

Wind Data Verification Report 9531 - Arriga 50m

Site Details		
Site Name	Arriga 50m	
Date/Time of report generation	27/11/2012 04:22 PM	
Site Number	9531	
Mast Height	50m	
Mast Location	325608 E 8101256 N	
Coordinate System	UTM 55K	
Mast Time Zone		
Report Period		
	Date (dd/mm/yyyy)	Time (24hr format)
Start	01/06/2010	00:00
Finish	31/05/2012	23:50
Data Recovery		
Averaging Period	10 minutes	
Missing data rows	0	
Data recovery rate	100%	



Comments

- Data for this period has been verified
- Erroneous wind direction data has been removed based on 'human' judgement. Level 3 (9.7m): 28.04% removed.

Sensor Summary

Anemometers				
Level	1	2	3	4
Measurement Height	49.6	49.6	29.9	9.9
Type	NRG	NRG	NRG	NRG
Serial Number	180000000000	180000000000	180000000000	180000000000
Installed on	-	-	-	-
Boom/Finial Orientation	47	231	47	51
Offset	0.39	0.37	0.39	0.38
Scale Factor	0.759	0.755	0.755	0.754
Status	OK	OK	OK	OK

Wind Vanes			
Level	1	2	3
Measurement Height	46.4	30	9.7
Type	2.1	2.1	2.1
Serial Number	-	-	-
Installed on	-	-	-
Boom Orientation	47	227	227
Offset	227	47	47
Status	OK	OK	OK

Environmental Sensors		
Air Property	Pressure	Temp. (External)
Measurement Height (m)	2	2.2
Type	-	-
Serial Number	18059973	-
Installed on	-	-
Status	OK	OK

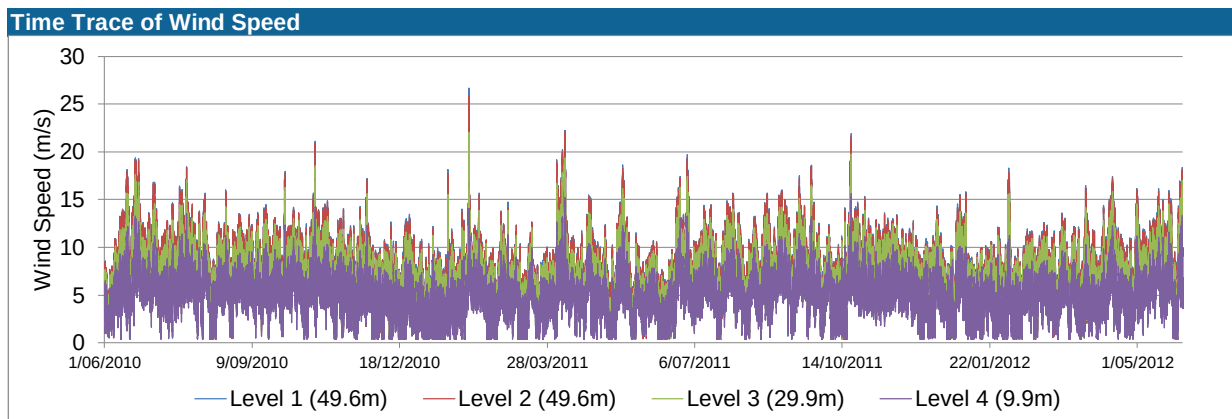
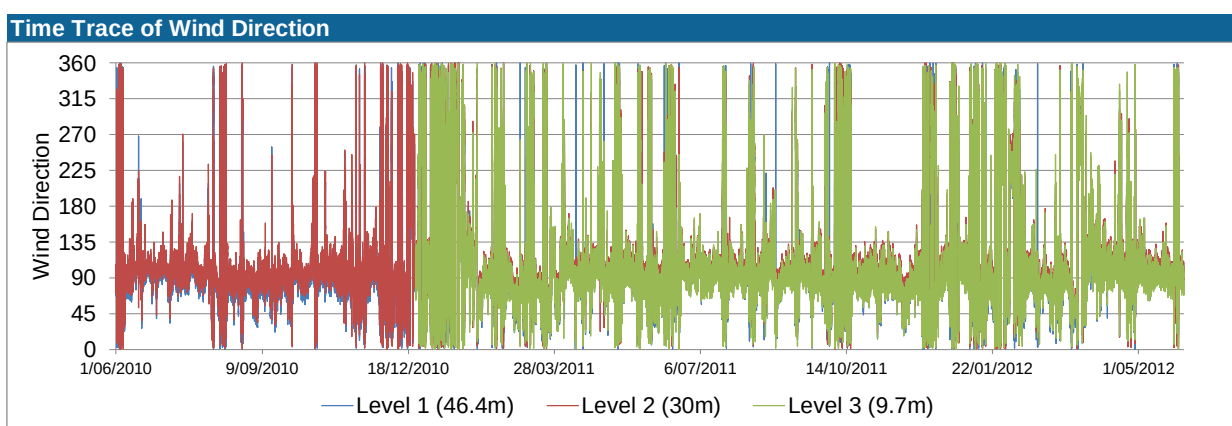
Statistics Summary

Wind Statistics	Level 1	Level 2	Level 3	Level 4
Height above ground level (m)	49.6m	49.6m	29.9m	9.9m
Recovery rate (%)	100%	100%	100%	100%
Minimum wind speed (m/s)	0.39	0.37	0.39	0.38
Average wind speed (m/s)	7.2	7.08	6.44	4.95
Maximum wind speed (m/s)	26.66	25.94	22.03	15.63
Maximum gust wind speed (m/s)	35.3	34.72	32.06	24.9
Average standard deviation (m/s)	1.07	1.08	1.12	1.16
Mean TI at 15 m/s	13.45%	13.72%	15.67%	18.66%
Representative TI at 15 m/s	17.05%	17.24%	19.18%	20.44%

Environmental Statistics	Units	Height	Minimum	Average	Maximum	Recovery Rate
Pressure	mbar	2m	716.6	912.2	920.2	100%
Humidity	-	-	-	-	-	-
Internal Temperature	-	-	-	-	-	-
External Temperature	degC	2.2m	10.3	21.5	38.1	100%

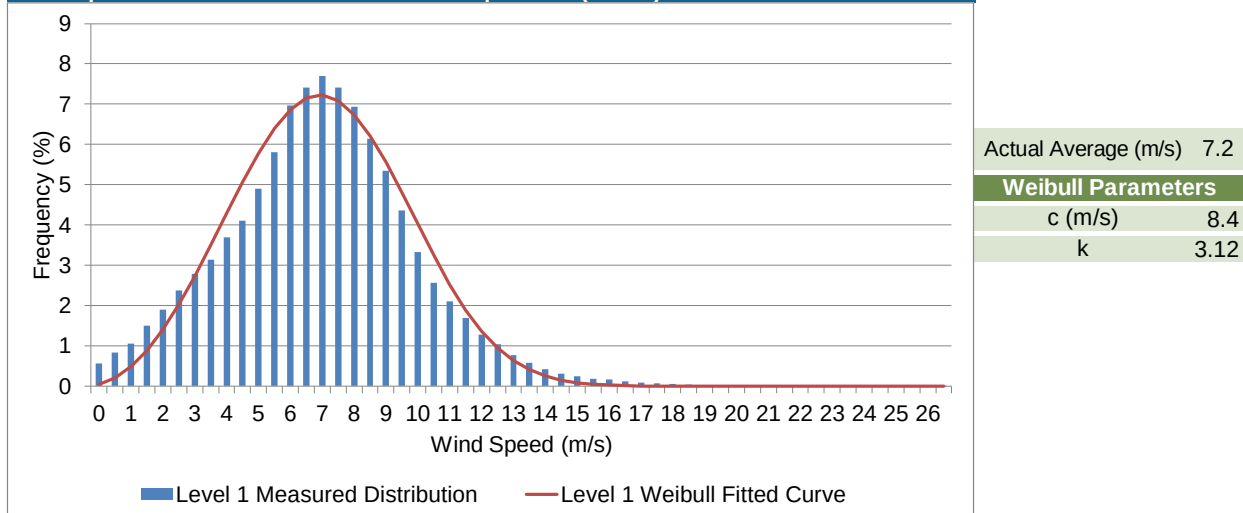
Wind Vanes	Level 1	Level 2	Level 3
Data Recovery Rate	100%	100%	71.96%

Time Traces

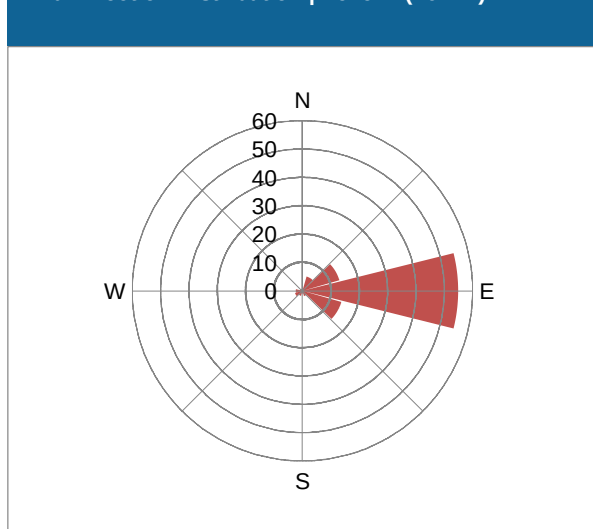


Distributions

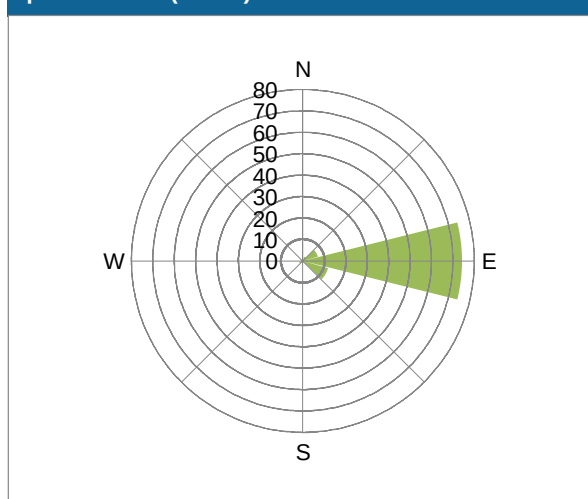
Wind Speed Distribution and Weibull Curve | Level 1 (49.6m)



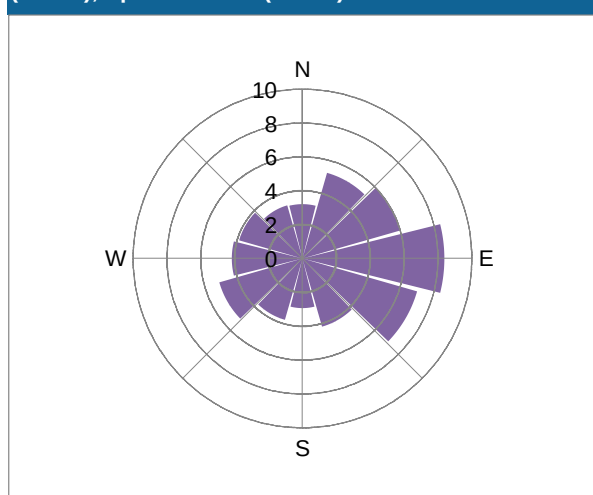
Wind Direction Distribution | Level 1 (46.4m)



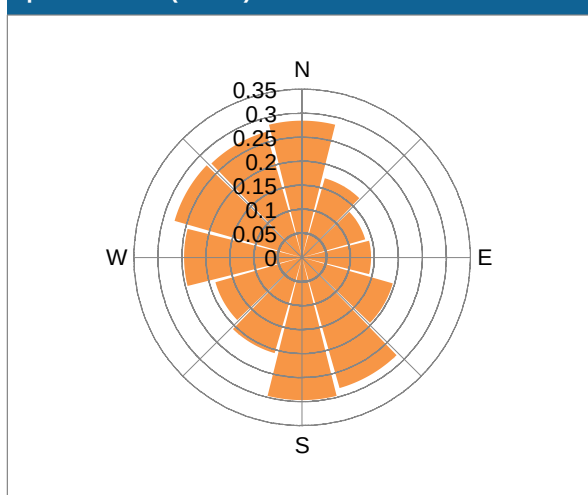
Wind Energy Distribution | Direction Level 1 (46.4m), Speed Level 1 (49.6m)



Mean Wind Speed Distribution | Direction Level 1 (46.4m), Speed Level 1 (49.6m)

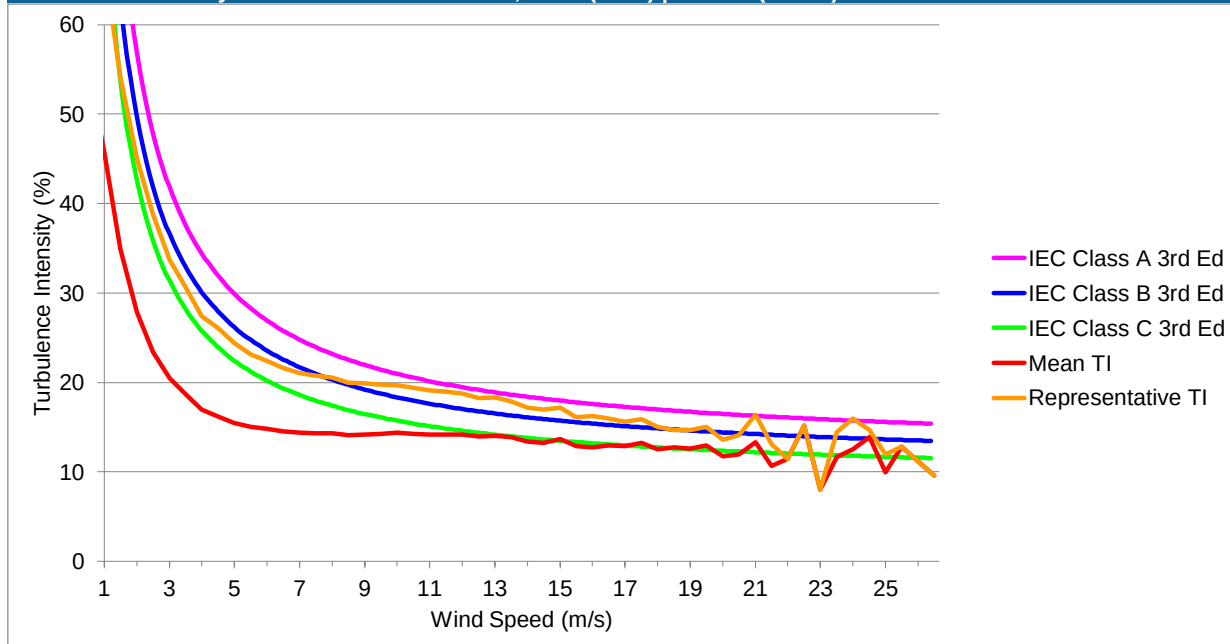


Mean Turbulence Intensity | Direction Level 1 (46.4m), Speed Level 1 (49.6m)

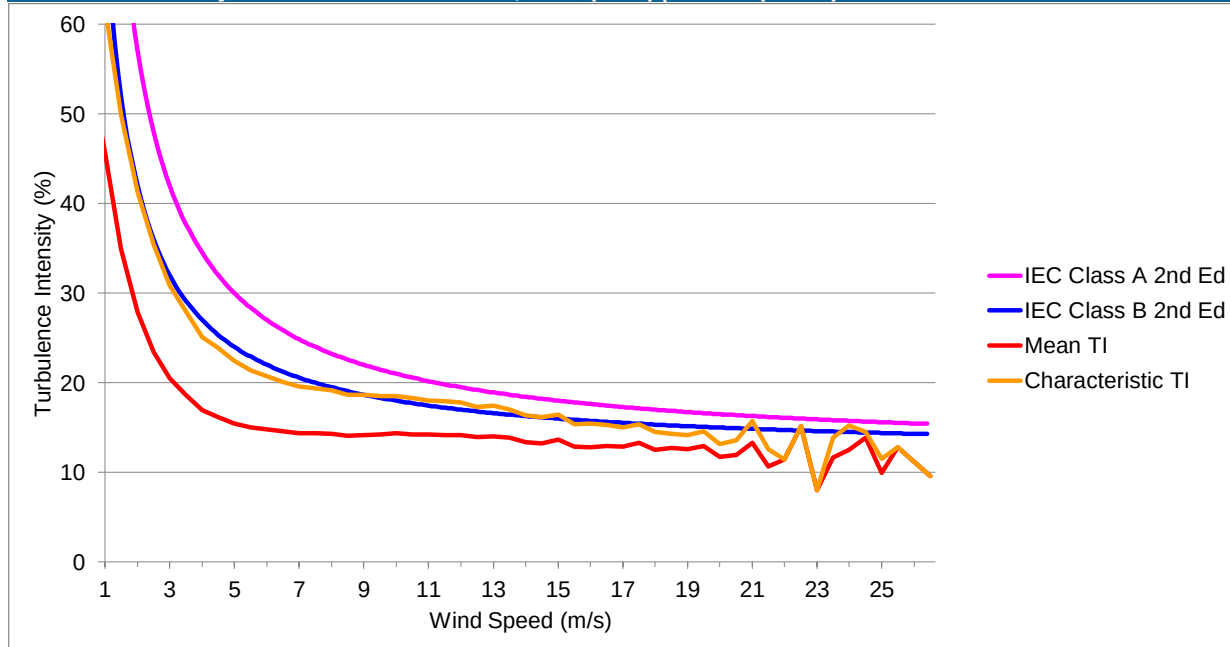


Turbulence Intensity

Turbulence Intensity Scatter Plot - IEC 61400-1, Ed. 3 (2005) | Level 1 (49.6m)



Turbulence Intensity Scatter Plot - IEC 61400-1, Ed. 2 (1999) | Level 1 (49.6m)



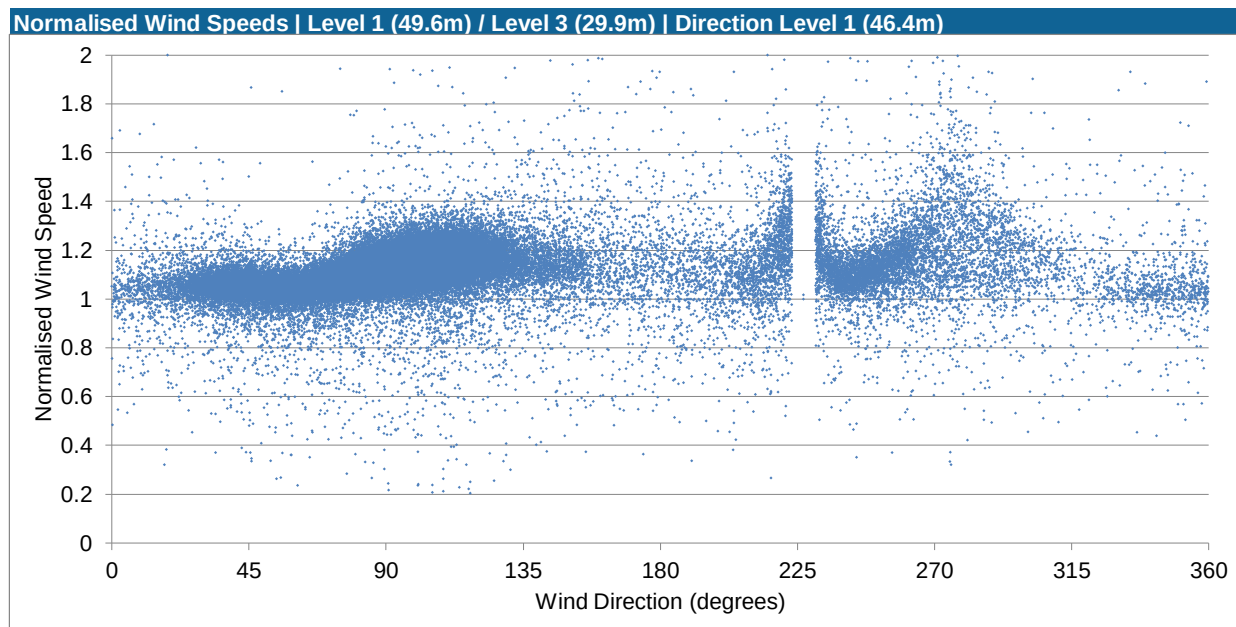
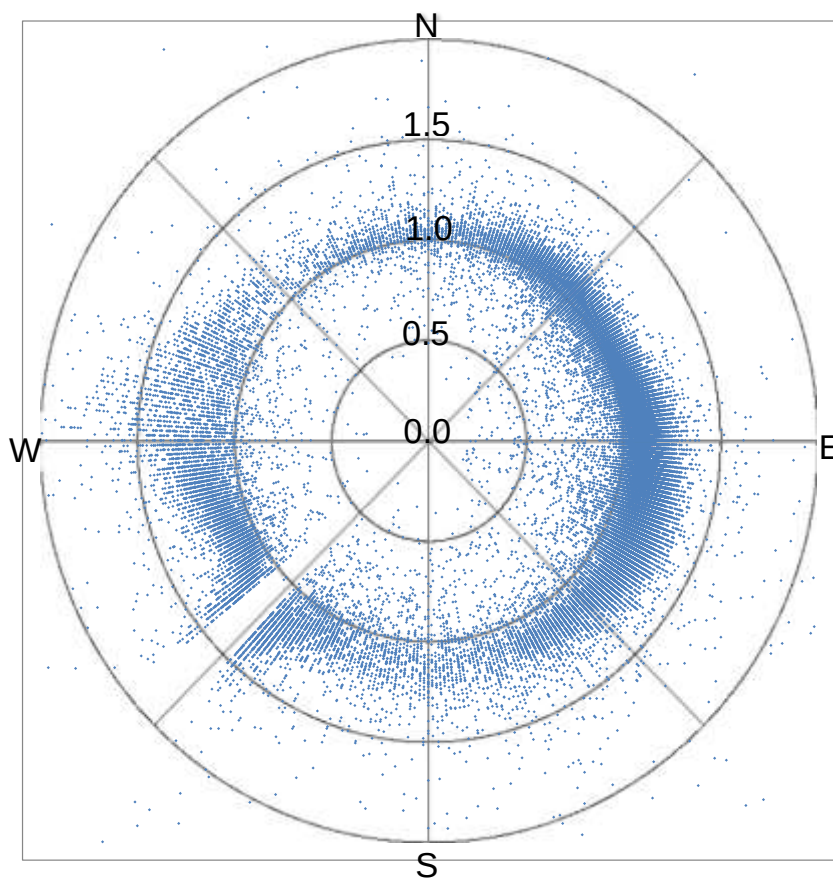
IEC standard 61400-1, Edition 3 (2005)

Mean TI at 15 m/s (%)	13.45%
Representative TI at 15 m/s (%)	17.05%
IEC Class (Edition 3)	B

IEC standard 61400-1, Edition 2 (1999)

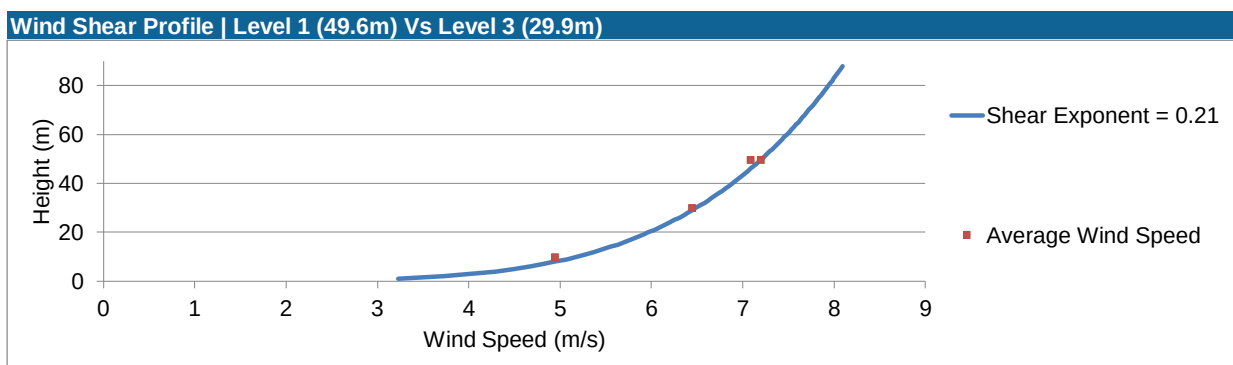
Mean TI at 15 m/s (%)	13.45%
Characteristic TI at 15 m/s (%)	16.26%
IEC Class (Edition 2)	A

Normalised Wind Speed

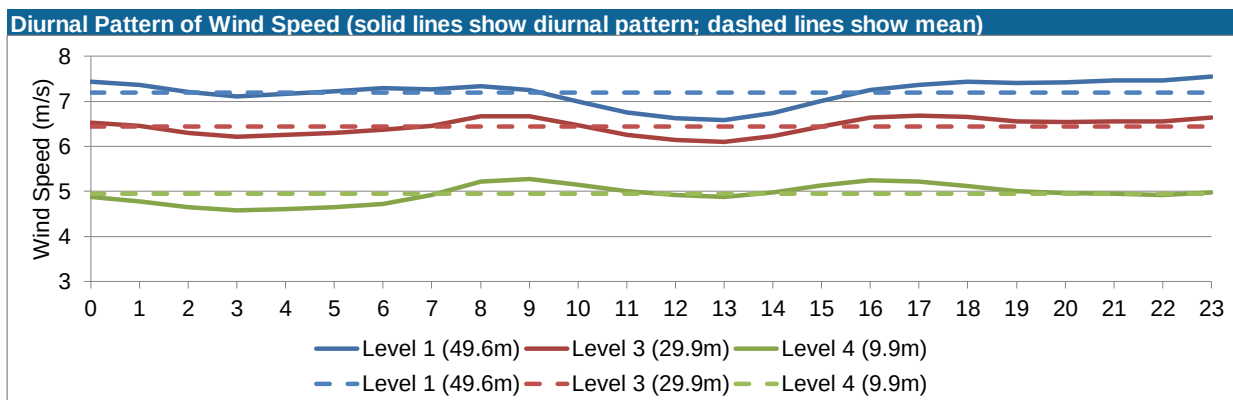
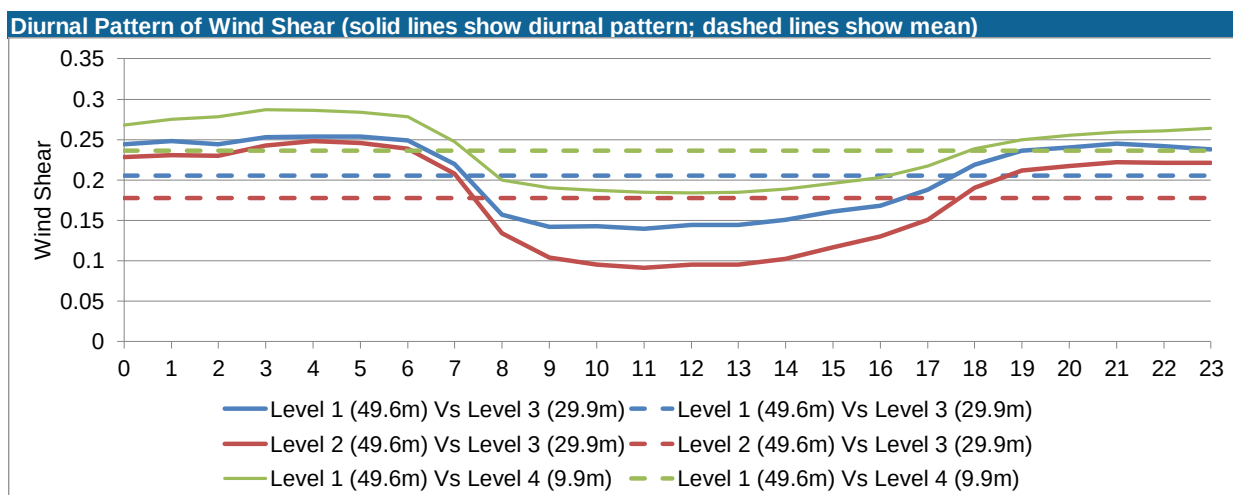


Wind Shear Analysis

Directional Wind Shear Exponents						
Direction Level 1 (46.4m)	% of Data Period	L1 (49.6m) Vs L3 (29.9m)	L2 (49.6m) Vs L3 (29.9m)	L1 (49.6m) Vs L4 (9.9m)	L2 (49.6m) Vs L4 (9.9m)	L3 (29.9m) Vs L4 (9.9m)
N	1.4	0.07	0.06	0.16	0.16	0.2
NE	12.9	0.08	0.06	0.16	0.15	0.19
E	67.6	0.21	0.18	0.23	0.22	0.24
SE	8.7	0.28	0.25	0.29	0.28	0.3
S	1.5	0.21	0.23	0.3	0.3	0.33
SW	3.5	0.25	0.24	0.32	0.31	0.35
W	3.6	0.33	0.28	0.41	0.39	0.44
NW	0.9	0.2	0.2	0.3	0.3	0.35
Overall Wind Shear	100	0.21	0.18	0.24	0.23	0.25



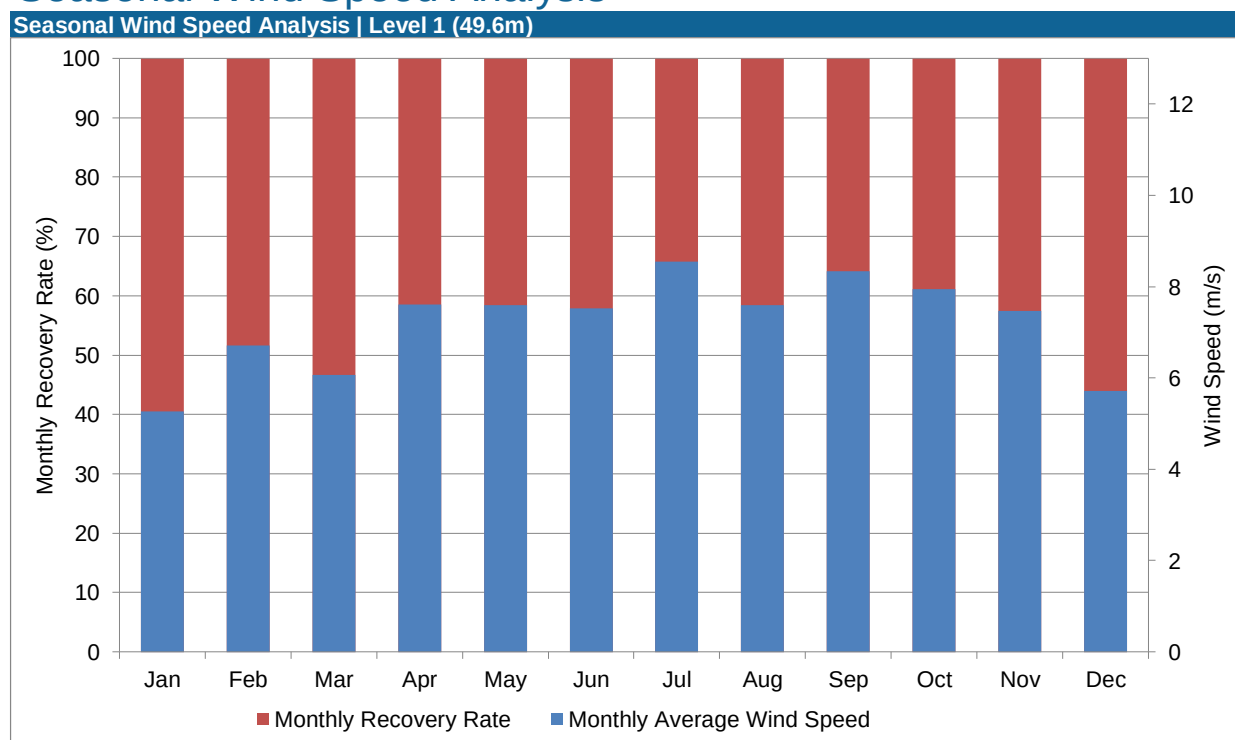
Diurnal Patterns of Wind Speed and Wind Shear



Wind Speed and Direction Frequency Table (%)

Wind Speed (m/s) Level 1 (49.6m) Concurrent availability = 100%	Wind Direction Level 1 (46.4m)												
	0	30	60	90	120	150	180	210	240	270	300	330	All
0 <= Wind Speed < 0.5	0	0	0.1	0.1	0.1	0	0	0.1	0	0	0	0.1	0.6
0.5 <= Wind Speed < 1.5	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	1.9
1.5 <= Wind Speed < 2.5	0.2	0.4	0.4	0.4	0.3	0.2	0.2	0.4	0.3	0.4	0.1	0.1	3.4
2.5 <= Wind Speed < 3.5	0.2	0.6	0.9	0.8	0.6	0.3	0.2	0.3	0.4	0.5	0.2	0.1	5.2
3.5 <= Wind Speed < 4.5	0.1	0.8	1.6	1.5	0.9	0.4	0.2	0.3	0.4	0.4	0.2	0.1	6.8
4.5 <= Wind Speed < 5.5	0.1	0.8	2.1	3.1	1.4	0.3	0.1	0.2	0.4	0.4	0.1	0	9
5.5 <= Wind Speed < 6.5	0	0.9	2.7	5.9	2.3	0.2	0	0.1	0.3	0.2	0.1	0	12.8
6.5 <= Wind Speed < 7.5	0	0.7	2.2	8.7	2.8	0.1	0	0.1	0.2	0.2	0.1	0	15.1
7.5 <= Wind Speed < 8.5	0	0.5	1.6	9.5	2.4	0.1	0	0	0.1	0.1	0	0	14.3
8.5 <= Wind Speed < 9.5	0	0.2	1	8.5	1.5	0	0	0	0.1	0.1	0	0	11.5
9.5 <= Wind Speed < 10.5	0	0.1	0.5	6.1	0.9	0	0	0	0.1	0	0	0	7.7
10.5 <= Wind Speed < 11.5	0	0	0.2	3.9	0.5	0	0	0	0	0	0	0	4.7
11.5 <= Wind Speed < 12.5	0	0	0.1	2.6	0.2	0	0	0	0	0	0	0	3
12.5 <= Wind Speed < 13.5	0	0	0	1.6	0.2	0	0	0	0	0	0	0	1.8
13.5 <= Wind Speed < 14.5	0	0	0	0.9	0.1	0	0	0	0	0	0	0	1
14.5 <= Wind Speed < 15.5	0	0	0	0.5	0.1	0	0	0	0	0	0	0	0.5
15.5 <= Wind Speed < 16.5	0	0	0	0.3	0	0	0	0	0	0	0	0	0.3
16.5 <= Wind Speed < 17.5	0	0	0	0.2	0	0	0	0	0	0	0	0	0.2
17.5 <= Wind Speed < 18.5	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1
18.5 <= Wind Speed < 19.5	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1
19.5 <= Wind Speed < 20.5	0	0	0	0	0	0	0	0	0	0	0	0	0
20.5 <= Wind Speed < 21.5	0	0	0	0	0	0	0	0	0	0	0	0	0
21.5 <= Wind Speed < 22.5	0	0	0	0	0	0	0	0	0	0	0	0	0
22.5 <= Wind Speed < 23.5	0	0	0	0	0	0	0	0	0	0	0	0	0
23.5 <= Wind Speed < 24.5	0	0	0	0	0	0	0	0	0	0	0	0	0
24.5 <= Wind Speed < 25.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Wind Speed >=25.5	0	0	0	0	0	0	0	0	0	0	0	0	0
All Wind Speeds	0.8	5.2	13.5	54.9	14.3	1.9	0.9	1.8	2.7	2.4	0.9	0.5	100

Seasonal Wind Speed Analysis

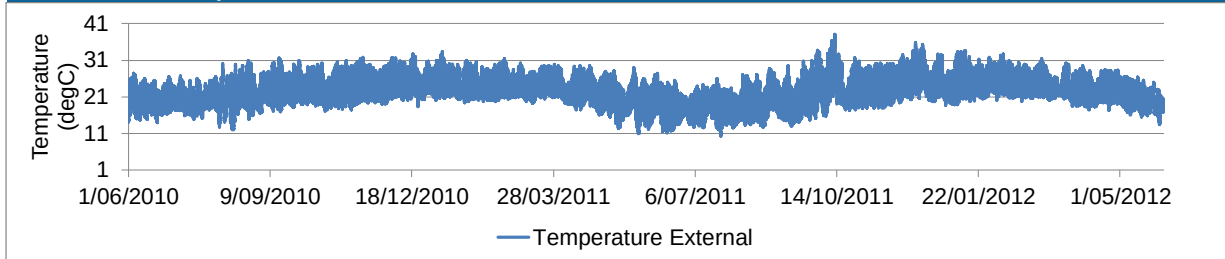


Distributions of Wind Direction, Mean Wind Speed and Mean TI

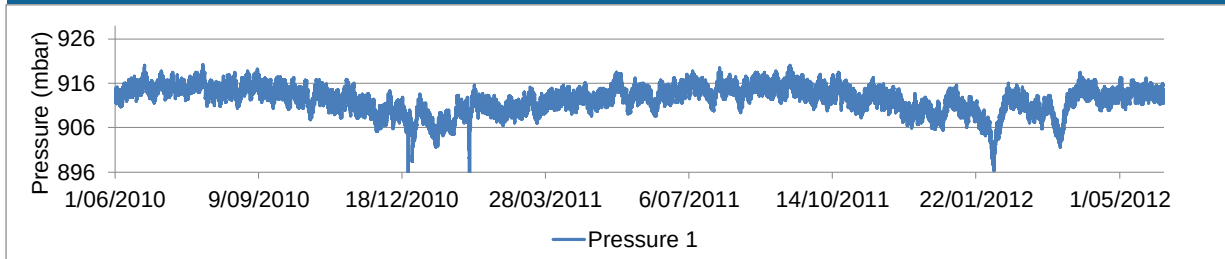
Wind Speed Level 1 (49.6m) Wind Direction Level 1 (46.4m). Concurrent availability = 100%				
Sector	Wind Direction (%)	Wind Direction Freq. (%)	Mean Wind Speed (m/s)	Mean TI (%)
1	0 <= Direction < 10	0.5	3.2	28.6
2	10 <= Direction < 20	0.4	3.5	26.3
3	20 <= Direction < 30	0.9	4.7	20.9
4	30 <= Direction < 40	2.3	5.3	17.1
5	40 <= Direction < 50	3.7	5.7	14.1
6	50 <= Direction < 60	3.1	5.3	13.5
7	60 <= Direction < 70	4.5	5.9	13.9
8	70 <= Direction < 80	10.2	7.2	13.3
9	80 <= Direction < 90	19.4	8.1	13.7
10	90 <= Direction < 100	21.5	8.8	14.9
11	100 <= Direction < 110	13	8.4	16.2
12	110 <= Direction < 120	6.2	7	19.5
13	120 <= Direction < 130	2.3	5.9	23.8
14	130 <= Direction < 140	1.1	5.1	25.6
15	140 <= Direction < 150	0.8	4.4	27.4
16	150 <= Direction < 160	0.5	3.8	29.9
17	160 <= Direction < 170	0.3	3.1	31.5
18	170 <= Direction < 180	0.3	2.9	29.4
19	180 <= Direction < 190	0.3	2.9	30.7
20	190 <= Direction < 200	0.3	3.1	26.7
21	200 <= Direction < 210	0.4	3.4	24.4
22	210 <= Direction < 220	0.8	3.9	20
23	220 <= Direction < 230	0.4	4.1	15.7
24	230 <= Direction < 240	1	5.1	16.7
25	240 <= Direction < 250	1.1	5.2	19.5
26	250 <= Direction < 260	1.1	4.8	21.6
27	260 <= Direction < 270	0.8	4	25.2
28	270 <= Direction < 280	0.7	4	25.6
29	280 <= Direction < 290	0.5	4.1	25.4
30	290 <= Direction < 300	0.4	3.8	27.1
31	300 <= Direction < 310	0.2	3.7	29.8
32	310 <= Direction < 320	0.1	3.7	28.6
33	320 <= Direction < 330	0.2	3.1	27.2
34	330 <= Direction < 340	0.2	3.5	26.8
35	340 <= Direction < 350	0.2	3.1	28.2
36	350 <= Direction < 360	0.3	3	29.1

Environmental Sensors

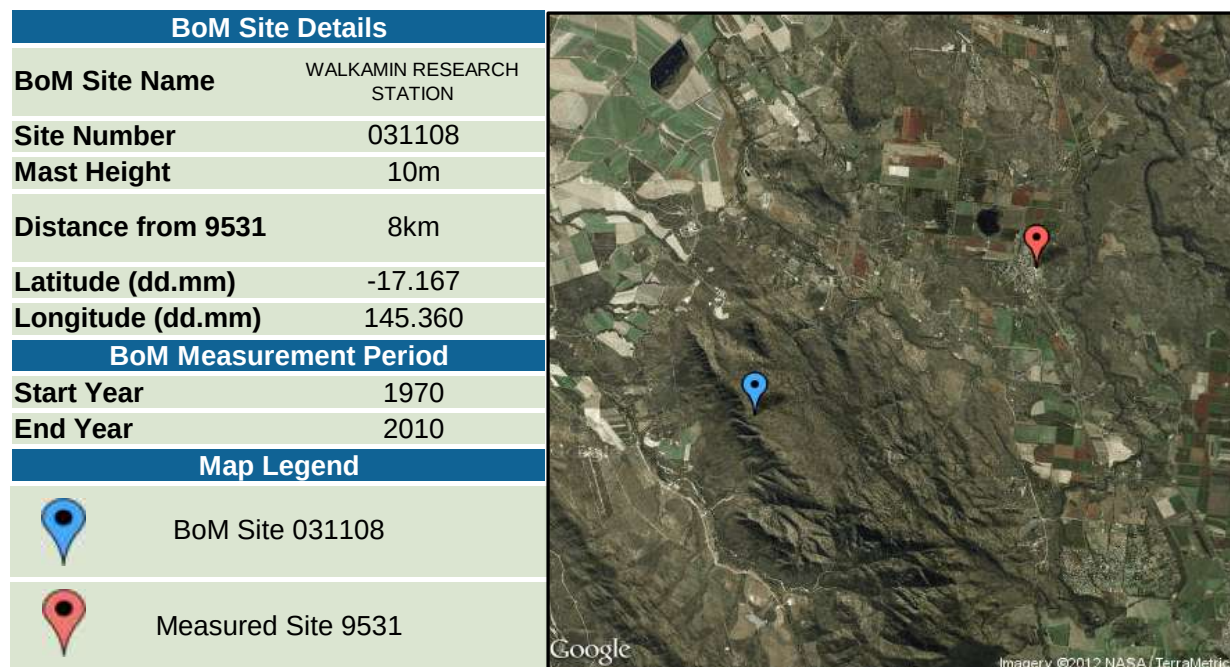
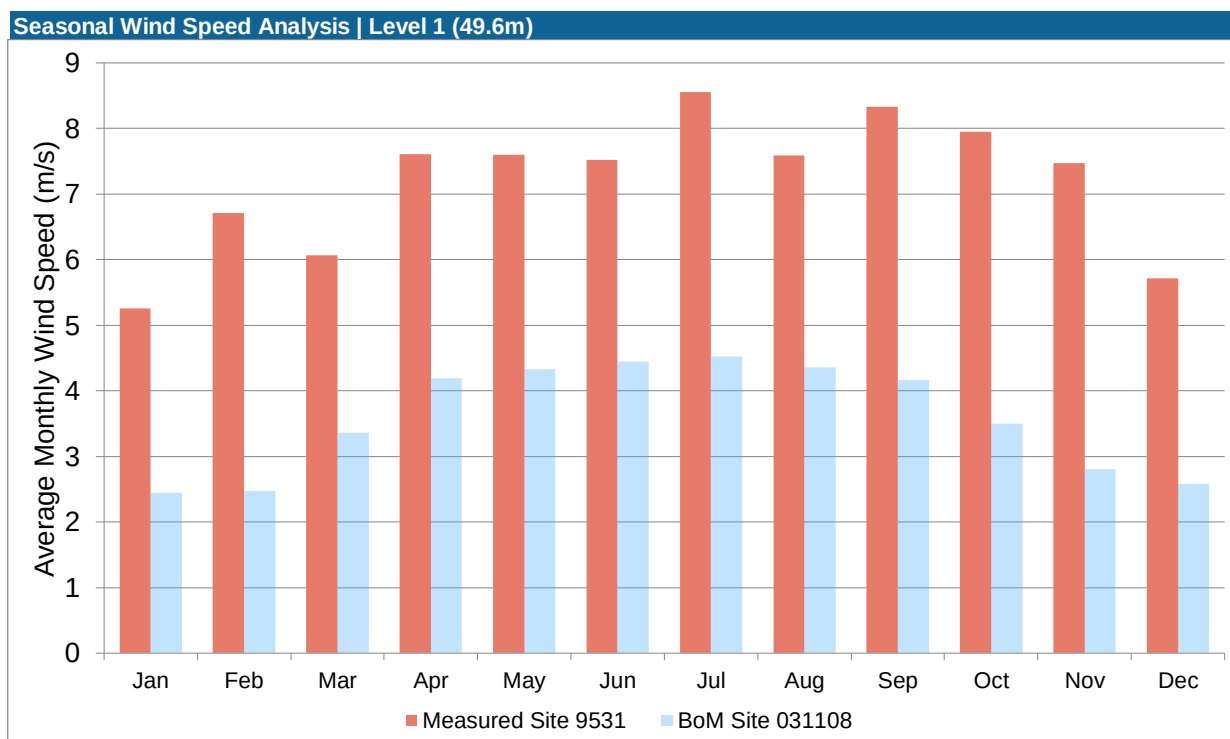
Time Trace of Temperature



Time Trace of Pressure



Long-term Bureau of Meteorology (BoM) Comparison



Source: Commonwealth of Australia, Bureau of Meteorology, 2012, Melbourne Victoria, viewed 27/11/2012 04:41 PM

BoM data is supplied for the interpretation and benefit of the reader in understanding nearby longer term climatic conditions. The presented BoM data represents long term monthly averages provided by the BoM and Parsons Brinckerhoff has not verified the accuracy or suitability of BoM data for wind measurement purposes. Parsons Brinckerhoff does not accept any risk or responsibility and other consequences resulting directly or indirectly from using the BoM data presented in this report.