Introduction

1. 9496041 Canada Inc. (doing business as NorthStar) is pleased to provide comments on the Innovation, Science and Economic Development (ISED) "Addendum to the consultation on releasing Millimeter Wave Spectrum to support 5G" SLPB-005-18.

2. NorthStar is a Canadian controlled, Montreal-based company that will provide innovative satellite-based earth observation and space object tracking services to a global client base. Forty NorthStar satellites will operate in multiple planes in near-polar, low earth orbits (500-700 km) and will feature hyperspectral, infrared and optical sensors, plus extensive use of inter-satellite links.

3. The NorthStar system will provide many significant benefits to Canada and Canadians. Beyond the obvious benefits of having such a global system operated out of Canada, NorthStar's hyperspectral sensors in particular will greatly enhance mankind's ability to monitor our planet and provide dramatically improved predictive analysis in such areas as agriculture, forest management, mining, and pipeline monitoring to name but a few.

4. NorthStar sensors will in essence continuously "film" the earth in a wide variety of frequency bands to analyze the surface chemistry of the planet. This transformative near real time monitoring of our planet will generate very large volumes of data (petabyte plus class) and will depend in large measure on the availability of suitable spectrum for high capacity communication downlinks and inter-satellite links.

5. NorthStar's strategy to obtain the downlink spectrum it needs is to locate its earth stations primarily in northern Canadian locations where there is little or no competition for use of the required spectrum. NorthStar intends to operate portions of its downlinks and inter-satellite links in the 26 GHz band currently allocated to EESS services and as such this consultation is relevant to us.

6. NorthStar's responses to the questions raised in ISED's consultation paper are below.

Question A1: ISED is seeking comments on the development of a flexible use licensing model for fixed and mobile services in the 26 GHz band (in addition to the bands currently under consultation through the mmWave Consultation), taking into account the timing of WRC-19,

5G technology standards development, international ecosystems and harmonization of spectrum use with other countries.

Response A1: Given the current evolution of technology and the need to maximize the use of scare spectrum resources, NorthStar supports the concept of both flexible use and shared use of this spectrum. However, sharing spectrum between different applications such as EESS and terrestrial 5G will require careful application of the right technology and comprehensive deployment planning within a well thought-out regulatory framework.

Question A2: ISED is seeking comments on the changes proposed above to introduce flexible use licensing in the 26 GHz band, including the ensuing changes to the CTFA Canadian footnotes and the policy on this band contained in SP 3-30 GHz, Revisions to Spectrum Utilization Policies in the 330 GHz Frequency Range and Further Consultation.

ADD CXX: In the frequency band 26.5-27.0 GHz, use of spectrum for fixed service systems and mobile service systems will be given priority over Earth exploration-satellite service systems and space research systems sharing this spectrum on a co-primary basis. Earth explorations-satellite service and space research service implementation in this band will be limited to applications that will pose minimal constraints upon the deployment of fixed service systems and mobile service systems

Response A2: While NorthStar is in general agreement with the concept of spectrum sharing, we have specific concerns with the proposed new footnote above. The proposed wording of that footnote appears to imply in part that terrestrial systems will have a near absolute priority over earth-exploration satellite systems, such that EESS may only impose “minimal constraints” on other users of this band. This approach may have some logic when applied in heavily populated areas where new systems (e.g. 5G) could be of great benefit to a large, widespread population and EESS ground stations might be few and far between. However, the regulations should allow for a more refined analysis in other scenarios, such as NorthStar’s plan to locate ground stations in remote areas of Canada.

One of NorthStar’s express purposes in locating ground stations in remote areas is to avoid competition for spectrum. Should NorthStar’s EESS ground station operations come into conflict with terrestrial users of this band (e.g. 5G) in sparsely populated areas, regulations should allow for an appropriate balance to be struck between NorthStar’s significant investment in its ground infrastructure and its operations in support of important global

missions verses the appropriate provision of new terrestrial services in remote areas. An alternate wording of the footnote could be:

> *" … will be limited to applications that will pose ~~minimal~~ only appropriately balanced constraints upon the deployment of fixed service systems and mobile service systems …"*

Question A3: ISED is seeking comments on the importance of harmonizing the Canadian band plan with the United States in the 26 GHz and 28 GHz bands, recognizing that the 26 GHz band is not available for 5G services in the United States at this time.

Response A3: While Northstar recognizes that the primary thrust of this question relates to 5G terrestrial service, we would like to ensure that Canada does not adopt a more restrictive policy for EESS in the same spectrum at 26 GHz.

Question A4: ISED is seeking comments on the minimum block size that should be made available for the 26.5–28.35 GHz band. Is it necessary that the frequency blocks be multiples of the 3GPP channel bandwidths (50 MHz, 100 MHz, 200 MHz and 400 MHz)?

Response A4: NorthStar has no comments on the minimum block sizes applicable terrestrial systems using the 3GPP standards.

Question A5:

A. ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services in the 26.5–27.5 GHz band to ensure coexistence with ISS.

B. If limits are proposed, ISED is inviting detailed proposals on what the limits should be, and why they should be implemented.

Response A5 A&B: Until the RSS for terminal devices are finalized for 26 GHz 5G, it is difficult (and hence, premature) to determine the specific impact on inter-satellite links. This item should be re-visited once the 5G specifications are approved.

Question A6:

A. ISED is seeking comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and EESS/SRS earth stations in the 26.5–27.0 GHz band when a pre-determined trigger threshold is exceeded.

B. If the proposed site-by-site coordination is supported, what coordination trigger and value would be the most appropriate (e.g. power flux density or distance threshold)? C. ISED is also inviting proposals for specific additional technical rules for flexible use terrestrial stations and EESS/SRS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.

Response A6 A&B: Northstar concurs that site by site frequency coordination should be required. EESS systems typically employ a limited number of earth stations, so in principle it is both technically and logistically possible to coordinate for each such site. For NorthStar's specific case, NorthStar's earth stations will largely be in northern locations so coordination should not be burdensome on terrestrial operators. Both a distance threshold and a PFD limit may be required. An example is that if the EESS earth station is located more than XX kilometers from a planned terrestrial deployment no coordination is required however if closer than the distance limitation, a PFD limit may be required. It is in our view still too early to set specific values for XX and the PFD limit since the final specifications for mm wave systems in Canada (RSS) have not been set.

Question A7:

A. ISED is seeking comments on whether there should be restrictions on the geographic areas in which new EESS and SRS earth stations can be deployed in the 26.5–27.0 GHz band.

B. If geographic restrictions on EESS and SRS earth stations are proposed, ISED is inviting detailed proposals on how they could be implemented, and what areas should be targeted.

Response A7 A&B: Predefining a geographic restriction (i.e. exclusion zone) for EESS or SRS earth stations may limit deployment of the emerging earth observation technologies like NorthStar, that the world needs to monitor and police compliance with national and

international environmental regulations, among other objectives. Provided frequency coordination procedures are well established and followed, there should not be any restrictions on EESS or SRS earth station locations.

Question A8:

A. ISED is seeking comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the 27.0–28.35 GHz band when a pre-determined trigger threshold is exceeded.

B. If the proposed site-by-site coordination is supported, what coordination trigger and value would be the most appropriate (e.g. power flux density or distance threshold)?

C. ISED is also inviting proposals for specific technical rules for proposed flexible use terrestrial stations and FSS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.

Response A8 A,B&C: Question 8 relates to FSS earth stations. NorthStar will not operate FSS stations and therefore has no comments.

Question A9:

A. ISED is seeking comments on whether there should be restrictions on the geographic areas in which new FSS earth stations can be deployed in the 27.0–28.35 GHz band.

B. If geographic restrictions on FSS earth stations are proposed, ISED is inviting detailed proposals on how they could be implemented, and what areas should be targeted.

Response A9 A,B&C: Question 9 relates to FSS earth stations. NorthStar will not operate FSS stations and therefore has no comments.

Question A10:

A. ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services in the 27.0–28.35 GHz band to ensure coexistence with FSS space stations.

B. If limits are proposed, ISED is inviting detailed proposals on why they should be implemented, and what the limits should be.

Response A10 A&B: Question 10 relates to FSS space stations. NorthStar will not operate FSS stations and therefore has no comments.

Question A11:

A. Further to section 9 of the mmWave Consultation, are there any new considerations or suggested approaches regarding the licensing of flexible use mmWave spectrum, given the addition of the 26 GHz band?

Response 11: NorthStar has no further considerations at this time.