5G STRATEGY WESTERN SYDNEY CITY DEAL

Digital commitment C5

1.4

The NSW Government and Local Government will develop a 5G Strategy for the Western Parkland City, which will include partnering with the telecommunications industry to trial 5G technology.

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Executive summary

The NSW Government and local councils of the Western Parkland City: Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly will partner with industry to create the conditions where 5G and the new world of applications it enables will be part of the fabric of the region.

The development of a 5G Strategy is one of the 38 commitments in the Western Sydney City Deal (City Deal) and provides the opportunity for the Western Parkland City to be one of the early adopters of 5G technology.

5G will unlock new ways to improve how places function, and in time, will deliver benefits across a variety of sectors including healthcare, manufacturing and transport. The efficient delivery of 5G as part of the communications infrastructure mix maximise connectivity outcomes and for Western Sydney to become a global innovation hub and first-class smart region.

The Western Parkland City will provide a testbed to trial 5G use cases and technology in an urban and peri-urban environment. This Strategy will guide these trials.

Summary of 5G principles and actions

A number of principles have been established to guide the 5G trials and future rollout of 5G in the Western Parkland City. The principles have been employed to ensure positive outcomes in the Western Parkland City in relation to:

- » connectivity
- » meeting citizen needs and expectations
- » ensuring good urban amenity outcomes
- » ensuring 5G can be implemented in a commercially sustainable way, and
- » accelerating the value of 5G for the economy.

Principles in brief

- 1. Supporting competition in the provision of 5G
- 2. Early and substantive engagement with private sector investors in 5G
- 3. Infrastructure assets should be shared where possible
- 4. Public infrastructure assets should be made available
- 5. Common design and delivery standards should be established
- Communities need to be engaged constructively in the 5G rollout
- 7. Design trials to demonstrate 5G's full capabilities
- Security and resilience of data and the network is paramount

Actions

To support the principles and to facilitate the delivery of 5G access that meets the future demands of the population in a consistent and sympathetic way, the following actions should be delivered:

- 1. Government measures should foster competition in the supply of 5G to promote long term benefits for consumers
- 2. Governments should work with the telecommunications industry to support the rollout, take-up and use of 5G
- **3.** Governments should work with industry with the objective of using shared sites for 5G infrastructure
- 4. The eight councils of the Western Parkland City conduct an audit of existing council owned assets with the view to these assets being used to expand 5G coverage to be led by Penrith City Council
- 5. Develop common design and delivery standards in consultation with industry
- 6. For the Western City Parkland, the NSW and local Government develop an industry agreed Digital Infrastructure Toolkit that sets out guidelines for planning and deploying communications infrastructure, which includes tools for best practice community engagement and leading visual amenity outcomes
- **7.** Ensure the 5G trials demonstrate to the greatest extent possible 5G's full capabilities
- 8. Embedding security as a key design principle [in the trials], including secure by design.

Digital vision for the Western Parkland City

Delivering a digitally enabled world for our citizens in the Western Parkland City.

The true potential of Western Parkland City will be realised by providing new connectivity and digital solutions. The Western Parkland City will be:

- » an **inclusive** and digitally capable region, where everyone has access to opportunities;
- » a **productive** region with flexible, future-focused communication infrastructure for fast, reliable and affordable digital connectivity; and
- » a resilient and sustainable region that uses technology to manage natural resources efficiently and is focused on environmental, air and water quality.

Realising our vision

Backbone infrastructure like fibre connections, Narrowband (NB) Internet of Things (IoT) networks and upgrades to existing mobile technology networks are essential to support the digital transformation in the Western Parkland City.

Providing residents with reliable and affordable connectivity and access to digital tools to live, work and study is fundamental to attracting businesses and building a strong local economy and promoting economic prosperity in the region.

One key promising technology is 5G. This Strategy helps to guide how industry and government can work together to enable access to and early adoption of 5G for the Western Parkland City and maximise the benefits it will provide over time – helping to realise our vision.

The Strategy:

- » provides the strategic context for 5G in Western Parkland City
- » outlines key principles for the rollout of 5G in the Western Parkland City
- » provides justification for the principles and challenges to the principle being applied
- » recommends key actions to achieving a 5G network to meet the future demands of the population in a consistent and sympathetic way, and
- » meets one of the 38 commitments outlined as part of the Western Sydney City Deal.

We want to make sure the conditions for investment in 5G and improved connectivity in the Western Parkland City are right - meaning:

- » the policy settings and regulatory frameworks protect the legitimate interests of businesses and the community
- » regulatory and policy settings focus on outcomes and are adaptable to emerging technologies and network requirements, and
- » we have a consistent planning and delivery approach across the eight council areas that make up the Western Parkland City and a unified government approach to the rollout of new technologies and digital infrastructure.

The Strategy will guide the trialling of 5G in the Western Parkland City, with the process starting in 2020. The trials will create and test use cases for 5G and boost private sector investment and market confidence.

Strategic context





The Western Parkland City is a diverse and thriving region in Sydney's outer west. It encompasses the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly local government areas.

The population of the Western Parkland City is projected to grow from just over one million in 2016 to well over 1.5 million by 2036.

Greater Sydney Regional Plan – A Metropolis of Three Cities

The Western Parkland City was established in the *Greater Sydney Region Plan – A Metropolis of Three Cities.*

A core vision of the Western Parkland City is to create new jobs and economic opportunities, and a Western Economic Corridor to attract globally significant defence and aerospace activities and contribute to strong trade, freight, logistics, advanced manufacturing, health, education and science economy.¹



Greater Sydney Commission 2018, Greater Sydney Region Plan A Metropolis of Three Cities – connecting people, p. 16

Western Sydney City Deal

The Western Sydney City Deal is a 20-year agreement and partnership of the Australian and NSW governments, and the eight councils of the Western Parkland City. The City Deal represents a coordinated approach to strategic planning across government and an emphasis on optimising place-based infrastructure delivery for the Western Parkland City.

The Western Sydney City Deal's 38 commitments lay the foundation for a liveable city with infrastructure and facilities that bring residents closer to jobs, services, education and the world.

Core to achieving this is digital connectivity and the four City Deal Digital Commitments - this Strategy delivers on one of these commitments. Figure 2 outlines how these digital commitments relate to each other.

This Strategy has been prepared by the Department of Planning, Industry and Environment on behalf of the NSW Government and in partnership with Penrith City Council. It has been informed by the Western Parkland City *Digital Action Plan* and will help establish the Smart Western City Program.



Figure 2. Western Sydney City Deal digital commitments and their relationship to each other

Western Sydney Aerotropolis

At the heart of the Western Parkland City will be the Aerotropolis: an innovative smart city that will attract new industries to Australia, capture investment for national economic growth, and underpin a strong economic base that drives the growth of resilient skilled jobs.

The 11,200-hectare Aerotropolis will encompass the planned Western Sydney International Airport and target industries such as defence, aerospace, advanced manufacturing, freight and logistics, agribusiness, health, education and tourism.

Master planning and delivery of the Aerotropolis is being led by the Western City and Aerotropolis Authority (WCAA).

The ambitions for the Aerotropolis will only be realised with fast, low latency broadband connectivity.

The case for 5G

Taking advantage of the latest technology

5G is the next generation wireless broadband technology, it will use new infrastructure to deliver faster broadband speeds with lower latency (or lag time).





Spectrum efficiency Achieving even more bits per Hz with advanced antenna techniques

Figure 3. The differences between 4G and 5G



100x Traffic capacity Driving network hyper-densification with more small cells everywhere 品

100x Network efficiency Optimising network energy consumption with more efficient processing

3G and 4G networks currently reach 99.4 per cent of Australia's population² and these networks will continue to carry the bulk of network traffic for the near-term.

Australia's mobile network operators have been investing heavily in infrastructure and upgrading their 4G networks and strengthening their spectrum holdings. As improvements in 4G and investments in 5G are made, 3G will be phased out in Australia over the next few years.³

The number of 5G connections will start building quickly from 2020 onward, as networks are rolled out and smartphones that support 5G proliferate.

In 2025, 21 per cent of all worldwide mobile connections will be 5G, with connections numbering around 2.7 billion.⁴

- 3 Commonwealth of Australia 2019, Australian Communications and Media Authority Communications report 2017-18, p.18
- 4 https://www.ccsinsight.com/wp-content/uploads/2019/02/CCS_Insight_5G_ Forecast_Sample.pdf

² Commonwealth of Australia 2019, Australian Communications and Media Authority Communications report 2017-18, p.4

China is expected to dominate the 5G landscape in the foreseeable future, after all mobile service providers launched in November 2019, having deployed 5G in 50 cities before launching.

In Australia, Telstra and Optus have begun to roll out early 5G networks while Vodafone has announced it will be launching 5G services in 2020.

Initially, 5G networks will work alongside existing 4G networks. Figure 4 shows an example of how 4G and 5G will co-exist. It is likely that 5G will be delivered through a combination of macro and small cells.

Where there is significant demand and traffic, network design may use a small cell and high frequency 5G signals to service this demand. This means 5G networks are expected to be denser and closer to the ground than current network design, particularly in urban environments. 5G is expected to have 12 million connections worldwide by the end of 2019. The number of connections will then skyrocket to 205 million worldwide at the end of 2020.



Figure 4. 4G will continue to service mobile connectivity needs in the near term, working with 5G

Meeting demand for 5G

5G will lay the platform for the anticipated surge in connected devices and sensors by making more efficient use of spectrum and core networks than 3G and 4G technologies.⁵

IoT is currently enabled by 4G and other networks and in 2017 its adoption in the Australian consumer market rose by 55 per cent. In addition, government investment in and use of sensor technologies is becoming more compelling as they are capable of gathering more information and data and become self-powering and cheaper.⁶

Business and industry uses of IoT solutions are driving exponential growth and it is predicted that the existing 4G network will be unable to cope with the projected growth in data and devices - driving the need for 5G.

Government agencies and local councils are increasingly adopting IoT technology to manage services; provide information to citizens; and monitor assets and resource use. For example, the eight Councils of the Western Parkland City are implementing a shared sensor network using a *Smart Cities and Suburbs Program* grant from the Australian Government.

Grex Group 2017 Digital Connectivity p.10

New opportunities for using 5G

The improved connectivity offered by 5G will enable the potential of emerging technologies including augmented and virtual reality, autonomous vehicles, machine learning and robotics to be explored.

5G can better handle the increasing number of wireless devices being used simultaneously, so it will also facilitate greater use of Internet of Things (IoT).

5G will facilitate digital services and technology adoption across industries and places including:

6	Smart agriculture	 » Sensor networks to collect data on environmental conditions » Data to inform and predict farming practices and work » Connected and autonomous machinery » Remote monitoring of assets
	Schools, education and training	 Remote and virtual education programs Interactive and virtual training Data insights to inform tailored and individual content development and design Improving learning options for people experiencing education barriers and mental disabilities
	Hospitals and healthcare	 » Remote patient monitoring and assessment and out of hospital care » Data insights for preventative health program design
	Public spaces and parks	 Smart light, sound and sense technologies and connected camera networks Data insights to monitor asset use and needs to inform maintenance and investment Real time and long-term data to help crime prevention and increase public safety Increased use of public spaces, more active communities Smart irrigation and environmental sensing
2	Advanced manufacturing, freight and logistics	 » Robotics and artificial intelligence to manufacture goods » Automated ordering and distribution processes » Connected and automated freight solutions, including road and air drones
	Smart cities and buildings	 » Mass data capacity for improved commercial productivity and internet of things solutions » Embedded sensors and communications technology in infrastructure to improve asset functionality and maintenance » Improved connectivity for remote and virtual meetings
	Stadiums and precincts	 » Mass capacity for streaming and sharing content » Virtual and remote video access in real time » Improved live broadcasting capacity » Connected camera networks and other sensors to monitor crowd behaviour

Related policies, plans, strategies and legislation

In general, to determine the approval pathway (if any) required for proposed telecommunications infrastructure, the following should be considered in order:

- » Commonwealth legislation and regulation and instruments like the *Telecommunications Act 1997* and the Telecommunications Code of Practice 2018.
- » State legislation, regulation and instruments, like the *Environmental Planning and Assessment Act (1979)* and State Environmental Planning Policy (Infrastructure) 2017, or ISEPP.
- » Local legislation and policies, like Local Environmental Plans (LEPs).

Telecommunications infrastructure that is "federally exempt" will generally not require State (and by extension, local) approval. If the proposed fails to meet that test, it will then be required to get approval from a pathway under State legislation.

It is important to note that gaining planning or building approval under State legislation does not itself grant you access to the land or property.

In addition, the *Building Momentum State Infrastructure Strategy 2018-2038*, chapter 6 has a number of relevant recommendations for the enablement of smart places. The first of these recommendations that has been delivered is the NSW Government IoT policy that provides:

- » practical guidance to help organisations design, plan and implement IoT solutions
- » advice on standards and obligations where available and practical
- » tools and templates to help effectively manage an IoT enabled project, and
- » guidance on where and how to source additional advice if required.

The policy was designed for NSW Government agencies, however it will be adopted across the Western Parkland City as outlined in the *Digital Action Plan* and will apply for the Western Parkland City 5G trials.

Trialling 5G in the Western Parkland City

The C5 Digital Commitment of the Western Sydney City Deal provides for trialling of 5G.

The trials will apply and test the principles set out in this Strategy and provide confidence to the market to support the future 5G rollout in the Western Parkland City.

The trials will identify opportunities within the Western Parkland City to test and assess 5G and its capabilities, limitations and benefits.

We will be seeking proposals from industry to partner with us and deliver the trials that brings tangible use cases to the pilots.

Key criteria for trial initiatives

We will trial technology applications that:

- » require the capabilities that 5G offers, including the high bandwidth, ultra-low latency connection (including as offered by millimetre wave 5G) or a high density of connected devices in combination with other technologies
- » cover a range of sectors and settings
- » are able to be scaled
- » will, at scale, contribute to the digital vision of the Western Parkland City
- » align with one or more of eight priority areas internet connectivity, smart monitoring, data sharing, smart public spaces, smart transport, community engagement, local jobs and smart planning and management.

These priority areas were established in consultation with industry and City Deal partners to guide delivery of the Digital Western Parkland City.

Some potential use cases for the 5G trial include:

- » Autonomous construction precinct remote controlled, monitoring and automation of equipment within a defined zone
- » Advanced manufacturing machine to machine co-ordination and real time remote management of processes
- Education/smart hubs one-to-many and many-to-one HD video communication to support removing geographic barriers and improving opportunities for students and/or people working from home
- » Utility management example IoT energy monitoring or smart energy grids
- » Public safety support emergency services to respond more quickly and detect crimes or prevent accidents.

City of Melbourne's 5G and IoT Testbed

In 2019, the City of Melbourne opened an Expression of Interest for a 5G and IoT testbed to explore:

- 1. Governance
- 2. Data collection, sharing and storage
- **3.** Infrastructure placement and design.

The testbed:

- helps establish models that harness emerging
 5G and IoT technology
- helps set a design standard for 5G and loT infrastructure that minimises impact on the public realm and that meets Melbourne City urban design standards
- is in the Melbourne Innovation District, which includes residential and commercial uses, public spaces, local roads, and university buildings.

Principles guiding the 5G trial

A number of principles have been established to guide the 5G trial and future rollout of 5G in the Western Parkland City.

The principles have been employed to ensure positive outcomes in the Western Parkland City in relation to:

- » connectivity
- » meeting citizen needs and expectations
- » ensuring good urban amenity outcomes
- » ensuring 5G can be implemented in a commercially sustainable way, and
- » accelerating the value of 5G for the economy.

Principles in brief

- » Supporting competition in the provision of 5G
- » Early and substantive engagement with private sector investors in 5G
- » Infrastructure assets should be shared where possible
- » Public infrastructure assets should be made available
- » Common design and delivery standards should be established
- » Communities will need to be engaged constructively in the 5G rollout
- » Design trials to demonstrate 5G's full capabilities
- » Security and resilience of data and the network is paramount.

The feasibility of the principles will be tested through the trial. They will be evaluated at trial completion, amended and updated and will apply for future 5G projects in the Western Parkland City. The trial will also identify further actions to ensure smooth implementation of 5G.

Principle 1– Supporting competition in the provision of 5G

Australia's telecommunications industry operates in a market open to new entrants. Competition has driven high population coverage, technological innovation, high levels of service, greater choice and affordable pricing. It has done this without the need to intrusive regulation that can lead to sub-optimal outcomes. This Strategy is committed to promoting ongoing competition in the provision of 5G services to continue to deliver consumers the best possible outcomes.

Key benefits

- » Better consumer outcomes driven by the need to compete and innovate for customers
- » Less need for intrusive, distortionary regulation

Key enablers

- » Arrangements, including in trials, that give all market players equal opportunities to compete
- » New South Wales Policy Statement on the Application of Competitive Neutrality.

ACTION 1: Government measures should foster competition in the supply of 5G to promote long term benefits for consumers.

Principle 2 – Early and substantive engagement with industry

In order to support the timely rollout of 5G there is a commitment to engage with carriers early and in a substantive way to ensure social, economic and environmental outcomes for the Western Parkland City are realised. Having early and substantive engagement with telecommunications carriers delivers a number of significant benefits.

Key benefits

- » Improved planning outcomes
- » Improved network design for both telecommunications providers
- » Lower deployment costs particularly important given the expected population growth in the Western Parkland City
- » Enhanced consumer experience as it facilitates an efficient network rollout by carriers
- » Better visual amenity and consumer experience
- » Telecommunications are available before residents and businesses move in.

Key enablers

» A commitment from councils, governments and carriers to establish processes that facilitate communication regarding telecommunications needs.

ACTION 2: Governments should work with the telecommunications industry to support the rollout, take-up and use of 5G.

The cost of small-cell deployment can be reduced by up to 50 per cent if three players share the same network. *McKinsey Global Institute*

Passive and active sharing

Passive sharing of infrastructure is when providers share sharing mobile network infrastructure like transmission, power, cables, ducts, cooling systems and towers, with each operator installing their own antennas and electronic equipment.

 Active sharing arrangement are when providers jointly invest in and share antennas, electronic equipment and even spectrum.

Principle 3 – Infrastructure assets should be shared where possible

The costs of 5G infrastructure rollout depends significantly on the required network design, planning costs and the costs of deploying base stations.

Industry needs to find ways to reduce these costs in order to achieve widespread small cell deployment in the Western Parkland City with the fastest speeds and lowest latency outcomes.⁷

Sharing infrastructure is one way to reduce deployment costs and can also improve visual amenity.

Preparing for a system that supports flexibility from the beginning and enables network sharing schemes that are flexible to changes in commercial relationships and business models is an example of an initiative that could be trialled in the City.

Promoting a shared infrastructure approach should encourage market entry by lowering operating costs and making deployment more feasible for operators.

Infrastructure sharing is common practice in the telecommunications industry where it is practical and commercial. The *Telecommunications Act 1997* provides for sharing of sites and towers by carriers. Further, the *Telecommunications Code of Practice 2018* encourages carriers to co-locate facilities with the existing facilities of other carriers or public utilities, or utilise public easements and cooperate with any other carriers or utilities to minimise inconvenience and impacts.



In the instance that infrastructure sharing is undertaken, it will need to be:

- » in compliance with regulations and competition rules to ensure there are no unintended consequences for consumers and competition
- » without adversely affecting the safety, security and operation of the existing public infrastructure.

Making information more accessible and clearly outlining co-building options will help to reduce uncertainty to both the lead and co-locating parties.⁸

ACTION 3: The three levels of Government in the Western Sydney City Deal should work with the telecommunications industry with the objective of using shared sites for 5G infrastructure in the Western Parkland City.

Key benefits:

- » Lower deployment costs particularly important while user demand is still growing
- » Visual amenity outcomes.

Key enablers:

- » Early and substantive engagement with private sector carriers investing 5G
- » The NSW Government is developing a fibre optic cable network database to capture all fibre networks owned or managed by the NSW Government. This indicates telecommunications assets that could be leveraged for the Western Parkland City and 5G deployment.

Principle 4 – Public infrastructure assets should be made available

Site access has been identified as a practical challenge for providers given the technical and commercial changes that are likely to arise from increased infrastructure requirements for 5G deployment.

Governments can support deployment of 5G by identifying accessible and available sites and assets to host infrastructure. This can include public street furniture and infrastructure like land, buildings and roads.⁹

⁸

Optus 2017, Submission in response to ACCC Draft Decision, Domestic Mobile Roaming Declaration Inquiry, Public Version, p. 13

⁹ Kings College London 2018, How government can drive 5G innovation, p. 1

Protecting visual amenity

The Smart Docklands project from Dublin, Ireland, has brought 5G to a 1.5-squaremile area in the east of the city, and with it, officials have been rolling out small cell infrastructure to help close coverage gaps.

Those small cells have been installed on all manner of city infrastructure, including lamp posts, trash cans and stoplights. Given the historic nature of the city, the project team said they needed to be "really strategic" with the infrastructure they use. "We can't just drill holes into them and stick things up." Access to such assets needs to be on terms and conditions, including pricing, which encourages industry to use them. This may assist in facilitating infrastructure deployment in an efficient and timely way by providing an alternative - more efficient pathway for industry. It may also have the added benefit of improving visual amenity.

Carriers have specific powers and immunities under Commonwealth law relating to telecommunications infrastructure deployment and installation. These laws help carriers to rollout telecommunications infrastructure quickly in a nationally-uniform way, rather than having to follow state, territory and local government requirements.

New arrangements that take account of technology developments and changes in operating practices and opportunities to streamline deployment processes are being progressed by the Department of Infrastructure, Transport, Regional Development and Communications.¹⁰

However, if carriers are offered a more attractive alternative deployment pathway under state laws, they will be attracted to this. Conversely, if powers and immunities provide them with the better options, they will default to that.

Key benefits:

- » Availability of sites for infrastructure deployment
- » Deployment can be facilitated in a cooperative manner and designed in a way that leads to enhanced visual amenity outcomes.

Key enablers:

- » The NSW Government is developing a digital twin, or digital copy, of the physical environment in Western Parkland City:
 - This tool could be used to identify sites for infrastructure deployment
 - The NSW Spacial Digital Twin includes dimensions, regulations, and dates of past, current and expiring contracts.
 - This information can assist in developing infrastructure access and sharing agreements.

ACTION 4: The eight councils of the Western Parkland City will identify council owned assets within the NSW Spatial Digital Twin, with a view to use and expand these networks - to be led by Penrith City Council.

¹⁰ Department of Communications and the Arts 2017, *5G-Enabling the future economy* p. 12

Principle 5 – Common design and delivery standards should be established

Given the significant greenfield land around the airport and in the Western Parkland City, it will be possible to incorporate enabling infrastructure into area-based planning initiatives and reserve corresponding space for next generation communications. This will ensure the future needs of the communities and businesses in the area can be met without the need to retro-fit solutions in the future.

The density of assets required to enable 5G to operate effectively and the need for cells to be connected to fibre and power means careful consideration needs to be given to amenity and design.

The Western Sydney Planning Partnership (Planning Partnership) comprises all eight Western Parkland City councils, Blacktown Council and representatives from the Department of Planning, Industry and Environment, Transport for NSW, Sydney Water and the Greater Sydney Commission.

The Planning Partnership is establishing design standards so that communications infrastructure is built into the urban form to allow for future digital requirements and avoid the need to retrofit. Such designs will be tested with industry to ensure that they would not inhibit the rollout of future infrastructure.

These design standards will include guidance for the built environment around equipment attachments for street furniture, for different furniture types, which will enable co-location and ease of scalability across the Western Parkland City, for example, design standards the multi-purpose poles graded based on residential/high street scapes.

By providing this guidance, public assets can be designed so they are suitable for a variety of urban environments and able to be modified for new purposes, improving public amenity. Engagement with industry, in line with principle two, will be key to establishing successful common design and delivery standards.

Key benefits:

- » Urban amenity outcomes are achieved
- » Consistency in approach based on the uses of the place
- » Early design and planning to prevent retrofitting of infrastructure at a later date
- » Less community and business disruption.

Key enablers:

- » Western Sydney Planning Partnership's Engineering and Design Standards
- » Early and substantive engagement with private sector carriers investing 5G.

ACTION 5: Develop common design and delivery standards in consultation with industry.

Principle 6 – Communities need to be engaged constructively in the 5G rollout

As with all new planning and development projects, the rollout of 5G requires community engagement.

The increase in network density and physical requirements to deploy 5G infrastructure closer to the user heightens the need for community engagement.

At present, each new deployment of infrastructure requires different levels of engagement with the community, depending on the approvals pathway followed – for example advertising in local papers, door knocking and/or notifying community representatives.¹¹

There is some community concern around the deployment of 5G and its potential impacts and a consistent and collaborative approach to building an understanding of 5G and its practical requirements is required.

Key benefits:

- » Broad acceptance of 5G infrastructure and resulting benefits
- » Community and user needs and impacts are considered in the design and site selection
- » The timely and efficient delivery of infrastructure
- » Impacts and perceived impacts are managed and understood

Key enablers:

- » Western Parkland City Digital Action Plan Leave nobody behind; and Connecting our community
- » NSW Government Internet of Things Policy.

¹¹ Wollondilly Shire Council 2018, Telecommunications Facilities https://www. wollondilly.nsw.gov.au/planning-and-development/faqs/new-faq-page/

ACTION 6: For the Western City Parkland, the NSW and local Government develop an industry agreed Digital Infrastructure Toolkit that sets out guidelines for planning and deploying communications infrastructure, including:

- » mechanisms for working with carriers on matters of community concern
- » codes for installing and deploying communications infrastructure on public assets across the eight councils, including terms and conditions that encourage this approach to deployment
- » clear guidelines for councils and industry on the planning and design approvals procedures, where relevant
- » standard guidelines for community engagement noting there are already extensive mandated requirements for consultation
- » include appropriate information on the safety and regulation of electromagnetic energy (EME) levels in line the advice of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in the toolkit.

Principle 7 – Design trials to demonstrate 5G's full capabilities and different delivery models

5G has three core capabilities which set it apart from existing connectivity options:

- » enhanced mobile broadband
- » ultra-reliable low latency communications
- » massive machine-to-machine communications commonly associated with the enhanced Internet of Things (IoT).

5G delivers greater capabilities that support improved and new applications, not only for the mass market, but also industrial and enterprise users. As such, 5G is a potential general purpose technology that can underpin a range of industrial, agricultural and other commercial applications.

Spectrum needs to be made available in a timely way to enable investment and competition; and the delivery of new and better connections for communities and businesses. 5G will operate over several different spectrum bands to support a range of use cases, including:

- » low bands (sub 1 GHz)
- » mid bands (1 to 6 GHz)
- » high, or millimetre wave (mmWave), bands (24 to 86 GHz).

The reason for this is that signals can:

- » travel longer distances at low frequencies but carry less data
- » carry large amounts of data at high frequencies but only over shorter distances.

The rollout of 5G is facilitated by the Australian Government making 5G-suitable spectrum available in a timely manner.

In December 2018, the Australian Government successfully auctioned 125 MHz of spectrum in the 3.6 GHz band, which MNOs are using to deploy 5G. Additionally, the Government is working to optimise the adjacent 3.4 GHz band to make it better suited for 5G services.

The Australian Government has also recently taken steps to bring 5G-suitable mmWave spectrum to market. On 18 October 2019, the Minister for Communications, Cyber Safety and the Arts, the Hon Paul Fletcher, issued a spectrum re-allocation declaration for the 26 GHz band, consistent with advice from ACMA.

This decision paves the way for ACMA to auction 2.4 GHz of 5G-suitable spectrum in the 26 GHz band in early 2021. This will give mobile network operators access to mmWave band spectrum with high data carrying capacity, which will be important for achieving 5G's full potential. Apparatus licences will also be made available on an administrative basis across the 26 and 28 GHz bands.

On 19 December 2019 the Australian Communications and Media Authority (ACMA) announced a proposed pathway to make more spectrum available for carriers in the 850 MHz expansion band and improve the use of spectrum in the 900 MHz band, with potential benefits for 5G deployment.¹²

The Western Sydney 5G trials will seek to demonstrate the full capabilities of 5G, including across wider areas and high traffic areas, and in a range of settings.

¹² www.paulfletcher.com.au/media-releases/media-release-pathway-to-delivermore-low-band-spectrum

Key benefits:

- » Applications are trialled using different characteristics of 5G in a range of different settings
- » Citizens and businesses experience the wider benefits of 5G.

Key enablers:

- » Timely access to complementary spectrum, including via spectrum, apparatus and scientific licences
- » Equitable access to spectrum for carriers and others
- » 5G trials in the Western Parkland City.

ACTION 7: Ensure sufficient complementary spectrum is available to conduct 5G trials.

Principle 8 – Security and resilience of data and the network is paramount

5G is likely to be a widely used general purpose technology and it will be important to take into account the security of the network. Carriers and carriage service providers are subject to the Telecommunication Sector Security Reforms (TSSR) as a matter of course.

Any 5G trial will need to comply with the Australian Government's 5G Security Guidance issued on 23 August 2018 and demonstrate consideration of the following:

- » Risks that may affect overall network integrity and availability, as well as the confidentiality of data.
- » Supply chain risks from all organisations involved in the delivery of a product or service in the trial. For products, this includes their design, manufacture, delivery, maintenance and disposal.
- » How data handling and privacy requirements will be managed.

All parties involved in the Western Parkland City digital deployment will need to actively manage the security of networks, data handling and privacy requirements. Security considerations around what data is being collected, how it will be used, who will access the data and how is it being protected are also critical, particularly when networks are handling highly sensitive data. Security of the network becomes even more paramount when critical infrastructure and high-risk applications are in play that rely on the low-latency, massive machine-type communications offered by 5G, and is particularly critical:

- » For use cases like connected vehicles, medical sensors and emergency medical support
- » community desire for full transparency on data management and concerns about data security.

In the Western Parkland City, we will provide effective governance to enable data to be shared and analysed to improve decision-making (see *Digital Action Plan*, Being Responsible with Data). This data governance will take into account Commonwealth, State and council requirements for the managing privacy of data.

Any 5G trial will need to integrate secure by design principles. Secure by design is an approach to software and hardware development that tries to minimise vulnerabilities by designing from the foundation to be secure and taking malicious practices for granted.

ACTION 8: Embedding security as a key design principle in the trials, including secure by design.

Key benefits:

- » Community confidence in data handling and network security
- » Reduced risk of network failure and consequences of network failure.

Key enablers:

- » Commercial imperatives of industry
- » Commonwealth security requirements (e.g. TSSR) applying to carriers and carriage service providers
- » NSW Government Cyber Security Policy
- » Data Governance Framework for the Western Parkland City (identified in the *Digital Action Plan*, G1)
- » Trial design.

Taking action

When we engaged with stakeholders and industry, we identified challenges to deploying 5G in the Western Parkland City and employing the principles detailed above, including:

- » commercial considerations
- » technical and spectrum constraints
- » challenges with practical deployment
- » regulatory and planning barriers
- » geographic considerations.

To help smooth the way for 5G in the Western Parkland City, a series of actions have been identified (and referenced in previous chapters).

Action	Related principle/s
1. Government measures should foster competition in the supply of 5G to promote long term benefits for consumers.	Supporting competition in the provision of 5G
2. Governments should work with the telecommunications industry to support the rollout, take-up and use of 5G.	Early and substantive engagement with private sector investors in 5G
3. The three levels of Government in the Western Sydney City Deal should work with the telecommunications industry with the objective of using shared sites for 5G infrastructure in the Western Parkland City.	Infrastructure assets should be shared where possible
4. The eight councils of the Western Parkland City conduct an audit of existing council owned assets with the view to use and expand these networks – to be led by Penrith City Council.	Public Infrastructure assets should be made available
5. Develop common design and delivery standards in consultation with industry.	Common design and delivery standards should be established
 6. For the Western Parkland City, the NSW and Local Government develop an industry-agreed Digital Infrastructure Toolkit that includes: » mechanisms for working with carriers on matters of community concern » codes for installing and deploying communications infrastructure on public assets across the eight councils, including terms and conditions that encourage this approach to deployment » clear guidelines for councils and industry on the planning and design approvals procedures, where relevant » standard guidelines for community engagement noting there are already extensive mandated requirements for consultation » Include appropriate information on the safety and regulation of electromagnetic energy (EME) levels from ARPANSA in the toolkit. 	Communities need to be engaged constructively in the 5G rollout
7. Ensure the 5G trials demonstrate to the greatest extent possible 5G's full capabilities.	Design trials to demonstrate 5G's full capabilities
8. Embedding security as a key design principle in the trials, including secure by design.	Security and resilience of data and the network is paramount

