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Ornithology

## UNSHINAGH WIND FARM (Planning Ref. LA02/2021/1205/F)

### Further Information: ORNITHOLOGY

- 7.1 These remarks are by way of reply to the detailed responses submitted to the planners by **NED Ornithology** and **RSPB NI** in relation to the above proposal and as summarized in the planner's report<sup>1</sup>.

### NED Ornithology

#### Breeding bird surveys

- 7.2 NED Ornithology appears to be content with the methodology used to survey breeding birds including curlew.

#### Winter bird surveys

- 7.3 NED Ornithology has commented that due to some differences in the distribution of survey visits between the two sections of the site then the surveys may not be fully representative of winter bird activity within the entire site throughout the winter season. The comments refer only to Year 2 and relate to a minor difference in the temporal distribution of the winter survey visits between the two sections of the site - there are no concerns in relation to the methodology per se (which is essentially the same time-budgeted method as used for the breeding bird surveys). For such a large site and especially in winter (when periods of inclement weather and limited daylight hours place additional constraints on survey visits) then for practical reasons it is not always possible to align survey visits as might be desired under an 'ideal scenario'. NED Ornithology does not appear to regard this as a significant concern. The surveyor (DS) is a field ornithologist with almost 40 years' experience and is content that the surveys are likely to be representative of bird activity on the site during winter and RSPB NI have not commented on this issue.

#### Vantage point surveys

- 7.4 NED Ornithology appears to be satisfied overall with the methodology of the vantage point surveys however they have some comments.

#### Survey hours

- 7.5 The short-fall of survey hours during the first winter period was due to the chronology of the project therefore it was not possible to commence the winter vantage points before November in Year 1 because the necessary landowner agreements, access permissions and risk assessments for the surveys could not be completed before then. Therefore, there were no vantage point surveys during September and October of the first winter period (2019), however, the month of October was surveyed in 2020 and the month of September was surveyed in 2020 and again in 2021 (Table 7.3 in the ES). VP5 and VP6 were not surveyed in Year 1 but were added in Year 2 due to the

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<sup>1</sup> Section 26 Planning Application Development Management Report (Reference LA02/2021/1205/F)

addition of the southern cluster of turbines that were not included in the layout design at the start of the project. In an 'ideal world' all the vantage points would have been surveyed from the start however the realities of the project chronology and evolution dictated otherwise.

- 7.6 The main concern of NED Ornithology appears to be that the distribution of the survey hours was not explained more fully and it is accepted that this could have been done by way of additional comment within the relevant section of the ES. While notwithstanding the above points, NED Ornithology appears to be content that the VP survey effort was satisfactory overall. In this regard it is worth pointing out that there is a significant degree of overlap in the viewsheds of the various vantage points which means that most of the site received significantly greater survey effort than the required minimum due to being visible from multiple vantage points: for example, almost all of the northern cluster of turbines is visible from three vantage points and the southern cluster from two vantage points - this increased survey effort has not been quantified or tabulated but is well illustrated in Figure 7.1 in the ES ('Ornithology Viewpoint Coverage').

#### ***Vantage point locations***

- 7.7 The selection of the vantage points followed the recommended practice as much as possible within 'real world' constraints - for any vantage point project (and more especially a commercial project) these constraints are very significant and include not just issues to do with the local topography but also issues of land ownership and the associated access permissions required for the surveys. Specifically in relation to the location of VP1, the issue was the local topography - moving the VP to just outside the buffer area results in greatly reduced visibility over the site and this was not considered to be acceptable. Therefore, although VP1 was located within the buffer area, this was a necessary compromise - a highly experienced observer (DS) adopting a static position and a low-profile in the landscape is highly unlikely to have significantly affected bird flight activity within the area visible. As with the survey hours, the main concern of NED (Ornithology) appears to be that the location of the vantage points was not explained more fully and it is accepted that this could have been done by way of further comment within the relevant section of the ES. Hopefully NED Ornithology is now content on both these issues.

#### ***Wider area raptor surveys***

- 7.8 NED Ornithology appears to be content with the methodology and scope of the wider area raptor surveys completed as part of the ornithology assessment.

#### ***Collision risk assessment***

- 7.9 NED Ornithology appears to be content with the collision risk assessment and estimates provided in the ES and are also content that the predicted collision rates are unlikely to cause a significant adverse effect on the local populations of raptor species including hen harrier.

#### ***Curlew***

#### ***Territory mapping***

- 7.10 NED Ornithology would have liked the core areas and wider territories that are utilized by curlew within the site to have been defined and mapped. In order to address this issue, the applicant commissioned further breeding wader survey work and a wider review of breeding waders within the site including a review of the published research in relation to curlew breeding behaviour and territory sizes. This work has been completed by Bird Surveyors Ltd and is included as a Technical Appendix to these remarks. The surveys completed by Bird Surveyors Ltd indicate a curlew population of four or five pairs within a 1 km extent of the site during the survey years 2023 and 2024. Some shifts in territory locations were noted between the survey years and this is discussed further in the report.
- 7.11 The number of curlews found within the survey area in the most recent survey year (2024) is closely comparable to the number found during the 2020 / 2021 baseline period as presented in the ES and is significantly less than the eight to nine pairs indicated by NED Ornithology based on surveys completed by NIEA and RSPB in 2017. Furthermore, the 2017 survey findings are now almost a decade out of date and therefore cannot be considered to be representative of the 'current' curlew population within the survey area. Even after allowing for some shifts in territory locations between survey years, the results of the earlier (ES) and more recent (Bird Surveyors Ltd) surveys are comparable and strongly indicate that the curlew population within the survey area has declined significantly (by approximately 50 %) since the 2017 survey and is 'currently' (2023 / 2024) not more than four or five pairs and this should be taken as the 'current' baseline condition' for curlew. This decline reflects the recent decline in the wider Northern Ireland curlew population as summarized by NED Ornithology in their response. It is also important to note that without the implementation of suitable 'curlew friendly' farming practices then it is quite likely that the numbers of curlew within the site and the immediately surrounding area will continue to decline in keeping with the trend already indicated and currently there are no agreements with landowners or any proposals for the implementation of suitable farming practices on the site beyond those already agreed or currently being negotiated (see below) by the applicant.

***Compensatory habitat***

- 7.12 NED Ornithology has several concerns about the suitability of the habitat compensation area currently being proposed although the size of the proposed area is not specifically mentioned as a concern.
- 7.13 NED Ornithology is concerned that because curlew already occur within the existing (proposed) management area then it cannot be regarded as 'new' habitat however that conclusion does not acknowledge that in better quality habitat curlew can be expected to occur at higher densities than in poorer quality habitat therefore 'new' habitat can in effect be created by improving habitat quality. For example, the standard reference literature describes how curlew breeding density can vary depending on such factors as groundwater level - in wetter habitats curlew can be found at higher densities (and have correspondingly smaller territory sizes) than in



drier habitats<sup>2</sup>. Also, in instances where curlew feeding areas are located some distance from the nest-sites then the feeding areas are more likely to be treated as 'neutral' by the birds therefore birds from different nesting territories may be able to utilize the same feeding area.

- 7.14 NED Ornithology is also concerned that part of the existing (proposed) habitat management area is within 800 m of turbines however this applies to a relatively minor part and most of the management area is beyond 800 m. Although the 'Pearce-Higgins' research indicates that curlew might occur at lower densities within 800 m of turbines it does not indicate that birds would be completely excluded from these areas therefore land within 800 m of turbines (whilst it might be considered to be 'sub-optimal'), can still be expected to have some value.

#### **Size of the curlew habitat compensation area**

- 7.15 NED Ornithology has not raised any specific concerns in relation to the size of the curlew habitat compensation area, however in the light of the other concerns relating to this issue some remarks on the size of the habitat compensation area are included here.
- 7.16 The existing (proposed) curlew habitat compensation area is 49.8 ha which is comparable to the average 'core areas' for curlew that are described in the contemporary published research. This research has been extensively reviewed by Bird Surveyors Ltd in their report (referred to above) however two examples are given: (1) an Irish study found core areas in the range of 34 - 50 ha (median values) with the size of the area occupied depending on the stage of the breeding season; (2) a study in the Yorkshire Dales found mean core areas of between 4 - 59 ha (again, depending on the stage of the breeding season) and an overall average core area size for the entire breeding season of 28 ha. These core area values from the contemporary research are comparable to values quoted for curlew territory sizes in the standard reference literature<sup>3</sup>.
- 7.17 Curlew 'home ranges' are much larger than the core areas however this is a result of the highly mobile behaviour of the birds. For example, they are particularly mobile early in the season on arrival to the breeding area and before they have settled onto nest-sites ('pre-breeding') and again after nesting is finished and they are preparing to depart the breeding area ('post-breeding'). Furthermore, feeding sites used by the birds can in some instances be located some distance away from the nesting areas. Therefore, not all of the wider home range is 'functional habitat' that is utilized by the birds.
- 7.18 Considering the findings of the contemporary published research and also the additional information in the standard reference literature then it is proposed that

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<sup>22</sup> Cramp, S. et al. (2000) 'The Birds of the Western Palearctic, Volume III, Waders to Gulls' Oxford University Press

<sup>3</sup> Cramp, S. et al. (2000) 'The Birds of the Western Palearctic, Volume III, Waders to Gulls' Oxford University Press

the size of any curlew habitat management area should be acceptable so long as it is comparable to the core areas that are likely to be required by the birds that might be displaced. This approach would be expected to provide at least adequate habitat for the birds to complete their breeding cycle and in particular during the most sensitive stages of the breeding season (nesting and early chick rearing) when the core areas are more tightly constrained. The birds will still be able to visit other habitat patches within a wider home range, with the core area (which is of most value to the birds) being under habitat management measures.

- 7.19 N.B. Alongside a revision to the number and location of turbines within the site and in consideration of the updated curlew baseline the applicant has been negotiating with landowners and has agreed additional land in a suitable area (> 800 m from turbines) that will be added to the existing proposed curlew habitat management area. Refer to Section 6 of this FEI, a total of 147ha of curlew management will be provided as part of the project.

#### **Proposed 'curlew extension' to Antrim Hills SPA**

- 7.20 NED Ornithology mentions a possible boundary extension to the Antrim Hills SPA for curlews however at the time of writing it appears that this is just a proposal which is being considered by NIEA and has not been confirmed.

#### **Antrim Hills SPA**

- 7.21 NED Ornithology has concerns in relation to the Antrim Hills SPA which is designated for its breeding populations of hen harrier and merlin.

#### **Wind farm infrastructure**

- 7.22 The concerns of NED Ornithology appear to relate principally to wind farm infrastructure being located within the SPA boundary. A revision to the proposed infrastructure layout has reduced the number of turbines from 14 to nine by way of deletion of the four turbines previously located within the SPA (T7, T9, T12 and T13) and the additional deletion of T2. A short section of proposed track (partly linking the locations of T8, T10 and T11) remains within the SPA however it is located close to the boundary and is within an area of farmland (small enclosed fields) where there are already several existing tracks that are used by farm vehicles.

#### **Hen harrier foraging**

- 7.23 NED Ornithology also appears to have some concerns in relation to possible connectivity of the proposal with foraging hen harriers that originate from nest locations within the SPA. The information held by NED Ornithology (and included in their response) indicates that the closest hen harrier nest in recent years (2018) was located approximately 3 km from the nearest proposed turbine which is closer to the turbines than nests located during the baseline surveys (none closer than 4 km) but is still beyond the 'core' foraging range for hen harrier indicated by the published guidance. As stated by NED Ornithology the core foraging range for hen harriers is taken as 2 km although the birds travel beyond this distance - up to 10 km has been

recorded in Scotland, however in the context of Northern Irish habitats 10 km is likely to be very exceptional and a 5 - 6 km limit is more typical (DS, pers. obs.). The published guidance<sup>4</sup> recommends that the “core range should be used” when determining whether there is likely to be connectivity between a proposal and the relevant SPA qualifying feature - in this case the qualifying feature is hen harrier therefore the distance for determining connectivity should be 2 km. The guidance does also state that in “exceptional cases” maximum foraging distances may be considered in the assessment of connectivity (for example in cases where there is a lack of other foraging habitat available to the birds) however in the case of the current proposal that scenario is not supported by the hen harrier foraging observations, both within the site (low levels of foraging activity were observed) or within the wider area of the SPA (extensive suitable foraging habitat is found within the vicinity of both the most recently confirmed nest-sites).

- 7.24 N.B. The nest locations quoted above relate to the original turbine layout, however with the deletion of the four turbines within the SPA then the distances for all nests relative to the nearest turbines will, accordingly, now be significantly greater.

#### Merlin

- 7.25 NED Ornithology mentions that merlin have historically been present in the vicinity of the proposal, however based on the information presented in the ornithology report, NED Ornithology appears to be content that the proposal is unlikely to have any significant adverse effects on merlin.

## RSPB NI

#### Curlew

- 7.26 RSPB NI has concerns in relation to curlew. These are broadly the same as the concerns expressed by NED Ornithology and RSPB NI reference the same 2017 curlew survey findings as NED. The remarks made above in relation to curlew under ‘NED Ornithology’ are therefore also relevant to the RSPB NI concerns and so it is not necessary to repeat those remarks here however some further remarks are offered in relation to some of the specific points mentioned by RSPB NI.

#### Curlew displacement

- 7.27 RSPB NI contend that the assumption should be that all of the curlew pairs present within the likely zone of effects of the proposal will be displaced however this is an over-precautionary approach and is not supported by the published ‘Pearce-Higgins’ research. As already discussed under ‘NED Ornithology’ above, the applicant commissioned further breeding wader survey work including an analysis of curlew territories and possible displacement values - this work has been completed by Bird Surveyors Ltd and their report is included as a Technical Appendix to these remarks.

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<sup>4</sup> SNH (2016) Assessing Connectivity with Special Protection Areas (Guidance Note June 2016)

## **Curlew numbers**

- 7.28 RSPB NI quote the findings of the 2017 survey (also referenced by NED Ornithology) plus the results of surveys completed in 2018 and 2019 however all these surveys are now more than five years out of date and cannot therefore be regarded as ‘current’. RSPB NI also provide some curlew observations from 2020 and 2021 - these are therefore contemporaneous with the baseline ornithology surveys completed for the ES however (as acknowledged by RSPB NI) the survey coverage was incomplete for those two years and therefore the observations are not comparable with the surveys completed for the ES which covered all of the survey area. As already described above under ‘NED Ornithology’ the most recent surveys (completed by Bird Surveyors Ltd) indicate that the results of these earlier surveys are now out of date.. Even after allowing for some shifts in territory locations between years, the ‘current’ (2023 / 2024) curlew population within the entire survey area is four or five pairs and this should be taken as the new ‘baseline condition’ for assessing any displacement effects.

## **Hen Harrier**

- 7.29 RSPB NI has concerns in relation to hen harriers. These are broadly the same as the concerns expressed by NED Ornithology in relation to the Antrim Hills SPA for which hen harrier is the principal qualifying interest and the remarks made above under ‘NED Ornithology’ are therefore not repeated here, however some additional clarification is provided in relation to specific points raised by RSPB NI.

## **Habitat suitability assessment**

- 7.30 RSPB NI has requested that details of the hen harrier ‘Habitat Suitability Assessment’ are provided for review however the reference to this in the ES was simply in relation to general appraisals of habitat quality made by the surveyor (DS) during the course of fieldwork and contrary to the expectations of RSPB NI a report was not completed in relation to this - in retrospect (and to avoid confusion) this could have been made clearer in the ES. Although a report was not completed, the in-field appraisal of general habitat suitability was done by an observer with almost 40 years’ experience watching hen harriers in the upland habitats of Northern Ireland so it is contended that this appraisal (and the associated remarks in the ES) should be considered to be of relevance even in the absence of a report.

## **Golden Eagle**

- 7.31 RSPB NI appears to have some concerns in relation to golden eagles and mention that a pair have been trying to establish a territory over recent years in East Antrim. While this is not disputed, there has to be considerable doubt over how likely it is that a permanent territory will be established within the wider vicinity of the proposal and over what time scale this might occur. As things stand, the baseline observations presented in the ES should be taken as representative of golden eagle activity in the vicinity of the proposal and indicate that there are unlikely to be any significant adverse effects on golden eagles.

### **Collision risk assessment**

- 7.32 RSPB NI would have liked curlew to be included within the collision risk assessment however due to the large displacement distances that are indicated for curlew by the ‘Pearce-Higgins’ research it is expected that any collision risk effects will be insignificant when considered in the context of displacement effects therefore displacement (not collision risk) should be considered to be the ‘real’ issue in terms of possible adverse effects on curlew<sup>5</sup>. For this reason, the curlew assessment focused on displacement effects and a collision risk assessment was considered to be unnecessary.

### **Cumulative effects**

- 7.33 RSPB NI has commented on several aspects of the cumulative assessment included within the ornithology report.

### **Scope of cumulative assessment**

- 7.34 RSPB NI is of the view that the cumulative assessment should have included all other types of developments within the relevant area and not been confined to an assessment of other wind farms. Whilst it is acknowledged that this approach is recommended within the SNH guidance, the guidance also acknowledges that to complete a cumulative assessment requires data and that access to such data “may not always be possible”. The guidance recommends that data for cumulative assessments will normally be obtained from the environmental statements, however for some types of developments environmental statements are not required or relevant data may be unavailable for other reasons and in some cases the possible effects of the ‘other types’ of developments on sensitive bird species are either not known, cannot be quantified or are likely to be insignificant when compared to the possible displacement effects of wind farms. In reality, therefore, including all these other types of developments is in most cases unrealistic and / or unnecessary. Furthermore, the approach taken by the assessment has been the same as that followed by previous cumulative assessments completed by DS in relation to other wind farm proposals and there have been no adverse comments regarding this approach either from the statutory consultees or RSPB NI.

### **Hen harriers**

- 7.35 RSPB NI has commented that the cumulative assessment for hen harriers should have been based on the maximum foraging range rather than the core foraging range however this is an over-precautionary approach and is not supported by the published SNH guidance which recommends that the “core range should be used” when determining whether there is likely to be connectivity between a proposal and the relevant SPA qualifying feature.

### **Mitigation measures**

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<sup>5</sup> Percival, S. (2005): Birds and wind farms, what are the real issues? (British Birds 98 / 4)

- 7.36 RSPB NI has concerns in relation to the proposed habitat management measures for curlew. These are broadly the same as the concerns expressed by NED Ornithology and include: (1) that part of the proposed curlew management area is within 800 m of turbines; (2) the size of the compensation area and (3) the issue of ‘new’ habitat. These issues have been addressed in detail under ‘NED Ornithology’ and those remarks are therefore not repeated here, however some additional remarks are provided in relation to specific issues raised by RSPB NI.

### **Construction outside the bird breeding season**

- 7.37 RSPB NI is of the opinion that offering to construct the proposed wind farm outside the bird breeding season is not likely to be a useful mitigation measure however this is not supported by the ‘Pearce-Higgins’ research which concludes that “effects appear to result from disturbance during wind farm construction”. The same research further concludes by recommending further studies on the impacts of construction on large waders (including curlew) and ways to mitigate these effects and suggests that these could include “the preclusion of construction activity during the breeding season to prevent detrimental effects of disturbance”<sup>6</sup>.
- 7.38 Turbines T8 and T9: RSPB NI have particular concerns in relation to T8 and T9 due to proximity to curlew locations however following the revision to the turbine layout T9 has now been deleted.
- 7.39 HRA / appropriate assessment: RSPB NI have some concerns in relation to the HRA included within the ornithology report however in any case an appropriate assessment in relation to the proposal has subsequently been completed by Shared Environmental Service and this has been made available to the planners.

### **Survey Methodology**

- 7.40 RSPB NI has made some comments in relation to the bird survey methodologies in the ornithology report - the comments are quite detailed and an attempt is made to address what appear to be the principal concerns. As a general remark, it is noted that the SNH guidance emphasises the need to use “appropriately skilled and experienced observers” and in this regard it is significant that the surveyor for the ornithology baseline (DS) has almost 40 years of ‘field’ experience.

### **Vantage point survey hours**

- 7.41 RSPB NI has commented on the survey hours for the vantage points. Several remarks in relation to this issue are included above under ‘NED Ornithology’ therefore those are not repeated here. However, it is worth reiterating that there is a significant degree of overlap in the viewsheds of the various vantage points which means that most of the site received significantly greater survey effort than the required minimum due to being visible from multiple vantage points: for example, almost all of the northern cluster of turbines is visible from three vantage points and the

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<sup>6</sup> Pearce-Higgins, J.W. et al. (2012) ‘Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis’ *Journal of Applied Ecology*

southern cluster from two vantage points - this increased survey effort has not been quantified or tabulated but is well illustrated in Figure 7.1 in the ES ('Ornithology Viewpoint Coverage').

### Simultaneous surveys

- 7.42 RSPB NI identify several examples of apparent simultaneous vantage point surveys however no simultaneous watches were completed therefore any such 'apparent examples' can only be due to minor errors in either field-recording or data-input. In particular, it is perhaps to be expected that some field-errors might occur, however, any such errors should be viewed in the context of the entire two-year baseline study. It seems unreasonable of RSPB NI to focus on any such errors and in particular to suggest that there might be concerns about the validity of the vantage point surveys, which were completed by an observer with almost 40 years' experience. It is worth noting that the observed flight activity for the various raptor species is broadly in line with what might be expected for a site in this part of the Antrim Plateau and (importantly) the foraging activity for hen harriers observed within the site is in keeping with the locations of the confirmed nest-sites within the wider surrounding area.
- 7.43 Two of the examples of apparent simultaneous watches given by RSPB appear to be mistaken: on 13.06.20 a watch was indeed completed at VP4 however there was no watch that day at VP3 (a watch was also completed at VP1 but not simultaneously with VP4) ; similarly, on 14.06.20 a watch was completed at VP4 however there was no watch that day at VP3 (a watch was again also completed at VP1 but not simultaneously with VP4).

### Watch durations

- 7.44 RSPB NI has commented on the duration of some of the VP watches and refer to the 9-hour daily limit per observer that is recommended by the SNH guidelines. It is recognised that on several of the days mentioned by RSPB the observer (DS) exceeded the recommended 9-hour maximum however in three of the examples the limit was exceeded by just one hour. It is also recognised that one 12-hour VP-day was completed by the observer however this needs to be viewed within the context of two years of survey work. Furthermore, the other two examples of 12-hour VP-days given by RSPB appear to be mistaken: only six hours appear to have been completed on 13.06.20 and eight hours on 14.06.20. Because the survey site is quite remote and can be difficult to access at times then on occasions a pragmatic decision was taken by the observer to remain 'in the field' and continue with surveys so as to maximize (for example) time spent on the site during suitable conditions and this is mentioned in the ornithology report. For an experienced, skilled and highly motivated observer then occasional long-duration survey days can be considered acceptable - by way of example, skilled and highly motivated observers surveying honey buzzards in central Scotland will complete vantage-point watches of up to ten-hours duration<sup>7</sup>.

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<sup>7</sup> McInerney, C.J. and Shaw, K.D. (2022) 'The Honey Buzzard in central Scotland' *British Birds* 115, April 2022, 198-212

### **‘Settling-in times’**

- 7.45 RSPB NI has commented on the ‘settling-in times’ for some of the watches and refer to the 10-minute settling-in period that is recommended by the SNH guidelines however for an experienced observer the absolute requirement for a settling-in period can be gauged depending on various factors such as the approach route to the vantage point (and therefore whether birds are likely to have been disturbed), bird activity on the site and use of a vehicle as a ‘hide’ or ‘screen’ therefore (for an experienced observer) some degree of variation from the guidelines on settling-in periods should be acceptable.

### **VP Selection**

- 7.46 RSPB NI has commented on some of the vantage point locations. These issues have been addressed in the remarks under ‘NED Ornithology’ and those remarks are therefore not repeated here. RSPB NI also refers specifically to the vantage point located in the vicinity of the harrier roosting-spot and has concerns that the presence of an observer at this vantage point might have influenced the behaviour of birds approaching the roost. Although not stated in the ornithology report, the VP in question is located beside a farm track and it was possible to make some of the observations using a vehicle either as a full ‘hide’ or partial ‘screen’ therefore in those specific instances it is highly unlikely that the flight behaviour of harriers approaching the roost site would be affected. In any case (and as stated in the ES) the observer is highly skilled and experienced (with almost 40 years of field-experience) and would not place himself in a location where the behaviour of a ‘target species’ is likely to be affected - field experience indicates that a static observer, wearing subdued clothing and adopting a low-profile in the landscape is highly unlikely to have a significant effect on the flight behaviour of birds in the immediate area. In retrospect, however, it is acknowledged that it would have been useful to have included further details of the vantage point selection within the relevant section of the ES.

### **Conclusions**

- 7.47 These remarks have attempted to address the principal concerns raised to the planners by NED ornithology and RSPB NI in relation to the proposed Unshinagh Wind Farm. The concerns relate primarily to issues around curlew displacement, curlew habitat compensation and the Antrim Hills SPA (hen harriers). Subsequent to the original planning submission (LA02/2021/1205/F) the applicant has:
1. Reduced the turbine layout from 14 to nine by removing the four turbines previously located within the SPA boundary (T7, T9, T12 and T13) and also removing T2 - a short section of proposed new track remains within the SPA but is close to the boundary within an area of enclosed farm fields and there are existing farm tracks in that area;
  2. Engaged with landowners with a view to obtaining additional land in a suitable area (> 800 m from turbines) that could be included as part of the curlew habitat management area in addition to the land that has already been secured (see Section 6 of this FEI, 147ha of Curlew Management to be provided);



3. Commissioned further breeding wader survey work and a wider review of breeding waders within the site including a review of the published research in relation to curlew breeding behaviour and territory sizes.

### **Reduced turbine layout**

- 7.48 As a general remark, the reduction in the number of turbines from 14 to nine is expected to significantly reduce overall any possible adverse effects on local bird communities due to the proposed development.

### **Curlew**

- 7.49 The new surveys commissioned by the applicant have indicated a curlew population within the survey area that is significantly lower (by about 50%) than the numbers indicated by the earlier surveys completed by NIEA and RSPB NI (which in any case are more than five and, in some instances, approaching ten years out of date). The updated curlew baseline and revised displacement estimate for curlew are fully detailed and discussed in the Bird Surveyors Ltd report commissioned by the applicant.
- 7.50 The review of the contemporary research on curlew breeding and territorial behaviour along with consideration of the standard reference literature has provided an indication of the size of the area of curlew compensation habitat that might be required and this is comparable to the curlew 'core areas' (the areas of most importance for completion of the breeding cycle) rather than the 'home ranges' (which are much larger and include significant areas of 'non-functional' habitat). It is considered that the existing (proposed) curlew compensation area, in combination with the additional land that it is hoped to secure, should provide at least adequate habitat for the birds to complete their breeding cycle.

### **SPA (hen harriers)**

- 7.51 The conclusion of the appropriate assessment completed by SES was based on the location of significant parts of the wind farm infrastructure within the SPA, however with the removal of the four turbines previously located within the SPA boundary there should not now be any significant direct impacts on the SPA / hen harrier habitat. A short section of proposed track remains within the SPA but for the reasons already outlined above this is not likely to be significant in terms of the overall integrity of the SPA. The possible indirect effects on hen harriers (foraging displacement) also need to be assessed. Considering the locations of 'contemporary' hen harrier nest-sites (those occupied within the last ten years) then (for core foraging ranges as recommended by the SNH guidance) there is highly unlikely to be significant connectivity between the revised wind farm infrastructure and hen harrier nest-sites located within the SPA.

## Appendix:

# Unshinagh Windfarm

## Breeding Waders Review

May 2026

# 1 Introduction

## 1.1 Background

The Unshinagh Wind Farm proposal (LA02/2021/1205/F) has undergone previous environmental assessment, including ornithological surveys completed between 2019 and 2021 and subsequent statutory consultation. During the determination process, significant concerns were raised by NIEA, Shared Environmental Services (SES), RSPB NI and the Planning Authority regarding potential impacts on breeding waders, particularly curlew, snipe, and lapwing, within and around the proposed development footprint.

These concerns centred on the sensitivity of the Antrim Plateau for breeding waders, the presence of territories within 500 m and 800 m of proposed turbine locations, and the need for a robust, contemporary evidence base to understand spatial and temporal patterns of wader activity. The Planning Authority's Notice of Opinion (January 2024) highlighted the requirement for clearer demonstration that the development would not result in unacceptable adverse impacts on Northern Ireland Priority Species, including curlew.

In response, the Developer commissioned an updated programme of ornithological fieldwork covering the 2023–2025 breeding seasons, together with a review of earlier baseline surveys and relevant third-party datasets (RSPB NI, NIEA/NED). This work has been undertaken by Bird Surveyors Ltd following recognised and published best practice for upland wader survey, territory mapping and review of potential displacement and disturbance.

The purpose of this Breeding Waders Review is to provide an updated, multi-year review of breeding wader distribution, abundance and territory stability within the 500 m turbine buffer, the 800 m curlew buffer, and the wider 2 km priority species survey area. The review also considers the implications of these findings for project design, mitigation planning and future ornithological requirements.

It is recognised that breeding wader populations on the Antrim Plateau exhibit annual variation in occupancy, productivity and detectability, and that curlew in particular are undergoing severe national and regional decline. Updated survey effort therefore provides essential context to understand the persistence, vulnerability and conservation significance of wader territories in proximity to the proposed development.

This report forms part of the Developer's ongoing programme of ornithological assessment and is intended to support decision-making, inform any future design evolution, and ensure that breeding wader interests are fully considered in accordance with relevant planning policy and environmental legislation.

## 1.2 Purpose of Report

This Breeding Waders Review has been prepared to provide an updated review of breeding wader activity within and around the proposed Unshinagh Wind Farm. The report consolidates multi-year field surveys (2023–2025) with a review of earlier baseline data (2020–2021) and relevant third-party information to ensure that the current understanding of wader distribution, abundance and territory stability is accurate, contemporary and robust. The purpose of this report is to:

- document the presence, status and spatial distribution of key breeding wader species, notably curlew, snipe, lapwing and golden plover, within the 500 m turbine buffer, the 800 m curlew buffer and the wider 2 km priority species survey area;
- identify any persistent or emerging breeding territories of conservation concern;
- provide an evidence base to inform project design, mitigation planning and future ornithological requirements;
- ensure that breeding wader interests are fully considered in accordance with relevant planning policy, environmental legislation and the expectations of statutory consultees.

# 2 Monitoring & Review

A programme of breeding-season surveys has been undertaken at Unshinagh to establish an understanding of wader activity within the development area and the wider survey buffers. Earlier surveys completed between 2020 and 2021 as part of the Environmental Impact Assessment provide the initial dataset for curlew, snipe, golden plover and other waders. To complement

this baseline, a further period of targeted survey was carried out between 2023 and 2024, following recognised best-practice methods for upland breeding bird assessment.

The combined dataset allows for a multi-year review of breeding wader distribution, territory persistence and habitat use across the site. Surveys were undertaken within the 500 m turbine buffer, the 800 m curlew buffer and the wider 2 km priority species survey area. Methods deployed across both survey periods include systematic walkover surveys, breeding bird transects, vantage point observations and targeted dusk surveys for snipe.

A combined approach has been used to assemble the breeding wader evidence base for Unshinagh. This includes extraction of relevant information from the earlier Environmental Impact Assessment (EIA) surveys completed between 2019 and 2021, targeted breeding-season surveys undertaken in 2023 and 2024, and a review of publicly available datasets and consultee submissions.

The following subsections outline the survey approach used to inform the breeding wader review and describes how the earlier and updated datasets have been integrated. The following subsections provide a summary of each survey method and the parameters recorded, forming the basis for the assessment of breeding wader activity at Unshinagh.

## **2.1 Review of EIA Baseline Data (2019–2021)**

Breeding wader information from the Environmental Impact Assessment surveys undertaken between 2020 and 2021 was collated to establish the initial baseline for this review. All relevant material from the published Environmental Statement and its technical appendices was examined, including mapped observations, vantage point records, walkover survey outputs and breeding bird registrations for curlew, snipe, lapwing and other waders. These data were extracted and reorganised into a consistent analytical format to allow direct comparison with the updated survey results.

Where the original material was presented in figure format, mapped locations, flightlines and territory indicators were digitised to ensure that all records could be assessed spatially within the 400 m snipe buffer, 500 m turbine buffer, the 800 m curlew buffer, the 1 km curlew buffer and the wider 2 km priority species survey area. This process ensured that the earlier dataset could be integrated with the more recent survey years and assessed using the same spatial framework. The extracted EIA dataset therefore provides a spatially referenced baseline against which subsequent breeding seasons can be compared.

## **2.2 Updated Breeding Wader Surveys (2023–2024)**

A further programme of breeding-season survey work was undertaken in 2023 and 2024 to supplement the original 2020–2021 baseline and to provide additional information relevant to the revised turbine layout. The 2023 surveys focused primarily on the northern part of the survey area, including the Curraghvaghil Loughs and adjacent habitats, and did not provide full coverage of the southern sector. This work was designed both to update information on breeding waders within the northern portion of the site and to examine potential functional connectivity between the site and the Antrim Hills SPA in relation to hen harrier movements.

In 2024, a full breeding-season survey programme was completed across the entire original application site, covering the period from March to August. This included systematic walkover surveys to document territorial behaviour and breeding evidence, breeding bird transects across suitable habitats, vantage point observations to record flight activity and wider landscape use, and targeted surveys to detect snipe and other waders during peak display periods. Surveyors recorded all relevant behaviours, including display flights, calling birds, foraging movements and any evidence of confirmed or probable breeding. All observations were mapped in the field and subsequently digitised to ensure compatibility with the earlier baseline dataset.

Together, the 2023 and 2024 surveys provide updated information on breeding activity, territory locations and patterns of site use, allowing the earlier 2020–2021 baseline to be revisited in light of the more recent field information. This combined dataset forms the basis for reviewing wader occupancy across the site and for understanding how the revised layout relates to the most current ornithological information.

## **2.3 Review of Publicly Available Information and Consultee Submissions**

In addition to the field survey data, a review was undertaken of publicly available information relevant to breeding waders in the Unshinagh area. This included consultee submissions provided during the planning process, such as those from NIEA

Natural Environment Division, RSPB NI and Shared Environmental Services, as well as any other wader records available in the public domain. These sources were examined to identify additional observations, long-term patterns or contextual information that could inform the assessment.

As part of this review, the DAERA Natural Environment Map Viewer was consulted to identify designated sites, priority habitats and any mapped records of sensitive species within and around the survey area. The map viewer provides spatial layers relevant to breeding waders, including habitat classifications and species records, and was used to confirm the wider ecological context of the site.

In addition, the DAERA Breeding Wader Mapping Tool, launched to support the protection of breeding wading birds in Northern Ireland, was reviewed to identify any mapped concentrations of curlew, lapwing, snipe or redshank etc within the wider landscape. This tool provides an overview of areas where breeding waders have been recorded historically or recently and assists in understanding regional patterns of occupancy that may be relevant to the Unshinagh site.

Where spatially referenced information from these sources was available, it was incorporated into the mapping and comparison process to ensure that all relevant evidence was considered. This review provides an additional layer of context to the field survey data and helps ensure that the breeding wader assessment reflects the full range of information available for the site and its surrounding landscape.

## 2.4 Synthesis of Wader Information and Review Framework

The combined dataset from the EIA baseline surveys (2019–2021), the updated breeding-season surveys (2023–2024), and the review of publicly available information provides comprehensive multi-year evidence base for understanding breeding wader activity within the Unshinagh landscape. When considered together, these sources allow for an integrated review of territory distribution, habitat use and spatial patterns of occupancy in relation to the revised windfarm layout.

The synthesis of these datasets enables a wider understanding of how curlew, snipe, lapwing and other waders utilise the site and its surrounding habitats. By examining repeated observations across multiple breeding seasons, it is possible to identify areas of consistent use, locations where territories have persisted over time, and areas where activity has varied between years. This multi-year perspective is essential for interpreting the ecological function of the site and for understanding how breeding waders interact with the landscape at both local and wider spatial scales.

The revised windfarm layout has been considered within this context by examining the spatial relationship between proposed turbine locations, associated infrastructure and the mapped distribution of wader territories. This includes review of interactions within the 400 m snipe buffer, 500 m turbine buffer, the 620 m, 800 m and 1 km curlew buffers and the wider 2 km priority species survey area. The synthesis process therefore provides a clear basis for evaluating whether the revised layout intersects with areas of repeated breeding activity or areas of higher sensitivity.

Disturbance and displacement risk has been assessed using established best-practice methods, particularly the approaches described by Pearce-Higgins et al. (2009; 2012). These studies provide evidence-based estimates of the potential reduction in breeding wader density associated with proximity to wind turbines and associated infrastructure. Those findings allow for an estimation of potential effects by applying distance-based metrics to the mapped distribution of territories and by considering the likelihood of behavioural responses such as reduced occupancy, altered habitat use or displacement from preferred breeding areas.

To support this review, the various wader datasets, whilst recognising any variations in survey method, was also used to generate minimum bounding geometries for each species' territorial distribution, allowing recognised displacement buffers to be applied and enabling calculation of the potential hectareage of habitat that may be subject to displacement effects in different years.

By applying these recognised methods to the combined multi-annual dataset, it is possible to evaluate the potential for disturbance or displacement in a consistent manner. This includes consideration of the spatial extent of predicted effects, the number of territories potentially affected and the degree to which the revised layout avoids or overlaps areas of repeated breeding activity. The synthesis therefore provides a robust framework for interpreting the breeding wader evidence base and for reviewing the potential implications of the revised windfarm design.

A revised windfarm layout has also now been developed, incorporating a series of adjustments made in direct response to the ecological and landscape sensitivities identified during earlier stages of assessment, and for the purposes of this report the original configuration (Figure 1) has been superseded by the updated layout (Figure 2) to which all subsequent analysis relates, with all turbines now removed from within the boundary of the Antrim Hills SPA.

### 3 Review of Original ES Submission & Consultation Responses

The following analyses relate specifically to the original submission and turbine layout, and are intended to provide a consistent, evidence-based interpretation of potential displacement effects using the Environmental Statement data alongside the findings of Pearce-Higgins et al. (2009, 2012). By applying the spatial and temporal avoidance patterns identified in these multi-site studies to the distribution of birds recorded within the original layout, the review establishes the likely extent of effects within the relevant 400 m to 1 km zones for wader species and provides a transparent basis for understanding how the published literature aligns with the baseline conditions previously submitted.

#### 3.1 Review of ES Baseline Wader Data (2019–2021)

Across the two baseline years (2020 and 2021), the Environmental Statement reports that the breeding bird surveys recorded a pattern of wader activity within the survey area. For curlew, the ES states that a total of four pairs were present during the baseline period, with three pairs occurring within 1 km of the proposed turbine layout and a further pair located within the wider 1–2 km extent. The ES notes that the same overall pattern was observed across both years, with birds using broadly similar areas of the landscape. No turbines were located within 800 m of the 2020 – 2021 curlew territories (Figure 3) but (upgraded) tracks and control buildings are located within 800 m.

For snipe, the ES reports five territorial pairs during the baseline period, with three pairs located within 500 m of the turbine array and the remaining pairs distributed more widely. The mapped registrations presented in the ES indicate that the same general areas were used in both survey years.

In its assessment of effects, the ES utilised the average estimates of Pearce-Higgins et al., (2009) and identified the potential displacement of one pair of curlew, based on the proximity of part of the mapped activity to the proposed turbine layout. For snipe, the ES identifies the potential displacement of one to two pairs, reflecting the presence of several territories within 500 m of proposed turbines. These displacement estimates are presented in the ES as part of the author's assessment of likely effects arising from the development.

The results section of the Environmental Statement does not report any breeding territories for other wader species such as lapwing, redshank or woodcock. Although these species are mentioned in relation to survey methods, no breeding records or mapped registrations for them are presented in the baseline results, and golden plover is reported as an occasional winter record rather than as a breeding wader and lapwing had a single sighting.

#### 3.2 Review of RSPB Baseline Response & Wader Data (2016-2022)

The RSPB NI submission presents information on breeding waders within the wider Unshinagh and Aughnafatten area, with a primary focus on curlew. Annual survey data between 2016 and 2022 indicate that curlew territories within 1 km of the proposed turbine locations have ranged from 2 to 9 territories per year, with the highest number recorded in 2017 during a joint RSPB/NIEA survey.

The submission notes that survey access to the northern part of the site was withdrawn in 2019, and that subsequent counts relate mainly to the southern area and public road vantage points. Despite these limitations, RSPB NI reports that the southern area has consistently supported approximately 2–4 curlew territories per year across the period of record. The submission also highlights wider conservation concerns for curlew, referencing their continued decline in Northern Ireland and the species' elevated conservation status.

In relation to snipe, the RSPB NI submission does not provide site-specific territory counts but notes that snipe have recently been uplisted from Amber to Red on the Birds of Conservation Concern in Ireland list. The submission expresses concern about potential impacts on breeding snipe in the absence of mitigation measures that are scientifically demonstrated to be effective, with the commentary focused on the species' conservation status rather than numerical data for the Unshinagh site.



For the RSPB dataset, no spatially explicit mapping was provided beyond a broad division between the southern and northern parts of the site, and as the boundary between these two zones is not defined, it remains unclear whether the pairs recorded around the Curraghvohil Loughs are being treated by either RSPB NI or the ES as belonging to the southern or northern portion of the development area, and this requires clarification.

### 3.3 Review of NED Baseline Response

NED identifies curlew as a key species of concern within the proposed development area. Their response notes that the wider Antrim Hills landscape has previously supported up to nine curlew territories within 1 km of the proposed turbine locations, based on survey work in which NED was directly involved. This corroborates the RSPB submission. NED also refers to the Environmental Statement, which reports four curlew pairs within the survey area and identifies the potential displacement of one pair.

NED highlights that curlew are under consideration for addition as a selection feature of the Antrim Hills SPA, and emphasises the recognised sensitivity of the species to wind farm development. In this context, NED applies a curlew displacement distance of 800 m, reflecting the buffer within which breeding curlew may be affected by turbine construction and operation.

For snipe, NED does not present independent survey data but refers to the Environmental Statement, which reports five territorial pairs, including three pairs within 500 m of the turbine layout. NED applies a 400 m displacement distance for snipe, consistent with standard assumptions for this species. No additional snipe information is provided beyond the review of ES figures and the application of this displacement buffer.

NED also refers to lapwing and golden plover, but only in the context of the Environmental Statement. The ES reports golden plover as occasional winter records and does not present breeding data for lapwing, and NED does not add any further information of its own for these species. No other wader species are mentioned in the NED response. NED does not provide any spatially explicit data in its consultation response, and as a result no comparison of territory locations or range can be made from their submission.

### 3.4 Integrated Review of Curlew Evidence (ES, RSPB NI, NED)

Across the three data sources, curlew are consistently identified as a key species of concern within the Unshinagh and wider Antrim Hills landscape. The Environmental Statement (ES) provides two years of baseline data (2020–2021), reporting a stable total of four breeding pairs in each year. Of these, the ES identifies three pairs located within 1 km of the proposed turbine layout and a further pair between 1–2 km. No 800 m breakdown is provided in the ES although mapping data shows site infrastructure but no turbines within 800 m of the curlew territory centres (Figure 3). The ES assessment is based on a 1 km displacement zone (Pearce-Higgins et al., 2009), within which it predicts a 30.4% reduction in breeding density, and the predicted loss of one pair of curlew.

RSPB NI presents a longer dataset spanning 2016–2022, with 800 m and 1 km breakdowns for 2016–2019. These earlier years show higher curlew numbers within both distance bands than those reported in the ES. Between 2016 and 2019, RSPB NI recorded between five and nine territories within 1 km, and between one and eight territories within 800 m. The highest numbers occurred in 2017, when nine territories were recorded within 1 km, eight of which were within 800 m. RSPB NI notes that from 2019 onwards, survey access restrictions limited coverage to the southern area, and later-year figures (2021–2022) therefore reflect only this portion of the site, where two to three territories were recorded within 1 km. No survey was undertaken in 2020 due to COVID-19 restrictions.

The NED position draws on both its involvement in earlier survey work and its review of the ES. NED confirms NIEA participation in the 2017 survey, which recorded nine curlew territories within 1 km of the proposed turbines. For the ES baseline years, NED reports the ES figure of three pairs within 1 km. NED applies an 800 m displacement buffer for curlew, reflecting the distance within which breeding curlew are considered vulnerable to disturbance or displacement effects. NED also notes that curlew are under consideration as a potential selection feature for the Antrim Hills SPA, emphasising the recognised importance of this area for the species.

The combined evidence shows that curlew have been recorded regularly within both 800 m and 1 km of the proposed turbine locations, with the highest numbers documented in years when full survey access was available. The ES presents a lower and more spatially restricted curlew population based on two years of baseline data, while the RSPB NI and NED evidence



demonstrates that higher numbers have been recorded historically, particularly in 2017–2019, and that curlew use of the area has, at least in the past, been more extensive than indicated by the ES alone.

The Environmental Statement concludes that the proposed development would result in a moderate adverse effect on curlew, based on four breeding pairs recorded in both baseline years, three of which lie within 1 km of the turbine layout and a predicted 30.4% reduction in breeding density within this zone (one pair lost). RSPB NI adopts a precautionary approach to curlew displacement, stating that all breeding pairs located within the relevant displacement distance (typically 800 m–1 km) may be assumed to be displaced (range 2–9 pairs). This contrasts with the ES, which models a 30.4% reduction in breeding density within 1 km, and NED, which applies an 800 m displacement buffer and considers the loss of even a single pair to be significant.

NED advises that any mitigation or compensation land intended to support curlew must be located beyond the 800 m displacement buffer, as areas within this distance are considered unsuitable due to predicted disturbance and displacement effects.

### 3.5 Specific Consideration of Curlew Displacement Based on Pearce-Higgins et al. (2009) & (2012)

A review of the multi-site analysis by Pearce-Higgins et al. (2009) indicates that curlew exhibit a measurable displacement response to wind turbines, with the large-scale modelling demonstrating a statistically significant avoidance effect and an estimated displacement range extending to approximately 800 m from turbine locations. The authors note that this pattern arises because “the discrepancy between the results of the two scales of analysis for curlew resulted from the 800-m range of avoidance”, confirming that curlew respond at a broader spatial scale than several other wader species.

Within this avoidance zone, the study predicts a reduction in curlew breeding density of 42.4% (3.4–72.8%) within 500 m of turbines, and when scaled across a 1 km radius, the modelled reduction equates to 30.4% (3.0–52.1%). While turbines were consistently associated with reduced occurrence, the study found no evidence of significant curlew displacement in relation to access tracks or overhead transmission lines, indicating that turbine proximity is the primary driver of the observed effect.

These findings provide a robust, empirically derived context for interpreting potential displacement effects at upland wind farm sites and support the use of an 800 m turbine-related displacement zone as a precautionary basis for assessment and management zone planning (as suggested by NED).

On a precautionary basis, it is also relevant that Pearce-Higgins et al. (2009) report a 95% confidence interval of 3.0–52.1% for the curlew displacement effect within 1 km of turbines, such that the Environmental Statement's use of the central 30.4% value may not reflect the upper bound of potential impact, and sensitivity testing at both 3% and 52.1% provides a more precautionary treatment of this uncertainty.

The subsequent multi-site analysis by Pearce-Higgins et al. (2012) demonstrates that curlew are most strongly affected during the construction phase, with significant reductions in density on wind farm sites that do not recover post-construction and remain lower than reference sites. This temporal pattern refines the earlier spatial findings of Pearce-Higgins et al. (2009), which identified turbine-related avoidance extending to approximately 800 m and a modelled reduction in curlew density of 30.4% (3.0–52.1%) within 1 km of turbines. The 2012 analysis suggests an effective displacement distance of around 620 m but confirms that construction disturbance is the primary driver of curlew declines, with turbine proximity effects persisting thereafter.

For curlew, Pearce-Higgins et al. (2009, 2012) indicate turbine-related avoidance extending to at least 620 m, with evidence of effects out to approximately 800 m, and a modelled reduction in density of 30.4% (3.0–52.1%) when averaged across a 1 km radius. In this review, 620 m and 800 m buffers are therefore used to map the spatial extent of potential curlew habitat subject to displacement, while the 1 km zone is used as the analytical area within which percentage reductions in territory numbers are applied.

RSPB have considered that total displacement may occur. Depending on whether the lower 3% rate, the central 30.4% estimate, or the upper 52.1% precautionary bound from Pearce-Higgins et al. (2009) is applied, the number of curlew pairs potentially affected ranges from fewer than one pair at the lower end, to around one to three pairs on average, and up to approximately five pairs under the most precautionary scenario (Table 1).

**Table 1. Range of potential curlew pair displacement based on Pearce-Higgins (2009) effect intervals (1 km zone)**

| Year | Dataset    | Pairs within 1 km | Displaced pairs at 3% | Displaced pairs at 30.4% | Displaced pairs at 52.1% |
|------|------------|-------------------|-----------------------|--------------------------|--------------------------|
| 2016 | RSPB NI    | 2                 | 0.06                  | 0.61                     | 1.04                     |
| 2017 | RSPB NI    | 9                 | 0.27                  | 2.74                     | 4.69                     |
| 2017 | NED / NIEA | 9                 | 0.27                  | 2.74                     | 4.69                     |
| 2018 | RSPB NI    | 7                 | 0.21                  | 2.13                     | 3.65                     |
| 2019 | RSPB NI    | 6                 | 0.18                  | 1.82                     | 3.13                     |
| 2020 | ES         | 4                 | 0.12                  | 1.22                     | 2.08                     |
| 2021 | ES         | 4                 | 0.12                  | 1.22                     | 2.08                     |
| 2021 | RSPB NI    | 2*                | 0.06                  | 0.61                     | 1.04                     |
| 2022 | RSPB NI    | 3*                | 0.09                  | 0.91                     | 1.56                     |

\* spatially restricted survey area

### 3.6 Specific Consideration of Snipe Displacement Based on Pearce-Higgins et al. (2009) & (2012)

The available evidence for snipe is more limited than for curlew, as neither RSPB NI nor NED provided any numerical data for comparison, meaning that the only site-specific figures come from the Environmental Statement, which recorded five territorial pairs, three of which were located within 500 m of the proposed development.

Pearce-Higgins et al. (2009) identified snipe as one of the species most sensitive to turbine proximity, reporting significant avoidance effects at both fine-scale and large-scale resolutions and predicting reductions in breeding density of between 15% and 53% within 500 m of turbines. Their modelling also indicated that snipe responded strongly within a 400 m zone around turbine locations, with the clearest and most reliable displacement occurring inside this distance. The study found no evidence that tracks, powerlines or other linear infrastructure influenced snipe distribution or breeding density.

The subsequent temporal analysis by Pearce-Higgins et al. (2012) reinforces this picture, showing that snipe densities declined significantly on wind farm sites during the construction period and, importantly, did not recover afterwards, with post-construction densities remaining lower than those on reference sites. This effect was strongest at sites where the turbine footprint overlapped more of the surveyed area, indicating that the disturbance and habitat modification associated with construction had a lasting influence on snipe occupancy.

These findings provide a basis for review: the ES three pairs within 500 m fall within the displacement envelope identified by the research literature, and the 400–500 m zone represents the spatial extent within which effects should be considered. On this basis, and without extending estimates beyond 500 m, the likely number of snipe pairs affected is limited to those recorded within this core zone, with the wider literature supporting the conclusion that effects are both construction-driven and persistent within this distance.

Applying the Pearce-Higgins displacement range of 8 - 47% within 500 m to the three snipe pairs recorded in this zone indicates that the number of pairs potentially affected lies between fewer than one pair at the lower bound, around one pair under the central assumption, and up to approximately two pairs under the upper estimate (Table 2).

**Table 2. Range of potential snipe pair displacement based on Pearce-Higgins (2009) effect intervals (500 m zone)**

| Dataset / Year | Snipe pairs within 500 m | Snipe pairs beyond 500 m | Displaced pairs at 8.1% (lower) | Displaced pairs at 47.5% (central) | Displaced pairs at 67.7% (upper) |
|----------------|--------------------------|--------------------------|---------------------------------|------------------------------------|----------------------------------|
| ES 2020        | 3                        | 2                        | 0.24                            | 1.43                               | 2.03                             |
| ES 2021        | 3                        | 2                        | 0.24                            | 1.43                               | 2.03                             |

### 3.7 Specific Consideration of Golden Plover Displacement Based on Pearce-Higgins et al. (2009) & (2012)

The Environmental Statement recorded occasional golden plover in flight during vantage point watches, but there was no evidence of breeding activity, no mapped flight lines, and no flight-height information from which collision risk or turbine

interaction could be assessed. The ES therefore did not undertake any analytical work for this species and confined itself to reporting the observations.

RSPB NI did not mention golden plover in their consultation response, and NED referred to the species only in passing by repeating the ES descriptive records, without providing any independent data or undertaking any assessment. In the absence of breeding birds, mapped flight routes, or flight-height data, no displacement or density-reduction calculations based on Pearce-Higgins et al. (2009, 2012) can be applied for golden plover on the basis of the information available.

### 3.8 Specific Consideration of Lapwing Displacement Based on Pearce-Higgins et al. (2009) & (2012)

Lapwing were recorded only once during the ES baseline surveys, with no indication of territorial behaviour, display flights, or breeding activity within the study area. No mapped registrations or flight-height data were collected, and the ES did not carry out any collision risk modelling or displacement analysis for this species.

RSPB NI did not refer to lapwing in their consultation response, and NED mentioned the species only in the context of the ES survey reporting, without supplying any additional information or analysis. Given the absence of breeding evidence, flight activity data, or any quantifiable behavioural information, it is not possible to apply the displacement or density-reduction frameworks described by Pearce-Higgins et al. (2009, 2012) to lapwing on the basis of the information available.

## 4 Review of Updated Surveys

This section provides a review of the ornithological information available for the site, drawing together the original baseline surveys undertaken in 2020–2021, the updated breeding-season surveys completed in 2023 and 2024, and the revised wind farm layout developed subsequently.

The purpose of this review is to consider how the more recent field data relate to the earlier baseline, to identify any changes in the distribution or behaviour of key wader species over time, and to examine how the revised layout interacts with the areas used by these species. By re-analysing the original baseline information alongside the updated survey results, the review establishes the evidence base from which to understand patterns of site use across the survey periods and to determine the extent to which the revised layout reflects the most current ornithological information

### 4.1 Review of Wader Surveys from 2023 & 2024

The 2023 breeding-season surveys recorded a total of five curlew territories within the northern part of the survey area (Figure 4). Of these, four territories were located within 800 m of the revised turbine layout, with a fifth territory positioned just beyond 800 m but within 1 km. Two of the territories associated with the Curraghvohil Loughs which may fall within the zones identified as either “northern” or “southern” due to the absence of a defined boundary between these areas and could therefore be interpreted as belonging to either part of the site (see previous comments from RSPB NI response).

A contextual understanding of whether these territories are defined and were distributed in 2023 is important if future survey results are to be compared or contrasted with this dataset. A further curlew territory was identified several kilometres to the north of the application site, but this was located beyond the 1 km zone of influence and is therefore not considered further in relation to the revised layout. These results provide the 2023 distribution of curlew relative to the revised layout based on the spatial coverage achieved that year.

The 2023 breeding-season surveys recorded a total of six snipe territories within the northern part of the survey area (Figure 5). Of these, one territory was located within 500 m of the revised turbine layout, with a further two territories positioned within 800 m and three territories located within 1 km. The remaining two territories were situated beyond the 1 km zone.

The 2024 breeding-season surveys recorded a total of four curlew territories within the survey zone (Figure 6). Of these, two territories were located within 800 m of the revised turbine layout, and all four were situated within 1 km. Two of the territories occurred again at the Curraghvohil Loughs, with one additional pair positioned in the northern part of the site and one additional pair in the southern part, consistent with the pattern previously noted in earlier survey years. Two turbines lie within the 800 m buffer of the curlew territory centres identified in 2024. In addition to the four territories within the survey zone, a further five

curlew pairs were recorded to the south and south-east beyond the 1 km zone of influence, and three additional pairs were identified to the north and north-west, all of which were also located beyond 1 km of the revised layout.

The 2024 breeding-season surveys recorded a total of ten snipe territories within the survey area (Figure 7). Of these, four territories were located within 500 m of the revised turbine layout, with a further four territories situated within 1 km. The remaining two territories were positioned to the west of the site beyond 1 km from the revised turbine layout.

In addition to curlew and snipe, the 2023–2024 surveys recorded several other wader species within the wider landscape. Golden plover were observed wintering within the site complex, with additional birds recorded passing over during migration periods. These movements are typical of upland landscapes in Northern Ireland, where golden plover utilise a mosaic of foraging and roosting areas during winter and migration. Their presence is therefore consistent with the species' known ecology and does not indicate any change in status relative to earlier datasets (Appendix 1).

During wider survey coverage, turnstone and redshank were also recorded, along with additional curlew, at coastal locations to the east of the site. These areas lie well beyond any potential zone of influence of the proposed wind farm and represent normal use of coastal habitats by these species. Their occurrence is therefore unrelated to the proposed development and reflects the expected distribution of coastal waders in the region.

The presence of these additional species in 2023–2024 is consistent with the broader regional assemblage of wintering and passage waders, and the numbers and locations recorded fall within the expected ecological range for the area. None of these observations alter the conclusions of the displacement assessment for curlew or snipe, nor do they indicate any deviation from the patterns documented in the ES baseline, RSPB NI datasets or the NED 2017 National Wader Survey. No further analyses of these data have been included here although spatial mapping and flight height data are available for further analysis if required at a later date.

#### 4.2 Review of Potential Wader Displacement during 2023 & 2024

Across the 2023 - 2024 surveys, the curlew results show a number of territories occurring within the survey zone in both years, with shifts in their distribution between seasons. In 2023, five territories were recorded in the study area (which was only north of and including the Curraghvohil Loughs), four of which lay within 800 m of the revised layout and all five within 1 km, with an additional territory several kilometres to the north falling outside the 1 km zone. In 2024, four territories were identified within the survey zone, two of them within 800 m and all four within 1 km, while a further eight pairs were recorded beyond the 1 km boundary, five to the south and south-east and three to the north and north-west.

The snipe results show a similar pattern of numbers and year-to-year variation but also the southern area was not surveyed during 2023. In 2023, six territories were identified, including one within 500 m, three within 1 km, and two beyond 1 km. In 2024, ten territories were recorded, with four within 500 m, eight within 1 km, and two located to the west beyond the 1 km zone.

For both species, the displacement calculations applied to these tables (Tables 3 & 4) follow the same approach used in the ES and earlier analyses: for curlew, the Pearce-Higgins turbine-related density-reduction rates of 3%, 30.4% and 52.1% are applied to the number of pairs within 1 km of the revised layout, giving a range of 1–3 potentially displaced pairs per year; for snipe, the species-specific rates of 8.1%, 47.5% and 67.7% are applied to the number of pairs within 500 m of turbines, giving a range of 1–3 potentially displaced pairs per year, and on a precautionary basis the assessment adopts the upper values of around three displaced curlew pairs and three displaced snipe pairs per year.

**Table 3. Range of potential curlew pair displacement based on Pearce-Higgins (2009) effect intervals (1 km zone) in 2023–2024**

| Year | Total Pairs | Within 500 m | Within 800 m | Within 1 km | Beyond 1 km | Displaced (3%) | Displaced (30.4%) | Displaced (52.1%) |
|------|-------------|--------------|--------------|-------------|-------------|----------------|-------------------|-------------------|
| 2023 | 5           | 0            | 4            | 5           | 1 (N)       | 0.15           | 1.52              | 2.60              |
| 2024 | 4           | 0            | 2            | 4           | 8 (5SE+3NW) | 0.12           | 1.22              | 2.08              |

**Table 4. Range of potential snipe pair displacement based on Pearce-Higgins (2009) effect intervals (500 m zone) in 2023-2024**

| Year | Total Pairs | Within 400 m | Within 500 m | Within 1 km | Beyond 1 km | Displaced (8.1%) | Displaced (47.5%) | Displaced (67.7%) |
|------|-------------|--------------|--------------|-------------|-------------|------------------|-------------------|-------------------|
| 2023 | 6           | 1            | 2            | 4           | 2*          | 0.16             | 0.95              | 1.35              |
| 2024 | 10          | 2            | 4            | 8           | 2           | 0.324            | 1.90              | 2.71              |

\*a 7<sup>th</sup> site was recorded beyond the 2km zone

### 4.3 Multi-Year Review of Curlew and Snipe Information

When the ES baseline (2020–2021), RSPB NI datasets (2016–2022), NED 2017 survey (Colhoun et al., 2018) and the 2023–2024 results are considered together, a consistent picture emerges of recurrent use of the wider landscape by both curlew and snipe, with a number of territories of each species falling within the turbine displacement envelopes in most years. Application of species-specific displacement rates from Pearce-Higgins et al. (2009) indicates that the proposed wind farm could, if constructed, contribute an additional displacement effect of up to around three curlew pairs per year (based on the 3%, 30.4% and 52.1% rates applied to pairs within 1 km) and up to around three snipe pairs per year (based on the 8.1%, 47.5% and 67.7% rates applied to pairs within 500 m). These values represent the precautionary upper bounds; lower and central estimates are smaller.

Interpreting between-year differences also requires caution because the datasets differ in survey effort, survey methods and spatial coverage. The ES baseline involved full-site coverage using vantage points and walkover transects, whereas the RSPB NI data were collected under access restrictions that limited surveyors to the southern part of the site and public roads in some years. The NED 2017 survey used a different methodology again, and the 2023-2024 surveys varied in their spatial focus, with 2023 emphasising the northern sector and 2024 providing full-site coverage. These differences inevitably influence the number of territories detected and the apparent proximity of birds to turbines. As such, variation in survey design and coverage is a confounding factor that must be recognised when comparing years (Figure 8a & 8b).

Allowing for these methodological differences, the multi-year pattern is consistent with what is known from wider wader ecology. Both curlew and snipe show interannual variation in territory occupancy, that may be driven by changes in water levels, vegetation structure, grazing, predation pressure and weather. Long-term studies of breeding waders (e.g. Grant et al. 1999; Douglas et al. 2014; Franks et al. 2017) demonstrate that pair numbers and territory locations can fluctuate between years.

Territories may shift within a landscape between years even when birds remain broadly site-faithful at larger scales, a pattern well documented for curlew (e.g. Brown et al. 2015; Buchanan et al. 2020) and snipe (e.g. Wilson et al. 2005). The repeated use of the Curraghvohil Loughs area by curlew, with pairs recorded in slightly different positions in different years, and the appearance of additional pairs to the south/south-east and north/north-west in some years but not others, are perhaps typical of territory turnover within a wider functional landscape unit rather than evidence of directional change.

This interpretation is reinforced by the wider regional context. Both curlew and snipe have undergone long-term population declines across Northern Ireland, with low productivity and habitat change identified as major drivers (e.g. Colhoun & Cummins 2013; BTO NI 2020; RSPB 2021). In such circumstances, small fluctuations in local numbers around the site may plausibly be part of a broader population contraction and redistribution. The displacement estimates derived from the Pearce-Higgins framework therefore represent a potential additive pressure acting on a population already affected by wider landscape-scale factors.

The multi-year evidence suggests that while the proposed turbines may contribute to wader displacement - quantified here as up to three pairs per species per year on a precautionary basis - the between-year differences in territory numbers and locations are at least as likely to reflect interannual variation, survey effort differences and wider population dynamics. The review therefore appropriately treats turbine-related displacement as a potential additive effect, rather than a mechanism explaining the observed variation in the multi-year dataset.

Interpretation of the multi-year dataset must also recognise two important limitations. First, the survey coverage and methods varied between years, with full-site coverage achieved in the ES baseline and 2024 surveys, more spatially restricted coverage in 2023, and the RSPB NI datasets constrained in some years to the southern part of the site and public-road vantage points

due to access restrictions. These differences inevitably influence the number and distribution of registrations obtained, and they introduce a confounding effect when comparing apparent changes in territory numbers or proximity to the proposed layout between years.

Second, while the RSPB NI dataset provides valuable multi-year information on the presence and number of curlew and snipe territories, it does not include spatially explicit mapping of registrations or territory centroids beyond a broad north–south division of the site. As a result, it is not possible to examine between-year movements, range shifts or consistent areas of use within the RSPB NI dataset, nor to integrate those data into the home-range, kernel-density or minimum-bounding-geometry analyses undertaken for the ES and updated 2023–2024 surveys. This limitation means that the spatial-use assessment necessarily focuses on the datasets for which spatial information is available (2020–2021 and 2023–2024), while the RSPB NI data can only be used to contextualise overall numbers rather than spatial patterns.

Together, these constraints mean that the multi-year analysis should be interpreted as an assessment of broad consistency in the range of numbers recorded across datasets, rather than a fine-scale comparison of spatial use between years. The absence of spatially explicit RSPB NI data and the variation in survey coverage reinforce the need for the home-range and utilisation-distribution analyses and recently available historical national datasets, included in this review, which directly address the concerns raised by RSPB NI and NED regarding the limited spatial-use analysis in the original ES.

## 5 Review of Curlew and Snipe Kernel Density at Unshinagh

Following the review of the number of curlew and snipe pairs occurring within standard displacement buffers, it is also possible to consider the spatial extent and configuration of the areas used by these species within the wider landscape. Buffer-based displacement metrics provide a useful first indication of potential turbine-related effects, but they do not capture the shape, orientation or internal structure of the areas used by birds for breeding, foraging, roosting or movement. To address this, the next stage of the assessment examines the ranging behaviour of curlew and snipe using a combination of home-range estimation tools, including kernel density estimation (KDE), and minimum bounding geometries (MBG) derived from multi-year field observations.

Curlew and snipe typically use a mosaic of habitats during the breeding season, with movements between nesting, foraging and roosting areas occurring at fine spatial scales. Curlew, in particular, are known to maintain large, irregularly shaped home ranges that may include multiple wetland and grassland patches, while snipe tend to occupy smaller, wetter, more tightly clustered territories centred on saturated ground. These patterns are well documented in the literature, with studies showing that curlew home ranges can extend over several hundred hectares with complex internal structure (e.g. Grant et al. 1999; Brown et al. 2015), while snipe typically exhibit more compact utilisation distributions associated with wet flushes, bog margins and damp grassland (e.g. Wilson et al. 2005).

To reflect these ecological realities, the spatial analysis uses kernel density utilisation distributions to identify the core areas (e.g. 50% UD) and wider activity zones (e.g. 95% UD) used by birds across the survey years. These are complemented by minimum bounding geometries, which provide a conservative representation of the maximum area within which birds were recorded. Together, these layers allow the assessment to move beyond simple distance-based metrics and instead evaluate the actual spatial footprint of curlew and snipe activity in relation to the revised turbine layout.

Overlaying these home-range and utilisation-distribution layers with the proposed infrastructure enables a more nuanced understanding of potential habitat interactions, including whether turbines intersect (i) core nesting or foraging areas, (ii) peripheral or occasionally used parts of the range, (iii) movement corridors between habitat patches, or (iv) areas that fall outside the functional range of the species.

This approach also helps to contextualise the interannual variation observed in the multi-year datasets. Because curlew and snipe territories can shift between years in response to habitat condition, water levels, grazing, predation pressure and weather (e.g. Douglas et al. 2014; Franks et al. 2017), home-range and kernel-density analyses provide a way to identify persistent landscape features that remain important across years, even when the exact location of territories changes. This is particularly relevant in the present case, where survey effort and spatial coverage have varied between datasets, and where the proposed wind farm is not yet operational, meaning that any observed variation reflects ecological processes and survey differences, not turbine effects.



By integrating these spatial layers with the revised layout, the assessment can therefore determine whether the proposed turbines overlap with key functional areas used by curlew and snipe, or whether they lie predominantly in peripheral or unused parts of the landscape. This provides an ecologically grounded basis for evaluating potential habitat-related effects and complements the earlier buffer-based displacement analysis.

Both RSPB NI and NED noted in their consultation responses that the ES did not provide any analysis of curlew or snipe range use, home-range extent or spatial utilisation, and specifically highlighted the absence of any information of how birds used the wider landscape. The inclusion of home-range estimation, kernel-density utilisation distributions and minimum bounding geometries in this updated assessment therefore directly addresses those concerns by providing a spatially explicit evaluation of the areas used by these species in relation to the revised layout

### 5.1 Kernel Density Mapping for Curlew 2020, 2021, 2023 & 2024

The 2020 kernel-density map for curlew, generated from point data collected during walkover and vantage point surveys (but without flight line information), shows a series of utilisation areas that illustrate how the species was using the landscape during that season (Figure 9). The highest-intensity zones form a clear cluster in the central part of the site, where the birds were repeatedly recorded moving, foraging and holding territory. These dense patches of activity extend across the ground surrounding three of the revised turbine locations and continue through the central corridor of the site where the access tracks and control building are situated.

The KDE surface shows both the concentrated core-use areas and the broader halo of lower-intensity use that surrounds them, creating a coherent picture of how curlew were interacting with the habitat mosaic in 2020. The pattern is typical of the species in upland fringe landscapes, with repeated use of wetter grassland, rushy pasture and shallow slopes, and it provides a clear indication of the functional range occupied by birds during that year.

The 2021 kernel-density map for curlew, produced from the walkover and vantage point survey data (Figure 10), shows a broadly similar pattern of landscape use to that recorded in 2020, but with a noticeable eastward shift in the distribution of the highest-intensity areas. The blue-shaded utilisation surface again forms a centralised cluster, indicating that the birds continued to focus their activity within the same general habitat block at the centre of the site.

However, the densest patches of use extend further towards the eastern side of the central basin, suggesting a slight re-orientation of territory centres or foraging movements in that direction during the 2021 season. Despite this shift, the overall range, extent and configuration of the utilised area remain comparable to 2020, with a similar blend of core-use zones surrounded by a wider halo of lower-intensity activity. The map therefore depicts a pattern of use that is consistent with the species' known tendency for year-to-year adjustments within a stable functional landscape unit, while still showing the same centralised clustering of activity that characterises curlew use of the site.

The 2023 kernel-density map for curlew reflects the fact that survey effort during that year was concentrated in the northern part of the site (Figure 11), and that no walkover point-based registrations were collected. Instead, the utilisation surface was generated from vantage-point flight-line data, which produces a broader, more diffuse representation of space use than the tightly clustered point-based KDEs from earlier years (2020-2021). As a result, the 2023 map shows a noticeably wider and more open pattern of curlew activity, with the densest areas of use extending across the northern habitats and only limited utilisation indicated in the southern parts of the site. The distribution is therefore biased northwards, reflecting both the survey design and the birds' observed movements during the season. Despite the methodological differences, the map still illustrates the functional landscape used by curlew in 2023, but it does so in a way that emphasises the northern sector and shows a much weaker signal of activity in the central and southern areas compared with the 2020 and 2021 walkover-derived ranges.

The 2024 analysis provides the most spatially comprehensive picture of curlew use of the site to date, as survey effort once again covered both the northern and southern parts of the landscape in a manner comparable to the 2020 and 2021 walkover seasons. Two parallel datasets were generated: one based on point-derived walkover registrations (Figure 12) and a second based on vantage-point flight-line observations (Figure 13). The walkover-derived kernel-density map shows a noticeably broader pattern of ranging than in the earlier years (2020-2021), with curlew activity extending across a wider part of the central and northern habitats and a more dispersed set of core-use patches than the more clustered distributions seen in 2020 and 2021. The combined dataset (Appendix 2) suggests that birds were making greater use of the available habitat mosaic during the 2024 season, with movements and foraging activity spanning a larger functional area and with some differences between the two methods of survey (Appendix 2).

The vantage-point polyline dataset reinforces this impression of expanded landscape use. When converted into a utilisation surface, the flight-line data depict a more extensive and open pattern of movement across the site, with curlew traversing both the northern and southern sectors and linking habitat blocks that appeared more discrete in the earlier walkover-based maps. The resulting KDE surface shows a broad, interconnected utilisation zone that reflects the birds' wider-ranging behaviour during the season and highlights the permeability of the landscape for commuting and foraging flights. Compared with the earlier years, the 2024 flight-based map therefore presents an enlarged spatial footprint of curlew activity, capturing a greater extent of the areas used during the breeding period.

The two 2024 datasets provide a complementary view of curlew use of the site: the walkover data showing a wider and more varied set of ground-based activity centres than before, and the vantage-point data illustrating an expanded pattern of flight movements across the landscape. Both outputs confirm that curlew were using a broader area in 2024 than in the earlier walkover years, and that the functional range of the species during this season encompassed a more extensive portion of the northern and central habitats.

Across the four survey years, the spatial-use analyses show a broadly consistent pattern of curlew activity centred on the core habitats within the middle of the site around Curraghvohil Loughs and to the south around Mullaghboy Hill, with year-to-year variation reflecting both ecological shifts and differences in survey method and occurrence of pairs around Craigfad Loughs (Binnagee) to the north-east also. The 2020 and 2021 walkover-derived kernel-density maps reveal tightly clustered core-use areas in the central basin, with a slight eastward shift in 2021 but an overall similar range and configuration of utilised habitat.

In 2023, when survey effort focused on the northern sector and utilisation was derived from vantage-point flight-line data rather than walkover registrations, the resulting distribution appears more diffuse and is biased towards the northern habitats, with limited activity indicated in the south. The 2024 season, which again covered both northern and southern areas, produced two complementary datasets: walkover point data showing a broader and more dispersed pattern of ground-based activity than in earlier years, and flight-line data depicting an expanded landscape footprint that links habitat blocks across the site. These outputs demonstrate that curlew consistently use a central functional landscape unit across years, while also exhibiting natural interannual adjustments and wider ranging behaviour especially when assessed through flight-based methods.

## 5.2 Kernel Density Mapping for Snipe 2023 & 2024

Because only single territorial points were reported for snipe in the 2020 and 2021 ES baseline, it was not possible to generate meaningful kernel-density utilisation maps for those years, and the available information provides only a very limited indication of where birds were active. In contrast, the 2023 survey, although focused primarily on the northern part of the study area, did allow a kernel-density surface to be produced from vantage-point flight-line data (Figure 14). This resulted in a distribution that is necessarily biased towards the northern habitats, reflecting both the survey design and the locations from which snipe were observed displaying and commuting.

The 2024 dataset provides a more complete picture, as survey effort once again covered both the northern and southern sectors of the site and allowed a composite utilisation surface to be generated (Figure 15). This map shows a broader pattern of snipe activity across the full extent of the study area, with the distribution extending beyond the northern focus of the 2023 dataset and capturing the functional range of habitats used during the season. Southern areas (south of the Curraghvohil Loughs) do appear less utilised than the central and northern parts of the site.

The 2023 and 2024 outputs illustrate how snipe were using the landscape in years where spatially explicit data were available, while also highlighting the interannual variability in distribution (for example, the stronger northern focus in 2023), a pattern that likely reflects both differences in survey effort and natural movements of the species between years.

## 6 Minimum Bounding Geometry, Spatial Overlap & Displacement Analysis

Having established the spatial patterns of curlew and snipe activity across the multi-year dataset through kernel-density mapping, vantage-point flight analysis and point-based registrations, the next stage of the assessment focuses on translating these patterns into defined spatial units that can be compared directly with the revised turbine layout. To achieve this, the mapped activity for each species has been converted into minimum bounding geometries, providing a conservative but spatially explicit representation of the areas used by birds during each survey year. These polygons capture the outer limits of recorded



movements and ground-based activity, allowing the full functional range of each species to be assessed in relation to the proposed infrastructure.

By overlaying these minimum bounding geometries with the revised turbine layout and the relevant displacement buffers, it is possible to quantify the hectareage of overlap between areas used by birds and areas potentially affected by turbine presence. This approach provides a more quantitative and spatially explicit basis for evaluating potential spatial displacement than reliance on point-based distances alone, as it incorporates the shape, extent and configuration of the habitats actually used by the species.

For curlew, the analysis uses the full suite of mapped ranges derived from walkover and flight-line data. For snipe, the bounding geometries are based on the spatially explicit datasets available for 2023 and 2024, recognising that the 2020 and 2021 ES baseline contained only single territorial points and therefore could not support kernel density range estimation but does allow minimum bounding polygons to be constructed for both curlew and snipe.

To examine potential displacement effects, the bounding geometries have been intersected with the 620 m and 800 m buffers commonly applied in curlew calculations, and with the 400 m and 500 m buffers relevant to snipe. This allows the analysis to identify not only whether turbines fall within the mapped ranges, but also the extent of habitat within each buffer zone that overlaps with areas used by the species. The resulting hectareage calculations provide an indication of the potential scale of spatial displacement and form the basis for considering whether mitigation or compensation habitats may be required.

## 6.1 Minimum Bounding Geometry and Displacement Estimation for Curlew

Minimum bounding geometries were generated for each survey year to provide a spatially defined representation of the areas used by curlew and to allow direct comparison with the revised turbine layout. For 2020 and 2021, the bounding geometries were derived from the point-based registrations provided in the ES baseline, enabling polygons to be constructed despite the limited number of observations (Figures 16 & 17). In 2023, the bounding geometry was based on vantage-point flight-line data, producing a broader polygon that reflects both the nature of the dataset and the northern focus of survey effort (Figure 18). In 2024, separate bounding geometries were produced from the walkover point data and the flight-line dataset, providing complementary representations of the functional range used by curlew during that season (Figures 19 & 20).

These bounding geometries were intersected with the species-specific displacement buffers applied to the revised turbine layout. For curlew, the analysis used the standard 620 m and 800 m buffers, representing the distances commonly applied in assessments of breeding curlew sensitivity to wind energy infrastructure. The intersections allowed the hectareage of overlap between curlew activity areas and the displacement buffers to be calculated for each year and dataset. The values are presented with calculated hectareage values (Table 5).

**Table 5. Range of potential curlew habitat displacement based on Pearce-Higgins (2009) effect intervals (620 m & 800 m zones) in 2020-2021 and 2023-2024.**

| Year | Dataset                                            | Total Area of MBG<br>(ha) | 620 m Buffer Overlap<br>(ha) | 800 m Buffer Overlap<br>(ha) |
|------|----------------------------------------------------|---------------------------|------------------------------|------------------------------|
| 2020 | Walkover point data                                | 186                       | 33                           | 72                           |
| 2021 | Walkover point data                                | 148                       | 5                            | 25                           |
| 2023 | VP flight-line data*                               | 337                       | 214                          | 278                          |
| 2024 | Walkover point data                                | 253                       | 79                           | 128                          |
| 2024 | Walkover point & VP flight-line<br>data (combined) | 707                       | 336                          | 447                          |

*\*No separate walkover only data estimate has been derived*

The pattern of overlap reflects the spatial-use characteristics identified earlier in the review. The 2020 and 2021 polygons produce a defined area of intersection with the displacement buffers, with the 2021 eastward shift resulting in a slightly altered configuration of overlap. The 2023 vantage-point dataset, with its northern bias, produces a different pattern of intersection, while the 2024 datasets show a more extensive area of overlap due to the broader ranging behaviour recorded during that season.

When analysing the 2024 data the walkover data produces a smaller area of overlap than combined walkover and vantage point data although the walkover area was smaller there were still parts of the range estimation (from kernel density mapping) that differed in these two estimates of range (Figure 21). These results provide a clear, quantitative basis for understanding the potential scale of curlew displacement under the revised layout and will inform the subsequent consideration of mitigation and compensation requirements.

### 6.2 Implications for Curlew Habitat Displacement and Management Requirements

The curlew displacement analysis indicates that the extent of habitat intersecting the 620 m and 800 m buffers varies considerably between years, reflecting both natural inter-annual shifts in territory placement and differences in survey resolution. The 2020-2021 point-based datasets produce relatively compact bounding geometries with smaller areas of overlap, whereas the 2023 vantage-point dataset and the 2024 walkover/combined datasets generate larger polygons and correspondingly greater estimated overlap. These values represent a range of potential displacement in any given year, rather than a cumulative total.

Across all years assessed, the area of curlew habitat intersecting the 620 m buffer falls within the range 5–336 ha (average 133.4 ha), while the area intersecting the 800 m buffer lies within 25–447 ha (190 ha). These ranges provide the basis for estimating the scale of habitat potentially affected by displacement and for determining the extent of management required. The upper end of the range reflects years in which broader ranging behaviour was recorded and where survey methods captured a wider functional area.

NED has indicated that habitat management areas for curlew should be located beyond 800 m from turbines, irrespective of the displacement distance applied in the assessment. This requirement must be considered alongside the presence of site infrastructure - including access tracks, compounds and the substation - which in several locations lie within 800 m of known curlew territories. Although published research indicates that disturbance effects from tracks and ancillary infrastructure are generally limited, consultees for example may still consider these features when evaluating the suitability of proposed management areas, particularly where they occur close to the Lough Curraghvohil pairs or indicative areas of high site usage by the species.

### 6.3 Minimum Bounding Geometry and Displacement Estimation for Snipe

Minimum bounding geometries were also produced for snipe to define the spatial extent of activity recorded in each survey year and to enable direct comparison with the revised turbine layout. For 2020 and 2021, the ES baseline provided single territorial locations, and these were used to generate simple bounding polygons that capture the limited spatial information available for those years (Figure 22 & 23). Although these datasets do not allow for detailed spatial modelling, they still provide a consistent geometric framework for assessing potential interaction with displacement buffers.

In 2023, the available vantage-point flight-line data allowed a wider bounding geometry to be created (Figure 24). This polygon reflects the pattern of snipe movements recorded during that season, albeit with a northern emphasis due to the distribution of survey effort. The 2024 dataset, which combined registrations and observations across both the northern and southern parts of the study area, enabled a wider bounding geometry to be generated. This composite polygon provides a larger depiction of snipe habitat use within the study area and captures the wider functional range recorded during the 2024 breeding season. In 2024, separate bounding geometries were produced from the flight-line dataset (and any point locations derived from walkover data), providing representations of the functional range used by snipe during that season (Figures 25 & 26).

To assess potential displacement, each bounding geometry was intersected with the species-specific buffers applied to the revised turbine layout. For snipe, the analysis used the standard 400 m buffer, with an additional 500 m buffer applied as a precautionary sensitivity test. These intersections allowed the area of overlap between snipe activity and the displacement zones to be quantified for each year. The results are summarised with calculated hectare values (Table 6).

**Table 6. Range of potential snipe habitat displacement based on Pearce-Higgins (2009) effect intervals (400 m & 500 m zones) in 2020-2021 and 2023-2024.**

| Year | Dataset | Total Area of MBG<br>(ha) | 400 m Buffer Overlap<br>(ha) | 500 m Buffer Overlap<br>(ha) |
|------|---------|---------------------------|------------------------------|------------------------------|
|------|---------|---------------------------|------------------------------|------------------------------|

|             |                                   |            |            |            |
|-------------|-----------------------------------|------------|------------|------------|
| <b>2020</b> | Walkover point data               | <b>118</b> | <b>38</b>  | <b>50</b>  |
| <b>2021</b> | Walkover point data               | <b>118</b> | <b>38</b>  | <b>50</b>  |
| <b>2023</b> | VP flight-line data               | <b>421</b> | <b>132</b> | <b>154</b> |
| <b>2024</b> | Walkover point data               | <b>103</b> | <b>0</b>   | <b>3</b>   |
| <b>2024</b> | Composite dataset (walkover + VP) | <b>792</b> | <b>159</b> | <b>211</b> |

The resulting pattern of overlap varies between years, reflecting both the differing quality of spatial data and natural shifts in snipe distribution. The 2020 and 2021 polygons produce small, tightly defined intersections with the displacement buffers, consistent with the limited spatial information available. The 2023 flight-line dataset generates a broader area of overlap concentrated in the northern part of the site, while the 2024 composite dataset produces a more extensive intersection with the buffers due to the wider distribution of activity recorded across both sectors of the study area. These quantified overlaps form the basis for evaluating the potential scale of habitat displacement.

#### 6.4 Implications for Snipe Habitat Displacement and Management Requirements

The displacement analysis for snipe shows clear variation between years, reflecting both the species' natural mobility and the differing spatial resolution of the survey datasets. The 2020–2021 point-based datasets produce small, tightly defined bounding geometries with limited overlap, whereas the 2023 vantage-point dataset and the 2024 composite dataset generate larger polygons and correspondingly greater estimated overlap. As with curlew, these values represent a range of potential displacement in any given year, rather than a cumulative total.

Across all years assessed, the area of snipe habitat intersecting the 400 m displacement buffer lies within the range 38–159 ha, while the area intersecting the 500 m sensitivity buffer lies within 50–211 ha. These ranges provide an indication of the potential scale of habitat that may be subject to disturbance-related effects during construction and operation. The upper end of the range reflects years in which broader ranging behaviour was recorded and where survey methods captured a wider functional area.

Unlike curlew, NED have not explicitly stated that snipe management areas must be located beyond 400 m from turbines. However, given their position on curlew - and the general precautionary approach applied to upland waders - it is reasonable to anticipate that consultees may prefer management areas to be located outside the core disturbance zone wherever feasible. This expectation must be balanced against the practical constraints of land availability, particularly in areas where suitable wet ground habitats lie close to proposed infrastructure.

Although evidence of post-construction windfarm monitoring (M. Ruddock, personal observation) indicates that snipe are generally more adaptable and may be less displacement-sensitive than curlew, several territories in 2023 and 2024 were located within 400 m of turbines and access routes. While disturbance effects from tracks and ancillary infrastructure may be limited, these features may still be considered during consultation, particularly where they coincide with areas of higher snipe activity and the intensification of land management can have wider effects than initially anticipated (M. Ruddock, personal observations).

On this basis, the snipe displacement results indicate that a management area in the order of up to 159–211 ha may be required to maintain or enhance suitable habitat conditions. This estimate using walkover-only calculations shows that smaller areas (0 – 38 ha) may be displaced whilst vantage point data indicates larger ranges (154 – 211 ha). The final configuration of management zones will need to consider: (i) the mapped ranges of snipe across all survey years, (ii) the 400 m displacement buffer (and 500 m sensitivity buffer where relevant), (iii) the availability of suitable wet ground habitats, (iv) and the constraints imposed by land ownership and the proximity of infrastructure. This approach ensures that snipe - while perhaps more flexible than curlew - are addressed in a manner that is precautionary, evidence-based and aligned with likely regulatory expectations.

## 7 Review of Published Literature on Curlew Ranging Behaviour

Recent advances in GPS telemetry have substantially improved understanding of the spatial ecology of curlew, providing detailed estimates of home-range size, core-area use and seasonal variation across a range of landscapes. These findings are directly relevant to interpreting potential displacement at Unshinagh during the breeding season. Although the absolute values differ between studies, a consistent pattern emerges: curlew exhibit tightly constrained movements during incubation, expand their ranging behaviour during chick-rearing, and in some cases occupy extensive areas across the full breeding season.

Wintering birds also maintain substantial home ranges, while non-breeding individuals may range over very large areas, often overlapping multiple breeding territories.

Wintering studies, such as Mander et al. (2022), demonstrate that curlew on the Humber Estuary typically maintain winter home ranges of approximately 555 ha ( $\pm 558$  ha SD), with some individuals exceeding 1,000 ha. These winter ranges were centred on stable high-tide roosts and adjacent intertidal foraging areas, and the birds showed strong fidelity to both roosting and feeding locations across the non-breeding season. Mander et al. also reported that home ranges tended to be larger at night than during the day, reflecting nocturnal foraging movements across the mudflats when tidal conditions permitted. Despite this variation, the spatial footprint of wintering curlew remained tightly associated with the estuarine system, and a radius of roughly 1 - 1.5 km generally captured the majority of winter space-use. Although curlew winter along the coast to the east of Unshinagh, the available evidence indicates that winter home ranges do not extend inland far enough to overlap with the site, and wintering behaviour is therefore unlikely to be directly relevant to displacement at this location. No nocturnal studies have been undertaken as part of the windfarm survey methods.

Breeding-season studies in continental Europe provide a complementary perspective on curlew space-use in relatively intact or semi-natural landscapes. Bocher et al. (2024), working across Russia, Finland, Estonia, Germany and France, reported mean breeding home ranges of 99 ha ( $\pm 104$  ha), with values spanning from 11 ha to 561 ha. Core areas were correspondingly smaller, averaging 16 ha ( $\pm 17$  ha) and ranging from 3 ha to 92 ha. Habitat-specific patterns were evident: birds breeding in bogs typically used home ranges of around 55 ha (core areas  $\sim 8$  ha), whereas those in grassland averaged approximately 97 ha (core  $\sim 16$  ha), and those in abandoned farmland around 77 ha (core  $\sim 12$  ha). These differences likely reflect variation in prey availability, vegetation structure and the spatial configuration of nesting and foraging habitats. Even within these relatively undisturbed systems, some individuals ranged over several hundred hectares, and non-breeding birds used areas approaching 300 ha. The Bocher et al., (2024) dataset is particularly valuable because it spans a broad latitudinal and habitat gradient, demonstrating that while curlew can be highly adaptable, their breeding home ranges in natural and semi-natural landscapes tend to be compact relative to those observed in more fragmented systems.

The UK upland dataset reported by Bowgen et al. (2025) provides a detailed stage-specific breakdown of curlew space-use and highlights how movements change across the breeding cycle in a managed farmland-moorland mosaic. Across all breeding stages combined, the mean home range was 191 ha (median 71 ha; range 9.8 - 1,593 ha), with a mean core area of 28 ha (median 5.2 ha; range 1.5 - 359 ha). During incubation, movements contracted sharply, with mean home ranges of only 34 ha and core areas of approximately 4 ha, reflecting the need for adults to remain close to the nest and the limited foraging opportunities available during this period. Following hatching, adults expanded their movements considerably: chick-rearing home ranges averaged 253 ha, with core areas around 52 ha, as adults moved between nesting areas and more distant foraging sites to provision mobile chicks. These values align closely with those reported by Bocher et al. (2024), but they also highlight the influence of landscape structure and management. The Yorkshire Dales study area is characterised by a mixture of improved and unimproved grassland, heather moorland and active predator control, which together create a relatively favourable environment for curlew. As a result, even the larger chick-rearing ranges remained within the low hundreds of hectares, and the smallest incubation ranges were extremely compact. This contrasts with the much larger ranges observed in fragmented Irish landscapes (Colclough, 2024), underscoring the importance of local habitat configuration in shaping curlew space-use.

The Irish GPS-tagging work by Colclough (2024) adds an important dimension, as it captures curlew behaviour in fragmented bog and rough grassland mosaics perhaps more comparable to parts of the Unshinagh landscape. Irish breeding home ranges showed the widest variation of all studies. During incubation, home range estimates ranged from 0.4 km<sup>2</sup> to almost 10.5 km<sup>2</sup> (40 - 1,050 ha), with a median of 2.3 km<sup>2</sup> (230 ha). Four of the thirteen birds had incubation home ranges of less than 1.1 km<sup>2</sup>, while two exceeded 8.5 km<sup>2</sup>. Chick-rearing home ranges were even more variable, ranging from 0.3 km<sup>2</sup> to 82.5 km<sup>2</sup> (30 - 8,250 ha), with a median of 2.6 km<sup>2</sup> (260 ha). Several birds used relatively small areas ( $< 1$  km<sup>2</sup>), while a few made very extensive movements. Across the full breeding period (pre-incubation, incubation and chick-rearing), home ranges ranged from 0.7 km<sup>2</sup> to 46.5 km<sup>2</sup> (70 - 4,650 ha), with a median of 3.5 km<sup>2</sup> (350 ha). Core areas, even in Ireland, remained relatively small: incubation cores ranged from 0.03 km<sup>2</sup> to 2.45 km<sup>2</sup> (3-245 ha; median 34 ha), while chick-rearing cores ranged from 0.04 km<sup>2</sup> to 14.37 km<sup>2</sup> (4 - 1,437 ha; median 50 ha). These results show that while some Irish birds undertake very extensive movements, the core areas that matter most for nesting and early chick-rearing remain tightly constrained.

Colclough also reported exceptionally large home ranges for non-breeding or prospecting birds, which ranged from 28 km<sup>2</sup> to 1,135 km<sup>2</sup> (2,800 - 113,500 ha), with a mean of 281 km<sup>2</sup> (28,100 ha). These individuals frequently overlapped multiple breeding territories; in one case a single non-breeding bird overlapped eight breeding pairs. Such birds are not appropriate baselines for

displacement calculations, but they illustrate the permeability of the wider landscape and the potential for long-distance movements when birds are not tied to a nest.

**Table 7. Curlew tracking and home range studies in recently published literature from various study areas.**

| Study                     | Season / Stage             | Home Range (ha)                                      | Core Area (ha)                                     | Notes                                                             |
|---------------------------|----------------------------|------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------|
| <b>Mander et al. 2022</b> | Winter (Humber Estuary)    | Mean <b>555.5 ± 557.9</b> ; some > 1,000             | Not reported                                       | Strong site fidelity; night ranges larger than day ranges         |
| <b>Bocher et al. 2024</b> | Breeding (all habitats)    | Mean <b>99.1 ± 103.8</b> (range <b>11–561</b> )      | Mean <b>15.7 ± 17.0</b> (range <b>3–92</b> )       | Multi-country dataset (Russia, Finland, Estonia, Germany, France) |
|                           | Bogs                       | ~ <b>55</b>                                          | ~ <b>8</b>                                         | Smallest ranges among habitats                                    |
|                           | Grassland                  | ~ <b>97</b>                                          | ~ <b>16</b>                                        | Largest ranges among habitats                                     |
|                           | Abandoned farmland         | ~ <b>77</b>                                          | ~ <b>12</b>                                        | Intermediate values                                               |
|                           | Non-breeding               | ~ <b>292</b>                                         | Not reported                                       | Larger, more diffuse ranges                                       |
| <b>Bowgen et al. 2025</b> | Breeding (all stages)      | Mean <b>191</b> (median 71; range <b>9.8–1,593</b> ) | Mean <b>28</b> (median 5.2; range <b>1.5–359</b> ) | Upland farmland; predator-controlled landscape                    |
|                           | Incubation                 | <b>34</b>                                            | <b>4</b>                                           | Very restricted movements                                         |
|                           | Chick-rearing              | <b>253</b>                                           | <b>52</b>                                          | Substantial expansion post-hatching                               |
| <b>Colclough 2024</b>     | Incubation (OUF 95%)       | <b>40–1,050</b> (median <b>230</b> )                 | <b>3–245</b> (median <b>34</b> )                   | Fragmented Irish bog/grassland mosaics                            |
|                           | Chick-rearing (OUF 95%)    | <b>30–8,250</b> (median <b>260</b> )                 | <b>4–1,437</b> (median <b>50</b> )                 | Very wide variation; some extremely large ranges                  |
|                           | Full breeding season       | <b>70–4,650</b> (median <b>350</b> )                 | Not reported                                       | Includes pre-incubation movements                                 |
|                           | Non-breeding / prospecting | <b>2,800–113,500</b> (mean <b>28,100</b> )           | Not reported                                       | Overlaps multiple breeding territories; not used for displacement |

These studies provide a set of indicative values for interpreting potential displacement at Unshinagh. Incubation ranges are typically small, often between 30 ha and 100 ha, with core areas of only a few to a few dozen hectares. Chick-rearing ranges expand into the low hundreds of hectares, and full breeding-season ranges commonly fall between 80 ha and 300 ha, although some individuals in fragmented Irish landscapes range far more widely. Wintering ranges are generally in the region of 500–700 ha. Non-breeding birds can range over tens of thousands of hectares, but these movements are not directly relevant to breeding-season displacement.

When these home-range values are compared with the spatial overlap results from Unshinagh, the implications become clearer. In 2020, the minimum bounding geometry (MBG) covered 186 ha, with 33 ha overlapping the 620 m buffer and 72 ha overlapping the 800 m buffer. These overlap areas are broadly equivalent to the scale of incubation home ranges and core areas reported in the literature, suggesting that any displacement in that year would primarily affect the most sensitive early-season behaviours. In 2021, the overlap was even smaller, at 5–25 ha, which lies within the range of core-area estimates from both Bowgen et al., (2025) and Colclough (2024).

By contrast, the 2023 dataset, based on vantage-point flight lines, produced an MBG of 343 ha, with 214 ha overlapping the 620 m buffer and 278 ha overlapping the 800 m buffer. These values correspond to the scale of full chick-rearing home ranges and a substantial proportion of full breeding-season ranges. The combined 2024 dataset, with an MBG of 707 ha and overlaps of 336 ha and 447 ha, falls at the upper end of typical chick-rearing ranges and within the range of full-season home ranges reported in both the UK and Irish studies. The walkover-only 2024 values demonstrated a smaller (253 ha) bounding geometry of which 79 ha overlaps with the 620 m buffer and 128 ha overlaps with the 800 m buffer showing a pattern in years where curlew range more widely, the overlap with turbine buffers extends into the scale of habitat required for successful chick-rearing and full-season foraging.



A complementary way to interpret the likely scale of displacement at Unshinagh is to consider the number of pairs predicted to be displaced in each year using the Pearce-Higgins et al., (2009) turbine-related density-reduction rates, and to translate those values into an approximate area of functional habitat loss using the home-range requirements summarised above. For example, in 2023 the displacement calculations indicate that between 1.52 and 2.60 pairs may be displaced, depending on whether the central (30.4%) or upper (52.1%) displacement rate is applied. If a typical breeding home range is taken to be in the order of 80-300 ha, as reported across the UK and continental studies, then the displacement of 1.52 pairs would equate to the loss of approximately 120-450 ha of functional space, while the displacement of 2.60 pairs would correspond to approximately 210-780 ha.

These values are similar to the spatial overlap estimates derived from the 2023 MBG, which indicated that 214 - 278 ha of habitat lay within the 620 m and 800 m displacement buffers. A similar pattern emerges for 2024, where the displacement of 1.22 - 2.08 pairs correspond to an approximate functional loss of 100-620 ha, again closely matching the 336-447 ha of overlap identified in the combined 2024 dataset. In earlier years, where the predicted displacement was much lower - for example, 0.12 - 2.08 pairs in both 2020 and 2021 - the corresponding functional loss estimates fall within the range of approximately 10 - 600 ha.

These values align closely with the smaller overlap areas recorded in those years (33 - 72 ha in 2020 and 5 - 25 ha in 2021), indicating that the scale of predicted displacement is ecologically consistent with the scale of habitat intersecting the turbine buffers. This reciprocal approach - translating displaced pairs into indicative habitat loss - provides an independent validation of the spatial overlap analysis and demonstrates that the magnitude of predicted displacement is coherent with the home-range requirements documented in the curlew tracking literature.

## 8 Review of Published Wader Data

This section provides a review of the historical wader information recently made available through the aggregated national wader datasets (and which we understand may include e.g. the RSPB NI data which has been referred in their consultation response), and which were released in April 2026 and therefore post-date both the original Environmental Statement and the subsequent 2023 - 2024 survey work.

Unlike the annualised field surveys, these datasets present a consolidated record of wader activity across multiple years and sources, offering a broader context for understanding patterns of occurrence within the wider landscape. The purpose of this review is to examine how the aggregated records relate spatially to the revised turbine layout and to identify any areas of overlap or consistency with the field-based evidence already gathered. By considering these historical datasets alongside both the 2020 - 2021 baseline and the more recent 2023 - 2024 surveys, the review provides an integrated picture of wader use of the site and its surroundings, enabling a clear understanding of how the revised layout aligns with all available ornithological information.

### 8.1 Partridge 1986-1987

The historical dataset used in this assessment derives from the Northern Ireland Breeding Wader Survey undertaken in 1986–1987 and documented in Partridge (1987) and Partridge & Smith (1992). These studies contain the original field-mapped registrations of breeding waders collected through repeated visits during the breeding season, using the standard territory-mapping methods of the period. These registrations were later made available online in the form of geometric circular features, but the archive does not provide accompanying metadata describing their radius, derivation, or species attribution.

For the purposes of this review, the available digitised circular features were imported into the GIS environment and treated as spatial indicators of locations where breeding wader activity was recorded during the 1986–1987 survey. Because the online resource does not provide species-level information, territory boundaries, or methodological notes explaining the meaning of the circular geometry, no assumptions were made regarding the size of territories or the behaviour represented by these features. The mapped points were simply overlaid onto the proposed Unshinagh planning boundary, turbine layout, access tracks and associated infrastructure to determine whether any of the 1986 - 1987 wader locations coincide with, or lie adjacent to, the proposed development footprint.

This mapping exercise therefore involved only the georeferenced circular features derived from these surveys and the current site design, with no species-specific interpretation possible from the online dataset. The outputs provide a spatial indication of

where historical breeding activity was recorded relative to the updated proposed development area. This examination shows that the available dataset comprises a small number of mapped features, including a single circular feature located in the northern part of the study area and at least two polygonal features situated in the southern portion of the landscape, extending contiguously further to the south and south-east (Figure 28).

When these historical features are considered alongside the potential curlew displacement zones derived from the 620 m and 800 m buffers, the areas of overlap equate to 128 ha and 144 ha for the 620 m buffer and 161 ha and 188 ha for the 800 m buffer. Summed across the two southern polygons, this corresponds to a total potential overlap of 272 ha under the 620 m buffer and 349 ha under the 800 m buffer. Additional clusters of historical wader activity are also present further south within the wider 5 km buffer, and further isolated records occur beyond the 5 km radius to the north. These mapped locations provide a spatial indication of where breeding waders were recorded during the 1986–1987 survey in relation to the present-day development area.

Given the present-day curlew distribution in the wider landscape, it is plausible that the historically mapped features relate to curlew activity; however, this cannot be confirmed from the available dataset, as the online resource provides no species attribution or metadata.

## 8.2 Balmer et al., 2013

The next historical dataset examined for this assessment was derived from the BTO Bird Atlas 2007–11 (Balmer et al. 2013), accessed via the online mapping portal. The Atlas provides national-scale distribution data for breeding and wintering birds across Britain and Ireland, mapped at the 10 km and 2 km tetrad scales. For the purposes of this review only the 2 km tetrad-level presence/absence data were available for extraction, and only for those tetrads in which waders were recorded.

The online portal does not provide species-specific abundance, territory counts, or behavioural classifications but does identify these records to species level. Instead, the available data consist solely of square polygons indicating tetrads where a species was recorded as present during the breeding season and, separately, during the winter period. No further metadata (e.g. survey effort, number of registrations, breeding confirmation codes) are available at the downloadable resolution.

For this review, the tetrads containing any breeding-season wader records (curlew, lapwing, snipe, redshank, oystercatcher, golden plover) were digitised as geometric square features and imported into the GIS environment. These squares were then overlaid onto the Unshinagh planning boundary, turbine layout, access tracks and associated infrastructure to identify whether any Atlas-recorded breeding-season wader tetrads intersected with, or lay adjacent to, the proposed development footprint and also within a 5 km buffer of the area.

The same procedure was applied to the wintering-season Atlas data, with all tetrads containing winter records of waders extracted and mapped. These winter tetrads were similarly overlaid onto the site boundary and 5 km buffer to determine the proximity of historical non-breeding wader records to the proposed development area.

Because the Atlas data are presence-only and tetrad-based, no assumptions were made regarding the number of pairs, habitat use within each square, or the precise location of activity within the tetrad. The mapped squares were used solely as indicators of wader occurrence within the 2007–11 period, providing a broad-scale context for understanding the distribution of breeding and wintering waders in the wider landscape surrounding the Unshinagh site. There were no overlaps of tetrad data for either the breeding or non-breeding seasons in these datasets (Figure 29 & 30).

## 8.3 1 km Breeding Wader Layers (1980–2012 and 2012–2023).

Two 1 km resolution datasets were used to examine the historical and contemporary distribution of breeding waders in Northern Ireland, derived from the standardised presence/absence layers produced as part of the Breeding Wader Sensitivity Mapping project (NIEA/RSPB/BTO). These datasets consolidate multiple survey sources into a unified spatial framework and provide the most comprehensive 1 km-scale overview of wader occurrence available for the region.

The 1980 - 2012 layer represents the historic baseline and incorporates all targeted and general wader survey data collected between 1980 and 2011. Records were standardised to a presence (2) / absence (1) / no-data (0) format for each of the ten target species. Coordinates from point datasets, grid references and polygon centroids were harmonised into a 1 km grid. Each

grid square therefore reflects the maximum recorded status for each species across the entire 32-year period. This dataset provides a long-term view of wader distribution prior to the major declines documented.

The 2012 - 2023 layer represents the contemporary distribution and was generated using the same standardised presence/absence approach. It incorporates BBS records, Bird Atlas tetrad data (filtered to April–July), targeted NIEA and RSPB surveys, and LIFE project datasets. As with the historic layer, all records were converted to a unified 1 km grid with presence, absence or no-data values for each species. This dataset reflects the current status of breeding waders in Northern Ireland following a decade of population contraction and habitat change.

For the purposes of this assessment, both the 1980 - 2012 and 2012 - 2023 1 km layers were imported into the GIS environment and overlaid onto the Unshinagh planning boundary, turbine layout, access tracks and associated infrastructure. Each 1 km square was treated as a spatial indicator of presence, absence or lack of survey coverage within the relevant time period for each species. No assumptions were made regarding the number of pairs or the precise location of activity within each square. Only those species whose 1 km presence squares intersected the site boundary or turbine footprint were taken forward for further interpretation; species with no spatial intersection were not considered further in the site-specific assessment.

Within the 1980 - 2012 1 km dataset, seven species were recorded in the wider study area (curlew, golden plover, snipe, lapwing, dunlin, common sandpiper and redshank). Of these, only three species were recorded in proximity to the revised site boundary and therefore examined for overlap assessment: curlew, snipe and lapwing. Redshank were recorded both along the coast and, notably, at an inland location to the north-west near Dungonnell within 5 km of the site, but no redshank presence squares intersected or lay adjacent to the development footprint.

Curlew presence was recorded along the eastern side of the northern site boundary (Figure 31) and within a block of occupied 1 km squares to the south (Figure 31), centred around Mullaghboy Hill and extending eastwards. No curlew presence was recorded in the Curraghvohil area in this dataset. Using the full area of each intersecting 1 km square, the overlap with the 620 m displacement buffer was 166 ha, and the overlap with the 800 m buffer was 234 ha.

Snipe were not recorded to the northern part of the site, but one occupied 1 km square occurred to the south of the development footprint (Figure 32). No snipe presence was recorded in the Curraghvohil area. The 400 m displacement clip for snipe corresponded to a maximum of 5 ha. Lapwing presence was recorded to the south of the site, including around Mullaghboy Hill and forming a contiguous band extending southwards towards Lisles Hill and beyond (Figure 33). Lapwing were not subject to a displacement-buffer assessment in this study; no displacement calculations were undertaken for this species on this historical data.

Within the 2012 - 2023 1 km dataset, curlew was the only wader species recorded within the wider region of the Unshinagh site (Figure 34). Relative to the 1980–2012 layer, the distribution of curlew appears expanded within the site area, with a westward shift in occupied squares, alongside a contraction of the southern component of the population. Several 1 km squares show consistent occupation across both time periods, indicating a persisting, albeit spatially shifting, curlew presence in the landscape. For all other wader species; including snipe (Figure 35); no presence was recorded within the 5 km buffer of the site in the 2012–2023 dataset. No hectareage overlap estimation was therefore possible for snipe or any other species

Using the full area of each intersecting 1 km square, the overlap with the curlew 620 m displacement buffer was 256 ha, and the overlap with the curlew 800 m buffer was 351 ha. The hectare values presented above are based on the full area of each intersecting 1 km square, rather than the actual location of breeding pairs within those squares. This approach is inherently precautionary, as the true nesting locations are likely to occupy only a portion of each grid cell.

The online mapping tools used to derive these distributions provide presence-only 1 km squares without information on within-square positioning, and therefore the outer limits of each square were used to estimate potential overlap. This could be considered a precautionary method appropriate because the overall range depicted in these datasets it is presumed aligns with the curlew numbers reported by RSPB NI for 2016 - 2022 and provides an indication of the mapped distribution and reflective of the known population. The calculated overlap areas should be interpreted as upper-bound estimates, although these are broadly consistent with the earlier overlap estimations, but recognising that actual pair locations may be more spatially restricted than the 1 km layer suggests.



## 9 Summary

The multi-year evidence base shows that curlew and snipe utilise areas within recognised displacement distances of the revised Unshinagh layout, and that some functional habitat loss remains likely despite the removal of turbines from within the Antrim Hills SPA. The Environmental Statement (2020–2021) recorded four curlew pairs in each baseline year, with three pairs within 1 km of turbines. Applying the Pearce-Higgins (2009) effect-size model to these ES values predicts displacement of 0.12 pairs (3%), 1.22 pairs (30.4%), and 2.08 pairs (52.1%). Spatially, the ES-derived MBGs show 186 ha of curlew range in 2020 and 148 ha in 2021, with 33 ha and 5 ha respectively within the 620 m displacement zone, and 72 ha and 25 ha within the 800 m zone.

The RSPB NI dataset (2016–2022) indicates higher curlew use of the landscape, with 5–9 pairs annually within 1 km and 1–8 pairs within 800 m. Applying the same effect-size model to these higher counts produces displacement estimates of 0.06–0.27 pairs (3%), 0.61–2.74 pairs (30.4%), and 1.04–4.69 pairs (52.1%), representing the upper bound of plausible impact. These years coincide with higher apparent curlew spatial footprint and demonstrate that the ES baseline reflects lower although within range of these RSPB estimates.

Updated surveys in 2023–2024 confirm curlew activity in the northern sector. The 2023 VP-derived MBG covers 337 ha, with 214 ha within 620 m and 278 ha within 800 m. Applying the Pearce-Higgins (2009) effect-size model to the five curlew territories recorded within 1 km in 2023 indicates a potential displacement of 0.15–2.61 pairs (3–52.1%). In 2024, walkover data alone produced an MBG of 253 ha (79 ha within 620 m; 128 ha within 800 m), with four territories within 1 km corresponding to a predicted displacement of 0.12–2.08 pairs. The combined 2024 walkover and VP dataset expands the MBG to 707 ha, with 336 ha within 620 m and 447 ha within 800 m, but does not increase the number of territories beyond the four recorded within 1 km. These values show that curlew habitat use remains extensive and that the revised layout still overlaps with areas repeatedly used for breeding.

For snipe, the ES recorded five territorial pairs, including three pairs within 500 m of turbines. Applying the Pearce-Higgins (2009) snipe-specific effect sizes (8.1%, 47.5%, 67.7%) yields predicted displacement of 0.16–1.35 pairs. When four pairs occur within 500 m (updated dataset), displacement increases to 0.32–2.71 pairs. Spatially, snipe MBGs show 118 ha of mapped range in both 2020 and 2021, with 38–50 ha within the 400–500 m displacement zones. In 2023, the VP-derived MBG expands to 421 ha (132 ha within 400 m; 154 ha within 500 m). In 2024, walkover data alone show 103 ha (0–3 ha within displacement zones), while the combined dataset expands to 792 ha, with 159 ha within 400 m and 211 ha within 500 m. These results confirm that snipe habitat use varies between years but that the revised layout still intersects with areas used by breeding snipe.

Across all methods; buffer-overlap, MBG, home-range extrapolation and effect-size modelling; the results converge on similar conclusions: the revised layout would result in the loss of a number of curlew and snipe territories and the potential displacement of tens to several hundred hectares of suitable habitat within the relevant displacement radii. Although reduced relative to the original layout, the residual impact remains ecologically sensitive given the conservation status of both species.

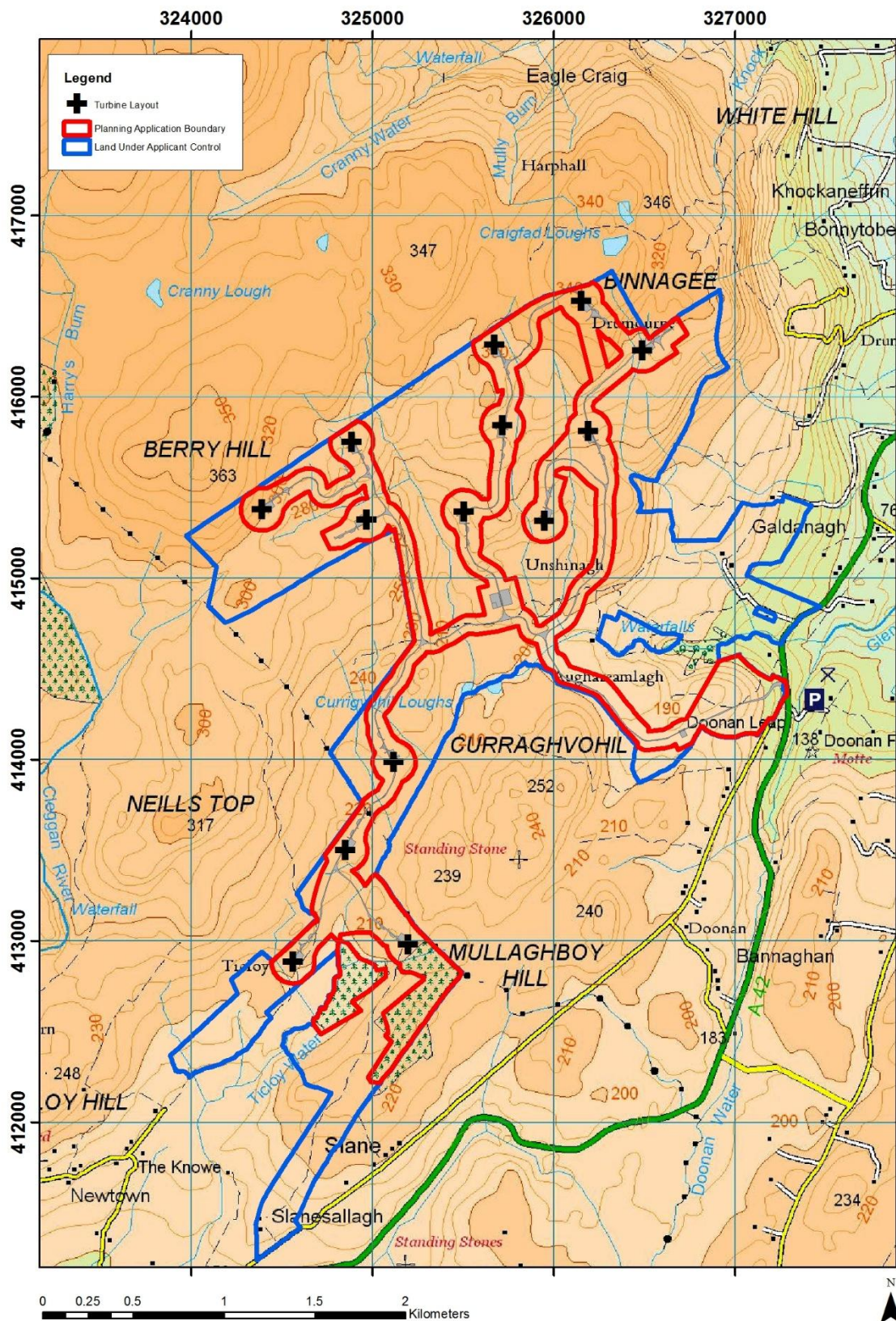
Mitigation should therefore focus on minimising construction-phase and operational phase disturbance, protecting hydrological conditions in wetland habitats and avoiding further encroachment into areas of repeated wader activity. However, on-site measures alone may not fully offset functional habitat loss. Compensation land will likely be required beyond the 800 m curlew and 400–500 m snipe displacement zones, ideally comprising hydrologically intact bog, wet grassland or flush systems capable of supporting stable breeding territories. Compensation should be proportionate to the upper-range displacement estimates to ensure ecological equivalence.

A supporting literature review confirmed that the assessment aligns with current scientific understanding of wader responses to wind-farm development, particularly the spatial and behavioural avoidance patterns described in Pearce-Higgins et al. (2009, 2012) and subsequent studies on curlew ranging behaviour and snipe ecology, territory fidelity and construction-phase sensitivity.

In parallel, the DAERA Breeding Wader Mapping Tool and the Natural Environment Map Viewer were used to situate the site within the wider regional distribution of priority wader species, verify the presence of mapped concentrations of curlew and snipe in the surrounding landscape, and ensure that the observations drawn from the site-specific datasets are consistent with broader patterns of occupancy and habitat use across the Antrim Plateau. Together, these sources provide an external source of spatial information that supports the ecological relevance of the displacement estimates presented in this review.

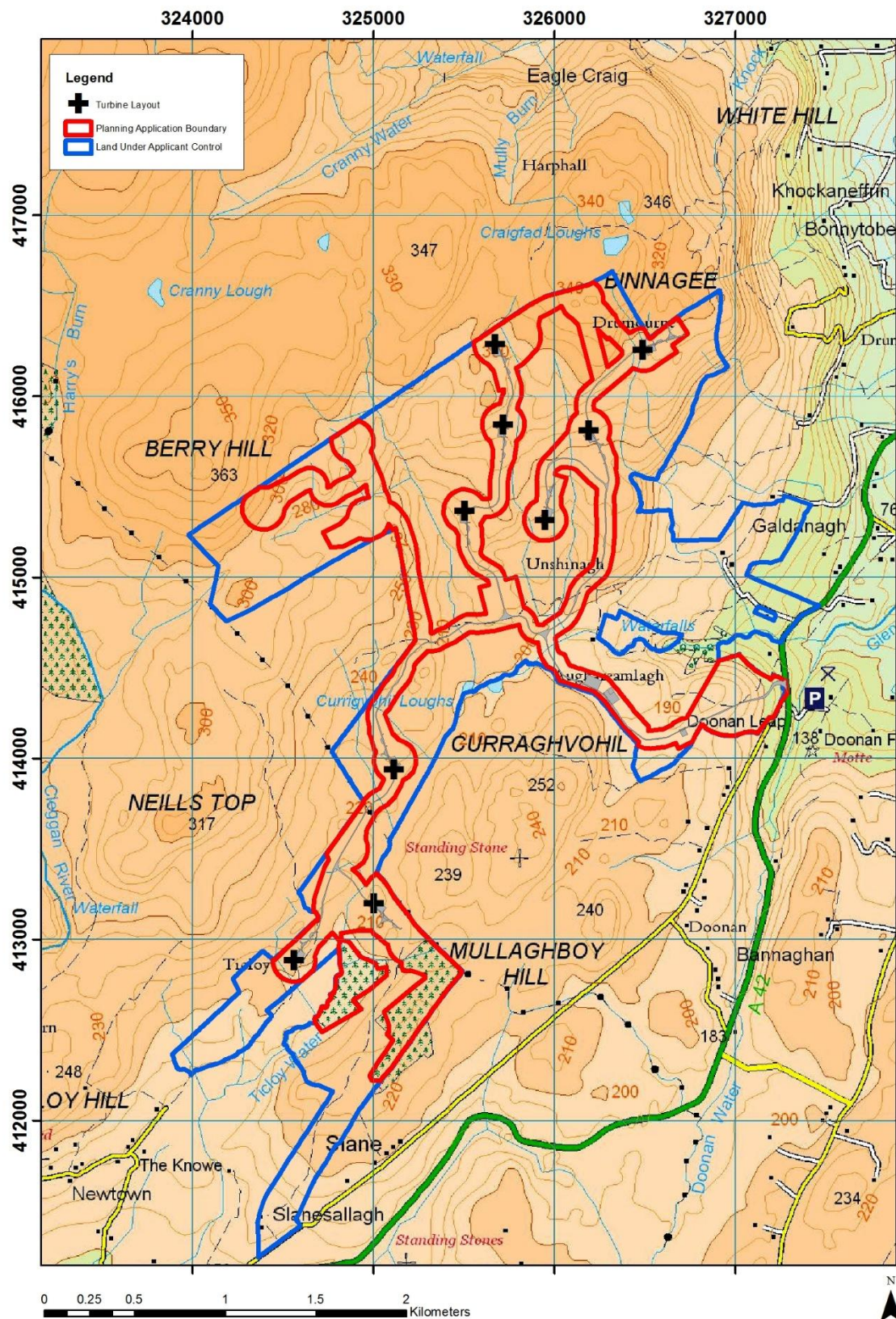
## 10 Figures

**Figure 1. Old turbine and site layout showing red line planning boundary and blue line landownership area.**



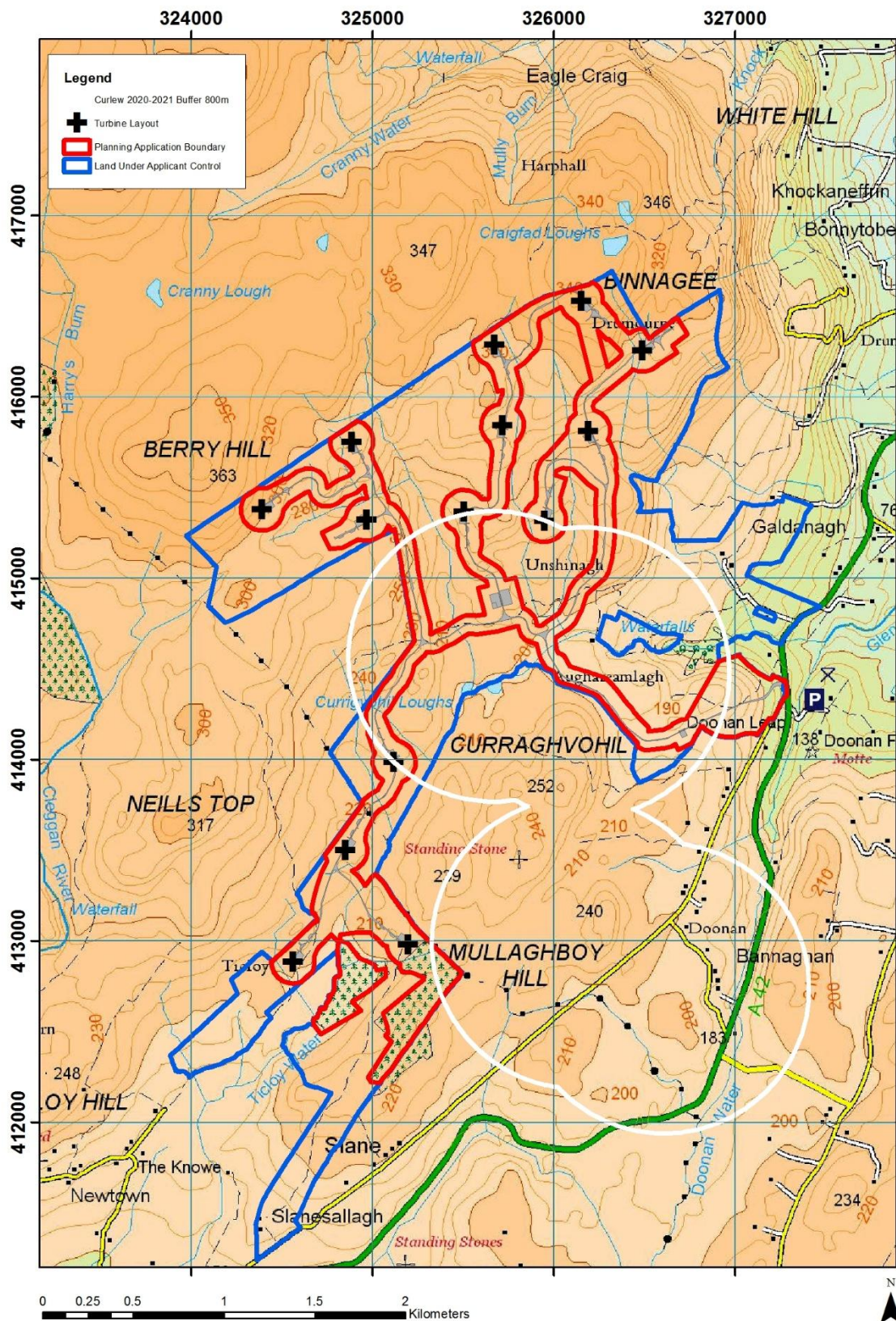
**Figure 2. Revised layout showing red line planning boundary and blue line landownership area.**





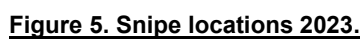
**Figure 3. Curlew locations showing 800 m buffers in 2020 and 2021 and old site layout.**



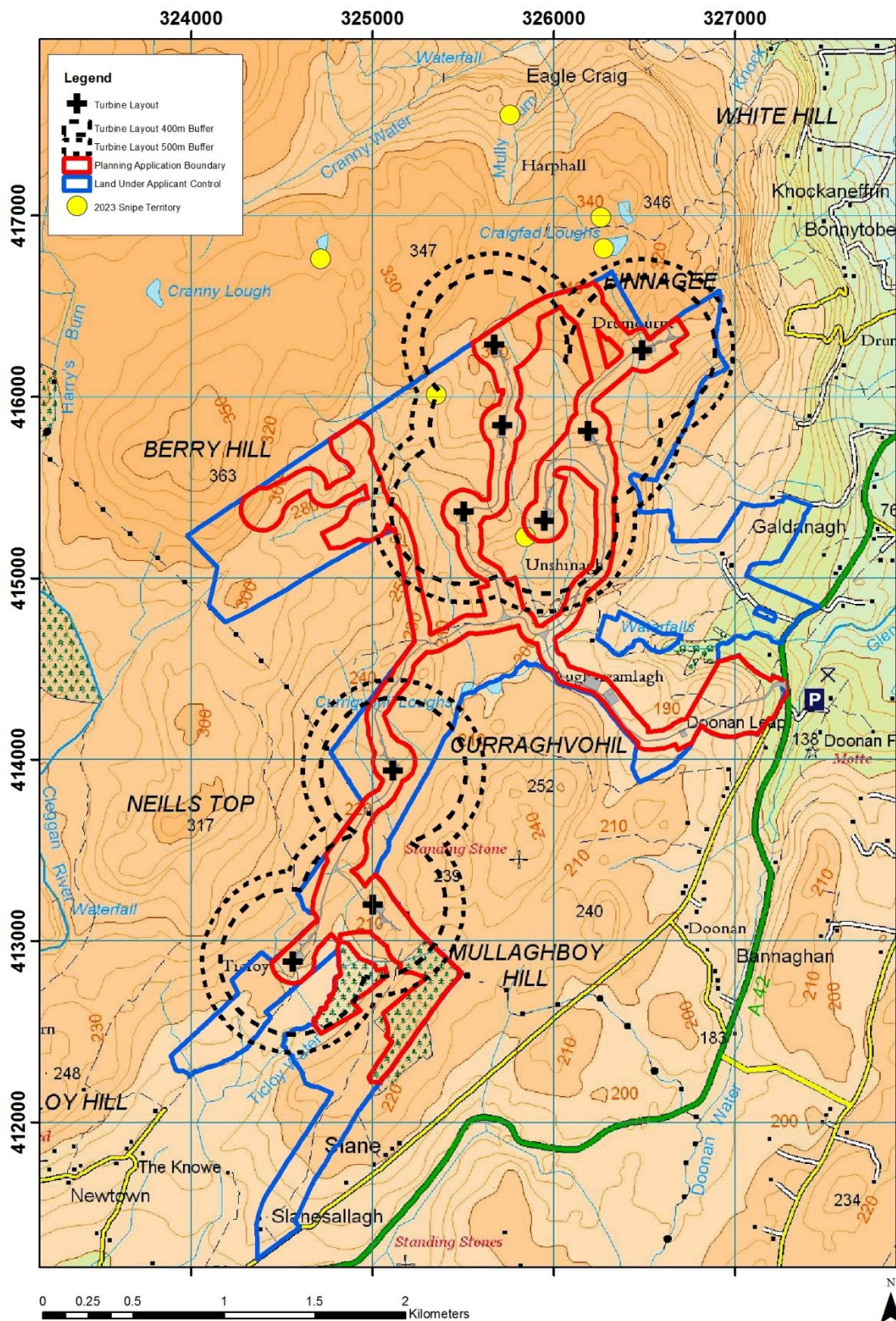


**Figure 4. Curlew locations 2023.**



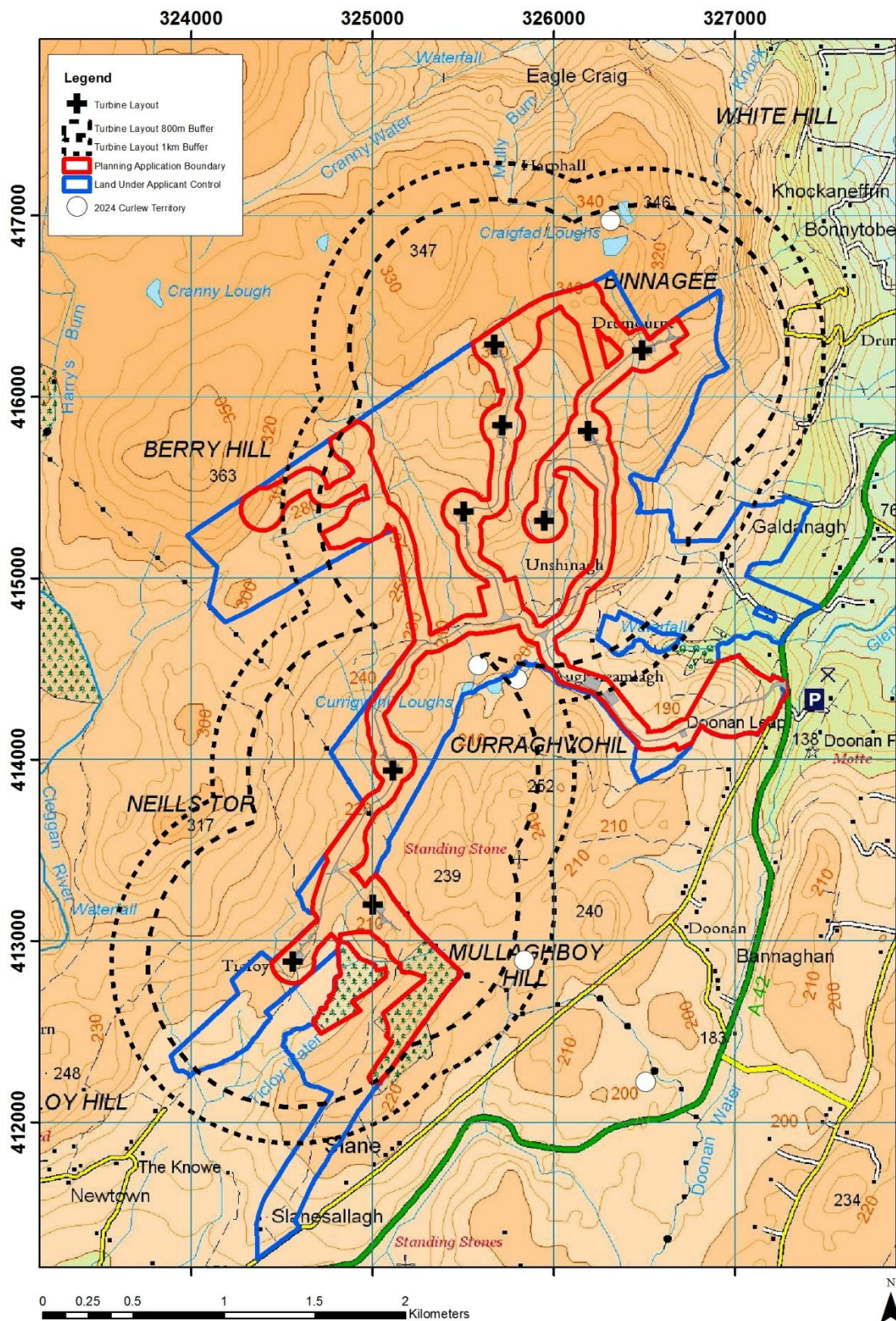






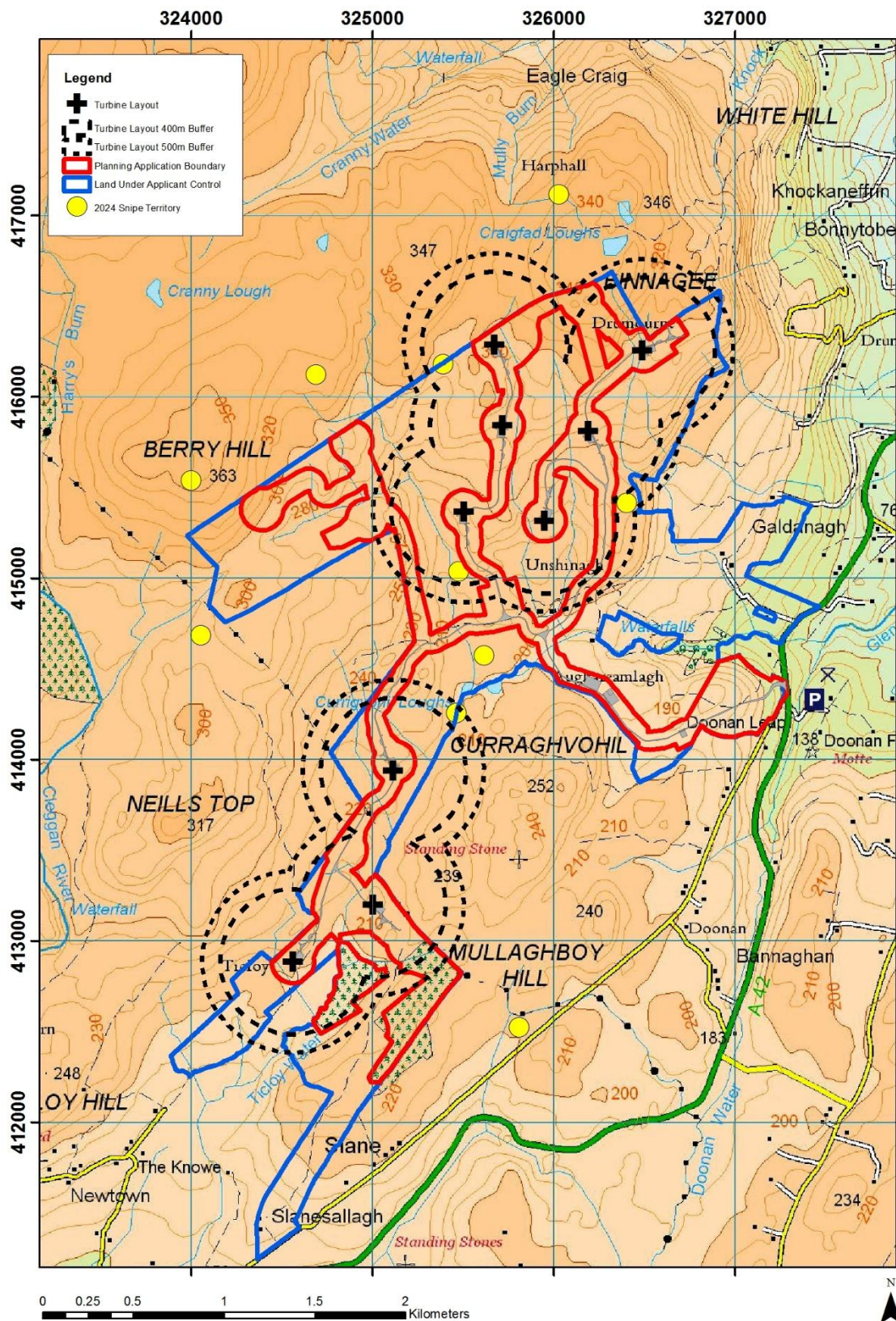
**Figure 6. Curlew locations 2024.**





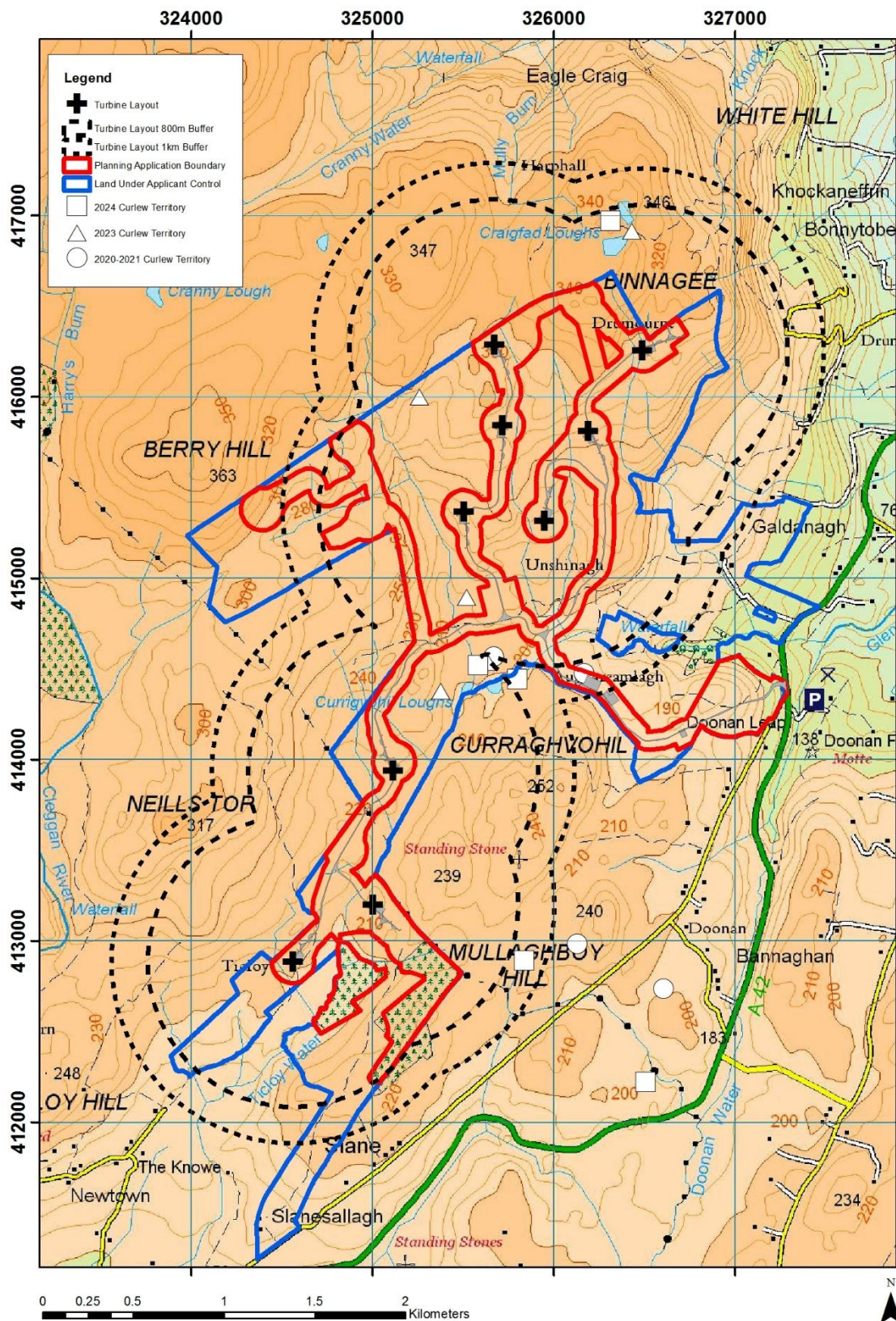
**Figure 7. Snipe locations 2024.**





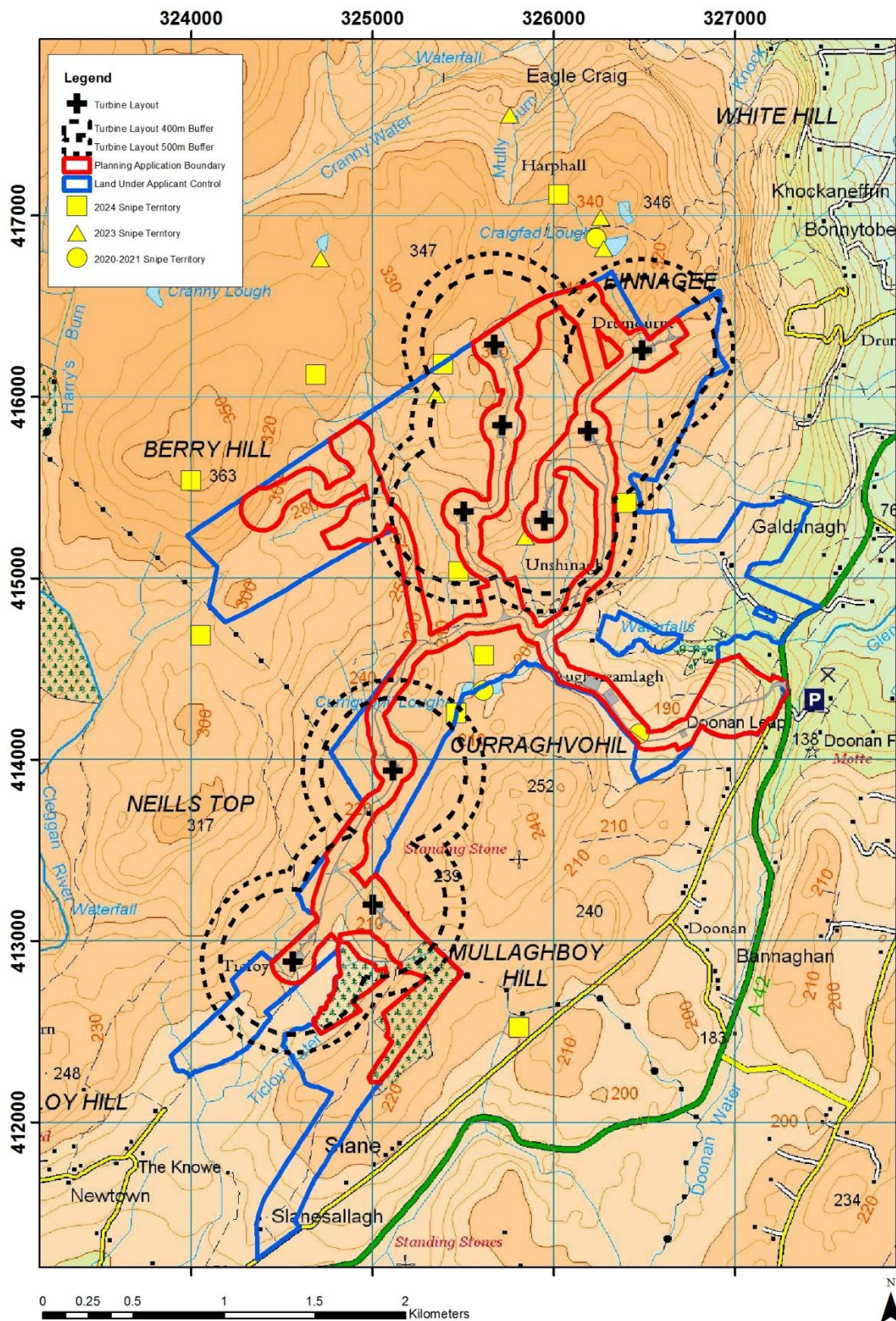
**Figure 8a. Multi-year map of all curlew locations (2020 – 2021, 2023 – 2024).**





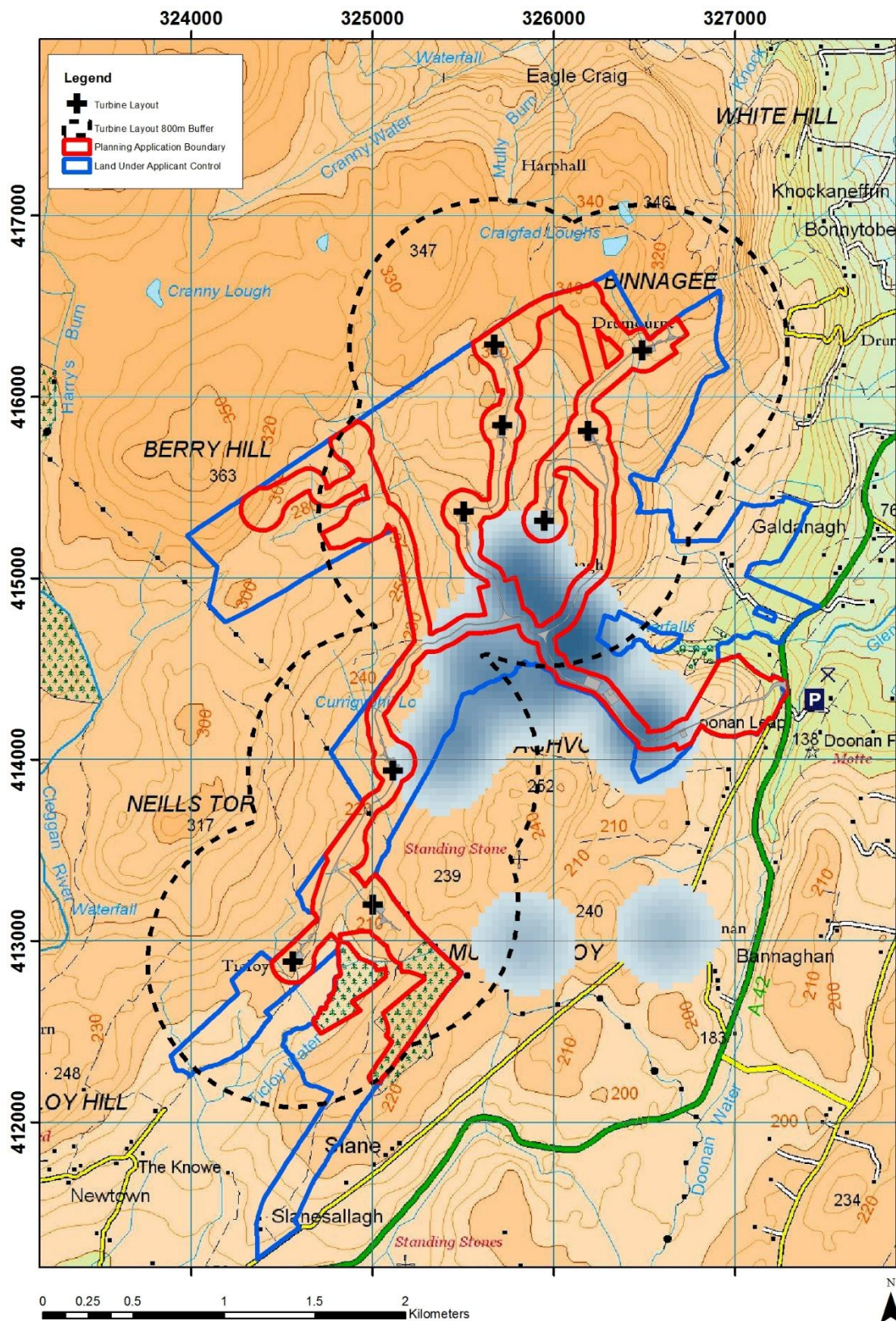
**Figure 8b. Multi-year map of all snipe locations (2020 – 2021, 2023 – 2024).**





**Figure 9. 2020 Kernel density map of curlew range.**





**Figure 10. 2021 Kernel density map of curlew range.**



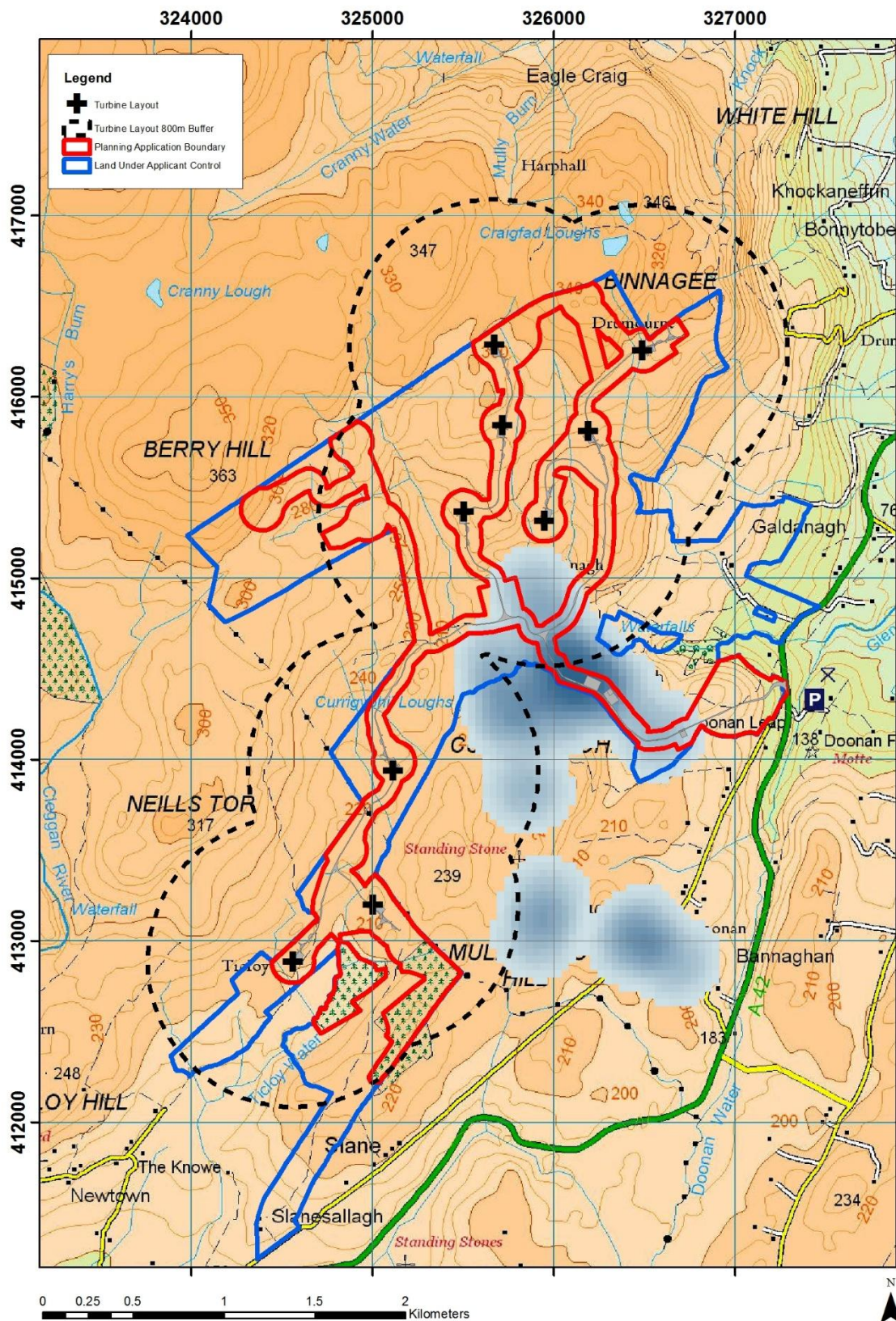


Figure 11. 2023 Kernel density map of curlew range.



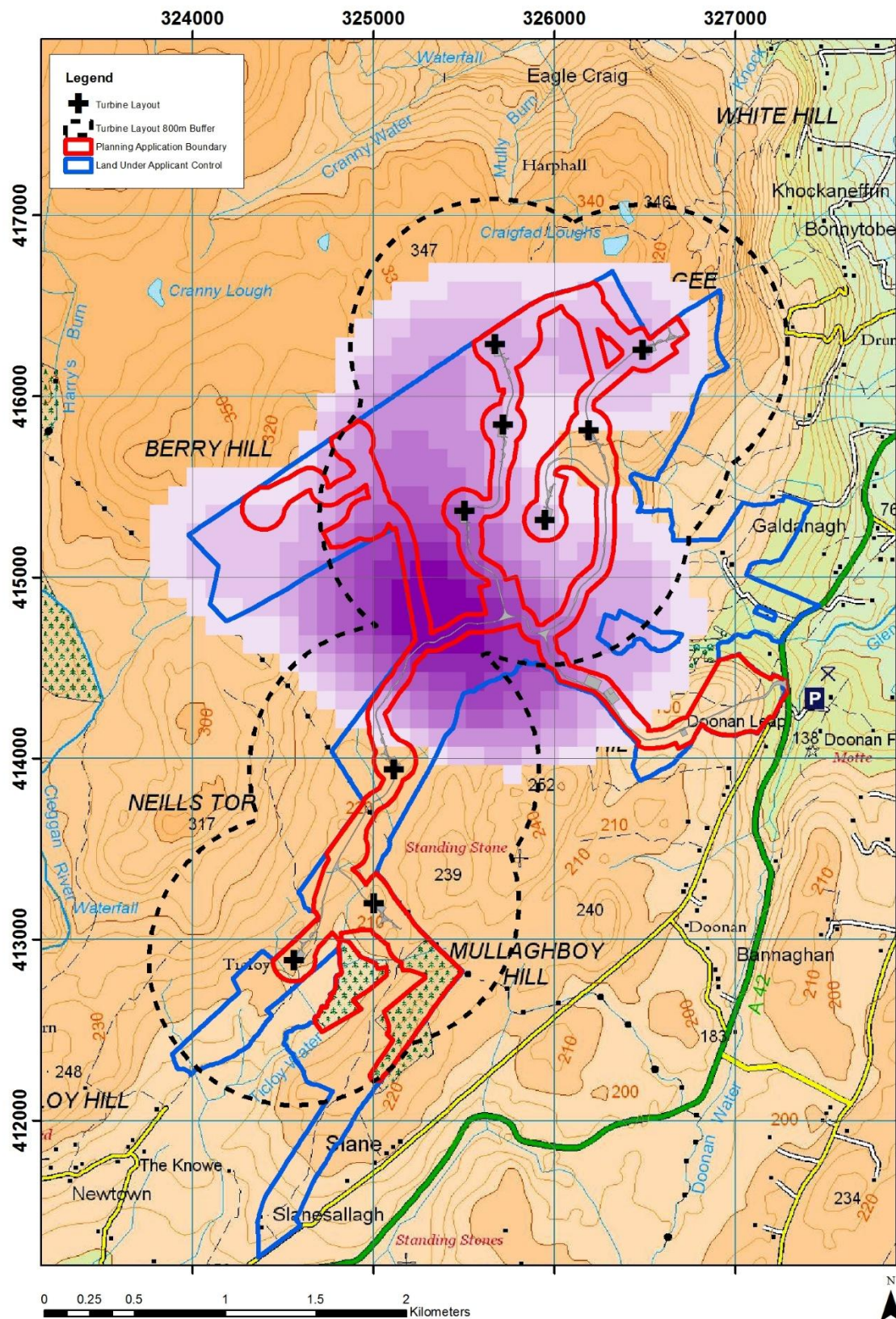
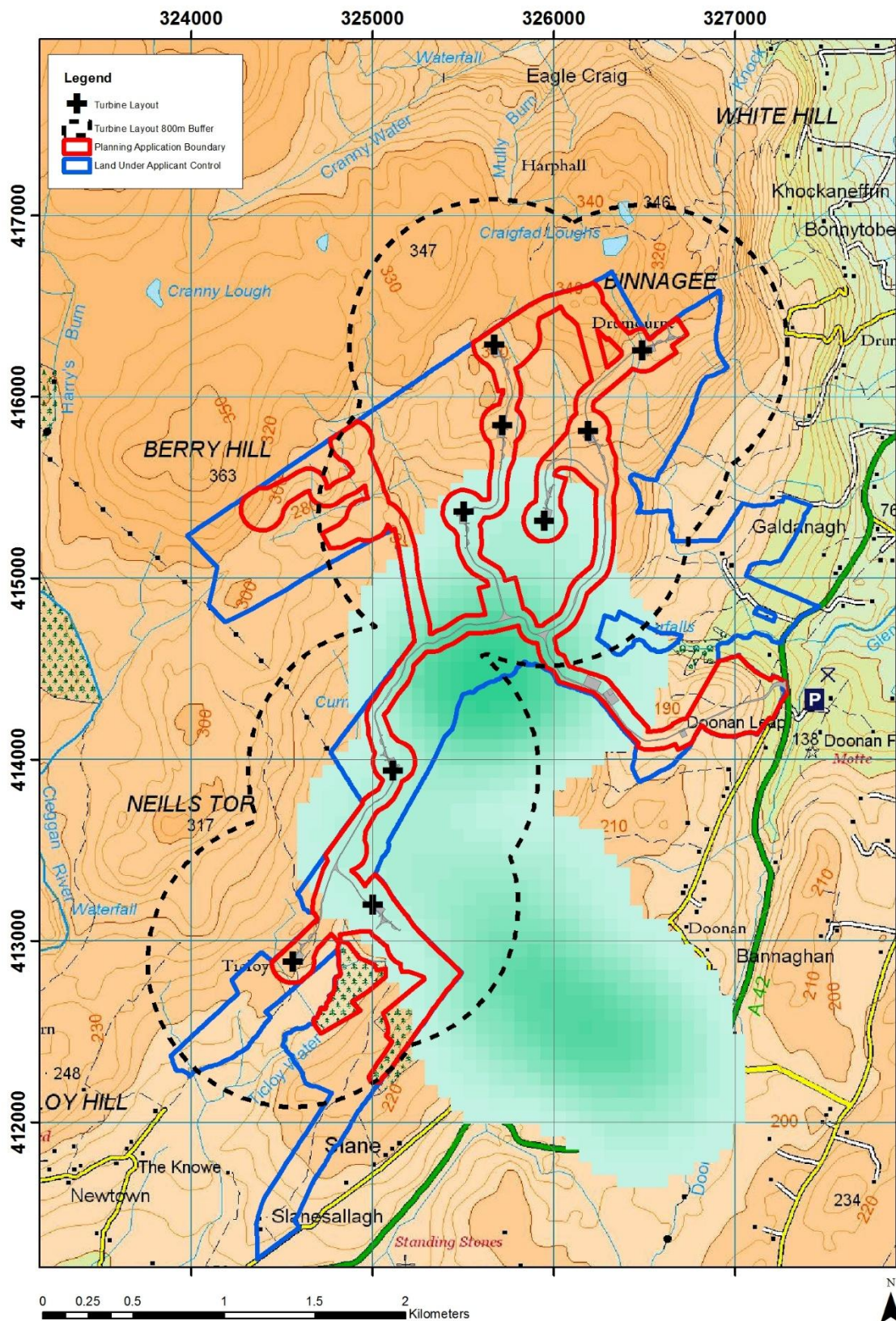


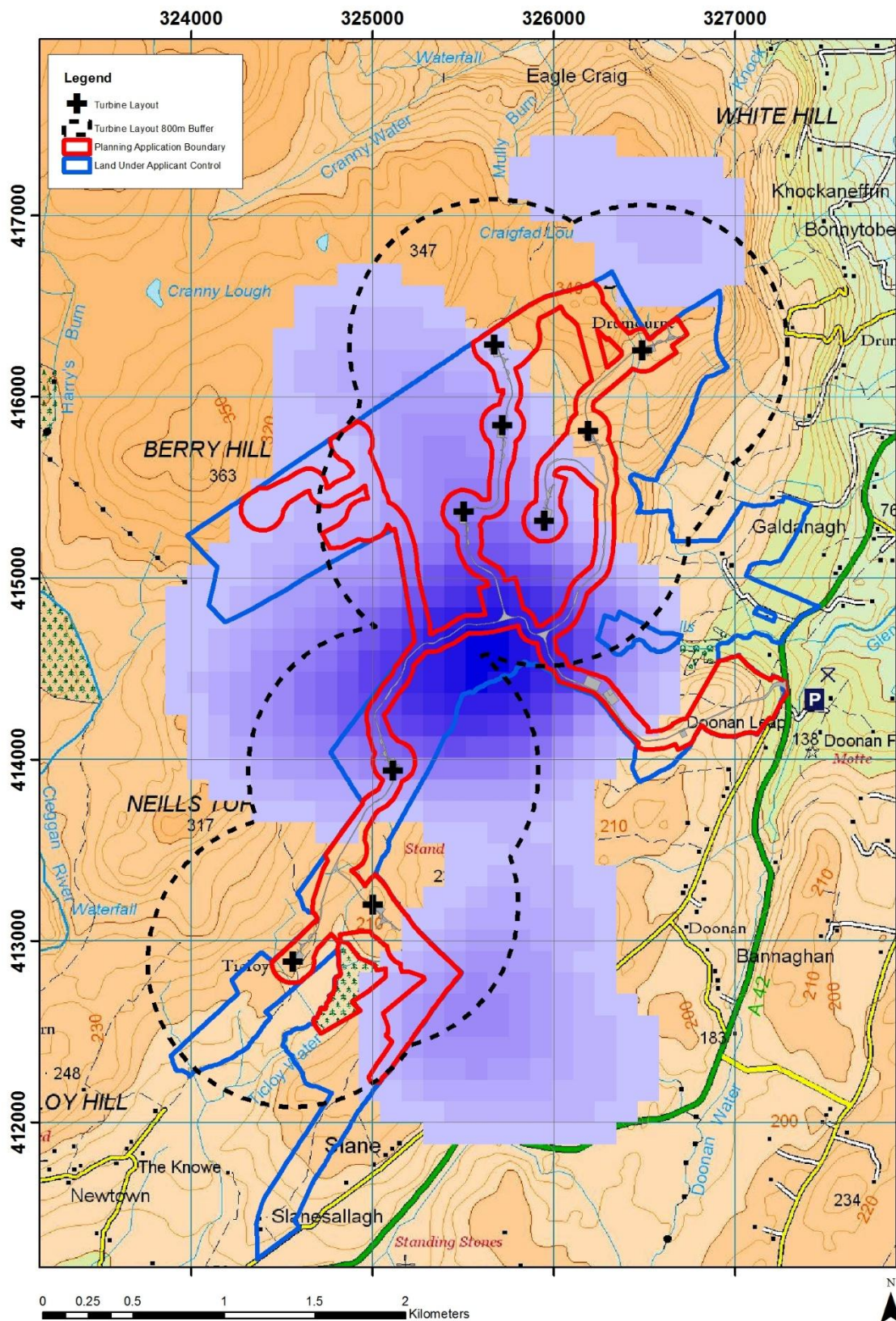
Figure 12. 2024 Kernel density map of curlew (based on walkover data).





**Figure 13. 2024 Kernel density map of curlew (based on vantage point data).**



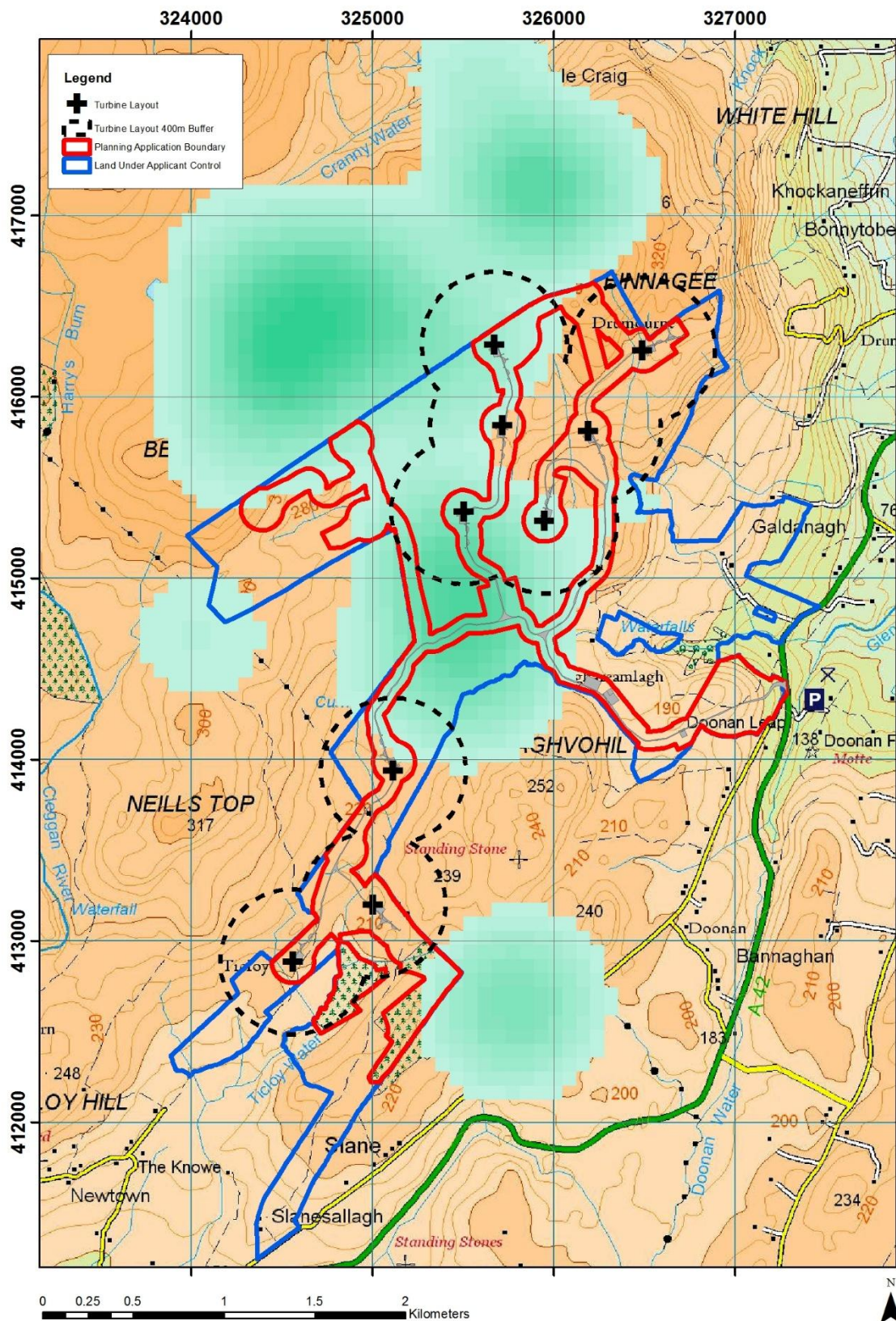


**Figure 14. 2023 Kernel density map of snipe (vantage point data).**



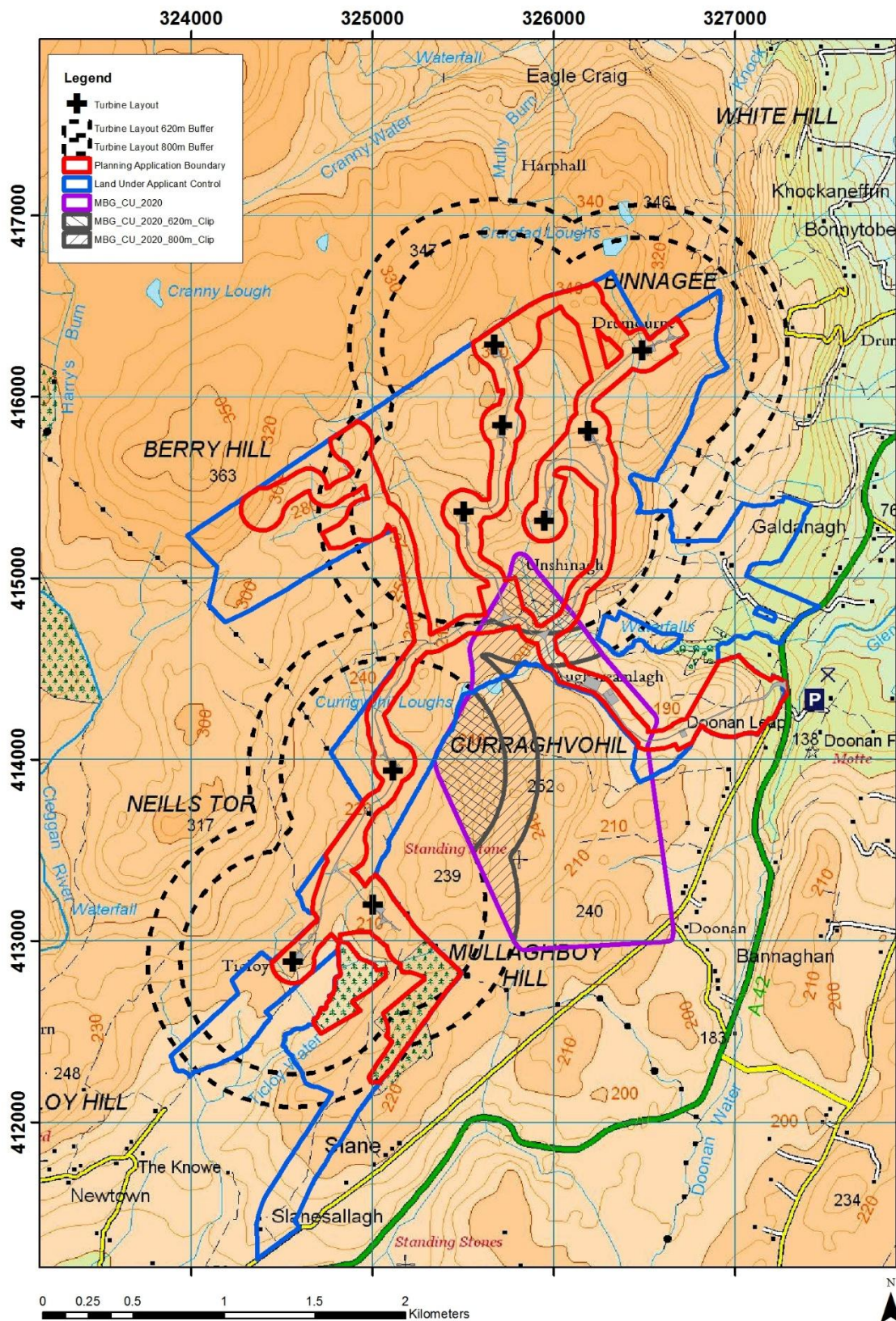






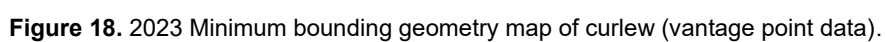
**Figure 16. 2020 Minimum bounding geometry map of curlew (walkover data).**





**Figure 17. 2021 Minimum bounding geometry map of curlew (walkover data).**







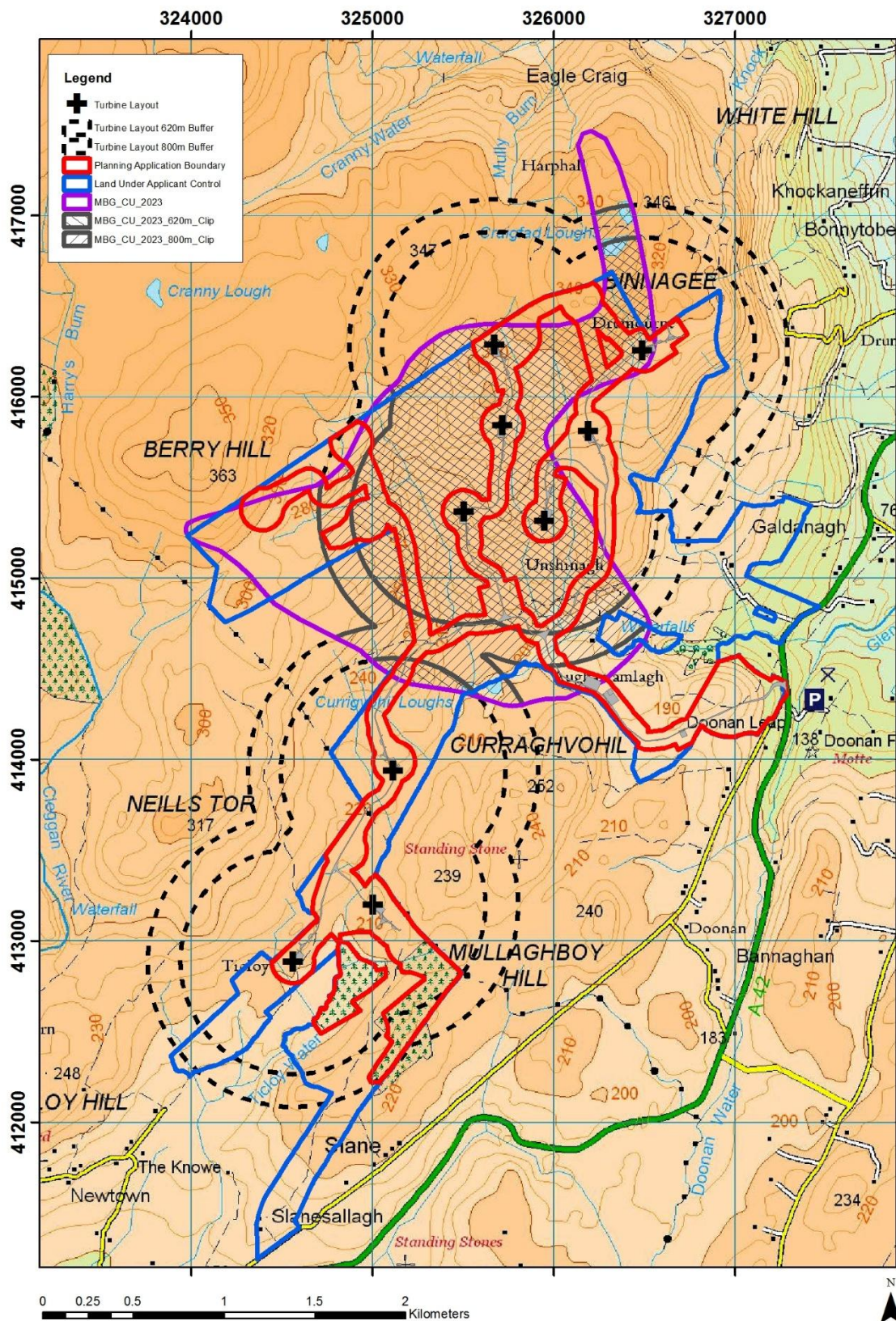
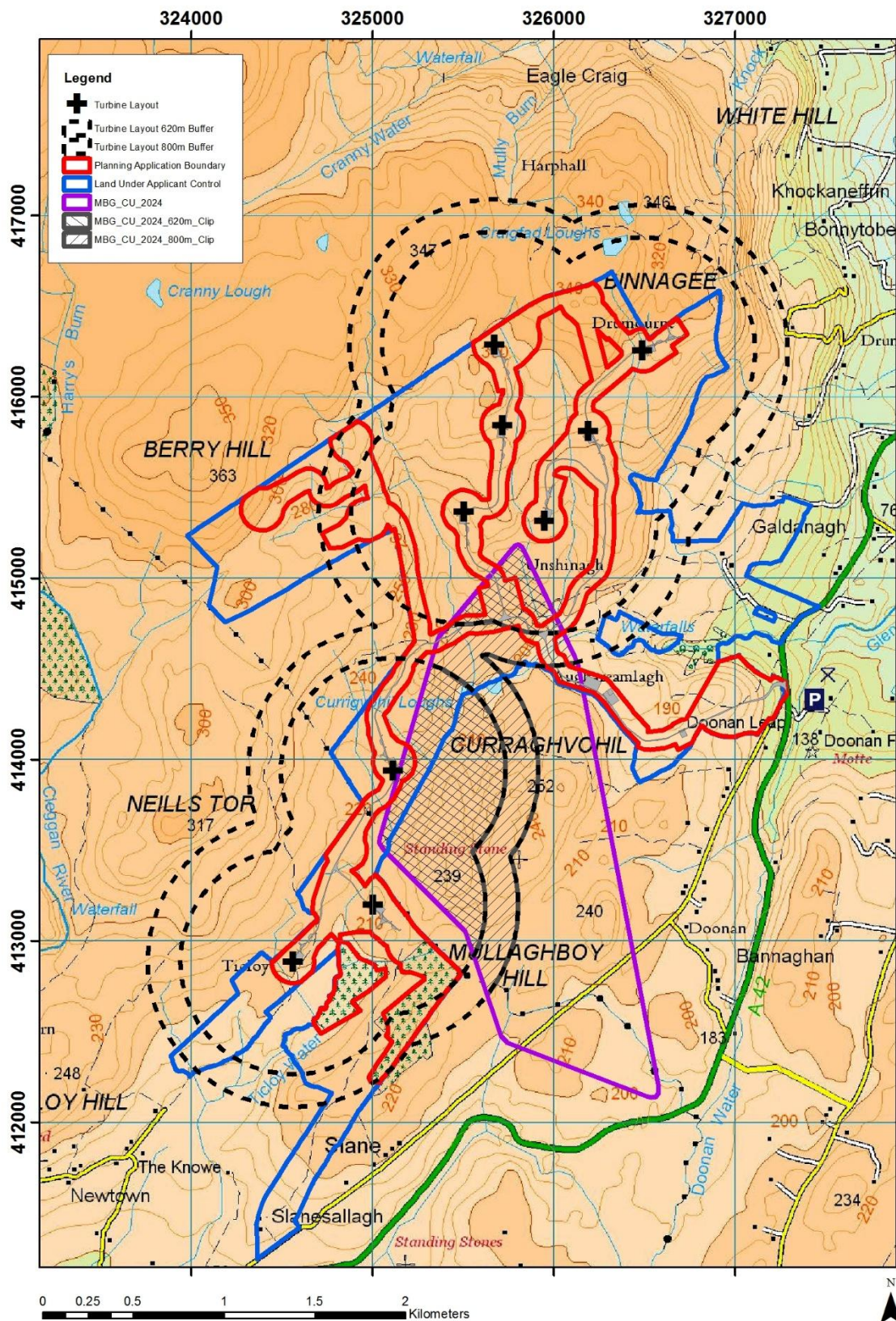


Figure 19. 2024 Minimum bounding geometry map of curlew (walkover data data).





**Figure 20.** 2024 Minimum bounding geometry map of curlew (walkover data & vantage point data).



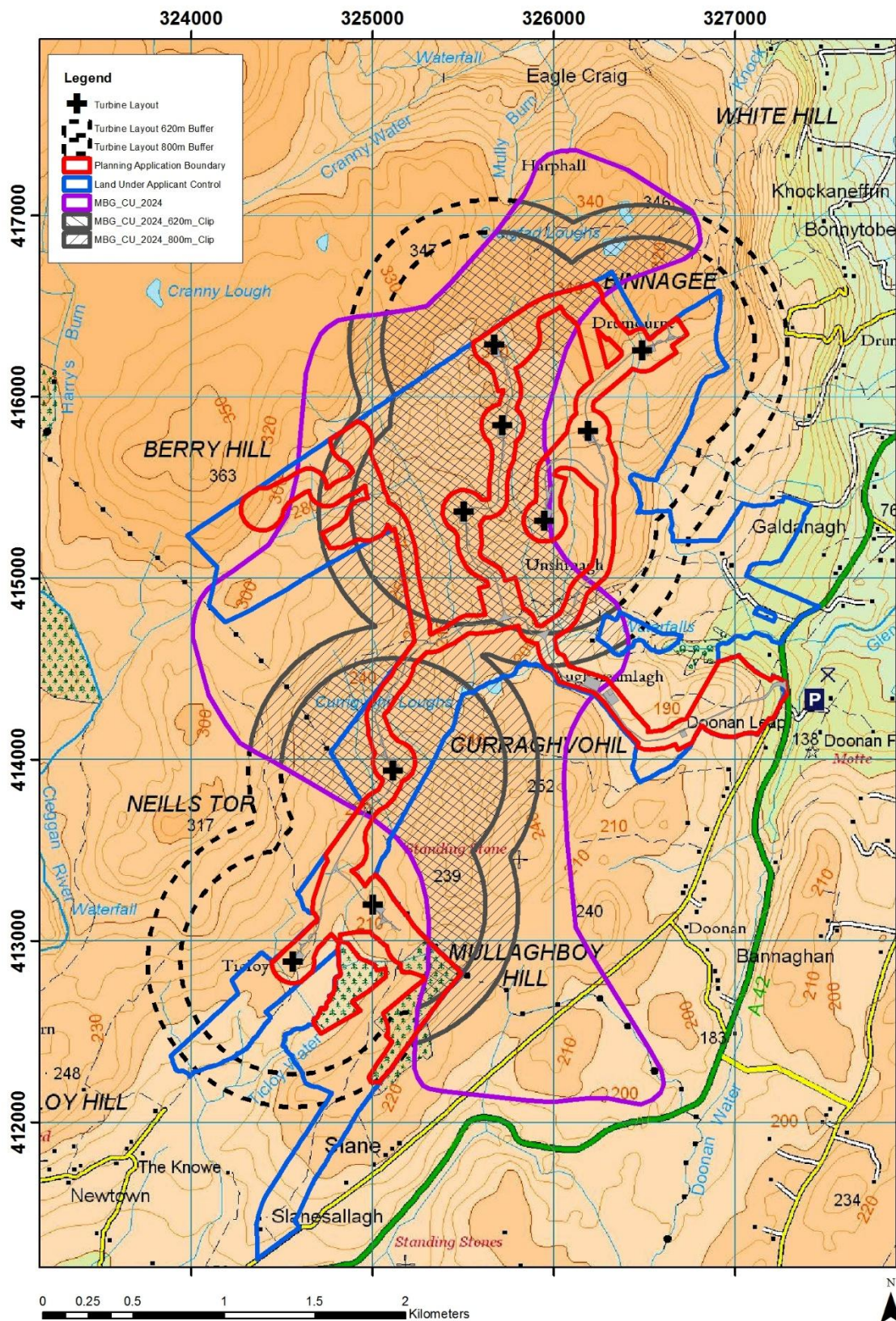


Figure 21. 2024 Minimum bounding geometry map of curlew (based on kernel density mapping).



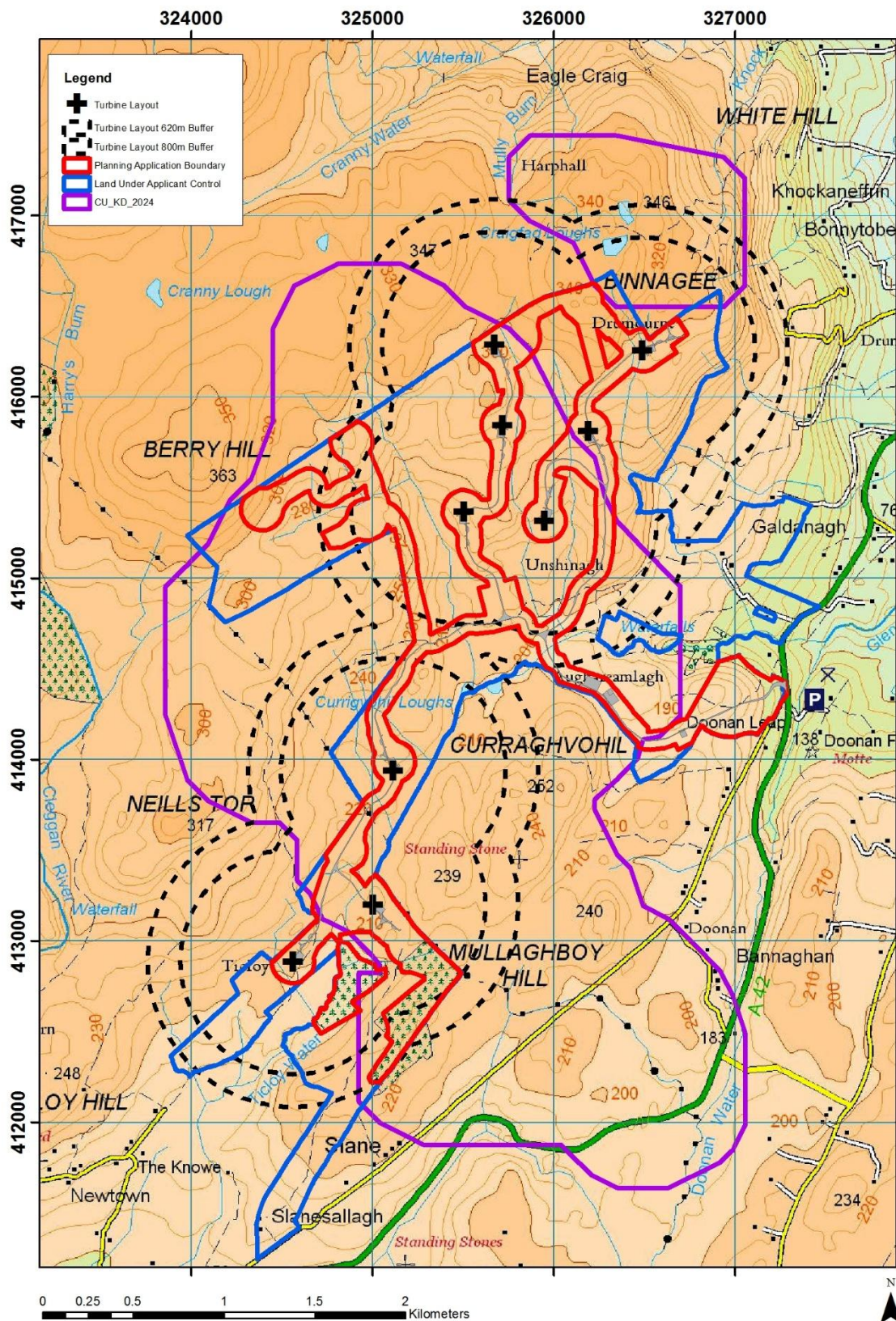


Figure 22. 2020 Minimum bounding geometry map of snipe (walkover data).



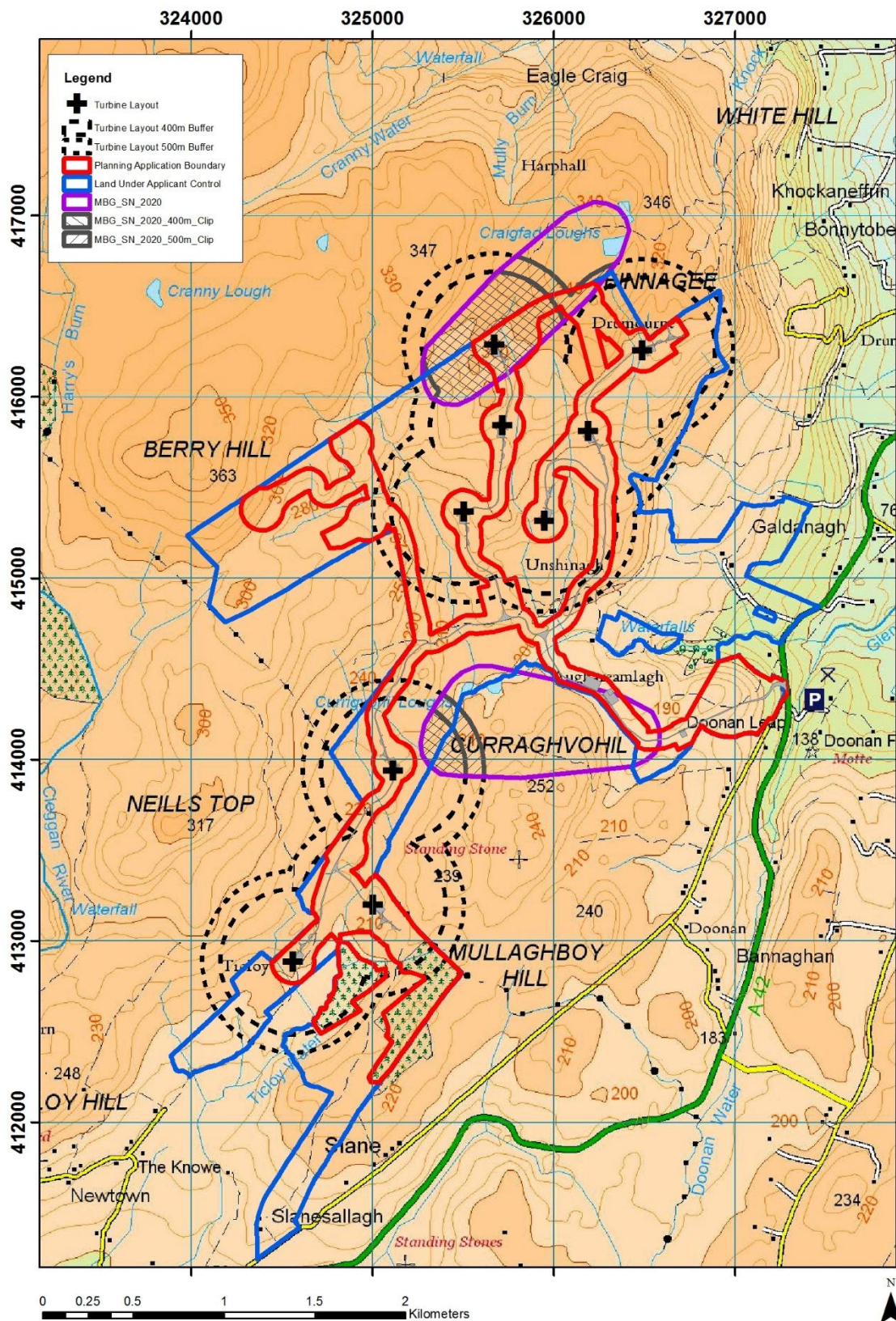
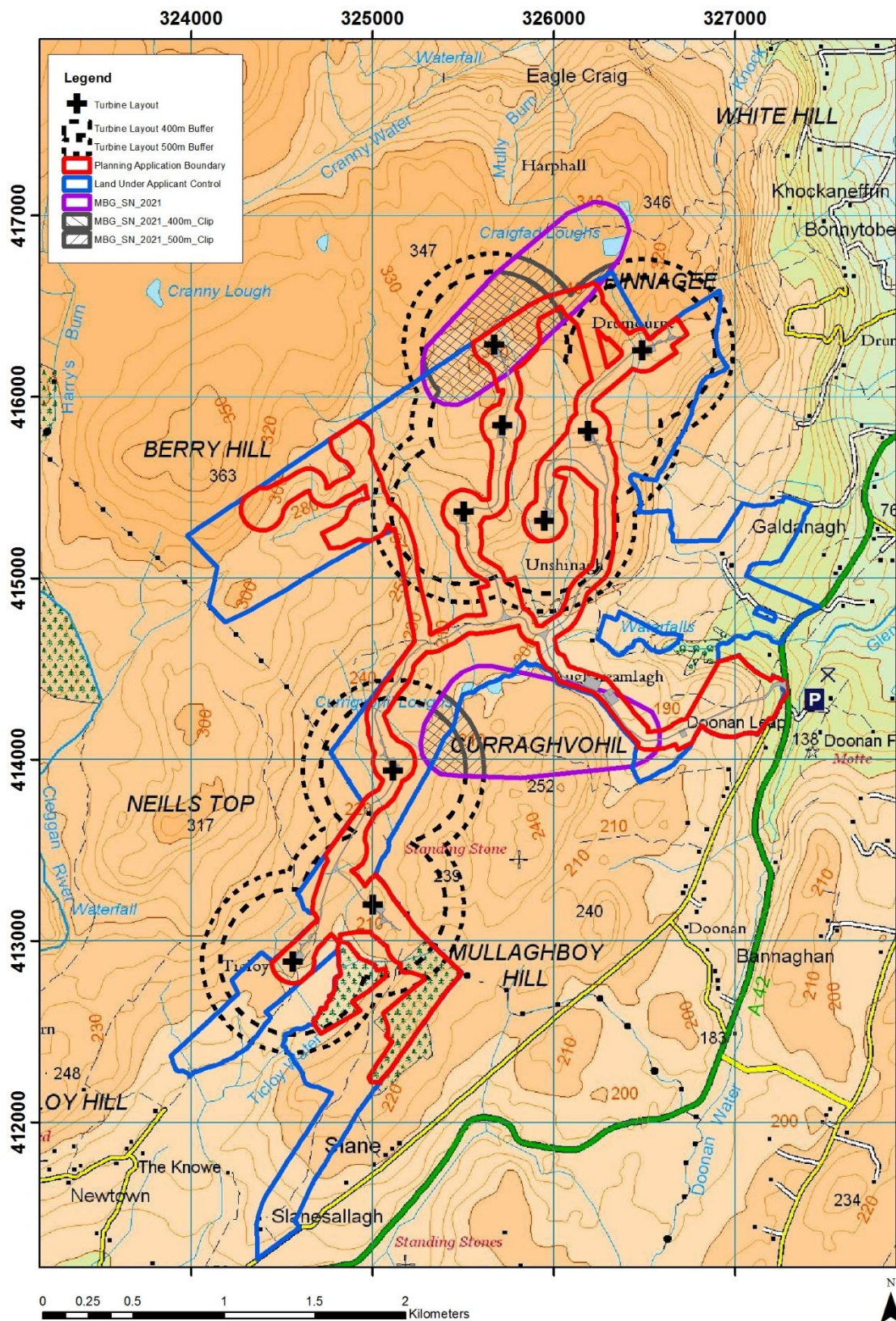


Figure 23. 2021 Minimum bounding geometry map of snipe (walkover data).



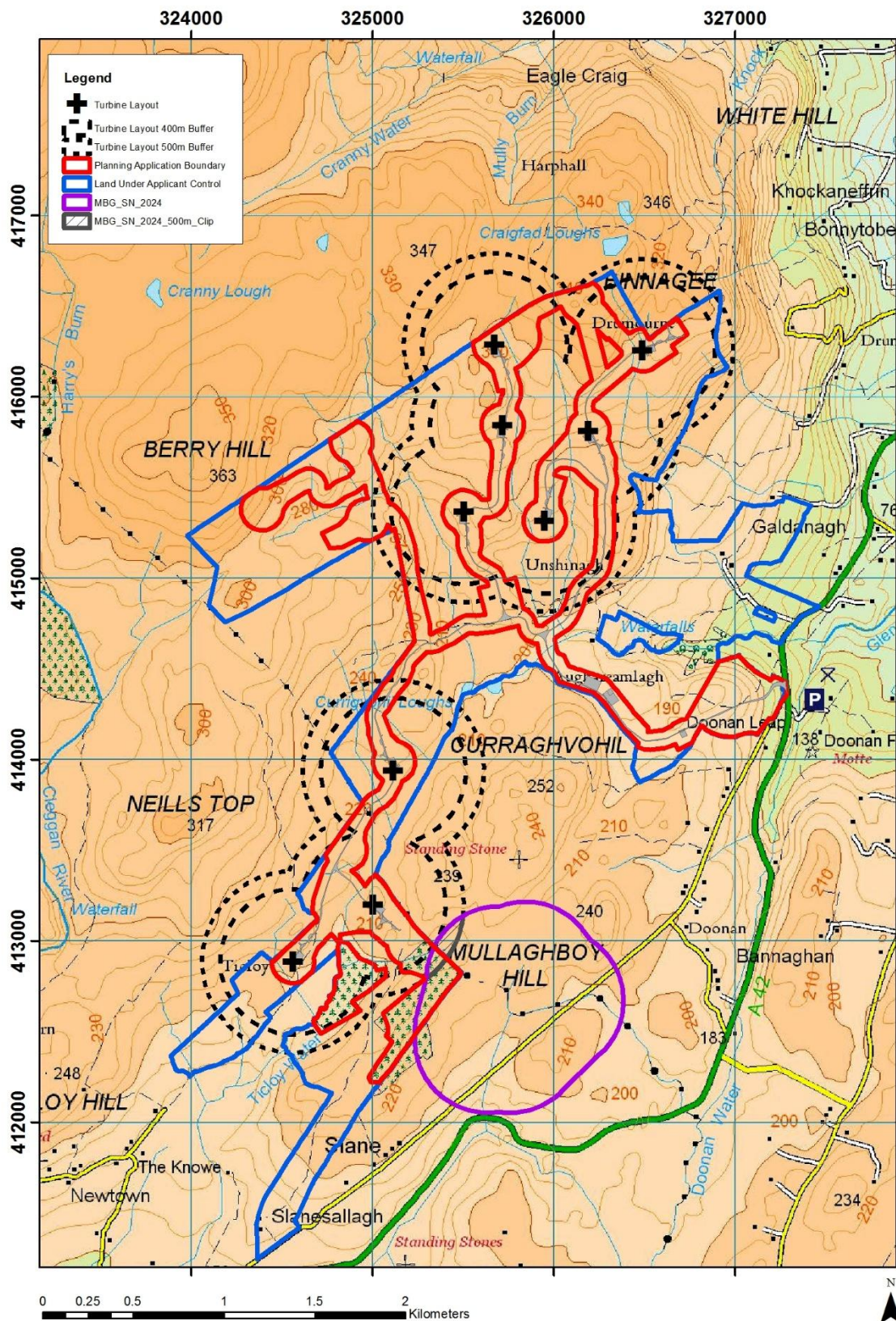


**Figure 24.** 2023 Minimum bounding geometry map of snipe (walkover and vantage point data).









**Figure 26.** 2024 Minimum bounding geometry map of snipe (walkover data & vantage point data).



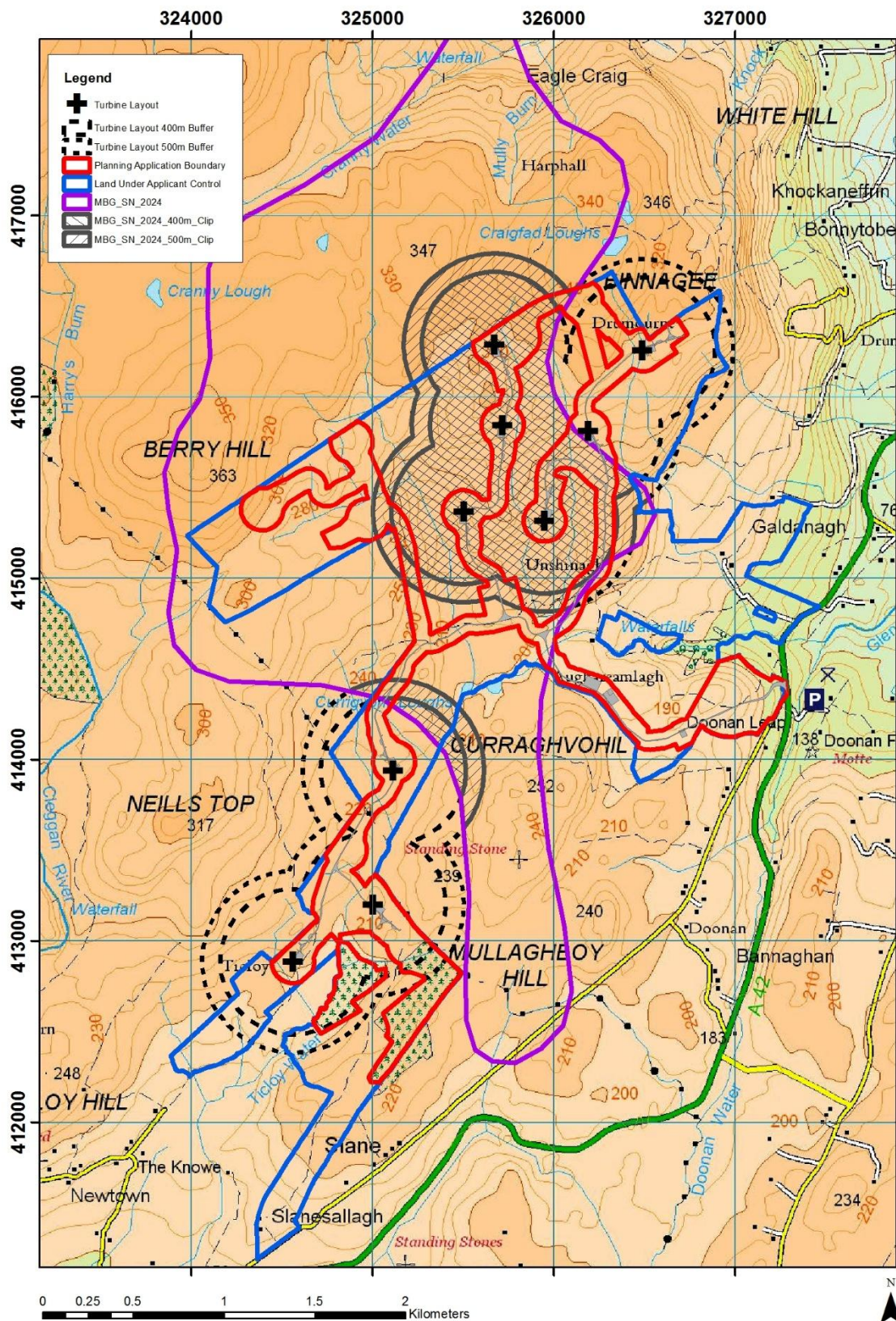


Figure 27. 2024 Minimum bounding geometry map of snipe (based on kernel density mapping).



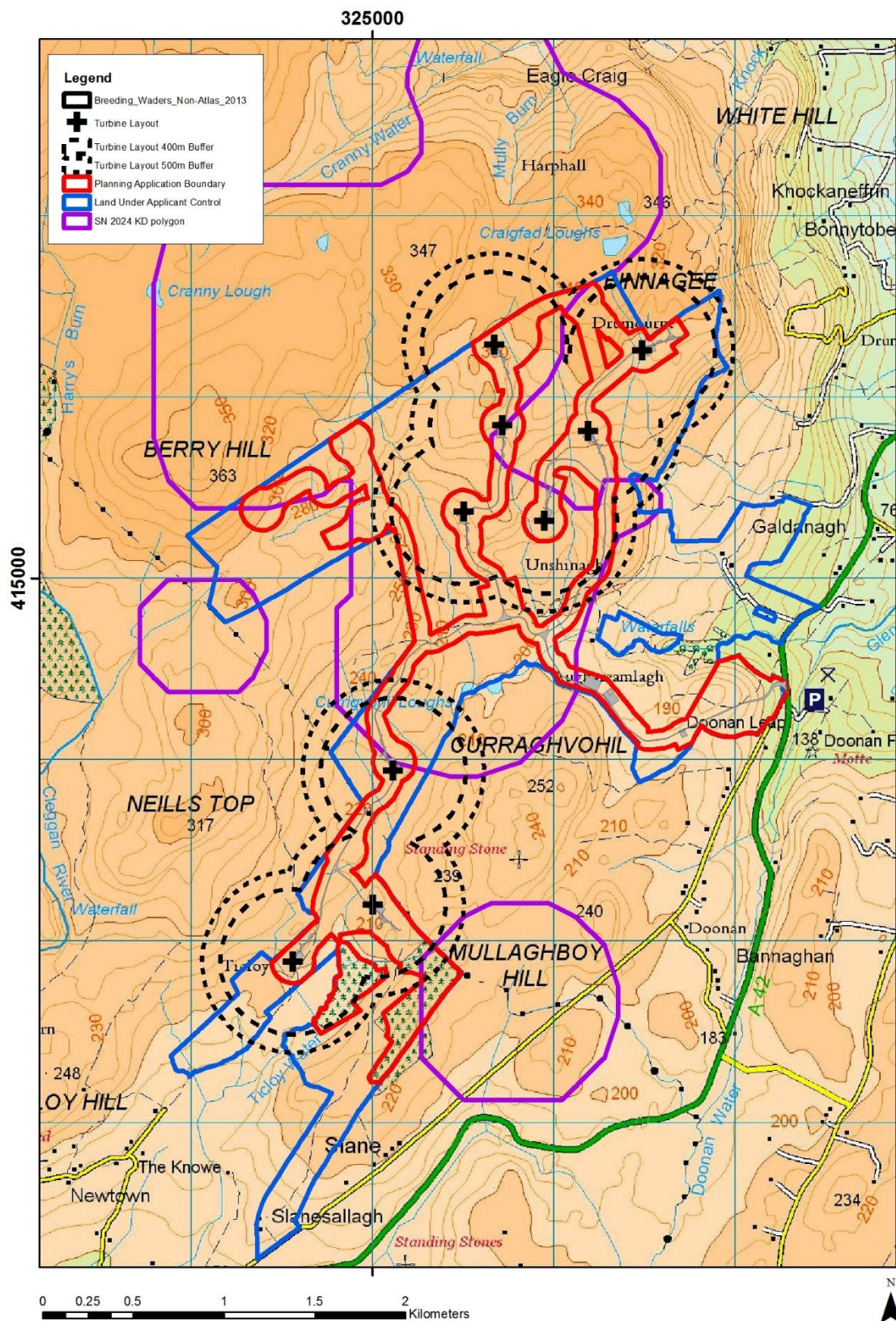


Figure 28. 1987 (Partridge, 1987) wader distribution



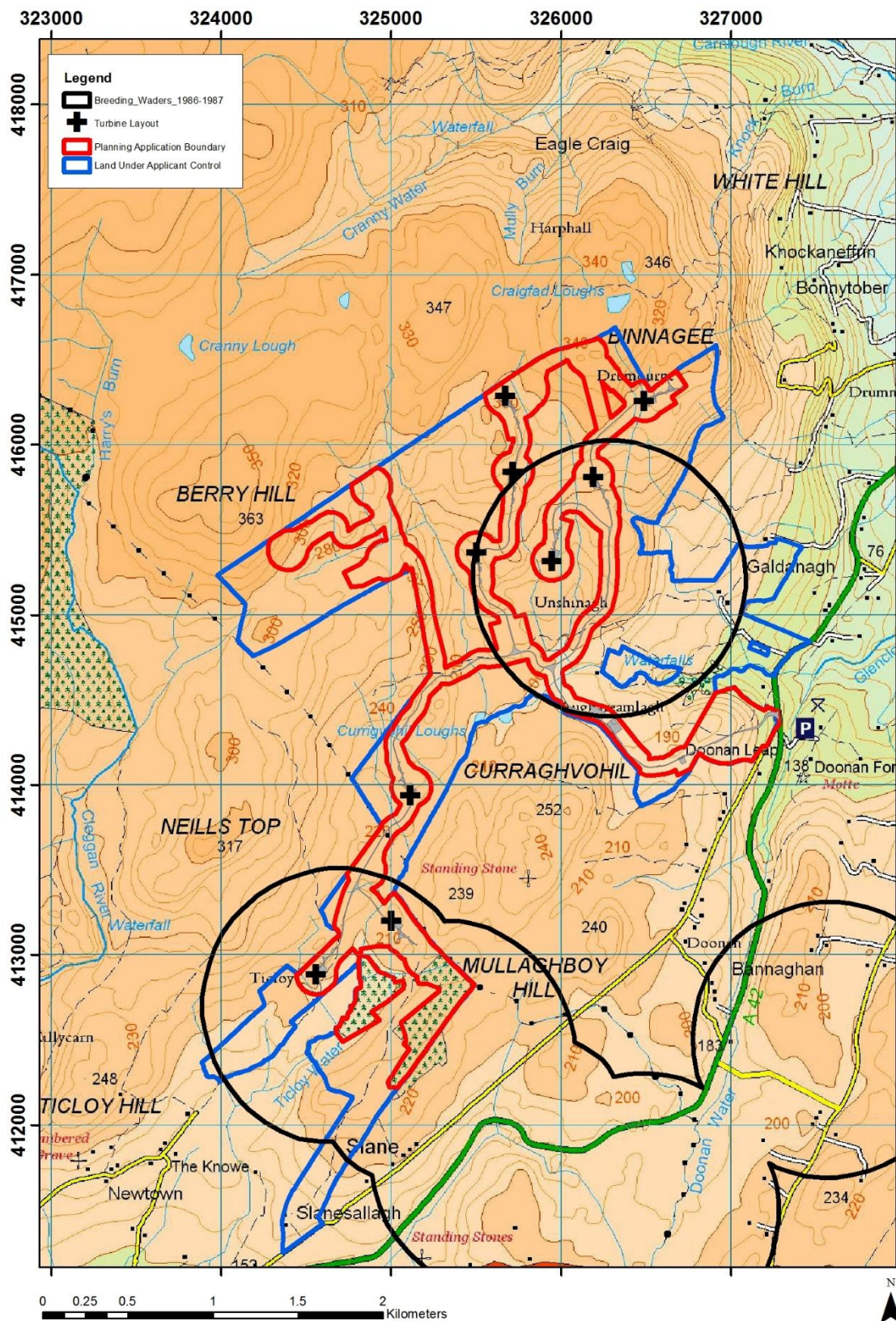
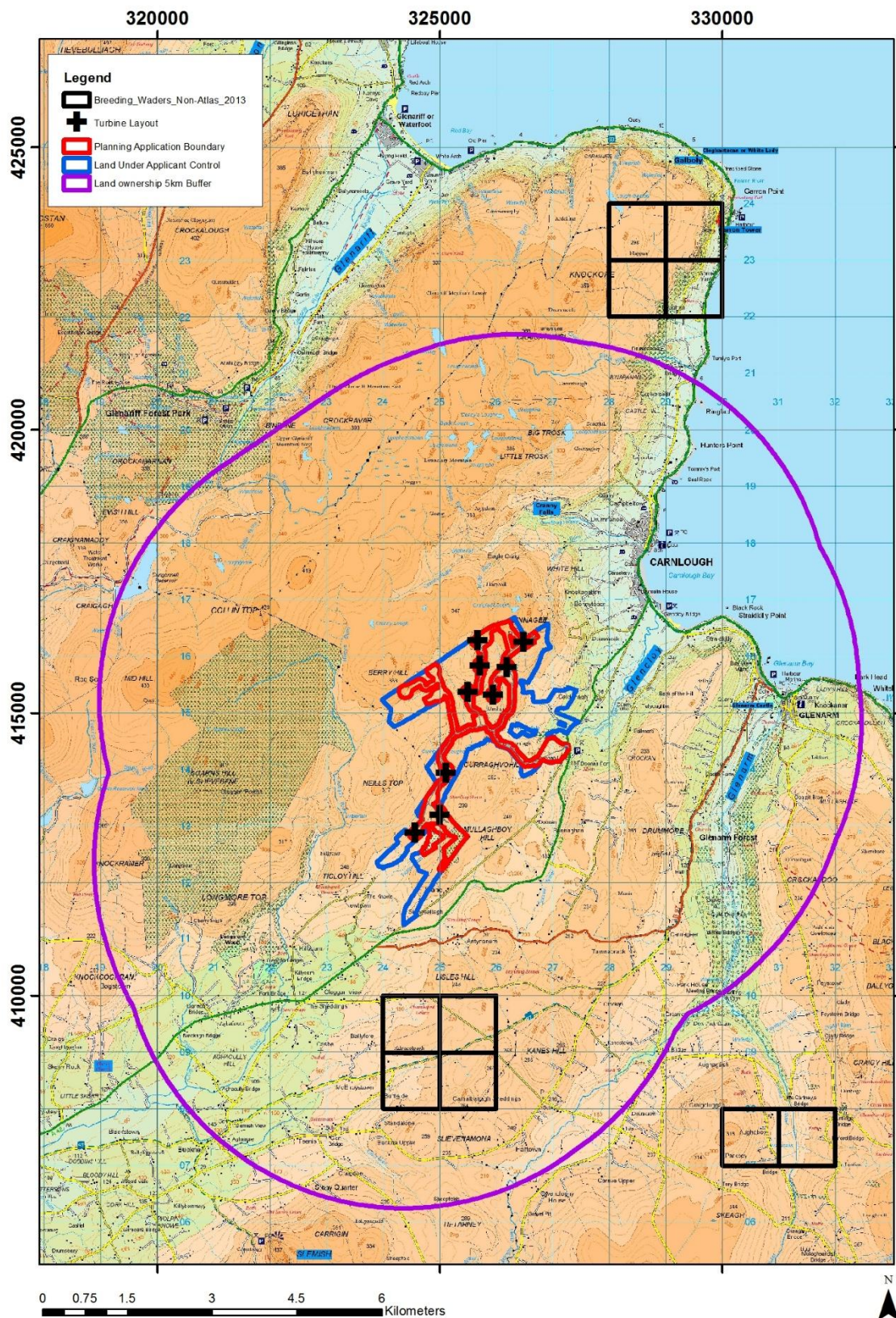


Figure 29. 2008 – 2011 Balmer et al., 2013 breeding wader distribution.





**Figure 30.** 2008 – 2011 Balmer et al., 2013 breeding wader distribution.



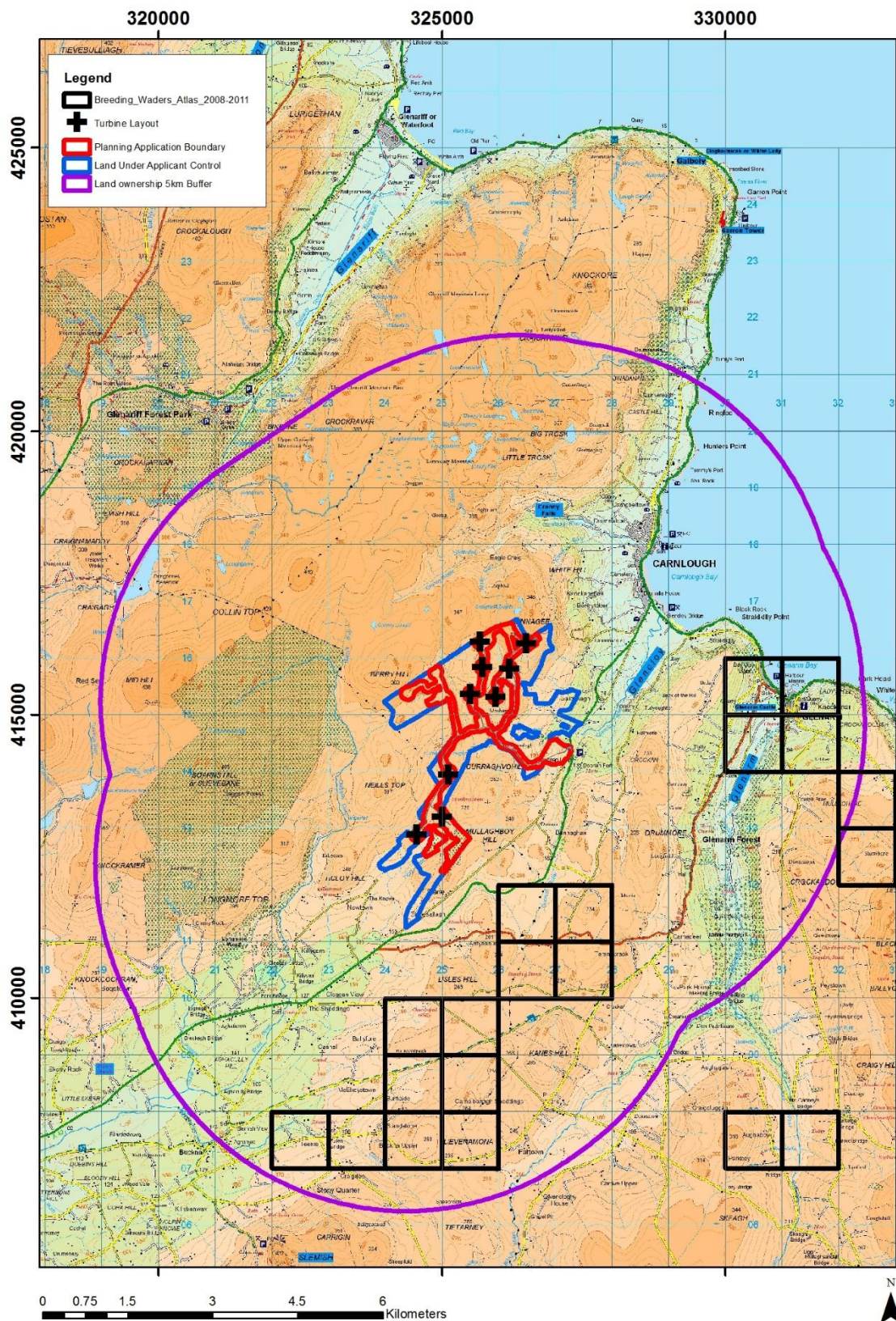


Figure 31. 1980 – 2012 Curlew presence and absence within 1km square layer.



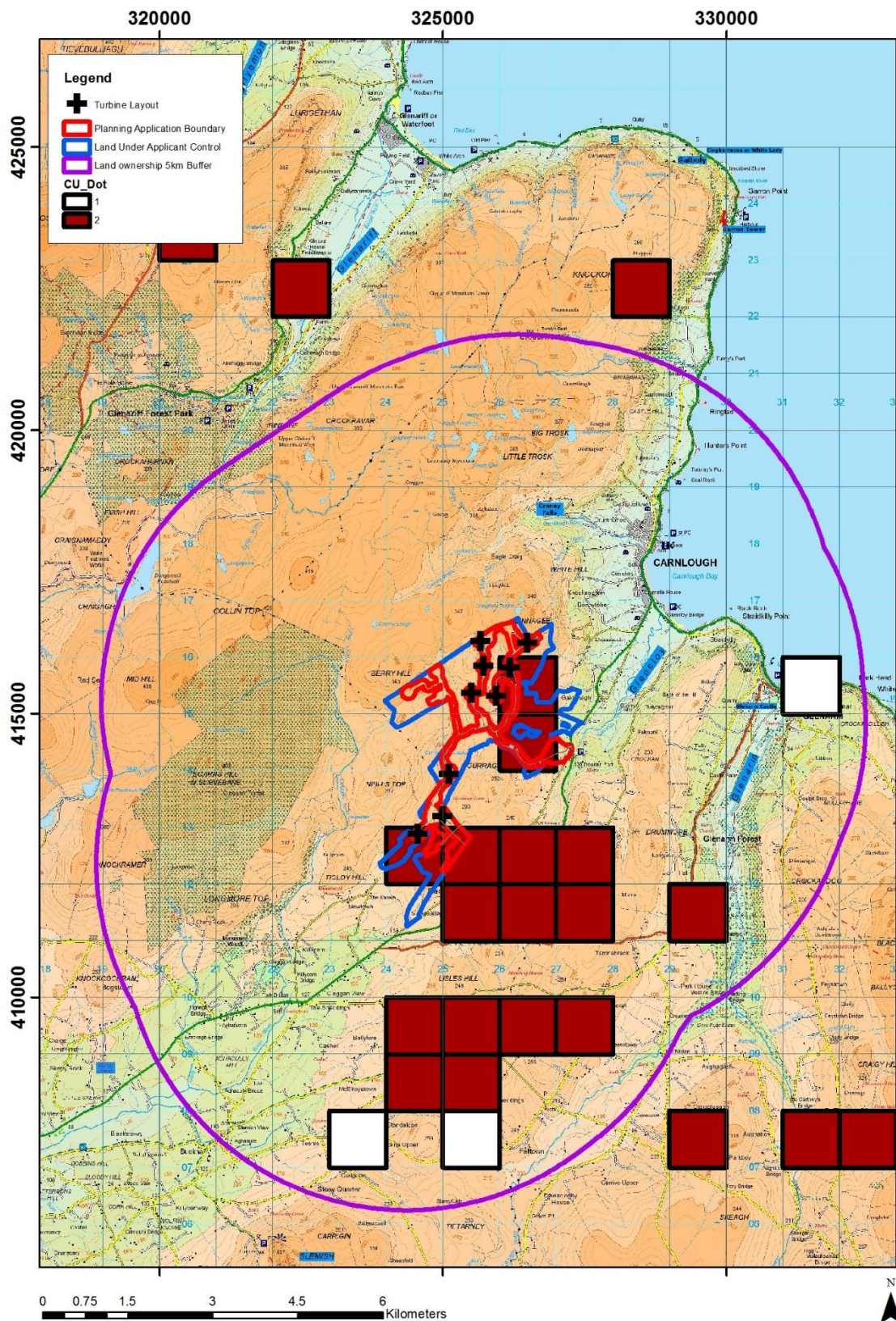


Figure 32. 1980 – 2012 Snipe presence and absence within 1km square layer.



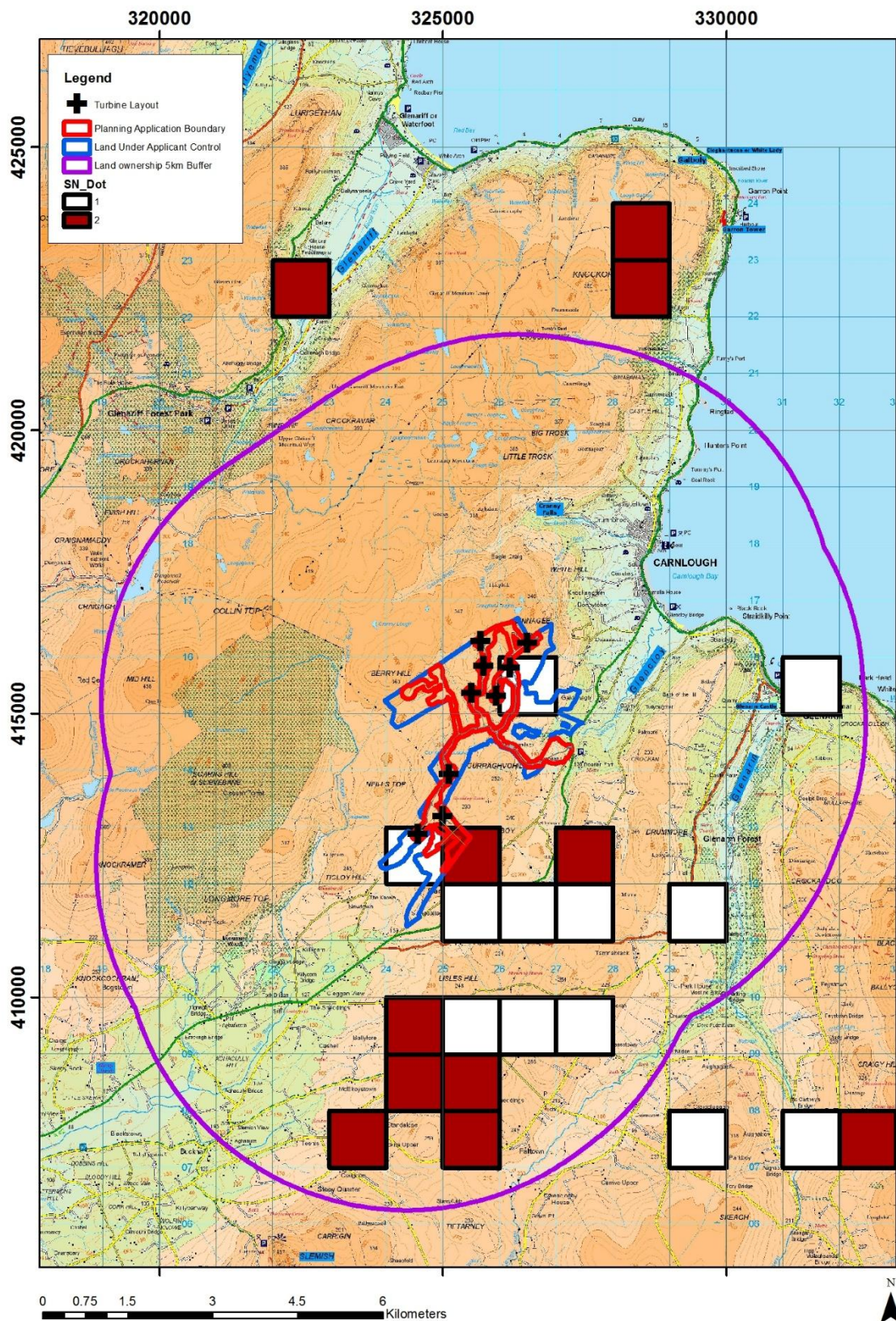


Figure 33. 1980 – 2012 Lapwing presence and absence within 1km square layer.



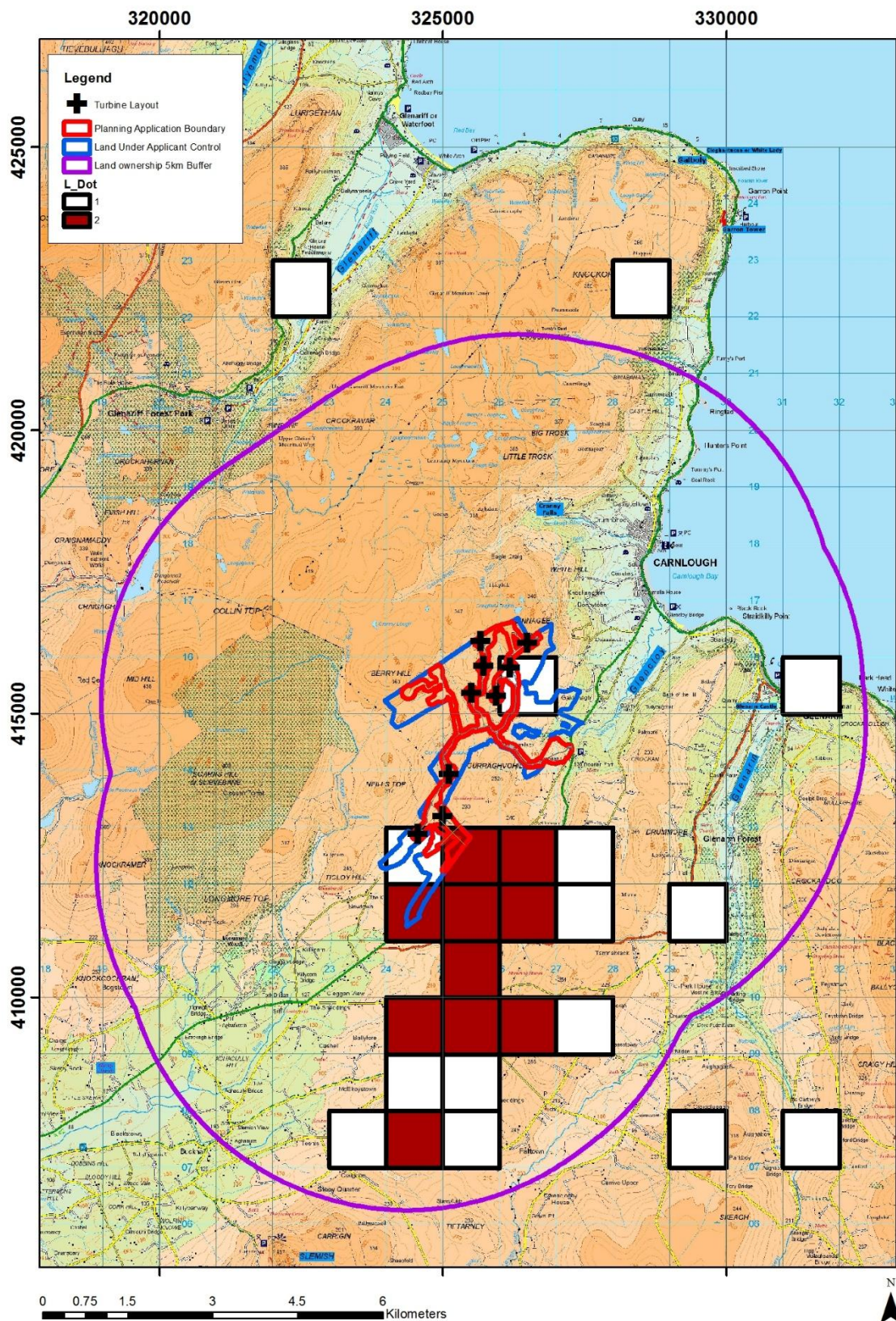


Figure 34. 2012 – 2023 Curlew presence and absence within 1km square layer.



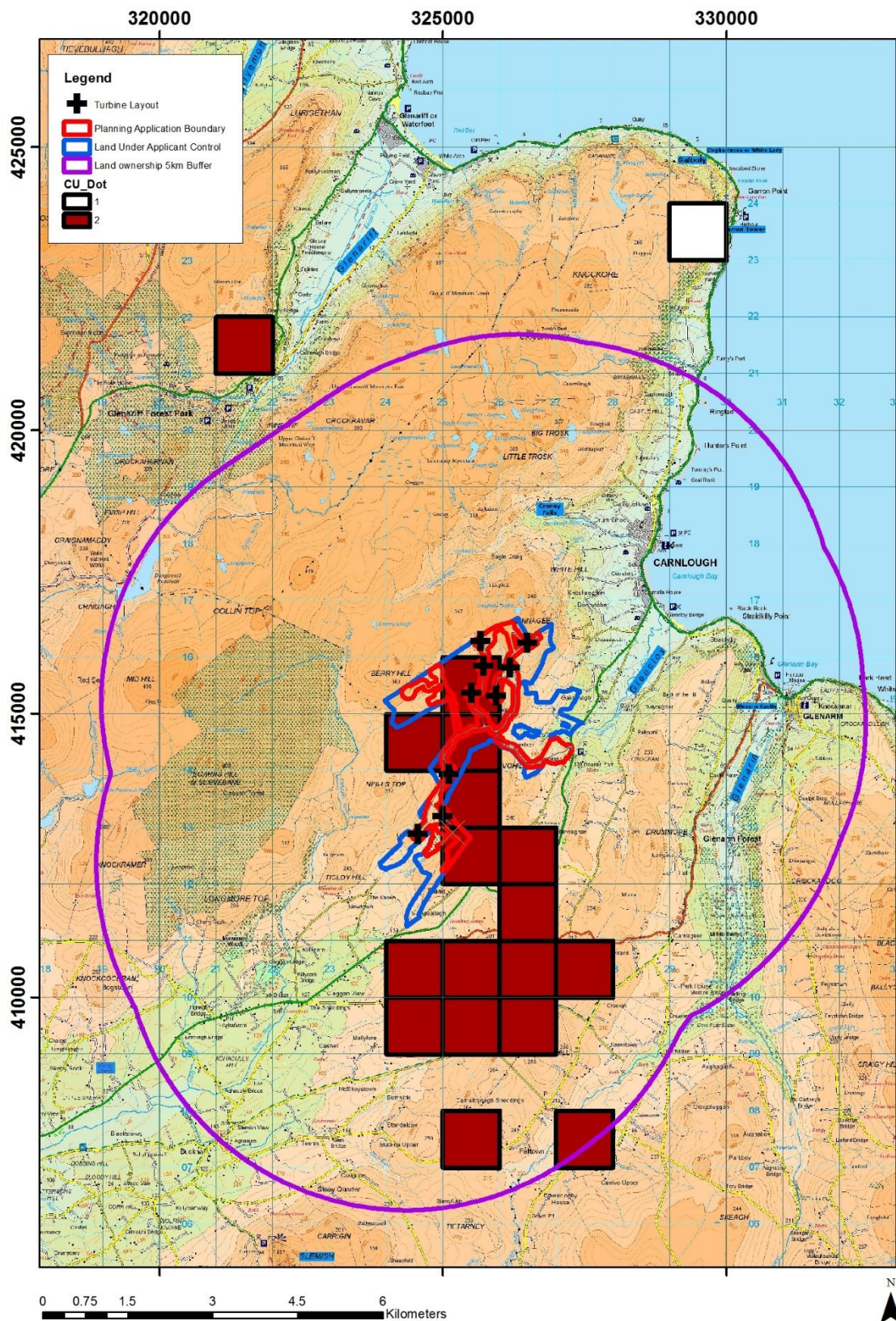


Figure 35. 2012 – 2023 Snipe presence and absence within 1km square layer.





## 11 References

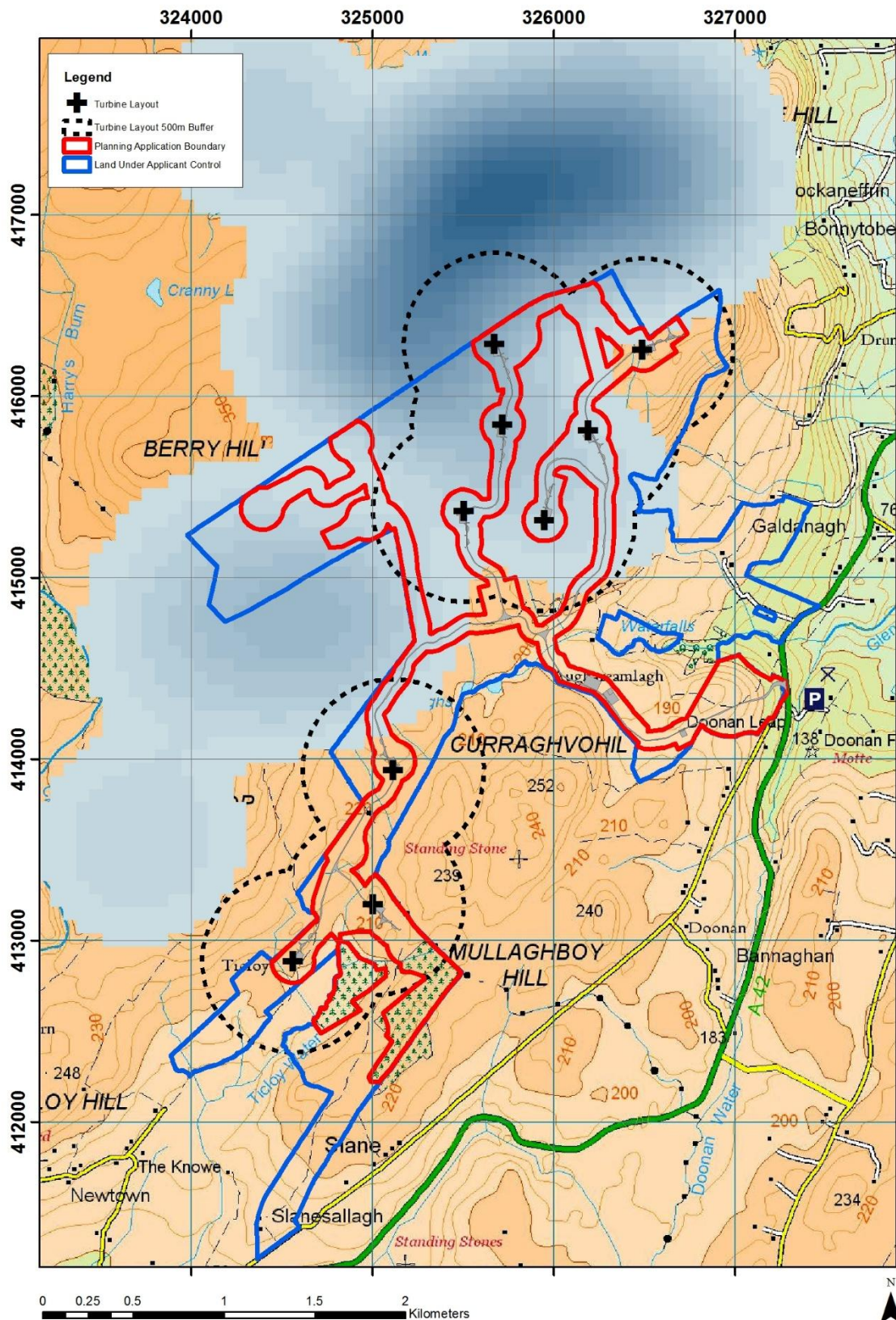
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## 12 Appendix 1





## 13 Appendix 2

