

# Cambium Networks

## Response to Future use of the 3.6 GHz band August 2017

Roy Wittert  
Regional Sales Director  
[roy.wittert@cambiumnetworks.com](mailto:roy.wittert@cambiumnetworks.com)

Eddie Stephanou  
Regional Technical Manager  
[eddie.stephanou@cambiumnetworks.com](mailto:eddie.stephanou@cambiumnetworks.com)



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## 2. EXECUTIVE SUMMARY

The Cambium Networks team in Australia, appreciates the opportunity to submit a follow up response to our response to the Discussion paper in November 2016. This response to this Options paper on Future use of the 3.6 GHz band is little changed to that response.

Cambium Networks, is a leading vendor of Fixed Wireless products, that currently ships Point to Multipoint and Point to Point products that support the 3.3 GHz to 3.9 GHz band. Current products are all TDD based.

Our response to this Options paper is based on our knowledge and experience gained over the past seven and half years working with network operators and enterprise customers building networks and delivering services in the 3.6 GHz band. We have seen the significant and positive impact that those services have had. We have actively promoted the availability and use of the spectrum; and the use of Fixed Wireless network architectures to deliver broadband services to underserved areas and to provide reliable connectivity for mission critical applications. Our response is hence based on our domain knowledge of the industry in Australia and on a global basis, and specifically Fixed Wireless technology and how it can be effectively used to connect the unconnected – people, places and things. Our response also contains some personal and emotional feelings as regards the impact that the current extended embargoes and contemplated re-farming is having on our business, the businesses of our customers, and the lives of those currently receiving broadband services.

We do not agree with the preferred option 3c put forward by the ACMA in the Options paper.

Cambium Networks highlights that the band is currently allocated and used for Fixed Wireless (Broadband Wireless Access (BWA) or Fixed Wireless Access (FWA)) and not mobile applications. This options paper continues to wrongly assume that the band is allocated only for Mobile Broadband use. The highest value assessment (HVA) as a result, is poorly conceived and is blatantly wrong. The assumption of mass use of the band in regional and rural areas for mobile telephony is incorrect and hence the entire assessment is incorrect and misleading. At best we see there is some potential value for spectrum licensing in metro areas, (Area 1). We also note that Optus already owns a significant slice of the 3.5GHz band. This leaves interest and possible use primarily from Telstra and Vodafone for 5G applications in this band.

We continue to assert that the BEST VALUE use of this band in regional and rural areas remains for Fixed Wireless Broadband, for high speed broadband to underserved areas, but also for ITS and IIoT applications for mining and SMART Cities.

We will discuss and highlight that the 3.575 GHz – 3.7 GHz band is currently only used for Fixed Wireless applications (BWA). We propose that the 3.4 GHz -3.6 GHz band is also not ideal for mobile services, especially in rural and regional areas, but is rather ideal and proven for Fixed Wireless applications. To contemplate the re-allocation of the current 3.575 GHz to 3.7 GHz band by the WiSP Community and

allocate it to others to deliver the same Fixed Wireless services is surely a matter for the ACCC to review and consider?

The contemplated use for 5G, may assume mobile services, but this is as yet unclear and there is contemplation that in fact initial 5G services may be deployed as Fixed Wireless and not mobile. Perhaps, the use of 3 GHz for small cells in high density areas like stadiums is possible, but mmWave options being defined for 5G are more applicable.

The massive demand for higher data rates (both mobile and fixed) has led to over-crowding in the traditional frequency bands i.e. < 6 GHz bands. This fifth generation of communication systems (5G) will result in commercialization of systems operating in the higher spectrum bands up to 86 GHz. This includes millimeter-wave frequency bands operating above 24 GHz. Millimetre waves enable an order of magnitude increase in bandwidth to greater than 1 GHz.

The ITU has also identified the 3.3 to 3.4 GHz band for IMT and whilst the ACMA has indicated this band is in monitor mode, we strongly suggest that this band be included in this discussion and consideration for allocation for Fixed Wireless be given sooner than later.

Fixed Wireless currently plays a significant and important role in delivering value to the Australian economy. We will again spend some time explaining what Fixed Wireless is, why it is so important and hope that this helps with an understanding of current use, its value and importantly best future value use.

There are a number of products manufactured in this band, some standards based LTE (based on TDD and not FDD) and some like our PMP 450 range based on our proven Canopy MAC layer TDMA protocol, that lends itself to the use of this band for Fixed Wireless Point to Multipoint services.

Cambium Networks, continues to innovate and recently started shipping a **Massive MU-MIMO** product in the 5GHz ISM band, that will provide the best spectral efficiency in the market, delivering up to 400Mbps+ in a 20MHz channel. **This product will support the 3.3 GHz to 3.9 GHz band by late-2018 and hence offer significant opportunity and value to deliver business grade broadband services to many under-served areas.**

Whilst the NBN is building an effective Fixed Wireless Service, its regional coverage areas does have gaps. It is also taking longer to build than was initially planned. In the past six years, since 3.6 GHz band was allocated by the ACMA for Point to Multipoint Fixed Wireless services(BWA), a significant number of Wireless Service Providers (WiSPs) have invested in and built infrastructure to deliver broadband services to communities and businesses in underserved areas in good faith. We also see continued demand for mining, IoT and Smart City applications, currently stifled by the current embargo.

We also recognise the NBN is themselves making excellent use of both 2.3GHz and 3.5GHz spectrum in remote and rural areas and recently announced they would expand the fixed wireless coverage from 4% to 6% of the population. This is a strong endorsement for the proven value of Fixed Wireless. The industry requires the little remaining 125MHz of spectrum for WiSPs to fill the gaps being left by the NBN, BUT also importantly for mines and transport industry for IIoT application.

It is encouraging to see that the New Zealand Government has recognised the role of Fixed Wireless service providers, and instead of trying to discourage them with embargoes and re-farming, a recent tender issued by Crown Fiber will support their ability to serve underserved areas.

Many industries have evaluated, tested and proven this band to be effective for delivering secure and reliable services for Industrial Internet of Things (IIoT) and Intelligent Transportation System (ITS) applications. This band can and will continue to be important for innovation and IIoT applications. We note that in the US, the FCC has allocated the 3.550 GHz to 3.700 GHz as the Citizens Broadband Radio Service (CBRS) band. This is also being called the Innovation band and will be available for multi-use purposes. A set of standards are being developed to support this and Cambium Networks is actively participating in this process.

It is clear now the small allocation is targeted by the larger Tier 1 service providers for 5G applications. 5G at best will be standardized by 2020, and then take some time to be built and proven. The use will be METRO only and hence there is NO justification or sensible reason for the preferred Option 3c.

We strongly suggest a dynamic shared spectrum model being proposed by the WiSPAU Org to manage all 3.6 GHz spectrum outside of the Metro Area and also be extended to include the 3.3 GHz to 3.4 GHz bands.

There remains value in use of the band even in Metro Areas for ITS and IIoT/IoT applications, which include CCTV for Public Safety as it is used in regional QLD currently.

In the US, rather than looking at the 3 GHz band for 5G, the FCC has allocated bands above 24 GHz for 5G and proposed those for inclusion in the 5G standards back in September at WRC15. The specific bands that will be studied for 5G services include the 27.5 to 28.35 GHz, also known as the 28 GHz band; the 37 to 38.6 GHz band, also known as the 37 GHz band; from 38.6 to 40 GHz, known as the 39 GHz band; and the 64-71 GHz band. These same bands are identified globally by the ITU for 5G use and we also note that 5G will be deployed for Fixed Wireless applications as well as Mobile Broadband.

We hope that through this submission to the Options paper, we will again demonstrate that the best use of the 3.6 GHz spectrum is for Fixed Wireless and should be continued to be allocated in remote and regional areas as an Apparatus License or under a shared spectrum model. Thought should be given to removing Embargo 42 and allocating some of this band to ITS and IOT applications in metro areas. Consideration should also be given to expanding the available band down to 3.3 GHz, especially in the regional and rural areas.

Careful consideration should be given to re-farming of current unused and underutilized bands, rather than the re-farming or reallocation of the 3.575 GHz to 3.7 GHz band. **A good example of this, is the legacy spectrum with FDD arrangements defined for the 3425–3442.5/3575–3592.5 MHz frequency ranges that is unused or very effectively used as an FDD allocation and should be re-farmed as TDD spectrum for BWA, which we now note is planned for spectrum auction as per notification on 2<sup>nd</sup> August**

In summary, we propose:

- Best use of the 3 GHz band is for Fixed Wireless in regional and rural areas.
- Current use by WiSPs, Mining Industry, and State Governments should be maintained.
- Allocation should be done based on apparatus licenses or shared spectrum model
- Additional spectrum in the 3.3- 3.4 GHz band should also be allocated for Fixed Wireless.
- Fixed Wireless in the 3 GHz band is important for ITS and IIoT applications.
- Allocation of TDD apparatus licenses should be allowed in Metro areas to support ITS and other IoT applications.
- Current embargoes in regional and rural areas be removed as soon as possible.
- Strong consideration should be given to a Dynamic Spectrum Sharing (DSS) model to ensure best use allocation.

### 3. INTRODUCTION

#### 3.1. INTRODUCTION TO CAMBIUM NETWORKS

At Cambium Networks, we support the communications of life for millions of people around the world and connect enterprise networks where other radios cannot. No matter what the conditions or locations, wherever people or networks need to be connected, our wireless broadband solutions deliver clear voice, data and video communications people and networks can rely on.

Our Mission is Connecting the Unconnected and delivering solutions and technology to Bridge the Digital Divide.

Cambium Networks provide professional grade fixed wireless broadband, microwave solutions and more recently Wi-Fi. Our solutions are deployed in thousands of networks in over 150 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding performance metrics. To date Cambium Networks has delivered over seven million radio devices, a count that continues to accelerate year-over-year.

Cambium Networks are proven, respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice, and video connectivity solutions that enable and ensure the communications of life, empowering personal, commercial, and community growth virtually everywhere in the world.

Following ten-years as a business unit within Motorola Solutions, Inc. Cambium Networks was established in 2011 following divestiture from Motorola Solutions.

#### 3.2. WHAT IS FIXED WIRELESS?

Key to understanding the value of Fixed Wireless, is understanding how it is different from and should not be confused with Mobile Broadband (MBB).

Mobile Broadband is synonymous with the networks that support mobile phones and are designed and built with that in mind.

Whilst similar in many respects, Fixed Wireless Broadband, does not support mobility and is optimised to provide the best results for delivery of fixed data services using radio frequency. (RF). The typical application for Fixed Wireless is to provide a fixed data service using RF, when fiber or copper are not possible, suitable, available or affordable.

Fixed Wireless is not slower than fiber! The often-forgotten fact about data transmission using RF, is that it is in-fact quicker than transmitting data using light signals over glass (i.e. fiber optic) and whilst fiber has the benefit of being able to support more capacity and is less prone to interference, it is

sometimes just not cost effective or practical to deploy; as recently recognized by Google's fiber deployment efforts which have been halted due to economic hurdles. Fixed Wireless is not a replacement for fiber, but rather an excellent technology for achieving broader fixed service coverage in underserved areas.

Advances in RF and modulation techniques, over the past 5-10 years have also made RF an effective option for last mile FIXED SERVICES, or proving reliable and secure fixed data connections for enterprise, Internet of Things (IoT), Industrial IoT (IIoT) and ITS applications. Examples of these are backhaul for WiFi or LTE networks supporting autonomous trucks in open pit mining; and Backhaul of CCTV and Traffic Information to the traffic control room and broadband internet in regional and rural areas. Today in many places fixed wireless is a viable last mile solution in metro areas, where legacy copper cannot support the required bandwidth and fiber is not available.

Mobile Broadband technology, like TDD LTE, has been adapted to support Fixed Wireless and is effectively used today for Fixed Wireless by nbn. There is no specific standard for fixed wireless and many vendors like Cambium Networks, have developed the required Layer 2 protocols to support reliable Point to Point (PTP) and Point to Multipoint (PMP) services.

So fixed wireless should not be confused with mobile broadband and Wi-Fi services.

Some key attributes of Fixed Wireless:

- Low latency
- Layer 2
- Ability to be implemented with variable symmetry i.e., Asymmetric to emulate ADSL and LTE, symmetric to support business grade services or even with reverse asymmetry to support CCTV (Safe City initiatives) and other backhaul needs.
- Secure

### 3.3. WHY THE NEED FOR FIXED WIRELESS.

Fixed Wireless allows service providers to build backhaul (PTP) and last mile access (PMP) infrastructure in difficult to reach, remote or rural locations that do not have access to fixed line broadband. Licensed Microwave networks are able to achieve GB speeds and so too are Fixed Wireless last mile solutions.

Fixed Wireless is a proven solution for connecting the unconnected, when fiber or copper are not available, cost effective or feasible due to geography or cost.

Fixed Wireless is vital for helping to bridge the digital divide and this is gaining greater recognition and acceptance and will be further validated by 5G solutions.

### 3.4. WHY IS THERE NOT MORE FIXED WIRELESS?

Fixed Wireless has been largely ignored by Tier 1 carriers as they focused on high revenue services delivered by mobile broadband, and hence the focus has been on building the best possible 2G, 3G, 4G and perhaps soon 5G infrastructure. This will soon change as 5G will be deployed for both Fixed and Mobile applications.

There is currently no specific standard for Fixed Wireless, but for some time WiMAX (IEEE 802.16) was considered the standard. It was actually developed for both fixed and mobile broadband, but when LTE won the technology battle for mobile broadband, the drive and focus was to build mobile networks.

We suggest that the poor mobile experience and high latency of WiMAX stalled the deployment of Fixed Wireless.

Some reasons we believe why WiMAX was not a greater success:

- High latency of >30ms
- Limited bandwidth, as services were typically limited by paired FDD spectrum of 3.5MHz, 7MHz or at most but not often 10MHz channels
- So called WiMAX spectrum, was allocated in the 2.3 GHz and 3.3- 3.6 GHz bands, both of which are not ideal for having indoor CPE. So when WiMAX modems were placed indoor the service often suffered from poor performance and this coupled with high latency lead to the demise of many fixed wireless solutions in tier 1 carriers

Now also the bandwidth in many places was not coordinated for more suitable TDD solutions. Instead fixed wireless solution grew in leaps and bound in the 2.4 GHz and even more so in the 5 GHz ISM bands, driven by cost effective technology and entrepreneurial Wireless Services Providers (WiSPs) that grasped the opportunity to build networks to deliver broadband services in areas and regions that were not effectively served by Tier 1 Service providers.

With the end of life of WiMAX chipsets, other more suitable TDD, Fixed Wireless Solutions and technology, able to make use of the small amount of licensed spectrum available in the 3 GHz bands emerged.

In Australia the NBN is being built with Fixed TDD LTE in the 2.3 GHz and 3.5GHz and service coverage is being expanded from 4% to 6%.

Enterprises like some of the larger mining companies, and TMR QLD found value in the solution and started to build what were effectively early IoT networks.

### 3.5. LTE AND FIXED WIRELESS

We have seen proprietary dedicated Fixed Wireless solutions emerge from vendors like Cambium Networks, but the large telco equipment vendors, recognised the market opportunity to sell LTE as a standards base fixed wireless solution and we have seen TDD LTE emerge.

LTE is however layer 3 by design, requires a more complex enterprise packet core that adds cost, asymmetric by design and hence has some limitations vs lower cost more flexible non standards based solutions.

### 3.6. WHY THE NEED FOR LICENSED SPECTRUM FOR FIXED WIRELESS.

Almost all service providers prefer the certainty that licensed spectrum ensures, to be able to justify the investment in Fixed Wireless Infrastructure.

The remote and regional WiSPs were OK to deploy Fixed Wireless in unlicensed bands, typically 5.8GHz band. For the most part it has proven to be reliable and secure, but as some areas become more popular and more networks were built, congestion resulted and the need for licensed band for Fixed Wireless started to grow. Certain enterprise and industrial applications also cannot risk possible interference, so when the ACMA allocated the 3.55 GHz to 3.7 GHz band in 2009/10 the opportunities in the market started to grow due to the ability to build and invest with confidence

More and more the need for licensed spectrum has grown.

Fixed Wireless is now a proven and well respected solution for bridging the digital divide, but small service providers' just as large ones need the certainty and comfort offered by licensed spectrum for delivering interference free broadband services.

It is important, however, that the licensed spectrum for regional and rural areas remains cost effective to enable networks to be built and deliver the required services in underserved areas. Spectrum for IloT and ITS services in metro areas is also now required and so too does this spectrum need to be priced affordably as it is now in regional towns.

### 3.7. IN SUMMARY.

Fixed Wireless is playing an important role in bridging the Digital Divide all over Australia, as well as enabling key connectivity (IloT and ITS) solutions for enterprise, government and industry.

Everyone agrees that effective broadband is vital for a growing economy. Licensed spectrum for Fixed Wireless, whilst important, also needs to be cost effective to continue to drive broader acceptance.

It is important for Fixed Wireless to be treated separately from mobile broadband and Wi-Fi and that any desire to re-farm spectrum should take this into account. Special care and thought is specifically required for broadband internet in regional and remote areas. The opportunity to remove Embargo 42 and provide some licensed spectrum for ITS applications is now more necessary than ever.

The re-farming of the 3.6 GHz spectrum provides this opportunity. It is vital for industry, government and regional communities. The key role that WiSPs play in Australia, **MUST** be recognised and supported, just as they are being supported and recognised in New Zealand.

The overall social benefit of effectively used 3.6 GHz spectrum for BWA, massively overshadows a stringent carrier based spectrum licensing model.

#### 4. RESPONSE TO QUESTIONS SPECIFIC TO OPTIONS PRESENTED.

##### 4.1. SHOULD THE 3.6 GHZ BAND BE PROGRESSED FROM THE PRELIMINARY REPLANNING STAGE TO THE RE-FARMING STAGE IN THE ACMA'S PROCESS FOR CONSIDERING ADDITIONAL SPECTRUM FOR MBB SERVICES? WHY/WHY NOT?

Firstly the use of the term MBB needs to change. MBB clearly refers to mobile broadband and whilst fixed wireless is included in the definition it is lost by using this term. The ACMA needs to move forwards and start using a term that encompasses both Fixed and Mobile Wireless, perhaps WBB?

Cambium suggests considered and sensible thought needs to be applied to the proposed re-farming process of this band for the provision for 5G. The ongoing needs of the WiSPAU Community, mining companies in the current extended Area 3 and regional and rural councils and transport authorities' needs to catered for on an immediate and ongoing basis.

The best option would be to implement a dynamic spectrum sharing model, that catered for all needs ie Telstra to run 5G trials and possible 5G services in this band in Metro areas and removal of the embargo as soon as possible in the pink area. Ie Option 3a. To that extent perhaps the rush to re-farm this band should be considered more carefully and rather grant Scientific Licenses to Telstra and Vodafone to trial and validate 5G services in Metro areas. The band could probably be better used for IoT and Public safety CCTV more effectively in the medium and short term. There is no question in our minds that re-farming should NOT take place in the larger Area 3.

##### 4.2. DO THE AREAS IDENTIFIED IN THIS ANALYSIS COVER THE LIKELY AREAS OF HIGH DEMAND FOR ACCESS TO THE 3.6 GHZ BAND? WOULD SMALLER OR LARGER AREAS BE MORE APPROPRIATE? WHY?

No. We strongly propose that only the metro and, at most, the edge metro areas be included in the possible re-farming process. Although these areas have been embargoed since 2008 anyway. Demand for the 3.6GHz band is required across all areas, but the use cases differ and it is not a one size fits all. A dynamic shared spectrum model that will accommodate the current incumbents' regional and rural areas should be adopted.

##### 4.3. IF ANY PART OF THE 3.6 GHZ BAND IS RE-ALLOCATED FOR THE ISSUE OF SPECTRUM LICENCES IS SEVEN YEARS A SUITABLE RE-ALLOCATION PERIOD? IF NOT, WHAT PERIOD OF TIME WOULD BE APPROPRIATE?

If only Area 1 is considered, then this is not a factor. We strongly oppose issuing spectrum licensing for the greater Area 3 and even for Area 2. If in the extreme case this does occur, then 10-15 years would be more appropriate. Option 3a is considered best.

**4.4. SHOULD DIFFERENT RE-ALLOCATION PERIODS BE CONSIDERED FOR DIFFERENT AREAS? FOR EXAMPLE, SHOULD A LONGER PERIOD BE CONSIDERED FOR SERVICES OUTSIDE AREA 1?**

Yes, as per Q 4.4 above.

Yes, as per Q 4.4 above.

**4.5. ARE THESE GUIDELINES APPROPRIATE? WHY?**

No, these guidelines are not correct, if you agree that the highest value use assessment is incorrect for much of the defined areas. From a Cambium perspective, and the use of our products for Fixed Wireless Broadband access for enterprise and residential internet, for industrial IIoT applications and ITS applications in regional areas, we support very tight dynamic channel filtering, GPS Synchronization and Automatic Transmit Power Control (ATPC), that can ensure high density adjacent cells, effective channel re-used and no co-channel interference. Also our proposition is that all but metro and areas be made available for ongoing use of the 3.575 – 3.7GHz band for Fixed Wireless application based on current apparatus licensing and a Dynamic Spectrum Sharing model in the future. The possible issues seen for high density deployments do not apply and are only limited to a VERY small footprint.

**4.6. ARE THERE ANY OTHER ISSUES THAT AFFECT THE USABILITY OF AN AREA-WIDE LICENCE THAT SHOULD BE TAKEN INTO ACCOUNT WHEN DEFINING THE LICENCE AREA?**

The concept of an area wide license should only be an issue largely for the high density metro areas. The concept of a high area wide license should not be considered for the larger pink area that makes up the most of Area 3. Option 3a is hence a suitable approach.

**4.7. IF POINT-TO-POINT LICENCES ARE AFFECTED BY REPLANNING ACTIVITIES IN THE 3.6 GHz BAND, ARE THE OPTIONS IDENTIFIED FOR POINT-TO-POINT LICENCES SUITABLE? ARE THERE ANY ALTERNATIVE OPTIONS THAT SHOULD BE CONSIDERED?**

For us a Point to Point license in the current 3.575 to 3.7GHz band are similar to deploying an access point with a single CPE (Subscriber Module). They can be accommodated moving forwards via the apparatus license model and a DSS in the future. Given that we strongly propose the areas where these links are currently licensed should not be considered for re-planning or spectrum auction, this is a non-issue.

#### 4.8. IS THE 5.6 GHZ BAND A VIABLE OPTION FOR WIRELESS BROADBAND SYSTEMS?

No, the 5.6GHz band is not a suitable replacement at all, but consideration to making it available as additional spectrum should still be considered. Perhaps just as an addition to the current ISM band. The band is not ideal as 40MHz is too limited and would typically restrict the use to only one provider in any one location, driving up the value of such a limited amount of spectrum unnecessarily. The 3GHz spectrum is ideal for use in remote and regional areas as well, with much better propagation characteristic than 5.6GHz. 3.6GHz propagates further and also does well through trees in nLOS conditions the 5.6GHz band is definitely NOT a suitable replacement option.

#### 4.9. UNDER WHAT CIRCUMSTANCES SHOULD APPARATUS- AND CLASS-LICENSED ARRANGEMENTS BE CONSIDERED FOR THE 5.6 GHZ BAND?

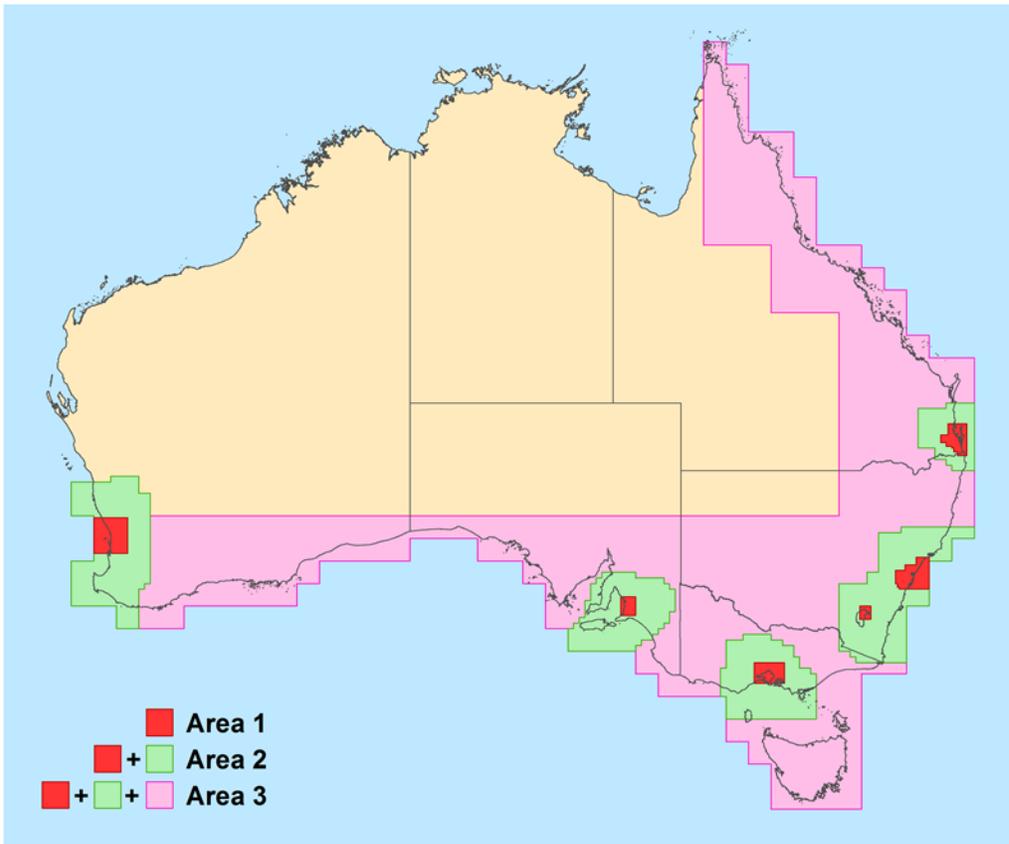
As per 4.8, it is not ideal as a replacement for the current 125MHz in the 3.6GHz band. It could well be made available as additional apparatus or class licensed spectrum. The most sensible would be adding it the current 5.4 and 5.8 class license arrangements, along with the 5.1 and 5.2 bands.

#### 4.10. IF APPARATUS LICENSING ARRANGEMENTS ARE DEVELOPED FOR WIRELESS BROADBAND SYSTEMS IN THE 5.6 GHZ BAND, ARE THE NOTIONAL ARRANGEMENTS PROPOSED IN APPENDIX 3 SUITABLE?

No, there is too little available bandwidth, it is not a suitable replacement for 3.6GHz as per 4.8 above.

#### 4.11. IF POINT-TO-MULTIPOINT LICENCES ARE AFFECTED BY REPLANNING ACTIVITIES IN THE 3.6 GHZ BAND, ARE THE ALTERNATIVE OPTIONS IDENTIFIED SUITABLE? ARE THERE ANY ALTERNATIVE OPTIONS THAT SHOULD BE CONSIDERED?

We really believe a suitable option can be achieved to meet both the needs of the larger service providers for use of the 3.6GHz band for 5GHz services in metro areas, and leave the allocation for WiSPs, Mining (Industrial IoT), ITS and Public Safety –CCTV application in regional and rural areas. Areas need to be carefully defined, but the current pink area should remain part of the apparatus license areas and be included in a DSS model in the future. Only Areas 1 and perhaps Areas 2 should be considered for spectrum licensing and as such the pink area in Area 3 should be released from Embargo immediately. I.e Options 3a and possibly 3b with some careful consideration or an inclusion of 4a to take into account IoT applications contemplated by 5G are catered for.



4.12. THE ACMA SEEKS COMMENT ON THE SUITABILITY OF THE CURRENT WEST COAST EARTH STATION PROTECTION ZONE LOCATED NEAR MINGENEW, WA, FOR LONG-TERM SATELLITE SERVICE USE. ARE THE CURRENT REGULATORY ARRANGEMENTS EFFECTIVE?

We see no issue with and accepting the limitation for use of the 3.6GHz spectrum in this zone.

4.13. IN THE EVENT FSS EARTH STATIONS ARE AFFECTED BY REPLANNING ACTIVITIES IN THE 3.6 GHZ BAND, THE ACMA SEEKS COMMENT ON:

- a. **Any issues surrounding the development and establishment of an east coast earth station protection zone; particularly on what factors would be necessary to make it an attractive option for earth station operations.**

No comment.

**b. Whether there are any views on potential candidate locations to consider.**

No comment

**c. Whether there should there be more than one earth station protection zone on the east and west coasts of Australia.**

No comment

**d. If the identification of a central Australia earth station zone should be considered.**

No comment

**4.14. ARE THE APPROACHES FOR AMATEURS, RADIOLOCATION SERVICES, CLASS-LICENSED DEVICES AND TVRO SYSTEMS SUITABLE?**

Yes, and especially as per our suggestion and the possible implementation of a DSS solution.

**4.15. ARE THERE ANY OTHER OPTIONS FOR INCUMBENT SERVICES, NOT IDENTIFIED IN THIS PAPER, WHICH SHOULD BE CONSIDERED?**

**No comment.**

**4.16. SHOULD ANY OF THE SHARING ARRANGEMENTS DISCUSSED IN THIS SECTION BE CONSIDERED FOR IMPLEMENTATION IN THE 3.6 GHZ BAND? WHY OR WHY NOT?**

Yes, this make good sense moving forward to create a model that includes the concepts of a DSS or LSA model. If an underlying Spectrum Access System is deployed then the current apparatus licensing model could be incorporated in that for the areas we propose are no included in a spectrum auctions. The metro areas could be included in such a model similar to the CBRS but adjusted for the local market and taking into account Optus already has a large 3.5GHz metro holding. The key however is to accept the proposed model in Option 3b needs to have the areas included changed to include Area 1 and or 2 at MOST. The WiSPAU Association is proposing such a model be developed.

**4.17. ARE THERE ANY OTHER SHARING ARRANGEMENTS THAT SHOULD BE CONSIDERED?**

Yes, only to understand that the “highest Value Use assessment” is not valid, the larger part of area 3 is not going to be used for Area based 5G licensing any time soon and the use of the spectrum for 5G IoT applications is BEST managed by the current Apparatus licensing model or a future DSS solution.

**4.18. ARE THERE ANY OTHER REPLANNING OPTIONS THAT SHOULD BE CONSIDERED?**

There are a good range of options, but Option 3a or a mix of 3a and 4a, seem to be the best options.

**4.19. WHICH REPLANNING OPTION SHOULD BE IMPLEMENTED IN THE BAND? WHY?**

Option 3a, as per reasons already discussed above.

**4.20. IN THE EVENT AN AREA-WIDE LICENSING OPTION IS IMPLEMENTED, IN WHICH OF THE DEFINED AREAS (THAT IS, AREA 1, 2, 3 AND AUSTRALIA-WIDE AS DEFINED IN APPENDIX 6) SHOULD THESE ARRANGEMENTS BE IMPLEMENTED? ARE THE CURRENT AREA DEFINITIONS APPROPRIATE? IF NOT, WHAT AREA SHOULD BE DEFINED?**

Area 1 only, as per Option 3a. The current embargo should be removed in the pink areas as soon as possible.

**4.21. IF OPTION 4A IS IMPLEMENTED, WHAT FREQUENCIES AND AREAS SHOULD BE RE ALLOCATED FOR THE ISSUE OF SPECTRUM LICENCES? HOW MUCH SPECTRUM SHOULD REMAIN SUBJECT TO SITE-BASED APPARATUS LICENSING ARRANGEMENTS? SHOULD DIFFERENT AMOUNTS BE CONSIDERED IN DIFFERENT AREAS?**

We do not see carving up the 125MHz of spectrum as a good option, but perhaps this may be an idea for the green parts of area 2, as limited 5G would be applicable so maybe only a couple of 10 or 20MHz bands could be allocated for 5G and the rest for WiSP, ITS and IoT use based on apparatus licenses.

**4.22. IF OPTION 4B IS IMPLEMENTED, WHAT FREQUENCIES AND AREAS (THAT IS, INCUMBENT APPARATUS LICENCE SERVICES) SHOULD REMAIN SUBJECT TO SITE-BASED APPARATUS LICENSING ARRANGEMENTS?**

Perhaps best taken care of by a DSS/LSA model....but the greater pink area needs to be allocated immediately back to for sale under Apparatus licensing.

**4.23. COMMENT IS SOUGHT ON THE ACMA'S PREFERRED OPTION (OPTION 3C) FOR THE 3.6 GHZ BAND.**

As discussed above we strongly believe the HUV model is not valid and hence Option 3c is not the best option. We propose Option 3a and based on more discussion and understanding of what 5G will offer and when Option 3b may be applicable. In any event, in the best interests of all the current embargo needs to be amended to not cover the pink area as soon as possible