



TELSTRA CORPORATION LIMITED

Submission to the ACMA's consultation on Replanning of the 3700–4200 MHz band

Public submission

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2 EXECUTIVE SUMMARY

Mobile traffic continues to grow exponentially, and consequently so does demand for mobile spectrum, especially mid-band spectrum. Forecasts showing growth in excess of 20% CAGR through to the middle of this decade are common and are driven by increasing adoption of augmented reality, gaming and business applications. To meet the growing demand, many jurisdictions internationally are planning to release more spectrum in this range for IMT, and we agree with the ACMA that given the changing demand profile for mid-band spectrum, the case for replanning the 3700-4200 MHz band is clear.

Since our submission to the ACMA's previous consultation on this band in September 2019, we have conducted further analysis and examination of domestic and global developments in the 3700-4200 MHz band. We now consider a full 300 MHz (3700-4000 MHz) can be reallocated to IMT on an exclusive spectrum licence basis in all six metro centres as well as in Hobart, and not only in four of metro centres as per our previous submission. We continue to recommend 100 MHz (3700-3800 MHz) be reallocated for IMT in regional areas.

The case for 300 MHz to be reallocated to IMT in all metro centres is underpinned by our view that Fixed Satellite Service (FSS) earth stations in the range 3700-4000 MHz in all seven capital cities can, over the course of the next 5 years, be retuned above 4000 MHz, or transitioned to other bands (such as Ku). Telstra is the largest licensee of C-Band FSS earth stations in Sydney with an aggregate 161 MHz capacity below 4000 MHz and are comfortable that it can all be retuned above 4000 MHz within 5 years and for a reasonable cost. Based on our situation, we think it should be possible for most or all earth stations below 4000 MHz to be retuned above 4000 MHz within 5 years. As such, we advocate for a modified version of the ACMA's preferred Option 3 from the consultation paper that reallocates a full 300 MHz (3700-4000 MHz) to IMT in all six metro centres and Hobart.

Another modification we propose to the ACMA's Option 3 is for PTP links used to support the supply of USO services be grandfathered for the duration they continue to be essential for the delivery of the USO services. We recommend 3.8 GHz band PTP links used for other purposes be transitioned to alternate bands (e.g., 6 GHz or 7 GHz bands) within a 4 year timeframe, and propose that some of the proceeds of a future price-based allocation of 3700-4200 MHz could be used as an incentive to defray the relocation costs and accelerate the transition of these links.

We recommend any price-based reallocation of the 3700-4200 MHz band (resulting from a Ministerial decision directing a reallocation) occur simultaneously with any spectrum that is reallocated from the 3.4 GHz band urban excise. This will ensure the shortest time to achieving large contiguous blocks of mid-band spectrum by ensuring all mid-band spectrum made available for reallocation is done at the same time, rather than across two separate price-based events. Finally, we also recommend the ACMA add to its five-year work program an optimisation (or 'restacking') exercise for the full n77/n78 band to maximise the utility of this spectrum



01 Introduction

We welcome the opportunity to comment on the ACMA's consultation paper *Planning options for the 3700–4200 MHz band* (IFC 22/2020). We strongly agree with the view of the Australian Communication and Media Authority (ACMA) that a clear case exists for reviewing, and potentially changing, the spectrum management framework in the band, and we support the allocation of up to 300 MHz of this band for exclusive IMT use in metro centres.

Subsequent to our submission¹ to the August 2019 consultation *Planning of the 3700-4200 MHz band* (IFC 27/2019) we have further considered the amount of spectrum in Sydney and Perth that can be reallocated to IMT. This work included analysing the levels of incumbency, potential for short-term coexistence, and latest international developments. We are now of the view that 3700-4000 MHz (a total of 300 MHz) of spectrum in Sydney and Perth should be reallocated to IMT; the same amount we previously recommended for the four other metropolitan centres. However, a longer reallocation period is required in Sydney and Perth to allow for the orderly transition of incumbent C-Band satellite services to higher frequencies in the band, or to other bands. We are now also of the view that 300 MHz can also be allocated to IMT in Hobart.

Our submission is structured as follows:

- Section 2 contains our case for an increased allocation of mid-band spectrum for IMT;
- Section 3 explains why we support a modified Option 3;
- Section 4 addresses other related matters including our thoughts on using auction proceeds to fund transition, timing for price-based allocation and optimisation of the entire 3400-4000 MHz band; and
- Appendix 1 contains our specific responses to the questions posed in the consultation paper.

02 Up to 300 MHz of the band should be reallocated for IMT

This section sets out the case for the reallocation of up to a further 300 MHz of mid-band spectrum for IMT based on increasing traffic demand (both near and longer term), a decline in the use of FSS and PTP links over the past 5 years, and reports from global organisations calling for increased mid-band spectrum for IMT.

Mobile network traffic increased during the pandemic

The Deloitte Access Economics' Mobile Nation series of reports² demonstrates the value that mobile networks deliver to Australia's economic prosperity, along with more intangible social benefits such as staying connected with family and friends, and access to real-time information on the go 'anywhere, anytime'. This has become even more obvious amid the COVID-19 pandemic. Transition to working-from-home (WFH) and the rapid increase of video-calling for business and with family and friends has been critical in enabling efforts to manage the pandemic both globally and in Australia by enabling people to stay in touch while at home. According to the June 2020 Ericsson Mobility Report, "*Previously, consumers have not fully embraced video calling as ... evidenced by a relatively low uptake in most*

¹ Available at: <https://www.acma.gov.au/consultations/2019-09/planning-3700-4200-mhz-band-consultation-272019>

² Deloitte Access Economics, **Mobile Nation 2019**. <https://www2.deloitte.com/au/en/pages/economics/articles/mobile-nation.html>



*countries. Now as many as half of respondents in a recently conducted consumer study [April 2020 after the start of the pandemic] claim they have increased their usage of video calls.*³

While it is reasonable to expect that during periods when people are largely confined to their homes, they will use Wi-Fi supplied from their fixed line (e.g. nbn) services, this is only true to the extent that people have fixed line services. Consumers who only use mobile have increased their consumption on the mobile network.

This is corroborated by a June 2020 OpenSignal report⁴ that shows double digit decreases in the mobile network speed consumers experienced during the height of the pandemic. As OpenSignal observe, “*We identified a number of drivers that have likely contributed to those speed drops, including increasing mobile data consumption, operators relaxing data limits, changes in the time and location of users’ mobile usage, as well as pre-emptive measures adopted by operators to ensure continuity of service on their networks.*”

Although the pandemic will not continue indefinitely, there is unlikely to be a return to pre-COVID norms after COVID restrictions are completely lifted. Businesses and institutions that had not previously fully embraced WFH practices have been forced to adopt them, and staff able to WFH have developed new habits. Many of the shifts in the way we work will remain, and the changes seen in mobile traffic demand will also remain.

Mobile traffic demand is forecast to grow

The GSMA Intelligence’s report *The Mobile Economy - Asia Pacific 2020*⁵ observes that “*Mobile data consumption in Asia Pacific will grow more than threefold by 2025, spurred by increased smartphone adoption and availability of affordable high-speed networks.*” This will see the 2019 average of 9.2 GByte per subscriber per month increase to an average of 28.9 GByte per subscriber per month by 2025; a CAGR of 21.0%. In some respects, this growth rate appears low in comparison to the historic CAGR shown in the Ericsson Mobility Report⁶, which shows that mobile network data traffic has grown globally at around 60% CAGR since 2014, however, the GSMA Intelligence forecast of 21% CAGR represents a more mature market than existed last decade and is consistent with Ericsson’s forecast of 33% CAGR through to 2025 for South-East Asia⁷.

As the ACMA also observes⁸, numerous countries are already investigating or making parts of the 3700–4200 MHz band available for Wide Area Wireless Broadband (WA WBB) or Local Area Wireless Broadband (LA WBB) applications. In part, these moves are driven by the developing IMT ecosystem for 3GPP NR band n77. As the GSA notes⁹ in its February 2020 update to the report **3300-4200 MHz: A Key Frequency Band for 5G**, “*The commercial availability of [n77 compatible] devices has arrived at an*

³ Ericsson **Mobility Report**, June 2020, p.5. <https://www.ericsson.com/en/mobility-report/reports/june-2020>

⁴ Opensignal. Second chart titled **Mobile Network Experience during the COVID-19 Pandemic**. Australia is shown on the top row. During weeks 14-16 of the pandemic, download speeds decreased by >10%. <https://www.opensignal.com/2020/06/08/mobile-network-experience-during-the-covid-19-pandemic-june-update>

⁵ GSMA Intelligence report **The Mobile Economy - Asia Pacific 2020**. Figure 9, p.16. https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/06/GSMA_MobileEconomy_2020_AsiaPacific.pdf

⁶ Ericsson **Mobility Report**, June 2020, Figure 15, p.17

⁷ Ericsson **Mobility Report**, June 2020, Figure 19, p.21

⁸ Replanning of the 3700-4200 MHz band, July 2020, p14-15.

⁹ GSA Report **3300-4200 MHz: A Key Frequency Band for 5G**, box on p.5 titled “Commercially Available Now”. <https://gsacom.com/paper/3300-4200-mhz-a-key-frequency-band-for-5g/>



unprecedented speed – only one year after the availability of the first 3GPP 5G-NR standard release – and over one third of them include support for the n77 and n78 bands.”

These insights into mobile traffic demand are important as they show a growing demand for terrestrial mobile capacity highlighting that Australia needs to urgently continue working on allocating more mid-band spectrum to meet this demand. The urgency is also driven by the need to allow time for re-stacking to create contiguous mid-band spectrum, as we describe further below.

While FSS and PTP use of the band is in decline

The opportunity to re-allocate parts of the 3700-4200 MHz band is also driven by declining use by FSS and PTP links. We agree with the ACMA’s observation that the number of FSS earth station registrations has continued to decline. Table 4 on p.11 of the ACMA’s 2019 consultation¹⁰ observed that 347 Earth Receive licences in June 2015 had declined to 255 by May 2019. This figure had further declined to 232 registrations by June 2020 according to Table 10 on p.60 of the current consultation paper. Similarly, we agree with the ACMA’s observation that the number of PTP links has declined. Table 3 on p.10 of the ACMA’s 2019 consultation observed the 190 PTP licences in June 2015 had declined to 103 by May 2019, which declined further to around 94 licences by June 2020.¹¹

Nevertheless, we recognise the demand for FSS earth stations and PTP links will not completely disappear and, as an ongoing user of this band for both FSS and PTP links, we forecast that demand for these two services has largely stabilised.

Minimum contiguous mid-band allocation per MNO

While the GSMA’s March 2020 update to its 5G Spectrum Positions¹² statement still shows that in the order of 80-100 MHz of contiguous spectrum per operator is recommended, other global associations are already starting to identify the requirement for even larger blocks of contiguous mid-band spectrum to be made available for Mobile Network Operators (MNOs) by the middle of this decade.

The GSA report **3300-4200 MHz: A Key Frequency Band for 5G**¹³ observes, “*At least 80–100 MHz contiguous blocks in the 3300–4200 MHz range are being made available per operator in several leading countries. This target should be achieved in all markets by 2020.*” However, the report goes on to say, the “*GSA believes that additional mid-band spectrum may therefore be required for MNOs in leading markets by 2023–2025; the 3300–4200 MHz range may represent a valuable opportunity in this respect.*” We support the GSA’s view on this matter and highlight the importance of mid-band spectrum to IMT for its optimal balance between coverage and capacity, as well as the ability to create large contiguous allocations for mobile network operators. Based on compound growth rate forecasts, we are of the view that by the middle of this decade, an allocation closer to 150 MHz per operator will be required, and in order to create the possibility of contiguous spectrum allocations, the option to facilitate a future restack of the entire 3.4-4.0 GHz band is required. Given the length of time required to achieve a restack after the allocation is completed, it is important that 3700-4000 MHz is reallocated in early 2023 (for alignment with reallocation of the urban excise – see section 4.2) to allow adequate time for the subsequent optimisation of the full n77/n78 band.

¹⁰ Planning of the 3700-4200 MHz band, August 2019.

¹¹ Based on count of unique licences for PTP links in 3700-4200 in the ACMA’s RRL, 11 Aug 2020.

¹² GSMA report **5G Spectrum Public Policy Position**, position #1, p.5.
<https://www.gsma.com/spectrum/wp-content/uploads/2020/03/5G-Spectrum-Positions.pdf>

¹³ GSA Report **3300-4200 MHz: A Key Frequency Band for 5G**, p.6 under the heading “Wide and contiguous channel assignments”. <https://gsacom.com/paper/3300-4200-mhz-a-key-frequency-band-for-5g/>



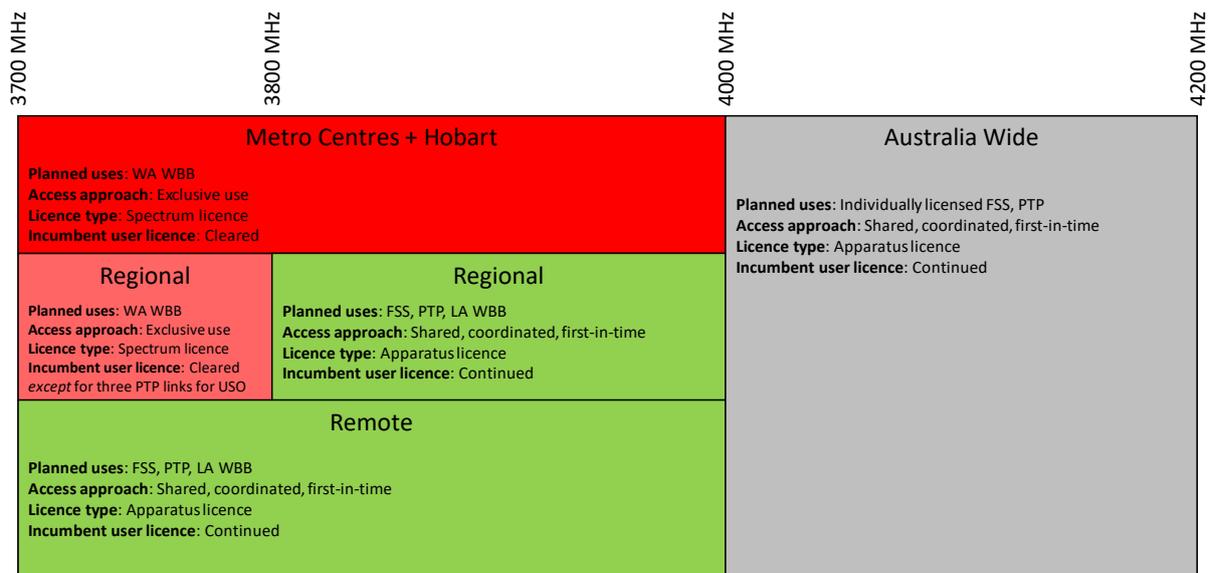
03 Our recommendation for a modified Option 3

The ACMA proposed three options for reallocation of parts of the 3700-4200 MHz band, and its preference is for Option 3 primarily because of the outcome of the cost-benefit analysis, as described in Appendix F of the consultation paper. We support the ACMA's preference of Option 3, with the following modifications:

- Exclusive spectrum licensing of an additional 300 MHz (3700-4000 MHz) in the six metro centres plus Hobart (red shading);
- Exclusive spectrum licensing of an additional 100 MHz (3700-3800 MHz) using the geographic areas defined by the 3.6 GHz band spectrum licensed geographies with three PTP links in the range 3700-3800 MHz excised from regional Victoria/Tasmania for the ongoing supply of USO services to King Island, Flinders Island and eastern Victoria (light red shading);
- Apparatus licensing elsewhere in the range 3700-4000 MHz (green shading); and
- No allocation for IMT above 4000 MHz Australia-wide (grey shading).

Our proposal for the modified Option 3 is illustrated in Figure 1 below.

Figure 1: Telstra's proposal for a modified Option 3



Before we provide greater detail on our proposal for a modified Option 3, we outline our support for the ACMA's planning outcomes and why we agree with the ACMA that Option 1 and Option 2 are not suitable.

3.1. Support for the ACMA's planning outcomes

The ACMA outlines a series of planning outcomes it wishes to achieve through the replanning of the 3700-4200 MHz band, and seeks comment on these outcomes from stakeholders. We support the ACMA's planning outcomes, although we remain concerned about the impact of class licensed building



material analysis and ultra-wideband (UWB) devices, and we offer some comments on point-to-point (PTP) links and Earth Station Protection Zones.

LIPD (Class Licensed) devices. In response to previous consultations^{14, 15}, we have noted our concerns related to class licensing of UWB ground and wall penetrating radar devices. It remains our view that such devices should be apparatus licensed, thus requiring them to be registered on the Australian Radiocommunications Register of Licences (RRL). While use of these devices will not be at one fixed location (hence, there is no point registering a site location for the operation of the device), a list of operators, with their city and state, authorised by apparatus licence to use such devices would be of assistance. Then, in the event interference is caused to our network, steps could be taken to identify the operator to address interference should it occur.

PTP links. We agree with the ACMA's planning outcome in relation to PTP links and note that twenty-six (26) existing links are used to support Universal Service Obligation (USO) services, including to King Island, Flinders Island and one in regional Victoria near Cann River. Importantly, many of these links are already combined with PTP links in other bands (e.g. 6 GHz) to provide frequency-redundant transmission links, and removal of 3.8 GHz links would mean critical USO services would not be able operate to the designed performance objectives.

Earth Station Protection Zones (ESPZs). We maintain our position described in our Nov 2017 submission¹⁶ to the Draft 3.6 GHz band Reallocation Recommendation consultation that where detailed studies for Earth Station Protection Zones (ESPZs) show that one or more proposed protection zones are unsuitable or not necessary, those zones expire no later than the seven year reallocation period for the regional area which was set for the 3.6 GHz band. This is to avoid unnecessarily locking 5G services out of these areas.

3.2. Views on the ACMA's proposed options

Option 1: We agree with the ACMA's assessment that Option 1 is suboptimal, as it inhibits the opportunity for innovative services to be deployed in **regional and remote** areas. The ACMA observes that Option 1 also inhibits innovative services in metro areas, however we are less concerned about this, as we discuss shortly. Further, the forced clearing of 3.8 GHz PTP links would mean that critical USO services would not be able operate to required performance objectives, undermining the quality of these services.

We observe a reasonable amount of discussion in the consultation paper on creating an allocation of spectrum for Local Area Wireless Broadband (LA WBB) for private deployment by wireless internet service providers (WISPs), miners, local government, campuses, factories and utilities. The ACMA observes¹⁷ that between 40 MHz and 100 MHz is desirable for each LA WBB operator. While some LA WBB operators may require bandwidth of this order, what we are concerned about is possible

¹⁴ Telstra submission to ACMA consultation IFC 27/2019, Planning of the 3700-4200 MHz band, p.14:
<https://www.acma.gov.au/consultations/2019-09/planning-3700-4200-mhz-band-consultation-272019>

¹⁵ Response #2 to ACMA consultation IFC 45/2018:
<https://www.acma.gov.au/consultations/2019-08/class-licensing-updates-supporting-5g-and-other-technology-innovations-consultation-452018>

¹⁶ Telstra submission to ACMA consultation on the Draft Reallocation Recommendation for the 3.6 GHz band, Nov 2017, available at: https://www.acma.gov.au/sites/default/files/2020-06/Draft%20reallocation%20recommendation%20consultation%20-%20submissions_1.zip

¹⁷ Replanning of the 3700-4200 MHz band, July 2020, p.57.



reduction in the utility of spectrum in metro areas should allocations of any quantum be made to small LA WBB operators such as university campuses or technology precincts. RALI FX-19 describes the coordination procedures between Broadband Wireless Access (BWA) operators in the 3575-3700 MHz band, and is likely to serve as a template for coordination between apparatus licensed LA WBB operators above 3700 MHz. FX-19 specifies a protection criterion of $I/N = -6 \text{ dB}^{18}$ at the receiving base station. In our experience as a mid-band spectrum operator, this sensitivity can be exceeded by co-channel base stations in excess of 95 km away (where 95 km is the maximum distance a spectrum licensee has to consider under section 4.9 of RALI FX-19). What this means is a small LA WBB operator (e.g. a university campus) operating at a power level of 1 W to cover the facility could still fall victim to a WA WBB operator (say a WISP running at a power level of 50-60 W) well in excess of 50km away and possibly as far as 100km away. When the radius the metropolitan areas of capital cities such as Melbourne and Sydney is only ~50km, a LA WBB located centrally could deny re-use of that part of the spectrum for very large portions of those cities.

We have no objection to allocations being made to LA WBB operators in regional and remote areas where mining operators or local councils acquiring spectrum are unlikely to cause denial to other potential users, as demand for spectrum is lower and hence there is no need to re-use the same frequencies in close proximity. In metro areas however, careful coordination between base stations is required to enable them to work in close proximity. MNOs overcome this challenge using a range of interference mitigation techniques such as power control, pointing angles and synchronisation. This is achievable where all the transmitters are owned and operated by the one entity such as an MNO, but may be vastly more challenging between university campuses, local councils and the like.

In short, we are concerned about proposals that would preserve an allocation for LA WBB use in metropolitan areas, as we consider this would prevent the spectrum reaching its highest value use where the available spectrum per person per unit area is low and the spectrum could otherwise achieve far greater utility and be better used to serve the entire metropolitan population through its allocation to a wide area network operator. In regional areas, where the demand for spectrum is lower and hence the need for close-proximity reuse of the same spectrum is not required, we support allocations for LA WBB use in the range 3800-4000 MHz.

Option 2: We agree with the ACMA's assessment that Option 2 will not provide WA WBB with the level of certainty of access to spectrum required to make investment decisions given that Option 2 only provides apparatus licences above 3700 MHz. We agree with the ACMA's assessment that Option 2 presents the least impact on current and future FSS services, however, as we outline in section 3.3.1, we are of the view that this is not of concern as FSS earth stations should be able to be retuned above 4000 MHz over the course of the next 3 to 5 years.

Option 3: We also agree with the ACMA that Option 3 (as presented in the consultation paper) offers the best outcome of all three options by meeting the Desirable Planning Outcomes and the goal of efficient allocation of spectrum by balancing the needs of all use cases including WA WBB, LA WBB, FSS and PTP.

However, as already mentioned, we recommend that modifications be made to Option 3 to further maximise the utility of this spectrum and allow it to achieve Highest Value Use.

¹⁸ RALI FX-19, Attachment 2a, Protection Criteria for 1900-1920 and 3575-3700 MHz band BWA receivers. Section 5.



3.3. Modifications to Option 3

We have outlined the high-level attributes of our proposal for a modified Option 3 at the start of section 03. In this subsection we go into further detail on the following attributes of our modifications:

- All FSS earth stations below 4000 MHz in metro centres can be cleared over a period of time;
- The Hobart geographic area should be defined to align with 3.4 GHz band licensed areas;
- Grandfathering of three specific routes for PTP links used to support USO services;
- No need for a mandated guard band to protect FSS above 4000 MHz.

3.3.1 FSS earth stations in all metro centres below 4000 MHz can be cleared

Based on the ACMA's Register of Radiocommunications Licences (RRL) as at 19 August 2020, Telstra is the largest licensee of C-Band satellite receivers in 3700-4200 MHz in Australia with 76 licensed services in Sydney and Perth; 56 of which are in the range 3700-4000 MHz as shown in Table 1 below.

Table 1: Telstra's and total aggregate C-Band FSS capacity in Sydney and Perth

Location	No. Telstra Licences	Telstra aggregate bandwidth between 3.6-4.0 GHz	All Licensees' aggregate bandwidth between 3.6-4.0 GHz
Sydney*	43	161.4 MHz	295.8 MHz
Perth*	13	35.8 MHz	178.6 MHz

* 100km Radius around CBD

In order to meet our modified Option 3 proposal, FSS services in metro centres in the range 3700-4000 MHz must be cleared (FSS in regional areas in the range 3700-3800 MHz must also be cleared, but this is less of a challenge). We have conducted preliminary analysis into ways in which this can be achieved, and it is our view that it can be facilitated through a combination of retuning within the C-Band above 4000 MHz as well as some transition to Ku-Band, all at existing geographic locations. This is unlikely to be achievable with today's available transponder capacity (especially C-Band capacity), however, we expect new satellites will come on-line in the next few years, making new capacity available. Future satellites will add localised spot-beams capacity (as opposed to global-beams) allowing for the same frequency to be reused in adjacent spot-beams. Further, new satellite deployments are likely to be "multi-payload", meaning they will service a wide range of bands rather than a single band, reducing unit costs per MHz, but also opening additional capacity in other bands such as the Ku-Band.

Unlike forecast traffic growth for IMT, it is our view that aggregate demand for satellite capacity forecast for the next several years will remain largely unchanged and that launch of new satellite capacity (C-Band and other bands such as Ku-Band) coupled with re-use of spectrum arising from a shift to narrower spot beams will meet ongoing demand including services migrated from 3700-4000 MHz including Sydney and Perth. FSS earth stations in other less-densely incumbered locations such as Melbourne, Adelaide and Hobart can easily be accommodated above 4000 MHz.

Importantly, this means that incumbent users of C-Band satellite capacity in the range 3700-4000 MHz will not have to physically relocate away from Sydney and Perth. The ACMA's cost-benefit analysis which estimates costs in the order of \$113m-\$281m for clearing that portion of the band, assumes that 70%¹⁹ of incumbent satellite FSS earth stations will need to physically relocate. It is our view (as the

¹⁹ Replanning of the 3700-4200 MHz band, July 2020, Table 18, p.94, and 50% in Table 24, p.101.



largest incumbent user of the band in the two most densely occupied locations of Sydney and Perth) that no physical relocation is required. This significantly alters the costs, especially for Option 1, as all earth station services at the 8 gateway locations and 19 individual service sites can simply be retuned. Using the ACMA's estimated project cost of \$300,000 each, this would estimate a total retuning cost of \$8.1m

With regard to TVRO and VSAT terminals, we support the ACMA's view that "*no case has been identified to provide protection to unlicensed TVRO services in the 3700–4200 MHz band*"²⁰. We also agree with the ACMA that one key use for VSAT terminals that must be protected is Australia's obligations to the Comprehensive nuclear-test-ban treaty organisation (CTBTO). VSAT terminals are used to communicate monitoring data from monitoring stations located periodically around the planet, often in remote locations. We observe that of the 26 CTBTO licences in the RRL, 24 are already in the range 4100-4200 MHz and do not need to be retuned and one is on Cocos Is (3773.15 MHz) and also does not need to be retuned as it is outside the regional defined areas where 3700-3800 MHz is being cleared. However, the final CTBTO VSAT terminal is in Canberra²¹, and will require retuning. Its bandwidth is 2.3 MHz, and we are of the view this can easily be accommodated in the range 4000-4200 MHz given its location.

3.3.2 Definition of the Hobart geographic regions

We propose that Hobart should be included as one of the "metro centres" where the full 300 MHz (3700-4000 MHz) should be reallocated to IMT. This creates minor complexity, as immediately below 3700 MHz, Hobart is just part of the Victorian/Tasmanian regional geography²², and carving out Hobart for spectrum licensing for all of 3700-4000 MHz means the regional geography for Vic/Tas for 3700-3800 MHz will not match the Vic/Tas regional geography immediately below 3700 MHz. However, we believe the opportunity for significantly more spectrum in a state capital city significantly outweighs any minor complications from having different spectrum areas for different segments of the band – something that already exists in any event between 3.4 and 3.6 GHz spectrum licences.

A decision on whether 3700-3800 MHz for Hobart is included as part of Vic/Tas regional geography or is included as part of a Hobart metro geography can wait for a future consultation, should this band proceed to a price reallocation. For this current consultation, we propose the Hobart metro centre for the range 3800-4000 MHz should be aligned to a precedent definition, for which the best example is spectrum in the 3.4 GHz band (3400-3575 MHz). We propose the definition for Hobart for 3800-4000 MHz should be based on Geographic Area 4, as per Schedule 1 of Licence 10498938/1.

3.3.3. Grandfathering three specific routes for PTP links used to support USO services

As already noted, Telstra uses PTP links in the 3.8 GHz band for the provision of USO services to King Island, Flinders Island and in eastern Victoria near Cann River. It is not possible to retune these links as they are used as frequency redundancy (i.e. paired with either 6 GHz or 7 GHz links²³) on the same route. Frequency redundancy is designed to improve resilience against temporary atmospheric effects that can result in disturbances or increase path loss which can affect one band to a greater extent than the other.

²⁰ Replanning of the 3700-4200 MHz band, July 2020, p.59.

²¹ RRL Licence number 10602799/1.

²² See Optus licence 10917462, https://web.acma.gov.au/rri/licence_image.extract_pdf?pLICENCE_NO=10917462

²³ King Island, see 6 GHz links as per licence 1936992/1 and 1924443/1; Flinders Island, see 6 GHz links as per licence 10408045/1 and 10408044/1; Cann River, see 7 GHz link as per licence 9850903/1.



These links need to be grandfathered for the duration they continue to be essential for the delivery of the USO services to ensure ongoing provision of the USO services. Importantly, channels 4-7 inclusive in the PTP channel raster²⁴ need to be preserved to support USO services. The centre frequency for each of the lower pairs for channels 4-7 are 3730 MHz, 3770 MHz, 3810 MHz and 3850 MHz. We propose that a geographic area equating to a 50km-wide channel (25km either side of the line of the route) be removed from the Vic/Tas geographic region for 3700-3800 MHz for each of these three routes.

3.3.4 No mandated guard band to protect FSS earth stations

The FCC decision²⁵ to clear C-Band FSS from 3800-4000 MHz in the USA includes the provision of a 20 MHz guard band in the range 3980-4000 MHz, to protect earth station registrants from harmful interference both during and after the transition (paragraph 58, p.30). We are aware of one study²⁶ that has investigated whether guard bands are required between spectrum allocated for outdoor IMT base-stations and FSS services. Interestingly, the study concludes that no guard band is required for small cell IMT base stations; only for macro base stations, based on their study assumptions such as requiring protection of I/N = -10 dB, 20m base station height, etc.

Nevertheless, we propose that a mandatory guard band is inefficient, as it presumes coordination cannot be achieved by other mechanisms such as managing power levels, antenna orientation or terrain shielding. Instead, we propose the first-in-time provisions is an adequate mechanism to ensure FSS earth station receivers operating above 4000 MHz are protected. An IMT operator wishing to use spectrum up to 4000 MHz is required to coordinate around pre-existing FSS earth receivers as per clause 3.8 of RALI FX-19. In the absence of a mandated guard band, an IMT operator has a range of options to utilise the upper part of this spectrum, including small cells (as per the Transfinite study just referenced), reduced power, orientation or other forms of shielding. This flexibility will realise the greatest utility for the edge of the band allocated to IMT.

3.4. Transition period

We consider transition for FSS and PTP links separately:

FSS Earth Stations: The largest consequence of our modified Option 3 is the clearing of FSS earth stations in the frequency range 3700-4000 MHz in Sydney and Perth, and of these two locations, Sydney is the most challenging. We propose a reallocation period in the order of five years for these locations. This is also the same reallocation period afforded to incumbent satellite licensees in Perth for the 3.6 GHz auction. The rationale for a reallocation period of this length is to allow for additional satellite capacity (above 4000 MHz) to come online to accommodate existing and future C-Band satellite demand in these cities.

PTP links. We propose a reallocation period of four (4) years for PTP links to transition to a different band (most likely the 6 GHz band), with financial incentives from the proceeds of a price-based allocation of spectrum in the 3700-4000 MHz range to be used to assist the costs of PTP operators who clear the band within the first two (2) years as an incentive for operators to meet the minimum

²⁴ See RALI FX-03, Appendix 1: Channel arrangements and assignments for the 3.8 GHz band, which conforms to ITU-R Recommendation F.635-7, <https://www.itu.int/rec/R-REC-F.635/en>

²⁵ FCC Report and Order of Proposed Modification. GN Docket Number 18-122. Available at <https://docs.fcc.gov/public/attachments/DOC-362358A1.pdf>

²⁶ Transfinite Systems. **Report for the GSMA on the mitigations required for adjacent channel compatibility between IMT and ubiquitous FSS Earth Stations in the 3.4 – 3.8 GHz frequency band.** August 2019. https://tslstorage.blob.core.windows.net/papers/Report_for_GSMA_on_3.4-3.8_GHz_Compatibility.pdf



reallocation period specified in the Radiocommunications Act. However, as we noted in section 3.3.3, PTP links used in the supply of USO services must be grandfathered for the duration they continue to be essential for the delivery of the USO services to ensure to operate to required performance objectives.

04 Other matters

4.1. Use auction proceeds to partially fund PTP transition

We consider the use of proceeds from a price-based allocation to partially fund the transition of PTP links that are not grandfathered. We do not offer a view on the use of auction proceeds for the transition of FSS earth stations.

PTP links. We propose that as an incentive to clear the band more quickly, proceeds from the auction could be used to help fund the transition costs for PTP links where that transition occurs within the first two years of the reallocation period. Assuming a Ministerial decision to designate spectrum in the range 3700-4200 MHz for reallocation could be achieved by the end of 2021 calendar year, the incentive to transition within 2 years could see most, if not all, PTP links cleared by the end of 2023. This would coincide well with a restack commencing in late 2023 or early 2024 (calendar year) so that optimal use of the new spectrum could be achieved by 2024.

For clarity, this incentive to transition within the first two year will not directly benefit Telstra as all PTP links operated by Telstra are used in the provision of critical USO services and are required to be grandfathered. Only other PTP link operators could be direct beneficiaries of early transition incentives. In terms of Telstra being an indirect beneficiary, spectrum licensed WA WBB operators as a whole will be an indirect beneficiary of earlier clearing of PTP links, as it will permit an earlier restack of 3400-3800 MHz in regional areas, as we discuss in section 4.3 below.

4.2. Reallocation should occur at the same time as the ‘urban-excise’ spectrum

Table 11 in the draft FYSO 2020-24²⁷ currently contains no timing indication for a price-based allocation of spectrum in the range 3700-4200 MHz. However, in the row immediately above related to the 3.4 GHz “urban excise”, the ACMA notes “*The allocation of any additional frequencies and areas designated for spectrum licensing could occur in first half of 2023*”, which we agree with and support.

We propose the allocation of spectrum in the range 3700-4200 MHz could be combined with the allocation of any 3.4 GHz “urban excise” spectrum (both subject to Ministerial designation decisions) to create a single allocation exercise encompassing the n78 / n77 bands. Reallocating all spectrum through a single exercise is the quickest route to facilitating a restack of the band, which is important for achieving contiguous spectrum for MNOs in the band.

²⁷ FYSO 2020-24, Table 11 p.73. https://www.acma.gov.au/sites/default/files/2020-04/FYS-2020-24_Consultation-draft.docx



4.3. The entire 3400-3800/4000 MHz band should then be the subject of a restack

The spectrum efficiency benefits as well as the ability to enable high throughput 5G applications arising from contiguous blocks of spectrum are well understood²⁸, and in section 02 of our submission (under the heading **Minimum contiguous mid-band allocation per MNO**) we provided references to GMSA and GSA reports that also highlight the need for contiguous mid-band blocks of spectrum for MNOs. While the optimisation²⁹ of the 3400-3575 MHz band has gone some way to achieving this goal, further work is required.

As a part of the overall replanning considerations for the 3700-4200 MHz band (this current consultation) we recommend the ACMA include on its future work program, a restack of the n78 (3400-3800 MHz) and where appropriate the n77 (3300-4200 MHz) bands. This activity does not currently appear in the section of FYSO 2020-24 on Optimisation (p.56 of the Draft FYSO) so we recommend it be added. More detail can be found in our submission to the Draft FYSO 2020-24, and we propose the timing of the restack can occur from late 2023 after any price-based allocations have concluded. Obviously, any restack proposal is subject to appropriate consultation with licensees.

²⁸ A good resource is CEPT ECC Report 287, available at <https://docdb.cept.org/download/3a143dbe-7cbc/ECCRep287.pdf>

²⁹ <https://www.acma.gov.au/consultations/2019-08/optimising-3400-3575-mhz-band-consultation-122019>



Appendix 1: Answers to consultation questions

This appendix contains our answers to the specific questions asked by the ACMA in the consultation.

1. Comment is sought on the case for action and desirable planning outcomes for the 3700–4200 MHz band, including the supporting information at Appendices A, B and C.

Section 02 in the body of our submission sets out our views on the ACMA's case for action including details of: increasing traffic demand (both near and longer term); declining use of FSS and PTP links; and reports from global organisations calling for increased mid-band spectrum for IMT.

Section 3.1 in the body of our submission contains three comments on the ACMA's planning outcomes.

With respect to **Appendix A: Summary of respondent positions to the August 2019 consultation Planning for 3700-4200 MHz**, we note that our position in relation to incumbent FSS earth stations has evolved since last year's consultation. We are now of the view that the full 300 MHz (3700-4000 MHz) can be reallocated to IMT in Sydney, Perth and Hobart. Further details are in section 03 in the body of our submission, and we have no further comments on the Appendix A, other than to say it is a thorough appraisal of the submissions, and we thank the ACMA for taking the time to carefully review all the submissions it received.

With respect to **Appendix B: Domestic Considerations**, we have some concern that small LA WBB operators (e.g. a university campus, factory, technology park or a utility) wishing to deploy LTE or 5G technology in a small localised area could create spectrum denial for a considerable surrounding area (several tens of kilometres) by being a co-channel victim receiver to another LA WBB (or WA WBB) operator. We explain how this is possible in section 3.2 in the body of our submission and how denial of access to spectrum undermines the utility of the spectrum. In relation to Table 9 in Appendix B, we acknowledge there is stated demand for 120-300 MHz spectrum for LA WBB in metro areas, however, we would be extremely concerned if spectrum was reserved for LA WBB in metro areas due to the risk that a single small player could cause unacceptable levels of denial of access to valuable spectrum. In regional and remote areas we do not have the same concern, and we would not object to 3800-4000 MHz being purposed for LA WBB use, co-primary with FSS use.

We also support the ACMA's statement³⁰ that it is not specifically proposing to use Dynamic Sharing Access (DSA) in 3700-4200 MHz, commensurate with its decision in the May 2020 paper titled *New Approaches to Spectrum Sharing – Next Steps*.

With respect to **Appendix C: Technical issues**, we support the ACMA's proposed approach to use RALI FX-19 as the basis for developing technical coordination arrangements for parts of the 3700-4200 MHz band reallocated to WA WBB operators, and agree with the use of techniques such as the device boundary condition approach for co-channel coordination with LA WBB. Our views that where fallback synchronisation is required between a device operated by a spectrum licensee and a device operated by an apparatus licensee (including under an AWL), the spectrum licensee should be able to select the frame pattern. This is to avoid elevating the apparatus licensee to the same level of rights in resolving interference issues.

³⁰ Replanning of the 3700-4200 MHz band, July 2020, p.58



The ACMA also offers a view on coordination between FSS and WBB and notes that pending any changes to the arrangements for the 3700-4200 MHz, the assumed filter performance characteristics of FSS earth stations in the Receiver RAG may need to be reviewed, and an update to RALI FX-19 may be required. We agree with this observation and the proposed approach. We have also noted in section 3.3.4 in the body of our submission that we believe a guard band is not required between WA WBB (IMT) and FSS earth stations, and have set out the reasons why we believe it is better to have a flexible range of options to mitigate interference issues, rather than a single mandated approach that may unnecessarily deny access to otherwise usable spectrum.

We offer no views on the technical arrangements for compatibility with radio altimeters operating in 4200-4400 MHz.

2. Comment is sought on the proposed options, including appropriate values for frequency segment breakpoints as well as any alternative options.

We propose a variation to the ACMA's preferred Option 3 as follows:

- **Six defined metro centres plus Hobart:** We propose the reallocation of 300 MHz (3700-4000 MHz) to IMT. It is our position that FSS services can be adequately accommodated in 4000-4200 MHz, and that there is no requirement to reserve a guard band below 4000 MHz, as protection can be achieved through first-in-time provisions given the co-primary status of FSS and IMT in 3700-4200 MHz in the ARSP.
- **Regional areas:** We propose the reallocation of 100 MHz (3700-3800 MHz) to IMT using the geographic areas defined by the 3.6 GHz band spectrum licensed geographies (except for a metro Hobart carve-out). Above 3800 MHz, we propose apparatus licensing using AWLs for IMT. This would allow C-Band FSS Earth stations to use 3800-4000 MHz in regional areas, and for Wireless ISPs (WISPs) to also use 3800-4000 MHz in regional areas either using P-MP apparatus licences or AWLs.
- **FSS reallocation period:** We propose a five-year reallocation period for FSS earth stations to clear the band below 4000 MHz in the six metro centres and Hobart, and/or clear the band below 3800 MHz in regional areas.
- **PTP reallocation period:** We propose 4 years, with financial incentives using the proceeds from an auction for PTP operators who clear the band within the first two years. PTP links used to supply USO services must be grandfathered for the duration they continue to be essential for the delivery of the USO services.

The full details of our proposed modified Option 3 are set out in Section 03 of our submission.

3. Comment is sought on possible variations to the proposed options and implementation considerations.

The ACMA proposes variations to its three options similar to those we proposed in our response to the August 2019 consultation on Planning of the 3700-4200 MHz band. In particular, the variation to the options is to make spectrum available to either 3900 MHz or 4000 MHz for exclusive licensing only in Brisbane, Canberra, Melbourne and Adelaide, thereby leaving spectrum above 3800 MHz in Sydney and



Perth available for FSS on an ongoing basis while simultaneously maximising the spectrum available for IMT in other capital cities.

We are now of the view that reserving spectrum above 3800 MHz in Sydney and Perth for FSS earth stations is no longer required, as it is now our view that FSS earth stations in Sydney and Perth can be retuned above 4000 MHz over the next five years, facilitated by the likely launch of new satellites with greater localised spot beams and multi-band payloads. We expand further on our views as to how this is possible in section 3.3 in the main body of our submission.

4. Comment is sought on the discussion and outcomes of the assessment of options, including the cost benefit analysis and its assumptions. This includes any evidence for the value placed on the band for WBB and FSS use.

We appreciate the effort the ACMA has gone to in order to develop the quantitative cost benefit analysis, and the discussion on the outcomes of the analysis. The ACMA's logic and rationale on the whole seems reasonable to us, and we think elements of the approach such as using the estimated value of the spectrum to WA WBB operators as a proxy to indicate the public interest value of the spectrum is reasonable.

In the list below we make a few brief observations about some of the input assumptions for the ACMA's consideration.

- Option 1, Table 18, p.94. The ACMA uses an assumption that 70% of FSS earth stations in the range 3700-3900 MHz require physical (geographic) relocation. Our analysis predicts that this is not the case, and that within the next five years, it should be possible for all FSS earth stations in metro centres to retune to frequencies above 4000 MHz without physical relocation.
- Option 1, Table 19, p.94. The ACMA is using \$100,000 as the cost for a PTP link to transition to a new band. This may represent the just the capital cost, as based on our experience, the fully loaded costs including design, planning, labour and ancillary costs is closer to \$300,000 per link.
- Option 3, Table 24, p.101. The ACMA uses an assumption that 50% of FSS earth stations in the range 3700-3900 MHz require physical (geographic) relocation. As per comment above, our analysis shows no relocation is required.
- Option 3, Table 25, p.101. As per comment above, we propose the transition costs per link are closer to \$300,000 each.

5. The ACMA invites comment on its preliminary preferred option.

Throughout our submission we have provided our views on our proposed modification to the ACMA's preferred Option 3, and we won't restate those views here. In our response to question 5, we simply outline the key concerns we would have should the ACMA proceed with Option 3 as currently defined in the consultation paper. Those two concerns are:

- Option 3 includes Australia-wide access (therefore including metro areas) to spectrum above 3800 MHz for apparatus license LA WBB. We believe this creates an unacceptable risk that the



portion of the band reserved for this purpose in **metro** areas will result in the spectrum not reaching its highest value use (greatest utility). We have no concern about an arrangement for access to spectrum for apparatus licensees above 3800 MHz in regional or remote areas;

- The inefficient use of 3800-4200 MHz for FSS earth stations also denies the opportunity for the spectrum in 3800-4000 MHz in metro centres to reach its highest value use.

As a final observation, under either the ACMA's Option 3 or our proposed modified Option 3, apparatus licensed LA WBB would be able to operate in 3800-4000 MHz in regional and remote areas (albeit with the need for LA WBB to coordinate around incumbent FSS operators). As such, there should be no need to accommodate LA WBB operators in 3400-3575 MHz in regional areas, which should be factored into future band planning considerations for 3400-3575 MHz in those areas.