

Project	
Site	
Turbine	GW 87/1500
Hub Height	80 m
Wind Data	

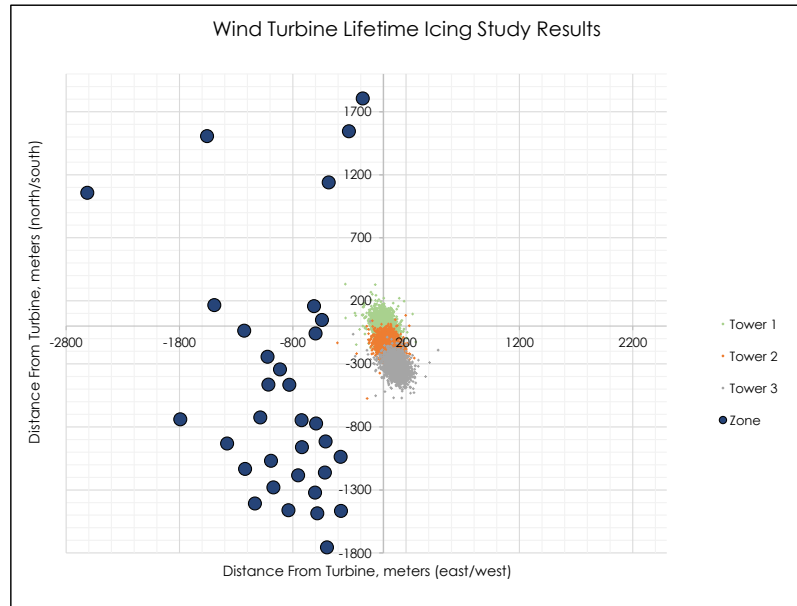
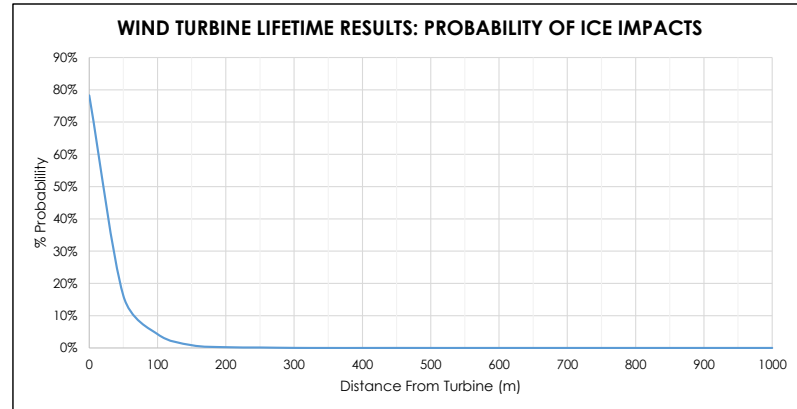
# WIND TURBINE ICING STUDY RESULTS (1 of 2)

## ZONES 1-33



ICING STUDY RESULTS				
Zone of Interest	Distance to closest turbine (m)	Distance to closest turbine (ft)	Impacts Over Lifetime	Number of Impacts Per Year
Z-1	2,817	9,244	0	0
Z-2	2,166	7,105	0	0
Z-3	1,814	5,953	0	0
Z-4	1,574	5,165	0	0
Z-5	1,238	4,061	0	0
Z-6	1,042	3,419	0	0
Z-7	1,221	4,006	0	0
Z-8	1,348	4,421	0	0
Z-9	1,501	4,924	0	0
Z-10	1,228	4,028	0	0
Z-11	1,050	3,446	0	0
Z-12	972	3,188	0	0
Z-13	922	3,025	0	0
Z-14	1,099	3,606	0	0
Z-15	1,259	4,132	0	0
Z-16	1,922	6,307	0	0
Z-17	1,608	5,277	0	0
Z-18	1,556	5,105	0	0
Z-19	1,329	4,359	0	0
Z-20	933	3,061	0	0
Z-21	833	2,732	0	0
Z-22	1,043	3,422	0	0
Z-23	1,215	3,988	0	0
Z-24	1,440	4,724	0	0
Z-25	1,647	5,404	0	0
Z-26	1,476	4,843	0	0
Z-27	855	2,804	0	0
Z-28	860	2,821	0	0
Z-29	632	2,073	0	0
Z-30	544	1,784	0	0
Z-31	601	1,971	0	0
Z-32	1,550	5,087	0	0
Z-33	1,235	4,053	0	0

Maximum Icing Distance (1 event) (m)	473
<b>99.9<sup>th</sup> Percentile Max Distance (m)</b>	<b>251</b>



**Note:** This study assumes full wind turbine operation. **Actual turbine operation will be restricted during icing events.**



Zones of Interest

### CONCLUSIONS

Based on the icing model results for zones 1-33, there are no modeled impacts. The project will not pose any ice throw risk to the modeled nearby residences and businesses.

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Wind Data	

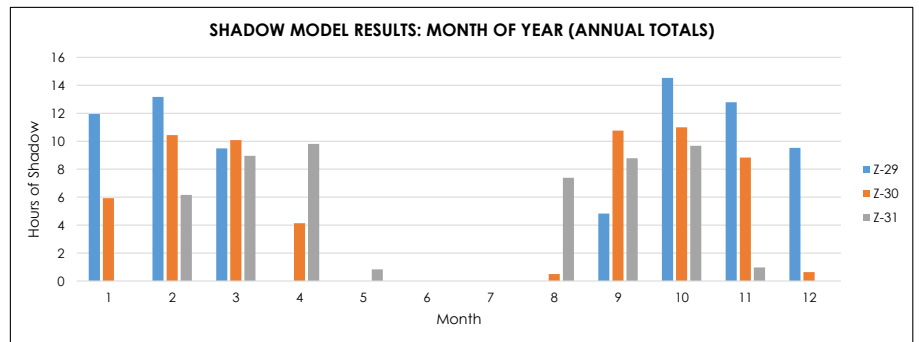
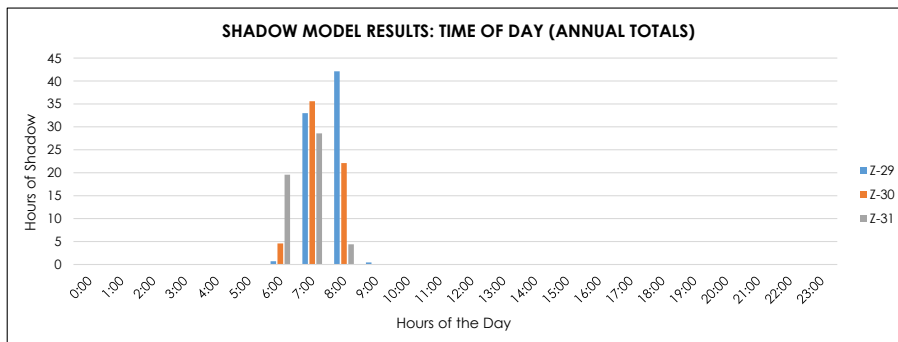
## WIND TURBINE SHADOW STUDY RESULTS (1 of 2)

### ZONES 1-33



SHADOW FLICKER STUDY RESULTS					
Zone of Interest	Distance to closest turbine (m)	Distance to closest turbine (ft)	Modeled Hours of Shadow Flicker Per Year	Hours (Excluding Cloudy Days)	Expected Hours (Excluding Cloudy and Partly Cloudy Days)
Z-1	2,817	9,244	8	5	3
Z-2	2,166	7,105	0	0	0
Z-3	1,814	5,953	0	0	0
Z-4	1,574	5,165	0	0	0
Z-5	1,238	4,061	0	0	0
Z-6	1,042	3,419	0	0	0
Z-7	1,221	4,006	0	0	0
Z-8	1,348	4,421	0	0	0
Z-9	1,501	4,924	17	12	7
Z-10	1,228	4,028	26	18	11
Z-11	1,050	3,446	35	25	15
Z-12	972	3,188	48	35	20
Z-13	922	3,025	59	42	25
Z-14	1,099	3,606	48	34	20
Z-15	1,259	4,132	68	49	29
Z-16	1,922	6,307	15	11	6
Z-17	1,608	5,277	33	23	14
Z-18	1,556	5,105	5	4	2
Z-19	1,329	4,359	15	11	6
Z-20	933	3,061	40	28	17
Z-21	833	2,732	0	0	0
Z-22	1,043	3,422	0	0	0
Z-23	1,215	3,988	0	0	0
Z-24	1,440	4,724	0	0	0
Z-25	1,647	5,404	0	0	0
Z-26	1,476	4,843	0	0	0
Z-27	855	2,804	0	0	0
Z-28	860	2,821	0	0	0
Z-29	632	2,073	182	130	76
Z-30	544	1,784	148	106	62
Z-31	601	1,971	125	90	53
Z-32	1,550	5,087	0	0	0
Z-33	1,235	4,053	0	0	0

KEY						
Hours	0-30	30-60	60-90	90-120	120-150	150+
Color						



**CONCLUSIONS**  
Based on the expected hours of shadow flicker for zones 1-33, shadow flicker will not exceed acceptable limits at any nearby residences or businesses. The zones with the most amount of shadow flicker hours (Z-29, Z-30, Z-31), are all owned by [REDACTED]

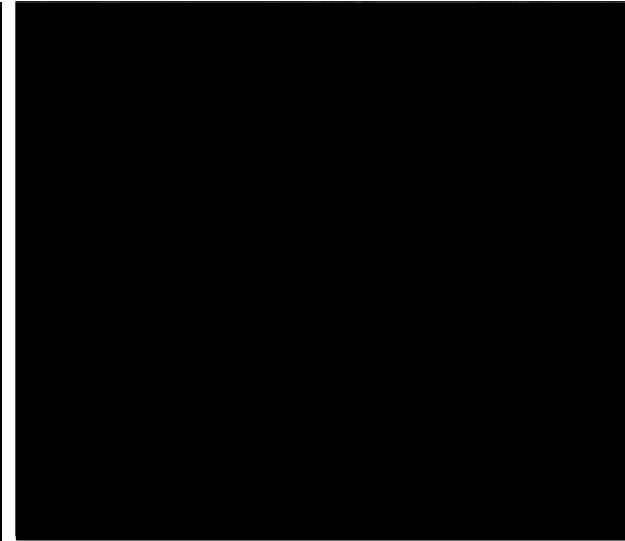
Project	
Site	
Turbine	GW 87/1500
Hub Height (m)	80
Source SPL (dBA)	105

## WIND TURBINE SOUND STUDY RESULTS (1 of 2)

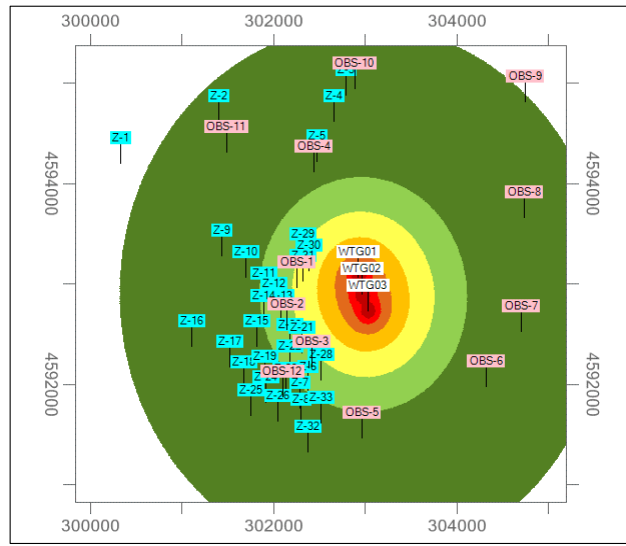
### SHORT-TERM OBSERVATION RESULTS (ZONES 1-33)



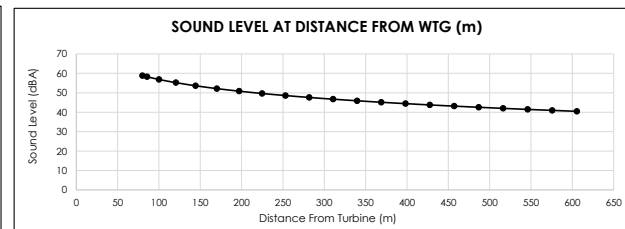
MODELED SOUND PRESSURE LEVELS (SPL)			
Structure Name	Distance to Closest Turbine (m)	Distance to Closest Turbine (ft)	Modeled Turbine SPL (dBA)
Z-1	2817	9244	17.8
Z-2	2166	7105	23.0
Z-3	1814	5953	26.1
Z-4	1574	5165	28.5
Z-5	1238	4061	32.1
Z-6	1042	3419	35.0
Z-7	1221	4006	32.8
Z-8	1348	4421	31.3
Z-9	1501	4924	29.9
Z-10	1228	4028	33.1
Z-11	1030	3446	35.6
Z-12	972	3188	36.9
Z-13	922	3025	37.6
Z-14	1099	3606	35.2
Z-15	1259	4132	33.3
Z-16	1922	6307	26.3
Z-17	1608	5277	29.4
Z-18	1556	5105	29.7
Z-19	1329	4359	32.1
Z-20	933	3061	37.1
Z-21	833	2732	38.4
Z-22	1043	3422	35.4
Z-23	1215	3988	33.1
Z-24	1440	4724	30.6
Z-25	1647	5404	28.5
Z-26	1476	4843	30.1
Z-27	855	2804	37.7
Z-28	860	2821	37.4
Z-29	632	2073	41.0
Z-30	544	1784	42.8
Z-31	601	1971	42.1
Z-32	1550	5087	29.0
Z-33	1235	4053	32.4



Zones of Interest



Sound Model Results



KEY		MEASURED SOUND PRESSURE LEVELS NEAR				
Range (dBA)	Color	Structure Name	Location		Avg Measured SPL (dBA)	Modeled Turbine SPL (dBA)
			Lat	Lon		
60+	Red	OBS-1	41.4638	-83.3678	64.0	41.2
55-60	Orange	OBS-2	41.4601	-83.3689	57.0	38.2
50-55	Yellow	OBS-3	41.4568	-83.3655	49.0	38.2
45-50	Light Green	OBS-4	41.4743	-83.3659	54.0	33.1
40-45	Green	OBS-5	41.4506	-83.3588	50.0	31.8
35-40	Light Green	OBS-6	41.4555	-83.3428	54.0	29.5
<35	Dark Green	OBS-7	41.4605	-83.3385	52.0	28.0
		OBS-8	41.4708	-83.3384	56.0	26.4
		OBS-9	41.4811	-83.3386	47.0	20.4
		OBS-10	41.4819	-83.3609	58.0	25.5
		OBS-11	41.4758	-83.3774	52.0	25.6
		OBS-12	41.4540	-83.3694	53.0	32.5

COMPARISON				
Chainsaw	Diesel Truck	Vacuum Cleaner	Average Home	Library
110 dBA	90 dBA	70 dBA	50 dBA	40 dBA

**CONCLUSIONS**  
Based on the sound model results for zones 1-33, the turbine sound level is not expected to exceed acceptable limits at any nearby residences or businesses. The zones with the highest sound levels (Z-29, Z-30, Z-31), are owned by [REDACTED]. All modeled sound pressure levels are less than that of an average home, and are significantly less than measured sound levels.