EXHIBIT B

RADIATION HAZARD ANALYSIS

Overview

This Radiation Hazard analysis calculates the levels of non-ionizing radiation emitted from Northwood Space Corporation's ("Northwood") gateway earth station in Bismarck, ND.[1] The calculations are performed in accordance with 47 CFR § 1.1310(d) and (e) and the Federal Communications Commission's ("FCC" or "Commission") Office of Engineering and Technology ("OET") Bulletin 65. This analysis covers transmission capability in the 2025–2110 MHz band only, consistent with Northwood's application for Part 25 Earth Station Licensing.[2]

The Commission's rules[3] specify two separate tiers of exposure limits:

1. Occupational/Controlled Exposures
    a. Apply in situations where persons are exposed as a consequence of their employment, have training, and are fully aware of and can control their exposure.[4]
    b. Maximum Permissible Exposure (MPE) limit of no greater than 5 mW/cm^2 for an average of 6 minutes.[5]

2. General Population/Uncontrolled Exposures
    a. Apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.[6]
    b. MPE limit of no greater than 1 mW/cm^2 for an average of 30 minutes.[7]

Using the analysis and equations found in the OET Bulletin 65,[8] this report analyzes the maximum power density levels in the vicinity of an antenna in three regions: the far field, the near field, and at the main antenna surface. This analysis finds that using Northwood's proposed site layout, both Controlled Exposures and Uncontrolled Exposures limits are met with proper mitigations enacted.

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[1] NAD83 Coordinates of 46° N 52' 56.1'', 100° W 48' 17.4''.

[2] *See* ICFS File No. SES-LIC-20260426-01141.

[3] *See* 47 C.F.R. § 1.1310(d) and (e).

[4] *See id.* § 1.1310(e)(2).

[5] *See id.* § 1.1310(e)(1).

[6] *See id.* § 1.1310(e)(3).

[7] *See id.* § 1.1310(e)(1).

[8] Cleveland, R. F., Jr., Sylvar, D. M., Ulcek, J. L., Standards Development Branch, Allocations and Standards Division, Office of Engineering and Technology, & Federal Communications Commission. (1997). Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. In OET Bulletin 65 (97th–01 ed.).

Input Parameters

Northwood's earth station has six 2.4-meter diameter parabolic antennas capable of scanning the full 360° azimuthal plane of the station site. Each antenna is operated independently of the others, with a single point of communication operating with a single antenna at a time. The minimum elevation angle for transmission is 5°,[9] ensuring that the main beam of the antenna does not radiate towards the horizon. The antennas have a centerline height of 1.6 meters above ground level.

A frequency of 2025 MHz is used for all analysis, as this provides a bounding worst case due to its longer wavelength compared to 2110 MHz. System parameters that are used in this analysis include:

Frequency (F)	2025	MHz
Wavelength (λ)	0.148	Meters
Diameter of Antenna (D)	2.4	Meters
Power per Transmit Beam (P)	20	Watts
Maximum Antenna Gain (G_{max})	32.70	dBi
Aperture Efficiency (η)	70%	(unitless)
Duty Cycle (ζ)	100%	(unitless)

Antenna Surface

The surface of the antenna holds the highest concentration of fields due to its proximity to the feed of the antenna. Equation 1 calculates the maximum power density at the surface of the parabolic dish, which assumes that the antenna is transmitting at full power. This is the bounding worst-case calculation, as this is the maximum potential radiation that can be emitted from a single antenna.

$$S_{Ant\_Surf} = \zeta * \frac{4*P}{Area} \qquad (1)$$

$$S_{Ant\_Surf} = 100\% * \frac{4 * 20W}{\pi * (1.2m)^2}$$

$$S_{Ant\_Surf} = 17.69 \frac{W}{m^2} = 1.77 \frac{mW}{cm^2}$$

The levels calculated are above the MPE limits for an Uncontrolled Environment but within the allowable limits for Controlled Exposure environment. Uncontrolled Exposure (i.e., general public) is not possible because access to the antenna is controlled by a perimeter fence around the site with a single access gate leading to the location of the antenna. As an additional cautionary measure, Category 2 "NOTICE" signage will be posted at the gate and around the perimeter fence to alert personnel that RF exposure levels beyond this point exceed the general population/uncontrolled exposure limits but remain within occupational/controlled exposure limits, as required by 47 C.F.R. § 1.1307(b)(4). Only authorized personnel of Northwood will be allowed within the perimeter fencing, and all employees at the site will receive training regarding

[9] Consistent with 47 C.F.R. § 25.205.

risks at the site, including exposure to non-ionizing radiation. As further health and safety precautions, if there is to be work done on an antenna located at the site for any reason, such as maintenance or inspection, power to the RF transmitters will be turned off, eliminating any power density that might occur in close proximity to the antennas.

Near Field

The near field region of the antenna is defined as the region generally in proximity to an antenna or other radiating structure, in which the electric and magnetic fields do not have a substantially plane-wave character but vary considerably from point to point. This distance which the near field extends to is between the face of the antenna and the distance found in Equation 2:

$$L_{nf} = \frac{D^2}{4*\lambda} \qquad (2)$$

$$L_{nf} = \frac{(2.4\,m)^2}{4 * 0.148\,m}$$

$$L_{nf} = 9.72\,m$$

The power density in this near field varies according to location in the near-field. However, the maximum value of the near-field, on-axis, power density can be expressed by Equation 3;[10]

$$S_{nf} = \zeta * \frac{4*P}{\eta*Area} \qquad (3)$$

$$S_{nf} = 100\% * \frac{4 * 20W}{70\% * \pi * (1.2m)^2}$$

$$S_{nf} = 25.26\frac{W}{m^2} = 2.53\frac{mW}{cm^2}$$

This maximum value is defined assuming the main beam of the antenna is pointed directly at the target. Since the main beam cannot be formed at elevation angles lower than 5°, an off-axis adjustment can be used. For off-axis calculations in the near-field and in the transition region it can be assumed that, if the point of interest is at least one antenna diameter removed from the center of the main beam, the power density at that point would be at least a factor of 100 (20 dB) less than the value calculated for the equivalent distance in the main beam.[11] As the antenna is over twice the antenna diameter to the perimeter fence around the site (greater than 5 meters), this correction can be used to find the level of radiation at the fence for the general public.

$$S_{nf\_off\_axis} = \frac{S_{nf}}{100}$$

$$S_{nf\_off\_axis} = 0.25\frac{W}{m^2} = 0.025\frac{mW}{cm^2}$$

[10] *See* IEEE Std. C95.3-2021, Section D.4.4

[11] Hankin, N., "The Radiofrequency Radiation Environment: Environmental Exposure Levels and RF Radiation Emitting Sources," U.S. Environmental Protection Agency, Washington, D.C. 20460. Report No. EPA 520/1-85-014, July 1986.

This level is below both the Controlled Environment and Uncontrolled Environment MPE limits.

Far Field

The far field region of the antenna is defined as the region of the field of an antenna where the angular field distribution is essentially independent of the distance from the antenna. In this region (also called the "free space region"), the field has a predominantly plane-wave character, i.e., locally uniform distribution of electric field strength and magnetic field strength in planes transverse to the direction of propagation. The distance at the point where this field takes plane-wave characteristics starts is found using Equation 4:

$$L_{ff} = \frac{0.6*D^2}{\lambda} \qquad (4)$$

$$L_{ff} = \frac{0.6 * (2.4m)^2}{0.148m}$$

$$L_{ff} = 23.33\ m$$

The power density in the far field varies according to location and rolls off as a function of distance squared. Equation 5 calculates the power density at the start of the far-field:

$$S_{ff} = \zeta * \frac{P*G}{4*\pi*L_{ff}^2} \qquad (5)$$

$$S_{ff} = 100\% * \frac{20W * 10^{32.7/10}}{4 * \pi * (23.33m)^2}$$

$$S_{ff} = 5.45\frac{W}{m^2} = 0.545\frac{mW}{cm^2}$$

This power density represents the maximum power density with boresight of the main beam pointing directly at a spot. As the control electronics of the system do not allow any beam to transmit at elevations below 5°, the power density using the off-axis gain is used to find the exposure to a person standing on the ground.

At 5° off boresight, the maximum gain of the transmitting beam while staying compliant with ITU-R S.465-6 is approximately 12.1 dBi, or approximately 16.23 in linear gain. Using this gain, a person standing 23.33 meters from the front of the antenna would see the following power density, with the main beam transmitting at a 5° elevation angle:

$$S_{Off\_Axis} = \zeta * \frac{P * G_{Off\_angle}}{4 * \pi * L_{ff}^2}$$

$$S_{Off\_Axis} = 100\% * \frac{20W * 16.23}{4 * \pi * (23.33m)^2}$$

$$S_{Off\_Axis} = 0.047\frac{W}{m^2} = 0.004\frac{mW}{cm^2}$$

This level is below both the Controlled Exposure and Uncontrolled Exposure MPE limits.

Mitigations

The analysis shows a single region near the antenna surface that exceeds the Uncontrolled Environment/General Public MPE limits. The Commission has defined categories for different exposure limits.[12]

Table 1. FCC Exposure Limit Categories

<10	W/m^2	FCC Category 1	Uncontrolled / General Public
>10 & <50	W/m^2	FCC Category 2	Controlled / Occupational
>50 & <500	W/m^2	FCC Category 3	Up to 10x Occupational
>500	W/m^2	FCC Category 4	

The area near the surface of the antenna[13] classifies as a Category 2 area. 47 C.F.R. § 1.1307 requires the following precautions for Category 2 areas:

> "Category Two—NOTICE: Mitigation actions are required in the form of signs and positive access control surrounding the boundary where the continuous exposure limit is exceeded for the general population, with the appropriate signal word "NOTICE" and associated color (blue) on the signs."

As discussed in previous sections, if there is a need for a Northwood employee to be near the antenna (defined as within a distance of D, or 2.4 meter) for any reason (maintenance, inspection, etc.), power to the RF transmitters will be turned off, eliminating any power density that might occur in close proximity to the antennas. All employees will also undergo site-specific training informing each employee how to operate the system, including locations of power turn-off switches in case of emergency.

Further, as mentioned above, Northwood will take the additional precaution of placing Category 2 signage on the perimeter fence and at the entrance gate to the site, warning of the dangers of being near a transmitting antenna, in hopes of deterring any unexpected intrusions on the site, however unlikely this may be.

Conclusion

Northwood has used power density calculations in the previous sections consistent with approved Commission bulletins to perform initial site analysis and has identified regions where power

[12] See 47 C.F.R. § 1.1307(b)(2).

[13] Within the 2.4-meter zone for antenna surface power density calculations

density levels may exceed MPE limits. As shown in this analysis, the general public will always be kept below the 1 mW/cm^2 Uncontrolled Exposure limit, and radiation from this earth station antenna will not harm the general public. For all Northwood employees, training will be conducted to make all persons aware of the dangers of RF radiation and informed of all operations that occur on site. Northwood has implemented further mitigations to ensure all employees are kept below the Occupational/Controlled Exposure limits by ensuring the cessation of all transmissions if access to the antenna is needed and by placing appropriate Category 2 signage on the perimeter fence and at the entrance gate to the site.

Northwood is committed to the safety of all employees and the public as a whole and hopes that the analysis done in this report addresses any concerns about RF exposure from Northwood's Earth Station antenna.