



Spectrum Management and Telecommunications

# Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band

**NOTE 1:** A change has been made to paragraph 44 of the document. The word “only” was moved in the last sentence. (June 18, 2018)

**NOTE 2:** A change has been made to paragraph 58 to replace the reference to section 6.9 with a reference to section 6.10. (June 18, 2018)

**NOTE 3:** Annex A has been updated. (June 18, 2018)

**NOTE 4:** A change has been made to paragraph 80. The word “uplink” has been changed to “downlink”. (July 12, 2018)

**NOTE 5:** For additional clarity, changes have been made to paragraph 65 and question 11. The phrase “Tier 4 service areas that include a population centre of 30,000 people or more” has been changed to “Tier 4 service areas in which the largest population centre is of 30,000 people or more.” In addition, the phrase “Tier 4 service areas that include a population centre of less than 30,000 people” has been changed to “Tier 4 service areas in which the largest population centre is of less than 30,000 people.” (July 26, 2018)

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## 1. Intent

1. Through the release of this document, Innovation, Science and Economic Development Canada (ISED), on behalf of the Minister, is initiating a consultation on revisions to the 3450–3650 MHz band (referred to as the 3500 MHz band) to accommodate flexible use for fixed and mobile services. The consultation also seeks preliminary comments on the potential changes to the 3400–3450 MHz band and the 3650–4200 MHz band (referred to as the 3800 MHz band).

## 2. Legislative mandate

2. The Minister of Innovation, Science and Economic Development, through the [Department of Industry Act](#), the [Radiocommunication Act](#) and the [Radiocommunication Regulations](#), with due regard to the objectives of the [Telecommunications Act](#), is responsible for spectrum management in Canada. As such, the Minister is responsible for developing national goals and policies for spectrum utilization and for ensuring effective management of the radio frequency spectrum resource.

## 3. Policy objectives

3. Canadians want high-quality services, ubiquitous coverage and affordable prices from their telecommunications service providers. Canadians rely on wireless telecommunications services to access a variety of applications, multi-media services, social networking and Internet browsing; to do business and connect with others; and to manage finances, health and homes.

4. ISED is committed to ensuring that Canadian consumers, businesses and public institutions continue to benefit from the latest wireless telecommunications services across the country. A robust wireless telecommunications industry drives the adoption and use of digital technologies and enhances the productivity of the Canadian economy.

5. Spectrum is a critical resource for wireless carriers. Additional spectrum for flexible use will enable providers to increase network capacity to meet the traffic demands of higher usage rates, and support the provision of next-generation wireless technologies. The development and deployment of 5<sup>th</sup> generation (5G) technologies is essential to Canada becoming a global centre for innovation, and will bring Canada to the forefront of digital development and adoption through the creation and strengthening of a world-leading wireless infrastructure.

6. Beyond initial improvements to the speed and capacity of mobile broadband networks and services, 5G technologies are expected to transform services across all sectors of the economy including manufacturing, healthcare and transport. Testing and demonstrations of different use cases are taking place domestically and internationally; however, it is unclear at this time which business cases will drive

ongoing investment in 5G networks, which services and applications will deliver the greatest benefits to Canadians, and when such applications will be ready for market.

7. Spectrum releases in Canada are designed to align with international market developments and the continual evolution of wireless technologies around the world. By ensuring that the spectrum being made available reflects global trends, emerging 5G standards and the equipment ecosystem that is expected to materialize in the coming years, Canada positions itself to benefit from the next generation of smartphones and other advanced wireless devices. Canadian consumers benefit from the economies of scale that come when manufacturers produce equipment for many markets. In addition, specific Canadian circumstances must be taken into account, which, in this case, include the reliance of some Canadians on fixed wireless access using the 3500 MHz band for broadband connectivity, and the competitive dynamics of the market for commercial mobile services.

8. For example, given Canada's geography and widely dispersed population, it can be difficult to make a business case for the deployment of new innovative services in some rural and remote areas of the country. Consequently, some rural areas may continue to rely on fixed wireless access in the 3500 MHz band over a longer period of time than urban areas. As such, and in accordance with one of the objectives of the *Telecommunications Act*—to promote the availability of reliable and affordable services to all regions of Canada—ISED continues to consider options for promoting access in rural areas within the context of managing this spectrum resource, and within a broader policy context, noting that challenges may vary based on geography, population density and the state of the marketplace.

9. In developing this consultation paper, the Minister has been guided by the policy objectives stated in the [Telecommunications Act](#), and the policy objective of the [Spectrum Policy Framework for Canada](#) (SPFC), to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource. These objectives and the enabling guidelines listed in the [SPFC](#), will continue to guide the Minister in managing the spectrum resource.

10. Through Canada's [Innovation and Skills Plan](#) and its focus on people, technologies and companies, the Government of Canada is committed to promoting innovation-led growth across all sectors of the Canadian economy. Today's economy is digital. Decisions made arising from this consultation will support the [Innovation and Skills Plan](#) priorities and the SPFC policy objective by positioning Canada at the leading edge of the digital economy through the enabling of flexible use of the 3500 MHz band to support 5G technologies. Consequently, ISED's policy objectives for the 3500 MHz band are to:

- foster innovation, investment and the evolution of wireless networks by enabling the development and adoption of 5G technologies
- support sustained competition, so that consumers and businesses benefit from greater choice
- facilitate the deployment and timely availability of services across the country, including rural areas

#### 4. Background and context

11. The [Commercial Mobile Spectrum Outlook](#) published in March 2013 signalled the likely repurposing and release of 100 to 175 MHz of spectrum for commercial mobile services in the 3500 MHz band by 2017. In 2014, ISED released DGSO-007-14, [Decisions Regarding Policy Changes in the 3500 MHz Band \(3475–3650 MHz\) and a New Licensing Process](#) (referred to as the 2014 Decision), which included a decision to implement a fundamental reallocation of the 3475–3650 MHz band to allow mobile services in addition to existing fixed services. The 2014 Decision also stated that flexible use in this band would be implemented after further consultation on a flexible use band plan and licensing framework. The 2014 Decision determined that the future licensing framework should permit existing licensees that are in compliance with existing conditions of licence to continue to provide fixed wireless access services. However, until recently, there was uncertainty regarding the future use of this band internationally.

12. In October 2017, ISED released the [Consultation on the Spectrum Outlook 2018 to 2022](#) (the Outlook Consultation), which notes that, internationally, the 3500 MHz band is currently being considered as one of the key bands for future 5G technologies and that there have been developments in making the larger 3400-4200 MHz band available for flexible use. Initial comments from the Outlook Consultation indicate support for a review of the 3400–4200 MHz band. Responses also indicate that the 3500 MHz band is considered a priority and that there is significant interest in the release of this mid-band spectrum to enable 5G deployments. Some concerns regarding continued access to the band and protection of existing services were expressed by fixed satellite service (FSS) providers and small wireless Internet service providers (WISPs).

13. Comments received on the Outlook Consultation supported releasing low, medium and high band spectrum to enable the development and adoption of 5G technologies. Frequencies possess different propagation characteristics and can be developed to offer applications and services that make use of these different characteristics and benefits. In June 2017, ISED published the [Consultation on Releasing Millimetre Wave Spectrum to Support 5G](#), taking the first step in making this high-band spectrum, optimal for low-latency and high-bandwidth use, available for 5G services in the future. Further, in March 2018, ISED published the [Technical, Policy and Licensing Framework for Spectrum in the 600 MHz Band](#) to support increased network capacity and the deployment of next-generation technologies. ISED considers that this approach of planning the release of spectrum in low, medium and high frequency bands will be beneficial to the deployment of 5G technologies offering higher speeds, low-latency and improved capacity and coverage.

14. Taking into account these developments, ISED is hereby consulting on additional changes to the 3500 MHz band to accommodate flexible use, as well as potential changes to the 3800 MHz band in the future.

15. This consultation examines the frequency range of 3400–3650 MHz in section 6, and the 3800 MHz band (3650–4200 MHz) in section 7.

## 5. International situation and ecosystem development in the 3500 MHz and 3800 MHz bands

16. *International context:* Portions of the band ranging from 3400 to 3800 MHz are either available or being made available for commercial mobile or flexible use in several countries, including the United States, the United Kingdom, Ireland, Japan, China, Singapore and Australia. As the 3500 MHz band is viewed as key spectrum to support 5G technologies, many countries have begun work to make this spectrum available for this purpose. In most cases, a licensing process is the first step in advancing the development and deployment of new technologies. Subsequent network deployment can occur a few years after the licences have been issued, with consumers making use of the network and services only once devices and handsets have been fully developed. For this reason, ISED is closely monitoring international developments in this band in order to competitively position Canada for 5G services.

17. In 2015, the Federal Communications Commission (FCC) in the United States made the 3550–3700 MHz band (150 MHz) available for flexible use on a shared basis through a database-supported authorization system, known as the Citizen Broadband Radio Service (CBRS). Specifically, the FCC created a three-tiered framework to coordinate shared use of the band. According to this framework, incumbents, including U.S. radar systems and fixed satellite service earth stations, will comprise the first tier and receive protection from all other users, followed by priority access licences (PAL), the second tier, and general authorized access (GAA), the third tier. PALs will receive protection from GAA operations whereas GAA users must accept interference from all other users. Automated frequency coordinators, known as Spectrum Access Systems (SASs), will coordinate operations between and among users in different access tiers. The FCC will auction up to 70 MHz of spectrum for PALs for commercial mobile use for 3-year terms with limited options for renewal. In August 2017, the Notice of Inquiry titled [Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz](#) indicated that the FCC was exploring the opportunity to expand the CBRS up to 4200 MHz. In October 2017, the FCC launched a [consultation](#) on potential changes to the licensing rules in this band to support 5G deployments, as the framework was initially developed before it was apparent that the 3500 MHz band would play a significant role as one of the key mid-range bands for 5G network deployments throughout the world. The FCC is consulting on increasing the length of licence terms for PALs from the initial proposal of three years to ten years, including an expectation of renewal, larger geographic licence areas, and auction methodology. An FCC decision on the changes is expected in 2018.

18. In November 2016, the European Commission’s Radio Spectrum Policy Group (RSPG) provided an [opinion](#) on spectrum-related aspects for next-generation (5G) wireless systems. The opinion stated that the RSPG considers the 3400–3800 MHz band as the primary suitable band for the introduction of 5G technologies in Europe, in part because the band is already harmonized for mobile use in Europe and because it consists of up to 400 MHz of contiguous spectrum, enabling wide channel bandwidth. The

European coordinating body for communications, the European Conference of Postal and Telecommunications Administrations (CEPT), has published and continues to update [Europe's 5G roadmap](#), which outlines the main targets to be addressed regarding harmonisation of spectrum for 5G technologies.

19. Several European countries have recently released or announced a plan to release portions of the 3500 MHz band. Ofcom completed a spectrum auction for 150 MHz (3410–3480 MHz and 3500–3580 MHz) and published the [results](#) in April 2018. Ofcom also published its [Statement and Consultation](#) to make additional spectrum available in the 3600–3800 MHz band for 5G technologies. Contrary to Canada, the United Kingdom has very few incumbents in the band. In February 2018, Ofcom [announced](#) it would auction the 3600–3800 MHz band for mobile use in 2019, and that it would revoke all fixed link licences in the 3600–3800 MHz band in 2022 as well as stop protecting earth station licensees from interference in 2020. These changes would allow mobile services in the 3600–3800 MHz band to be deployed in many areas in 2020, but not necessarily across the United Kingdom until 2022.

20. The German regulator, Federal Network Agency (BNetzA), published a [framework](#) for 5G spectrum in June 2017 that included auctioning the 3400–3700 MHz band for 5G technologies, [planned](#) for 2019, though current licences in the band do not expire until December 2021 and 2022 and therefore will not be available for 5G technologies until then. The French regulator, Autorité de régulation des communications électroniques et des postes (Arcep), launched a consultation in July 2017 regarding the release of 300 MHz of contiguous spectrum in the 3400–3800 MHz band for 5G technologies by 2020.

21. The 3500 MHz band is also being released in Asia. In 2014, Japan awarded 120 MHz of spectrum in the 3400–3600 MHz band to 3 major operators for mobile deployment. Japan's 5G consultation launched in July 2017 included the 3600–4200 MHz band. South Korea will auction the 3500 MHz band in June 2018. China has reserved the 3300–3600 MHz band for 5G services, with each of its 3 wireless providers gaining access to 100 MHz of spectrum in the band.

22. Australia is planning to auction 125 MHz of spectrum in the 3575–3700 MHz band in October 2018. From March 2018, incumbent users of the band, including fixed satellite service earth stations, point-to-point links, and site-based wireless broadband services, will have two years to vacate the band in most major cities, five years in Perth to allow additional time for current satellite users, and seven years in regional areas of Australia.

23. **Equipment ecosystem development:** The 3<sup>rd</sup> Generation Partnership Project (3GPP) has completed specifications for three Long-Term Evolution (LTE) bands that cover the 3400–3800 MHz band to operate with time-division duplex (TDD) technologies. LTE bands 42 and 43 cover the 3400–3600 MHz and 3600–3800 MHz bands, respectively. LTE band 48 covers the U.S. 3550–3700 MHz band. Fixed LTE equipment has existed for significant periods of time for bands 42 and 43. LTE fixed and mobile equipment is being developed for band 48.

24. In addition, 3GPP has identified the 3300–4200 MHz band for its 5G New Radio (NR) standards. Specifications were developed in late 2017 for two TDD NR bands: band n77 (3300–4200 MHz) and band n78 (3300–3800 MHz).<sup>1</sup> It is expected that equipment for 5G operations based on these specifications, requiring an LTE anchor network, will become available as early as 2019. Broad deployment of 5G operations, including of flagship mobile products for consumer use, will not take place until 2020 and beyond. Specifications for standalone NR 5G operations, not requiring an LTE anchor network, are expected to be included in the standards later in 2018, when the specifications for 3GPP’s Release 15 are finalized. The focus of Release 15 has been on achieving much higher data rates, improved connectivity and higher system capacity compared to existing 4G networks.

25. Specifications for additional advanced 5G features, such as ultra-reliable low latency communication, massive machine-to-machine communication and network slicing, are expected to be completed when Release 16 specifications are finalized in late 2019. These advanced 5G features will be used by industries in vertical markets including manufacturing, healthcare, public safety and transport. Availability of equipment using 5G features for these vertical markets is demand driven and will be determined in part by the business cases and investment plans that are still maturing. Therefore, the timelines for the availability of equipment using these advanced 5G features are unknown at this time.

**Q1 – ISED is seeking comments on its assessment of the timelines identified for the development of an equipment ecosystem for 5G technologies in the 3500 MHz and 3800 MHz bands, and whether the timelines will be the same in both bands.**

## **6. The 3500 MHz band**

### **6.1 Current allocation and utilization of spectrum in Canada in the 3500 MHz band**

26. In Canada, the 3100–3500 MHz band is allocated to radiolocation on a primary basis; however, radiolocation is not used in the 3475–3500 MHz portion of the band. Radiolocation use in the 3300–3450 MHz band is limited to government use. The 3400–3475 MHz portion of the band is reserved for aeronautical and maritime radars, but currently has limited use.

27. The 3475–3650 MHz band is currently allocated to fixed and mobile services on a co-primary basis (radiolocation and fixed-satellite services are other co-primary services in separate parts of the band) and is being used for fixed wireless access systems as flexible-use licences have not yet been issued.

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<sup>1</sup> The choice of two NR bands was based on global coverage of frequency ranges, proposals in 3GPP, design implications and analysis. Equipment for a wider band is more complex and likely more expensive.



**Figure 1: Current spectrum utilization, 3400–3650 MHz**



## 6.2 Current licensees in the 3500 MHz band

28. Currently, the 3475–3650 MHz band is primarily used to provide fixed wireless Internet services, often in rural and remote communities. Most of the licences were issued for 10-year terms, through auction processes between 2004 and 2009, and were geographically defined using [Tier 4 service areas](#). Through 3 separate auctions, 674 licences were issued to 17 licensees, with the first set of licences having expired in 2014. As part of the 2014 Decision, upon expiry of auctioned licences, ISED allowed licensees to apply for new licences with 1-year terms, provided that all their conditions of licence had been met. The majority of the auctioned licences have already passed their initial 10-year licence term, and eligible licensees have applied annually and received new 1-year licences. There are a small number of auctioned licences that are still within their initial licence term and will expire in 2019. See annex A for a list of current spectrum licensees.

29. Where deployment conditions were only partially met, the 2014 Decision allowed licensees to apply for grid cell based licences. These licences encompassed their existing coverage area, allowing licensees to continue to offer services in those areas. The spectrum that was not renewed (i.e. the spectrum holdings reverted to ISED due to non-compliance) in rural areas was made available on a first-come, first-served basis for 1-year licence terms, with a high expectation of renewal. A total of 10 licensees have been issued 26 licences through this process since 2014.

30. Prior to 2004, ISED licensed spectrum for fixed wireless access systems on a first-come, first-served basis in rural areas of Canada. These licences are limited to the specific grid cells required for the coverage area. There are 12 licensees and a total of 34 licences that are still authorized from this licensing process. A list of all licences acquired through a first-come, first-served process can be found in annex B.

## 6.3 Further changes to the allocations in the 3500 MHz band

31. The 2014 Decision indicated that flexible use would apply to 175 MHz of spectrum within the 3475–3650 MHz band. ISED is of the view that the amount of flexible use spectrum could be expanded

by 25 MHz, allowing for 200 MHz of flexible use spectrum, by also changing the allocation in the 3450–3475 MHz band that is currently used for radiolocation and fixed services.

32. Based on current use of the band and as confirmed by existing government users, ISED is of the view that removing the priority for radiolocation use in the 3450–3475 MHz band will not negatively impact the operation of government radiolocation systems or the existing fixed point-to-point use. As such, in order to increase the amount of spectrum available for flexible use in the 3500 MHz band, ISED proposes to reallocate the 25 MHz of spectrum in the 3450-3475 MHz band from the radiolocation service to the mobile service. This will enable flexible use across the entire 3450–3650 MHz band in Canada.

33. The 3475–3500 MHz band is currently allocated for radiolocation service. Given the stated policy objectives for the 3500 MHz band, and that there are no current radiolocation users in this portion of the band, ISED is proposing the removal of this radiolocation allocation.

34. ISED proposes to further modify the Canadian Table of Frequency Allocations to add a primary mobile allocation to the 3450–3475 MHz band and remove the radiolocation allocation in the 3450–3475 MHz band. In addition, ISED proposes to suppress Footnote C15 in the Canadian Table of Frequency Allocations. Changes would be as follows:

3 450 - 3 475	FIXED MOBILE RADIOLOCATION 5.433 Amateur C15
3 475 - 3 500	FIXED MOBILE RADIOLOCATION 5.433 Amateur C15

**SUP**

**C15 (CAN-14)** In certain locations in Canada the radiolocation service has priority over the fixed service in the 3450-3500 MHz band, and over the mobile service in the 3475-3500 MHz band. ISED will identify through spectrum policy the general area of radiolocation system operation.

**Q2 – ISED is seeking comments on the proposals for:**

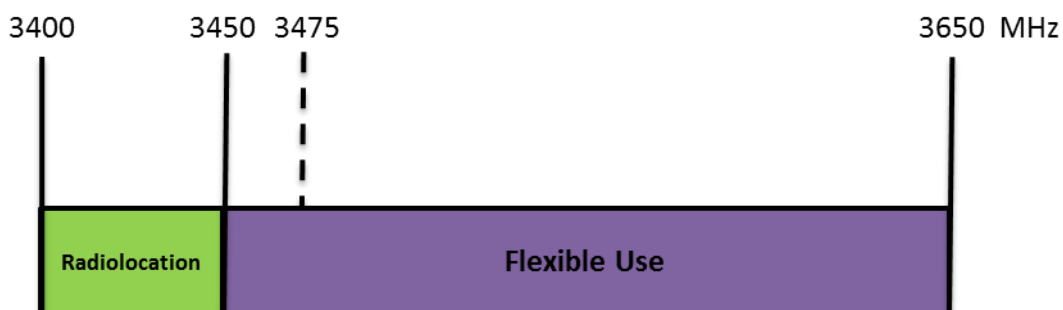
- adding a primary mobile allocation to the 3450–3475 MHz band
- removing the radiolocation allocation in the 3450–3500 MHz band
- making the corresponding changes to the Canadian Table of Frequency Allocations

#### 6.4 Flexible use in the 3500 MHz band

35. The 2014 Decision to reallocate the 3500 MHz band to allow mobile use and to adopt a flexible use policy throughout the 3475-3650 MHz band stated that mobile services would only be allowed once the technical and licensing frameworks for the new band plan are developed. It also specified that all fixed wireless access systems within the 3500 MHz band would be subject to a transition to a new band plan and modified technical rules. Pending the development of a new band plan and associated rules to allow flexible use, licensees have been limited to the provision of fixed services.

36. The 3500 MHz band provides opportunities to promote innovation and early adoption of 5G technologies while maintaining current uses through the adoption of a flexible use licensing model. Flexible use licensing would enable licensees to better target their services to the needs of their customers. This approach is intended to enable new technology and innovations to evolve, while supporting a variety of different needs and use cases. It will enable the continuation of existing services and support the growing demand for new services, such as 5G services. As such, in addition to the reallocation discussed in section 6.3, ISED is proposing to also allow flexible use in the 3450–3475 MHz band.

**Figure 2: Proposed spectrum utilization, 3450–3650 MHz**



**Q3 – ISED is seeking comments on the proposal to allow flexible use in the 3450–3475 MHz band.**

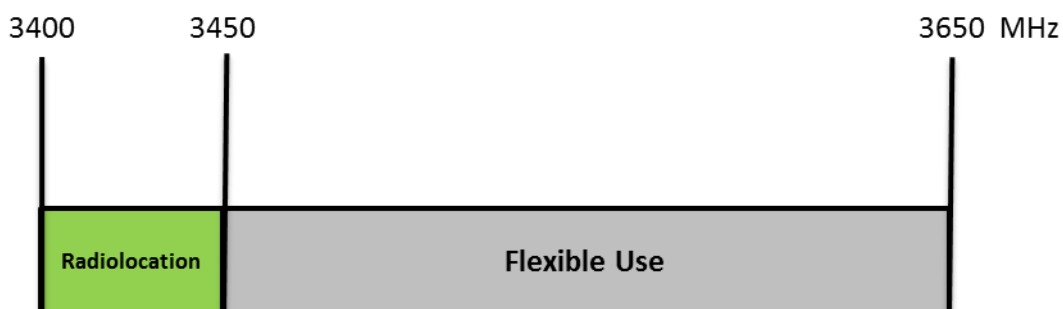
#### 6.5 Coexistence of radiolocation and other services in the 3400–3450 MHz band

37. As stated in the Outlook Consultation, ISED is making use of the current consultation to review the use of the entire 3400–4200 MHz frequency range.

38. As demand for spectrum increases, traditional services are competing with new services to use the same spectrum. Depending on the extent to which the spectrum is already being used, it may not

always be possible to completely repurpose spectrum for new uses. ISED recognizes that there are new technologies and techniques (e.g. cognitive radio, dynamic spectrum access) being developed that will change the way spectrum is accessed through intelligent decision-making solutions and geographic/operational awareness of the radio environment. These technologies and techniques will provide new opportunities for optimizing the use of spectrum and promise to make it increasingly feasible to share spectrum in real time between multiple different services. Recognizing that these new sharing paradigms are still in the early stages of development, ISED is monitoring progress and exploring ways to implement provisions that would enable such opportunities in the future. ISED will also continue to examine new approaches to spectrum licensing in order to enable and support the development, adoption, and use of new and future wireless technologies and applications.

**Figure 3: Proposed spectrum utilization, 3400–3450 MHz**



39. As sharing technologies continue to evolve, ISED is exploring other mechanisms for optimizing spectrum use in the 3400–3450 MHz band. Many countries are including this band in their examination of spectrum use and equipment is being developed to support this frequency range. ISED is of the view that radiolocation, given its intermittent use, may allow for sharing with low powered services. Given the objective to protect existing radiolocation services, ISED is seeking comments regarding interest in the co-existence of services in this band and options for sharing spectrum between radiolocation and other services.

**Q4 – ISED is seeking comments regarding interest in sharing spectrum between radiolocation and other services in the 3400–3450 MHz band, and options for doing so.**

### **6.6 Provisions to allow existing licensees to continue services in the 3500 MHz band**

40. As mentioned in section 6.1, the 3475–3650 MHz band is primarily being used to provide fixed wireless Internet through fixed wireless access systems. The results of recent international spectrum auctions and stakeholder feedback on ISED’s Outlook Consultation suggest that the value of the 3500 MHz band has increased significantly with the introduction of the mobile allocation and the expectation of it being a key band for the deployment of 5G services. To support competition and

innovation, ISED is seeking to provide an opportunity for additional licensees to deploy 5G services in the band, thus requiring current licensees to return a portion of their spectrum holdings.

41. In accordance with the 2014 Decision, ISED will develop a flexible use policy framework to accommodate both current and future users. ISED is proposing options that will allow incumbents to continue providing wireless services, that will provide additional stakeholders with an opportunity to acquire flexible use spectrum, and that will realign the band plan to facilitate the use of the spectrum for 5G technologies.

42. In order to address the requirements of the various stakeholders, ISED is considering different approaches for determining the amount of spectrum that will continue to be licensed to incumbents and the conditions of these authorizations.

43. ISED notes that incumbent licensees will be required to reduce their spectrum holdings and transition to different frequencies in the new band plan. ISED is of the view that, with improved deployment efficiencies and new technologies, licensees should be able to continue to maintain current service offerings with a reduced amount of spectrum. Many incumbent licensees have been building their fixed wireless networks for over 10 years, since the initial auction process took place in 2004. Under either of the options proposed below, current licensees would be able to continue to provide fixed wireless services with their remaining holdings and, in some cases, to expand their existing networks or take advantage of fixed 5G technologies to improve their services at any time.

44. To be licensed for flexible use, incumbent licensees in this band will be required to apply to ISED for a new flexible use spectrum licence. At that time, ISED will issue a new flexible use spectrum licence and will cancel the fixed use spectrum licences. Incumbents will only be permitted to offer mobile services once their flexible use licence is issued.

45. ISED is considering two options for establishing the amount of spectrum that will be licensed to the incumbents. ISED considers that both options will allow incumbent licensees to continue providing fixed services, while ensuring that sufficient spectrum will be available for new 5G services. ISED is also seeking alternative proposals that would meet ISED's policy objectives as stated in section 3.

46. Calculations will be based on the spectrum holdings as of the date of this publication. Any subsequent licence transfers or divisions of a licence by area and/or frequency will not alter the total amount of spectrum available to incumbents for flexible use. In the event of a transfer, the calculation will also take into consideration the revised amount of spectrum that will continue to be licensed to incumbents, based on the decisions made as a result of this consultation.

**Option 1 – For each licence area, existing licensees would be issued flexible use licences for one third of their current spectrum holdings rounded to the nearest 10 MHz, with a minimum of 20 MHz.**

47. This option generally provides more spectrum to those with larger holdings. The minimum amount that a current licensee could be issued in the relevant licence area would be 20 MHz. ISED considers this to be sufficient for small service providers in rural areas to maintain service offerings, recognizing that changes to the networks may be required including equipment upgrades. This option would provide comparable amounts of spectrum in each licensing service area, generally between 120 and 140 MHz, for a future licensing process.

**Option 2 – For each licence area, existing licensees would be issued flexible use licences for a fixed amount of spectrum. Any licensee that holds 50 MHz of spectrum or more would be licensed for 50 MHz, and all other licensees would be licensed for 20 MHz.**

48. ISED considers that this option also provides both larger and smaller entities with sufficient spectrum to continue to provide current services. In most cases, licensees that hold small amounts of spectrum would retain a greater portion of their spectrum whereas those holding significant amounts of spectrum would see the largest percentage reduction in their holdings. This option would provide more uniform amounts of spectrum across the country for incumbents, but would leave a lesser amount of spectrum available for a competitive licensing process in many licensing areas where there are multiple licensees. Spectrum available for a future licensing process would range from 50 to 150 MHz in each service area.

**Q5 – ISED is seeking comments on the expected impacts of the following options with regards to the continuation of existing services, competition in the Canadian marketplace and availability of new 5G services for Canadians.**

**Option 1 – For each licence area, existing licensees would be issued flexible use licences for one third of their current spectrum holdings rounded to the nearest 10 MHz, with a minimum of 20 MHz.**

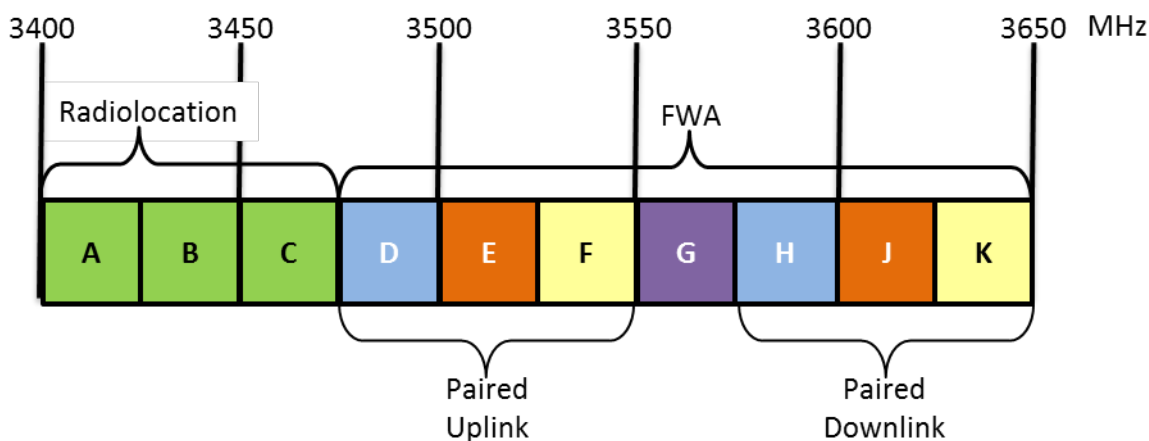
**Option 2 – For each licence area, existing licensees would be issued flexible use licences for a fixed amount of spectrum. Any licensee that holds 50 MHz of spectrum or more would be licensed for 50 MHz, and all other licensees would be licensed for 20 MHz.**

**Q6 – ISED is seeking comments on alternative options for licensees to return spectrum to the Department to make available for a future licensing process. Respondents are asked to provide a rationale for any alternative proposals, including how they would meet ISED's policy objectives as stated in section 3.**

## 6.7 Changes to the 3500 MHz band plan and interference mitigation

49. **Changes to the band plan:** As illustrated in figure 4, the current Canadian band plan in the 3475–3650 MHz band consists of three paired frequency blocks and one unpaired block. This band plan was designed in anticipation of the predominant use of equipment supporting frequency division duplexing (FDD) technologies. Currently, most of the equipment deployed in this band uses TDD (time-division duplex) technology.

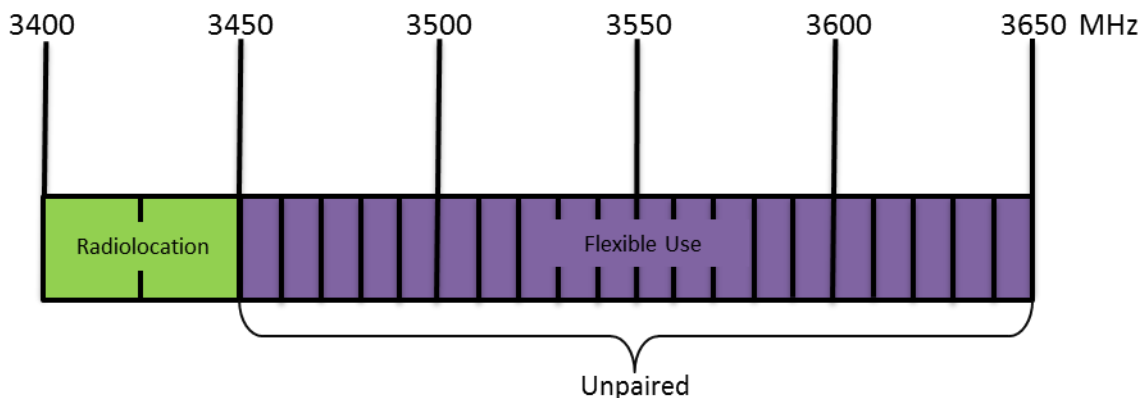
**Figure 4: Current 3500 MHz band plan**



50. Today, all 4G equipment available for the 3450–3650 MHz band is based on TDD technology. Recent developments in 3GPP in regard to 5G mobile equipment standards indicate that the future equipment ecosystem will also use TDD technology. For these reasons, ISED is proposing a band plan based on unpaired blocks.

51. **Block size:** ISED is proposing to implement a band plan composed of 20 unpaired blocks of 10 MHz, which provides a channel spacing size supported by both LTE and 5G NR. Given the options discussed in section 6.5 for determining the amount of spectrum effectively retained by incumbent licensees, the proposed band plan of unpaired blocks would facilitate the issuance of new licences to both incumbent and new licensees. The adoption of the proposed band plan does not preclude ISED from licensing blocks as aggregated packages of multiple 10 MHz blocks to facilitate large bandwidth channels for 5G technologies.

**Figure 5: Proposed 3500 MHz band plan**



52. **Interference mitigation:** In the case where two or more TDD systems operate in the same or adjacent frequency blocks and in close geographic proximity, there exists a potential for mutual inter-system interference. This can be mitigated by measures such as TDD synchronization or the implementation of a guard band between operating frequencies.

**Q7 – ISED is seeking comments on a revised band plan using unpaired blocks of 10 MHz in the frequency range of 3450–3650 MHz.**

**Q8 – ISED is seeking comments on whether any additional measures should be taken to limit potential interference issues with the proposed TDD band plan.**

### 6.8 Timing for the introduction of mobile services in the 3500 MHz band

53. ISED recognizes that the 3500 MHz band is one of the key bands for 5G networks in many countries. It is expected that this band will be one of the first bands where 5G technologies will be launched in Canada. ISED intends to continue to support competition in the wireless market for the benefit of Canadian consumers across the country. As such, ISED is considering when to allow incumbents to use 3500 MHz spectrum for mobile services.

54. ISED recognizes that industry is aiming to make 5G mobile equipment available in the 2019–2020 timeframe, as mentioned in section 5. ISED is also considering the timing of other spectrum releases, including the 600 MHz and millimeter wave bands, and the impact that the timing of mobile deployments in the 3500 MHz band will have on the competitive landscape of the wireless industry.

55. Since taking steps to introduce new competitors to the wireless market in 2008, ISED has continued to make significant efforts to sustain and strengthen competition in the Canadian wireless



market. National and regional service providers have made substantial investments to deploy and expand wireless networks in many markets across Canada and to provide wireless services to Canadians.

56. Many licensees have already deployed LTE systems in the 3500 MHz band and, if authorized, could make use of the mobile functionality of their existing equipment. If ISED were to issue flexible use licences to incumbents in advance of a future licensing process, incumbents would have a significant competitive advantage as they would have the opportunity to deploy mobile services sooner than their future competitors in the 3500 MHz band.

57. In accordance with its objective of supporting sustained competition, ISED is proposing that the issuance of all flexible use licences, to both incumbents and new licensees of the 3500 MHz band, be issued at the same time. This will allow each licensee to enter the market at the same time, creating the conditions to maximize competition to the benefit of Canadians. To this end, ISED is seeking comments on the competitive and technological implications of this proposal.

58. Where incumbent licensees do not intend to provide mobile services, they could continue to be issued annual fixed use licences until they are required to transition as per the transition plan (see section 6.10 for the proposed transition plan).

**Q9 – ISED is seeking comments on the proposal to align the timing of the issuance of flexible use licences to incumbents with the issuance of licences to those who acquire 3500 MHz flexible use licences in a future licensing process.**

## **6.9 Future licensing process in the 3500 MHz band**

59. Following the publication of a decision on issues raised in this consultation, a new consultation will be launched on a technical, policy and licensing framework for flexible use licences in the 3500 MHz band. As demand is expected to exceed supply, an auction is likely to be selected as the optimal licensing process.

60. The consultation on a technical, policy and licensing framework will address the conditions of licence for the new flexible use licences, including the licence term, competitive measures, transferability and divisibility, and deployment conditions.

61. As part of the Outlook Consultation, ISED received general comments on different licensing approaches and auction formats. ISED recognizes that there are a number of options to consider when selecting the format for a spectrum auction, each with its own set of advantages and disadvantages. To better understand the priorities of stakeholders with regards to auction format and timing, ISED is seeking comments on the importance of price discovery in a future licensing process, noting that an

auction format with such capabilities requires additional software development, which requires more time to implement and would result in a later auction start date.

**Q10 – ISED is seeking preliminary comments on the importance of price discovery in a licensing process for flexible use licences in the 3500 MHz band.**

#### **6.10 Transition plan for incumbents of the 3500 MHz band**

62. **Transition plan objective:** The transition plan for the 3500 MHz band seeks to address two objectives: i) providing timely access to flexible use spectrum in order to facilitate the introduction of 5G technologies for Canadians, and ii) accommodating the continued provision of existing fixed wireless broadband services to Canadians who rely on them. ISED is of the view that 5G mobile services will first be deployed in large urban population centres. Until mobile services progressively expand outside large urban population centres, rural users may continue to rely on fixed broadband services. As such, ISED is seeking to adopt a transition plan that will allow for the timely deployment of mobile services in urban areas while providing rural providers of fixed services with more time to transition to the new flexible use system. ISED believes that the proposal in this section could accommodate urban and rural users, and is seeking comments on the timelines and any alternative proposals.

63. **Transition plan principle:** Similar to the transition plans for other bands, ISED proposes that the transition policy be based on a “where and when necessary” principle. The proposed transition policy would allow incumbent licensees to continue operating where such operations do not prevent deployment by new licensees.

64. ISED recognizes that new licensees will be planning to launch mobile services in a timely manner. ISED also notes that some incumbents, in particular smaller operators in rural and remote areas, may face challenges with transitioning to their allotted spectrum within the new band plan. In an effort to address the needs of the rural incumbents and the needs of the new and existing licensees wanting to deploy 5G services, ISED is considering timelines that provide for expedited transition in urban areas and longer transition in rural areas; the proposed transition would minimize the potential disruption of existing services and allow additional time for rural licensees to plan their move to new frequencies. The proposed transition plan would include a minimum protection period and a minimum notification period, and would apply to licensees holding both tier and grid cell licences.

65. **Protection period:** Following the issuance of flexible use licences after the future licensing process, ISED is proposing that incumbent licensees be protected from having to transition for a minimum period of time, depending on the area that they are currently serving. Incumbent licensees operating systems that would interfere with the planned deployment of another licensee would be

provided a minimum period during which their system would be protected from transition. Proposed protection periods are as follows:

- In Tier 4 service areas, in which the largest population centre is of 30,000 people or more:
  - a minimum protection period of 6 months for sites within the [large urban population centres](#)<sup>2</sup> and the 10 km buffer zone surrounding those centres
  - a minimum protection period of 2 years for all other sites
- In Tier 4 service areas, in which the largest population centre is of less than 30,000 people, a minimum protection period of 3 years

66. In accordance with the proposed transition principle, the proposed protection periods of six months would provide timely access to flexible use spectrum in order to facilitate the introduction of 5G technologies in large urban areas. The proposed two and three year protection periods would provide additional time for incumbents to transition to the new band plan where and when required, and possibly longer in rural areas until such a time as transition is necessary to accommodate new licensees.

67. **Notification process:** Licensees that acquire licences through the future licensing process would be required to demonstrate to ISED the time frames required for the deployment of their planned systems, as well as the specific incumbent operations that would prevent deployment, including the specific areas and spectrum frequencies. ISED would assess the request and provide a notice to the incumbent licensee.

68. **Notification period:** ISED is proposing that incumbent licensees be provided with the following notification periods before they would be required to transition:

- a minimum notification period of 6 months in [large urban population centres](#) and in the 10 km buffer zone surrounding those centres
- a minimum notification period of 1 year in all other areas

69. Compared to ISED's standard transition times, this proposal provides shorter transition times for larger urban population centres where 5G services are likely to be deployed quickly while providing longer transitions times for other areas of the country, especially for rural areas.

70. The minimum protection period and the minimum notification period can overlap. For example, as depicted in figure 6 below, where it is deemed that continued operation of an incumbent system will prevent planned deployment by the new licensee, notification could be provided to an incumbent licensee in a rural tier two years after the issuance of a new licence awarded after the licensing process, requiring that a transition occur three years after the issuance of the new licence. Similarly, an

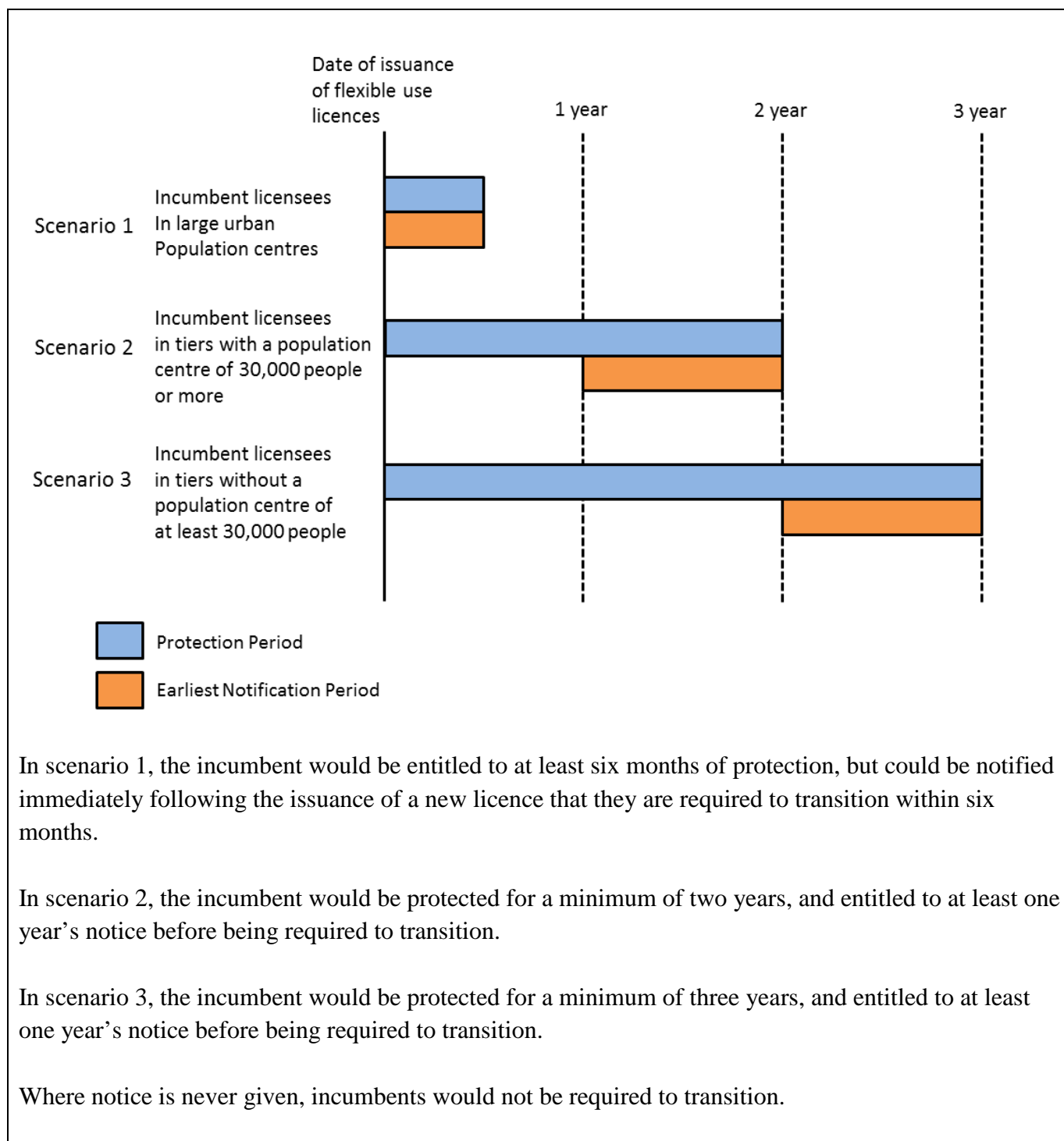
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<sup>2</sup> ISED is using Statistic Canada's definition of a large urban population centre, which has a population of 100,000 people or more. As of 2016 census data, there is a total of 30 large urban population centres.

incumbent in a large urban centre could receive a notification shortly after the licensing process for a transition to occur approximately six months after the new licence has been issued. Once the protection period is over the notification periods would be used to determine transition timing.

71. Voluntary agreements between the new licensees and incumbent licensees may provide for earlier displacement, or for the continued operation of the incumbent systems.

**Figure 6: Proposed minimum protection and notification periods**



**Q11 – ISED is seeking comments on the proposed protection and notification provisions for incumbent licensees as outlined below.**

**Protection period:**

- **For Tier 4 service areas in which the largest population centre is of 30,000 people or more:**
  - a minimum protection period of 6 months for sites within [large urban population centres](#) and the 10 km buffer zone surrounding those centres
  - a minimum protection period of 2 years for all other sites
- **For all Tier 4 service areas in which the largest population centre is of less than 30,000 people, a minimum protection period of 3 years**

**Notification period:**

- a minimum notification period of 6 months in [large urban population centres](#) and in the 10 km buffer zone surrounding those centres
- a minimum notification period of 1 year in all other areas

**Q12 – ISED is seeking comments on alternative transition plans, or variations to the times proposed. Respondents are asked to provide a rationale for any alternative proposals.**

## **6.11 Technical and cross-border considerations for the 3500 MHz band**

72. Historically, Canada has limited the use of fixed systems in the 3450–3500 MHz band in certain areas of Canada due to the use of radars by Canada and the United States. However, as discussed in section 6.3, ISED is proposing to remove the radiolocation allocation in the 3450–3500 MHz band in order to increase the spectrum available for flexible use.

73. There is limited maritime radar use in Canada in the 3400–3475 MHz band, but still some maritime radar use in the United States in the 3400–3650 MHz band. As a result, fixed or mobile systems operating in the cities of Halifax, Dartmouth and Vancouver, and nearby coastal areas including those communities that are along the Straits of Georgia and Juan de Fuca, could be susceptible to an increased potential for interference in the 3450–3650 MHz band due to occasional radar use, particularly in the lower portion of the frequency band.

74. Further, there is the potential for intermittent interference resulting from aeronautical radar use below 3450 MHz in Canada and in the 3400–3650 MHz band in the United States.

75. ISED is of the view that new flexible use systems will be able to tolerate intermittent interference generated by the emissions of maritime and aeronautical radars that operate both within the 3450–

3650 MHz band and in adjacent bands. ISED understands that new LTE and 5G technologies will be more resilient to the interference than pre- and non-LTE technologies that were previously deployed for some fixed wireless access services, and is seeking comments to confirm this understanding.

76. Mechanisms are currently in place to minimize mutual interference between radiolocation systems in Canada and the United States and fixed wireless access systems in the 3475–3650 MHz band. Flexible use systems have been introduced in the United States in the 3550–3700 MHz band. ISED intends to work with the FCC on a new cross-border arrangement that would protect new Canadian and U.S. flexible use services in the areas near the Canada–U.S. border.

**Q13 – ISED is seeking comments on whether the fixed and mobile equipment for LTE and 5G technologies will be able to operate with intermittent interference from radars, including cross-border interference, within the 3450–3650 MHz band and in adjacent bands.**

#### **6.12 Moratorium in the 3500 MHz band**

77. Some of the spectrum in the 3500 MHz band that has reverted to ISED has been available on a first-come, first-served basis for one-year terms, with a high expectation of renewal, defined on a grid cell basis. As a result of the considerations and potential changes raised in this consultation, and the possible significant reorganization of current licensees' spectrum holdings, ISED is now placing a moratorium on new applications for first-come, first-served spectrum licensing in the 3475–3650 MHz band.

**Decision 1 – ISED is issuing a moratorium on new applications for first-come, first-served spectrum licensing in the 3475–3650 MHz band.**

#### **7. The 3800 MHz band (3650–4200 MHz)**

78. In the Outlook Consultation, ISED indicated that it would also review the 3650–4200 MHz band, given that many countries around the world, including the United States, the United Kingdom, Ireland, Japan, China and Australia, are making changes to their regulatory rules, or are consulting on this matter, in order to facilitate commercial mobile or flexible use in this band. ISED is not proposing any immediate changes to the 3800 MHz band. However, given that it is expected that this will also be a key band for 5G deployments in the next five years, ISED is seeking comments on how to optimize the use of this band in the future.

## 7.1 International situation in the 3800 MHz band

79. As discussed in section 5, many countries have begun to release spectrum up to 3800 MHz for flexible use. In addition, there is an existing equipment ecosystem for LTE equipment up to 3800 MHz and the standards for 5G equipment will cover the 3300–4200 MHz frequency range.

80. Internationally, the 3800 MHz band has traditionally been used as a downlink for fixed-satellite services (FSS) with varying amounts of spectrum being made available in different countries. The United States and the United Kingdom have recently begun to examine the potential use of the FSS portion of the band for flexible use, but regulatory developments have been slower internationally in this band than the 3500 MHz band. For instance, Europe considers the 3400–3800 MHz band to be the primary band suitable for the introduction of 5G services, and the European Commission’s [Strategic Roadmap Towards 5G for Europe](#) does not mention mid-band spectrum above 3800 MHz.

81. In July 2017, the FCC released a Notice of Inquiry entitled [Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz](#), seeking comments on the use of 3700–4200 MHz for expanded flexible use in recognition of the growing need for additional spectrum for this purpose. The FCC has begun the process of determining whether spectrum in this range can be made available for wireless broadband use and will explore various implementation options. They also sought comments on how the service rules governing the band could be modified to encourage the efficient use of spectrum resources.

82. The United Kingdom is exploring the opportunity to make the 3800–4200 MHz band available for mobile use, given the feasibility of sharing with current fixed and fixed satellite systems. According to the Japanese report [Radio Policies Towards 2020s](#) published in June 2016, the 3600–4200 MHz and 4400–4900 MHz bands along with the 27.5–29.5 GHz band have been identified as suitable candidates for 5G services.

## 7.2 Current use of the spectrum in the 3800 MHz band in Canada

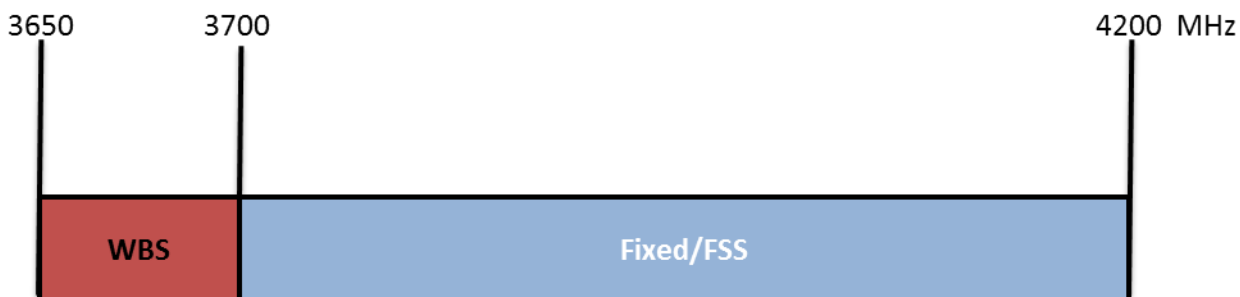
83. As described in SP 3650 MHz, [Spectrum Utilization Policy, Technical and Licensing Requirements for Wireless Broadband Services \(WBS\) in the Band 3650–3700 MHz](#), the 3650–3700 MHz band is currently licensed on a shared “all-come, all-served” basis.<sup>3</sup> Although this band has co-primary allocations for fixed, mobile and fixed satellite services in Canada, it is currently primarily used for fixed point-to-multipoint services. Licensees can use this spectrum for both fixed and mobile applications. These licences are issued on a Tier 4 basis for a one-year term and can be renewed annually.

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<sup>3</sup> CPC-2-1-26, [Licensing Procedure for Wireless Broadband Services \(WBS\) in the Frequency Band 3650-3700 MHz](#)



**Figure 7: Current allocation of the 3800 MHz band**



84. There are currently 927 licences issued to 281 licensees. The majority of licensees are using the spectrum to provide broadband Internet services, many to rural and remote communities. There are also a number of grandfathered FSS earth stations in the 3650–3700 MHz band. A list of these earth stations can be found in SAB-001-09, [Revised List of Grandfathered Fixed Satellite Service \(FSS\) Receive Earth Stations in the Band 3650–3700 MHz](#).

85. Licensed use of the 3700–4200 MHz band is primarily used by FSS systems for the delivery of telephony and Internet in northern and remote communities. In addition, there are unlicensed broadcast receivers that are currently being used to receive TV programming from satellites, which is then distributed over cable infrastructure. Broadcast studios also use unlicensed receivers for programming. There are currently limited fixed point-to-point links in operation in the 3700–4200 MHz band, which are mainly used for backhaul.

### 7.3 Future changes to the 3650–3700 MHz band

86. Many countries are planning to use the 3650–3700 MHz band for commercial mobile use, in particular for 5G services as described in section 5.

87. In the United States, this band was also available for WBS until the FCC’s 2015 [Report and Order](#), which included 3650–3700 MHz as part of their Citizen Broadband Radio Service (CBRS). As mentioned in section 5, the FCC has set up a three-tiered sharing framework enabled by a Spectrum Access System (SAS). As part of this decision, the FCC has grandfathered their existing WBS deployments for five years, allowing time for these licensees to update equipment to align with the new rules. At the end of the transition period, the grandfathered WBS providers have the option to apply for PALs (priority access licences) or continue to operate as GAA (general authorized access) users. In addition, the FCC aligned the technical GAA rules such that WBS providers could continue to provide the same coverage when they migrate to the new band plan and licensing rules.

88. The current band plan for WBS in Canada includes two unpaired 25 MHz blocks with restrictions on the use of the upper block in urban areas to equipment that employs unrestricted contention-based protocols. ISED recognizes that this band plan and these restrictions do not reflect the

expected future equipment ecosystem, but could potentially be modified to align with either the 3500 MHz or the 3800 MHz bands.

89. There is currently no limitation on the number of WBS licences that may be issued for the same spectrum and geographic area. Licensing for all areas is on an all-come, all-served basis and all licences have equal access to the spectrum. ISED recognizes that there have been some challenges (e.g. coordination between licensees) in the WBS band due to these licensing procedures. Given the significant uptake in the use of this band, ISED is exploring opportunities to optimize its use.

90. ISED intends to review the band through a future consultation. This future consultation will address potential changes to the spectrum utilization policy, band plan, and the technical and policy considerations in order to optimize the use of this spectrum. Spectrum Access Systems (SASs) or a similar database approach may be considered in Canada to optimize the use of limited spectrum in the WBS band. Such a database would have the capacity to analyse interference situations and instruct base stations to reduce power or move to a different channel in order to minimize interference. In light of current developments of SASs in the United States, and in order to better develop a future consultation for WBS, ISED is seeking preliminary comments on whether a database model or other methods could be used to optimize the 3650–3700 MHz band.

**Q14 – ISED is seeking preliminary comments on how to optimize the use of the 3650–3700 MHz band, including the potential use of a database access model.**

#### **7.4 Opportunities for new uses of the 3700–4200 MHz band**

91. ISED is seeking comments on how to position Canada in regard to long-term changes to the 3700–4200 MHz band. ISED recognizes that the band is being primarily used by both licensed and unlicensed FSS stations to provide services to Canadians living in rural and remote areas as well as in urban areas.

92. There are an unknown number of unlicensed TV-receive only (TVRO) stations and cable head ends that operate in the band but are not required to register their locations. As a result, the Department cannot currently determine their locations or the extent of the use of these applications, or establish frequency management parameters.

93. Given the expected increase in spectrum usage as a result of the introduction of 5G services, particularly in urban areas, ISED is seeking comments on whether exclusion zones should be considered for the placement of these TVRO stations, cable head ends and other fixed or FSS operations within the band. In order to maximize the use of this band, ISED would be required to implement a process to determine the locations of unlicensed users, likely requiring users to report the technical parameters of their TVRO stations and cable head ends.

94. As mentioned in section 5, many countries are examining up to 3800 MHz, and some up to 4200 MHz, to make additional spectrum available for 5G technologies. With LTE and 5G technologies being developed up to 4200 MHz, a mobile allocation is being considered in the Canadian Table of Frequency Allocations as a future change to this portion of the band to optimize the use of this spectrum.

95. In February 2018, Ofcom released an [update](#) to its 3.6–3.8 GHz paper, which states its intention to revoke fixed link licences in this frequency range with a five year notification period. In addition, as of June 1, 2020, Ofcom will no longer take registered satellite earth stations with a receive component into account for frequency management purposes. This decision will enable future mobile services in the 3600–3800 MHz band in many areas starting in June 2020 and nationwide before the end of 2022.

96. As discussed, the FCC has begun to develop multi-tiered sharing approaches for the 3500 MHz band and is exploring the opportunity to expand it up to the 4200 MHz band through a recent [Notice of Inquiry](#). Ofcom is also considering developing a similar approach for portions of the 3800 MHz band. ISED will be monitoring the developments from other countries, in particular with respect to the potential for sharing spectrum between services in the 3400–4200 MHz frequency range, with a view to improving efficiencies throughout both bands.

97. ISED notes that initial comments from the Outlook Consultation indicated interest in the 3700–4200 MHz band from several groups, including fixed satellite service providers, small WISPs and commercial mobile operators.

**Q15 – ISED is seeking comments on the importance of the 3700–4200 MHz band to future FSS operations.**

**Q16 – ISED is seeking comments on whether unlicensed operators in the 3700–4200 MHz band should be required to submit their technical parameters to ISED to assist in frequency management.**

**Q17 – ISED is seeking comments on which steps Canada should take to optimize the use of the 3700–4200 MHz band in consideration of the current services being provided and the developing technologies that would permit the use of new services in this band (e.g. exclusion zones).**

**Q18 – ISED is seeking comments on the challenges and considerations related to the coexistence of other services, such as mobile and/or fixed wireless access, in the 3700–4200 MHz band.**

## **8. Additional information**

### **8.1 Next steps**

98. ISED intends to review the comments received and publish its decision on the issues raised in this consultation in advance of a consultation on a policy, technical and licensing framework.

### **8.2 Submitting comments**

99. Respondents are requested to provide their comments in electronic format (Microsoft Word or Adobe PDF) by [email](#).

100. In addition, respondents are asked to specify question numbers for ease of referencing and to provide supporting rationale for each response.

101. Paper submissions should be mailed to the following address:

Innovation, Science and Economic Development Canada  
c/o Senior Director, Spectrum Licensing and Auction Operations  
235 Queen Street, 6<sup>th</sup> Floor  
Ottawa, Ontario K1A 0H5

102. All submissions should cite the *Canada Gazette*, Part I, the publication date, the title and the notice reference number (SLPB-004-18). Parties should submit their comments no later than July 12, 2018, to ensure consideration. Soon after the close of the comment period, all comments received will be posted on ISED's [Spectrum Management and Telecommunications](#) website.

103. ISED will also provide interested parties with the opportunity to reply to comments from other parties. Reply comments will be accepted until August 10, 2018.

104. All comments and reply comments will be published, so those making submissions are asked not to provide confidential or private information in their submissions.

105. After the initial comment period, ISED may, at its discretion, request additional information if needed to clarify significant positions or new proposals. Should additional information be requested, the reply comment deadline may be extended.

### **8.3 Obtaining copies**

106. All spectrum-related documents referred to in this paper are available on ISED's [Spectrum Management and Telecommunications](#) website.

107. For further information concerning the process outlined in this consultation or related matters, contact:

Senior Director  
Spectrum Licensing and Auction Operations  
Innovation, Science and Economic Development Canada  
235 Queen Street, 6<sup>th</sup> Floor  
Ottawa, Ontario K1A 0H5  
Telephone: 613-302-3436  
Fax: 613-957-4067  
Email: [ic.spectrumauctions-encheresduspectre.ic@canada.ca](mailto:ic.spectrumauctions-encheresduspectre.ic@canada.ca)

## Annex A — Current licence holdings in the 3500 MHz band as of June 15, 2018

Tier 2 Reference	Tier #	Tier Name	D 3475-3500 MHz	E 3500-3525 MHz	F 3525-3550 MHz	G 3550-3575 MHz	H 3575-3600 MHz	J 3600-3625 MHz	K 3625-3650 MHz	
Newfoundland and Labrador	4-001	St. John's	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-002*	Placentia	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-003*	Gander/Grand Falls/Windsor	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-004*	Corner Brook/Stephenville	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-005*	Labrador	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
Nova Scotia and Prince Edward Island	4-006	Charlottetown	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-007*	Summerside	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-008*	Yarmouth	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-009*	Bridgewater/Kentville	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	
	4-010	Halifax	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	
	4-011*	Truro	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	
	4-012*	Amherst	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-013*	Antigonish/New Glasgow	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	
New Brunswick	4-014	Sydney	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
	4-015	Saint John	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
	4-016*	St. Stephen	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
	4-017	Fredericton	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
	4-018	Moncton	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
	4-019*	Miramichi/Bathurst	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
	4-020*	Grand Falls	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
	4-021*	Edmundston	Subdivisions	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk
			Subdivisions				Xplornet			
	4-022*	Campbellton	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
Eastern Quebec	4-023*	Matane	Subdivisions	Xplornet	Applicant***	Xplornet	Xplornet	Xplornet	Applicant***	
			Subdivisions							ISED
	4-024*	Mont-Joli	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
	4-025	Rimouski	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
	4-026*	Rivière-du-Loup	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
	4-027*	La Malbaie	Inukshuk	Inukshuk	Grid Licence	Xplornet	Inukshuk	Inukshuk	Grid Licence	
	4-028	Chicoutimi-Jonquière	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	Xplornet	
	4-029*	Montmagny	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
	4-030	Québec	Subdivisions	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk
			Subdivisions				Xplornet			
	4-031*	Sainte-Marie	Grid Licence	Xplornet	Inukshuk	Inukshuk	Grid Licence	Xplornet	Inukshuk	
	4-063*	Roberval/Saint-Félicien	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	Xplornet	
	4-064*	Baie-Comeau	Applicant***	Xplornet	Inukshuk	Inukshuk	Applicant***	Xplornet	Inukshuk	
4-065*	Port-Cartier/Sept-Îles	Applicant***	Xplornet	Applicant***	Applicant***	Applicant***	Xplornet	Applicant***		
Southern Quebec	4-032*	Saint-Georges	Grid Licence	Xplornet	Inukshuk	Inukshuk	Grid Licence	Xplornet	Inukshuk	
	4-033*	Lac-Mégantic	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	
	4-034*	Thetford Mines	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	
	4-035*	Plessisville	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	
	4-036*	La Tuque	Inukshuk	Inukshuk	Xplornet	Broadpoint	Inukshuk	Inukshuk	Xplornet	
	4-037	Trois-Rivières	Sogetel	Xplornet	Inukshuk	Inukshuk	Sogetel	Xplornet	Inukshuk	
	4-038*	Louiseville	Xplornet	ISED	Inukshuk	Xplornet	Xplornet	ISED	Inukshuk	
	4-039*	Asbestos	Inukshuk	Xplornet	iTéract	Xplornet	Inukshuk	Xplornet	iTéract	
	4-040	Victoriaville	iTéract	Xplornet	Inukshuk	Xplornet	iTéract	Xplornet	Inukshuk	
	4-041*	Coaticook	Xplornet	iTéract	Inukshuk	Xplornet	Xplornet	iTéract	Inukshuk	
	4-042	Sherbrooke	Inukshuk	iTéract	Xplornet	Inukshuk	Inukshuk	iTéract	Xplornet	
	4-043*	Windsor	Xplornet	iTéract	Inukshuk	Xplornet	Xplornet	iTéract	Inukshuk	
	4-044	Drummondville	Subdivisions	ISED	iTéract	Xplornet	Inukshuk	Sogetel	iTéract	Xplornet
			Subdivisions					ISED		
	4-045*	Cowansville	Inukshuk	iTéract	Inukshuk	Inukshuk	Inukshuk	iTéract	Inukshuk	
	4-046*	Farnham	Inukshuk	iTéract	Inukshuk	Xplornet	Inukshuk	iTéract	Inukshuk	
	4-047	Granby	Inukshuk	iTéract	Xplornet	Inukshuk	Inukshuk	iTéract	Xplornet	
	4-048	St-Hyacinthe	Sogetel	Xplornet	Inukshuk	Xplornet	Sogetel	iTéract	Inukshuk	
	4-049	Sorel	Subdivisions	ISED	Xplornet	Inukshuk	Inukshuk	Sogetel	iTéract	Inukshuk
			Subdivisions					ISED		
4-050	Joliette	ISED	Inukshuk **	Inukshuk	Xplornet	ISED	Inukshuk **	Inukshuk		
4-051	Montréal	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk		
4-052*	Sainte-Agathe-des-Monts	Inukshuk	Inukshuk **	Xplornet	Xplornet	Inukshuk	Inukshuk **	Xplornet		
4-054*	Mont-Laurier/Maniwaki	Xplornet	Inukshuk	Broadpoint	Inukshuk	Xplornet	Inukshuk	Broadpoint		
4-058*	Rouyn-Noranda	Xplornet	Inukshuk	Inukshuk	Bell	Xplornet	Inukshuk	Inukshuk		
4-059*	Notre-Dame-du-Nord	Xplornet	Inukshuk	Inukshuk	Bell	Xplornet	Inukshuk	Inukshuk		
4-060*	La Sarre	Xplornet	Inukshuk	Inukshuk	Broadpoint	Xplornet	Inukshuk	Inukshuk		
4-061*	Amos	Télédistribution	Inukshuk	Inukshuk	Xplornet	Télédistribution	Inukshuk	Inukshuk		
4-062*	Val-D'Or	Xplornet	Inukshuk	Inukshuk	Bell	Xplornet	Inukshuk	Inukshuk		
4-066*	Chibougamau	Subdivisions	Xplornet	ISED	ISED	Broadpoint	Xplornet	ISED	ISED	
		Subdivisions		I.D.LOGIQUE	Kativik RG				Kativik RG	

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\* Denotes Tier 4 service areas without a population centre of at least 30,000 people.

\*\* Denotes that the Tier 4 area also has a grid cell licence in the tier. Grid cell licence details can be found in annex B.

\*\*\* Denotes that an application has been received and is under review.

Tier 2 Reference	Tier #	Tier Name	D 3475-3500 MHz	E 3500-3525 MHz	F 3525-3550 MHz	G 3550-3575 MHz	H 3575-3600 MHz	J 3600-3625 MHz	K 3625-3650 MHz
Eastern Ontario and Outaouais	4-053*	Hawkesbury	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
	4-055	Ottawa / Outaouais	Inukshuk **	Xplornet **	Inukshuk	Inukshuk	Inukshuk **	Xplornet **	Inukshuk
	4-056*	Pembroke	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-057*	Arnprior/Renfrew	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-067	Cornwall	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk
	4-068*	Brockville	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet
	4-069*	Gananoque	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet
	4-070	Kingston	Xplornet	Inukshuk	Inukshuk **	Inukshuk	Xplornet	Inukshuk	Inukshuk **
	4-071*	Napanee	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	Xplornet
	4-072	Belleville	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk
	4-073*	Cobourg	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	Xplornet
	4-074	Peterborough	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet
	4-075*	Lindsay	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet
	Southern Ontario	4-076*	Minden	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet
4-077		Toronto	Inukshuk	Inukshuk	Inukshuk **	Inukshuk	Inukshuk	Inukshuk	Inukshuk **
4-078		Alliston	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk
4-079		Guelph /Kitchener	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk
4-080*		Fergus	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
4-081*		Kincardine	Comcentric	Xplornet	Inukshuk	Inukshuk **	Comcentric	Xplornet	Inukshuk
4-082*		Listowel/Goderich	Comcentric	Xplornet	Inukshuk **	Inukshuk	Comcentric	Xplornet	Inukshuk
4-083*		Fort Erie	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk
4-084		Niagara-St. Catharines	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk
4-085*		Haldimand/Dunnville	Rogers	Inukshuk	Rogers	Xplornet	Rogers	Inukshuk	Rogers
4-086		London/St.Thomas / Woodstock	Inukshuk **	Xplornet	Inukshuk	Xplornet	Inukshuk **	Xplornet	Inukshuk
4-087		Brantford	Inukshuk	Xplornet	Rogers	Xplornet	Inukshuk	Xplornet	Rogers
4-088		Stratford	Inukshuk	Xplornet	Comcentric	Xplornet	Inukshuk	Xplornet	Comcentric
4-089		Chatham	Inukshuk	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
4-090		Windsor/Leamington	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk
4-091*		Wallaceburg	Inukshuk	Xplornet	Grid Licence	Xplornet	Xplornet	Grid Licence	Inukshuk
4-092		Sarnia	ISED **	Inukshuk	Inukshuk	Xplornet	ISED	Inukshuk	Inukshuk
4-093*		Strathroy	Grid Licence	Xplornet	Inukshuk	Xplornet	Grid Licence	Xplornet	Inukshuk
4-094	Barrie	Xplornet	Inukshuk	ISED	Inukshuk	Inukshuk	Inukshuk	ISED	
4-095	Midland	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	
4-096*	Gravenhurst/Bracebridge	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	Xplornet	Inukshuk	
Northern Ontario	4-097	North Bay	Xplornet	Inukshuk	Inukshuk	Bell	Xplornet	Inukshuk	Inukshuk
	4-098*	Parry Sound	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk
	4-099*	Elliot Lake	Grid Licence	Inukshuk	Inukshuk	Xplornet	ISED	Inukshuk	Inukshuk
	4-100	Sudbury	Inukshuk	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk
	4-101*	Kirkland Lake	Xplornet	Bell	Inukshuk	Inukshuk	Xplornet	Bell	Inukshuk
	4-102	Timmins	Xplornet	Bell	Inukshuk	Inukshuk	Xplornet	Bell	Inukshuk
	4-103*	Kapuskasing	Xplornet	Bell	Inukshuk	Inukshuk	Xplornet	Bell	Inukshuk
	4-104*	Kenora/Sioux Lookout	Tbaytel	Inukshuk	Inukshuk	Xplornet	Tbaytel	Inukshuk	Inukshuk
	4-105*	Iron Bridge	Bell	Inukshuk	Inukshuk	Xplornet	Bell	Inukshuk	Inukshuk
	4-106	Sault Ste. Marie	Bell	Xplornet	Inukshuk	Inukshuk	Bell	Xplornet	Inukshuk
4-107*	Marathon	Xplornet	Tbaytel	Inukshuk	Inukshuk	Xplornet	Tbaytel	Inukshuk	
4-108	Thunder Bay	Tbaytel	Xplornet	Inukshuk	Inukshuk	Tbaytel	Xplornet	Inukshuk	
4-109*	Fort Frances	Xplornet	Vianet	Inukshuk	Inukshuk	Xplornet	Vianet	Inukshuk	
Manitoba	4-110*	Steinbach	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-111	Winnipeg	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
	4-112*	Lac du Bonnet	Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk
	4-113*	Morden/Winkler	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-114	Brandon	Xplornet	Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk
	4-115*	Portage la Prairie	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-116*	Dauphin	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-117*	Creighton/Flin Flon	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
4-118*	Thompson	Broadpoint	Inukshuk	Inukshuk	Xplornet	Broadpoint	Inukshuk	Inukshuk	

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Tier 2 Reference	Tier #	Tier Name	D 3475-3500 MHz	E 3500-3525 MHz	F 3525-3550 MHz	G 3550-3575 MHz	H 3575-3600 MHz	J 3600-3625 MHz	K 3625-3650 MHz	
Saskatchewan	4-119*	Estevan	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	
			Subdivisions		Signal Direct	Signal Direct		Signal Direct		
			Subdivisions		ISED	ISED		ISED		
	4-120*	Weyburn	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	
			Subdivisions		Signal Direct	Signal Direct		Signal Direct		
			Subdivisions		ISED	ISED		ISED		
	4-121	Moose Jaw		ISED	ISED	ISED	Xplornet	ISED	ISED	
	4-122*	Swift Current	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet
			Subdivisions		ISED	ISED		ISED		
	4-123*	Yorkton	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet
			Subdivisions		ISED	ISED		ISED		
	4-124	Regina		Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk
	4-125	Saskatoon		Xplornet	Inukshuk	Inukshuk	Inukshuk	Xplornet	Inukshuk	Inukshuk
4-126*	Watrous	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	
		Subdivisions		ISED	ISED		ISED			
4-127*	Battleford	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	
		Subdivisions			Inukshuk				Inukshuk	
		Subdivisions			ISED				ISED	ISED
4-128	Prince Albert		Xplornet	Xplornet	ISED	ISED	Xplornet	Xplornet	ISED	
4-130*	Northern Saskatchewan	Subdivisions	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	Xplornet	
		Subdivisions		MN Netset	MN Netset					
		Subdivisions		ISED	ISED					
Alberta	4-129*	Lloydminster	Subdivisions	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	CCi	
			Subdivisions						ISED	ISED
	4-131	Medicine Hat/Brooks		Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet
	4-132	Lethbridge		Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-133*	Stettler/Oyen/Wainwright	Subdivisions	Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Xplornet
			Subdivisions							ISED
	4-134*	High River		Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
	4-135*	Strathmore		Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-136	Calgary	Subdivisions	Inukshuk **	Inukshuk	Inukshuk	Xplornet	Inukshuk **	Inukshuk	Inukshuk
			Subdivisions							
	4-137	Red Deer		Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet
	4-138*	Wetaskiwin/Ponoka		Xplornet	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk
	4-139*	Camrose		Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet
	4-140*	Vegreville	Subdivisions	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet
			Subdivisions							
	4-141	Edmonton	Subdivisions	TELUS	Inukshuk	Xplornet	Xplornet	TELUS	Inukshuk	Xplornet
			Subdivisions							
	4-142*	Edson/Hinton		Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
4-143*	Bonnyville	Subdivisions	Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet	
		Subdivisions								ISED
4-144*	Whitecourt		Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
4-145*	Barrhead		Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet	
4-146	Fort McMurray		Xplornet	Inukshuk	Xplornet	Xplornet	Xplornet	Inukshuk	Xplornet	
4-147*	Peace River		Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	Xplornet	
4-148	Grande Prairie		Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
British Columbia	4-149*	East Kootenay	Subdivisions	Cranbrook	Xplornet	Inukshuk	Xplornet	Cranbrook	Xplornet	
			Subdivisions							ISED
	4-150*	West Kootenay	Subdivisions	Inukshuk **	Xplornet	Inukshuk	Xplornet	Inukshuk **	Xplornet	Inukshuk
			Subdivisions							
	4-151	Kelowna		ABC Allen	Inukshuk	Xplornet	Xplornet	ABC Allen	Inukshuk	Xplornet
	4-152	Vancouver		Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk	Inukshuk
	4-153*	Hope		ISED	Inukshuk	Inukshuk	ABC Allen	Xplornet	Inukshuk	Inukshuk
	4-154	Victoria		ISED	ISED	ISED **	ISED	ISED	ISED	ISED **
	4-155	Nanaimo		ISED	ISED	ISED	ISED	ISED	ISED	
	4-156	Courtenay		ISED	ISED **	Inukshuk	ISED	ISED	ISED	Inukshuk
	4-157*	Powell River		Inukshuk	Inukshuk	Xplornet **	ABC Allen	Inukshuk	Inukshuk	Xplornet
	4-158*	Squamish Whistler	Subdivisions	Xplornet **	Inukshuk **	Inukshuk **	Inukshuk	BaseTech **	Inukshuk	Inukshuk
			Subdivisions							
	4-159*	Merritt		ABC Allen	Inukshuk	Inukshuk	Xplornet	ABC Allen	Inukshuk	Inukshuk
	4-160	Kamloops		Xplornet	Inukshuk **	Inukshuk	Xplornet	Xplornet	Inukshuk **	Inukshuk
	4-161*	Ashcroft		ABC Allen	Inukshuk	Inukshuk	Xplornet	ABC Allen	Inukshuk	Inukshuk
	4-162*	Salmon Arm		Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
	4-163*	Golden		Xplornet	Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk
4-164*	Williams Lake		ABC Allen	Inukshuk **	Inukshuk	Xplornet	ABC Allen	Inukshuk	Inukshuk	
4-165*	Quesnel/Red Bluff		ABC Allen	Xplornet	Inukshuk	Xplornet	ABC Allen	Xplornet	Inukshuk	
4-166*	Skeena		ABC Allen	Xplornet	Inukshuk **	Xplornet	ABC Allen	Xplornet	Inukshuk	
4-167	Prince George		ABC Allen	Xplornet	Inukshuk	Xplornet	ABC Allen	Xplornet	Inukshuk	
4-168*	Smithers		ABC Allen	Xplornet	Inukshuk	Xplornet	ABC Allen	Xplornet	Inukshuk	
4-169*	Dawson Creek		Inukshuk	Xplornet	ABC Allen	Xplornet	Inukshuk	Xplornet	ABC Allen	
Yukon, NWT and Nunavut	4-170*	Yukon		Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	
	4-171*	Nunavut		ISED	ISED	SSI Micro	Xplornet	Ice Wireless	ISED	
	4-172*	Northwest Territories		Inukshuk	Inukshuk	Xplornet	Xplornet	Inukshuk	Inukshuk	

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## Annex B — Current grid cell licence holdings in the 3500 MHz band as of June 15, 2018

Reference	Tier 2 and 4	Grid Name	D	E	F	G	H	I	J
Tier 2	Tier 4 Reference	(pop. in grid, % of Tier 4)	3475-3500 MHz	3500-3525 MHz	3525-3550 MHz	3550-3575 MHz	3575-3600 MHz	3600-3625 MHz	3625-3650 MHz
Southern Quebec	4-027*	La Malbaie (covers entire tier 4: 29,287 pop)			Xplornet **				Xplornet **
	4-031*	Sainte-Marie (covers entire tier 4: 51,853 pop)	iTéract **				iTéract **		
	4-050	Joliette (155,079 pop)		Bell				Bell	
	4-052*	Sainte-Agathe-des-Monts (75,902 pop)		Bell				Bell	
Eastern Ontario and Outaouais	4-032*	Saint-Georges (covers entire tier 4: 70,299 pop)	iTéract **				iTéract **		
	4-055	Ottawa / Outaouais (1,378,972 pop)		Storm Internet Services				Storm Internet Services	
		Merrickville (61,650 pop, 4% of total)	Xplornet			Xplornet			
4-070	Kingston (175,895 pop)	Prescott (18,129 pop, 10% of total)			Xplornet			Xplornet	
Southern Ontario	4-077	Toronto (6,646,250 pop)			Xplornet				Xplornet
	4-081*	Kincardine (181,398 pop)				Xplornet			
	4-082*	Listowel / Goderich (83,266 pop)	Clinton (16,983 pop, 20% of total)	Bell					
			Clinton (69,865 pop, 84% of total)			Comcentric			
	4-086	London / Woodstock / St. Thomas (654,522 pop)	St. Thomas (1,831 pop, 0.3% of total)	Bell					
			London (21,942 pop, 3% of total)	Bell					
	4-091*	Wallaceburg (covers entire tier 4: 28,813 pop)			CCINet **				CCINet **
4-092	Sarnia (125,916 pop)	Sarnia (9,938 pop, 8% of total)	Bell						
4-093*	Strathroy (covers entire tier 4: 46,029 pop)			CCINet **			CCINet **		
Northern Ontario	4-099*	Elliot Lake (covers entire tier 4: 29,826 pop)		Wire IE **					
Alberta	4-136	Calgary (1,248,227 pop)	Cochrane (15,168 pop, 1% of total)	Xplornet			Xplornet		
British Columbia	4-154	Victoria (432,549 pop)	Victoria Saanich Peninsula (312,936 pop, 72% of total)			Beacon Wireless			Beacon Wireless
			Gulf Islands (7,997 pop, 2% of total)			Beacon Wireless			Beacon Wireless
			Gulf Islands (5,347 pop, 1% of total)			Beacon Wireless			Beacon Wireless
			Gulf Islands (4,039 pop, 1% of total)			Beacon Wireless			Beacon Wireless
	4-156	Courtenay (114,583 pop)	Tahsis - Kyuquot (320 pop, 0.3% of total)		TELUS				
	4-157*	Powell River (26,780 pop)	Calvert Island - Ocean Falls (1 pop, 0% of total)			TELUS			
	4-158*	Squamish Whistler (68,481 pop)	Whistler (7,997 pop, 12% of total)	ABC Allen				ABC Allen	
			Squamish (4,898 pop, 7% of total)			TELUS			
			Squamish (13,147 pop, 19% of total)		TNW				
	4-160	Kamloops (101,949 pop)	Lillooet (1,847 pop, 3% of total)	ABC Allen			ABC Allen		
4-164*	Williams Lake (38,447 pop)	Red Lake (40 pop, 0.04% of total)		TELUS			TELUS		
4-166*	Skeena (56,717 pop)	Nemah Valley (146 pop, 0.4% of total)		TELUS					
		Terrace (10,156 pop, 18% of total)			TNW				

\* Tier 4 is classified as "rural". The rural classification is given to Tier 4 service areas that contain a population centre of 30,000 or less; all others are classified as "urban."  
 \*\* Licence covers the entire Tier 4 service area.