

Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction

Consultation paper

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Executive summary

The ACMA is progressing a work program to allocate spectrum in the 3.4–4.0 GHz frequency range, to support a range of users and use cases.

As part of this work program, there are 4 separate spectrum allocation processes:

- > An administrative allocation of area-wide apparatus licences (AWLs) in remote areas of the 3.4–4.0 GHz band, intended to support both wide-area and local-area wireless broadband use cases. The ACMA expects to commence this allocation process in Q2 2023.
- > The auction of spectrum licences in the 3.4/3.7 GHz bands, intended to support the continued deployment of wide-area wireless broadband (WA WBB) services, such as mobile and fixed wireless networks. As outlined below, the ACMA intends to conduct this auction in Q4 2023.
- > An administrative allocation of AWLs in the 3.8 GHz band (3.8–3.95 GHz in metropolitan areas and surrounds, and 3.75–3.95 GHz in some regional areas) to support new local-area wireless broadband (LA WBB) services and the continued deployment of satellite and point-to-point (PTP) services. There may be some co-dependencies with regards to allocation limits for some interested stakeholders. This is discussed further under the ‘Allocation limits’ section of this paper. The ACMA is considering implementing an initial allocation limit of zero at the 3.8 GHz band AWL allocation for incumbent spectrum licensees in the 3.4–3.7 GHz frequency range and an additional cross-band limit, taking into account spectrum licensed holdings including those acquired in the Q4 2023 auction, in order to create an initial priority access period for these non-WA WBB users. The ACMA expects to commence this allocation process in Q1 2024, and to consult on a draft Applicant Information Pack (AIP) (including the proposed approach to allocation limits) in Q2 2023.
- > An allocation of apparatus licences in urban excise areas of the 3.4–3.475 GHz band, and metropolitan and regional areas of the 3.95–4.0 GHz band, intended to support restricted cell LA WBB use. The ACMA expects to convene a Technical Liaison Group (TLG) to develop the technical arrangements to support the use of this spectrum in Q1/Q2 2023. We will decide on allocation timing after work on technical and licensing arrangements for this spectrum has been completed.

The allocation design matters which are the subject of this consultation paper only pertain to the 3.4/3.7 GHz bands auction, although we acknowledge that there may be some co-dependencies between the other 3 allocation processes for interested stakeholders, particularly in relation to the licensing technical frameworks which are intended to manage the coexistence of services with radio altimeters in a nearby band. Parties interested in the 3 other allocations should note that the detail on the radio altimeter matter is contained in this consultation paper, under ‘Coexistence with radio altimeters’.

3.4/3.7 GHz bands auction draft instruments

To enable the allocation of the 3.4/3.7 GHz bands spectrum, on 14 July 2022, the ACMA made the [Radiocommunications \(Spectrum Re-allocation – 3.4 GHz and 3.7 GHz Bands\) Declaration 2022](#) (the re-allocation declaration).

In preparation for the auction of spectrum licences, we have prepared draft allocation and technical instruments which describe the parts of the spectrum we are offering in the auction, as well as setting out the rules and procedures that we propose will govern the auction process for the allocation of the spectrum. We note that the Australian Competition and Consumer Commission (ACCC) has [released its allocation limits advice for the 3.4 GHz and 3.7 GHz spectrum allocation](#). We have considered this advice in developing our proposed options for allocation limits, which are included in this consultation paper.

The draft allocation and technical instruments are:

- > a spectrum marketing plan, to be made under section 39A of the [Radiocommunications Act 1992](#) (the Act), describing the 3.4/3.7 GHz bands products on offer (draft marketing plan)
- > an allocation determination, to be made under sections 60 and 294 of the Act, covering the auction procedures and rules for the 3.4/3.7 GHz bands (draft allocation determination)
- > a draft unacceptable level of interference determination variation
- > a draft Radiocommunications Advisory Guidelines for managing interference from spectrum licensed transmitters variation
- > a draft Radiocommunications Advisory Guidelines for managing interference to spectrum licensed receivers variation
- > a draft Radiocommunications and Licensing Instructions MS47 (the draft RALI MS47).

This paper summarises the matters included in the draft allocation and technical instruments and invites comments from interested parties on those instruments and any other issues relevant to the allocation of spectrum licences in the 3.4/3.7 GHz bands. Draft versions of the allocation and technical instruments for the 3.4/3.7 GHz bands auction are published alongside this paper on the ACMA website.

Managing coexistence with radio altimeters

In developing spectrum licence technical frameworks, coexistence between future and existing uses (in the same band in different geographic areas and in spectrally nearby bands) is routinely considered. In the review of the existing spectrum licence technical framework to include bands to support this allocation process, coexistence between wireless broadband (WBB) and radio altimeters was identified as a key coexistence consideration.¹

Radio altimeters are critical sensors that are used by many aircraft (both fixed and rotary wing) to enable and enhance flight safety and operations. Ensuring coexistence between radio altimeters with uses of the spectrum such as WBB is a therefore key requirement of the ACMA.

Similarly, the ACMA must consider opportunities to facilitate new uses of the spectrum such as WBB. Spectrum in the 3400–4200 MHz range is of particular interest globally

¹ This coexistence scenario is also relevant to other allocation processes [in the broader 3.4–4.0 GHz band](#) that the ACMA is undertaking and comments in this section are applicable to all technical frameworks.

as a band for 5G WBB (in addition to 4G and earlier broadband services in parts of the range) with extensive deployments worldwide in varying parts of the band. The ACMA considers that the efficient use of this spectrum that supports both radio altimeters and WBB will contribute to the long-term public interest.

The ACMA has been carefully considering this issue since 2019 and closely following global developments. Domestically, the ACMA has engaged the Technical Liaison Group (TLG) on radio altimeter coexistence as well as engaging directly with a range of stakeholders including a whole-of-government approach with relevant agencies – most importantly, the Civil Aviation Safety Authority (CASA).

The ACMA has not only engaged on the issue with relevant sector stakeholders, but collaborated across government, including close cooperation with CASA, and high-level representation from aviation and communications areas of the Department of Infrastructure, Regional Development, Airservices Australia, and the Department of Home Affairs. These agencies support a precautionary approach and continue to work towards a solution that provides certainty for both aviation operations and the implementation of new WBB services, recognising that both are important public-interest elements for Australia.

As part of the TLG process, the ACMA developed a report, *Coexistence between radio altimeters operating in 4200–4400 MHz and wireless broadband systems in 3400–4000 MHz*, which is published alongside this consultation paper. This report consolidates the extensive information available to assist consideration of the matter by interested parties and outlines the ACMA's proposed approach for coexistence. A draft of the report was shared previously with the TLG in October 2022.

The theoretical studies, controlled trial and empirical evidence from real world deployments regarding the coexistence of radio altimeters and WBB do not provide a conclusive view of the actual likelihood of interference occurring to radio altimeters. Some lack of certainty and consensus on spectrum coexistence matters is not unusual. However, the critical nature of radio altimeters in some use cases makes this lack of definitive evidence more challenging than usual.

Given these circumstances, the ACMA considers it appropriate to adopt a precautionary approach to the implementation of new WBB uses into this environment. This is based on the concept that the absence of definitive data to accurately determine risk likelihood and consequence (in this risk of interference to radio altimeters) should not preclude action to mitigate the possible risk through the adoption of prudent controls (i.e., regulatory measures). The consequences of excessive or unnecessary regulatory restrictions on WBB systems may, however, reduce the long-term benefits that these services, including 5G, can provide to the Australian economy and society.

While the ACMA manages spectrum to support the safe operation of radio altimeters, the ACMA is of the view that the performance of some current radio altimeters does not support the efficient planning, allocation and use of the spectrum. This is due to the need to adopt a precautionary approach by mitigation measures in technical frameworks to manage WBB uses operating in spectrum well away from the radio altimeter band. The imposition of mitigation measures impacts on the overall utility of the spectrum for WBB use. The ACMA notes, however, that the performance of radio altimeters can be significantly improved through the retrofitting of improved filters on affected radio altimeters.

An outline of the ACMA's proposed approach is summarised below, discussed later in this paper, and outlined in detail (along with supporting discussion) in the report on

Coexistence between radio altimeters operating in 4200–4400 MHz and wireless broadband systems in 3400–4000 MHz published alongside this consultation paper.

The core tenet of the ACMA's proposed approach to managing coexistence between radio altimeters and WBB is based on dual obligations on the aviation and telco sectors where interim mitigations on WBB are imposed for a defined period, to enable the necessary retrofitting of radio altimeters to improve their coexistence performance. The ACMA's proposed approach is, in principle, similar to that adopted in the US (and proposed in Canada). The ACMA has discussed the detail of the proposed approach with CASA which has provided its support, while noting discussions continue on specific implementation aspects.

The ACMA's proposed coexistence framework retains a 200 MHz separation between WBB and radio altimeter use and applies additional mitigations (both interim and ongoing) to WBB deployments. Interim mitigations on WBB operating above 3800 MHz are proposed until the end of March 2025, which provides time for radio altimeters to be retrofitted with improved filter performance. After that time, ACMA expects to remove the interim mitigations. These interim mitigations include measures around specific runways and some that apply generally to deployments everywhere.

Other ongoing measures applying to WBB above 3800 MHz (in addition to the 200 MHz separation already mentioned) include in-band and unwanted power limits.

In proposing this approach, we acknowledge that retrofitting radio altimeters to improve their filter performance will impose costs on the aviation sector, as will the imposition of interim mitigations impose costs on WBB deployment during this period. We are aware of estimated retrofit costs published by the US Federal Aviation Authority (FAA) and consider them a useful guide. The FAA total estimated average cost per aircraft is US\$25,000 per remaining aircraft from an original affected fleet of 7993. The total cost is likely to be significantly less in Australia due to having a smaller fleet and fewer affected aircraft. We do want to use this consultation to elicit better cost implications on both aviation and WBB sectors, and other specific information on the issue using the attached targeted questions to stimulate responses.

1. Issues for comment

The ACMA invites comments on the issues set out in this paper, summarised below. Further detail about these issues can be found in the body of the paper.

Draft marketing plan

1. **Licence commencement and duration:** we seek comments on our preliminary views that:
 - > 3.4 GHz licences will commence as soon as possible after a winning bidder pays its spectrum access charge. The expiry date will be 13 December 2030 (approximately 7 years), to align with existing 3.4 GHz band licences.
 - > Subject to the payment of the spectrum access charge, 3.7 GHz licences will commence 8 weeks after publication of the auction results for a term of 20 years, the maximum allowable under subsection 65(3) of the Act.
2. **Licence renewal statements:** we seek comments on our preliminary views to include the following statements in spectrum licences issued as a result of the 3.4/3.7 GHz bands auction:
 - > For spectrum licences in the 3.4 GHz band:
 - > The spectrum licences may be renewed at the ACMA's discretion.
 - > A renewal application period of 13 December 2028 to 12 December 2030 (a period of 2 years before licence expiry).
 - > A renewal decision-making period of 6 months after receiving an application for renewal of the licence.
 - > There will be a public interest statement.
 - > For spectrum licences in the 3.7 GHz band:
 - > The spectrum licences may be renewed at the ACMA's discretion.
 - > A renewal application period of one year, commencing 5 years before licence expiry.
 - > A renewal decision-making period of 2 years, commencing immediately after the renewal application period.
 - > There will be no public interest statement.
3. **Frequency lot configuration:** we seek comments on the following proposed lot sizes:
 - > generic lots – 5 MHz
 - > leftover lots – 2.5 MHz.
4. **Geographic lot configuration:** We seek views on our proposal to:
 - > Disaggregate the Rural Australia area in both the 3.4 GHz and 3.7 GHz bands according to the 3.6 GHz regional boundaries.
 - > Configure the regional areas in 3700–3800 MHz as follows:
 - > 3700–3750 MHz: aligned with 3.6 GHz regional areas.
 - > 3750–3800 MHz:

- > Queensland and Victoria: Regional Area 2 (RA2) + Major Regional Centres 1 (MRC1)
- > Other regional areas: RA2.
- > Configure the metropolitan areas as independent products.
- > Aggregate the Regional WA south and Regional WA central areas in 3475–3510 MHz and 3700–3800 MHz.
- > Aggregate Tamworth with surrounding areas as follows:
 - > 3400–3575 MHz: aggregate with Regional NSW south and Quirindi East.
 - > 3700–3750 MHz: aggregate with Rural North NSW / South Queensland.
- > These settings are reflected in Schedules 1–4 to the draft marketing plan.

5. Product naming: we seek comments on the proposed naming scheme for products in the auction.

Draft allocation determination

6. Sequencing: we seek comments on our proposal to sequentially allocate the 3.4/3.7 GHz bands spectrum. We propose to allocate 3.7 GHz band spectrum through all 3 auction stages first, followed by the allocation of 3.4 GHz band spectrum, with a minimum period of 5 working days between allocation processes.

7. Commencement of auction: we seek comments on a proposal to include a power for the ACMA to vary the start date and time of the 3.7 GHz band auction.

8. Auction stages and rounds: we seek comments on our proposal to:

- > include a pre-bidding round in the primary stages of the auction, during which bidders must specify their start demand and may adopt the minimum spectrum requirement (MSR) for each product in each of the relevant bands
- > include a pre-bidding round in the secondary stages of the auction, during which bidders must confirm their interest in the available lots.

9. Allocation of leftover lots: we seek comments on our proposal to:

- > offer to allocate each leftover lot (of 2.5 MHz, see also 'Frequency lot configuration') to an eligible recipient (that is, an existing adjacent licensee) for a set price before the 3.7 GHz auction
- > allocate any leftover lots not taken up by an eligible recipient, effectively as a 7.5 MHz lot (that is, to the winner of a lot that is assigned the frequency range adjacent to the leftover lot).

10. Auction announcements: we seek comments on the proposal to publish the following information:

- > after the eligibility deadline, publish the names of all registered bidders
- > after the end of the auction, publish the results of the auction including the names of unsuccessful bidders.

- 11. Minimum spectrum requirement (MSR):** we seek comments on our proposal to apply a MSR of 2 lots for each product in the 3.4/3.7 GHz bands auction.
- 12. Information policy:** we seek comments on our proposal to provide exact excess demand information to bidders at the end of each clock round in the primary stages of the auction.
- 13. Pre-assignment of frequencies for unsold lots:** we seek comments on our proposal that the frequency range of any unsold lots be contiguous and be determined based on the assignment bids, rather than pre-assigned.
- 14. Allocation limits:** We seek views on the following proposed options for allocation limits:
 - > Option 1: 140 MHz limit in both metropolitan and regional areas in the cross-band frequency range of 3.4–3.8 GHz
 - > Option 2: 140 MHz limit in metropolitan areas and 160 MHz in regional areas in the cross-band frequency range of 3.4–3.8 GHz
 - > Option 3: No limits.

In particular:

- > We seek views on which of the allocation limits options, including the spectrum included in the cross-band frequency range, best achieves our identified objectives for this allocation (i.e., by facilitating the efficient planning, allocation and use of the spectrum, supporting digital connectivity and investment in regional Australia, and promoting competitive markets).
 - > We seek views on how the implementation of an allocation limit at auction may affect likely demand for the 3.4 GHz band and/or 3.7 GHz bands individually and whether your demand would differ between the imposition of an allocation limit under Options 1, 2 and 3.
 - > We seek views on weighing the different efficiency impacts of auction settings that seek to minimise the risk of unsold lots versus the risk of spectrum monopolisation.
 - > We seek views on the matters relevant to the substitutability of other spectrum with 3.4/3.7 GHz bands spectrum, and the appropriate cross-band frequency range to apply to the allocation limits.
 - > We seek views on our proposal to auction the 3.7 GHz and 3.4 GHz sequentially and its impact on the appropriate approach to applying allocation limits in the auction, if at all.
 - > We seek views on our proposal to apply a metropolitan allocation limit (i.e., 140 MHz) to Hobart and Rural TAS Upper (product definitions as proposed in Figure 4 of the 'Lot configuration' section of this paper) in the 3700–3800 MHz frequency range. We note that for the 3.6 GHz band spectrum licence auction held in 2018, Hobart was included in the 'Tasmania' product, which was considered a regional area for the purposes of applying allocation limits in that auction.
 - > We are seeking views on the short, medium and long-term costs and benefits if Options 1, 2 or 3 are implemented in this auction.
- 15. Exclusions from allocation limits:** we seek comments on our proposal to exclude the following spectrum from the allocation limits:
 - > leftover lots
 - > the Regional WA Central Middle product.

16. Insignificant holdings threshold: we seek comments on our proposal to:

- > set the insignificant holdings threshold at 30% of the population
- > apply a calculation method with the effect that if a sub-area of a product is deemed to cover a small or 'insignificant' percentage of the population of the whole geographic area of a product, existing holdings in the sub-area would not be counted towards an applicant's allocation limit
- > calculate existing holdings for the 3.7 GHz band allocation, and after the conclusion of that auction process, re-calculate existing holdings for the 3.4 GHz band allocation as if licences had been issued as a result of the 3.7 GHz band allocation.

17. Affiliations: we seek comments on our proposal to:

- > prevent applicants who are affiliated from participating in the auction as separate bidders
- > deem agreements between parties about use or acquisition of the spectrum available for bidding at auction to cause the parties to the agreement to be affiliated. (However, leftover lot spectrum would be excluded from the definition of a 'relevant agreement'.)

18. Application and registration process: we seek comments on our proposal to:

- > undertake a 2-stage application/eligibility nomination process covering participation in the 3.7 GHz band allocation and the 3.4 GHz band allocation
- > enable the submission of application and eligibility nomination documents via an online interface
- > set the application fee for the auction at \$10,000
- > require applicants to secure eligibility points that may be used for bidding in the 3.7 GHz band allocation and/or the 3.4 GHz band allocation by requiring an eligibility payment or deed of financial security that secures the value of the eligibility points requested
- > require an eligibility payment or deed of financial security of 10% of the price of the leftover lot from eligible recipients who choose to take up a leftover lot.

19. Variation of prices: we seek comments on our proposal to include in the allocation determination the power for the ACMA to vary starting prices and/or the set price of leftover lots after applications open, but before the eligibility deadline. If the ACMA varied the starting prices and/or the set price of leftover lots, the application deadline and eligibility deadline would be extended.

20. Payment terms: we seek comments on our proposal to require upfront payment of winning prices before licence issue.

21. Changes to the Radiocommunications (Spectrum Licence Tax)

Determination 2021: we seek comments on our proposal to:

- > change the existing frequency range used to calculate spectrum licence tax from 3400–3700 MHz to 3400–3800 MHz
- > change the base amount for this frequency range, used to calculate spectrum licence tax, from \$166,032 to \$221,376 to reflect the change in the frequency range.

Draft technical instruments

22. **Spectrum licence technical framework:** We seek comments on the proposed technical framework, including relevant aspects of draft RALI MS47 as they relate to spectrum licences.
23. **Coexistence of radio altimeters with wireless broadband:** Alongside this consultation paper, we have also published a report on coexistence between radio altimeters and WBB. Published at Appendix A of this consultation paper is a list of separate questions aimed at eliciting evidence to assist us in making final decisions around the technical framework to manage coexistence between wireless broadband and radio altimeters.

2. Introduction

As part of the ACMA’s program of mid-band (3.4–4.0 GHz) allocations, we will auction spectrum in the 3.4/3.7 GHz bands pursuant to section 153L of the *Radiocommunications Act 1992* (the Act).

To make the spectrum available for auction, the ACMA has made the [Radiocommunications \(Spectrum Re-allocation – 3.4 GHz and 3.7 GHz Bands\) Declaration 2022](#) (the re-allocation declaration). The terms of the re-allocation declaration are summarised in Table 1.

Table 1: Summary of the re-allocation declaration

Relevant term	The ACMA’s re-allocation declaration
Licence type	Spectrum licences
Parts of the spectrum	<p>The frequency ranges:</p> <ul style="list-style-type: none"> > 3400–3425 MHz in Albury, Cairns, Hobart, Launceston, Quirindi west, Rockhampton, Rural Australia, Townsville > 3425–3442.5 MHz in Quirindi west, Rural Australia > 3475–3492.5 MHz in Quirindi east, Quirindi west, Regional New South Wales north, Regional New South Wales south, Regional Queensland, Regional South Australia, Regional Victoria, Regional Western Australia central, Regional Western Australia south, Rural Australia > 3492.5–3510 MHz in Albury, Cairns, Hobart, Launceston, Quirindi east, Quirindi west, Regional New South Wales north, Regional New South Wales south, Regional Queensland, Regional South Australia, Regional Victoria, Regional Western Australia central, Regional Western Australia south, Rockhampton, Rural Australia, Townsville > 3510–3542.5 MHz in Albury, Cairns, Hobart, Launceston, Quirindi west, Regional Western Australia central, Rockhampton, Rural Australia, Townsville > 3542.5–3575 MHz in Regional Western Australia central. <p>This part of the spectrum is referred to as the 3.4 GHz band in this paper.</p> <p>The frequency ranges:</p> <ul style="list-style-type: none"> > 3700–3750 MHz in all metropolitan areas (Adelaide, Brisbane, Canberra, Hobart, Melbourne, Perth, Sydney), Albury, Ballarat and Bendigo, Cairns, Launceston, Regional New

Relevant term	The ACMA's re-allocation declaration
	<p>South Wales north, Regional New South Wales south, Regional Queensland, Regional South Australia, Regional Victoria, Regional Western Australia central, Regional Western Australia south, Rockhampton, Rural Australia, Toowoomba and Townsville</p> <p>> 3750–3800 MHz in all metropolitan areas, Ballarat and Bendigo, Regional New South Wales south, Regional Queensland, Regional South Australia, Regional Victoria, Regional Western Australia central, Regional Western Australia south and Toowoomba.</p> <p>This part of the spectrum is referred to as the 3.7 GHz band in this paper.</p> <p>Together, the spectrum is referred to as the 3.4/3.7 GHz bands.</p>
Re-allocation period	Five years from the commencement of the re-allocation declaration.
Re-allocation deadline	The end of the re-allocation period.

In order to allocate the re-allocated spectrum, we are required to prepare an allocation determination and a marketing plan (allocation instruments).

The ACMA is seeking comment on the draft versions of the allocation and technical instruments.

Draft allocation instruments

Marketing plan

Section 39A of the Act requires the ACMA to prepare a marketing plan for issuing spectrum licences within the parts of the spectrum subject to a re-allocation declaration.

The marketing plan is a legislative instrument which sets out the product offering, and may specify matters including:

- > the procedures to be followed for issuing spectrum licences
- > the timetable for issuing spectrum licences in accordance with the plan
- > how the spectrum is to be apportioned among the spectrum licences to be issued
- > the conditions, or types of conditions, that may be included in the spectrum licences to be issued.

Further discussion of the draft version of the marketing plan is in the 'Draft marketing plan' section of this paper.

Allocation determination

Section 60 of the Act requires the ACMA to determine written procedures to apply to the allocation of spectrum licences. Section 294 of the Act enables the ACMA to make determinations fixing spectrum access charges payable by licensees for issuing

spectrum licences and specifying the times when spectrum access charges are payable.

An allocation determination made under section 60 of the Act for the purposes of an auction sets out the auction rules and procedures, and may specify matters including, but not limited to:

- > the type of auction
- > how the auction will be advertised
- > pricing (application fees, starting prices, deposits), eligibility requirements and methods of payment for licences.

Discussion of the draft version of the allocation determination is in the 'Draft allocation determination' section of this paper.

An allocation determination may impose limits on the aggregate of the parts of the spectrum that may be used by any one person, or a specified group of persons. The Act was amended by the [Radiocommunications Legislation Amendment \(Reform and Modernisation\) Act 2020](#) (the Modernisation Act), such that the power to set allocation limits now falls under the ACMA's remit. Further discussion on the proposed application and quantum of the allocation limits for the 3.4/3.7 GHz bands auction is under the 'Allocation limits' section of this paper.

Draft technical instruments

The ACMA has also prepared draft technical instruments as part of a technical framework to provide the technical and interference management rules for the operation of radiocommunications devices under a spectrum licence in the 3.4/3.7 GHz bands.

Section 145 of the Act allows the ACMA to make determinations that set out the unacceptable levels of interference for each spectrum-licensed band. Under sections 66 to 69A and section 71 of the Act, spectrum licences must include core conditions, statutory conditions and other conditions imposed by the ACMA. Further guidance on interference management with other services is provided in radiocommunications advisory guidelines made under section 262 of the Act. These elements comprise the spectrum licensing technical framework.

For this auction, the coexistence between wireless broadband (WBB) and radio altimeters is a key consideration. Further discussion of the draft version of the technical instruments, including issues relevant to coexistence between WBB and radio altimeters, is in the 'Draft technical framework' section of this paper.

Background

The ACMA is progressing a program of mid-band spectrum allocations to support a range of 5G technologies including mobile, fixed wireless and satellite services in the Australian market. The 3.4/3.7 GHz bands auction will be the second of 4 allocations in the 3.4–4.0 GHz band.

The upcoming mid-band allocations are:

- > An administrative allocation of area-wide apparatus licences (AWLs) in remote areas of the 3.4–4.0 GHz band, intended to support both wide-area and local-area wireless broadband use cases. The ACMA expects to commence this allocation process in Q2 2023.

- > The auction of spectrum licences in the 3.4/3.7 GHz bands, intended to support the continued deployment of wide-area wireless broadband (WA WBB) services, such as mobile and fixed wireless networks.
- > An administrative allocation of AWLs in the 3.8 GHz band (3.8–3.95 GHz in metropolitan areas and surrounds, and 3.75–3.95 GHz in some regional areas) to support new local-area wireless broadband (LA WBB) services, and the continued deployment of satellite and point-to-point (PTP) services. The ACMA expects to commence this allocation process in Q1 2024. There may be some co-dependencies with regard to allocation limits for some interested stakeholders. The ACMA is considering implementing an initial allocation limit of nil at the 3.8 GHz band AWL allocation for incumbent spectrum licensees in the 3.4–3.7 GHz frequency range and an additional cross-band limit taking into account spectrum licensed holdings including those acquired in the Q4 2023 auction, in order to create an initial priority access period for non-WA WBB users. This is discussed further under the ‘Allocation limits’ section of this paper.
- > An allocation of apparatus licences in urban excise areas of the 3.4–3.475 GHz band, and metropolitan and regional areas of the 3.95–4.0 GHz band, intended to support restricted cell LA WBB use.

This work program is based on the planning decisions the ACMA has made for the 3.4–4.0 GHz band. Further opportunities will be made available for stakeholders to respond to the ACMA’s policy settings for other allocation processes (see also [the ACMA website](#) for next steps for each of the allocation processes).

Process to date: consultation on arrangements in the 3.4–4.0 GHz band

In 2019, after industry consultation and consideration of responses, the ACMA published the [Optimising arrangements for the 3400–3575 MHz band – Planning decisions and preliminary views](#) paper, in which we identified planning outcomes and outlined an implementation plan. We acknowledged that the mix of licensing types across the 3400–3575 MHz frequency range has impeded commercial negotiations between licensees to facilitate a move to more efficient arrangements in this frequency range (defragmentation). The [3400 MHz options paper](#) also identified options for making more of this frequency range available for WBB use. Our preliminary planning decisions involved restacking apparatus licences, converting NBN Co’s 3.5 GHz public telecommunications service (PTS) licences to spectrum licences, and re-allocating additional spectrum for WBB use via apparatus and spectrum licensing.

In July 2020, we published the [Replanning of the 3700–4200 MHz band](#) options paper, making a case to review and potentially change the spectrum management framework in the 3700–4200 MHz frequency range. These options were based on submissions made to consultation on the [Planning of the 3700–4200 MHz band](#) discussion paper.

Current Australian regulatory arrangements in the 3700–4200 MHz frequency range support the following mix of uses:

- > apparatus-licensed PTP fixed service links
- > coordinated fixed satellite service (FSS) receive earth stations
- > various low-power class-licensed devices.²

Following consultation with stakeholders, technical studies and engagement both domestically and internationally, we completed a review of the 3700–4200 MHz

² While there is no radiodetermination service allocation in the band, several radiodetermination licences have been issued in accordance with subsection 10(7) of the Australian Radiofrequency Spectrum Plan 2021 (or its predecessor instruments).

frequency range, and published the [Replanning the 3700–4200 MHz band](#) outcomes paper.

As the consideration of technical arrangements for the 3400–3575 MHz and 3700–4200 MHz bands occurred at a similar time, the ACMA used this as an opportunity to holistically assess the arrangements across the broader 3400–4200 MHz frequency range. In doing so, we aimed to support the best long-term use of the spectrum in the band by optimising access for both spectrum and apparatus-licence uses.

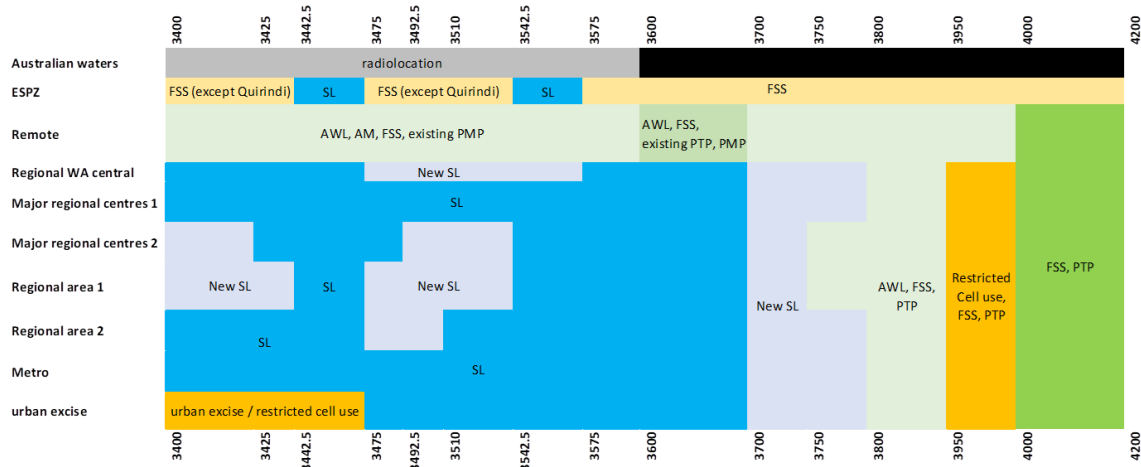
Between March and July 2022, we consulted again on the appropriate planning arrangements in the [Proposed spectrum re-allocation declaration for the 3.4 GHz and 3.7 GHz bands](#) consultation (the re-allocation declaration consultation). Final planning decisions are outlined in the [Proposed spectrum re-allocation declaration for the 3.4 GHz and 3.7 GHz bands](#) outcomes paper, which was published when the re-allocation declaration was made. The ACMA has also notified incumbent licensees who will be affected by the re-allocation declaration (i.e., incumbent apparatus licences are automatically cancelled at the end of the re-allocation period pursuant to section 153H of the Act).

Final planning decision for the 3.4–4.0 GHz band

Indicative proposed arrangements in the 3.4–4.0 GHz frequency range, taken from the re-allocation declaration consultation paper, are represented below in Figure 1.

Figure 1: Illustration of planning arrangements in the frequency range 3.4–4.0 GHz

AM = amateur services, FSS = fixed satellite services, PMP = point-to-multipoint services, PTP = point-to-point services, AWL = area-wide apparatus licences, SL = spectrum licences, ESPZ = earth station protection zone



Note: This diagram is illustrative only.

According to the planning decisions:

- > Spectrum in the 3.4/3.7 GHz bands will be spectrum-licensed (i.e., through the 3.4/3.7 GHz bands auction).
- > We plan to make the 3.4–3.475 GHz frequency range available for restricted cell LA WBB use via the issue of apparatus licences in urban excise areas.
- > We will implement a segmentation approach in the 3.8 GHz band:
 - > Spectrum in the 3.75–3.95 GHz frequency range in some regional areas and 3.8–3.95 GHz in metropolitan areas and surrounds should

be made available for apparatus licensing and continued FSS and PTP use.

- > Our preliminary view was that the 3950–4000 MHz frequency should be segmented for restricted cell use.
- > Consideration of the technical frameworks and implementation of the urban excise and segmentation decisions has commenced but not yet been completed.

The planning decision for the 3.4–4.0 GHz band is reflected in the ACMA’s work program for the band.

Legislative context and policy environment

Guiding legislation

The ACMA’s decisions are guided by the object of the Act to promote the long-term public interest derived from the use of the spectrum by providing for the management of the spectrum in a manner that:

- a) facilitates the efficient planning, allocation and use of the spectrum
- b) facilitates the use of the spectrum for:
 - (i) commercial purposes
 - (ii) defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes)
- c) supports the communications policy objectives of the Australian Government.

Ministerial Policy Statement

The former minister responsible for the communications portfolio issued the [Radiocommunications \(Ministerial Policy Statement – 3.4–4.0 GHz\) Instrument 2022](#) (MPS) for the allocation of the spectrum in the 3.4–4.0 GHz band, containing the following objectives:

- > supporting the deployment of new and innovative technology, including 5G
- > supporting a range of use-cases and users
- > supporting digital connectivity and investment in regional Australia
- > promoting competitive markets.

Under section 28C of the Act, the ACMA must have regard to the MPS in exercising its powers and performing its functions under the Act.

Government communications policy objectives

As part of the government’s October 2022 Budget announcements, the Minister for Communications (the minister), the Hon Michelle Rowland MP, [restated](#) the government’s commitment to deliver better connectivity to Australians, including to increase connectivity for rural, regional, remote and First Nations communities and to enable the ACMA to continue to auction high value spectrum.

In her [speech to the Radcomms conference in November 2022](#), the minister noted that the allocation of spectrum in the 3.4–4.0 GHz band will support digital connectivity and investment in regional Australia, as well as its importance for the deployment of new and innovative technology including 5G services.

In its [statement of expectations for the ACMA \(SoE\)](#), the government articulated its expectation that the ACMA take a proactive regulatory approach. Of particular relevance for the ACMA’s spectrum management functions, the SoE outlined the

government's expectation that the ACMA support the government's communications and media objectives, including:

- > promoting investment, innovation and the adoption of new and emerging technologies while continuing to safeguard the interests of consumers and small businesses
- > supporting government policies related to regional, rural and remote Australia including by having regard to relevant ministerial policy statements in the planning and allocation of spectrum to support innovation and competition in these areas
- > promoting the long-term public interest derived from spectrum, including the benefits of technological developments that improve spectrum utilisation.

Indicative timeline and next steps

To help potential bidders understand the process leading up to the auction, we have prepared an indicative timeline based on the proposals in this consultation paper. This timeline is for guidance purposes only.

Dates in this timeline are estimates and may change as the consultation on allocation processes progresses. Allocation processes will be finalised after submissions to this consultation have been considered. Updated timelines will be published on the ACMA's website when further information becomes available.

Table 2: Proposed timeline for the 3.4/3.7 GHz bands auction

Event	Date
The ACMA publishes this consultation paper and invites comments on the draft allocation instruments.	13 February 2023 to 29 March 2023
The ACMA holds a tune-up to discuss the proposals in the consultation paper	24 February 2023
The ACMA makes allocation instruments and registers them on the Federal Register of Legislation .	June 2023
The ACMA will advertise the auction, publish the Applicant Information Pack (AIP) and invite applications to participate in the 3.4/3.7 GHz bands auction. The AIP will give potential bidders information relevant to the decision on whether to participate, and if they choose to do so, how to participate. Starting prices, set prices for leftover lots, lot ratings and the value of each	Applications open July 2023

Event	Date
eligibility point will also be published at the same time.	
<p>By the application deadline, applicants are required to:</p> <ul style="list-style-type: none"> > submit a completed application form > submit a completed deed of acknowledgement form > submit a completed deed of confidentiality form > pay the application fee. 	Application deadline July 2023
<p>By the eligibility deadline, applicants are required to:</p> <ul style="list-style-type: none"> > submit a completed eligibility nomination form > (for eligible applicants) elect whether to take up the leftover lot(s) > pay the required eligibility payment or provide a deed of financial security, or a combination of both. 	September 2023
Auction system training and mock auctions held to familiarise registered bidders with the auction system.	After the eligibility deadline
Estimated auction commencement.	October 2023

3. Draft marketing plan

In accordance with section 39A of the Act, the draft marketing plan includes:

- > procedures for issuing spectrum licences
- > a timetable for issuing spectrum licences
- > how the spectrum dealt with under the plan is to be apportioned among the spectrum licences to be issued (i.e., how we propose to divide it into lots for bidders to acquire in the auction)
- > the conditions and types of conditions we propose to include in spectrum licences issued in accordance with the marketing plan.

Spectrum licences

Sample spectrum licence and core licence conditions

The draft marketing plan includes a sample spectrum licence. The sample licence includes proposed conditions intended to enable all licensees to operate services without causing unacceptable interference to other services including those operating in other parts of the radiofrequency spectrum.

Core conditions, in accordance with section 66 of the Act, will apply to spectrum licences to:

- > define their geographic boundaries
- > define their range of frequencies
- > set outside-the-area radio emission limits
- > set outside-the-band radio emission limits.

The draft marketing plan also describes other licence conditions and rules applying to spectrum licences,³ including those relating to licence trading, use by third parties,⁴ and registration of transmitters with the ACMA.⁵

Licence duration and commencement

Licence duration

The ACMA's preliminary view on licence duration is to adopt the hybrid option, as presented in the re-allocation declaration consultation and subsequent tune-up:

- > 3.4 GHz – expiry on 13 December 2030 (approximately 7 years)
- > 3.7 GHz – 20-year duration.

Stakeholders expressed a range of views on the appropriate licence term but there was majority support for the hybrid option. We consider that this option strikes the right balance between investment certainty and a market environment that supports licence trading.

³ For these purposes, the draft marketing plan refers to 2 legislative instruments that, at the time this paper was published, had not yet been made: the Radiocommunications (Australian Radio Quiet Zone Western Australia) Frequency Band Plan 2023 and the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2023.

⁴ The ACMA may make rules about third-party use of spectrum licences under section 68 of the Act.

⁵ Under section 69 of the Act, a spectrum licence must include a condition that transmitters not be operated under the licence unless the requirements of Part 3.5 of the Act (relating to registration of devices) have been met.

We also consider that this option best meets the object of the Act and the policy objectives outlined in the MPS. Table 3 below analyses how each of the licence term options presented in earlier consultations achieves the object of the Act and the policy objectives in the MPS.

Table 3: Comparative analysis of licence term options against objectives

Objectives	Licence duration options		
	Option 1 (~7-year licences)	Option 2 (3.4 GHz: ~7-year licences, 3.7 GHz: 20-year licences)	Option 3 (all 20-year licences)
Efficient allocation and use of spectrum	<ul style="list-style-type: none"> × Short licence term may limit investment certainty. × Short licence term may discourage participation of new entrants. ✓ Short licence term may provide for more efficient allocation and use in the medium to long term as it is more likely to facilitate commercially-led defragmentation activities. × Re-allocation period of 5 years may constrain use of a licence with a short licence term. 	<ul style="list-style-type: none"> × Short licence term may limit investment certainty in the 3.4 GHz band, which may affect how efficiently the band is allocated and used. ✓ Compared to Option 1, Option 2 may provide greater investment certainty for future licensees in the 3.7 GHz band. × Compared with Option 1, Option 2 results in misaligned licence expiry dates across the 3.4–3.8 GHz band, which may introduce barriers to trading across the wider band. This may influence bidding behaviour at auction. However mitigations may be available under the Act. 	<ul style="list-style-type: none"> ✓ Long licence terms may provide greater investment certainty, encouraging deployment of services within the spectrum. × Similar to Option 2, long licence terms across the 3.4/3.7 GHz bands may introduce some complexity to defragmentation options for licensees as there is a mismatch between expiry of existing 3.4 GHz licences and new 3.4 GHz licences. This may cause uncertainty about achieving contiguous spectrum holdings. However, mitigations may be available under the Act.
Support deployment of new and innovative technology	Broadly catered for by technology flexible technical framework		
	<ul style="list-style-type: none"> × Reduced investment certainty due to short licence term may constrain deployment by some licensees, particularly those in the 3.7 GHz band where large contiguous blocks of spectrum are available at auction. ✓ Short licence terms in the 3.4 GHz band may facilitate earlier defragmentation (and therefore contiguous spectrum). This may support the deployment of new and innovative 	<ul style="list-style-type: none"> × Reduced investment certainty due to short licence term may constrain deployment in 3.4 GHz band for any new entrants. ✓ The combination of a long licence term and large contiguous blocks of spectrum available in the 3.7 GHz band may encourage bidders to acquire the spectrum to deploy new and innovative technologies. 	<ul style="list-style-type: none"> ✓ Similar to Option 2, longer licence terms may provide greater investment certainty and therefore encourage deployment, particularly in the 3.7 GHz band. × Piecemeal, long-term acquisitions of the 3.4 GHz band (which are not contiguous and are available in small parcels) may discourage bidders from deploying new technologies that require larger bandwidths.

Objectives	Licence duration options		
	Option 1 (~7-year licences)	Option 2 (3.4 GHz: ~7-year licences, 3.7 GHz: 20-year licences)	Option 3 (all 20-year licences)
	technology in that spectrum.		
Support a range of WBB use cases and users	Broadly catered for by band planning and licensing arrangements and approach to broader 3.4–4.0 GHz band (i.e., mixture of AWLs and spectrum licences for WA and LA WBB use cases).		
	<p>× Short licence terms may reduce likelihood of new entrants seeking to acquire spectrum licences, particularly in the 3.7 GHz band. However, adjacent 3.8–4.0 GHz AWLs may offer an alternative.</p>	<p>○ Short licence terms may reduce likelihood of new spectrum licensees in the 3.4 GHz band (although this may already be limited due to limited available spectrum and adjacency to existing licences).</p> <p>✓ Compared to Option 1, Option 2 is more likely to encourage new entrants to acquire 3.7 GHz spectrum (due to the long licence term) and therefore a larger range of users and/or use cases.</p>	<p>○ Long licence terms may enhance likelihood of new spectrum licensees in both 3.4 and 3.7 GHz bands. However, interest in the 3.4 GHz band may already be constrained due to available quantum and adjacency to existing licences.</p>
Support regional connectivity and investment in regional Australia	<p>× Limited investment certainty may discourage bidders from acquiring spectrum in regional areas in the short-term, particularly in the 3.7 GHz band.</p> <p>✓ However, a uniform licence term in the 3.4–3.7 GHz frequency range may encourage existing licensees to acquire the regional spectrum in the 3.4 GHz band.</p>	<p>✓ Compared to Option 1, longer licence term in 3.7 GHz may enhance likelihood of regional investment through providing investment certainty.</p>	<p>✓ Longer licence duration in the 3.7 GHz band may enhance likelihood of regional investment, especially for new entrants.</p> <p>× Regional investment in 3.4 GHz may be limited by mismatch in licence expiry and greater difficulty to defragment holdings.</p>
Promote competitive markets	We consider this objective is primarily met through other auction policy settings, such as the allocation limits.		

Note: O symbol represents neutral impact.

Licence commencement

The ACMA's preliminary view is that 3.4/3.7 GHz spectrum licences should commence shortly after the auction concludes. Stakeholders have supported this approach throughout the ACMA's consultations.

In the 3.4 GHz band, we propose that licences expire on 13 December 2030 to align with existing 3.4 GHz licences. Given there is a common expiry date, licences may commence as soon as the licensee pays the spectrum access charge. In the 3.7 GHz band, in order to achieve a common expiry date, we must set a common commencement date for the 20-year licence term. To allow sufficient time for invoice payment and licence issue, we propose to set a common commencement date of 8 weeks after the publication of the auction results for licences issued before that time. In the unlikely event any licence is issued after that time, the licence will commence on the day it is issued, and run for less than 20 years to ensure it shares the common expiry date with licences issued before that time.

Licence commencement and duration: we seek comments on our preliminary views that:

- > 3.4 GHz licences will commence as soon as possible after a winning bidder pays its spectrum access charge. The expiry date will be 13 December 2030 (approximately 7 years), to align with existing 3.4 GHz band licences.
- > Subject to the payment of the spectrum access charge, 3.7 GHz licences will commence 8 weeks after publication of the auction results for a term of 20 years, the maximum allowable under subsection 65(3) of the Act.

Licence renewals

Section 65A of the Act sets out the requirements for spectrum licences to contain statements regarding renewal arrangements, such as a renewal statement, renewal application period statement, renewal decision-making period statement and public interest statement. This section outlines our preliminary views on these matters for spectrum licences issued for the 3.4/3.7 GHz bands.

We have taken the following general approach:

- > 3.4 GHz spectrum licences – align the renewal arrangements with existing licences in the band to the maximum extent possible, to facilitate defragmentation and licence trading.
- > 3.7 GHz spectrum licences – follow the approach for long-term spectrum licences outlined in the document, [Our approach to radiocommunications licensing and allocation](#).

Renewal statement

A spectrum licence must include a renewal statement to the effect that:

- > the licence cannot be renewed
- > the licence may be renewed at the discretion of the ACMA
- > the licence may be renewed at the ACMA's discretion, so long as specified circumstances exist.⁶

Renewal application period statement

If a spectrum licence includes a renewal statement to the effect that it may be renewed, we must also include a renewal application period statement outlining the

⁶ Subsection 65A(1) of the Act.

period during which a spectrum licensee can apply for a licence renewal.⁷ The renewal application period for a spectrum licence must:⁸

- > begin at a time when the licence is in force and
- > end before the licence is due to expire.

Our preliminary view is that 3.4 GHz spectrum licences have a renewal application period of 13 December 2028 to 12 December 2030, that is a period of 2 years before licence expiry. Existing 3.4 GHz spectrum licences do not have a renewal application period statement, and therefore any application for renewal must be made within the 2-year period ending when the licence is due to expire.⁹ To enable defragmentation and trading, we propose to align the renewal application period for 3.4 GHz spectrum licences issued after the auction with existing 3.4 GHz spectrum licences. That is, our intention is to consider whether to renew 3.4 GHz spectrum licences issued after the auction concurrently with existing 3.4 GHz spectrum licences as they come due for expiry.

Our preliminary view is that 3.7 GHz spectrum licences have a renewal application period of one year, commencing 5 years before licence expiry. This aligns with our general approach to long-term spectrum licences and ensures we can begin consideration of licence renewal arrangements well before expiry to give sufficient clarity to licensees and the wider industry.

Renewal decision-making period statement

A spectrum licence may also include a statement to the effect that a specified period is the 'renewal decision-making period' for the licence.¹⁰ This is the time in which the ACMA decides whether to renew a licence, after receiving a licence renewal application from a licensee. If such a statement is not included in the spectrum licence, then the renewal decision-making period is either:

- > 6 months after receiving an application for renewal
- > if the ACMA has issued a notice¹¹ requesting further information from the renewal applicant, 6 months after receiving the further information.¹²

Our preliminary view is that 3.4 GHz spectrum licences have a renewal decision-making period of 6 months after receiving a licence renewal application. This aligns the renewal decision-making period with existing 3.4 GHz spectrum licences (which do not include a renewal decision-making period statement), facilitating defragmentation and trading.

Our preliminary view is that 3.7 GHz spectrum licences have a renewal decision-making period of 2 years, commencing immediately after the renewal application period. This aligns with our general approach to long-term spectrum licences and ensures we can consider any licence renewal applications well before expiry to give sufficient clarity to licensees and the wider industry.

Public interest statement

A spectrum licence may also include a public interest statement, which requires the ACMA not to renew the licence unless it is satisfied it is in the public interest to do so.¹³ Further, the Act provides that the ACMA must not renew a licence for a period

⁷ Subsection 65A(10) of the Act.

⁸ Subsection 65A(13) of the Act.

⁹ Subsection 77A(3) of the Act.

¹⁰ Subsection 65A(15) of the Act.

¹¹ See section 77B of the Act as amended.

¹² Subsection 286(6) of the Act.

¹³ Subsections 65A(17) and 77C(6) of the Act.

that is 10 years or longer unless it is satisfied it is in the public interest to do so (whether or not the licence includes a public interest statement).¹⁴

Our preliminary view is that 3.4 GHz spectrum licences should include a public interest statement. We would like to facilitate more efficient use of the 3.4 GHz band spectrum, which is currently subject to significant fragmentation. The public interest statement will reflect that the ACMA is guided by the object of the Act, in particular in relation to whether the spectrum is being efficiently allocated and used. When considering the efficiency of allocation and use of the spectrum, one relevant aspect is the extent of fragmentation across the band, which can be mitigated through secondary market activity amongst spectrum licensees.

Our preliminary view is that 3.7 GHz spectrum licences should not include a public interest statement. Over the course of a 20-year licence, there will be sufficient opportunity for licensees to achieve more efficient use of the spectrum. Regardless of whether the 3.7 GHz licences include a public interest statement, the ACMA must not renew a licence for greater than 10 years unless it is satisfied it is in the public interest to do so. More generally, the ACMA is guided in all its decisions by the object of the Act, to promote the long-term public interest derived from the use of the spectrum.

Licence renewal statements

We seek comments on our preliminary views to include the following statements in spectrum licences issued as a result of the 3.4/3.7 GHz bands auction:

For spectrum licences in the 3.4 GHz band:

- > The spectrum licences may be renewed at the ACMA's discretion.
- > A renewal application period of 13 December 2028 to 12 December 2030 (a period of 2 years before licence expiry).
- > A renewal decision-making period of 6 months after receiving an application for renewal of the licence.
- > There will be a public interest statement.

For spectrum licences in the 3.7 GHz band:

- > The spectrum licences may be renewed at the ACMA's discretion.
- > A renewal application period of one year, commencing 5 years before licence expiry.
- > A renewal decision-making period of 2 years, commencing immediately after the renewal application period.
- > There will be no public interest statement.

Lot configuration

Spectrum is typically divided into lots before it can be offered to the market. There are 2 dimensions to lot configuration – frequency and geography. In deciding lot configuration for any allocation, we are guided by the object of the Act to promote the long-term public interest derived from the use of the spectrum. We consider a range of factors, including the source of demand and the technical characteristics of the spectrum. We also have regard to the MPS.

¹⁴ Subsection 77C(5) of the Act.

Lot configuration – frequency

Generic lots

Our preliminary view is that the lot size in the 3.4/3.7 GHz bands auction should be 5 MHz. The majority of submissions to the July 2022 tune-up expressed support for a lot size of 5 MHz. Some submitters preferred a 10 MHz lot size but supported a 5 MHz lot size if a MSR of 10 MHz (2 lots) was available. Our view is that a lot size of 5 MHz enables existing licensees with holdings that are not a multiple of 10 MHz to ‘round up’ their holdings.

Leftover lots

As shown in Figure 2, in regional area 1 (RA1),¹⁵ there are 2 blocks of spectrum supply of 42.5 MHz and 67.5 MHz. This means that spectrum cannot be evenly divided into 5 MHz lots, and ‘leftover lots’ of 2.5 MHz are required, as shown in Figure **Error! Reference source not found.** 2 below. The internationally harmonised channel bandwidths for the n78 band (3300–3800 MHz) are 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90 and 100 MHz, so any 2.5 MHz holdings are not useable on their own.

Figure 2: Leftover lots in RA1

Area	3400	3425	3442.5																		
Regional WA central																					
Major regional centres 2	5	5	5	5	5																
Regional area 1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2.5
Regional area 2																					

Area	3475	3492.5	3510												3542.5											3575
Regional WA centre	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5					
Major regional centres 2				5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5				
Regional area 1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2.5				
Regional area 2	5	5	5	5	5	5	5																			

In major regional centres 2 (MRC2), the spectrum supply of 50 MHz from 3492.5–3542.5 MHz is not aligned with the frequency boundaries in other areas by 2.5 MHz, as seen in Figure 2 above. This may prevent bidders from obtaining contiguous frequency holdings across geographic areas. To align these frequency boundaries, we propose to configure 2 lots of 2.5 MHz at either end of this spectrum block. This approach was supported by stakeholders in the July 2022 tune-up, and is shown in Figure 3 below.

Figure 3: Leftover lots in MRC2

Area	3475	3492.5	3510												3542.5											3575
Regional WA central	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5					
Major regional centres 2				2.5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2.5				
Regional area 1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2.5				
Regional area 2	5	5	5	5	5	5	5																			

¹⁵ These geographic areas are defined in our consultation paper [Proposed spectrum re-allocation declaration for 3.4 GHz and 3.7 GHz bands](#).

Our preliminary view is that the following areas will be configured with ‘leftover lots’ of 2.5 MHz:

- > Major Regional Centres 2: 3492.5–3495 MHz and 3540–3542.5 MHz.
- > Regional Area 1: 3440–3442.5 MHz and 3540–3542.5 MHz.

This is consistent with the approach presented at the July 2022 tune-up and was supported by stakeholders in their submissions. The leftover lot allocation section below describes our preliminary view on how leftover lots should be allocated in the auction. Schedule 3 to the draft marketing plan provides a complete list of the leftover lots available for allocation.

Figure 4 below shows an illustration of the resulting frequency lot configuration for the 3.4/3.7 GHz bands auction, showing both the generic lots and leftover lots. Due to the large number of products, we have not included a table of all lots available in the auction.

Frequency lot configuration

We seek comments on the following proposed lot sizes:

- > The lot size for generic lots should be 5 MHz.
- > The lot size for leftover lots should be 2.5 MHz.

Figure 4: Illustration of frequency lot configuration for the 3.4/3.7 GHz bands

Region	Area	3400-3425	3425-3442.5	3442.5-3475	3475-3492.5	3492.5-3510	3510-3542.5	3542.5-3575	3575-3700	3700-3750	3750-3800								
Metropolitan	Adelaide									100 MHz (20 lots x 5 MHz)									
	Brisbane																		
	Canberra																		
	Melbourne																		
	Perth																		
	Sydney																		
Major Regional Centres 2	Albury	25 MHz (5 lots x 5 MHz)					50 MHz (9 lots x 5 MHz + 2 x 2.5 MHz leftover lots)			Combined with RA1 ↓	AWL								
	Cairns										50 MHz (10 lots x 5 MHz)								
	Launceston																		
	Rockhampton																		
	Townsville																		
	Hobart																		
Regional Area 1 (3700-3750 MHz: includes Major Regional Centres 1, Major Regional Centres 2, Regional Area 2)	Rural North QLD	42.5 MHz (8 lots x 5 MHz + 2.5 MHz leftover lot)					67.5 MHz (13 lots x 5 MHz + 2.5 MHz leftover lot)			50 MHz (10 lots x 5 MHz)	AWL								
	Rural Central QLD																		
	Rural North NSW / South QLD																		
	Rural South / West NSW																		
	Rural VIC																		
	Rural TAS																		
	Rural SA																		
Rural WA																			
Regional Area 2 (3750-3800 MHz: includes Major Regional Centres 1)	Regional QLD					35 MHz (7 lots x 5 MHz)				↑ Combined with RA1	50 MHz (10 lots x 5 MHz)								
	Regional NSW																		
	Regional VIC																		
	Regional SA																		
	Regional WA																		
Regional WA central	Regional WA central						65 MHz (13 lots x 5 MHz)												

Lot configuration – geography

In order to support the efficient allocation and use of the spectrum, at the July 2022 tune-up, we identified the following objectives to be met for geographic lot configuration in the 3.4/3.7 GHz bands:

- > define the ‘spectrum product’ to meet expected demand, to the extent possible.
- > maximise opportunities for bidders to obtain contiguous spectrum holdings (frequency and geography).
- > enable future defragmentation by:
 - > aligning 3.4 GHz areas with existing 3.4 GHz areas
 - > aligning 3.7 GHz metropolitan areas with existing 3.6 GHz areas.
- > minimise auction complexity by making the auction as simple as possible for bidders to express their spectrum demand.

In light of the objectives, at the July 2022 tune-up, we sought comments on the following questions related to geographic lot configuration:

- > How should the Rural Australia area be disaggregated?
- > How should the regional lots in 3700–3800 MHz be defined?
- > Should metropolitan areas be aggregated as a single lot?
- > Should Regional WA south and Regional WA central be aggregated as a single lot?
- > Should Regional NSW north (Tamworth) be aggregated with surrounding areas?

Disaggregation of Rural Australia

The Rural Australia area defined in the re-allocation declaration covers rural areas outside the metropolitan, major regional centres (MRC1 and MRC2) and inner regional areas (Regional Area 2) of Australia. Rural Australia and Quirindi West together make up Regional Area 1. Our preliminary view is to disaggregate Rural Australia according to the 3.6 GHz regional areas, in both the 3.4 GHz and 3.7 GHz bands.

In the 3.7 GHz band, there has been broad support for disaggregating Rural Australia to align with the regional areas in the frequency adjacent 3.6 GHz band (3575–3700 MHz). This approach will likely be consistent with demand from likely bidders, and will simplify future defragmentation activities.

In the 3.4 GHz band, we presented 3 options for disaggregating Rural Australia at the July 2022 tune-up and sought comments:

- a) Aligned with the state-based licence boundaries from the 3.4 GHz auction in 2000.
- b) Aligned with the current 3.4 GHz licence boundaries (Western Australia and southern/eastern Australia).
- c) Aligned with the 3.6 GHz band regional areas.

These options are shown in Figures 5–7 below.

Figure 5: Rural Australia option (a) – year 2000 3.4 GHz auction boundaries

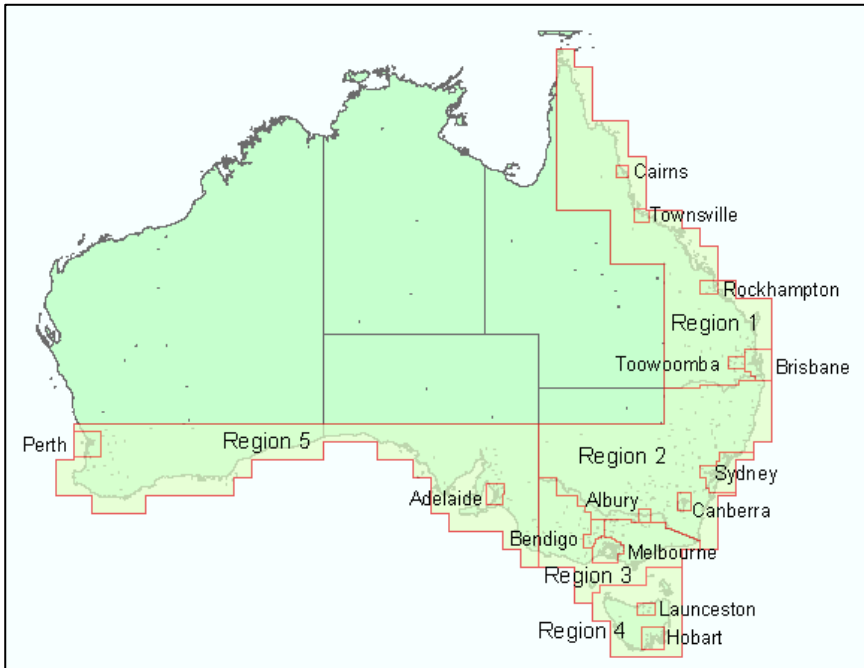


Figure 6: Rural Australia option (b) – current 3.4 GHz licence boundaries

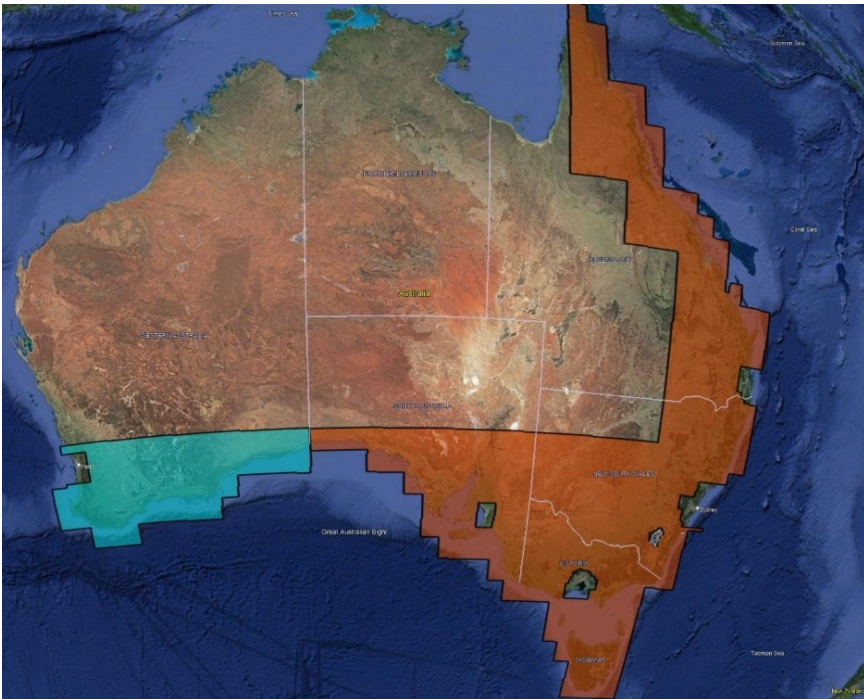
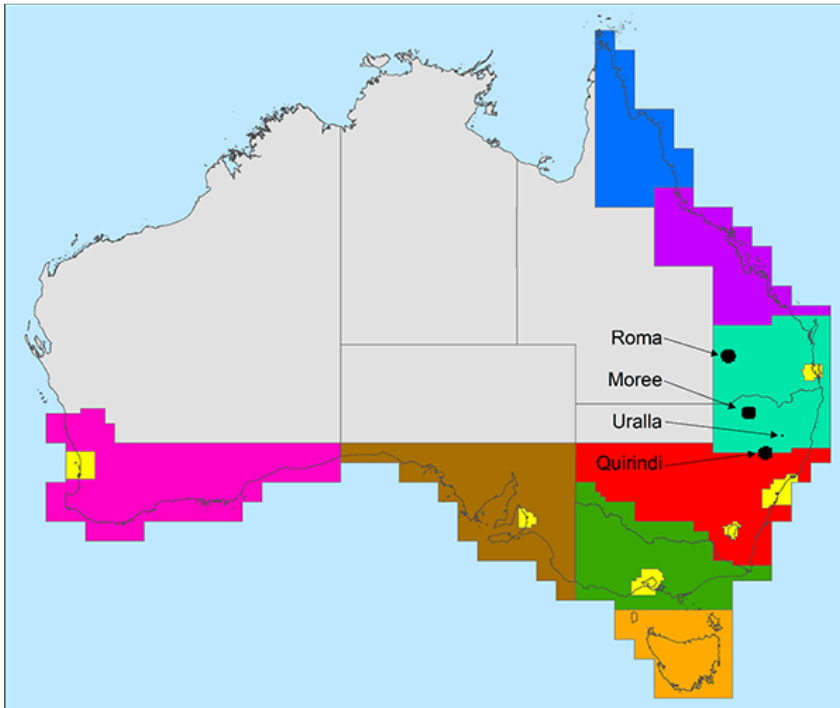


Figure 7: Rural Australia option (c) – 3.6 GHz regional areas



Stakeholders did not express majority support for any of these options. Table 4 below considers stakeholder submissions against the geographic lot configuration objectives outlined earlier.

Table 4: Analysis of options for disaggregating Rural Australia area

Objective	(a) – year 2000 boundaries	(b) – current 3.4 GHz boundaries	(c) – 3.6 GHz regional areas
Aligning with spectrum demand	A majority of stakeholders expressed differential demand for spectrum across Rural Australia. Does not align with demand profile indicated by most stakeholders.	A minority of stakeholders expressed the same demand across Rural Australia. However, this may limit participation by other bidders with differential demand across southern and eastern Australia.	A majority of stakeholders expressed differential demand for spectrum across Rural Australia.
Maximise opportunity for contiguous holdings	Enables contiguous holdings over smaller geographic areas. Bidders can aggregate holdings through bidding for multiple products.	Enables contiguous holdings over a wide geographic area.	Enables contiguous holdings over smaller geographic areas. Bidders can aggregate holdings through bidding for multiple products.

Objective	(a) – year 2000 boundaries	(b) – current 3.4 GHz boundaries	(c) – 3.6 GHz regional areas
Enable future defragmentation	Boundaries do not align with existing 3.4 GHz and 3.6 GHz boundaries. Existing boundary on WA/SA border is not included.	Boundaries align with existing 3.4 GHz boundaries. Stakeholders with existing spectrum holdings across Rural Australia value the ability to defragment those holdings on a national basis.	Boundaries align with existing 3.6 GHz boundaries. Enables long-term defragmentation of band despite non-alignment with existing 3.4 GHz boundaries. Partial or aggregated trades can be used to defragment 3.4 GHz holdings.
Minimise auction complexity	Applying allocation limits over geographic areas inconsistent with existing 3.4 GHz and 3.6 GHz areas increases auction complexity.	Applying allocation limits over the large southern/eastern Australia area with multiple existing holdings in the 3.6 GHz band would increase auction complexity significantly.	Applying allocation limits over smaller areas consistent with the 3.6 GHz band is less complex.

On balance, we consider option (c) best meets the objectives. It enables bidders to express differential demand across rural areas, while those with similar demand can achieve that outcome through bidding for multiple products. It also best facilitates future defragmentation through aligning the areas with regional areas in the frequency adjacent 3.6 GHz band. Applying the allocation limits is extremely complex due to mismatched geography across the wider 3.4–3.8 GHz band. Option (c) is the least complex to implement because it aligns with the 3.6 GHz geographic areas. Therefore, we have adopted option (c) as our preliminary view in the draft marketing plan.

Regional products in 3700–3800 MHz

In the re-allocation declaration, we declared the following regional areas for re-allocation in the 3.7 GHz band:

- > 3700–3750 MHz: all regional areas (MRC 1, MRC2, RA1, RA2, Regional WA central)
- > 3750–3800 MHz: all regional areas, excluding Regional Area 1.

These areas are shown in Figures 15 and 17 below.

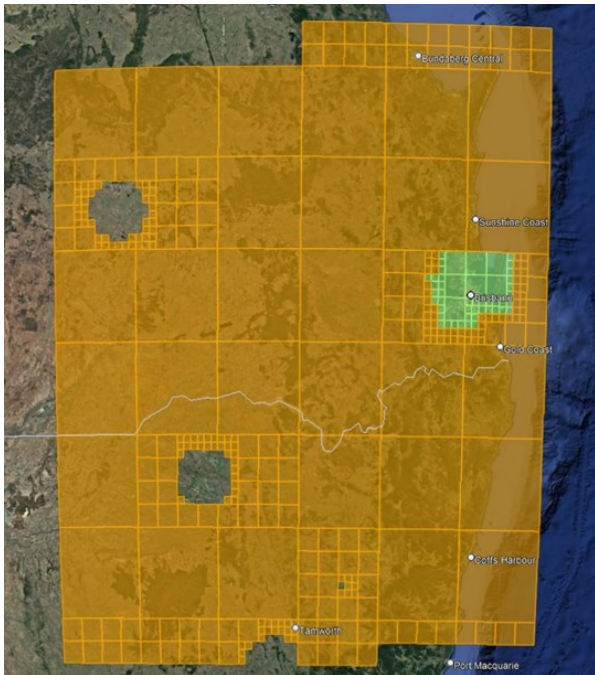
This means that the regional areas re-allocated for spectrum licensing differ between the lower 50 MHz and upper 50 MHz of the 3.7 GHz band. At the July 2022 tune-up, we presented 2 options for how to configure regional products to address these different areas.

Table 5: Options for 3700–3800 MHz regional product configuration

	3700–3750 MHz	3750–3800 MHz
2 lot option	1) Metropolitan 2) RA1+RA2+MRC1	1) Metropolitan 2) RA2+MRC1
3 lot option	1) Metropolitan 2) RA2+MRC1 3) RA1	1) Metropolitan 2) RA2+MRC1

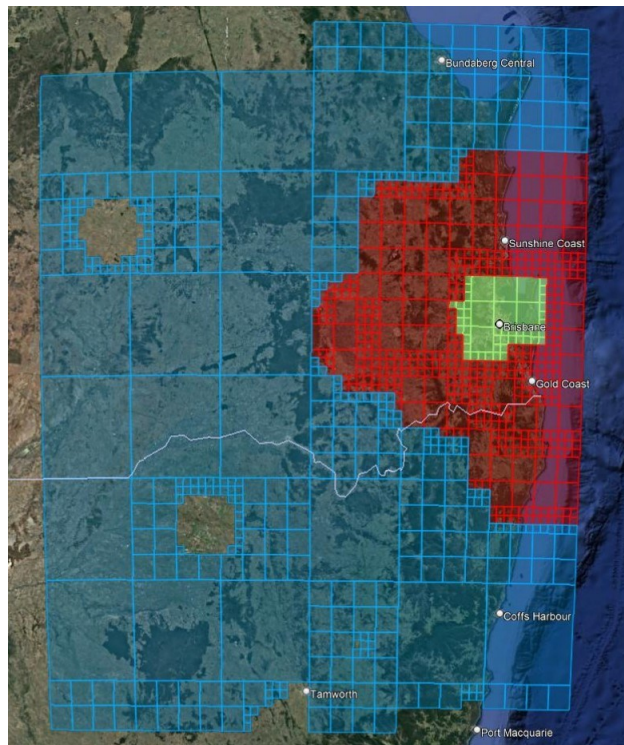
An example of these options is shown in Figures 8 and 9 below.

Figure 8: 2 lots option, Brisbane 3700–3750 MHz



Green – metropolitan, Orange – regional (RA1+RA2+MRC1)

Figure 9: 3 lots option, Brisbane 3700–3750 MHz



Green – metropolitan, Red – regional (RA2+MRC1), Blue – rural (RA1)

Stakeholders expressed clear support for the 2 lots option. This view prioritises the ability to defragment the 3.7 GHz band with existing holdings in the 3.6 GHz band over expressing differential demand between the regional (RA2+MRC1) and rural (RA1) lots. It also means that any bidders with specific demand for spectrum in urban fringe areas will only be able to bid for that spectrum in the 3750–3780 MHz range. Any bidders who wish to obtain urban fringe spectrum in the 3700–3750 MHz range must also bid for the surrounding rural areas.

The 2 lots option increases auction complexity because allocation limits must be applied across different geographic areas within the 3.7 GHz band as well as between the 3.4 GHz and 3.7 GHz bands. We consider that a 30% insignificant holdings threshold will enable application of an allocation limit across these areas without

unfairly advantaging or restricting any potential bidder. Therefore, we have adopted the 2 lots option as our preliminary view in the draft marketing plan.

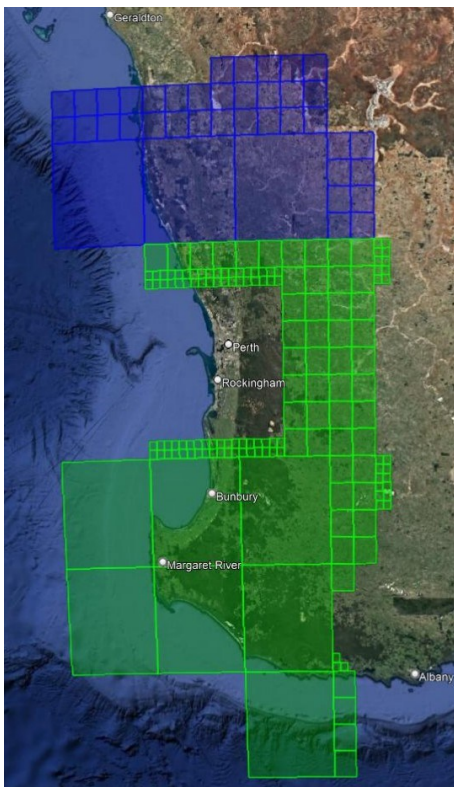
Metropolitan areas

Our preliminary view is to configure the metropolitan areas (Brisbane, Sydney, Canberra, Melbourne, Hobart, Adelaide and Perth) as separate lots. Stakeholders who addressed this issue in their submissions supported configuring the metropolitan areas as separate lots. Existing licensees have different spectrum holdings across the metropolitan areas. Therefore, offering the metropolitan areas as independent products will enable bidders to balance their metropolitan holdings (if they so choose) and express differential demand.

Regional WA aggregation

For historical reasons, in the 3.4 GHz band the regional areas surrounding Perth are split into 2 distinct areas: Regional WA central and Regional WA south, as shown in Figure 10 below.

Figure 10: Regional WA central (blue) and Regional WA south (green)



The following spectrum is available in each area:

- > 3.4 GHz:
 - > Regional WA south: 3475–3510 MHz
 - > Regional WA central: 3475–3575 MHz
- > 3.7 GHz:
 - > 3700–3800 MHz in both of the above areas.

In tune-up submissions, all stakeholders supported aggregating the Regional WA areas in the 3.7 GHz band. A majority of stakeholders supported aggregating the areas in the 3.4 GHz band, but a minority supported separate products to address differential holdings between the 2 areas.

In the 3.6 GHz band (3575–3700 MHz), these areas are aggregated into a single region. Our preference would be to aggregate both areas across the whole 3400–3800 MHz frequency range. This would enable a licensee to achieve a contiguous geographic holding in these frequency ranges, thus increasing spectrum utility by removing the geographic boundary between the 2 areas and any need for interference management at that boundary. However, the different level of supply between the 2 areas in the 3.4 GHz band complicates the ability to aggregate the products, because the supply only overlaps in the frequency range 3475–3510 MHz. Therefore, our view is that the areas should be an aggregated Regional WA product in 3475–3510 MHz, and then a separate Regional WA central product in 3510–3575 MHz. This maximises the opportunity for contiguous holdings while improving supply for stakeholders.

This creates complexity in applying the allocation limits in Regional WA due to the differential holdings between the 2 areas. Therefore, we have decided to exclude Regional WA central from the allocation limits.

Regional NSW north (Tamworth) aggregation

In the re-allocation declaration, the exclusion of the Quirindi Earth Station Protection Zone (ESPZ) from re-allocation in the 3750–3800 MHz frequency range meant Tamworth was no longer geographically adjacent to other re-allocated areas.

At the tune-up, we sought comments on the following proposals, as shown in Figures 11 and 12 below:

- > 3400–3575 MHz: the small size of Tamworth and Quirindi East means it would be more efficient to aggregate them with the adjacent Regional NSW south area. Otherwise, if the products were obtained by different licensees, it would be difficult to manage interference at the area boundaries.
- > 3700–3750 MHz: Tamworth is no longer adjacent to the Regional NSW south area because of the exclusion of the Quirindi ESPZ. However, it is adjacent to the Rural North NSW / South Queensland area, so it would be more efficient to aggregate it with that area.

Figure 11: 3400–3575 MHz: aggregation of Tamworth (red) with Quirindi East (yellow) and Regional NSW south (green)

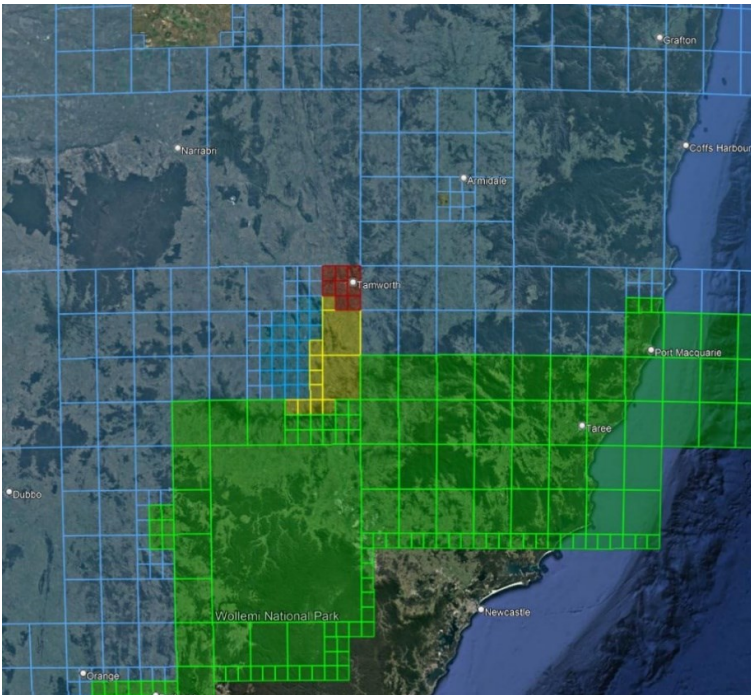
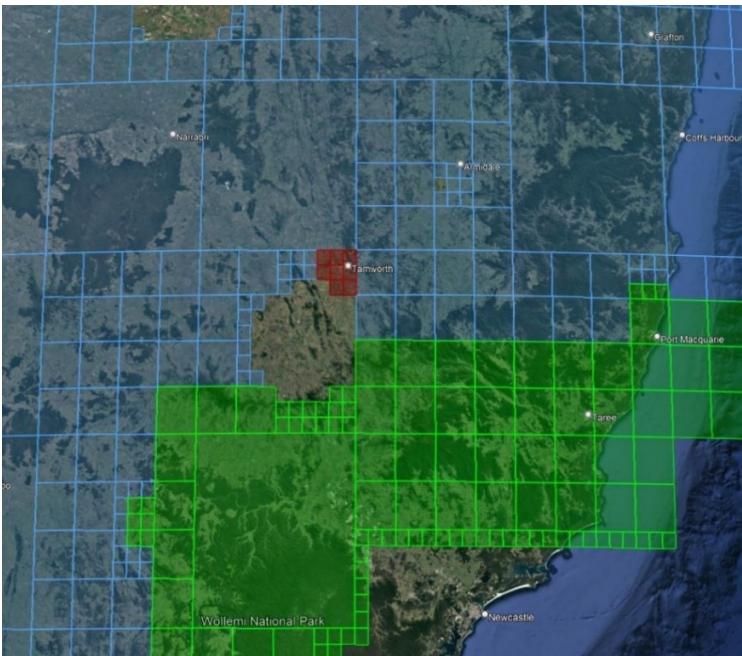


Figure 12: 3700–3750 MHz: aggregation of Tamworth (red) with Rural North NSW / South Queensland (blue)



In the 3400–3575 MHz frequency range, a majority of stakeholders supported our proposal to aggregate Tamworth with Quirindi East and Regional NSW south, with some expressing concerns that existing holdings in Tamworth may prevent them bidding in the Rural Australia lots if they were aggregated. A minority supported aggregating Tamworth with Rural Australia to assist with achieving defragmentation across the wider band.

Our proposal achieves both the spectrum demand and defragmentation objectives stated above. Aggregating Tamworth with Rural Australia in 3400–3575 MHz does not achieve the defragmentation objective and there is evidence of differential demand between these areas from some stakeholders. Therefore, our preliminary view in the draft marketing plan is to aggregate Tamworth with the Quirindi East and Regional NSW south areas.

In the 3700–3750 MHz frequency range, stakeholders supported our proposal for aggregating Tamworth with Rural North NSW / South QLD. Therefore, this proposal forms our preliminary view in the draft marketing plan.

Minor adjustments to regional and rural areas in the 3.7 GHz band

As noted in the re-allocation declaration consultation, there were a number of minor adjustments required to some regional and rural areas in the 3.7 GHz band to align them with the frequency adjacent 3.6 GHz regional areas, rather than with the 3.4 GHz regional areas. This is reflected in the region names with ‘3700–3750’ and ‘3750–3800’ appended in Schedule 4 to the draft marketing plan.

Proposed geographic product configuration

Schedule 4 to the draft marketing plan defines the proposed geographic areas for the 3.4/3.7 GHz bands. The geographic areas are defined using Hierarchical Cell Identifier Scheme (HCIS) cells, which may be converted into a placemark file (.kmz) viewable in Google Earth using the [converter tool](#) on the ACMA’s website.

Figures 13–18 below show the areas declared for spectrum licensing in the re-allocation declaration and our preliminary view on geographic areas for lots of a product for the following frequency ranges:

- > 3400–3575 MHz
- > 3700–3750 MHz
- > 3750–3800 MHz.

Geographic product configuration

We seek views on our proposal to:

- > Disaggregate the Rural Australia lot in both the 3.4 GHz and 3.7 GHz bands according to the 3.6 GHz regional boundaries.
- > Configure the regional areas in 3700–3800 MHz as follows:
 - a) 3700–3750 MHz: aligned with 3.6 GHz regional areas
 - b) 3750–3800 MHz in the following configuration:
 - i. Queensland and Victoria: Regional Area 2 (RA2) + Major Regional Centres 1 (MRC1)
 - ii. Other regional areas: RA2.
- > Configure the metropolitan areas as independent products.
- > Aggregate the Regional WA south and Regional WA central areas in 3475–3510 MHz and 3700–3800 MHz.
- > Aggregate Tamworth with surrounding areas as follows:
 - a) 3400–3575 MHz: aggregate with Regional NSW south and Quirindi East
 - b) 3700–3750 MHz: aggregate with Rural North NSW / South Queensland

These settings are reflected in Schedules 1–4 to the draft marketing plan and at Figures 14, 16 and 18 below.

Figure 13: 3400–3575 MHz (re-allocated areas)

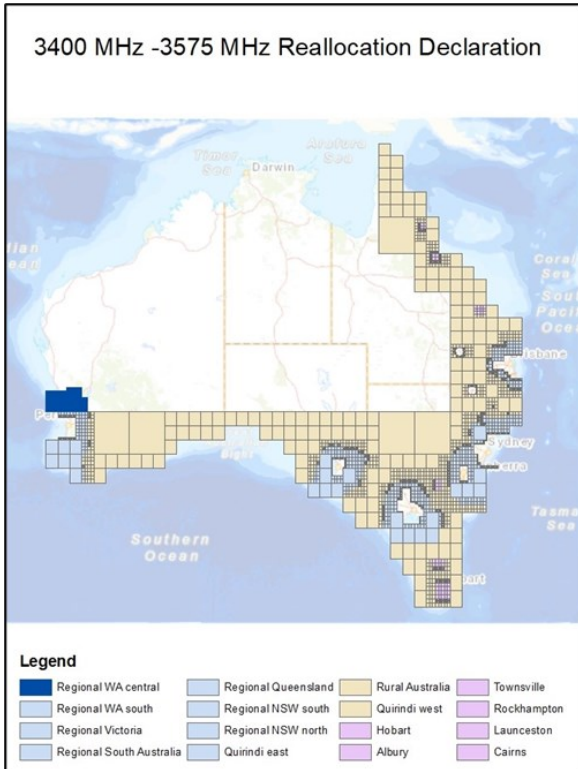


Figure 14: 3400–3575 MHz (proposed configuration)

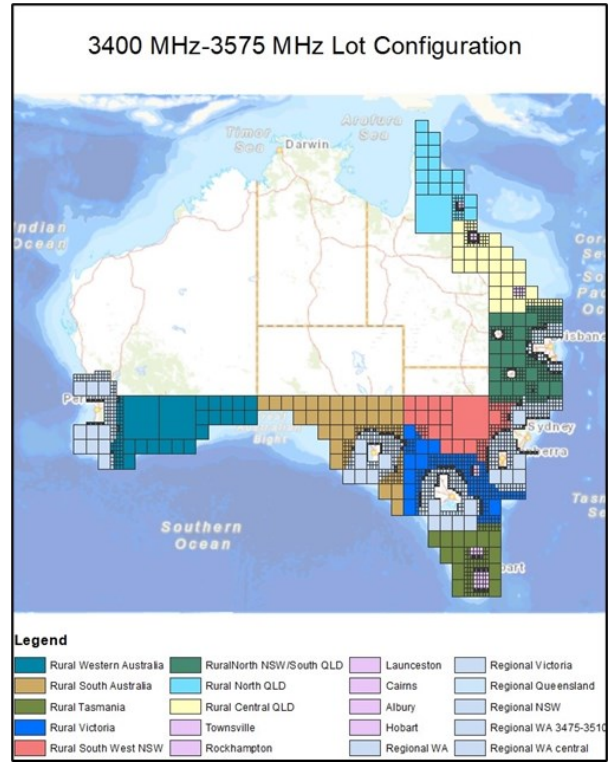


Figure 15: 3700–3750 MHz (re-allocated areas)

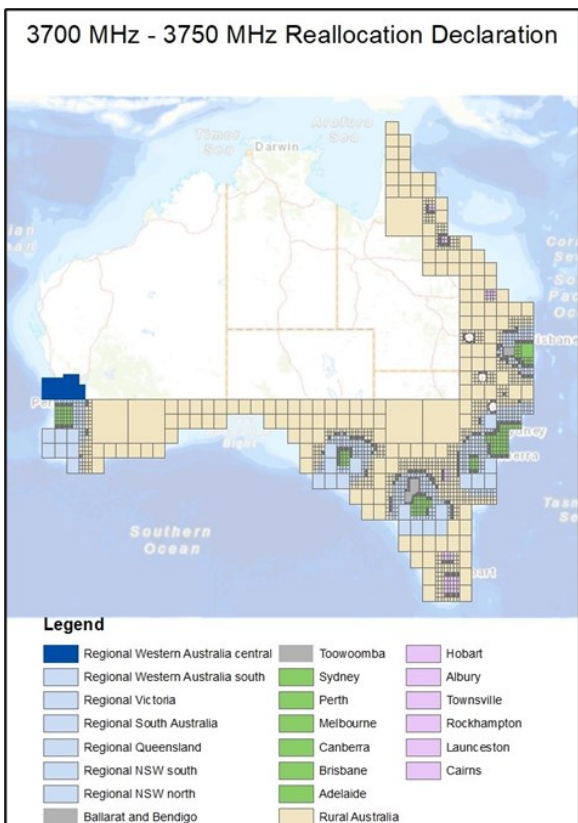


Figure 16: 3700–3750 MHz (proposed configuration)

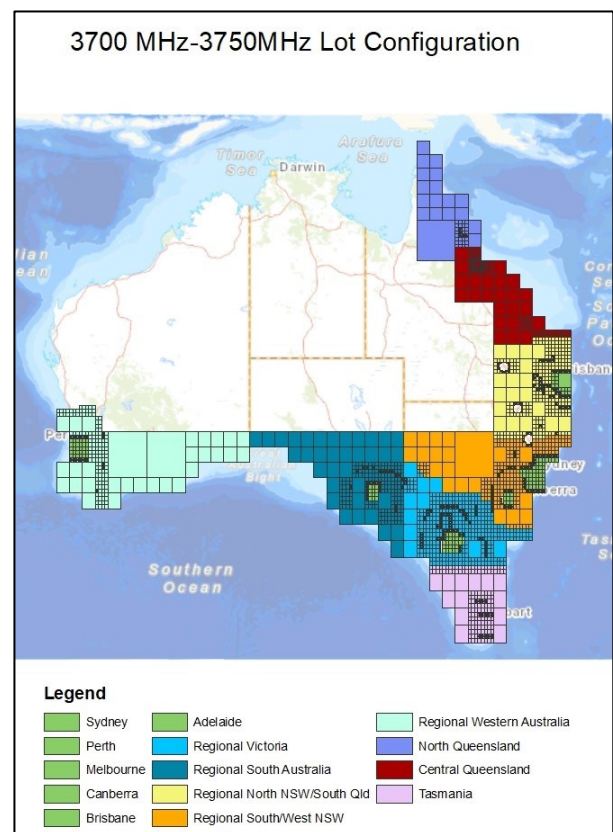


Figure 17: 3750–3800 MHz (re-allocated areas)

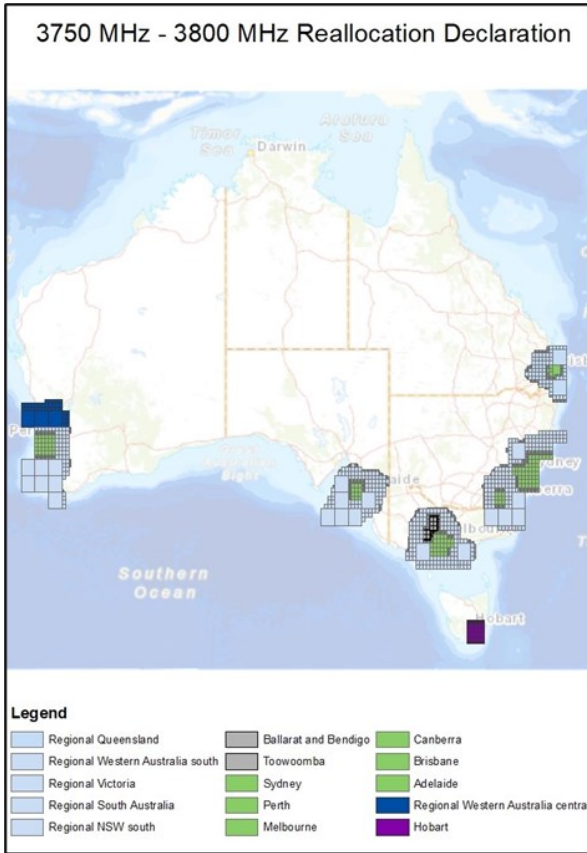
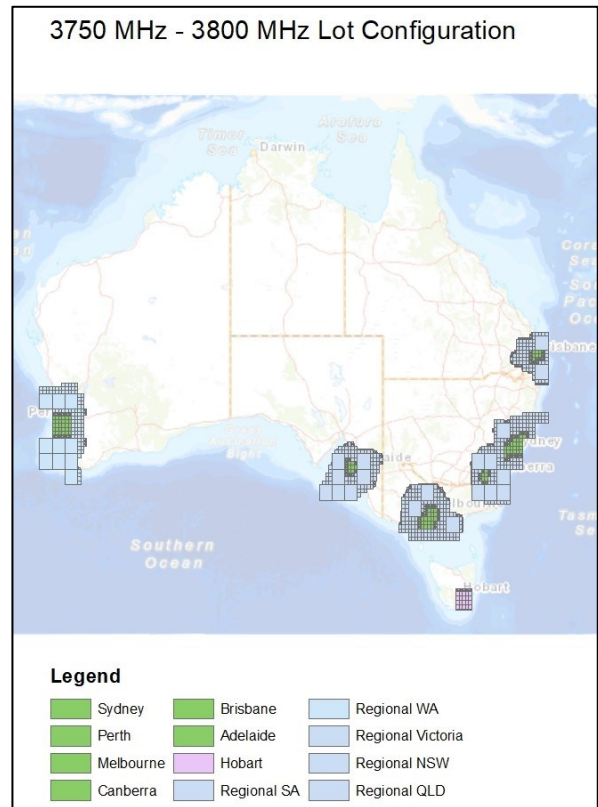


Figure 18: 3750–3800 MHz (proposed configuration)



Products

Schedules 1 and 2 to the draft marketing plan list the proposed products for the 3.7 GHz and 3.4 GHz bands respectively. Schedule 3 lists the proposed leftover lots.

We propose the following naming scheme for products in the 3.4/3.7 GHz bands auction:

Table 6: Proposed naming scheme for the 3.4/3.7 GHz bands auction

Frequency range (MHz)	Product name	Product ID
3400–3475	...Lower	...01
3475–3575	...Middle	...02
3700–3800	...Upper	...03

In adopting this naming scheme, it should be noted that:

- > There is no Lower product for the Regional Area 2 products (e.g., Regional SA), even though there is a Middle and Upper product.
- > The product for the Regional WA Central area is called Regional WA Central Middle.

This naming scheme achieves consistent product names and product IDs across the bands and prevents products with overlapping frequencies having different product names and product IDs. We welcome comments on the proposed naming scheme.

4. Draft allocation determination

The draft allocation determination includes:

- > rules for how the spectrum will be allocated by auction
- > the auction format that will be used
- > procedures that will apply to the auction
- > responsibilities of bidders/applicants and the ACMA throughout all stages of the auction.

Section 60 of the Act requires the ACMA to determine the procedures to be applied in allocating spectrum licences by auction, by tender, by allocation for a pre-determined price or a negotiated price, by direct allocation, or by a combination of those methods. The ACMA may also impose limits on the aggregate amount of spectrum acquired as a result of the auction, following consultation with the ACCC pursuant to subsection 60(13A) of the Act. Section 294 of the Act also allows the ACMA to make a determination fixing the spectrum access charges payable by licensees, for issuing spectrum licences, and specifying the times when such spectrum access charges are payable. These rules are included in the draft allocation determination for consultation.

Allocation methodology

Auction format

Where there is expected to be significant excess demand for spectrum, an auction is generally the allocation method that best achieves the object of the Act. The auction mechanism is intended to enable bidders to reveal their valuations, enabling the spectrum to be allocated to the bidder or bidders who value it the most. Generally, a party's valuation of the spectrum is a good proxy for the public benefits they can provide from the use of the spectrum. Auctions can also enhance the efficiency of allocation of the spectrum. As such, where there is competing demand, an auction provides for an outcome that maximises the long-term public interest from the use of the spectrum.

In addition, auctions provide a transparent method of allocating spectrum where there is likely to be competing demand, either in the aggregate or for individual lots.

We propose to use a 2-stage generic lots clock auction format, with an English open outcry (EOO) format for a secondary stage (if required). The format was previously referred to as the enhanced simultaneous multi-round ascending (ESMRA) auction format and was used in the recent 26 GHz and 850/900 MHz band auctions.

Auction system

The 3.4/3.7 GHz bands auction will use a different auction system to the system used in the 3.6 GHz, 26 GHz and 850/900 MHz auctions. The underlying 2-stage generic lots clock auction format remains unchanged. The main differences from the previous auction system are:

- > updated user interface
- > implementation changes – bidder onboarding, pre-bidding round and the transition between auction stages.

We will give each bidder an opportunity to trial the auction system before the auction commences. This will be in the form of a mock auction. We also intend to provide training to all registered bidders prior to their mock auction.

Sequencing

Typically, we prefer to auction spectrum that is considered to be partially or wholly substitutable within a simultaneous auction, allowing for bidders to use information about demand for one part of the spectrum to inform bids on another, and to allow dynamic switching of demand during the auction. This enhances the efficiency of the allocation.

The ACMA is consulting on options for implementing allocation limits at auction. We are considering including all spectrum-licensed holdings in the 3.4–3.8 GHz frequency range when calculating a bidder's allocation limit (with the exception of certain geographic areas and frequency ranges). However, imposing a cross-band allocation limit in a simultaneous auction of the 3.4/3.7 GHz bands will dramatically increase the complexity both for the administration of the auction (via the auction system) and for bidders participating in the auction. The complexity is a result of the number of spectrum products on offer, and the variable geographic lot configuration across the bands.

We considered whether disaggregating the spectrum available at auction into geographically smaller products so that they all align across different frequency ranges would eliminate the majority of issues related to the application of allocation limits involved in a simultaneous auction – including the calculation of existing holdings and dynamic issues where demand is spread across multiple bands. However, our concern with greater geographic disaggregation is that it may be less spectrally efficient, as it would impose additional boundaries between geographic regions, increasing the risk of 'utility loss zones' at boundaries.¹⁶ Stakeholder feedback received to date has consistently expressed a preference for the more aggregated areas.

A sequential auction of 3.7 GHz band and 3.4 GHz band spectrum would significantly reduce the complexity relating to the implementation of a cross-band allocation limit relative to a simultaneous auction of both bands, thereby simplifying the bidding environment for the bidders. We consider this will increase the ability of bidders to bid in their best interests. This is necessary for allocative efficiency.

Sequential auctions mean that bidders cannot dynamically switch demand between bands, arguably hindering efficiency. However, the extent to which bidders may wish to switch demand in a simultaneous auction will be reduced where products are less substitutable because they have different licence terms. As described at 'licence duration and commencement', we propose to allocate 3.7 GHz band licences for 20 years and 3.4 GHz band licences for 7 years. Accordingly, the lot ratings for 3.7 GHz band products are likely to be significantly higher than lot ratings for 3.4 GHz band products because of the relative value of the lots due mainly to the longer licence term. As a result, switching demand from 3.4 GHz band products to 3.7 GHz band products covering a similar area in a simultaneous auction may not be possible. Lot ratings are discussed further below.

Given the spectrum in the 3.7 GHz band is likely to be of higher value, we propose that the 3.7 GHz band spectrum be allocated first through all 3 stages as described below, followed by the 3.4 GHz band through all 3 stages. We will allow a minimum period of 5 working days between the end of the 3.7 GHz allocation and the start of the 3.4 GHz allocation. This will provide bidders who wish to bid in both bands the opportunity to revise their bidding strategy after the 3.7 GHz allocation has concluded.

¹⁶ 'Utility loss zones' occur where there are restrictions on deploying systems near geographic boundaries, due to technical sharing constraints for spectrum licensing. Restricted deployment along geographic boundaries affects the utility of the spectrum and the provision of services for the population within those areas.

It will also allow those bidders who were unsuccessful in acquiring spectrum in the 3.7 GHz band the opportunity to acquire spectrum in the 3.4 GHz band.

Sequencing

We propose to sequentially allocate the 3.4/3.7 GHz bands spectrum. We propose to allocate 3.7 GHz band spectrum through all 3 auction stages first, followed by the allocation of 3.4 GHz band spectrum through all 3 auction stages, with a minimum of 5 working days between allocations.

Commencement of auction

We have included the power for the ACMA to vary the start date and time of the 3.7 GHz band auction. Our proposal is to enable the ACMA to vary the start of the first clock round of the 3.7 GHz band auction at least 2 working days before the commencement of the pre-bidding round of the 3.7 GHz band auction, to delay it by at least 10 working days. The ACMA must also set a pre-bidding round of a period of at least 3 hours that falls within the 48 hours prior to the varied start date and time of the first clock round of the 3.7 GHz band auction.

Although the ACMA will conduct extensive auction system testing prior to the mock auctions, this will allow the auction manager to reschedule the auction in case any issues arise during the mock auctions.

Commencement of auction

We seek comments on our proposal to include a power for the ACMA to vary the commencement date and time of the 3.7 GHz band auction.

Auction stages and rounds

The following describes the auction stages and rounds that will occur for each of the 3.7 GHz and 3.4 GHz band allocations.

Primary stage

- a) Pre-bidding round

In previous auctions, the pre-bidding round allowed bidders to confirm or modify their start demands and MSR selections specified in their eligibility nomination form shortly before bidding rounds commenced. However, for this allocation process, bidders will not be required to nominate start demands in the eligibility nomination form, instead bidders will enter their start demands and MSR selections in the pre-bidding round of each of the 3.7 GHz and 3.4 GHz band allocations. The pre-bidding round will still occur shortly before bidding rounds commence in the primary stage for the allocation of each band.

- b) Bidding rounds

The primary stage is a series of bidding rounds that progress according to a clock function. In each round, bidders must indicate 2 details for each product simultaneously: the changed level of demand for lots, and the price point at which they wish to express that demand. For example, the bidder may choose to increase their bid by for 2 lots at a price point of \$114. This bid may be for more lots, or fewer lots, than the bid made during the previous clock round, or it may be for the same number of lots.

The start demand for lots of a product for the first round of the primary stage is the demand expressed by bidders at the conclusion of the pre-bidding round. This start demand is binding, which means that a decrease bids for lots of a product may be

rejected or only partially applied, if the total start demands (of all bidders) for lots in of a product is less than or equal to supply.

In each round of the primary stage, bidders may indicate whether they wish to change their demand for lots of a product, which may change from or be the same as the demand expressed in the previous round. Bids may be changed at any time until the end of the round.

The primary stage ends when there is no excess demand for any product.

Secondary stage

The secondary stage will be used to offer any single unallocated lots of a product that are still available after the end of the primary stage (residual lots).

These single lots may be as a result of the functioning of the MSR in the primary stage or unsold lots as a result of insufficient demand in the primary stage. Selection of the MSR for a product will affect a bidder's ability to bid in the secondary stage for a single lot of that product. If a bidder applies the MSR for a product and does not acquire any lots of that product during the primary stage, they will not be permitted to participate in the secondary stage. This is to prevent bidders from reducing demand during the primary stage in an attempt to obtain a single unsold lot of a product at a lower price in the secondary stage.

Allocation limits continue to apply in the secondary stage. Any bidder who has reached its allocation limit for a product in the primary stage will be ineligible to bid for a residual lot of that product in the secondary stage. Since some products overlap geographically (e.g. Albury Lower and Albury Middle), a case may arise where there are residual lots available for both products, but the allocation limits restrict a bidder to bidding on only 1 residual lot. Prior to the start of the secondary stage, bidders will be asked to nominate the residual lot they are interested in. The nomination will be confirmed in the pre-bidding round.

a) Pre-bidding round

There will be a pre-bidding round in the secondary stage, which is a new concept for this auction. Bidders will be required to make a binding nomination of their interest in the available lots in the secondary stage pre-bidding round. Bidders who do not nominate their interest in the available lots will be ineligible to bid in the secondary stage bidding rounds.

b) Bidding rounds

The secondary stage uses an EOO format with a simple ascending-bid process. All residual lots will be offered concurrently within this stage. The starting prices for the secondary stage are the same as for the primary stage.

Before each round in the secondary stage, the auction manager states the price of each residual lot (the specified price) that the bidder must meet in the upcoming round in order to place a valid bid in the round. The bidder can make a bid at or above the specified price (a continue bid) or place a lower bid (an exit bid). Once a bidder has made an exit bid, the bidder cannot resume bidding on that lot in future rounds.

Bidding on a residual lot stops when there is only one continue bid made on the lot in a round, where only exit bids are made on the lot in a round, or where no bids are made on the lot in a round. A bidder will only win if no other bidder places a higher bid, such as when there is only one bidder who bids at least the specified price in the final round, or there is a bidder who places the highest exit bid in the final round in which

only exit bids are placed. The highest bidder in the final round wins and pays the amount of the second-highest bid. This ensures that the winner never pays more than necessary to win, which encourages 'true value' bidding.

The secondary stage ends when the final round has concluded for each residual lot available for bidding in the secondary stage.

Assignment stage

In the assignment stage, winning bidders from the primary and secondary stage may submit bids for their preferred frequency range. After the primary stage (or if required, the secondary stage) ends, and at least 24 hours before the assignment stage starts, winning bidders will be provided with all frequency range options for each product in the assignment stage. For example, if 4 lots are available in a product, and there are 2 winning bidders, and Bidder A wins only 1 lot and Bidder B wins 3 lots, Bidder A may submit bids for frequencies assigned to Lot 1, Lot 2, Lot 3 and Lot 4, even though Bidder A may only be assigned Lot 1 or Lot 4 (due to Bidder B's allocation of 3 lots which must be allocated as contiguous frequencies). This differs from previous auctions, where bidders were provided only with their feasible frequency range options for each product in the assignment stage.

The ACMA may also use the assignment stage for the 3.4 GHz allocation to allocate leftover lots, as discussed below.

Auction stages and rounds

We propose to:

- > Include a pre-bidding round in the primary stages of the auction, during which bidders must specify their start demand and may adopt the minimum spectrum requirement (MSR) for each product in each of the relevant bands.
- > Include a pre-bidding round in the secondary stages of the auction, during which bidders must confirm their interest in the available lots.

Allocation of leftover lots

The leftover lots are described in the 'lot configuration' section of this paper.

In the July 2022 tune-up, we identified 2 options for allocating the leftover lots:

- > Secondary stage – bidders bid on frequency specific 2.5 MHz lots, in addition to unsold 5 MHz generic lots from the primary stage.
- > Assignment stage – leftover lots are allocated to the winner of the adjacent lot. A bidder includes any value it wishes to express for the leftover lot in its bid for an adjacent frequency range.

Responses from stakeholders on the preferred method for allocating leftover lots varied.

Maximising the possibility that spectrum is allocated, rather than remaining unsold, is consistent with the object of the Act. Reducing the amount of unsold spectrum and aligning spectrum allocations with internationally harmonised channel bandwidths also promotes the deployment of 5G technology and supports digital connectivity and investment in regional Australia, since all of the leftover lots cover regional areas. Furthermore, ensuring the auction is not overly complex ensures bidders are able to bid in line with their best interests, which is also necessary to support an efficient allocation.

Auctioning spectrum typically provides for an outcome that maximises the public interest from the use of the spectrum. However, in the case of these leftover lots,

given their small size, they are likely to have very limited utility on their own, and as such are likely to be of material value only to adjacent licensees.

We present 4 options for the allocation of the leftover lots, including 2 additional allocation options to supplement those raised at the July 2022 tune-up:

- > **Option A: Secondary stage allocation.** Under Option A, frequency-specific leftover lots are offered for bidding in the secondary stage of the auction (in the same stage that any unsold generic 5 MHz lots from the primary stage are offered). Option A enables both existing adjacent licensees and other interested parties to bid for the spectrum.
- > **Option B: Assignment stage allocation.** Under Option B, leftover lots would be allocated to the winner of adjacent frequency assignment in the assignment stage. Under this option, leftover lots will be offered as a 7.5 MHz lot (the 2.5 MHz lot together with the 5 MHz lot) in the assignment stage.
- > **Option C: Pro-rata primary price direct allocation.** Under Option C, the ACMA would offer the leftover lots to existing licensees (or a related body corporate) whose licences adjoin the leftover lot after the primary stage of the 3.4 GHz band auction, at a pro-rata price based on the price paid for the generic lots of the frequency-adjacent product after the primary stage at auction (the primary price). If the offer is rejected, then the leftover lots would be allocated in the assignment stage in accordance with Option B.
- > **Option D: Set price direct allocation.** Under Option D, leftover lots would be offered at a set price to the existing adjacent licensee (or a related body corporate) before the auction commences. The existing licensees will be named in the marketing plan. If the leftover lots are not acquired by the existing adjacent licensee, then they would be allocated in the assignment stage in accordance with Option B.

When determining the allocation method for the leftover lots, we are guided by the object of the Act and the MPS; particularly our objective to facilitate the efficient planning, allocation and use of the spectrum. With respect to the leftover lots, we consider that in order to support the efficient allocation and use of the spectrum, the appropriate allocation method will:

- > maximise the likelihood that the spectrum is allocated to a party that values it (most likely an adjacent licensee)
- > minimise the complexity of the auction system and rules.

Accordingly, Table 7 presents the analysis of each option focusing on the extent to which it achieves the objective of efficient allocation and use of the spectrum.

Table 7: Comparative analysis of options for the allocation of leftover lots

ACMA objective	Efficient allocation and use of the spectrum
Option A	✓ Can facilitate an efficient allocation if the existing adjacent licensee bids for the leftover lot. Given their limited utility as independent lots, we consider the existing adjacent licensee is likely to derive the greatest value from the leftover lots as it will align their existing holdings with internationally harmonised channel bandwidths (which are typically in multiples of 5 MHz or more preferably 10 MHz).

ACMA objective	Efficient allocation and use of the spectrum
	<p>✓ A bidder may seek to acquire the leftover lot to facilitating trading to support defragmentation of existing holdings.</p> <p>× This option may reduce the certainty with which bidders value the leftover lot during the secondary stage. More than one bidder may win generic lots of spectrum in products that are adjacent to the leftover lots. If a bidder considers there is a benefit in obtaining the leftover lot, bidders in the secondary stage would acquire a frequency-specific leftover lot and then bid for the frequency assignment of generic lots won in the primary stage (and secondary stage) in the assignment stage to ensure adjacency of frequencies. We note that if the leftover lot is sought by a bidder to facilitate trading, then value of contiguity is less of a concern.</p> <p>× Introduces further complexity to the auction. The secondary stage may require 2 steps to allocate the generic lots unsold from the primary stage and the frequency specific leftover lots. The configuration and operation of the secondary stage is likely to be very complex in this scenario. It may be difficult to justify added complexity to the auction when the outcome of the bidding is likely to result in the leftover lot being allocated at the starting price.</p>
Option B	<p>× A bidder who wins spectrum at auction and has no existing adjacent holdings to the frequency-specific leftover lot is unlikely to want to bid for the leftover lot, because the resulting amount of spectrum will not be aligned with internationally harmonised channel bandwidths. Consequently, the leftover lots will have little to no utility.</p> <p>× The assignment stage allocation would also introduce some additional complexity into the auction. Given the possibility the bidder who acquires spectrum adjacent to the leftover lot at auction may not have use for the leftover lot, additional auction complexity to enable this outcome may not be desirable.</p>
Option C	<p>✓ May achieve an efficient allocation by providing an opportunity for the existing adjacent licensee to acquire the leftover lot to round up its holdings to a multiple of 5 MHz in a geographic area. It also achieves a market price for the leftover lots as each will be offered at a pro-rata price based on the primary price for the 5 MHz lots in the same geographic area.</p> <p>○ May protract the length of the auction and introduces some complexity in the auction system and auction rules, as this process is to be implemented at the end of the primary stage for the 3.4 GHz band allocation. Bidders will be</p>

ACMA objective	Efficient allocation and use of the spectrum
	<p>required to follow a process for the election and allocation of leftover lots after the end of that primary stage. The outcome of that election will be implemented in the assignment stage configuration for the 3.4 GHz band allocation. There must also be a fallback assignment stage allocation process (i.e., in accordance with Option B) for those lots not acquired by adjacent licensees.</p>
<p>Option D</p>	<p>✓ Option D has the same benefits of Option C as it enables the spectrum to be allocated to the existing adjacent licensee, which is likely to be the most efficient allocation of the spectrum.</p> <p>○ Compared to Option C, Option D does not achieve a market price for the leftover lots as we propose to allocate them at a price set by the ACMA. However, as noted under discussion of Option A, we consider it very likely that the existing adjacent licensee would derive the greatest value from the spectrum. To this end, Option D mitigates the risk that a bidder other than the existing adjacent licensee acquires the leftover lot for the purpose of preventing the existing adjacent licensee from accessing it.</p> <p>✓ Option D is significantly simpler to implement for the ACMA and for bidders to follow as the allocation of leftover lots occurs before commencement of the primary stage of the 3.7 GHz band allocation.</p>

Note: ○ symbol represents neutral impact.

On balance, our preliminary view is to offer to directly allocate frequency-specific 2.5 MHz leftover lots to an eligible recipient (or a related body corporate) for a set price (Option D). We consider Option D may deliver all the benefits of Option C without the additional auction complexity for bidders. We consider this approach will best achieve our objectives for this allocation.

Allocation of leftover lots
<p>We propose to adopt Option D for the allocation of leftover lots, that is:</p> <ul style="list-style-type: none"> > Offer to allocate each leftover lot to an eligible recipient for a set price in the first instance. > Allocate any leftover lots not taken up by an eligible recipient to the winner of the lot of a product that is assigned the spectrum adjacent to the leftover lot.

Auction announcements

Registered bidders become aware of the identities of all other registered bidders through the associates review process conducted shortly after the application deadline. Under previous auction rules, the ACMA has not publicly announced the identity of all registered bidders. A bidder could publicly announce that they were a

bidder in the auction, but could not announce the identity of other bidders in the auction.

We seek stakeholder views in relation to the proposal that the ACMA announce the identity of all registered bidders in the auction after the eligibility deadline (that is, before the auction commences). We understand the identity of all bidders is routinely made available prior to the start of the auction in many other jurisdictions, including the US, UK, Canada, France, Germany, Hong Kong, Singapore, Spain and Taiwan. We consider that it would improve transparency of the auction process without revealing commercially sensitive information.

Consequently, after the end of the auction, the auction results will include the names of unsuccessful bidders.

This proposal is not described in the draft allocation determination. We will consider stakeholder comments on this matter ahead of finalising the allocation determination.

Auction announcements

We seek stakeholder views in relation to the following announcements about the auction:

- > After the eligibility deadline, the names of all registered bidders.
- > After the end of the auction, the results of the auction including the names of unsuccessful bidders.

Auction rules

Minimum spectrum requirement

As outlined in Part 6, Division 1 of the draft allocation determination, bids placed in the primary stage may be fully applied, partially applied or not applied. For example, if a bidder makes a bid reducing its demand in a geographic area from 2 lots to 0 lots, the bid may be partially applied if there is only one lot of excess demand in the round. The bidder is left with a reduction of one lot, rather than 2. If there are 2 lots of excess demand in the round, then the bid is fully applied, and the bidder is able to reduce its demand by 2 lots. If there are 0 lots of excess demand in the round, the bidder's bid is not applied.

The minimum spectrum requirement (MSR) is an optional feature in the primary stage of a 2-stage generic lots clock auction. Where an MSR is available, and the bidder chooses to use the MSR feature on a particular product, the bidder is guaranteed that it will not be left with an amount of spectrum less than its MSR for that particular product. Applying the example above, if the bidder has selected to use the MSR and reduces demand from 2 to 0 lots, its bid will be fully applied even if there is only one lot of excess demand.

Option 1: MSR of 4 lots

An MSR of 4 lots mitigates exposure risk for bidders, particularly where bidders may wish to obtain spectrum in the 3.4/3.7 GHz bands in multiples of 10 MHz. In this sense, a larger MSR promotes efficient spectrum allocation and use by preventing bidders from obtaining spectrum holdings that are insufficient for 5G services.

However, if there is excess demand of 1 lot, a bidder with a MSR of 4 lots can reduce its demand to zero. This increases the risk of unsold lots and of gaming behaviour at auction; specifically price driving behaviour. A bidder may game the auction by expressing artificially high spectrum demand to inflate prices for its competitors, and

withdraw by submitting a zero bid with no commitment. This risk is particularly present in this auction due to the small amount of spectrum supply in some products.

While these unsold lots from the primary stage would be available for bidding in the secondary stage, other interested bidders may not be able to express demand for them (e.g., because they would exceed the allocation limits based on their winnings in the primary stage). A further complication is that even if all 3 lots were sold in the secondary stage, the EOO format means they are bid on independently and may sell at different prices.

Option 2: No MSR

Although not offering the MSR feature would promote auction simplicity, we consider the exposure risk for bidders is too high when compared with the marginal benefits gained from removing the need for a secondary stage to allocate unsold spectrum from the primary stage.

Option 3: MSR of 2 lots

In response to the ACMA's most recent consultation, the majority of submitters supported an MSR of 2 lots. We adopted an MSR of 2 lots in the 850/900 MHz band and 26 GHz band auctions.

To a lesser extent than an MSR of 4 lots, an MSR of 2 lots will mitigate the exposure risk for bidders so that a bidder does not acquire an amount of spectrum that is not aligned with its business case. However, a smaller spectrum holding can still be used for lower capacity 5G services or traded on the secondary market. Compared with the occurrence of unsold lots that may result from price driving under an MSR of 4 lots, enabling bidders to acquire a smaller spectrum holding to the bidder's true value is a more efficient allocation of spectrum. An MSR of 2 lots also reduces the likelihood of strategic bidding (when compared with an MSR of 4 lots).

On balance, we consider implementing an MSR of 2 lots (option 3) strikes the right balance between enabling bidders to obtain spectrum suited to their business needs, and mitigating the occurrence of anti-competitive behaviour at auction. If an MSR is adopted, a secondary stage is required to allocate any single unsold lot of a product resulting from MSR operation during the primary stage.

Minimum spectrum requirement

We propose to include an option to apply an MSR of 2 lots in the 3.4/3.7 GHz bands auction.

Information policy

In an ascending auction format such as a 2-stage generic lots clock auction format, the auction manager typically provides bidders with information about the extent of demand for each product throughout the auction. Doing so provides bidders with information that they can use to inform their bidding strategies, which is a key reason why auctions are structured in an open, transparent fashion.

In contrast to standard simultaneous multi-round ascending auctions, 2-stage generic lots clock auctions have a higher risk of strategic demand reduction. Strategic demand reduction is a bidding strategy that involves sacrificing some of the spectrum that a bidder might like to have acquired in the auction in return for ending the auction earlier, and at a lower price for the spectrum that the bidder actually wins.

Although providing detail about the level of excess demand can create incentives for bidders to close out the auction early, this is offset by the benefits of price discovery and transparency. In the 3.6 GHz band auction, information about exact excess

demand was provided only where it was greater than supply by more than 4 lots (a limited information policy). In the 26 GHz band auction, we provided exact excess demand information, including where aggregate demand was equal to or less than supply (a full information policy). A full information policy was also applied in the most recent 850/900 MHz band auction.

We propose a full information policy be applied for the 3.4/3.7 GHz bands auction by providing exact excess demand information to bidders at the end of each clock round.

Information policy

We propose to provide exact excess demand information to bidders at the end of each clock round.

Activity rule

In the last 3 auctions (3.6 GHz, 26 GHz and 850/900 MHz bands), we implemented a global (aggregate) activity rule, which calculates the maximum bidding activity allowed in the next round based on the bidding activity in the current round. This activity rule promotes meaningful bidding and price discovery by ensuring bidders express their demand throughout the auction. This means bidders know that a competitor is unable to lower their overall demand and then increase it at a later stage and outbid them. The activity rule will be used in the 3.4/3.7 GHz bands auction and will be based on the 'eligibility requirement'.

Eligibility requirement

A bidder's maximum eligibility is based on the eligibility secured by the bidder at the eligibility deadline. Eligibility is measured in eligibility points. Each lot in the auction will have a lot rating which determines how many eligibility points is required to bid on it. Each bidder's maximum eligibility points will need to be adjusted after the end of the 3.7 GHz band allocation for the 3.4 GHz band allocation. After the end of the 3.7 GHz band allocation, the bidders used eligibility (that is, the total eligibility of lots won in the primary and secondary stages) will be subtracted from the maximum eligibility points secured in the bidder's eligibility nomination form. This will become the bidder's maximum eligibility points for the 3.4 GHz band allocation.

In each round of the primary stage of each allocation, the bidder must be active on a specified percentage (for example, 95 per cent) of its eligibility, or the bidder's eligibility is reduced. The specified percentage is set by the auction manager and is called the 'eligibility requirement'. End-of-round activity is calculated as the greater of the total eligibility points of all lots:

- > the bidder placed bids for in the round; or
- > in the bidder's posted demand.

If the eligibility requirement is not met, the bidder's eligibility in the next round is reduced to (end-of-round activity) divided by (eligibility requirement), rounded down to the nearest integer. Eligibility is calculated at the end of each round, based on end-of-round activity. However, the bid processing algorithm prevents any bid from being applied that would cause the bidder to exceed its eligibility at any point during bid processing.

We will consult on the eligibility requirement with registered bidders after the close of applications, together with other auction parameters.

Pre-assignment of frequencies for unsold lots

In the 3.6 GHz and 26 GHz band auctions, any unsold lots (except in paired lower/upper products) were pre-assigned to the highest position in the band. For the

850/900 MHz band auction, the frequency range of any unsold lots was contiguous and determined by the assignment bids, rather than pre-assigned.

For the 3.4/3.7 GHz bands auction, we consider that some bidders may express demand for frequency ranges adjacent to their existing spectrum licensed holding in the wider 3.4–3.8 GHz frequency range. Therefore, the relative value of frequency ranges may differ between bidders. On that basis, we propose to adopt the same policy for assignment of unsold lots as per the 850/900 MHz band auction. That is, all unsold lots would be contiguous, but not pre-assigned within the frequencies available.

Pre-assignment of frequencies for unsold lots

We propose the frequency range of any unsold lots be contiguous and determined by the assignment bids, rather than pre-assigned.

Assignment stage pricing rule

In the 2-stage generic lots clock auction format, the assignment stage is used to assign frequency ranges to the amounts of spectrum won in the primary (and if used, the secondary) stage. In the assignment stage, bidders submit confidential, one-shot bids for any, or all, of available frequency range options. A pay your bid rule is possible, where bidders submit confidential bids for various assignment scenarios and pay the full price of their bids on the selected scenario. However, this can lead to a bidder basing its bids on how they believe a competitor might value the scenarios, rather than on their own valuations. In previous spectrum auctions, we have used a second-price rule known as the nearest Vickrey core price, to encourage bidders to bid according to their own valuation of the assignment scenarios and reduce the risk of undesirable outcomes resulting from strategic bidding. We propose to use the same pricing rule for the 3.4/3.7 GHz bands allocations.

Allocation limits

The ACMA may determine procedures to impose limits on the aggregate of the parts of the spectrum that may be used by any person or specified group of persons as a result of a spectrum allocation, in accordance with subsection 60(5) of the Act. The allocation limits will affect how much spectrum a bidder can acquire at auction.

We are considering whether to impose allocation limits on the 3.4/3.7 GHz bands auction, and if so, the nature and quantum of the allocation limit. Allocation limits are a regulatory intervention into the market, and are likely to impose costs and generate benefits. Consistent with the Office of Impact Analysis' (formerly the Office of Best Practice Regulation, referred to in this paper as the OIA) guidelines for regulatory impact analysis, we are undertaking a process equivalent to a regulatory impact statement (referred to as a RIS-like process) on the ACMA's proposal to implement allocation limits at this auction. A RIS-like process enables us to assess the proposal to impose allocation limits using the Regulatory Impact Analysis framework.

Case for action

Spectrum is a finite resource used to deploy wireless services, such as WA WBB services (including mobile and fixed wireless networks). Spectrum in the 3.4/3.7 GHz bands is key mid-band spectrum for the deployment of 5G networks.

Our role in managing spectrum is guided by the object of the Act: to promote the long-term public interest derived from the use of the spectrum, including through facilitating the efficient planning, allocation and use of the spectrum and by supporting the

communications policy objectives of the government.¹⁷ As required by the Act, we must also have regard to the objectives specified in the MPS. Specifically, our objectives for this allocation are to:

1. Facilitate the efficient planning, allocation and use of the spectrum.
2. Support digital connectivity and investment in regional Australia.
3. Promote competitive markets.
4. Support the deployment of new and innovative technology, including 5G.
5. Support a range of use cases and users.

We consider the first 3 objectives are most relevant to the implementation of allocation limits in the 3.4/3.7 GHz bands auction. The final 2 objectives are supported by the ACMA's planning decisions for the 3.4–4.0 GHz band: the availability of this mid-band spectrum will support the deployment of 5G technologies, and the mix of licence types to be offered in the band is intended to support a range of use cases and users.

As required by the Act, the ACMA consulted with the ACCC to inform our decision on allocation limits for this auction, and the ACCC conducted a public consultation to inform its views. On 1 August 2022, the ACCC provided the ACMA with its [advice on allocation limits for the 3.4/3.7 GHz bands spectrum auction](#), which recommend the imposition of allocation limits for the 3.4/3.7 GHz bands.¹⁸ As noted in its advice, the ACCC had regard to the objectives of promoting competition in downstream markets for the long-term interests of end-users, encouraging investment in infrastructure including in regional Australia, and supporting the deployment of new and innovative technology.¹⁹

In its advice to the ACMA, the ACCC's assessment of the state of the market is:²⁰

In the future, [mobile network operators (MNOs)] will likely need additional mid-band spectrum to ensure they can cater for increasing data demands of 5G services. Currently, there are holdings imbalances between the MNOs so that in differing areas they may individually have a strong need to acquire spectrum. NBN Co, in particular, has substantial regional holdings and may have an incentive to prevent MNOs acquiring spectrum to deny the possibility of them expanding their fixed wireless services to compete with NBN Co's offerings.

The ACCC advised that an allocation limit is required to prevent monopolisation of spectrum available at auction:²¹

[An anti-monopolisation] limit would prevent any party from monopolising all the spectrum in this allocation. Such a limit helps to ensure that no single MNO can acquire and hold key 5G spectrum for a long period to the potential detriment of competition in downstream markets.

We agree that it is appropriate to implement an allocation limit for the 3.4/3.7 GHz bands auction and consider that a limit is necessary to achieve the objectives of this allocation. Without an allocation limit, it is possible that one party may monopolise the available spectrum, and in doing so, deny other bidders the opportunity to obtain additional spectrum to meet future capacity requirements. As the ACCC advises, 'a

¹⁷ The policy environment in which we are conducting this allocation is outlined in more detail under the 'Legislative context and policy environment' section of this paper.

¹⁸ Pursuant to subsection 60(13A) of the Act, the ACMA must consult the ACCC about whether allocation limits should be implemented, and if so, the nature of those limits.

¹⁹ ACCC advice, p. 6.

²⁰ ACCC advice, p. 3.

²¹ ACCC advice, p. 17.

limit helps to ensure that no single MNO can acquire and hold key 5G spectrum for a long period to the potential detriment of competition in downstream markets'.²²

Options for allocation limits

At a high level, an allocation limit that restricts demand too much may increase the risk that spectrum is not sold at auction, impeding the efficient allocation and use of the spectrum. Conversely, an allocation limit which is too relaxed may enable one bidder to obtain all or a significant amount of the spectrum on offer.

The appropriate allocation limit will be informed by how well it meets the objectives as stated under the 'Case for action' section: that is, whether the allocation limit facilitates the efficient planning, allocation and use of the spectrum, supports digital connectivity and investment in regional Australia, and promotes competitive markets.

[Responses to the ACCC's consultation](#) were divided on the appropriate quantum of the allocation limit for the 3.4/3.7 GHz bands auction. Of those who provided a public view: Optus' preliminary view advocated for a 100 MHz allocation limit in the 3.4–4.0 GHz frequency range; Pivotel proposed a 150 MHz allocation limit across 3.4–4.0 GHz; Telstra supported a 175 MHz limit across 3.4–3.8 GHz; and TPG proposed a 120 MHz limit in the 3.4–3.8 GHz frequency range with a secondary limit of 45% of the 425 MHz available in the 2.3 GHz band (2302–2400 MHz) and the 3.4–4.0 GHz frequency range. NBN Co did not express a view on the quantum of the allocation limit.

Based on the ACCC's advice and responses to the ACCC's consultation, and consistent with OIA guidance, we have identified 3 options for the imposition of allocation limits that the ACMA seeks views on (noting that there is an additional, non-regulatory option of imposing no limits in any areas):

- > **Option 1: 140 MHz in metropolitan and regional areas in the 3.4–3.8 GHz frequency range.** This is equivalent to 35% of spectrum-licensed space in the 3.4–3.8 GHz frequency range.

The ACCC advises that limits are required in order to provide the best opportunity to maximise competition in downstream mobile and fixed wireless broadband markets post-auction.²³

Option 1 is the limit recommended by the ACCC in its advice to the ACMA. As noted in its advice, the ACCC considers that a limit of 140 MHz is in the long-term interests of end users.

- > **Option 2: 140 MHz in metropolitan areas and 160 MHz in regional areas, in the 3.4–3.8 GHz frequency range.** This is equivalent to 35% of spectrum-licensed space in the 3.4–3.8 GHz frequency range in metropolitan areas, and 40% in regional areas.

Option 2 would apply the ACCC's recommended limit in metropolitan areas, and a slightly less restrictive limit in regional areas.

Option 2 considers differential limits for metropolitan and regional areas. If the ACMA decides to apply different limits to metropolitan and regional areas, these areas will be defined in the allocation instruments. Metropolitan areas are products which encompass Brisbane, Sydney, Canberra, Melbourne, Hobart, Adelaide and Perth. All other products available at auction will be designated as regional areas, with the exception of Regional WA Central Middle. Under

²² ACCC advice, p. 17.

²³ ACCC advice, p. 17.

Option 2, the metropolitan allocation limit is proposed to apply to Rural Tasmania Upper in the frequency range 3700–3750 MHz, and Hobart in the frequency range 3750–3800 MHz. We note that in previous allocations, such as the 3.6 GHz band auction, Hobart was considered a regional area. In the 3.4/3.7 GHz bands auction, we propose to consider Hobart a metropolitan area for the purposes of applying allocation limits.

- > **Option 3: No limits in any areas.** Under Option 3, no limits would be imposed for the auction. This represents the option with no regulatory intervention with respect to allocation limits.

As the spectrum holdings of incumbent licensees in the 3.4–3.8 GHz frequency range differ geographically to the spectrum available at auction, we are proposing to implement an insignificant holdings threshold (discussed later in this paper). The proposed operation of the allocation limits is illustrated by the allocation limits calculation tool published with this consultation paper. This can be found in the key documents section of the consultation landing page.

The allocation limits calculation tool is being made available to provide transparency on how allocation limits are intended to function in the 3.4/3.7 GHz auction. In particular, the calculation tool is intended to assist stakeholders in achieving a common understanding of how allocation limits will apply with sequential auctions, and how existing spectrum licence holdings may be deemed insignificant for the purposes of applying allocation limits, which is important given the complex nature of existing spectrum licence holdings in the band and the new method being used to determine which insignificance. The calculation tool also allows for the regional allocation limit to be switched between 140 MHz and 160 MHz so that stakeholders can assess the potential impacts of the different options.

Due to the complex nature of existing spectrum licence holdings in the band, the calculation tool outlines 5 separate scenarios for how allocation limits can apply and therefore the demand able to be expressed for any product. These include calculations for a potential new licensee with zero existing holdings, plus separate calculations for the 4 incumbent licensees in the band (NBN Co, Optus, Telstra and TPG) that are tailored to their specific existing holdings. The existing spectrum licence information drawn upon in the calculation tool is publicly available in the Register of Radiocommunications Licences. If there are any issues identified with the licence information we have used in the calculation tool or with the general function of the calculation tool, please include this in your submission to this consultation paper.

Our assessment of each of the allocation limits options against the ACMA's objectives is in Table 8 below. The key risks the ACMA has identified are the risk of unsold lots, and the risk of monopolisation of the spectrum. Unsold, vacant spectrum is a source of inefficiency, as it is an unused, valuable resource. The risk of monopolisation primarily relates to the possibility that one bidder may acquire all of the available spectrum at auction, potentially for the purposes of keeping the spectrum from its competitors. In any case, significantly imbalanced holdings as a result of this auction may have long-term impacts on competition in downstream markets, noting some of the spectrum licences on offer may be granted for a period of 20 years.

Table 8: Comparative analysis of allocation limits options with ACMA objectives

Objective	Option 1	Option 2	Option 3
<p>Efficient allocation and use of the spectrum</p>	<p>× Compared to Option 3 (no limits), increased risk of unsold lots, due to restriction on demand. Unsold spectrum is a key source of inefficiency for the allocation and use of spectrum, as spectrum is a valuable resource and any subsequent allocation process would involve impose costs for bidders and the ACMA. Further, if spectrum is not allocated, defragmentation activities are less likely to occur.</p> <p>✓ Decreased risk that one bidder may monopolise the spectrum.</p>	<p>✓ Compared to Option 1, slightly decreased risk of unsold lots due to the less restrictive allocation limit in regional areas.</p> <p>✓ Somewhat decreased risk that one bidder may monopolise the spectrum compared to Option 1.</p>	<p>× There is a higher risk of monopolisation compared to Options 1 and 2</p> <p>✓ Compared to Options 1 and 2, decreased risk of unsold lots as there are no restrictions on the amount of spectrum a bidder may acquire at the auction. If all spectrum is allocated, then a key regulatory barrier to defragmentation activities is removed, increasing the likelihood that defragmentation will occur.</p>
<p>Support digital connectivity in regional Australia</p>	<p>× Compared to Options 2 and 3, ACMA considers the risk of unsold lots is greater in regional areas under Option 1. Unsold lots may make defragmentation activities more difficult in the 3.4 GHz band (3400-3575 MHz). Fragmentation of spectrum holdings is currently most prevalent in regional areas. Failure to allocate some of this spectrum may curtail the optimal deployment of networks in these areas.</p> <p>✓ More likely to facilitate the entry of a new bidder (outside of the current incumbent licensees in the 3.4–3.8 GHz frequency range) in regional areas, due to the more restrictive limit in regional areas.</p>	<p>✓ Due to the slightly decreased risk of unsold lots (compared to Option 1), there is an increased possibility that the spectrum will be allocated and used in regional Australia.</p>	<p>✓ Decreased risk of unsold lots in regional areas. Spectrum in regional areas in the 3.4 GHz band is the most fragmented in the 3.4–3.8 GHz frequency range. If spectrum is allocated, then it is more likely that defragmentation activities will occur. Enabling these activities to occur may potentially improve the quality of services provided in regional Australia.</p> <p>× However, the increased risk of monopolisation of the spectrum could prevent some interested bidders from obtaining regional spectrum to roll out services in competition with existing regional providers.</p>

Objective	Option 1	Option 2	Option 3
Promote competitive markets	<ul style="list-style-type: none"> ✓ Comparative to Options 2 and 3, decreases risk of monopolisation of spectrum holdings by one operator at auction. ✓ May increase competition by enhancing the possibility of new market entry (outside of the current incumbent licensees in the 3.4–3.8 GHz frequency range) by limiting the amount of spectrum the incumbent licensees may acquire. 	<ul style="list-style-type: none"> ✓ Comparative to Option 3, decreases risk of monopolisation of either 3.4 GHz or 3.7 GHz spectrum by one operator at auction. × Slightly decreased possibility of facilitating the entry of a new bidder (outside of the current incumbent licensees in the 3.4-3.8 GHz frequency range) when compared with Option 1. 	<ul style="list-style-type: none"> × If one party purchases all spectrum on offer, then there may be resulting spectrum holding imbalances that are detrimental to downstream competition. An entrenched imbalance (as some spectrum licences may be issued for a term of 20 years) may result in decreased competition in the relevant markets over time. × May not facilitate the entry of a new bidder (outside of the current incumbent licensees in the 3.4–3.8 GHz frequency range).

Cross-band frequency range

The frequency range within which spectrum licensed holdings will be calculated to count towards a bidder’s allocation limit is referred to as a ‘cross-band frequency range’.

In considering its advice, ACCC consulted on other potentially relevant mid-band spectrum and 2.3 GHz band spectrum in particular. Submissions were somewhat supportive of a limit to be applied in the 3.4–3.8 GHz frequency range for the 3.4/3.7 GHz bands auction. Of the public responses to the ACCC’s consultation, NBN Co supported the inclusion of all sub-6 GHz band spectrum holdings when calculating a bidder’s allocation limit; Optus and Pivotal both agreed that only spectrum-licensed holdings in the 3.4–4.0 GHz frequency range should be accounted for; similarly, Telstra supported spectrum-licensed holdings in the 3.4–3.8 GHz frequency range;²⁴ and TPG supported the inclusion of spectrum-licensed holdings in the 2.3 GHz band as well as the 3.4–3.8 GHz frequency range in the cross-band frequency range.

In its advice the ACCC noted that the 2.3 GHz band has similar propagation characteristics, vendor availability and technical frameworks as the 3.4-3.8 GHz band. However, the ACCC ultimately concluded that other factors supported its recommendation that the ACMA implement an allocation limit in the 3.4-3.8 GHz cross-band frequency range at the 3.4/3.7 GHz bands auction.

²⁴ We note that spectrum-licensed holdings in the 3.4–3.8 GHz frequency range are equivalent to those in the 3.4–4.0 GHz frequency range as there are no spectrum-licensed holdings in the 3.8–4.0 GHz frequency range.

In considering the ACCC's advice, the ACMA has conducted its own analysis of technical and policy matters that are relevant to a decision on the appropriate cross-band frequency range:

- > Propagation characteristics
- > Equipment availability and international harmonisation
- > Complexity of the application of allocation limits
- > Approaches used in other jurisdictions

Our considerations on these matters are detailed below.

Technical characteristics of substitutable spectrum

From a technical perspective, propagation losses increase as the frequency increases. The smaller the difference in frequency between 2 bands, the smaller the difference in propagation characteristics. From this perspective, the propagation characteristics of other mid-band spectrum (1800 MHz, 2.1 GHz, 2.3 GHz and 2.5 GHz bands) are more comparable to the 3.4/3.7 GHz bands than the sub-1 GHz bands.

Propagation characteristics influence factors such as cell coverage and signal penetration through clutter and into buildings. As a general rule, lower frequencies support larger cell sizes and have better clutter/indoor penetration. The deployment of new technology including 5G and active antenna systems can help improve these factors for networks in the mid-band. The initial focus globally for the introduction of these technologies has been the 3300–3800 MHz band.

While the 5G equipment ecosystem is currently more mature in the 3300–3800 MHz frequency range, equipment availability for other mid-band spectrum is rapidly increasing and expected to continue to do so. In its [January 2023 member report on the 5G equipment ecosystem](#), the Global mobile Suppliers Association (the GSA) identified the number of announced 5G devices supported in different 3GPP bands. Band n78 (3300–3800 MHz) topped the list, however, there is still significant (and growing) device support in other mid-band frequencies available for WBB use in Australia. This includes bands n77 (3300–4200 MHz), n7 (2500–2570 / 2620–2690 MHz), n40 (2300–2400 MHz), n1 (1920–1980 / 2110–2170 MHz) and n3 (1710–1785 / 1805–1880 MHz).

Mid-band spectrum is expected to continue playing a key role in providing network capacity and coverage in metropolitan and regional areas. There are some key differences between bands, including:

- > The 2.3 GHz band and the 3.4–3.8 GHz frequency range are configured for use by time division duplex (TDD) or unpaired spectrum technologies, while other mid-band spectrum (the 1800 MHz, 2 GHz and 2.5 GHz bands) is configured for frequency division duplex (FDD) or paired spectrum use. While there are differences in how FDD and TDD systems operate they are both capable of supporting new technologies such as 5G and active antenna systems. The size of an active antenna array will vary with frequency (independent of whether it employs FDD or TDD). Larger arrays are more practical in higher frequency bands which is beneficial in offsetting the increased propagation losses to improve coverage and capacity.
- > The total amount of spectrum available in each band varies. Typically, operators have access to more spectrum and therefore larger operating bandwidths in higher frequency bands. For example, there is 400 MHz of spectrum available in the 3.4–3.8 GHz frequency range but only 2x60 MHz (120 MHz) in the 2 GHz band. This can affect the cost efficiency or cost-per-bit of deployments, with

greater benefits realised for wider bandwidth deployments.²⁵ Other than the 3.4–3.8 GHz frequency range, bands where operators currently have large bandwidth spectrum holdings include: Optus in the 2.3 GHz band (up to 98 MHz in metropolitan areas), NBN Co in the 2.3 GHz band (up to 98 MHz in regional areas), Telstra in the 1800 MHz band (2 x 40 MHz in most regional areas) and Telstra in the 2.5 GHz band (2 x 40 MHz Australia-wide).

Despite the differences identified, all mid-band spectrum can be used to provide similar services and can be configured to either improve network capacity or provide a broad coverage layer as required. While the availability of 5G equipment currently differs by band, with the constant evolution of technology and growing network capacity requirements, it is expected this will change and bands can be re-farmed to support such use in the future – this includes providing support for future generation technologies as well. In fact, in Australia, 5G services have already been deployed in most bands below 3.4 GHz. The ACMA has also been working with industry to update mid-band spectrum technical frameworks (for both FDD and TDD bands) to ensure they can support new technologies such as 5G and active antenna systems.

The ACMA considers that any near-term differences in equipment availability across these bands are of limited relevance, because in the medium to longer term these bands will become more substitutable. In this context, therefore, we consider all mid-band spectrum to be at least partially substitutable.

Policy considerations for the cross-band frequency range

Despite the technical substitutability of spectrum in the 1–6 GHz frequency range in the long-term, it is likely that the existing licensees in the band will seek to acquire spectrum in this auction in order to complement existing spectrum-licensed holdings in the 3.4–3.8 GHz frequency range, rather than to deploy new networks. All incumbent spectrum licensees in this frequency range are currently deploying networks using their existing holdings.

Spectrum in the 3.4–3.8 GHz frequency range is internationally harmonised for 5G use.²⁶ For the 3.4 GHz band in particular, adjacent licensees are likely to derive the greatest value from the spectrum by using it to supplement existing holdings by enabling them to obtain access to larger geographic areas and bandwidths. It is less likely that a licensee will derive as much value by obtaining spectrum at the 3.4/3.7 GHz bands auction to supplement its holdings in the 1–6 GHz frequency range as it does by obtaining spectrum to supplement its holdings in the 3.4–3.8 GHz frequency range. Therefore, existing licensees would likely consider spectrum in the 3.4–3.8 GHz frequency range more substitutable than other mid-band spectrum.

Examples of allocation limits applied in other jurisdictions reflect this approach. In jurisdictions which have conducted an auction of spectrum in the 3.4–3.8 GHz frequency range in the last 2 years where an allocation limit has been imposed, a limit has applied only within the frequency range on offer (see also Belgium's 2022 auction of 3410–3800 MHz, Denmark's 2021 auction of 3410–3800 MHz, France's 2020 auction of 3490–3800 MHz, Sweden's 2021 auction of 3400–3720 MHz). In contrast, between 2016 and 2017, the UK conducted an allocation of spectrum in the 3410–3480 MHz and 3500–3580 MHz frequency ranges and accounted for all spectrum-licensed holdings, limiting each bidder to 37% of currently licensed spectrum.

²⁵ [Coleago report on 2300 MHz spectrum](#), 30 July 2020.

²⁶ 3GPP supports both band n77 and n78 for 5G deployment. At WRC-15, the 3400–3600 MHz frequency range was identified for international mobile telecommunications in Europe, Africa, parts of the Middle East, the Americas, and parts of the Pacific Islands. Since then, the GSA has [identified](#) 84 countries that have issued licences in the 3300–4200 MHz frequency range for WBB use.

Although the nature of substitutability is likely different for a non-incumbent licensee (in the 3.4–3.8 GHz frequency range) or a new entrant, the question over the cross-band frequency range is unlikely to be relevant for any new market entrants given the restrictions would be unlikely to have any practical effect for these parties under any approach.

Further, an operator's existing holdings in another band may constrain their ability to obtain geographically contiguous spectrum in the 3.4/3.7 GHz bands, which would impose issues at licence boundaries (resulting from the need to manage co-channel interference). This was noted by the ACCC in its advice to the ACMA.²⁷ It is clear that licensees value obtaining contiguous spectrum holdings in a given geographical area (the larger the better). The ACMA understands licensees also value obtaining the same frequency in adjacent geographical areas because, in order to manage interference, the ability to deploy services near licence boundaries becomes increasingly constrained. The ACMA considers that having geographically contiguous spectrum avoids this issue.

To a certain degree, allocation limits across areas where there are mismatched geographic boundaries may be successfully implemented by configuring other auction settings accordingly, such as tailoring the geographic areas of the available products to align with all boundaries of the current holdings in the cross-band frequency range and/or the application of an insignificant holdings threshold. In this case, the geographic boundaries in the 1–6 GHz mid-band frequency range do not align. Any further disaggregation of geographic areas of products available at this auction beyond those proposed may increase the need for interference management measures around the geographic boundaries, increasing the 'utility loss zone' issue (referred to above at the 'Sequencing' section of this paper). More disaggregated geographic areas may also increase the risk that bidders will not obtain geographically contiguous areas in the 3.4–3.8 GHz frequency range which suit their needs.

Importantly, while spectrum in the 1–6 GHz frequency range is likely to be considered broadly substitutable with the 3.4/3.7 GHz bands spectrum, implementing limits over the 1–6 GHz frequency range will further increase the complexity of the allocation due to the diversity in spectrum holdings in these bands. Such additional complexity, in an already complex auction, will make bid strategy formulation and auction implementation overly complicated. We would also need to freshly consider the appropriate quantum of the allocation limit and how such limits might be implemented through our auction design, which may require further time and potentially further consultations which could have implications on the proposed timing of this spectrum allocation.

Taking into account relevant technical and policy matters, we consider that cross-band limits should account for the 3.4–3.8 GHz frequency range only. We seek comments on the matters relevant to the cross-band frequency range, as well as on the cross-band frequency range itself.

Types of holdings considered

When calculating a bidder's allocation limit, we propose only to consider the bidder's spectrum-licensed holdings within the 3.4–3.8 GHz cross-band frequency range. Any apparatus-licensed holdings within the 3.4–3.8 GHz frequency range in the metropolitan and regional areas which have been declared for re-allocation will be cancelled immediately after the re-allocation period, which ends on 16 July 2027. The urban excise areas in the 3400–3475 MHz frequency range are currently vacant. Therefore, apparatus licences in the 3.4–3.8 GHz frequency range in the metropolitan

²⁷ ACCC advice, p. 15.

and regional areas are not relevant for a bidder's ability to compete in downstream markets as a result of the spectrum licence auction.

Spectrum accessible through a third-party authorisation under section 68 of the Act, for which the bidder is not the licensee is proposed not to be counted towards the bidder's allocation limit. This is consistent with the allocation limits policies applied in recent auctions, such as the 850/900 MHz band, 26 GHz band and 3.6 GHz band auctions.

Inclusion of third-party authorisations for this allocation would likely exacerbate the complexity that flows from mismatched geographic boundaries noted above in the discussion of inclusion of holdings in other bands in the cross-band frequency range. It may not be possible to disaggregate geographic boundaries and set an insignificant holdings threshold that will be coherent and applicable for third party authorisations. Including third-party authorisations in the calculation of a bidder's existing holdings would lead to complexity at auction which may reduce certainty for bidders and lead to unintended auction outcomes, due to the difficulty in forming bidding strategy for the auction.

We note that allocation limits cease to have effect at the conclusion of the 3.4 GHz auction (that is, the second of the 2 auctions). There are other regulatory mechanisms to consider longer-term competition concerns arising from potential third-party authorisations, and the ACCC has the ability to consider these through the regulatory framework in the *Competition and Consumer Act 2010* by operation of section 68A of the Act.

Therefore, we propose to only include the spectrum-licensed holdings for which the bidder is the licensee in assessing the application of the allocation limits to the bidder.

Relevantly, we are aware that on 21 December 2022, the ACCC announced that it would not grant authorisation for a deal proposed by Telstra and TPG of a Multi-Operator Core Network (MOCN) agreement, and related agreements for Telstra to lease TPG's spectrum in regional areas, including spectrum in the 700 MHz, 800 MHz, 2 GHz and 3.6 GHz bands, excluding 1800 MHz and 26 GHz. Telstra and TPG have now applied to the Australian Competition Tribunal for a review of the merger authorisation determination.

Limits applicable to the 3.8–3.95 GHz area-wide apparatus licence allocation

This auction will be followed by the allocation of AWLs in the 3.8 GHz band. Our 4 mid-band allocations in the 3.4–4.0 GHz band are guided by the object of the Act and the objectives contained in the MPS. Of particular relevance to the 3.8 GHz band AWL allocation in metropolitan and regional areas is the objective to support a range of users and use cases. As the 3.4/3.7 GHz bands auction is intended to support WA WBB applications, our view is that 3.8 GHz band spectrum should be prioritised for LA WBB use on a shared basis with fixed satellite and PTP services.

The ACMA's initial view is that the AWLs in the 3.8 GHz band will be allocated via an 'allocation window', as was used in [the allocation of AWLs in the 26/28 GHz bands](#).

The ACMA is also considering applying allocation limits that would preclude existing 3.4–3.7 GHz spectrum licensees (currently NBN Co, Telstra, Optus and TPG Telecom, and related parties) from being issued an AWL for a period of time after applications open; that is, a nil limit would be applied to NBN Co and the MNOs for a specified period of time from the start of the initial allocation window. This nil limit would provide LA WBB, PTP and FSS initial priority to access spectrum in the band. We are currently considering the approach to allocating licences for the spectrum that may remain following this initial priority access period. We are considering imposing

cross-band limits that would take into account spectrum-licensed holdings across the 3.4–4.0 GHz band (including spectrum acquired in the 3.4/3.7 GHz auction).

We will continue to develop a proposed approach to this allocation process and how best to manage demand for this spectrum over the coming months. We expect to consult on our preliminary views on allocation limits for the 3.8 GHz band AWL allocation in Q2 2023. Although this consultation pertains to the auction of spectrum licences, we acknowledge there may be some interplay between the limits for the 3.4/3.7 GHz bands auction and those we are considering for the 3.8 GHz band AWL allocation.

Allocation limits

We seek views on the following proposed options for allocation limits:

- > Option 1: 140 MHz limit in both metropolitan and regional areas in the cross-band frequency range of 3.4–3.8 GHz
- > Option 2: 140 MHz limit in metropolitan areas and 160 MHz in regional areas in the cross-band frequency range of 3.4–3.8 GHz
- > Option 3: No limits.

In particular:

- > We seek views on which of the allocation limits options, including the spectrum included in the cross-band frequency range, best achieves our identified objectives for this allocation (i.e., by facilitating the efficient planning, allocation and use of the spectrum, supporting digital connectivity and investment in regional Australia, and promoting competitive markets).
- > We seek views on how the implementation of an allocation limit at auction may affect likely demand for the 3.4 GHz band and/or 3.7 GHz bands individually and whether your demand would differ between the imposition of an allocation limit under Options 1, 2 and 3.
- > We seek views on weighing the different efficiency impacts of auction settings that seek to minimise the risk of unsold lots versus the risk of spectrum monopolisation.
- > We seek views on the matters relevant to the substitutability of other spectrum with 3.4/3.7 GHz bands spectrum, and the appropriate cross-band frequency range to apply to the allocation limits.
- > We seek views on a proposal to auction the 3.7 GHz and 3.4 GHz sequentially and its impact on the appropriate approach to applying allocation limits in the auction, if at all.
- > We seek views on a proposal to apply a metropolitan allocation limit (i.e., 140 MHz) to Hobart and Rural TAS Upper (product definitions as proposed in Figure 4 of the 'Lot configuration' section of this paper) in the 3700–3800 MHz frequency range. We note that for the 3.6 GHz band spectrum licence auction held in 2018, Hobart was included in the 'Tasmania' product, which was considered a regional area for the purposes of applying allocation limits in that auction.
- > We are seeking views on the short, medium and long-term costs and benefits if Options 1, 2 or 3 are implemented in this auction.

Exclusions from allocation limits

Leftover lots

Our preliminary view is that leftover lots are likely to have value chiefly to the existing adjacent licensees. Our preliminary view is to exclude the leftover lots from the allocation limits. Including leftover lots in the allocation limits may potentially discourage existing spectrum licensees from acquiring them. If that is the case, including them in the allocation limits may cause them to remain unallocated and result in a suboptimal allocation of spectrum. Given the small size of the leftover lots (2.5 MHz), it is unlikely that excluding them from allocation limits will have the effect of undermining the MPS objective to promote competitive markets.

Regional WA Central Middle

Our preliminary view is to exclude Regional WA Central Middle from the allocation limits. A bidder who acquires additional spectrum in this product is likely to be limited or prohibited from acquiring spectrum in the other Regional WA products because it would cause them to exceed the allocation limit when assessed in relation to Regional WA Central Middle. This is inconsistent with the MPS objective to support digital connectivity and investment in regional Australia, since acquiring spectrum in a lowly populated area (Regional WA Central Middle) prevents a bidder acquiring spectrum in much larger regional areas. This may result in bidders not acquiring spectrum and delivering services in Regional WA Central Middle. The proposed insignificant holdings threshold (discussed below) does not solve this problem because it works the other way round – holdings in smaller areas are not counted towards larger areas. The small population of Regional WA Central Middle means that a bidder who exceeds the allocation limit in relation to this product is unlikely to undermine the MPS objective to promote competitive markets.

Exclusions from allocation limits

We propose to exclude the following spectrum from the allocation limit:

- > leftover lots
- > the Regional WA Central Middle product.

Insignificant holdings threshold

In past auctions, the Minister has directed the ACMA to impose an ‘insignificant holdings threshold’ so that if a sub-area of a product available at auction was deemed to cover a small or ‘insignificant’ percentage of the population of the whole geographic area of a product, existing holdings in the sub-area would not be counted towards the bidder’s allocation limit. The purpose of this threshold was to reconcile the differences between the areas available at auction with the areas covered by existing licences. For the 3.6 GHz band auction, the threshold was set at 15% of the population of a given regional area. For the 850/900 MHz band auction, the threshold was set at 25% of the population of the ‘major population’ area. The use of the insignificant holdings threshold meant that a bidder could exceed the allocation limit in the sub-area deemed insignificant.

For the 3.4/3.7 GHz bands auction, the geographic composition of some bidders existing holdings in the 3.4–3.8 GHz frequency range are not aligned with the geographic areas of the products proposed to be available at auction. Therefore, we consider it would be appropriate to include an insignificance test, to avoid an existing spectrum licensee who may wish to be a bidder in the 3.4/3.7 GHz bands auction from being restricted to a level of spectrum holdings below the allocation limit in a larger area due to existing holdings in a smaller area. We propose to include a threshold of 30% of the population in order to eliminate the minor issues involved in the 3.7 GHz

band where adopting different geographic lot configuration in 3700–3750 MHz and 3750–3800 MHz may unduly restrict participation.

However, we consider that the calculation method used in previous auctions would likely lead to counterintuitive outcomes for some existing spectrum licensees, particularly in circumstances where bidders have existing holdings in multiple frequencies but in different geographic areas.

We therefore propose a calculation method that calculates existing holdings as being the largest quantum of spectrum a bidder owns that covers at least the insignificant holdings threshold percentage of the population. The calculation method supports an outcome where a bidder would only exceed the allocation limits if allocation of lots to that bidder exceeds the limit in a sub-area (or collection of sub-areas) that cover a percentage of the population of the product that is greater than the insignificant holdings threshold.

The calculation method we propose is as follows:

- i. Determine the bidder's existing holdings in each unique sub-area and the percentage of the population of the larger geographic area (the product being demanded) that is attributable to each sub-area.
- ii. Rank the bidder's existing holdings in each sub-area (that is, considering the bandwidth in each sub-area) in descending order.
- iii. Calculate the cumulative percentage of the population for each sub-area descending down the list by bandwidth (e.g., the second-ranked sub-area's cumulative population percentage will be the sum of the first and second-ranked sub-areas' population percentages).
- iv. Descending down the list by bandwidth, find the first sub-area (or first collection of sub-areas with equal bandwidth) where the cumulative percentage of the population exceeds the insignificant holdings threshold. The existing holdings for this sub-area (using the below example, 100 MHz) will be the existing holdings used to calculate expressible demand under the allocation limit for a product for a bidder.
- v. The limit would only be considered to be exceeded if the bidder is expressing demand on the product that causes the excess (e.g., if a sub-area is insignificant for Product X Upper but that area constitutes the whole geographic area for other products such as Product Y Lower and Product Y Middle, a bidder's demand for Product X Upper causing them to go above the limit in Sub-Area C does not mean they have exceeded the limit in Product Y Lower and Product Y Middle if they express zero demand for these 2 products).

For example, assume that Product X Upper is made up of 4 sub-areas (A, B, C and D), and that a bidder holds 80 MHz in Sub-Area A (30% of the population), 100 MHz in Sub-Area B (25% of the population), 120 MHz in Sub-Area C (15% of the population) and zero in Sub-area D (30% of the population). Based on these parameters, the calculation method is intended to generate an outcome like in the table below. The sub-areas within Product X Upper are ranked in descending order of the bidder's existing holdings (in MHz of bandwidth); the cumulative population percentage for each sub-area is calculated; and the existing holdings in the first sub-area where the cumulative population percentage exceeds the proposed 30% insignificant holdings threshold are the calculated existing holdings for the product. It is demonstrating that the bidder has existing holdings of at least 100 MHz covering 40% of the population of Product X Upper.

Table 9: Existing holdings calculation example ('Product X Upper')

Sub-area	Existing holdings	Rank	Population percentage	Cumulative population percentage	Calculated existing holdings
C	120 MHz	1	15%	15%	100 MHz
B	100 MHz	2	25%	40%	
A	80 MHz	3	30%	70%	
D	0 MHz	4	30%	100%	

The allocation limits are proposed to limit the aggregate of the parts of the spectrum that may be used by any person or specified group of persons as a result of the 3.4/3.7 GHz bands auction in the 3.4–3.8 GHz frequency range. Therefore, in a sequential auction as is proposed for the 3.4/3.7 GHz bands auction, we will need to give effect to the allocation limits during the allocation of the 3.7 GHz band and again during the allocation of the 3.4 GHz band.

To do so, we propose to take the following steps:

- i. Calculate existing holdings using the calculation method described above to determine expressible demand in each product in the 3.7 GHz band.
- ii. Allocate the 3.7 GHz band spectrum.
- iii. Re-calculate existing holdings using the calculation method, adding any spectrum won in the 3.7 GHz band to determine expressible demand in each product the 3.4 GHz band.
- iv. Allocate 3.4 GHz band spectrum.

The proposed operation of the allocation limits is illustrated by the allocation limits spreadsheet, published in the key documents section with this consultation paper.

Insignificant holdings threshold

We propose to:

- > Set the insignificant holdings threshold at 30% of the population.
- > Apply a calculation method so that if a sub-area of a product is deemed to cover a small or 'insignificant' percentage of the population of the whole geographic area of a product (that is, not more than 30%), existing holdings in the sub-area would not be counted towards the allocation limit.
- > Calculate existing holdings for the 3.7 GHz band allocation, and after the conclusion of that allocation process, re-calculate existing holdings for the 3.4 GHz band allocation.

Affiliations

We have considered whether the affiliations provisions used in previous auctions are appropriate for the current market.

In previous auctions, the ACMA was directed by the minister to impose rules to prevent applicants who were affiliated from avoiding the effect of the allocation limits, by applying the limits to each applicant and all the applicant's associates collectively. The minister's directions defined who was an associate of an applicant, including parties to a 'relevant agreement' about the spectrum that was being allocated.

To comply with these directions, the ACMA prevented 2 persons who were 'affiliated' from participating in the auction as separate bidders. Two bidders were considered to be affiliated if one was an associate of another, or if they had an associate in common. The affiliates provisions ensure the allocations limits are not exceeded by preventing parties who are closely related from participating in the auction as separate bidders. By preventing closely related parties from participating in the auction as separate bidders, this assists to maintain the integrity of the auction process.

We have considered each of the provisions contained in the previous allocation determination and our view is that the affiliates provisions used in previous auctions are generally still fit for purpose. In those allocation determinations, 'relevant agreement' has been defined consistently with the definition of 'relevant agreement' that appears in the Corporations Act 2001, which captures a wide range of agreements. We consider relevant agreements between parties about spectrum on offer in the auction could impact the auction outcome and/or cause the allocation limits set to be exceeded. Therefore, as with previous auctions, agreements between parties about the spectrum available at auction would cause the parties to the agreement to be associated for the purposes of the auction. Given the leftover lots will not contribute to the allocation limit for a bidder, we consider that an agreement about leftover lots and no other spectrum to be allocated at the 3.4/3.7 GHz bands auction should not cause parties to be associated. We further consider it appropriate to continue to require bidders to report any changes in their affiliations on an ongoing basis during the auction period to ensure the allocation limits are not exceeded.

If an affiliation is identified between applicants before the eligibility deadline, the following options are proposed to remedy the affiliation and allow participation in the auction:

- > All but one of the affiliated applicants must withdraw their application, allowing the remaining applicant to continue participating in the auction.
- > All the affiliated applicants withdraw their applications and submit a new single application on behalf of all affiliated applicants.

If an affiliation is identified between applicants during the 3.7 GHz band auction or the 3.4 GHz band auction, the following options are proposed to ensure the allocation limits are applied appropriately:

- > The affiliated bidders must jointly give the ACMA a direction on how to allocate the lots between the affiliated bidders up to the application limit, to ensure the limits are not exceeded.
- > If the ACMA does not receive such a direction, we will allocate the spectrum between the affiliated bidders at our discretion, up to the allocation limit.

Before issue of any licences, each affiliated bidder would be required to pay the balance of their full winning price despite receiving less spectrum. Where an affiliated bidder does not pay the balance of their full winning price, they may be excluded from obtaining a spectrum licence and any eligibility payment paid may be forfeited. In addition, any amounts secured under a deed of financial security provided by the applicant may be recoverable by the ACMA on behalf of the Commonwealth.

The ACMA is conducting 2 sequential auctions, therefore, it is possible that an affiliation is identified between bidders in or after the first auction (3.7 GHz band) and before the second auction (3.4 GHz band). This will impact participation by those affiliated bidders in the second auction (3.4 GHz band). If an affiliation is identified between bidders before the 3.4 GHz band auction commences, we propose to allow each affiliated bidder to participate in the 3.4 GHz band auction as separate bidders subject to:

- > An affiliated bidder having sufficient eligibility points to participate in the 3.4 GHz auction.
- > The affiliated bidders, as a specified group of persons, having spectrum licensed holdings below the allocation limit.
- > A joint direction is given by the affiliated bidders on how the allocation limit will be apportioned between the bidders, and if a joint direction is not given, the spectrum will be apportioned by the ACMA at its discretion. For example, the ACMA may impose a 140 MHz allocation limit in Melbourne. If 2 bidders are affiliated, and each affiliated bidder has a spectrum licence for 50 MHz of spectrum in Melbourne, the specified group of persons made up of the 2 bidders holds spectrum licences for a total of 100 MHz of spectrum in Melbourne. Those 2 affiliated bidders can acquire 40 MHz of spectrum in Melbourne before the allocation limit in Melbourne is reached. The affiliated bidders may direct the ACMA that Bidder A can bid for up to 25 MHz of spectrum in Melbourne and Bidder B can bid for up to 15 MHz of spectrum in Melbourne, or any other combination up to the allocation limit.

This is consistent with affiliations that are identified during a single auction process, where bidders may continue through to the end of the auction as separate bidders, after which time the winning spectrum is reconciled against the allocation limit to ensure the allocation limit is not exceeded. The joint direction on how spectrum is to be apportioned between affiliated bidders, or as decided by ACMA, ensures the allocation limit is applied to the affiliated bidders as a single group. Further, it reduces the risk that affiliated bidders win spectrum in excess of the allocation limit, and as a result, are required to pay the balance of their full winning price despite receiving less spectrum after the end of the auction.

Affiliations

We propose to:

- > Prevent applicants who are affiliated from participating in the auction as separate bidders.
- > Deem agreements between parties about the spectrum available for bidding at auction to cause the parties to the agreement to be affiliated. However, leftover lot spectrum would not have this effect.
- > Allow affiliated bidders, identified after the eligibility deadline but before the start of the 3.4 GHz band auction, to participate in the 3.4 GHz band auction as separate bidders subject to the allocation limit applying to them as a specified group of persons.

Application and registration process

The draft allocation determination sets out the application process that interested parties must comply with, in order to be eligible to participate in and bid for spectrum at auction. This includes specifying documentation necessary to submit a complete application, when it must be submitted and how.

Given we propose the 3.7 GHz band and 3.4 GHz band be allocated sequentially, we propose to implement a streamlined single application process followed by a single eligibility nomination process. The single application and eligibility nomination processes will allow bidders to apply to participate in the 3.4/3.7 GHz bands auction with the flexibility to bid on either or both of 3.7 GHz band and 3.4 GHz band spectrum up to the bidder's allocation limit.

Online application interface

We are aware that the application and registration processes can be administratively burdensome for applicants, and that submitting a large volume of documents by email can cause problems with the size of attachments. Therefore, we are investigating the feasibility of developing an online portal for submitting application and eligibility nomination documents to the ACMA for the 3.4/3.7 GHz bands auction, to be used in tandem with submitting original documents.

The outline of the solution we are considering is:

- > Completing web-based forms for the application form and eligibility nomination form.
- > Executing paper copies of deeds and statutory declarations and uploading them via the online portal.

We will retain email and in-person based processes for giving documents to the ACMA.

We welcome any comments or suggestions in regard to this proposal.

Stage 1: Application stage

By the application deadline (estimated to be in July 2023), the applicant must submit:

- > a completed application form registering their intent to participate in the auction
- > a deed of acknowledgment binding the applicant to follow the procedures detailed in the allocation determination
- > deed(s) of confidentiality
- > a non-refundable application fee of \$10,000.

We consider that the application fee is sufficiently large to discourage frivolous or non-serious applications, without being so large as to be a disincentive for genuine applicants.

Eligible recipients who intend to elect to acquire leftover lots must apply to participate in the auction even if they do not wish to acquire any other lot.

In order to maintain the integrity of the auction process, we intend to seek a statement from each applicant that the applicant has not colluded with another party in relation to the 3.4/3.7 GHz bands auction.

Stage 2: Eligibility nomination stage

In previous simultaneous auctions, each applicant nominated its provisional start demands on its eligibility nomination form, and its eligibility points were calculated by adding the lot ratings for its provisional start demands. An applicant secured its eligibility points by providing an eligibility payment and/or deed of financial security for 10% of the total value of the provisional start demands at the starting prices.

Given we intend to implement a streamlined single application process followed by a single eligibility nomination process, we have identified 2 possible eligibility nomination approaches:

- a) Applicants nominate provisional start demands for both bands
- b) Applicants nominate eligibility points which can be used flexibly across both bands.

Under option (a), applicants would nominate provisional start demands for both the 3.7 GHz and 3.4 GHz band spectrum in their eligibility nomination form. However, our view is that it is not possible for an applicant to nominate a start demand for the 3.4 GHz band allocation when it cannot take into account any spectrum won in the 3.7 GHz band allocation. We consider nominating a start demand for the 3.4 GHz band allocation process assuming no spectrum had been acquired in the 3.7 GHz allocation process would require from applicants an eligibility payment that would not properly reflect the amount required or deed of financial security for spectrum that an applicant may not be able to acquire. This would result in an eligibility payment or deed of financial security amount that is unnecessarily high.

Under option (b), applicants will secure the number of eligibility points they will need to express demand for the lots they would like to acquire in the 3.7 GHz and/or 3.4 GHz band allocations. The ACMA will set a dollar value for each eligibility point. The number of eligibility points nominated by the applicant will be multiplied by the dollar value of each eligibility point to determine the eligibility payment or deed of financial security amount required to secure the eligibility points required by the applicant.

The number of eligibility points required by a bidder will be based on the lot ratings for each product available for bidding and the spectrum they wish to acquire. The applicant multiplies their desired number of lots of each product by the specified lot rating. The total lot ratings for all the bidder's desired lots determines the number of eligibility points a bidder would need to facilitate bidding for the lots it seeks to acquire. Bidders can use eligibility points to bid on any lot, or any combination of lots, up to their maximum eligibility points and up to the allocation limit. Eligibility points may be used in the 3.7 GHz band allocation and/or the 3.4 GHz band allocation. Bidders cannot bid on lots in such a way that their bidding activity would exceed their eligibility points or result in their breaching the allocation limit.

The eligibility points a bidder may secure for the purposes of bidding in the 3.7 GHz band and/or 3.4 GHz band allocations may be greater than the total spectrum that may be secured by the bidder in the 3.7 GHz band allocation or the 3.4 GHz band allocation. However, the eligibility points that may be used in 3.7 GHz band allocation and 3.4 GHz band allocation will be limited by the allocation limit as applied to the bidder and the total amount of spectrum available. They may also be reduced for each bidder in the pre-bidding round(s) of the primary stage of the 3.7 GHz band allocation process and the 3.4 GHz band allocation process, depending on the start demands expressed.

Bidders that are allocated spectrum in the 3.7 GHz band allocation who wish to participate in the 3.4 GHz band allocation will have their eligibility points adjusted after the end of the 3.7 GHz band allocation. After the end of the 3.7 GHz band allocation, the bidder's used eligibility (that is, the total eligibility of lots won in the primary and secondary stages of the 3.7 GHz band allocation) will be subtracted from the eligibility points secured in the bidder's eligibility nomination form. This will determine the bidder's eligibility points for the 3.4 GHz band allocation. As described above, the eligibility points a bidder can use in the 3.4 GHz band may reduce after the pre-bidding round of the primary stage has been completed.

Option (b) enables the 3.4 GHz auction to follow shortly after the 3.7 GHz auction. Further, it allows a more flexible use of eligibility points across both bands, and thus enables bidders to secure their eligibility points with an eligibility payment and/or deed of financial security amount based on their intended demand across the whole auction process.

Therefore, we propose to implement the eligibility approach described in option (b).

Given our preferred view that leftover lots will not be available for bidding in the primary or secondary stage:

- > an eligible recipient will not need to secure eligibility points for leftover lots
- > eligible recipients can nominate, before the eligibility deadline, which leftover lots, if any, they would like to have directly allocated to them.

Therefore, by the eligibility deadline, an applicant will specify:

- > the applicant's eligibility points that will be used for bidding in the 3.4/3.7 GHz bands auction
- > for eligible recipients, which leftover lots, if any, they would like to have directly allocated to them for the price set by the ACMA.

By the eligibility deadline, in order to register as a bidder, the applicant must make an eligibility payment and/or give a deed of financial security for their eligibility points. The amount of the eligibility payment and/or deed of financial security amount will depend on:

- > the number of eligibility points nominated by the applicant
- > for eligible recipients, the leftover lots they wish to acquire.

The ACMA will set a price for each leftover lot. An eligibility payment or deed of financial security amount of 10% of the price of the leftover lots sought will be required from eligible recipients who choose to take up a leftover lot.

If a leftover lot recipient is also securing eligibility points for bidding in the auction, and there is a shortfall between the amount of the eligibility payment and/or deed of financial security and the total amount required to secure the nominated eligibility points and for providing 10% of the amount required to secure the leftover lots, and the leftover lot recipient does not 'top up' the payment or the deed, any eligibility payment made and/or amount secured by the deed of financial security will be applied to cover the leftover lots first. The nominated eligibility points secured for the auction will be reduced accordingly. For example, if 10% of the value of leftover lots is \$100,000 and the applicant wishes to also secure eligibility points for bidding in the auction to the value of \$100,000, an eligibility payment and/or deed of financial security amount of \$200,000 would be required. If the applicant makes an eligibility payment and/or provides a deed of financial security for \$150,000, then \$100,000 will be first used to cover the amount required to secure the leftover lots, and the remaining \$50,000 will be used for the purposes of securing eligibility points.

The election to acquire a leftover lot must be made before the eligibility deadline. It is a binding commitment that cannot be withdrawn or amended (unless the ACMA varies the price of a leftover lot). Failure to make an eligibility payment and/or provide a deed of financial security will not prevent the leftover lot recipient from being allocated its leftover lot. It may however affect an applicant's ability to bid in the auction, as discussed above.

Leftover lots elected to be taken up by an eligible recipient before the eligibility deadline will be allocated to that eligible recipient immediately after the eligibility deadline (or the extended eligibility deadline, if there is one). We will advise all bidders of the leftover lots that have been elected to be taken up after the eligibility deadline (or the extended eligibility deadline).

Application and registration process

We propose to:

- > undertake a 2-stage application/eligibility nomination process covering participation in the 3.7 GHz band allocation and the 3.4 GHz band allocation
- > enable the submission of application and eligibility nomination documents via an online interface
- > set the application fee for the auction at \$10,000
- > require applicants to secure eligibility points that may be used for bidding in the 3.7 GHz band allocation and/or the 3.4 GHz band allocation by requiring an eligibility payment or deed of financial security that secures the value of the eligibility points requested
- > require an eligibility payment or deed of financial security of 10% of the price of the leftover lot from eligible recipients who choose to take up a leftover lot.

Lot ratings and starting prices

Under the terms of the draft allocation determination the ACMA must specify a lot rating and starting price for the lots of each of the products available for bidding in the auction.²⁸ Lot ratings provide indications of the relative value of a product for the purpose of the auction. Geographic regions valued more highly are given a higher lot rating. Lot ratings may also take into account licence term (i.e., the longer the licence term, the higher the lot rating). Lot ratings are used to determine the total eligibility points available to bidders at the start of the auction.

By the eligibility deadline, each bidder nominates the number of eligibility points it will need to facilitate bidding in the 3.4/3.7 GHz bands auction. To calculate the eligibility points, the applicant multiplies the number of lots in each product the bidder seeks to acquire by the specified lot rating.

Lot ratings provide the basis for the activity rule that allows each bidder to bid flexibly on its most profitable package of lots in each round, substituting between different lots where necessary. As such, appropriate lot ratings facilitate price discovery in the auction. Lot ratings are typically aligned with the relative population in the geographic area for different products.

Starting prices are the initial prices for each lot in the first round of the auction. If demand exceeds supply for a product, the price for all lots of a product increases according to the clock price for that round.

The lot ratings, starting prices for lots of each product available for bidding in the auction and the set price of leftover lots will be released in the AIP.

Variation of prices

In the 26 GHz band auction and the 850/900 MHz band auction, we included the ability for the ACMA to change the starting prices after applications opened, but before the eligibility deadline. We propose to include the flexibility to vary starting prices in the 3.4/3.7 GHz bands auction as well.

We expect a variation of starting prices would occur only in unusual circumstances, such as where a significant change occurs in the market after prices are set.

²⁸ Leftover lots are not proposed to be available for bidding in the primary stage of the 3.4 GHz band auction, therefore, will not have a lot rating.

If starting prices are changed, lot ratings may also be changed. Consequently, we would extend the application and eligibility deadlines, to give applicants the opportunity to vary, or withdraw their application without penalty, and for new applicants to apply to participate.

We propose to also include in the allocation determination a power for the ACMA to vary the set price for leftover lots. As for the change to starting prices, if the set price for a leftover lot is changed, we would extend the application and eligibility deadlines, to give applicants the opportunity to withdraw an application or to submit an updated eligibility nomination form. The ACMA may change starting prices and the set price of a leftover lot independent of each other.

Variation of prices

We propose to include in the allocation determination the power for the ACMA to vary starting prices and/or the set price of leftover lots after applications open, but before the eligibility deadline. If the ACMA varied the starting prices and/or the set price of leftover lots, the application deadline and eligibility deadline would be extended.

Payment terms

The draft allocation determination sets out financial obligations of winning bidders to pay their winning price. The draft allocation determination also includes procedures for the ACMA to refund eligibility payments to unsuccessful bidders, or a winning bidder whose eligibility payment exceeds its winning price.

For some previous auctions, the ACMA has set out the following 2 methods of payment of the winning price:

- > upfront payment, where the entire winning price must be paid before licence issue
- > payment by instalments, where only the first of several instalments must be paid before licence issue.

Consistent with the recommendations of the Spectrum Pricing Review, the ACMA has typically favoured upfront payments of winning prices. In the 26 GHz auction, the minister directed the ACMA to provide winning bidders with the election of paying upfront or by instalments. An upfront payment was required for the winning price from the 850/900 MHz band auction, however, the time for such payments is not until closer to the commencement of the spectrum licences in July 2024.

For the 3.4/3.7 GHz bands auction, we propose to require upfront payment of the winning price from each bidder, shortly after the end of the 3.4 GHz band allocation.

Payment terms

We propose to use the upfront payment arrangement for payment of winning prices shortly before licence issue and commencement.

Unsuccessful bidders

In previous auctions, the ACMA has returned eligibility payments or cancelled deeds of financial security as soon as possible after the auction. For the 3.4/3.7 GHz auction, we intend to return eligibility payments or cancel deed of financial security closer to the 6-month deadline specified in the draft allocation determination to allow time to resolve any complaints or issues related to potential breaches of auction rules.

Changes to the Radiocommunications (Spectrum Licence Tax) Determination 2021 (SLT Determination)

We propose to make amendments to the SLT Determination to include the 3.7 GHz band so that spectrum licence tax can be imposed on the spectrum licences won in the 3.7 GHz band at auction. Spectrum licence tax will also be payable on licences issued for 3.4 GHz band spectrum and for any leftover lots allocated in the 3.4/3.7 GHz bands auction.

The proposed changes are to item 9 of clause 2 of Schedule 1:

- > amend the frequency range from 3400–3700 MHz to 3400–3800 MHz.
- > change the base amount from \$166,032 to \$221,376 to reflect the change in the frequency range.

The increase in the base amount is to ensure that the winners of spectrum in the 3700–3800 MHz frequency range pay the equivalent spectrum licence tax as those with spectrum licences in the 3400–3700 MHz frequency range. The change in the base amount will not increase the spectrum licence taxes for existing spectrum licences in the 3400–3700 MHz frequency range.

Changes to the Radiocommunications (Spectrum Licence Tax) Determination 2021

We propose to make the following amendments to item 9 of clause 2 of Schedule 1:

- > change the frequency range from 3400–3700 MHz to 3400–3800 MHz
- > change the base amount from \$166,032 to \$221,376 to reflect the change in the frequency range.

Unsold lots

Any parts of the spectrum which are offered in this allocation, either via auction or for a pre-determined price, but not allocated, may or may not be offered for allocation at a later stage. If the ACMA decides to allocate any spectrum which is not allocated in the current process, the ACMA will determine procedures for that process.

5. Draft technical framework

Elements of a spectrum licensing technical framework

A spectrum licensing technical framework consists of 3 interlocking regulatory elements under the Act:

- > The conditions specified in the spectrum licence: in particular, the core conditions that define the spectrum space (both frequency and geographic area) and the level of emissions permitted inside and across the frequency boundaries of the licence (section 66). Section 71 also provides for the ACMA to apply other conditions in a spectrum licence.
- > A determination of unacceptable levels of interference for the purpose of device registration in each band (section 145).
- > Radiocommunications advisory guidelines (RAGs) that provide assistance and advice for coordination with stations in other services when and where required (section 262).

Often, radiocommunications assignment and licensing instructions (RALIs) may be created or modified that also support, and are referenced in, a spectrum licensing technical framework.

A more comprehensive explanation of spectrum licensing technical frameworks is provided in the document [Spectrum licensees – know your obligations](#).

3.4 GHz Technical Liaison Group

The ACMA generally reviews or develops a new technical framework through the formation of a [Technical Liaison Group](#) (TLG). A TLG is a short-term advisory body convened by the ACMA as a forum for consultation between the ACMA, industry and other stakeholders with an interest in the technical aspects of spectrum licences.

In July 2021, the ACMA formed the 3700–4200 MHz band (subsequently renamed to 3.4–4.0 GHz) Technical Liaison Group (TLG) to provide advice on the development of all technical frameworks required in the 3400–4000 MHz range. Some discussions were held on spectrum licensing technical framework issues in 2021 but the TLG was then refocused on the remote area-wide licensing (AWL) framework. The TLG was re-engaged in September–October 2022 to consider the remaining spectrum licensing technical framework issues. A record of the TLG discussions are available on the [ACMA website](#).

One of the key bases for the TLG process was a desire to have a single spectrum licensing technical framework covering both the 3.4 GHz band and 3.7 GHz bands that was to be adapted from the existing 3.4 GHz spectrum licensing technical framework. This is because the bands are directly adjacent to each other and are considered substitutable. A single framework then simplifies network design for any licensees that end up holding spectrum in all bands and would help to reduce the complexity of any future defragmentation of spectrum holdings across the broader 3400–3800 MHz frequency range.

Draft technical framework elements

The ACMA is proposing to amend the existing spectrum licensing technical framework ('the framework') for the 3.4 GHz band to encompass the spectrum spaces contained in the re-allocation declaration.

The elements that comprise the current 3.4 GHz technical framework are:

- > Conditions in the spectrum licence (a copy of a current 3.4 GHz band spectrum licence is [available here](#))
- > [Radiocommunications \(Unacceptable Levels of Interference – 3.4 GHz Band\) Determination 2015](#) (s.145 determination or 's.145')
- > [Radiocommunications Advisory Guidelines \(Managing Interference from Spectrum Licensed Transmitters – 3.4 GHz Band\) 2015](#) ('RAG Tx')
- > [Radiocommunications Advisory Guidelines \(Managing Interference to Spectrum Licensed Receivers – 3.4 GHz Band\) 2015](#) ('RAG Rx')
- > Any relevant referenced radiocommunications assignment and licensing instructions (RALIs).

After considering the outcomes from the TLG, we have drafted amendments to the framework. This includes amendments to the s.145, RAG Tx, and RAG Rx and a new draft RALI MS47, which have been published alongside this consultation paper. A sample spectrum licence is also included in the draft marketing plan, also published with this consultation paper.

It is noted that when developing or updating a spectrum licensing technical framework to include new spectrum, the ACMA would usually consider amendments to the [Radiocommunications \(Trading Rules for Spectrum Licences\) Determination 2012](#) to define a minimum contiguous bandwidth (MCB) for trading. However, as this instrument is due to sunset on 1 April 2023, the ACMA has separately consulted on a proposed remake of this instrument and intends to make a replacement instrument before 1 April 2023. The consultation draft included, among other things, defining a 10 MHz MCB for the broader 3400–3800 MHz band. Interested stakeholders are referred to the [ACMA website](#) for details on that consultation process.

Conditions in the spectrum licence

Each spectrum licence includes both core conditions and statutory conditions specified under relevant sections of the Act. The Act also provides that other specific conditions may be included by the ACMA.

- > **Core conditions:** required under section 66 of the Act, these conditions define the spectrum space within which the licensee is authorised to operate radiocommunications devices under the licence, and the maximum permitted level of radio emissions inside and outside the band. These conditions are included in all spectrum licences.
- > **Statutory conditions:** required under sections 67 to 69A of the Act, these conditions include information about payment of charges, use by third parties, residency, registration of transmitters and devices exempt from registration. These conditions are included in all spectrum licences.
- > **Other conditions:** conditions included under section 71 of the Act generally provide for the efficient management of the spectrum and administration of the Act. These conditions may vary from one band or licence to another.

Radiocommunications Advisory Guidelines

Further guidance on interference management with other services is provided in RAGs made under section 262 of the Act. RAGs can refer to any aspect of radiocommunications or radio emissions.

Generally, RAGs include provisions to help assess the possible interference between spectrum-licensed devices and services operating under spectrum, apparatus or class licences. Potentially affected services are identified in the RAGs to enable licensees to

assess and mitigate the risk of interference with these services. RAGs may also set out the ACMA's approach to resolving interference disputes.

If interference arises between a spectrum-licensed service and another service, conditions on each of the licences generally provide a path to resolution. We will, however, consider the provisions of the RAGs in resolving the matter. Some provisions may also be incorporated by reference as a licence condition, and hence, would be mandatory for the licensee to meet.

Currently, there are 2 RAGs relevant to the deployment of services in the 3.4 GHz band, the RAG Tx and RAG Rx. The ACMA proposes to amend these RAGs so they encompass the spectrum space defined in the re-allocation declaration and to take into account any licensed services that may be affected as a result.

Summary of general or common amendments

Overall, amendments proposed to the existing framework are:

- > general updates to align with other spectrum licence technical frameworks where appropriate
- > updating the definition of the 3.4 GHz band to cover the 3400–3800 MHz frequency range
- > adding or amending appropriate coexistence management for services that are now relevant in the band including under AWLs, earth receive stations, radio-navigation class-licensed services and incumbent apparatus-licensed services affected by the re-allocation declaration
- > removal of co-ordination requirements with Public Telephony Systems (PTS) as there are no longer provisions for them in the band
- > updating of references as some of these, such as to the 3.6 GHz marketing plan instrument, are subject to sunseting and may or may not have been remade.

Summary of other amendments to each framework element

Proposed other amendments to the relevant elements of the framework are described below.

Sample spectrum licence

The sample spectrum licence in the draft marketing plan proposes core conditions relating to unwanted emissions that differ from existing licences near the 3.4/3.7 GHz bands. These conditions are crafted to align with 3GPP standards and to update the frequency range over which they apply to account for the re-allocation declaration. Responses from the TLG in relation to these amendments were supportive.

A new clause (the RAG Tx clause) has been added to Licence Schedule 4 which requires licence holders to comply with new clauses in the amended RAG Tx concerning management of coexistence with radio-navigation services (i.e., radio altimeters) which operate under a class licence in the 4200-4400 MHz band.

The ACMA presently does not intend to include the RAG Tx clause in the final version of the sample spectrum licence in the draft marketing plan. However, the RAG Tx clause remains in the sample spectrum licence for consultation, to illustrate how such a condition would be implemented if the ACMA reconsidered that position.

For details on other aspects of the sample licence please refer to the Draft marketing plan section of this paper.

Unacceptable levels of interference (s.145 determination)

We consider the s.145 determination is generally fit for purpose, but it has been amended to reflect the general amendments described above.

Managing interference from spectrum-licensed transmitters (RAG Tx)

The RAG Tx provides guidance on the protection of apparatus and class-licensed receivers from interference caused by transmitters operating under a spectrum licence. Other key changes proposed to the RAG Tx include the matters set out below.

The ACMA proposes to amend the provisions about the coordination with earth receive stations as there may now be spectrum licensed transmitters on frequencies below, on or above earth receive stations in adjacent geographic areas. This is proposed to be managed by the modification of the provisions in relation to the application of an assumed radiofrequency (RF) filter to an earth receive station. If the station was registered under its licence after the re-allocation declaration was made then an RF filter is assumed to exist both at the upper and lower edges of the licensed bandwidth, rather than just the lower edge.

There were views expressed in the TLG that the attenuation performance of the RF filter detailed in table 1 of clause 4.3 (also in table 8 of RALI MS47 for AWLs) should be changed to reflect current technology, and that protection values for earth station receivers should be changed. While we are not proposing to update any of these parameters at this point, we welcome specific evidence and proposals for changes to these elements.

Some satellite sector members in the TLG reiterated comments in relation to the practicalities of RF filtering, and the ACMA proposal to allow earth receive stations to have a licensed bandwidth, based on a practical RF filter bandwidth,²⁹ that is different to that used for satellite coordination:

- a) Employing custom RF filters to minimise licensed bandwidth at any time is very costly and may require new filters when there are carrier changes.
- b) Employing more standard RF filters with wider bandwidths would result in higher receiver licence taxes, especially in metropolitan areas.

The ACMA notes these concerns. However, this earth receive station licensing approach is proposed to be introduced to give earth receive station licensees both certainty and flexibility around coordination with WBB services. Our view remains that this is a practical approach given the introduction of WBB into the band and the potential for earth receive stations to deny large amounts of spectrum space.

The TLG paper had asked for views on coordination with earth station receivers concerning the application of the RF filter on either the lower frequency only of the earth station licence or on both lower and upper frequencies. The TLG paper proposed a number of scenarios related to the reallocation period and whether the earth station was registered in the Register of Radiocommunications Licences before the re-allocation declaration was made. After considering the outcomes of the TLG, the ACMA proposes that:

- a) For coordination of spectrum licensed transmitters occurring before the end of the reallocation period, with earth receive stations first registered before the start of the reallocation period, then filtering at the lower edge only is to be assumed, and when there are multiple earth receive licences operating on the

²⁹ The actual RF filters licensees used would be indicated by licence special conditions

same antenna, the RF filter should only be applied from the lower edge of the lowest frequency licence. This is the provision in the extant framework.

- b) For all other cases, filtering at both lower and upper edges is to be assumed.

These provisions will allow a reasonable period of time for incumbent earth station licensees to fit new RF filters and obtain new licences that reflect the filtering, should they wish.

The ACMA had proposed to extend sections 8.1 and 8.2 of the RAG Tx to both AWLs and spectrum licences rather than spectrum licences alone. Telecommunications TLG member views were that doing so would be both unnecessary and burdensome, given AWLs have a stricter device boundary criterion ('strict DBC') applying for coordination with spectrum licences compared to the DBC applicable to AWLs under draft RALI MS47. Given that the coordination method under section 8.2 is based on the less strict DBC ('normal DBC') in draft RALI MS47, it is unlikely to fail for receivers used in relation to AWLs and, consequently, the burden to conduct coordination for every spectrum licence to such receivers is unnecessary.

Upon review, the ACMA agrees that under most circumstances the risk is low if this coordination check is not done. Consequently, we now do not propose for sections 8.1 and 8.2 to apply to receivers used in relation to AWL (but section 8.2 will still apply to receivers registered under a spectrum licence) in the framework. Instead, a new Part 12 has been proposed in the RAG Tx. This part defines the in-band protection requirements from transmitters operating under a spectrum licence into geographically adjacent AWLs. It is noted that criteria for transmitters operating under an AWL (and other apparatus licences) into a geographically adjacent spectrum licence are contained in the proposed amendment to the RAG Rx.

Refer to the later section 'Coexistence with radio altimeters' for proposed changes to the RAG Tx to manage that issue.

Managing interference to spectrum-licensed receivers (RAG Rx)

The RAG Rx provides guidance on the management of interference into receivers operating under a spectrum licence. Key changes proposed to the RAG Rx include:

- > Amending the definition of the 3.4 GHz band to cover the 3400–3800 MHz frequency range.
- > Removing the definition of and any reference to RALI MS39 'Frequency Coordination and Licensing Procedures for Apparatus Licensed Public Telecommunications Services in the 3.5 GHz band' as it has been retired.
- > Including a reference to the RALI MS47 DBC for the management of in-band interference from apparatus licences issued after specified date in different frequency ranges. The specified date for the 3.4/3.7 GHz bands is the day the re-allocation declaration commenced. The specified date for the 3575–3700 MHz band is the day any other re-allocation declarations for the 3.6 GHz band commenced.
- > It is intended that apparatus licences issued after the specified date that authorise the operation of transmitters in any part of the associated defined frequency range, adhere to meet the DBC defined in RALI MS47. It is intended that spectrum licensees are not afforded protection from apparatus licences that were issued before the specified date and that encompass any part of the associated defined frequency ranges.

- > Amending the frequency range for the receiver blocking requirement of the notional receiver. The applicable range has been expanded to cover the frequencies encompassed in the re-allocation declaration and aligns with international standards for 4G and 5G equipment (this includes [3GPP TS 36.104](#) and [3GPP TS 38.104](#)).

Draft RALI MS47

The draft RALI MS47 provides the assignment and licensing requirements for AWL services in remote areas in the band. It includes aspects of coordination of AWLs with spectrum licences in the 3400–4000 MHz range and, consequently, forms part of the framework. Also, additional coordination requirements for apparatus licenced earth receive stations with spectrum licences are contained in RALI MS47.

Some TLG members commented about the limitation of the scope of RALI MS47 to remote areas only. As decisions on any AWL allocations in areas other than remote areas have not yet been made, RALI MS47 is proposed only to apply to remote areas at this time. We expect, however, that relevant aspects of the RALI MS47 will apply to any AWL/spectrum licence geographic or frequency boundary in future revisions of RALI MS47.

Pivotal commented in the TLG that they would like flexibility in application of the 2 different device boundary criteria in RALI MS47, one 'normal DBC' applying between AWLs and a more stringent DBC applying between AWLs and spectrum licences.

Telecommunications TLG members expressed the general view that potential TDD synchronisation of AWLs with spectrum licences could offer spectrum efficiencies and that they would be happy to assist in providing information to AWL licensees to allow them to synchronise if desired. However, they considered that a formal agreement was undesirable. Further, their view was that AWLs should operate on an effective 'no interference, no protection' ('NINP') basis with spectrum licences.

The ACMA's current view is that AWLs will operate in the interference management basis described by the AWL and spectrum licences frameworks (i.e., they do not operate entirely NINP).

Concerning RALI MS47 DBC flexibility and synchronisation generally, our view is that existing mechanisms in the AWL and spectrum licence frameworks do offer a path for flexibility, potentially without formal agreement between AWL licensees and spectrum licensees. For example, if an AWL licensee wanted to operate radiocommunications transmitters closer to a spectrum licence boundary than the normally specified RALI MS47 DBC allowed then under clause 4.1.2 of RALI MS47, the RALI MS47 DBC does not apply if there is an active agreement in place with the spectrum licensee.

Also, it is intended that the ACMA consult on amendments to the Radiocommunications Licence Conditions (Area-Wide Licence) Determination 2020 (AWL LCD), to impose conditions on all AWLs that may be issued in remote areas which affect spectrum licences in the 3.4/3.7 GHz bands. The ACMA is considering whether such conditions would require the operation of an AWL transmitter in accordance with RALI MS47, and whether there would be a mechanism to allow a particular licensee to operate the transmitter otherwise than in accordance with RALI MS47. The ACMA may have regard to the potential for interference, efficient spectrum management and any other relevant matters in considering whether to use that mechanism. This power, if included, could potentially be used to facilitate flexibility in the application of the RALI MS47 DBC, without formal agreement between licensees, subject to satisfying the ACMA.

Other aspects relevant to the framework

Some TLG members identified concerns with date fields in the ACMA's Register of Radiocommunications Licences ([RRL](#)). Specifically, it was noted that the date fields in the RRL may not be able to indicate accurately when a particular station was first registered. It was asserted that the inaccuracy of such date fields may have implications for date-based coordination conditions and/or first-in-time based coordination.

The ACMA acknowledges the issue with the RRL and notes that:

- > The issue is mainly limited to when an apparatus licence is renewed in the 60-day period after it expired.
- > The issue will not affect first-in-time determination as that check can still be carried out accurately by a prospective licensee. i.e., the existing, first-in-time station will still be in the RRL to observe that it is 'first', regardless as to whether its dates are accurate.
- > In relation to time-based provisions of the RAG Rx, RAG Tx and RALI MS47, and noting that the RRL may not accurately identify the date of registration of an individual station, we propose 2 options:
 - a) Accredited Persons (APs) can contact the ACMA to establish the initial registration date for the relevant station.
 - b) The ACMA may publish lists of applicable stations that are likely to be affected by the relevant provisions. This list could be updated periodically, to capture licences that have been surrendered or that have expired, or stations that have been removed from a licence or deregistered.

In relation to option (b), we have conducted an initial audit and are of the view that the number of stations that may need to be considered is in the order of >1,000.

The ACMA welcomes views on the practicality of these options, while noting a project to replace the existing SPECTRA spectrum management system has commenced.

Telecommunications TLG members did not agree with the addition of a new requirement for AWLs to not overlap existing point-to-multipoint (PMP) licences (now contained at clause 3.3.1 of RALI MS47). This clause was added to respond to an issue raised in response to the public exposure of draft RALI MS47 to allow a transition path for incumbent PMP licences to be replaced by AWLs. If AWLs were allowed to overlap with PMP licences, then there is no opportunity for a PMP licensee to acquire an AWL at its location.

We note the concerns and that this may result in a 'Swiss cheese' of AWL holdings. We remain of the view that a transition path for PMP licences to AWLs is desirable. However, we also recognise our preference long term is to have only AWL, and no PMP licences in relevant spectrum spaces. Consequently, we intend to review this provision in RALI MS47 over time.

Coexistence with radio altimeters

Introduction

In developing spectrum licence technical frameworks, coexistence between future and existing uses (in the same band in different geographic areas and in spectrally nearby bands) is routinely considered. In the review of the existing spectrum licence technical framework to include bands to support this allocation process, coexistence between WBB and radio altimeters was identified as a key coexistence consideration.

This coexistence scenario is also relevant to other allocation processes [in the broader 3.4–4.0 GHz band](#) that the ACMA is undertaking, so comments in this section are applicable to all technical frameworks.

Coexistence between aircraft radio altimeters operating above 4200 MHz and WBB is being considered globally with information and the associated evidence base for decision making evolving.

The ACMA has been carefully considering this issue and closely following global developments. Domestically, the ACMA has engaged the TLG on radio altimeter coexistence as well as engaging directly with a range of stakeholders – most importantly the Civil Aviation Safety Authority (CASA). As part of that process, the ACMA developed a report on *Coexistence between Radio Altimeters operating in 4200–4400 MHz and Wireless Broadband systems in 3400–4000 MHz* (the report on coexistence between RAs and WBB) which was published alongside this consultation paper. This report, a draft of which was shared with the TLG in October 2022, consolidates the extensive information available to assist consideration of the matter by interested parties, and outlines the ACMA’s proposed approach for coexistence.

An overview of the issue, the ACMA’s considerations and proposed approach are provided below. Questions regarding this issue are at **Appendix A** to this consultation paper. Feedback to this consultation process will assist the ACMA in finalising its decisions on coexistence arrangements applicable for the spectrum licence technical framework and also relevant to AWL allocation processes in the 3.4–4.0 GHz frequency range.

Discussion

The object of the Act is to promote the long-term public interest derived from the use of the spectrum, by providing for the management of the spectrum in a manner that, among other things, facilitates its efficient planning, allocation and use, and facilitates the use of the spectrum for both commercial and other purposes.³⁰

In this context, the ACMA acknowledges that radio altimeters are critical sensors that provide high integrity, accurate measurements of aircraft (whether commercial, civil or military) height above terrain and obstacles and these are used by many aircraft (both fixed and rotary wing) to enable and enhance flight safety and operations. Ensuring coexistence between radio altimeters with uses of the spectrum such as WBB is a therefore key requirement of the ACMA.

Similarly, the ACMA must consider opportunities to facilitate new uses of the spectrum such as WBB. Spectrum in the 3400–4200 MHz range is of particular interest for WBB globally as an early band for 5G WBB (in addition to 4G and earlier broadband services in parts of the range) with extensive deployments worldwide in different parts of the band. The ACMA considers that the efficient use of this spectrum that supports both radio altimeters and WBB will contribute to the long-term public interest.

The theoretical studies, controlled trials and empirical evidence from real world deployments regarding the coexistence of radio altimeters and WBB do not provide a conclusive view of the actual likelihood of interference to radio altimeters. Some lack of certainty and consensus on spectrum coexistence matters is not unusual, given the differing perspectives of stakeholders, however, the critical nature of radio altimeters in some use cases, makes this lack of definitive evidence more challenging than usual.

³⁰ This description is paraphrased from paragraph 3 of the Act.

Given these circumstances, the ACMA considers it appropriate to adopt a precautionary approach to the implementation of new WBB uses into this environment. This is based on the concept that the absence of definitive data to accurately determine risk likelihood and consequence (in this case risk of interference to radio altimeters) should not preclude action to mitigate the possible risk through the adoption of prudent controls (i.e., regulatory measures). The consequences of excessive or unnecessary regulatory restrictions on WBB systems may, however, reduce the long-term benefits that these services can provide to the Australian community.

An important consideration in determining this proposed approach is that the spectrum management coexistence performance of some³¹ current radio altimeters appears to be generally poor and not conducive to good spectrum management outcomes. This is characterised by industry testing³² that indicates apparent susceptibility of some radio altimeters, in some circumstances, to operation of WBB devices far from the radio altimeters operating band (some multiples of 100 MHz). This occurs via a mechanism whereby fundamental (or 'wanted') WBB emissions interact with radio altimeter operation due to poor radio altimeter filter performance.

Notwithstanding the necessity of continuing to ensure the spectrum management environment is conducive to the safe operation of radio altimeters, the ACMA is of the view that the performance of some current radio altimeters does not support the efficient planning, allocation and use of the spectrum. This is due to the need to adopt a precautionary approach to WBB technical frameworks for operating in spectrum well away from the radio altimeter band that impact on the utility of the spectrum for WBB use.

Interim mitigations combined with radio altimeters retrofits of a defined timeframe

The coexistence issues outlined above can be resolved through improved radio altimeter performance by retrofitting filters to susceptible existing deployed radio altimeters and, ultimately, through the adoption of new radio altimeter standards. The United States (US) for example has adopted the approach of requiring retrofitting radio altimeters in a defined period during which additional constraints are imposed on WBB deployments to support coexistence. Canada is considering a similar approach.

The ACMA's proposed approach is, in principle, similar to that adopted in the US (and proposed in Canada) and is based on dual obligations on the aviation and telecommunications sectors. That is, the approach involves the use of interim constraints on WBB for a clearly defined period to enable the necessary radio altimeters to be retrofitted. At the end of this period interim mitigations would be removed, leaving ongoing mitigations only.

The ACMA is of the view that it is important that these interim mitigations are explicitly time limited with a clear end date – proposed to be the end of March 2025. This is to ensure that the impacts of these mitigations on WBB (and the benefits they provide) are limited to the extent compatible with providing a reasonable opportunity for improved radio altimeters devices to be implemented in Australia. There is an expectation that the coexistence environment between radio altimeters and WBB will be significantly improved through the deployment of improved performing RAs. The current expectation is that this would enable interim mitigations to be removed entirely.

³¹ Given the lack of availability of detailed RA device data and being able to associate them to specific aircraft, it is not possible to be more definitive on the scale of the extent of poorer performing RAs applicable in Australia.

³² See the RTCA, AVSI, Japanese and Canadian 'blackbox' testing in Appendices B and C of the RA report.

It will be a matter for CASA to determine what, if any, restrictions would be placed on aircraft operations after the end of the interim mitigations.

This approach has been formed by the ACMA based on the currently available evidence. While the ACMA will consider the information before it at the time and may contemplate retention of modest ongoing additional mitigations after this date, or to modestly extend the date of interim mitigations, the currently available evidence does not suggest that this will be necessary. Consequently, the ACMA recommends industry work on the basis that all the interim mitigations will be removed in their entirety within the proposed time.

Proposed approach

The proposed approach to managing coexistence between radio altimeters and WBB is based on dual obligations on the aviation and telco sectors where interim mitigations on WBB are imposed while providing a clearly defined period for necessary radio altimeters to be retrofitted. An outline of the ACMA's proposed approach is summarised below and outlined in detail (along with supporting discussion) in the report on coexistence between RAs and WBB (published alongside this paper).

Ongoing WBB mitigations

These mitigation strategies are intended to be long term:

- a. A 200 MHz guard band (4000–4200 MHz) where no WBB deployments will be permitted.³³
- b. In-band radiated power limits – in the form of a Total Radiated Power (TRP) – for all WBB transmitters operating in the 3400–4000 MHz band.
- c. Unwanted emissions limits (in the form of a TRP or conducted power per antenna port) for all WBB transmitter operating in the 3400–4000 MHz band. These apply broadly, including in the 4200–4400 MHz radio altimeter band.

Interim WBB mitigations

These mitigation strategies are intended to be in place until the end of March 2025 (a timeframe to enable radio altimeter retrofits to occur), and to be imposed on WBB deployments above 3800 MHz:

- a. For WBB deployments around runways identified in consultation with CASA:
 - (i) Exclusion zones, where no WBB base stations are permitted to be deployed.
 - (ii) Restricted zones, except in metropolitan and regional restricted cell areas in 3950–4000 MHz, where WBB base station deployments are permitted but with obligations to meet a specified power flux density (PFD) limit.
- b. For WBB deployments everywhere:
 - (i) Additional WBB base station unwanted emission limits in 4200–4400 MHz based on effective isotropic radiated power (EIRP) spectral density rather than TRP or conducted power per antenna port.
 - (ii) Maximum WBB base station power limits in the form of EIRP density limits.
 - (iii) Requiring WBB base station antennas to only point or scan below the horizon.

³³ Previously determined as part of the planning outcomes for the band.

- (iv) A requirement for WBB base station antennas to minimise grating lobes as much as practicable.

The approach in the current version of the report on coexistence between RAs and WBB is consistent with the approach included in the draft report provide to the TLG in October 2022. The interim mitigation end date is being proposed to change to 31 March 2025, based on feedback to avoid the holiday period and to align with a similar end date that Canada is proposing.

The summary above also omits one ongoing mitigation that was initially identified in earlier TLG consultations. This was a general guidance clause that requested spectrum licensees deploying WBB deployments to consider radio altimeter services when planning around airports and heliports. This was proposed to be implemented using clauses in the RAG Tx, referenced by the sample licence. This clause was not supported by any sector as it was seen to be both vague in operation and ineffectual. While it remains in the draft framework for consultation, the ACMA does not currently intend to proceed with this clause and instead is of the view that explicit mitigations should be the focus. The draft technical framework, however, includes the original clause to indicate how a framework could implement any mitigation required for spectrum licences.

Feedback on draft approach shared with the TLG

The ACMA has considered feedback received from the exposure of the original version of the radio altimeter report to the TLG and has decided to release the report publicly without change to substantive proposals. However, updates were made to reflect new information now available³⁴, corrections, clarifications and general improvements to presentation. Feedback received from the TLG has also assisted the ACMA in developing a set of specific questions we are seeking industry input on.

TLG feedback confirmed that the key issues are 1) the frequency boundary above which interim mitigations would apply and 2) the approach of retrofitting radio altimeters to improve performance, including timing for these retrofits. These issues are briefly discussed below. Further industry comments on the first draft of the RA Report can be found in the TLG package released concurrently with this paper.

Frequency boundary

Aviation stakeholders were generally of the view that interim mitigations should extend down to 3700 MHz, and that additional permanent mitigations should be adopted (such as effective isotropic radiated power (EIRP) and more stringent unwanted emissions limits). Telecommunications stakeholders remained of the view that a 200 MHz guard band (from 4000–4200 MHz) alone was sufficient mitigation but accepted temporary mitigations above 3800 MHz to progress the issue.

While we received significant feedback advocating that the proposed interim mitigations be extended to below 3800 MHz, none of the submissions or new evidence provided at that time was sufficiently compelling to the ACMA to make changes to the proposals presented here. We remain of the view that there is not sufficient evidence to require interim mitigations below 3800 MHz. Consequently, specific radio altimeter coexistence mitigations are not currently proposed for the spectrum licensing technical framework.

Outside the context of the spectrum licensing technical framework, some aviation stakeholders suggested that the restricted cell (low power) arrangements being

³⁴ Key examples of the new information that has become available include that from Canada (Industry Canada [ISED consultation-srsp-520-issue-3](https://wwwISED.ca/ISED-consultation-srsp-520-issue-3)) and the US (FAA <https://public-inspection.federalregister.gov/2023-00420.pdf>).

considered by the ACMA in the 3950–4000 MHz range in metropolitan and regional areas be extended to the whole of Australia as that may reduce the risk of RA issues. The ACMA is of the view that, as we are proposing common mitigations to manage the issue Australia-wide, it is not necessary to extend the geographic scope of the use of restricted cells.

Timeframe for radio altimeter retrofits and interim mitigations

Telecommunications stakeholders were of the view that the proposed end date to interim mitigations should be shorter. Aviation stakeholders were of the view that an interim radio altimeter retrofit was not practical and hence did not support any specific timeframe. There were some views expressed that the interim mitigations should apply until a long-term retrofit/replacement program was complete (potentially 5–8 years) after the revised radio altimeter standard is finished (this is currently expected to occur by the end of 2023).

We note feedback from CASA that the timing of the end of any period of possible mitigations should not coincide with a major travel period, such as the end of year period or Easter. The consultation now proposes a 31 March 2025 end date, which also aligns with a similar end date proposed by Canada.

The radio altimeter report and targeted questions (see below) discuss the interim retrofit program and a future state where a new radio altimeter standard is developed, and new equipment based on that standard rolled out. Our proposal is that the time frame for the interim mitigations is tied to an interim retrofit rather than a future program based on the future standard.

Consultation questions

Published with this paper is a list of targeted questions, (Appendix A) aimed at eliciting evidence to assist us in making final decisions. We seek informed, evidence-based responses to those questions, the proposals in general and the radio altimeter report as a whole. Specific feedback that can be used by the ACMA in its decision making, rather than general positional or policy statements, is requested. This includes estimated costs for potential RA retrofits, but noting that the [FAA estimated costs](#) is not provided for the whole affected fleet (7993) but is approximately US\$25,000 per affected aircraft on average for the remain fleet of 1,000 aircraft. Total cost is likely to be significantly less in Australia due to having a smaller fleet and fewer affected aircraft.

6. Invitation to comment

Making a submission

We invite comments on the issues set out in this consultation paper.

- > [Online submissions](#) can be made by uploading a document. Submissions in PDF, Microsoft Word or Rich Text Format are preferred.
- > Submissions by post can be sent to:
 - The Manager
 - Major Spectrum Allocations Section
 - Australian Communications and Media Authority
 - PO Box 13112
 - Law Courts Melbourne VIC 8010

The closing date for submissions is **COB, 29 March 2023**.

Consultation enquiries can be emailed to SpectrumAllocations@acma.gov.au.

A tune-up regarding this consultation paper will be held on **24 February 2023**. More information is available on [the ACMA's website](#).

Publication of submissions

We publish submissions on our website, including personal information (such as names and contact details), except for information that you have claimed (and we have accepted) is confidential.

Confidential information will not be published or otherwise released unless required or authorised by law.

Privacy

View information about our policy on the [publication of submissions](#), including collection of personal information during consultation and how we handle that information.

Information on the *Privacy Act 1988*, how to access or correct personal information, how to make a privacy complaint and how we will deal with any complaints, is available in our [privacy policy](#).

Appendix A: Questions for comment on wireless broadband and radio altimeter coexistence

The radio altimeter (RA) report, found in the key documents section of this consultation, presents our proposals to manage radio altimeter and wireless broadband (WBB) coexistence. We seek general feedback on these proposals and the RA report as a whole. In addition to the general feedback, we have identified a series of specific questions where extra information and supporting evidence will assist us in making final decisions.

Many of these questions are informed by feedback received from Technical Liaison Group (TLG) members on the original RA report, and from recent global developments (such as in the US and Canada). Some of these questions are technical in nature, necessitating a detailed, technically informed response. In some cases, additional context to the question is provided to assist in interpreting and responding to the question.

General questions

Question 1

Are there current or potential future industry coordination mechanisms where WBB operators and the aviation community can coordinate and communicate regarding WBB deployments?

(TLG members did not support the inclusion of general guidance to WBB licensees to consider radio altimeters issues in their deployments.³⁵ We are not inclined to proceed with such a measure, but seek information on possible alternative mechanisms that may deliver similar outcomes.)

Question 2

What are your views on any or all aspects of the [recent Canadian consultation](#) that would be relevant in the Australian context. What, if any, aspects of the revised mitigations should be adapted for use in Australia, and why?

(The Canadian regulator ISED has released a new [consultation](#) with revised proposed mitigations – RA Report Appendix C paragraph 7.66 onwards. These revisions have been based on a comprehensive body of laboratory and over-the-air testing work, as well as other considerations. While a full derivation of quantitative values proposed is not provided, this work contains additional insights relevant to Australian considerations.)

³⁵ As discussed in 1.15 and 4.25 of the RA Report and discussed in this consultation paper.

WBB deployment questions

Question 3

Are the findings from the [NTIA ITS report](#)³⁶ regarding 5G base station emission levels and pattern measurements applicable to Australian WBB deployments? If not, on what basis would equipment deployed in Australia have a materially different performance than the emission levels and pattern measurements outlined in the NTIA study? What are the implications and costs of using equipment that does meet the measurements observed by the NTIA study?

Question 4

What are the effects on WBB deployments if all WBB deployments were restricted to an EIRP of 62 dBm/MHz (rather than a TRP limit) on an ongoing basis (other than those in restricted cell segments with lower powers)? If any, what are the implications and costs of being restricted to this EIRP value, and is there an alternative that would be practicable and appropriate?

(The NTIA ITS report notes practical limitations on current equipment limiting operation to an EIRP of 62 dBm/MHz for most bandwidths. The majority of current Australia deployments operate below this figure, as per the RA report Appendix.)

Question 5

What, if any, are the implications if conducted unwanted emission levels are specified lower than the 3GPP TS.38.104³⁷ spurious domain Category B limits of -30 dBm/MHz (or a TRP equivalent) specifically considering possible ongoing limits of -33 dBm/MHz, -35 dBm/MHz, -40 dBm/MHz or -48 dBm/MHz? Where applicable, both equipment nominally designed for both band n77 and n78 band equipment should be considered, with spectrum allocations up to 3800 MHz for n78 equipment and 4000 MHz for n77 equipment assumed.

(The [NTIA ITS report](#) indicates that, in practice, 5G base stations have better unwanted emissions levels – i.e., have lower emissions – than included in 3GPP specifications.)

Question 6

Can WBB equipment comply with the ACMA proposed interim unwanted emission EIRP limits proposed in the RA report main body and Appendix D, in addition to the TRP and conducted per port limits proposed in the sample spectrum licence contained in the marketing plan? What, if any, are the implications if unwanted emissions are specified as an EIRP rather than a TRP or conducted limit on an ongoing basis?

³⁶ *Measurements of 5G New Radio Spectral and Spatial Power Emissions for Radar Altimeter Interference Analysis*. See paragraph 3.79 of the ACMA RA report.

³⁷ E.g. see [ETSI TS 38.104 version 16.4.0](#) Release 16 Table 6.6.5.2.1-2: General BS transmitter spurious emission limits in FR1, Category B

Question 7

What evidence is there for using lower maximum side-lobe gains, and what alternative value could be used? What would be a practical elevation pattern envelope that both non-AAS and AAS WBB base stations could reasonably implement and commit to, in order to manage grating lobes and beam pointing?

(The interim mitigation zone calculations use an assumed WBB antenna side-lobe gain level of 18 dBi, as per RA report Appendix D. We note feedback from some TLG members that suggests this value is significantly too high.)

Question 8

Are there any technical limitations for WBB AAS base station systems that would make compliance with a requirement to not scan or point the main beam above the horizon impracticable to implement?

Aviation spectrum use questions

Question 9

Given that the proposed interim mitigations were determined using a single take-off/landing scenario, what evidence is there for other critical scenarios (such as deviation from normal flight paths beyond the margin already applied to the glideslope angle) around airports that would require consideration? If there are such scenarios, based on the same methodologies currently used, what would the required zone shapes and sizes be?

Question 10

What is a practicable and demonstrable timeframe for the replacement³⁸ of the affected aircraft radio altimeters fleet to meet the proposed revised DO-155A/MOPS and the expected subsequent FAA technical standard order (TSO), which would be expected to be adopted globally?

Question 11

If the draft RTCA DO-399 is adopted to form the new DO-155A/MOPS standard, what evidence is there for any ongoing mitigations after a MOPS-based replacement and what should they be, based on similar methodologies to the ACMA methods?

Question 12

What are suggested processes for the consideration of adding new approaches to the identified runways list in areas where WBB has already been deployed, during the period of interim mitigations?

³⁸ We recognise that it may not be necessary to undertake additional work other than simply adding a filter to some radio altimeters to meet new standards. However, for simplicity the term radio altimeter 'replacement' is used here.

Interim radio altimeter retrofit questions, including cost implications

Question 13

What are the costs and operational implications to complete an interim retrofit of filters (or make other changes as necessary) to radio altimeters on affected aircraft operated in Australia by 31 March 2025?

(This would be in a similar manner to the US interim retrofit to the performance level of a 'radio altimeter tolerant airplane', as described in the FAA [proposed revised Airworthiness Directive](#).)

Question 14

To support an answer to question 13, what evidence is there to determine the size of the Australian aircraft fleet required to undergo an interim retrofit?

Question 15

What are your views of the costs referenced by the FAA in the proposed revised AD, if they were to be used to estimate costs for an interim retrofit for aircraft in Australia?

Question 16

What are the cost and operational implications for the aviation sector if the interim mitigation period is extended from the proposed 31 March 2025 date?

(Data on a possible yearly extension of the end of interim mitigations is also requested; i.e., separate cost and operational implications also provided for 31 March 2026, 2027, etc – interim mitigation end dates).

Question 17

What are the expected impacts on WBB deployment plans, costs and business cases if interim mitigations cease on 31 March 2025? What are they if the interim mitigations period is extended?

(Data on a possible yearly extension of the end of interim mitigations is also requested; i.e., separate impacts on WBB deployment plans, costs and business cases also provided for 31 March 2026, 2027, etc – interim mitigation end dates).