COMMUNICATIONS ALLIANCE LTD

AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY

FUTURE USE OF THE 1.5 GHZ AND 3.6 GHZ BANDS

INITIAL INVESTIGATION OF THE 1427–1518 MHZ AND 3575–3700 MHZ BANDS FOR MOBILE BROADBAND SERVICES DISCUSSION PAPER

COMMUNICATIONS ALLIANCE SATELLITE SERVICES WORKING GROUP SUBMISSION

NOVEMBER 2016

TABLE OF CONTENTS

INTRODUCTION

The Communications Alliance Satellite Services Working Group (SSWG) welcomes the opportunity to provide this submission in response to the *Future use of the 1.5 GHz and 3.6 GHz bands - Initial investigation of the 1427–1518 MHz and 3575–3700 MHz bands for mobile broadband services* Discussion Paper by the Australian Communications and Media Authority (Discussion Paper).

Executive Summary

Communications Alliance recognises the important role of the ACMA in its functions of spectrum planning for Australia, managing a limited resource that has significant economic and social value. Communications Alliance has worked closely with the ACMA in recent years, reviewing various spectrum bands, and more recently the Spectrum Review and the Mobile Broadband Strategy, acknowledging the considerable work by the regulator and industry in getting discussions to this stage.

The primary focus of the Discussion Paper is to canvass whether the ACMA should progress the 1.5 GHz and 3.6 GHz bands to the preliminary re-planning stage of the ACMA's process for consideration of additional spectrum for Mobile Broadband (MBB) services. This discussion is of paramount significance to many of the members of the SSWG.

The SSWG understands the arguments being presented in the Discussion Paper and is keen to engage with the ACMA in a number of areas where the SSWG feels further consideration will benefit the outcomes.

First, the SSWG believes the ACMA would benefit from a recalibration of its assessment as to how radio access technologies will support the next generation of connectivity with the advent of 5G and the Internet of Things (IoT). The ACMA should recognize the broader 5G ecosystem, which will include not just advanced MBB technologies, but also Wi-Fi, fixed wireless access, and the fibre, microwave and satellite backhaul necessary to support and extend these high-capacity systems.

Secondly, the SSWG acknowledges the principle of allocating spectrum to the highest-value use, but would point out to the ACMA that this concept extends beyond the quantifiably economic to 'those costs/benefits that are more intangible and harder to quantify.'[1] The social and economic value of incumbent users in these bands need to be recognised, weighed and accommodated vis-à-vis the potential new users of the spectrum.

The SSWG also wishes to take the opportunity to revisit the proposed replanning timetable, some of the assumptions being made and draw the ACMA's attention to the technical arguments which need to be considered.

The SSWG strongly recommends that the review of the two bands be decoupled from each other, with the1.5 GHz band considered first and the 3.6 GHz band considered later, at a time when there is greater clarity around user demand and in spectrum management issues.

The SSWG observes that the having Embargoes 42 and 70 in place for a number of years has artificially suppressed demand, with the result that actual demand for satellite capacity in these bands is now unknown. The SSWG recommends that as a part of the replanning

[1] see 'Appendix C—Preliminary assessments of the highest-value use of the 1.5 GHz and 3.6 GHz bands' of the Discussion Paper. Page 58.

processes that these Embargoes be revised following the completion of the planning process.

The format of the SSWG response presented in this submission is in two parts. The first section provides general commentary on the Discussion Paper. This is followed by a detailed response to the twenty-six questions posed in the Discussion paper.

Communications Alliance is aware are that a number of its members, including Telstra, Optus, Intelsat, Inmarsat and Foxtel will be providing their own submissions. We understand that the interests of our members in these bands will not necessarily concord and hence this submission has been developed to present the views of the satellite services sector through the SSWG.

In particular Telstra does not support the view of some other SSWG members that the 1.5 GHz band should be prioritised ahead of the 3.6 GHz band. Telstra believes that 3.6 GHz should be prioritised ahead of 1.5 GHz and moved immediately to the next stage of planning, on the basis that 3.6 GHz is a key band for launching 5G technology in Australia and globally. To avoid any delays, the review of the remainder of the 3.4-3.7 GHz band should be conducted in parallel with the planning for the 3.6 GHz band. Telstra also disagrees with the view of some other SSWG members that unlicensed C-band television receive-only TVRO terminals should be authorised (but without protection) as such authorisation is unnecessary (noting that alternative streaming options over the internet are available) and would risk hampering the replanning and future allocation of the 3.6 GHz band.

About Communications Alliance

Communications Alliance is the primary telecommunications industry body in Australia. Its membership is drawn from a wide cross-section of the communications industry, including carriers, carriage and internet service providers, content providers, equipment vendors, IT companies, consultants and business groups.

Its vision is to provide a unified voice for the telecommunications industry and to lead it into the next generation of converging networks, technologies and services. The prime mission of Communications Alliance is to promote the growth of the Australian communications industry and the protection of consumer interests by fostering the highest standards of business ethics and behaviour through industry self-governance. For more details about Communications Alliance, see http://www.commsalliance.com.au.

SCOPE OF REVIEW

The SSWG recommends that the review of the 1.5 GHz and 3.6 GHz spectrum bands should be delinked and considered separately. Each of these two bands has its own distinct characteristics, radio technologies, and regulatory history, and there is no advantage to considering them both together.

In the case of the 3.6 GHz band, the SSWG recommends that the investigation should be extended at the outset to the broader frequency range of 3400 MHz to 3700 MHz band. It is understood that this is the intention of the ACMA spectrum planning in the longer term. Considering the broader frequency band initially will lead to efficiencies and better outcomes.

The SSWG also recommends that any review undertaken needs to be specific to the individual sub bands.

PREPARING FOR THE FUTURE: 5G, MOBILE BROADBAND, AND THE BIGGER PICTURE

The SSWG recognises that spectrum usage into the future will be shaped by a developing 5G vision and its profound effects across a wide range of industry sectors and consumer applications and services. However, the Discussion Paper appears to rest on an hypothesis which is tied primarily to a mobile broadband (MBB) strategy. This is not coupled well with the observations in the ACMA *Five-year spectrum outlook* [2] which depicts a much broader picture.

This broader and more accurate picture is one which also includes large-scale machine-to-machine transactions and the disruptive force of the Internet of Things (IoT), together with how these apply to verticals beyond just communications and entertainment. These other verticals include transport, education, energy, health and the interconnected concept of Smart Cities.

In terms of technology and services, 5G technology will not just be used for MBB, although that is its primary purpose. It is expected that 5G technology will also be Integrated into Wi-Fi hotspots and fixed wireless access applications. As well, satellite developments will play an integral role in the 5G ecosystem by, for example, providing or extending connectivity to places not economically, realistically or adequately served by terrestrial technologies.

New satellite systems are being introduced or developed and these are overturning the old assumptions of speed, capacity, and latency. High Throughput Satellite (HTS) systems use multiple beam arrangements and advanced ground infrastructure to give speed and capacity comparable to terrestrial technologies.

IPStar, NBN, Inmarsat Global Xpress, Intelsat EPIC, Kacific and SES-12 satellites are all examples of HTS systems in geostationary satellite orbit (GSO) that have been or will be deployed soon in Australia or the broader Asia-Pacific region. In addition, O3b and OneWeb are examples of low-latency HTS systems in non-geostationary satellite orbits (NGSO) that have been or will soon be deployed. All of these developments have the attraction of instant coverage and cost effective broadband terminals.

Future satellite systems will continue to be multiband, typically involving C-, Ku- and Ka-bands. With respect to C-band, the satellite industry is bringing further innovation to the

[2] ACMA Five-year spectrum outlook 2016–20: The ACMA's spectrum management work program, October 2016

band, as well as the heavy use which exists. The deployment of C-band HTS payloads (e.g. Intelsat IS-33e, IS-35e and spreading throughout the global fleet) – which operate as low as 3625 MHz in the case of IS-35e – will allow for increased efficiencies for services and applications, significant improvements in spectrum re-use, cost reductions for connectivity, and they support of the introduction of new services and applications (including IoT and M2M for fixed and mobile).

Satellite networks will also continue to evolve with increased throughput (Tbps) utilising more powerful spacecraft and use of higher frequencies (such as Q/V bands), thereby reducing the cost per bit of data communications. Satellite technology can also help relieve congestion and overloading of networks and, when integrated into 5G systems can support a resilient 5G network and ensure connectivity in times where terrestrial networks are unavailable. Lower frequency band satellite services are ideal for high reliability and mobility applications including safety services.

For these reasons, the spectrum requirements for satellite services should be appropriately weighted and considered within the spectrum solutions designed for next generation broadband networks in diverse deployment scenarios.

The SSWG suggests that the ACMA adopt a more holistic assessment in its analysis which involves a range of services and technologies beyond terrestrial mobile broadband. It would short-change future developments in Australia to not have a program of spectrum allocation and assignment which responds to multiple service needs.

HIGHEST-VALUE USE

The SSWG suggests that the intention of analysing the use of spectrum according to the highest-value use needs some adaptation to make it relevant to the incoming environment. Traditionally the ACMA has institutionalised its methods and performed analysis based on economic orthodoxy, leading to the evaluation of the most proficient service use of spectrum – in economic terms. This has two problems:

- Other applications and services do not lend themselves easily to comparison on an economic basis, and the ACMA has yet to find a convincing framework of analysis. In the meantime, other legitimate value may be in the process of being destroyed.
- The intersecting and interdependent services of the future broadband environment will be compromised by analysis which leads to single service choices of the use of frequency bands. A more realistic approach needs to accommodate sharing of these interdependent services.

The ACMA itself recognises, however, that its analysis should include 'costs/benefits that are more intangible and harder to quantify.' The SSWG proposes that, at the very least, the ACMA include in its 'highest-value use' analysis the following 'intangible' in order to take a more holistic and dynamic view of its spectrum management role – specifically, the 'highest-value uses' of spectrum should be those that ***maximise the utility of spectrum for the realisation of complementary services and technologies which contribute to the complex developing eco-system***. With such a basis for consideration, the administrative role of the ACMA would better address cross-industry needs and overall market growth in the telecommunications sector.

Equally, social benefits need to be taken into account when estimating highest-value use in addition to economic benefits. The Discussion Paper gives only cursory consideration to social value in the decision making on the future of spectrum allocation and assignment. Social value from satellite services in the 1.5 GHz and 3.6 GHz bands are significant and should be taken into consideration by the ACMA when considering the comparative benefits in more detail. These benefits include but are not restricted to:

- maritime distress – SOLAS (safety of life at sea).
- fleet monitoring for the Australian Search and Rescue Centre.
- secure communications for the Australian Defence Force.
- fishing agent management.
- ship position monitoring – in/out of fishing areas, duration and tracking for State fishery departments.
- ship position information for national security and maintaining exclusion zones.
- provision of services for national security agencies such as ASIO.
- aeronautical services for SITA including Air Navigation Services and Flight Deck Management.
- communications to remote areas of Australia, often where the is no terrestrial alternative, for homes and business users.
- weather monitoring by the Australian Bureau of Meteorology.
- disaster relief and recovery.

REPLANNING TIMETABLE

The SSWG reluctantly acknowledges that there is a case to proceed to the next phase of spectrum re-planning for both the 1.5 GHz and 3.6 GHz bands at this point in time. Nevertheless the terms and conditions of the replanning need to be closely considered and the ACMA needs to present a convincing strategy, transition and sharing concepts which do not destroy existing value in the pursuit of achievement of highest value.

The SSWG firmly believes that the review of the 1.5 GHz and 3.6 GHz bands should be decoupled from each other and for each band to be subject to its own review in its own timeframe. Of the two bands, the *ACMA Work Plan 2016-17* in the ACMA *Five-year spectrum outlook* only lists a project for the 1.5 GHz band (Page 43) and as a high priority with a completion date of late 2017/early 2018. This suggests that the ACMA has already considered separating these two reviews, an approach that the SSWG supports. The SSWG observes that these bands provide different satellite services, use quite distinct technologies, and provide limited opportunity for substitution with each other.

In relation to the timing of the investigation of two bands, however, SSWG members have differing priorities as to the order in which the two bands should be investigated.

The MSS operators using the 1.5 GHz band (including Optus) on the SSWG recommend the ACMA focus on the 1.5 GHz band initially and set aside consideration of the 3.6 GHz band until such time that there is further clarity around user demand (which will be evident from terrestrial deployments in the 3.4 to 3.6 GHz band), and in any outstanding technical aspects of spectrum management as WRC-19 approaches. The 1.5 GHz band is likely to be a more tractable problem that can be resolved more quickly because the compatibility issues in Australia relate mostly to out-of-band interference into MSS downlinks. The 3.6 GHz band will likely be a more difficult problem that involves both in-band sharing and out-of-band interference mitigation, and should ideally be addressed together with the adjacent 3.4 to 3.6 GHz band.

As noted earlier in our response under 'Scope of Review', the SSWG sees a real benefit for any investigation by the ACMA to address the wider band from 3.4 to 3.7 GHz. Recognising that there would potentially be a time impost with this approach, the SSWG feels that it

would be offset by benefiting from better informed studies and being able to resolve the wider spectrum band in one process.

In addition, it would make more sense to re-set the objectives and re-start with a broadened range of investigation of the 3.4 to 3.7 GHz band, rather than perform two reviews in succession.

Telstra, on the other hand, recommends that the 3.6 GHz band should take precedence over the1.5 GHz band as it believes this band will be the first band to launch 5G technology, both globally and to Australia. Although the channel plans for the 1.5 GHz and 3.6 GHz bands are largely settled for most countries, ITU-R WP 5D is not planning to make its final approvals until October 2017 for 3.6 GHz and June 2018 for 1.5 GHz. So it is expected that the channel plan for 3.6 GHz band will be approved prior to 1.5 GHz. This is another reason why Telstra believes that the 3.6 GHz should be progressed ahead of 1.5 GHz.

The challenge for the ACMA is to strike a balance between fully understanding market needs and the vision of the future, acting with agility, taking account of international studies in the ITU and other international bodies, and vendor realities. In considering the timing of regulatory change in Australia, the ACMA needs to explain to industry the risks/costs and the basis of its judgement in a transparent manner.

TECHNOLOGY SOLUTIONS

The SSWG suggests that the ACMA should rely closely on industry and market opinions and developments when developing decisions on technology solutions such as duplex arrangements.

In both bands under consideration a move to the proposed re-farming proposals should be significantly influenced by consideration of potential in-band and adjacent band effects on incumbents.

The SSWG suggests that due consideration be given to all mechanisms to provide the appropriate safeguards for in-band sharing between incumbents and new users (e.g. power limits, separation distances from FSS receivers) and in managing adjacent band interference, e.g. the use of out-of-band emission masks, guard bands and separation distances.

The SSWG wishes to draw attention to the existing regime in place since 2009 for 3575 to 3710 MHz for C-Band receive and point-to-point wireless in remote Australia, which employs co-frequency sharing, separation distances and protection from out-of-band emissions. This was triggered by the mining industry interests who wished to use Wi-Fi at sites next to their earth receive station.

The SSWG also recalls that in 2006 the spectrum planning area of the ACMA sent out a notice to all C-Band licence holders forewarning changes in the future, including moving satellite earth stations, a precursor to the concept of satellite parks flagged in 2009. The industry has always been opposed the idea of satellite parks for the reasons provided in previous submissions. Operators are either not in a position to relocate earth stations or to find alternative means of delivery. In addition, the costs would amount to many millions of dollars in capital expenditure including establishing terrestrial communication links to the major cities.

EMBARGOES

The SSWG observes that having Embargos 42 and 70 in place for a number of years has artificially suppressed demand, with the result that actual demand for satellite capacity in these bands is now unknown.

Embargo 42, relating to the 3575 to 3710 MHz band, has resulted in freezing developments for satellite services in the marketplace in the 3.6 GHz band. The SSWG recommends that as a part of the replanning processes that Embargo 42 be revised following the completion of the planning process to allow access for fixed satellite downlink services.

In the case of Embargo 70, relating to the 1427 to 1518 MHz band, and also the *1.5 GHz Frequency Band Plan 2015,* the SSWG recommends that these restrictions be revised following the completion of the planning process to retain the possibility of access to 12.5 MHz of spectrum for Broadcasting satellite Service (Sound) within the 1467 to 1492 MHz range in rural and remote areas.

C-BAND TV RECEIVE-ONLY

The SSWG suggests that there is an opportunity to authorise what the ACMA considers the unauthorised operations of some 200,000 C-band television receive-only TVRO terminals (including in the extended C-band).

The SSWG recalls that the ACMA released a paper in 2011 entitled '*Licensing for Earth receive stations - Initial consultation on changes to the current licensing arrangements for Earth receive stations* September 2011'. In this paper the ACMA canvassed the concept of using a class licence approach to receive only Earth stations in the 3600 to 4200 MHz with no rights and no protection. The SSWG notes that this matter has not been progressed by the ACMA to date.

The SSWG encourages the ACMA to re-evaluate its previous thinking in this area. The SSWG recommends that this could be achieved under the new legislation with an authorisation on a secondary or tertiary basis, with no understanding of protection.

SPECIFIC COMMENTS ON 1.5 GHz BAND

In Australia, the 1525 to 1559 MHz band is used for MSS downlinks and is used by Inmarsat, Thuraya and other MSS operators to provide services in Australia. These services are also used by Australian ships and aircraft throughout the world. Interest in this band is driven by the use of the adjacent frequency band, 1518 to 1559 MHz, which is used by MSS downlinks.

The lower part of the MSS band, 1518 to 1525 MHz, is referred to as the 'extended L-band downlink'. This band is not currently used in Australia for MSS operations by Inmarsat or Thuraya, but is planned to be used in the near future, on the next generation of Inmarsat satellites, Inmarsat-6.

This band provides additional capacity for L-band MSS systems which is vital to meet the continuing and increasing demand for MSS services, including narrow band M2M applications and wider bandwidths to support broadband applications.

The L-band spectrum including 'extended L-band' is currently in use by Inmarsat on the 'Alphasat' satellite, which provide coverage of Europe, the Middle East and Africa. New Inmarsat-6 satellites are currently being built by Airbus that, like Alphasat, will have extended

L-band capability. The first of the satellites is planned to be launched around 2019. It is therefore likely that Inmarsat will seek to operate MSS services in the band 1518 to 1525 MHz in Australia in the near future.

The SSWG understands that both MSS operators will request that in considering possible refarming actions for incumbent services in the 1.5 GHz band, the ACMA should also take into account that the band 1518 to 1525 MHz may be used for MSS services in the near future.

Current Inmarsat and Thuraya terminals are designed to be capable of operating anywhere in the world and hence are capable of receiving on any frequency within the full downlink band, 1518 to 1559 MHz. This means that MSS terminals operating in Australia and elsewhere could suffer harmful interference from mobile broadband systems if deployed in the band 1427 to 1518 MHz. It was with this concern in mind that WRC-15 agreed that compatibility studies between IMT and MSS are necessary and should be taken into account in the frequency arrangements for IMT in the 1.5 GHz band. The need for these studies is recorded in Resolution 223 (Rev. WRC-15), as noted by the ACMA on page 19 of the Discussion Paper.

Those ITU-R technical studies are currently underway in ITU-R Working Parties 5D and 4C and are not yet concluded. The CEPT has already conducted studies on this compatibility issue and a draft CEPT Electronic Communications Committee Report (ECC Report) is currently going through the approval process. These studies are based on the assumption that the 1427 to 1518 MHz band would be used by terrestrial mobile systems for 'Supplementary Downlink' (SDL). Hence the study considers potential interference from transmitting mobile base stations to receiving MSS terminals. The interference situation would be similar for an FDD arrangement for which the base station transmit band would be just below 1518 MHz. Studies so far have not considered potential interference from IMT user terminals, and so would not cover the possible use of TDD systems or FDD arrangements for which the band below 1518 MHz is used for the user terminal emissions.

The draft ECC Report contains the results of extensive studies but does not provide precise recommendations on compatibility measures required to ensure adequate protection. However, it is apparent from the studies that a guard band of at least 3 MHz is necessary to avoid harmful interference to MSS operations. Even with a 3 MHz guard band, special requirements would need to be placed on IMT base stations and MSS terminals. IMT base stations transmitting below 1518 MHz would require in-band and out-of-band EIRP limits. MSS terminals would be required to implement improved filtering so as to limit the harm caused by IMT base station blocking of the MSS terminal receiver.

In addition, the incumbent Australian satellite operator AsiaSpace operates the existing ASIABSS Broadcasting-satellite service, providing L-band satellite digital radio services to Asia, in the 1467 to 1492 MHz global allocation. China is very active in the ITU-R regarding the 1467 to 1492 MHz band for BSS (Sound). Optus has advised in various ACMA consultations regarding the 1.5 GHz band, that it continues to press for retaining up to 12.5 MHz in rural and remote areas of Australia for future BSS(Sound). This is the only frequency band allocated for this type of service in Australia.

SPECIFIC COMMENTS ON 3.6 GHz BAND

The 3.6 GHz band has been available for terrestrial broadband applications for many years but in general there has been limited use of the band for these applications due to the planning of the band for legacy analogue systems and the lack of commercially viable solutions. While there are signs of renewed terrestrial interest in this band, it remains the fact

that this band has seen limited use in the decade since it has been made available for terrestrial broadband deployment -- not only in Australia but also in most countries of the world. In the meantime, the FSS has continued to make use of this band for receiving earth stations, in support of high value applications in Australia and elsewhere, notwithstanding an embargo that has artificially suppressed satellite demand over the same decade.

For instance, Inmarsat is continuing to use the C-band, including the 3.6 GHz band, to provide the feeder links and TT&C links for its networks of Inmarsat-3, Inmarsat-4 and Alphasat satellites that provide vital maritime and other mobile satellite services around the world. This includes the land earth station located in Perth. The Inmarsat-5 satellites also use these bands for TT&C. The Inmarsat-6 constellation will have feeder links in the 3.6 GHz band C-band.

Inmarsat does not expect to deploy additional C-band earth stations in Australia but envisages that Perth will remain a key station in its network for the future. To support the operation of the Inmarsat-6 feeder links, the spectrum required to support operations will be greater than currently at Perth. Inmarsat has previously requested to the ACMA that the band below 3600 MHz be allocated to the FSS on a primary basis so that earth station operations in AUS in that band (at least in the 3550 to 3600 MHz band) can also be afforded long-term protection. Unfortunately, those requests have not been taken up by the ACMA. Nonetheless, in forward planning for this band, the ACMA should retain the possibility to increase the spectrum licensed to earth stations in the 3.6 GHz band.

The SSWG believes that the Perth facility and the other licensed 3.6 GHz earth stations in Australia should not be removed or refarmed. As is indicated by the ACMA, there are 20 earth stations licensed for operation in the 3.6 GHz band and for most, perhaps all, it is not practical to change location or frequency band.

Incumbent licensed FSS operations in the 3.6 GHz band should also be allowed to continue operations on an ongoing basis. Clearly sharing arrangements would be needed to ensure that FSS earth stations do not suffer harmful interference from MBB systems. This likely means establishing coordination areas within which MBB systems would be required to coordinate with the earth station operator before deployment to ensure that interference is not caused to the earth station. ITU-R Studies conducted for WRC-15 agenda item 1.1 have shown separation distances of tens of kilometres, sometimes hundreds of kilometres are required when considering interference from MBB base stations operating on the same frequencies as the earth station. A coordination area could be established for an earth station, based on specific characteristics of the earth station and generally applicable characteristics for MBB systems.

Adjacent band interference into FSS earth stations operating in 3700 MHz and above (of which there are many more than in 3.6 GHz) must also be considered and mitigated. This would mean limiting the unwanted, out-of-band emissions from MBB terminals and base stations, the introduction of a guard band and/or a separation distance or coordination area around FSS earth stations operating at 3700 MHz and above. The required separation distances will likely be much lower than those applicable to the co-frequency case, e.g. one to two kilometres.

Much can be learned from the IMT-FSS sharing studies – for both in-band and adjacent band sharing – that have already been performed by the ITU in the 3.6 GHz band, but the exact results of those studies may need to be adapted if the technical parameters of the terrestrial transmitters are different.

There are other techniques that can also be used by the MBB operator to mitigate the impact of interference, such as using small cells or deploying base stations below roof-top level, to provide additional path loss to the earth station receiver.

Inmarsat requires ongoing access to the band for the Perth earth station, potentially with a need for increased downlink (and uplink) spectrum at that site. There are no plans for other C-band earth stations in Australia and no plans to cease operations at Perth. Regarding Inmarsat use of the 3.6 GHz band in Australia, there is no alternative to the use of those particular frequencies, which are governed by the capabilities of the satellites and the need to share the C-band spectrum with other satellite operators.

There could indeed be a diminution of service in the vicinity of the Perth earth station for MBB due to the need to avoid interference to that station. As mentioned already there are mitigations that can be applied by MBB operators to reduce the impact. The mobile community has long argued that it can share with FSS operations in this band and so the onus should be on mobile operators to demonstrate that is the case.

Regarding the proposed introduction of MBB in the 3.6 GHz band, the SSWG wishes to underline the importance of providing continuing protection for Inmarsat's Perth operations as well as those of other 3.6 GHz FSS licensees in other parts of Australia. The SSWG believe that if this band is made available for MBB systems in Australia, those systems should be required to avoid in-band and adjacent band interference into Perth and other C-band earth stations.

International organisations and country-specific arrangements

IEEE

With respect, the reference in the Discussion Paper to the IEEE in 2008 amending the IEEE 802.11 standard so as to support operations in the 3650 to 3700 MHz band is incomplete, if not misleading. IEEE 802.11y was intended for higher powered commercial Wi-Fi applications. Amendments provided a contention based protocol (CBP), an extended channel switch announcement (ECSA) and dependent station enablement (DSE). The CBP was required by the FCC for interference management purposes. The ECSA and DSE protocols enabled base stations to control receiving devices, e.g. to switch channels or disable them, also for interference management purposes.

In its July 13, 2015 submission[3] responding to the FCC's Further Notice of Rulemaking concerning Commercial Operations in the 3550 to 3650 MHz Band[4], the IEEE 802.11 Working Group comments that the 2008 amendment 'failed to develop commercial traction' because the potential market was so restricted due to the exclusion zones, located predominantly on the US east and west coasts, making development of compliant products economically unviable.

Consequently, the IEEE 802.11 Working Group decided not to amend IEEE 802.11y to support operations in the 3.5 GHz band, so its use for MBB would be constrained.

Japan

The SSWG wishes to point out that the statements concerning Japanese allocations on page 33 of the Discussion Paper may need some clarification. In Japan, there is a primary

[3] Comments of IEEE 802.11, Before the Federal Communications Commission, July 13, 2015, https://ecfsapi.fcc.gov/file/60001115064.pdf .

[4] Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550 to 3650 MHz Band, https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-49A1_Rcd.pdf

allocation to FIXED-SATELLITE SERVICE across the whole of the 3400 to 4200 MHz band. Furthermore, in order to introduce IMT systems to the band 3480 to 3600 MHz in Japan, a certain consultation procedure (non-open public basis) to resolve each case issue is now being developed. In the case where harmful interference into a TVRO Earth Station is observed then these TVRO Earth Stations are able to seek protection from the IMT base station(s).

DISCUSSION PAPER QUESTIONS

Question	SSWG comment
1. Should the 1.5 GHz band and/or the 3.6 GHz band be progressed from the *initial investigation* stage to the *preliminary re-planning* stage in the ACMA's process for consideration of additional spectrum for MBB services? Why/Why not?	The SSWG reluctantly recognises that the ACMA has a strong interest to progress these two bands to the preliminary re-planning stage. Taking into account discussions both domestically and internationally, the SSWG recommends that the review of the two bands be decoupled from each other, with the1.5 GHz band considered initially and the 3.6 GHz band be considered as such time that there is further clarity in user demand and in spectrum management issues. Of the two bands, the ACMA *Work Plan 2016-17* in the ACMA *Five-year spectrum outlook* only lists a project for the 1.5 GHz band (Page 43) and as a high priority with a completion date of late 2017/early 2018. This suggests that the ACMA has already considered separating these two reviews. The SSWG agrees that the 1.5 GHz band can be progressed to the preliminary re-planning stage, on the basis that the re-planning accommodates other necessary service users. The SSWG does not agree for the 3.6 GHz band to be progressed to the preliminary re-planning stage at this point in time. The conditions ventured for the 3.6 GHz band are clouded by a longer-term scenario posed by the ACMA for 3.4 to 3.7 GHz.
2. Should either of the 1.5 GHz and 3.6 GHz bands be prioritised through the ACMA's process for consideration of additional spectrum for MBB services? If so, which band? Why?	Refer to response to Q1.
3. Are there specific issues, other than those mentioned, that may affect the timeframe in which the 1.5 GHz or 3.6 GHz bands could be made available for MBB?	The SSWG observes that the ACMA timetable is subject to having a clear picture of the future developments in the planning for these bands to be able to make the appropriate decisions. This will highly depend on developments within the ITU-R and 3GPP and whether the ACMA approach is holistic enough. The SSWG members have advised that the ITU are developing band plans etc for IMT in both the 1427 to 1518 MHz and 3600 to 3700 MHz bands. It is noted that it is planned that 3.6 GHz band work would be completed at the Oct 2017 meeting of WP 5D whilst

Question	SSWG comment
	the 1.4 GHz band work would not be completed until the June 2018 meeting. So it is essential to have an understanding of what is coming out of the current study cycle and not for Australia to get ahead of international work without the appropriate knowledge of what is possible with channel arrangements and the influence on spectrum sharing arrangements.
4. If the 1.5 GHz and 3.6 GHz bands are re-farmed for MBB, would there be benefit in allocating the bands simultaneously?	The SSWG notes that the bands are not closely related in their current usage. It is also not at all clear why the two bands have been subject to a review together as they are subject to different factors and timeframes.
Questions specific to the 1.5 GHz band	
5. The ACMA seeks comment on expected future use of the 1.5 GHz band by the fixed, broadcasting and broadcasting-satellite services and by the Department of Defence in Australia.	Optus has informed the SSWG that, since the 1980's, interest has been received from Australian broadcasters about using satellite to deliver Sound broadcasting services. This lead to WARC-92 making an allocation in the 1452 to 1492 MHz band for digital sound broadcasting using both terrestrial and satellite. Since that time, there has been some interest in the satellite component but absence of a policy on rollout of Digital Sound Broadcasting (both terrestrial and satellite) has limited further consideration. It is noted that this is the only frequency band which is designated for digital sound broadcasting and the inability to use this band would prevent the technology from ever being developed in the future. Optus has also advised the SSWG that in earlier submissions on MBB to the ACMA and as part of Australia's WRC-15 preparations, Optus has argued for up to 12.5 MHz to be kept available for broadcasting-satellite services (BSSs) mainly in the rural and remote areas. The SSWG supports that position. The SSWG also supports Optus belief that geographical separation of service areas can allow co-frequency co-existence with IMT in capital cities and would encourage the ACMA to retain a level of access for broadcasting satellite services in rural and remote areas. The SSWG also observes that there is some connection to C-band with an ongoing need for feeder links for L-band. The SSWG understands that Australian radio broadcasters do not see a BSS service as being commercially viable, so there is currently no interest.

Question	SSWG comment
6. Comment is sought on the potential deletion or modification of footnote AUS3 from the Australian Radiofrequency Spectrum Plan (ARSP).	No comment.
7. If the 1.5 GHz band is re-farmed for MBB services, what frequency arrangement should be adopted? Should a frequency division duplex (FDD), supplemental downlink (SDL) or time division duplex (TDD) arrangement be adopted? Why/why not? What type of arrangement should be adopted (that is, 3GPP bands 11 and/or 21, 3GPP band 32, 3GPP band 45 or another arrangement)?	The SSWG does not offer any comment as to the merits of the various MBB frequency arrangements other than to encourage arrangements which: • protect Mobile Satellite Services in the 1518 to 1525 MHz band in accordance with the arrangements established by ITU studies, including adjacent band interference. • facilitate Broadcasting Satellite Service (Sound) in a portion of the 1467 to 1492 MHz in rural and remote areas. As noted in the response to Q5, the SSWG understands that Australian radio broadcasters do not see a BSS service as being commercially viable, so there is currently no interest.
8. If the 1.5 GHz band is re-farmed for MBB services, what geographical areas should be re-farmed? To what extent are mobile network operators (MNOs) interested in the 1.5 GHz band outside of metropolitan areas?	The SSWG suggests that any refarming should not affect incumbent satellite services in those geographical areas. These services above 1518 MHz will be ubiquitous and this will need to be taken into account. Protection measures such as out-of-band emission limits and guard bands will be necessary wherever MBB services in the 1.5 GHz band are deployed.
9. If the 1.5 GHz band is re-farmed for MBB services, should a geographically and/or spectrally staged process be considered, where more heavily utilised parts/areas are re-farmed later than those that are more lightly utilised?	To preserve options for future digital sound broadcasting satellites, the SSWG recommends that the segments outside of 1427 to 1467 MHz and 1492 to 1518 MHz should be deployed first for MBB. Should capital city/major city demand for MBB usage exceed that available from use of that spectrum then the 1467 to 1492 MHz spectrum could be opened up for MBB in those areas. As noted in the response to Q5, the SSWG understands that Australian radio broadcasters do not see a BSS service as being commercially viable, so there is currently no interest.

Question	SSWG comment
10. What are the alternative spectrum or delivery options for current users of the 1.5 GHz band if the band is re-farmed for MBB services and migration of incumbent services is required?	Whilst terrestrial Digital Audio Broadcasting can use either the 174 to 230 MHz or the 1.5 GHz bands with the 174 to 230 MHz band being used in Australia, the 1.5 GHz band is the only band available for satellite DAB in Australia with no alternative bands. The SSWG understands that Commercial Radio Australia does not wish to implement DAB in the 1.5 GHz band and have advised the ACMA of that decision previously.
11. Could services, in particular fixed services, provided in the 1.5 GHz band be migrated to new or existing mobile networks in areas where the band is re-farmed for MBB services?	The SSWG offers no comment except to note that any migration would be subject to cost considerations.
12. Should existing users (some or all) be allowed to continue operation within the band either temporarily or on an ongoing basis?	The SSWG suggests that the social and economic value of incumbent users in these bands need to be recognised and that they should be allowed to continue operation.
13. What types of sharing arrangements could be put in place to facilitate coexistence between MBB services and existing users of the 1.5 GHz band in both the short and long term?	In recognising that there are many narrow, small capacity, medium-to-long haul fixed links in remote areas of Australia, the SSWG highlights the importance of sharing studies before any conclusion should be formulated. The SSWG notes that WRC studies have identified impracticalities, e.g. that separation distances were very large for co-frequency sharing. On the other hand, adjacent band sharing appeared to be more manageable using a guard band.
14. Comment is sought on the ACMA's proposal to progress the 1.5 GHz band to the *preliminary re-planning* stage of its process for consideration of additional spectrum for MBB services, as detailed in the ACMA's mobile broadband strategy.	Refer to responses to Q1 and Q2.

Question	SSWG comment
15. To assist the ACMA in conducting a comprehensive assessment of the highest-value use for the 1.5 GHz band, responses to the following questions are requested:	
a. Do you see demand for fixed broadband/MBB services in the 1.5 GHz band?	The SSWG observes that Embargo 70 has prevented the real demand for incumbent users from showing itself. The SSWG was unsure of actual mobile broadband demand as well in this band and suggests that a case is yet to be made.
b. What benefits do you envision from using the band for fixed broadband/MBB services?	No comment.
c. What are relevant data points (for example, market based allocation results) for considering the demand for 1.5 GHz band spectrum for use by MBB providers?	No comment.
d. Is demand the same or similar across regions (that is, across metropolitan, rural and remote areas), or are some regions more likely to be in demand for MBB providers?	The SSWG will leave mobile operators to provide a response but will offer that intuitively the demand is not the same across regions. Mobile operators operate in many geographic areas and would prefer to avoid investing in several different frequency ranges nationally across Australia.
e. Do incumbent 1.5 GHz band licensees require ongoing access to the band, or are there plans to cease operation at some future point?	Refer to responses to Q1 and Q2.
f. Do other options exist for the delivery of point-to-point, point-to-multipoint, fixed receive, aeronautical and radiodetermination incumbent services? How practical are they? What are the costs involved? Will there be a	The SSWG recognises that there are cost implications in refarming services. For example, the Digital Radio Concentrator System (DRCS) could be moved to another service, such as onto a satellite network, but at what cost to the operator and ultimately to the customer? If an operator has in place a network that is fulfilling a need, why would that operator change and incur costs of their own volition?

Question	SSWG comment
diminution of the service delivered if MBB services are introduced in the band?	
Questions specific to the 3.6 GHz band	
16. The ACMA seeks comment on expected future use of the 3.6 GHz band by fixed, fixed-satellite, amateur and radiolocation services in Australia.	The 3400 to 4200 MHz C-Band has been a cornerstone of many satellite services for decades. In addition to its key function in providing connectivity within and to areas of high rain fall, where other available bands are inappropriate, C-band is used for a number of critical functions The SSWG notes that there is strong, sustained demand for the 3600 to 3700 MHz band for Fixed Satellite Services Earth Stations (FSS-ES) in the foreseeable future to support MSS feeder links (such as for the new Inmarsat-6 series) and HTS implementations (such as for Intelsat EPIC). This is evident in the services still being provided in this band at multiple teleports in various major cities in Australia, notwithstanding the embargo against the deployment of new earth stations in this band. Indeed, if anything, the true demand for use of this band in Australia has been suppressed by the embargo that has been in place for 10 years. In a global context there are over 169 commercial satellites which use 3.4 GHz to 4.2 GHz C-band spectrum today and of those, 69 satellites carry some portion of 3400 to 3700 MHz band. Hundreds of millions of households depend on C-band for television programming including events such as the World Cup and the Olympics. Billions of dollars already invested in this technology and the ground infrastructure by satellite operators with over $15 billion spent by industry in the past five years launching 52 C-band satellite and $10 billion of additional investment to launch 35 new satellites by 2017. Once satellites are launched into space, they remain active for up to 20 years and the frequencies cannot be changed aboard the spacecraft. MSS operators wholesale services to customers in Australia who have ongoing requirements. In addition future innovation in the band is envisaged.

Question	SSWG comment
	It is also worth noting that the SSWG members also see an ongoing need for access to the 3700 to 4200 MHz band for fixed satellite downlinks for the foreseeable future at the various teleports in Australia. The SSWG envisages that there will be demand for FSS-ESs to continue operating in the 3600 to 3800 MHz band in the future. For example, if the band is re-farmed for IMT services, it may not be possible for satellite earth stations to relocate to new bands or alternative means of delivery. One option to enable such services to continue operating is to implement adequate measures to protect incumbent services and ensure their commitment and quality of services to their customers is continued unimpeded to ensure long term stability within this band for satellite operators. The SSWG believes that the right level of geographical separation and other mitigations can reduce the burden on mobile deployment while ensuring regulatory compliance with interference management criteria. For many years the mobile community has been seeking access to this band on the basis that they can share with FSS earth stations and so the onus should be on the mobile operators to take action to ensure that they can meet the interference criteria. **Use of TVRO systems in Australia** With respect to C-band television receive-only (TVRO) systems, the SSWG notes the ACMA's comment on page 36 of the Discussion Paper makes the statement that 'these are typically used to obtain satellite television services meant for other countries'. The SSWG contends that this is not correct as these services are often non-English programing related to a specific linguistic/cultural group which may have communities in many countries including Australia. The SSWG is aware of marketing of a number of these services amongst various multi-cultural communities in Australia.
17. If the 3.6 GHz band is re-farmed for MBB services:	
a. Do you agree that a time division duplex (TDD) arrangement should be adopted? Why/Why not?	No comment.

Question	SSWG comment
b. Should all or only part of the band be considered for re-farming?	The SSWG opposes re-farming the bands if this means that FSS-ESs from the 3.6 GHz band would need to be vacated. Clearly sharing arrangements would be needed to ensure that those existing FSS-ESs do not suffer harmful interference from MBB systems. Satellite earth station operators may have only a limited or indirect ability to choose which frequencies they receive from the entire 3400 to 4200 MHz C-band. This is because they need to connect to a transmitter, often in other continents, via a satellite. The frequencies that they use may be determined by the operators of the transmitting station, or by the satellite operator based on the propagation characteristics of the bands or availability of satellite capacity. The exact commercial agreements, and technical constraints, shared among these parties will vary from case to case. In some cases, the frequencies to be used may also change from time to time, leading some earth station operators to seek flexibility to access the entire C-band. In addition to in-band sharing arrangements, if any part of the 3.6 GHz band is to be re-farmed for MBB, the SSWG would recommend implementing a guard band in which MBB must not transmit in order to protect FSS-ESs operating at 3700 MHz and above.
c. Should different amounts of spectrum be re-farmed in different areas?	The same spectrum should be re-farmed across different geographic areas as this also maximises the opportunity for a seamless MBB experience when roaming over those boundaries.
18. If the 3.6 GHz band is re-farmed for MBB services, what geographical areas should be considered?	Existing satellite users of the 3.6 GHz band should be allowed to continue operating in view of the socially and economically valuable services they are still providing. This means that the existing teleports licensed to operate in the 3.6 GHz band will need to be protected from MBB emissions in the same band. ITU-R Reports M.2109, S.2199 and S.2368 show that sharing between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3600 to 3800 MHz frequency bands could require separation distances of tens of kilometres (or more). The necessary separation in any given case will depend on a number of factors including MBB emission limits, terrain and other blockages. Thus, the location of

Question	SSWG comment
	existing FSS-ESs will necessarily constrain the geographical areas in which MBB can be deployed in the event of re-farming. In addition, protection of FSS-ESs operating at 3700 MHz and above (which are much more common) from adjacent band interference may also require separation distances (up to one to two kilometres), again depending on various parameters. The introduction of out-of-band emission limits and a guard band may alleviate such a constraint.
19. If the 3.6 GHz band is re-farmed for MBB services, should existing users (some or all) be allowed to continue operation within the band, either temporarily or on an ongoing basis? Should/could sharing arrangements be developed? Should sharing only be considered for some services or specific licences? If yes, what kind of arrangements would be suitable to support the ongoing operation of incumbent services or specific licences? If no, why?	As noted above, in the event of re-farming for MBB, existing FSS-ES in the 3.6 GHz band (including those used for MSS feeder links) should be allowed to continue operation indefinitely in view of the socially and economically valuable services they are still providing. See Answer to Question 18 above for potential techniques for FSS-MBB sharing of the same spectrum.
20. If the 3.6 GHz band is re-farmed for MBB services, and migration of incumbent services is required, are there alternative spectrum or delivery options?	If the band is re-farmed for IMT services, it may not be possible for FSS-ESs to relocate to new bands or alternative means of delivery. The MSS operators such as Inmarsat and Thuraya have a large number of existing satellites in orbit that use the 3400 to 3700 MHz band as feeder links, and more such satellites are planned in the future (e.g. Inmarsat-6 series). There is also a large installed base of maritime, aeronautical and other users of MSS that have been relying on the proper functioning of these feeder links for both routine and safety-of-life communications for a very long time. The feeder link operations for these services cannot be relocated to above 3700 MHz to avoid MBB. Most, but not all, FSS satellites using this band also carry the adjacent 3700 to 4200 MHz band. Provided the adjacent band is adequately protected from interference, it may be possible to relocate existing 3.6 GHz band users to spectrum above 3700 MHz.

Question	SSWG comment
	This depends on capacity being available above 3700 MHz, which cannot be guaranteed due to high demand for that spectrum. Moreover, any such relocation could involve costly (and manual) equipment changes at multiple, and often remote, customer locations. It would also be difficult to 'migrate' existing 3.6 GHz teleports to different locations. Relocation of existing teleports is not necessarily feasible given satellite footprints, fibre availability and the difficulties of relocating earth station personnel. At the very least, any such relocation could require tens of millions of dollars, take a number of years and cause significant disruption to existing services.
21. In determining whether to re-farm the 3.6 GHz band for MBB, are there any adjacent band issues that should be considered? This includes:	
a. the effect such use may have on adjacent band services	Any plans for MBB in 3575 to 3700 MHz must take account of the adjacent band fixed satellite usage as indicated ITU-R studies. It is important that FSS-ESs operating in the adjacent 3700 to 4200 MHz band are also protected from interference from new terrestrial wireless systems. The 3700 to 4200 MHz band is much more heavily used – especially for video contribution and distribution – than the 3.6 GHz band at many more teleports and customer locations. SSWG members expect the use of this band to continue growing steadily into the future. Chances are, if you are watching a live sporting event or TV program, then that video programming is being delivered into Australia via a C-band satellite in the 3700 to 4200 MHz.
b. the effect adjacent band services may have on the utility of the 3.6 GHz band for MBB services.	Some combination of an out-of-band emission mask for the MBB service, a guard band and appropriate separation/coordination distances will likely be necessary to ensure that FSS-ESs in the adjacent 3700 to 4200 MHz band are protected. The coordination distances required for the adjacent frequency case will likely be much lower than those applicable to the co-frequency case.
22. If the 3.6 GHz band is re-farmed for MBB services, should the ACMA review arrangements in the broader 3400-3700 MHz band? Why/Why not?	Yes, assuming the ACMA is proposing to allow the same MBB services in the entire 3400 to 3700 MHz band. Since this is the intention of the ACMA spectrum planning in the longer term, it would make sense to consider re-planning of the broader frequency 3400 to 3700 MHz band rather than just the 3.6 GHz band. In the SSWG's

Question	SSWG comment
	view, considering the broader frequency band initially will lead to efficiencies and better outcomes.
23. Would such a review be facilitated through the alignment of geographical boundaries in the 3.6 GHz band with existing boundaries defined for spectrum and apparatus licensing in the 3400–3575 MHz band (that is, to facilitate trading)?	As noted above, the geographic areas in which MBB can be implemented in the 3.6 GHz band will be constrained by the need to protect co-frequency FSS-ESs and, to a lesser extent, adjacent band FSS-ESs in 3700 to 4200 MHz. These geographical constraints may or may not align with the existing boundaries for spectrum and apparatus licensing in 3400 to 3575 MHz.
24. Is there anything else that could be considered as part of the 3.6 GHz band process that may facilitate a future review of the broader 3400–3700 MHz frequency range?	The SSWG recommends that the investigation should be extended at the outset to the broader frequency range of 3400 MHz to 3700 MHz band. It is understood that this is the intention of the ACMA spectrum planning in the longer term, hence it would make sense to consider re-planning of the broader frequency 3400 to 3700 MHz band rather than just the 3.6 GHz band. In the SSWG's view, considering the broader frequency band initially will lead to efficiencies and better outcomes. The approach would benefit from better informed studies and being able to resolve the wider spectrum band in one process.
25. Comment is sought on the ACMA's proposal to progress the 3.6 GHz band to the *preliminary re-planning* stage of its process for consideration of additional spectrum for MBB services, as detailed in the ACMA's mobile broadband strategy.	The SSWG, with the exception of Telstra, does not agree for the 3.6 GHz band to be progressed to the preliminary re-planning stage at this point in time. The conditions ventured for the 3.6 GHz band are clouded by a longer-term scenario posed by the ACMA for the broader 3.4 to 3.7 GHz band. The 3.6 GHz band review should be deferred to a time when there is greater clarity around user demand and in spectrum management issues. Telstra believes that the 3.6 GHz band should be moved immediately to the next stage of planning on the basis that 3.6 GHz is a key band for launching 5G technology in Australia and globally.
26. To assist the ACMA in conducting a comprehensive assessment of the highest-value use for the 3.6 GHz band, responses to the following questions are requested:	
a. Do you see increasing demand for fixed broadband/MBB services in the 3.6 GHz band? What benefits do you envision	In a world powered by demand for information, access to the Internet has become increasingly important. While this question appears to seek input on increases in demand for terrestrial fixed broadband and MBB, it should be noted that access to

Question	SSWG comment
from using the band for fixed broadband/MBB services?	the Internet is often enabled – whether directly or indirectly – by satellite services. Advances in access technology and High Throughput Satellites (HTS) have made accessing the internet over satellite services a reality, resulting in further growth in data traffic over multiple satellite bands, including the 3575 to 3700 MHz band (which will be used, e.g. on certain Intelsat EPIC satellites). Thus, the ACMA should not only consider increasing demand for fixed broadband/MBB services, but for all modes of Internet access, and to then develop a spectrum plan that meets those combined requirements. By the same token, focusing only on the benefits of using this band for fixed broadband/MBB services would be a mistake, as it would ignore the direct and indirect costs of re-farming such spectrum (including loss of the benefits of existing services) and the possibility that the same service may be deliverable through other more cost-effective means.
b. Which regions of Australia will be in demand for fixed broadband/MBB services in the 3.6 GHz band?	No comment
c. Is demand the same or similar across regions, or are some regions/areas more likely to be in demand for MBB providers?	No comment
d. Do incumbent 3.6 GHz band licensees require ongoing access to the band, or are there plans to cease operation at some future point?	Existing licensees require ongoing access and there are no plans to cease operation.
e. Do other options exist for the delivery of fixed, fixed-satellite and amateur incumbent service, how practical are they? What are the costs involved? Will there be a diminution of the service	There are other frequency bands available for incumbent satellite services, just as there are other frequency bands available for MBB and fixed broadband. This does not mean that it is practical (or even possible) to move existing satellite services in the 3.6 GHz band to other bands. The other frequency bands are already in use, may not be available and may not be an adequate substitute for the 3.6 GHz band (e.g. due to propagation differences). Moreover, demand for satellite services is also increasing

Question	SSWG comment
delivered if MBB services are introduced in the band?	as evidenced by the launch and construction of HTS systems by multiple companies that require access to greater amounts of spectrum. As a result, a re-farming of the 3.6 GHz band for MBB that precludes continued use of the band by incumbent satellite users will almost certainly result in a diminution of satellite services overall. Thus, if the ACMA does re-farm the 3.6 GHz for MBB, at a minimum, existing FSS users of that band should be allowed to continue operating, with appropriate sharing arrangements in place to ensure co-existence without harmful interference from new MBB services.
f. Should further consideration be given to the migration of incumbent 3.6 GHz band FSS earth stations to low density population areas?	No. SSWG members have strongly argued over recent years against the forced re-location of its satellite facilities to low density population areas in the so called 'Satellite Parks' and maintains that position. The need to establish new facilities in remote areas, to connect those new facilities to the major cities, and to relocate or purchase new equipment would require many millions of dollars in capital expenditure. Finding or relocating personnel for duty at such locations will also be difficult and expensive.

Published by:
COMMUNICATIONS
ALLIANCE LTD

Level 12
75 Miller Street
North Sydney
NSW 2060 Australia

PO Box 444
Milsons Point
NSW 1565

T 61 2 9959 9111
F 61 2 9954 6136
E info@commsalliance.com.au
www.commsalliance.com.au
ABN 56 078 026 507