

Wind Data Verification Report 9530 - Arriga 80m

Site Details		
Site Name	Arriga 80m	
Date/Time of report generation	27/11/2012 02:20 PM	
Site Number	9530	
Mast Height	80m	
Mast Location	329088 E 8100271 N	
Coordinate System	UTM 55K	
Mast Time Zone		
Report Period		
	Date (dd/mm/yyyy)	Time (24hr format)
Start	1/06/2010	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

Sensor Summary

Anemometers				
Level	1	2	3	4
Measurement Height	81	80.9	50.2	11.5
Type	NRG	NRG	NRG	NRG
Serial Number	179500095708	179500132407	179500127837	179500096006
Installed on	-	-	-	-
Boom/Finial Orientation	337	157	341	345
Offset	0.38	0.38	0.35	0.36
Scale Factor	0.757	0.761	0.762	0.758
Status	OK	OK	OK	OK

Wind Vanes			
Level	1	2	3
Measurement Height	77.8	47.5	11.4
Type	2.1	2.1	2.1
Serial Number	-	-	-
Installed on	-	-	-
Boom Orientation	337	341	165
Offset	157	161	345
Status	OK	OK	OK

Environmental Sensors		
Air Property	Pressure	Temp. (External)
Measurement Height (m)	2.2	2.5
Type	-	-
Serial Number	-	-
Installed on	-	-
Status	OK	OK

Statistics Summary

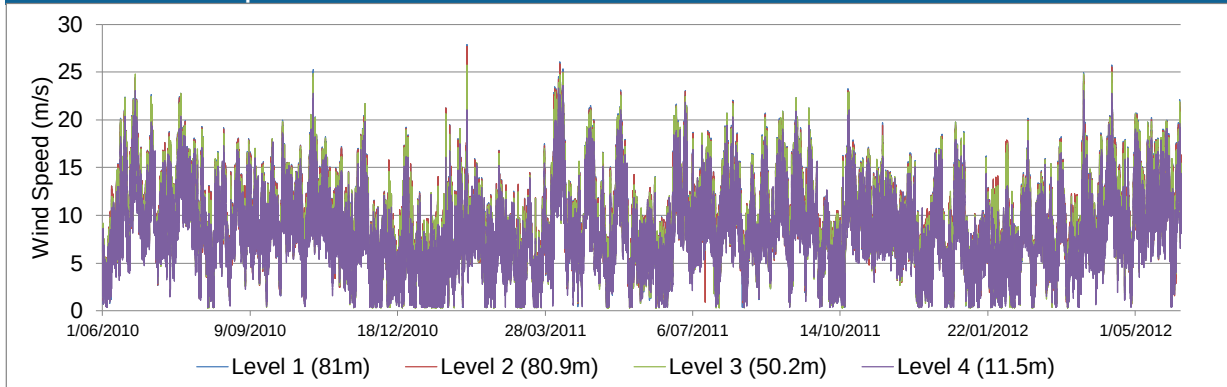
Wind Statistics	Level 1	Level 2	Level 3	Level 4
Height above ground level (m)	81m	80.9m	50.2m	11.5m
Recovery rate (%)	100%	100%	100%	100%
Minimum wind speed (m/s)	0.38	0.38	0.35	0.36
Average wind speed (m/s)	9.14	9.11	8.94	8.24
Maximum wind speed (m/s)	27.87	27.66	25.69	23.57
Maximum gust wind speed (m/s)	35.58	35.76	34.65	33.3
Average standard deviation (m/s)	1.08	1.08	1.17	1.37
Mean TI at 15 m/s	10.16%	10.10%	11.50%	14.39%
Representative TI at 15 m/s	14.21%	14.15%	14.83%	17.15%

Environmental Statistics	Units	Height	Minimum	Average	Maximum	Recovery Rate
Pressure	mbar	2.2m	881.9	909.8	917.3	100%
Humidity	-	-	-	-	-	-
Internal Temperature	-	-	-	-	-	-
External Temperature	degC	2.5m	10.3	19.7	36.7	100%

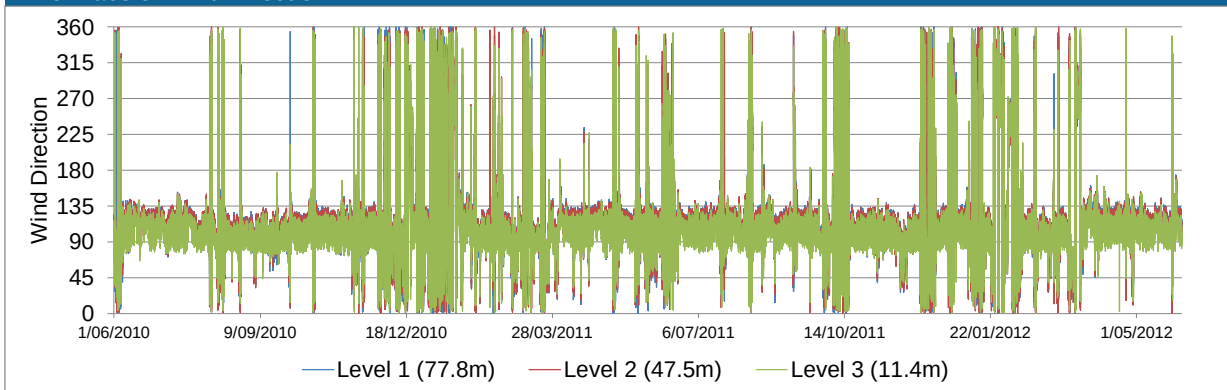
Wind Vanes	Level 1	Level 2	Level 3
Data Recovery Rate	100%	100%	100%

Time Traces

Time Trace of Wind Speed

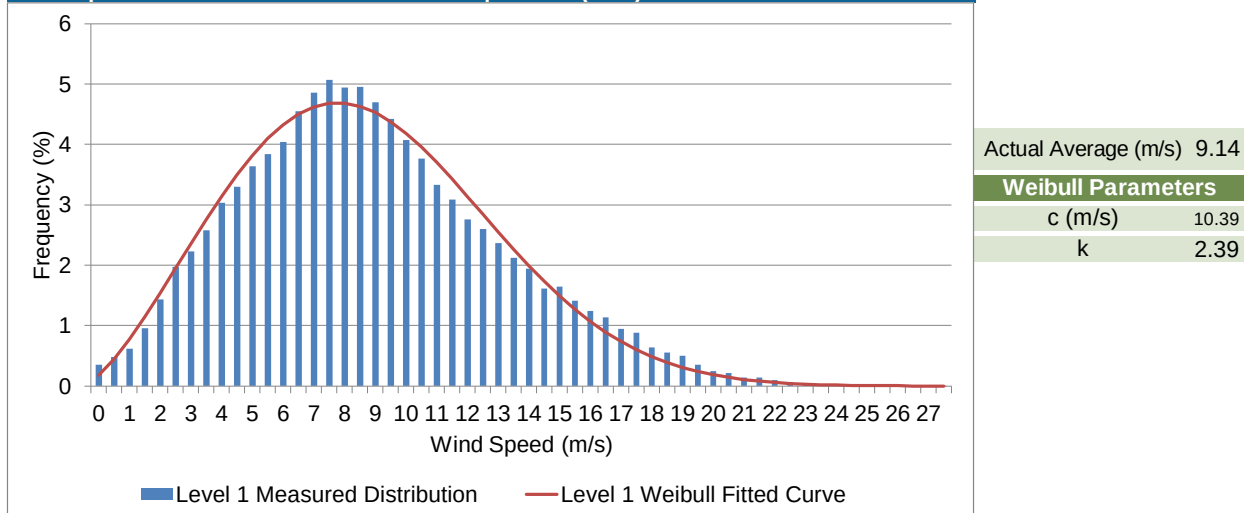


Time Trace of Wind Direction

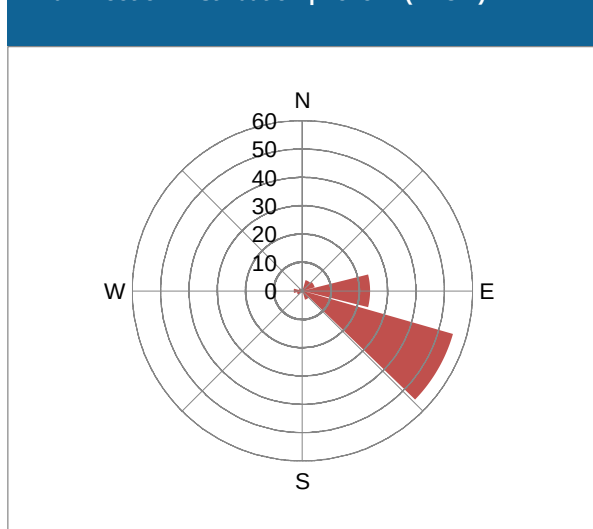


Distributions

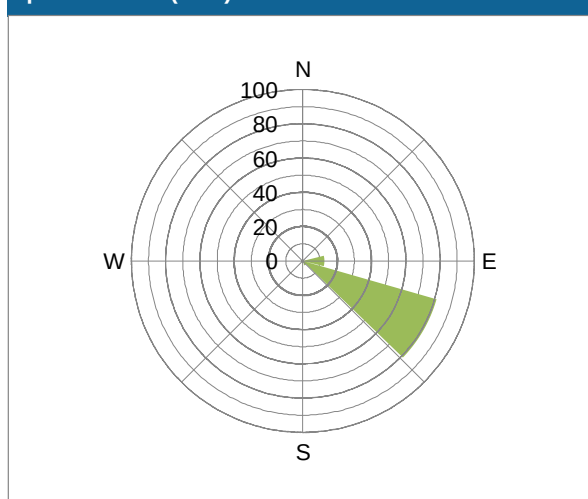
Wind Speed Distribution and Weibull Curve | Level 1 (81m)



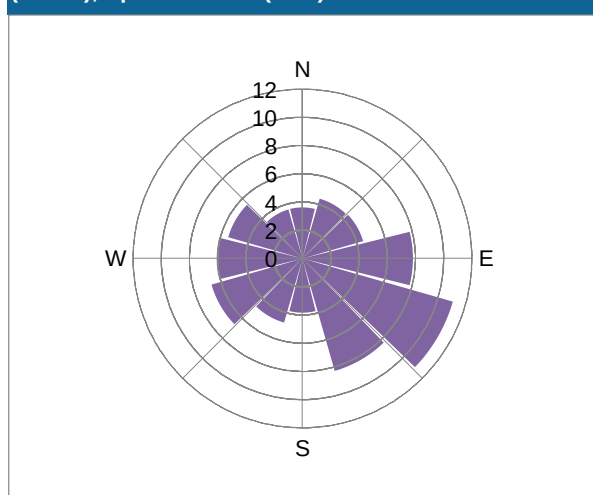
Wind Direction Distribution | Level 1 (77.8m)



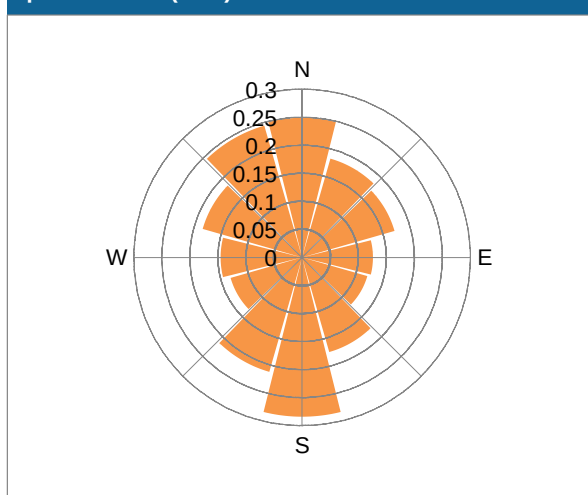
Wind Energy Distribution | Direction Level 1 (77.8m), Speed Level 1 (81m)



Mean Wind Speed Distribution | Direction Level 1 (77.8m), Speed Level 1 (81m)

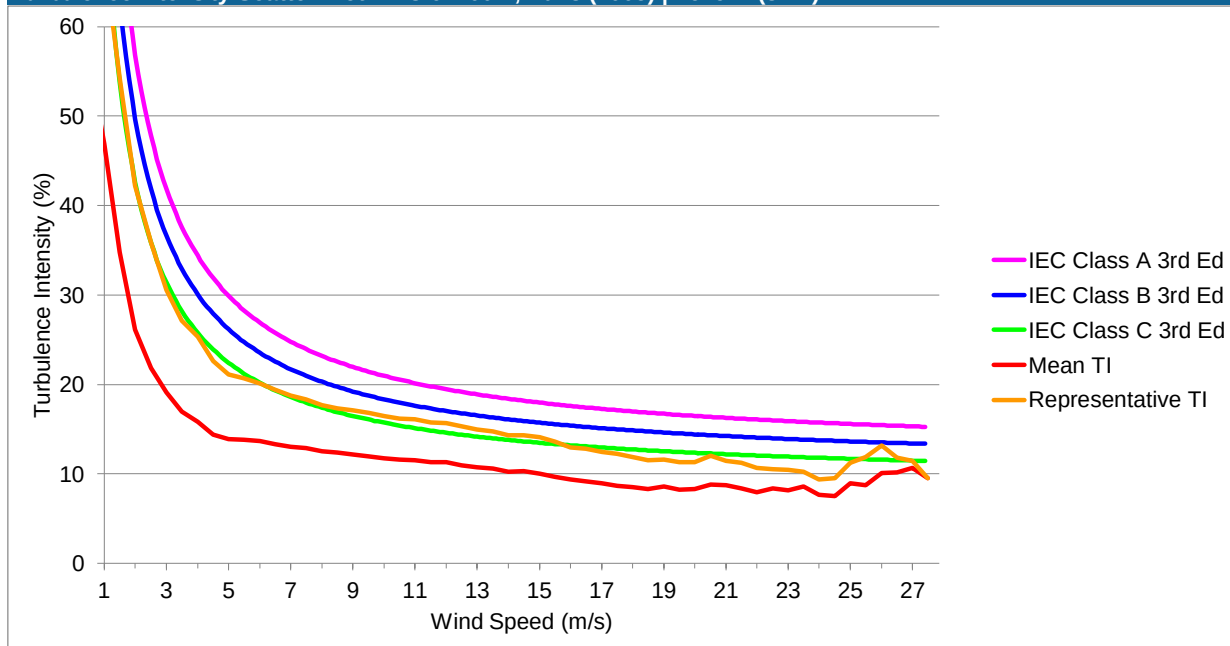


Mean Turbulence Intensity | Direction Level 1 (77.8m), Speed Level 1 (81m)

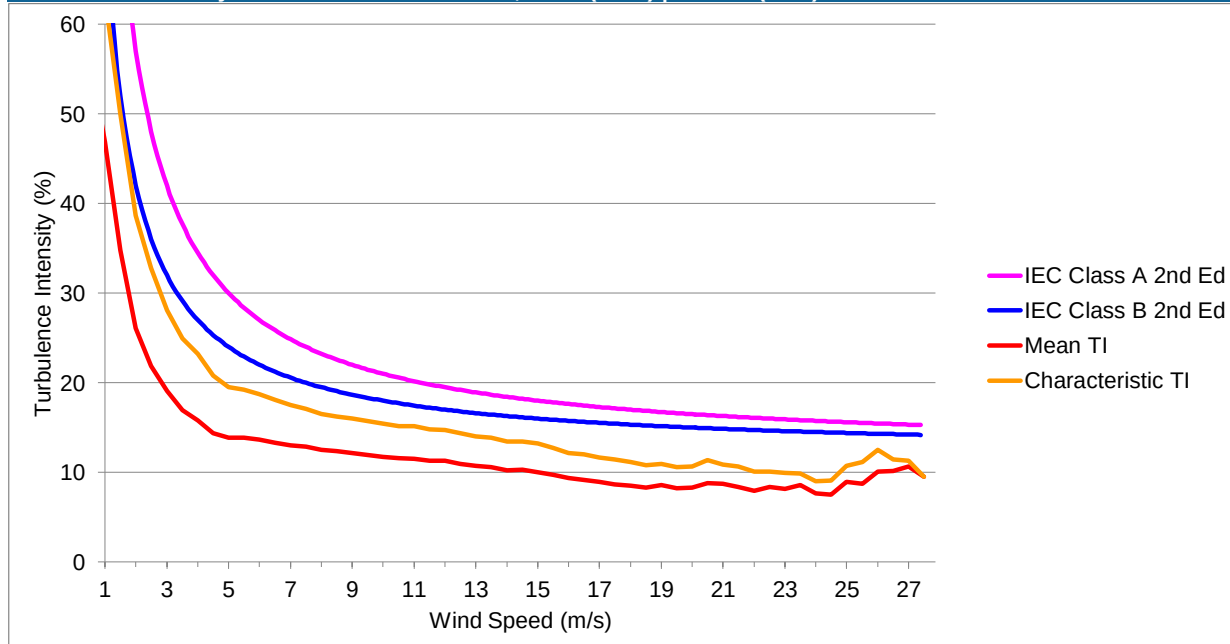


Turbulence Intensity

Turbulence Intensity Scatter Plot - IEC 61400-1, Ed. 3 (2005) | Level 1 (81m)



Turbulence Intensity Scatter Plot - IEC 61400-1, Ed. 2 (1999) | Level 1 (81m)



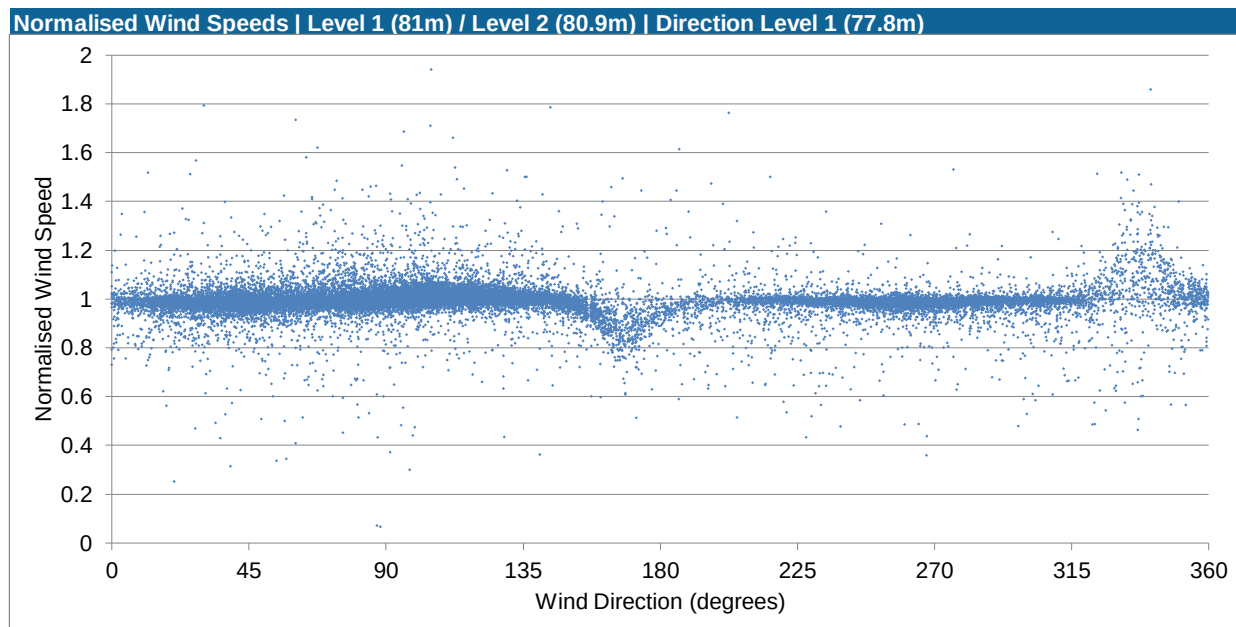
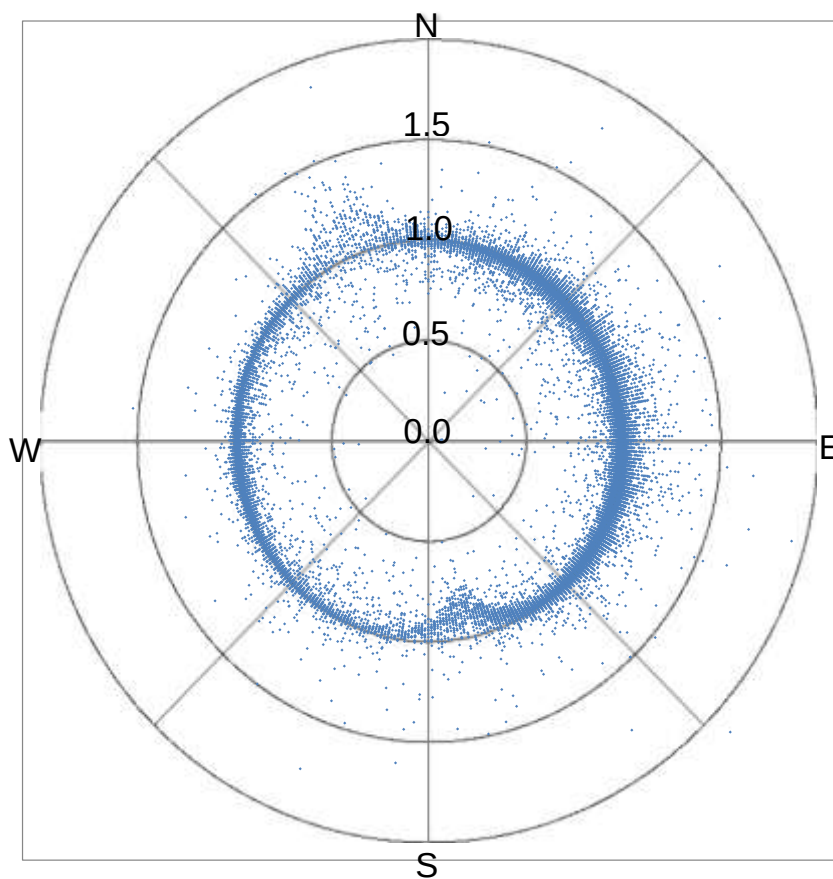
IEC standard 61400-1, Edition 3 (2005)

Mean TI at 15 m/s (%)	10.16%
Representative TI at 15 m/s (%)	14.21%
IEC Class (Edition 3)	C

IEC standard 61400-1, Edition 2 (1999)

Mean TI at 15 m/s (%)	10.16%
Characteristic TI at 15 m/s (%)	13.32%
IEC Class (Edition 2)	B

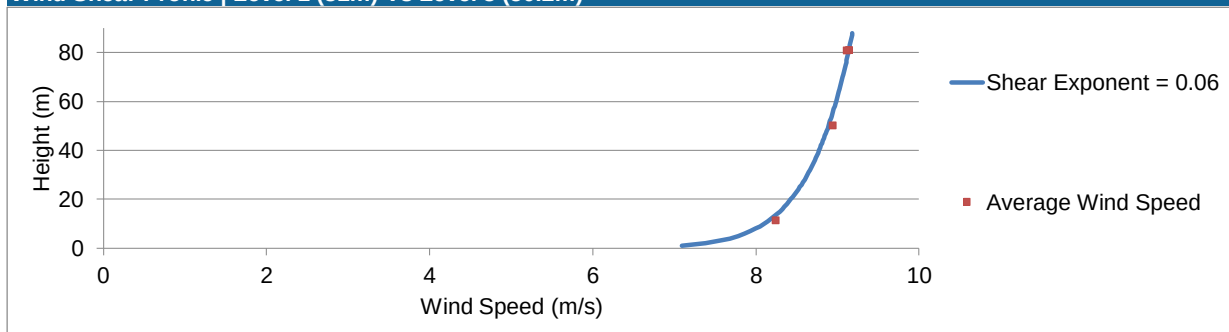
Normalised Wind Speed



Wind Shear Analysis

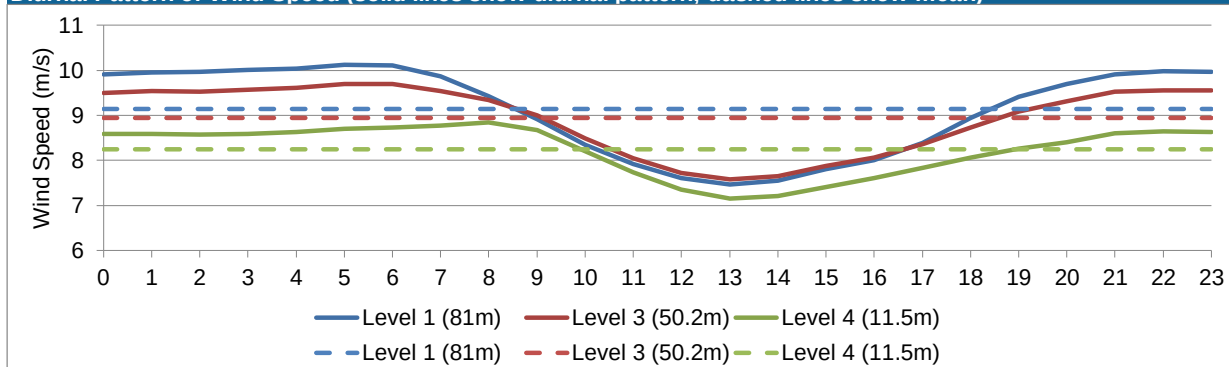
Directional Wind Shear Exponents						
Direction Level 1 (77.8m)	% of Data Period	L1 (81m) Vs L3 (50.2m)	L2 (80.9m) Vs L3 (50.2m)	L1 (81m) Vs L4 (11.5m)	L2 (80.9m) Vs L4 (11.5m)	L3 (50.2m) Vs L4 (11.5m)
N	1.6	0.23	0.25	0.23	0.23	0.23
NE	6.8	0.16	0.2	0.08	0.09	0.05
E	39.5	0.01	0	0.01	0.01	0.02
SE	43.6	0.06	0.05	0.07	0.07	0.07
S	1	0.16	0.32	0.16	0.2	0.16
SW	2	0.16	0.21	0.23	0.24	0.25
W	4.2	0.11	0.15	0.17	0.18	0.19
NW	1.3	0.24	0.27	0.25	0.26	0.26
Overall Wind Shear	100	0.06	0.06	0.06	0.06	0.06

Wind Shear Profile | Level 1 (81m) Vs Level 3 (50.2m)

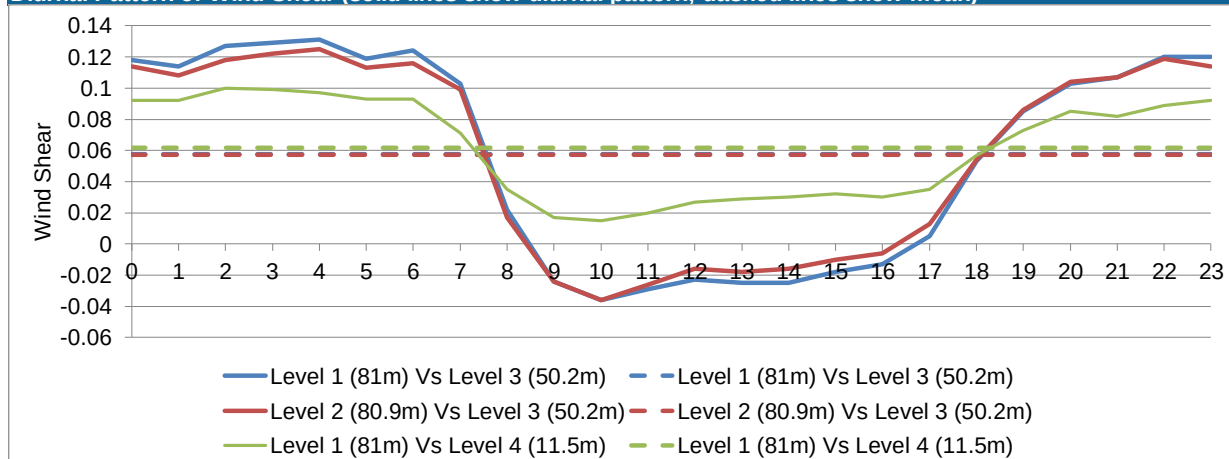


Diurnal Patterns of Wind Speed and Wind Shear

Diurnal Pattern of Wind Speed (solid lines show diurnal pattern; dashed lines show mean)



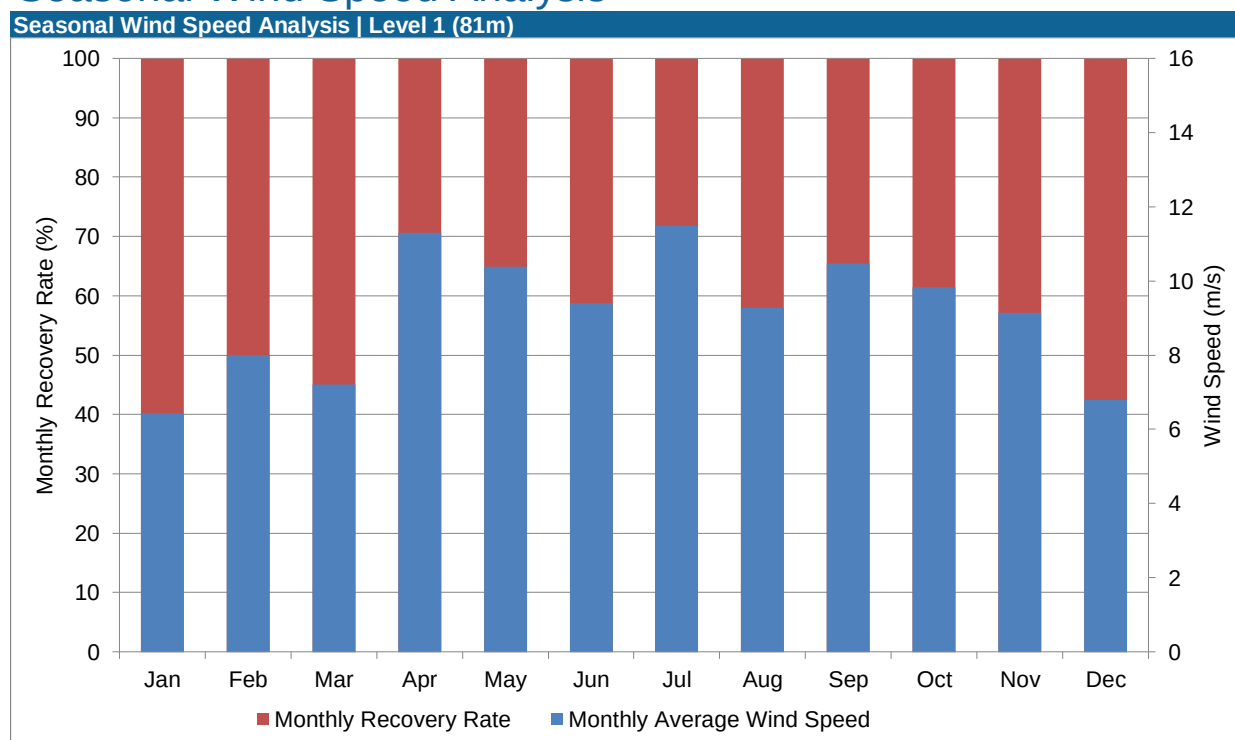
Diurnal Pattern of Wind Shear (solid lines show diurnal pattern; dashed lines show mean)



Wind Speed and Direction Frequency Table (%)

Wind Speed (m/s) Level 1 (81m) Concurrent availability = 100%	Wind Direction Level 1 (77.8m)												
	0	30	60	90	120	150	180	210	240	270	300	330	All
0 <= Wind Speed < 0.5	0	0	0	0	0	0	0	0	0	0	0	0.1	0.4
0.5 <= Wind Speed < 1.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.1
1.5 <= Wind Speed < 2.5	0.2	0.4	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2.4
2.5 <= Wind Speed < 3.5	0.2	0.7	0.8	0.9	0.4	0.2	0.1	0.1	0.2	0.3	0.2	0.1	4.2
3.5 <= Wind Speed < 4.5	0.2	0.9	1.1	1.4	0.8	0.3	0.1	0.1	0.2	0.3	0.2	0.1	5.6
4.5 <= Wind Speed < 5.5	0.1	0.8	0.9	2.2	1.5	0.3	0.1	0.1	0.2	0.5	0.2	0.1	6.9
5.5 <= Wind Speed < 6.5	0.1	0.5	0.5	2.7	2.8	0.3	0.1	0.1	0.2	0.5	0.2	0	7.9
6.5 <= Wind Speed < 7.5	0	0.3	0.3	3.3	4.3	0.3	0	0	0.2	0.5	0.1	0	9.4
7.5 <= Wind Speed < 8.5	0	0.1	0.2	3.4	5.3	0.3	0	0	0.2	0.3	0.1	0	10
8.5 <= Wind Speed < 9.5	0	0	0.1	2.9	5.8	0.3	0	0	0.2	0.2	0.1	0	9.6
9.5 <= Wind Speed < 10.5	0	0	0	2.3	5.5	0.3	0	0	0.1	0.1	0.1	0	8.5
10.5 <= Wind Speed < 11.5	0	0	0	1.5	5.2	0.2	0	0	0.1	0.1	0	0	7.1
11.5 <= Wind Speed < 12.5	0	0	0	0.9	4.7	0.2	0	0	0	0	0	0	5.8
12.5 <= Wind Speed < 13.5	0	0	0	0.7	4.1	0.1	0	0	0	0	0	0	5
13.5 <= Wind Speed < 14.5	0	0	0	0.5	3.4	0.1	0	0	0	0	0	0	4.1
14.5 <= Wind Speed < 15.5	0	0	0	0.3	2.8	0.1	0	0	0	0	0	0	3.3
15.5 <= Wind Speed < 16.5	0	0	0	0.1	2.4	0.1	0	0	0	0	0	0	2.7
16.5 <= Wind Speed < 17.5	0	0	0	0	2	0	0	0	0	0	0	0	2.1
17.5 <= Wind Speed < 18.5	0	0	0	0	1.5	0	0	0	0	0	0	0	1.5
18.5 <= Wind Speed < 19.5	0	0	0	0	1	0	0	0	0	0	0	0	1.1
19.5 <= Wind Speed < 20.5	0	0	0	0	0.6	0	0	0	0	0	0	0	0.6
20.5 <= Wind Speed < 21.5	0	0	0	0	0.3	0	0	0	0	0	0	0	0.4
21.5 <= Wind Speed < 22.5	0	0	0	0	0.2	0	0	0	0	0	0	0	0.2
22.5 <= Wind Speed < 23.5	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1
23.5 <= Wind Speed < 24.5	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1
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	0.9	3.9	4.5	23.9	55.2	3.2	0.6	0.7	2	3.1	1.3	0.6	100

Seasonal Wind Speed Analysis

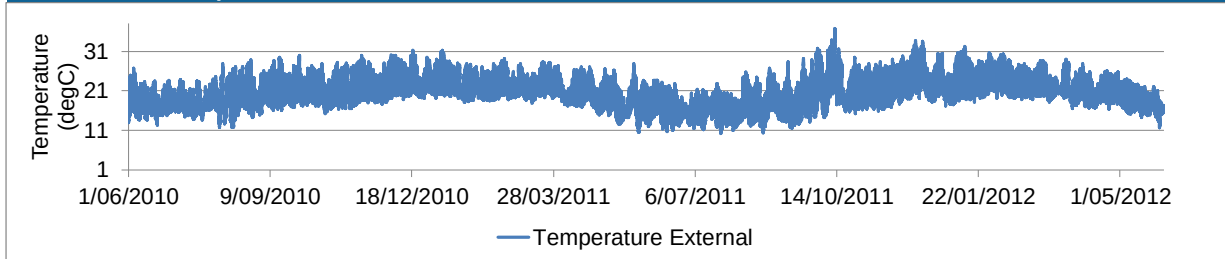


Distributions of Wind Direction, Mean Wind Speed and Mean TI

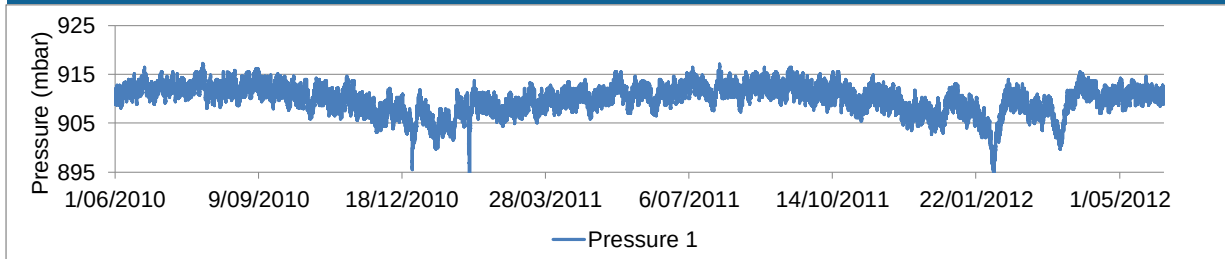
Wind Speed Level 1 (81m) Wind Direction Level 1 (77.8m). Concurrent availability = 100%				
Sector	Wind Direction	Wind Direction Freq.	Mean Wind Speed	Mean TI
	(%)	(%)	(m/s)	(%)
1	0 <= Direction < 10	0.6	3.6	24.7
2	10 <= Direction < 20	0.6	3.8	22.9
3	20 <= Direction < 30	1	4.2	19.8
4	30 <= Direction < 40	1.5	4.5	17.6
5	40 <= Direction < 50	2.1	4.7	16.5
6	50 <= Direction < 60	1.5	4.6	17
7	60 <= Direction < 70	1.2	4.2	18
8	70 <= Direction < 80	1.7	4.6	16.6
9	80 <= Direction < 90	4	6.3	13.9
10	90 <= Direction < 100	10.1	7.9	12
11	100 <= Direction < 110	18.8	9.2	12.9
12	110 <= Direction < 120	18.6	10.2	13.1
13	120 <= Direction < 130	22.4	12.4	10.7
14	130 <= Direction < 140	5.8	11.3	13.1
15	140 <= Direction < 150	1.1	7.6	17.9
16	150 <= Direction < 160	0.5	5.7	23
17	160 <= Direction < 170	0.3	4	25.8
18	170 <= Direction < 180	0.2	3.6	30.8
19	180 <= Direction < 190	0.2	3.9	28.4
20	190 <= Direction < 200	0.2	4	27
21	200 <= Direction < 210	0.2	3.9	24
22	210 <= Direction < 220	0.3	4.8	19.8
23	220 <= Direction < 230	0.4	6	16
24	230 <= Direction < 240	0.5	6.1	14.2
25	240 <= Direction < 250	0.8	7.1	12.4
26	250 <= Direction < 260	1.1	6.8	13.1
27	260 <= Direction < 270	1.2	6.2	13.8
28	270 <= Direction < 280	0.9	5.6	16
29	280 <= Direction < 290	0.6	5.9	16.3
30	290 <= Direction < 300	0.5	5.7	18.1
31	300 <= Direction < 310	0.4	5.2	19.8
32	310 <= Direction < 320	0.3	4.7	20.7
33	320 <= Direction < 330	0.2	3.2	24.4
34	330 <= Direction < 340	0.2	3.5	26.4
35	340 <= Direction < 350	0.2	3.3	27.2
36	350 <= Direction < 360	0.2	3.5	25.1

Environmental Sensors

Time Trace of Temperature

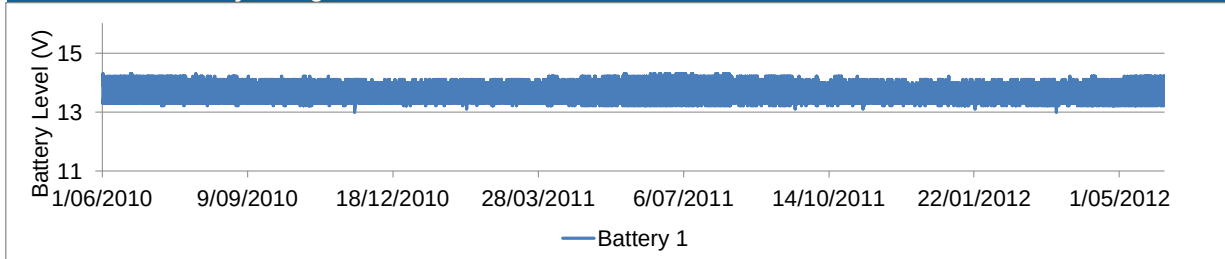


Time Trace of Pressure

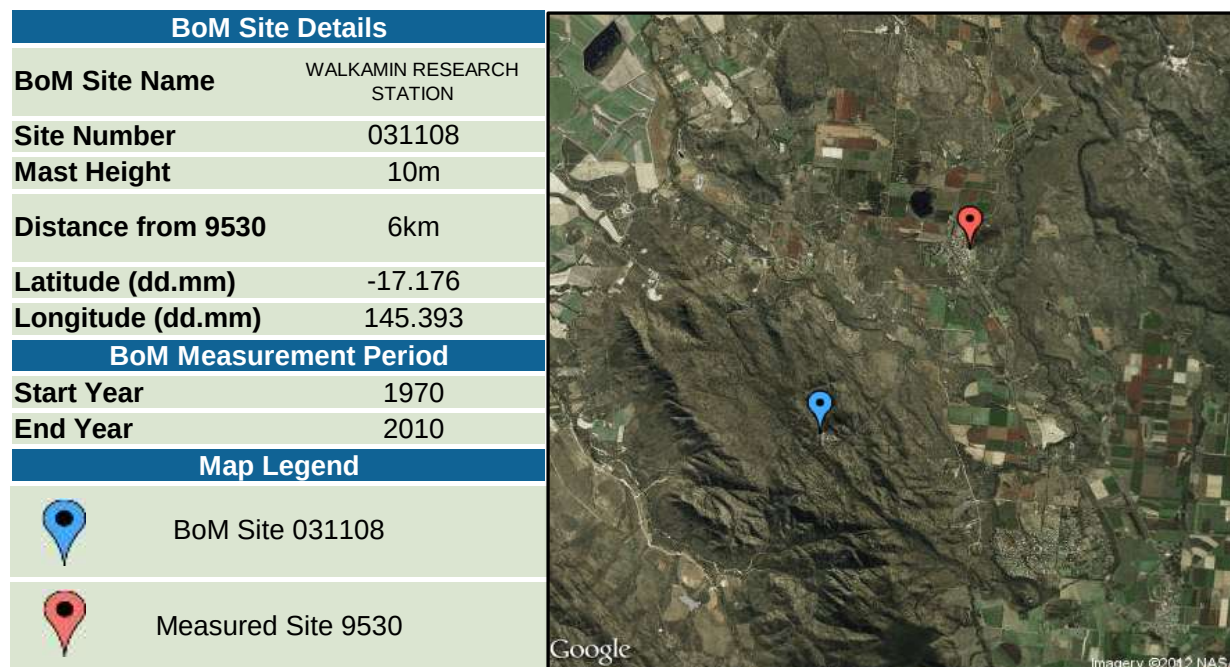
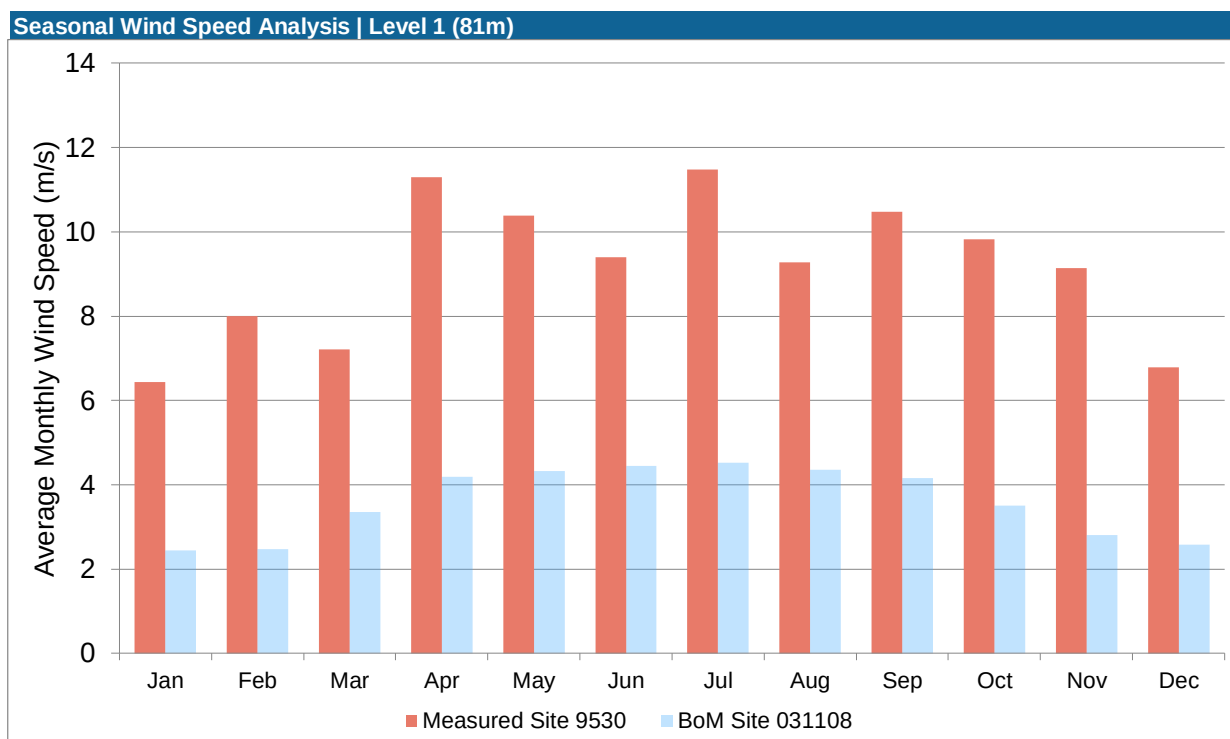


Data Logger Battery

Time Trace of Battery Voltage



Long-term Bureau of Meteorology (BoM) Comparison



Source: Commonwealth of Australia, Bureau of Meteorology, 2012, Melbourne Victoria, viewed 27/11/2012 02:23 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.