

# Wind Power GeoPlanner™

## Doppler and NEXRAD Weather Radar Study

Agricola Wind



Prepared on Behalf of  
Liberty Renewables Inc.

August 19, 2024



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## **1. Introduction**

The purpose of this document is to describe the research, calculations, and analysis performed to assess the impact of the proposed Agricola Wind Project (the Project) on the operation of Doppler Weather Radar Systems (owned and operated by television stations and commercial interests) and the NEXRAD radars (jointly operated by the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the U.S. Air Force) within the vicinity of the Project. This report also discusses the New York State Mesonet weather station network and addresses any potential for impact from the presence of the Project. This study was performed for Liberty Renewables Inc.

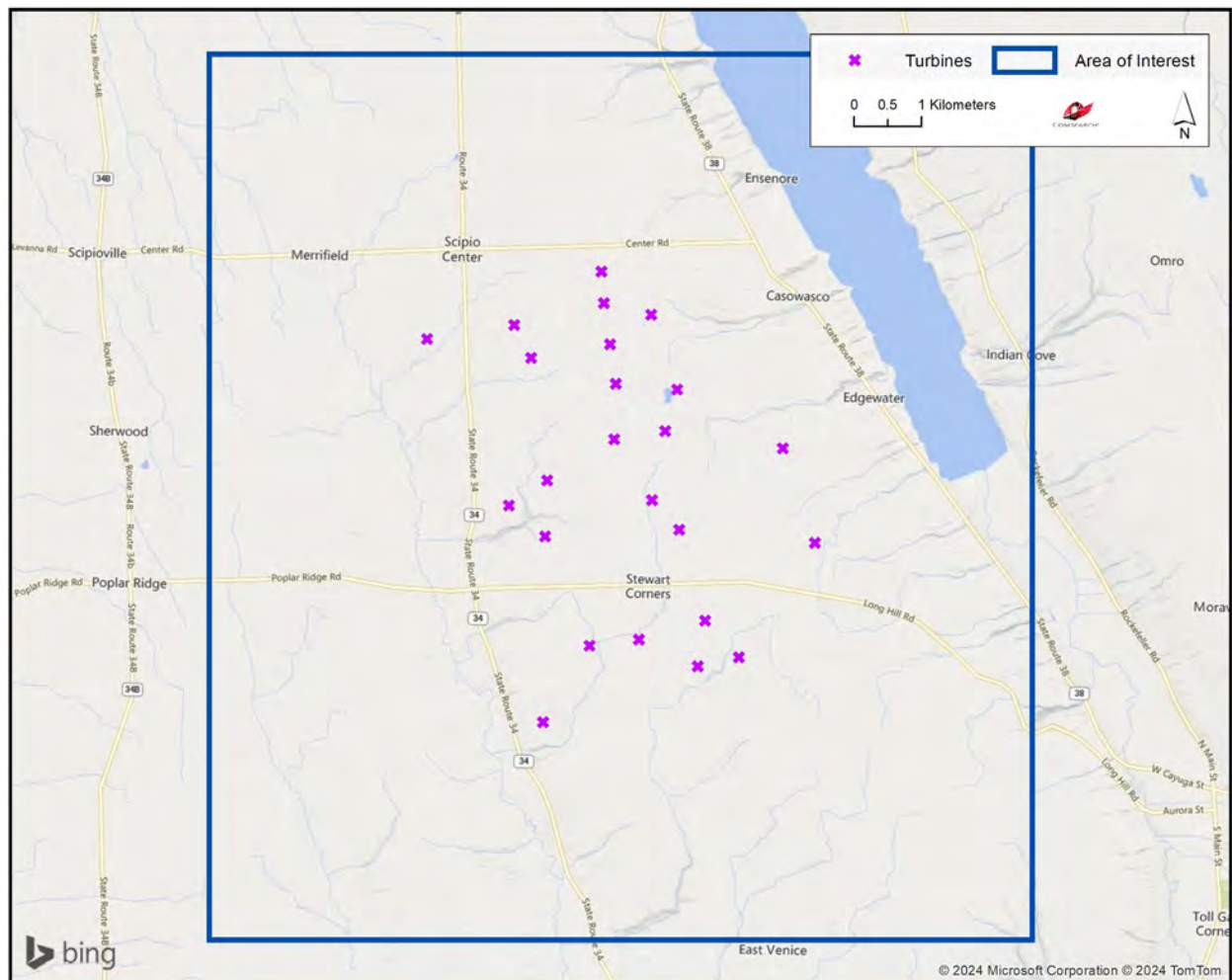
## **2. Project Area**

The Agricola Wind Project is located within Cayuga County, New York as shown in Figure 1 (the Project Area). The Project Area is defined as the rectangular area with a minimum of a 2-mile buffer from all turbine locations as noted in Figures 1 - 4. The turbines associated with the Project will have a maximum hub height of 119 meters and a rotor diameter of 162 meters, giving the structures an overall maximum height of 200 meters above ground level. At the time of this study, there are 24 turbines proposed for the Agricola Wind Project. Table 1 lists these turbines and their coordinates within the Project Area. A detailed view is provided in Figure 2.



**Figure 1: Location of Agricola Wind Project in the State of New York**





*Figure 2: Location of Turbines within Agricola Wind Project*

TurbineID	Latitude (NAD83)	Longitude (NAD83)	Ground Elevation (m)	Maximum Blade Height Above Mean Sea Level (m)
T-1	42.77148695	-76.56518110	331.92	531.92
T-2	42.77352734	-76.55138254	378.12	578.12
T-3	42.76939464	-76.54646110	380.66	580.66
T-4	42.78089774	-76.53390128	392.32	592.32
T-5	42.77670238	-76.53335934	397.15	597.15
T-6	42.77536884	-76.52478575	394.69	594.69
T-7	42.77124190	-76.53205525	404.30	604.30
T-8	42.76597068	-76.53088898	402.30	602.30
T-9	42.75856534	-76.53105019	403.79	603.79
T-10	42.76534903	-76.51980318	404.37	604.36
T-11	42.75977835	-76.52181171	412.06	612.06
T-12	42.75779212	-76.50056164	385.40	585.40
T-13	42.75296415	-76.54298281	360.93	560.93
T-14	42.74951972	-76.54980057	352.26	552.26
T-15	42.74548994	-76.54316298	355.95	555.95
T-16	42.75054996	-76.52396454	408.73	608.73
T-17	42.74671517	-76.51897594	414.39	614.39
T-18	42.74526960	-76.49442742	405.73	605.73
T-19	42.72980650	-76.50778340	410.46	610.46
T-20	42.73464360	-76.51400469	408.61	608.61
T-21	42.72855334	-76.51521219	392.56	592.56
T-22	42.73196366	-76.52592079	371.23	571.23
T-23	42.73102696	-76.53482064	366.04	566.04
T-24	42.72073819	-76.54294595	324.30	524.30

*Table 1: Wind Turbine Coordinates*

### 3. Technical Data

Based on a preliminary analysis of the terrain within the vicinity of the Project and taking into account the maximum height of the proposed wind turbines, a reasonable search radius for radar systems was established at 250 kilometers from the center of the Project Area. Tables 2 and 3 contain the technical parameters of the commercial Doppler radar systems located within 250 kilometers of the Project, including ownership and geographical data<sup>1</sup>. A depiction of the location of the Doppler radar systems with respect to the proposed Project are shown below in Figure 3. Table 4 and Figure 4 contains the information on the NEXRAD radar systems found with 250 kilometers.

ID	Call Sign	Frequency (MHz)	Ground Elevation (m)	Antenna Height (m)	Output Power (Watts)	Distance to Nearest Turbine (km)
1	WPPY879	5575.0	483.0	33.0	250000	44.07
2	WNQJ338	5350.0-5460.0	162.0	44.0	175	123.46
3	KNNP370	5350.0-5360.0	185.0	14.0	175	190.09
4	WPRT837	5460.0	135.7	45.7	200	213.07
5	WPZR862	5550.0-5600.0	292.6	39.0	250000	234.55

*Table 2: Technical Data for Commercial Interest and Television Station Doppler Radar Systems within 250 Kilometers of the Agricola Wind Project*

ID	Call Sign	Owner- Operator	Location	Latitude (NAD83)	Longitude (NAD83)
1	WPPY879	Nexstar Media Inc.	POMPEY, NY	42.94450000	-76.02463889
2	WNQJ338	WHEC-TV, LLC	BROCKPORT, NY	43.21255556	-77.95472222
3	KNNP370	Nexstar Media Inc.	BUFFALO, NY	42.95366667	-78.87752778
4	WPRT837	WRGB Licensee, LLC	NISKAYUNA, NY	42.81319444	-73.89125000
5	WPZR862	WNYT-TV, LLC	BRUNSWICK, NY	42.78591667	-73.62819444

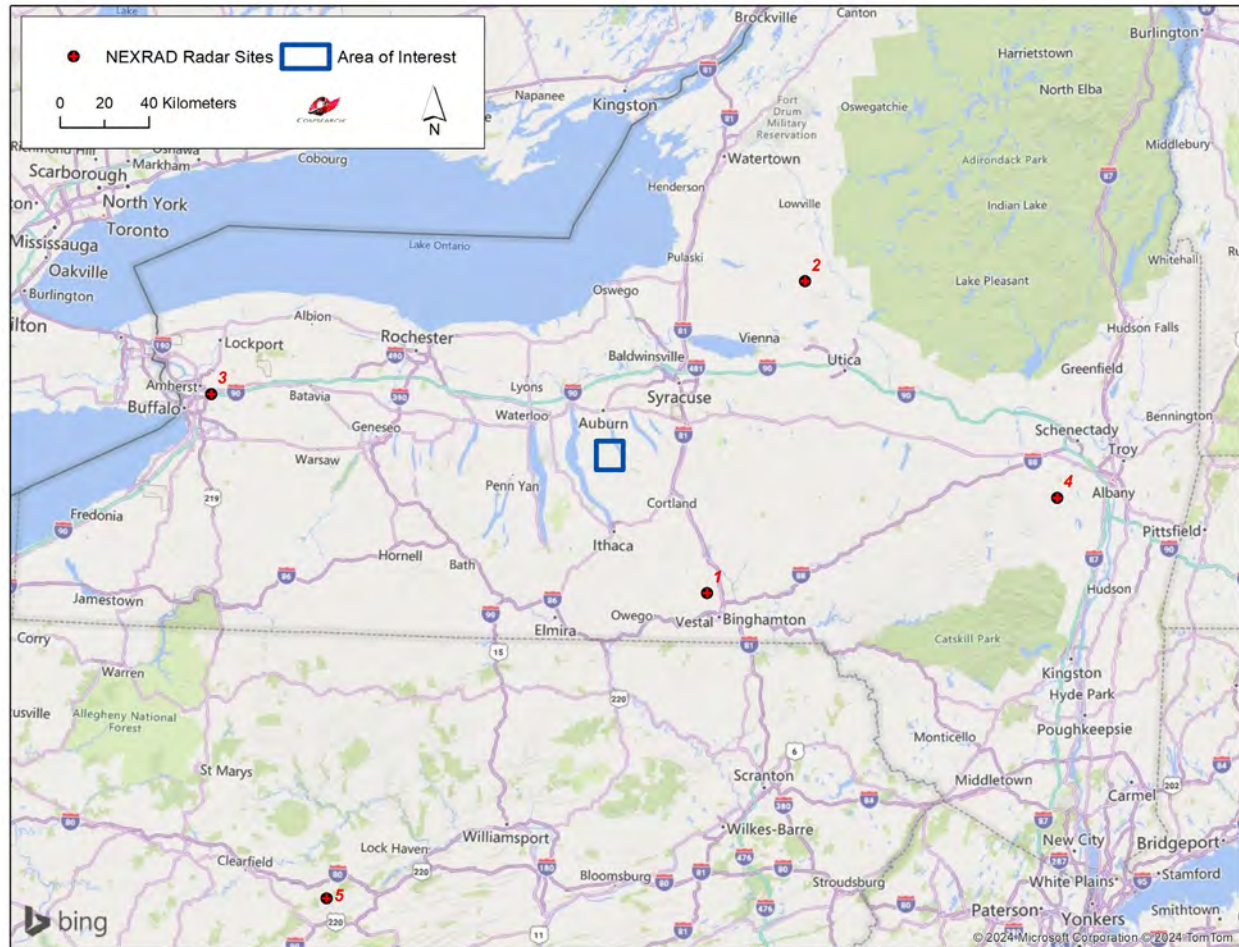
*Table 3: Location and Ownership of Commercial Interest and Television Station Doppler Radar Systems within 250 Kilometers of the Agricola Wind Project*

<sup>1</sup> 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](http://www.comsearch.com/files/data_license.pdf).

Table 4: Location and Technical Data for NEXRAD Radar Systems within 250 Kilometers of the Agricola Wind Project







**Figure 4: Location of NEXRAD Radar Systems within 250 Kilometers of the Agricola Wind Project**

## **4. Impact Assessment**

The technical approach to determine the potential impact of the turbines on the radar systems in the area is to calculate whether the wind turbines are in line-of-sight (LOS) of the radar systems. The proposed wind turbines of the Agricola Wind Project have the potential to block radar coverage and produce false targets if the turbines are in line-of-sight of the radar systems' transmitted signals.

To verify the presence or absence of LOS conditions between the Project and the radar systems identified in Section 3, LOS coverage plots were generated for each of the radar systems. These plots identify the geographical regions that have LOS to a given radar by taking into account the height of the radar antenna, the maximum height of the wind turbine blades, the curvature of the earth, and potential refractivity in the atmosphere. The plots may be referenced in the Appendix section of this report.

According to the LOS coverage plots, the effective terrain elevations would block LOS between nine radar systems and the entire Project Area. However, one doppler radar antenna, WPPY879, has LOS conditions to the Project wind turbines.

## **5. New York State Mesonet**

The New York State Mesonet is a statewide network of weather stations developed and run by the University at Albany, which currently comprises a total of 126 stations. Mesoscale networks serve to collect data on mesoscale meteorological phenomena, such as dry lines, squall lines, and sea breezes, which is used to supplement data gathered by traditional automated surface observing systems (ASOS) and helps to support decision-making in agriculture, emergency management, energy, ground transportation, and aviation. To ensure the highest quality of data, each station in the New York State Mesonet must be located at least 300 feet (91.44 meters) from any tall obstacles, such as wind turbines. Table A-1, provided in the Appendix section of this report, lists the New York State Mesonet stations and their respective distances to the turbines in the Agricola Wind Project. Table A-1 shows that the closest station to the Project, "Scipio Center", is 0.36 kilometers (360 meters) from the nearest proposed turbine location and well outside range of impact. Finally, it should be noted that the data from each station is transmitted via the Internet to a central ingest system located at the University of Albany and is therefore not subject to telecommunications interference from the Agricola Wind Project as defined in the scope of this report.

## **6. Conclusions**

Based on the analysis described in this report, the effective terrain elevations would block LOS between four commercial Doppler radar systems and all five NEXRAD radar systems and the entire wind project area.

However, one Doppler radar antenna, WPPY879, has LOS conditions to the turbines in the wind project area. Based on the distance between the radar location and the proposed turbines, additional consideration needs to be made based on the angle seen from the radar location. Since

most doppler radars emit pulses at various elevation angles ranging from 0.50 – 19.5 degrees <sup>2</sup>, structures that fall below the lowest elevation angle based on distance and maximum turbine height would not be “seen” by the radar system. Considering the LOS locations in the Project, the height of the turbines and the distance and centerline of the radar, the turbines with regard to call sign WPPY879 would fall below a 0.13° elevation angle. Since this angle falls well below the lowest radar elevation angle of 0.50°, the Project will not be visible to the commercial Doppler radar and therefore they will not be impacted. No notification or project modifications are required. The New York State Mesonet system is not subject to impact due to the large separation distance between the component weather stations and the Project turbines.

## **7. Contact**

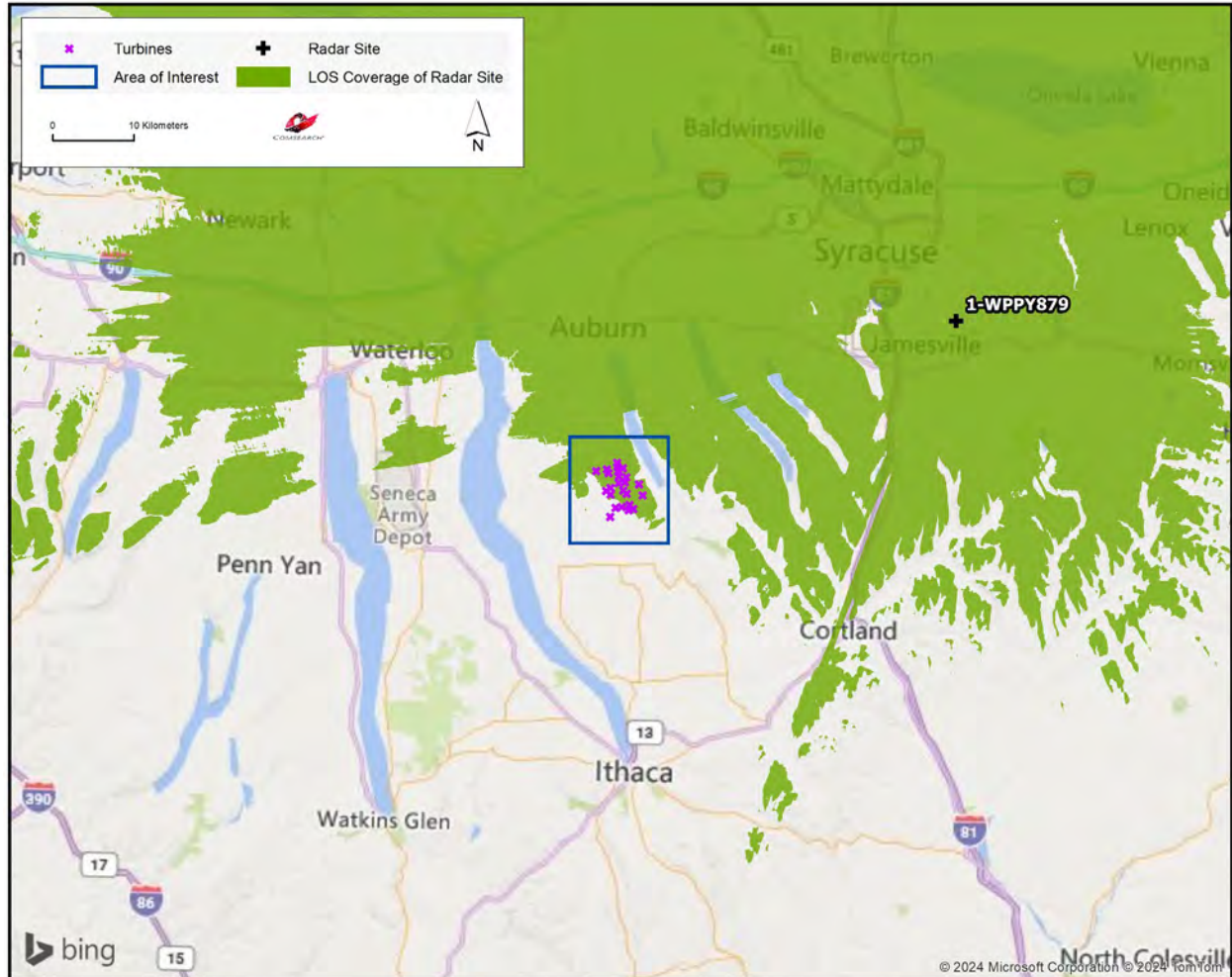
For questions or information regarding the Doppler Radar Study, please contact:

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Web site:	<a href="http://www.comsearch.com">www.comsearch.com</a>

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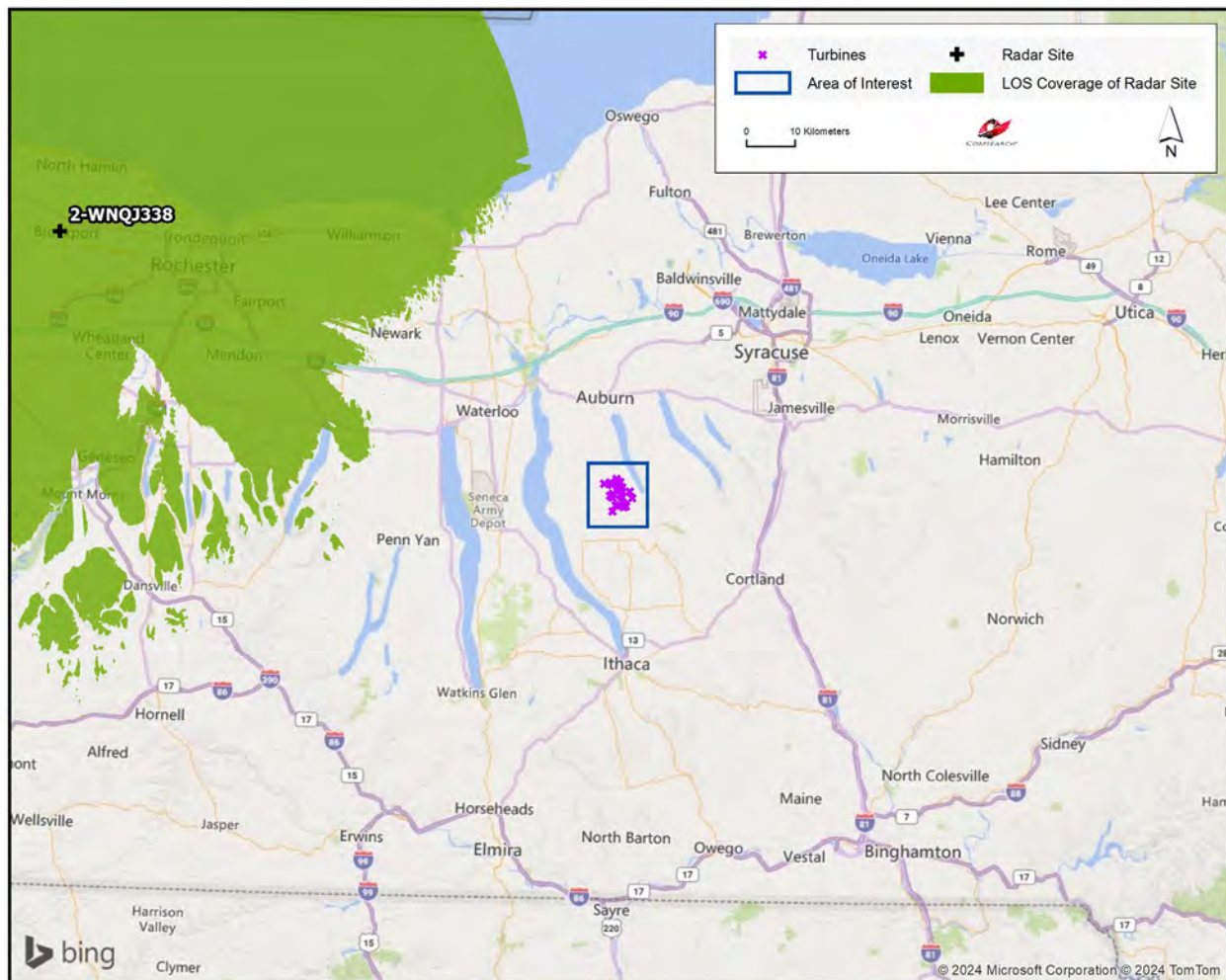
<sup>2</sup> The source of this material is the COMET® Website at <http://meted.ucar.edu/> of the University Corporation for Atmospheric Research (UCAR), sponsored in part through cooperative agreement(s) with the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce (DOC) ©1997-2010 University Corporation for Atmospheric Research. All Rights Reserved.

## Appendix

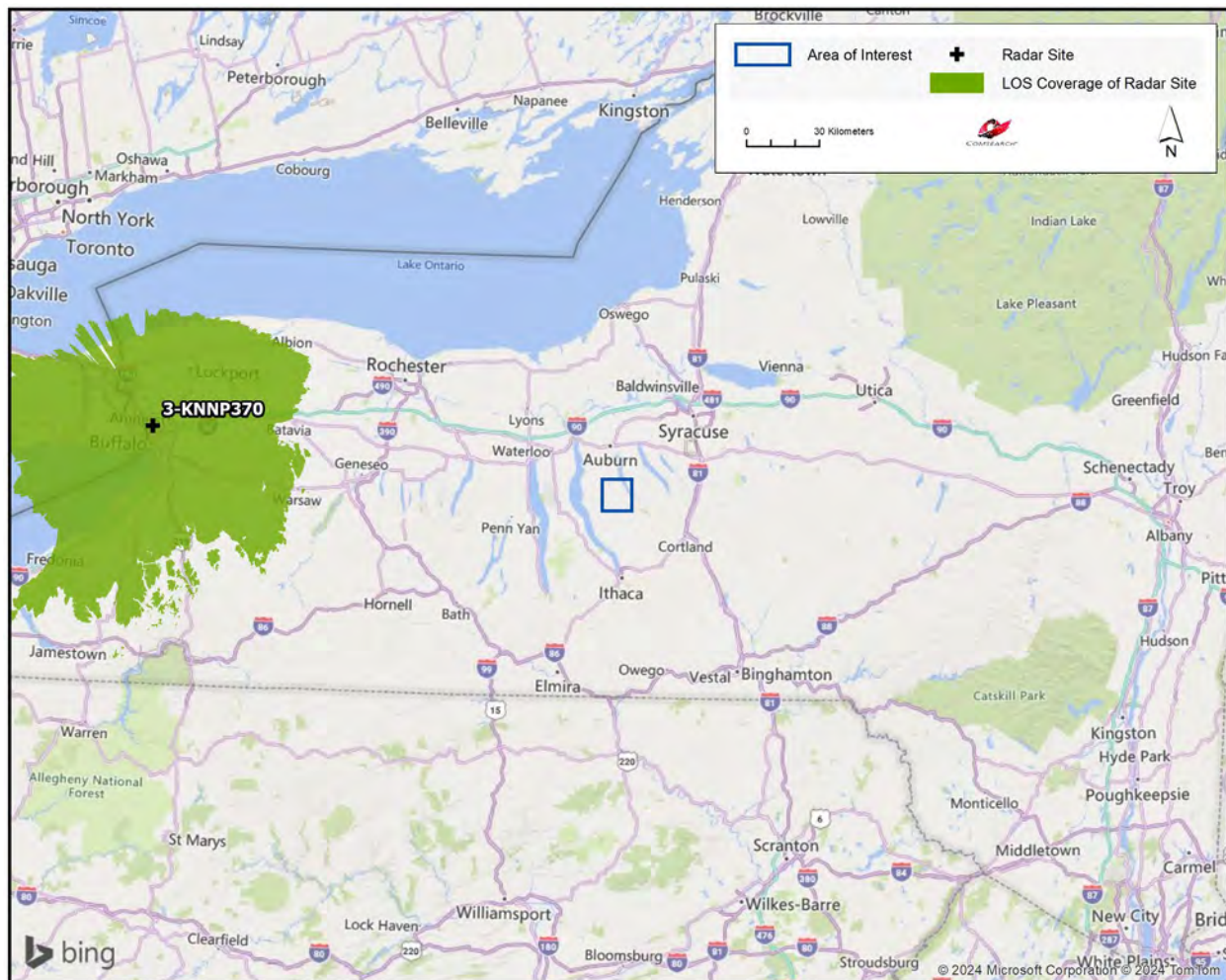


*Figure A1-1: Line-of-Sight Coverage of WPPY879 with Respect to Agricola Wind Project*



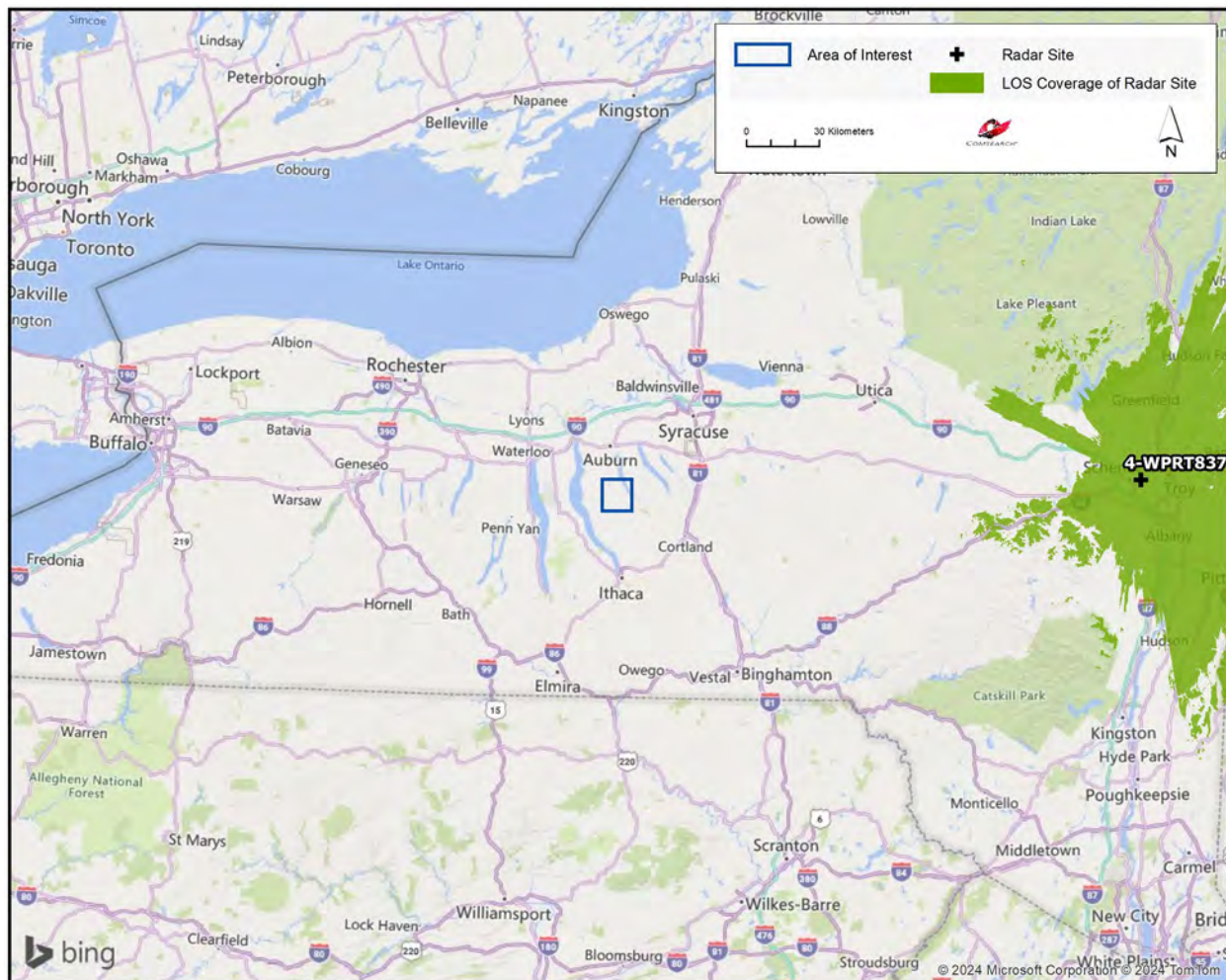


**Figure A1-2: Line-of-Sight Coverage of WNQJ338 with Respect to Agricola Wind Project**

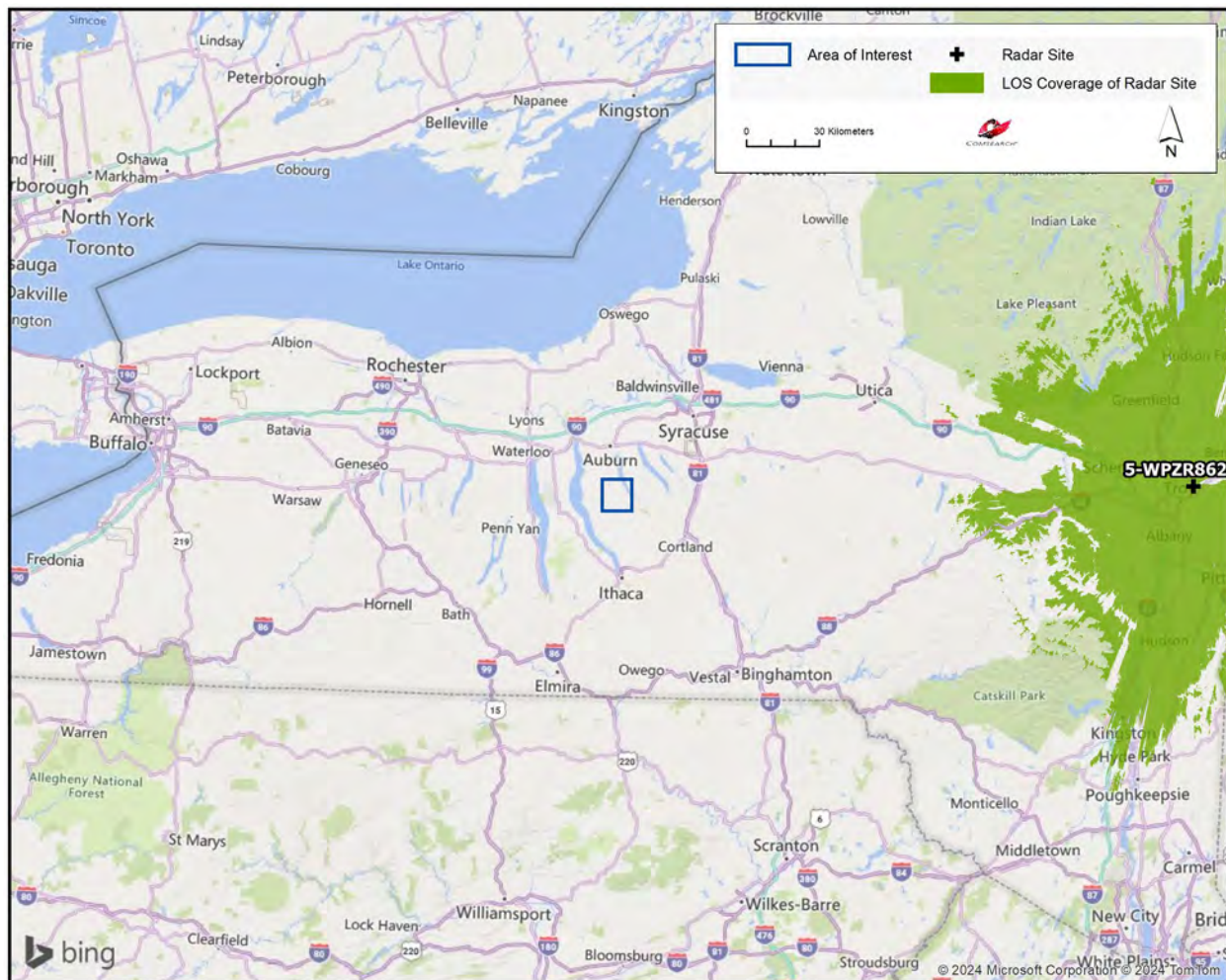


*Figure A1-3: Line-of-Sight Coverage of KNNP370 with Respect to Agricola Wind Project*



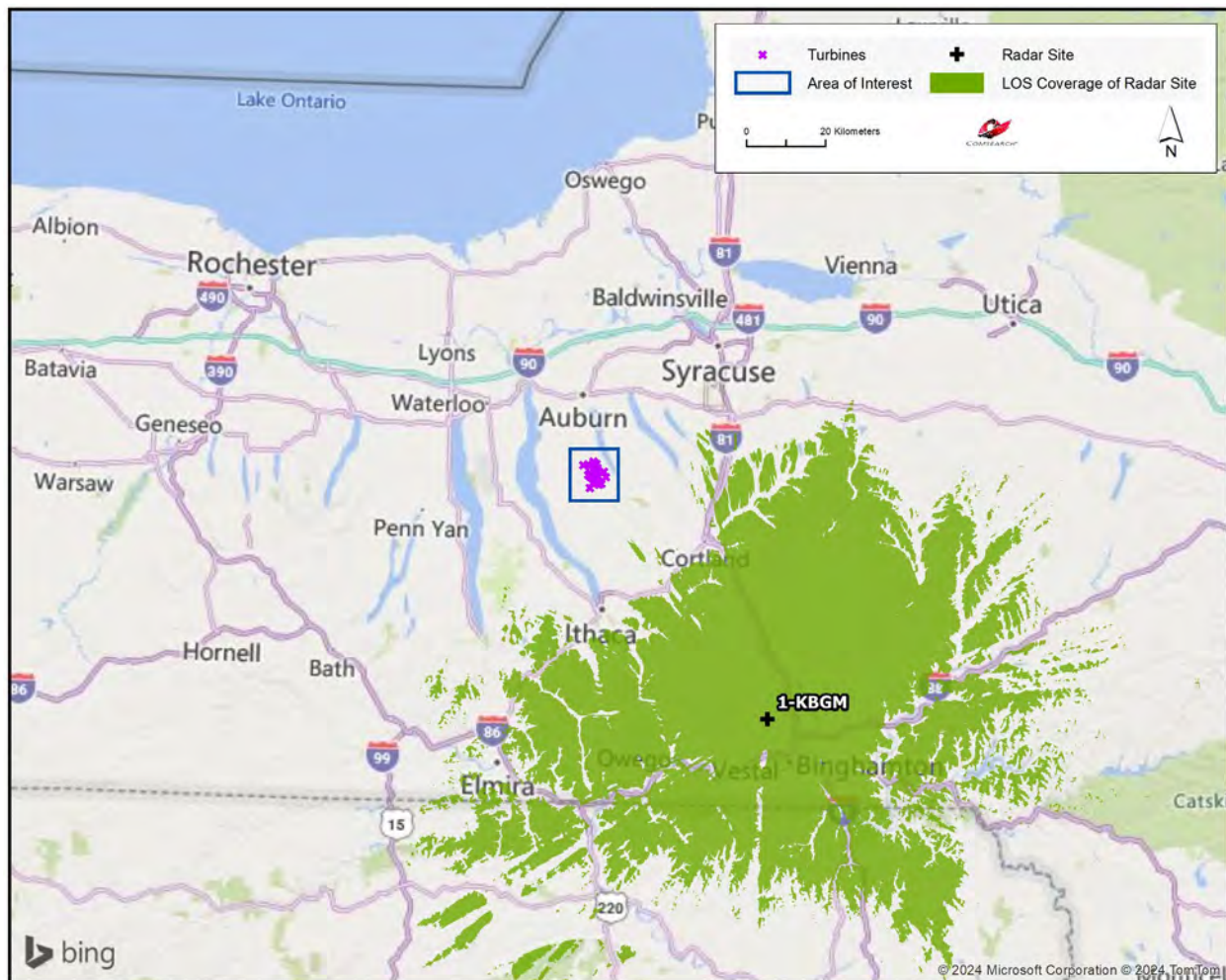


*Figure A1-4: Line-of-Sight Coverage of WPRT837 with Respect to Agricola Wind Project*

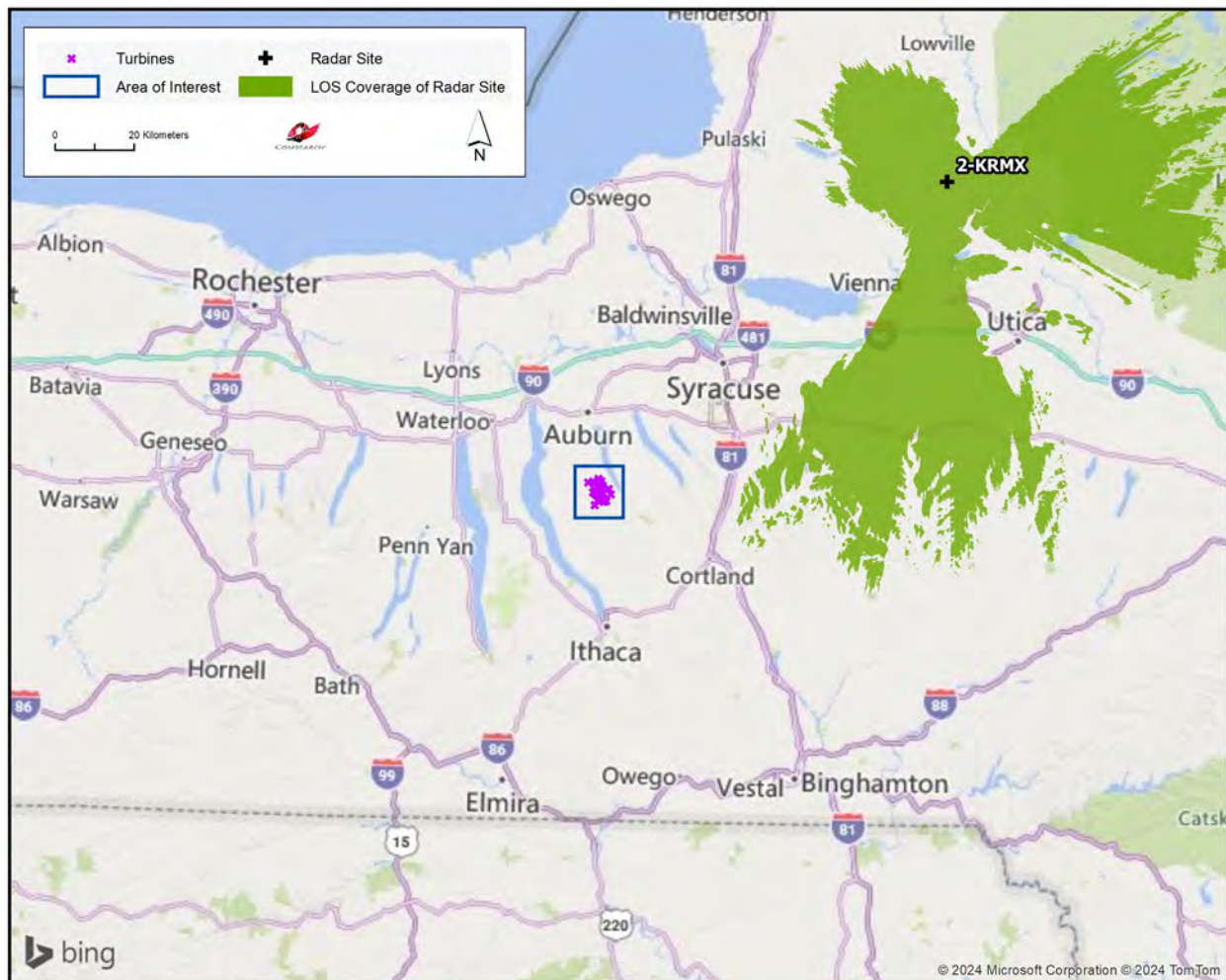


*Figure A1-5: Line-of-Sight Coverage of WPZR862 with Respect to Agricola Wind Project*



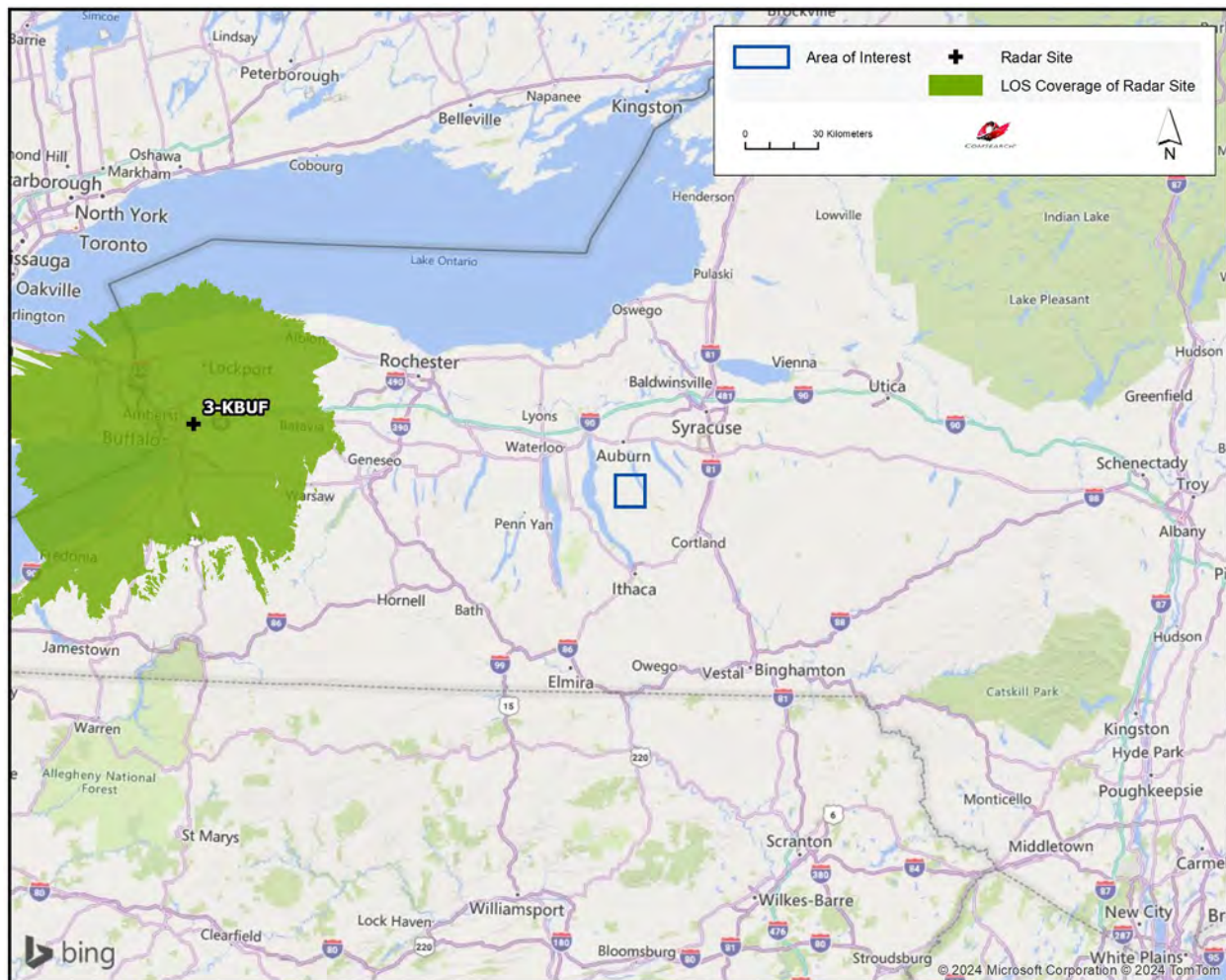


*Figure A2-1: Line-of-Sight Coverage of KBGM with Respect to Agricola Wind Project*

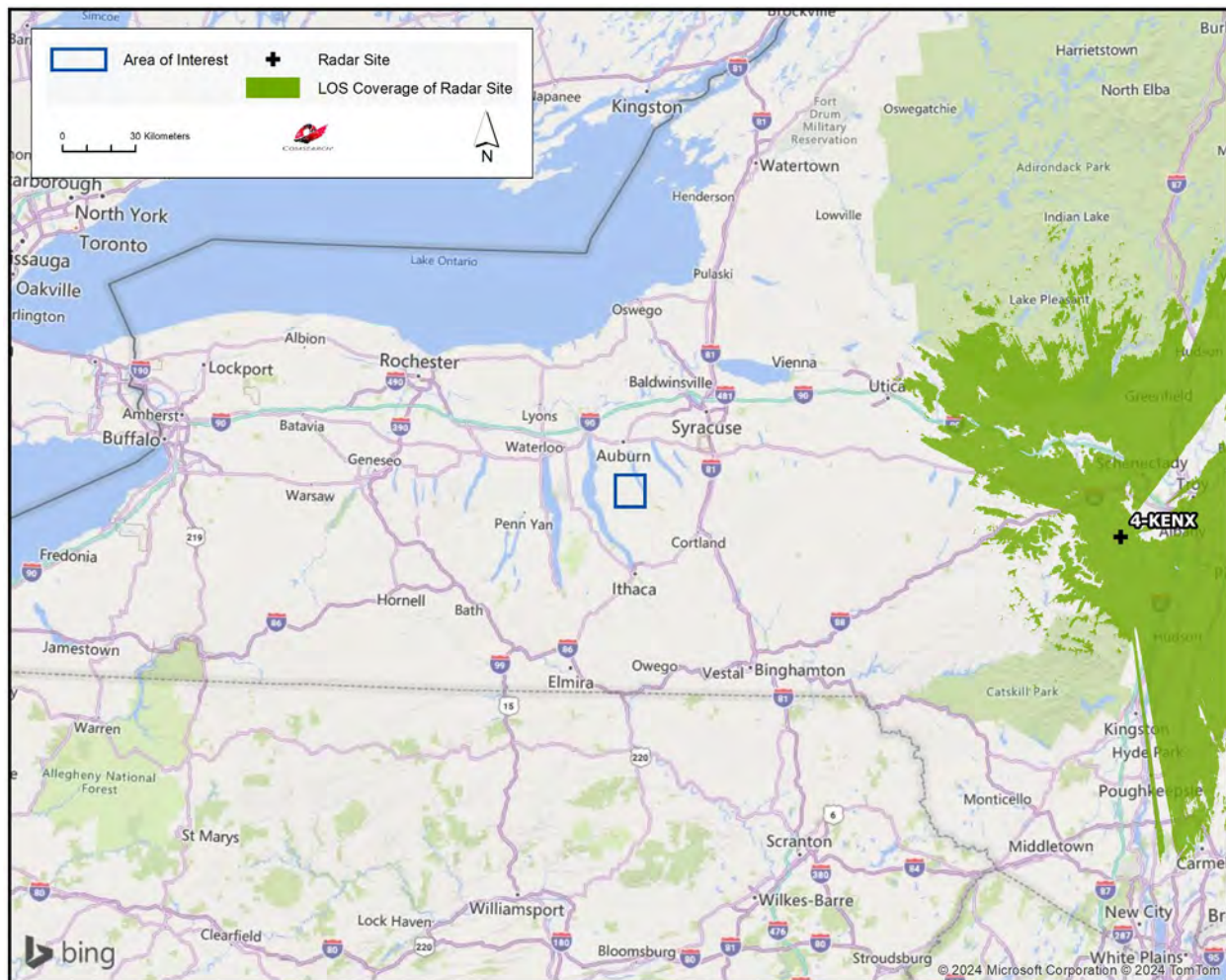


*Figure A2-2: Line-of-Sight Coverage of KRMX with Respect to Agricola Wind Project*



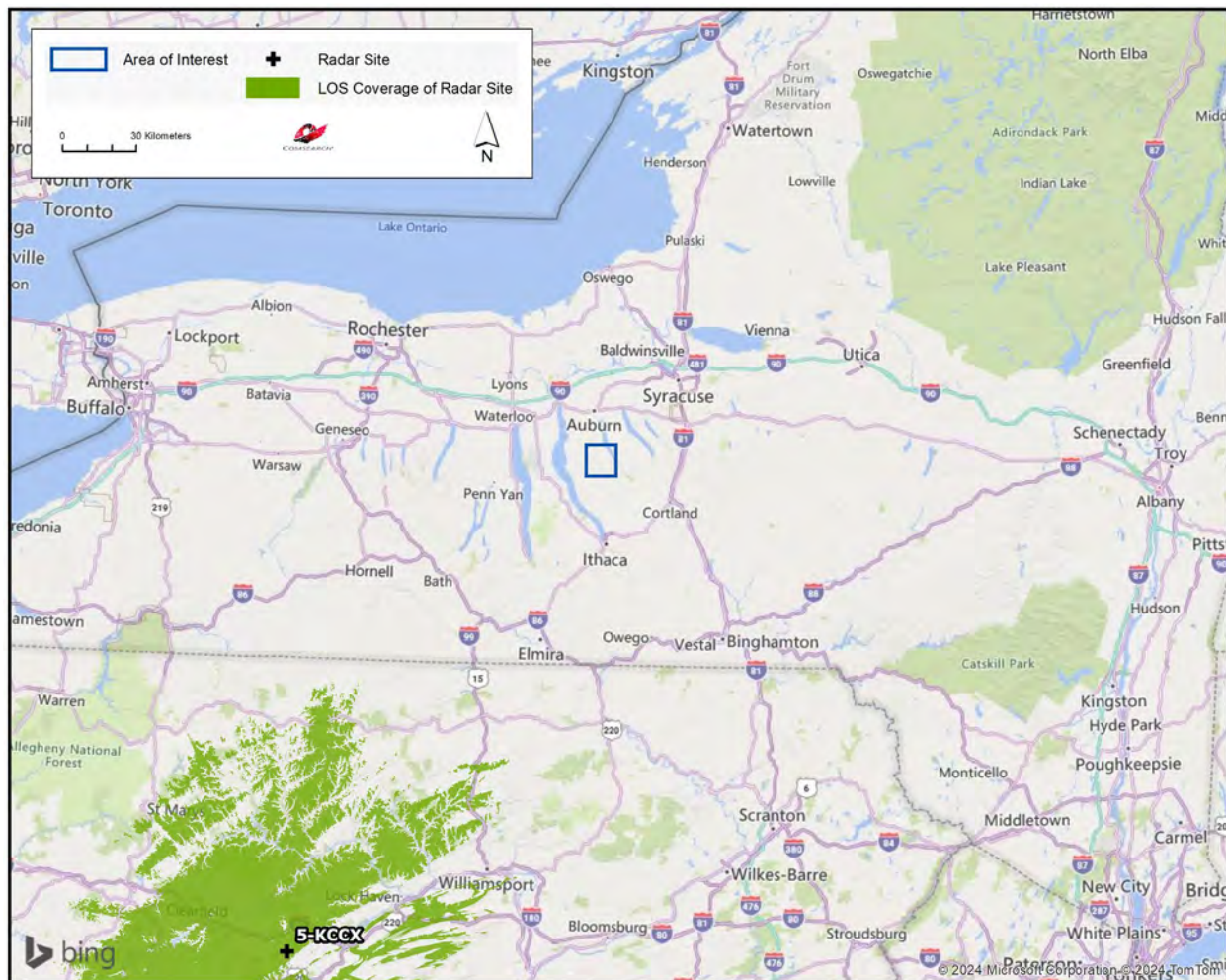


*Figure A2-3: Line-of-Sight Coverage of KBUF with Respect to Agricola Wind Project*



*Figure A2-4: Line-of-Sight Coverage of KENX with Respect to Agricola Wind Project*





*Figure A2-5: Line-of-Sight Coverage of KCCX with Respect to Agricola Wind Project*

Station ID	Station Name	Date Commissioned	County	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
SCIP	Scipio Center	9/22/2016	Cayuga	42.75621600	-76.53403500	0.36
GROT	Groton	12/21/2016	Tompkins	42.54855000	-76.37534000	22.88
WATE	Waterloo	11/4/2015	Seneca	42.87966000	-76.81255000	23.52
TULL	Tully	3/30/2016	Onondaga	42.79463000	-76.11555000	31.48
JORD	Jordan	11/17/2015	Onondaga	43.06980000	-76.47006000	32.51
PENN	Penn Yan	5/24/2016	Yates	42.65578000	-76.98746000	36.90
BURD	Burdett	5/23/2016	Schuyler	42.41042000	-76.77176000	39.25
CINC	Cincinnatus	4/21/2016	Cortland	42.52242400	-75.97562200	49.22
BERK	Berkshire	11/19/2015	Tioga	42.32030000	-76.20319000	51.91
FAYE	Fayetteville	7/14/2016	Onondaga	43.05422600	-75.99004100	53.11
TYRO	Tyrone	5/23/2016	Schuyler	42.40611000	-77.05390000	54.60
WOLC	Wolcott	3/9/2016	Wayne	43.22868000	-76.84261000	55.59
CLIF	Clifton Springs	7/13/2016	Ontario	43.01479000	-77.18518000	57.40
SBRI	South Bristol	2/19/2016	Ontario	42.75217000	-77.35931000	65.03
CSQR	Central Square	11/5/2015	Oswego	43.32613000	-76.10445000	69.93
MORR	Morrisville	6/27/2016	Madison	42.88391700	-75.64244700	71.34
ELMI	Elmira	6/30/2016	Chemung	42.11332000	-76.83664000	71.66
OSWE	Oswego	7/7/2016	Oswego	43.44318300	-76.55323300	73.58
COHO	Cohocton	5/17/2016	Steuben	42.51178000	-77.43762000	76.98
OWEG	Owego	7/20/2016	Tioga	42.02571000	-76.25543000	80.74
SHER	Sherburne	2/23/2016	Chenango	42.64026000	-75.48370000	83.62
ONTA	Ontario	11/1/2016	Wayne	43.25941000	-77.37331000	85.30
BING	Binghamton	10/4/2016	Broome	42.05843000	-75.95104000	87.52
BELD	Belden	11/30/2015	Broome	42.22322000	-75.66852000	89.02
CAMD	Camden	6/29/2016	Oneida	43.33985000	-75.74299000	89.36
RUSH	Rush	7/12/2016	Monroe	43.00099000	-77.63739000	91.22
WEST	Westmoreland	11/18/2015	Oneida	43.10647000	-75.46146000	93.22
ADDI	Addison	8/10/2016	Steuben	42.04036000	-77.23726000	94.76
BROO	Brookfield	8/5/2016	Madison	42.79591000	-75.29929000	97.94



Station ID	Station Name	Date Commissioned	County	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
OSCE	Osceola	6/22/2016	Lewis	43.49915000	-75.71175000	104.09
YORK	York	8/9/2016	Livingston	42.85504000	-77.84776000	105.31
REDF	Redfield	6/21/2016	Oswego	43.62218000	-75.87769000	107.58
HART	Hartsville	8/9/2016	Steuben	42.21122100	-77.68973300	109.99
LAUR	Laurens	1/15/2016	Otsego	42.52526000	-75.13690000	113.96
BELL	Belleville	4/28/2016	Jefferson	43.78962000	-76.11373000	117.11
DEPO	Deposit	8/23/2016	Delaware	42.06855100	-75.39219300	117.57
GROV	Grove	7/20/2016	Allegany	42.48951000	-77.94946000	117.79
WALT	Walton	4/18/2016	Delaware	42.23950000	-75.17879000	121.84
BROC	Brockport	6/16/2016	Monroe	43.20835000	-77.96592000	124.12
HERK	Herkimer	8/10/2016	Herkimer	43.03662000	-75.00957000	125.49
BATA	Batavia	2/18/2016	Genesee	43.01994000	-78.13566000	131.22
SPRI	Springfield	8/15/2016	Otsego	42.84315000	-74.88961000	131.70
HARR	Harrisburg	6/21/2016	Lewis	43.80352000	-75.68853000	132.68
BELM	Belmont	5/16/2016	Allegany	42.24249000	-78.03958000	134.04
WARS	Warsaw	5/16/2016	Wyoming	42.77993000	-78.20889000	134.53
COLD	Cold Brook	11/11/2015	Herkimer	43.26126800	-74.97877800	136.04
GFLD	Glenfield	8/29/2016	Lewis	43.71680000	-75.40925000	138.34
WGAT	Woodgate	8/29/2016	Oneida	43.53240800	-75.15859700	138.96
COPE	Copenhagen	2/5/2016	Lewis	43.92056400	-75.60786600	147.16
CAPE	Cape Vincent	4/27/2016	Jefferson	44.10452000	-76.32686000	147.97
HARP	Harpersfield	8/4/2016	Delaware	42.47280000	-74.69849000	150.39
MEDI	Medina	7/19/2016	Orleans	43.22668000	-78.30927000	150.95
ANDE	Andes	8/4/2016	Delaware	42.18227000	-74.80139000	152.59
OPPE	Oppenheim	7/29/2016	Fulton	43.06260000	-74.66543700	153.42
DELE	Delevan	3/8/2016	Cattaraugus	42.41846400	-78.42320000	157.48
NBRA	North Branch	7/21/2016	Sullivan	41.82792000	-74.99689000	159.85
COBL	Cobleskill	1/25/2016	Schoharie	42.67626700	-74.50796700	162.85
SPRA	Sprakers	11/9/2015	Montgomery	42.87427000	-74.50859000	163.00
OLDF	Old Forge	9/2/2016	Herkimer	43.74157000	-74.97786000	164.97



Station ID	Station Name	Date Commissioned	County	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
OLEA	Olean	6/2/2016	Cattaraugus	42.09141000	-78.40743000	168.68
EAUR	East Aurora	8/8/2016	Erie	42.71349000	-78.63173000	169.36
PHIL	Philadelphia	7/8/2016	Jefferson	44.19354000	-75.71591000	170.27
CROG	Croghan	11/2/2016	Lewis	43.97496000	-75.20100000	171.01
ROXB	Roxbury	8/24/2016	Delaware	42.32964000	-74.46746000	172.73
WELL	Wellesley Island	4/27/2016	Jefferson	44.30782000	-76.00858000	174.83
PISE	Piseco	3/25/2017	Hamilton	43.46474000	-74.50432000	180.40
JOHN	Johnstown	3/22/2016	Montgomery	42.98428300	-74.30176700	181.07
BUFF	Buffalo	3/9/2017	Erie	43.00017000	-78.76717000	181.70
CLAR	Claryville	10/20/2016	Ulster	41.97920000	-74.51710000	183.71
BURT	Burt	6/15/2016	Niagara	43.31699000	-78.74903000	188.01
ELDR	Eldred	8/25/2016	Sullivan	41.53961000	-74.87992000	188.59
DUAN	Duanesburg	7/22/2016	Schenectady	42.80319000	-74.17361000	189.97
WBOU	Woodbourne	9/1/2016	Sullivan	41.74505000	-74.58833000	192.45
RAQU	Raquette Lake	11/10/2016	Hamilton	43.82275200	-74.62509100	192.71
MEDU	Medusa	8/24/2016	Albany	42.46869000	-74.16541000	193.49
EDWA	Edwards	8/16/2016	St. Lawrence	44.32177000	-75.24413000	200.36
EDIN	Edinburg	7/15/2016	Saratoga	43.22819000	-74.11293000	201.42
BRAN	Brant	4/23/2016	Erie	42.59494000	-79.02154000	202.32
RAND	Randolph	6/2/2016	Cattaraugus	42.14928000	-78.90096000	204.19
TANN	Tannersville	2/1/2017	Greene	42.17071000	-74.11343000	205.90
HAMM	Hammond	8/16/2016	St. Lawrence	44.51302000	-75.61729000	206.10
VOOR	Voorheesville	8/16/2016	Albany	42.65242000	-73.97562000	206.56
OTIS	Otisville	12/10/2015	Orange	41.48249000	-74.50368000	215.96
BSPA	Ballston Spa	8/18/2016	Saratoga	43.02280000	-73.87498000	216.12
ILAK	Indian Lake	7/26/2016	Hamilton	43.79067000	-74.23933000	216.39
HFAL	High Falls	11/17/2016	Ulster	41.79880000	-74.12312000	222.00
NEWC	Newcomb	10/18/2016	Essex	43.97329000	-74.22273000	228.65
WALL	Wallkill	6/23/2016	Ulster	41.63409000	-74.15370000	229.30
REDH	Red Hook	8/2/2016	Dutchess	42.00168000	-73.88391000	230.24





Station ID	Station Name	Date Commissioned	County	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
KIND	Kinderhook	8/30/2016	Columbia	42.41001000	-73.71557000	231.07
SCHO	Schodack	1/11/2017	Rensselaer	42.50631000	-73.68584000	231.83
TUPP	Tupper Lake	7/13/2016	Franklin	44.22128000	-74.43826000	232.86
FRED	Fredonia	4/23/2016	Chautauqua	42.41817000	-79.36660000	233.33
SCHA	Schaghticoke	6/20/2016	Rensselaer	42.89697000	-73.61405000	236.06
WARW	Warwick	4/14/2016	Orange	41.24036000	-74.39056000	241.05
SCHU	Schuylerville	8/9/2015	Saratoga	43.11699600	-73.57828400	241.51
CHES	Chestertown	12/6/2015	Warren	43.65390000	-73.77736000	242.57
POTS	Potsdam	7/8/2016	St. Lawrence	44.65686700	-74.97443300	243.29
GFAL	Glens Falls	3/10/2017	Warren	43.34087000	-73.60202000	244.70
BEAC	Beacon	8/22/2016	Dutchess	41.52875000	-73.94527000	250.24
COPA	Copake	8/3/2016	Columbia	42.13659000	-73.51988000	253.80
STEP	Stephentown	12/8/2015	Rensselaer	42.52620000	-73.35906000	258.21
LOUI	Louisville	3/26/2016	St. Lawrence	44.87169000	-75.05608000	260.86
GABR	Gabriels	1/20/2016	Franklin	44.41742000	-74.17867000	262.87
WHIT	Whitehall	8/26/2015	Washington	43.48507300	-73.42307100	263.03
DOVE	Dover Plains	12/9/2016	Dutchess	41.77367000	-73.57542000	263.82
CLYM	Clymer	6/1/2016	Chautauqua	42.02447000	-79.62408000	265.27
NHUD	North Hudson	9/13/2016	Essex	44.01310000	-73.70516000	265.89
SUFF	Suffern	8/17/2016	Rockland	41.13038000	-74.08987000	267.80
SOME	Somers	2/28/2017	Westchester	41.31037000	-73.76711000	276.26
TICO	Ticonderoga	1/28/2016	Essex	43.87469000	-73.41879000	278.98
WFMB	Whiteface Mountain Base	1/29/2016	Essex	44.39323600	-73.85882900	280.14
BREW	Brewster	3/30/2017	Putnam	41.43993000	-73.57642000	281.48
MALO	Malone	8/15/2016	Franklin	44.85286900	-74.32887400	290.51
BRON	Bronx	9/12/2017	Bronx	40.87248100	-73.89352200	299.47
MANH	Manhattan	7/18/2017	New York	40.76754400	-73.96448200	303.59
ESSX	Essex	12/5/2015	Essex	44.31360400	-73.37189600	306.18
STAT	Staten Island	5/3/2017	Richmond	40.60401400	-74.14849900	307.03
SARA	Saranac	7/12/2016	Clinton	44.70758500	-73.67115000	314.33



Station ID	Station Name	Date Commissioned	County	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
QUEE	Queens	4/18/2017	Queens	40.73433500	-73.81585600	314.95
BKLN	Brooklyn	6/19/2017	Kings	40.63176200	-73.95367800	315.34
ELLE	Ellenburg	8/30/2016	Clinton	44.89550000	-73.84502000	319.15
WANT	Wantagh	11/10/2016	Nassau	40.65510000	-73.50616000	339.76
CHAZ	Chazy	7/8/2016	Clinton	44.89565000	-73.46461000	340.51
STON	Stony Brook	2/21/2018	Suffolk	40.91912000	-73.13168000	344.98
SOUT	Southold	11/10/2016	Suffolk	41.04008100	-72.46586400	384.09

*Table A-1: New York State Mesonet Weather Stations and Distance to the Agricola Wind Project*