



## Baron Winds Project

Case No. 15-F-0122

1001.26 Exhibit 26

Effect On Communications

## TABLE OF CONTENTS

EXHIBIT 26	EFFECT ON COMMUNICATIONS.....	1
(a)	Existing Broadcast Communication Sources .....	1
(1)	AM Radio .....	1
(2)	FM Radio.....	1
(3)	Television.....	3
(4)	Telephone .....	4
(5)	Microwave Transmission.....	5
(6)	Emergency Services .....	6
(7)	Municipal/School District Services .....	10
(8)	Public Utility Services.....	11
(9)	Doppler/Weather Radar (all affected sources; not limited to two-mile radius).....	11
(10)	Air Traffic Control (all affected sources; not limited to a two-mile radius).....	12
(11)	Armed Forces (all affected sources; not limited to two-mile radius).....	12
(12)	GPS.....	13
(13)	LORAN (all affected sources; not limited to two-mile radius).....	13
(14)	Amateur Radio Licenses .....	14
(b)	Existing Underground Cable and Fiber Optic Lines within Two Miles .....	16
(c)	Anticipated Effects on Communication Systems.....	16
(1)	Potential Structure Interference with Broadcast Patterns.....	16
(2)	Potential for Structures to Block Lines-of-Sight.....	17
(3)	Physical Disturbance by Construction Activities.....	17
(4)	Adverse Impacts to Co-Located Lines due to Unintended Bonding.....	17
(5)	Other Potential for Interference.....	18
(d)	Evaluation of Design Configuration.....	19
(e)	Post-construction Activities to Identify and Mitigate Adverse Effects on Communication Systems.....	19
(f)	Potential Interference with Radar or Other Instrumentation Systems Used for Air Traffic Control, Guidance, Weather or Military Operations.....	19
	REFERENCES .....	21

## EXHIBIT 26 EFFECT ON COMMUNICATIONS

### (a) Existing Broadcast Communication Sources

This section of the Application identifies existing broadcast communication sources and the electric interconnection between the Facility and the point of interconnection. The regulation requires identification of communication sources within a two-mile radius of the Facility, unless otherwise noted. A Communication Tower Study (Appendix PPP) prepared by Comsearch identified two tower structures and four communication antennas within the Facility Site. The identified structures are used for microwave, FM, and land mobile services in the area. Detailed impact assessments were performed for these and other service types and are discussed below.

#### (1) AM Radio

Comsearch conducted a review of Federal Communications Commission (FCC) license data and compiled a list of AM radio stations within approximately 30 kilometers (18.6 miles) of the proposed Facility Area (see Appendix KKK). Six database records for AM stations were identified, consisting of three stations each licensed separately for daytime and nighttime operations: WDNY, located 11.2 kilometers (7.0 miles) to the northwest of the nearest turbine, WLEA, located 10.5 kilometers (6.5 miles) to the southwest of the nearest turbine, and WABH, located 24.2 kilometers (15.1 miles) to the southeast at the nearest turbine. According to Comsearch, potential interference with AM broadcast coverage could only occur if turbines were located within 3 kilometers (1.9 miles) of AM broadcast stations. Because all three stations are located well outside of this distance, the Facility is not anticipated to result in adverse impacts to coverage of local AM stations.

#### (2) FM Radio

Comsearch conducted a review of FCC license data and compiled a list of FM radio stations within approximately 30 kilometers (18.6 miles) of the proposed Facility (see Appendix KKK). Thirty database records were identified, 24 of which are licensed and operating. An itemized list of the database records is provided in Table 26-1 below.

Table 26-1. FM Radio Stations within 30 Kilometers of the Facility

Call Sign	Frequency (MHz)	Distance to Nearest Turbine (kilometers)	Distance to Nearest Turbine (miles)
WCIK <sup>1</sup>	103.1	0.20	0.12
WCKR	92.1	4.21	2.62
W236CP	95.1	5.01	3.11

Call Sign	Frequency (MHz)	Distance to Nearest Turbine (kilometers)	Distance to Nearest Turbine (miles)
WZHD	97.1	5.01	3.11
W248BC	97.5	6.83	4.25
W283BR	104.5	6.84	4.25
WDNY-FM	93.9	6.86	4.26
NEW	99.9	6.86	4.26
W257AX	99.3	8.22	5.11
W257AX	99.3	8.22	5.11
NEW	106.9	10.4	6.47
WKPQ	105.3	12.2	7.57
WSQA	88.7	12.25	7.61
W226AP	93.1	12.25	7.61
W294AW	106.7	13.22	8.22
W239BK	95.7	16.53	10.27
W280EB	103.9	17.87	11.10
W284BX	104.7	17.87	11.10
WVIN-FM	98.3	18.71	11.63
W229AR	100.3	18.71	11.63
W293CE	106.5	18.91	11.75
WALF	89.7	20.59	12.80
WETD	90.7	20.89	12.98
W260BE	96.1	25.39	15.77
W265BX	100.9	27.53	17.10
WQRW	93.5	27.63	17.17
WZKZ	101.9	27.63	17.17
WCIY	88.9	27.68	17.20
W283BF	104.5	27.76	17.25
WNBL	107.3	27.76	17.25

<sup>1</sup>Due to the close proximity to the proposed wind turbines, Comsearch used aerial imagery to verify the location of FM station WCIK. The station's actual location was identified at 42.437663°N, 77.534093°W (NAD83), approximately 187 meters northeast of the location defined by the coordinates listed on the station's FCC license. This places WCIK within approximately 266 meters of the nearest turbine (T26).

According to Comsearch, potential interference with FM broadcast coverage is expected to be minimal as long as the turbines are sited in the far-field region of the broadcast antennas and line-of-sight to the populations served by the FM stations is maintained. For FM frequencies, this results in a minimum separation distance of 500 meters between the tip of the turbine blade and the FM antenna location. The closest operational station to the Facility, WCIK, is located approximately 266 meters from the nearest turbine (T26). After considering the rotational sweep of the turbine blades (68 meters), the total separation distance between the station antenna and the tip of turbine's

blades reduces to 198 meters. At this distance, radiation pattern distortion could become a factor. Signal attenuation is also possible, but can be difficult to quantify without precise field measurements.

Three proposed turbines (T22, T26, and T34) have blade sweep inside the near field of station WCIK. The next closest FM station to the Facility, WCKR, is more than 4 kilometers from the nearest turbine and well out of range of impact. Since FM radio operates in the VHF frequency band, signals can propagate over large distances despite partial obstructions between the broadcast station and FM receiver. Furthermore, FM radio uses frequency modulation, whereas signal perturbations due to wind turbines affect primarily the signal amplitude and phase (i.e., multipath).

In order to mitigate the potential impacts to station WCIK, pre- and post-construction drive test measurements of FM coverage of WCIK will be performed to determine the actual impact of the wind turbines. In the event that significant signal attenuation is observed after construction, the FM antenna will be raised to a higher radiation center of the same tower, provided the tower has sufficient height and space above the existing antenna installation. If the same tower cannot be used, an auxiliary broadcast antenna will be installed in order to fill in coverage in weak-signal areas impacted by the wind turbines after they are installed. As another mitigation measure, Comsearch recommended shifting one or more of the turbines to the far field region of station WCIK, while accounting for blade length, in order to minimize the risk of distorting the radiation pattern of the FM station antenna. However, this option was determined to be infeasible due to setbacks and turbine spacing, and, therefore, the other mitigation options listed above are preferred.

### (3) Television

Off-air television stations broadcast signals from terrestrially-based facilities directly to television receivers. Off-air reception does not include cable or satellite television reception, neither of which are affected by the presence of wind turbines. Television stations at a distance of 100 kilometers or less are the most likely to provide off-air coverage to the project area and neighboring communities. Comsearch examined the coverage of television stations and communities in the area that could potentially have degraded television reception as a result of Facility operation (see Appendix LLL). There are 51 television stations within 100 km (62 miles) of the proposed Facility, of which only 36 are currently licensed and operating. Seventeen of these 36 are low-power stations or translators, which serve local audiences and have limited ranges; the remaining 19 stations are full power stations.

After the wind turbines are installed, thirteen of the full-power stations (WENY-TV, WYDC, WSKA, WPXJ-TV, WETM-TV, WUHF, WHAM-TV, WHEC-TV, WROC-TV, WNYO-TV, WGRZ, WKBW-TV, and WIVB-TV), as well as

three low-power digital stations (W16BE-D, W20BL-D, and WPBY-LD), may have reception disrupted in and around the Facility Site, primarily in locations within 10 kilometers of the Facility that have clear line-of-sight to a wind turbine but not to the respective station.

Communities and homes to the south and east of the Facility Site may have degraded reception of stations WPXJ-TV, WUHF, WHAM-TV, WHEC-TV, WROC-TV, WGRZ, WKBW-TV, WNYO-TV, and WIVB-TV, which are located north and west of the Facility Site. Similarly, stations W20BL-D, WENY-TV, WYDC, WSKA, WPBY-LD, and WETM-TV, which broadcast from southeast of the Facility Site, may have diminished reception in communities directly to the north and the west of the Facility Site. In the case of station W16BE-D, which broadcasts from the south, disruption is likely to be limited to communities north of the Facility Site.

It is important to note that both cable service and direct broadcast satellite service will be unaffected by the presence of the Facility. Residents that experience degraded off-air television service after installation of the Facility can issue a formal complaint with Applicant. The Applicant takes seriously any complaint that it receives from members of the public. The Applicant will investigate the complaint in accordance with the Complaint Resolution Plan (attached as Appendix T).

#### (4) Telephone

Three cellular sites were identified near the Facility (Appendix OOO). However, cellular mobile phone signal propagation is typically not affected by physical structures because the beam widths of the radiated signal from the base stations and mobile units are very wide and the wavelength of the signal is long enough to wrap around objects such as wind turbine towers and blades. In addition, the cellular network consists of multiple base stations that are designed so that if the connection cannot be made to one base station it will shift to adjacent base stations to make the connections. From an electromagnetic interference standpoint, the emissions from wind turbines, which are specified by the Federal Communications Commission (FCC), should be taken into account to ensure they will not interfere with base stations or the mobile units. The setback distance for the cellular tower base station from the Facility wind turbines was calculated to be 77.3 meters (Appendix OOO). There is approximately 2.5 kilometers between the nearest cellular site and turbine. As a result, no changes in coverage are anticipated when the turbines are installed.

In the unlikely event that a mobile phone carrier believes their coverage has been compromised by the presence of the Facility, they have many options to improve their signal coverage to the area through optimization of a

nearby base transmitter or even adding a new sector or cell site. Utility towers, meteorological towers or even the turbine towers within the Facility Area can serve as a platform for a base transmit site or cell enhancer.

Wireless operators are granted area-wide licenses from the FCC to deploy their cellular networks, which often include handsets with Emergency 911 capabilities (i.e., phones that automatically provide the location of the phone to emergency services). Mobile phone market boundaries differ from service to service. Therefore, Comsearch disaggregated the carriers' licensed areas down to the county level (see Appendix MMM). The type of service (e.g., cellular service at 800 MHz [CELL], advanced wireless service [AWS], personal communication service at 1.9 GHz [PCS], wireless communications service at 2.3 GHz [WCS], lower 700 MHz service [700 MHz]) for each mobile phone carrier with E911 service in Steuben County is provided below:

- AT&T: AWS, CELL, PCS, WCS, 700 MHz
- Blue Wireless: PCS
- DISH Network: AWS, 700 MHz
- Northstar Wireless: AWS
- SNR Wireless: AWS
- Sprint: PCS
- T-Mobile: AWS, PCS, 700 MHz
- Verizon: AWS, CELL, PCS, 700 MHz

According to Comsearch, commercial Emergency 911 communications are typically unaffected by the presence of wind turbines, and no significant adverse impacts to these services are anticipated as a result of the Facility. Wireless networks are designed to operate reliably in a non-line-of-sight environment. They are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by the wind turbines will not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in coverage should occur when the wind turbines are installed.

#### (5) Microwave Transmission

Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). 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. Comsearch prepared a study evaluating the potential impact of the Facility wind turbines on licensed, proposed, and applied non-federal government microwave systems in the area (see Appendix NNN). The study identified one microwave path that intersects the Facility Site. Table 26-2 provides the call sign, band, and licensee for the path. A map showing the location of this microwave path is provided in Figure 26-1.

**Table 26-2. Microwaves Paths within the Facility Site**

Callsign 1	Callsign 2	Band	Licensee
WQSX431	WQSX432	11 GHz	Uniti Fiber PEG, LLC

To assure an uninterrupted line of communication, a microwave link should be clear, not only along the axis between the center point of each microwave dish, but also within a formulaically calculated distance around the center axis of the radio beam, known as the Fresnel Zone. Comsearch calculated the Fresnel Zone for the microwave path listed above, and mapped it in relation to the rotor-swept area of the final turbine layout. The analysis evaluated all 76 proposed turbines, each with a blade diameter of 136 meters and a tower height of 84 meters. The proposed turbine locations have shifted slightly since the Comsearch analysis. An updated overlay analysis of the Fresnel Zones and the updated layout shows that none of the turbines would result in obstruction of the microwave path identified for the area.

(6) Emergency Services

Comsearch conducted an assessment of the emergency services communication sources in the vicinity of the Facility Site to identify potential impacts from the planned turbines (Appendix MMM). Registered frequencies for the following types of first responder entities were evaluated: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other State, county, and municipal agencies. Land mobile and emergency services incumbent data were derived from the FCC's Universal Licensing System and the FCC's Public Safety & Homeland Security Bureau. Comsearch identified 63 site-based licenses and 38 regional area-wide licenses designated for public safety use. The licensee, call sign, frequency bands, antenna height, and distance to nearest turbine for the site-based licenses is provided in Table 26-3. The licensee, area of operation, and frequency band for the area-wide licenses is provided in Table 26-4.

**Table 26-3. Site-Based Licensed Communication Sources**

Licensee	Call Sign	Frequency Bands (MHz)	Antenna Height (meters)	Distance to Nearest Turbine (kilometers)
New York State Division of State Police	KED916	150-174	24	0.32
New York State Division of State Police	KED916	25-50, 150-174	36	0.32
Livonia, Avon & Lakeville R.R. Corp.	WSN393	150-174	12.1	1.54
Livonia, Avon & Lakeville R.R. Corp.	WSN393	150-174	12.7	1.54
Cohocton, Village of	KCX948	25-50	16	1.98
Steuben, County of	KEC902	25-50	19	1.98
NPCR, Inc.	WPTF683	800/900	80.8	2.51
Hornell Area Transit	WQOS995	450-470	38.1	5.09
Hornell Department of Public Works	WQRQ652	150-174	38	5.09
South Dansville Volunteer Fire Dept.	KAN685	25-50	11	5.86
Gunlocke Corp.	WQLD751	450-470	13.7	5.95
Mobiletech Communications	WQXT791	450-470	8.5	6.13
New York State Electric & Gas Corp.	KEA335	25-50	15	6.29
El Paso - Tennessee Gas Pipeline	WQHN494	25-50	21.3	6.52
The Pfeiffer Group	WPTL768	150-174	87.4	6.81
Dansville Central School District	WQDI250	25-50	20	6.81
Livingston, County of	KEA535	150-174	20	6.86
Livingston, County of	KEA535	150-174	48.7	6.86
Livingston, County of	KEI205	150-174	48.7	6.86
Livingston, County of	WPPG508	450-470	48.7	6.86
NPCR, Inc.	WPTG637	800/900	57.9	6.86
Nextel of New York, Inc.	WQAJ376	800/900	57.9	6.86
Clearcom, Inc.	WPUJ923	450-470	59.4	6.88
New York State Electric & Gas Corp.	KEA335	25-50	55	6.9
Steuben, County of	KEB394	150-174	46	6.9
Steuben, County of	KEB394	150-174	56.3	6.9
Steuben County Emergency Services	KED548	25-50	41	6.9
Pfeiffer, Terry L	WNKM682	450-470	30	6.9
Steuben, County of	WPKV895	800/900	41	6.9
Steuben, County of	WPWZ931	150-174	51.8	6.9
Steuben, County of	WPXA430	25-50	59.7	6.9
Steuben, County of	WPXB731	150-174	51.8	6.9
Steuben County	WPYC262	25-50	59	6.9
Dansville Central School District	KNEY983	25-50	20	6.92
Nextel of New York, Inc.	WPBY732	800/900	91	6.92
Pfeiffer, Terry L	WPMN760	150-174	87	6.92
Pfeiffer, Terry L	WPMW543	150-174	87	6.92
Pfeiffer, Terry L	WPPW879	150-174	87	6.92

Licensee	Call Sign	Frequency Bands (MHz)	Antenna Height (meters)	Distance to Nearest Turbine (kilometers)
Steuben, County of	WQQV659	150-174	42.6	6.92
Steuben, County of	WQRF718	150-174	42.6	6.92
Steuben, County of	WQRH377	150-174	42.6	6.92
Steuben, County of	WQRH572	150-174	42.6	6.92
Wayland Cohocton Schools	WQWF910	450-470	11.9	7.1
Wayland Cohocton Schools	WQWF910	72-76	8.2	7.22
Mobiletech Communications	WQXT791	450-470	8.5	7.1
Steuben County Office of Emergency Svcs.	WNBN231	25-50	11	7.14
Arkport Central School	WQML307	450-470	12	7.28
Wayland, Village of	KRB996	150-174	12	7.38
G S T Boces	WNVA970	450-470	10.6	7.53
Mobiletech Communications	WQXT791	450-470	8.5	7.54
Mobiletech Communications	WQXT791	450-470	8.5	7.63
Hornell, City of	KEA220	150-174	38	7.7
Hornell, City of	KEA220	150-174	47.2	7.94
Hornell, City of	WPGZ896	150-174	44.2	7.94
NPCR, Inc.	WQCM436	800/900	45.4	8.2
H.P. Hood, LLC	WQIW780	450-470	15.2	8.31
Norfolk Southern Railway Company	KEA442	150-174	31	8.62
Norfolk Southern Railway Company	KEA442	150-174	36	8.62
Pfeiffer, Terry L	WPMG258	450-470	10	9.06
NPCR, Inc.	WPRX810	800/900	46	9.32
Pfeiffer, Terry L	WPMG258	150-174	87	9.48
Pfeiffer, Terry L	WPMG258	450-470	87	9.48
Norfolk Southern Railway Company	KEA442	150-174	43	9.48

**Table 26-4. Area-Wide Licensed Communication Sources**

Licensee	Area of Operation	Frequency Band (MHz)
Addison, Village of	Countywide: Steuben	150-174
American National Red Cross	Statewide: New York	25-50, 450-470
Bath, Village of	Countywide: Steuben	150-174
Bergen Volunteer Fire Department	Statewide: New York	150-174
Canisteo, Village of	Countywide: Steuben	150-174
Central Islip Hauppauge Volunteer Ambulance, Inc.	Statewide: New York	150-174
Corning City Police Department	Countywide: Steuben	150-174
Erie, County of	Statewide: New York	25-50, 150-174, 421-430, 450-470
Massasauga Search and Rescue, Inc.	Statewide: New York	150-174
National Ski Patrol System, Inc.	Statewide: New York	150-174
New York, City of	Statewide: New York	450-470, 800/900, 4940-4990
New York City Police Department	Statewide: New York	150-174

Licensee	Area of Operation	Frequency Band (MHz)
New York, State of	Statewide: New York	0-10, 25-50, 150-174, 220-222, 450-470, 800/900, 4940-4990
New York State Department of Corrections and Community Supervision	Statewide: New York	150-174, 450-470, 4940-4990
New York State Department of Environmental Conservation Office for Public Protection	Statewide: New York	25-50, 150-174
New York State Department of Health, Bureau of EMS	Statewide: New York	25-50, 150-174, 450-470
New York State Department of Labor	Statewide: New York	150-174
New York State Department of Transportation	Statewide: New York	0-10, 4940-4990
New York State Division of State Police	Statewide: New York	150-174, 450-470, 800/900, 2450-2500
New York State Emergency Management Office	Statewide: New York	25-50, 150-174
New York State Office of Parks, Recreation, and Historic Preservation	Statewide: New York	450-470
New York State Office of Parks, Recreation, and Historic Preservation – Albany	Statewide: New York	150-174
New York State Office of Parks, Recreation, and Historic Preservation – Niagara Region	Statewide: New York	150-174
New York State Office of Parks, Recreation, and Historic Preservation – Long Island Region	Statewide: New York	150-174
Niagara Frontier Search and Rescue	Statewide: New York	150-174
Northeast Mobile Search and Rescue	Statewide: New York	150-174
Northeastern Forest Fire Protection Compact	Statewide: New York	25-50, 150-174
Ossining, Village of	Statewide: New York	25-50, 450-470
Painted Post, Village of	Countywide: Steuben	150-174
Savona, Village of	Countywide: Steuben	25-50
Steuben, County of	Countywide: Steuben	25-50, 150-174, 450-470, 4940-4990
Steuben County Emergency Services	Countywide: Steuben	25-50
Triborough Bridge and Tunnel Authority	Statewide: New York	4940-4990
Urbana, Town of	Countywide: Steuben	450-470
Wayland, Village of	Countywide: Steuben	150-174
Wayne Fire District	Countywide: Steuben	25-50
Western New York Search Dogs, Inc.	Statewide: New York	150-174
Woodbury, Town of	Statewide: New York	4940-4990

According to Comsearch, the first responder, industrial/business land mobile sites, area-wide public safety, and commercial E-911 communications are typically unaffected by the presence of wind turbines, and no significant adverse impacts to these services are anticipated as a result of the Facility. Although each of these services operates in different frequency ranges and provides different types of service including voice, video and data applications, there is commonality among these different networks in regards to the impact of wind turbines on their services. Each of these networks is designed to operate reliably in a non-line-of-sight environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with

overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by the wind turbines does not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in their coverage should occur when the wind turbines are installed.

According to Comsearch, when planning the wind energy turbine locations in the area of interest, a conservative approach would dictate not locating any turbines within 77.5 meters (254 feet) of land mobile fixed-base stations to avoid any possible impact to the communications services provided by these stations. This distance is based on FCC interference emissions from electrical devices in the land mobile frequency bands. The nearest land mobile-fixed base station is 320 meters (1,050 feet) from the proposed turbine locations. Therefore, the proposed wind turbines are all in compliance with the recommended conservative setback criteria for FCC interference emissions in the land mobile bands.

Although adverse impacts to emergency services communications are not anticipated, in the unexpected event that a public safety entity believes its coverage has been compromised by the presence of the Facility, the Applicant will work with the public safety entity to remedy any interference related to the wind farm. If there is a compromise in coverage, the public safety entity has many options to improve its signal coverage to the area through optimization of a nearby base station or even adding a repeater site. Utility towers, meteorological towers or even the turbine towers within the Facility Site can potentially serve as the platform for a base station or repeater site.

#### (7) Municipal/School District Services

Municipal and school district communication sources were included in the assessment of emergency services communication sources described above in Section (a)(6). Comsearch identified five site-based and no area-wide licenses issued to school districts. The site-based communication sources include two 20-meter (65.6-foot) antennas licensed to the Dansville Central School District, two antennas licensed to Wayland Cohocton Schools, an 11.9-meter (39.0 foot) antenna and an 8.2-meter (26.9 foot) antenna, and a 12-meter (39.4 foot) antenna licensed to the Arkport Central School. Comsearch also identified numerous communication sources licensed to municipalities, including local towns and villages. Tables 26-3 and 26-4 in Section (a)(6) above provide a full listing of site-based and area-wide communication sources in the area, identified by licensee.

For the reasons set forth in Section (a)(6) above, land mobile sites and area-wide public safety communications are typically unaffected by the presence of wind turbines, and no significant adverse impacts to these services are anticipated as a result of the Facility. The municipal and school communications sources fall under these categories.

#### (8) Public Utility Services

A petroleum product pipeline, operated by Sunoco, is within 2 miles of the Facility Site. However, due to the distance of the Sunoco pipeline from the Facility, no impacts to the pipeline are anticipated. In addition, three transmission lines are in the vicinity of the Facility. Two of those lines cross the Facility Site. One line that crosses the Facility Site is associated with the existing point of interconnection (POI) substation and the other crosses the Facility Site, but does not cross over any proposed Facility components. There will be no impacts to existing transmission lines from the Facility. See Figure 4-3 in Exhibit 4 for locations of these utilities.

#### (9) Doppler/Weather Radar (all affected sources; not limited to two-mile radius)

NEXRAD (next-generation radar) or Doppler weather radar are operated by the National Weather Service (an agency of the National Oceanic and Atmospheric Administration [NOAA]), the Federal Aviation Administration (FAA), and the U.S. Air Force. NEXRAD detects precipitation, winds, and temperature and humidity discontinuities. From these data, computer algorithms generate a suite of meteorological and hydrological products and alerts used for determining short-term forecasts, advisories, and warnings for significant weather events such as tornadoes, large hail, wind shear, downbursts, flash floods, and other weather phenomena. The data are also used by FAA air traffic controllers for the safe and efficient operation of the National Airspace System.

Wind turbine and weather spectra can span the same Doppler frequencies and share a similar dynamic range, causing conventional radar clutter filtering algorithms, which only filter energy returned from nearly stationary objects (buildings, terrain, etc.), to fail in isolating the weather signal. When wind farms are located in a NEXRAD radar beam/radar line of sight, the spinning blades can reflect unfilterable energy back to the radar system and appear as clutter in the base data. The unfiltered wind turbine clutter can adversely impact radar data quality and the performance of the radar's internal weather detection algorithms.

Turbines sited within 18 kilometers (11.2 miles) of a NEXRAD begin to impact multiple elevation scanning angles and create multipath scattering returns that show up as spikes of enhanced reflectivity down range of the wind farm (Vogt et al., 2011; Norin and Haase, 2012). KBUF, the NEXRAD closest to the proposed Facility, is located approximately 70 miles northwest of the proposed Facility; therefore, impacts are not anticipated.

In addition, the Applicant sent a written notification of the proposed Facility to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. The NTIA provided plans for the proposed Facility to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), which include the NOAA, FAA, and U.S. Air Force, among other agencies. The NTIA's review found that there are no concerns regarding interference with Doppler or other weather radar. NTIA correspondence is attached as Appendix JJJ.

(10) Air Traffic Control (all affected sources; not limited to a two-mile radius)

The closest air traffic control tower is located approximately 64 miles northwest of the Facility Site at the Buffalo Niagara International Airport (AirNav.com, 2017). The FAA is the organization in the United States government responsible for air traffic control and for evaluating and issuing determinations on petitions for objects that penetrate the nation's airspace. The Applicant has submitted the proposed Facility layout to the FAA so that aeronautical studies of locations of each proposed turbine can be conducted under the provisions of 49 USC § 44718. The FAA can issue two types of determinations, one that identifies a presumed hazard and another that identifies no hazard. On November 3, 2016, the Facility received Determinations of No Hazard to Air Navigation (DNH) for all 76 turbine locations. The DNHs are valid until May 2018 prior to which one 18-month extension can be filed.

In addition, as discussed in Section (a)(9) above, the FAA is one of the federal agencies represented in the IRAC, which has reviewed the proposed Facility as part of the NTIA review. That review identified no concerns with air traffic control or other federal communication systems associated with the Facility. The response letter from NTIA is included in Appendix JJJ.

(11) Armed Forces (all affected sources; not limited to two-mile radius)

As discussed in Section (a)(9) above, the NTIA provides plans for the proposed Facility to the federal agencies represented in the IRAC, which include the Department of Homeland Security, U.S. Air Force, U.S. Army, U.S. Navy, U.S. Coast Guard, and Department of Veteran Affairs. The Department of Defense (DoD), through its Siting Clearinghouse, can either respond informally or formally to a project. Informal consultations may be initiated by a project proponent. Formal consultations may be initiated either by the FAA, during its application review process, or the project proponent. As discussed in Section (a)(10) above, the Applicant has obtained DNHs from the FAA. Because formal DoD consultations can be conducted by the FAA, the Applicant's receipt of the DNHs constitutes formal review and approval by the DoD.

Moreover, according to the *Military Installations, Ranges, and Training Areas* GIS dataset maintained by the DoD, the nearest Armed Forces installation to the Facility Site is the NOSC Rochester Navy Reserve, located approximately 42 miles north of the proposed Facility (Data.gov, 2017). As described above, the Applicant sent a written notification of the proposed Facility to the NTIA on April 3, 2015. The NTIA reviewed the proposed Facility, and identified no concerns regarding military or other federal communication system. The response letter from NTIA is included in Appendix JJJ.

#### (12) GPS

Global Positioning System (GPS) is a U.S.-owned utility that provides users with positioning, navigation, and timing services. This system consists of three segments: the space segment, the control segment, and the user segment. The U.S. Air Force develops, maintains, and operates the space and control segments. The GPS control segment consists of a global network of ground facilities that track the GPS satellites, monitor their transmissions, perform analyses, and send commands and data to the constellation. The GPS ground facility located closest to the proposed Facility is the Air Force Satellite Control Network remote tracking station located in New Hampshire. The National Executive Committee coordinates GPS-related matters across multiple federal agencies to ensure the system addresses national priorities as well as military requirements. The National Executive Committee is chaired jointly by the Deputy Secretaries of Defense and Transportation, and membership includes top leaders from the Departments of State, the Interior, Agriculture, Commerce, and Homeland Security, the Joint Chiefs of Staff, and NASA (National Coordination Office for Space-Based Positioning, Navigation, and Timing, 2016).

Each of the agencies represented in the National Executive Committee are also represented in the IRAC. As discussed in Section (a)(9) above, the NTIA has reviewed the proposed Facility, and did not identify any concerns with GPS or other federal communication systems. Therefore, adverse impacts are not anticipated. The response letter from NTIA is included in Appendix JJJ.

#### (13) LORAN (all affected sources; not limited to two-mile radius)

LORAN was a long range navigation system developed during World War II that has since been deemed obsolete. Radio signals were sent through a series of towers across long distances as an aid to keep ships and aircraft on course. In accordance with the 2010 Department of Homeland Security Appropriations Act, the U.S. Coast Guard terminated the transmission of all U.S. LORAN signals in 2010. Therefore, no further discussion of LORAN is provided in this Application.

(14) Amateur Radio Licenses

Database searches of all amateur radio licenses registered to users with zip codes overlapping a two-mile radius of the Facility was conducted via the FCC License Data Search on the website of the American Radio Relay League (ARRL, 2017) and via RadioQTH's database of call signs (Lewis, 2017). Eighty-one database records were returned. Because the data are organized by zip code, some of these records may be greater than two miles from the Facility Site, but within a zip code that is within two miles of the Facility Site. The call sign, expiration date, and operator class for each of the amateur radio licenses is provided below in Table 26-5.

Table 26-5. Amateur Radio Licenses in the Vicinity of the Facility Site

Call Sign	Expiration Date	Operator Class
KC4TRX	05/24/2022	General
WA2SJR	09/22/2025	Advanced
KB2NCD	07/01/2021	Novice
K2JLF	10/29/2026	Technician
K2WDF	08/23/2024	General
N2QHF	04/14/2022	Technician
KB2CBU	05/27/2027	Technician
KA2GEH	02/12/2026	Advanced
KC2VAY	04/24/2019	Technician
KC2CNS	03/22/2018	General
KD2MCL	10/24/2026	Technician
KD2HZI	02/18/2025	General
KD2MGF	11/21/2026	Technician
KC2FFR	06/08/2019	Technician
KD2IRI	05/04/2025	General
KC2FGP	06/17/2020	General
KD2LXW	09/28/2026	Technician
N2YSC	05/31/2024	Technician
K2ADW	9/12/2027	Technician
KD2GJS	05/02/2024	Technician
KD2BPJ	02/16/2022	General
KD2GEB	04/10/2024	Technician
KC2LZW	10/02/2023	General
KC2BNL	06/06/2027	Technician
KB2UAX	09/30/2015	Technician
KC2MZW	05/20/2024	Extra
KD2LYL	10/03/2026	Technician
KD2KIL	02/24/2026	Technician
KD2FRK	02/24/2024	Technician

Call Sign	Expiration Date	Operator Class
KD2KIK	02/24/2026	Technician
N2QFG	04/07/2022	Technician
KC2JLO	04/23/2022	Technician
KB2WXV	02/02/2026	General
KB2VLM	08/04/2025	Technician
N2JEN	10/29/2021	General
KD2NUF	06/26/2027	Technician
KD2HFB	09/23/2024	Technician
KC2UMF	01/26/2019	Technician
KB2WEY	01/21/2026	General
KB2SMB	11/21/2024	General
KD2CRR	08/24/2022	Technician
K2TJW	04/09/2024	Technician
KE2EA	01/14/2018	Extra
KC2YPN	05/28/2020	Technician
N2USZ	05/11/2023	Technician
KD2BRF	03/01/2022	General
KD2GEA	04/10/2024	Technician
KD2GDZ	04/10/2024	Technician
KD2BPI	02/16/2022	Technician
KC2TXP	09/11/2018	Technician
KL7GB	06/28/2026	General
W2JPH	11/28/2020	General
KC2VJY	06/09/2019	Technician
KD2FSB	02/24/2024	Technician
KD2FRP	02/24/2024	Technician
KC2VUQ	09/21/2019	Technician
KD7LTN	02/05/2021	Extra
KD2OFF	09/25/2027	General
N2XPH	01/04/2024	Extra
KC2PPG	04/27/2016	Technician
KC2NYZ	03/24/2025	General
KC2YPM	05/28/2020	Technician
KD2FRY	02/24/2024	Technician
W2NFM	08/03/2025	General
N2NAJ	07/02/2021	Technician
KD2KIJ	02/24/2026	Technician
WB2LMS	03/13/2018	General
WB2KHT	03/17/2018	Advanced
KB8SXE	02/08/2027	Technician
W2TOD	06/02/2024	Extra
KC2FSW	12/14/2019	Technician

Call Sign	Expiration Date	Operator Class
WA2FKD	06/30/2024	General
KC2VUR	09/21/2019	Technician
KD2IRJ	05/04/2025	Extra
KD2GDY	04/10/2014	Technician
KD2FRO	02/24/2024	Technician
KD2LXT	09/28/2026	Technician
KB1EE	06/29/2023	Extra
KC2JLP	04/23/2022	Technician
KA2ZMZ	12/06/2025	Novice
KB2SLZ	11/21/2024	General

(b) Existing Underground Cable and Fiber Optic Lines within Two Miles

GeoTel provided data on locations of underground fiber optic cable. Southern Tier Network has buried fiber optic cables within two miles of the Facility Site. No impacts to these resources are anticipated, because the only Facility component that will cross the path of the fiber optic cable will be overhead collection lines. The Applicant is not aware of any transmission telecommunication lines within the Facility Site. See Figure 4-3 in Exhibit 4 for locations of these cables.

(c) Anticipated Effects on Communication Systems

Section (a) above provides a description of the communication systems in and around the Facility and any expected impacts to those systems. The subsections below provide a more general discussion of the anticipated effects of the proposed Facility and the electric interconnection on the communication systems identified above in Sections (a) and (b).

(1) Potential Structure Interference with Broadcast Patterns

Three proposed turbines (T22, T26, and T34) have blade sweep inside the near field of FM station WCIK. The next closest FM station to the project, WCKR, is more than 4 kilometers from the nearest turbine and well out of range of impact. Since FM radio operates in the VHF frequency band, signals can propagate over large distances despite partial obstructions between the broadcast station and FM receiver. Furthermore, FM radio uses frequency modulation, whereas signal perturbations due to wind turbines affect primarily the signal amplitude and phase (i.e., multipath). A full discussion of the potential impact to this station is provided above in Section (a)(2).

Thirteen of the licensed full-power television stations and three low-power stations may have their reception disrupted in and around the Facility, primarily in locations on the opposite side of the Facility Site relative to the

station antennas (Appendix LLL). A full discussion of the identity of these stations and where reception is expected to be diminished is provided above in Section (a)(3).

## (2) Potential for Structures to Block Lines-of-Sight

As noted in Section (a)(5) above, microwave telecommunication systems are wireless point-to-point links that communicate between two sites (antennas) and require clear line-of-sight conditions between each antenna. To assure an uninterrupted line of communication, a microwave link should be clear, not only along the axis between the center point of each microwave dish, but also within a formulaically calculated distance around the center axis of the radio beam, known as the Fresnel Zone. Comsearch calculated the Fresnel Zone for each of the microwave paths identified in the vicinity of the proposed Facility (see Appendix NNN). An overlay analysis was conducted using these Fresnel Zones and the final Facility layout, assuming turbines would be built with 136-meter diameter rotors. This analysis showed that Fresnel Zones will not overlap the rotor-swept area of any of the wind turbines in the proposed Facility layout. Consequently, there will be no impact to microwave communications.

## (3) Physical Disturbance by Construction Activities

Physical disturbance to communication infrastructure (e.g., towers, buried cables, etc.) is not anticipated. The location of any such infrastructure adjacent to the Facility will be indicated on construction drawings and reviewed by the contractor prior to construction. The Applicant will also coordinate with Dig Safely New York prior to commencing any construction activities.

## (4) Adverse Impacts to Co-Located Lines due to Unintended Bonding

All Facility construction and maintenance work that requires excavation will follow the One Call process with Dig Safely New York, Inc. This process helps prevent damage by alerting the excavator to the locations of underground utilities, including electric, gas, oil, steam, water, sewer, and communications lines. The process starts by the excavator flagging the area to be excavated. The excavator will then provide information to Dig Safe New York about the company performing the excavation, the duration of the job, the locations of digging, the depth of the excavation, and other information. Dig Safely New York members, who are utility operators, respond to the request either by noting that the area is clear, or by providing the locations of their facilities. These facilities are then marked above ground, and either avoided or protected during the excavation. If an underground facility is unable to be avoided and needs to be exposed, the excavator will provide proper support and protection so that the facility is not damaged. Upon completion of work, the excavator backfills around any exposed utilities. Therefore, the

Applicant does not believe that there is significant potential for the proposed Facility and electrical interconnection to adversely impact co-located lines, to the extent co-located lines are even present, due to unintended bonding.

#### (5) Other Potential for Interference

The degradation of FM stations is expected to be minimal as long as the turbines are sited in the far-field region of the broadcast antennas and line-of-sight to the populations served by the FM stations is maintained. For FM frequencies, this translates to a minimum separation distance of 500 meters between the tip of the turbine blade and the FM antenna location. One of the currently licensed FM stations is within this range of impact from three turbines (T22, T26, and T34). Since FM radio stations operated in the VHF frequency band, signals can propagate over large distances despite partial obstructions between the broadcast station and FM receiver. In addition, FM radio uses frequency modulation, whereas signal perturbations due to wind turbines affect primarily the signal amplitude and phase. Nonetheless, potential mitigation measures are addressed in Section (a)(2), above.

The exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations are located within their respective exclusion distance limit from wind turbines; the maximum possible exclusion distance is 3 km (1.9 miles). The closest AM station to the Facility, WDOE, is approximately 10.5 kilometers from the nearest turbine. Consequently, there will be no impact to AM radio broadcast coverage (see Appendix KKK).

First responder, municipal/school district services, industrial/business land mobile sites, area-wide public safety, and mobile telephone communications are typically unaffected by the presence of wind turbines. Harmful effects to these services in the vicinity of the proposed Facility are not anticipated. This is because each of these networks is designed to operate reliably in a non-line-of-sight environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area, with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by the wind turbines does not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in their coverage should occur when the wind turbines are installed (see Appendix MMM). As discussed in Section (a)(6) above, any interference that does occur can easily be mitigated.

(d) Evaluation of Design Configuration

A map illustrating Facility components and relevant communication system constraints (e.g., Fresnel zones, radio station exclusion zones, etc.) is provided in Figure 26-1. The Facility has been designed to avoid impacts to communication systems to the extent practicable. In the unlikely event that the Facility has impacts on communications systems as discussed in Sections (a)(2) (FM radio), (a)(3) (television), (a)(4) (telephone), (a)(6) (emergency services) or (a)(14) (amateur radio licenses), the Applicant will take appropriate steps to review and respond to the complaint as set forth in Section (e) below.

(e) Post-construction Activities to Identify and Mitigate Adverse Effects on Communication Systems

The Applicant takes seriously any complaints that it receives from members of the public concerning the impact of the Facility. As discussed in Exhibit 12, the Applicant has developed a Complaint Resolution Plan through which residents can issue a formal complaint should any issues, such as degraded television service, arise as a result of construction or operation of the Facility. This Plan is attached as Appendix T. Complaints will be able to be made in person at the Facility's O&M building, via phone, or by writing, and the Applicant will contact the individual within 48 hours of receipt of the complaint. The Applicant will implement a multi-step complaint response for all registered complaints, which will include: (1) community engagement; (2) gathering information; (3) response to the complaint; (4) a follow up after the response has been issued; and (5) further action if the complainant believes that the issue continues to exist.

In particular, if it is determined that Facility operation has resulted in impacts to existing off-air television coverage, the Applicant will address each individual problem by offering cable television hookups (in areas where cable service is available) or, in areas where cable service is not available/practical, direct broadcast satellite reception systems, as well as investigating methods of improving the television reception system. It is important to note that both cable service and direct broadcast satellite service will be unaffected by the presence of the Facility (see Appendix LLL).

Additionally, the tower structures identified in the Communication Tower Study (Appendix PPP) could be a potential benefit in support of communications network needs for the Facility. An example would be the implementation of a Supervisory Control and Data Acquisition (SCADA) system that monitors and provides communications access to the Facility.

(f) Potential Interference with Radar or Other Instrumentation Systems Used for Air Traffic Control, Guidance, Weather or Military Operations

As described above, the Applicant sent a written notification of the proposed Facility to the NTIA on April 3, 2015. Upon receipt of notification, the NTIA provided plans for the proposed Facility to the federal agencies represented in the IRAC, which include the FAA, NOAA, DoD, Department of Homeland Security, among other federal agencies. The NTIA has reviewed the proposed Facility layout, and provided a response indicating that no concerns were raised among these participating agencies (see Appendix JJJ). The Facility also received DNHS for all 76 turbine locations from the FAA. Therefore, the Facility is not anticipated to result in other adverse impacts to federal communication systems.

## REFERENCES

AirNav.com. 2017. *Buffalo Niagara International Airport*. Last updated January 5, 2017. Available at <http://www.airnav.com/airport/KBUF>. (Accessed January 2017).

American Radio Relay League (ARRL). 2017. *FCC License Data Search*. Available at: <http://www.arrl.org/advanced-call-sign-search>. (Accessed January 2017).

Data.gov. 2017. *Military Installations, Ranges, and Training Areas*. GIS Dataset maintained by Department of Defense. Dataset available at <https://catalog.data.gov/dataset/military-installations-ranges-and-training-areas>. (Accessed January 2017).

Lewis, E.L. 2017. *RadioQTH Call Sign Lookup*. Available at: <http://www.radioqth.net/lookup>. (Accessed January 2017).

National Coordination Office for Space-Based Positioning, Navigation, and Timing. 2016. Official U.S. Government Information about the Global Positioning System (GPS) and Related Topics. Available at: <http://www.gps.gov/> (Accessed January 2017).

Norin, L. and G. Haase. 2012. *Doppler Weather Radars and Wind Turbines*. In: *Doppler Radar Observations – Weather Radar, Wind Profiler, Ionospheric Radar, and Other Advanced Applications*, edited by J. Bech and J.L. Chau. InTech, April 2012.

Vogt, R. J., T.D. Crum, W. Greenwood, E.J. Ciardi, and R.G. Guenther. 2011. *New Criteria for Evaluating Wind Turbine Impacts on NEXRAD Radars*. WINDPOWER 2011, American Wind Energy Association Conference and Exhibition, Anaheim, CA.