

SaskTel Comments:

Gazette Notice SLPB-004-18

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

July 12, 2018

EXECUTIVE SUMMARY

1. The following is a summary of SaskTel's submission in response to Gazette Notice SLPB-004-18 *Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band* ("the Consultation").
2. This consultation is timely. The 3500 MHz band is a high priority spectrum for 5G services. Globally there is a lot of activity by many administrations to allocate this spectrum for mobile 5G services, and the 3rd Generation Partnership Project (3GPP) has included this band in industry standards as one of the first bands for 5G. Canada needs to follow with spectrum policies and licensing procedures in order to take advantage of the new 5G technology, and therefore allow Canadians to benefit from the new wireless broadband services being offered by new 5G networks.
3. SaskTel agrees with the Department's assessment of the development of the 3500 MHz and 3800 MHz bands by various spectrum regulators and administrations globally, as well as the assessment of the development of an equipment ecosystem for 5G technologies in these bands. We also agree with the Department's assessment of the timelines for the potential availability of 5G equipment. Of the two bands identified by 3GPP for 5G in this spectrum, band n77 3300-4200 MHz, and band n78 3300-3800 MHz, SaskTel believes that devices capable of operating in band n78 will be available first, and band n77 capable devices will follow afterward.
4. SaskTel agrees with the Department's proposal to modify the Canadian Table of Frequency Allocations (CTFA) to allow the 3500 MHz band to be used for 5G mobile services.
5. SaskTel agrees with the Department's proposal to allow flexible use licensing in the 3450-3475 MHz band, giving licensees the option of deploying either fixed or mobile services. This aligns well with flexible use services that are currently allowed in the 3475-3650 MHz band. New 5G services can effectively be deployed in the combined 3450-3650 MHz band, allowing new and innovative services to be delivered.

6. SaskTel recognizes the ongoing research and development work on new technologies and techniques to access spectrum, e.g. cognitive radio, and dynamic spectrum access. However, as the Department has noted in the Consultation, these new spectrum sharing paradigms are still in the early stages of development. SaskTel agrees with the Department that despite the promise of these new spectrum sharing techniques, more research and development work is required before these new technologies can be introduced into commercial mobile spectrum and operating broadband wireless networks serving customers with a high quality of service.
7. SaskTel believes it may be possible for flexible use systems to share the 3400-3450 MHz with radiolocation services, but further studies and more detailed information will be required. SaskTel understands that interference from Radiolocation services will be intermittent in nature. Although the new LTE and 5G technologies are quite robust in terms of mitigating external interference sources, more studies will have to be conducted to fully characterize the interference risk, and actual field tests may be required.
8. Since the stated objective is to protect radiolocation services from interference,¹ SaskTel is more concerned about interference into radiolocation services, rather than interference into LTE and 5G networks. This is because the latest generation of LTE and 5G radiocommunication receivers are likely more robust than radiolocation receivers.
9. Despite some of these risks and unknowns, SaskTel would be interested in exploring options to share the 3400-3450 MHz band with radiolocation services. We believe that these risks are likely manageable. Sharing the spectrum with radiolocation services provides the opportunity to utilize the 3400-3450 MHz band more fully and more efficiently.
10. SaskTel has compared the two options presented by ISED in the Consultation for establishing the amount of flexible use spectrum that will be licensed to the incumbent 3500 MHz licence holders in exchange for their fixed spectrum

¹ The Consultation, section 6.5 paragraph 39

licences. SaskTel has found that Option 1 would be the most appropriate choice. Receiving a flexible use spectrum licence with one third of the spectrum of an existing fixed spectrum licence is a fair exchange, considering the much higher value of a flexible use licence. Incumbent licence holders would be provided the flexibility to deploy new fixed and/or mobile technologies, and therefore be given the opportunity to offer new wireless services to customers. Incumbent licence holders would also be free to acquire additional spectrum through the auction process, should they so desire.

11. Freeing the 3500 MHz spectrum for auction will then provide an opportunity for all service providers to acquire 3500 MHz spectrum through the auction process, allowing for the deployment of new 5G technologies and services. This will also result in the most efficient utilization of the spectrum.
12. It would not be fair if a situation arises where an incumbent licence holder was to receive a windfall of very valuable flexible use spectrum licences in the 3500 MHz band, made even more valuable by the global efforts to make this spectrum available for 5G deployments. The wireless market is highly competitive, and there are many large, well funded service providers holding large amounts of 3500 MHz fixed spectrum licences.
13. We believe implementing Option 1 would be fair for all parties. However, should the Department choose to consider other alternatives, SaskTel urges the Department to ensure that no incumbent licence holder receives an unfair advantage or a windfall of flexible use licenses, and that all parties are treated equally and fairly.
14. SaskTel agrees with the Department's proposed 3450-3650 MHz band plan using unpaired blocks of 10 MHz. The proposed blocks sizes are compatible with 3GPP standards for both LTE and 5G deployments. As noted by the Department in the Consultation, the proposed band plan does not preclude the licensing of aggregated packages of multiple 10 MHz blocks. The ability of service providers to aggregate multiple blocks into larger contiguous blocks of spectrum will be very important for the effective deployment of 5G services.

15. SaskTel does not believe that additional measures should be imposed at this time by the Department to limit potential interference issues between adjacent TDD systems using the proposed band plan. It would be best for network operators to coordinate amongst each other the appropriate measures that need to be taken to mitigate interference between TDD networks.
16. SaskTel agrees with the proposal by the Department to issue all new flexible use spectrum licences, to both new and incumbent licensees, at the same time. This will give the opportunity for each licensee to enter the market at approximately the same time, and not provide an unfair competitive advantage to an individual licensee. This level playing field will allow for fair competition amongst licensees in this band, to the benefit of all Canadians.
17. The 3500 MHz band is developing into a global 5G band, and as stated numerous times in consultation comments by different parties, this band is becoming very important for mobile wireless service providers. Because this band is so important, it is essential that a price discovery process be utilized in the auction licensing process.
18. Because of the widely varying number of incumbents and the varying amounts of spectrum assigned to each incumbent in each service area, it is expected that there will be a wide variation in the number of blocks being auctioned in every service area. It will simply not be possible to attain the proper value for each spectrum licence in each service area without a price discovery process.
19. SaskTel understands that utilizing an auction process with price discovery will make the auction process more complex, and therefore could delay the timing of the auction. However, the importance and benefits of the price discovery process far outweigh the drawbacks created by a delay in the auction schedule. Conducting an auction licensing process without a price discovery mechanism would do injustice to the licensing of this crucially important spectrum band for 5G. The lack of a price discovery process in the auction would not promote competition, but in fact would hinder or even obstruct fair competition.
20. One method of reducing the complexity of the spectrum auction, and therefore reduce the risk of a delay in the auction schedule, is to use a less complex auction

format that still includes price discovery, such as the Simultaneous Multiple Round Auction (SMRA) format. The SMRA format is far less complex than the Combinatorial Clock Auction (CCA) formats that the Department has been using lately. Without all of the complexities of the CCA formats (such as package bidding, second price rules, etc.), the time required to develop auction software for the SMRA format will be far less than for any of the CCA formats. This in turn will reduce the risk of a delay in the auction schedule.

21. The risk of exposure has often been cited as a major disadvantage of the SMRA format. We believe this risk can be managed. By employing proper auction bidding strategies during the auction, this risk can be greatly reduced.
22. SaskTel believes that the SMRA format would be the appropriate choice for the 3500 MHz spectrum auction. It includes a price discovery process that is essential for the effective auction of a large number and complex group of spectrum licences. The SMRA format is far less complex than CCA auction formats, allowing for greatly reduced auction software development time. Any risks of exposure in the SMRA format can be mitigated or at least reduced through effective auction bidding strategies.
23. SaskTel understands and agrees with the requirements to provide notification and protection periods as part of the transition plan for incumbents in the 3500 MHz band. However, as discussed below, SaskTel has some concerns with the length of some of these time periods.
24. SaskTel agrees with the proposal to impose different protection and notification periods for different service areas, i.e. large urban population centres (populations greater than 100,000 people), and Tier 4 service areas with and without a population centre of more than 30,000 people.
25. SaskTel agrees with the minimum 6-month notification and protection periods proposed for the large urban population centres. There will be strong competitive pressures to install 5G mobile systems in the larger cities first, and it is very important that these deployments not be unnecessarily delayed.

26. The Department has proposed a minimum one-year notification period for all sites outside of the large urban population centres. SaskTel agrees that the proposed one-year notification period should be sufficient to allow time for incumbent licensees to transition their operation.
27. For all sites outside of the large urban population centres, the Department has proposed a minimum protection period of two years. For Tier 4 service areas without a population centre of at least 30,000 people, the proposed protection period is a minimum of three years.
28. Although the two-year protection period is appropriate, particularly for rural installations, the three year protection period is too long, and is just not reasonable.
29. When considering the fact that incumbent licensees are aware, or should be aware, as of the publishing date of the Consultation (June 2018), that they are going to be required to transition their operations, the incumbents will have plenty of lead time to plan, design, perhaps finance, and complete their transition. The Minister of Innovation, Science and Economic Development has announced at the 2018 Canadian Telecom Summit that the Department is planning to conduct the 3500 MHz spectrum auction sometime in 2020. It is reasonable to assume that if the auction does take place in 2020 as planned, that flexible use licences resulting from the auction could be issued as early as the latter half of 2020.
30. The proposed three-year protection period for rural Tier 4 service areas would then extend protection to 2023. That is five years from the first notification to incumbents in June 2018 that transition will be required. Five years is an eternity in the telecommunications industry, and this is an unreasonably long period of time to expect new flexible use licensees to have to wait to deploy their spectrum.
31. SaskTel is concerned that the long protection periods for rural Tier 4 service areas will impact SaskTel's potential plans to provide either LTE or 5G Fixed wireless broadband services to rural residents. The 3500 MHz spectrum would be used by SaskTel to grow and expand our existing Fusion services providing fixed wireless broadband services to rural customers.

32. SaskTel recommends that the protection period for all sites outside of large urban population centres be no more than two years. This includes all Tier 4 service areas, both with and without population centres of 30,000 people. Considering the advance notice already given by the Department in June 2018, this is clearly enough time to plan, design, and implement required network transitions.
33. SaskTel strongly believes that a database model will not be appropriate for the 3650-3700 MHz WBS band, either now or in the future. The use of a database model will only complicate the licensing and installation processes, and will raise equipment costs. This will therefore raise both the operating and capital costs for WBS operators. Although the FCC in the United States is implementing a database model in the WBS band, this is only because there are incumbent operators in the US that must be protected. This situation does not exist in Canada. More importantly, SaskTel does not believe the use of a database model will solve interference issues, nor reduce the risks of future network impairments caused by future deployments by other WBS operators. Using a database model will only increase costs and hinder operators in trying to serve their customers, without solving any problems.
34. Currently SaskTel utilizes the 3700-4200 MHz C band for FSS satellite services to provide the following services:
 - Voice telephony services to two very isolated communities in northern Saskatchewan
 - IP-based WAN data services to 19 remote communities, where fibre or other terrestrial facilities are either too costly or simply impractical.
 - Broadcast video distribution to approximately 260 communities in Saskatchewan.
35. SaskTel requires continued access to C band FSS spectrum for delivery of telecommunications voice trunking, IP-based services, and broadcast video for remote and northern locations. SaskTel expects that low-earth orbit (LEO) satellite-based service offerings will, over the long term, supplant C band FSS requirements for trunking and IP services. We estimate that these transitions to LEO technologies may take place in the 2021 to 2025 time frame. The time frame however will depend upon the launch and deployment schedule for the LEO

constellations, as well as the pace of transition of services from C band geostationary earth orbit (GEO) FSS satellite service to new LEO satellite technology. Despite the long-term prognosis for the C band, the 3700-4200 MHz band is currently very important, and will remain important in the near-term future for FSS operations for SaskTel. SaskTel must continue to have access to the C band FSS spectrum until new satellite-based alternatives, such as LEO systems, are available and the business case justifies the transition to new technologies.

36. SaskTel recommends that operators of unlicensed satellite earth stations (e.g. television receive-only or TVRO sites) in the 3700-4200 MHz band be required to submit their technical parameters to ISED to assist in spectrum planning and frequency management. It is very important that the Department have a complete picture of the current utilization and future demand for FSS services in the 3700-4200 MHz C band spectrum in order to properly plan and manage proposed transitions to flexible use services in this spectrum, and protect incumbent services.
37. In order to properly optimize the use of the 3700-4200 MHz spectrum, a complete picture of the current usage of the band is required, as well as future plans for these services. The Department should initiate a process to collect information on all current usage of the band, including services being provided, as well as any future plans for when these services might be expected to migrate or evolve to new technologies and/or different spectrum bands. This information can be used to estimate the demand for C band spectrum over the longer term. SaskTel expects some or most of the FSS services currently being provided in the C band via GEO satellites will migrate to new LEO satellite technologies. The time frames for these transitions to LEO technologies however are presently only estimates.
38. Because of the ubiquitous geographical distribution of existing C band satellite earth stations, the use of exclusion zones will likely not be an effective method of spectrum sharing between FSS stations and new flexible use systems. The more appropriate mechanism would be by dedicating a portion of the band for new flexible use systems, with FSS satellite systems dedicated to the other portion of the band. The amount of spectrum that could be dedicated for flexible use would depend of course on the level of demand for FSS C band services, and the

amount of spectrum required to meet the demand for these FSS services. This will very likely require FSS services to change frequencies within the 3700-4200 MHz band.

39. It is well established that flexible use systems, which includes mobile services, cannot co-exist well with FSS satellite systems. The only reasonable method for coexistence would be to divide the spectrum into blocks dedicated for each service. The size of the required blocks for the FSS services directly depends on the amount of spectrum required to meet the demand for C band FSS services.

INTRODUCTION

40. Saskatchewan Telecommunications (“SaskTel” or “the Company”) is pleased to provide this response to Gazette Notice SLPB-004-18 *Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band* (“the Consultation”).
41. SaskTel's detailed responses to the questions posed in the Consultation are below. The section numbering of this document corresponds to the section numbering of the Consultation. Failure to address any particular issue or item, or the Comments made by any other party, should not be construed as agreement with those Comments where such agreement is not in the interests of SaskTel.

SASKTEL RESPONSE TO THE CONSULTATION ON REVISIONS TO THE 3500 MHz BAND TO ACCOMMODATE FLEXIBLE USE AND PRELIMINARY CONSULTATION ON CHANGES TO THE 3800 MHz BAND

4. *Background and context*
5. *International situation and ecosystem development in the 3500 MHz and 3800 MHz bands*

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.

42. SaskTel agrees with the Department's assessment of the development of the 3500 MHz and 3800 MHz bands by various spectrum regulators and administrations globally, as well as the assessment of the development of an equipment ecosystem for 5G technologies in these bands.
43. SaskTel also agrees with the Department's assessment of the timelines for the potential availability of 5G equipment. Of the two bands identified by 3GPP for 5G in this spectrum, i.e. band n77 3300-4200 MHz, and band n78 3300-3800 MHz, SaskTel believes that devices capable of operating in band n78 will be available first, and band n77 capable devices will follow afterward. Most of the administrations moving ahead early with auctioning and licensing 3500 MHz

spectrum for 5G are utilizing spectrum bands in the 3300-3800 MHz range. It is SaskTel's estimate that the first 3500 MHz 5G devices will be developed using band n78 to meet the demands from the initial 5G markets. It is also generally less expensive to design and build a 5G device operating over the narrower band n78 (500 MHz wide) as compared to band n77 (900 MHz wide).

6. The 3500 MHz band

6.3 Further changes to the allocations in the 3500 MHz band

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

44. SaskTel agrees with the Department's proposal to modify the Canadian Table of Frequency Allocations (CTFA) to:

- Add a primary Mobile allocation to the 3450-3475 MHz band.
- Remove the Radiolocation allocation in the 3450-3500 MHz band.
- Suppress Canadian Footnote C15 in the CTFA.

45. The proposed changes will facilitate the use of this spectrum for 5G mobile services.

6.4 Flexible use in the 3500 MHz band

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

46. SaskTel agrees with the Department's proposal to allow flexible use licensing in the 3450-3475 MHz band. This will allow licensees to deploy either mobile and/or fixed services in this band. We agree that this will allow existing licensees to continue offering fixed services if they so choose, with the option of also offering mobile services.

47. The flexible use policy in the 3450-3475 MHz band will be harmonized with the previous decision by ISED to allow flexible use in the 3475-3650 MHz band. With flexible use allowed in the combined 3450-3650 MHz band, new licensees will be

able to deploy new 5G technologies and offer 5G mobile and/or 5G fixed services, allowing service providers to address both potential 5G use cases. The flexible use policy will also provide flexibility to the service provider in the future, allowing for the delivery of new and innovative services.

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

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.

New Spectrum Sharing Techniques:

48. SaskTel recognizes the ongoing research and development work on new technologies and techniques to access spectrum, e.g. cognitive radio, and dynamic spectrum access. With spectrum being finite, and becoming scarcer as growth in demand for wireless broadband data increases, new and innovative methods to access and utilize spectrum will be required in the future.
49. However, as the Department has noted in the Consultation, these new spectrum sharing paradigms are still in the early stages of development. SaskTel agrees that despite the promise of these new spectrum sharing techniques, more work is required before these new technologies can be integrated into commercial mobile networks serving customers with a high quality of service. While the current generation of LTE equipment and future 5G technologies are quite robust in terms of mitigation of interference, maintaining a high quality of service still requires the reduction (or ideally elimination) of random external interference sources, something that the new spectrum sharing paradigms being developed cannot currently provide.
50. SaskTel agrees with the Department that more research and development work needs to be done on these new spectrum sharing techniques, and that it is too early to consider their introduction into commercial mobile spectrum and operating broadband wireless networks. The research and development work on new spectrum sharing techniques should continue to be monitored.

Sharing with Radiolocation Services in the 3400-3450 MHz band:

51. SaskTel agrees that devices and equipment are being developed as per 3GPP standards that will be capable of operating in the 3400-3450 MHz band. We understand from the Consultation document that the radiolocation services will be intermittent in use, and that there may or may not be geographical separation between the radiolocation source and any potential low power wireless deployments in this band. Interference from the operation of aeronautical radar in Canada is expected to be intermittent, but interference from maritime radar sources may be more problematic.²
52. Although the new LTE and 5G technologies are quite robust in terms of mitigating external interference sources, more studies will have to be conducted to fully characterize the interference risk, and actual field tests may be required. The impact of the interference on the LTE and 5G networks will likely be a degradation in performance, either in coverage or capacity, or perhaps both. The real question is what is the magnitude of this degradation, and will it have an impact on customer experience? This depends largely on the magnitude and duration of the interfering signal.
53. Full characterization of the impacts on LTE and 5G network performance from interference from radiolocation services requires detailed information on the characteristics of the radiolocation waveform, transmitter power, and other parameters.
54. Since the stated objective is to protect radiolocation services from interference,³ SaskTel is more concerned about interference into radiolocation services, rather than interference into LTE and 5G networks. This is because the latest generation of LTE and 5G radiocommunication receivers are likely more robust than radiolocation receivers.
55. SaskTel believes that in most parts of the country it will be possible to reduce or mitigate the risk of interference from radiolocation sources through geographical

² The Consultation, sections 6.5 and 6.11

³ Ibid, section 6.5 paragraph 39

separation. Where geographical separation is not possible, then LTE and 5G network designs and configurations could potentially allow this risk to be managed. For example, LTE or 5G RF carriers in the 3400-3450 MHz band could be combined with other frequency bands and blocks using carrier aggregation techniques. Should interference from a radiolocation source occur, the result would be a reduction in performance and data throughput, but not a loss of service. This might be manageable by the network operator.

56. SaskTel notes that the objective is to protect existing radiolocation services, while still allowing deployment of fixed and mobile systems. This implies that there may need to be geographical or power limitations imposed on fixed or mobile deployments. No information is provided in the Consultation on what measures will be required to protect the radiolocation services from interference from terrestrial fixed and mobile systems.
57. Despite some of these risks and unknowns, SaskTel would be interested in exploring options to share the 3400-3450 MHz band with radiolocation services. We believe that these risks are likely manageable. Sharing the spectrum with radiolocation services provides the opportunity to utilize the 3400-3450 MHz band more fully and more efficiently.
58. SaskTel also believes that there may be other wireless service providers that would be interested in using the 3400-3450 MHz band and sharing this spectrum with radiolocation users, particularly if the cost of spectrum access could somehow be reduced.

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

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.

59. SaskTel has compared the two options presented by ISED in the Consultation for establishing the amount of flexible use spectrum that will be licensed to the incumbent 3500 MHz licence holders in exchange for the fixed spectrum licences. SaskTel has found that Option 1 would be the most appropriate choice. Receiving a flexible use spectrum licence with one third of the spectrum of an existing fixed spectrum licence is a fair exchange, considering the much higher value of a flexible use licence. Incumbent licence holders would be provided the flexibility to deploy new fixed and/or mobile technologies, including new 5G services, and therefore be given the opportunity to offer new wireless services to customers.
60. SaskTel also agrees that incumbent service providers currently offering fixed services can continue to provide fixed and/or mobile services with the reduced amount of spectrum using new technologies such as 5G featuring much higher spectral efficiency. With the new flexible use licences, incumbent operators can choose to continue to offer fixed services, or could choose to provide mobile services, including 5G. Incumbent operators would still be able to acquire additional spectrum through the auction process, if they desire to supplement their spectrum holdings.
61. SaskTel believes that Option 1 provides a fair value for exchanging the existing incumbent 3500 MHz fixed spectrum licences for new valuable 3500 MHz flexible use licences. This gives incumbent operators an opportunity to offer new

services. Freeing the spectrum for auction will then provide an opportunity for all service providers to acquire 3500 MHz spectrum through the auction process, allowing for the deployment of new 5G technologies and services. This will also result in the most efficient utilization of the spectrum.

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.

62. As SaskTel stated in our response to Q5 in this Consultation, we believe Option 1 is the most appropriate choice, and is fair to all parties. SaskTel has no alternative options for consideration by the Department.
63. It would not be fair if a situation arises where an incumbent licence holder was to receive a windfall of very valuable flexible use spectrum licences in the 3500 MHz band, made even more valuable by the global efforts to make this spectrum available for 5G deployments. The wireless market is highly competitive, and there are many large, well funded service providers holding large amounts of 3500 MHz spectrum. These large service providers can afford to give up two thirds of their 3500 MHz spectrum licence holdings, and they would still have the option of acquiring additional spectrum through an open auction process.
64. We believe implementing Option 1 would be fair for all parties. However, should the Department choose to consider other alternatives, SaskTel urges the Department to ensure that no incumbent licence holder receives an unfair advantage or a windfall of flexible use licenses, and that all parties are treated equally and fairly.

6.7 Changes to the 3500 MHz band plan and interference mitigation

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

65. SaskTel agrees with the Department’s proposed 3450-3650 MHz band plan using unpaired blocks of 10 MHz. The proposed blocks sizes are compatible with 3GPP standards for both LTE and 5G deployments. As noted by the Department in the Consultation, the proposed band plan does not preclude the licensing of

aggregated packages of multiple 10 MHz blocks. The ability of service providers to aggregate multiple blocks into larger contiguous blocks of spectrum will be very important for the effective deployment of 5G services.

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

66. SaskTel does not believe that additional measures should be imposed at this time by the Department to limit potential interference issues between adjacent TDD systems using the proposed band plan. It would be best for network operators to coordinate amongst each other the appropriate measures that need to be taken to mitigate interference between TDD networks. This would give the operators the flexibility to select the most appropriate measures to mitigate interference and to optimize their networks. These measures could include network synchronization, the implementation of guard bands, or other appropriate measures.
67. It is expected that wireless network operators would be required through conditions of licence to coordinate with operators of nearby TDD-based systems operating in the same or adjacent frequency block(s), and that it would be up to the operators to come to a mutually agreeable solution.
68. The Department should only become involved with these discussions in the unlikely event that the network operators cannot come to an agreement.

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

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.

69. SaskTel agrees with the proposal by the Department to issue all new flexible use spectrum licences, to both new and incumbent licensees, at the same time. This will give the opportunity for each licensee to enter the market at approximately the same time, and not provide an unfair competitive advantage to an individual licensee. This level playing field will allow for fair competition amongst licensees in this band, to the benefit of all Canadians.

70. SaskTel also agrees with the Department's proposal to allow incumbent licensees that do not intend to provide mobile services to continue to be issued fixed spectrum licences on an annual basis until they are required to transition as per the transition plan, as discussed in section 6.10 of the Consultation.

6.9 Future licensing process in the 3500 MHz band

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.

71. The 3500 MHz band is developing into a global 5G band, and as stated numerous times in consultation comments by different parties, this band is becoming very important for mobile wireless service providers. Because of the high profile of this band for 5G, it is extremely important that a price discovery mechanism be utilized in the auction licensing process to ensure that the spectrum is auctioned in the most effective manner.
72. Because of the widely varying number of incumbents in the different service areas, there will be a wide variation in the number of spectrum blocks available for auction in each of the service areas. The complexity of the large and varying number of spectrum licences being auctioned is compounded by the variations in population counts and market conditions in each of the Tier 4 service areas.
73. Given the large number of licences being auctioned and the complexity of the licence structure, it will not be possible for bidders to effectively express their value of the multiple spectrum licences being auctioned without a price discovery process. Auction formats without price discovery, e.g. single round bid formats, will amount to bidders essentially submitting wild guesses on the spectrum values, making for a very inefficient mechanism to auction these important spectrum licences.
74. The 3500 MHz band will be the first auction of 5G spectrum in Canada, and as noted by SaskTel this band will likely become a global 5G band. For spectrum as important as 3500 MHz, auction winners cannot be determined through guessing and luck. This would not do justice to this high-profile spectrum.

75. Without an effective auction process that includes price discovery to fairly and properly determine auction winners, there cannot be a level playing field amongst bidders and service providers, and this will hinder and impede proper competition in the market place.
76. SaskTel understands that utilizing an auction process with price discovery will make the auction process more complex, and therefore could delay the timing of the auction. However, the importance and benefits of the price discovery process far outweigh the drawbacks created by a delay in the auction schedule.
77. Conducting an auction licensing process without a price discovery mechanism would do injustice to the licensing of this crucially important spectrum band for 5G. The lack of a price discovery process would not promote competition, but in fact would hinder or even obstruct fair competition.
78. For these reasons, price discovery is extremely important in the licensing process for flexible use licences in the 3500 MHz band, and SaskTel recommends that the Department conduct an auction licensing process that includes price discovery for this band.
79. One method of reducing the complexity of the spectrum auction is to use a less complex auction format that still includes price discovery, such as the Simultaneous Multiple Round Auction (SMRA) format. The SMRA format is far less complex than the Combinatorial Clock Auction (CCA) formats that the Department has been using lately. The Department has stated in the Consultation the concern that the time required to develop auction software will delay the start of the auction. Without all of the complexities of the CCA formats (such as package bidding, second price rules, etc.), the time required to develop auction software for the SMRA format will be far less than for any of the CCA formats. This in turn will reduce the risk of a delay in the auction schedule.
80. The risk of exposure has often been cited as a major disadvantage of the SMRA format. We believe this risk can be managed. By employing proper auction bidding strategies during the auction, this risk can be greatly reduced. In the worst-case scenario where an auction bidder does acquire undesired spectrum licences, these licences can be sold on the secondary spectrum market. With the

expected high demand for the 3500 MHz spectrum, there will be no shortage of buyers for spectrum licences.

81. SaskTel believes that the SMRA format would be the appropriate choice for the 3500 MHz spectrum auction. It includes a price discovery process that is essential for the effective auction of a large number and complex group of spectrum licences. The SMRA format is far less complex than CCA auction formats, allowing for greatly reduced auction software development time. The risk of exposure cited as a disadvantage of the SMRA format can be mitigated or at least reduced through effective auction bidding strategies.

6.10 Transition plan for incumbents of the 3500 MHz band

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 that include a population centre 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 that include a population centre 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**

82. As stated in the Consultation, the objectives of the transition plan are to provide timely access to flexible use spectrum for deployment of new 5G technologies, while still accommodating the continued provision of existing fixed wireless broadband services. The proposed transition policy is based on a principle of transition “where and when necessary”, allowing incumbent licensees to continue operating where they are not preventing deployments by new licensees. SaskTel agrees with the objectives and principles of the transition plan, as it provides a balanced approach for transition of both new and existing wireless services.

83. SaskTel agrees with the approach of employing a notification process whereby specific incumbent operations that are preventing new deployments would be

identified by the new flexible licensee, allowing the Department to issue displacement notices when required based on the timeline of new flexible use deployments.

84. We understand and agree with the requirement to provide notification and protection periods, although as explained below SaskTel has some concerns with the length of some of these time periods. Wireless network operators require time to transition their networks, including time to plan, design, and install new equipment if a network technology upgrade is required.
85. SaskTel agrees with the proposal to impose different protection and notification periods for different service areas, i.e. large urban population centres (populations greater than 100,000 people), and Tier 4 service areas with and without a population centre of more than 30,000 people.
86. Deployment of 5G mobile systems will almost certainly take place in large urban areas first, and SaskTel agrees with the minimum 6-month notification and protection periods proposed for the large urban population centres. There will be strong competitive pressures to install 5G mobile systems in the larger cities first, and it is very important that these deployments not be unnecessarily delayed.
87. The Department has proposed a minimum one-year notification period for all sites outside of the large urban population centres. SaskTel agrees that the proposed one-year notification period should be sufficient to allow time for incumbent licensees to transition their operation.
88. For all sites outside of the large urban population centres, the Department has proposed a minimum protection period of two years. For Tier 4 service areas without a population centre of at least 30,000 people, the proposed protection period is a minimum of three years.
89. Although the two-year protection period is appropriate, particularly for rural installations, the three-year protection period is too long, and is just not reasonable. When considering the fact that incumbent licensees are aware, or should be aware, as of the publishing date of the Consultation, that they are going

to be required to transition their operations, the incumbents will have plenty of lead time to plan, design, perhaps finance, and complete their transition.

90. From the Consultation, published June 2018:

ISED notes that the incumbent licensees will be required to reduce their spectrum holdings and transition to different frequencies in the new band plan.⁴

91. The Minister of Innovation, Science and Economic Development, the Honourable Navdeep Bains, PC, MP, announced during a speech at the 2018 Canadian Telecom Summit that the Department is planning to conduct the 3500 MHz spectrum auction sometime in 2020.⁵ It is reasonable to assume that if the auction does take place in 2020 as planned, that flexible use licences resulting from the auction could be issued as early as the latter half of 2020.

92. The proposed three-year protection period for rural Tier 4 service areas would then extend protection to 2023. That is five years from the first notification to incumbents in June 2018 that transition will be required. Five years is an eternity in the telecommunications industry, and this is an unreasonably long period of time to expect new flexible use licensees to have to wait to deploy their spectrum.

93. SaskTel is concerned that the long protection periods for rural Tier 4 service areas will impact SaskTel's potential plans to provide either LTE or 5G fixed wireless broadband services to rural residents. SaskTel is already providing fixed wireless broadband services in rural areas using 2500 MHz spectrum, but more capacity is required to meet high customer demands for bandwidth, and SaskTel sees the 3500 MHz band as an ideal band to provide additional capacity for our rural fixed wireless broadband service. Growth in rural customer demands for bandwidth are growing far too rapidly to have to wait up to five years to deploy new spectrum.

94. Therefore, SaskTel recommends that the protection period for all sites outside of large urban population centres be no more than two years. This includes all Tier 4 service areas, both with and without population centres of 30,000 people.

⁴ The Consultation, section 6.6, paragraph 43.

⁵ The text of the speech can be found at <https://www.canada.ca/en/innovation-science-economic-development/news/2018/06/2018-canadian-telecom-summit.html>

Considering the advance notice already given by the Department in June 2018, this is clearly enough time to plan, design, and implement required network transitions.

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.

95. As detailed in our response to Q11 above, SaskTel is in agreement with the objectives and principles of the proposed transition plan, including the use of protection and notification periods. SaskTel is in agreement with the proposed protection and notification periods, except for the protection period for rural Tier 4 service areas.
96. SaskTel recommends that the protection period for incumbents in rural Tier 4 service areas (i.e. Tier 4 service areas without a population centre of at least 30,000 people) be no more than two years. This matches the proposed protection period for other Tier 4 service areas. As detailed in our response to Q11 above, a protection period of two years is more than enough time for network transition, even in rural areas, when consideration is given to the total lead time that has been provided to incumbent licensees. Incumbent licensees would be wise to begin planning and preparations for transition now, as the Department has noted in the Consultation published June 2018 that they will be required to transition. Given expected auction timelines, a two-year protection period for rural Tier 4 service areas would protect incumbents until circa 2022, or a total of 4 years from the initial June 2018 notice. Four years is more than enough time to plan, design, and implement a network transition.
97. Therefore, for these reasons SaskTel is recommending a protection period of no more than two years for all Tier 4 services areas, both rural and non-rural.

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

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.

98. Although the new LTE and 5G technologies are quite robust in terms of mitigating external interference sources, more studies will have to be conducted to fully characterize the interference risk, and actual field tests may be required. The impact of the interference on the LTE and 5G networks will likely be a degradation in performance, either in coverage or capacity, or perhaps both. The real question is what is the magnitude and duration of this degradation, and will it have an impact on customer experience? This depends largely on the magnitude and duration of the interfering signal.
99. Full characterization of the impacts on LTE and 5G network performance from interference from radiolocation services requires detailed information on the characteristics of the radiolocation waveform, transmitter power, and other parameters.
100. Since the stated objective is to protect radiolocation services from interference,⁶ SaskTel is more concerned about interference into radiolocation services, rather than interference into LTE and 5G networks. This is because the latest generation of LTE and 5G radiocommunication receivers are likely more robust than radiolocation receivers.
101. SaskTel believes that in most parts of the country it will be possible to reduce or mitigate the risk of interference from radiolocation sources through geographical separation. Where geographical separation is not possible, then LTE or 5G network designs and configurations could potentially allow this risk to be managed. For example, LTE or 5G RF carriers in the 3400-3450 MHz band could be combined with other frequency bands and blocks using carrier aggregation techniques. Should interference from a radiolocation source occur, the result would be a reduction in performance and data throughput, but not a loss of service. This might be manageable by the network operator.

⁶ The Consultation, section 6.5 paragraph 39

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

7.3 *Future changes to 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.

102. SaskTel has reviewed the licensing policies and procedures for the WBS (3650-3700 MHz) band. SaskTel also notes that vendors are manufacturing equipment suitable for providing fixed wireless broadband services in the WBS band. As noted by the Department in the Consultation⁷, there appears to be a significant uptake and a fairly large number of licences issued in this band. Those licensees that have deployed are mostly providing wireless broadband services to rural and remote communities.
103. The policies and procedures for the WBS band state that new installations must be coordinated between licensees. The Department has recognized that there have been some challenges in this coordination process between licensees.⁸
104. Despite the licensing process in place, SaskTel believes that the risks of interference in the WBS band, either currently or in the future, are very similar to the risks of interference when operating in a licence-exempt band. Operators in the WBS band wishing to maintain a high quality of service to their customers will always face the possibility of interference in the future, and will have to constantly manage this risk.
105. SaskTel strongly believes that a database model will not be appropriate for the 3650-3700 MHz WBS band, either now or in the future. The use of a database model will only complicate the licensing and installation processes, and will raise equipment costs. This will therefore raise both the operating and capital costs for WBS operators. More importantly, SaskTel does not believe the use of a database model will solve interference issues completely. There will always be a risk of either future interference, or the risks of reduced network performance and coverage caused by future deployments by other WBS operators. Utilizing a

⁷ Ibid, section 7.2, paragraph 84

⁸ Ibid, section 7.3, paragraph 89

database model will only increase costs and hinder operators in trying to serve their customers, without solving any problems.

106. The Spectrum Access System (SAS) in the United States is only being developed because of the large number of incumbent users of the spectrum that must be protected from interference. SaskTel notes that there are no such incumbents in Canada, and therefore no need for the development or use of any database model for the WBS band in Canada.

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

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

107. Currently SaskTel utilizes the 3700-4200 MHz C band for FSS satellite services to provide the following services:
- Voice telephony services to two very isolated communities in northern Saskatchewan
 - IP-based WAN data services to 19 remote communities, where fibre or other terrestrial facilities are either too costly or simply impractical.
 - Broadcast video distribution to approximately 260 communities in Saskatchewan.
108. SaskTel requires continued access to C band FSS spectrum for delivery of telecommunications voice trunking, IP-based services, and broadcast video for remote and northern locations. Demand for these services is expected to remain flat or slightly increasing for the next 3 to 8 years. This depends on network and technology evolutions both at SaskTel and in the satellite industry.
109. SaskTel expects that low-earth orbit (LEO) satellite-based service offerings will, over the long term, supplant C band FSS requirements for trunking and IP services. New LEO service offerings are promising lower cost delivery of broadband services with very high data rates. We estimate that these transitions to LEO technologies may take place in the 2021 to 2025 time frame. The time frame however will depend upon the launch and deployment schedule for the LEO constellations, as well as the pace of transition of services from C band

geostationary earth orbit (GEO) FSS satellite service to new LEO satellite technology.

110. Despite the long-term prognosis for the C band, the 3700-4200 MHz band is currently very important, and will remain important in the near-term future for FSS operations for SaskTel. SaskTel must continue to have access to the C band FSS spectrum until new satellite-based alternatives, such as LEO systems, are available and the business case justifies the transition to new technologies.

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.

111. SaskTel recommends that operators of unlicensed satellite earth stations (e.g. television receive-only or TVRO sites) be required to submit their technical parameters to ISED to assist in spectrum planning and frequency management. It is very important that the Department have a complete picture of the current utilization and future demand for FSS services in the 3700-4200 MHz C band spectrum in order to properly plan and manage proposed transitions to flexible use services in this spectrum, and protect incumbent services.
112. For example, as noted above, SaskTel provides video distribution services to approximately 260 communities in Saskatchewan.
113. Considering that most of the unlicensed TV receive only (TVRO) satellite stations across the country are likely serving cable head ends that are providing video services for an entire community, it is important, that as an incumbent C band FSS user, these video distribution services be protected.
114. Therefore, SaskTel recommends that operators of unlicensed earth stations in the 3700-4200 MHz band be required to submit their technical parameters to the Department so that proper policy decisions can be made to manage the C band spectrum, including transitions and sharing with flexible use systems, while still protecting incumbent satellite services, including unlicensed operations.

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).

115. In order to properly optimize the use of the 3700-4200 MHz band, a complete picture of the current usage of the band is required, as well as future plans for these services. This includes unlicensed operations, and as noted in our response to Q16, the Department should require operators of unlicensed satellite earth stations (e.g. TVRO stations) to submit technical parameters so these operations can be included in spectrum planning and management.
116. The Department should initiate a process to collect information on all current usage of the band, including services being provided, as well as any future plans for when these services might be expected to migrate or evolve to new technologies and/or different spectrum bands. This information can be used to estimate the demand for C band spectrum over the longer term. SaskTel expects some or most of the FSS services currently being provided in the C band via GEO satellites will migrate to new LEO satellite technologies. The time frames for these transitions to LEO technologies however are presently only estimates.
117. Because of the ubiquitous geographical distribution of existing C band satellite earth stations, the use of exclusion zones will likely not be an effective method of spectrum sharing between FSS stations and new flexible use systems. The more appropriate mechanism would be by dedicating a portion of the band for new flexible use systems, with FSS satellite systems dedicated to the other portion of the band. The amount of spectrum that could be dedicated for flexible use would depend of course on the level of demand for FSS C band services, and the amount of spectrum required to meet the demand for these FSS services. This will very likely require FSS services to change frequencies within the 3700-4200 MHz band.
118. Incumbent FSS satellite services should be allowed to continue operating in the C band spectrum until they can be transitioned to new technologies such as LEO satellite systems.

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.

119. It is well established that flexible use systems, which includes mobile services, cannot co-exist well with FSS satellite systems. The alternatives for coexistence for the two services to share the 3700-4200 MHz band include either through geographical separation (i.e. exclusion zones) or a frequency band division. Because of the ubiquitous geographical distribution of the large number of existing C band FSS stations, an approach using exclusion zones will likely not be effective.
120. Therefore, the only reasonable method for coexistence would be to divide the spectrum into blocks dedicated for each service. The size of the required blocks for the FSS services directly depends on the amount of spectrum required to meet the demand for C band FSS services. In our response to Q17, SaskTel believes that the Department should initiate a study to quantify the demand for C band FSS services, the spectrum required to meet that demand, and the options and time frames of future plans to evolve or migrate these services to newer more advanced technologies such as LEO systems.

CONCLUSION

121. SaskTel has reviewed the Consultation with the Department's proposed changes and revised policies for the 3450-3650 MHz (3500 MHz) band, and the 3650-4200 MHz (3800 MHz) band to accommodate flexible use for fixed and mobile services. As a regional based service provider, SaskTel has provided the Department input, suggestions, and recommendations on the questions raised in the Consultation.
122. Along with our input and comments, SaskTel has recommended that:
- The Department issue flexible use spectrum licences to eligible incumbent licence holders utilizing Option 1 as detailed in the Consultation. This provides a fair exchange for the spectrum licences, considering the higher value of flexible use licences. Incumbent licence holders must not be allowed to unfairly receive a windfall of highly value flexible use spectrum licences in the highly competitive wireless market.

- An auction process be utilized for new 3500 MHz flexible use spectrum licences that includes a price discovery process. Because of the extremely high importance of the 3500 MHz band, and the widely varying amounts of spectrum to be made available in the different service areas due to the presence of incumbent licence holders, it is crucial that a price discovery process be employed. SaskTel is well aware that this will complicate the auction process and possibly create delays, but the need for a price discovery process far outweighs the risks of delays.
- In order to reduce the complexity of the spectrum auction, and reduce the risk of delays, SaskTel recommends that the Department use the SMRA auction format. The SMRA format includes a price discovery process that is essential for the effective auction of a large number and complex group of spectrum licences. The SMRA format is also far less complex than CCA auction formats, allowing for greatly reduced auction software development time.
- SaskTel recommends transition protection periods for incumbent operations of no more than two years for all sites outside of large urban population centres. Considering the public attention focused on the 3500 MHz band, and the publication of the Consultation in June 2018, and the plans by the Department to hold the auction in 2020, a two-year protection period will provide a four year period (from 2018 to 2022) to plan and implement a transition. Four years is far more than enough time for incumbents to implement a transition, even in rural regions.
- The use of a database model is not recommended for the 3650-3700 MHz WBS band. Using a database model will add cost and complexity to network deployments in this band, without really reducing the risks of interference or solving any problems.
- SaskTel recommends that operators of unlicensed earth stations (e.g. TVRO sites) be required to submit their technical parameters to the Department so that this information can be included in studies of the usage and future demand for C band spectrum for FSS services. The Department needs to compile a complete picture of the scope of use and demand for the 3700-4200 MHz C band for FSS satellite systems. This includes the collection of data for all users, and the feasibility and timelines

for transition to newer satellite technologies such as LEO offering higher capacity and better performance. The C band study must include unlicensed TVRO operations as well in order to gain a complete picture of the C band spectrum.

- SaskTel recommends that any sharing of the C band spectrum between flexible use mobile and FSS systems be implemented through a division of the spectrum, whereby blocks of the band are dedicated for either flexible use mobile or FSS. The size of the dedicated blocks for FSS will depend on the amount of spectrum required to meet the demand for FSS services currently being provided.

123. SaskTel is pleased to have had the opportunity to provide our inputs and comments to the important issues raised in this Consultation, and hopes that our submission will provide a fuller view of these issues to the Department.