

Kyoto energypark

Appendix E

Assessment of Environmental Issues
Aviation
Garrad Hassan
(28 August 2008)



**ASSESSMENT OF
ENVIRONMENTAL ISSUES
FOR THE PROPOSED
KYOTO ENERGY PARK –
AVIATION**

Client	Pamada Pty Ltd
Contact	Mark Dixon
Document No	2621/PR/004
Issue No	C
Status	Final
Classification	Client's Discretion
Date	28 August 2008

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Revision History

Issue	Issue Date:	Summary
A	10 Apr 2008	Initial release
B	13 May 2008	Minor revisions following client feedback.
C	28 Aug 2008	Minor revisions following client feedback. 42 wind turbine layout included.

Circulation:	Copy No:
Pamada	Electronic
GH	Electronic

Copy No: Electronic

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1 EXECUTIVE SUMMARY

Pamada Pty Ltd. (Pamada) is developing the Kyoto Energy Park near Scone, New South Wales. Garrad Hassan Pacific (GH) has been requested by Pamada to carry out an environmental study relating to the installation of wind turbines across two sites within the Kyoto Energy Park project. The study is as follows:

The key findings in this report are:

The proposed Kyoto Energy Park has a total height of greater than 110 m and therefore notification of the project to The Civil Aviation Safety Authority (CASA) [1]. A letter detailing the proposed Kyoto Energy Park project was compiled and sent to CASA.

- A map of the Obstacle Limitation Surface (OLS) was obtained from the operator of the Scone aerodrome, the Upper Hunter Shire Council which illustrated that the turbines within the proposed Kyoto Energy Park project are outside of the OLS.
- CASA has formally indicated that despite the proposed turbines being outside of the OLS, obstacle lighting would be required under the CASA Advisory Circular AC 139-18(0) titled 'Obstacle Marking and Lighting of Wind Farms'.

It is highly likely that any development consent for the proposed Kyoto Energy Park project will include a condition that the project complies with the requirements of CASA. It is therefore recommended that once the final layout of the proposed Kyoto Energy Park wind farm is known, CASA is approached to determine if obstacle lighting is still required. If it is required, then a lighting plan will need to be prepared for approval by CASA.

- On advice from CASA, Airservices Australia were contacted and informed about the proposed Kyoto Energy Park project. Airservices Australia responded outlining that some of the proposed wind turbines would infringe upon three flight procedures.

GH independently confirmed using in-house modelling software that some of the turbines in the original 47 turbine layout infringe the flight procedures identified by Airservices Australia. The layout for the proposed Kyoto Energy Park project has been revised to a 42 turbine layout. This revised layout among other alterations incorporates a small change to the position of turbine 15 to avoid infringing the Airservices Australia procedures. In the revised layout turbines 36, 37, 38, 39, 40, 41 and 42 infringe the Airservices Australia procedures.

Airservices Australia otherwise confirmed that the proposed Kyoto Energy Park wind farm will not impact on Precision/Non-Precision Nav Aids, HF/VHF Communications, Cables, ASMGCS, Radar or Satellite/Links.

- The remaining turbines that infringe the control planes of Airservices Australia will be required to be deleted or reduced in height for the proposed layout of the KEP to comply fully with aviation considerations.

It is our understanding that Pamada will still seek development approval for the proposed Kyoto Energy Park project. The final layout for the project will depend on negotiations between Pamada and Airservices Australia after a more detailed evaluation of the aircraft procedures for Scone aerodrome.

Aviation –Local Operators

Information regarding aerial spraying and cropper operations in and around the Scone Aerodrome were made with Coleen Pinkerton, the Manager of Technical Support Services from the Upper Hunter Shire Council. Requests were made to as to whether the Upper Hunter Shire Council, the aerodrome operator, could foresee any impact on these operations from the proposed Kyoto Energy Park project. Local airport operators were also contacted to determine the potential impact on local operators.

2 DESCRIPTION OF THE WIND FARM SITE

There are two areas proposed for wind farms, Mountain Station and Middlebrook Station. The Mountain Station and Middlebrook Station sites are located approximately 9 km and 7.5 km respectively west of Scone in New South Wales, as shown in Figure 1.

The sites are in an area of escarpments and ridges on the western side of the Hunter Valley. The proposed wind farm lies on a prominent escarpment called Mount Moobi and nearby ridgelines. Mount Moobi is of elevation between 600m and 640m which runs approximately north-south. Terrain slopes around the Main Ridge can be described as moderate to the west and complex in all other directions, as there are steep slopes present, particularly to the east.

Various configurations of turbine sizes are under consideration. The proposed maximum blade tip height is 150m agl.

3 AVIATION

The proposed Kyoto Energy Park is situated close to Scone Aerodrome and therefore must be assessed to ensure its compliance with construction regulations imposed by relevant authorities. These have been identified as The Civil Aviation Safety Authority (CASA), Airservices Australia and The Ministry of Defense. The Ministry of Defense merely require notification of the construction plans rather than expressing explicit guidelines.

3.1 CASA

The Civil Aviation Safety Authority (CASA) requires notification [1]:

- (a) by an aerodrome operator, if it becomes aware of any development or proposed construction near the aerodrome that is likely to create an obstacle, or if an object will infringe the obstacle limitation surfaces (OLS) of an aerodrome; or*
- (b) by a person who proposes to construct a building or structure the top of which will be 110 metres or more above ground level.*

The proposed Kyoto Energy Park has a total height of greater than 110 m and therefore notification of the project to CASA is required. A letter detailing the proposed Kyoto Energy Park project was compiled and sent to CASA in October 2007 [2].

According to the CASA website [1] Scone has a Registered aerodrome with registration number R131.

A map of the Obstacle Limitation Surface (OLS) was obtained from the operator of the Scone aerodrome, the Upper Hunter Shire Council. The OLS is shown in Figure 2. It can be seen that the turbines within the proposed Kyoto Energy Park project are outside of the OLS.

CASA replied to GH on the 31st October 2007 [3] and indicated that despite the proposed turbines being outside of the OLS, obstacle lighting would be required under the CASA Advisory Circular AC 139-18(0) titled 'Obstacle Marking and Lighting of Wind Farms'.

It is highly likely that any development consent for the proposed Kyoto Energy Park project will include a condition that the project complies with the requirements of CASA. It is therefore recommended that once the final layout of the proposed Kyoto Energy Park wind farm is known, CASA is approached to determine if obstacle lighting is still required. If it is required, then a lighting plan will need to be prepared for approval by CASA.

3.2 Airservices Australia

On advice from CASA, Airservices Australia were contacted and informed about the proposed Kyoto Energy Park project. Airservices Australia responded outlining that some of the proposed wind turbines would infringe upon three flight procedures. These procedures are described below as 29RNAV [4], NDB [5] and CAT C Circling [6]. Details of the precise three dimensional boundary conditions of the flight procedures were obtained from Airservices Australia [7]. Models were created to independently verify the infringement claims using in-house software. This was done by modelling the procedure boundaries in three dimensions and overlaying the surrounding terrain which was elevated by 150m (the height of the wind turbines). The wind turbine positions within the proposed Kyoto Energy Park project were then overlaid so that any infringements could be identified.

3.2.1 29RNAV

The 29RNAV missed approach protection is shown diagrammatically in Figure 3. This procedure is critical in the missed approach, climbing in a narrow valley until aircraft can reach a safe altitude to turn toward more benign terrain. The sloping protection surface commences at the green line near the aerodrome (MGA co-ordinates E294197.0, N6451393.0 to E297585.7, N6455353.6, zone 56) at an altitude of 1580 feet (published) -100 feet (aircraft altitude allowance) -98 feet (obstacle clearance) = 1382 feet rising at 2.5%. Laterally, the missed approach splays outwards at 15°. In the central half of the procedure (indicated by the dashed cyan lines) full missed approach obstacle clearance of 98 feet (30m) protection is applied, whilst in each of the remaining quarters the obstacle clearance reduces linearly to zero feet (0ft) at the solid cyan line [7].

The equation for the plane of the central half of the procedure was calculated and modelled in 3D. The lines for the procedure boundary were constructed and overlaid onto this. The corresponding surface terrain (+150m) was constructed and also overlaid. This view was exported and is illustrated in Figure 4 for the old 47 turbine layout, and Figure 5 for the revised 42 turbine layout. The surface of the central half of the procedure is the lower altitude limit of the procedure and therefore gives a conservative picture of which turbines infringe on the procedure. The infringing turbines are shown in these figures. Turbines within the middle 50% (between the cyan dotted lines) which are visible above the protection surface would be infringing on the procedure. At the outer 25% (between the cyan dotted and solid lines) where the sloping protection surface rises to a further 30m at its extremes turbine infringement was verified on a case-by-case basis by overlaying the sloping protection surface which had been raised by up to 30m.

Airservices Australia indicated that in the old layout, turbines 15 and all those north of turbine 39 inclusive (39,40, 41, 42, 43, 44, 45, 46 and 47) infringe the 29RNAV procedure [7]. GH concurred with this finding.

The revised layout for the proposed Kyoto Energy Park project has incorporated an 80m move south to turbine 15 which sees it no longer infringing the 29RNAV procedure. With this revised layout, turbines 36, 37, 38, 39, 40, 41 and 42 are left infringing the 29RNAV procedure.

3.2.2 NDB

The NDB approach protection is shown diagrammatically in Figure 6. The missed approach climb commences at line marked SOC (E292372.6, N6454906.6 to E297544.2 N6455633.5, zone 56) with the same distribution of obstacle clearance as 29RNAV. The procedure splays at 10.3° and commences at 2140-100-98 = 1942ft climbing at 2.5% [7].

The equation for the plane of the central half of the procedure was calculated and modelled in 3D. The lines for the procedure boundary were constructed and overlaid onto this. The corresponding surface terrain (+150m) was constructed and also overlaid. This view was exported and is illustrated showing the original 47 turbine layout in Figure 7 and the revised 42 turbine layout in Figure 8. The surface of the central half of the procedure is the lower altitude limit of the procedure and therefore gives a conservative picture of which turbines infringe on the procedure. Turbines within the middle 50% (between the red dotted lines) which are visible above the protection surface would be infringing on the procedure. At the outer 25% (between the red dotted and solid lines) where the sloping protection surface rises to a further 30m at its extremes turbine infringement was verified on a case-by-case basis by overlaying the sloping protection surface which had been raised by up to 30m.

Airservices Australia indicated that turbine 40 from the old layout infringed the NDB procedure [7]. GH could not confirm this within the accuracy of our modelling process, however this finding is superseded by the fact that turbine 40 from the old layout already infringed the 29RNAV procedure as detailed above.

In the revised 42 turbine layout, turbine 36 is closest to turbine 40 in the old layout. GH could not confirm within the accuracy of our modelling process that turbine 36 from the revised layout infringed the NDB procedure, however this finding is superseded by the fact that turbine 36 already infringed the 29RNAV procedure as detailed above.

3.2.3 CAT C Circling

The aircraft circling approach protection is shown diagrammatically in Figure 9. The protection area is horizontal. The inner circle is for smaller aircraft (notated as Cat A/B) and the modified 'keyhole' is for larger aircraft (Cat C). The 'keyhole' is due to the circling restriction of 3 nautical miles for larger aircraft but extends to the full length of 4.2 nautical miles where an approach overlies that area. The surface is at 2530-100-394 feet = 2036 feet [7].

The equation for the plane was modelled in 3D. The lines for the procedure boundary were constructed and overlaid on to this. The corresponding surface terrain (+150m) was also overlaid. This view was exported and is illustrated with the original 47 turbine layout in Figure 10 and the revised 42 turbine layout in Figure 11. Turbines which are visible above the protection surface and are within the procedure boundaries infringe upon the circling procedure.

Airservices Australia indicated that turbines 15 and 39 from the original 47 turbine layout infringed the CAT C Circling procedure [7]. GH concurred with this finding.

As discussed in Section 3.2.1 turbine 15 was relocated 80m to the south and now avoids infringing the CAT C Circling procedure.

Turbine 36 from the revised 42 turbine layout still infringes the CAT C Circling procedure, however this finding is superseded by the fact that turbine 36 already infringed the 29RNAV procedure as detailed above.

3.2.4 Other Services

Airservices Australia otherwise confirmed that the proposed Kyoto Energy Park wind farm will not impact on Precision/Non-Precision Nav Aids, HF/VHF Communications, Cables, ASMGCS, Radar or Satellite/Links.

3.3 Local Operators

Information regarding aerial spraying and cropper operations in and around the Scone Aerodrome were made to the Manager of Technical Support Services from the Upper Hunter Shire Council (UHSC). Requests were made to as to whether the UHSC, the aerodrome operator, could foresee any impact on these operations from the proposed Kyoto Energy Park project. UHSC indicated that their response mirrors that of the regulator Airservices Australia.

4 CONCLUSIONS AND RECOMMENDATIONS

Aviation - CASA

The Civil Aviation Safety Authority (CASA) requires notification [1]:

- (a) by an aerodrome operator, if it becomes aware of any development or proposed construction near the aerodrome that is likely to create an obstacle, or if an object will infringe the obstacle limitation surfaces (OLS) of an aerodrome; or*
- (b) by a person who proposes to construct a building or structure the top of which will be 110 metres or more above ground level.*

The proposed Kyoto Energy Park has a total height of greater than 110 m and therefore notification of the project to CASA is required. A letter detailing the proposed Kyoto Energy Park project was compiled and sent to CASA.

A map of the Obstacle Limitation Surface (OLS) was obtained from the operator of the Scone aerodrome, the Upper Hunter Shire Council which illustrated that the turbines within the proposed Kyoto Energy Park project are outside of the OLS.

CASA formally indicated that despite the proposed turbines being outside of the OLS, obstacle lighting would be required under the CASA Advisory Circular AC 139-18(0) titled 'Obstacle Marking and Lighting of Wind Farms'.

It is highly likely that any development consent for the proposed Kyoto Energy Park project will include a condition that the project complies with the requirements of CASA. It is therefore recommended that once the final layout of the proposed Kyoto Energy Park wind farm is known, CASA is approached to determine if obstacle lighting is still required. If it is required, then it is recommended that a lighting plan is prepared for approval by CASA.

Aviation – Airservices Australia

Airservices Australia were contacted and informed about the proposed Kyoto Energy Park project. Airservices Australia responded outlining that some of the proposed wind turbines from the original 47 turbine layout would infringe upon three flight procedures. These procedures were denoted 29RNAV, NDB and CAT C Circling. Details of the precise three dimensional boundary conditions of the flight procedures were obtained from Airservices Australia. Models were created to independently verify the infringement claims using in-house software. This was done by modelling the procedure boundaries in three dimensions and overlaying the surrounding terrain which was elevated by 150m (the height of the wind turbines). The wind turbine positions within the proposed Kyoto Energy Park project were then overlaid so that any infringements could be identified.

GH independently confirmed that some of the turbines from the original 47 turbine layout did infringe the flight procedures identified by Airservices Australia. Due to various constraints identified during the development process, the layout for the proposed Kyoto Energy Park project has now been modified and a revised 42 turbine layout has been produced.. This revised layout incorporated a small change to the position of turbine 15 which no longer infringes any of the Airservices Australia procedures.. GH confirms that turbines 36, 37, 38, 39, 40, 41 and 42 of the revised layout still infringe the 29RNAV procedure, while turbine 36 alone still infringes the CAT C Circling procedure.

GH could not independently verify, within the accuracy of our modelling process, that turbine 40 infringed upon the NDB procedure as stated by Airservices Australia. In fact no turbines

from the Middlebrook Station site in both the original layout and the revised layout were found to infringe upon the NDB procedure. It is recommended that this is examined at a future date in more detail, along with consideration of the 29RNAV procedure upon which several turbines, from the Middlebrook Station site, were already found to infringe.

Airservices Australia otherwise confirmed that the proposed Kyoto Energy Park wind farm will not impact on Precision/Non-Precision Nav Aids, HF/VHF Communications, Cables, ASMGCS, Radar or Satellite/Links.

It is our understanding that Pamada will continue to seek development approval for the proposed Kyoto Energy Park project. The final layout for the project will depend on many factors including negotiations between Pamada and Airservices Australia. This would be assisted by a more detailed evaluation of the aircraft procedures for Scone aerodrome in consultation with Airservices Australia.

Aviation –Local Operators

Information regarding aerial spraying and cropper operations in and around the Scone Aerodrome were made to the Manager of Technical Support Services from the Upper Hunter Shire Council (UHSC). Requests were made to as to whether the UHSC, the aerodrome operator, could foresee any impact on these operations from the proposed Kyoto Energy Park project. UHSC indicated that their response mirrors that of the regulator Airservices Australia.

5 REFERENCES

- 1 CASA Advisory Circular AC 139-18(0), “Obstacle marking and lighting of wind farms”, July 2007.
- 2 Letter from Garrad Hassan to CASA 2621/PL/002-A dated 5th October 2007.
- 3 Letter from Garrad Hassan to CASA dated 31st October 2007.
- 4 <http://www.airservicesaustralia.com/publications/current/dap/SCOGN01-108.pdf>
- 5 <http://www.airservicesaustralia.com/publications/current/dap/SCONB01-101.pdf>
- 6 Email from Joe Doherty, Airservices Australia, “RE: 2621 – RE: Kyoto Energy Park wind turbine project near Scone, NSW” received 30th November 2007.
- 7 Email from Joe Doherty, Airservices Australia, “FW: 2621 – RE: Kyoto Energy Park wind turbine project near Scone, NSW”, received 19th December 2007.

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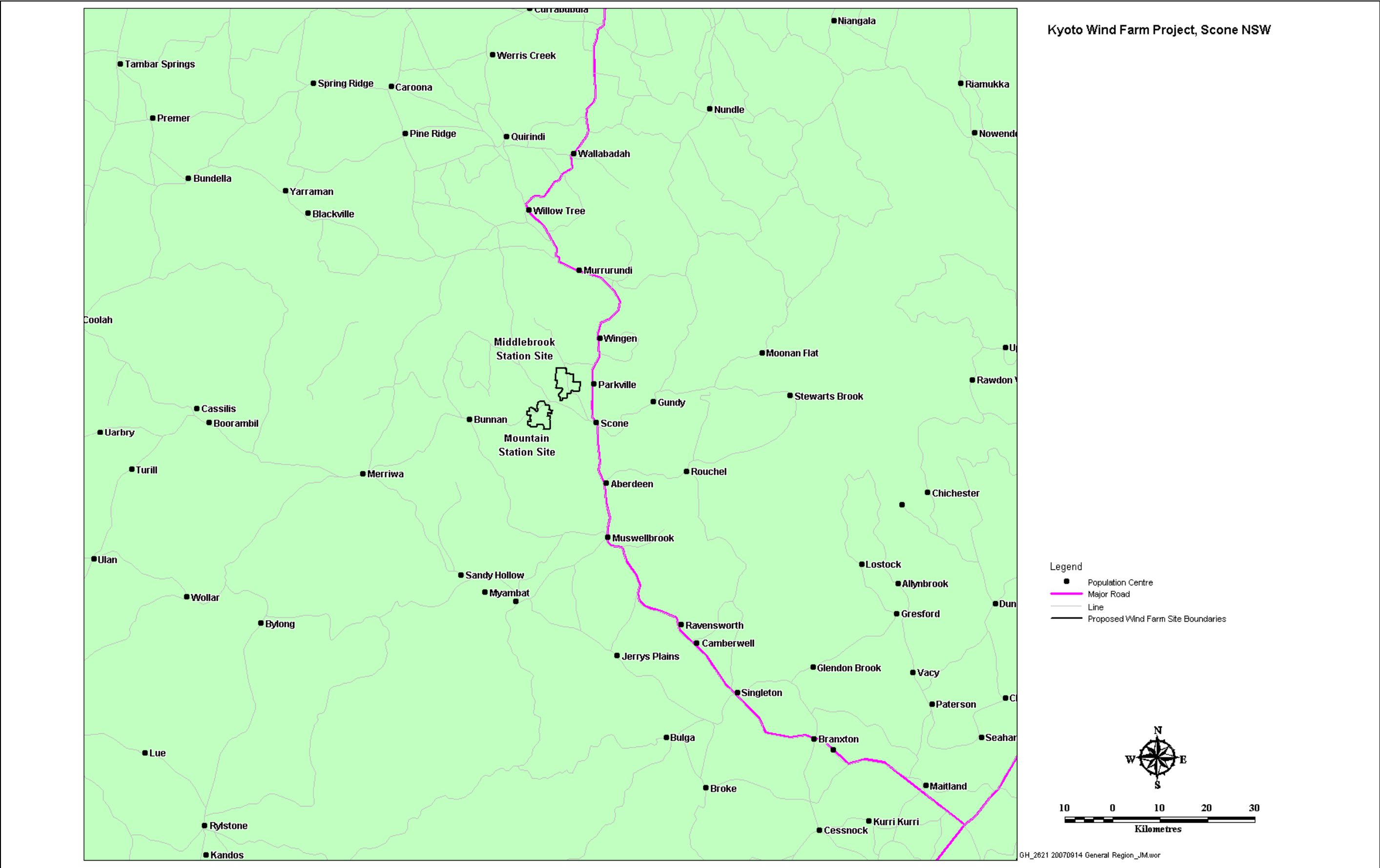


Figure 1 Location of proposed Kyoto Wind Park

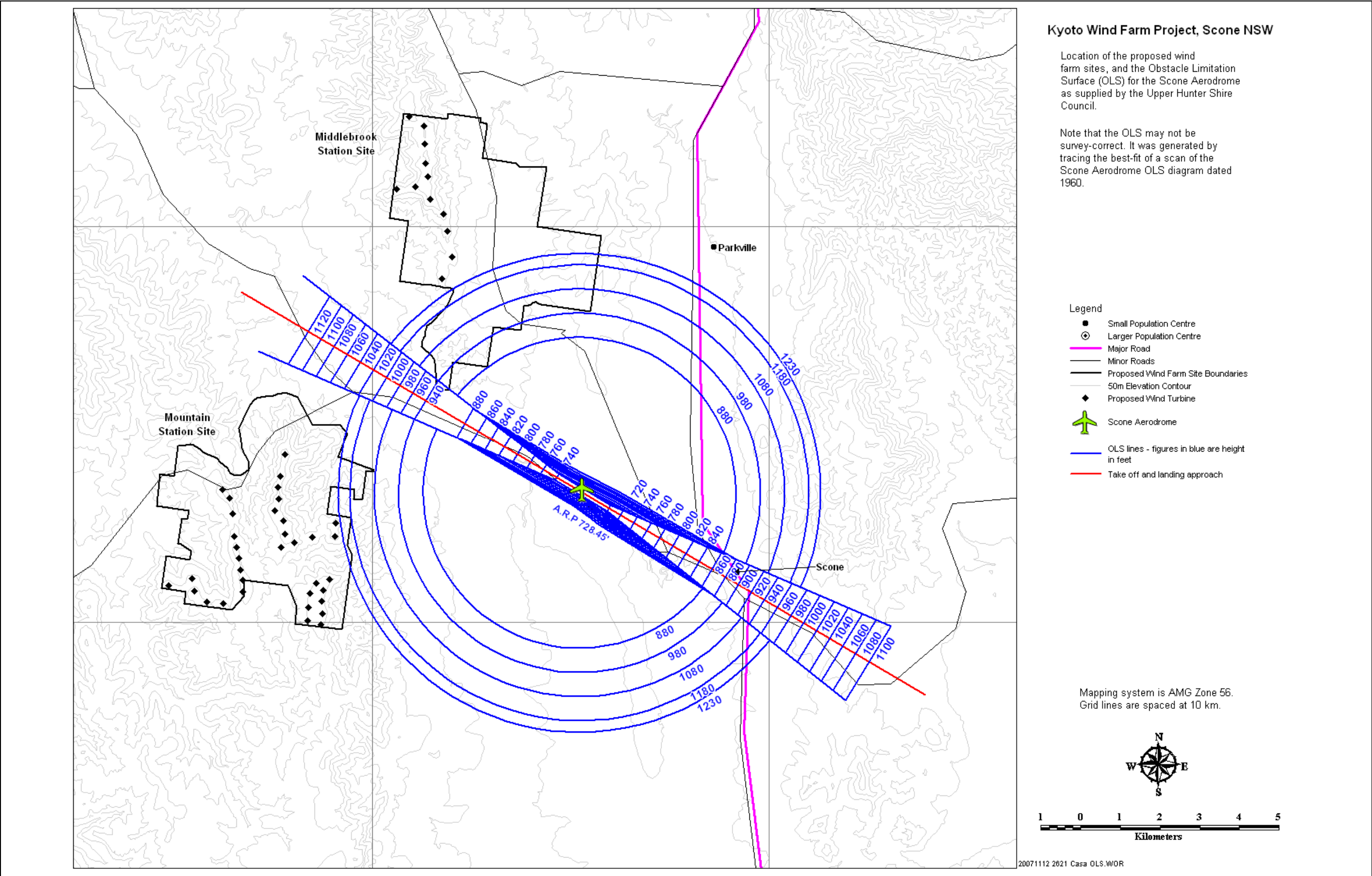


Figure 2 Map of the Obstacle Limitation Surface (OLS) for the Scone aerodrome nearby to the proposed Kyoto Energy Park.

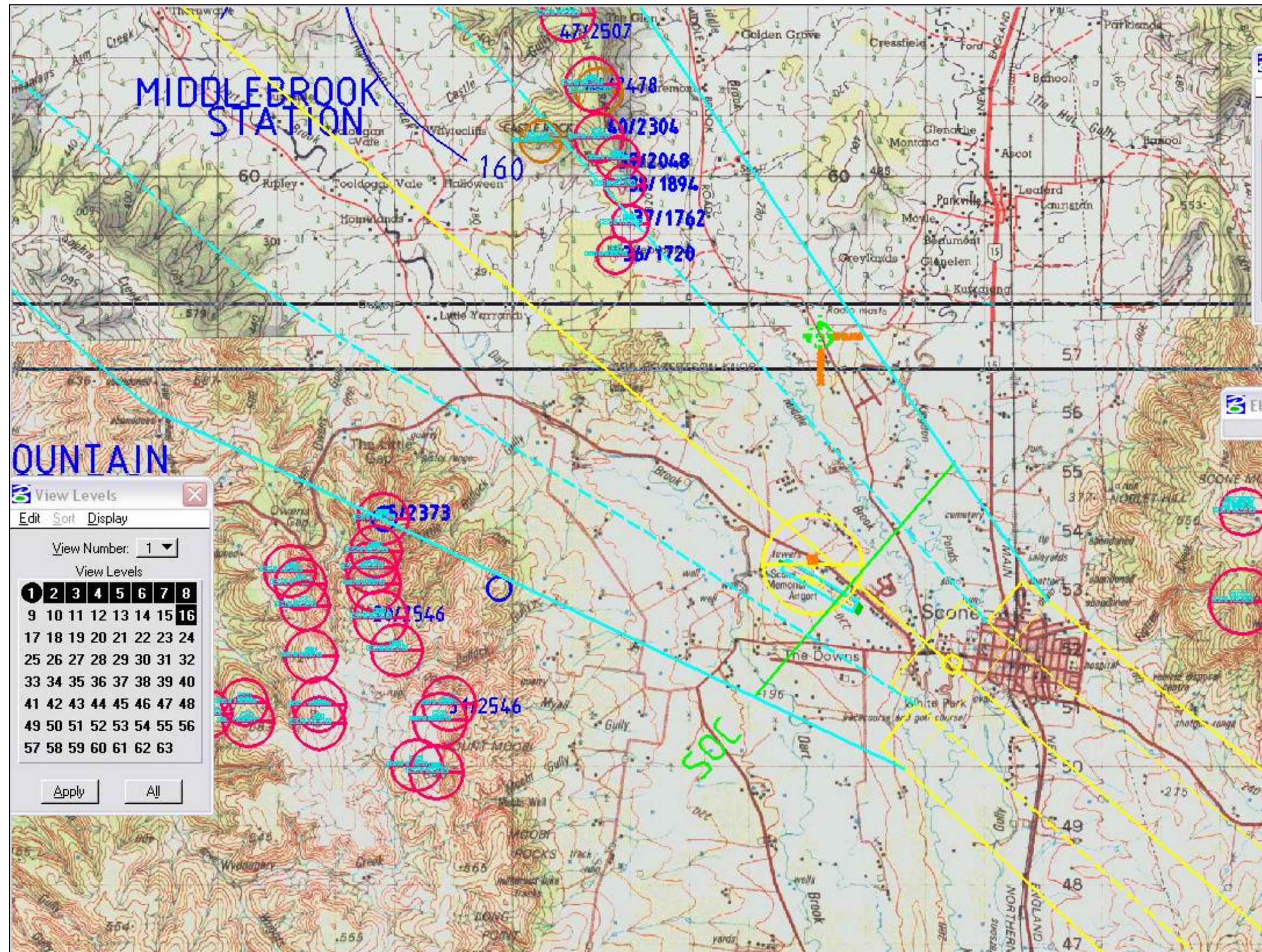


Figure 3 29 RNAV missed approach to the run way procedure.

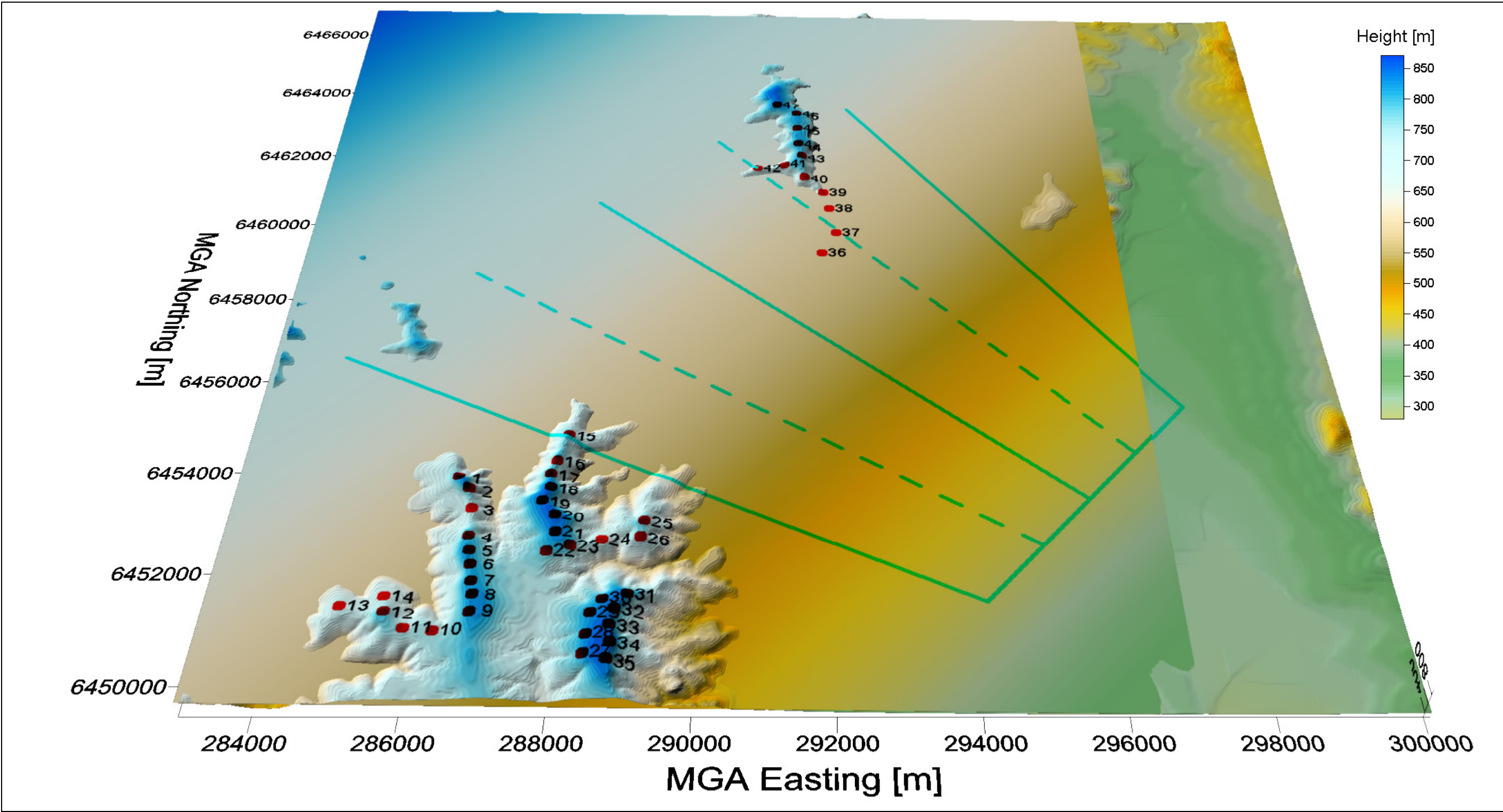


Figure 4 29RNAV sloping protection surface overlaid with terrain surface + 150m (original 47 turbine layout)

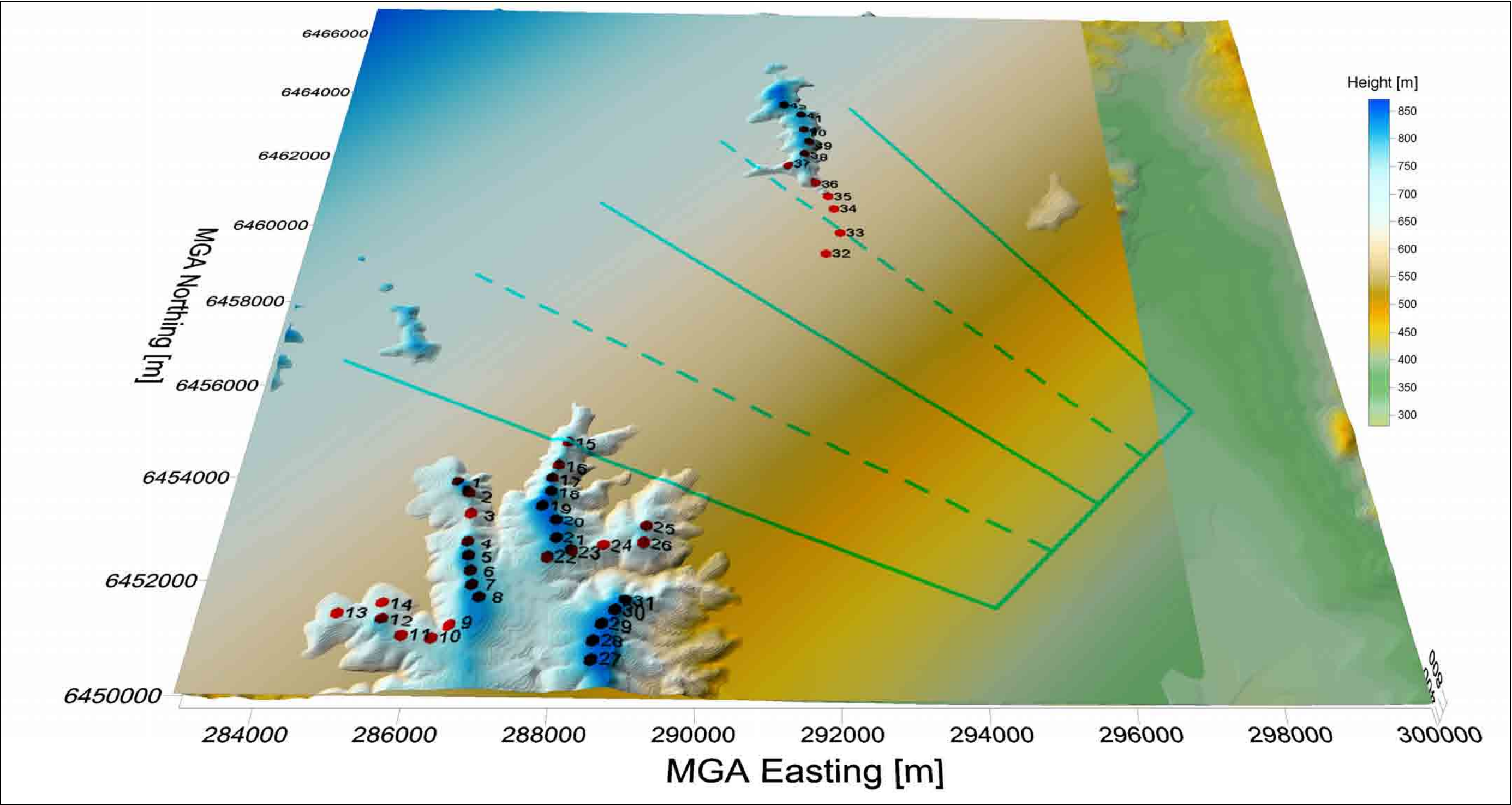


Figure 5 29RNAV sloping protection surface overlaid with terrain surface + 150m (revised 42 turbine layout)

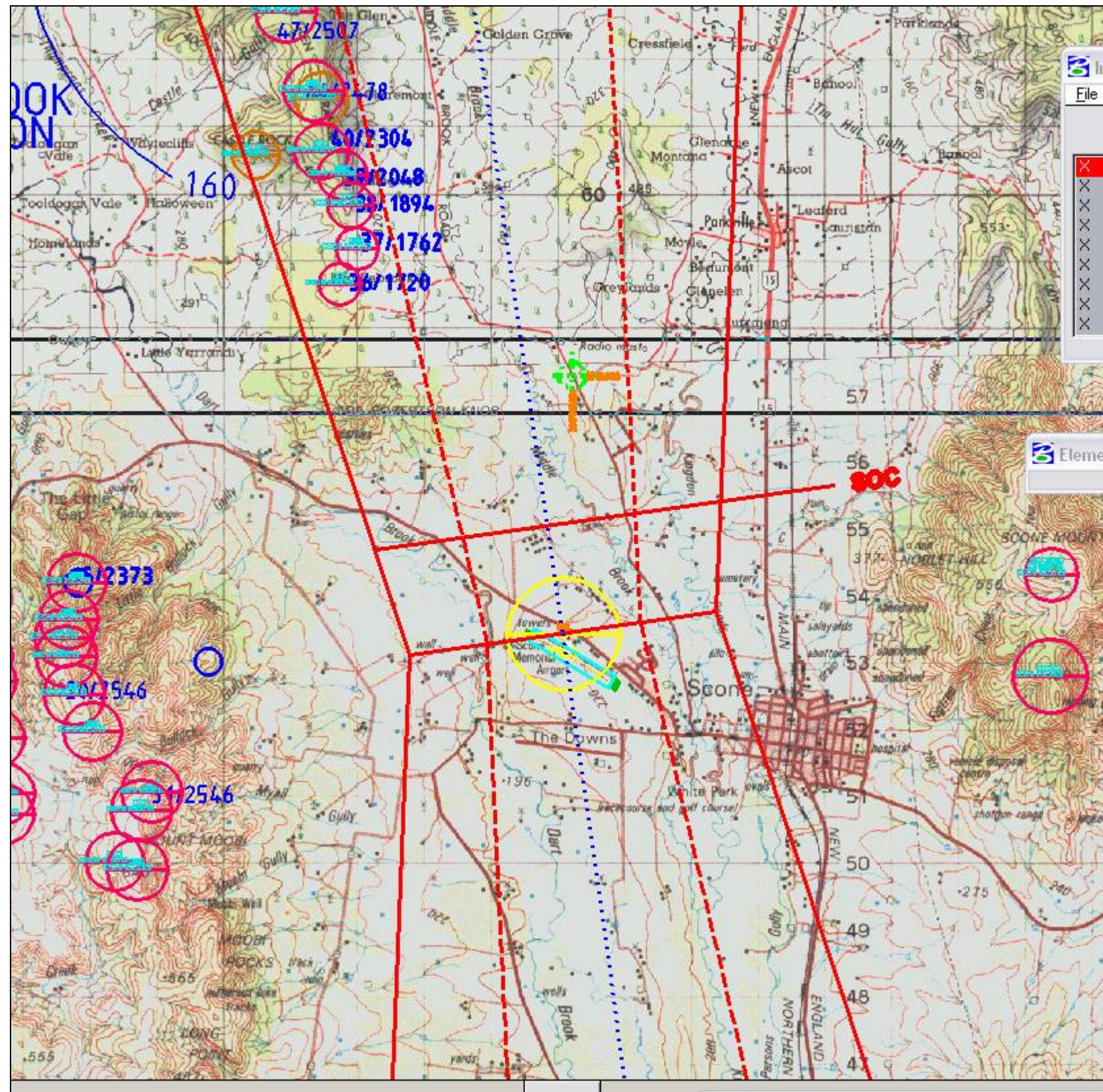


Figure 6 NDB approach protection procedure.

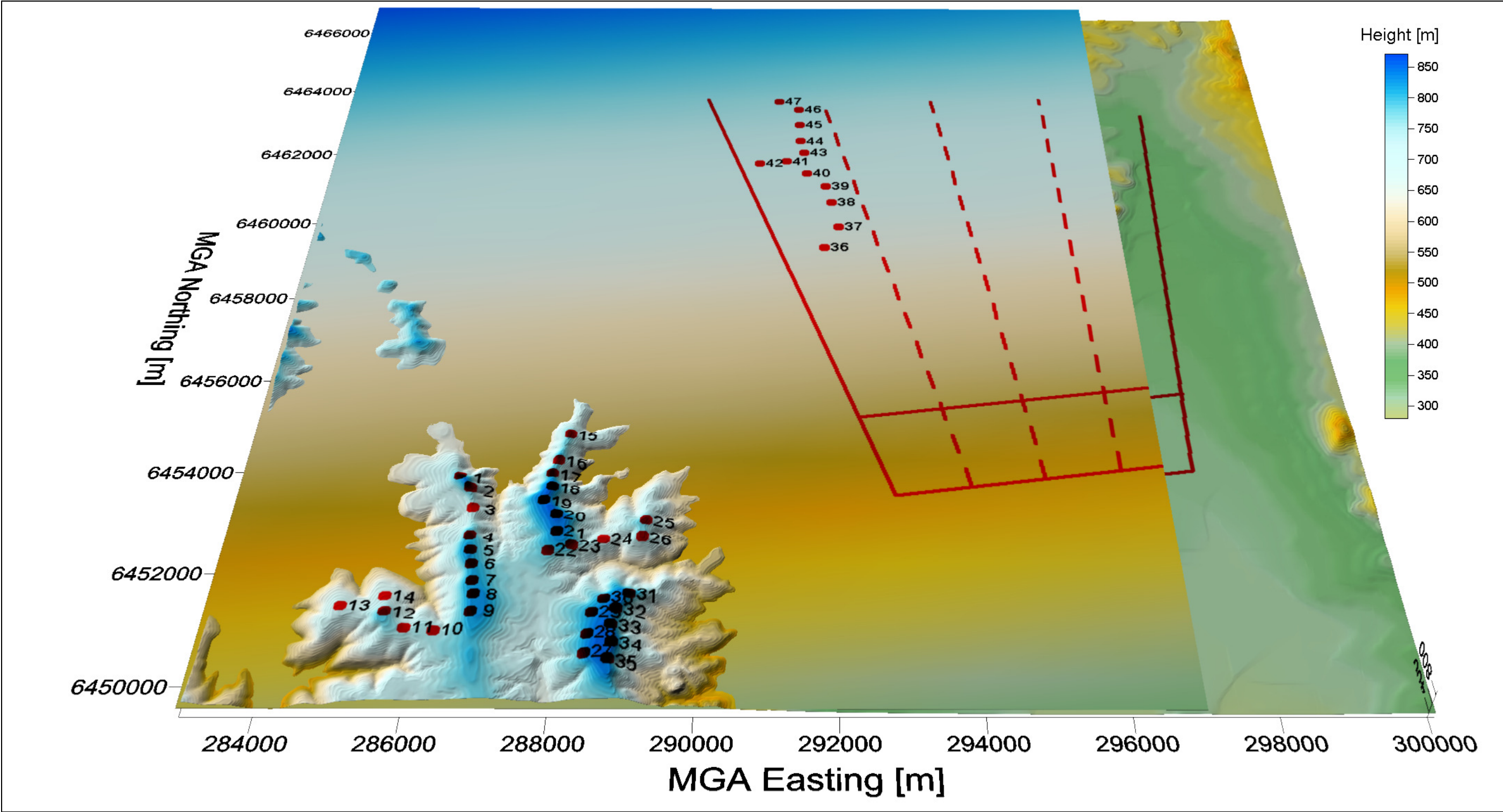


Figure 7 NDB sloping protection surface overlayed with terrain surface + 150m (original 47 turbine layout)

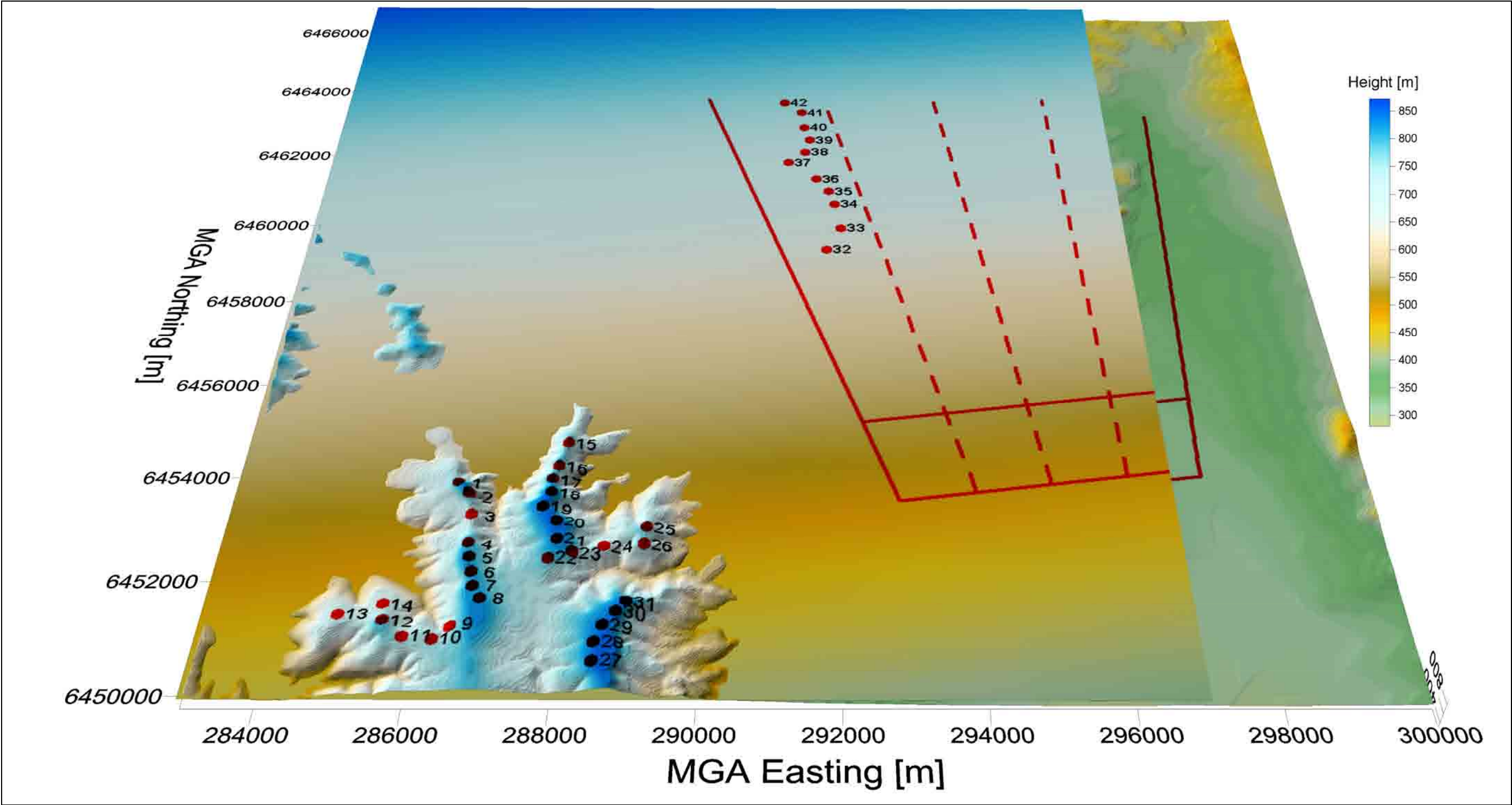


Figure 8 NDB sloping protection surface overlaid with terrain surface + 150m (revised 42 turbine layout)

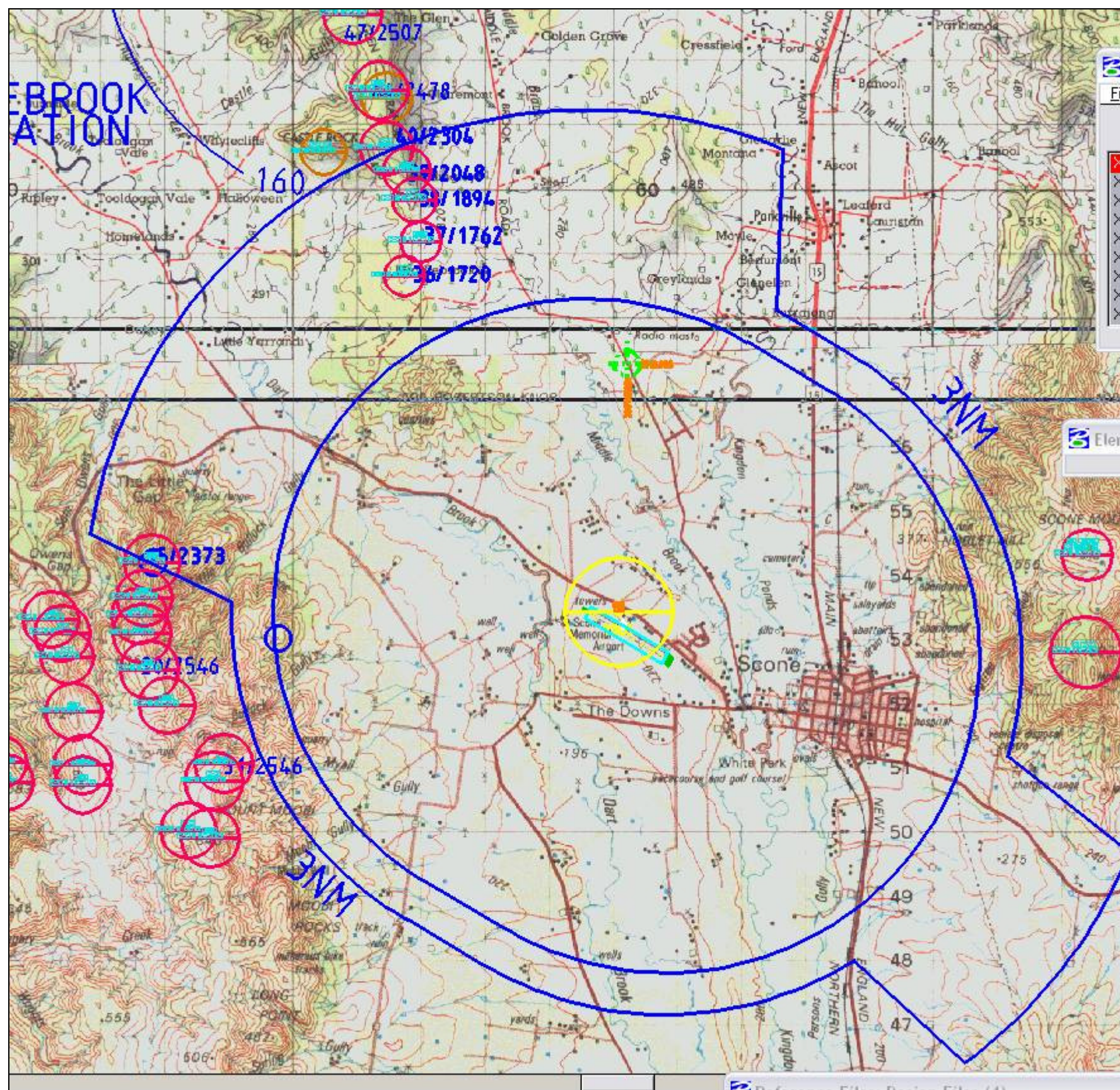


Figure 9 CAT C Circling protection procedure.

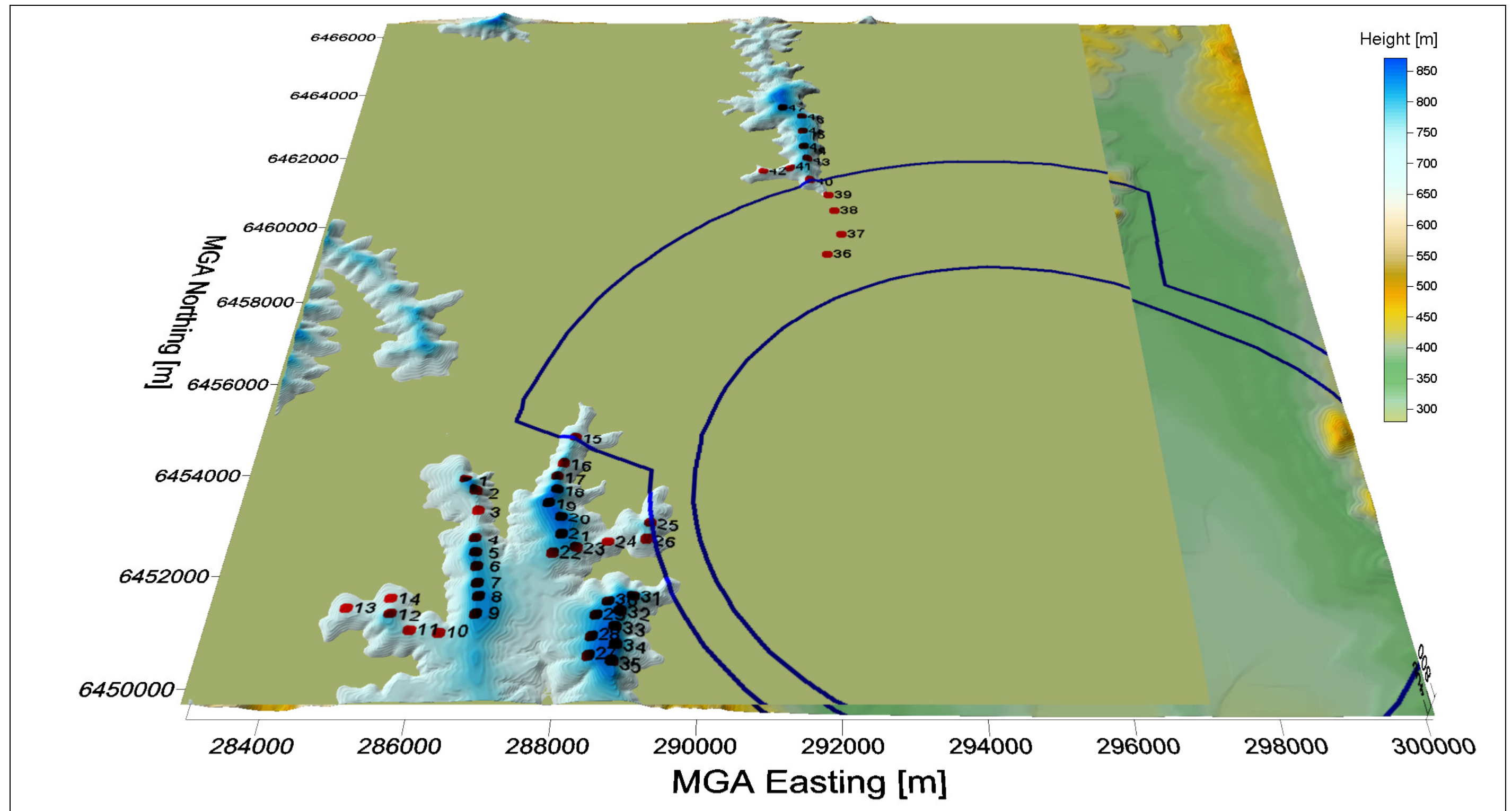


Figure 10 Circling protection surface overlaid with terrain surface + 150m (original 47 turbine layout)

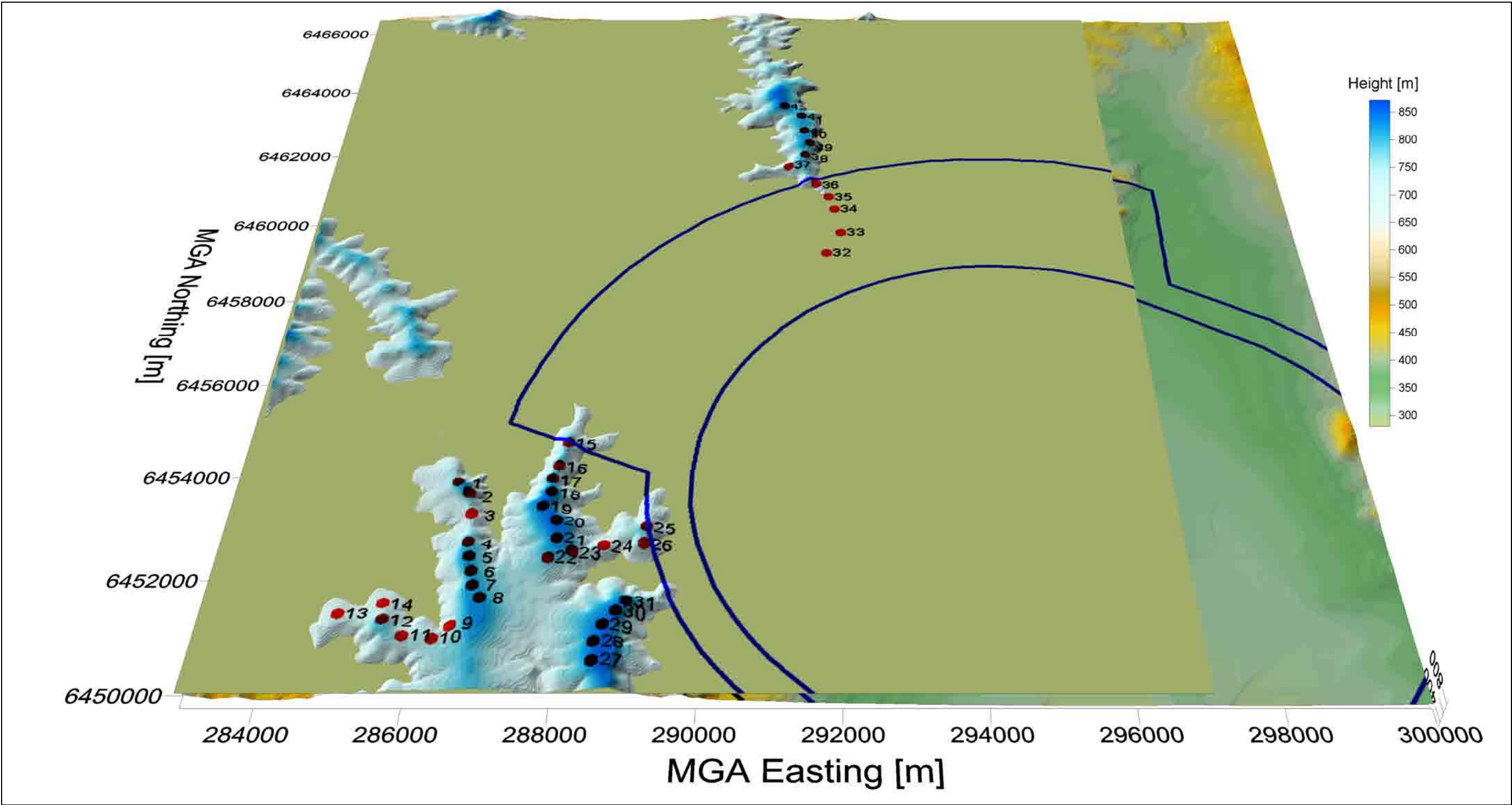


Figure 11 Circling protection surface overlaid with terrain surface + 150m (revised 42 turbine layout)

Kyoto energypark

Appendix E(i)

Response to Aviation Issues
from the Department of Defence
(12 March 2008)



Australian Government

Department of Defence
Defence Support Group

2004/1044160/2
LPSI/OUT/23/2008

Mr Mark Dixon
Senior Project Manager
Pamada Pty Ltd
Level 16
14-24 College Street
SYDNEY NSW 2010

Dear Mr Dixon

PROPOSED KYOTO ENERGY PARK - SCONE NSW

1. I refer to your email dated 10 January 2008 advising of the proposed Kyoto Energy Park to be located approximately 13km west of Scone in NSW. The proposal will include up to 47 wind turbines, a closed loop hydro electric plant, a substation, associated cabling for connection to the existing transmission network, maintenance facilities and a visitor's centre. A future stage of the project will include a solar thermal plant. A wind monitoring mast was installed on site in January 1999. The wind farm will be spread across two sites called Mountain Station and Middlebrook Station. Each wind turbine will have a blade length of 45m mounted on a tower between 80m - 105m high making the total height between 125m - 150m. Upgrade of power lines in the area to accommodate the power needs will be required.
2. The Department of Defence has assessed the proposal with respect to any impact on the safety of military flying operations and possible interference to Defence communications and airfield surveillance radars.
3. The Department advises the proposed development will be outside any areas affected by the Defence (Areas Control) Regulations (DACR). The DACR control the height of objects (both man-made structures and vegetation) and the purpose for which they may be used within approximately 15km radius of Defence airfields. In addition, the proposal has been assessed as unlikely to affect existing Defence communications within the region.
4. The proposed wind turbines will be located on the eastern edge of an area where aircraft from RAAF Base Williamtown conduct low level flying. The energy park proponent will need to liaise closely with the RAAF Base and provide design details including location and height of the wind turbines before construction commences and then keep the Base informed of the construction time-frame. This is a requirement to ensure flight safety. The RAAF Base Williamtown point of contact is the RAAF Williamtown Base Command Post, Telephone (02) 4964 5888, Fax (02) 4964 7881 and Email WLM.BCP@defence.gov.au
5. CASA has produced an Advisory Circular, AC 139-18(0) *Obstacle Marking and Lighting of Wind Farms* dated July 2007, which provides amongst other things, guidance to proponents of wind farms. Wind Turbines are tall structures which can be hazardous objects to aviation and the AC outlines measures on how to reduce the hazard including the use of obstacle marking and lighting. In accordance with the AC, CASA will need to assess the proposal and provide determination.

6. In addition, there is an ongoing need to obtain and maintain accurate information about tall structures so that risks associated with inadvertent collision by low flying aircraft can be reduced. RAAF AIS in Melbourne is responsible for recording the location and height of tall structures. The information is held in a central database managed by RAAF AIS and relates to the erection, extension or dismantling of tall structures the top measurement of which is:

- a. 30 metres or more above ground level - within 30 kilometres of an aerodrome, or
- b. 45 metres or more above ground level elsewhere.

7. The proposed wind turbines, wind monitoring mast and possibly the electricity transmission lines will meet the above definition of tall structure. RAAF AIS has requested that the proponent supply them with location and height details once the final position of the wind turbines have been determined and before construction commences. After construction is complete, the Department of Defence requests that the proponent provide RAAF AIS with "as constructed" details. RAAF AIS has a web site with a Vertical Obstruction Report Form at www.raafais.gov.au/obstr_form.htm which can be used to enter the location and height details of tall structures.

8. Information on tall structures and any queries in regard to the database should be directed to:

Aeronautical Data Officer
RAAF AIS (VBM-M2)
Victoria Barracks
St Kilda Road
Southbank Vic 3006

Tel: (03) 9282 6400 Fax: (03) 9282 6695

Email: ais.charting@defence.gov.au

9. Guyed wind monitoring masts can be very difficult to distinguish against the surrounding background for a pilot conducting low level flying operations and can be a direct hazard to aviation safety. Therefore, if the details have not already been provided, please provide height and location details for the existing wind monitoring mast to both RAAF Base Williamstown and RAAF AIS.

10 The vertical velocity from a gaseous exhaust plume may cause airframe damage and/or affect the handling characteristics of an aircraft in flight. If the solar thermal plant to be constructed at a later stage has an exhaust plume then assessment by Defence and CASA may be required. Your attention is drawn to CASA Advisory Circular, AC 139-05(0) *Guidelines For Conducting Plume Rise Assessments* dated June 2004 for further details.

11. The Department of Defence has no objection to the proposed energy park subject to the conditions stated at paragraphs 4, 7, 9 and 10. Please direct any questions to Mr Gary Lee on telephone (02) 6266 8187.

Yours sincerely



John Kerwan

Director Land Planning & Spatial Information
BP3-1-A052
Department of Defence
CANBERRA ACT 2600

L2 March 2008

cc. Base Commander RAAF Base Williamtown
Regional Manager DS-CNNSW