AVIATION PROJECTS

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By email: Mark.Herod@aecom.com

Our ref: 101602-01

Dear Mr Herod

Re: Coopers Gap Wind Farm Obstacle Lighting Design

Aviation Projects was engaged by AECOM to undertake an Obstacle Lighting Design for the proposed Coopers Gap Wind Farm.

AECOM requested Aviation Projects to document the findings of the Obstacle Lighting Design for further consultation with the Civil Aviation Safety Authority (CASA) to determine the final number of obstacle lights required on the wind turbines.

References:

- AECOM, STG2 Topo.pdf, elevation data for Wind Turbines over topographic contours;
- AECOM, ElevDataBasedOn25DEM, elevation data excel;
- AECOM, CoopersGapProposedTurbines123.kmz, location of wind turbines in Google Earth;
- AECOM, STG2_TurbineLayout_Aviation.pdf,
- Civil Aviation Safety Authority, *Manual of Standards Part 139 – Aerodromes*, version 1.14: dated January 2017, section 9.4.3.4A

  (c) obstacle lights must be provided on a sufficient number of individual wind turbines to indicate the general definition and extent of the wind farm, with intervals between lit turbines not exceeding 900 m.

Aviation projects assessed each wind turbine to determine if MOS 139 requires the turbine to be lit and recommends 65 lit turbines. The Coopers Gap Wind Farm study area and turbine layout are shown in Figure 1 (Source, AECOM). This figure defines the wind farm corridors and those wind turbines at the edge that are required to be lit to indicate the general wind farm extent to comply with MOS 139 lighting requirements.

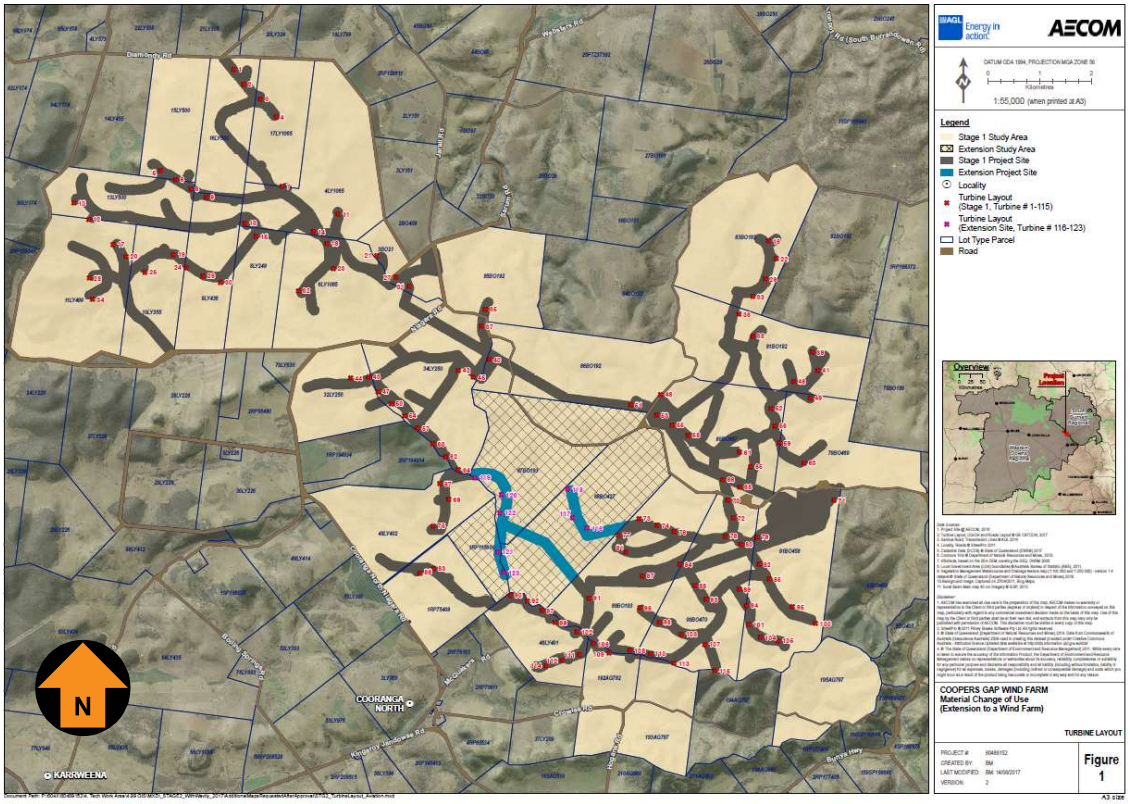

Figure 1 Turbine Layout

The analysis of the elevation data provided by AECOM of the Coopers Gap Wind Farm area was considered to ensure wind turbines located at the highest terrain were also lit. Figure 2 provides the Coopers Gap Wind Farm topography and locates WTG101, WTG104 and WTG105 on the highest elevation ranging from 807 m to 822 m Australian Height Datum (AHD), which requires obstacle lighting.

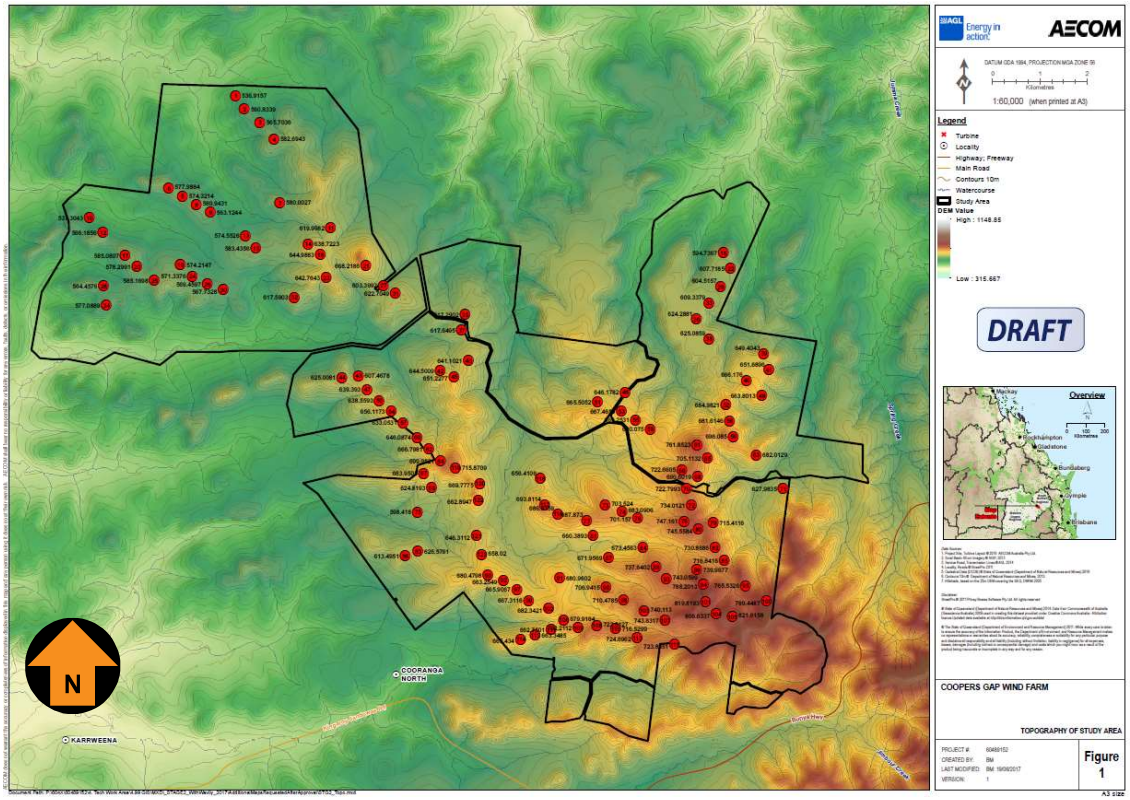

Figure 2 Coopers Gap Wind Farm topography

The Cooper Gap Wind Farm Obstacle Lighting Design in Figure 3 (Source, AECOM, Google Earth). The colours of the wind turbines relate to Stage 1 and Stage 2 of the wind farm development as follows:

- Stage 1 wind turbines are orange or red (if lit); and
- Stage 2 wind turbines are grey or red (if lit).

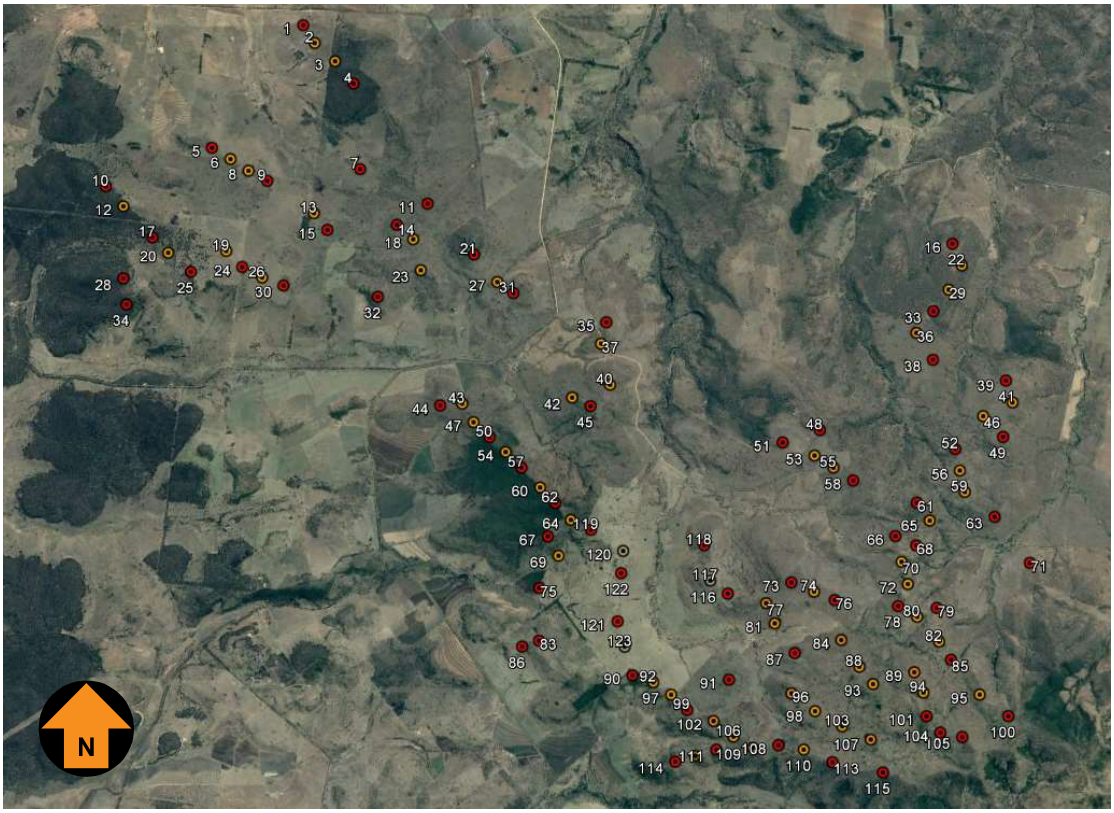

Figure 3 Coopers Gap Wind Farm Obstacle Lighting Design

The findings of the Obstacle Lighting Design for each wind turbine are outlined in Table 1.

Table 1 Coopers Gap Wind Farm Obstacle Lighting Design findings.

WTG	*Stage*	*Elevation (m AHD)*	*Obstacle Lighting required*	*Findings*
1	Stage 1	537	Yes	WTG1 is on the perimeter edge and should be lit.
2	Stage 1	561	No	Within 900 m from lit WTG1.
3	Stage 1	566	No	Within 900 m from lit WTG1 and lit WTG4.
4	Stage 1	583	Yes	WTG4 is on the perimeter edge and should be lit.
5	Stage 1	578	Yes	WTG5 is on the perimeter edge and should be lit.
6	Stage 1	574	No	Within 900 m from lit WTG5.
7	Stage 1	580	Yes	WTG7 is more than 900 m from other WTGs.
8	Stage 1	581	No	Within 900 m from lit WTG5 and lit WTG9.

WTG	Stage	Elevation (m AHD)	Obstacle Lighting required	Findings
9	Stage 1	563	Yes	WTG9 is approximately 900 m from WTG13
10	Stage 1	537	Yes	WTG10 is on the perimeter edge and should be lit.
11	Stage 1	620	Yes	WTG11 is on the perimeter edge and should be lit.
12	Stage 1	566	No	Within 900 m from lit WTG10.
13	Stage 1	575	No	Within 900 m from lit WTG15.
14	Stage 1	639	Yes	WTG14 is on the perimeter edge and should be lit.
15	Stage 1	583	Yes	WTG7 is more than 900 m from closest lit WTG30.
16	Stage 1	595	Yes	WTG16 is on the perimeter edge and should be lit.
17	Stage 1	585	Yes	WTG17 is on the perimeter edge and should be lit.
18	Stage 1	645	No	Within 900 m from lit WTG14.
19	Stage 1	574	No	Within 900 m from lit WTG24.
20	Stage 1	578	No	Within 900 m from lit WTG17.
21	Stage 1	668	Yes	WTG21 is on the perimeter edge and should be lit.
22	Stage 1	608	No	Within 900 m from lit WTG16.
23	Stage 1	643	No	Within 900 m from lit WTG14
24	Stage 1	571	Yes	WTG24 is more than 900 m from closest lit WTG25.
25	Stage 1	585	Yes	WTG25 is on the perimeter edge and should be lit.
26	Stage 1	569	No	Within 900 m from lit WTG30 and lit WTG24.
27	Stage 1	603	No	Within 900 m from lit WTG31
28	Stage 1	564	Yes	WTG28 is on the perimeter edge and should be lit.
29	Stage 1	605	No	Within 900 m from lit WTG16 and lit WTG33.
30	Stage 1	568	Yes	WTG30 is on the perimeter edge and should be lit.
31	Stage 1	623	Yes	WTG31 is on the perimeter edge and should be lit.
32	Stage 1	618	Yes	WTG32 is on the perimeter edge and should be lit.
33	Stage 1	609	Yes	WTG33 is more than 900 from closest lit WTG38.
34	Stage 1	577	Yes	WTG34 is on the perimeter edge and should be lit.
35	Stage 1	617	Yes	WTG35 is on the perimeter edge and should be lit.
36	Stage 1	624	No	Within 900 m from lit WTG38.
37	Stage 1	618	No	Within 900 m from lit WTG35.

WTG	Stage	Elevation (m AHD)	Obstacle Lighting required	Findings
38	Stage 1	625	Yes	WTG38 is on the perimeter edge and should be lit.
39	Stage 1	649	Yes	WTG39 is on the perimeter edge and should be lit.
40	Stage 1	641	No	Within 900 m from lit WTG45.
41	Stage 1	652	No	Within 900 m from lit WTG39.
42	Stage 1	645	No	Within 900 m from lit WTG45.
43	Stage 1	607	No	Within 900 m from WTG44.
44	Stage 1	625	Yes	WTG44 is on the perimeter edge and should be lit.
45	Stage 1	651	Yes	WTG45 is more than 900 from closest lit WTG57.
46	Stage 1	666	No	Within 900 m from lit WTG49.
47	Stage 1	639	No	Within 900 m from lit WTG50.
48	Stage 1	646	Yes	WTG48 is on the perimeter edge and should be lit.
49	Stage 1	664	Yes	WTG49 is on the perimeter edge and should be lit.
50	Stage 1	639	Yes	WTG50 more than 900 m from closest lit WTG57.
51	Stage 1	666	Yes	WTG51 is on the perimeter edge and should be lit.
52	Stage 1	685	Yes	WTG52 more than 900 m from closest lit WTG49.
53	Stage 1	667	No	Within 900 m from lit WTG51.
54	Stage 1	656	No	Within 900 m from lit WTG50.
55	Stage 1	669	No	Within 900 m from lit WTG58.
56	Stage 1	682	No	Within 900 m from WTG52.
57	Stage 1	633	Yes	WTG57 more than 900 m from closest lit WTG50.
58	Stage 1	680	Yes	WTG58 more than 900 m from closest lit WTG48.
59	Stage 1	696	No	Within 900 m from lit WTG63.
60	Stage 1	646	No	Within 900 m from lit WTG57.
61	Stage 1	762	Yes	WTG49 is at end of a corridor and should be lit.
62	Stage 1	669	Yes	WTG62 is lit to enable WTG60 not lit in corridor.
63	Stage 1	682	Yes	WTG63 is on the perimeter edge and should be lit.
64	Stage 1	700	No	Within 900 m from lit WTG62.
65	Stage 1	705	No	Within 900 m from lit WTG61.
66	Stage 1	723	Yes	WTG66 is at end of a corridor and should be lit.

WTG	Stage	Elevation (m AHD)	Obstacle Lighting required	Findings
67	Stage 1	684	Yes	WTG67 is on the perimeter edge and should be lit.
68	Stage 1	691	Yes	WTG68 is on the perimeter edge and should be lit.
69	Stage 1	625	No	Within 900 m from lit WTG119.
70	Stage 1	723	No	Within 900 m from lit WTG68.
71	Stage 1	628	Yes	WTG71 is on the perimeter edge and should be lit.
72	Stage 1	734	No	Within 900 m from lit WTG78.
73	Stage 1	704	Yes	WTG73 is at end of a corridor and should be lit.
74	Stage 1	683	No	Within 900 m from lit WTG76.
75	Stage 1	598	Yes	WTG75 is on the perimeter edge and should be lit.
76	Stage 1	701	Yes	WTG52 more than 900 m from closest lit WTG76.
77	Stage 1	688	No	Within 900 m from lit WTG73.
78	Stage 1	747	Yes	WTG78 is lit to enable WTG80 not lit in corridor.
79	Stage 1	715	Yes	WTG78 is on the perimeter edge and should be lit.
80	Stage 1	745	No	Within 900 m from lit WTG78.
81	Stage 1	660	No	Within 900 m from lit WTG87.
82	Stage 1	731	No	Within 900 m from lit WTG85.
83	Stage 1	627	Yes	WTG83 is on the perimeter edge and should be lit.
84	Stage 1	673	No	Within 900 m from WTG76.
85	Stage 1	717	Yes	WTG85 is lit to enable WTG82 not lit in corridor.
86	Stage 1	614	Yes	WTG86 is on the perimeter edge and should be lit.
87	Stage 1	672	Yes	WTG87 is more than 900 from closest lit WTG73.
88	Stage 1	738	No	Internal to overall layout.
89	Stage 1	740	No	Internal to overall layout
90	Stage 1	680	Yes	WTG90 is on the perimeter edge and should be lit.
91	Stage 1	681	Yes	WTG87 is more than 900 from closest lit WTG99.
92	Stage 1	663	No	Within 900 m from WTG90.
93	Stage 1	743	No	Internal to overall layout.
94	Stage 1	788	No	Internal to overall layout.
95	Stage 1	766	No	Within 900 m from lit WTG100.

WTG	Stage	Elevation (m AHD)	Obstacle Lighting required	Findings
96	Stage 1	707	No	Internal to overall layout.
97	Stage 1	666	No	Within 900 m from lit WTG99.
98	Stage 1	710	No	Internal to overall layout.
99	Stage 1	667	Yes	WTG99 is lit to enable WTG102 not lit in corridor.
100	Stage 1	789	Yes	WTG100 is on the perimeter edge and should be lit.
101	Stage 1	820	Yes	WTG104 is located on high terrain and should be lit.
102	Stage 1	682	No	Within 900 m from lit WTG99.
103	Stage 1	740	No	Internal to overall layout.
104	Stage 1	807	Yes	WTG104 is located on high terrain and should be lit.
105	Stage 1	822	Yes	WTG105 is located on the highest terrain and on the perimeter edge and should be lit.
106	Stage 1	680	No	Internal to overall layout.
107	Stage 1	744	No	Within 900 m from lit WTG115.
108	Stage 1	722	Yes	WTG108 is lit to enable WTG109 not lit in corridor.
109	Stage 1	702	No	Within 900 m from lit WTG108.
110	Stage 1	717	No	Within 900 m from lit WTG113.
111	Stage 1	663	Yes	WTG111 is lit to enable WTG112 not lit in corridor.
112	Stage 1	663	No	Within 900 m from lit WTG111.
113	Stage 1	725	Yes	WTG113 is on the perimeter edge and should be lit.
114	Stage 1	665	Yes	WTG114 is on the perimeter edge and should be lit.
115	Stage 1	724	Yes	WTG115 is on the perimeter edge and should be lit.
116	Stage 2	687	Yes	WTG116 is lit to enable WTG117 not lit in corridor.
117	Stage 2	694	No	Within 900 m from lit WTG116.
118	Stage 2	656	Yes	WTG118 is on the perimeter edge and should be lit.
119	Stage 2	716	Yes	WTG119 lit to enable WTG64 not lit in corridor.
120	Stage 2	670	No	Within 900 m from lit WTG122.
121	Stage 2	646	Yes	WTG121 is more than 900 from closest lit WT122.
122	Stage 2	663	Yes	WTG122 is more than 900 from closest lit WT121.
123	Stage 2	658	No	Within 900 m from lit WTG121.

Recommendation

A total of 65 Wind Turbines are recommended for obstacle lighting.

If you wish to clarify or discuss of the contents of this correspondence, please contact me on 0417 631 681.

Kind regards

Keith Tonkin

Managing Director

23 June 2017