Assessment of Radio Frequency Emissions Around Villenova, NY

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Prepared for New Leaf Energy, Inc.

By

Smith and Fisher, LLC.

Kyle T. Fisher
Kevin T. Fisher

4791 Wintergreen Court
Woodbridge, VA 22192

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INTRODUCTION

This report has been prepared in response to a requirement set forth by the Town of Villenova, New York, to assess the potential interference impact of a proposed wind turbine installation to be located off Route 83 and South Hill Rd near Hamlet, New York, on the surrounding radio frequency environment. The primary focus of this investigation is within a specific portion of the radio frequency (RF) spectrum ranging from 2 MHz to 200 MHz, given its relevance for potential interference concerns in the vicinity. These frequencies cover broadcast operations, Land Mobile and cellular uses and microwave point to point communications. Due consideration will also be accorded to avionic frequencies employed by proximate airports and any nearby ground radar installations to ensure comprehensive coverage of potential sources of RF disruption.

As the proposed wind turbine has the potential to generate 60 Hz alternating current (AC) energy, with the produced voltage being fed into step-down transformers, there exists a possibility for the generation of RF noise from the turbine. Our past experiences with RF interference studies, predominantly conducted using a spectrum analyzer and an omni-directional antenna, form a reference point for this investigation.

This report seeks to evaluate any potential adverse impacts on turbine-generated electromagnetic signals and consider confounding factors such as attenuation and multi-path distortion. The wind turbine's elevation above the surrounding terrain potentially compounds the concerns that its spurious emissions could elevate the detectable noise floor in the vicinity of the site.

Finally, the data gleaned from this RF analysis of the wind turbine installation will serve as a critical point of reference for addressing any future RF interference scenarios. Our objective is to ensure that the development of renewable energy resources such as wind turbines is conducted harmoniously with the existing radio frequency landscape.

BACKGROUND

There are many different technologies and methods of communication that contribute to the specific RF (radio frequency) environment in a given location, each operating within its own allocated frequency band:

- Television (TV): Terrestrial digital TV broadcasts operate in the very high frequency (VHF) and ultrahigh frequency (UHF) frequency bands (54-608 MHz). Satellite television operates in the super high frequency (SHF) band. These stations can occupy large bandwidths, sending out both video and audio signals to households. Their signals often require powerful transmitters and thus, if located close to a given area, can contribute substantially to the RF environment.

- FM Radio: Frequency Modulation (FM) radio operates within the VHF frequency band (between 88 and 108 MHz). These stations can propagate sound information (mostly music and talk) over a large area. Its signals can contribute to the RF environment in a large area but often have more limited range than AM signals.

- AM Radio: Amplitude Modulation (AM) radio operates in the MF band (around 535 to 1605 kHz). AM radio signals can travel far distances because their propagation occurs along the ground and is dependent on the conductivity of the earth along which the signal travels. In addition, AM signals can travel hundreds and thousands of miles due to it being reflected off a layer of the atmosphere called the ionosphere (which forms at sunset and dissipates at sunrise). Although the audio quality is lower than it is for FM stations (due to manmade electrical noise), these stations can be beneficial for voice-centric broadcasts such as talk shows and news.

- Land Mobile Radio (LMR) Systems: LMR systems are used by emergency services, businesses, and other organizations for short-range communications. These systems typically operate in VHF or UHF bands. They often use repeaters to increase their range and can significantly contribute to the RF environment, especially in urban areas.

- Cellular Networks: Cellular networks contribute significantly to the RF environment. They use multiple frequency bands ranging from UHF for second and third generation (2G/3G) services up to SHF for the newest fifth generation (5G) services. Cell base station antennas are scattered throughout populated areas, constantly transmitting signals to and from mobile devices.

- Microwave Paths: Microwave point-to-point links are prevalent in telecommunications, transmitting data, voice, and video between fixed points. They operate between 6 GHz and 80 GHz. The primary path or main beam concentrates most energy directed at the receiving antenna, affecting only devices in its direct path. Side lobes, smaller peaks of radiation at angles away from the main beam, can cause interference if other systems are operating near them. Signal strength drops sharply due to free-space path loss as distance from the transmitter grows.

- Airport Communications: Airport communications also play an important part in the RF environment. They use a variety of systems for different purposes, including navigation, air traffic control, and airport operations, all using different portions of the RF spectrum. These systems include VHF for aircraft communications, SHF for radar systems, and even higher frequencies for satellite-based systems.

Each of these systems generates a significant amount of RF energy, which together forms the RF environment in a given location. The RF environment is continually monitored and regulated by the Federal Communications Commission to avoid interference between different systems that could lead to failures in the communication services.

RF Environment

Television Stations

Broadcast television signals, being a form of electromagnetic energy, can significantly contribute to the radio frequency environment within a 50-mile radius of their transmitter site. Here's a summary of the effects:

- Occupies Spectrum: Television stations occupy a specific 6 MHz channel within the VHF or UHF frequency spectrum, based on regulations defined by the Federal Communications Commission (FCC) in the United States. This spectrum is allocated to a specific broadcast station to avoid interference with other signals in the same or adjacent frequency bands in the same market or adjacent television market.

- Interference: If not properly regulated, the high-power signals can cause interference with other radio/television services operating within the vicinity of the transmitter. This interference can manifest as noise or distortion to other devices that operate in the same or nearby frequency bands.

- Coverage and Signal Strength: The intensity of the RF signal decreases with distance from the source due to the inverse square law. Therefore, within a 50-mile radius, there will be a gradual decline in signal strength. However, the actual coverage area can be influenced by factors like antenna height, terrain, and weather conditions. In ideal conditions, a high-powered TV station can provide a good signal within this range, but in practice, obstacles can create areas of weak reception.

- Reflection, Refraction, and Diffraction: TV signals can bounce off or be refracted by large buildings and other structures, and they can bend around obstacles, a phenomenon known as diffraction. These effects can cause both constructive and destructive interference, potentially causing signal 'ghosting' or multi-path interference in some areas.

- Electromagnetic Compatibility: Other electronic equipment, especially those that use RF signals, can experience operational issues due to the high-power signals of the TV broadcast station. These issues can be mitigated by using appropriate shielding and filtering techniques.

A broadcast TV signal has a significant contribution to the RF environment within its coverage range. Regulatory authorities often implement rules and guidelines to control this impact, ensuring that different technologies can co-exist within the same frequency spectrum without causing harmful interference to each other.

There are 19 stations authorized to operate by the Federal Communications Commission within 50 miles (80 km) of the proposed New Leaf Wind Turbine. They are listed below.

Call	Ch.	Frequency (MHz)	City	St	ERP (W)	Dist	Licensee
WBBZ-TV	7	174-180	Springville	NY	26.9	40.3	Itv Of Buffalo, LLC
WVTT-CD	11	198-204	Olean	NY	3	60.9	HC2 Station Group, Inc.
WBNF-CD	15	476-482	Buffalo	NY	15	75.8	Hme Equity Fund II, LLC
WNYO-TV	16	482-488	Buffalo	NY	575	75.8	New York Television,
WDTB-LD	18	494-500	Hamburg	NY	15	61.8	Word Of God Fellowship
WWHC-LD	20	506-512	Olean	NY	3	60.9	Dtv AMerica Corporation
WBXZ-LD	23	524-530	Buffalo	NY	15	61.4	Bridge News LLC
W24EU-D	24	530-536	Erie	PA	15	62.2	Lowcountry 34 Media,
WPXJ-TV	24	530-536	Batavia	NY	500	72	Inyo Broadcast License
WNYB	27	548-554	Buffalo	NY	15	75.8	Radiant Life Ministries
CKVP-DT	29	560-566	Fonthill	ON	3.85	78.4	
W30EW-D	30	566-572	Erie	PA	2.5	74.5	Dtv AMerica Corporation
WBUO-LD	30	566-572	Olean	NY	5.9	67.3	Digital Networks-North
WNED-TV	31	572-578	Buffalo	NY	175	76.4	Western Ny Public Broadcast
WUTV	32	578-584	Buffalo	NY	1000	75.8	Wutv Licensee, LLC
WGRZ	33	584-590	Buffalo	NY	522	60.9	Multimedia Entertainment
WKBW-TV	34	590-596	Buffalo	NY	660	51.6	Scripps Broadcasting
WIVB-TV	36	602-608	Buffalo	NY	800	52.7	Nexstar Media Inc.
WNLO	36	602-608	Buffalo	NY	800	52.7	Nexstar Media Inc.

Appendix A.1 is a map of these stations with their FCC noise-limited service contours plotted in relation to the proposed New Leaf wind turbine and airfields in the area.

FM Stations

A Broadcast FM signal also tends to influence the Radio Frequency environment within a 50-mile radius of its transmitter site in several ways:

- Occupies Spectrum: One of the most immediate impacts is that a given station occupies a specific frequency in the RF spectrum, between 88.1 MHz to 107.9 MHz in most parts of the world. Each FM station requires a specific frequency slot to broadcast its signal.

- Interference: High-power FM broadcast signals can potentially interfere with other users of the RF spectrum. This is most likely to occur with adjacent frequencies (e.g., other FM radio stations broadcasting close to the same frequency). To avoid this, the FCC allocates frequencies and power levels and ensures sufficient physical separation between FM stations on the same and adjacent frequencies.

- Coverage Area: An FM signal radiates out from the transmitter site and attenuates, or diminishes, with distance. Within a 50-mile radius, a high-powered transmitter should be strong enough to provide a reasonably clear signal. However, factors such as the antenna's height above the surrounding terrain, transmitter power, frequency, and local terrain can all affect the actual coverage area of a given station.

- Multipath Propagation: In urban environments, the RF signal can reflect off buildings, leading to multipath propagation where several copies of the signal arrive at a given receiver at slightly different times. This can cause distortion or "fading" of the FM signal.

- Impacts on Other Devices: FM transmitters, especially high-power ones, may cause interference with electronic devices within close proximity. This is most likely with poorly shielded devices or devices that operate at frequencies harmonically related to the FM signal.

- Potential Intermodulation: When multiple RF signals are present (as in a broadcast environment with multiple stations), signals can mix and produce emissions on new frequencies called intermodulation products. If these new frequencies align with other operational frequencies in the area, they can cause interference to a device..

- Terrain Effect: Terrain plays a significant role in how the FM signal affects the RF environment. Mountainous or hilly terrain can obstruct the signal, while flat terrain or water can enhance the signal's reach.

A well-managed FM transmission station will try to minimize its negative impact on the surrounding RF environment by adhering to proper standards and regulations set by regulatory bodies like the FCC.

There are 115 FM stations with a 50-mile radius arc around the proposed New Leaf Wind Turbine site.

Due to the size of the table it has been included as Appendix A2.1 of this report.

Additionally, in the Appendix is a map of these stations and their FCC contours plotted in relation to the New Leaf wind turbine as well as airfields located in the area.

AM Stations

Broadcasting an AM (Amplitude Modulation) signal from a transmitter site has several effects on the RF (Radio Frequency) environment within a 50-mile radius. The influence of the signal largely depends on the power of the transmitter, the height and type of the antenna (which is the AM tower itself), and the soil conductivity and atmospheric conditions.

- Signal Propagation: The most immediate effect of broadcasting an AM signal is an increase in the overall RF environment within a 50-mile radius of the transmitter site. The broadcast signal will travel through the environment and will be detectable by any capable receiver within the range.

- Interference: One of the main ways an AM signal can adversely affect the RF environment is a result of interference to other AM stations. If there are other nearby AM signals within the same or adjacent operating frequency, a receiver may experience interference. The same holds true if there are devices within the operating radius of the AM station that are sensitive to the broadcast frequency. This interference can cause issues with the quality of the received signals.

- Skywave Propagation: Unlike FM signals, AM signals can bounce off the Earth's ionosphere, a phenomenon known as skywave propagation. This can extend their reach beyond the immediate 50-mile radius when the ionosphere forms at sunset. Conversely, skywave propagation can also create interference with other distant AM stations broadcasting on the same or adjacent frequency.

- Ground Wave Propagation: During daylight hours, AM signals propagate via the ground wave, hugging the surface of the earth. This allows the signal to bend around the Earth's surface and reach beyond the horizon. Ground wave propagation is responsible for the signal coverage within the 50-mile radius and is heavily dependent on the conductivity of the soil over which it travels.

- Effects on Electrical Equipment: A strong AM signal can induce voltages in electrical circuits, especially if those circuits are resonant at or near the broadcast frequency. This can lead to humming or buzzing noises in audio equipment or cause malfunctions in sensitive devices.

- Noise Generation: The broadcasting of AM signals may also introduce noise into the RF environment. This noise could come from the signal's modulation process, the transmitter hardware, or even environmental factors. This noise can impact other signals and receivers in the environment, especially around the AM station’s transmitter site.

It's also important to note that the Federal Communications Commission (FCC) has regulations in place to manage these effects. They allocate specific frequency bands for different uses and set maximum power levels for transmitters to minimize interference and manage the overall RF environment.

There are 60 AM stations licensed within a 50-mile radius of the proposed New Leaf wind turbine. Below is a screenshot of the licensed stations from the FCC’s database.

CJFT	AM	530 kHz	DA1	Unlimited	C C	-	FORT ERIE	ON	CA	---	0.25 kW	106052	61.45 km	38.18 mi	12.76°	_ _
WGR	AM	550 kHz	DAN	Daytime	B B	LIC	BUFFALO	NY	US	BML-20090226ACL	5.0 kW	56101	51.13 km	31.77 mi	26.60°	AUDACY LICENSE, LLC
WGR	AM	550 kHz	DAN	Nighttime	B B	LIC	BUFFALO	NY	US	BML-20090226ACL	5.0 kW	56101	51.13 km	31.77 mi	26.60°	AUDACY LICENSE, LLC
CKTB	AM	610 kHz	DA1	Daytime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	106109	75.44 km	46.88 mi	357.37°	_ _
CKTB	AM	610 kHz	DA1	Nighttime	B B	-	ST. CATHARINES	ON	CA	---	5.0 kW	106109	75.44 km	46.88 mi	357.37°	_ _
CJRN	AM	710 kHz	DA2	Daytime	B B	-	NIAGARA FALLS	ON	CA	---	5.0 kW	98816	61.45 km	38.18 mi	12.76°	_ _
CJRN	AM	710 kHz	DA2	Nighttime	B B	-	NIAGARA FALLS	ON	CA	---	3.5 kW	98816	61.45 km	38.18 mi	12.76°	_ _
CJRN	AM	710 kHz	DA2	Daytime	B B	-	NIAGARA FALLS	ON	CA	---	10.0 kW	98816	61.45 km	38.18 mi	12.76°	_ _
CJRN	AM	710 kHz	DA2	Daytime	B B	-	NIAGARA FALLS	ON	CA	---	10.0 kW	136974	61.45 km	38.18 mi	12.76°	_ _
WBEN	AM	930 kHz	DAN	Daytime	B B	LIC	BUFFALO	NY	US	BMML-20210205AAF	5.0 kW	34381	70.21 km	43.63 mi	11.13°	AUDACY LICENSE, LLC
WBEN	AM	930 kHz	DAN	Nighttime	B B	LIC	BUFFALO	NY	US	BMML-20210205AAF	5.0 kW	34381	70.21 km	43.63 mi	11.13°	AUDACY LICENSE, LLC
WDCZ	AM	970 kHz	DA2	Daytime	B B	LIC	BUFFALO	NY	US	BML-20150209AEM	5.0 kW	27668	47.10 km	29.26 mi	24.28°	KIMTRON, INC.
WDCZ	AM	970 kHz	DA2	Nighttime	B B	LIC	BUFFALO	NY	US	BML-20150209AEM	5.0 kW	27668	47.10 km	29.26 mi	24.28°	KIMTRON, INC.
WUFO	AM	1080 kHz	NDD	Daytime	D B	LIC	AMHERST	NY	US	BL-20220915AAA	1.0 kW	60154	68.93 km	42.83 mi	24.13°	VISION MULTIMEDIA GROUP LLC WUFO
WBBF	AM	1120 kHz	NDD	Daytime	D B	LIC	BUFFALO	NY	US	BML-20190926ABV	1.0 kW	53967	58.76 km	36.51 mi	26.70°	RADIO LICENSE HOLDING CBC, LLC
CFAJ	AM	1220 kHz	DA2	Daytime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	102783	77.97 km	48.45 mi	354.10°	_ _
CFAJ	AM	1220 kHz	DA2	Nighttime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	102783	77.97 km	48.45 mi	354.10°	_ _
CFAJ	AM	1220 kHz	DA2	Daytime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	102783	77.97 km	48.45 mi	354.10°	_ _
CFAJ	AM	1220 kHz	DA2	Nighttime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	102783	77.97 km	48.45 mi	354.10°	_ _
C122C	AM	1220 kHz	DA	Daytime	B B	-	ST CATHARINES	ON	CA	---	10.0 kW	190796	77.97 km	48.45 mi	354.12°	_ _
C122C	AM	1220 kHz	DA	Nighttime	B B	-	ST CATHARINES	ON	CA	---	10.0 kW	190796	77.97 km	48.45 mi	354.12°	_ _
CFAJ	AM	1220 kHz	DA2	Daytime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	102783	77.97 km	48.45 mi	354.12°	_ _
CFAJ	AM	1220 kHz	DA2	Nighttime	B B	-	ST. CATHARINES	ON	CA	---	10.0 kW	102783	77.97 km	48.45 mi	354.12°	_ _
C122C	AM	1220 kHz	DA2	Daytime	B B	-	ST CATHARINES	ON	CA	---	10.0 kW	190796	77.97 km	48.45 mi	354.12°	_ _
C122C	AM	1220 kHz	DA2	Nighttime	B B	-	ST CATHARINES	ON	CA	---	10.0 kW	190796	77.97 km	48.45 mi	354.12°	_ _
WECK	AM	1230 kHz	ND1	Daytime	C C	LIC	CHEEKTOWAGA	NY	US	BL-19801008AE	1.0 kW	1914	68.93 km	42.83 mi	24.13°	RADIO ONE BUFFALO, LLC
WECK	AM	1230 kHz	ND1	Nighttime	C C	LIC	CHEEKTOWAGA	NY	US	BL-19801008AE	1.0 kW	1914	68.93 km	42.83 mi	24.13°	RADIO ONE BUFFALO, LLC
WJTN	AM	1240 kHz	ND2	Daytime	C C	LIC	JAMESTOWN	NY	US	BML-20020823ABO	0.5 kW	29922	30.31 km	18.83 mi	201.28°	MEDIA ONE HOLDINGS, LLC
WJTN	AM	1240 kHz	ND2	Nighttime	C C	LIC	JAMESTOWN	NY	US	BML-20020823ABO	1.0 kW	29922	30.31 km	18.83 mi	201.28°	MEDIA ONE HOLDINGS, LLC
WHLD	AM	1270 kHz	DA2	Daytime	B B	LIC	NIAGARA FALLS	NY	US	BL-20010702ADF	5.0 kW	7822	47.10 km	29.26 mi	24.28°	RADIO LICENSE HOLDING CBC, LLC
WHLD	AM	1270 kHz	DA2	Nighttime	B B	LIC	NIAGARA FALLS	NY	US	BL-20010702ADF	1.0 kW	7822	47.10 km	29.26 mi	24.28°	RADIO LICENSE HOLDING CBC, LLC
WXRL	AM	1300 kHz	DA2	Daytime	B B	LIC	LANCASTER	NY	US	BML-20170526ABM	5.0 kW	17068	70.82 km	44.00 mi	34.53°	DOME BROADCASTING, INC.
WXRL	AM	1300 kHz	DA2	Nighttime	B B	LIC	LANCASTER	NY	US	BML-20170526ABM	2.5 kW	17068	70.82 km	44.00 mi	34.53°	DOME BROADCASTING, INC.
WICU	AM	1310 kHz	ND1	Daytime	D B	LIC	WARREN	PA	US	BL-6666	5.0 kW	34928	60.69 km	37.71 mi	183.42°	LILLY BROADCASTING OF PENNSYLVANIA LLC
WICU	AM	1310 kHz	ND1	Nighttime	D B	LIC	WARREN	PA	US	BL-6666	0.094 kW	34928	60.69 km	37.71 mi	183.42°	LILLY BROADCASTING OF PENNSYLVANIA LLC
WKSN	AM	1340 kHz	ND2	Daytime	C C	LIC	JAMESTOWN	NY	US	BL-20111101ALS	0.26 kW	65592	30.31 km	18.83 mi	201.28°	MEDIA ONE HOLDINGS, LLC
WKSN	AM	1340 kHz	ND2	Nighttime	C C	LIC	JAMESTOWN	NY	US	BL-20111101ALS	0.52 kW	65592	30.31 km	18.83 mi	201.28°	MEDIA ONE HOLDINGS, LLC
WOEN	AM	1360 kHz	ND1	Daytime	D B	LIC	OLEAN	NY	US	BL-19980917AA	1.0 kW	19708	66.68 km	41.43 mi	114.79°	SOUTHERN BELLE, LLC
WOEN	AM	1360 kHz	ND1	Nighttime	D B	LIC	OLEAN	NY	US	BL-19980917AA	0.03 kW	19708	66.68 km	41.43 mi	114.79°	SOUTHERN BELLE, LLC
WWCB	AM	1370 kHz	ND2	Daytime	D B	LIC	CORRY	PA	US	BML-20210507AAH	1.0 kW	13967	64.25 km	39.92 mi	223.17°	LAKE ERIE COLLEGE OF OSTEOPATHIC MEDICINE, INC.
WWCB	AM	1370 kHz	ND2	Nighttime	D B	LIC	CORRY	PA	US	BML-20210507AAH	0.014 kW	13967	64.25 km	39.92 mi	223.17°	LAKE ERIE COLLEGE OF OSTEOPATHIC MEDICINE, INC.
WWWS	AM	1400 kHz	ND1	Daytime	C C	LIC	BUFFALO	NY	US	BML-20091125AGN	0.745 kW	56104	67.18 km	41.75 mi	20.06°	AUDACY LICENSE, LLC
WWWS	AM	1400 kHz	ND1	Nighttime	C C	LIC	BUFFALO	NY	US	BML-20091125AGN	0.745 kW	56104	67.18 km	41.75 mi	20.06°	AUDACY LICENSE, LLC
WDOE	AM	1410 kHz	ND2	Daytime	D B	LIC	DUNKIRK	NY	US	BL-20150417ABJ	1.0 kW	49209	22.30 km	13.86 mi	301.56°	CHADWICK BAY BROADCASTING CORPORATION
WDOE	AM	1410 kHz	ND2	Nighttime	D B	LIC	DUNKIRK	NY	US	BL-20150417ABJ	0.031 kW	49209	22.30 km	13.86 mi	301.56°	CHADWICK BAY BROADCASTING CORPORATION
WPSE	AM	1450 kHz	ND2	Daytime	C C	LIC	ERIE	PA	US	BL-20130131ASW	1.0 kW	65467	79.35 km	49.31 mi	252.15°	_ _
WPSE	AM	1450 kHz	ND2	Nighttime	C C	LIC	ERIE	PA	US	BL-20130131ASW	0.77 kW	65467	79.35 km	49.31 mi	252.15°	_ _
WOLY	AM	1450 kHz	ND2	Daytime	C C	LIC	OLEAN	NY	US	BL-20220415AAD	1.0 kW	2863	62.08 km	38.57 mi	120.20°	SOUTHERN BELLE, LLC
WOLY	AM	1450 kHz	ND2	Nighttime	C C	LIC	OLEAN	NY	US	BL-20220415AAD	1.0 kW	2863	62.08 km	38.57 mi	120.20°	SOUTHERN BELLE, LLC
WOLY	AM	1450 kHz	ND1	Daytime	C C	LIC	OLEAN	NY	US	BL-20220415AAD	1.0 kW	2863	62.09 km	38.58 mi	120.20°	SOUTHERN BELLE, LLC
WOLY	AM	1450 kHz	ND1	Nighttime	C C	LIC	OLEAN	NY	US	BL-20220415AAD	1.0 kW	2863	62.09 km	38.58 mi	120.20°	SOUTHERN BELLE, LLC
CHOW	AM	1470 kHz	DA2	Daytime	B B	-	WELLAND	ON	CA	---	10.0 kW	105828	66.59 km	41.37 mi	349.59°	_ _
CHOW	AM	1470 kHz	DA2	Daytime	B B	-	WELLAND	ON	CA	---	10.0 kW	105828	66.59 km	41.37 mi	349.59°	_ _
CHOW	AM	1470 kHz	DA2	Nighttime	B B	-	WELLAND	ON	CA	---	10.0 kW	105828	66.59 km	41.37 mi	349.59°	_ _
WESB	AM	1490 kHz	ND1	Unlimited	C C	LIC	BRADFORD	PA	US	BL-19890421AD	1.0 kW	54827	60.53 km	37.61 mi	136.16°	RADIO STATION WESB, INC.
WWKB	AM	1520 kHz	DA1	Unlimited	A A	LIC	BUFFALO	NY	US	BL-10547	50.0 kW	34383	51.14 km	31.77 mi	26.68°	AUDACY LICENSE, LLC
WZTE	AM	1530 kHz	ND2	Daytime	D B	LIC	UNION CITY	PA	US	BL-20181217ABE	4.8 kW	26610	75.44 km	46.87 mi	232.21°	INSPIRATION TIME, INC.
WZTE	AM	1530 kHz	ND2	Critical Hours	D B	LIC	UNION CITY	PA	US	BL-20181217ABE	0.25 kW	26610	75.44 km	46.87 mi	232.21°	INSPIRATION TIME, INC.
WGGO	AM	1590 kHz	ND2	Daytime	D B	LIC	SALAMANCA	NY	US	BML-20210209AAK	5.0 kW	9409	41.58 km	25.84 mi	119.59°	HOLY FAMILY COMMUNICATIONS
WGGO	AM	1590 kHz	ND2	Nighttime	D B	LIC	SALAMANCA	NY	US	BML-20210209AAK	0.014 kW	9409	41.58 km	25.84 mi	119.59°	HOLY FAMILY COMMUNICATIONS

*** 60 AM Records within 80.00 km distance of 42° 21' 32.00" N, 79° 7' 26.00" W ***

Cellular Base Stations

Cellular radio signals have a significant impact on the RF (Radio Frequency) environment within a 10-mile radius of its transmitter (base station) site. Base station antennas can be mounted on towers, attached to rooftops, as well as mounted atop power line stanchions and water towers. Here are some of the main ways that these signals can affect the RF environment:

- Signal Propagation: When a cellular base station transmits a signal, it propagates until obstacles such as buildings or terrain disrupt it. These signals can travel up to 10 miles, although their strength decreases significantly with distance. The resulting signal distribution forms a "cell," which gives cellular networks their name.

- Interference: In a dense area with several different transmitter sites within a 10-mile radius, there may be interference between the different signals. This interference can degrade signal quality and lead to dropped calls or slow data speeds. In modern cellular networks, different techniques like frequency reuse, spatial diversity, and beamforming are used to minimize this interference.

- Frequency Spectrum Utilization: Each cellular signal uses a specific portion of the RF spectrum. In a 10-mile radius, if multiple transmitters are using the same frequencies, they could interfere with each other. Therefore, proper frequency management and coordination between different networks is essential.

- Coverage Holes: Due to physical barriers and the nature of RF propagation, there can be coverage holes or areas where adequate signal does not reach consumers’ devices or is significantly attenuated. These areas may experience poor cellular reception.

- Noise Floor: The collective RF signals from multiple sources, including cell base stations, create a "noise floor" – the baseline level of RF energy in the environment. A higher noise floor can make it harder for receivers to pick out the signal they're looking for, particularly if it's a weak signal.

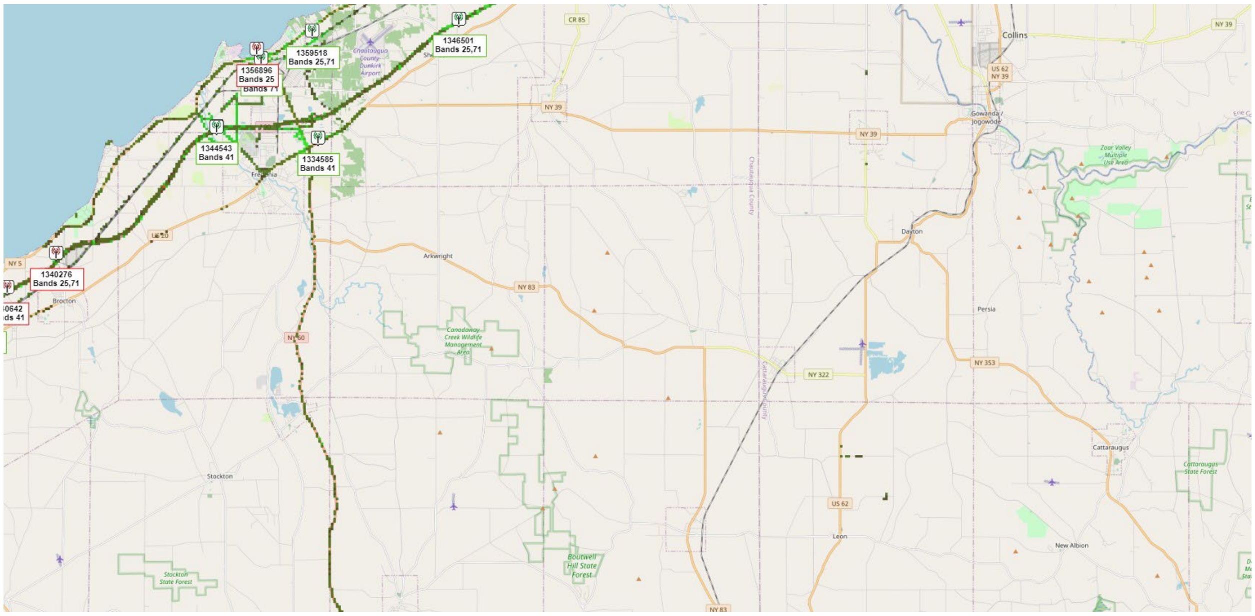
- Multipath Propagation: This phenomenon occurs when signals bounce off buildings, mountains, or other obstacles, arriving at the receiving antenna from different paths and therefore at slightly different times. This can cause constructive and destructive interference, affecting the quality of signal received.

Cellular radio signals can affect the RF environment in a variety of ways. It's the role of RF engineers to design and manage cellular networks in a way that maximizes coverage and quality while minimizing negative impacts like interference.

Below is a list of the bands in use by the four major carriers operating in and around the proposed wind turbine site.

Bands	Lower Frequency (MHz)	Upper Frequency (MHz)	Sevice	Duplexing
2	1930	1989.9	PCS Blocks A-F	FDD
4	2110	2154.9	AWS-1	FDD
5	869	893.9	CLR	FDD
12	729	745.9	Lower SMH Block A/B/C	FDD
13	746	755.9	Upper SMH Block C	FDD
14	758	767.9	Upper SMH Block D	FDD
17	734	745.9	Lower SMH Block B/C	FDD
18	860	874.9	Lower 800	FDD
25	1930	1994.9	E-PCS Blocks A-G	FDD
26	859	893.9	E-CLR	FDD
29	717	727.9	Lower SMH Block D/E	FDD
30	2350	2359.9	WCS Block A/B	FDD
41	2496	2689.9	BRS/EBS	TDD
46	5150	5904.9	U-NII	TDD
48	3550	3699.9	CBRS	TDD
66	2110	2199.9	AWS 1-3	FDD
71	617	651.9	600MHz US	FDD
n25	1930	1995	E-PCS	FDD
n41	2496	2689.99	BRS/EBS	TDD
n66	2110	2200	AWS-3	FDD
n71	617	652	600 MHz	FDD
n261	27499.96	28349.92	28 GHz	TDD
1900	1850	1990	GSM	FDD

Below is a map with known base stations from T-Mobile's 5G Bands plotted on a map near the proposed New Leaf wind turbine site.



The Appendix has maps with locations of the base stations of all 4 major carriers in relation to the Wind Turbine and nearby airports.

Land Mobile

Land Mobile Radio (LMR) systems play a crucial role in communications, particularly for public safety, emergency services, military, and commercial applications. LMR systems are designed to provide communication over relatively short distances (typically within a 10-mile radius) and are often used where mobile communication is essential, such as in emergency response and field service operations.

Here's a general idea of how a LMR signal affects the RF (radio frequency) environment within a 10-mile radius of its transmitter site:

- Occupation of RF Spectrum: LMR operates within specific frequency bands. In the United States, for example, commercial radios are typically available in the VHF and UHF frequency bands. 30−50 MHz (sometimes called "Low VHF Band" or "Low Band"), 150−172 MHz (sometimes called "High VHF Band" or "High Band"), 450−470 MHz "UHF". Many larger populated areas have additional UHF frequencies from 470 to 490 MHz, and 490−512 MHz. There are also frequencies in the 800 and 900 MHz range available. Commercial, public safety and government users are required to obtain U.S. Federal Communications Commission licensing in the United States. Any active transmission within these bands would occupy a chunk of the RF spectrum, thus making it unavailable for other users or services operating on the same frequencies.

- Interference: The strength and quality of the LMR signal decrease as the distance from the transmitter increases. Near the transmitter, the signal will be strong, but it may interfere with other communication systems operating on the same or nearby frequencies. This interference can manifest as noise, distortion, or even complete disruption of the affected signal. This is one of the reasons why careful frequency coordination and assignment is essential.

- Coverage Area: The effective communication radius for LMR systems is influenced by the transmitter power, antenna height, terrain, and the type and quality of the receiving equipment. Typically, a single LMR base station can cover an area within a 10-mile radius fairly effectively, but obstructions such as buildings, hills, or trees can reduce the effective range and create "dead zones" where the signal is weak or nonexistent.

- Reflection, Refraction, and Diffraction: Like any radio signal, LMR signals can be reflected, refracted, and diffracted by various objects and terrain features. This can create areas where the signal is unexpectedly strong or weak, even within the intended coverage area.

- Multipath Propagation: This is a phenomenon where the transmitted signals reach the receiving antenna by two or more paths due to reflection, refraction, or diffraction. This can cause signal fading or interference at the receiver, reducing the quality of communication.

- Saturation: In heavily populated areas or places with many active LMR systems, the RF environment can become "saturated," with more signals than the available spectrum can comfortably accommodate. This can lead to increased interference and reduced communication quality.

A LMR transmitter can have a significant impact on the RF environment within its coverage area. However, with careful frequency management and system design, these impacts can be minimized, allowing the LMR system to coexist with other RF services.

Within a 10-mile radius of the proposed New Leaf wind turbine there are thousands of licensed LMR services. This link contains a file with all the LMR services within a 10-mile radius of the proposed wind turbine:
https://drive.google.com/file/d/1V8HcyRyrkph_J_ryoNbuOJmCQM676zw3/view?usp=sharing

Microwave Paths

Microwave point-to-point links are commonly used for telecommunication to transmit data, voice, and video across relatively short distances (between fixed locations). These links typically operate in frequency bands ranging from 6 GHz to 80 GHz. The impact of a point-to-point microwave path on the RF environment around its transmitter site can be described as follows:

- Primary Path or Main Beam: The energy transmitted by a microwave antenna is mostly concentrated in the main beam. This beam is directed towards the receiving antenna. Only devices or systems in or very close to this direct path are likely to experience any significant impact from the microwave transmission.

- Side Lobes: The primary antenna will usually have side lobes, which are smaller radiations that emanate at angles away from the primary path. These can potentially interfere with other systems if those systems are operating on or near the same frequency and are in the vicinity of these side lobes.

- Free-space Path Loss: One of the primary reasons that microwave transmissions have limited ranges is due to free-space path loss. As the distance from the transmitter increases, the signal strength decreases dramatically. The impact of this transmission diminishes quickly as one moves away from the direct line of sight of the transmission.

- Interference: If there are other systems operating on or near the same frequency, and if those systems don't have adequate filtering, they might experience interference. However, good engineering practices typically ensure that such interference is minimized.

- Reflections and Multipath: Structures, terrain, and atmospheric anomalies can reflect the microwave signals, potentially causing multipath interference. This can affect the quality of the microwave link itself and may also influence other systems within the environment.

- Atmospheric Absorption: At certain frequencies, especially higher up in the microwave range, atmospheric gasses like water vapor and oxygen can absorb the signal. This can limit the range of the link and reduce the potential impact on the surrounding RF environment.

- Safety Concerns: Microwave signals, like all RF emissions, can pose health risks if exposure levels are too high. However, regulatory standards (such as those set by the FCC in the US) are in place to ensure public safety. As long as the point-to-point link adheres to these standards, there should be no significant health risk to people in the vicinity.

- Harmonics and Spurious Emissions: Every transmitter has the potential to emit unwanted signals at frequencies other than its primary operating frequency. These are usually much weaker than the primary signal and are typically well regulated, but if present, they could affect the RF environment.

In summary, while a point-to-point microwave transmission will have some impact on the RF environment, the impact is typically limited and well-understood. Proper engineering and regulatory compliance ensure that these impacts are minimal and that coexistence with other RF systems and public safety is maintained.

Comsearch Microwave Frequency Coordination Study

The results of the microwave frequency coordination study are below:

Our study identified one microwave path within two miles of the Villenova, NY Wind Turbine project. The Fresnel and Consultation Zones for this microwave path were calculated and mapped in order to assess the potential impact from the turbines. A total of three turbines were considered in the analysis, each with a blade diameter of 163 meters and a hub height of 105 meters. Of those turbines, none were found to have potential obstruction with the microwave system in the area.

The call sign of the studied microwave path is listed below:

ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1	Licensed	WROV912	WROV911	11 GHz	25.5	Netsync Internet Service Corporation

The data from the frequency coordination study is linked here:
https://drive.google.com/file/d/1wqo7tiplwJ211WRi_NEMmEtbLgbhln80/view?usp=sharing

Airport Communications

Air Route Traffic Control Centers

Air Route Traffic Control Centers (ARTCC) are facilities in the United States that manage the flow of air traffic between airports. They are responsible for controlling aircraft en route in a specific region of airspace, usually in the cruising phase of the flight. The U.S. has 21 ARTCCs, each controlling a different region of airspace.

As for radio communication, ARTCCs typically operate within the aviation or aeronautical band, which falls within the VHF radio band, between 118 and 137 MHz (megahertz). Most of these VHF radio assignments also have a UHF (225 to 380 MHz) paired frequency used for military flights.

The specific frequencies a given ARTCC uses can vary significantly and are determined by factors like the volume of air traffic, geographic area, and type of operations (for example, high altitude vs. low altitude). Therefore, each ARTCC has a set of frequencies assigned to them for their operation.

However, it's essential to note that the exact frequency an aircraft would use to communicate with an ARTCC depends on the specific sector of airspace it is flying in at the time. Airspace is divided into sectors, each with its own frequency, to manage the volume of air traffic efficiently. Therefore, the frequency an aircraft uses could change several times during a single flight.

The Federal Aviation Administration (FAA) maintains a comprehensive list of frequencies for each ARTCC and their sectors, which can typically be found in resources such as the Chart Supplement (formerly the Airport/Facility Directory or A/FD) or on sectional aeronautical charts.

Automated Weather Observing System

AWOS stands for "Automated Weather Observing System". It's a suite of sensors which automatically generate a series of weather data for pilots, meteorologists, and other users.

The numbers following AWOS, such as AWOS-3, denote different versions or levels of the system, with each providing a different set of data.

Specifically, AWOS-3 provides the following weather information:

- Altimeter setting: This indicates the atmospheric pressure at sea level, which pilots use to calibrate their aircraft's altimeter.

- Wind data: Speed and direction.

- Temperature and dew point: These can be used to calculate relative humidity and potential for icing conditions.

- Visibility: Measured in statute miles, this indicates the maximum distance at which large objects can be clearly seen.

- Sky condition: This refers to the amount and type of cloud cover, up to 12,000 feet.

This system operates continuously (24/7) and can be accessed by pilots both in-flight and on the ground. It's particularly useful for those flying under visual flight rules (VFR), as it can provide timely and accurate updates on current weather conditions in a given area.

Common Traffic Advisory Frequency

Common Traffic Advisory Frequency (CTAF) is a communication frequency used by pilots in general aviation to transmit their intentions to other aircraft in the vicinity, typically when they're within 10 miles of an airport and below 10,000 feet altitude. The CTAF is primarily used at non-towered airports or during the hours when a towered airport is not in operation.

In the United States, CTAF frequencies are typically found in the VHF band, and ranges from 118.0 to 136.975 MHz, with a majority of them within the aircraft band of 122.700 to 123.575 MHz.

The specific frequency used as the CTAF can vary from one airport to another, and pilots consult the appropriate aeronautical charts or publications for the correct frequencies. When a UNICOM frequency is available and no other frequency is listed as the CTAF, pilots may use the UNICOM frequency to announce their intentions. It is also important for pilots to continually monitor and communicate on the appropriate frequency for the area in which they are flying.

Non-Directional Beacons

A Non-Directional Beacon (NDB) is a radio transmitter that is used as a navigational aid in aviation. It emits an omnidirectional signal that is received by an aircraft's Automatic Direction Finder (ADF), which allows pilots to determine their bearing to or from the beacon.

NDBs are characterized by the following:

- Omnidirectional Signal: Unlike some other navigational aids, an NDB does not provide any indication of the direction to the beacon from the aircraft. Instead, it simply transmits a signal in all directions, and the aircraft's ADF calculates the direction based on the received signal.

- Low Frequency: NDBs typically operate in the frequency range of 190 kHz to 535 kHz, which is classified as the low-frequency band in radio communication. This allows their signals to follow the Earth's curvature, providing good range even at relatively low altitudes.

- ADF Required: To use an NDB, an aircraft must be equipped with an Automatic Direction Finder. This instrument points towards the beacon, enabling the pilot to navigate towards or away from it.

- Morse Code: NDBs typically identify themselves by transmitting their identifier in Morse Code. This allows pilots to verify that they are receiving the correct beacon.

- Limitations: NDB signals can be affected by several factors such as thunderstorms, terrain, and even the aircraft's own structure. This can sometimes lead to inaccuracies in the indicated direction. They are also less precise than some other forms of radio navigation, which has led to a decrease in their use in many parts of the world.

Despite these limitations, NDBs and ADFs continue to be used, particularly in areas with less advanced aviation infrastructure or in smaller aircraft that may not be equipped with more advanced systems.

Universal Communications

UNICOM in aviation refers to a non-controlled communication system utilized in airports for the exchange of information between pilots and ground service providers. Its purpose is to aid in the coordination of ground operations such as fueling, hangering, parking, and other related services.

UNICOM is generally used in smaller airports where there isn't a control tower or the control tower is not operational 24/7. At larger airports, UNICOM may be used for non-critical communications such as those with Fixed Base Operators (FBOs) for services like fueling and towing.

UNICOM traditionally operates on the VHF band, with two primary frequencies being 122.950 MHz and 122.700 MHz. Some airports use other frequencies as well, typically in the 122 - 123 MHz range. Specific frequencies are assigned to different airports to prevent interference, and the assigned frequency will usually be listed in the airport's information in navigational charts or directories.

VHF Omnidirectional Range

VHF Omnidirectional Range (VOR) is a type of short-range radio navigation system for aircraft, enabling aircraft with a receiving unit to determine their position and stay on course by receiving radio signals transmitted by a network of fixed ground radio beacons. It uses frequencies in the very high frequency (VHF) band from 108.00 to 117.95 MHz.

The "omnidirectional" part of VOR refers to the fact that the signals are broadcast in all directions from the beacon. An aircraft can receive these signals and use them to determine its bearing or direction from the station, thus providing a navigational fix. The VOR network can be used to create "airways" in the sky which aircraft can follow, providing a direct path between different beacons.

VOR is typically combined with other navigational systems, such as the Distance Measuring Equipment (DME), to provide more complete navigational information. For example, while VOR tells the aircraft its direction from the beacon, DME can tell it how far away it is. This way, the aircraft can know both its direction and distance from a fixed point, allowing it to accurately determine its current position.

VOR remains a common form of aviation navigation, though it is being gradually phased out and replaced with satellite-based navigation systems like the Global Positioning System (GPS) in many parts of the world. It is however still crucial in areas with poor GPS coverage or during GPS outages.

Nearby Airports

Buffalo Niagara International Airport

FAA Data

The Buffalo Niagara International Airport (FAA Identifier: BUF) is situated at coordinates 42-56-25.5380N, 078-43-50.0510W (42.9404272,-78.7305697 estimated), with an elevation of 726.8 feet (221.5 meters) above sea level. The airport is located approximately 5 miles east of Buffalo, NY. It operates in the UTC -4 time zone (UTC -5 during Standard Time) and falls within the 14225 zip code area.

Buffalo Niagara International Airport is open to the public and has been operational since March 1940. The airport features a control tower and is under the jurisdiction of the Cleveland Center ARTCC. The Buffalo Flight Service Station (FSS) provides flight services, including NOTAMs (Notice to Airmen). The airport's attendance is continuous, and it has a lighted wind indicator and a white-green beacon that operates from sunset to sunrise. The airport charges landing fees and offers Aircraft Rescue and Firefighting (ARFF) services indexed as C for general operations and D for airline operations. Additionally, the airport holds customs landing rights for international flights.

Various communication frequencies are utilized at Buffalo Niagara International Airport. These include the automated weather observing system (ASOS) accessible by phone, as well as frequencies for ground control, tower, approach, departure, clearance delivery, and more.

The airport benefits from proximity to several nearby radio navigation aids, including NDBs (Non-Directional Beacons) with names such as KLUMP, PLAZZ, and KATHI. These aids contribute to navigation and situational awareness for pilots operating in the vicinity of the airport.

Buffalo Niagara International Airport features two runways: Runway 5/23 and Runway 14/32. Runway 5/23 measures 8829 x 150 feet and is composed of grooved asphalt in good condition. The runway's weight-bearing capacity is noted as PCN 81/F/B/W/T, with various weight capacities for different wheel configurations. The runway features high-intensity edge lights, precision markings, and a 4-light PAPI (Precision Approach Path Indicator) system.

Runway 14/32 measures 7161 x 150 feet and is also made of grooved asphalt in good condition. The weight-bearing capacity for this runway is designated as PCN 70/F/B/W/T. It also has high-intensity edge lights and a 4-light PAPI system. Runway 14/32 has both non precision and precision markings, and the approach lighting includes a MALSR (Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights).

Buffalo Niagara International Airport is publicly owned and managed by the Niagara Frontier Transportation Authority. The airport accommodates a variety of aircraft types. As of the given information, there are 33 aircraft based at the field, including 13 single-engine airplanes, 2 multi-engine airplanes, 16 jet airplanes, and 2 helicopters. The airport witnesses an average of 162 aircraft operations per day, with the majority (56%) being commercial flights, followed by 22% air taxi operations, 12% local general aviation, 9% transient general aviation, and less than 1% military operations.

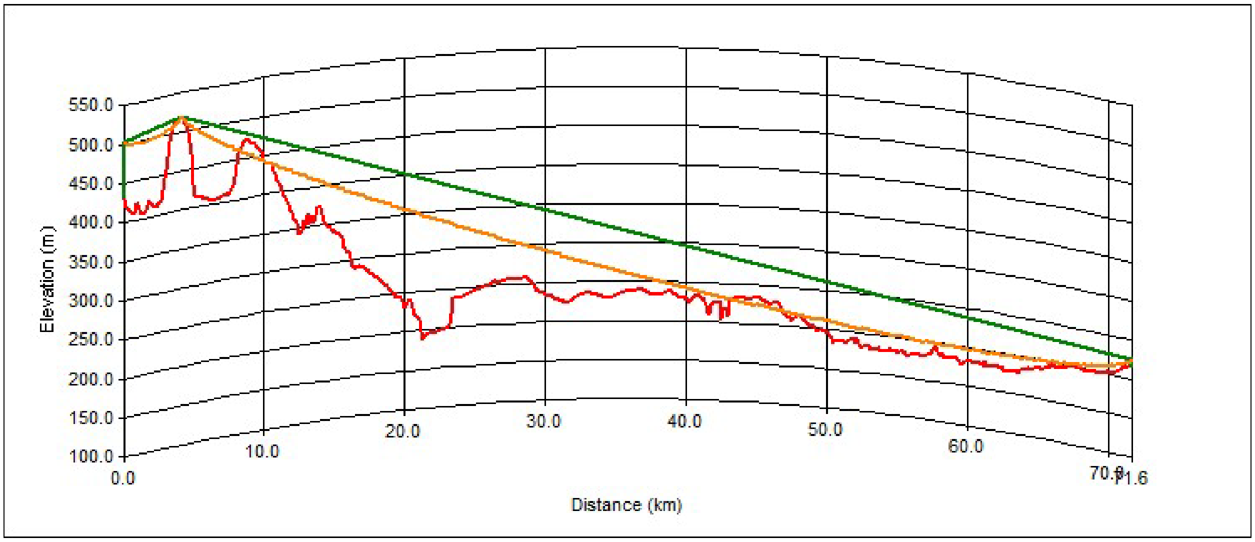
Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
BUF Ground	Communication	133.2	BUF	---	---
BUF Ground	Communication	257.8	BUF	---	---
BUF Tower	Communication	120.5	BUF	---	---
BUF Tower	Communication	257.8	BUF	---	---
BUF Approach	Communication	126.15	BUF	---	---
BUF Approach	Communication	126.5	BUF	---	---
BUF Approach	Communication	317.6	BUF	---	---
BUF Departure	Communication	126.15	BUF	---	---
BUF Departure	Communication	126.5	BUF	---	---
BUF Departure	Communication	317.6	BUF	---	---
Delivery	Communication	257.8	BUF	---	---
Taxi Clearance	Communication	124.7	BUF	---	---
Class C	Communication	126.15	BUF	---	---
Class C	Communication	126.5	BUF	---	---
Class C	Communication	317.6	BUF	---	---
D-ATIS	Communication	135.35	BUF	---	---
Emergency	Communication	121.5	BUF	---	---
Emergency	Communication	243	BUF	---	---
IC	Communication	121.15	BUF	---	---
IC	Communication	263.125	BUF	---	---
NDB	Approach	231	KLUMP	5	233
NDB	Approach	204	PLAZZ	5.5	52
NDB	Approach	329	KATHI	11.2	165

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.



Cattaraugus County Olean Airport

FAA Data

Located approximately 10 miles north of Olean, New York, Olean Airport boasts the FAA Identifier OLE. Its geographical coordinates are 42-14-28.3000N 078-22-16.9000W, or 42.2411944 degrees latitude and -78.3713611 degrees longitude. Nestled at an elevation of 2135.4 feet (650.9 meters), this surveyed airport presents an estimated magnetic variation of 11W, applicable since the year 2000. The airport operates in the UTC -4 time zone, shifting to UTC -5 during Standard Time. The corresponding zip code for Olean Airport is 14743.

Functioning since December 1958, the airport serves the public without a control tower on its premises. Managed by the City of Olean, the airport activates its lighting systems at sunset, ensuring safe operations through the night until sunrise. While there is no segmented circle, the airport has a lighted wind indicator. The Olean Airport facilitates various communication services, with its CTAF/UNICOM frequency set at 122.8. Weather information can be accessed through the AWOS-3 system on 118.375, and a nearby ASOS is available at ELZ (19 nm SE) on 119.275. The airport's air traffic services are supported by the Cleveland ARTCC and Buffalo Flight Service Station.

The airport features two runways: Runway 4/22 and Runway 16/34. Runway 4/22 is paved with asphalt and grooved, stretching 4800 feet in length and 100 feet in width. Its weight-bearing capacity varies based on the aircraft type. Runway 16/34, on the other hand, is a turf runway measuring 2117 feet by 100 feet. Both runways are equipped with edge lights and markings, catering to specific traffic patterns and headings.

The Olean Airport, owned by the City of Olean. It is home to 16 aircraft, primarily consisting of 15 single-engine airplanes and one multi-engine aircraft. On average, the airport handles around 70 aircraft operations per day, with the majority being local and transient general aviation flights. A smaller percentage comprises air taxi operations, while military traffic remains minimal.

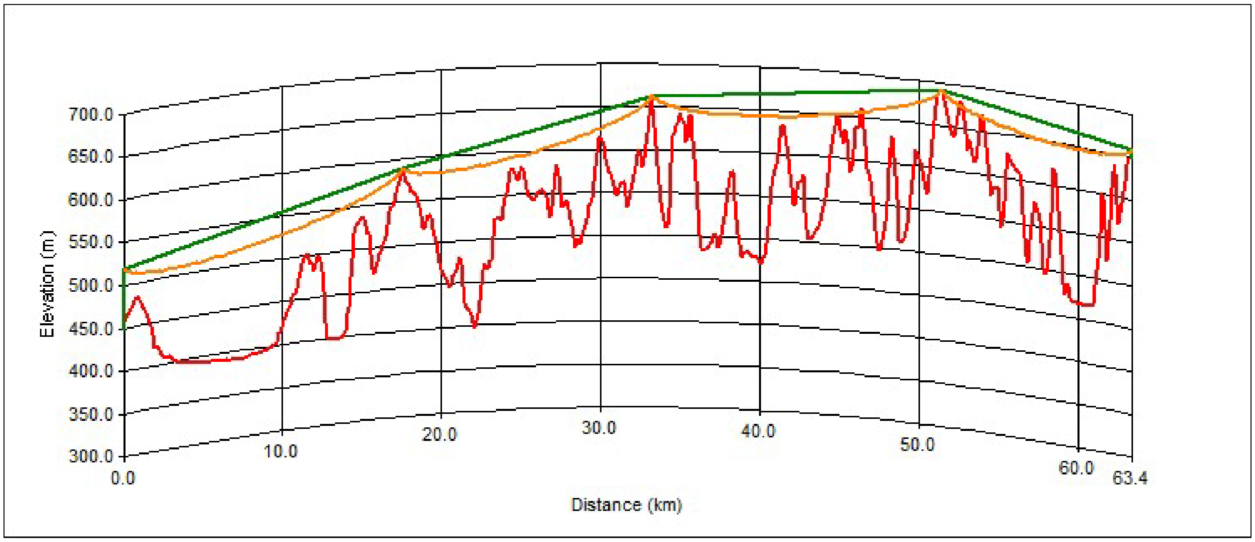
Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
CTAF/UNICOM	Communication	122.8	OLE	---	---
AWOS-3	Weather	118.375	OLE	---	---
ASOS	Weather	119.275	ELZ	19	SE
Approach	Communication	124.325	ZOB	---	---
Departure	Communication	353.85	ZOB	---	---
VOR	Navigation	114.7	JHW	33.5	92

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.



Chautauqua County/Dunkirk Airport

FAA Data

The FAA Identifier for Chautauqua County/Dunkirk Airport is DKK, situated at a latitude and longitude of 42-29-38.2000N 079-16-16.0000W, approximately 3 miles east of Dunkirk, NY. The elevation of the airport is 692.3 feet (211.0 meters), as surveyed. The magnetic variation at the location is 10W (2015), and it falls under the UTC -4 time zone (UTC -5 during Standard Time). The airport's zip code is 14048.

DKK has been open to the public since November 1943. It does not have a control tower and operates under the jurisdiction of the Cleveland Center ARTCC. The Buffalo Flight Service Station (FSS) provides NOTAMs services for the airport. The airport's wind indicator is lighted, and it has a segmented circle. The runway lights, including High-Intensity Runway Lights (HIRL) for runways 06/24 and Medium-Intensity Runway Lights (MIRLS) for runways 15/33, as well as PAPI lights for several runways, can be activated using the CTAF frequency. The beacon, a white-green lighted land airport, operates from sunset to sunrise.

Runway 6/24: The dimensions are 6000 x 100 feet (1829 x 30 meters) with an asphalt/grooved surface in excellent condition. Runway 15/33: The dimensions are 4000 x 100 feet (1219 x 30 meters) with an asphalt surface in fair condition. Similar to Runway 6/24, this runway has varying weight-bearing capacities.

The airport is publicly-owned by Chautauqua County and is managed by Shannon A. Barnhart. The operational statistics for the airport indicate that there are 29 aircraft based on the field, including 24 single-engine airplanes, 2 multi-engine airplanes, 2 jet airplanes, and 1 helicopter. The airport sees an average of 71 aircraft operations per day, with 69% being local general aviation, 23% transient general aviation, 7% air taxi, and 1% military operations.

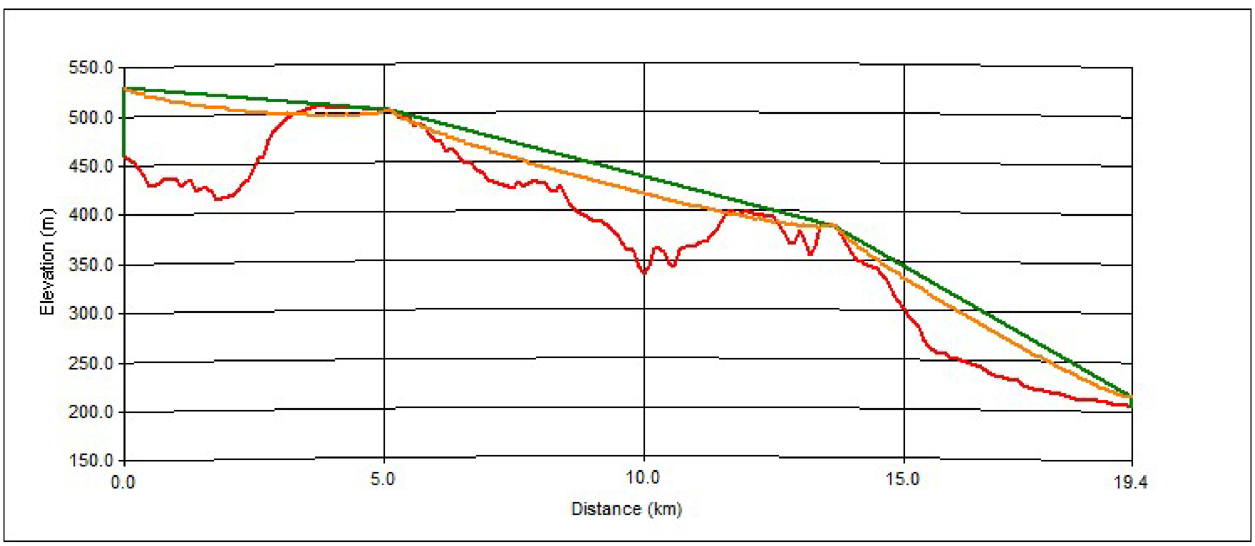
Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
CTAF/UNICOM	Communication	123.075	DKK	---	---
ASOS	Weather	119.275	DKK	---	---
Approach	Communication	126.5	BUF	---	---
Departure	Communication	126.5	BUF	---	---
VOR	Navigation	114.7	JHW	19.5	347

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.



Chautauqua County Jamestown Airport

FAA Data

Located approximately 3 miles north of Jamestown, New York, the Chautauqua County-Jamestown Airport (FAA Identifier: JHW) serves as a hub for aviation activities in the region.

Situated at coordinates 42°09'12.2180"N latitude and 79°15'28.8830"W longitude (42.1533939,-79.2580231, estimated), the airport stands at an elevation of 1723.3 feet (525.3 meters) above sea level, as surveyed. The airport's geographical location places it in the UTC -4 time zone (UTC -5 during Standard Time) and falls under the zip code 14701.

Since its activation in December 1938, the Chautauqua County-Jamestown Airport has been open to the public. Notably, the airport doesn't feature a control tower but operates with efficiency under the purview of the Cleveland Center ARTCC. Pilots and aviation enthusiasts can acquire information from the airport's UNICOM frequency, 122.975. Additionally, the airport facilitates its operations with the assistance of the Buffalo FSS for NOTAM services.

The airport maintains its operational lights, including high-intensity runway edge lights for Runways 7/25 and medium intensity lights for Runway 13/31, which greatly aid pilots during nighttime operations. The airport's beacon, a white-green lighted land airport beacon, ensures visibility and safety from sunset to sunrise. There is a landing fee imposed, specifically for multi-engine aircraft.

Runway configuration consists of three options: Runway 7/25 measures 5299 x 100 feet and is made of asphalt with grooves, while Runway 13/31 measures 4499 x 100 feet and is composed of asphalt.

Owned by Chautauqua County, the airfield has a variety of services including airframe and powerplant maintenance, the airport accommodates a range of aircraft. As of the 12-month period ending August 2022, the airport recorded an average of 26 daily aircraft operations, with the majority being local and transient general aviation flights, and a smaller percentage attributed to military operations.

Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
CTAF/UNICOM	Communication	122.975	JHW	---	---
AWOS-3	Weather	118.425	JHW	---	---
Approach	Communication	126.5	BUF	---	---
Departure	Communication	126.5	BUF	---	---
VOR	Navigation	114.7	JHW	6.4	258

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.

Gowanda Airport - D59

FAA Data

Gowanda Airport is designated with FAA Identifier D59, the airport resides at coordinates 42-30-14.2190N 078-57-02.1240W. Sitting at an elevation of 830 feet (253 meters, estimated), the airport is situated approximately 3 miles north of Gowanda, NY. The time zone observed is UTC -4 (UTC -5 during Standard Time), and the airport's zip code is 14070.

This public-use airport lacks a control tower and operates under the jurisdiction of the Cleveland Center ARTCC.

The airport's sole runway, Runway 9/27, measures 3430 x 100 feet (1045 x 30 meters) and has a turf surface in good condition. The traffic pattern is to the right for both directions. Runway 27 has a displaced threshold of 1132 feet, and the displaced threshold is unmarked.

Privately-owned by Dan Gernatt Gravel Prod. INC., the airport has five aircraft based on the field, all of which are single-engine airplanes. Over a 12-month period ending August 29, 2018, the airport reported an average of 69 aircraft operations per week, with 100% of these categorized as local general aviation activities.

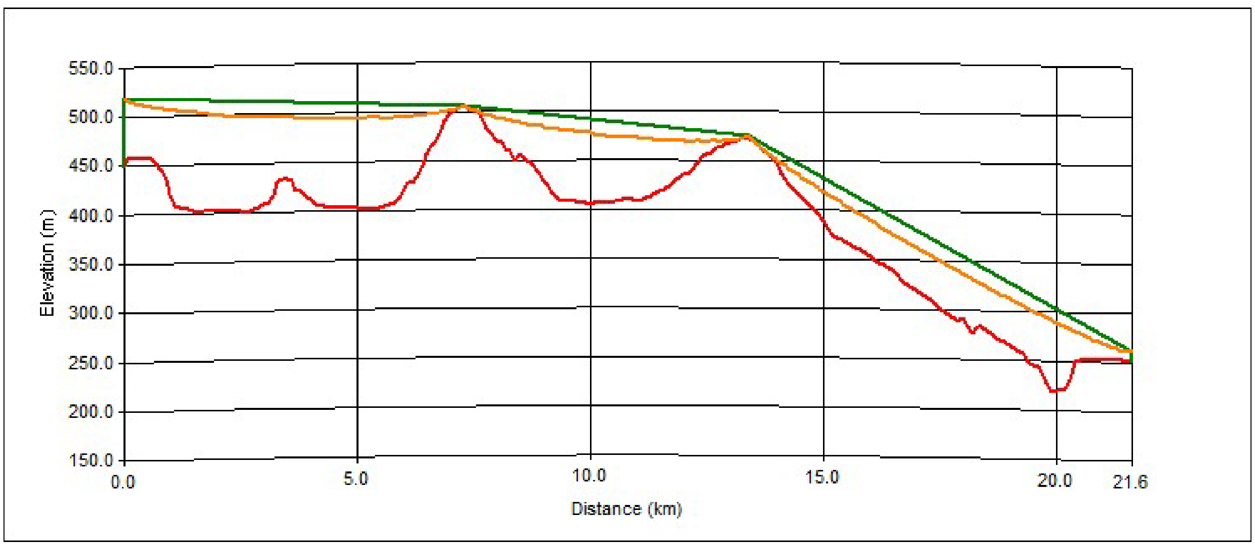
Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
CTAF/UNICOM	Communication	122.9	---	---	---
ASOS	Weather	119.275	DKK	14	W
VOR	Navigation	114.7	JHW	20.4	29

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.



Neverland Airport - NY76

FAA Data

The FAA Identifier for Neverland Airport is NY76, situated at coordinates 42°18'56.4000"N, 078°53'43.2000"W or 42.3156667 latitude and -78.8953333 longitude (estimated). The elevation of the airport is approximately 1901 feet or 579 meters (estimated) above sea level. It is located

2 miles to the west of Cattaraugus, NY. The airport falls under the UTC -4 time zone, which is UTC -5 during Standard Time. The zip code for the area is 14719.

NY76 is designated for private use and requires prior permission before landing. The airport became operational in October 2006. There is no control tower at this airport. The ARTCC responsible for this region is the Cleveland Center, while the Buffalo FSS handles flight services. The airport is attended from April to October during the period from dawn to dusk. A wind indicator is present, but there is no segmented circle for reference.

The airport has a single runway, designated as Runway 11/29. This runway measures 2100 x 50 feet (640 x 15 meters) and has a turf surface. The traffic pattern for both Runway 11 and Runway 29 is left-handed. NY76 is privately owned by Neverland Airport, LLC. and there is one aircraft based at the airport, which is a single-engine airplane.

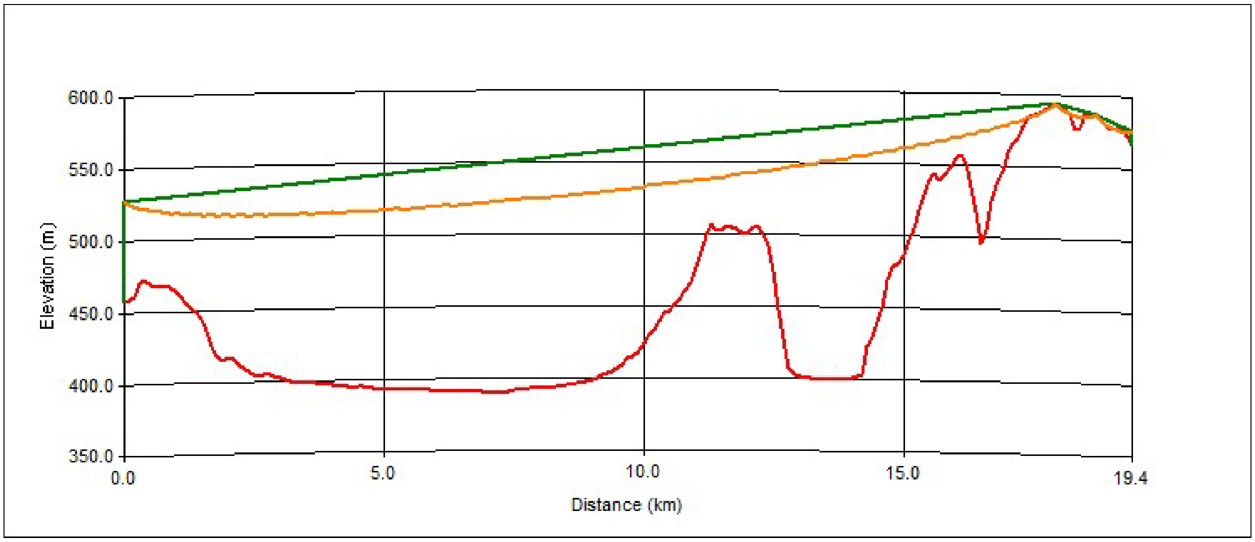
Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
AWOS-3	Weather	118.425	JHW	19	NW
ASOS	Weather	119.275	DKK	20	NW
VOR	Navigation	114.7	JHW	12.6	60

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.



Randolph Airport (Campbell Field) - 85NK

FAA Data

The FAA Identifier for this airport is 85NK, situated at coordinates 42-09-15.2200N 079-00-59.1500W, or 42.1542278°N, -79.0164306°W (estimated). The airport's elevation is approximately 1666 feet (508 meters) above sea level. The variation is noted as 09W (1985). It's located 2 miles to the west of Randolph, NY. The time zone followed is UTC -4, although it is UTC -5 during Standard Time. The airport falls within the zip code area 14772.

The airport operates as a private facility, requiring permission prior to landing. Its activation date dates back to February 1961. There is no control tower at the airport, and it is served by the Cleveland Center ARTCC. The Buffalo FSS provides services, and attendance at the airport is irregular. A wind indicator is present, but there is no segmented circle for traffic patterns.

The airport's single runway, labeled as Runway 8/26, has dimensions of 2495 x 80 feet (760 x 24 meters). The surface of the runway is composed of turf and is reported to be in excellent condition. The traffic pattern for both Runway 8 and Runway 26 is left-handed.

The airport is privately-owned and hosts a total of 3 aircraft based on its field. All the aircraft are single-engine airplanes. The average number of aircraft operations per week is 57, with all operations categorized as local general aviation. These statistics are based on a 12-month period ending on 21 October 2007.

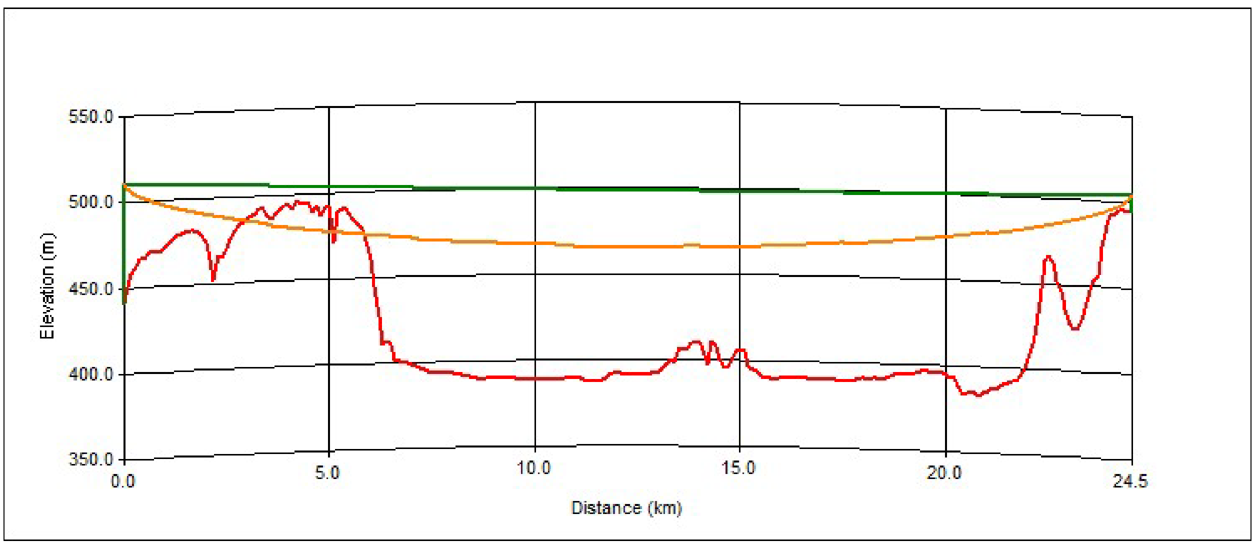
Frequencies of Concern

Below are the frequencies that would be used by an aviator utilizing this airfield.

Service	Use	Frequency (MHz)	Location	Distance from Airfield (nm)	Hdg/Rad from Airfield
AWOS-3	Weather	118.425	JHW	11	W
VOR	Navigation	114.7	JHW	5.1	121

Terrain Profile

Below the terrain profile utilizing the proposed wind turbine site as the starting point and the airfield as the end point. The red line indicates the terrain profile. The green line represents Line of Sight. The orange line indicates the Fresnel Zone. If any terrain falls within this zone there is a chance for degradation of a hypothetical source signal (which would be a positive in this case since it would be an unwanted signal potentially being generated by the wind turbine). The terrain profile below does not take into account the height of the wind turbine nor the equipment height at the airport.



Cleveland Center ARTCC

Frequencies of Concern

New York RCAG Sites							
Dunkirk, NY - RCAG							
Frequency	License	Type	Tone	Alpha Tag	Description	Mode	Tag
125.2		BM	CSQ	ZOB33 BUF-L	Sector 33 Buffalo Low	AM	Aircraft
256.8		BM		ZOB33 BUF-L	Sector 33 Buffalo Low	AM	Aircraft
369.9		BM		ZOB TSU	Tactical/Special Use	AM	Aircraft
Geneseo, NY - RCAG							
Frequency	License	Type	Tone	Alpha Tag	Description	Mode	Tag
128.025		BM	CSQ	ZOB37 GEE-H	Sector 37 Geneseo Hi	AM	Aircraft
323.25		BM		ZOB37 GEE-H	Sector 37 Geneseo Hi	AM	Aircraft
Holland, NY - RCAG							
Frequency	License	Type	Tone	Alpha Tag	Description	Mode	Tag
118.625		BM	CSQ	ZOB36 DSV-H	Sector 36 Dansville Hi	AM	Aircraft
306.9		BM		ZOB36 DSV-H	Sector 36 Dansville Hi	AM	Aircraft
120.625		BM	CSQ	ZOB38 IAG-SH	Sector 38 Niagara Super Hi	AM	Aircraft
316.05		BM		ZOB38 IAG-SH	Sector 38 Niagara Super Hi	AM	Aircraft
Wayland, NY - RCAG							
Frequency	License	Type	Tone	Alpha Tag	Description	Mode	Tag
127.475		BM	CSQ	ZOB31 ROC-L	Sector 31 Rochester Low	AM	Aircraft
346.35		BM		ZOB31 ROC-L	Sector 31 Rochester Low	AM	Aircraft
119.375		BM	CSQ	ZOB39 STU-SH	Sector 39 Steuben Super Hi	AM	Aircraft
235.975		BM		ZOB39 STU-SH	Sector 39 Steuben Super Hi	AM	Aircraft
124.325		BM	CSQ	ZOB73 BFD-L	Sector 73 Bradford Low	AM	Aircraft
353.85		BM		ZOB73 BFD-L	Sector 73 Bradford Low	AM	Aircraft

Buffalo Airport Surveillance Radar

Buffalo Niagara International Airport is the closest airfield to the wind turbine site that has an Airport Surveillance Radar (ASR-9). ASR systems at large airports share service with all nearby local airports.

The ASR-9 stands as the inaugural airport surveillance radar that could simultaneously detect meteorological phenomena and aircraft using the same beam, and visually represent both on a single display. Equipped with a digital Moving Target Detection (MTD) processor, it employs Doppler radar technology in tandem with a clutter map. This sophisticated combination enables it to filter out ground and weather interference and track targets with improved efficiency. Theoretically, the ASR-9 has the capacity to track up to 700 aircraft concurrently.

The radar's klystron tube transmitter works in the S-band spectrum, oscillating between 2.5 and 2.9 GHz, and uses circular polarization. It exhibits a peak power output of 1.3 MW, a pulse duration of 1 microsecond, and a pulse repetition frequency that ranges from 325 to 1200 pulses per second. If the primary frequency faces interference, it can be switched to a backup frequency. The radar's receiver demonstrates a high sensitivity, capable of detecting a radar cross-section of 1 square meter from a distance of 111 kilometers and provides a range resolution of 450 feet.

The radar's antenna can cover an elevation of 40° from the horizon and uses two feedhorns, which generate two vertically stacked, overlapping lobes with a 4° separation. The lower beam sends the outgoing pulse and is utilized for the detection of faraway targets near the horizon, while the higher beam, which is receive-only, identifies closer aircraft at higher elevations with reduced ground clutter. The antenna offers a gain of 34 dB and a beamwidth of 5° in elevation and 1.4° in azimuth. With a rotational speed of 12.5 RPM, the antenna scans the surrounding airspace every 4.8 seconds.

The system's electronics operate on a dual-channel basis and are designed for fault tolerance. The ASR-9 features a remote monitoring and maintenance subsystem which, in case of any malfunction, activates an integrated test that detects and isolates the issue. Consistent with other airport surveillance radars, the ASR-9 is equipped with a backup diesel generator to ensure uninterrupted operation during power outages.

Frequencies of Concern

The radar operates on frequencies of 2.5-2.9 GHz. The distance and terrain between the wind turbine and ALB is sufficient enough to not consider any impact to the communication frequencies used by Albany International Airport.

Radar Clutter Interference

If the proposed wind turbine is over 200 feet tall it will require a Federal Aviation Administration (FAA) Obstruction Evaluation / Airport Airspace Analysis (OE/AAA).

The FAA has regulatory jurisdiction over structures that exceed 200 feet above ground level, including utility-scale wind turbines, ensuring their compatibility with aviation safety and other airspace uses, including radar. Developers are obligated to lodge an application via the FAA's Obstruction Evaluation/Airport Airspace Analysis process. This evaluates the likelihood of radar interference emanating from the proposed wind farm. In tandem with this, the FAA alerts other federal departments with radar facilities in proximity to the planned project (DOD, DHS, and NOAA), enabling them to assess potential impacts.

The DOD Military Aviation and Installation Assurance Siting Clearinghouse brings together feedback from different DOD branches, offices, and bases to evaluate potential effects on their operations.

The DOD Siting Clearinghouse follows a systematic, formal review procedure to carry out compatibility assessments for proposed wind projects submitted to the FAA. An informal review process has been set up by the Clearinghouse to expedite these assessments, advising developers to seek a preliminary verdict before lodging an application with the FAA. This informal review facilitates a swift, transparent, and evidence-based analysis of potential project impacts, flagging potential concerns to project developers and federal agencies before entering the formal FAA review phase. If issues are identified, the Clearinghouse collaborates with the industry to resolve these, if possible, mitigating national security risks whilst endorsing harmonious domestic energy development.

Apart from the FAA process, NOAA has its own preliminary review process, details of which are available on its Radar Operations Center website.

Developers can utilize online tools for preliminary site screenings prior to liaising with federal agencies. These include the DOD Preliminary Screening Tool, the NOAA NEXRAD Screening Tool (incorporating the U.S. Wind Turbine Database), and the DOD Siting Clearinghouse.

Developers are required to file a notice 90 to 120 days before intended construction. Proposals must include individual turbine specifications (including latitude/longitude and overall turbine height) as well as the project layout at the time of filing.

If a project is found to potentially negatively impact, for instance, DOD military readiness (research, development, testing, and evaluation, training, and military operations) or DHS interests, these agencies partner with wind farm developers to identify mitigation strategies. The DOD Siting Clearinghouse has assessed approximately 10,000 energy projects since 2010 for potential impacts on military operations, with only a single case where discrepancies could not be reconciled.

The concern over the wind turbine creating Radar clutter will be studied thoroughly by United States Federal Government entities to ensure there will be no degradation of service.

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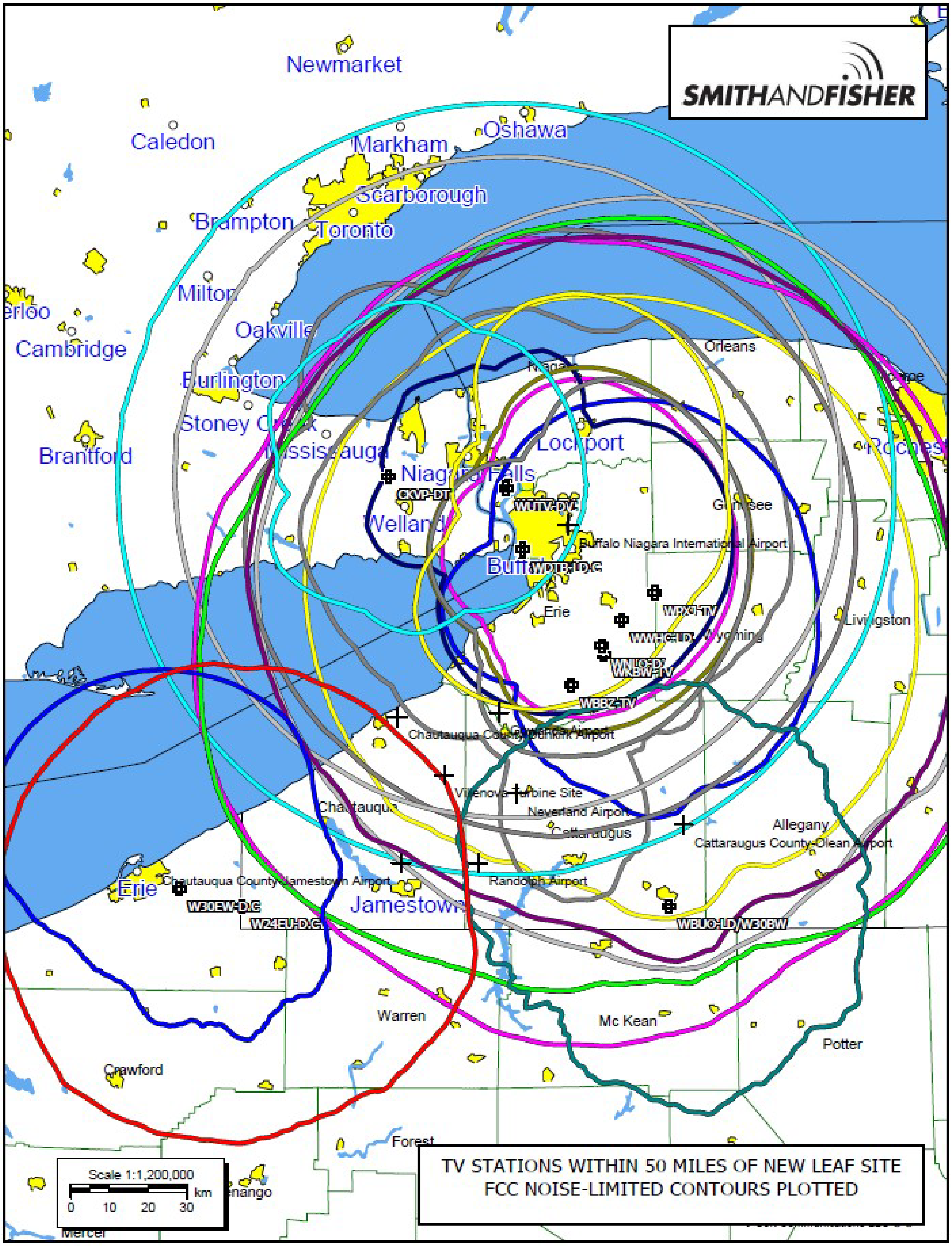
Appendix

A.1 Map of Television Stations Within 50-Mile Radius of Proposed Site



A2.1 List of FM Stations Within 50-Mile Radius of Proposed Site

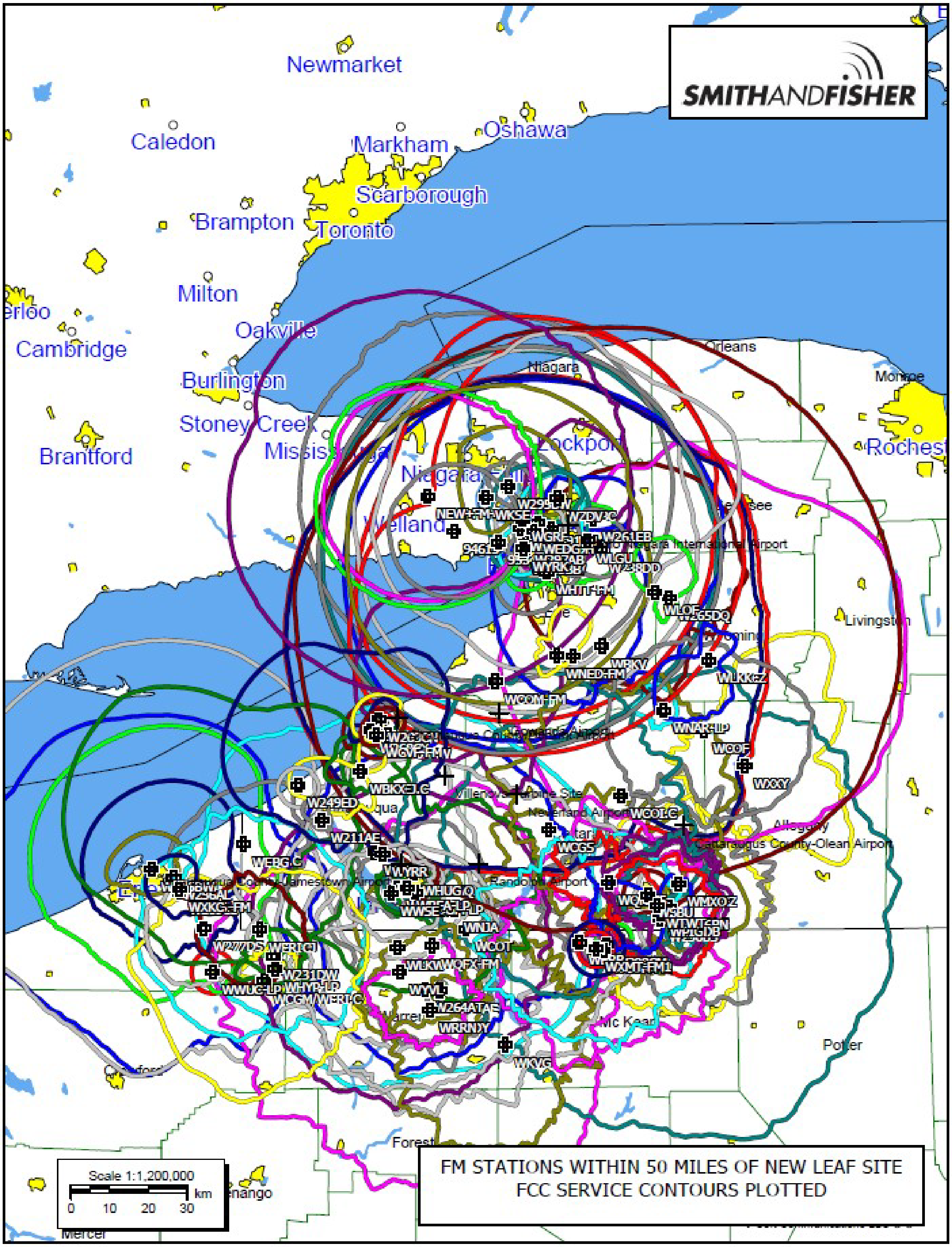
Call	Ch.	Freq (MHz)	City	St	ERP	Dist	Licensee
W201BE	201	88.1	Buffalo	NY	0.08	69.5	Priority Radio, Inc.
WUBJ	201	88.1	Jamestown	NY	2.7	26.8	Western New York Publ
WSBU	202	88.3	St. Bonave	NY	0.165	61.1	St. Bonaventure Unive
W203AW	203	88.5	Fredonia	NY	0.019	17.9	Holy Family Communica
WMCE-FM	203	88.5	Erie	PA	0.75	73.8	Lake Erie College Of
WYVL	203	88.5	Youngsvill	PA	2.5	52	Calvary Chapel Of Rus
WBFO	204	88.7	Buffalo	NY	50	77.4	Western New York Publ
WCVF-FM	205	88.9	Fredonia	NY	0.13	20.3	Board Of Trustees Of
WYRR	205	88.9	Lakewood	NY	0.42	25.8	Family Worship Center
CKYY-FM	206	89.1	Welland	ON	4.25	72.2	
NEW+	206	89.1	Welland	ON	3.1	72.2	
WCOM-FM	207	89.3	Silver Cre	NY	8	27.7	Family Life Ministrie
WCOF	208	89.5	Arcade	NY	1	68	Family Life Ministrie
W209CS	209	89.7	Erie	PA	0.01	74.7	CSN International
WNJA	209	89.7	Jamestown	NY	6	34.8	Western New York Publ
WBWA	210	89.9	Buffalo	NY	3	45.4	Educational Media Fou
W211AE	211	90.1	Mayville,	NY	0.003	33.7	Public Broadcasting O
WXXY	212	90.3	Houghton	NY	6	77.6	Wxxi Public Broadcast
WTWT	213	90.5	Portville	NY	2.5	64.4	Calvary Chapel Of Rus
WLGU	214	90.7	Lancaster	NY	1	71.1	Holy Family Communica
WCOT	215	90.9	Tidioute	PA	12	40.1	Family Life Ministrie
WBNY	217	91.3	Buffalo	NY	1.15	66.8	State University Of N
WOLN	217	91.3	Olean	NY	1	66.4	Western New York Publ
CIXL	219	91.7	Welland	ON	50	72.1	
W220EL	220	91.9	Jamestown	NY	0.009	26.5	Bible Broadcasting Ne
WCOI.C	220	91.9	Ellicottvi	NY	4.2	46	Family Life Ministrie
WZDV	221	92.1	Amherst	NY	1.4	77.4	Calvary Chapel Of The
WRRN	222	92.3	Warren	PA	50	60.7	Lilly Broadcasting Of
WBUF	225	92.9	Buffalo	NY	76	69.1	Townsquare Media Of B
W227BW	227	93.3	Cheektowag	NY	0.004	61.4	Calvary Chapel Of The
WWSE	227	93.3	Jamestown	NY	26.5	33.3	Media One Holdings, L
WBLK	229	93.7	Depew	NY	47	62.1	Townsquare Media Of B
W231AH	231	94.1	Bradford	PA	0.044	59.4	Family Life Ministrie
W231AH.	231	94.1	Bradford	PA	0.25	64.4	Family Life Ministrie
W231DW	231	94.1	Corry	PA	0.25	64.2	Lake Erie College Of
W231EA	231	94.1	Buffalo	NY	0.15	42.4	Kimtron, Inc.

WIHR-LP	231	94.1	Jamestown	NY	0.1	30.9	Advent Radio Ministri
WNED-FM	233	94.5	Buffalo	NY	96	42.5	Western New York Publ
W235BC	235	94.9	Bowmansvil	NY	0.027	77.4	Calvary Chapel Of The
WLKW	237	95.3	Celoron	NY	0.9	46.1	Educational Media Fou
W238DD	238	95.5	Lancaster	NY	0.25	70.8	Dome Broadcasting, In
W239BA	239	95.7	Niagara Fa	NY	0.25	76.4	Family Life Ministrie
WPIG	239	95.7	Olean	NY	43	66.4	Southern Belle, LLC
WEBG	240	95.9	Mina	NY	0.82	54.7	Ihm Licenses, LLC
WTSS	241	96.1	Buffalo	NY	47	62.1	Townsquare Media Of B
W242CT	242	96.3	Olean	NY	0.2	67.3	Southern Belle, LLC
W243DX	243	96.5	Buffalo	NY	0.035	61.4	Visions Multi Media G
WBKX	243	96.5	Fredonia	NY	1.4	21.6	Chadwick Bay Broadcas
W244DY	244	96.7	Warren	PA	0.22	60.7	Lilly Broadcasting Of
WCOR-FM	244	96.7	Lewis Run	PA	2.85	61	Family Life Ministrie
WWUC-LP	244	96.7	Union City	PA	0.09	78.4	Union City Family Sup
WGRF	245	96.9	Buffalo	NY	24	69.1	Radio License Holding
W249ED	249	97.7	Westfield	NY	0.099	37.8	Family Life Ministrie
WQRS	252	98.3	Salamanca	NY	3.2	50.8	Southern Belle, LLC
WKSE	253	98.5	Niagara Fa	NY	46	72.6	Audacy License, LLC
W254AQ	254	98.7	Jamestown	NY	0.01	26.5	Calvary Chapel Of Rus
W254BQ	254	98.7	Limestone	NY	0.25	59.6	Southern Belle, LLC
W255AE	255	98.9	Warren	PA	0.05	55.5	Public Broadcasting O
W255DH	255	98.9	Buffalo	NY	0.25	67.2	Radio License Holding
WHYP-LP	255	98.9	Corry	PA	0.1	66.4	Corry Area Radio Serv
W256AL	256	99.1	North East	PA	0.025	74.7	Inspiration Time, Inc
W256BS	256	99.1	Olean	NY	0.085	66.9	Southern Belle, LLC
WDCX-FM	258	99.5	Buffalo	NY	110	42.4	Kimtron, Inc.
WXKC	260	99.9	Erie	PA	50	74.5	Radio License Holding
W261EB	261	100.1	Lancaster	NY	0.25	76.7	Radio One Buffalo, LL
WBRR	261	100.1	Bradford	PA	1.65	55.5	Radio Station Wesb, I
94613	262	100.3	Crystal Be	ON	0.74	63.1	
W262BX	262	100.3	Jamestown	NY	0.25	31.6	Fmx Broadcasting
WNAR-LP	262	100.3	Arcade	NY	0.014	59.1	Arcade Christian Broa
W263CN	263	100.5	Dunkirk	NY	0.15	22.3	Family Life Ministrie
W263CZ	263	100.5	Olean	NY	0.25	66.7	Holy Family Communica
W263DC	263	100.5	Tonawanda	NY	0.22	76.4	Radio One Buffalo, LL
W264AT	264	100.7	Warren	PA	0.21	55.6	Family Life Ministrie
W265BB	265	100.9	Bradford	PA	0.05	59.6	The Pennsylvania Stat
W265DQ	265	100.9	Alden	NY	0.23	74	Lloyd Lane, Incorpora

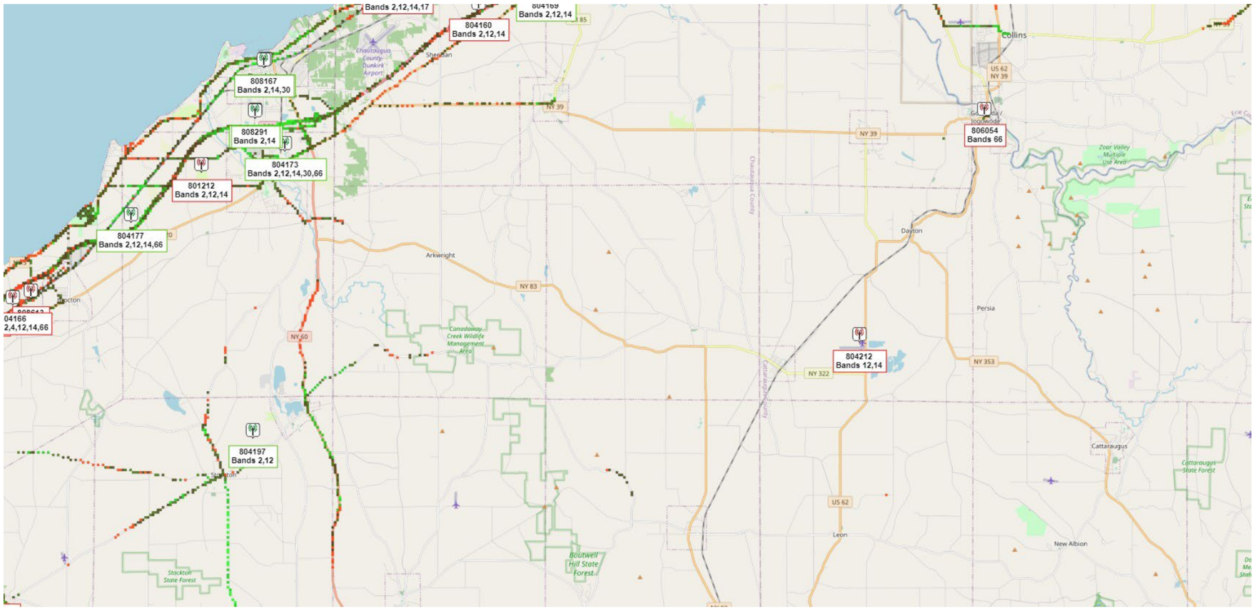
WCGE.C	265	100.9	North East	PA	4.6	54.8	Family Life Ministrie
95549	266	101.1	Fort Erie	ON	50	61.8	
W266BN	266	101.1	Olean	NY	0.099	67.3	Southern Belle, LLC
W267CN	267	101.3	Jamestown	NY	0.06	33.3	Media One Holdings, L
W268CJ	268	101.5	Corry	PA	0.25	62	Family Life Ministrie
W268CX	268	101.5	Dunkirk	NY	0.25	22.3	Chadwick Bay Broadcas
WMXO	268	101.5	Olean	NY	4	66.7	Southern Belle, LLC
WLOF	269	101.7	Elma	NY	2.8	72.1	Holy Family Communica
WHUG	270	101.9	Jamestown	NY	6	26.5	Media One Holdings, L
WBKV	273	102.5	Buffalo	NY	110	52.7	Educational Media Fou
WCGM/WE	274	102.7	Wattsburg	PA	4.4	70.5	Lake Erie College Of
WERI	274	102.7	Wattsburg	PA	3.5	62	Lake Erie College Of
W275BB	275	102.9	Cheektowag	NY	0.22	61.4	Radio One Buffalo, LL
WQFX-FM	276	103.1	Russell	PA	2.5	44.1	Media One Holdings, L
W277DS	277	103.3	Erie	PA	0.2	73.6	Inspiration Time, Inc
WEDG	277	103.3	Buffalo	NY	49	67.2	Radio License Holding
WRTS	279	103.7	Erie	PA	50	73.8	Ihm Licenses, LLC
WCOP-FM	280	103.9	Bradford	PA	0.9	59.4	Family Life Ministrie
WHTT-FM	281	104.1	Buffalo	NY	50	58.7	Radio License Holding
WNAE	282	104.3	Clarendon	PA	4.7	60.7	Lilly Broadcasting Of
W284AP	284	104.7	Buffalo	NY	0.25	69.6	Audacy License, LLC
WOGM-LP	284	104.7	Jamestown	NY	0.048	31.2	Lighthouse Baptist Ch
W285EZ	285	104.9	Arcade	NY	0.25	74.5	Lloyd Lane, Inc.
WRKT	285	104.9	North East	PA	4.5	73.8	Ihm Licenses, LLC
WKVG	286	105.1	Sheffield	PA	6	71.3	Educational Media Fou
W285ES	288	105.5	Salamanca	NY	0.25	50.8	Southern Belle, LLC
W288EJ	288	105.5	Dunkirk	NY	0.2	21.6	Chadwick Bay Broadcas
W288EJ.	288	105.5	Dunkirk	NY	0.25	21.6	Chadwick Bay Broadcas
WCGS	290	105.9	Little Val	NY	7	30.4	Family Life Ministrie
W291CN	291	106.1	Buffalo	NY	0.25	69.6	Family Life Ministrie
WXMT-FM	292	106.3	Bradford	PA	0.81	59.5	Xmt Entertainment LLC
WYRK	293	106.5	Buffalo	NY	50	62.1	Townsquare Media Of B
W295BW	295	106.9	Grand Isla	NY	0.15	76.4	Priority Radio, Inc.
WKZA	295	106.9	Lakewood	NY	5.1	46.1	Media One Group II, L
W296BW	296	107.1	Erie	PA	0.25	79.3	The Board Of Trustees
W296DB	296	107.1	Olean	NY	0.25	66.4	Southern Belle, LLC
W297AB	297	107.3	Buffalo	NY	0.073	63.8	Audacy License, LLC
W298CM	298	107.5	Bradford	PA	0.25	60.5	Radio Station Wesb, I
WLKK	299	107.7	Wethersfie	NY	17	74.5	Audacy License, LLC

WRFA-LP	300	107.9	Jamestown	NY	0.1	30.6	Reg Lenna Center For

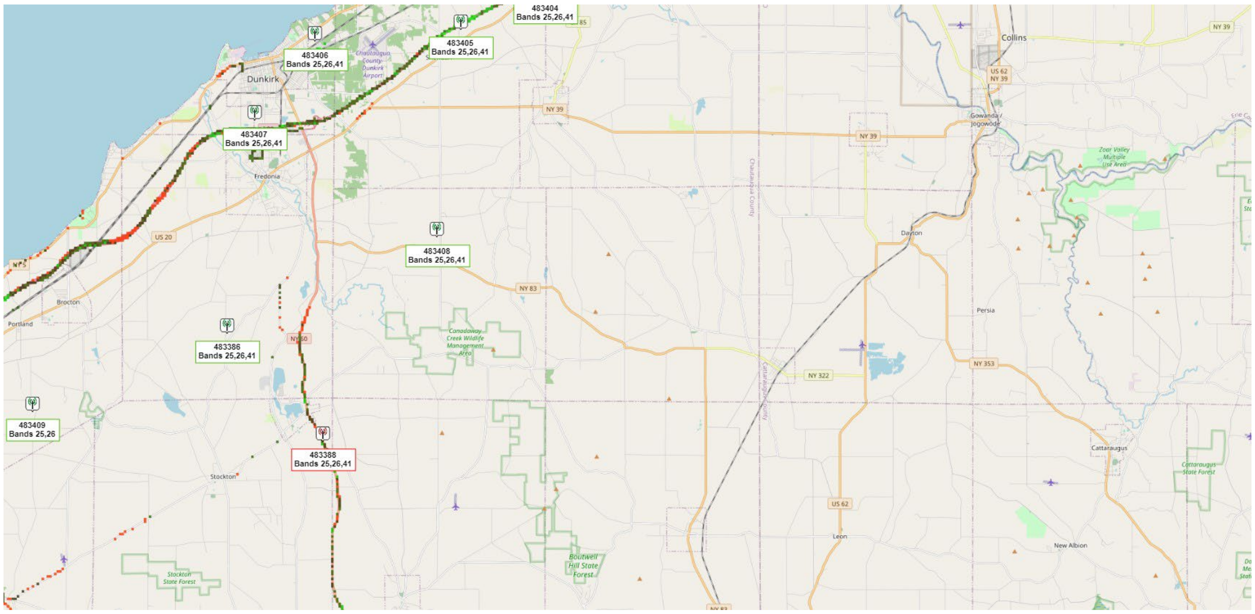
A2.2 Map of FM Stations Within 50-Mile Radius of Proposed Site

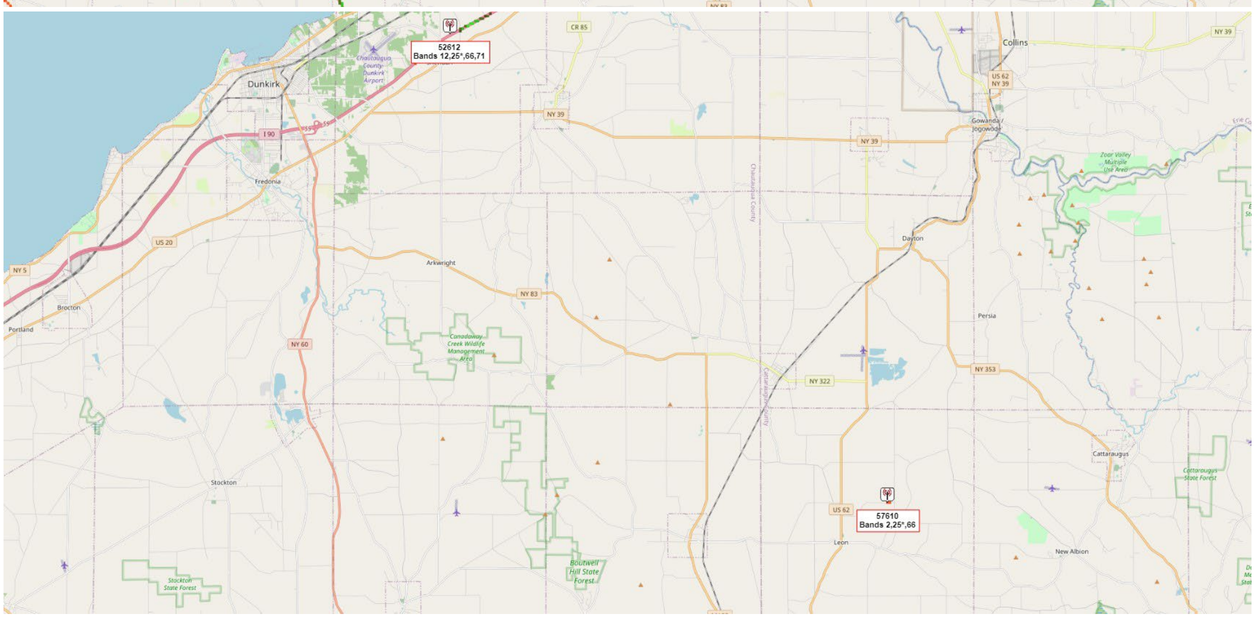


A3.1 Map of Known AT&T 4G Base Station Sites Near Proposed Site

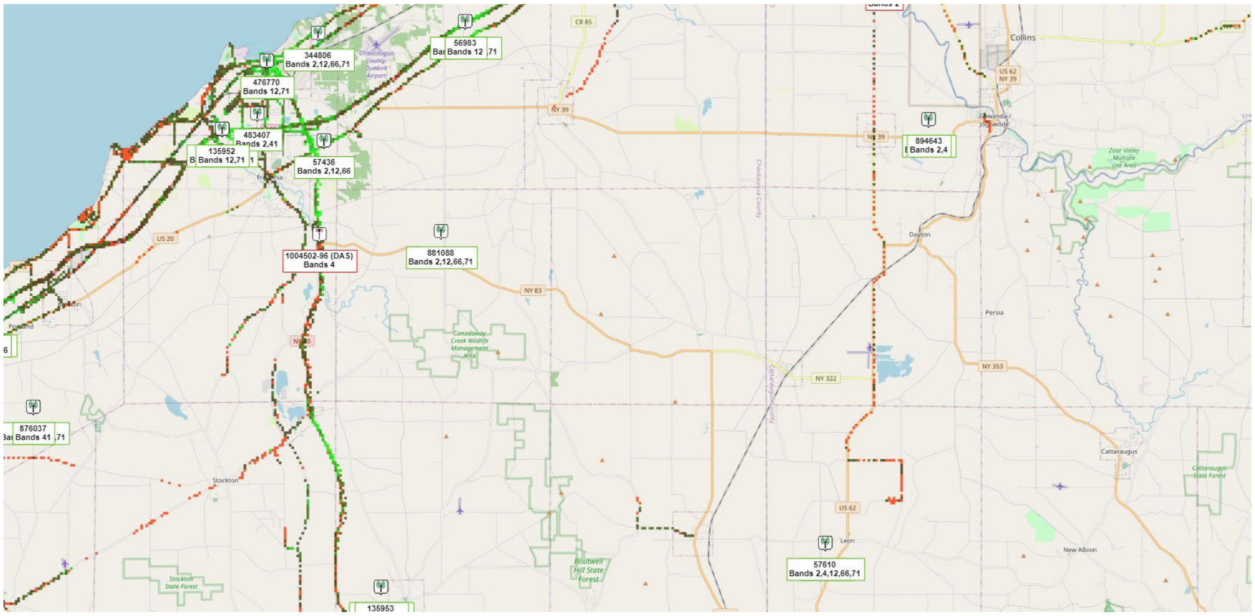


A3.2 Map of Known Sprint 4G Base Station Sites Near Proposed Site

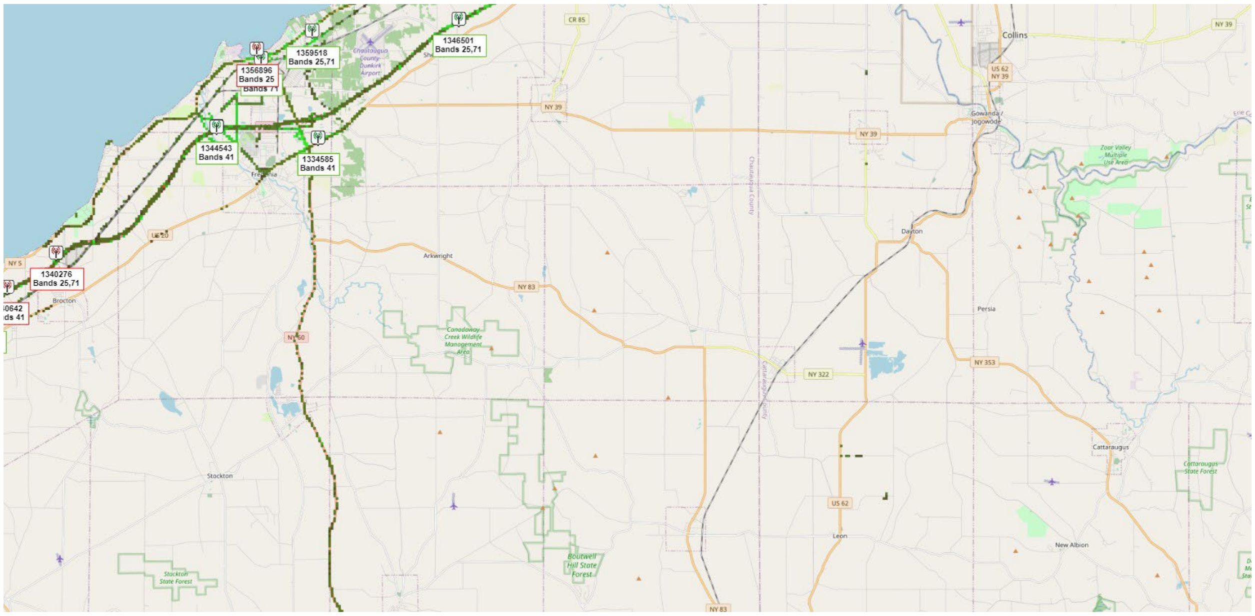




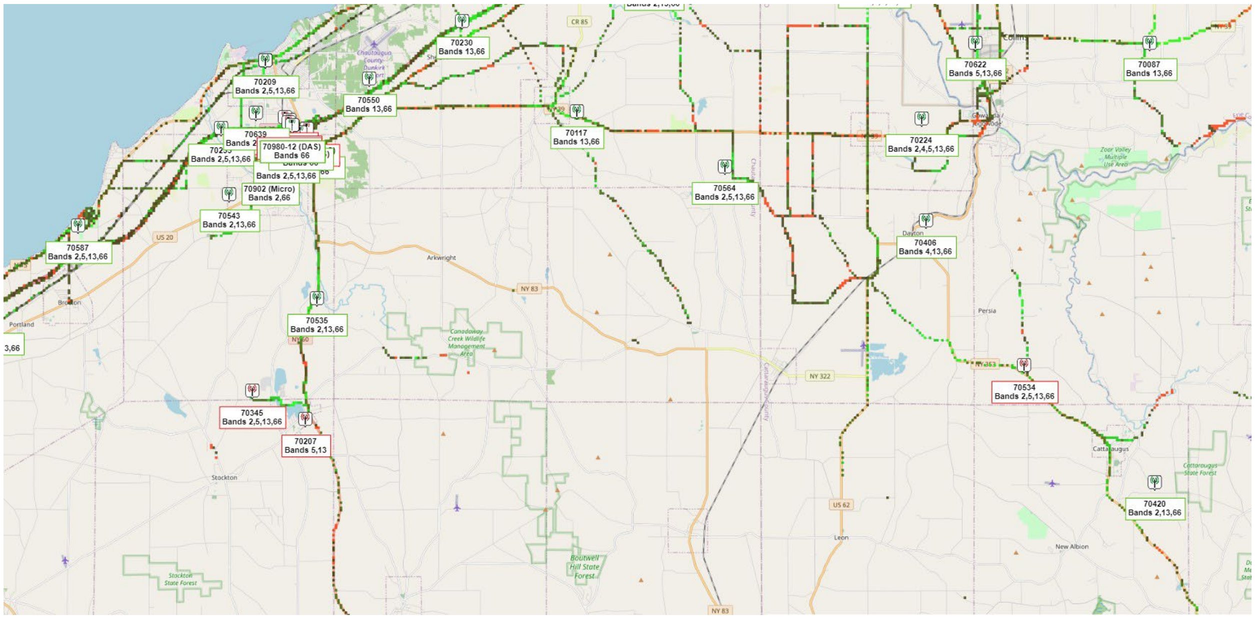
A3.3 Map of Known T-Mobile 4G Base Station Sites Near Proposed Site



A3.4 Map of Known T-Mobile 5G Base Station Sites Near Proposed Site



A3.5 Map of Known Verizon 4G Base Station Sites Near Proposed Site



A4 Comsearch Wind Power GeoPlanner Microwave Study

Wind Power GeoPlanner™

Microwave Study

Villenova, NY Wind Turbine

Prepared on Behalf of
Smith and Fisher, LLC

August 28, 2023

COMSEARCH
A CommScope Company

Table of Contents

1. Introduction

Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. This report focuses on the potential impact of wind turbines on licensed, proposed and applied non-federal government microwave systems.

2. Project Overview

Project Information

Name: Villenova, NY Wind Turbine

County: Chautauqua

State: New York

Number of Turbines: 3

Blade Diameter: 163 meters

Hub Height: 105 meters

Figure 1: Area of Interest

3. Two-Dimensional Fresnel Zone Analysis

Methodology

Our obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed and applied paths from 0.9 - 23 GHz[1]. First, we determined all microwave paths that intersect the area of interest[2] and listed them in Table 1. This path and the area of interest defined as within two miles of the planned turbine locations are shown in Figure 2.

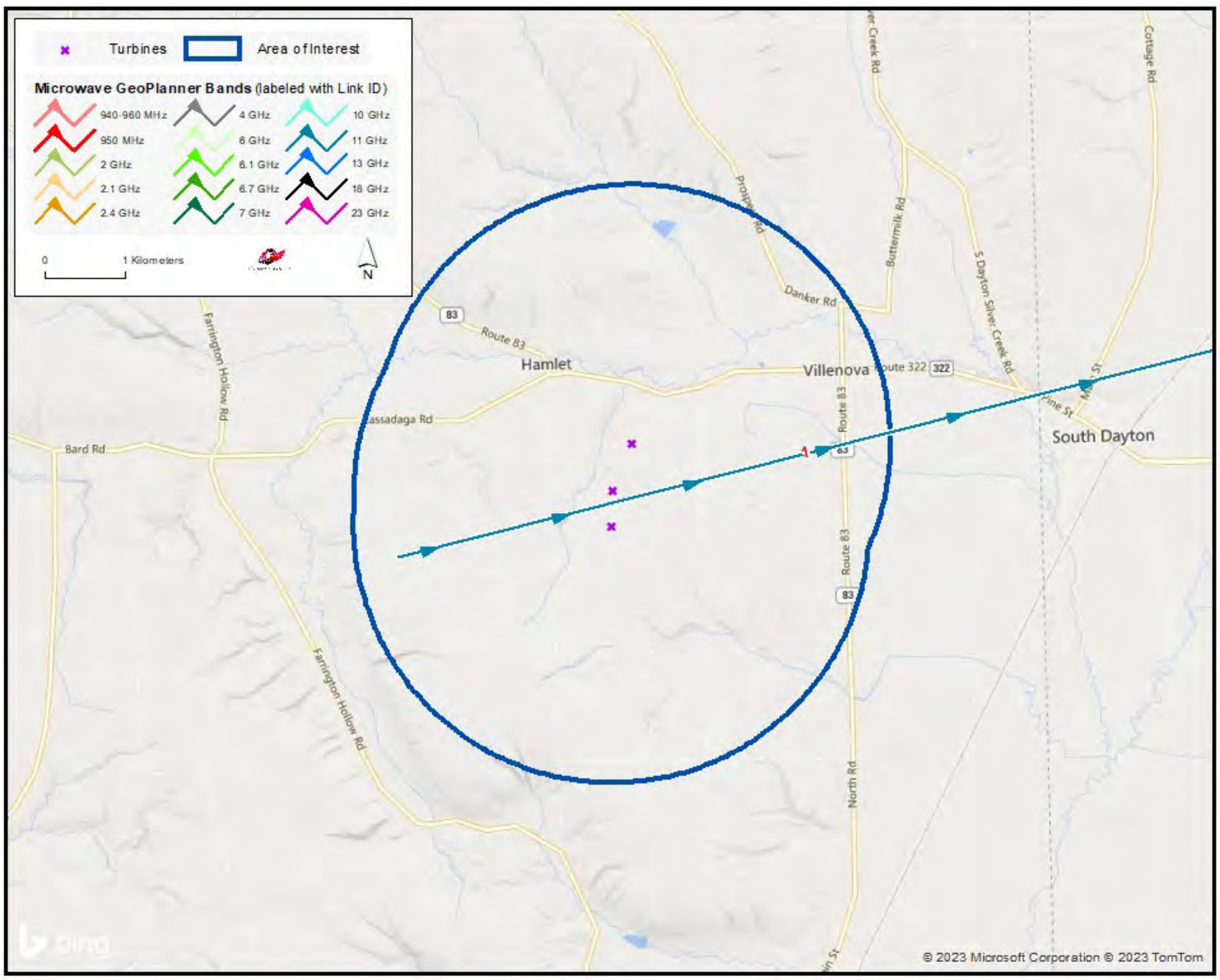


Figure 2: Microwave Paths that Intersect the Area of Interest

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[1] Please note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

[2] We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

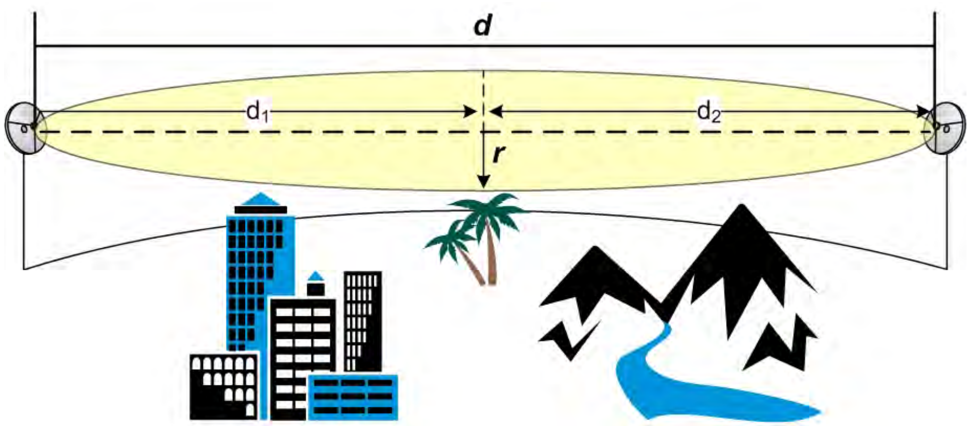
ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1	Licensed	WROV912	WROV911	11 GHz	25.5	Netsync Internet Service Corporation

Table 1: Summary of Microwave Paths that Intersect the Area of Interest
(See enclosed mw_geopl.xlsx for more information and GP_dict_matrix_description.xls for detailed field descriptions)

Verification of Coordinate Accuracy
It is possible that as-built coordinates may differ from those on the FCC license. For this project, the path crosses within close proximity of the proposed turbines and the tower locations for this path will have a critical impact on the result. Therefore, we verified these locations using aerial photography and they were found to be accurate.

Next, we calculated a Fresnel Zone for each path based on the following formula:

$$r \cong 17.3\sqrt{\frac{n}{F_{GHz}}\left(\frac{d_1 d_2}{d_1 + d_2}\right)}$$



Where,

r = Fresnel Zone radius at a specific point in the microwave path, meters
n = Fresnel Zone number, 1
F_{GHz} = Frequency of microwave system, GHz
d_1 = Distance from antenna 1 to a specific point in the microwave path, kilometers
d_2 = Distance from antenna 2 to a specific point in the microwave path, kilometers

In general, this is the area where the planned wind turbines should be avoided, if possible. Likewise, Comsearch recommends that an area directly in front of each microwave antenna should be avoided. This corresponds to the Consultation Zone which measures 1 kilometer along the main beam of the antenna and 24 ft (7.3 meters) wide. A depiction of the Fresnel Zones and Consultation Zones for the microwave path listed can be found in Figure 3, and is also included in the enclosed shapefiles[3,4].

Figure 3: Microwave Paths with Fresnel Zones

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[3] The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 17 projected coordinate system.

[4] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf.

4. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
1	0	3	0

Table 2: Fresnel Zone Analysis Result

Our study identified one microwave path within two miles of the Villenova, NY Wind Turbine project. The Fresnel and Consultation Zones for this microwave path were calculated and mapped in order to assess the potential impact from the turbines. A total of three turbines were considered in the analysis, each with a blade diameter of 163 meters and a hub height of 105 meters. Of those turbines, none were found to have potential obstruction with the microwave system in the area.

5. Contact

For questions or information regarding the Microwave Study, please contact:

Contact person: David Meyer
Title: Senior Manager
Company: Comsearch
Address: 21515 Ridgetop Circle, Suite 300, Sterling, VA 20166
Telephone: 703-726-5656
Fax: 703-726-5595
Email: David.Meyer@CommScope.com
Web site: www.comsearch.com

Appendix: Turbine Locations

NAME	Latitude	Longitude
South Hill Wind 3	42° 21' 10.49"N	79° 07' 33.70"W
South Hill Wind 4	42° 21' 24.45"N	79° 07' 32.79"W
South Hill Wind 5	42° 21' 43.61"N	79° 07' 21.25"W