Geoscience Australia Submission to the ACMA Consultation on the Space Object and RNSS Class Licences

To the Manager,

Geoscience Australia (GA) is pleased to make this submission to the Australian Communications and Media Authority (ACMA) consultation on the proposal to remake the Radiocommunications (Communication with Space Object) Class Object 1998 and to make the Radiocommunications (Radionavigation-Satellite Service) Class Licence 2015.

Geoscience Australia (GA) applies geoscience to Australia's most important challenges by providing geoscience information, services and capability. This submission details GA's functions and responsibilities supporting infrastructure, data and services for Positioning, Navigation and Timing (PNT) in Australia using the Radionavigation-Satellite Service (RNSS).

Yours sincerely,

Dr John Dawson
A/g Branch Head
Geodesy & Seismic Monitoring
Community Safety & Earth Monitoring Division
1. **Introduction**

Geoscience Australia (GA) applies geoscience to Australia's most important challenges by providing geoscience information, services and capability to the Australian Government, industry and stakeholders. GA typically provides its data products and information free to the community as a 'public good' under Creative Commons licences. These products translate directly into:

- a safer community, for example through location awareness;
- more efficient industries, for example through enhanced, quality assured Positioning, Navigation and Timing (PNT);
- more effective and efficient mechanisms for managing the environment, for example through water and land monitoring;
- increased productivity, for example through identification of new mineral and petroleum exploration opportunities and open access to spatial data products.

This submission focusses on GA’s functions and responsibilities for deploying, operating, managing, verifying, and modernising infrastructure, data and services for Positioning, Navigation and Timing (PNT) in Australia using the Radionavigation-Satellite Service (RNSS).

GA’s ability to deliver public good PNT products and services depends on the RNSS licensing framework, meaning the ability of that framework to support GA’s work has implications on GA’s ability to serve the public good. GA recognises that a simpler and more efficient framework for licensing the RNSS in Australia serves to maximise the public good.

PNT is identified in Australia’s Satellite Utilisation Policy (2013) as a ‘space application of national significance’ reflecting the importance of GA’s functions as a national focal point for civilian PNT. GA Chairs the Australian Government PNT Working Group (PNT-WG), leads planning and development of Australia’s National Positioning Infrastructure (NPI) and contributes PNT expertise to the Attorney General Department’s Space Community of Interest (CoI). These and other examples of GA’s leadership and contribution to domestic and international PNT activities are detailed herein.

Terminology from the ACMA Consultation Paper has been adopted for this submission, noting that RNSS is the ITU service name for systems that are commonly known as Global Navigation Satellite Systems (GNSS) or Regional Navigation Satellite Systems (Regional NSS).

GA’s submission¹ (September 2014) to the Department of Communications Spectrum Review also describes the public good contribution of the RNSS in Australia and GA’s role in strengthening the public good.

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2. **Response to the ACMA Consultation Paper**

2.1 Question 1 – Is the proposal to excise the RNSS into a new class licence supported? If so, or if not, why?

| Summary: | GA supports the ACMA proposal to excise the RNSS frequency ranges (1164–1215 MHz, 1215–1260 MHz and 1559–1610 MHz) into a new class licence: the Radiocommunications (Radionavigation-Satellite Service) Class Licence 2015. This proposal is a more efficient and effective approach to licensing reception of the RNSS in Australia reflecting the widespread economic and public safety benefits that RNSS products and services enable across the economy. Simplifying the RNSS legislative framework will reduce red tape whilst maintaining compliance with the Radiocommunications Act 1992 (and future updates to this Act – see response to Question 4), leading to greater protection and clearer rights and restrictions for accessing and using the RNSS in Australia. The benefits to consumers, industry and government of simplifying the RNSS licensing framework are described below. GA's support for this proposal is subject to the questions/issues raised in response to Questions 1, 4 and 5 below. |

2.1.1 **Background**

i. The legal and regulatory provisions informing this submission are listed below:

- ACMA Five-Year Spectrum Outlook 2013 – 2017
- ACMA Five-Year Spectrum Outlook 2014 – 2018
- Australian Radiofrequency Spectrum Plan (2013)
- International Telecommunication Union (ITU), Radio Regulations (Edition of 2012)
- Australian Communications and Media Authority Act 2005 (ACMA Act 2005)
- Radiocommunications (Prohibited Device) (RNSS Jamming Devices) Declaration 2004
- Radiocommunications License Condition (Apparatus License) Determination 2003
- Radiocommunications (Foreign Space Objects) Determination 2000
- Radiocommunications (Foreign Space Objects) Determination 2014
- Radiocommunications (Communication with Space Object) Class License 1998
- Radiocommunications Act 1992 ('the Act')

ii. GA manages the Australian Regional GNSS Network (ARGN) – the geodetic framework for all spatial data in Australia. This network is augmented by the AuScope™ GNSS network established under the National Collaborative Infrastructure Research Strategy (NCRIS) with co-funding from State and Territory land agencies. The ARGN and AuScope networks extend across the South Pacific and Antarctica and comprise over 130 multi-frequency (L1, L2, L5) GPS receivers, fifty percent of which can also track all new GNSS and Regional NSS services. Archived data from ARGN and AuScope are made openly available to the public via the internet. These networks underpin Geoscience Australia’s AUSPOS service – a free online GPS data processing facility.

iii. Reception of all signals in the RNSS is required 24/7 to support positioning in Australia. The ARGN establishes the national coordinate system or ‘datum’ used to align all spatial data from global, regional and local observing systems. The ARGN is the reference standard for Position

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2 AuScope aims to improve understanding on the structure and evolution of the Australian Continent and enable precise positioning applications.

3 Geocentric Datum of Australia 1994 (GDA94).
under the National Measurement Act 1960 in Australia. GA also provides expert witness on cases related to position uncertainty and GPS operational performance using its GNSS networks.

iv. Data from the ARGN and AuScope also contribute to the International GNSS Service (IGS) to support GNSS orbit and clock determination and definition of the Global Geodetic Reference Frame (GGRF\(^4\)). IGS products made are openly available to the global user community as a public good. These data and products are increasingly important as global demand for precise positioning in real-time continues to increase.

v. GA also hosts a multi-constellation QZSS receiver on behalf of the Japanese Government at Mt Stromlo and discussions are underway to host additional receivers on behalf of other GNSS and Regional NSS providers.

vi. The national datum supports positioning activities across the economy and data from AuScope and the ARGN are increasingly integrated into products and services managed by government and industry positioning providers (further detailed in Section 2.1.2). Interference in the RNSS spectrum jeopardises both the development and management of the national datum and access to this datum, including the availability and performance of multi-constellation RNSS products and services that are referenced to this datum.

vii. Substantial investment has been made by the Australian Government to build GA’s new GNSS antenna calibration facility; one of only three in the world and the only facility of its kind in the southern hemisphere. The facility enables highly accurate modelling of antenna biases to support GA’s responsibility for monitoring the horizontal and vertical motion of the Australian landmass, and to ensure the nation’s spatial data framework can support high precision, high integrity applications (e.g. engineering, mining, transport).

viii. GA is leading a work program to enhance Australia’s National Positioning Infrastructure (NPI) by strengthening access to quality assured multi-GNSS infrastructure and information across the country. Drivers for the NPI reflect the growing prevalence of multi-GNSS technology in the Australian economy, as described in Section 2.1.2 below.

2.1.2 Applications and public benefit of satellite navigation systems

i. GA agrees that the current RNSS licensing framework in Australia is a ‘regulatory burden for the ACMA and satellite navigation system operators/owners’\(^5\) given the public benefit derived from the transmission of RNSS signals is so large.

ii. The ACMA proposal to create an RNSS Class Licence that does not require satellites to be apparatus licensed will facilitate multi-constellation RNSS access, adoption, innovation and investment in Australia. Multi-constellation GNSS and Regional NSS devices are already available and contribute to the infrastructure underpinning Australia’s national coordinate framework (managed by GA), and associated equipment and services for mining, surveying, agriculture, transport (road, rail, maritime), engineering, construction, meteorology, finance, communications and geoscience. Tens of millions of ubiquitous consumer devices are used in Australia which integrate multi-constellation RNSS signals. The iPhone 6 for example incorporates GPS (US) and GLONASS (Russia) signals. Modern Qualcomm chips\(^6\), such as those in Samsung devices, also track China’s Beidou system (i.e. GPS + GLONASS + Beidou).

\(^4\) The first geospatial resolution on the Global Geodetic Reference Frame for Sustainable Development (GGRF) was adopted by the United Nations General Assembly on Thursday 26th February 2015. The resolution recognises geodesy is a key infrastructure underpinning social and economic development. The GGRF is fundamental for monitoring changes to the Earth including the continents, ice caps, oceans and the atmosphere. It is fundamental for mapping, navigation and universal timing. [http://www.unggrf.org/](http://www.unggrf.org/)


\(^6\) See [https://www.qualcomm.com/products/izat](https://www.qualcomm.com/products/izat)
a) **Key Message:** Updating the RNSS licensing framework to reflect the current state-of-play is viewed by GA as a whole-of-government opportunity to recognise, protect, champion and grow the public good and commercial activities enabled by the RNSS.

iii. In response to Section 1.2.1 (paragraph 2) of the ACMA Consultation Paper⁷, GA notes that the US GPS has stimulated millions/billions of dollars of commercial investment and enterprise, but the GPS system itself is a public utility provided by the US Government (i.e. the US Government is not a commercial service provider, it funds the provision of navigation signals free of charge to the global user community). This public funding model is also applied by other nations developing similar capabilities (Russia - GLONASS, China - Beidou, Europe - Galileo, Japan - QZSS, India – IRNSS). Some GNSS and Regional NSS providers are also proposing commercial signals/services to augment their public services (see Section 2.5, Question 5 below). This important distinction highlights that billions of dollars have been spent by foreign nations to develop GNSS and Regional NSS capabilities as public utilities, and these public utilities also support and enhance the delivery of government and industry services in Australia.

iv. Australia’s unique geographic location means our visibility to all new constellations is at a global high. Geoscience Australia leads and coordinates PNT activities aimed at enhancing access to these systems to support and promote downstream scientific, commercial and public good benefits. Whole-of-government planning through Geoscience Australia is contributing greater awareness and understanding on the societal and economic returns that derive from protecting the RNSS spectrum resource. Longer-term planning, such as the current proposal by the ACMA, will ensure the RNSS spectrum is protected in ways that maximise Australia’s operational and competitive opportunities and obligations.

b) **Key Message:** Australia is uniquely located geographically to develop, host and benefit from unprecedented expansion in multi-GNSS technologies, meaning reliable and sustainable access to the RNSS is critical.

v. GNSS and Regional NSS signals in the RNSS spectrum are highly sensitive to interference, which was recently demonstrated in the US as part of the ‘Lightsquared’ case⁸. Substantial concerns were raised by government and industry in the US in response to a national terrestrial broadband proposal submitted by the company Lightsquared to the US Federal Communications Commission (FCC). The proposed network was designed to transmit high-powered signals on frequencies adjacent to GPS spectrum. Extensive testing demonstrated that this network would cause unprecedented interference for GPS/GNSS devices and infrastructure across the US, primarily due to the Lightsquared signal drowning out very weak GPS signals. The proposal was ultimately rejected on public interest grounds.

vi. In the context of facilitating access to new and emerging systems, it’s also noteworthy that the US military is expanding its multi-constellation capabilities to ensure continued access, and to thwart potential spoofing.⁹

vii. Geoscience Australia is strengthening engagement with Commonwealth, State and Territory Governments, in cooperation with industry and the research community, to build interoperability, redundancy, integrity, capacity, sustainability, efficiency and transparency in the country’s National Positioning Infrastructure (NPI). Communicating with clarity and certainty requires confidence and understanding on how and why the RNSS spectrum resource is shared and protected for PNT. The ACMA proposal will help to facilitate this clarity and certainty.

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⁷ Section 1.2.1, Paragraph 2: “The main commercial service provider of navigation signals used by earth stations (such as mobile phones and vehicular satnav) has been the Global Positioning System (GPS) of the United States.”

⁸ [http://www.insidegnss.com/node/2689](http://www.insidegnss.com/node/2689)

⁹ [http://www.insidegnss.com/node/3991](http://www.insidegnss.com/node/3991)
viii. Allen Consulting (2008\textsuperscript{10}) estimated that GNSS and Regional NSS have the potential to generate cumulative benefits between $73 billion and $134 billion net present value by 2030 from productivity gains to the agriculture, construction and mining alone. The report also forecast that a more standardised approach to managing and enhancing this national network (for example, through the NPI project), could generate additional cumulative benefits between $32 billion and $58 billion from these three sectors alone. More recently, ACIL Allen (2013\textsuperscript{11}) estimated that real Gross Domestic Product (GDP) in Australia will be between $7.8 billion and 13.7 billion higher than it would otherwise have been in 2020 without precise positioning.

ix. The European GNSS Agency (GSA, 2015\textsuperscript{12}) recently forecast that core revenue (i.e. value directly attributable to GNSS chipsets rather than the full retail cost of devices) by 2023 will be greater than €100 billion in the global GNSS market, representing a compound average growth rate (CAGR) of 7% between from 2013 – 2023. The report analysed eight key market segments (see Figure 1): location-based services (LBS), road transportation, aviation, maritime, rail, agriculture, surveying, and timing & synchronisation. It was estimated that over 4 billion GNSS devices are in use worldwide and this installed base will at least double by 2023 (more than one GNSS device per person on average based on current population projections).

![Figure 1. Percentage breakdown of global cumulative core revenue (GSA\textsuperscript{12}, 2015) across different industry sectors between 2013 – 2023 combined with a list of applications that GNSS enables in each of these sectors in Australia (image compiled by GA).](http://www.crcsi.com.au/assets/Resources/ffa927a7-55d1-400a-b7d6-9234f4fe4ad2.pdf)

\textsuperscript{10} http://www.crcsi.com.au/assets/Resources/ffa927a7-55d1-400a-b7d6-9234f4fe4ad2.pdf
\textsuperscript{12} http://www.gsa.europa.eu/2015-gnss-market-report
x. GA also notes in response to Section 2.1 (paragraph 7) of the ACMA Consultation Paper that GPS and other GNSS/Regional NSS are ‘dual-use’ (civilian/military) systems, meaning some messages are encrypted using proprietary modulation schemes (i.e. unavailable to civilian users). However the modulation schemes used to broadcast open services (e.g. civilian access code) are not encrypted; they are published by system providers in their Interface Control Documents (ICD\(^\text{13}\)). Significant work is undertaken to harmonise modulation schemes towards a common standard internationally.

c) **Key Message:** GA supports the ACMA proposal to make the RNSS Class Licence 2015 which will not require associated RNSS satellites to be apparatus licensed. Support for this proposal is subject to the issues/queries raised in response to Questions 1, 4 and 5 below. GA also notes that only two space objects – GPS and Galileo – are currently identified in the Radiocommunications (Foreign Space Objects) Determination 2014.

2.2 **Question 2** – Is the proposal to remove the mobile-satellite service frequency ranges 1980–2010 MHz and 2170–2200 MHz from the space object class licence supported? If so, or if not, why?

- This question is outside the scope of GA’s response to the ACMA proposal.

2.3 **Question 3** – Are the changes proposed by the ACMA with respect to the operation of mobile ship stations by qualified operators and in accordance with relevant Resolutions of the IMO supported? If so, or if not, why?

- This question is outside the scope of GA’s response to the ACMA proposal.

2.4 **Question 4** – Considering the proposed space object class licence as a whole, are there any issues the ACMA has not considered in its development of the class licence that need to be addressed? If so, please provide further detail of the issue.

**Summary:** With reference to Questions 1 and 5 in this response, GA suggests further consideration be given to the following questions:

a) The Department of Communications is undertaking a review of the Australian Radiocommunications Act 1992. With regard to the RNSS licensing proposal, what are the implications of changes to this Act (i.e. will changes to the Act impact the outcomes of this proposal)?

b) Under the current proposal, and in the absence of a space apparatus licence, how will operators register their interest in using the RNSS spectrum (e.g. non-RNSS operators); to whom will this request be referred (noting current interests are referred to the apparatus licence holder); and who will monitor the RNSS spectrum for potential interference?

c) What consideration is being given to protecting neighbouring bands of the RNSS spectrum?

\(^{13}\) [http://www.gps.gov/technical/icwg/](http://www.gps.gov/technical/icwg/)
i. The Department of Communications is undertaking a Review of Australia’s Spectrum Policy and Management Framework. GA’s submission to this review outlined its dependence on spectrum for delivering PNT and Earth Observation from Space (EOS) products and services. GA notes that the ACMA proposal for a simpler legislative framework for licensing reception of the RNSS will maintain compliance with the Radiocommunications Act 1992 (the Act).

a) In light of the Spectrum Review, will a revision to the Act impact the RNSS licensing proposal that has been put forward by the ACMA? For example, will the RNSS continue to be protected under class licence or the equivalent instrument under a revised Act?

ii. Removing the need to apparatus licence satellites in the RNSS provides greater certainty to service providers and users that reception of signals from all GNSS and Regional NSS included in the Radiocommunications (Foreign Space Objects) Determination 2014 can be received under the proposed Radiocommunications (Radionavigation-Satellite Service) Class Licence 2015. Greater certainty will strengthen government and industry investment in RNSS infrastructure and services, which boosts productivity through greater adoption and innovation of RNSS equipment and services. Under the current licensing framework however (based on GA’s interpretation), proposals to transmit in the GNSS spectrum using non-RNSS devices are referred to the apparatus licence holder (e.g. a proposal to the ACMA to transmit in or nearby the RNSS spectrum will be referred to the licence holder). The ACMA proposal leaves open the question of how or to whom outside interests in the RNSS spectrum will be referred by the ACMA (or whether the ACMA will assume this responsibility in consultation with RNSS stakeholders across government and industry)?

b) GA seeks further clarity on how potential interference in the RNSS spectrum will be detected, monitored, reported and referred moving forward.

iii. Recent discussions were also held in the US between the US Federal Communications Commission (FCC) and the GNSS/PNT community regarding collaboration to protect GPS spectrum, and to use this spectrum as efficiently as possible as demand in adjacent bands increases. Key topics included critical GPS/GNSS applications, including the need to provide accurate location for emergency calls, setting tighter limits on out-of-band emissions affecting GNSS frequencies, and the use of GPS timing in the power grid, financial markets, and for telecommunications, all of which are highly relevant to Australia.

c) What consideration is being given to protecting neighbouring bands of the RNSS spectrum in Australia?

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15 [http://www.insidegnss.com/node/4068](http://www.insidegnss.com/node/4068)
2.5 Question 5 – Is the ACMA’s proposed approach to coexistence in the 1240–1300 MHz band between radionavigation-satellite service and the apparatus licensed use under the AUS101 and AUS1A footnotes appropriate? If so, or if not, why?

Summary: The 1240–1300 MHz band contains the RNSS augmentation signals B3 (Beidou), LEX (QZSS), and E6 (Galileo), each of which will enhance positioning accuracy and performance in Australia, leading to increased productivity. GA supports coexistence in the 1240–1300 MHz band between RNSS and apparatus licensed use under the AUS101 and AUS1A footnotes, noting research and development is underway in Australia to test and validate the performance of augmentation signals, and identify their economic and public safety benefits. Further to Question 4 (see Section 2.4), GA also seeks clarification on the general advisory note in the proposed class licence to better understand what protection is offered by the proposed class licence; how potential issues/interests in the RNSS spectrum are registered with the ACMA; and to whom these issues/interests are referred (i.e. in the absence of an apparatus licence holder)?

i. All new GNSS and Regional NSS providers will offer free and open access to their standard positioning and timing signals. Open access will expand the public utility that civilian users have grown accustomed to using GPS. Emerging services such as Japan’s QZSS, China’s Beidou and the Europe Union’s Galileo will offer additional signals/services that augment standard signals with additional positioning capabilities, including higher data throughput and increased accuracy. It is not yet clear if some or all of these signals will require an access fee.

ii. The opportunity to access these signals as a form of Space-Based Augmentation System (SBAS) in Australia offers substantial benefits in terms of positioning accuracy and performance. For example, Japan’s QZSS-LEX signal offers the capability to deliver data streams that improve the performance of standalone GPS/QZSS signals. Transmitting these signals in a similar portion of L-Band frequency to that of standard GPS/QZSS signals means the same GNSS receiver could be used to obtain both the radio signal and correction data, without needing to integrate a separate antenna device (such as a portable modem or dedicated satellite telecommunications antenna). This method of satellite delivery is also adopted by commercial service providers who integrate this functionality into specific brands of receiver. QZSS-LEX offers the potential to customise the data stream in alignment with international standards for use in any receiver. Testing of QZSS-LEX is currently underway in Australia, as described below, and GA also hosts a QZSS receiver on behalf of the Japanese Government.

iii. A recent collaboration was undertaken between Australia and Japan to test the QZSS-LEX signal for autonomous farming in Australia. The Project was facilitated by the Cooperative Research Centre for Spatial Information (CRCSI) and the Japanese Ministry of Internal Affairs and Communications (MIC). Testing was undertaken on crops at Rice Research Australia near Jerilderie in south-west New South Wales. The new Quasi-Zenith Satellite System (QZSS) was

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16 Note: A radiocommunications device to which this class licence applies will not be afforded protection from the interference caused by other radiocommunications services.


used to transmit positioning signals and augmentation information (e.g. higher accuracy positioning data) to an autonomous tractor imported from Japan.

iv. More broadly, governments, industry and the research communities of Australia are preparing for the transition to a multi-GNSS future. Testing and development is underway to inform future investment towards infrastructure and services that leverage multi-constellation augmentation capabilities. Satellite delivery of augmented positioning information is a key requirement for boosting productivity and safety in industries such as mining and agriculture and the rapidly evolving market for connected and automated modes of transport. Positioning requirements for Cooperative Intelligent Transport Systems (C-ITS) in Australia are also being investigated.19

a) **Key Message:** GA supports coexistence in the 1240–1300 MHz Band between the RNSS and apparatus licensed use under footnotes AUS 101 and AUS1A, whilst noting the significant capabilities and investment that RNSS augmentation signals within this Band will enable in Australia moving forward.

v. In response to the advisory note in the proposed class licence stating that RNSS receivers cannot claim protection from the interference caused by other radiocommunication services, and further to Question 4 above, GA seeks clarification on what protection is offered by the proposed class licence; how potential issues/interests in the RNSS spectrum are registered with the ACMA; and to whom these issues/interests referred (i.e. in the absence of an apparatus licence holder)? The definition of radiocommunication under the Act is provided below for reference:

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6 **Definition of radiocommunication**

(1) For the purposes of this Act, *radiocommunication* is:

(a) radio emission; or

(b) reception of radio emission;

for the purpose of communicating information between persons and persons, persons and things or things and things.

(2) The reference in subsection (1) to communicating information includes communicating information between a part of a thing and:

(a) another part of the same thing; or

(b) the same part of that thing;

(as, for example, in the operation of a radar device).

Note: Division 3 of Part 1.4 has the effect of extending the concept of radiocommunication in certain circumstances.

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Radiocommunications Act 1992 Part 1.3 (Section 6) – Definition of Radiocommunication.

2.6 Question 6 – Can operators of the 5010–5030 MHz band please provide further detail on the characteristics, purpose and expected service introduction of operations in this band?

- This question is outside the scope of GA’s response to the ACMA proposal.

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