Internet of Things Future Skilling Partnership	-	2.5	2.5	2.5
Artificial Intelligence Future Skilling Partnership	-	-	3.5	3.5
Robotics & Automation Future Skilling Partnership	-	-	-	3.0
PROGRAM MANAGEMENT (including Procurement)	-	0.5	1.2	1.8
SUBTOTAL without contingency	-	3.0	7.2	10.8
Contingency	-	30%	30%	30%
TOTAL with contingency	-	3.9	9.4	14.0

DIGITAL HUBS				
	CAPEX (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	-	15.0	15.0	15.0
Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote	-	-	20.0	20.0
Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth	-	-	-	25.0
PROGRAM MANAGEMENT (including Procurement)	-	3.0	7.0	12.0
SUBTOTAL without contingency	-	18.0	42.0	72.0
Contingency	-	30%	30%	30%
TOTAL with contingency	-	23.4	54.6	93.6

	CAPEX (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Extend affordable 100 Gigabit access	-	2.3	2.3	2.3
Regional Fibre Backhaul Network Extensions	-	17.6	17.6	17.6
Accelerate 5G rollout for Key Centres	-	-	8.9	8.9
Whole of Region 3G to 4G Uplift	-	-	-	32.1
Fixed Wireless & Satellite Upgrade to FttP	-	-	-	4.9
PROGRAM MANAGEMENT (including Procurement)	-	4.0	5.8	13.2
SUBTOTAL without contingency	-	23.9	34.6	79
Contingency	-	7.2	10.4	23.7
TOTAL with contingency	-	31.1	45.0	102.7

4.1.1.4 Commercial Off-set

The Program presents potential opportunities to offset some of the costs of technologies and initiatives. The value of revenues or recoverable costs across each option and focus area are outlined in the table below.

Recoverable costs/revenues below may be higher than capital costs above as they also consider recovery of contingency and operating costs.

Total 30y recoverable costs, incl contingency (\$m)

	Revenue (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Internet of Things Future Skilling Partnership	-	11.3	11.3	11.3
Artificial Intelligence Future Skilling Partnership	-	-	11.3	11.3
Robotics & Automation Future Skilling Partnership	-	-	-	11.3
TOTAL	-	11.3	22.6	33.9

	Revenue (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	-	18.0	18.0	18.0
Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote	-	-	42.9	42.9
Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth	-	-	-	74.1
TOTAL	-	18.0	60.9	135.0

	Revenue (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Extend 100 Gigabit to entire CBD extents of Bendigo City	-	2.2	2.2	2.2
Regional Fibre Backhaul Network Extensions	-	29.1	29.1	29.1
Accelerate 5G rollout for Key Centres	-	-	12.3	12.3
Whole of Region 3G to 4G Uplift	-	-	-	18.9
Fixed Wireless & Satellite Upgrade to FttP		-	-	27.1
TOTAL	-	31.3	43.6	89.6

Cost recovery is associated with the following initiatives:

- Extend 100 Gigabit to entire CBD extents of Bendigo City – infrastructure can recover through multi usage / access charges (estimated recovery rate – 100%)
- Regional Fibre Backhaul Network Extensions - infrastructure can recovered through usage / access charges (estimated recovery rate – 100%)
- Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo & Echuca) – Hub & Spoke usage charges (estimated OPEX recovery rate – 40%)
- Innovation / Startup / Scaleup Spokes at Castlemaine, Maryborough, Gisborne & Kyabram - Hub & Spoke usage charges (estimated OPEX recovery rate – 40%)
- Innovation / Startup / Scaleup Spokes at Kyneton, Wedderburn, Rochester, Woodend and Rushworth - Hub & Spoke usage charges (estimated OPEX recovery rate – 40%)
- Internet of Things Future Skilling Partnership - Program as a service (industry / business user pays) (estimated recovery rate – 25%)
- Artificial Intelligence Future Skilling Partnership - Program as a service (industry / business user pays) (estimated recovery rate – 25%)
- Robotics & Automation Future Skilling Partnership - Program as a service (industry / business user pays) (estimated recovery rate – 25%)

4.1.1.5 Ongoing Maintenance, Operating and Service Costs

The overall operating and maintenance (O&M) costs for the Program are included as 20% of capital costs as an industry standard for digital initiatives. The Table below outlines the total operating costs of the program options:

Total 30y operating costs (\$m)

SKILLING				
	OPEX (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Internet of Things Future Skilling Partnership	-	45.0	45.0	45.0
Artificial Intelligence Future Skilling Partnership	-	-	45.0	45.0
Robotics & Automation Future Skilling Partnership	-	-	-	45.0
SUBTOTAL without contingency	-	45.0	90.0	135.0
Contingency	-	30%	30%	30%
TOTAL with contingency	-	58.5	117.0	175.5

DIGITAL HUBS				
	OPEX (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	-	34.5	34.5	34.5
Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote	-	-	48.0	48.0
Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth	-	-	-	60.0
SUBTOTAL without contingency	-	34.5	82.5	142.5
Contingency	-	10.4	24.8	42.8
TOTAL with contingency	-	44.9	107.3	185.3

CONNECTIVITY				
	OPEX (\$m)			
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Extend 100 Gigabit to entire CBD extents of Bendigo City	-	0.5	0.5	0.5
Regional Fibre Backhaul Network Extensions	-	3.5	3.5	3.5
Accelerate 5G rollout for Key Centres	-	-	1.8	1.8
Whole of Region 3G to 4G Uplift	-	-	-	6.4
Fixed Wireless & Satellite upgrade to FttP	-	-	-	3.0
SUBTOTAL without contingency	-	4.0	5.8	15.2
Contingency	-	30%	30%	30%
TOTAL with contingency	-	5.2	7.5	19.8

4.1.1.6 Total costs

A summary of the total capital and operating costs (including contingency) are presented in the Table below.

Total capital and operating costs of each option (incl. contingency) (\$m)

SKILLING				
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Capital costs	-	3.9	9.4	14.0
Operating costs	-	58.5	117.0	175.5
TOTAL costs before cost recovery / revenues	-	62.4	126.4	189.5
TOTAL recoverable costs / revenues	-	11.3	22.6	33.9
TOTAL costs after cost recovery / revenues	-	51.1	103.8	155.6

DIGITAL HUBS				
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Capital costs	-	23.4	54.6	93.6
Operating costs	-	44.9	107.3	185.3
TOTAL costs before cost recovery / revenues	-	68.3	157.6	278.9
TOTAL recoverable costs / revenues	-	18.0	60.9	135.0
TOTAL costs after cost recovery / revenues	-	50.3	96.7	143.9
TOTAL with contingency	-	44.9	107.3	185.3

CONNECTIVITY				
	Base Case	Option 1	Option 2	Option 3
NOMINAL				
Capital costs	-	31.1	45.0	102.7
Operating costs	-	5.2	7.5	19.8
TOTAL costs before cost recovery / revenues	-	36.3	52.5	122.5
TOTAL recoverable costs / revenues	-	31.3	43.6	89.6
TOTAL costs after cost recovery / revenues	-	5.0	8.9	32.9

4.2 Whole of Life Cost Benefit Analysis

4.2.1 Approach to cost benefit analysis

The approach to determining and analysing benefits is the following:

- to identify a base case (no new technologies in place);
- identify the alternate case with the technologies in place (aligned to the Program Options); and finally
- identify beneficiaries and assess benefits using benchmarks of similar digital initiative implementations publicly available information and data provided by agencies.

4.2.2 Summary of quantitative and qualitative benefits

To quantify benefits for a strategic program business case for the types of digital initiatives envisaged, the following enablers were required to be in place:

- Sufficient data on the base case, measured before any 'smart' technology is in place, and have information how the base case has been trending over time
- An understanding of how the digital initiative may impact the base case measure
- Evidence from a sufficient number of comparable projects to act as benchmarks for the impacts of the digital initiatives.

Where there is insufficient data available or robust enough methodology to justify quantifying a benefit, a qualitative description based on evidence, studies, and literature review is provided.

The table below indicates the benefits being quantified and those discussed qualitatively. The benefits have been aligned to three groups of beneficiaries: customer, government and broader place/economy.

Place / Economy	Customer	Government	Producer
Social Inclusion	Reduced Travel Time	Lower re-trenching and repair costs	Reduced Barriers to Entry
Environmental Benefits (Reduced CO2 emissions)	Ease of access to teleworking	Reduced Road Depreciation	Efficient Construction processes and Material Consumption
Transport Management	Ease of access to online education	Reduced street lighting operational expenses of local government	
Increased economic development	Ease of access to online health	Underground Space Planning	
Improved employment opportunities	Convenience to online shopping & transactions		
Improved research and development	Increased online entertainment		

4.3 Benefit evidence and assumptions

The table below summarises how each benefit was quantified.

Within the table, each quantitative benefit has:

- A list of the associated initiatives that deliver the benefit,
- A description of how the benefit is derived from the initiatives, and
- The parameters for how each benefit is measured

4.3.1 Quantitative Benefits



Benefit	Option 1 \$(m)	Option 2 \$(m)	Option 3 \$(m)
Economic Uplift	213.0 ¹	266.3	319.5
Employment Increase	511.4 ^{2,3}	547.9	584.6

SKILLING			
Benefit	Option 1 \$(m)	Option 2 \$(m)	Option 3 \$(m)
Economic Uplift	80.0 ⁴	140.0	200.0
Employment Increase	111.2 ^{5,6}	116.8	122.3

DIGITAL HUBS			
Benefit	Option 1 \$(m)	Option 2 \$(m)	Option 3 \$(m)
Economic Uplift	132.1 ⁷	165.2	198.2
Employment Increase	111.2 ^{8,9}	116.8	122.3

CONNECTIVITY			
Benefit	Option 1 \$(m)	Option 2 \$(m)	Option 3 \$(m)
Economic Uplift	135.9 ¹⁰	237.9 ¹¹	345.0
Consumer Surplus	Included above	Included above	Included above

1. Extrapolated from <https://www.telstra.com.au/business-enterprise/news-research/research/embracing-the-digital-economy>
2. Extrapolated from <https://www.acs.org.au/insightsandpublications/reports-publications/technology-impacts-on-the-australian-workforce.html>
3. <https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8462.12384>
4. Extrapolated from <https://www.mckinsey.com/featured-insights/asia-pacific/digital-australia-seizing-opportunity-from-the-fourth-industrial-revolution>
5. Extrapolated from <https://www2.deloitte.com/au/en/pages/economics/articles/productivity-is-not-an-accident.html>
6. <https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8462.12384>
7. Extrapolated from <https://www2.deloitte.com/au/en/pages/economics/articles/productivity-is-not-an-accident.html>
8. Extrapolated from <https://www2.deloitte.com/au/en/pages/economics/articles/productivity-is-not-an-accident.html>
9. <https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8462.12384>
10. Extrapolated from 10 Gig Adelaide - Analysis from the South Australian Centre for Economic Studies
11. Extrapolated from <https://www.pwc.com/gx/en/industries/technology/publications/economic-impact-5g.html>

4.3.2 Qualitative Benefits

Qualitative measure	Initiative	How is the benefit derived
Increased economic development	All	<p>Increased economic growth is underpinned by increased investment and employment opportunities created through digital ecosystem, as well as from increased tourism (due to better internet connectivity and technology solutions like smart apps and VR).</p> <p>Mobile-based services can contribute to productivity and economic growth. 4G, 5G and IoT has the potential to improve productivity through cost savings across all parts of the economy. In one study, it was found that national rollout of 5G could result in additional per capita GDP from anywhere between \$1,900 and \$8,400.¹</p> <p>Investment attraction will be increased through expansion of local businesses and new businesses creation underpinned by improved internet connectivity, open data, new tech solutions, smart transport and start up ecosystem.</p> <p>Better internet connectivity can lead to a growth of ICT in the form of cloud computing and creation of new software.</p>
Improved employment opportunities	All	<p>Smart technologies can play a role in making job market more efficient, supporting local business growth, and developing digital skills that make people more employable. First, digital technologies can boost job creation in knowledge-centric and data-driven industries. Second, online digital skills programs will enhance people's career opportunities. Third, Innovation hubs located close to employees' homes can stimulate business growth and provide increased job opportunities</p> <p>For example, the increased use of machine-to-machine technologies (which enable networked devices to exchange information and perform actions without human guidance) and ecommerce can lead to more efficient use of capital and labour.</p>
Improved research and development	All	<p>Improved connectivity leading to open access to data is a prerequisite to progress for both research and development of new products and services.</p> <p>Further, internet connectivity and VR can remove the physical location constraint for experimental practices and facilitate the sharing of resources between larger numbers of students and researchers.</p>

1. Bureau of Communications and Arts Research, Department of Communications and the Arts, Australian Government, Impacts of 5G on productivity and economic growth, Working paper (April 2018)

4.4 Cost benefit analysis

The NPV results of the CBA are shown in the table below.

SKILLING

Cost Category	Option 1 (Critical)	Option 2 (Competitive)	Option 3 (Optimal)
Total costs (\$m 2022 PV, 30 years, with contingency)	62.4	126.4	189.5
Total benefits (\$m 2022 PV, 30 years)	443.7	550.8	657.6
Net Present Value (\$m 2022 PV)	109.6	43.5	16.5
Benefit Cost Ratio	7.1	4.4	3.5

DIGITAL HUBS

Cost Category	Option 1 (Critical)	Option 2 (Competitive)	Option 3 (Optimal)
Total costs (\$m 2022 PV, 30 years, with contingency)	68.3	161.9	278.9
Total benefits (\$m 2022 PV, 30 years)	502.8	614.3	756.9
Net Present Value (\$m 2022 PV)	118.3	-5.4	-110.4
Benefit Cost Ratio	7.4	3.8	32.7

CONNECTIVITY

Cost Category	Option 1 (Critical)	Option 2 (Competitive)	Option 3 (Optimal)
Total costs (\$m 2022 PV, 30 years, with contingency)	36.3	52.5	122.5
Total benefits (\$m 2022 PV, 30 years)	408.7	552.9	736.0
Net Present Value (\$m 2022 PV)	100.4	129.5	105.0
Benefit Cost Ratio	11.3	10.5	6.0

5 Immediate Funding Requirements

Project	FY2022 CAPEX Funding sought	Potential Funding Partner	Subsequent OPEX Funding required	Potential Funding Partner	Notes
SKILLING					
Internet of Things Future Skilling Partnership	3.9m	Victoria State Government / Commonwealth Government	9.8m	Universities & Industry	5 Year OPEX commitment required initially
Artificial Intelligence Future Skilling Partnership	5.5m		9.8m		
Robotics & Automation Future Skilling Partnership	4.6m		9.8m		
DIGITAL HUBS					
Innovation / Startup / Scaleup Hub & Spoke Facilities (Bendigo, Echuca & Maryborough)	23.4m	Victoria State Government / Commonwealth Government	7.8m	Councils	5 Year OPEX commitment required initially
Innovation / Startup / Scaleup Spokes at Castlemaine, Gisborne, Kyneton & Heathcote	31.2m		8.0m	Councils	
Innovation / Startup / Scaleup Spokes at Wedderburn, Rochester, Woodend and Rushworth	39.0m		8.0m	Councils	
CONNECTIVITY					
Extend 100 Gigabit to entire CBD extents of Bendigo City	3.6m	Connect Victoria (Gigabit State)	0.7m	Council & Telco Provider	
Regional Fibre Backhaul Network Extensions	27.5m	Connect Victoria (Gigabit State)	4.6m	Telco Provider	
Accelerate 5G rollout for Key Centres	13.9m	Connect Victoria (Mobile Coverage)	2.4m	Council & Telco Provider	
Whole of Region 3G to 4G Uplift	50.0m	Connect Victoria (Mobile Coverage)	8.3m	Telco Provider	
Fixed Wireless & Satellite upgrade to FttP	7.7m	Connect Victoria (Gigabit State)	3.9m	Telco Provider	

6 Risk Assessment

6.1 Risk Assessment

The Program risk assessment for each option is in the table below.

The risks are divided into Program and Technology level risks.

● Low/no risk
 ● Some/moderate risk
 ● High/extreme risk



Risk Category	Risk Description	Option 1	Option 2	Option 3
Overall Risk Rating		●	●	●
PROGRAM LEVEL RISKS				
Financial risks	Actual costs exceed the expected costs for the capital costs	●	●	●
	Overhead and operational costs for the asset owner exceed expectations	●	●	●
	Inability to secure funding / or sufficient funding to deliver and sustain the Program	●	●	●
	Cost recovery is not achieved delaying parts of the program	●	●	●
	Program is not delivered on time	●	●	●
	Delivery agencies and councils do not have the resource capacity or expertise to implement the program	●	●	●
	Stakeholders and other government agencies, do not prioritise projects, delaying parts of the program	●	●	●
	Sub-optimal Delivery Strategy that is not aligned with market and does not enable the market to deliver	●	●	●
	Low market interest or capacity to participate	●	●	●
	Loss of program knowledge	●	●	●
Number of parties involved in the Program (councils, government agencies, private sector, vendors, etc.) may cause implementation barriers	●	●	●	

Risk Category	Risk Description	Option 1	Option 2	Option 3
PROGRAM LEVEL RISKS (CONTINUED)				
Stakeholder / Governance risks	Change in policy direction or strategic priorities of Government	●	●	●
	Government and stakeholder do not coordinate (Program rolls out in not coordinated manner)	●	●	●
	100G BLCR scope and objectives are not aligned with government policy	●	●	●
	Imbalance between public and private interest leads to over-intervention and possible community backlash	●	●	●
	Lack of governance and accountability in overcoming Program issues/ achieving outcomes	●	●	●
Environmental Risks	Disruption to existing spaces and loss of amenities, heritage, landscape due to technology installation	●	●	●
	Increase in waste and energy	●	●	●
Legal / Compliance risks	New governance arrangements to partner with councils in the Program may require regulatory change	●	●	●
	Compliance with local and federal regulation may place restriction on technologies and undermine Program roll-out	●	●	●
	Planning and regulation framework is not aligned with 100G BLCR objectives and does not enable technology roll-out	●	●	●
TECHNOLOGY LEVEL RISKS				
Technology risks	Integrity and interoperability of products and services across technology supply chain	●	●	●
	Financial capacity of smaller vendors may cause operational problems and business continuity issues	●	●	●
	Resilience of network (capacity of critical infrastructure, e.g. electricity and telecom backbone may disrupt the Program technology usage)	●	●	●
	Technologies does not support the Program to achieve intended results	●	●	●
	Technology is made obsolete by other innovations	●	●	●
	Technologies are under-utilised	●	●	●
Cyber security risks	Cyber security incidents during Program delivery	●	●	●
Stakeholder / Governance risks	Misalignment with community expectations and community resistance to certain technologies	●	●	●
Environmental risks	Potential threats to health and biodiversity from technology installation	●	●	●
Reputation risks	Failure to comply with regulation relating to privacy and technology may lead to legal actions	●	●	●

6.2 Risk Mitigations

Mitigation strategies were developed for the preferred option and the post-mitigation risk level was reassessed. The post-mitigation risk rating is medium.

Key mitigations strategies include:

- Funding for dedicated resources and teams during the design, development and delivery stages
- Co-ordination amongst government agencies

- Early and on-going engagement with key stakeholders to articulate the economic, social and environment benefits of the Program
- Funding for change management, cyber security prevention and response, and training programs for local councils and agencies

The table below outlines management measures for each of the high and extreme risks. The table also shows the rating for each of the risks following implementation of the management measures.

Risk Description	Pre mitigation rating	Mitigation	Post mitigation rating
Overall Risk Rating	●		●
PROGRAM LEVEL RISKS			
Actual costs exceed the expected costs for the capital costs	●	M1 Program Management Office and project governance set-up to monitor budget performance M2 Budget an appropriate contingency allowance	●
Inability to secure funding / or sufficient funding to deliver and sustain the Program	●	M1 Early and ongoing engagement with the relevant stakeholders to articulate the need and benefits of the Program M2 Prioritisation of scope and defer less priority investments	●
Program is not delivered on time	●	M1 PMO with risk and program management function to be established M2 Early co-ordination with interfacing projects	●
Delivery agencies and councils do not have the resource capacity or expertise to implement the program	●	M1 Training in applications, data use and platforms included in project management costs	●
Change in policy direction or strategic priorities of Government	●	M1 Early and ongoing engagement with the relevant policy stakeholders to articulate the need and benefits of the Program	●
Compliance with local and federal regulation may place restriction on technologies and undermine Program roll-out	●	M1 Engagement with Program Governance Group provides avenue to address regulatory issues as they arise	●
Resilience of network (capacity of critical infrastructure, e.g. electricity and telecom backbone may disrupt the Program technology usage)	●	M1 Develop critical infrastructure assessment plan to prevent possible network disruption	●

7 Evidence of Connectivity “Lived Experience” for regional Business and Residents

The Program collaborated with the following Shires to gather lived experience data of Connectivity for businesses and residents via Surveys submitted through the Shires local engagement officers:

- Macedon Ranges (Residential and Business)
- Central Goldfields (Business for Maryborough)
- Loddon (Residential and Business)
- Mount Alexander (Business for Castlemaine).

The data provided to this Program is business survey data from 2020 as part of the Shire’s enhanced business broadband submission for the Federal Government Regional Connectivity Program (RCP).

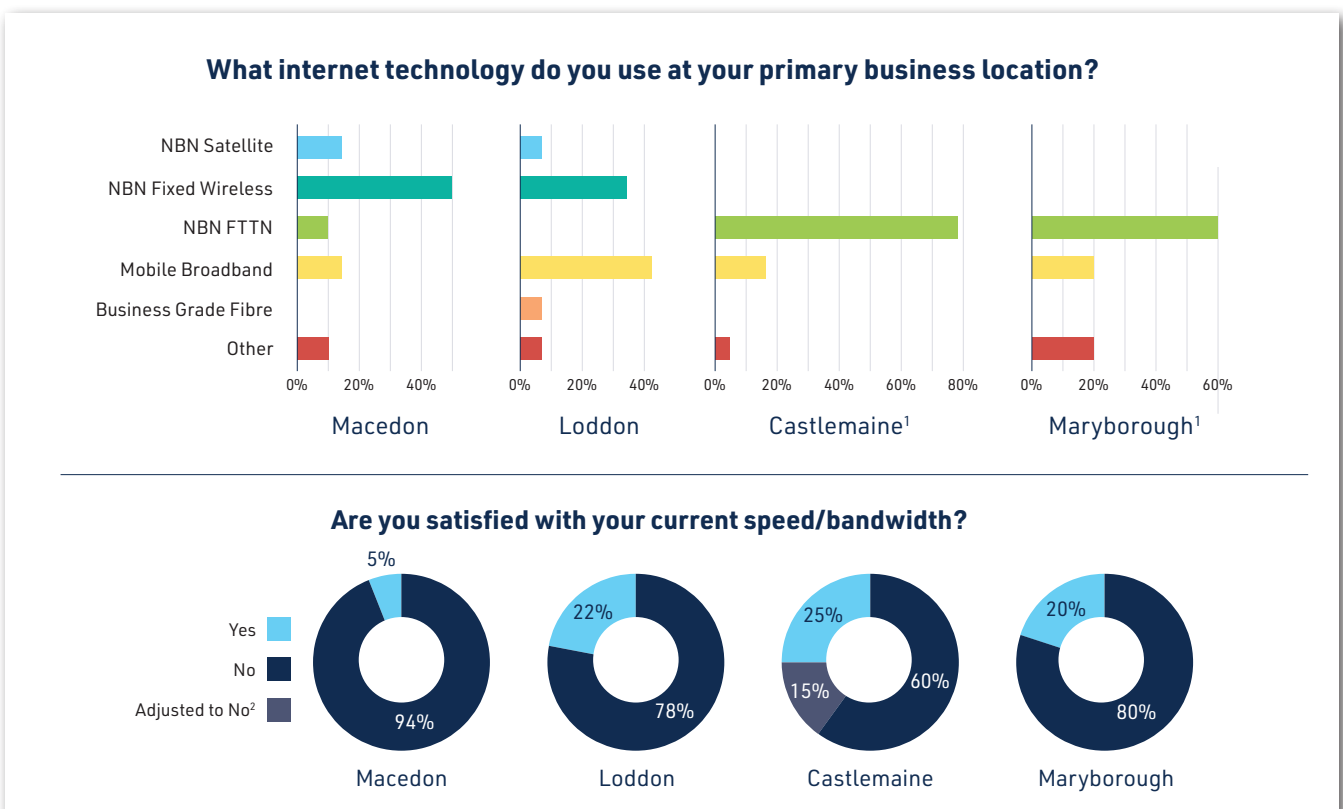
Data was not collected for Bendigo which is an NBN BFZ within its CBD area, and also not for Echuca which is both an NBN BFZ as well as a FTTP location.

7.1 Business Responses

Business surveys were sponsored by LGA Economic Development leads and approved at CEO level. Surveys were typically run for a short period in each Shire, ranging from two weeks to one month in order to capture a minimum samples size of 10% of businesses (as counted by having registered with Workcover).

Number of respondents:

- **Macedon Shire:** 22 responses. 80% gave business address for location mapping, 100% agreed to follow up and provided contact details.
- **Loddon Shire:** 21 responses. 100% gave business address for location mapping, 94% agreed to follow and provided contact details.
- **Castlemaine:** 43 responses. 100% gave business name for location mapping, 63% agreed to follow and provided contact details.
- **Maryborough:** 28 responses. 100% gave business name for location mapping, 96% agreed to follow up and provided contact details.
- Following are the key questions and responses.



1. Note that in the Shire wide surveys for Macedon Ranges and Loddon, there is very little fibre access for businesses relative to main towns such as Maryborough and Castlemaine which are predominantly FTTN access.
 2. The adjusted Castlemaine data is per the fact that in that Survey, respondents who answered Yes to satisfaction with available speed still requested higher speeds in a later question in order to meet business requirements.

Please describe any applications, business initiatives or investments that have been deferred because of a lack of connectivity?

Macedon Ranges Shire responses

- Our entire business runs on building and supporting applications in the cloud. When the internet stops so does work
- Have not been able to diversify and use zoom during lockdown. Paying for satellite and Telstra 4g (Telstra only works for phone due to congestion). Rainy or foggy day it is terrible.
- A slow internet connect reduces efficiency for my business. It makes all my operations slower and more time consuming, and of course I either have to build in the slow speeds to my prices making my less competitive, or I need to work longer hours to make up the lost time. Due to Covid I considered offering a 1-on-1 online (video conferencing) consulting 'product' for my clients, helping maximise their investment in their website, but until we can reasonably expect stable internet speeds I can't offer this service.
- When our internet connection drops out intermittently during the day, we are unable to access our customer database to proceed with customer orders. This results in loss of business and requires staff to work longer hours to catch up
- I cannot offer Telehealth for my medical clinic, patients cannot pay or transfer between accounts telephones, weborders, epos machine
- We only have access to Mobile Data to run a resort. So capped data limits. Unacceptable. Speed is average but better than most NBN speeds which are terrible. It affects guests returning more than anything else as many leave unhappy with the data service.
- My business is 100% reliant on the internet. I run two businesses a digital marketing agency and a consulting firm. This month alone I have lost over 20 hours due to poor internet connection or no internet. My meetings are all done via ZOOM and quite often I will have to call on mobile instead. Often the mobile network is dreadful at the same time. It's a disgrace. I also run a lot of digital webinars and I have to travel to Moonee Ponds to run them reliably. This has affected my income.
- We run satellite and ADSL to try and get a decent service for customers, they expect good wifi these days. The Satellite NBN is expensive and runs out of data by day 15 usually. That leaves the Telstra ADSL which is also expensive and so slow streaming is impossible which leads to frustrated customers. The NBN cable is 600metres from us down Corks Road, we would be open to sharing the cost to bring the cable up past all the houses if that was an option.
- Cost and data availability. Online programs for business now normal business are slow (ie MYOB) research PD constant and web page maintenance issues. Held off due to expanding online due to issues, data vs cost
- NBN two-way satellite is expensive, slow and sometimes unreliable, although generally pretty good. Unfortunately the 4 self contained cottages are not connected and this has impacted our business and our visitor experience to the point that reviews mention this. Visitors to our cellar door cannot connect on 3G or 4G here in Gisborne South.
- Internet is often extremely patchy and service is unreliable during rainy weather or times of high usage. On average once or twice per week we have to use a wifi hotspot off an Optus mobile because the Telstra service is abysmal. This impacts the ability of the business to run because of an inability to send or receive emails, participate in online meetings and phone calls are also impacted because of terrible reception and calls dropping out. Every time Telstra has an "upgrade", our service deteriorates

How would you measure the business benefit as a result of acquiring your required broadband access?

Macedon Ranges Shire responses

- We present and train internationally over virtual conferencing and it is extremely embarrassing as a remote working focused business to not have a failover option.
- Improved sales and less customer inconvenience
- Being able to reliably support and communicate with our customers at any time.
- Would save \$100s a month and as a small business it is critical. Being able to partially operate during lockdown would keep me earning income.
- Difficult to project a \$ value amount, but adding a new consulting service would make an appreciable difference to our income.
- More appointments and quicker payments (revenue)
- I am sure we would get more tourists into the area. How many more is unknown
- It would increase my businesses productivity by at least 25% and our revenue by potentially double that.
- We are currently so far behind the city it's not even close. People just have an expectation when they come to our region - the speed test I just completed does not even get to 20% of your lowest future requirement estimate above - yes that's less than one fifth. It's just terrible.

- Will be able to provide an online presence and compete. Looking to expand into NDIS and need to be able to be contactable and reliable via internet
- Better customer experience so they can Check In using the QR code, safety, satisfaction with staying in the cottages (guests cannot access ANY mobile reception), ability to run certain computer and media program.
- In terms of internet downtime and hours wasted on the phone to service providers. Acquiring the required access would minimise loss of billable hours and reduce frustration and stress levels (improve mental health)
- Opportunity to conduct online meetings, debriefs and facilitation.
- Increased productivity and reliability.
- Lifechanging. I have not been able to make calls today to my customers because the coverage is too poor here and they can't hear me. One customer said I sounded like a robot
- Enormous. I could put in proposals for virtual training work with confidence to deliver. External office space is difficult to find in the ranges and I have been using RACV club in the CBD out of lockdown which is not sustainable.
- Greatly improved productivity
- As expected to operate without interruption
- Speed in which we respond to clients. Especially when uploading brochures etc.
- Zero

Loddon Shire responses

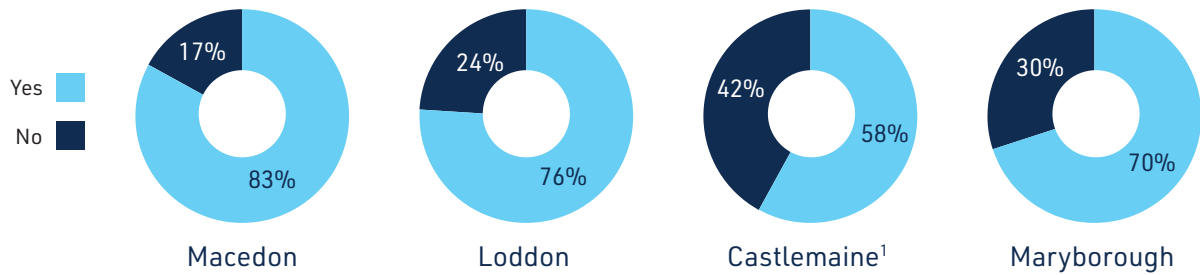
- The increase of our high function business operations with no down-time and peak efficiency. Being the choice for customers/guest in particular workers and companies who stayed in the park for work purposes but also for leisure, having all being able to access streaming services, including work conferencing and public WI FI internet services.
- Increase data collection capabilities to better manage farm operations
- Reliable service more productive employees
- Professional transactions and no impediment to sales.
- Being able to make better and faster business decisions and delivering better customer services
- Being able to access when needed and the time saved with quicker download.
- Increased Productivity
- More effective communications with people and not have to ring people back as you have missed phone calls
- Ability to access the information we require on any given time or day.
- No idea
- Its a fuel station, internet failure no card payments. 705 out of business without card payments.
- Checking guests in and out would be quicker Guest satisfaction in the rooms, means they are more likely to return bookings Running my accounts would be quicker and less frustrating
- Community members come to use the space including online courses. Opportunities for community members to study and the house running courses is needed.
- Faster access to information.
- Growth in membership
- Castlemaine responses
- Not sure what this question is asking
- Not sure - it would be marginal for us in terms of measurable benefit.
- Growth
- Essential
- Increase sales, efficiency, customer service and ability to increase online presence
- The question is not clear.
- It would improve business 100%
- Less time wasted waiting for interactions with our cloud based software including between our office locations
- increased productivity through less time spent uploading/downloading.
- Critical
- Students and staff would be free to set up and use all programs without disruption bringing confidence back into the digital arena.
- reliable productivity
- The basic measure of a fast, reliable service is being able to conduct the business. Online classes, teleconferences etc simply cannot be undertaken without sufficient bandwidth. The wider economic benefit of fast broadband can be assessed using measures such as productivity gains etc. However, fast broadband also has innovation benefits that cannot be easily measured, as they are unforeseen and occur in the future. So, an argument to put forward in a grant application is not only to fund a fast, reliable network to achieve known benefits, but also to fund evaluation of network benefits from an innovation perspective. Funding in this direction would provide a significant information resource for MAS and Bendigo Telco. The benefit of fast broadband can be measured with conventional measures such as productivity
- Increased efficiency, reduced frustrations
- More peace of mind
- Not happy that phone lines are connected via NBN as if it fails, we loose all our comunication with our customers.
- Essential
- Audience reach = profile and investment = employing more people in our region

- Less stress
- Already increased sales due to being able to product improved graphics for business and work social pages more
- Good
- Productivity improvement. Less stress, better mental health. Ability to take on more clients.
- A must have
- quick reliable broadband would enable more online services that we do not offer simply because of what is currently available to our business
- Timeliness of auto0file syncing across offices, faster response times when many staff using multiple NBN services concurrently.
- Considerable. As explained above, we would increase our efficiency, costs and data reliability significantly if we could fully digitalise our manufacturing process operations and records.
- I can deliver the minimum standard of business with a reliable service.
- Ability for businesses to be successful and not be hindered by internet availability.
- We would be able to employ more staff in regional Victoria and have a more cohesive office environment.
- Quality of service to clients through webinars and VOIP, more efficient internal communication with more use of face time (zoom/hangouts).
- Mandatory for operation
- Greater security of service
- Efficiency would increase as many of our employees are deployed in simple data recording, duplication and reporting functions. There would be an upskilling of capability and attractiveness of skilled employees in the Castlemaine and Bendigo region. Our cost competitiveness would improve to put us on a par with our interstate metro area based competitors which should assist in growth opportunities domestically and internationally.
- N/A
- Very high
- Ability for staff to complete tasks and not be interrupted in thought process by worrying about connectivity issues
- Maintain and improve efficiency of transfers - we do a lot both within Australia and internationally
- Broadband is required to connect remote sites, staff working from home, and cloud based finance systems.

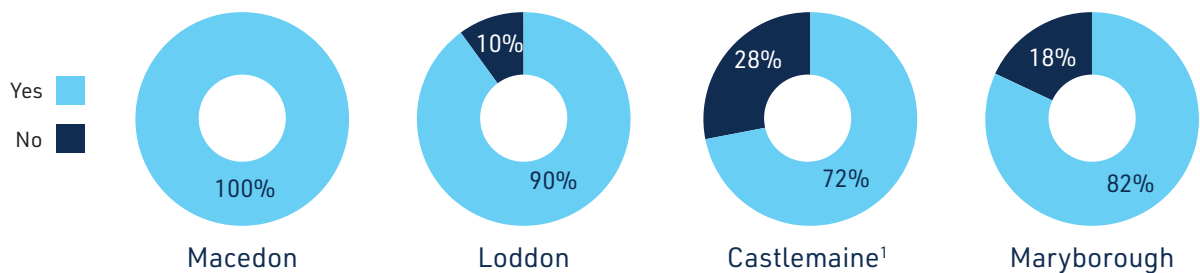
Maryborough responses

- Quick access to information when required.
- Productivity increase by not having to spend hours per week checking services, trouble shooting problems, talking with providers, explaining to customers/business partners/suppliers etc. The list is endless
- Good
- Massive benefit and unworkable if not working
- improved efficiency
- Better access to cloud applications is more and more relevant and without good internet access that will be impossible and a disadvantage.
- Better
- Faster uploading of critical print data files required for printing
- Better remote learning for our students. Video meets and classrooms use a lot of bandwidth
- Improved productivity, decreased frustration
- Time saved client inconvenience reduced Kids being able to learn effectively without drop outs and delays Clients being able to contact us consistently and us being able to talk to them properly without moving around trying to find a good spot etc
- Enhanced productivity Enhanced connectivity with customers
- Through the down time in areas which the system is full reliant
- Increases performance increased profitability with allows us to grow and hire more people in regional Victoria
- Ok
- Work would not be inhibited by slow speeds and drop outs
- Time spent amending failures due to slow speed and outages
- Freedom
- Improved connectivity and speed would greatly enhance the online portion of our business.
- It would substantially reduce the time spent travelling between locations in order to optimise my broadband, enabling me to spend more time on marketing.
- Seamless and hassle free connectivity that did not require any additional time, resources or cost
- At present we are near totally out of any business so what ever is done will have no effect on our business.
- Video training films and zoom meetings. Search speed along with accessing cloud based business software is important
- Immeasurable
- Less time online

Would acquiring the broadband access requested above remove an unfair advantage that your city-based competitors have?



Beyond the specific business benefit, would you estimate a community, economic or social benefit as a result? Jobs, future growth, additional business opportunity etc.



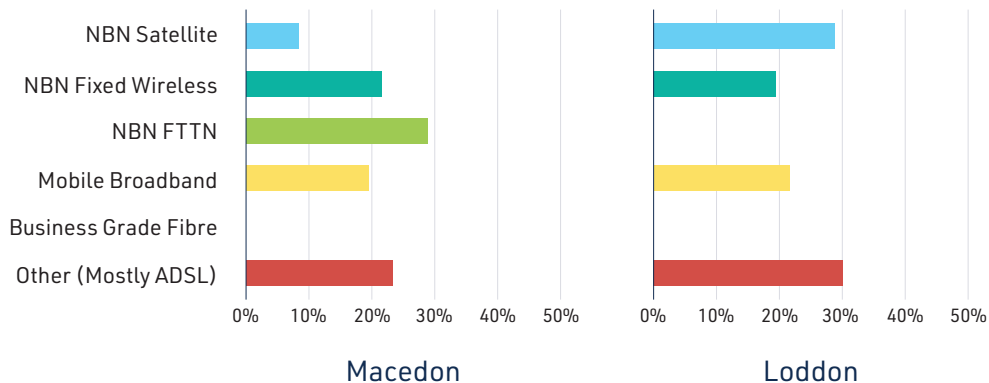
7.2 Residential Responses

Surveys for two of the Shires included lived experience questions for residences (as well as businesses) across both Internet access as well as Mobile access. These Shires can be characterized as having a distributed populations across smaller townships... none the less characteristic of the digital divide with metro.

Number of respondents:

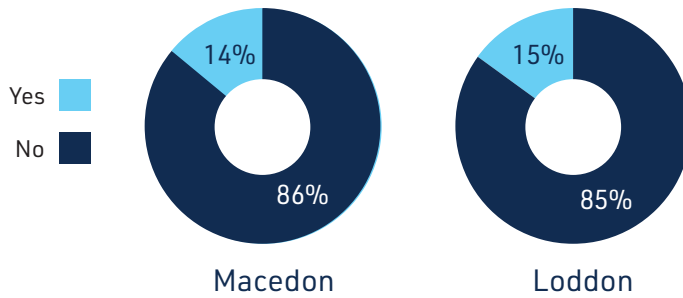
- **Macedon:** 58 responses, 87% gave address for location mapping and 87% agreed to follow up by email or phone.
- **Loddon:** 53 responses, 97% gave home address for location mapping and 93% agreed to follow up by email or phone.

What internet technology do you use at your residence?

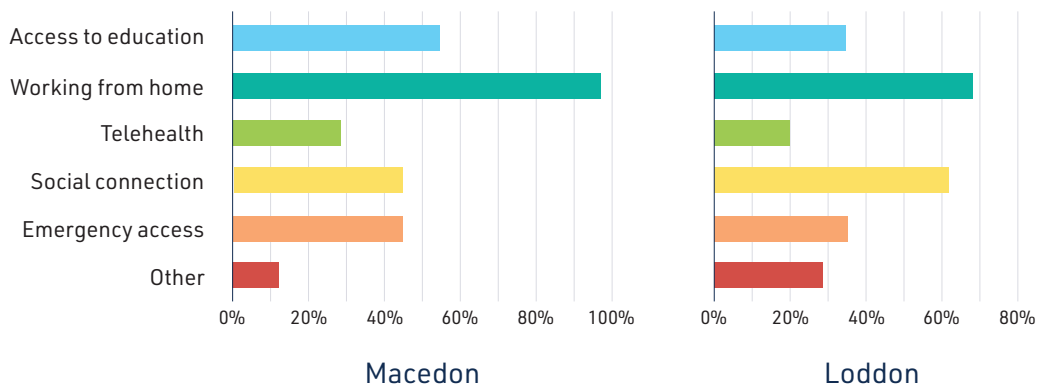


1. Note: Castlemaine's Survey had text based response rather than radio button.

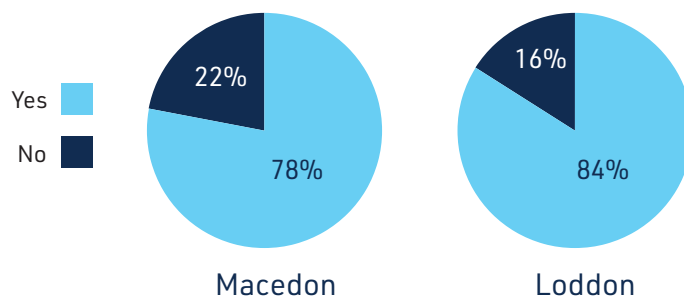
Are you satisfied with your current speed/bandwidth?



What is the impact of your personal access needs? Please select the benefits/ services you have been unable to access because of a lack of connectivity.



While this survey is focused on internet access, can you please indicate if you have any problems with mobile phone access?



Following are the text based responses for to elaborate on Yes answers:

Macedon Shire

- We have no coverage. I have purchased a booster, however it makes no/limited difference. Telstra land line does not work and have refused to fix the problem. Therefore, we are completely reliant upon satellite for any communication.
- Despite being with telstra and only being 100km from Melbourne we frequently have no phone coverage in our house. When commuting from home to Melb CBD about 50% of the journey has inadequate or no coverage - leading to lost productivity time for commuters (who all would love to use commuting hours as a part of their work day.) Phone blackspots are a major issue during emergency and natural disaster situations.
- Extremely poor only 2 bars and slow data speed if at all
- One bar, and sometimes reducing to SOS service only
- Woodend is typically only two bars reception with Telstra, difficult to understand given the site is in Urquhart Street West. This leads to slow data transfers and dropouts. Also has an impact on NBN use when using Telstra's 4G backup when the NBN fails.
- Very poor
- Patchy reception, very poor especially in the context of the mobile tower proposal being rejected by council. Should have happened already if time hadn't been wasted having to go through VCAT and overturn the short sighted decision.
- Phone internet drop outs and immensely slow download speeds for even low data pages
- Poor coverage with Telstra
- Telstra switches from 3G to 4G on occasions and creates black spots in the network
- Can drop out in different rooms in the house.
- Poor mobile phone coverage, limited 4g access most days worse in evenings
- I have no or little access to mobile data despite being on the Telstra network. This seems extremely dangerous especially in bushfire season when our home internet is also unreliable.
- It's sporadic at best and infuriating at worst.
- Mobile phone will only work if I go out onto the main road through Tylden. I presume the wireless and phone are on the same tower, and we only have one that is close enough for the town to reach. During emergency the high traffic is going to cause it to collapse, not to mention if the fire takes down the tower.
- Mobile data in woodend is almost useless at peak times (daylight hrs usually).
- Unreliable
- 1 bar signal and diminishing
- Rarely get 4G coverage, and only with a Telstra based provider. Forget about trying the Optus network, might as well use two cans and a piece of string
- Patchy signal in most town center buildings
- Constantly have no mobile service either and in town not remote
- 4g coverage is poor, even on Telstra
- What mobile access!!! That was a statement!!!
- Patch phone coverage in poor weather even though not far from town
- No service
- Regularly drops out.
- I have no mobile reception at my place which makes online transactions such as myGov, banking or school / childcare calls very inconvenient
- Mobile access is the issue that we face daily.
- Patchy coverage at best. Can't reliably hold a phone call that is not boosted by telstra router backup - which makes finding an alternative provider difficult. Even calling emergency services isn't any different - a call to 000 to seek an ambulance for a family member having a heart attack dropped twice - I couldn't even tell them which address to go to without it dropping out.
- It so SO bad in this area. I keep advocating for improvement to the politicians with absolutely no result
- Mobile coverage is inadequate at my house which makes the internet more important
- Ocassionally
- No signal or you lose connection. Poor reception/ connectivity. Frequent missed calls and dropping out of calls.
- All the time. Calls dropping / not connecting - Optus
- Very poor phone coverage - internet is fine- phone calls drop out all the time, reception is poor, unable to utilise cheaper providers as they have no coverage at all so restricted to larger more expensive telco's still with poor coverage
- Patchy and limited 4G availability outside the house. We installed an expensive Telstra supplied antenna and booster which doesn't work reliably.
- The service is terrible and not reliable. Especially those smart phones that rely on data/mobile internet. Making a phone call I have to be outside my house. Not great when its a cold winter or raining. Calls drop out, service is usually only 1 or 2 bars at best.
- I can't use my mobile phone at the moment. People cannot hear me. I live 1.5km from High St Woodend. Again, embarrassing.
- Unreliable reception with Telstra, Optus and

- Vodafone
- As above
- I have to use wifi calling as optus network drops out.
- Connectivity issues even with additional antenna installed on house

- Mostly with blackspots in more remote areas
- Next to no data and calls dropping

Loddon Shire

- Mobile phone calls are always fraught with dropping out. It's terrible
- Have to go outside to get connection
- low coverage
- On the edge of coverage map
- Mobile coverage is absolutely pathetic in more rural areas of the Loddon shire. If I have an emergency and can't call anyone, it's not my fault.
- Have to make calls outside. Sometimes drops out. I can't hear people or they can't hear me. Sometimes says emergency calls only. Notably worse on weekends and on holidays when tourists are in town.
- No reception
- Have to make calls from outside often 100m from our house. Told we could get an external antennae at our own cost \$1000.!
- 3G is not strong enough for where I live. It cuts out and is very slow.
- No service in house without expensive Celfi and antenna
- Poor mobile reception on 4g network both inside and outside our premises
- Even by going out side the house some days doesn't help getting service
- Mobile phone service is our biggest problem. Usually one bar , won't work most of time. Cant send a text.,receive emails etc.
- Constantly cuts out.
- I rarely every receive calls or can make calls in my house. I'll have to go outside and even then it cuts in and out. As a paid fire Fighter, I am on call most weekends during summer and after hours. So it is crucial to have good phone service, however this is not the case in Bridgewater and it's very frustrating for myself and my boss who rings me and cannot get through to me due to lack of phone service
- Bridgewater does not have a mobile phone tower
- There is very bad mobile phone connectivity in Bridgewater. There is next to no mobile internet coverage if you can't access home nbn.
- No phone service in the house. Phone service outside the house is not much better
- Calls dropping out. In a 20minute call dropped out 13 times. Our internet is mobile router with extremely slow loading
- Cellular access at Newbridge is very poor. The nearest BTS to my farm at Newbridge is at Tarnagulla which is 8.7 kms distant as the crow flies, but this is far too distant for a high quality service. I strongly recommend that the Loddon Shire pushes for a BTS (cellular basestation) at Newbridge township.
- Can't use it indoors and have many close by black spots
- Our mobile service at our property is non-existent. We we rely on wifi calling for our mobiles. If we lose power we lose wifi and therefore no mobile service. This is very dangerous with two asthmatics in the house or on catastrophic fire days.
- We are Telstra, which is Southern Loddon, Northern Loddon are Optus . Optus Vodafone users can't get any access from our place. My elderly (92) mother often stays with us. She spent 6 months during Covid Lockdown. Her phone is Optus and she couldn't use it to contact her friends and our city families. She has a medic alert necklace which wasn't working even though it is suppose to have GPS. It meant one of us had to be home with her incase she fell and couldn't raise an alarm. To keep in contact with family and friends she would use our landline. Our mobile phones don't always ring, messages about a missed call will come through messenger. This doesn't happen when I am at my son's baby sitting each Friday. When we have Loddon Shire Managers in Newbridge they can't google from their phones for information relevant to meeting. Visitor to Newbridge and surrounds can't get reception if they are not Telstra patrons. Our Rec Reserve campers also struggle to get reception which can be a worry if there were unsavory people about. Police during the horror fire season in 2019 had to move campers on because their resources were limited and means of contacting people diminished because of mobile reception..
- Poor to no service in Bridgewater, newbridge, Laanecoorie and eddington Victoria
- We get no service
- Telstra service has worsened.
- I recently upgraded to a 5G and there are many black spots

- Very poor reception
- Limited service
- Poor reception
- Lack of reception. A very expensive booster is required, unless you want to stand on the house roof hold a 10 foot long aerial.
- poor reception as in a dead spot, same for commercial free to air TV, had to get Foxtel
- Limited service
- Noticed a distinct reduction in the service strength both locally and when travelling around varying communities. The penetration strength of the signal is terrible in many of our communities, effectively reducing access to mobile technology if inside a building to text only - not able to make a phone call or use data successfully
- Frequent drop outs, poor phone call reception
- as q.13. Telstra phone service is terrible don't get 4g 90% of the time its only H+ symbol
- Yes no service with telstra affects customers using banking to purchase
- Failure to have 4g available at times
- Very spotty access, no connectivity during power outages which feels very unsafe
- Yes mobile phone service is extremely bad in our area
- There's 1 bar that drops in and out.
- Disgraceful and dangerous as if emergency we find it hard to connect
- Low service, mostly only 1 or 2 bars with Optus
- Drop out and dead zones
- No service for Optus in Bridgewater On Loddon or very little service

Glossary

Backhaul	Backhaul typically refers to the mid to long-distance transport of data from a series of disparate locations back to a more centralised location. The backhaul portion of the network comprises the intermediate links between the core, or backbone, of the network and the small sub-networks at the 'edge' of the entire hierarchical network. In the context of the NBN, backhaul services are the data carriage services provided over highspeed, high-capacity fibre lines, which carry aggregated network traffic between a Point of Interconnect (PoI) and a centralised or 'core' part of the network, for example an Internet Service Provider's data centre.
Bandwidth	Refers to the capacity and rate of data transfer over a network, usually measured in kilobits, megabits or gigabits per second.
Blackspot	An under-served premises, or area, usually in remote or rural locations and sometimes on the edges of cities, which is unable to obtain adequate, metro-comparable broadband or other communications services. Reasons for blackspots are normally related to the limitations of technologies, geography or a lack of investment.
Broadband	Broadband is a term used to refer to 'always on' high speed Internet or other network access. In the past, broadband services and technologies were defined in terms of a capability to transfer information at higher rates than traditional dial-up services.
Cloud Computing	Cloud computing is an Internet-based technology which stores information in servers and provides that information as an on demand service. Under cloud computing consumers can access all of their documents and data from any device with internet access such as a home or work PC, a mobile phone or other mobile internet enabled device.
Dark Fibre	It is the equipment at either end that dictates what capacity can be delivered over an optical fibre—ranging upwards from about 100 Mbit/s (at the low end). The term 'dark fibre' simply refers to optical fibre that is available for use and is provided without any equipment at either end. The term was originally used when talking about the potential network capacity of telecommunication infrastructure, but now also refers to the increasingly common practice of leasing fibre optic cables from a network service provider.
Digital Divide	The gap between people with effective access to digital and information technology and services, and those with very limited or no access at all. It refers both to a person's physical access to technology and the resources and skills available to effectively use the technology. Often used in Australia to describe the different levels of communications service available between metropolitan and regional areas.
Fibre Optic	Also known as optical fibre, fibre-optic cable is made up of thin threads of glass that carry beams of light. In telecommunications, data is translated into pulses of laser light that can be transmitted along the fibre cables. Fibre-optic technology is less susceptible to 'noise' and 'interference' than other data-transfer mediums such as standard copper telephone lines and can be used more reliably over longer distances without loss of speed or quality. Fibre is used extensively in backbone and international submarine networks, and to connect the base stations of mobile and wireless networks. It is increasingly being used for the last mile connection to home and business premises in FTTX networks.
Fibre to the Curb (FttC)	Refers to networks in which fibre connections are provided to a kerb-side equipment cabinet, in which the fibre's optical signal is converted to an electrical signal and delivered to premises over copper wires—typically over a maximum distance of 100 metres or less.
Fibre to the Node (FttN)	Similar to FTTC but using a neighbourhood node that serves more premises rather than a kerb-side node. Copper distances are typically up to around 1 km.
Fibre to the Premise (FttP)	Similar to Fibre to the Home, but a more neutral term that includes non-residential premises, such as schools, hospitals, and workplaces, as well as households. Fibre connections are provided all the way to premises, including individual units in multi-dwelling buildings
Fixed Line	Fixed line refers to technologies that use physical infrastructure, such as copper wires, rather than wireless infrastructure to deliver data connections. Traditional voice services, dial-up internet, xDSL, HFC cable and FTTP are all forms of fixed line services
Fixed Wireless Broadband	A family of wireless technologies that, as opposed to mobile wireless, delivers broadband services to a particular premises or fixed location. These services are sometimes called 'point-to-point' or 'point-to-multi-point' and require an antenna that is generally permanently attached to the user's building. Fixed wireless can be used for backhauling in certain cases but also as an access technology, particularly in rugged or remote terrain and areas with low population densities that may make a fixed line alternative impossible or uneconomic. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.

Gigabit per second (Gbit/s)	A measure of communications speed equal to 1 000 000 000 bits per second. Also expressed as Gbps and Gb/s.
Greenfield	A term used to describe a piece of undeveloped land, either currently used for agriculture or completely unused.
Internet	A worldwide, publicly accessible series of interconnected computer networks that transmit data using the standard Internet Protocol (IP). It is a 'network of networks' that consists of millions of smaller domestic, academic, business, and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked web pages and other resources of the World Wide Web (www).
Internet Service Provider (ISP)	Also known as a Retail Service Provider (RSP), an organisation that offers access to the Internet to its customers. ISPs generally also provide other services such as electronic mail accounts, data storage and web hosting to their customers. ISPs may employ a combination of their own and third party infrastructure, or simply resell services provided by a wholesale carrier.
Last mile infrastructure	Infrastructure used to provide the link from a customer's premises to the provider's nearest point of aggregation. For example, a provider offering a wireless broadband service to the customer would be providing last-mile infrastructure using wireless broadband technology. The "digital divide" is attributed to the lack of suitable "Last mile infrastructure" in lower population density areas.
Latency	The delay in data transmission caused by the time it takes for data to get from one designated point to another.
Megabits per second (Mbit/s)	A measure of communications speed equal to 1 000 000 bits per second. Also expressed as Mbps, mbps, Mb/s and mb/s.
Mobile Wireless and Mobile Broadband	Broadband services supported by mobile networks, such as '3G' and '4G' networks, offering mobility and flexibility for users of handheld and laptop devices. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
Point of Interconnect (PoI)	The connection point that allows Retail Service Providers (RSPs) and Wholesale Service Providers (WSPs) to connect to NBN Co network infrastructure.
Quality of Service (QoS)	The use of a range of networking technologies and techniques to provide guarantees on the ability of a network to deliver predictable results. Network performance within the scope of QoS can include availability, bandwidth, latency and error rate.
Satellite Broadband	Satellite broadband uses a radio dish to bounce a signal off a satellite and down to an earth station. It is common in rural and remote areas with low population densities, where fixed line alternatives are uneconomic. One-way satellite connections utilise a satellite link to download data to the broadband user and a standard telephone connection for uploading data back to the Internet. Two-way satellite connections use the satellite link to both upload and download information. The suitability of satellite broadband for some applications is impacted by the large physical distances between satellites and the earth's surface, which results in latency (delay) in the sending and receipt of data. Quality may also be affected by the number of simultaneous users and adverse weather conditions.
Smart Infrastructure	The application of communications technologies to infrastructure to make better, more efficient use of resources. Smart infrastructure can be used within the transport, energy, communications and water sectors.
Wholesale Service Provider (WSP)	A provider of infrastructure and services that deals only with other providers and does not have a commercial relationship with end-users or consumers. In telecommunications, a wholesale service provider allows other companies to lease access to equipment and services and avoid the expense of building their own infrastructure.
Wireless Broadband	Wireless broadband uses radio frequencies to transmit and receive data between customers and a local transmission point. Normally, this requires a number of base stations, similar to mobile phone towers, which transmit to customers who have a small transmitter/receiver connected to their computers or other digital devices. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
Wireless Spectrum	Often referred to as the Radio-Frequency Spectrum, this is the array of electromagnetic radio frequencies used for communications, including mobile broadband, television, AM and FM radio, defence and any other service employing a wireless technology. The spectrum is divided into many frequency ranges, or bands, and usually allocated for a specific technology, device, use or service. Wireless Spectrum is a finite and regulated public asset, and in Australia is administered by the Australian Communications and Media Authority (ACMA), often through a licensing regime.

