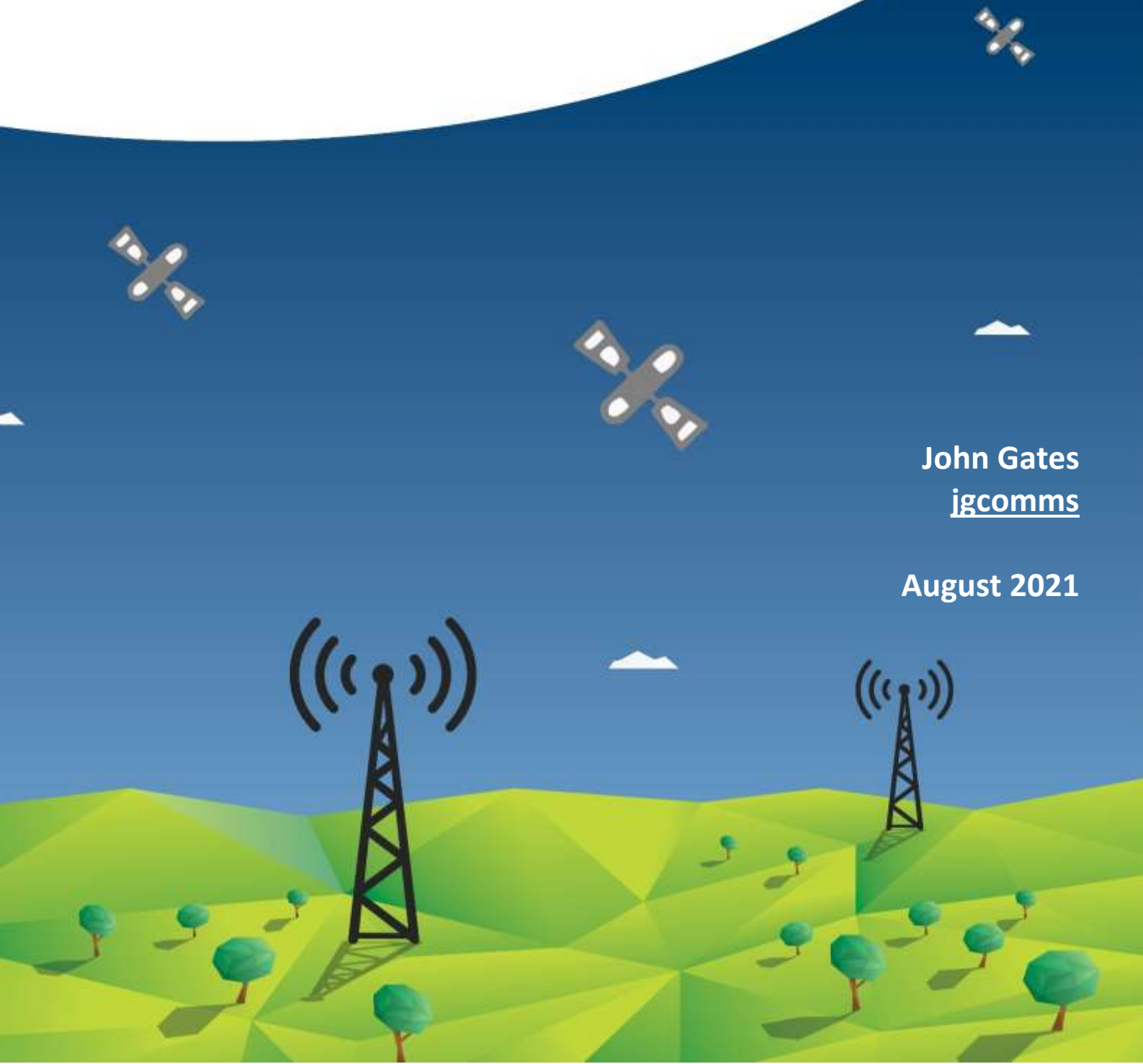
An Australian Government Initiative

Regional Development Australia
GREAT SOUTHERN WA

Great Southern Communications Capacity Audit



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Foreword

Regional Development Australia (RDA) is a Federal Government program that has established 52 RDA committees throughout regional Australia to partner between the Australian, state, territory and local governments to develop and strengthen the regional communities of Australia. It plays a pivotal role in ensuring the long-term sustainability of Australia's regions.

RDA Great Southern is one of nine RDA Committees in Western Australia and is governed by a board of members with diverse regional commercial, community and local government expertise.

The RDA charter, updated in October 2020, states that the role of RDA Committees is to:

- Facilitate regional economic development outcomes, investment, local procurement, and jobs
- Promote greater regional awareness of and engagement with Australian Government policies, grant programs and research
- Improve Commonwealth regional policymaking by providing intelligence and evidence-based advice to the Australian Government on regional development issues
- Co-ordinate the development of a strategic regional plan, or work with suitable existing regional plans that will align with the Commonwealth's regional priorities.

The RDA Great Southern Committee's desire to undertake this Communications Capacity Audit (CCA) is informed by the RDA Charter. The Committee has identified, in general terms, that communications technology sits at the heart of business and social life in contemporary times and, moreover, that the need to understand this position and to acknowledge its primacy has been highlighted by the COVID-19 pandemic which has fundamentally changed our attitudes towards physical movement and online communication. The committee also noted that a number of local governments have expressed dissatisfaction in the digital networks in their LGAs and have moved to conduct surveys and advocate for better performance in the digital ecosystem in their region.

This CCA was commissioned to provide a foundation and direction for further work in this area. Specifically, it identifies how a lack of connectivity contributes to limitations on regional business growth and general cultural and social wellbeing.

The CCA gives clear insight into the 'digital divide' which refers to the gap between demographics and regions that have access to modern information and communications technology, and those that don't or have restricted access. The digital divide is known to separate metropolitan and many regional communities and can, in general terms:

- stifle regional economic and social development
- provide inequitable access to services
- diminish the ability to modernise business practices and to compete effectively in the digitised economy
- contribute to declining regional populations
- Impact our regional standard of living, and in some emergency circumstances affect people's health and safety.

RDA Great Southern hope that the data presented is of value to regional stakeholders and will support their understanding of the current environment and their planning for the future.

Andrus Budrikis
CHAIR

Table of Contents

EXECUTIVE SUMMARY **6**

BACKGROUND AND CONTEXT **7**

A Brief Introduction to Contemporary Telecommunications 7
The Right to Access and Use Telecommunications Technologies 8
The COVID-19 catalyst 9

CONTEMPORARY LEGISLATIVE ENVIRONMENT **10**

Statutory Infrastructure Provider 10
Regional Broadband Scheme 10
Reforms to carrier separation arrangements 11

AUSTRALIAN TELECOMMUNICATIONS ENVIRONMENT **11**

The National Broadband Network 11
Fixed Line *12*
Fixed Wireless *12*
Sky Muster *13*
Mobile telephone and data networks 14

AUSTRALIAN GOVERNMENT SUPPORT PROGRAMS FOR REGIONAL AREAS **16**

Stronger Regional Digital Connectivity Package 16
Mobile Blackspot program expansion *16*
Regional Connectivity Program *17*
Regional Tech Hub *17*
Improved Connectivity in the WA Grainbelt Commonwealth Feasibility Study 17
Strengthening Telecommunications Against Natural Disasters 18
Improving the resilience of regional and remote mobile phone base stations *18*
Portable communications facilities to allow quicker service restoration *19*
Program to deliver improved communications *19*
Enhanced telecommunications for rural fire authorities and evacuation centres *19*
NBN Regional Co-Investment Fund 19

WESTERN AUSTRALIAN GOVERNMENT SUPPORT PROGRAMS **20**

eConnected Grainbelt Project 20
Agricultural Telecommunications Infrastructure Improvement Fund. 20
Digital Farm Grants program 20
The Digital Infrastructure Atlas 20
WA Internet of Things DecisionAg Grant Program 20
Co-funding support for the Regional Connectivity Program 21
Grainbelt Digital Enhancement Program 21
Regional Telecommunications Project 21

RESEARCH IN THE WHEATBELT **22**

GREAT SOUTHERN BACKGROUND **23**

TELECOMMUNICATIONS IN THE GREAT SOUTHERN **25**

National Broadband Network 25
Fibre availability *25*
Albany Business Fibre Zone *25*
NBN Fixed Wireless and Sky Muster Satellite *26*
Mobile Telephony and Data Networks 27
5G Spectrum auction *28*

RESPONSES TO AUSTRALIAN GOVERNMENT INITIATIVES **28**

Mobile Black Spot Program 28
Strengthening Telecommunications Against Natural Disasters 28
Regional Connectivity Program 29

RESPONSES TO STATE GOVERNMENT INITIATIVES 30

WA Digital Infrastructure Atlas 30
Digital Farm Grants 31
IoT DecisionAg Grant program 31

A SATELLITE FUTURE? 32

CONCLUSION 34

REFERENCES 35

APPENDICES 37

Appendix 1 -Case Studies 37
Oranje Tractor Farm 37
Great Southern Universities Centre 37
Appendix 2 – Telecommunications towers by LGA 40
Appendix 3 – MBSP reported blackspot locations 44
Appendix 4 – MBSP program funding blackspot by round 48
Appendix 5 – Tower resilience upgrades (STAND) 49
Appendix 6 – 4 Shire mobile telephony summary 49

List of Figures

Figure 1 - Last Ride of the Pony Express GM Ottinger (1873). Image: artnet.com 7
Figure 2 - How the internet works. Image: NBN 11
Figure 3 - Fixed wireless connection. Image: NBN 13
Figure 4 - NBN Satellite connection. Image: NBN 13
Figure 5 - Mobile network. Image: emf.com 14
Figure 6 - Generations of mobile technology. Image: ACMA 15
Figure 7 - Grainbelt mobile coverage. Image: Australian Government 18
Figure 8 - The Great Southern. Image: GSDC 24
Figure 9 - NBN available technologies by LGA 25
Figure 10 - Albany Business Fibre Zone. Image: NBN 26
Figure 11 - Road Muster vehicle. Image: NBN 29
Figure 12 - Fly Away satellite kit. Image: NBN 29
Figure 13 – Regional Connectivity Great Southern Projects 30
Figure 14 - Infrastructure Atlas Extract. Image: DPIRD 31
Figure 15 - Pivotel/SCF Environment. Image: SCF 32
Figure 16 - GSUC early speed test result. Image: GSUC 37

Executive Summary

This report has been compiled to provide a basic understanding of the current telecommunications environment in the Great Southern and to consider some of the challenges and opportunities that may arise based on that understanding.

The report has briefly looked at a range of factors that impact on the region's capacity to deliver a level of telecommunications connectivity that bridges the 'digital divide' and at least matches the quality of service that we understand is available in metropolitan centres.

The difficulty in addressing both the current situation and proposing possible areas of endeavour for the future is that the telecommunications environment, despite identified weaknesses in the regional environment, is constantly changing. This is no better demonstrated than by the almost immediate increase in business and social use of the internet in response to the COVID-19 pandemic and the associated restrictions on physical movement.

The pandemic has acted as a catalyst in increased telecommunications usage and provided a glimpse into the future for many people. So, whilst investment by service providers continues, whilst governments continue to provide support and investment through funding opportunities, and while technology improves the consumer demand for connectivity, for speed, and for data is constantly increasing.

Within the scope of the project, some of the key findings delivered in the report are:

- *Coverage Maps provided by major service providers do not reflect the 'lived experiences' of users in the region.*
- *Reports of unsatisfactory coverage may come from areas close to population centres and are not restricted to isolated and remote areas*
- *Lack of connectivity and costs restrict the use of IoT applications in agricultural enterprises*
- *IoT devices collect a lot of data that is essentially unused but puts pressure on communication networks*
- *Satellite technology is the default service for much of the Great Southern and current satellite technology has a limited life.*

All the above findings require further exploration, so the key recommendations of this report are:

1. *To perform a whole-of-region survey to expand on the basic work done by four regional LGAs and broaden the survey beyond mobile telephony to include connectivity in general*
2. *That in the initial stages, this communications intelligence could be gathered and managed at WALGA Great Southern Zone level*
3. *To investigate the value of 'excess' IoT data to agricultural enterprise as a whole and, if useful, to develop a collection and application regime to enable cooperative uses for that data*
4. *To recognise the future possibilities of, and monitor developments in, satellite technology that could positively impact the regional telecommunications environment.*

Background and Context

A Brief Introduction to Contemporary Telecommunications

In a contemporary society characterised by constant and ever accelerating change one of the most significant changes has been the ever-increasing use of telecommunications to convey messages.

The original telecommunications technology was the telegraph. The prototype telegraph, demonstrated by Samuel Morse in 1834, was a simple system that sent simple messages – initially in Morse code – using a conducting wire.

The main characteristic that the telegraph shares with all following telecommunications advances is 'time-space compression' (Harvey, 1989) which alters the relationship between time and space by not requiring a message to be physically carried through the environment.

Perhaps the most dramatic example of time-space compression and its immediate effect on communications methodologies and business practice is provided in the United States.

By 1861 Western Union had connected small established telegraph networks on the eastern seaboard of the USA with a network in California to create a transcontinental telegraph. The first transcontinental message was sent from St Joseph, Missouri to San Francisco, California on 24 October 1861 and two days later the Pony Express, the legendary but youthful mail service that promised to cover the journey in ten days or less, was disbanded (https://www.loc.gov/item/today-in-history/october-24/).

Figure 1 - Last Ride of the Pony Express GM Ottinger (1873). Image: artnet.com

The invention and deployment of telegraph also had an immediate effect on the carriage of business intelligence and social news and Albany has played a significant role in Western Australian telecommunications history and business development. The first telegraph service between Albany and Perth was established in 1871 and:

> *This had great commercial advantages for Perth as news and information could be delivered much more quickly once ships had docked at Albany. The greater breakthrough was the construction of the overland telegraph from Albany to Adelaide which began in1875. Traill (2013).*

One hundred and fifty years later, the contemporary telecommunications environment is a complex mix of technology and devices including telephones, radio, television, computers, microwave communication arrangements, fibre optics, satellites and the Internet that allow a massive range of communications activities that impact on our capacity to do business, to share knowledge and information, to manage natural and man-made disasters, to access cultural products and artefacts, and to enjoy a range of mediated social activities.

In other words, robust and accessible telecommunications structures are essential for the prosecution of business and for the enjoyment of everyday life in contemporary societies. Further, reliable and equitable access to such technologies by businesses and households located in remote and regional locations is essential to allow such locations to prosper and thrive.

The Right to Access and Use Telecommunications Technologies

The rights of all Australians to access and use telecommunications technologies including fixed line and pay phones were assured under a Telecommunications Universal Service Obligation (TUSO) enshrined in the *Telecommunications (Consumer Protection and Service Standards) Act 1999*.

However, since the TUSO was established there have been significant changes in communications technology, in the marketplace, and in customer preferences. Telecommunications is no longer based on Standard Telephone Services (STS) operating voice-standard analogue telephony over copper wire. While STS, also affectionately known as Plain Old Telephone Services (POTS) are still available, many consumers now rely on mobile phones for voice services and have an ever-increasing appetite for digital data-based communications such as email and internet.

This telecommunications environment encouraged considerable private investment in mobile telephony and data services and consumers saw the price of these services fall alongside a corresponding improvement in quality as unlimited voice calling and messaging became commonplace and data allowances and speeds continued to increase.

The Australian Government also made considerable investment in the new telecommunications regime through its investment in the National Broadband Network (NBN) which aimed to make high speed broadband (understood as 25mbps download) available to any business or household upon request by 2020.

The 2015 Regional Telecommunications Review (RTR) responded to this environment by questioning the usefulness of the TUSO and recommending adopting a new Consumer Communication Standard for voice and data that would provide technology neutral standards of availability, accessibility, affordability, performance, and reliability (p.52).

In 2017 the Productivity Commission released the Telecommunications Universal Service Obligation Report. Included in the report's suggestions was that:

> *The Australian Government should reframe the objective for universal telecommunications services to provide baseline broadband and voice services to all premises in Australia, having regard to the accessibility and affordability of these services, once NBN infrastructure is fully rolled out.*

The report also suggested that 'to contain costs to the broader community, the *baseline* should be set to meet the basic needs of most Australians in the majority of circumstances' (p. 22).

In 2018 the Australian Government committed to a Universal Service Guarantee (USG) to ensure all Australians access to voice and broadband services.

Notably, universal access to mobile telephony was not assured by the USG. The Australian Government observed that 'mobile services are provided commercially and not included in the USG, but Australia's world class mobile services reach 99.4 percent of the population and cover around 31 percent of our landmass' and that:

> *Coverage is expanding under the Government's $220 million Mobile Black Spots Program, which has already delivered 631 base stations across the country and will address more than 5,000 of the 10,000 community nominated blackspots.' (USG Fact Sheet p.2)*

However, despite the existence of the USG and the wide access to mobile telephony, many parts of Australia's regional and remote areas have no, or poor, voice and data reception through any sort of fixed or mobile device. The 2019 Australian Infrastructure Audit states that:

- *There are opportunities to improve the telecommunications services for the digitally disadvantaged, and for rural and remote communities and businesses,* and

- *The specific needs of rural and remote users are often overlooked in upgrades to national telecommunications infrastructure (p. 558).*

The A Stronger Tomorrow (2020) infrastructure review conducted by Infrastructure Western Australia acknowledged these findings and identified key challenges in the telecommunications area, including:

- *Addressing inadequate (sometimes non-existent), unreliable, or unaffordable digital connectivity in some regional areas which seriously impacts development opportunities,* and

- *Mitigating the risk that inadequate broadband capacity, speeds and data storage facilities will hamper capitalisation of economic opportunities, especially if technology continues to outpace enabling infrastructure (June 2020, p.36)*.

The COVID-19 catalyst

The A Stronger Tomorrow consultative process also identified that the recent COVID-19 pandemic highlighted the need for improved digital connectivity in remote, rural and regional locations (June 2020, p. 36). The Consultation Outcomes Report (December 2020) concurred and identified that the importance of telecommunications was highlighted by the pandemic and the subsequent and rapid adoption of remote working practices (p.34).

The Western Australian Government response to COVID-19, like many other governments, was to restrict physical movement by way of lockdowns and establishing quarantine protocols for those who did travel. In WA this meant international, interstate, and interregional travel were all severely restricted and business and cultural activity that had been predicated on physical co-location was severely compromised.

The pandemic worked as a catalyst in the development of online services and 'at a distance' business practices by Government departments and private sector enterprise that reimaged the notion of 'the office' and how business was done. Online video conferencing and online retailing and service provision became commonplace. Video conferencing replaced physical business meetings and family

gatherings, the home office became commonplace, streaming entertainment services and social media activity boomed, online shopping became standard, and electronic financial transactions replaced cash.

The adoption of these practices placed additional pressure on information and telecommunications infrastructure, increased awareness of the possibilities and opportunities provided by communications technology, and increased expectations of a high-quality service. In regional and remote areas inadequate digital connectivity highlighted the 'digital divide' and raised awareness about inequitable telecommunications infrastructure.

Contemporary Legislative Environment

The *Telecommunications Act (1997)* simply describes telecommunications as 'the carriage of communications by means of guided and/or unguided electromagnetic energy' (Sect 7) and involves a range of technologies including telephones, television, radio, mobile devices and the internet.

The contemporary communications environment in Australia is enshrined in the *Telecommunications Legislation Amendment (Competition and Consumer) Bill 2019* and the *Telecommunications (Regional Broadband Scheme) Charge Bill 2019*, also known as the *Telecommunications Reform Package*.

The *Telecommunications Reform Package* requires that all Australians have access to broadband services from a statutory infrastructure provider and requires all larger fixed line broadband network operators serving metropolitan Australia to contribute to the cost of broadband in regional and remote Australia. NBN is designated as the default broadband provider.

The package had three main elements:

- The Statutory Infrastructure Provider regime
- The Regional Broadband Scheme
- Reforms to carrier separation arrangements.

Statutory Infrastructure Provider

The Statutory Infrastructure Provider (SIP) obligations ensure that all Australian premises are able to access 'superfast' broadband services with upload/download speeds of at least 25/5 megabits per second (Mbps) or better. NBN is required to connect premises and supply wholesale broadband services on reasonable request. NBN became the default SIP for all of Australia after the Australian Government declared the NBN network built and fully operational on 23 December 2020.

Regional Broadband Scheme

The Regional Broadband Scheme (RBS) commenced on 1 January 2021 and ensures transparent and sustainable funding for essential broadband services to regional, rural and remote Australians.

The RBS addresses the expense of providing broadband services to regional Australia and aims to enable regional Australians to fully participate in the digital age.

Under the RBS, carriers pay $7.10 per month for each premises on their network with an active high speed superfast broadband service (over 25mbps) provided over a local access line. This charge applies to all premises serviced by fixed line and hybrid fibre networks.

Reforms to carrier separation arrangements

Since 1 January 2021, new high speed broadband networks are required to be wholesale-only. The new rules allow network providers to run separate wholesale and retail businesses on a 'functionally separated' basis. This is designed to create new commercial opportunities for providers and encourage them to invest and compete to offer better services for consumers.

Australian Telecommunications Environment

On 23 December 2020 the Minister for Communications declared that the initial NBN build was officially complete (December 2020). The official declaration followed an informal acknowledgment by the NBN four months earlier that the build was complete and that they were spending a further $4.5 billion to 'provide access to higher wholesale speeds and greater capability on its network to millions of customers living and working across Australia' (September 2020).

The National Broadband Network

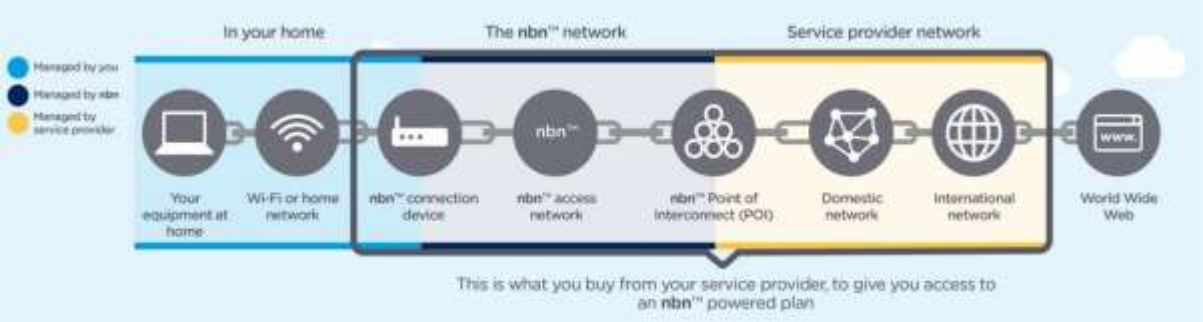

Figure 2 - How the internet works. Image: NBN

The NBN 2021 Corporate Plan explains its obligations ambitions beyond the basic statement that identifies its role as the SIP in that the NBN's $4.5 billion investment in network speed and capacity will be used to:

- Make the highest wholesale speed plans available to up to 75 per cent of premises in the fixed-line footprint by 2023
- Support the digitisation of small and medium businesses by making business-grade fibre services more accessible and affordable for more businesses
- Establish a dedicated fund to co-invest to improve broadband services for Australia's rural and regional communities (p. 6).

The final element of the investment identified above involves:

> *the creation of a $300 million fund to co-invest with state, local and federal governments to provide regional households, businesses and communities with enhanced broadband technologies and help meet the growing and diverse needs of Australians living in regional area. (p.8)*

NBN has also established the dedicated Regional Development and Engagement business unit (RDE) which, 'plays a critical role in bringing together all aspects of the fixed wireless and satellite teams, from engineering through to operations, to ensure regional customers remain front and centre' (p.37).

In terms of essential network provision, NBN provides wholesale fixed line, fixed wireless and Sky Muster satellite services which are sold directly through NBN or through Internet Service Providers (ISPs). The speed of any internet connection is affected by a range of factors including:

> *[T]he NBN access network technology and configuration over which services are delivered to your premises, whether you are using the internet during the busy period, and some factors outside of NBN's control (like your equipment quality, software, chosen broadband plan, signal reception or how your provider designs its network).*
> https://www.nbnco.com.au/learn/network-technology

Fixed Line

There are a range of fixed line connections currently available. A Fibre to the Premise (FTTP) connection connects a fibre optic line from the nearest available fibre node directly to a premise and offers the fastest internet connection.

Other types of fixed line connections are:

- Fibre to the Building (FTTB) - connects a fibre optic line to a fibre node in a building's communications room and then uses the existing technology in the building to connect to each apartment or office space.

- Fibre to the Node (FTTN) - connects a fibre optic line in a street cabinet or similar to the premises via the existing copper wire network. The cabinet may be located some distance away from the connected premises.

- Fibre to the Curb (FTTC) - connects a small fibre Distribution Point Unit (DPU), generally located in a pit on the street directly outside a premise, to the existing copper network in the premises.

- Hybrid Fibre Coaxial (HFC) - connects an available fibre node to an existing 'pay TV' or cable network in the premises.

Fixed wireless and Sky Muster satellite services are available in rural and remote areas.

Fixed Wireless

A fixed wireless connection uses data transmitted over radio signals to connect premises to the broadband access network. Data travels from a transmission tower located as far as 14 kilometres away to an outdoor antenna.

The internet connection comes from an ISP to a tower. The tower then sends the signal to an antenna located on a building. The antenna attaches to an indoor modem which connects to all devices in that building.

The veracity of a fixed wireless connection relies on a line of sight between an antenna and the transmission tower. Factors such as local vegetation, tree density, hills, and even buildings can affect your connectivity.

Figure 3 - Fixed wireless connection. Image: NBN

Sky Muster

NBN's two Sky Muster satellites are located in geostationary orbit over 35,000 kilometres above the Earth. The Sky Muster satellite service delivers broadband access network to homes and businesses in remote Australia where no fixed fibre or wireless services are available. Sky Muster requires an installed roof satellite dish and a modem installed at the point where the cable from the satellite dish enters the premises.

Figure 4 - NBN Satellite connection. Image: NBN

The NBN Sky Muster satellite service has been available to consumers since the first satellite was launched in April 2016. At the time of the launch, NBN claimed that the satellite was among the most advanced to have been deployed and launched a second satellite in October 2016.

The Sky Muster installation was not particularly successful and faced a barrage of criticism, including a call for an independent review by Stephen Jones MP, the Shadow Minister for Regional Communications in May 2017 because, '[T]here's a myriad of problems with Sky Muster, including installation issues, frequent outages and a frustrating lack of transparency between NBN Co and Retail Service Providers, not to mention the severe data restrictions.'

A range of Sky Muster service plans are available from a number of ISPs, but all services are restricted to two maximum speed tiers – 12/1mbps or 25/5mbps although, depending on plan, 'bursts' of speeds on the 25/5mbps tier over 25/5mbps may be experienced. The actual speed experienced is, like all networks, subject to a range of internal and external factors.

Latency is also a major factor that adversely affects all satellite service delivery, including Sky Muster. Latency is the delay you experience in seeing the results of your internet action. This includes delays in videos loading, delays in opening a web page properly, and delays in video chats. Latency in the Sky

Muster environment is considered to be a minimum of 500ms, compared to fixed fibre where a generally accepted figure is in the range of 10ms.

Mobile telephone and data networks

A mobile phone network is made up of a large number of signal areas called cells. These cells join or overlap each other to form a large coverage area. Users on the network can cross into different cells without losing connection.

Each cell is centred on a base station or mobile phone tower, which sends and receives the transmissions. A mobile device will connect to the nearest or least congested base station. The base stations are connected to a digital exchange where the communication is sent to other telephone or data networks.

Cells will often be smaller in size throughout large towns and cities due to the number of users in the area. The higher the population density the more base stations are needed. Communication over the mobile network can be voice, data, images, and text.

Transmission range is generally in the range of 14km with good line of sight. Signal strength can be amplified by using network coverage extension devices, or repeaters.

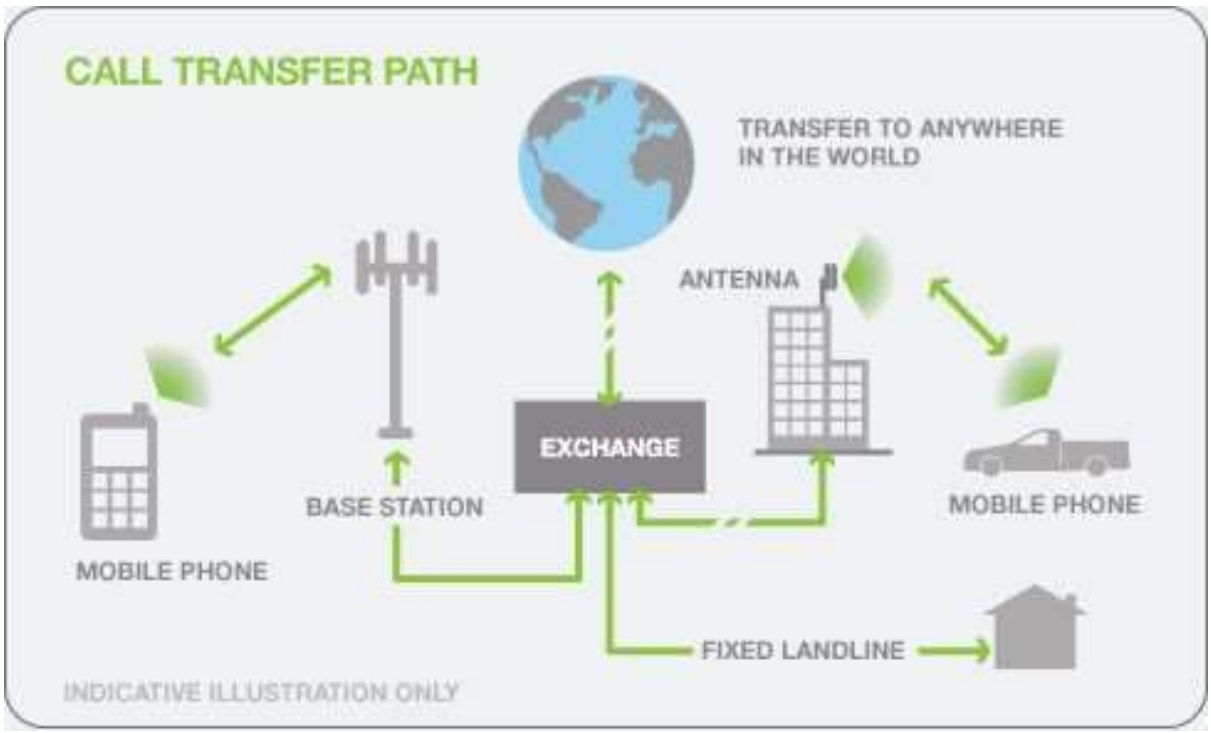

Figure 5 - Mobile network. Image: emf.com

There are three mobile network owner/operators (MNOs) in Australia: Telstra, Optus, and TPG Telecom (formerly Vodafone). All other mobile service providers lease services from one of these three networks. Aussie Broadband, for example, provides mobile services on the Optus network. Providers such as Aussie Broadband are known as Mobile Virtual Network Operators (MVNOs).

Mobile networks are generally characterised as having moved though five generations of development with changing technologies and capacities. The generations in current use include the remnants of 3G, which made data enabled touchscreen phones mainstream, and 4G which offers speeds 10 times faster than 3G and focusses on data rather than voice capacities.

5G provides a major evolution in mobile network technology and like its predecessor 4G, it is focussed on mobile data. 5G offers faster network speeds, lower latency, and more simultaneous connections. With a suggested minimum download speed of 100Mbps, latency as low as one millisecond, and the extended capacity for wireless network connections 5G is vital for new developments such as autonomous cars, extended Internet of Things (IoT) devices and connected machinery.

5G access requires a 5G-ready mobile phone or broadband modem which will become increasing available as 5G networks expand.

Impediments to the adoption of 5G technologies may come from some community concerns focussing on the health effects of radio-frequency (RF) technology and, towards the more unbalanced end of the spectrum.

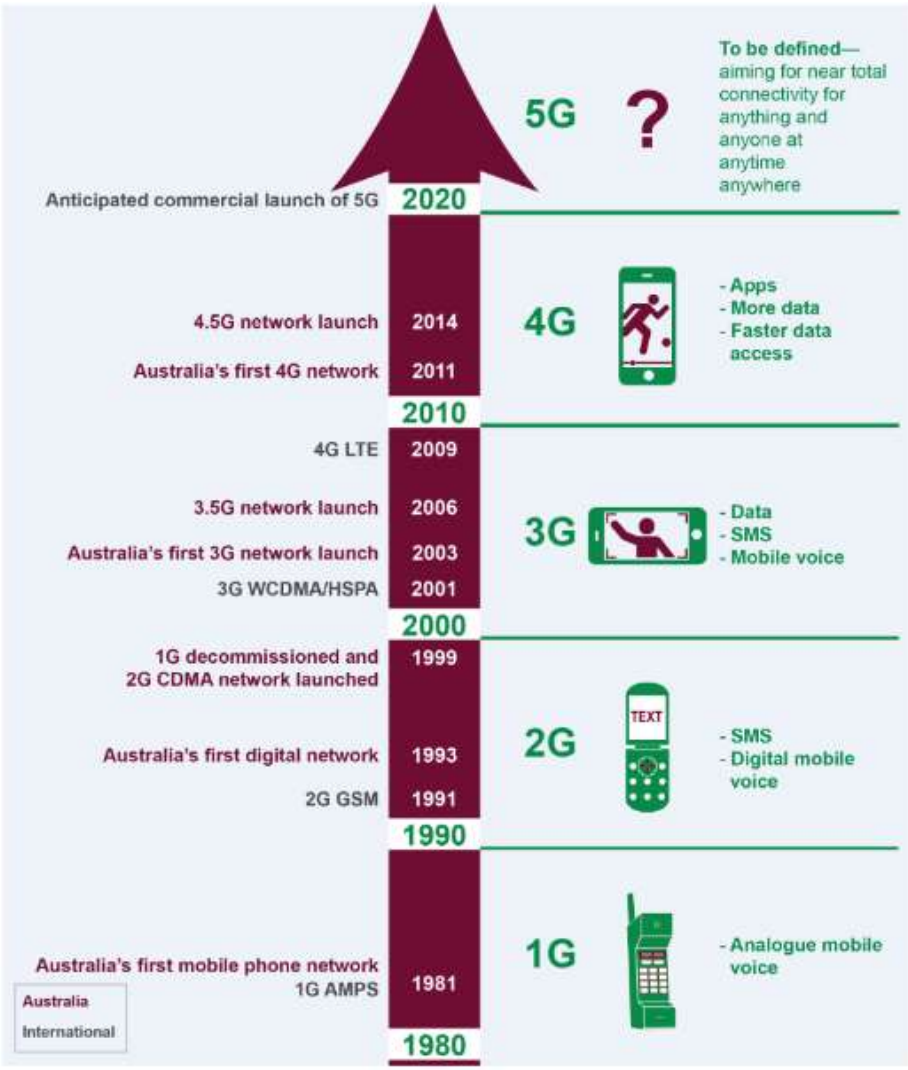

Figure 6 - Generations of mobile technology. Image: ACMA

Australian Government support programs for regional areas

In 2019 the Australian Infrastructure Audit identified that although Australia has among the fastest mobile network speeds in the world, rural and regional areas are at a distinct disadvantage because, although digital networks cover 99 percent of the population, they only cover 33 percent of the total landmass (p. 569).

A wide range of financial supports and grant opportunities have been developed to encourage the spread of telecommunications capacity in rural and regional areas of Australia. These mechanisms take the form of subsidies offered competitively on a co-contribution basis, usually to service providers.

Stronger Regional Digital Connectivity Package

In response to the 2018 Regional Telecommunications Review, the Federal Government announced the $220 million Stronger Regional Digital Connectivity Package (SRDCP) in March 2019.

The SRDCP was designed to improve broadband and mobile services in areas of high economic, social, and public safety significance, and consisted of:

- Mobile black spot expansion
- The Regional Connectivity Program
- The Regional Tech Hub

Mobile Blackspot program expansion

In 2015 the Commonwealth Government had committed $380 million to the Mobile Black Spot Program (MBSP) to invest in telecommunications infrastructure to improve mobile coverage and competition across Australia.

To develop the MBSP the then Department of Communications and the Arts sought nominations of regional locations with poor or no mobile coverage from members of the public, State, Territory and Local Governments and Members of Parliament. The database developed from these submissions was then used by applicants to design proposals for funding.

Base station developments were recommended for funding based on assessment criteria including:

- value for money
- expected coverage that each base station would deliver
- number of premises and the length of major transport routes being covered
- total cost of the base stations
- amount of Commonwealth funding being sought
- amount of funding the mobile network operator/mobile network infrastructure provider was proposing to co-contribute
- amount of co-contribution secured from a third party such as a state or local government.

The MBSP is supported by co-contributions from state and local governments, mobile network operators, businesses and local communities. The first five rounds of the MBSP delivered more than 1,200 new base stations across Australia.

In 2020 the SRDCP expanded the MBSP for a further two rounds and focuses on ‘regional public interest premises … that benefit the community, such as medical facilities, schools, and economic centres’ (Australian Government, July 2020).

Round 5A of the MBSP closed on 5 March 2021. The Round focuses on improving mobile connectivity along major transport corridors and in disaster-prone regions, such as bushfire-prone areas, as well as the testing of new technologies that support shared mobile coverage in regional areas. (Australian Government, November 2020). Funding allocations from Round 5A have not been announced at time of publication of this report.

Regional Connectivity Program

The $53 million Regional Connectivity Program (RCP) opened in July 2020 and closed in November 2020. The program was designed to 'provide targeted investment in local telecommunications infrastructure projects to maximise economic and social opportunities in regional, rural, and remote communities across the country.'

Examples of projects that could be funded under the RCP included:

> *upgrades to mobile infrastructure to improve community access to telehealth, remote education and retail internet and phone services, or the development of enterprise-grade broadband networks to support local agricultural, manufacturing and tourism businesses to engage more competitively online. (Australian Government, July 2020).*

In the 2020-21 Budget the Australian Government committed a further $30 million to the RCP over two financial years. This additional funding means there is now up to $83.0 million available under the program for projects to improve connectivity outside the NBN fixed-line footprint (Australian Government, October 2020).

Successful applicants were announced in April 2021.

Regional Tech Hub

The RCP has also funded a Regional Tech Hub, which is a simple platform aimed towards regional Australians to help them navigate digital technologies, building on the services and techniques developed by the volunteer organisation Better Internet for Rural, Regional and Remote Australia.

The National Farmers' Federation was selected to develop and operate the Regional Tech Hub, working in collaboration with the Australian Communications Consumer Action Network.

The Regional Tech Hub can be accessed at https://regionaltechhub.org.au/

Improved Connectivity in the WA Grainbelt Commonwealth Feasibility Study

As part of the 2019–20 Federal Budget, the Australian Government undertook a feasibility study into improving digital connectivity in the Western Australian Grainbelt (the Grainbelt). The feasibility study examined existing digital connectivity arrangements in the Grainbelt and helps identify the technical and commercial opportunities, including the challenges, related to improving connectivity in the region. The study was published in December 2020.

In the context of the study, the Grainbelt represents an area of 200,000 square kilometres and includes the entire Great Southern. The figure below identifies the combined claimed mobile coverage in the Grainbelt, which is outlined in green.

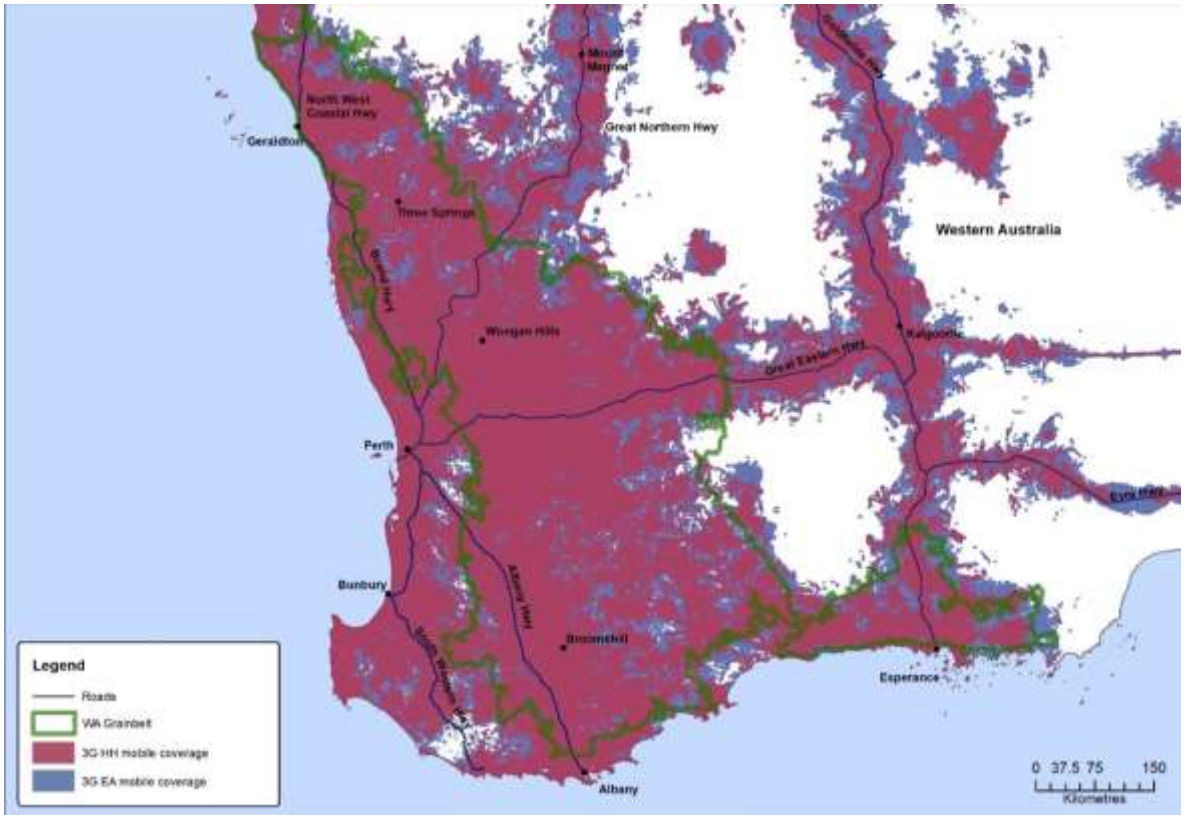

Figure 7 - Grainbelt mobile coverage. Image: Australian Government

Although the study, and the coverage map at Figure 7 above, indicated that there was already significant coverage in the area, it also noted, 'there are opportunities to improve the capacity and reliability of services for local communities and agricultural businesses in some areas' (p.3). The report concluded that:

> *Overall, we consider a wholesale approach to improving digital connectivity in the Grainbelt not to be feasible. Alternatively, there are opportunities for the Government to contribute to improved connectivity in the Grainbelt through a number of smaller scale projects in the area under existing government programs. (p. 23)*

Strengthening Telecommunications Against Natural Disasters

On 12 May 2020, the Government announced the $37.1 million Strengthening Telecommunications Against Natural Disasters (STAND) package. The STAND package is part of a $650 million bushfire recovery package, which is a component of the National Bushfire Recovery Fund.

STAND is comprised of four elements:

- Improving the resilience of regional and remote mobile phone base stations
- Portable communications facilities to allow quicker service restoration
- Program to deliver improved communications
- Enhanced telecommunications for rural fire authorities and evacuation centres.

Improving the resilience of regional and remote mobile phone base stations

STAND will provide $13.2 million to fund longer lasting backup power sources, such as batteries and diesel generators for base stations built under Rounds 1 and 2 of the Mobile Black Spot Program. These upgrades will increase backup operation to at least 12 hours.

The second stage will include a grants program to support a range of hardening measures at high priority locations to prevent telecommunications outages during disaster events. This includes:

- improving backup power and other infrastructure hardening measures, such as improved facility design at key telecommunications facilities such as mobile base station feed sites and exchanges
- providing backhaul transmission redundancy.

Portable communications facilities to allow quicker service restoration

$10 million was allocated to purchase portable communications facilities such as cells on wheels (COWs), mobile exchanges on wheels (MEOWs) and NBN Road Muster trucks, which can be positioned in bushfire affected areas to allow communications services to be restored quickly.

Funding is allocated under a competitive grants process, with the MNOs to own the portable facilities but give commitments to Government about their use during emergencies.

Program to deliver improved communications

$2.1 million was put towards a pilot program over the next two bushfire seasons to improve the information provided about access to telecommunications in emergencies.

Enhanced telecommunications for rural fire authorities and evacuation centres

$7 million will fund the deployment of approximately 2,000 NBN Co satellite services across the country, to rural and country fire services and designated evacuation centres, to provide additional redundancy when fixed line connections are experiencing outages.

NBN Regional Co-Investment Fund

NBN announced a $300 million Regional Co-investment Fund in its 2020 Corporate Plan (p.40). The fund aims to improve broadband services for Australia's rural and regional communities to help them realise the socio-economic benefits high speed broadband has the potential to unlock.

NBN invited submissions from federal, state, territory, and local government stakeholders, as well as several industry groups, on the design of the fund. These submissions closed on 29 April 2021.

According to the NBN Regional Co-investment Plan Consultation Paper:

> *The fund is intended to primarily target towns and localities in rural and remote areas outside greater capital cities that are served by NBN's Fixed Wireless or Satellite infrastructure, and seek co-investment from local, state or federal government to uplift digital capability in these towns or localities and to increase the number of premises that can access technologies that support higher speeds. For example, from Fixed Wireless or Satellite to Fixed Line; or Satellite to Fixed Wireless. (p. 6)*

Subsequently, guidelines for the fund were released and applications opened on 21 June 2021, with applications closing on 18 February 2022 and all upgrade works expected to be completed by 30 June 2024.

The guidelines are clear that all funded applications will need to deliver a commercial rate of return to NBN, and that all infrastructure assets remain the property of NBN. The guidelines are available at https://www.nbnco.com.au/content/dam/nbn/documents/about-nbn/reports/nbn-rcif-guidelines.pdf

Western Australian Government support programs

The Western Australian Government has also made a number of commitments to expand and support connectivity in regional and remote areas.

eConnected Grainbelt Project

Announced in 2015, the $10 million eConnected Grainbelt program aimed to 'connect information across the grains industry to enable growers to make more profitable decisions tailored to their farm business.' (GoWA, 2015). The Internet of Things DecisionAg Grants Project was developed under the auspices of this project (see below).

Agricultural Telecommunications Infrastructure Improvement Fund.

The Agricultural Telecommunications Infrastructure Improvement Fund was announced by the former Liberal National Government in January 2017. The $22 million fund was designed to:

> *invest in projects providing direct long-term benefits and impact on the agricultural industry. This could include improving mobile and internet coverage in innovative ways, improvements in knowledge management systems, or better utilisation of wireless technologies and computer-aided or controlled devices. (Govt of WA, January 2017)*

Digital Farm Grants program

The Digital Farm Grants program provides funding for last-mile solutions for agribusinesses in agricultural and pastoral regions that lie outside the current or planned NBN fixed wireless and fixed line footprint. The program aims to advance telecommunications and technology in WA's farming sector by:

- expanding mobile coverage
- providing fast, reliable, affordable and scalable broadband necessary to support digital farming practices
- enabling farming businesses to access smart farming and productivity enhancing technologies to improve productivity and output, making businesses internationally competitive.

The initial round of Digital Farm Grant funding was awarded in 2018. The third round was awarded in January 2021.

The Digital Infrastructure Atlas

The Digital Infrastructure Atlas was released in September 2018. The Atlas maps the location of key telecommunications infrastructure throughout the State. According to the then ICT Minister, the Honourable Dave Kelly the Atlas will:

> *help to open the door to initiatives that will improve digital connectivity in the regions, stimulating regional innovation and enhancing the business capacity and lifestyle of Western Australians. It will aid us in getting the best possible 'bang for our buck' by enabling identification of areas where need is greatest, or where existing infrastructure can be most effectively leveraged (September 2020).*

WA Internet of Things DecisionAg Grant Program

The Internet of Things (IOT) grants program complements work the eConnected Grainbelt Project undertook to establish digitally connected sites at DPIRD research facilities in Katanning and Merredin.

Fifteen projects shared over $500,000 in funding in 2019 to trial on-farm telecommunications network solutions, decision tools and analytic data platforms essentially assisting growers to make more informed, data-driven decisions.

A range of IoT apps and devices are used in projects that include water tank monitoring and security cameras.

Co-funding support for the Regional Connectivity Program

The State Government provided an allocation of up to $10 million in co-contributions to support Western Australian bids under the Regional Connectivity Program (RCP).

The State Government co-contribution funding was available to assist projects with WA-based digital infrastructure solutions.

Applications for State RCP funding support closed on 17 November 2020. Successful applicants to the RCP were announced in April 2021.

Grainbelt Digital Enhancement Program

The Grainbelt Digital Enhancement Program (GDEP) grew from the Agricultural Telecommunications Infrastructure Improvement Fund. GDEP aims to deliver high capacity backhaul wholesale broadband connectivity to improve access to digital technology to far-reaching, broad coverage areas throughout Western Australia's grainbelt.

GDEP sought initial Expressions of Interest by November 2018. One proponent has progressed to Stage 2 of the project and has been invited to respond to a Request for Proposals process, which includes developing a feasibility study, a commercial proposal, and securing indications of commercial support for the project.

Regional Telecommunications Project

The Regional Telecommunications Project (RTP) is an $85 million State Government initiative, that follows the completed Regional Mobile Communications Project. The RTP aims to improve high-speed mobile voice and data coverage across regional Western Australia in partnership with mobile network operators and the MBSP.
The RTP's focus is on small communities and strategic locations to:

- build capacity in regional communities, by establishing new avenues for economic and social development
- improve services in regional communities, through faster emergency response times, the development of connected, inclusive networks and access to services that rely on digital media, for example in health, education and training
- grow prosperity through new business activity and by enhancing the appeal of regional communities as places to live, work, invest, visit and learn (DPIRD 2021).

Research in the Wheatbelt

As a deep statistical analysis is beyond the scope of this project it is fortunate that Regional Development Australia Wheatbelt conducted a major survey to produce the 2013 Wheatbelt Digital Action Plan, which was revisited and revised in 2017. The complete and revised 2017 Wheatbelt Digital Action Plan is available at http://www.rdawheatbelt.com.au/initiatives/wheatbelt-digital-action-plan

Although 2017 might seem, in telecommunications terms, to be a long time ago the results and, in particular, the differences between the 2013 and 2017 observations, remain pertinent to the Wheatbelt and by extension to the majority of the Great Southern region.

In terms of business uses the revised report identified:

- *Increasing use of mobile phones*
- *Increasing access of business-related services*
- *Increasing usage of government services*
- *Mobile phone coverage was unsatisfactory despite the increase in phone towers*
- *Internet connectivity and speed remained problematic in many areas*
- *Costs and data allowances remain a constraint.*

In terms of social perspective, the revised report identified growing levels of usage in everyday life thorough all age groups and common uses included:

- *Paying accounts, banking, and accessing government services*
- *Using social media*
- *Sourcing news and doing research.*

The responses of these participants indicate that:

> Wheatbelt residents have progressed beyond the early adoption stage and are well into the maturation phase. Essentially the use of digital devices and digital connection has moved beyond being a technological novelty and has become a normal and expected means of conducting everyday activities. (p.4)

Great Southern Background

The Great Southern covers 39,007 square kilometres on the south coast of Western Australia, bordering 250km of the Southern Ocean and extending 200km inland. It comprises about 1.5 per cent of Western Australia's total land area.

There are 11 local government authorities in the Great Southern: The City of Albany and the Shires of Broomehill-Tambellup, Cranbrook, Denmark, Gnowangerup, Jerramungup, Kent, Katanning, Kojonup, Plantagenet, and Woodanilling.

The region has a total population of 60,000, 62 per cent of whom live in the City of Albany. Albany is the oldest European settlement in Western Australia. The city features a major port and provides a range of medical, educational, communications and commercial services. The City offers a range of heritage and nature-based tourism opportunities including the iconic National Anzac Centre and Discovery Bay.

The City is also home to the University of Western Australia's Albany Centre, and Wave Energy Research Centre, and the developing Great Southern Universities Centre.

Primary production is the backbone of the Great Southern economy. It is Western Australia's second largest agricultural region and about 60 per cent of its economic activity is directly or indirectly related to agriculture. Apart from broadacre cropping and livestock its output includes horticultural produce and premium wine. Harvest Road Oceans, through its Leeuwin Coast brand, is making significant aquaculture investments in Albany.

The Great Southern is unmatched in regional Western Australia for the scale, diversity and accessibility of its natural attractions, including rugged coastline, white sandy beaches, forests, wildflowers and the highest peaks in southern Western Australia.

It has outstanding biodiversity, heritage buildings, a strong reputation for festivals and events, and growing opportunities in outdoor recreation and eco-tourism.

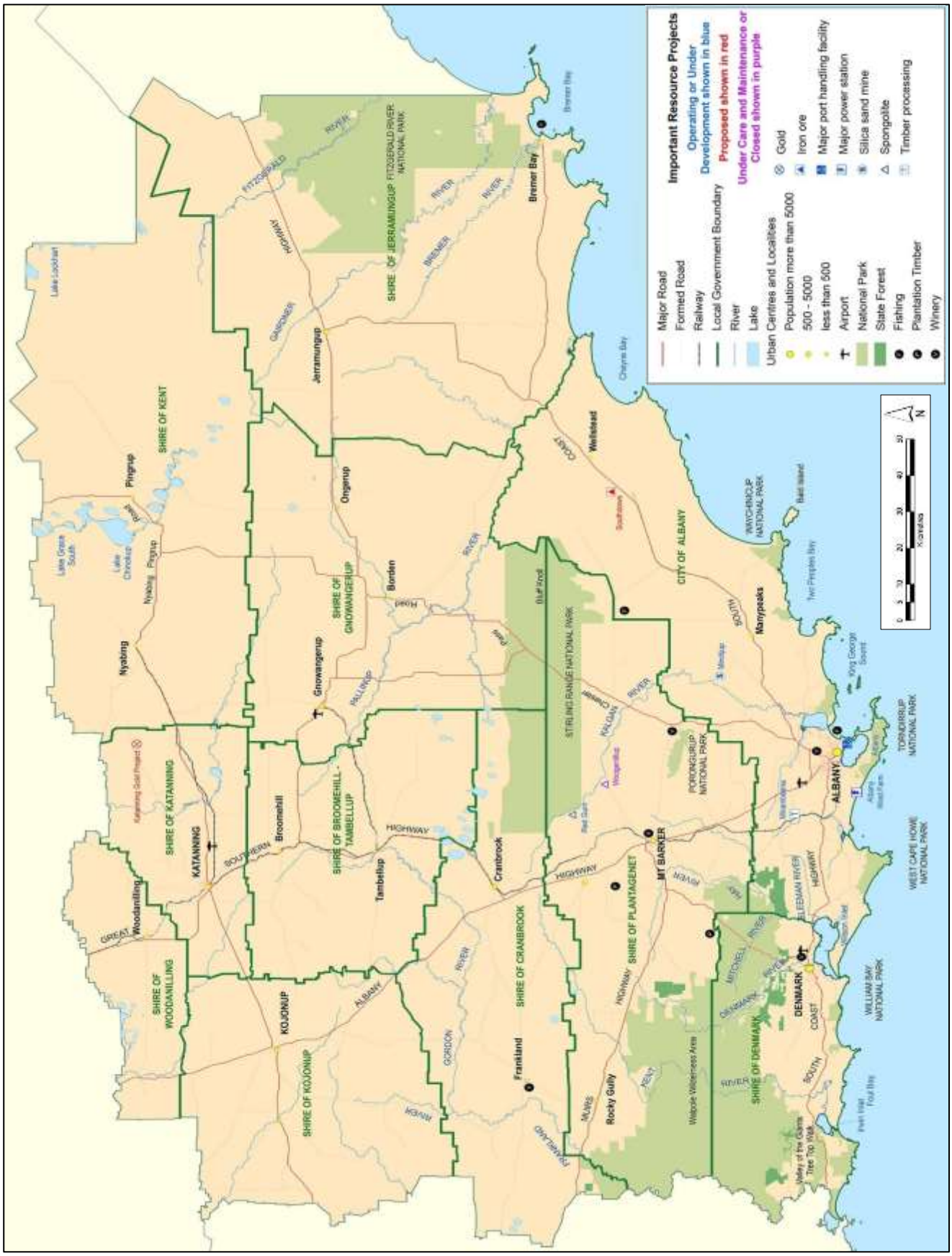

Figure 8 - The Great Southern. Image: GSDC

Telecommunications in the Great Southern

National Broadband Network

NBN, the Statutory Infrastructure Provider, provides a mix of wholesale fibre to the node and fibre to the premise fixed line, fixed wireless, and Sky Muster satellite services in the Great Southern.

The availability of service technologies at any particular premise is reliant on a number of factors, including location, the condition of existing infrastructure, and anticipated connection time.

NBN claims that they have rolled out services to approximately 35,000 premises in the region and more than 50 per cent of premises in the region are connected to the network.

According to NBN, 'the network was planned and designed based on best-fit logic across Australia, which has allowed NBN to match the ideal technology type to each area'.

This best-fit logic has provided a mixed technology environment across LGAs in the Great Southern as summarised below.

LGA	AVAILABLE TECHNOLOGIES			
	FTTN	FTTP	Fixed Wireless	Satellite
Albany	√	√	√	√
Broomehill/Tambellup			√	√
Cranbrook			√	√
Denmark	√	√	√	√
Gnowangerup				√
Jerramungup				√
Katanning	√	√	√	√
Kent				√
Kojonup	√	√	√	√
Plantagenet	√	√	√	√
Woodanilling				√

Figure 9 - NBN available technologies by LGA

Fibre availability

As displayed in the figure above, FTTP and FTTN connections are only available in five of the eleven LGAs in the Great Southern. Unsurprisingly, these LGAs, with the exception of the Shire of Denmark, are located along the major fibre route between NBN's POI location in Katanning and the major population and business centre at Albany.

It is important to note that these fibre connections are restricted to the more densely populated areas in each of these LGAs and do not service the whole LGA.

Albany Business Fibre Zone

Albany was identified as a Business Fibre Zone (BFZ) under NBN's Business Fibre Initiative which was announced on 22 September 2020. This NBN initiative created 240 BFZ's across Australia, including 85 in regional centres and claims to allow regional businesses to compete with national and state markets by 'levelling the playing field' and providing regional opportunities for decentralisation.

Businesses in a BFZ can access Enterprise Ethernet, which offers high speed broadband with symmetrical wholesale bandwidth tiers from 10/10 Mbps to nearly 1 Gbps. Enterprise Ethernet in a

regional BFZ offers pricing equivalent to CBD rates, which can be up to 67 per cent cheaper than current regional pricing. A free of charge fibre installation is also available to service providers.

A business not located within the BFZ may, subject to location, still be able to access Enterprise Ethernet with no up-front build cost to service providers, plus no up-front connection cost to the service provider if they sign up for a 3-year plan.

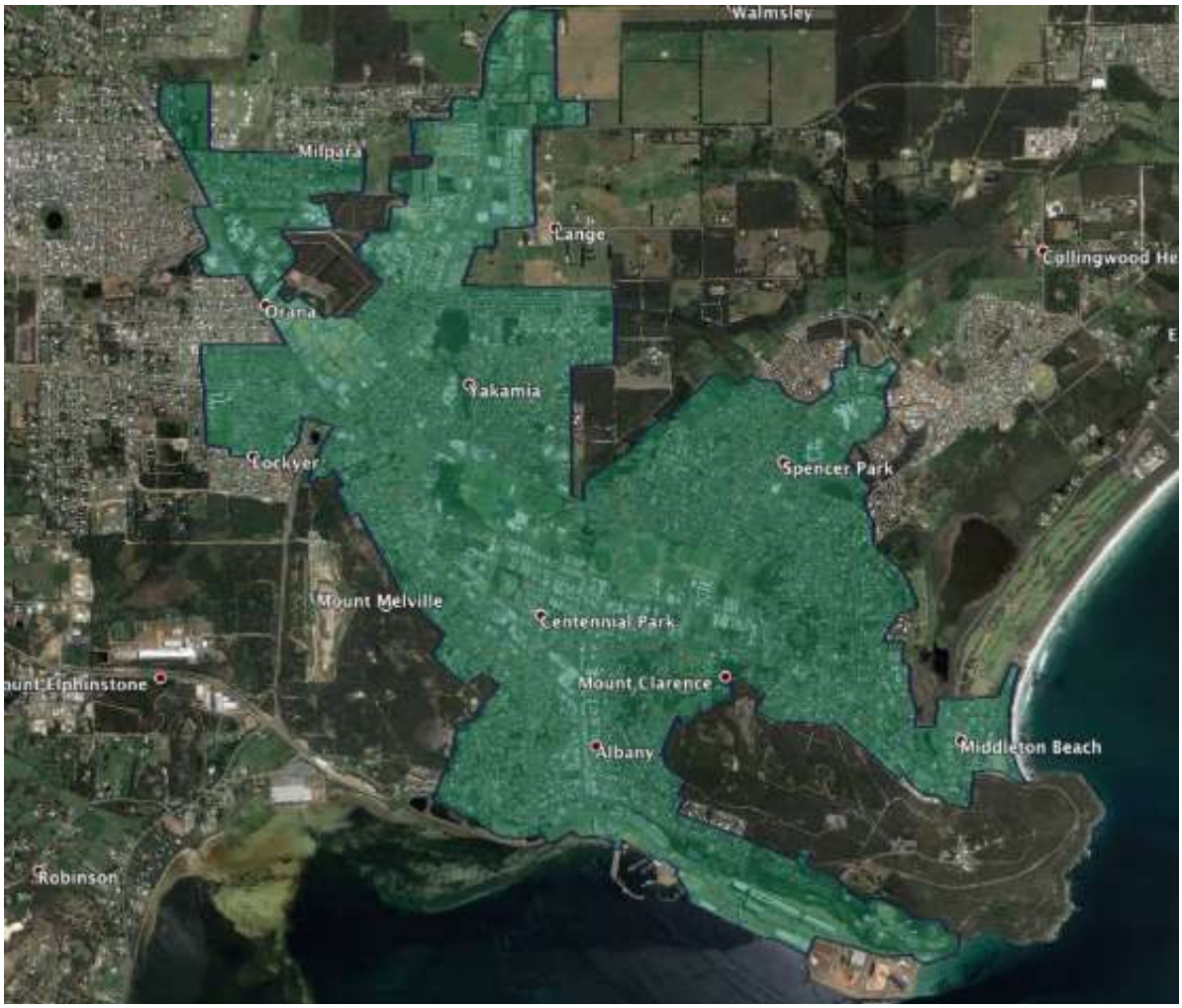

Figure 10 - Albany Business Fibre Zone. Image: NBN

This report has been unable to ascertain the level of interest for the offered BFZ services beyond activity at the Great Southern Universities Centre which is discussed in the Case Studies section in Appendix 1.

NBN Fixed Wireless and Sky Muster Satellite

NBN owns 24 fixed wireless towers in the region. These towers are identified in the complete list of telecommunications towers provided in Appendix 1. Fixed wireless services are available in all LGAs apart from Gnowangerup, Jerramungup, Kent, and Woodanilling.

The Sky Muster satellite regime brings NBN connectivity to the Shires of Gnowangerup, Jerramungup, Kent, and Woodanilling which cannot access any other NBN services. This makes Sky Muster satellite the default regime for the Great Southern and fixed fibre, with some extensions through fixed wireless only available in the major population areas.

Some smaller population clusters such as Woodanilling township for example, although the administrative centre of the Shire, relies on Sky Muster for connectivity. As the West Australian Local Government Authority, like many Australian businesses and organisations, transitions many of its activities to electronic cloud-based regimes the Shire of Woodanilling will face significant challenges managing its interface.

Issues with the performance of NBN fixed wireless and satellite services are well documented.

DPIRD's submission to the 2018 Regional Telecommunications Review notes that Sky Muster is unsuitable for a range of activities including:

Video streaming
Video conferencing
Transmission of agricultural drone data and images
Cloud-based business services
Interactive learning and education (p.3)

Importantly, the report also identifies that 'there is no upgrade path for increasing Sky Muster's capacity and performance over the life of the satellites, so the current level of service is the 'end game', best-case over the satellites' 15-year+ expected lifespan' (p.4).

Mobile Telephony and Data Networks

There are approximately 120 established and 30 proposed mobile base stations in the Great Southern, with the vast majority operated by Telstra. These base stations are listed by Local Government Authority in Appendix 2.

The base stations are towers, monopole towers or guyed towers/masts with a varying number of antennae attached to the headframe. The reach of each base station varies depending on size, location, geophysical obstructions and ranges between five and thirty kilometres.

Four LGAs in the Great Southern recently conducted short mobile connectivity surveys independent of this report. Overall, the Shires of Cranbrook, Gnowangerup, Kojonup, and Plantagenet received 320 responses to a short, seven question survey generated online using Survey Monkey software.

The survey sought to identify mobile service providers, strength of signal, the incidence of service loss, whether repeaters were used, if the signal strength varied throughout a home or property, if faults in service were reported and, if so, whether the issues were effectively addressed.
General indications from the survey identify Telstra as easily the most favoured service provider although strength of service, consistency of service provision, and resolution of service issues are all far from optimal. A schematic summary of survey responses is available at Appendix 6.

The survey questions relating to whether signal strength varied through a home or property and whether reported service issues had been resolved sought short descriptive answers. Responses to these questions recorded a wide range of answers but common characteristics identified:

- Varying signal strengths in the house
- Varying signal strengths across the property
- Unsatisfactory responses to service requests

Some of these 2020 survey results support observations made by the Great Southern Development Commission (GSDC) and provided as input to the Department of Regional Development and Primary Industries' submission to the 2018 Regional Telecommunications Review.

Of particular interest is that the GSDC notes that 'mobile phone coverage "on-the-ground" does not necessarily reflect "mobile coverage" mapping', and that 'the presumed/theoretical mobile coverage on the ground appears to have excluded the opportunity for new tower construction under Commonwealth MBSP programs' (DPIRD, 2018).

5G Spectrum auction

The Albany region featured in the latest Spectrum Auction held in April 2021. The 26 GHz spectrum has been identified as optimal for the delivery of 5G wireless broadband services. Licenses won at this auction will come into effect later in 2021 and are valid for fifteen years until 2036.

A total of 12 licenses were allocated in Albany, five to Telstra, four to Optus and three to Mobile JV, who are a subsidiary of TPG Telecom (formerly Vodaphone).

Responses to Australian Government Initiatives

Mobile Black Spot Program

The Mobile Black Spot Program identified 168 reported blackspot locations in the Great Southern between February 2016 and October 2018. A list of these locations, extracted from the Australian Government's National Black Spot Database of Reported Blackspot Locations, is provided at Appendix 3.

As a response to these reports, 34 base station developments in the Great Southern have been funded through five rounds of MBSP funding. These base stations are identified in Appendix 4.

The National Black Spot Database of Reported Blackspot Locations and spreadsheets identifying all locations funded through the MBSP to date are available at https://www.communications.gov.au/what-we-do/phone/mobile-services-and-coverage/mobile-black-spot-program

Applications seeking funding under Round 5A of the MBSP closed on 5 March 2021 and are currently being assessed.

Strengthening Telecommunications Against Natural Disasters

Through the $37.1 million Strengthening Telecommunications Against Natural Disasters (STAND) package, 20 towers in the Great Southern will receive battery upgrades to extend battery life from three to twelve hours. These towers had originally been funded in response to Rounds 1 and 2 of the MBSP. See Appendix 5 for the location of these towers. The list of Australia-wide upgrades is available at https://www.communications.gov.au/phone/improving-resilience-australias-telco-networks

NBN has received funding through STAND to provide emergency satellite units at rural and country fire service depots and designated evacuation centres. In late 2020 NBN installed satellite units at the following Great Southern locations:

- Peaceful Bay Volunteer Marine Centre
- Bremer Bay Sports Club
- Jerramungup Sports Ground
- Denmark Recreation Centre

Another phase of emergency satellite roll out will commence in Q2 2021. An additional Road Muster vehicle is also located in WA and is available to be deployed to emergency events along with two 'Fly Away' satellite kits.

Figure 11 - Road Muster vehicle. Image: NBN

Figure 12 - Fly Away satellite kit. Image: NBN

Regional Connectivity Program

In April 2021 the Government announced successful applicants under the Regional Connectivity Program, including three projects in the Great Southern that received funding totalling $887,601.

These projects are:

Proponent	$	LGA	Location/Technology
Telstra	474,892	Albany	Cave Point Lighthouse 4G base station
Pivotel	294,733	Cranbrook	Frankland River 4G LTE network
Pivotel	117,936	Albany	South Stirling 4G LTE network

Figure 13 – Regional Connectivity Great Southern Projects

The Cave Point lighthouse base station will bring mobile connectivity to the Torndirrup National Park for the amenity and safety of tourists and fishers, especially along the dangerous coastline including the notorious Salmon Holes.

The Pivotel 'ecoSphere' initiatives in Frankland River and South Stirling will provide enhanced connectivity to support agricultural and other business activities in those areas as well as enabling improved access to essential services for residents.

Responses to State Government Initiatives

WA Digital Infrastructure Atlas

The extract from the Digital Infrastructure Atlas below shows the LGA boundaries in the Great Southern, the NBN point of intersection in Katanning, approximate fibre locations, claimed 4GX mobile coverage (dark green), Pivotel digital farms project (purple), Superloop digital farms project (light green).

The atlas can also show a range of other data including mobile blackspot funded locations, and locations of radio communications licenses. Note the data is not necessarily contemporary. The approximate fibre location plotting for example is shows fibre locations at 30 April 2018.

Figure 14 - Infrastructure Atlas Extract. Image: DPIRD

Digital Farm Grants

Two proponents were awarded Digital Farm Grants in the inaugural round of the program in 2018. Pivotel Group Pty Ltd received $277,500 to support its Mount Barker Pivotel Ecosphere Network, and Superloop (Australia) Pty Ltd received $500,000 to deploy telecommunications infrastructure in the Great Southern.

Pivotel's Mount Barker 4G network consists of nine small cell towers linked by microwave located Mount Barker, Kendenup, Takalarup, South Stirling and Woogenellup. Backhaul is provided through a tower located on Mount Melville in Albany. The network aims to provide broadband internet to homesteads, to improve personal communications and safety, and to enable the connection of security cameras, sensors and other IoT devices to improve productivity across farms.

This network also supports the Stirling to Coast Farmers (SCF) group who are trialling Smart Farm initiatives on farms in West Kendenup and Woogenellup funded by the Department of Primary Industries and Regional Development's IoT DecisionAg Grant program and the National Landcare Program.

For more about these projects see the Pivotel/SCF Case Study in the Case Studies section of this report. Although the case study predicted there would be up to 50 farmers connected by 2019, the network is currently still supporting three sites in trial mode but is aiming to go 'live' into the population within a month of this report. SCF has identified general issues with connectivity as a major roadblock on the project and are currently connecting to the fibre backbone through the Mount Melville tower in Albany.

The Superloop project aims to build 12 new fixed wireless towers to cover up to 12,000 kilometres of Western Australia's Great Southern and Wheatbelt regions including Broomehill, Gnowangerup, Katanning, Kojonup, Tambellup, and Woodanilling.

At the time of writing, it appears that Katanning is the only LGA to have Superloop availability. The Shire of Gnowangerup is currently in negotiation with Superloop to piggyback the Superloop facility on a Shire-owned tower in the town. The Shire of Woodanilling will receive limited services to the west of the township from a base station in Wagin.

The Shire of Kent will benefit from the Dumbleyung Digital Connectivity Project managed by Field Solutions Group (FSG) which was supported in Round 3 of the program awarded in January 2021.

FSG will be constructing five towers for fixed wireless including one north of Nyabing scheduled for completion in the first quarter of 2022. The tower will provide fixed wireless to an area within an approximate 20-kilometre radius of the tower that includes Nyabing but will not reach Pingrup.

IoT DecisionAg Grant program

Stirling to Coast Farmers (SCF) are managing two projects under this program, one in Woogenellup and one in West Kendenup. The Woogenellup project is a broadacre cropping operation that hosts a range of AgTech solutions to demonstrate how farmers can take advantage of new technology in grain production systems. Implemented technology includes a mixture of cellular and LoRaWAN devices.

The West Kendenup project is a mixed farming operation with feedlot operation that focusses on a range of solutions that could help farmers mitigate risk by integrating new technology into their sheep/pasture systems. A range of cellular and Sigfox enabled devices are operating across the landscape.

A general diagram of the Pivotel/SCF projects and the Pivotel ecosphere/IoT intersections is below.

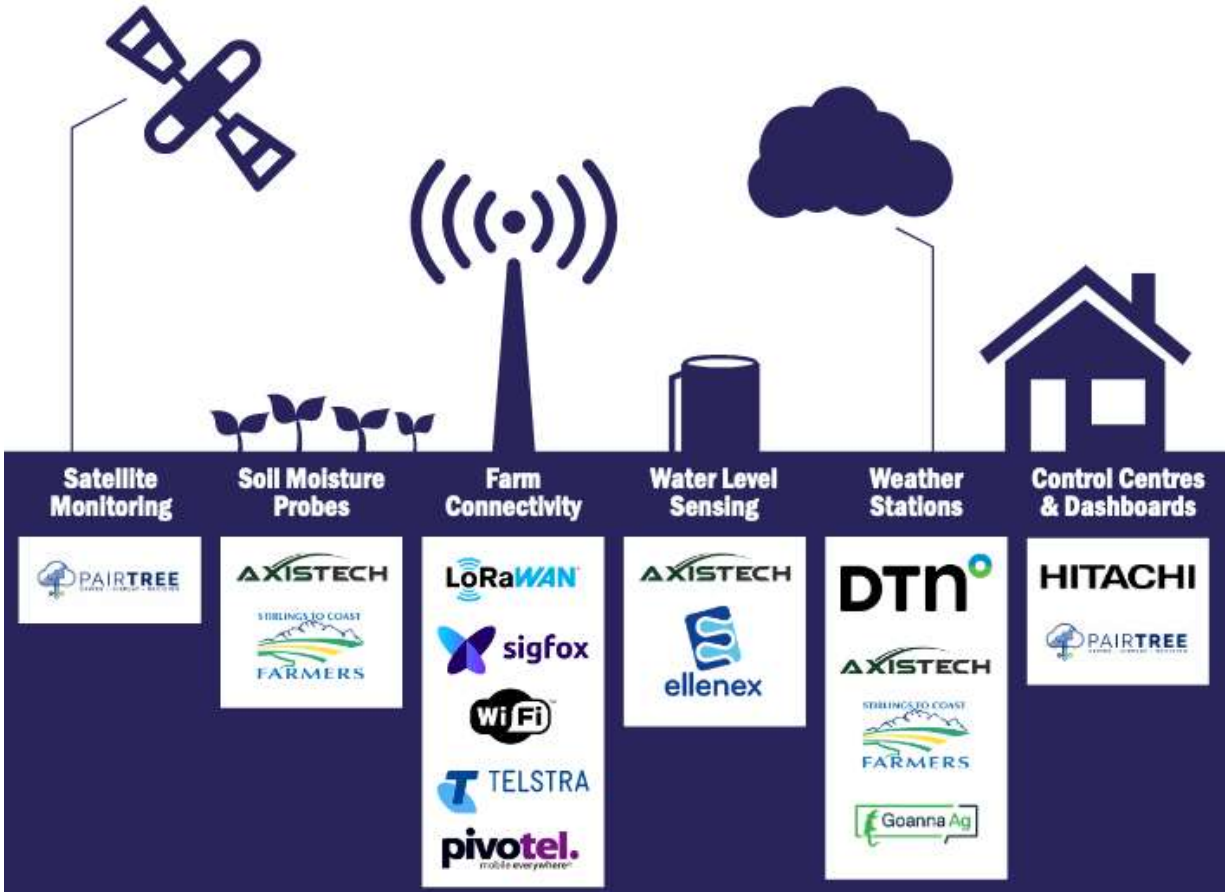

Figure 15 - Pivotel/SCF Environment. Image: SCF

A Satellite Future?

Whilst there are identified weaknesses in internet delivery to the region through all channels it is also notable that service providers are not providing any real impetus for change to the status quo. Services tend to improve in areas where an economic imperative can be identified, but developments in fixed line and wireless infrastructure will probably never provide all of region coverage.

The answer to this challenge may lie in a new style of satellite-based communications, and interest in satellite infrastructure is gaining momentum in Australia.

Recently the Australian Communications and Media Authority (ACMA) released its 'Market Study – Australian Space Sector' paper. The paper discusses the growing activity in the space sector, some of which is related to delivering voice and internet IoT technologies.

The paper notes an increase in both government and private investment and reduced prices for satellite installation due to the development of reusable rockets and the mass production of satellites, and that many start-up companies are 'seeking to provide high-speed internet to parts of the world where traditional broadband is too costly to provide' (p.16).

An opportunity to provide high capacity, high speed connectivity in regional and remote areas of Australia is provided by the potential of Low Earth Orbit (LEO) satellites. LEO satellites orbit at altitudes under 2,000 kilometres and offer the potential of widespread, low latency, high speed connectivity.

The Australian Government has identified the potential of Low Earth Orbit (LEO) satellite networks to service the West Australian Grainbelt:

> *LEO satellite networks could be considered as a possible future solution with the potential to enable near-ubiquitous coverage of the Grainbelt region. As the technology develops, there is a possibility that LEO satellite networks could be deployed within the forecast lifetime of any proposed new wholesale fibre backhaul network. (December 2020, p.21)*

One of the private companies investing in LEO development is Starlink, who are currently operating a trial version of its commercial services in southern New South Wales and northern Victoria (ABC).

Starlink is a satellite internet constellation being developed by Elon Musk's SpaceX company. The constellation will consist of thousands of mass-produced small satellites in low earth orbit working in combination with ground transceivers. Starlink has already launched almost 1,300 low orbit satellites internationally and according to the Starlink website:

> *Starlink is ideally suited for areas of the globe where connectivity has typically been a challenge. Unbounded by traditional ground infrastructure, Starlink can deliver high-speed broadband internet to locations where access has been unreliable or completely unavailable.*
> *(https://www.spacex.com)*

Starlink was approved to use Australia radio frequencies as a foreign-owned satellite in February 2020 and in November 2020 ACMA issued Starlink with licenses to communicate with four ground stations in Australia including one in Wagin, Western Australia.

Starlink are envisaging initial upload/download speeds of 50-150mbps with latency in the 20-40ms range (https://birrraus.com). Residents in areas below 32°S can apply for a Starlink dish and connection now.

Conclusion

The right of all Australians to access telecommunications technologies is assured by legislation, and the value that access will bring to lives of all people, including those in regional and rural areas has been made apparent as we have experienced the COVID-19 pandemic and transitioned our business and everyday lives to manage and survive though that pandemic.

However, despite the legislated right of access, a wide range of support programs and initiatives addressing the implementation and expansion of internet services offered by Australian and West Australian governments, and the heightened community understanding of the possibilities and advantages offered by telecommunications technologies, regional and rural areas in general, and the Great Southern in the specific terms of this report, remain compromised and underserviced.

Digital connectivity in the Great Southern is often inadequate and unreliable, and sometimes non-existent. The areas that can access FTTP, the most effective fixed line service, are restricted to a few central locations in major townships and other fixed line services such as FTTN are slightly less restricted but likewise limited. Fixed wireless and mobile services enhance and extend service availability into the region, but the range of these services are often unrealistically represented by ISP coverage maps.

A satellite service is the default service for a large part of the Great Southern and this service is compromised by concerns with speed, capacity and latency that reduce its capacity to manage contemporary communications demands.

1. *To perform a whole-of-region survey to expand on the basic work done by four regional LGAs and broaden the survey beyond mobile telephony to include connectivity in general*
2. *That in the initial stages, this communications intelligence could be gathered and managed at WALGA Great Southern Zone level*
3. *To investigate the value of 'excess' IoT data to agricultural enterprise as a whole and, if useful, to develop a collection and application regime to enable cooperative uses for that data*
4. *To recognise the future possibilities of, and monitor developments in, satellite technology that could positively impact the regional telecommunications environment.*

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Appendices

Appendix 1 -Case Studies

Oranje Tractor Farm

Oranje Tractor Farm is a boutique vineyard, orchard and potager garden located ten kilometres west of Albany. Oranje Tractor operate a cellar door through which they sell their wine and offer a range of bespoke wine tasting and wine and food pairing experiences that highlight the farm produce as well as the wine.

Tourists are attracted to Oranje Tractor to learn about their organic farming practices, to enjoy the tranquil and productive environment, and to sample the produce. They hosted HRH Prince Charles and Camilla, the Duchess of Cornwall on a private visit during their Australia – New Zealand Tour in November 2015 and regularly host groups of passengers from the cruise ships that visit Albany during the season.

Labour on the property is often provided by international travellers recruited through organisations such as Willing Workers on Organic Farms (WWOOF).

Although only ten kilometres from the Albany CBD, Oranje Tractor rely on ADSL and mobile telephony (via a repeater) for connectivity and this constrains their business in a number of ways.

Reception at the cellar door is irregular and inhibits their capacity to make contactless sales via the Square app. Online bookings for the offered experiences are also constrained by the lack of connectivity as are the increasing opportunities for online retail sales.

Their capacity to attract labour is also constrained. Oranje Tractor can only claim 'limited internet access available' when seeking to attract 'wwoofers' to their home and business. Wwoofers are generally young Europeans who are used to solid internet access and need access for simple social and cultural reasons such as streaming a film or connecting with family using video and may be studying or running an online business.

Great Southern Universities Centre

The Great Southern Universities Centre (GSUC) is a recent addition to the education industry in the region. GSUC was funded under the Australian Government's Regional University Centre Program in 2020 and is a facility that regional students can use to study tertiary courses locally delivered by distance from any Australian institution. GSUC is located in Albany's CBD.

Education is seen as a key drive of economic and social development in the region and the development of the GSUC addresses this and a number of other well canvassed regional issues including retaining youth and population in general, providing relevant skills, challenging the 'metrocentic' nature of contemporary Australian society.

The facilities provided at GSUC must necessarily include computer facilities, hi speed internet access, and video conferencing in order to provide access to online learning and training, to facilitate student support, and to allow peak time uploads of large numbers of large files including audio and video.

GSUC has used a local contractor to install around 30 devices – computers, screens, printers - and associated wiring and wi-fi to support these devices and other personal devices that students may provide.

GSUC sought quotes and engaged a locally-based ISP to install 1000mbps symmetrical Ethernet and take advantage of NBN's Business Fibre Initiative. Business Ethernet was connected to the property in May 2021, approximately three months after the initial request and initial speeds as shown in the image below were approaching the suggested speeds

Figure 16 - GSUC early speed test result. Image: GSUC

Pivotel/Stirling to Coast Farmers

STIRLINGS TO COAST FARMERS

pivotel. mobile everywhere®

CASE STUDY

TRANSFORMING FARMING OPERATIONS BY ENABLING INNOVATIVE DIGITAL OBSERVATION, TRACKING AND REPORTING TECHNOLOGY

The Challenge

69 percent of Australia's land area has no access to mobile phone coverage, meaning thousands of farming families are left without reliable connectivity to conduct business. The Western Australian government recognised the impact this lack of connection was having in regional WA, preventing farming businesses from access to the latest innovations in agricultural technology and diminishing their ability to compete in international export markets.

The Opportunity

Pivotel recognised its ecoSphere® technology could support the adoption of digital farm technologies by providing digital connectivity to farms in regional Western Australia. Pivotel was awarded two grants by the WA Department of Primary Industries and Regional Development (DPIRD) to build two ecoSphere® high speed 4G cellular networks in the regions of Mt Barker and Wickepin.

As part of the comprehensive tender process, Pivotel spoke with farming grower groups in the WA Grainbelt region aligning with those at the forefront of agricultural innovation. One of those groups was Stirlings to Coast Farmers (SCF), a farmer-led agricultural research development organisation leading in this field. Their Smart Farm initiative in the Mt Barker region required reliable mobile network communications to develop and deliver the latest operational capabilities. The partnership is creating a unique opportunity for farming communities in this region who want to implement the very latest ag-tech farming practices.

> "The blueprint to provide farms with connectivity to operate new technology has been in design for some time. We're enthusiastic about the opportunity to use Pivotel technology to finally make this vision a reality for farms in our region."
>
> - Dr Christine Kershaw
> **Stirlings to Coast Farmers**

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Business Problem

As part of the wider digital and technology-driven transformation happening in agriculture, SCF is encouraging their members to improve on-site efficiencies across their farms through the adoption of digital tools and systems. SCF recognised that remote farmers who lack effective connectivity in Australia are at a disadvantage when trying to keep up with international competitors and export markets that have connectivity and are rapidly adopting digital technology.

To ensure their farmers remain competitive in the market, SCF needed a mobile data network connection solution for their farms, some of which are located in the most remote areas of Australia. The organisation also wanted to move away from a dependence on major telcos who provide only partial coverage to farmers with no foreseeable improvement to be made to the speed or quality of their service to Australian farmers.

SCF CEO, Dr Christine Kershaw said there are numerous aspects of farming operations which could be enhanced by introducing digital connectivity.

“What we are seeing is fantastic innovation in observation, tracking and reporting technology across the agricultural space, designed to improve the livelihood of farmers and their ability to make better, real time decisions that can increase their productivity and profit,” Dr Kershaw said.

SCF’s Smart Farm initiative takes a holistic approach to improving entire farming operations from improving productivity and risk management and occupational health and safety (OH&S) through to reducing risk and financial exposure through the use of digital technology. Using the ecoSphere® by Pivotel network, SCF will be able to implement data collection tools (IoTs) across the farms, which will help transform the current non-connected farming model into a more sophisticated and digitally connected operation.

Business Solution

Pivotel’s ecoSphere® network combined with SCF’s enthusiastic drive to utilise the latest technological capabilities for agriculture is a symbiotic relationship. Pivotel’s 4G network will connect farms using a series of cellular base stations that are installed on towers across these properties. Multiple digital devices will be connected through the ecoSphere® network permitting fast communications between devices, local servers and global Internet services. In addition, the ecoSphere® network supports connectivity to ‘Internet of Things’ (IoT) devices used on farms to gather sensor reports on water levels, soil moisture, weather conditions and other important environmental and agricultural measures.

“Pivotel’s technology is making connectivity possible for our farmers, which means farmers can make better use of data on farms. This means we will see improvements in optimised seeding and harvesting processes and better individual animal management for improved productivity and animal welfare outcomes by enabling digital tracking tags to monitor weight gain and the health of livestock,” Dr Kershaw said.

“The technology will not only enable digital observation and tracking capabilities but will also enable a ‘connected farm’ where farmers can implement digital tools that will help them to make more informed projections; vastly improving their decision-making ability and reducing risk.”

The Outcome

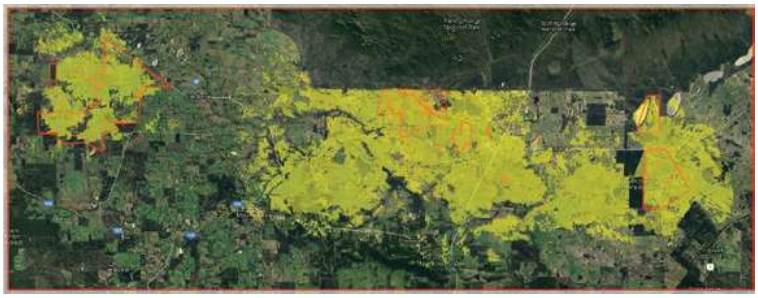
Pivotel and SCF are predicting there will be 50 farms connected as part of this first stage of the SCF Digital Farms initiative by the end of 2019. Two mixed farming operations focussed on cropping and livestock will become ‘Smart Farm’ pilot sites for the initiative where digital tools and systems will be demonstrated and tested.

“With Pivotel’s ecoSphere® solution, we will be able to work with our members to digitise processes and transform their operations to ensure the long-term sustainability of their farming businesses into the future.”

The Hardware

ecoSphere® by Pivotel
ecoSphere® by Pivotel is a customised mobile cellular 4G network for remote regions or properties that allows users to optimise operational efficiency and maximise safety.

ecoSphere® provides secure telephony, data, video, tracking and monitoring connections for on-site and remote assets and personnel.



About Stirlings to Coast Farmers

Stirlings to Coast Farmers was formed in 2009 to deliver credible, relevant research and information to farmers in the lower Great Southern coastal region of Western Australia. Find out more at scfarmers.org.au

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Appendix 2 – Telecommunications towers by LGA

*=Proposed #=Small Cell ^=Consultation in progress

GS LOCATIONS BY LGA					
LOCATION	**NBN**	**TELSTRA**	**OPTUS**	**VODA/TPG**	**OTHER**
CITY OF ALBANY					
FORTS RD MT CLARENCE		3G/4GX/5G		3G	
ABERDEEN ST		3G/4GX	3G/4G+		
MT MELVILLE	4G	3G/4GX/5G	3G/4G+	3G/4G	
ROCKY CROSSING RD		3G/4GX	3G/4G+	3G	
METTLER RD GREEN RANGE		3G/4GX/5G			
CHIPANA DR LITTLE GROVE#		4GX			
CHEYNES RD*		√			
CHILLINUP RD GNOWELLEN*		√			
LWR DENMARK RD*		√			
APEX DRIVE			3G/4G+		
CHESTER PASS RD KING RIVER			3G/4G+	3G	
MERCER RD WALMSLEY		3G/4GX/5G	3G/4G+	3G	
LOCKE ST ORANA		3G/4GX	3G/4G+		
WARDEN RD SPENCER PK		3G/4GX	3G/4G+		
BARRAS RD LITTLE GROVE*	4G				
ROBINSON RD	4G				
MOUNTAIN RD EAST BORNHOLM^		3G/4GX	3G/4G+		
BOTTLEBRUSH RD GLEDHOW			3G/4G+		
ELLEKER-GRASMERE RD ELLEKER		3G/4GX			
MAWSON RD NAPIER		3G/4GX			
NANARUP RD KALGAN		3G/4GX			
MOWFORTH RD ELLEKER^	4G				
WILLYUNG RD WILLYUNG^	4G				
NANARUP RD KALGAN^	4G				
NORTHWOOD LA LOWER KING		4GX/5G			
ALLERTON ST ROBINSON*		4GX/5G			
COLLINGWOOD RD COLLINGWOOD PK*		4GX/5G			
SOUTH COAST HWY GREEN RANGE		3G/4GX	3G		
CHILLINGUP RD KOJANEERUP*		√			
LAKE WARBURTON RD PALMDALE*		√			
PALMDALE RD TAKALARUP*		√			
WARRIUP RD MANYPEAKS		3G/4GX			
WILCOX RD REDMOND		3G/4GX			
SHIRE OF BROOMEHILL-TAMBELLUP					
INDIA ST BROOMEHILL*		√			
RIELLY ST BROOMEHILL	4G	3G/4GX			
FAIRFIELD RD BROOMEHILL		3G/4GX	3G/4G+		
BROOMEHILL-GNOWANGERUP RD		3G/4GX			
JAM CREEK RD DARTNALL		3G/4GX	3G/4G+		

TOOLBRUNUP RD LAKE TOOLBRUNUP*		√		
BIRT RD BOBALONG		3G/4GX		
NORRISH ST TAMBELLUP^		4GX		
NORRISH ST TAMBELLUP	4G			
SHIRE OF CRANBROOK				
SUKEY HILL RD CRANBROOK		3G/4GX	3G/4G+	3G/4G
ALBANY HWY CRANBROOK		3G		
YERIMINUP RD FRANKLAND*		√		
DUNN ST CRANBROOK*		√		
GOLDENDALE RD CRANBROOK		3G		
HORDACRE WY CRANBROOK	4G			
STURRY RD CRANBROOK		3G/4GX		
PARSONS RD TENTERDEN*	4G	√		
NUNIJUP RD TENTERDEN		3G/4GX		
BROCKMAN RD TENTERDEN	4G			
POISON HILL RD FRANKLAND		3G/4GX		
HERBERT ST FRANKLAND	4G			
BOYUP BROOK_CRANBROOK RD FRANKLAND	4G			
YERIMINUP RD FRANKLAND		3G/4GX		
UNICUP RD FRANKLAND*		√		
UNICUP RD FRANKLAND		3G/4GX		
BOKERUP RD FRANKLAND		3G/4GX		
SHIRE OF DENMARK				
HENWOOD ST DENMARK		3G/4GX	3G/4G+	3G/4G
MOIR DVE SHADFORTH	4G	3G/4GX	3G/4G+	
MT FRANKLAND NTL PARK*		√		
BANDIT RD BOW BRIDGE*		√		
935 STH COAST HWY DENMARK#		4GX		
HENWOOD ST DENMARK	4G			
FICIFOLIA RD BOW BRIDGE^	4G			
SWALLOW RD KENTDALE	4G			
RAME HEAD RD PEACEFUL BAY		3G/4GX		
DINGO FLAT RD HAZELVALE^	4G			
MACPHERSON DVE NORNALUP		3G/4GX		
NUT RD NORNALUP		3G/4GX		
TINDALE RD KENTDALE		3G/4GX		
WILLIAMS RD SCOTSDALE		3G/4GX		
OCEAN BEACH RD OCEAN BEACH*		3G/4GX		
SHIRE OF GNOWANGERUP				
MINDARABIN RD JAKITUP		3G/4GX		
YOUGENUP RD GNOWANGERUP		3G/4GX		
SANDALWOOD RD GNOWANGERUP		3G/4GX		
GNOWANGERUP-BORDEN RD GNOWANGERUP*		√		

NEW COUNTRY RD MAGITUP*		√		
HINKLEY RD JAKITUP*		√		
CARDINNUP RD NEEDILUP*		√		
SOUTH FENCE RD MILLS LAKE		3G		
ELDRIDGE ST ONGERUP		3G/4GX		
MONJEBUP RD ONGERUP*		√		
NIGHTWELL RD NALYERUP*		√		
GNOWANGERUP-JERRAMUNGUP RD NEEDILUP		3G/4GX		
CRACKARUP RD NEEDILUP		3G/4GX		
SANDALWOOD RD AMELUP		3G/4GX		
MOIR ST BORDEN		3G/4GX		
SHIRE OF JERRAMUNGUP				
RANGE RD PINGRUP*		√		
SOUTH COAST HWY GAIRDNER*		√		
VASEY ST JERRAMUNGUP		3G/4GX	3G	
LAKE NORTH RD WEST FITZGERALD		3G		
GAIRDNER SOUTH RD JERRAMUNGUP*		√		
FITZGERALD RD WEST FITZGERALD		3G/4GX		
SOUTH COAST HWY GAIRDNER		3G/4GX		
SOUTH COAST HWY JACUP		3G/4GX		
BEACON DVE HOPETOUN	4G	3G/4GX	3G/4G+	
VEAL ST HOPETOUN*		√		
MARY ST BREMER BAY		3G/4GX		
SWAMP RD BREMER BAY*		√		
TOOREBURRUP HILL BREMER BAY		3G/4GX		
WELLSTEAD RD BREMER BAY			3G/4G+	
HEATH ST BOXWOOD HILL		3G/4GX		
SHIRE OF KATANNING				
TRIMMER RD KATANNING				3G/4G
RICHARDSON ST KATANNING	4G	3G/4GX/5G		
PEMBLE ST KATANNING			3G/4G+	
WOLYAMING RD BADGEBUP		3G/4GX		
WASHINGTON RD CARROLUP		3G/4GX		
SHIRE OF KENT				
MILLS RD NYABING		3G/4GX	3G	
RICHMOND ST NYABING		3G		
RABBIT PROOF FENCE RD NYABING		3G/4GX		
FEATHERSTONE RD PINGRUP		3G/4GX		
SANDERSON RD PINGRUP		3G		
TOWNSEND RD PINGRUP		3G		
SHIRE OF KOJONUP				
ALBANY HWY KOJONUP		3G/4GX	3G/4G+	3G/4G
ALBANY HWAY CHANGERUP			3G/4G+	

BELL RD KOJONUP		3G/4GX		
BOKERUP RD FRANKLAND		3G/4GX		
ALBANY HWAY KUMEAH*		√		
LOVELAND RD KOJONUP*		√		
DELANEY SY KOJONUP	4G			
YARRANUP RD LUMEAH		3G/4GX		
KOJONUP-FRANKLAND RD MOBRUP		3G/4GX		
ORCHID VALLEY RD QUALEUP*		√		
NORRISH RD BOSCABEL		3G/4GX		
EATT RD QUALEUP		3G/4GX		
SHIRE OF PLANTAGENET				
TOWER RD MT BARKER	4G	3G/4GX	3G/4G+	3G/4G
THE SPRINGS RD DENBARKER		3G/4GX		
CHESTER PASS RD TAKALARUP*		√		
PORONGURUP RD PORONGURUP*		√		
WASHPOOL RD WOOGENELLUP*		√		
MUIRS HWY PERRILUP		3G/4GX		
WOOGENELLUP RD WOOGENELLUP		3G/4GX		
BRANSON RD TAKALAUP		3G/4GX		
SURREY DOWNS RD PORONGURP		3G/4GX		
SHORT ST MT BARKER		3G/4GX		
YARRALUP RD WOOGENELLUP#				PIVOTEL
WOOGENELLUP NORTH RD WOOGENELLUP#				PIVOTEL
STIRLING SCHOOL RD TAKALARUP#				PIVOTEL
THOMSON DVE SOUTH STIRLING#				PIVOTEL
SYRED RD TAKALARUP#				PIVOTEL
BEVAN RD MT BARKER#				PIVOTEL
ALBANY HWY KENDENUP*		√		
MARTAGALLUP RD KENDENUP		3G/4GX	3G/4G+	
REDGUM PASS KENDENUP	4G			
HUDSON RD KENDENUP	4G			
MALLAWILLUP RD KENDENUP#				PIVOTEL
UNNAMED RD KENDENUP#				PIVOTEL
MARTAGALLUP RD KENDENUP#				PIVOTEL
CREEK RD NARRIKUP		3G/4GX		
MILLS RD ROCKY GULLY		3G/4GX		
MT ROE NATL PARK ROCKY GULLY		3G/4GX		
SHIRE OF WOODANILLING				
LEGGOE RD BEAUFORT RIVER		3G/4GX		
ROBINSON RD EAST WOODANILLING		3G/4GX	3G/4G+	3G/4G

Appendix 3 – MBSP reported blackspot locations

Location	Latitude	Longitude	LGA
Albany Airport	-34.94445738	117.8034244	Albany
Albany West	-35.0337721	117.5969445	Albany
Badgebup	-33.63126051	117.8977812	Katanning
Bayonet Head	-34.97999035	117.933865	Albany
Borden	-34.07235404	118.2630956	Gnowangerup
Bornholm	-35.05982462	117.5703488	Albany
Boscabel	-33.70867217	117.0583737	Kojonup
Bow Bridge	-34.95252148	117.0199203	Denmark
Broomehill	-33.84591325	117.6392299	Broomehill-Tambellup
Chester Pass Road	-34.40503271	118.1011868	Gnowangerup
Cranbrook West	-34.29882777	117.3298302	Cranbrook
Denmark	-34.96119302	117.3568175	Denmark
Elleker	-35.00830069	117.7255245	Albany
Fitzgerald National Park	-33.84675161	119.2098637	Jerramungup
Gairdner	-34.20933102	118.9369119	Jerramungup
Hunwick Road	-34.95392932	117.6782436	Albany
Jacup	-33.7806487	119.151563	Jerramungup
Jingalup	-33.96574477	117.0308427	Kojonup
Kalgan-Nanarup	-34.96337258	118.0169775	Albany
Lower Denmark Road	-35.04119399	117.6222639	Albany
Lower King	-34.9564446	117.9334851	Albany
Lumeah	-33.97977414	117.2528717	Kojonup
Manypeaks	-34.82173303	118.1512842	Albany
Mount Barker	-34.62687861	117.6625554	Plantagenet
Needilup	-33.95337577	118.7717894	Jerramungup
Noobijup	-34.4087571	116.7719475	Cranbrook
Nornalup	-34.99064655	116.8249612	Denmark
North Jerramungup	-33.94116493	118.9209667	Jerramungup
Nyabing	-33.54227986	118.1503499	Kent
Ocean Beach	-35.00699967	117.3261509	Denmark
Ongerup North	-33.78047245	118.5473118	Gnowangerup
Peaceful Bay	-35.04141016	116.9273229	Denmark
Peaceful Bay Repeater	-35.00968579	116.8886764	Denmark
Peniup	-34.04462681	118.8508084	Jerramungup
Perillup	-34.54702196	117.243142	Plantagenet
Plantagenet	-34.71880463	116.9724277	Plantagenet
Porongurup	-34.69124819	117.915287	Plantagenet
Redmond Narrikup	-34.83549378	117.7121046	Plantagenet
Ryans Brook	-34.12033259	117.0698742	Kojonup
Salmon Holes	-35.10330405	117.9666433	Albany
Salmon Holes Repeater	-35.10214516	117.9667088	Albany

South Coast Highway A	-34.85893611	118.051475	Albany
South Mobrup Road	-34.131641	116.959415	Kojonup
Spencer Road	-34.73604479	117.5109233	Plantagenet
Sturry Road	-34.18560961	117.3836948	Cranbrook
Tenterden	-34.37083926	117.5481205	Cranbrook
Torbay	-35.03009069	117.6499979	Albany
Woogenellup	-34.5348633	117.819774	Plantagenet
Youngs	-35.01392425	117.5248099	Albany
Denbarker	-34.688186	117.464144	Plantagenet
Frankland River	-34.362627	117.08284	Cranbrook
Freds Road	-34.924037	117.222991	Denmark
Gunwarrie Road	-34.31472	117.223607	Cranbrook
Muradup	-33.843123	116.981381	Kojonup
Scotsdale	-34.913514	117.252959	Denmark
Adelaide Crescent	-35.025706	117.911185	Albany
Albany Highway	-33.708703	117.119761	Kojonup
Albany Hospital	-35.00348	117.903669	Albany
Albany-Lake Grace Road A	-33.658586	118.386592	Kent
Amelup	-34.251728	118.22202	Gnowangerup
Board Road	-34.974197	117.104493	Denmark
Cartmeticup	-33.450438	117.490001	Woodanilling
Cheviot Hills Road	-33.740943	117.362993	Katanning
Collie Changerup Road	-33.759271	117.005587	Kojonup
Cranbrook	-34.296193	117.553865	Cranbrook
Devils Creek Road	-34.213688	119.120629	Jerramungup
Girraween	-34.087922	116.950126	Kojonup
Glencoe	-33.46558	117.643158	Woodanilling
Gnowangerup	-33.937427	118.007603	Gnowangerup
Gnowangerup-Jerramungup Road	-33.953481	118.644954	Jerramungup
Hinkley Road	-33.903791	118.114666	Gnowangerup
Jingalup Road	-33.968134	117.100413	Kojonup
Katanning-Dumbleyung Road	-33.559923	117.550694	Woodanilling
Katanning-Nyabing Road	-33.68684	117.733149	Katanning
Kebaringup	-34.019403	118.160836	Gnowangerup
Kelly Road	-33.605615	117.618701	Katanning
Kendenup	-34.489725	117.623404	Plantagenet
Kenmare	-33.564531	117.210166	Woodanilling
Kent River	-34.534845	117.197074	Plantagenet
Kojonup-Katanning Road	-33.764445	117.355055	Katanning
Kuringup Road North	-33.367106	118.3316	Kent
Lake Cairlocup	-33.722018	118.744029	Kent
Lockier A	-35.005942	117.858832	Albany
Mallawillup Road	-34.476521	117.479611	Plantagenet
Mallee Road	-33.540318	119.433215	Jerramungup

Martinup Road	-33.930042	117.857578	Broomehill-Tambellup
McKail	-34.985466	117.831113	Albany
Mettler	-34.575452	118.585833	Albany
Mount McLeod Road	-34.958515	117.228255	Denmark
Napier	-34.838429	117.96092	Albany
New Country Road	-34.155207	118.157372	Gnowangerup
North Needilup Road	-33.595306	118.786908	Kent
Nyabing South Road	-33.710931	118.191014	Kent
Pallinup	-33.825821	117.960907	Gnowangerup
Porongurup Road	-34.673389	117.901516	Plantagenet
Qualeup	-33.83694	116.811005	Kojonup
Range Road	-33.592064	118.68325	Kent
Redmond	-34.886867	117.693339	Albany
Ross Road	-34.514271	117.690316	Plantagenet
Seppings	-35.009229	117.909037	Albany
Shadforth	-34.968	117.238	Denmark
Shamrock Road, Ryansbrook	-34.095415	117.17824	Kojonup
Sheoak Drive	-34.936642	117.397152	Denmark
Six Mile Road	-34.183649	118.106662	Gnowangerup
South Glencoe	-33.522409	117.668114	Katanning
Steele Road	-33.397834	118.611425	Kent
Stockyard Road	-34.383556	117.352694	Cranbrook
Suttons Road	-34.915063	117.191101	Denmark
Swamp Road	-34.31061	119.182396	Jerramungup
Tambellup	-34.056817	117.639684	Broomehill-Tambellup
The Gap Road A	-35.112306	117.902949	Albany
Tingledale	-34.965458	116.879152	Denmark
Valley of the Giants Road	-34.966456	116.87569	Denmark
Ward Road	-34.560293	117.590157	Plantagenet
Woodanilling	-33.564944	117.431118	Woodanilling
Yeriminup Road A	-34.234529	117.080147	Cranbrook
Albany-Lake Grace Road B	-33.637772	118.38102	Kent
Boyup Brook Cranbrook Road	-34.199591	117.16286	Cranbrook
Cardinnup Road	-34.037991	118.681546	Jerramungup
Cardinnup Road	-34.037991	118.68155	Jerramungup
Cheviot Hills Road	-33.749022	117.389913	Katanning
Martinup Road	-33.881418	117.836514	Broomehill-Tambellup
Monjebup Road	-34.251216	118.631617	Gnowangerup
Monjemup Road	-34.251216	118.63162	Gnowangerup
Mount Lindesay Road	-34.871759	117.292219	Denmark
Shamrock Road	-34.199591	117.162862	Cranbrook
Spring Dale Heights	-34.963828	117.40442	Denmark
Springdale Heights	-34.963828	117.404415	Denmark
Stockyard Road, Tenterden	-34.413929	117.364362	Cranbrook
The Gap Road B	-35.11796	117.893273	Albany

Tone Road	-33.928372	116.860168	Kojonup
Tone Road	-33.928372	116.86017	Kojonup
Tree Top Walk (Walpole-Nornalup National Park)	-34.978342	116.893887	Denmark
West Tambellup	-34.023772	117.444876	Broomehill-Tambellup
William Bay Road	-34.993488	117.218107	Denmark
William Bay Road	-34.993488	117.21811	Denmark
Yeriminup Road B	-34.240782	117.040244	Cranbrook
Beaufort River	-33.56541	117.04423	Woodanilling
Bremer Bay	-34.40604	118.9374	Jerramungup
Bremer Bay	-34.40314	119.04113	Jerramungup
Bremer Bay	-34.37572	118.81853	Jerramungup
Cardininup Road	-33.85329	118.72275	Jerramungup
Chittowurup	-33.85329	118.91035	Jerramungup
Denbarker	-34.7113	117.51113	Plantagenet
Denbarker	-34.68785	117.34619	Plantagenet
Devils Creek	-34.22236	119.2659	Jerramungup
Devils Creek Road	-34.30002	119.06453	Jerramungup
Gleeson Road	-33.85329	118.61436	Gnowangerup
Gleeson Road	-33.88468	118.61187	Gnowangerup
Glencoe	-33.52267	117.58889	Woodanilling
Holden Road	-33.85329	118.65408	Gnowangerup
Jingalup	-33.5716	117.015242	Woodanilling
Jingalup	-33.5758	117.052	Woodanilling
Jingalup	-33.5758	117.01523	Woodanilling
John Cove	-34.39474	119.40059	Jerramungup
Kendenup	-34.48951	117.58214	Plantagenet
Muradup	-33.845947	116.948465	Kojonup
Murray Road	-33.85329	119.27602	Jerramungup
Narrikup	-34.7649	117.7851	Plantagenet
O'Connor	-34.522809	117.678533	Plantagenet
Park Road	-33.85329	118.74956	Jerramungup
Park Road	-33.85329	118.70636	Gnowangerup
Rabbit Proof Fence Road	-33.4649	118.3252	Kent
Stock Road	-33.85329	118.85685	Jerramungup
Stock Road	-33.85329	118.81703	Jerramungup
Stock Road	-33.85329	118.76118	Jerramungup
Stock Road	-33.85329	118.90355	Jerramungup
Swamp Road	-34.30679	118.93777	Jerramungup
Withers Road	-33.642115	117.601589	Katanning

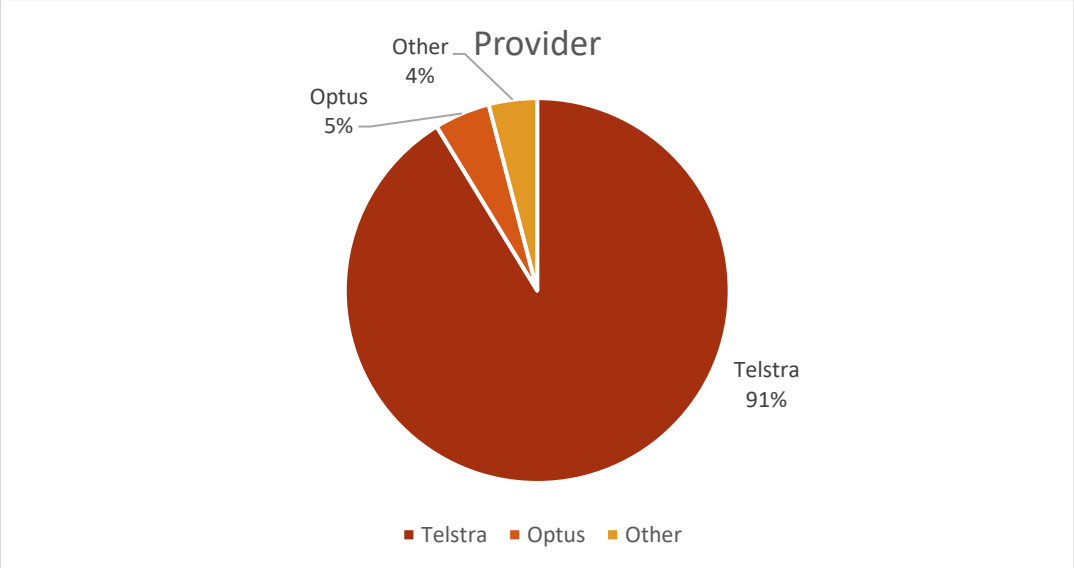
Appendix 4 – MBSP program funding blackspot by round

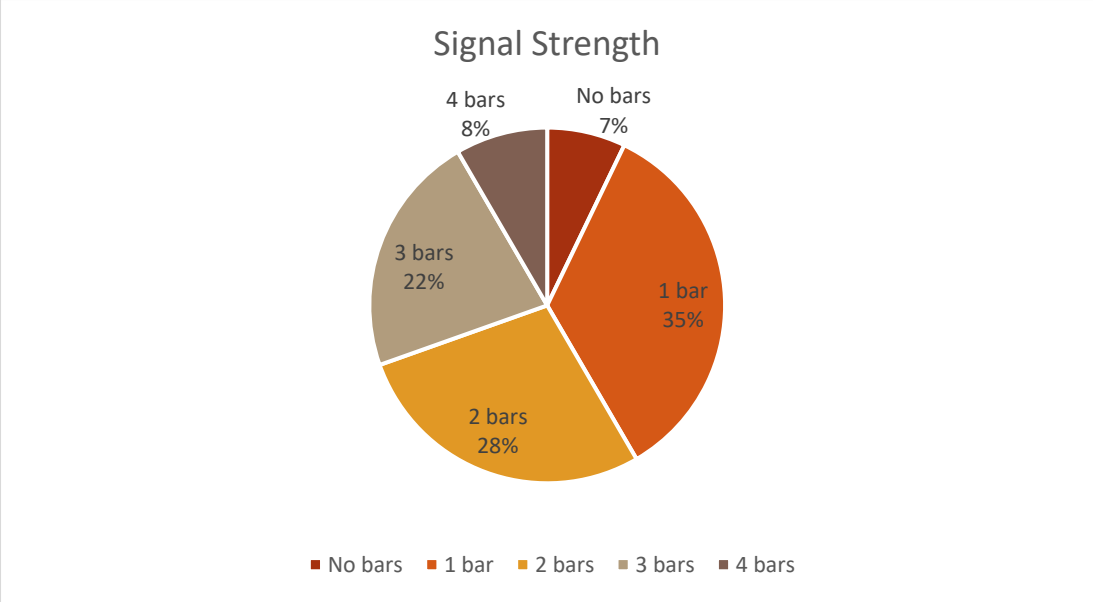
MBSP PROGRAM FUNDING BY ROUND GREAT SOUTHERN		
ROUND ONE		
Armstrong Road, Boscabel	Telstra	Kojonup
Broomehill Village	Telstra	Broomehill-Tambellup
Chester Pass Road, Toolbrunup	Telstra	Plantagenet
Elleker	Telstra	Albany
Jacup	Telstra	Jerramungup
Kalgan	Telstra	Albany
Lumeah	Telstra	Kojonup
Manypeaks	Telstra	Albany
Napier	Telstra	Albany
Noobijup	Telstra	Cranbrook
Nornalup	Telstra	Denmark
Ocean Beach	Telstra	Denmark
Perillup	Telstra	Plantagenet
Porongurup	Telstra	Plantagenet
Ryansbrook	Telstra	Kojonup
Salmon Holes	Telstra	Albany
South Coast Highway, Peaceful Bay	Telstra	Denmark
Sturry Road, Cranbrook	Telstra	Cranbrook
Tenterden	Telstra	Cranbrook
Tindale Road, Bow Bridge	Telstra	Denmark
Tindale Road, Plantagenet	Telstra	Plantagenet
Woogenellup	Telstra	Plantagenet
ROUND TWO		
Albany-Lake Grace Road	Telstra	Kent
Cheviot Hills Road	Telstra	Katanning
Mount Lindesay Road	Telstra	Denmark
Needilup	Telstra	Jerramungup
Shamrock Road	Telstra	Cranbrook
Tone Road	Telstra	Kojonup
West Tambellup	Telstra	Broomehill-Tambellup
Yeriminup Road	Telstra	Cranbrook
PRIORITY LOCATIONS ROUND THREE		**NIL**
ROUND FOUR		
Cheynes	Telstra	Albany
Gnowangerup Jerramungup Road	Telstra	Jerramungup
Mettler	Telstra	Albany
Narrikup West	Telstra	Plantagenet
ROUND FIVE		
Jingalup	Telstra	Kojonup

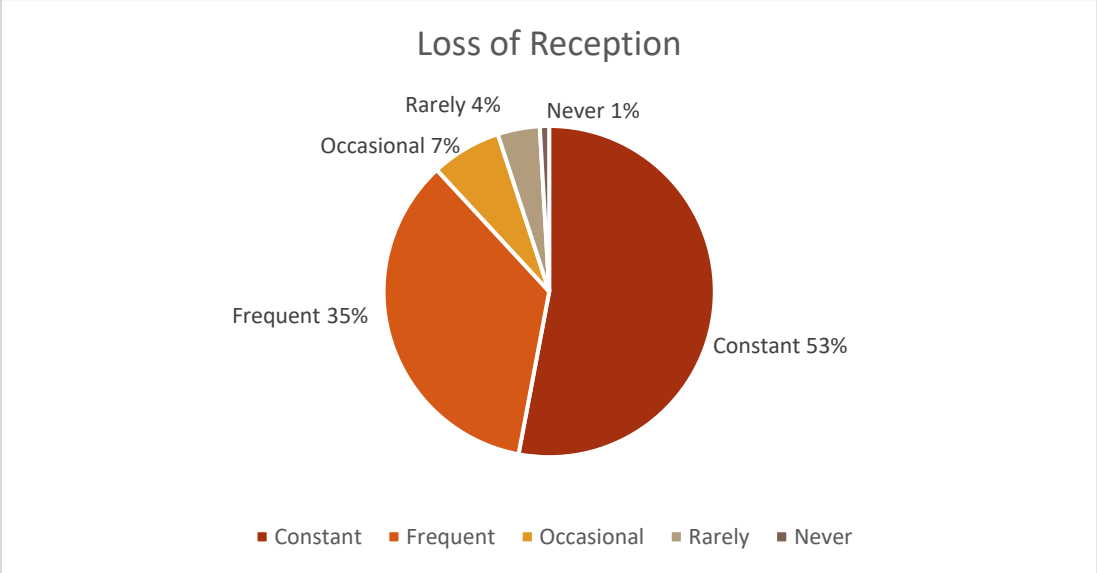
Appendix 5 – Tower resilience upgrades (STAND)

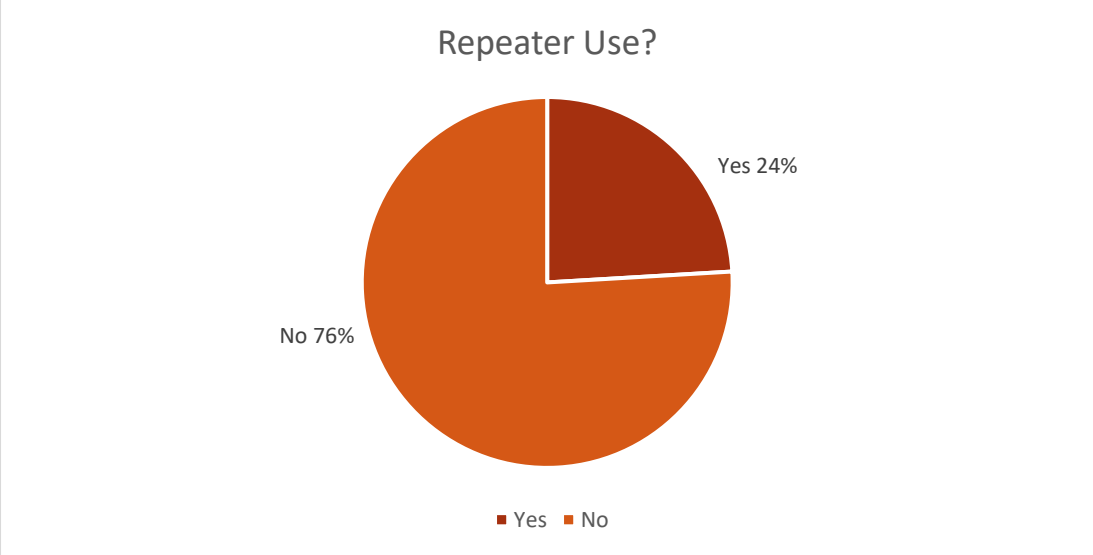
Site Name	State	Applicant
Albany-Lake Grace Road	WA	Telstra
Badgebup	WA	Telstra
Broomehill Village	WA	Telstra
Chester Pass Road, Toolbrunup	WA	Telstra
Cheviot Hills Road	WA	Telstra
Denbarker (replacement site for Salmon Holes)	WA	Telstra
Kalgan	WA	Telstra
Lumeah	WA	Telstra
Manypeaks	WA	Telstra
Martinup Road	WA	Telstra
Mt Frankland West	WA	Telstra
Napier	WA	Telstra
Narrikup	WA	Telstra
Needilup	WA	Telstra
Nornalup	WA	Telstra
Porongurup	WA	Telstra
South Coast Highway, Peaceful Bay	WA	Telstra
Tindale Road, Bow Bridge	WA	Telstra
West Tambellup	WA	Telstra
Yeriminup Road	WA	Telstra

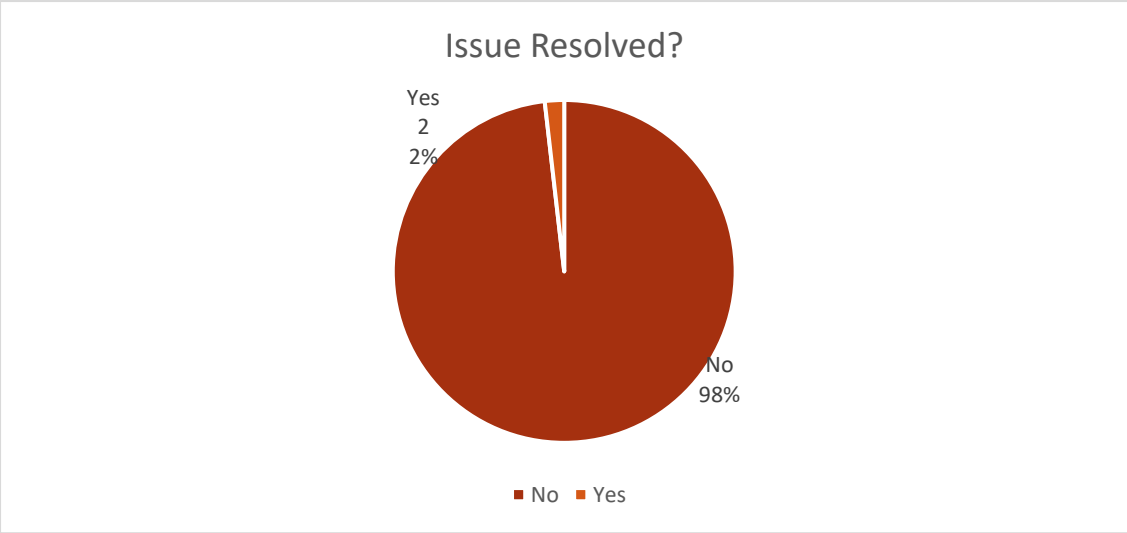
Appendix 6 – 4 Shire mobile telephony summary




Signal Strength
4 bars 8%
No bars 7%
3 bars 22%
1 bar 35%
2 bars 28%
No bars
1 bar
2 bars
3 bars
4 bars


Loss of Reception
Rarely 4%
Never 1%
Occasional 7%
Frequent 35%
Constant 53%
Constant
Frequent
Occasional
Rarely
Never


Repeater Use?
Yes 24%
No 76%
Yes
No


Issue Resolved?
Yes
2
2%
No
98%
No
Yes

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