

Planning considerations of a 500 metre setback between sensitive locations and shale gas well pad location: An analysis of the “land sterilisation” claim, taking account of the use of horizontal well drilling.

Petroleum industry representatives have stated that any restriction zone, or ‘setback distance’ between residential and other buildings, or other sensitive locations, and the siting of surface activity (well pads) is an unacceptable constraint on their freedom to operate.

In contrast Local Mineral Planning Authorities and community representative bodies have stressed that there must be a balance between the freedom to locate the heavy industrial surface activities of shale gas operations versus the protection of local communities, businesses and environment.

Recent information from shale gas operators in the USA¹ show that horizontal drilling is commonplace, and that typical production well pads contain multiple horizontal wells drilled and reaching out to 1,000 to 2,000 metres from the pad, with subterranean spacings between wells of typically 200-250 metres (from wells spaced at around 6 metres separation on the pad surface). Furthermore, Mr Steele QC, representing the shale gas industry at the hearing of 24th January 2019, stated that horizontal drilling could reach up to 2,500 metres (in production wells), subject to geological faults. Evidence from a representative of Cuadrilla at the same hearing stated that even in exploratory drilling they had been able to drill to 800 metres from the pad in the horizontal plane.

Also, at the hearing of the Examination in Public, held on 24 January 2019, industry representatives presented an ‘interactive map’ upon which the PEDL licence areas of Northern England were overlain with circles representing a 500 metre zone of restriction around all buildings (based on an address database) and protected areas (from public sourcing). The claim was made that only very limited areas remained available for shale gas operations (shown as shaded areas), and that the small total area of those shaded areas effectively “sterilised” the countryside from shale operations. Mr Steele QC put the total accessible area at only 20% of the whole licenced area.

However, this claim completely disregarded the now commonplace practice of horizontal drilling, by which method a single drill pad can access underground shale resources up to a horizontal radius of between 1000 and 2000 metres from the pad. Fig 1 shows a schematic representation of this capability.

Moreover, as the inspector specifically asked for comparative examples, we refer to research into the extensive shale gas operations in the Denton County area of Texas, USA, by Fry (2013)². Setback distances from property and communities ranged from 90 up to

¹ <https://www.aogr.com>

² Fry, M (2013) Urban gas drilling and distance ordinances in the Texas Barnett Shale. Energy Policy 62, 79–89

497.2 metres. The research also cites 12 municipal ordinances (regulations) which have increased the setback distances as the industry has developed. In no cases have setback distances been reduced. No reason is given but it is noteworthy that the trend has been to require greater safeguarding.

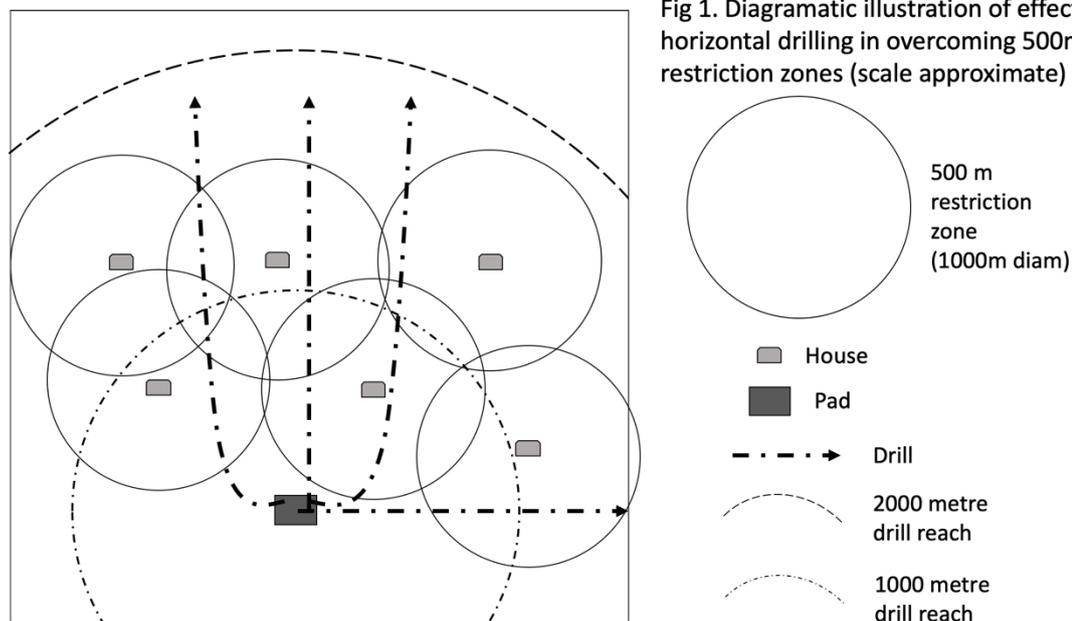


Fig 1. Diagrammatic illustration of effect of horizontal drilling in overcoming 500m restriction zones (scale approximate)

To date the UK shale gas industry has not made available their interactive map, due to claimed ‘intellectual property’ concerns. In view of this we have produced examples from within local PEDL areas in North Yorkshire, using Ordnance Survey maps superimposed with annotated zones to scale, representing zones of access of 1000 and 2000 metres from hypothetical well pad locations. The locations of pads were all outside proposed restricted areas, including 500 metre distance from all buildings as well as AONB and National Park boundaries.

The results of our analysis are shown in Appendix 1 and Appendix 2.

Appendix 1 shows maps of three example locations within local PEDL areas, with setback distances and possible well pad locations superimposed.

These maps were digitised and measured using the image analysis application, ‘ImageJ’ (<https://imagej.nih.gov/ij/>), and the results are shown in Appendix 2.

Conclusion

Results of area measurements for the maps shown in Appendix 1 clearly show that a much larger proportion of the areas would be accessible to gas extraction by the use of horizontal drilling. Given the extreme and unlikely scenario that every single 500m zone around all buildings were deemed unacceptable for pad location, it would still be possible to access 49.9 to 65.3%, or 70.8 to 86.1% of the total area using either 1000 or 2000 metre horizontal drilling respectively.

Therefore, even if no surface activity were permitted within the AONB and National Park, or within 500 metres of any building, up to 86% of the putative shale deposits within the

studied land area could still be available. Indeed, we have noted that Mr Steele QC stated in the hearing on 24 January 2019 that drills could reach up to 2500 metres horizontal distance from the well location.

We propose therefore that these results contradict the claim of “sterilisation” of shale gas accessibility based on a simple mapping illustration of the location of well pads.

Consequently we ask the Inspector to take account of the analysis we present here, and to recommend the retention of the proposed 500 metre offset test contained within Policy M17.

In so doing we emphasize the following points:

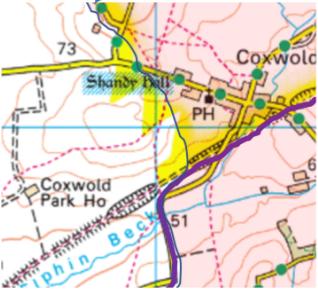
1. The proposed 500 metre restriction is not an absolute exclusion, but a zone within which planning approval to place a drill pad would depend upon the applicant convincing the LPA of both the justification and the acceptability of the proposed development.
2. The interactive map shown at the hearing on 24 Jan 2019 took no account of the ability of shale operators to access shale deposits within at least 1000-2000 metres of well sites by the use of horizontal drilling.

South Hambleton Shale Gas Advisory Group
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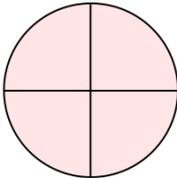
Appendix 1: Sample maps from SE57 region, showing proposed areas restricted from surface shale operations and the potential access to putative shale deposits using horizontal drilling methods.

KEY TO MAPS

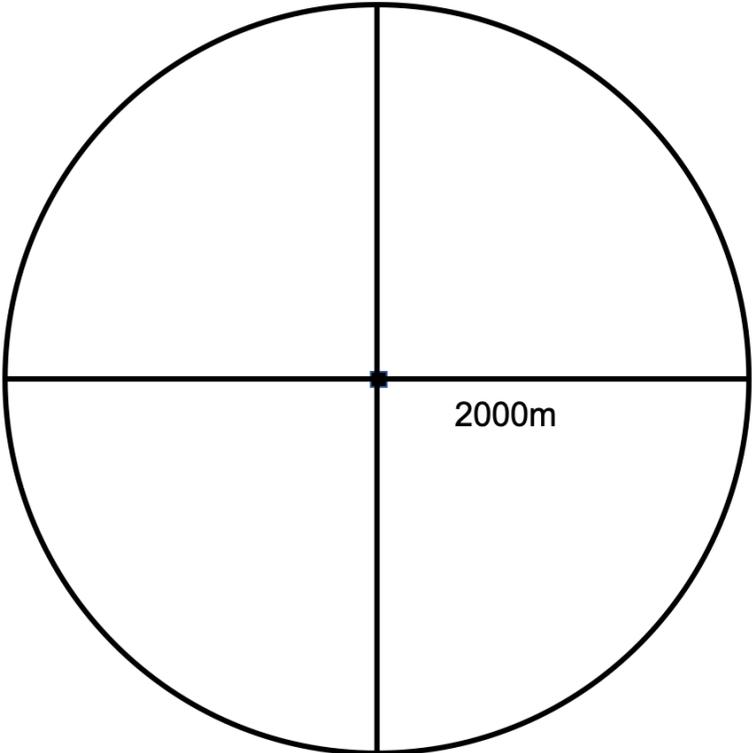
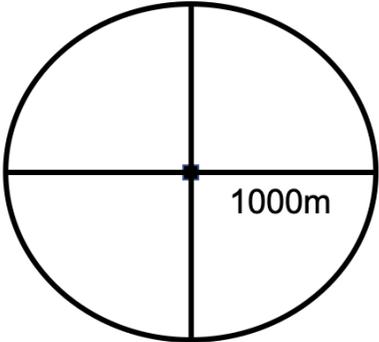
National Park boundary (yellow)



AONB boundary (purple)



500m radius restriction around buildings

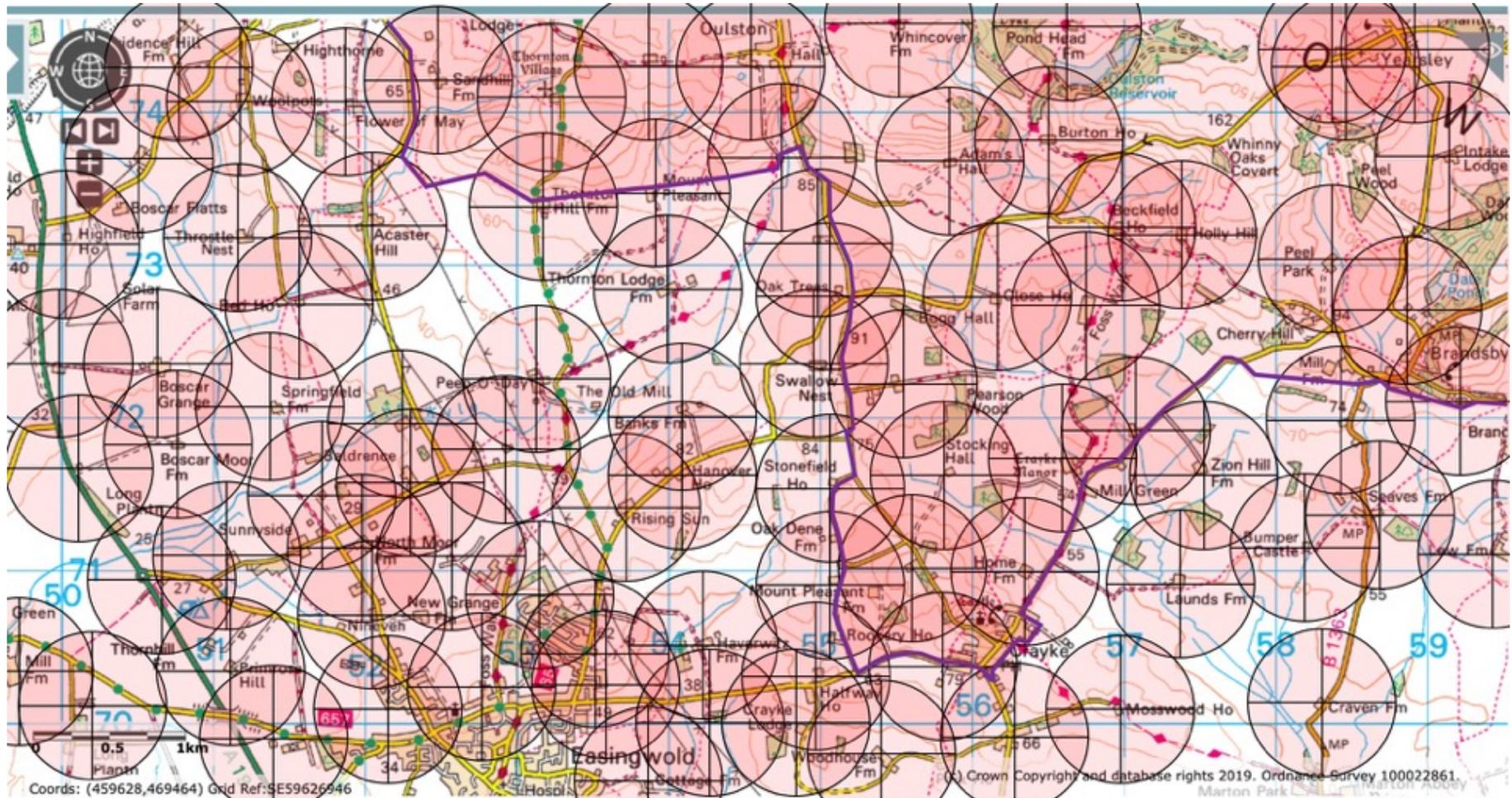


Hypothetical locations of pads showing horizontal drill reach

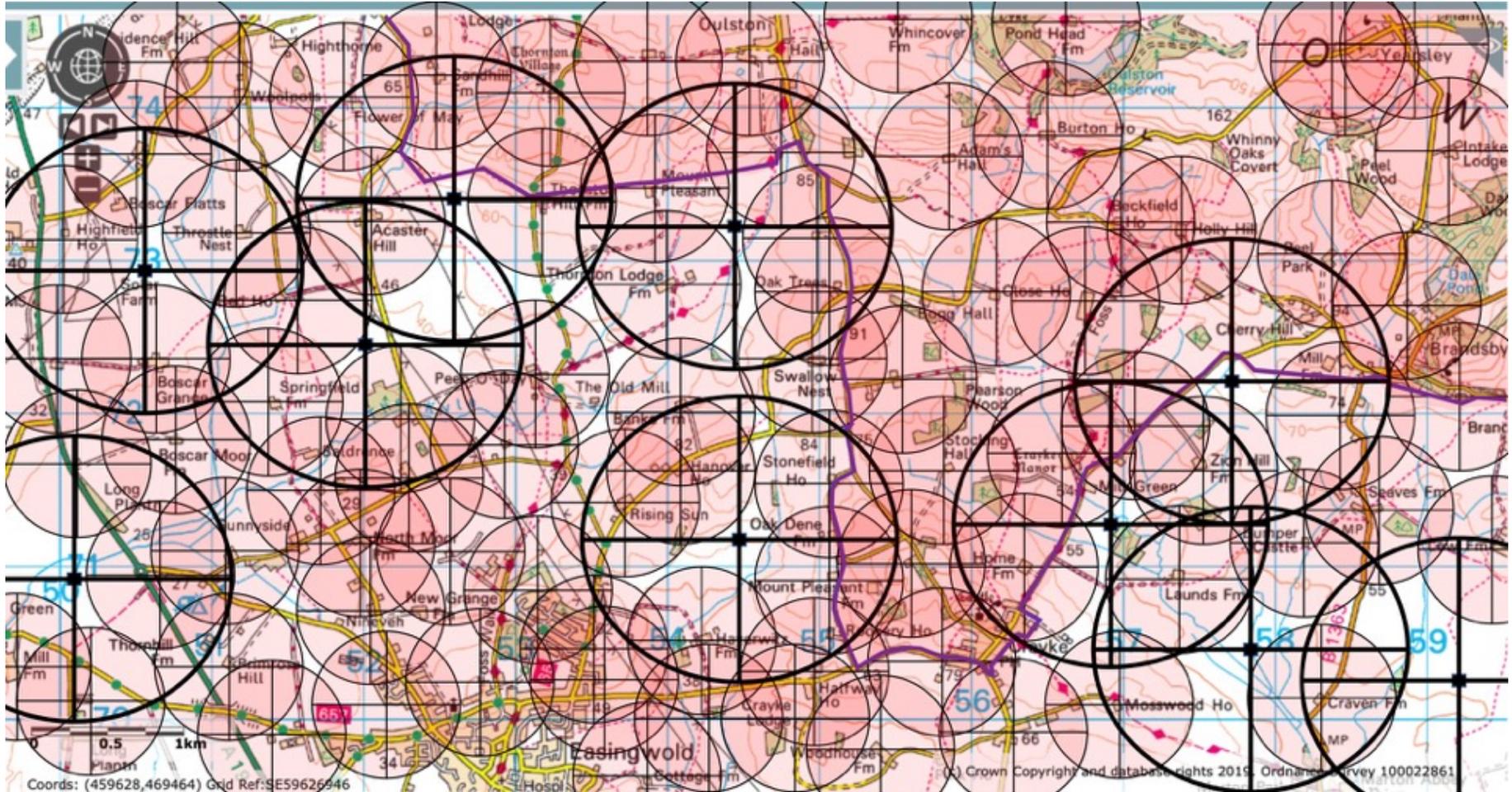
Sample Area 1: Crayke/Oulston



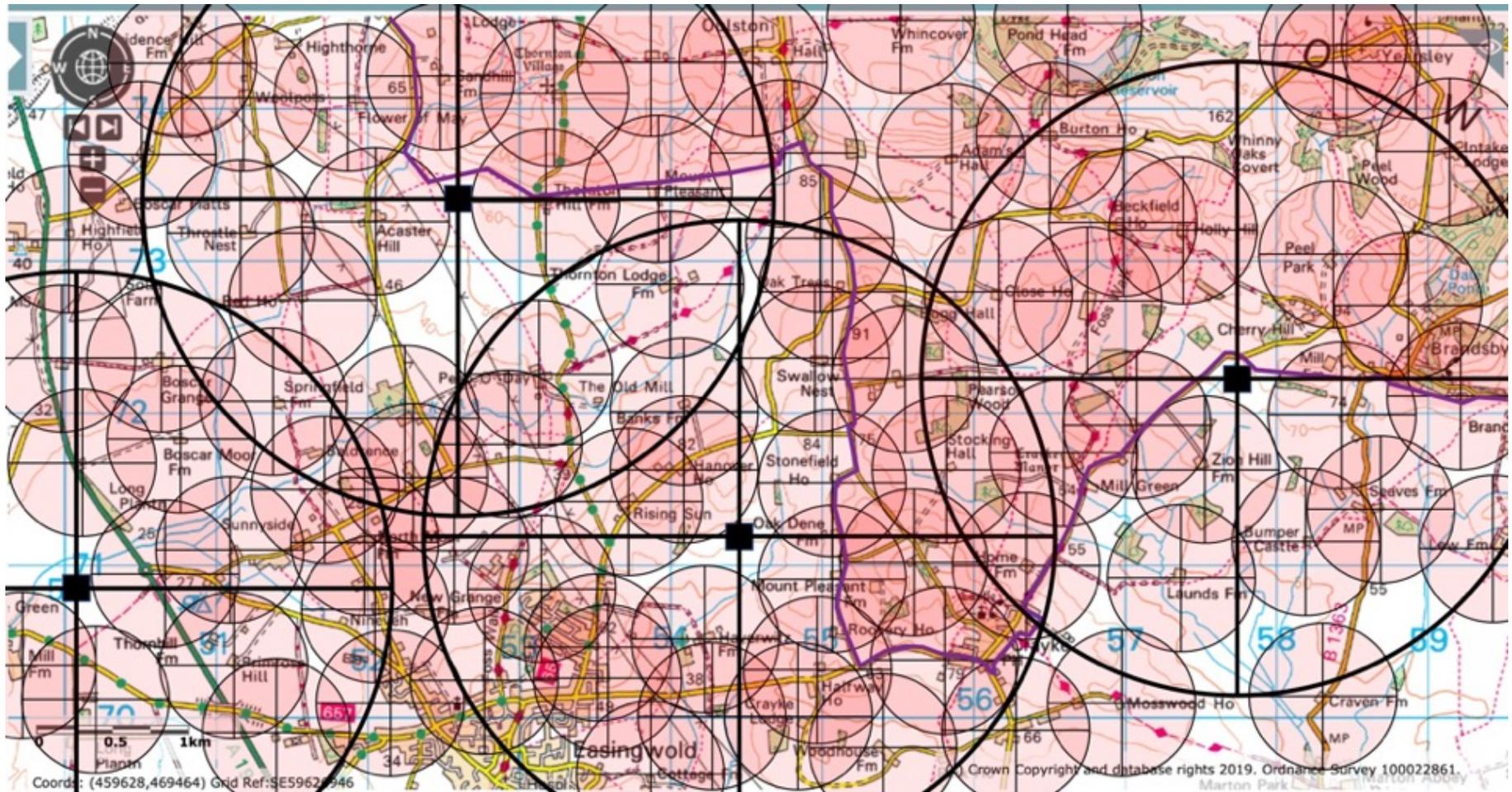
Addition of restricted zones (AONB plus 500m zones around all buildings)



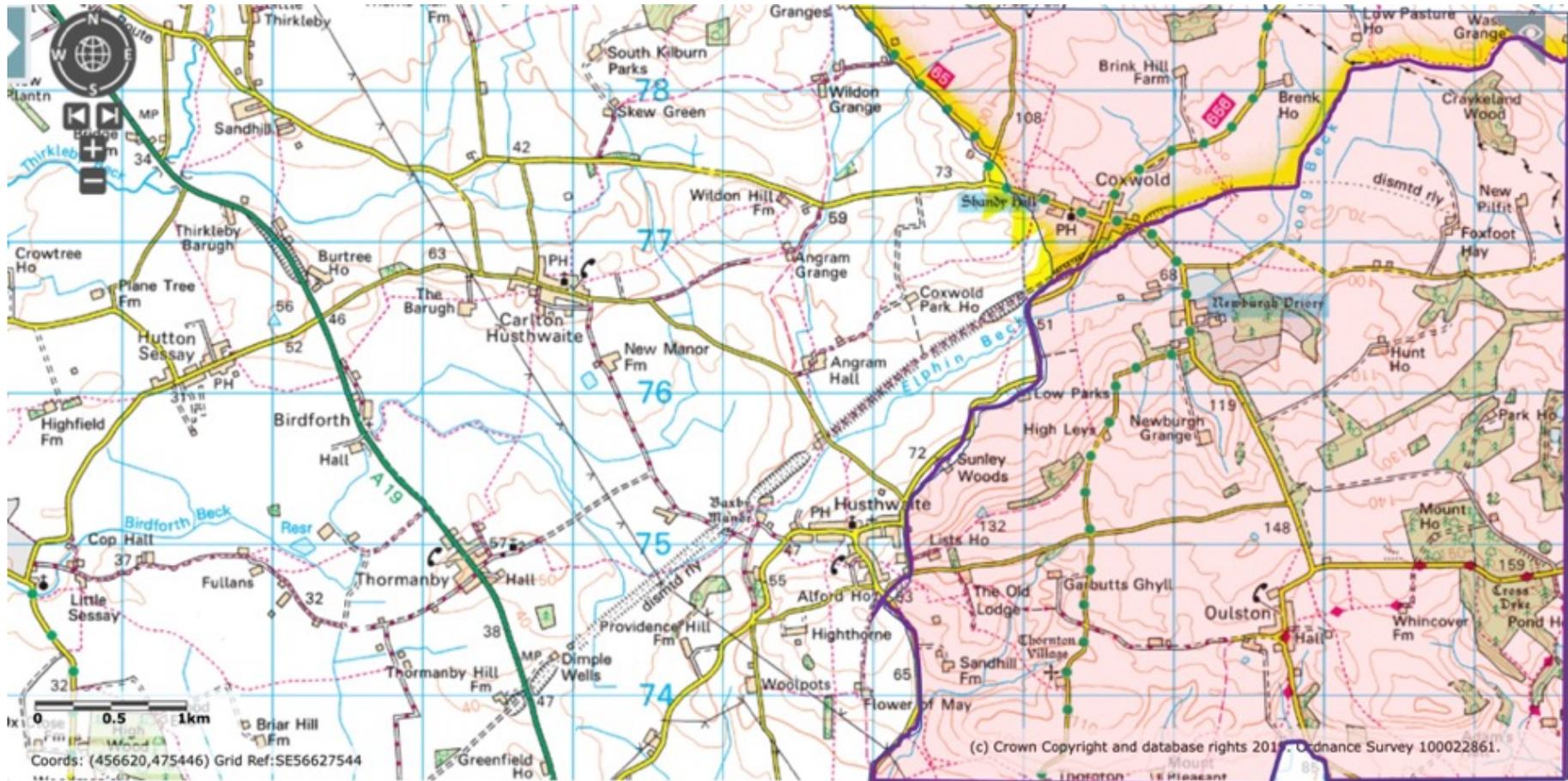
Addition of hypothetical well pads with 1000m horizontal radius



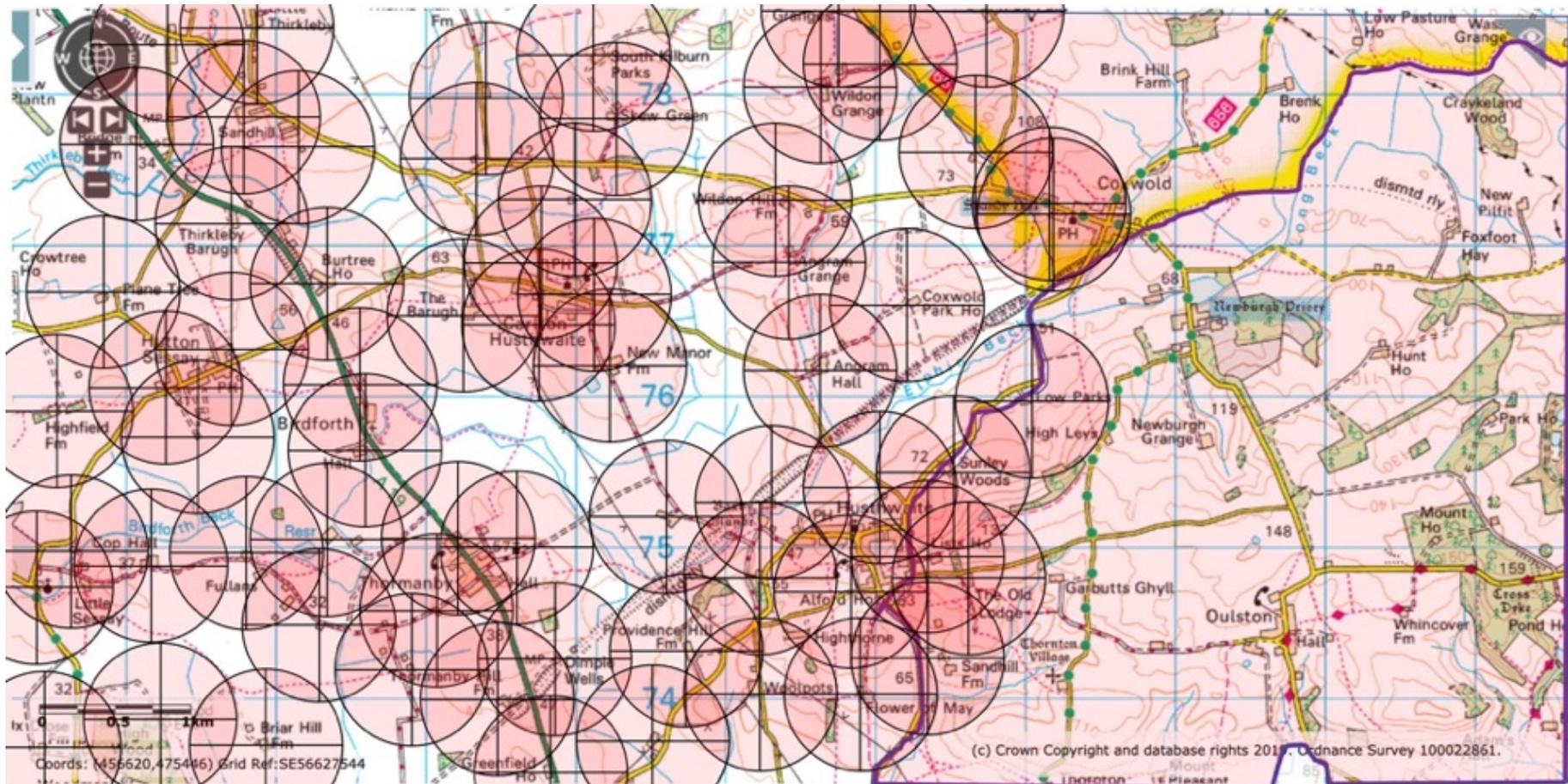
Addition of hypothetical well pads with 2000m horizontal radius



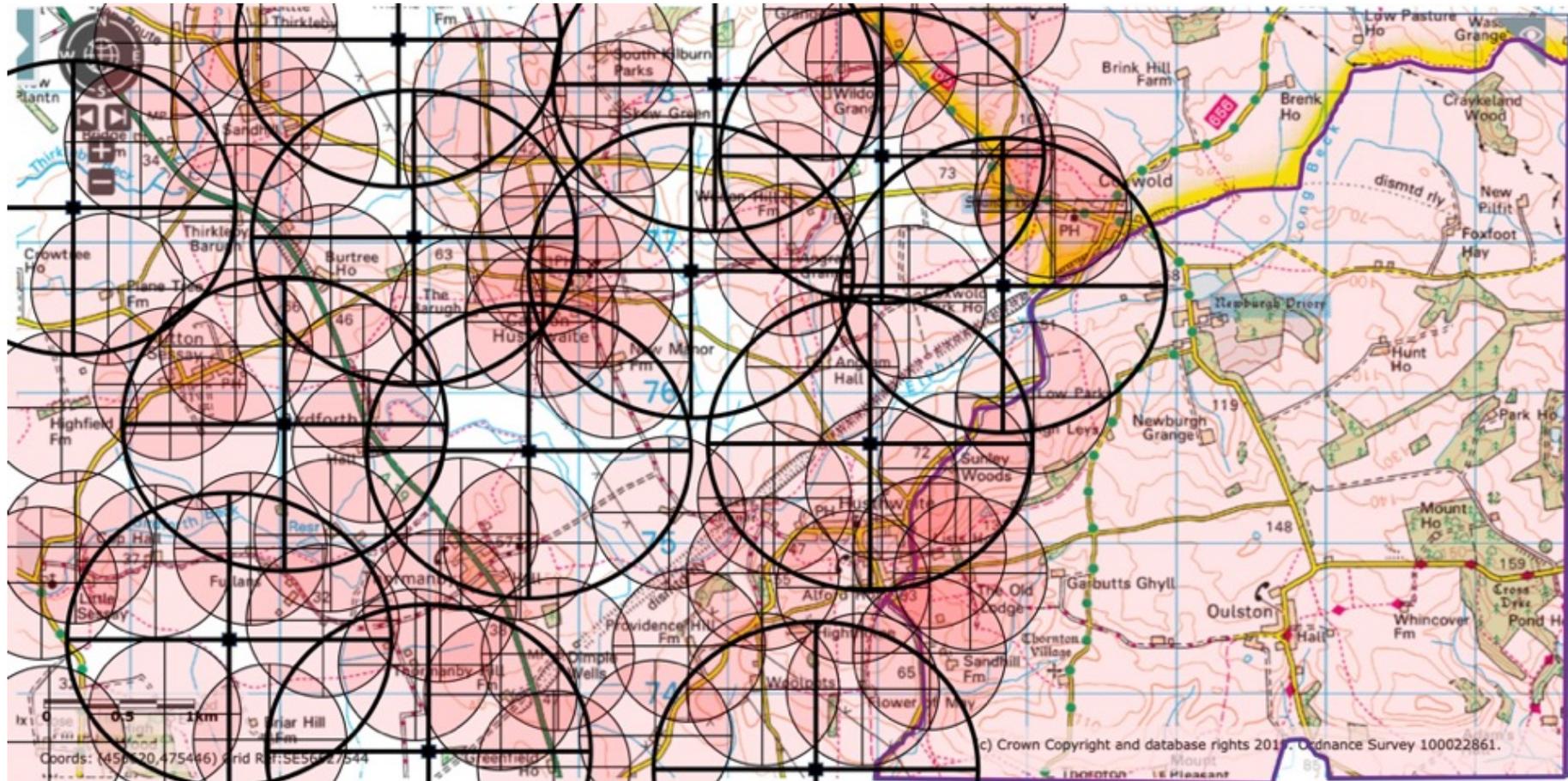
Sample Area 2: Husthwaite



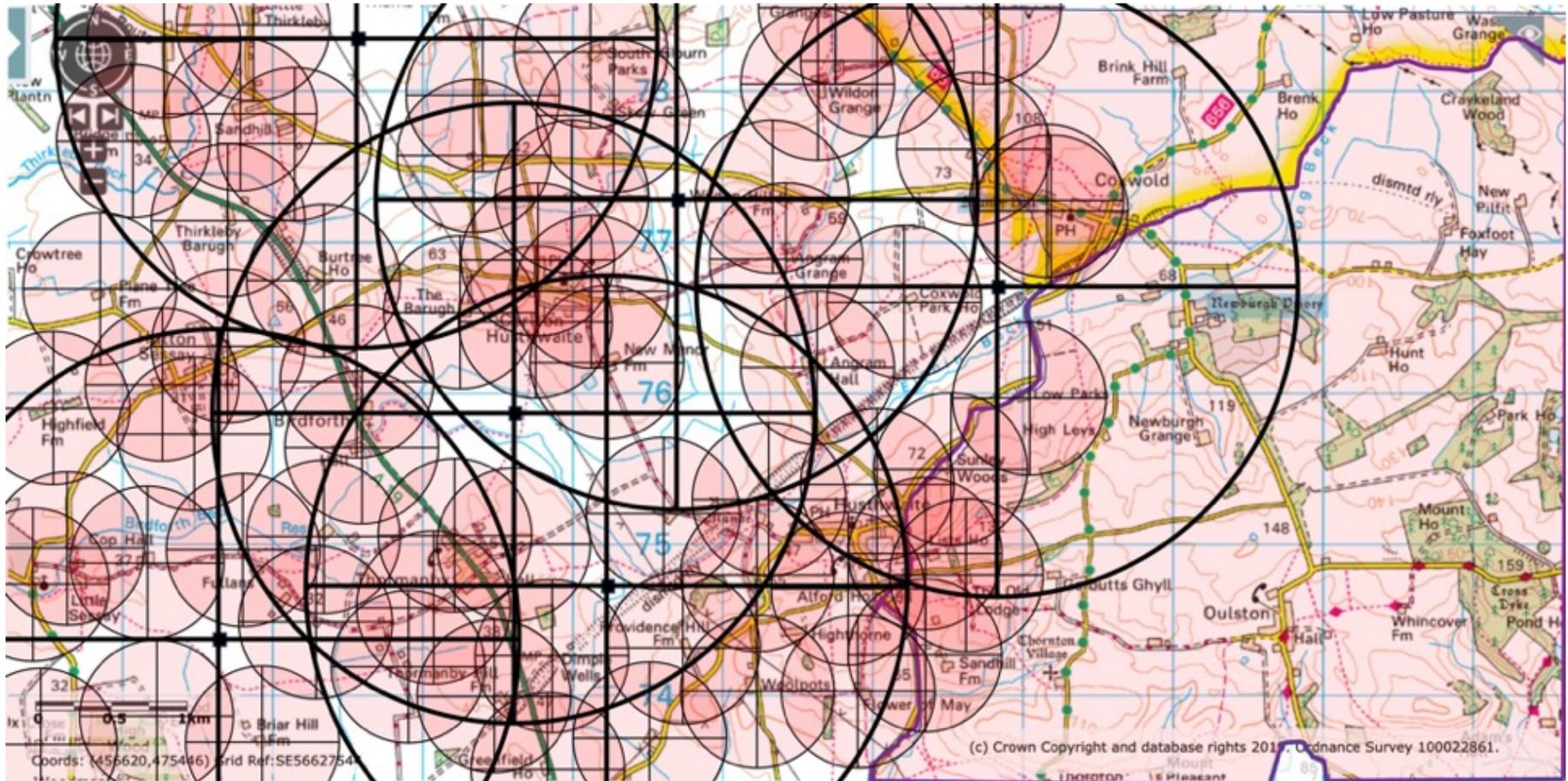
Addition of restricted zones (AONB plus 500m zones around all buildings)



Addition of hypothetical well pads with 1000m horizontal radius



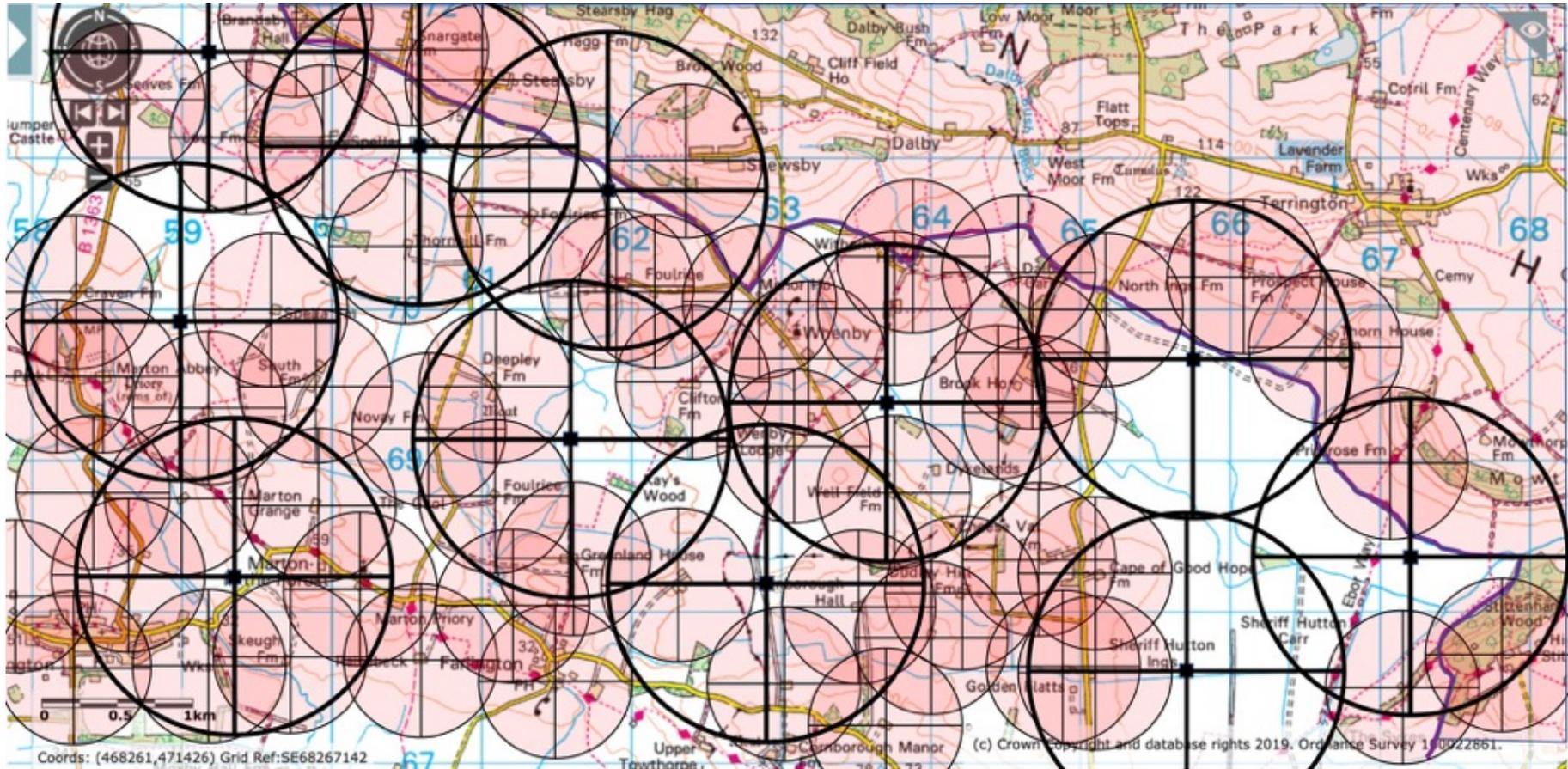
Addition of hypothetical well pads with 2000m horizontal radius



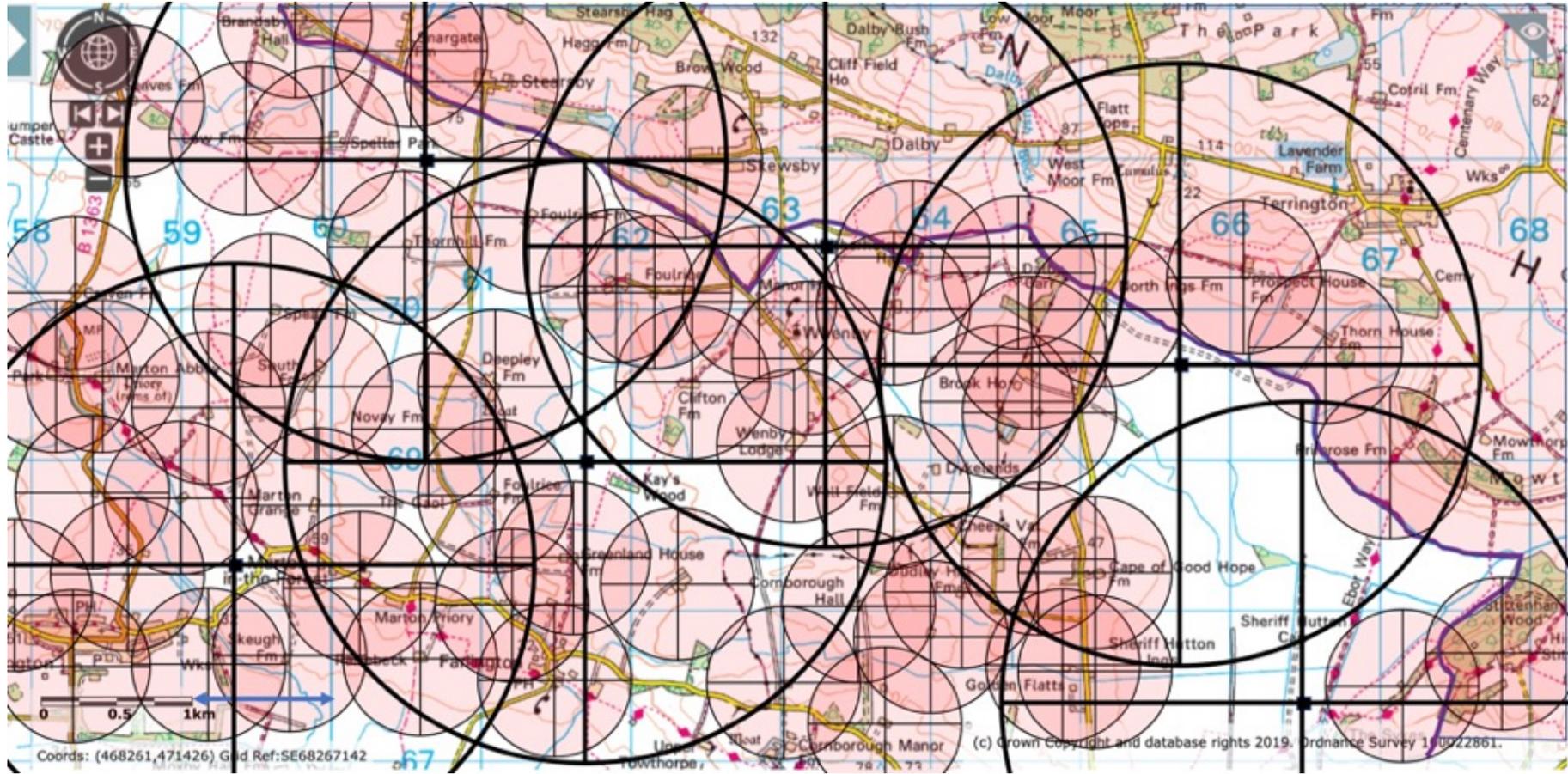
Sample Area 3: Whenby



Addition of hypothetical well pads with 1000m horizontal radius



Addition of hypothetical well pads with 2000m horizontal radius



Appendix 2: Image analysis of maps

Maps shown in Appendix 1 were digitised and specific areas were measured using the image analysis application 'ImageJ'. Areas measured are presented as a percentage of the total area of the map (Table 1).

Table 1. Summary of areas

Map area	% of area in AONB/NP	% not restricted*	% access 1k	% access 2k
Crayke/Oulston	32.7	11.4	49.9	79.1
Husthwaite	39.1	8.1	57.1	70.8
Whenby	32.2	13.6	65.3	86.1

* Not restricted by either AONB/NP or by a 500 metre setback around all buildings

In the following diagrams areas of AONB and National Park are shown in green. Areas covered by 500m zones around buildings are shown in pink. Areas shown in yellow represent the potential reach of horizontal drills of either 1000 or 2000 metres from hypothetical pads placed in non-restricted locations.

Map area 1 (Crayke/Oulston)

Image a: Area of AONB (32.7% of map area)

Image b: Total 'restricted area' of AONB plus 500 m restriction zones. Total restricted area measures 88.6% of the map area, with unrestricted area at 11.4%

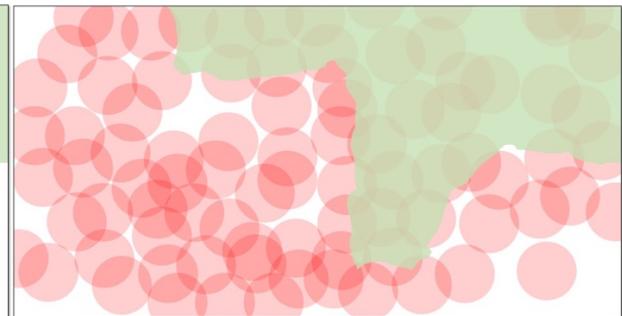
Image c: Area accessible from hypothetical drill pads with a horizontal reach of 1000m radius. Total accessible area measures 49.9% of the map area.

Image d: Area accessible from hypothetical drill pads with a horizontal reach of 2000m radius. Total accessible area measures 79.1% of the map area.

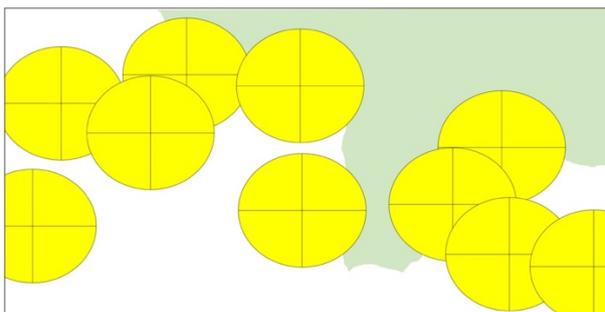
a. Area of AONB - 32.7% of this map area



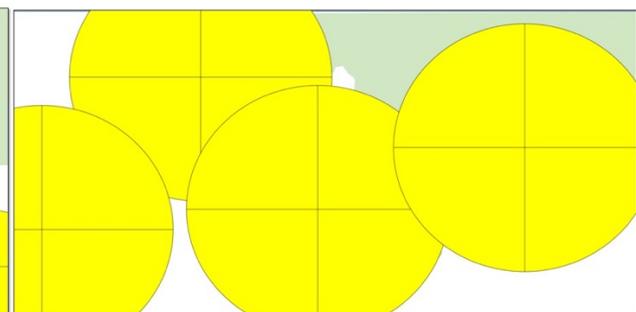
b. restricted area 88.6%, unrestricted area 11.4%



c. 1000m laterals: Total accessible area 49.9%



d. 2000m laterals: Total accessible area 79.1%



Map area 2: (Husthwaite area)

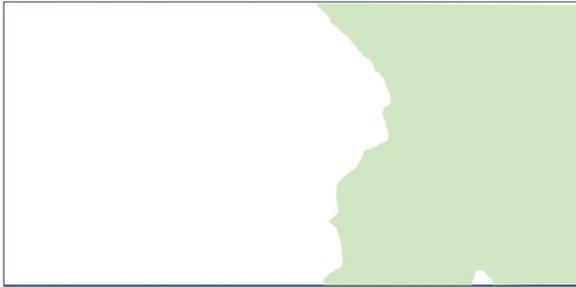
Image e: Area of AONB and NYM NP (39.1% of map area)

Image f: Total 'restricted area' of AONB/NP plus 500 m restriction zones. Total restricted area measures 91.9% of the map area, with unrestricted area at 8.1%

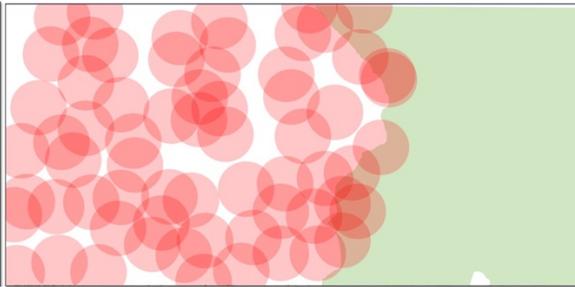
Image g: Area accessible from hypothetical drill pads with a horizontal reach of 1000m radius. Total accessible area measures 57.1% of the map area.

Image h: Area accessible from hypothetical drill pads with a horizontal reach of 2000m radius. Total accessible area measures 70.8% of the map area.

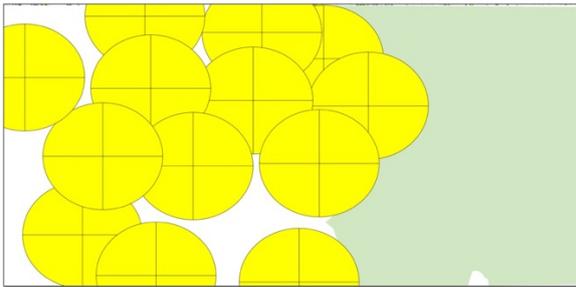
e. Area of AONB - 39.1% of this map area



f. restricted area 91.9%, unrestricted area 8.1%



g. 1000m laterals: Total accessible area 57.1%



h. 2000m laterals: Total accessible area 70.8%



Map area 3: (Whenby area)

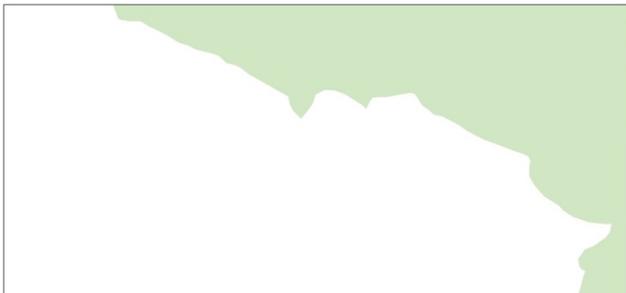
Image i: Area of AONB (32.2% of map area)

Image j: Total 'restricted area' of AONB/NP plus 500 m restriction zones. Total restricted area measures 86.4% of the map area, with unrestricted area at 13.6%

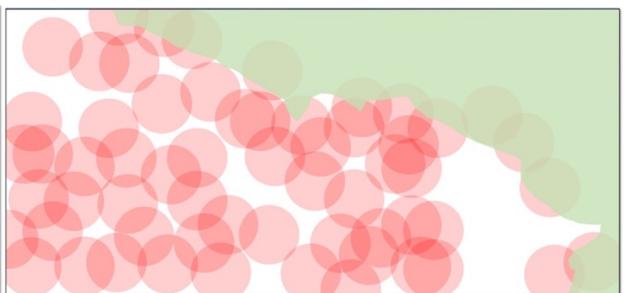
Image k: Area accessible from hypothetical drill pads with a horizontal reach of 1000m radius. Total accessible area measures 65.3% of the map area.

Image l: Area accessible from hypothetical drill pads with a horizontal reach of 2000m radius. Total accessible area measures 86.1% of the map area.

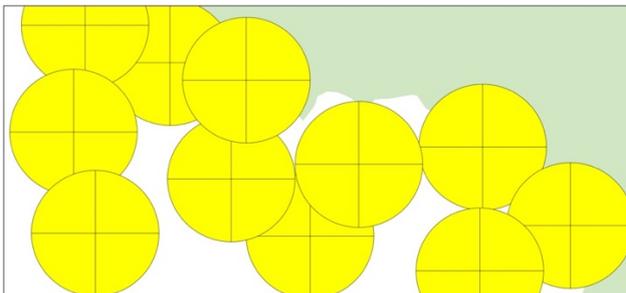
i. Area of AONB - 32.2% of this map area



j. restricted area 86.4%, unrestricted area 13.6%



k. 1000m laterals: Total accessible area 65.3%



l. 2000m laterals: Total accessible area 86.1%

