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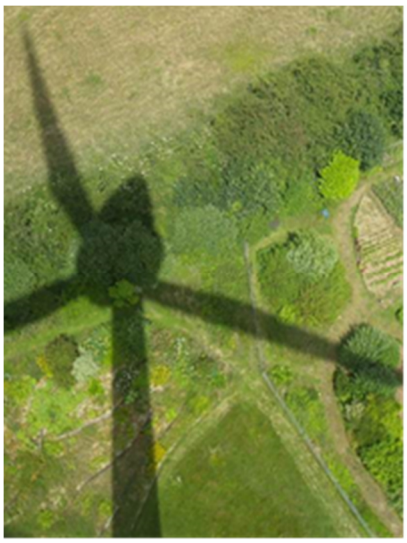
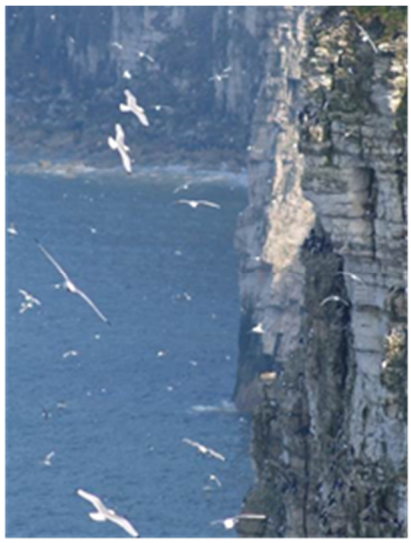


Appropriate Assessment Report

Seven Hills Wind farm Phase I

For

An Bord Pleanála

Project No.: IABP104/001

November 2016

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001	07/11/2016	Richard Arnold	Gabrielle Graham	Richard Arnold
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1. Introduction

1.1.1 The Seven Hills Wind farm comprises two proposed wind farms in Co. Roscommon. The two wind farms are referred to as Phase I and Phase II and are subject to separate planning applications. The connection to the national electricity grid would either be subject to a third application, as stated by the applicant in its Environmental Impact Statement, or, if buried, could be classed as exempted development and therefore not subject to a planning application. The applicant for each phase of the Seven Hills Wind farm is Galetech Energy Developments Ltd.

1.1.2 This report sets out an assessment of the Phase I wind farm under the Habitats Directive. It also includes consideration of Phase II of the wind farm, and other developments, as part of an 'in-combination' assessment.

1.1.3 The assessment is focussed on the potential impact of the proposed development on the qualifying bird species of the relevant SPAs. Separately, an assessment has been carried out of the potential effect of the proposed development on hydrology and hydrogeology, including reference to the effects on Natura 2000 sites (Keohane, 2016). Any effects on the hydrology of the turloughs could also impact on the bird populations since birds are sensitive to changes in the extent and depth of water, as well as the duration of flooding.

1.1.4 The proposed developments have a complex planning history. The current position is that a previous decision to grant consent for the developments was set aside by the High Court because the decision making process did not comply with the Habitats Directive. It is therefore necessary for both applications to be considered again.

1.1.5 There are a number of objectors to the developments. These include the National Parks and Wildlife Service (NPWS), a division of the Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs (DAHRRGA[1]). The basic contention of the NPWS is that insufficient information has been collected by the applicant on the behaviour of qualifying bird species for a firm conclusion to be reached that the development will not adversely affect the integrity of any Natura 2000 site[2]. Other objectors have raised similar concerns in relation to the effect of the development on hydrology/ hydrogeology, with potential effects on turloughs, some of which are also designated as Natura 2000 sites.

[1] Previously the Department of the Arts, Heritage and the Gaeltacht (DAHG)
[2] See for example the letter from DAHG dated 19th October 2015.

2. Natura Impact Statements

2.1.1 The applicant has prepared three Natura Impact Statements for the Seven Hills Wind farm Phase I (sometimes simply referred to as the Seven Hills Wind farm), these are:

- Natura Impact Statement & Appropriate Assessment as required under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC) of Seven Hills Wind Farm, Co. Roscommon. Moore Group, 14th July 2010, included as Appendix 7.2, Chapter 7 of the EIS (Moore Group, 2010).
- Appropriate Assessment & Natura Impact Statement as required under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC) Seven Hills Wind Farm Phase I. Moore Group, 5 August 2011, submitted with the "Further Information Response Reg. ref 10/541 Seven Hills Wind Farm" in August 2011 (Moore Group, 2011).
- Seven Hills Wind Farm Co. Roscommon Report to inform the Appropriate Assessment process. Ecofact Environmental Consultants Ltd. 6th June 2012. Included as Appendix E of "Request for Further Information Response Reg. Ref 11/273 Seven Hills Wind Farm – Phase II" in June 2012 (ECOFACT, 2012).

2.1.2 The last of these documents was not, and has not been, submitted as part of the Phase I application. Nevertheless, as it is the most recent and comprehensive of the three documents, the June 2012 AA report is assumed to have superseded the others. The June 2012 AA report included both a Screening Assessment and an Impact Assessment, including an assessment of cumulative impacts. The parties were informed prior to the oral hearing in June 2016 that all documents, whether submitted in support of Phase I or Phase II, would be taken into account as needed for the assessment of each proposal.

2.1.3 However, the June 2012 AA report does not take into account the survey work undertaken by the applicant in winter 2012/13 and winter 2014/15 and the associated collision risk assessments, for whooper swan and Greenland white-fronted goose, which are presented in the following reports:

- Seven Hills Phase 1: Wintering Bird Survey (January to March 2013). Ecofact Environmental Consultants Ltd (ECOFACT, 2013).
- Proposed Seven Hills (Phase 1) Wind Farm, Co. Roscommon: Wintering Bird Survey October 2014 to March 2015. Ecofact Environmental Consultants Ltd. (ECOFACT, 2015).

2.1.4 Therefore, the information presented in the June 2012 AA report and the subsequent wintering bird survey reports are taken as the key documents submitted by the applicant to inform this AA report.

2.1.5 Other sources of information have also been drawn upon, including the following:

- Proposed Seven Hills wind farm site [Phase 1] Ornithological assessment report June 2010. Forest, Environmental Research and Services Ltd. Included as Appendix 8.1 of the EIS (FERS, 2010) and the summary of this work presented in the EIS.

- Submission of Birdwatch Ireland to An Bord Pleanála on 16th November 2010 in relation to Seven Hills wind farm site Phase 1.
- Response to issues arising from item (5) of a Request for Further Information (RFI) from Roscommon Co. Council (planning reference no. 10/541) [for Seven Hills wind farm site Phase 1]. Forest, Environmental Research and Services Ltd. Included as Appendix D of the Further Information Response Reg. ref 10/541Seven Hills Wind Farm dated August 2011 (FERS, 2011).
- Seven Hills (Phase 1 & Phase 2) Overview of Environmental Information Submitted on Avifauna. Irish Wind Construction Management (IWCM) now Galetech Energy Services (IWCM, 2015a).
- Submission of the Department for the Arts, Heritage and the Gaeltacht to An Bord Pleanála dated 8th December 2015, which includes data on Greenland white-fronted goose.
- Submission of the Department for the Arts, Heritage and the Gaeltacht to An Bord Pleanála dated 19th October 2015.
- Data held by Birdwatch Ireland as part of its Ireland Wetland Bird Survey (I-WeBS).
- Site synopsis, conservation objectives and Natura 2000 standard data forms for the relevant Natura 2000 sites.

2.1.6 In addition, the applicant has also provided information on the environmental impact of the grid infrastructure. This is set out in the following document:

- Seven Hills (Phase 2) Wind Farm: Supplementary EIS and NIS Information (Grid Infrastructure. Reg. Ref 11/273 & PL20.244347. 18th May 2015 (IWCM, 2015b).

3. Screening Assessment

3.1 Applicant's Screening Assessment

3.1.1 The applicant completed a screening assessment as part of the June 2012 AA report for Phase I, pages 16 to 40. This provides (i) a description of the project (and the receiving environment); (ii) describes the characteristics of each Natura 2000 site; and (iii) sets out which Natura 2000 sites should be subject to further assessment.

3.2 Screening Assessment Methodology

3.2.1 The screening assessment methodology I have followed is based on EC guidance, in particular:

- Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2001); and
- Guidance Document: Wind Energy Developments and Natura 2000 (EC, 2011)

3.2.2 The steps set out in the following sections are in alignment with the first of these two documents.

3.2.3 I have also made reference to guidance issued by the National Parks and Wildlife Service entitled 'Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities'. (DEHLG, 2010).

3.3 Step One: Management of the Site

3.3.1 The project is not 'directly connected with or necessary to the management of the site' and therefore it needs to be ascertained whether the development is likely to have significant effects on Natura 2000 sites.

3.4 Step Two: Description of the Project

3.4.1 The applicant provides a description of the project on pages 12 to 15 of the June 2012 AA report for Phase I and elsewhere, e.g. chapter 3 of the EIS. In summary, the development comprises:

- Sixteen GE 2.5xl MW wind turbines, with the lowest turbine at 67m above sea level (ASL) to the highest at103m ASL. Each turbine has three blades and a rotor diameter of 100m and a rotor hub height of 85m. The turbine rotors would therefore sweep an area from 35m to 135m above ground level. The turbines rotate at between 5 and 14 revolutions per minute and operate when wind speeds are between 3ms-1 and 25ms-1. The turbines are separated by an average distance of approximately 450m.
- A single, permanent (25 year) anemometer mast at 85m high, with a triangular lattice structure.
- Hard standing and foundations at each turbine location, comprising a hard standing area of 10m x 18m (0.3ha total for the Phase I site) during the operational stage and a turbine base extending approximately 2.8m underground, occupying an area of approximately 300m^2 (0.5ha in total for the whole Phase I site).

- Internal site access tracks totalling 7750m and 5m wide (3.9ha in total) and 1m deep, constructed in a similar manner to agricultural tracks.
- Underground cabling totalling 6,713m, alongside the access tracks.
- A single storey and control facility with a floor area of 85.5m^2 and a compound area of unspecified size.
- Change of use of an existing residential dwelling to office use.
- Two temporary construction compounds and temporary access tracks. One temporary compound is likely to be located close to the proposed switch room to the east of the development (close to turbine no.12) and the other compound would be close to the site entrance.
- Temporary hard-standing areas for cranes next to each turbine which will measure 39m x 18m (1.1ha in total for the Phase I site) and will incorporate the permanent hard-standing at each turbine location (so the temporary hard standing will be 0.8ha in total for the Phase I site).

3.4.2 The planning application boundary encompasses a 20ha area which includes all the access tracks, turbines and so on. As the turbines are widely spaced, the area encompassed by a loop drawn around the turbines is approximately 200ha. From an ornithological perspective, it is the latter area which matters and therefore references to the Phase I site in this report are generally a reference to the 200ha over which the turbines are located.

3.4.3 The development will be connected to the national electrical grid. The EIS states that this will be subject to a separate planning application. However, it may be exempted development if it is buried. A separate assessment has been provided for the Seven Hills Wind Farm Phase II for the cable route which shows a route alongside the R362/R363 road to the Monksland substation (IWCM, 2015b).

3.4.4 During the construction stage, there will be approximately 13,154 vehicle movements with 'much reduced' vehicle movements (number not specified in the EIS) during the operation stage. The site entrance will be on the R357 to the north of Carrowkeel (approximately 1.6km north of Dysart (Thomas Street) Turlough). The likely access route for construction traffic would be from Athlone to Dysart along the R362/R363 and then northwards from Dysart on the R357 to the site entrance.

3.4.5 The construction period is expected to last 9 – 12 months and the wind farm would be operational for 25 years, with the potential to either (i) continue operation; (ii) refurbish/replace; or (iii) de-commission the wind turbines after this period ends. Options (i) and (ii) would be subject to renewed planning permission.

3.5 Step Three, part 1: Characteristics of the sites

Development Site

3.5.1 The development site is described on pages 15 and 16 of the June 2012 AA report for Phase I. It is described as comprising "predominantly of improved agricultural grassland with some gorse scrub and a relatively small area of [unimproved] calcareous grassland". The field boundaries

are predominantly stonewalls and the site lies between approximately 60 and 105m ASL. There are also two seasonally flooded areas within the application site, which were observed in diminished form during my site visit on 3rd May 2016 but are not described in the June 2012 AA report for Phase I or anywhere else in the submitted documentation with respect to ecology and ornithology. One of these seasonally flooded areas is close to proposed turbine no.6 and the other is close to proposed turbine no. 5.

Natura 2000 Sites

3.5.2 In selecting Natura 2000 sites for consideration of likely significant effects, the applicant chose a buffer of 15km from each wind farm site and considered only the Natura 2000 sites within that buffer, fully disregarding any Natura 2000 sites outwith that buffer.

3.5.3 Setting a buffer at 15km is a reasonable starting point for this process and is consistent with existing guidance (DEHLG, 2010). However, this guidance also indicates that Natura 2000 sites beyond this distance should also be included in the initial selection of sites for consideration if these may be subject to '*direct, indirect or cumulative effects, taking a precautionary approach so that a site is included if doubt exists'*. The guidance also makes clear that the selection of sites for consideration should be an iterative process.

3.5.4 There are a number of Natura 2000 sites within 15km of the development site. These are described by the applicant on pages 17 to 31 of the June 2012 AA report for Phase I. A further Natura 2000 site, the Middle/River Shannon Callows, lies to the south of the 15km search area for Phase I but inside the equivalent search area for Phase II.

3.5.5 A summary of each of these Natura 2000 sites is provided in Table 1 below. There are two types of Natura 200 site; Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). SPAs are designated for their bird interest and SACs are designated for their nature conservation interest other than birds. Those which have not yet been fully adopted by the EC are described as candidate SACs (cSACs). The legal protection for SACs and cSACs is the same.

Table 1: Natura 2000 sites identified for inclusion in the screening assessment

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to Phase I Site (closest point)
004139/ 000610	Lough Croan Turlough SPA and SAC	Turlough and fen, with some water present year round, flooding extensively in the winter. The site is of importance for its vegetation and wintering waterfowl. Qualifying features: three named species of wintering waterbirds and 'Wetland and Waterbirds'; (3180) Turloughs.	1.1km
004140/ 001637	Four Roads Turlough SPA and SAC (also known as Cloonlaughnan Turlough)	Turlough which is important for wintering waterfowl.	2.5km

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to Phase I Site (closest point)
		Qualifying features: two named species of wintering waterbirds and 'Wetland and Waterbirds'; (3180) Turloughs.	
004097/ NA	River Suck Callows SPA	Site extending for 70km, along the River Suck, the largest tributary of the River Shannon. Important for wintering waterfowl. Qualifying features: five named species of wintering waterbirds and 'Wetland and Waterbirds'.	3.5km
NA/ 002214	Killeglan Grassland SAC	Species –rich calcareous grassland with orchids. Qualifying features: (6210) Orchid-rich calcareous grassland	4.5km
NA/ 000611	Lough Funshinagh SAC	Lake which has some water present year round in most years, flooding extensively in winter and therefore classified as a turlough. The site is of importance for plants, breeding and wintering waterfowl and amphibians. Qualifying features: (3180) Turloughs.	5.5km
NA/ 002339	Ballynamona Bog and Corkip Lough SAC	Raised bog and turlough (Corkip Lough), with botanical and breeding and wintering bird interest, especially waders. Qualifying features: (3180) Turloughs, (7110) Raised Bog (Active), (7120) Degraded Raised Bog, (7150) Rhynchosporion vegetation, (91D0) Bog Wooodland	6.2km
NA/ 000609	Lisduff Turlough SAC	Turlough with botanical interest, also important for wintering wildfowl. Qualifying features: (3180) Turloughs.	6.5km
NA/ 001625	Castlesampson Esker SAC	Diverse site comprising esker, turlough, raised bog and gravel pits. The esker supports species rich grassland and the site is generally of high botanical interest. Qualifying features: (3180) Turloughs, (6210) Orchid-rich calcareous grassland.	8.1km
NA/ 000588	Ballinturly Turlough SAC	Turlough of interest for its vegetation and breeding and wintering birds. Qualifying features: (3180) Turloughs.	11km
004064/ 000440	Lough Ree SPA and SAC	Very large lake of importance for plants/vegetation, breeding and wintering waterfowl and fish.	11km

Site Code SPA/ SAC	Site Name & designation	Brief Description & Qualifying Features (with code)	Distance to Phase I Site (closest point)
		Qualifying features: thirteen named species of breeding birds and wintering waterbirds and 'Wetland and Waterbirds'; (3150) Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation, (6210) Orchid-rich calcareous grassland, (7120) Degraded raised bogs, (7230) Alkaline fens, (8240) Limestone pavements, (91A0) Old sessile oak woods with Ilex and Blechnum, (91D0) Bog woodland and (1355) Otter *Lutra lutra*.	
004096/ 00216	Middle Shannon Callows SPA/River Shannon Callows SAC	Extends for 50km along the River Shannon southwards from the southern point of Lough Ree and is 0.75 to 1.5km wide. Important for its lowland meadows, plants, wintering and breeding waterfowl and Directly connected to the River Suck Callows. Qualifying features: seven named species of breeding bird and wintering waterbirds and 'Wetland and Waterbirds'; (6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils, (6510) Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*), (8240) Limestone pavements, (91E0) Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, (1355) Otter *Lutra lutra*.	16.4km

3.5.6 The conservation objectives for these SPAs and SACs are, in summary, to maintain or restore the favourable conservation condition of the qualifying interest of each site. The apparent conservation condition[3] of the qualifying features for the relevant Natura 2000 sites is set out in Tables 2 to 6, Section 4.2 of this report.

3.5.7 Given the migratory nature of the birds which are qualifying features of the SPAs identified by the applicant, it is clear that effects on SPAs beyond 15km are possible. Birds which visit the SPAs in the Roscommon area may also make use of SPAs outside this zone and elsewhere in the British Isles as part of 'within season' movements, while on migration or in some years, depending on the climatic conditions in a given winter. So, in addition to those Natura 2000 sites listed in Table 1, there is the potential for significant effects on SPAs beyond the 15km distance if these are used as for part of the winter or during the breeding season by the same populations of birds.

3.5.8 For example, whooper swans which migrate from Iceland to the British Isles may then move several hundred kilometres from their initial wintering site to sites used later in the winter, with some birds spending the first part of the winter in Scotland or Northern Ireland and the latter in Ireland (Gardarsson, 1991). Table 3 and Table 5 – 10 of the 2014/15 survey report (ECOFACT,

[3] Conservation condition has not been defined by the NPWS for these specific Natura 2000 sites.

2015) clearly show that the South Roscommon locality is used by whooper swans primarily during the latter part of the winter (January to March), while the birds typically leave Iceland in autumn (late September or October). This suggests that these birds are spending the October to December period elsewhere and there is evidence that individual whooper swan use sites in Britain as well as in central Ireland (Wernham, et al., 2002). Since many of the localities used by wintering whooper swan are designated as SPAs, impacts on the population at one locality could have repercussions for the conservation objectives for an SPA elsewhere on the migratory route. Other species of migratory waterbirds similarly make use of other designated wetland sites as part of their annual cycle.

3.5.9 Since those SPAs would be difficult to identify individually, they can only be considered generically in the screening process.

3.6 Step Three, part 2: Identification of Potential Impacts

3.6.1 The development is located wholly outside Natura 2000 sites and therefore no direct impacts are anticipated.

3.6.2 However, there is the potential for indirect effects on the Natura 2000 sites. Several impact mechanisms have been identified by the applicant, the NPWS and within the An Bord Pleanála Inspector's reports. Those relating to birds are also described generically in various guidance documents including that produced by the EC (EC, 2011) and in the academic literature (Hötker, Thomsen, & Köster, 2006).

3.6.3 The potential impact mechanisms are summarised below:

- Changes in hydrology, as a result of installing turbine bases, access tracks, drainage, etc., affecting the water supplies to the turloughs and loughs, leading to changes in water levels or duration of flooding, potentially leading to damage to the SACs and affecting bird populations at the SPAs;
- Pollution, including surface water run-off, arising during the construction stage with subsequent impacts on wetland habitats within the SPAs and SACs;
- Disturbance and displacement of wintering birds associated with the SPAs as a result construction activity, including birds foraging outside the SPAs ('disturbance effects');
- Direct loss of feeding or roosting habitat outside the SPAs as well as disturbance and displacement, as a result of the presence of the turbines, of wintering birds from their feeding or roosting habitat ('displacement effects');
- As a result of the presence of the turbines, disruption or interruption of routes used by wintering birds while migrating or making local movements between sites (the 'barrier effect'); and
- Mortality of wintering birds as a result of collision with the turbines.

3.6.4 All of the identified impact mechanisms could, in some circumstances, lead to effects on the bird populations concerned. For example, changes in hydrology could affect the water levels, the extent of flooding or the duration of flooding in the turlough. This in turn could make the habitat less suitable or more suitable for some species of the birds, because many are adapted to feed

in a specific range of water depths and prefer waterbodies of a particular size range. For those species affected negatively, a population decline is the likely result.

3.7 Step four: Assessment of Significance

3.7.1 There are two possible conclusions for the screening assessment:

- 1. It can be objectively concluded that there are not likely to be significant effects on any Natura 2000 site; or
- 2. The information provided either suggests that significant effects are likely or that sufficient uncertainty remains to indicate that an appropriate assessment should be carried out.

3.7.2 If the second conclusion is reached, the project should be subject to an appropriate assessment and that assessment should include consideration of all the Natura 2000 sites that could not be objectively screened out i.e. the first conclusion above cannot be reached.

3.7.3 The applicant reached the conclusion that an appropriate assessment was required due to uncertainty over potential indirect and cumulative impacts on the qualifying interests of Natura 2000 sites. I agree with the applicant that an appropriate assessment is required for the Seven Hills Wind farm Phase I proposal. This is because there is clearly the potential for the qualifying bird species of the at least the nearest SPA (Lough Croan Turlough) to be harmed as a result of a barrier effect or collision with turbines.

3.7.4 The applicant determined that such uncertainty existed for (i) those SACs within the 15km buffer which are wetlands and definitely hydrologically connected to the wind farm sites and (ii) those SPAs within the buffer which are wetlands and definitely hydrologically connected to the wind farm sites or are less than c.10km away from the proposed development. The justification for the c.10km distance is based on published core ranges for wintering whooper swan and Greenland white-fronted goose, as well as the core range for breeding golden plover (Pendlebury, et al., 2009). The core range is based on the distances that birds travel from a given roost site or nest site to their foraging areas.

3.7.5 The applicant's conclusion was that the effect of the development on the following Natura 2000 sites should be considered in the further assessment:

- Lough Croan Turlough SPA and SAC;
- Four Roads Turlough SPA and SAC;
- River Suck Callows SPA.

3.7.6 The applicant initially considered Lough Ree SPA, which is within 15km of the wind farm site, but then excluded this site from further assessment based on the published core ranges of three species as described in paragraph 3.7.4 above. Potential significant effects on Lough Ree SAC was also discounted by the applicant because of a lack of hydrological link and the overall distance between the Phase I site and Lough Ree. Potential effects on the Middle Shannon Callows SPA and the River Shannon Callows SAC were not considered by the applicant in its

June 2012 AA Report for Phase I (or any other assessment in relation to Phase I) and so this site was also excluded from further assessment by the applicant.

3.7.7 However, in its 19th October 2015 submission, the NPWS makes the case that bird populations, in particular whooper swan, associated with Lough Ree could also be affected. This is because of the potential interchange or seasonal movement of birds between the SPAs. EC guidance (EC, 2001) indicates that the view of the relevant nature conservation agency can be sufficient for the significance test. Therefore, Lough Ree should not be screened out of further assessment without fuller consideration of the potential of the populations of all its qualifying species to also use the wind farm site or more local waterbodies during other parts of a winter or in some winters. At least 10 of the qualifying species of Lough Ree have been recorded much closer to the wind farm site and the scope for these birds to also form part of the Lough Ree population requires consideration. Individual shoveler and teal, for example, have been shown to use two wetland reserves 6km apart during the same winter in France (Guillemain, Fritz, & Duncan, 2002) and there is no suggestion that this might be an upper limit for such movements. Some of the other qualifying species of Lough Ree may behave similarly.

3.7.8 The applicant makes an assessment of potential cumulative effects at the screening stage (Section 3.4.3 of the 2012 AA report for Phase I). This assessment somewhat misses the point that at this stage the objective is to determine which Natura 2000 sites are likely to be significantly affected, taking into account cumulative impacts i.e. those which become significant as a result of the combined effects of the development in question and other relevant plans and projects. The proposed Seven Hills Wind farm Phase II development is an obvious candidate for consideration (as well as the existing two turbine wind farm at Skrine, Co. Roscommon (10km north east of Seven Hills Wind farm Phase I and approximately 5km from Lough Croan Turlough, Four Roads Turlough, Lisduff Turlough and Lough Funshinagh) and the 20 turbine wind farm at Sliabh Bawn[4], Co. Roscommon (19km north east and 4.5km from Lough Ree), which is currently under construction).

3.7.9 The Middle Shannon Callows SPA lies within 15km of the proposed Seven Hills Wind farm Phase II development. The applicant excluded the Middle Shannon Callows from further assessment for Phase II for the same reasons given for excluding Lough Ree from further assessment for Phase I. Again there is potential for the populations of qualifying species associated with the Middle Shannon Callows to also make use of waterbodies much closer to the wind farm sites and therefore be affected by either or both of the wind farm developments. At least six of the qualifying species of the Middle Shannon Callows, including whooper swan, have been recorded at waterbodies closer to the wind farm sites.

3.7.10 In turn, this gives rise to the potential for significant cumulative effects from Phase I and Phase II wind farm developments on all of SPAs within 15km of both wind farm sites and potentially on SPAs beyond this zone, as set out in paragraphs 3.5.7 and 3.5.8 above.

[4] The Sliabh Bawn wind farm was subject to a screening assessment under the Habitats Directive but is was determined that this development was not likely to have a significant effect on any Natura 2000 site and therefore an appropriate assessment was not carried out.

3.7.11 The effect of hydrological changes on the Natura 2000 sites is being assessed separately and by another consultant, Jer Keohane. In summary, Mr. Keohane identified potential connectivity between the Phase I site and Four Roads Turlough SPA/SAC, Lough Croan Turlough SPA/ SAC and the River Suck Callows SPA, which therefore gives rise to potential significant effects, and was uncertain about connectivity to Lisduff Turlough SAC.

3.7.12 Connectivity between the Phase I site and the remaining SACs listed in Table 1 above is considered unlikely on the basis of the available information (Keohane, 2016). In addition, all of these sites are located more than 4km from the Phase I site which means that they are too remote to experience negative impacts as a result of air pollution, dust, etc. arising on the construction site during the construction and de-commissioning stages of the wind farm.

3.7.13 One of the SACs, Ballynamona Bog and Corkip Lough lies about 200m from the R363 road which is likely to be used by construction traffic, with 13,154 additional vehicle movements predicted during the construction stage and presumably a similar or somewhat reduced number during the de-commissioning stage. The Phase II wind farm would generate a further 14,492 vehicle movements along this same section of road. Additional traffic potentially puts this SAC at further risk from air pollution and accidental spillages, despite not being hydrologically connected to the Phase I site. However, this SAC lies just beyond the distance at which significant effects are likely to occur (Bignal, Ashmore, Headley, Stewart, & Weigert, 2007; Angold, 1997; Bernhardt-Römermann, Kirchner, Kudernatsch, Jakobi, & Fischer, 2006).

3.8 Conclusion on Likely Significant Effects

3.8.1 There is broad agreement from all parties (the applicant, NPWS, etc.) that the project should be subject to an appropriate assessment.

3.8.2 There is also broad agreement that the appropriate assessment should include consideration of the effects on Lough Croan Turlough SPA and SAC, Four Roads Turlough SPA and SAC and the River Suck Callows SPA.

3.8.3 Lough Ree SPA should also be considered further. This can justified solely on the basis of the views of the NPWS however it is clear that there is the potential for populations qualifying bird species of Lough Ree to also use waterbodies more local to the wind farm sites.

3.8.4 As the Middle Shannon Callows SPA lies a similar distance for Phase II as Lough Ree does from Phase I, and the Middle Shannon Callows supports many of the same species, it is logical to also include the Middle Shannon Callows in the appropriate assessment, especially when considering the potential for cumulative effects arising from both Phase I and Phase II.

3.8.5 Arguably, any other SPAs used by these species *en route* to or from the Roscommon area should also be considered. However, these have not been identified (and it would be difficult to do so) and so can therefore only be considered generically. If it is decided that there will not be adverse effects on the integrity of the more local SPAs, then this conclusion is likely to apply to more remote sites as well.

3.8.6 Finally, there is uncertainty as to whether Lisduff Turlough SAC is hydrologically connected to the Phase I site (Keohane, 2016) and therefore it is not possible at this stage to conclude that

there is not likely to be significant effects on this Natura 2000 site. It should therefore also be included in the appropriate assessment.

3.8.7 It can be objectively concluded that there is not likely to be a significant effect on the SAC qualifying features for the remaining SACs shown in Table 1 and therefore these can be excluded from further assessment.

4. Appropriate Assessment

4.1 Applicant's Appropriate Assessment

4.1.1 The applicant completed an impact assessment as part of the June 2012 AA report for Phase I, pages 41 to 85. This provides a description of three Natura 2000 sites selected for further assessment (Lough Croan SAC/SPA, Four Roads SAC/SPA and the River Suck Callows SPA) and their qualifying features, followed by an assessment of potential effects, a description of mitigation measures and consideration of the potential for the development to contravene the conservation objectives of each of the designated sites in light of the mitigation measures proposed. However, as previously stated, this report did not and could not have considered the data collected in subsequent surveys.

4.2 Appropriate Assessment Methodology

4.2.1 The appropriate assessment methodology draws on the same guidance used in the screening assessment (see section 3.2 of this document). The approach to determining conservation condition is explained in Appendix 3 of this document.

4.3 Step One, part 1: Information on Natura 2000 Sites

Lough Croan Turlough SPA (004139) and SAC (000610)

Brief Description

4.3.1 Lough Croan Turlough SPA and SAC is described in Table 1 of this report and in more detail on pages 41 and 42 of the 2012 AA report for Phase I. Further information on the qualifying species is provided in Appendix 2.

Qualifying Features

4.3.2 The qualifying features of the Lough Croan Turlough SPA and SAC are set out in Table 2 below. For an explanation of Baseline Reference Value and how it is used to determine favourable condition, see Appendix 3.

Table 2: Qualifying features of the Lough Croan Turlough SPA and SAC

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	Ap Obs
A056	Shoveler (*Anas clypeata*)	157	117	235 (Present)
A410	Golden Plover (*Pluvialis apricaria*)	2025	730	0 (0)
A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	164	14*	0 (52)
A999	Wetland and Waterbirds	-	-	-

3180	Turloughs	100.8ha (B)	-	-

'BRV' = Baseline Reference Value which is taken to be (i) for birds, the five year peak mean set out on the site synopsis and (ii) for habitats, the extent set out on the Natura 2000 standard data form.

'5 year peak mean' = the average of the peak counts over the last five years for which data is available i.e. winters 2008/9 to 2012/13, 2009/10 to 2013/14 or 2010/11 to 2014/15, derived from I-WeBS unless stated.

Ap Obs = the peak count obtained by the applicant in the 2012/13 and 2014/15 winters, with 2012/13 data in parentheses if available.

* separately, the NPWS data submitted to ABP 8th December 2015 indicates a 5 year peak mean of 97, which is still below the BRV.

ND = no data submitted by the applicant for this site.

Green = apparently favourable conservation condition, red = apparently unfavourable, amber = uncertain, no colour = no recent measure to make a comparison with 'BRV'.

Conservation Objectives

4.3.3 The conservation objectives for Lough Croan Turlough SPA are as follows:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA, as shown in Table 2.
- To maintain or restore the favourable conservation condition of the wetland habitat at Lough Croan Turlough SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

4.3.4 The conservation objectives for Lough Croan Turlough SAC are as follows:

- To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected, as shown in Table 2.

Conservation Condition

4.3.5 A comparison between the 'Baseline Reference Value' BRV and the five year peak mean indicates that the shoveler population at Lough Croan Turlough is in unfavourable conservation condition. However, the applicant recorded higher numbers in 2014/15 than those in the I-WeBS database.

4.3.6 Making the same comparison for golden plover and Greenland white-fronted goose indicates that the populations of both these species at Lough Croan Turlough are in unfavourable condition. This means that the relevant conservation objective for all species is to restore the population to the level that it was when the site was designated.

4.3.7 The turlough itself appears to be in favourable conservation condition, based on the entry in the Natura 2000 Standard Data Form, where conservation [condition] is assigned category B 'good

conservation'. This means that the relevant conservation objective is to maintain that condition. This would appear to apply to the qualifying feature of 'Wetland and Waterbirds' as well.

Four Roads Turlough SPA (004140) and SAC (001637)

Brief Description

4.3.8 A brief description is provided in of Four Roads Turlough SPA and SAC is provided in Table 1 of this report and a fuller description is provided in the 2012 AA report for Phase I, pages 41 and 42. Further information on the qualifying species is provided in Appendix 2.

Qualifying Features

4.3.9 The qualifying features of the Four Roads Turlough SPA and SAC are set out in Table 3 below.

Table 3: Qualifying features of the Four Roads Turlough SPA/SAC

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App obs
A410	Golden Plover (*Pluvialis apricaria*)	3717	248	100 (present)
A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	93	60*	21 (3)
A999	Wetland and Waterbirds	-	-	-
3180	Turloughs	79.44ha (C)	-	-

See explanatory notes under Table 2.

* separately, the NPWS data submitted to ABP 8th December 2015 indicates a 5 year peak mean of 96, which is just above the BRV.

Conservation Objectives

4.3.10 The conservation objectives for the Four Roads Turlough SPA and SAC are the same as for Lough Croan Turlough, with the relevant qualifying features shown in Table 3.

Conservation Condition

4.3.11 The available data for golden plover indicates that the population at Four Roads Turlough are in unfavourable condition. This means that the relevant conservation objective is to restore the populations to the level that they were when the site was designated. For Greenland white-fronted goose the situation is more complex, in that one dataset (from I-WeBS) indicates unfavourable condition whereas a second dataset just indicates favourable condition (by three birds). However, as this flock is almost certainly that associated with the River Suck Callows and Lough Croan Turlough, and this flock is diminished in size from when these sites were designated, unfavourable condition is assumed.

4.3.12 The turlough itself appears to be in unfavourable conservation condition, based on the entry in the Natura 2000 Standard Data Form, where conservation [condition] is assigned category C 'average or reduced conservation'. This appears to be because the site has suffered from agricultural improvement and therefore is little of interest for its vegetation. The status of the 'Waterbirds and Wetlands' qualifying feature is unclear.

River Suck Callows SPA

Brief Description

4.3.13 A brief description is provided in of the River Suck Callows SPA provided in Table 1 of this report and a fuller description is provided in the 2012 AA report for Phase I, page 43. Further information on the qualifying species is provided in Appendix 2.

Qualifying Features

4.3.14 The qualifying features of the River Suck Callows SPA are set out in Table 4 below.

Table 4: Qualifying features of the River Suck Callows SPA

Annex I/II code	Qualifying Feature	'BRV'	Five Year Mean	App Obs not full site
A038	Whooper Swan (*Cygnus cygnus*)	124*	187	67 (15)
A050	Wigeon (*Anas penelope*)	1,203*	2,857	320 (0)
A140	Golden Plover (*Pluvialis apricaria*)	1,850**	1,134	15 (Present)
A142	Lapwing (*Vanellus vanellus)*	3,640*	1,638	100 (Present)
A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	386***	168	79 (105)
A999	Wetland and Waterbirds	-	-	-

See explanatory notes under Table 2.

* Data from 2002, Natura 2000 standard data form and site synopsis

** Data from 2004, I-WeBS as no count is given on the Natura 2000 standard data form or site synopsis

*** five year peak mean from 1988/89 to 1993/94

Conservation Objectives

4.3.15 The conservation objectives for the River Suck Callows SPA are as follows:

- To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA, as shown in Table 4.
- To maintain or restore the favourable conservation condition of the wetland habitat at the River Suck Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Conservation Condition

4.3.16 Both whooper swan and wigeon appear to be in favourable conservation condition, while golden plover and lapwing appear to be in unfavourable condition. However, for these species the count data given as the 'BRV' is from one year, 2002 or 2004, rather than a five year peak mean. This means that the comparison between the 'BRV' and the current five year peak mean may not be reliable.

4.3.17 The Greenland white-fronted goose population also appears to be in unfavourable condition at the River Suck Callows. In this instance, the comparison is based on five year peak means and is therefore a more reliable assessment.

4.3.18 The status of the 'Waterbirds and Wetlands' qualifying feature is unclear.

Lough Ree SPA (004064)

Brief Description

4.3.20 A brief description of Lough Ree is provided in Table 1 of this report. Further information on the qualifying species is provided in Appendix 2.

Qualifying Features

4.3.21 The qualifying features of Lough Ree SPA are set out in Table 5 below.

Table 5: Qualifying features of Lough Ree SPA

Annex I/II code	Qualifying Feature	'BRV'	5 year mean, data only from 2010/11	App Obs
A004	Little Grebe (*Tachybaptus ruficollis*)	34*	19	-
A038	Whooper Swan (*Cygnus cygnus*)	89	99	-
A050	Wigeon (*Anas penelope*)	1475	749	-
A052	Teal (*Anas crecca*)	912	231	-
A053	Mallard (*Anas platyrhynchos*)	675	252	-
A056	Shoveler (*Anas clypeata*)	40	0	-
A061	Tufted Duck (*Aythya fuligula*)	661	760	-
A065	Common Scoter (*Melanitta nigra*)	35	5 pairs, 17 birds ***	-
A067	Goldeneye (*Bucephala clangula*)	137	12	-
A125	Coot (*Fulica atra*)	250	524	-
A140	Golden Plover (*Pluvialis apricaria*)	2035	205	-
A142	Lapwing (*Vanellus vanellus*)	3870	1443	-
A193	Common Tern (*Sterna hirundo*)	90**	Min. 80***	-
A999	Wetland and Waterbirds	-	-	-

See explanatory notes under Table 2.

* From site synopsis as no data given on the standard data form

** data from 1990

*** data from 2012 (Hunt, Heffernan, McLoughlin, Benson, & Huxley, 2013)

Conservation Objectives

4.3.22 The Conservation Objectives for the Lough Ree SPA are the same as for the River Suck Callows, but with reference to the qualifying features in Table 5.

Conservation Condition

4.3.23 Ten of the species which are qualifying features of the SPA appear to be in unfavourable condition, while three, including whooper swan, appear to be in favourable condition.

4.3.24 The status of the 'Waterbirds and Wetlands' qualifying feature is unclear.

Middle Shannon Callows SPA (004096)

Brief Description

4.3.26 A brief description of the Middle Shannon Callows is provided in Table 1 of this report. Further information on the qualifying species is provided in Appendix 2.

Qualifying Features

4.3.27 The qualifying features of the Middle Shannon Callows SPA are set out in Table 6 below.

Table 6: Qualifying features of the Middle Shannon Callows SPA

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App Obs
A038	Whooper Swan (*Cygnus cygnus*)	287	291*	-
A050	Wigeon (*Anas penelope*)	2,972	2,736*	-
A122	Corncrake (*Crex crex*)	60	1**	-
A140	Golden Plover (*Pluvialis apricaria*)	4,254	2,439*	-
A142	Lapwing (*Vanellus vanellus*)	11,578 (63 pairs)	2,860*	-
A193	Common Tern (*Sterna hirundo*)	-	ND	-
A156	Black-tailed Godwit (*Limosa limosa*)	1500/ 388	220*	-
A179	Black-headed Gull (*Chroicocephalus ridibundus*)	1061	307*	-
A999	Wetland and Waterbirds	-	-	-

See explanatory notes under Table 2.

* Data from I-WeBS, Shannon Callows Aerial Survey (conducted in January)

** Data extracted from A Framework for Corncrake Conservation to 2022. NPWS, 2015.

Conservation Objectives

4.3.28 The conservation objectives for Middle Shannon Callows SPA are the same as for the River Suck Callows, but with reference to the qualifying features in Table 6.

Conservation Condition

4.3.29 Six of the species which are qualifying features for the Middle Shannon Callows SPA appear to be in unfavourable condition. Just one, whooper swan, is apparently in favourable condition and the status one species, the common tern, is unknown but assumed to be favourable. The status of the 'Waterbirds and Wetlands' qualifying feature is again unclear.

Lisduff Turlough SAC (000609)

Brief Description

4.3.31 A brief description of Lisduff Turlough SAC is provided in Table 1 of this report.

Qualifying Features

4.3.32 The qualifying features of Lisduff Turlough SAC are set out in Table 7 below.

Table 7: Qualifying features of Lisduff Turlough SAC

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App Obs
A038	Turloughs	41.46ha (A)	-	-

See explanatory notes under Table 2.

Conservation Objectives

4.3.33 The conservation objective for Lisduff Turlough SAC is to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected, as set out in Table 7 above.

Conservation Condition

4.3.34 According to the Natura 2000 standard data form, Lisduff Turlough is in favourable condition, it having been assigned category A – 'excellent conservation'.

4.4 Step One, part 2: Potential effects on Conservation Objectives

4.4.1 The project could be considered contrary to the conservation objectives for the SPAs if it either (i) resulted in a reduction in the population of a qualifying species such that it fell below the 'Baseline Reference Value' at the SPA or (ii) prevented, or hindered the ability of, the population of a qualifying species returning to a level which was equal to the Baseline Reference Value. The potential mechanisms for impacts which could contravene the conservation objectives are as set in paragraph 3.6.3. In summary these are: (i) changes in hydrology affecting turloughs and bird habitat; (ii) pollution during construction affecting bird habitat; (iii) disturbance of wintering birds during construction; (iv) displacement of birds; (v) the barrier effect; and (vi) collision with turbines.

4.4.2 The project would be contrary to the conservation objectives for the SACs, which are all turloughs, if it reduced the extent of the turlough, damaged its structure or function, or interfered with the ability of the turlough to be restored to a favourable conservation condition. Again, there is no scope for direct effects on the designated turloughs, however, the potential for the wind farm infrastructure to interfere with local hydrology has been identified. This could in turn result in changes to the turlough habitat.

4.5 Step Two, part 1: Impact Prediction 'Alone'

Applicant's Assessment

4.5.1 The applicant has provided an impact assessment in the 2012 AA report for Phase I. This covers the three Natura 2000 sites that were selected by the applicant for further assessment and their qualifying features. However, the assessment pre-dates a significant amount of bird survey work which was undertaken in the winters of 2012/13 and 2014/15 and potential effects on Lough Ree SPA, the Middle Shannon Callows SPA and Lisduff Turlough SPA were not considered. Re-assessment is therefore required in the light of the new information collected during these surveys and encompassing the qualifying features of the additional Natura 2000 sites.

Methodology and Confidence in the Assessment

Ornithology

4.5.2 The assessment that follows is based on the survey work undertaken by the applicant. An assessment of this survey work is included in Appendix 1 of this document.

4.5.3 The ornithological survey work does not appear to have followed standard guidelines which reduces confidence in the data and therefore any subsequent assessment, including the one given here. It also means that some information which I would have expected to be available is missing, for example, flight lines for ducks and waders.

4.5.4 During its survey work, the applicant did not record any of the qualifying species of any of the SPAs on the Phase I site and observed just two of the seventeen species flying over the wind farm site, whooper swan and Greenland white-fronted goose. Golden plover was recorded foraging in grassland to the north of the proposed turbines.

4.5.5 Some conclusions of the applicant are that:

- The proposed development site is not of any significant ornithological importance;
- For most of the year the development site will not be used by any birds of conservation importance;
- The most important roosting and grazing areas could be regarded as independent sites, as in birds tend to graze close to where they roost, with little or no diurnal [daily?] movement across the Phase I site;
- Disturbance through human activity is major issue affecting the whooper swan and Greenland white-fronted geese population currently, causing additional flight activity;
- Some displacement of whooper swans is likely from fields to the north of Dysart (Thomas Street) Turlough but that this is not of significance;
- On a small number of occasions each year, birds of conservation importance will interact with the proposed development site, including whooper swans flying from Dysart (Thomas Street) Turlough to Lough Croan Turlough, Greenland white-fronted goose flying to/from Lough Croan and, at night, golden plover; and
- Based on some conservative assumptions, and without considering any mitigation, one whooper swan could collide with a turbine every one to three years[5] during the operation of the wind farm and one Greenland white-fronted goose would suffer the same fate every 6 to 116 years[6].

4.5.6 As set out in Appendix 2 of this document, all of the qualifying species are migratory and many also appear to make local movements between waterbodies or change sites during the course of the season. Many of these species are also known, from studies elsewhere, to roost in one location (typically a waterbody, such as the SPAs under consideration here) and to forage in another, with roosting for several species taking place during the day and foraging taking place at night. Examples of species which forage at night are wigeon, shoveler, tufted duck, golden plover and lapwing. Given the position of the Phase I site in relation to waterbodies used by the qualifying species, there would seem to be a risk that other qualifying species (i.e. in addition to whooper swan, Greenland white-fronted goose and golden plover) also make flights over the wind farm site from time to time and that some of them may use parts of the Phase I site, or nearby, for foraging.

4.5.7 So, based on the applicant's survey work and the degree of confidence in it, the premises for the assessment that follows are (i) that the Phase I site is not used regularly for foraging by any of

[5] The applicant used a number of scenarios to model collision risk. For whooper swan, the lowest figure (1 year) quoted here is based on flight speeds of 50km/h, 100% wind farm operation, an avoidance rate of 98%, a flock size of 45 and 10 flights through the wind farm per annum and the higher figure (3 years) is based flight speeds of 80km/h, 90% wind farm operation, an avoidance rate of 98%, a flock size of 45 and 10 flights through the wind farm per annum. Other scenarios based on 97% and 99% avoidance rates are discounted as the SNH guidance is to use 98%.

[6] For Greenland white-fronted goose, the lowest figure (6 years) quoted here is based on flight speeds of 50km/h, 100% wind farm operation, an avoidance rate of 99%, a flock size of 52 and 10 flights through the wind farm per annum and the higher figure (116 years) is based 70km/h, 90% wind farm operation, an avoidance rate of 99.93%, a flock size of 52 and 10 flights through the wind farm per annum.

the seventeen qualifying species; (ii) that the Phase I site does not lie on a flight path that is used daily between a roosting and foraging area; (iii) the Phase I site or nearby areas may occasionally be used for foraging by some species; and (iv) that the Phase I site may be flown over occasionally by whooper swan and Greenland white-fronted goose, as well as golden plover and other qualifying species, even though flights by golden plover and other qualifying species flying over the site were not recorded by the applicant.

4.5.8 Based on the premises set out 4.5.7 above, I set out below an assessment of the risks that the qualifying species are affected by the impacts set out in 3.6.3 above. The basic question being asked in Section 4.5 of this report is "what is the level of risk that a *few* individuals of the qualifying species population experience the effect either during construction or from time to time during the 25 year operating period?". The levels of risk are on a five point scale:

- Negligible
- Very low
- Low
- Medium
- High

4.5.9 The potential consequences for the population and the conservation objectives are addressed in Section 4.7.

Hydrology and Hydrogeology

4.5.10 Mr. Keohane reached the conclusion that he was "not satisfied that the nature and extent of investigation that has been undertaken in respect of [the Seven Hills Phase I] development meets the standard and consistency required to generate [sufficiently complete, precise and definitive] findings" to reach a conclusion with respect to the integrity of the Turlough habitats within and outside the Natura 2000 sites (Keohane, 2016). In the light of this conclusion, there is little purpose in assessing the potential effects of the development on turlough habitat though changes in hydrology and pollution until more detailed investigations have been completed, suffice to say that impacts on turlough habitats remain uncertain. This includes the qualifying feature of 'Waterbirds and Wetland habitats' for the SPAs which include Turloughs.

Lough Croan Turlough SPA (004139) and SAC (00610)

Construction Stage - Direct impacts

4.5.11 There would clearly be no direct impacts on the qualifying features of Lough Croan Turlough SPA and SAC during the construction stage, since the Seven Hills Wind farm site and Lough Croan Turlough are separated by a distance of 1.1km.

Construction Stage - Indirect impacts

Disturbance and displacement of wintering birds

4.5.12 Breeding and wintering birds can be affected by construction activity with some bird species avoiding areas subject to and close to the area affected by construction activity (Burton, Rehfisch, & Clark, 2002; Pearce-Higgins, Stephen, Douse, & Langston, 2012). Such avoidance is referred to as displacement. As displacement can result in a reduced area of available habitat it can affect the survival rates and therefore, possibly, population sizes of birds.

4.5.13 However, Lough Croan Turlough lies beyond the distance at which there is a likelihood of disturbance/displacement effects as a result of construction activity. The three qualifying bird species (shoveler, golden plover and Greenland white-fronted goose) are therefore only likely to be vulnerable to disturbance during the construction stage if they spend time away from Lough Croan Turlough and closer to, or on, the Phase I site, including at Dysart (Thomas Street) Turlough which is less than 1km (approximately 900m) from the nearest turbine. As set out in Appendix 2, the distances that these species can range from their roost sites to their foraging areas is in excess of 1km which means that the Phase I site is within that range. Of course, use of the wind farm site and areas nearby for foraging by these species would only occur if suitable habitat is present.

4.5.14 One of the qualifying species at Lough Croan Turlough, **shoveler**, occurs at its highest concentrations locally at Lough Croan Turlough during the winter period. The applicant asserts that the birds which use Lough Croan Turlough are there all winter. However, other, more detailed, studies elsewhere indicate that some shoveler leave their day roost (usually a large waterbody) to forage elsewhere at night, typically within 2 to 3km of the day roost. In addition, smaller numbers of shoveler have been recorded at other waterbodies nearby, such as Four Roads Turlough, Lough Funshinagh, Coolagarry Turlough and Lisduff Turlough, which perhaps indicates some local movement between sites. There are also two seasonal waterbodies present on the Phase I site which could potentially attract shoveler. However, this type of waterbody is not the preferred habitat of this species (it prefers permanent, shallow waterbodies with abundant emergent and aquatic vegetation (Snow & Perins, 1998)). The presence of this species on site is therefore unlikely and the risk of disturbance or displacement during the construction period is **very low**.

4.5.15 Whilst there were no records of **golden plover** at Lough Croan Turlough in the last two seasons for which data is available, peak counts in the three years prior were between 500 and 2,250 birds and it is likely that this species will again be recorded at Lough Croan Turlough. The typical home range for a golden plover flock is 6 -8km and this species is known to forage on grassland (and arable land) up to 100m above sea level (at least). Furthermore, this species forages at night in smaller flocks, spread over a wider area, than during the day. All of this indicates that the grassland within and close to the Phase I site has the potential to provide foraging habitat for golden plover, both during the day and, perhaps most likely, at night. Indeed, the applicant has records of golden plover feeding in fields to the north of the location of the proposed turbines. Moreover, this species also occurs at Dysart (Thomas Street) Turlough which is partly between 800m and 1km from the Phase I site. The Phase I site extends over 200ha (based on a loop drawn around the outermost turbines) and, when land within 1km of the wind farm is considered, the total area is approximately 950ha, and it covers most of the land

between Lough Croan Turlough, Dysart (Thomas Street) Turlough and Cuileenirwan/Coolagarry Turlough. There is clearly the potential for golden plover to use this area for foraging on occasion. As the applicant has no records of this species on the Phase I site and both wetland sites where this species has been recorded are more than 800m form the Phase I site, the risk of disturbance and displacement of this species during the construction stage is, on balance, considered to be **medium**.

4.5.16 **Greenland White-fronted Goose** is recorded at Lough Croan Turlough occasionally. This species forages at distances of up to 8km from its roost site and so again this puts the Phase I site well within foraging range for birds associated with Lough Croan Turlough. The Greenland white-fronted goose increasingly forages on agricultural grasslands (Fox T. D., et al., 2006) with an apparent preference for wet and low lying areas such as callows, although it is not restricted to this habitat and will forage on drier grasslands (Fox & Stroud, 2002). The edges of Lough Croan Turlough are approximately 70m ASL and there is agricultural grassland at approximately this level which extends from the turlough through the 1km zone around the Phase I site and into part of the Phase I site itself. There are no records of birds using this area of land (they were recorded foraging in fields to the northwest of Lough Croan Turlough in 2013) however this situation appears to put the birds at **low** risk of experiencing disturbance or displacement during the construction period.

Damage to Turlough habitats/'Wetland and Waterbirds'

4.5.17 Further information is required to complete an assessment of likelihood of impacts on Turlough and Waterbird habitats.

Operation Stage - Indirect impacts

Disturbance and displacement of wintering birds

4.5.18 The proposed wind farm would not result in the complete displacement of birds from Lough Croan Turlough SPA, or any part of it, because the turlough lies beyond the distance at which turbines of this size could result in complete displacement (Drewitt & Langston, 2006; Rees, 2012). There is some suggestion that bird numbers may be reduced at distances beyond the point at which complete displacement occurs (Rees, 2012) and Lough Croan Turlough may be within that zone. However, the more immediate risk is that birds are displaced from land on or closer to the wind farm site, including Dysart (Thomas Street) Turlough. The assessment of this risk for the three qualifying species is essentially the same as for the construction stage.

Barrier Effect

4.5.19 Large wind farms, or multiple wind farms in the same area, could create a barrier effect if they lie between areas used by a given population of birds, such as between roosting and foraging sites, between two sites used by the same population over a winter or on migration routes. Birds of many species take evasive action on encountering a wind farm and fly around it rather than through it. This behaviour is known as macro-avoidance. It has the effect of reducing the likelihood of collision with turbines but may lengthen the distance travelled. This in turn may increase energetic costs and reduce survival rates with, in theory, knock-on effects on population size.

4.5.20 Birds flying a direct route between Lough Croan Turlough and Dysart (Thomas Street) Turlough and between Lough Croan Turlough and parts of the River Suck Callows would encounter the Phase I wind farm site. Birds flying a direct route from Lough Croan Turlough to all the other local wetland sites within 15km of the Phase I and Phase II wind farm sites would not encounter the wind farm site. At its widest, the Phase I wind farm would be approximately 2.2km across and any barrier effect is likely extend at least 200m from the wind farm for some species, giving an overall potential barrier of 2.6km across. However, the turbines are quite widely spaced, being separated, blade tip to blade tip, by over 300m on average, which may limit the degree to which the wind farm is a barrier to movement for many species, with birds choosing instead to pass through the gaps between the turbines.

4.5.21 There are no records of **shoveler** from either Dysart (Thomas Street) Turlough or the River Suck Callows, which indicates that this species is unlikely to be making regular, local journeys from Lough Croan Turlough which would be interrupted by the Phase I wind farm. Furthermore, this species' breeding grounds lie in directions extending clockwise from NNE to SE from Lough Croan Turlough and therefore the Phase I site, which lies to the southwest of Lough Croan Turlough, would not interrupt the direct migratory route. There is the possibility (but no firm evidence) that the birds which use Lough Croan Turlough move on to spend part of the winter further to the south and west and any birds making this journey or the return journey could be subject to a barrier effect when arriving at or leaving Lough Croan Turlough. However, the proportional increase in the distance travelled would be slight. Therefore, the risk of a barrier effect affecting the shoveler is likely to be **very low**.

4.5.22 Unlike shoveler, the **golden plover** has been recorded at both Dysart (Thomas Street) Turlough and the River Suck Callows which means that direct flights between Lough Croan Turlough and these two sites are possible and these would be interrupted by the wind farm. A bird flying from Lough Croan Turlough to Dysart (Thomas Street) Turlough in a straight line would currently need to fly 3km whereas flying the same route but avoiding the wind farm site altogether would involve flying 3.8km to 4.5km depending on whether the diversion was to the east or west, representing up to a 25% to 50% increase in the distance travelled. Birds flying to parts of the River Suck Callows may have to make a similar detour but this would be a smaller proportion of the overall journey. The applicant has no records of the golden plover actually making this journey and it may be that the birds avoid flying over hills (such as that on which the wind farm is partly located) but it is not clear that the surveys undertaken for the Phase I site were sufficiently broad in scope to have recorded the local movements of golden plover (see Appendix 1). The situation for migrating golden plover is much the same as for shoveler, although the breeding grounds of the golden plover are more to the north. The risk of golden plover experiencing a barrier effect is currently considered to be **medium**, given the use of both Lough Croan Turlough and Dysart (Thomas Street) Turlough by this species.

4.5.23 The **Greenland white-fronted goose** population also uses the River Suck Callows but there are no records of this species at Dysart (Thomas Street) Turlough. The main area where this species is recorded on the River Suck Callows is at Muckanagh. Birds moving along a direct route between Lough Croan Turlough and Muckanagh would not encounter the Phase I site. However, this species has also been recorded at several other locations along the River Suck and the Phase I site lies on the direct route between three of these sites and Lough Croan Turlough. The applicant has one record of 52 Greenland white-geese which could have been

making this journey, in response to disturbance by a farm worker in the field near to Lough Croan Turlough where the geese were foraging. The applicant's observation was that the birds flew at a height which exceeded turbine height which may mean that such journeys may not be altered by the presence of the wind farm. However, it is possible that the wind farm would add 500m or more to any such journeys if the birds took a less direct route in response to the presence of the wind farm. The Greenland white-fronted goose is a shy species which moves readily in response to disturbance which may mean that flights between Lough Croan Turlough and the River Suck Callows are reasonably frequent. The situation for this species when migrating is much the same as for shoveler, although the breeding grounds of the Greenland white-fronted goose are more to the north. The risk of Greenland white-fronted goose experiencing a barrier effect is currently considered to be **medium**, given the use of both Lough Croan Turlough and the River Suck Callows by this species.

Collision

4.5.24 Birds which encounter a wind farm may choose to avoid it altogether and therefore make a detour around the wind farm, as described above under Barrier Effect, or continue on through the wind farm. In the latter situation, the birds are at risk of collision with the turbines. By far the majority of birds entering the wind farm (>98%) would be expected to take evasive action, known as micro-avoidance, to avoid such collisions. The likelihood of a collision is influenced by factors such as the species of bird, weather conditions, topography and turbine type.

4.5.25 As set out in paragraph 4.5.21 above, it is probably only **shoveler** which stopover at Lough Croan Turlough while on migration to or from sites further south and west which could encounter the Phase I wind farm site. Again, this behaviour has not been recorded by the applicant. However, the detailed pattern of migration for this species is not well understood (Arzel, Elmberg, & Guillemain, 2006) and, elsewhere, this species has been recorded moving on to other sites, especially during periods of cold weather. The NPWS identified this species as a key concern for collision risks when making local and migratory movements, perhaps at night (NPWS October 2015 submission). Elsewhere, there is at least one record of an apparent collision by this species with a wind turbine (Graff, 2015) and therefore there is at least a possibility of such fatalities occurring at the Phase I site if the birds cross the wind farm site during migratory movements. Based on the current information, the risk that a small number of shoveler arriving at or leaving Lough Croan Turlough collide with a turbine over the 25 years of the operational stage is judged to be **low**. There are no flights lines on which to base a collision risk assessment and the applicant has not provided such an assessment.

4.5.26 As set out in paragraphs 4.5.15 and 4.5.22, the **golden plover** could encounter the Phase I site while foraging and making local movements between wetland sites. As set out in Appendix 2, the golden plover is considered to be potentially at risk of collision with wind turbines and there are records of mortality of this species at wind farm sites. Based on the current information on the distribution of this species locally, the risk that a small number of golden plover collide with a turbine over the 25 years of the operational stage pf the Phase I wind farm is judged to be **medium,** even though it is expected that most birds would avoid collision with the turbines. Again, there are no flight lines on which to base a collision risk assessment and the applicant has not provided such an assessment.

4.5.27 As set out in paragraph 4.5.23, the **Greenland white-fronted goose** flock that occurs locally could encounter the Phase I site when making local movements between sites. The applicant has undertaken a collision risk assessment for this species in which it estimated that up to approximately 4 individual birds (see paragraph 4.5.5 of this report) could collide with a turbine over the 25 year operational life of the Phase I development, based on a flock of 45 (or 52) birds flying through the wind farm 10 times a year (ECOFACT, 2013). During the oral hearing in June 2016, the applicant indicated that this was a conservative estimate not based on observed flight lines but on an entire flock of geese. However, it is conceivable that this number of flights are made by this species across the wind farm site in a year, given its position between Lough Croan Turlough and the River Suck Callows. Since the applicant completed its collision risk assessment, SNH has updated the recommended avoidance rates for use in the model. The new avoidance rate is 99.8%. Based on the current information, the risk that a small number of Greenland white-fronted goose collide with a turbine over the 25 years of the operational stage is judged to be **medium** (the best estimate is 1 to 2 birds over this time period based on the flock size and frequencies used by the applicant and the 99.8% avoidance rate[7]).

Damage to Turlough habitats/'Wetland and Waterbirds'

4.5.28 As for the construction stage.

Summary Table

Table 8: Summary of the Construction and Operational Impacts on Lough Croan Turlough SPA (004139)

Species	Disturbance	Displacement	Barrier	Collision
Shoveler	Very Low	Very Low	Very low	Low
Golden plover	Medium	Medium	Medium	Medium
Greenland white-fronted goose (GWFG)	Low	Low	Medium	Medium

[7] The figures given here differ from those provided by the applicant because the applicant used different avoidance rates. The avoidance rates used by the applicant were 97%, 98%, 99% and 99.93% and the numbers quoted in main body of the report are based on the last two of these, with calculations given for both 70 and 50km/h flight speeds. The 99% avoidance rate indicates, at flight speeds of 70km/h, three to four birds would be killed over 25 years, while the 99.93 rate indicates that none would be killed until the wind farm had been operational for over 100 years.

Four Roads Turlough SPA (004140) and SAC (001637)

Construction Stage - Direct impacts

4.5.29 The construction of the Seven Hills Wind farm would not result in direct impacts on Four Roads Turlough SPA during the construction stage.

Construction Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.30 Four Roads Turlough SPA is located 2.5km away from the Phase I site and is therefore well beyond the distance at which birds using the SPA are likely to be disturbed as result of construction activity. However, the Phase I site is within the foraging range for the two qualifying bird species of Four Roads Turlough, golden plover and Greenland white-fronted goose.

4.5.31 Moreover, the birds which utilise Four Roads Turlough may be part of the same populations which makes use of Lough Croan Turlough. Golden plover is highly mobile species which is known to change sites elsewhere during the winter and it is near certain that it is one Greenland white-fronted goose flock that uses both sites. Therefore, the assessment for Four Roads Turlough SPA is the same as that set out for these species at Lough Croan Turlough, with respect to construction activity.

Damage to Turlough habitats/'Wetland and Waterbirds'

4.5.32 Further information is required to complete an assessment of likelihood of impacts on Turlough and waterbird habitats.

Operation Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.33 As for the construction stage.

Barrier Effect

4.5.34 The Phase I wind farm could, to greater or lesser degree, interrupt direct flights of **golden plover** from Four Roads Turlough to six other wetland sites where this species has been recorded; the Middle Shannon Callows, Lough Feacle, Corkip Lough, Dysart (Thomas Street) Turlough, Coolagarry/Cuilenirwan Loughs and Castlehampton Esker, necessitating a slight detour in each case if the birds choose to avoid the wind farm site. Moreover, the birds which use Four Roads Turlough may also be those which make use of Lough Croan Turlough. Again, the applicant presented no records of golden plover making any such movements between wetland sites, or of golden plover flying over the wind farm site. However, given the proximity of these sites to the Phase I site, it is reasonable likely that such journeys are made occasionally and the risk of some birds experiencing a barrier effect is therefore considered to be **medium**.

4.5.35 Considering only the wetland sites where **Greenland white-fronted goose** has been recorded, the Phase I site lies on a direct route from Four Roads Turlough to a short section of the River Shannon Callows. Should the birds make this journey, it would require only a very slight increase in the overall journey distance to avoid the Phase I site. The additional burden on the birds is therefore likely to be negligible. However, since the birds associated with Four Roads Turlough also make use of Lough Croan Turlough, the risks of these birds experiencing a barrier effect are considered to be the same as set out for Lough Croan Turlough i.e. **medium**.

Collision

4.5.36 As the populations are likely to be linked, the collision risks for the golden plover and white-fronted goose populations associated with Four Roads Turlough SPA are the essentially the same as that set out for Lough Croan Turlough.

Summary Table

Table 9: Summary of the Construction and Operational Impacts on Four Roads Turlough SPA (004140)

Species	Disturbance	Displacement	Barrier	Collision
Golden plover	Medium	Medium	Medium	Medium
GWFG	Low	Low	Medium	Medium

River Suck Callows SPA (004097)

Construction Stage - Direct impacts

4.5.37 There would be no direct impacts on the River Suck Callows SPA.

Construction Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.38 The closest point of the River Suck Callows to the Phase I site is 3.5km away and therefore well beyond the distance at which any qualifying species are likely to be affected by disturbance during the construction stage while present at the River Suck Callows. All of the qualifying species of the River Suck Callows have been recorded at waterbodies closer to the wind farm site, including Lough Croan Turlough which is 1.1km from the Phase I site. This is still beyond the distance at which disturbance from construction activity is likely to arise.

4.5.39 However, the possibility of the birds foraging on or near the Phase I site needs to be considered again. The Phase I site is comfortably within the potential foraging range from the River Suck Callows for whooper swan and Greenland white-fronted goose and potentially within the foraging range for wigeon, golden plover and lapwing. Furthermore, these last three species have all been recorded at both Lough Croan Turlough and Dysart (Thomas Street) Turlough which are closer to the Phase I site, placing it well within the foraging range for these species when using these two wetland sites. Unlike the Greenland white-fronted goose population, it is

not known if it is the same populations making use of all three sites but it is a real possibility and so it is assumed.

4.5.40 The **whooper swan** feeds in inland waters and on improved pasture and arable land, typically low-lying and wet areas, such as callows. The Phase I site is partly on a hill, with the turbine bases located between 67m above sea level (ASL) and 103m ASL with very little that could be described as low lying and wet. However, as mentioned previously, there is some land within and near the Phase I site which is more or less level with Lough Croan Turlough and there are two areas of seasonal flooding on the Phase I site (at which large, white feathers belonging to an unknown species of bird were found during my site visit) that might attract whooper swan on occasion[8] but are probably too small to be used regularly by this species, if at all. Moreover, the applicant has observed a flock of whooper swan feeding 'at the edge of' the Phase I site, near to Dysart (Thomas Street) Turlough in February 2015 (ECOFACT, 2015). The risk of disturbance and displacement during the construction stage is therefore considered to be **medium**.

4.5.41 The two areas of seasonal flooding on the Phase I site are much smaller than the sites where **wigeon** has been recorded locally and may be of insufficient size to attract this species in any numbers or at all. In addition, the applicant has no records of wigeon on the Phase I site. The risk of wigeon being displaced or disturbed during the construction stage is therefore likely to be **very low**.

4.5.42 For **golden plover**, the risks of displacement are considered to be same as that set out under Lough Croan Turlough above i.e. **medium**.

4.5.43 The **lapwing** also forages on grassland (and arable land), often alongside the golden plover. The applicant has no records of the lapwing on the Phase I site however there remains the possibility that the Phase I site, or land in proximity to it, is occasionally used as foraging habitat by this species. Like golden plover, the risk of disturbance and displacement during the construction stage is assessed to be **medium**.

4.5.44 The assessment for the **Greenland white-fronted goose** is as set out for Lough Croan Turlough i.e. **low.**

Operation Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.45 The risks of disturbance and displacement during the operational stage are essentially the same as for the construction stage.

Barrier Effect

4.5.46 The River Suck Callows extends for 70km of which only a short section, say 4km, is in proximity to the Phase I site, the closest point being approximately 3.5km away. Birds departing or

[8] The applicant reports use by this species of small areas of flooding locally, with four birds recorded at a small flash near Curraghboy (ECOFACT, 2013)

arriving from this section of the Callows could potentially encounter the Phase I site whilst making local movements to other sites.

4.5.47 The **whooper swan** has been recorded from most of the local wetland sites. Depending on the point of origin, the Phase I site lies on a direct path between parts of the River Suck Callows and several of these wetland sites, such as Lough Croan Turlough, Lough Funshinagh, Coolagarry/Cuilenirwan Loughs, Brideswell and Corkip Lough. The birds recorded crossing the site in 2010 were potentially making the journey between the River Suck Callows and Lough Croan Turlough. A detour around the wind farm site could add a 500m or more (or greater than 13%) to this journey, while detours made around the Phase I site while moving between the River Suck Callows and other sites would add proportionally less than this to the overall journey distance. Given the evidence that the birds may make the journey from the River Suck to Lough Croan Turlough occasionally, the risk of a barrier effect is considered to be **medium**.

4.5.48 Whilst the applicant has no records of **wigeon**, **golden plover** and **lapwing** making a journey across the Phase I site, it lies on a direct path between the River Suck and other sites used by these species, for example Lough Croan Turlough and Lough Funshinagh. Any birds making this journey and avoiding the wind farm site may need to make a detour similar to that described above for whooper swan. Given the proximity of these wetlands to the Phase I site, that these birds would occasionally experience a barrier effect is considered to be **medium**.

4.5.49 The risk for Greenland white-fronted goose is as set out under Lough Croan Turlough i.e. **medium.**

Collision

4.5.50 Two of the five qualifying species of the River Suck Callows SPA have been recorded flying over the Phase I site, seemingly making their way, at least on some occasions, from the River Suck Callows to Lough Croan Turlough. These are whooper swan and Greenland white-fronted goose.

4.5.51 **Whooper swan** was recorded flying over the Phase I site on four occasions by the applicant during its survey work. As set out in Appendix 1, this species is considered to be one of the 22 species most vulnerable to wind farm development in Ireland (Mc Guinness, et al., 2015) and it has a relatively high risk of collision with turbines when passing through a wind farm (SNH, 2010) with fatalities of this species having been recorded at existing wind farm sites (Rees, 2012). The flight heights recorded by the applicant when birds were flying across the Phase I site were all below 35m however another study, with a much greater number of observations, indicate that 10% of flights are greater than 40m above ground level (Larsen & Clausen, 2002) which is within the height range to be swept by the rotors at the Phase I site, and another, more recent study with a smaller sample size found that up to 75% of flights were at heights equivalent to that swept by turbine rotors (which at that site is 35m to 125m AGL) (Ecology Consulting, 2014). The applicant also recorded a flock of 52 whooper swan flying at 40m AGL elsewhere in the study area. Therefore, we could expect that at least 10% of the flights made through the wind farm site by this species to be within the area swept by the turbine rotors.

4.5.52 The applicant has undertaken a collision risk assessment for this species, based on the assumption that a flock of 45 birds through the wind farm site 10 times a year with an avoidance

rate of 98% as per SNH guidelines. The applicant's observations suggest that the flock size of seven and a flight frequency of 16 times per annum is more realistic, see Appendix 2. Using these parameters, the collision risk assessment indicates that four to six swans could be killed as a result of collision during 25 year life of the wind farm, although the number is likely to be less as the species is known to avoid flying through wind farms and, as set out above, generally flies at heights below the rotor swept area. Based on the current information, the risk that a small number of whooper swan collide with a turbine over the 25 years of the operational stage is judged to be **medium**.

4.5.53 **Wigeon**, **golden plover** and **lapwing** have not been recorded on or flying over the Phase I site by the applicant, but as noted above these species could occasionally make journeys from the River Suck Callows to wetlands on the far side of the Phase I site. With the possible exception of wigeon, these species are all potentially at risk of collisions with turbines. Given the arrangement of the wetlands at which these species have been recorded around the Phase I site, and the large populations of these species which are present locally, the risk that a small number of each species collide with a turbine over the 25 years of the operational stage is judged to be **medium**.

4.5.54 The assessment for Greenland white-fronted goose is as set out for Lough Croan Turlough i.e. **medium.**

Summary Table

Table 10: Summary of the Construction and Operational Impacts on River Suck Callows SPA (004097)

Species	Disturbance	Displacement	Barrier	Collision
Whooper swan	Medium	Medium	Medium	Medium
Wigeon	Very low	Very low	Medium	Medium
Golden plover	Medium	Medium	Medium	Medium
Lapwing	Medium	Medium	Medium	Medium
GWFG	Low	Low	Medium	Medium

Lough Ree SPA (004064)

Construction Stage - Direct impacts

4.5.55 There would be no direct impacts on Lough Ree SPA.

Construction Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.56 The closest point of Lough Ree to the wind farm site is 11km away and therefore well beyond the distance at which any qualifying species present would experience disturbance and

displacement from construction activity. The Phase I site is also beyond the likely foraging range of for these species while they are using Lough Ree.

4.5.57 Lough Ree has 13 qualifying species of bird altogether, of which 10 have been recorded at Dysart (Thomas Street) Turlough and/or Lough Croan Turlough, which are much closer to the Phase I site. It is not known if the Lough Ree populations are linked to those recorded more locally to the Phase I site but it is a possibility and in line with the precautionary principle should be assumed. As set out above, the birds are unlikely to experience disturbance during the construction stage while at most of the main waterbodies however could do so if they also make use of Dysart (Thomas Street) Turlough or forage on or near the Phase I site.

4.5.58 Of the Lough Ree qualifying species, only whooper swan has been recorded near and over the Phase I site however, as set out above, the two seasonal waterbodies present on the site could perhaps attract the occasional whooper swan, wigeon, teal mallard or shoveler and the farmland habitat is suitable for foraging golden plover and lapwing.

4.5.59 An assessment for **whooper swan** is set out under the River Suck Callows where the risk of disturbance was considered to be medium. However, given the degree to which Lough Ree is removed from the Phase I site, the risk that the specific birds associated with Lough Ree experience disturbance is likely to be **low**.

4.5.60 An assessment for **wigeon** is set out under the River Suck Callows and the conclusion was that the risk of disturbance for this species was **very low**. **Teal** has been recorded at Dysart (Thomas Street) Turlough and so could potentially experience disturbance from construction activity when utilising this site, although the risk that the specific birds associated with Lough Ree are affected is considered to be **very low**. **Mallard** and **shoveler** are perhaps about as likely to use the small waterbodies on site as wigeon, and so the risks that these species are disturbed during the construction stage are similarly **very low**.

4.5.61 The risks of disturbance for **golden plover** and **lapwing** are as set out under Lough Croan Turlough and the River Suck Callows, respectively, although the risks that birds associated with Lough Ree are affected is lower than stated.

4.5.62 The habitat on the Phase I site is not suitable the remaining six qualifying species (**little grebe**, **tufted duck**, **common scoter**, **goldeneye**, **coot** and **common tern**) and these species have not been recorded at Dysart (Thomas Street) Turlough. Therefore the risk of displacement for these species during the construction stage is likely to be **negligible**.

Operation Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.63 As for the construction stage.

Barrier Effect

4.5.64 The Phase I site does not lie on a direct path between Lough Ree and most of the other waterbodies present in the locality. The exceptions being Dysart (Thomas Street) Turlough and a small section of the River Suck Callows. Any detour made by the birds to avoid the Phase I

site on direct flights between Lough Ree and these sites would not add significantly to the journey distance and so there is a negligible risk of a barrier effect for birds moving directly from Lough Ree to any other waterbody.

4.5.65 Again, 10 of the qualifying species for Lough Ree have been recorded closer to the Phase I site. If these populations are linked and these birds also move, say, between Lough Croan Turlough and Dysart (Thomas Street) Turlough or the River Suck Callows then there is a possibility of the barrier effect acting on the Lough Ree population. The qualifying species of Lough Ree which have been recorded at both Lough Croan Turlough and Dysart (Thomas Street) Turlough or the River Suck Callows are whooper swan, wigeon, teal, mallard, coot, golden plover and lapwing.

4.5.66 Assessments has already been provided for whooper swan, wigeon, shoveler, golden plover and lapwing, although given the degree to which Lough Ree is removed from the Phase I site, the risks of any barrier effect acting on the Lough Ree population must be lower than stated for the other sites considered above.

4.5.67 For **teal**, which occurs in large numbers locally and is a species which is generally known to be mobile, it is quite likely that this species crosses the Phase I site occasionally and therefore could experience a barrier effect. **Little grebe**, **mallard, tufted duck** and **coot** are less numerous locally and are generally more sedentary and so perhaps less likely to make occasional flights over the Phase I site. Taking into account the degree of separation between Lough Ree and the Phase I site, the risks of the specific Lough Ree populations of these species, including teal, experiencing any barrier effect whilst making local movements is considered to be **very low**.

4.5.68 All of the Lough Ree qualifying species are migratory to a greater or lesser degree. With the exception of one species, the common scoter, all are likely to arrive from, or depart to, their breeding (if a wintering species at Lough Ree) or wintering grounds (if a breeding species at Lough Ree) in either a northerly, easterly or southerly direction and would therefore not encounter the Phase I wind farm. However, some of the wintering birds could move on from Lough Ree further to the south and west and common scoter could migrate from Lough Ree to its wintering grounds in any direction. Given the distance between Lough Ree and the Phase I site, the probability of any of these birds (including **common scoter**, **goldeneye** and **common tern**) encountering the Phase I site is very low and, for any that did, the effect on journey distances as a result of making a detour around the wind farm would be **negligible**.

Collision

4.5.69 Assessments for whooper swan, wigeon, shoveler, golden plover and lapwing have already been provided, although once again the risks to the Lough Ree population are likely to be lower than stated.

4.5.70 The remaining qualifying species of Lough Ree that have been recorded closer to the wind farm sites, although not on the wind farm site itself, are little grebe (nearest at Lough Croan Turlough), teal (at Dysart (Thomas Street) Turlough), mallard (at Lough Croan Turlough) and tufted duck (at Lough Feacle).

4.5.71 Any **little grebe** moving directly between Lough Ree and Lough Croan Turlough would not encounter the wind farm site while birds moving on from Lough Croan Turlough (or less likely

Lough Ree) to wintering sites elsewhere could potentially encounter the wind farm site. However, the little grebe is so infrequent locally that the risk that a small number associated with Lough Ree collide with a turbine over the 25 years of the operational stage is judged to be **negligible**.

4.5.72 **Teal** occurs in quite high numbers locally and these birds appear to make local movements between waterbodies during the winter season or make migratory movements through the local area. It is possible that birds observed more locally to the wind farm site includes those associated with Lough Ree. Once again, the applicant has not provided any information on routes, frequency or numbers. As this species occurs at both the River Suck Callows and Lough Ree, movements between these sites and others could take birds across the wind farm site. Based on the current information, the risk that a small number of teal associated with Lough Ree collide with a turbine over the 25 years of the operational stage is judged to be **very low**.

4.5.73 As with teal, **mallard** appears to make local movements between the wetland sites and there is a possible connection between the birds observed and the population associated with Lough Ree. This species could also be at risk if it flies through the wind farm site. However this species is infrequent locally and therefore the risk that a small number of mallard associated with Lough Ree collide with a turbine over the 25 years of the operational stage is judged to be **very low**.

4.5.74 **Tufted duck** and **coot** are observed at local waterbodies so infrequently that the risk of a small number associated with Lough Ree collide with a turbine over the 25 years of the operational stage is judged to be **negligible**.

4.5.75 As set out above under 'Barrier Effect' the probability that the qualifying species of Lough Ree, such as **common scoter**, **goldeneye** and **common tern**, encounter the Phase I site while making longer migratory movements are very low and therefore the risk of collision for these birds is **negligible**.

Summary Table

Table 11: Summary of the Construction and Operational Impacts on Lough Ree SPA (0041064)

Species	Disturbance	Displacement	Barrier	Collision
Little grebe	Negligible	Negligible	Very low	Negligible
Whooper swan	Low	Low	Low	Low
Wigeon	Very low	Very low	Low	Low
Teal	Very low	Very low	Very low	Very low
Mallard	Very low	Very low	Very low	Very low
Shoveler	Very low	Very low	Very low	Very low
Tufted duck	Negligible	Negligible	Very low	Negligible
Common Scoter	Negligible	Negligible	Negligible	Negligible
Goldeneye	Negligible	Negligible	Negligible	Negligible
Coot	Negligible	Negligible	Very low	Negligible
Golden plover	Low	Low	Low	Low
Lapwing	Low	Low	Low	Low
Common tern	Negligible	Negligible	Negligible	Negligible

Middle Shannon Callows SPA (004096)

Construction Stage - Direct impacts

4.5.76 There would be no direct impacts on the Middle Shannon Callows SPA.

Construction Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.77 The closest point of the Middle Shannon Callows to the wind farm site is 16.5km away and therefore well beyond the distance at which any qualifying species are likely to be affected by disturbance during the construction stage while remaining within the Middle Shannon Callows. In addition, the Phase I site is well beyond the foraging range of any of the qualifying species while roosting within the Middle Shannon Callows.

4.5.78 Once again displacement and disturbance during the construction stage could only occur if these populations also use sites much closer to the Phase I site. Of the eight qualifying species of the Middle Shannon Callows, six have been recorded at wetland sites closer to the wind farm site. These are whooper swan, wigeon, golden plover, lapwing, black-tailed godwit and black-

headed gull. Assessments for the first four of these have already been provided, although the level of risk for the Middle Shannon Callows populations will be lower than stated for the SPAs which are closest to the Phase I site.

4.5.79 The nearest recorded location for **black-tailed godwit** is Four Roads Turlough. The black-tailed godwit is a wetland species and there is very little wetland on the Phase I site, the exception being the two small, seasonally flooded areas which are unlikely to be large enough to attract this species. Moreover, this species is not frequently recorded locally and there is wide availability of more favourable sites. The risk of displacement for black tailed godwit during the construction stage is therefore considered to be **negligible**.

4.5.80 Although the applicant has no records of **black-headed gull** using the Phase I site, the habitat on site is suitable for this species. Even if it does use the Phase I site from time, this species is generally very tolerant of human activity (including operational wind farms) and the risk that individuals are disturbed or displaced in any significant way is **negligible**.

Operation Stage - Indirect impacts

Disturbance and Displacement of Wintering Birds

4.5.81 As for the construction stage.

Barrier Effect

4.5.82 The Phase I site does not lie on a direct path between the Middle Shannon Callows and most of the other waterbodies present in the locality. The exception is Four Roads Turlough but a detour to avoid the wind farm by birds flying this route would not add significantly to the overall journey. However, as set out above, six of the qualifying species have been recorded closer to the wind farm site and it is possible that the populations are linked. Assessments have been provided for four of these species above; whooper swan, wigeon, golden plover and lapwing.

4.5.83 **Black-tailed godwit** has also been recorded at the River Suck Callows, Four Roads Turlough, and Lough Feacle, but not frequently at the last of these two sites. The Phase I site lies between Four Roads Turlough and Lough Feacle so any birds making this journey could make a detour around the wind farm. The applicant has no records of this species making this journey but it is possible that it occurs from time to time. Given the general low abundance of this species at these sites and the degree that these birds are removed from the Middle Shannon Callows, the risk of a barrier effect for the Middle Shannon Callows population is considered to be **negligible**.

4.5.84 **Black-headed gull** has been recorded in reasonable numbers at most of the waterbodies locally including Lough Croan Turlough and Dysart (Thomas Street) Turlough, and Four Roads Turlough and Lough Feacle. Direct journeys between these sites could take birds across the Phase I site and therefore result in the birds making a detour around the wind farm site, however, the evidence is that this species does not avoid wind farm sites and so there is a **negligible** risk of this species experiencing a barrier effect.

4.5.85 The probability of birds on migration, including **corncrake**, to or from the Middle Shannon Callows encountering the phase I site is low and for any that did the extension to journey time as a result of a detour around the wind farm would be **negligible**.

Collision

4.5.86 Assessments of collision for whooper swan, wigeon, golden plover and lapwing have already been provided, although again the risks must be lower than stated for the SPAs closer to the Phase I site, given the degree to which the Middle Shannon Callows is removed from the Phase I site.

4.5.87 For **black-tailed godwit,** a peak count of four were observed by the applicant at Four Roads Turlough in one month only during the 2014/15 survey. As with the other bird species, it is not clear whether these birds were also associated with the Middle Shannon Callows. However, the wind farm site is located on a direct route between the Middle Shannon Callows and Four Roads Turlough which could bring birds moving between these two sites through the wind farm site. In addition, black-tailed godwit has previously been observed at the River Suck Callows and Lough Feacle. Given that this species is relatively uncommon at the wetland sites which are closest to the Phase I site, the risk that a small number of black-tailed godwit collide with a turbine over the 25 years of the operational stage is judged to be **negligible**.

4.5.88 Gulls are among the most frequently recorded victims of collisions with turbines which must be as a reflection of their abundance and lack of macro-avoidance behaviour. As the **black-headed gull** is fairly numerous locally and is likely to make local movements between sites, there is a significant risk that a small number collide with a turbine over the 25 years of the operational stage. The risk that these are associated with the Middle Shannon Callows is however judged to be **low**.

4.5.89 The remaining two species are breeding species which migrate south for winter. These are the **corncrake** and the **common tern**. The corncrake will be restricted to the River Shannon Callows during the breeding season and the common tern will be restricted to the River Shannon and Lough Ree. Since both are likely to migrate in the opposite direction to the wind farm the risk that individuals of either species associated with the Middle Shannon Callows collides with a turbine is judged to be **negligible**.

Summary Table

Table 12: Summary of the Construction and Operational Impacts on Middle Shannon Callows SPA (004096)

Species	Disturbance	Displacement	Barrier	Collision
Whooper swan	Low	Low	Low	Low
Wigeon	Very low	Very low	Low	Low
Golden plover	Low	Low	Low	Low
Corncrake	Negligible	Negligible	Negligible	Negligible
Lapwing	Low	Low	Low	Low
Common tern	Negligible	Negligible	Negligible	Negligible

Species	Disturbance	Displacement	Barrier	Collision
Black-tailed godwit	Negligible	Negligible	Negligible	Negligible
Black-headed gull	Negligible	Negligible	Negligible	Low

Other Natura 2000 sites

4.5.90 The qualifying bird populations of other SPAs located more than 15km away may also be affected by the Phase I development if significant numbers of these birds also use the sites mentioned above. The risks that such populations are affected are likely to be lower than stated for the more local sites.

4.6 Step Two, part 2: Impact Prediction 'In combination'

Applicant's Assessment

4.6.1 The applicant has presented an 'in combination' assessment in section 4.2.3 of the June 2012 AA report. This included the identification of a number of small scale developments locally as well as several wind farms including a two turbine development at Skrine, a 20 turbine development at Sliabh Bawn, as well as several other wind farms which are more than 20km away from the Phase I wind farm. Strangely, the applicant did not consider here the likely 'in combination' effects of both the Phase I and Phase II wind farms at Seven Hills.

Project Descriptions

4.6.2 Skrine, Sliabh Bawn and Seven Hills Phase II are all within a 20km radius of the Phase I site and therefore should be considered for cumulative effects.

Table 13: Summary of projects considered for 'in-combination' effects

	Seven Hills Phase I	Seven Hills Phase II	Skrine	Sliabh Bawn	TOTAL
No. of Turbines	16	19	2	20	57
Wind farm size*	200ha	400ha	40ha?	833ha	1473ha
Habitat Types	Grassland	Grassland	Grassland	Woodland	-
SPAs within 15km or so of wind farm and also the Phase I site	-	River Suck Callows Lough Croan Turlough Four Roads Turlough Lough Ree Middle Shannon Callows	River Suck Callows Lough Croan Turlough Four Roads Turlough Lough Ree	Lough Ree	-

*based on a loop drawn around the turbines rather than the planning application boundary

4.6.3 In addition, there is the potential from cumulative effects arising from the grid connection. This is particularly the case if the grid connection is made using overhead power cables, since these can also cause death and injury to birds, such as whooper swan. However, the applicant makes clear that its intention is to bury the cables (IWCM, 2015b) and this arrangement would not pose a risk to flying birds. The effect of the cable trench on hydrology and knock-on effects on turloughs may need further consideration.

4.6.4 Clearly, there is the most potential for cumulative impacts arising from Seven Hills Phase I, Seven Hills Phase II and Skrine, since these are all within 15km of three of the same SPAs and comprise similar habitat types. The Skrine wind farm, with only two turbines in a relatively small area would contribute the least to any 'in combination' effects. The Seven Hills Phase I and Phase II sites are approximately 3.5km apart and both are less than 3km from the River Suck Callows SPA.

Potential Effects

Ornithology

4.6.5 It seems that the qualifying species of the River Suck Callows which have also been recorded at both Dysart (Thomas Street) Turlough and Lough Feacle are most at risk from 'in combination' effects from wind farm development. These are whooper swan, wigeon, golden plover and lapwing. For all of these species, the risks of experiencing each type of impact associated with the wind farm will be generally higher than for either the Phase I or Phase II sites alone. This is based on an assumption these same birds the River Suck Callows as well as one or other of the other two sites, if not both.

4.6.6 By way of example, the combined area within the two wind farms and a zone extending 1km around the turbines is over 2,400ha. There are potentially records of golden plover using this area, depending what the applicant meant by 'to the north of the turbines' at Phase I, but no records of lapwing using any of this land for foraging. Given its proximity to the wetland sites used by these species, it seem likely that at some point in the winter parts of this land will be used by the birds. The combined areas of these two zones must increase the risk that the birds will be displaced from part of their core foraging range, compared to this risk when each wind farm site is considered separately.

4.6.7 As well as displacement, the risks of collision must also be increased. Whooper swan is the only one of these species which has been recorded flying over both the Phase I and Phase II sites and for which a collision risk assessment is available. The best estimate is that four to -six individuals would be killed as a result of Phase I, and four individuals as a result of Phase II over the 25 year lifespan of these two projects, giving an 'in combination' estimate of eight to ten individuals. So as well as increasing the risk of collision, the total numbers of birds affected is likely to be higher with both wind farms operational.

4.6.8 While the risks would generally increase for whooper swan, wigeon, golden plover and lapwing, this increase is not considered sufficient to change the levels of risk (low, medium, etc.) from that derived from the assessment of Phase I on its own.

Hydrology and Hydrogeology

4.6.9 There are no SACs with the turloughs as a qualifying feature which are likely to be connected by hydrology to more than one of the wind farm sites (Keohane, 2016), meaning that an 'in combination' effect on a single SAC by this mechanism is unlikely.

4.7 Step Three: Conservation Objectives

Applicant's Assessment

4.7.1 The applicant has provided an assessment of the effect of the development in relation to the conservation objectives for the site in section 4.4 of the 2012 AA report. This considered the potential effects of the development in light of the mitigation measures proposed by the applicant. This contrasts with the methodological guidance provided by the EC (EC, 2001) in which mitigation is determined after the effects of the development on the conservation objectives are considered. Here, the approach set out in the EC guidelines is followed.

Methodology

Ornithology

4.7.2 The risks that a few individuals (or more) of each of the qualifying species experience disturbance during construction, displacement, a barrier effect or collision from time to time is set out in Sections 4.5 and 4.6. The next part of the process is to attempt to relate the consequences of these effects on the individuals concerned.

4.7.3 Disturbance during the construction stage will occur for the maximum of two winter seasons. It is possible that this would result in mortality in situations where: (i) the available habitat just meets the requirements of the population, since disturbance could displace the birds from areas of suitable habitat; or (ii) the birds are only just meeting their energy requirements, since disturbance may result in increased energy expenditure as a result of making more frequent flights. Equally, if the available habitat far exceeds the requirements, then birds may simply relocate elsewhere with no effect on survival rates (although there would still be a localised reduction in numbers) and the birds may simply be able to compensate for the additional energy expenditure by foraging more.

4.7.4 Displacement during the operation stage could equally result in mortality in the same way as (i) above. Again, the birds may be able to simply move on, although the available evidence indicates that displaced birds fare less well than others (Burton, Rehfisch, Clark, & Dodd, 2006). The barrier effect could result in mortality in a similar way as (ii) above, with the birds expending more energy making a detour around the wind farm. Equally, the detour may not add significantly to energy expenditure or the birds may again be able to compensate by more foraging. Collision with turbines would obviously cause mortality.

4.7.5 The next consideration is whether any mortality arising from these effects has any effect on the population from year to year. This again is complex because such mortality may: (i) simply affect what is known as the 'doomed surplus' which are birds which will die anyway over the course of winter of one cause or another; (ii) be compensated by improved breeding productivity or survival rates in the remaining population; (iii) enable other members of the population to breed if the population is limited by the availability of suitable nest sites; or (iv) cause the population to decline.

4.7.6 In the first three scenarios, the mortality is termed compensatory and there is no effect on the breeding population or the numbers returning the following winter. In the last, the mortality is

termed additive and clearly there would be an effect on numbers returning. For common species with a high reproductive rate and increasing populations, mortality such as might be caused by a wind farm is perhaps more likely to be compensatory, whereas for uncommon, long lived species with a high maturation age, low reproductive rate and a declining population, the mortality is perhaps more likely to be additive.

4.7.7 Although it may be possible to give a view, it will usually not be possible, without a great deal of research, to determine if disturbance, displacement or the barrier effect will result in mortality or whether any mortality associated with the wind farm will be compensatory or additive. So, where it is unclear, disturbance, displacement and the barrier effect are assumed to cause mortality and such mortality, and mortality from collisions, is assumed to be additive. This approach is in line with the precautionary principle. A further complication is that, even if the wind farm causes a small population decline, for many species this would be impossible to detect or attribute to the wind farm. To give two examples: (i) some species, such as golden plover, have large populations which fluctuate widely from year to year, based on weather conditions and, against this background, the loss of small percentage of the population could not be discerned easily, if at all; (ii) if a site is especially favourable, increased mortality there may simply enable individuals from less favourable sites to occupy the vacated space, rendering the decline undetectable at the favourable site[9].

4.7.8 The last part of the process is to relate the potential effect on the population to the conservation objectives. In order for the conservation objectives of an SPA to be contravened, the development would have to either (i) cause sufficient mortality for the population of any one qualifying species to fall below the 'Baseline Reference Value' or (ii) sufficient mortality to prevent or hinder the restoration of the population to the 'Baseline Reference Value'. Less mortality would not contravene the conservation objectives.

4.7.9 In summary, for each of the qualifying species, the following questions are posed:

- What is the risk of the effect occurring, as determined in Sections 4.5 and 4.6?
- If the effect occurred, is it likely to cause mortality? Yes, no, uncertain (assumed yes).
- If mortality occurred, is it likely to be additive and therefore affect the population? Yes, no, uncertain (assumed yes).
- If the population is affected, would that contravene the conservation objectives? Yes or no, uncertain with level of risk given (assumed yes).

4.7.10 A concluding statement is then given on the level of risk that the conservation objectives are contravened, without the application of any mitigation.

Hydrology and Hydrogeology

4.7.11 Further information is required to complete the assessment on turloughs and waterbird and wetland features.

[9] Population declines are often detected in less favourable areas first.

Lough Croan Turlough SPA (004139) and SAC (00610)

4.7.12 The shoveler population at Lough Croan Turlough was assessed as being at very low risk of disturbance/displacement and experiencing a barrier effect, and a low risk of collision with a turbine as a result of the Phase I wind farm. 'In combination' effects arising from the other developments identified would not change the identified levels of risks. This species is very unlikely to make use of the Phase I site and is only likely to fly over it during longer migratory flights. Therefore, this population is highly unlikely to suffer mortality as a result of displacement or the barrier effect. If mortality arose form collision, it is not clear whether this is likely to be additive or compensatory. As the risks of mortality are low, and the population is doing reasonably well, **there is a very low risk that the Phase I wind farm would contravene the conservation objectives for shoveler (i.e. it is uncertain).**

4.7.13 The golden plover population at Lough Croan Turlough was assessed as being of medium risk of disturbance, displacement, experiencing a barrier effect and collision both as a result of the Phase I development on its own. 'In combination' effects arising from the other developments identified would increase these risks but not be sufficient to change these risk levels. Overwinter survival has been shown to influence the breeding population size in this species (Parr, 1992) and this in turn could result in reductions in numbers seen at specific wintering sites. Based on this research, any overwinter mortality associated with the wind farm is assumed to be additive. A small decline would however be impossible to detect, given the large population size and fluctuating numbers. Nevertheless, as the population is apparently in unfavourable condition, such mortality could interfere with the ability to restore the population. Of course, a decline in numbers could also occur at Lough Croan Turlough if the birds were simply put off using the local area by the presence of the turbines, with or without additive mortality. In conclusion, without mitigation there is **a medium risk that the Phase I wind farm would contravene the conservation objectives for golden plover at Lough Croan Turlough (i.e. it is uncertain).**

4.7.14 The Greenland white-fronted goose population was assessed as being at low risk of disturbance and displacement, medium risk of experiencing a barrier effect and medium risk of collision. This species is not known to use waterbodies around the other identified wind farm sites, meaning 'in combination' effects do not change the assigned levels of risk. It is uncertain whether displacement or the barrier effect would lead to mortality. The Greenland white-fronted goose population in Ireland is declining and productivity is very low. This means that the population is not managing to compensate for existing mortality and any further mortality is most likely to be additive. The best estimate is that one or two geese would be killed over the twenty five year life of the wind farm. This will be barely discernible in a flock of around 100 individuals. However, as the population is apparently in unfavourable condition, any additive mortality as a result of the Phase I wind farm would interfere the ability to restore the population. Therefore, without mitigation there is a **medium risk that the Phase I wind farm will contravene the conservation objectives for Greenland white-fronted goose at Lough Croan Turlough (i.e. it is uncertain).**

4.7.15 There is insufficient information available to reach a conclusion in relations to Turloughs and the Waterbirds and Wetlands qualifying feature.

Four Roads Turlough SPA (004140) and SAC (001637)

4.7.16 The two qualifying species of Four Roads Turlough are golden plover and Greenland white-fronted goose. The assessment for these species is as set for Lough Croan Turlough above. Once again, there is insufficient information to reach a conclusion in relation to Turloughs and Waterbird habitat.

River Suck Callows SPA (004097)

4.7.17 The **whooper swan** population was assessed as being at medium risk of disturbance, displacement, experiencing a barrier effect and collision, with these risks exacerbated as a result of other wind farm developments, but not so much as to change the level of risk assigned. The best estimate is that four to six individuals would be killed as a result of Phase I and two individuals as a result of Phase II. The population is above the Baseline Reference Value (by 63 individuals) and the population is increasing. Against this background, it seems quite likely that any low level mortality associated with the wind farm would be offset by further population growth and would not take the population down below the BRV. Therefore, without mitigation **there is a very low risk that the Phase I wind farm would contravene the conservation objectives for whooper swan at the River Suck Callows (i.e. it is uncertain).**

4.7.18 The **wigeon** population was assessed as being at very low risk of disturbance and displacement, medium risk of experiencing a barrier effect and a medium risk of collision. The same level of risks apply 'in combination'. While this species is declining in Ireland, the population at the River Suck Callows appears to be substantially above the Baseline Reference Value. Therefore any low level mortality arising from the wind farm, even it were additive, would be insufficient to drive population levels below the Baseline Reference Value at this SPA over the 25 year lifespan of the development. Therefore, the Phase I wind farm would **not interfere with the conservation objectives for wigeon**.

4.7.19 For **golden plover,** the assessment is as set out for Lough Croan Turlough i.e. there is a **medium risk that the conservation objectives are contravened**.

4.7.20 The **lapwing** population was assessed as being at medium risk of displacement, experiencing a barrier effect and collision. Like the golden plover, it is not clear if any mortality associated with the wind farm would be additive or compensatory and so additive mortality is assumed. As the population is in unfavourable condition, there is a **medium risk that the Phase I wind farm interferes with the conservation objectives at the River Suck Callows.**

4.7.21 For **Greenland white-fronted goose**, it is near certain that these birds are associated with the River Suck Callows SPA as well as Lough Croan Turlough and Four Roads Turlough. The implications of the wind farm on the conservation objectives for this species at the River Suck are therefore the same as that set out for Lough Croan Turlough i.e. the risk is **medium.**

Lough Ree SPA (004064)

4.7.22 The little grebe population is assessed as being at negligible risk of disturbance and displacement, and at very low risk of experiencing a barrier effect and collision. The risks 'in

combination' are insufficiently higher to change the risk level. The population at Lough Ree is in an apparently unfavourable condition and, given the very small population, any mortality associated with the wind farm could interfere with the conservation objectives. However, the risk of such mortality over the 25 year period are so low that we can safely conclude that the Phase I wind farm would **not interfere with the conservation objectives for little grebe**.

4.7.23 For **whooper swan** the assessment is as set out for the River Suck Callows except that the risks of the conservation objectives are contravened is even lower due to the degree to which Lough Ree is removed from the wind farm sites.

4.7.24 The **wigeon** population is assessed as being at very low or low risk of experiencing impacts from the Phase II wind farm. Unlike the River Suck Callows population, that at Lough Ree is in unfavourable condition. Therefore, without mitigation there is **a low risk that the Phase I wind farm, alone and in combination, would contravene the conservation objectives for wigeon at Lough Ree.**

4.7.25 For the **teal** and **mallard** populations associated with Lough Ree, the risk of displacement and experiencing a barrier effect were assessed to be very low and the risk of collision was assessed to be low. Again, the risks 'in combination' are insufficiently higher to change the risk levels. The populations of these species at Lough Ree are apparently in unfavourable condition. However, the risk of such mortality over the 25 year period directly affecting the Lough Ree populations is so low that we can safely conclude that the Phase I wind farm **would not interfere with the conservation objectives for teal and mallard at Lough Ree.**

4.7.26 For the **shoveler** population associated with Lough Ree, the risks are all very low. Unlike the Lough Croan Turlough population, the population associated with Lough Ree is apparently in unfavourable condition, however, given the low risk to this population, it can safely be concluded that the Phase II wind farm **would not interfere with the conservation objectives for shoveler at Lough Ree**.

4.7.27 For **tufted duck**, the risk of displacement is negligible while the risks of a barrier effect and collision are very low. Again, the risks 'in combination' are insufficiently higher to change the risk levels. This makes negative effects from the wind farm very unlikely and, given the apparent favourable condition of the Lough Ree population, the Phase I wind farm **would not contravene the conservation objectives for tufted duck**.

4.7.28 For **common scoter and goldeneye**, the risks of mortality associated with the Phase I wind farm, and the other identified wind farms, are negligible and therefore the wind farm will **not interfere with the conservation objectives for these species**.

4.7.29 The assessment for **coot** is the same as for tufted duck i.e. the Phase I wind farm **would not contravene the conservation objectives**.

4.7.30 The assessment for **golden plover** is as for Lough Croan Turlough and the assessment for **lapwing** is as for the River Suck Callows, albeit that **the risk that the conservation objectives are contravened is low** rather than medium.

4.7.31 The final species, **common tern**, the risks are negligible and therefore the Phase I wind farm, alone or 'in combination' with other developments, **will not contravene the conservation objectives for this species**.

Middle Shannon Callows SPA (004096)

4.7.32 The assessment for whooper swan and wigeon is as set out for Lough Ree.

4.7.33 The risks to the **corncrake** population associated with the Middle Shannon Callows are negligible and therefore **the conservation objectives for this species would not be contravened**.

4.7.34 The assessments for golden plover, lapwing and common tern are as set out for Lough Ree.

4.7.35 For **black-tailed godwit**, the risks were assessed to be negligible and therefore the Phase I wind farm would **not contravene the conservation objectives** for this species.

4.7.36 For the population of **black-headed gull** associated with the River Shannon Callows, the risks were considered to be negligible for displacement, negligible for a barrier effect and low for collision. This species is also in unfavourable condition and therefore it is concluded that there is a **low risk that the Phase I wind farm contravenes its conservation objectives** by interfering with the ability to restore the population.

4.8 Step Four: Mitigation Measures

Construction Management

4.8.1 The applicant sets out measures to control pollution, noise and waste in section 4.3.1.1, pages 73 to 78 of the June 2012 AA report. It is accepted that good construction practice can adequately control risks of pollution to the SACs and SPAs. This can be ensured through appropriate planning conditions, subject to more detailed assessment on hydrology.

4.8.2 The applicant has also committed, in section 4.3.1.2 of the 2012 June AA report, to erect turbines only during the summer period such that the turbines are in place in October when the birds arrive at their wintering grounds. If this achievable, and the turbines are installed over the course of one or two summers, then this could substantially mitigate the risks associated with disturbance and displacement during the construction stage. Again, this can be ensured through an appropriate planning condition. However, this potentially contradicts with the construction programme given in Chapter 3 of the EIS (page 15), where a construction period of 9 - 12 months is given, so clarification of the applicant's intentions is required.

Turbine Design

4.8.3 The turbines that the applicant intends to install have a rotor sweep area of 35 to 135m above ground level and so the lower point of this sweep is above the level of the majority of whooper swan flights. This would have the effect of reducing the likelihood of whooper swan collisions with the turbines.

Merlin Radar System

4.8.4 The applicant proposes to install and operate the Merlin Avian Radar System to both monitor bird movements and to automatically shut down turbines as birds approach. The applicant describes this system in section 4.3.2.2, pages 80 to 81 of the 2012 AA report and a presentation on this system was given at the June 2016 Oral Hearing. If this system is able to function as described then it has the potential to fully mitigate the risks of collision, although it would not address any risk of displacement nor that potentially arising from the barrier effect.

4.8.5 NPWS has not accepted that the efficacy of the Merlin Avian Radar System has been demonstrated (see its October 2015 submission). A recent search of the scientific literature reveals no peer reviewed scientific papers which fully demonstrate that the system will work as described by the applicant. There is some evidence to the contrary. One research project found that the system was good at tracking large flocks of larger birds, such as geese, but poor at tracking single large birds and small flocks of smaller birds such as ducks (Gerringer, Lima, & DeVault, 2015) and there is anecdotal evidence of a fatality of a single large bird at a wind farm using the Merlin system (Subramanian, 2012). The system therefore can be considered to have the potential to reduce mortality of birds approaching the wind farm but it cannot be considered to fully mitigate the risk of collision.

Electricity Cables

4.8.6 The applicant has committed to burying electrical cables as these can also pose a hazard to birds. Burying the cables would clearly fully mitigate any risks that birds might collide with electricity cables.

4.9 Conclusions on Site Integrity

4.9.1 The Phase I development would not result in obvious direct impacts on the Natura 2000 sites. There are also no short, simple and certain indirect impact pathways which would obviously lead to the contravention of the conservation objectives. Therefore, it cannot be concluded that the Phase I development would contravene the conservation objectives and therefore have an adverse effect on the integrity of the Natura 2000 sites. The same applies to 'in combination' effects.

4.9.2 Of course this is not the relevant test. The relevant test is whether it can be ascertained that the development would **not**, alone or 'in combination' with other developments, contravene the conservation objectives and therefore have an adverse effect on the integrity of the Natura 2000 sites. The simple answer is that this cannot be ascertained with the available information. This is also the position of NPWS with respect to birds and Mr. Keohane with respect to turlough habitats.

4.9.3 The areas of uncertainty are:

- The effect of the development on hydrology and therefore the effect on waterbird habitat at the turloughs;
- The level of use of the Phase I site and the surrounding 500m by the qualifying species during the winter, by day and at night, and therefore the degree to which the birds will be displaced;
- The effect of the wind farm on birds using Dysart (Thomas Street) Turlough (which could be used by the same bird populations as use the SPAs) as it is less than 1km from the nearest turbines;
- The extent to which the qualifying species of waders and ducks cross the wind farm site and therefore the likelihood of a barrier effect and collision;
- The effect of collisions on the bird populations in relation to the conservation objectives and the current conservation condition i.e. whether or not the bird populations will be able to compensate for any mortality; and
- The efficacy of the MERLIN avian radar system in preventing mortality of the qualifying species.

4.9.4 The guidance is that where it cannot be ascertained that there will not be an adverse effect on the integrity of a Natura 2000 site, an adverse effect should be assumed and planning permission should be refused.

4.9.5 However, leaving aside the potential for the turlough/wetland habitat to be damaged, the overall risk that the conservation objectives for qualifying species of birds are contravened, taking into account the mitigation proposed by the applicant, is considered to be low to medium. The populations at most risk are the Greenland white-fronted goose population (at Lough Croan Turlough, etc.), followed by golden plover (at Lough Croan Turlough, etc.), lapwing (at the River Suck Callows) and black headed gull (at the Middle Shannon Callows). The principal reason that this risk exists is because the populations of these species are apparently in unfavourable

conservation condition at the relevant SPAs. There is also a very low risk of contravening the conservation objectives of the whooper swan at the River Suck Callows as a result of potential in-combination effects arising from Phase I and Phase II (and a very low risk that these same objectives are contravened by Phase I on its own).

4.9.6 To improve the assessment set out in this report, the applicant could consider:

- 1. Undertaking additional survey work at the Phase I site which fully demonstrates that the wind farm poses negligible risks to the qualifying species. This would include searches for foraging golden plover and lapwing by day and by night as well as vantage point watches which encompass all the qualifying species. The level of survey work could be agreed with the NPWS in advance.
- 2. Undertaking collision risk modelling for all of the qualifying species observed during further surveys of the Phase I site.
- 3. Providing peer reviewed scientific research which demonstrates the efficacy of the MERLIN radar system at an operational wind farm.
- 4. Removing or moving the two or three proposed turbines at the lowest altitude to the east of the wind farm, to create a safe low altitude passage between Lough Croan Turlough and Dysart (Thomas Street) Turlough/the River Suck;
- 5. Moving the turbines within 1km of Dysart (Thomas Street) Turlough so that they are more than 1km from the turlough.
- 6.Committing to the provision of refuge areas close to the wetland sites and, within those refuge areas, provide high quality foraging habitat and protect the birds from disturbance to make it less likely that the birds make flights over the wind farm.
- 7. Committing to measures to improve the conservation condition of the qualifying species at the Natura 2000 sites in order to improve the resilience of the populations.

4.9.7 My view is that the sixth suggestion, in relation to refuge areas, is mitigation. The applicant has made the observation that disturbance of birds is a leading cause of flights across the wind farm site. The intention of the refuge area is therefore to reduce the number of flights that the birds make across the wind farm site and therefore reduce the risk of collision.

4.9.8 My view is that the seventh suggestion could also be considered mitigation (rather than compensation) as the intention of the measures is to improve the resilience of the population and therefore reduce the risk that any mortality associated with the wind farm results in population level effects, rather than compensate for negative effects that are certain to happen. However, this point is finely balanced.

4.9.9 This seventh suggestion might at first appear to have parallels with People over Wind, Environmental Action Alliance Ireland vs. An Bord Pleanála (Court of Appeal, 20/11/2015). In this case, the judges determined, that

- A development which compromised the objective of restoration might well affect the integrity of a Natura 2000 site;

- It is enough for the developer to demonstrate that the development would not compromise the objective of restoration (or maintenance) in order for consent to be granted; and
- In circumstances where the development would not compromise the restoration objective, there is no need for the developer to contribute towards the restoration of the population of a qualifying species that is currently in unfavourable condition.

4.9.10 In other words the development does not need to have a beneficial effect in order to meet the tests set out in the Directive; it is enough not have an adverse effect.

4.9.11 The situation here is different, in that it is not quite possible to reach the conclusion that the development will not compromise the restoration objective and therefore not quite possible to reach the conclusion that there will be no adverse effect on the integrity of any Natura 2000 site. In this situation, more certainty is needed that the restoration objective will not be compromised and the suggestion is that this could be achieved by taking steps to improve the conservation condition of the population of qualifying species as part of this project. In doing so, it could enable a conclusion to be reached that there would be no adverse on the integrity of the Natura 2000 sites as a result of this project.

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Appendix 1: Evaluation of Bird Survey Effort

Survey Guidelines

Other than some basic guidance on potential survey methods (Percival, 2003), there are no detailed guidelines for undertaking bird survey work in relation to wind farms in Ireland. However, Scottish Natural Heritage (SNH) has produced a comprehensive set of guidelines for such survey work and these are generally relevant throughout Britain and Ireland. The guidelines were first published in November 2005 (SNH, 2005), received a minor update in 2010 and were more comprehensively updated in May 2014 (SNH, 2014). These guidelines therefore provide a useful benchmark against which the survey work undertaken to inform the assessment can be judged. It is reasonable to expect the applicant to have followed the guidelines, in the form published at the time when the survey was undertaken, as a minimum. Regardless of any guidelines, and the degree to which they were adhered to, the information collected needs to be sufficient to enable a firm conclusion to be reached that the development will not result in an adverse effect on the integrity of any Natura 2000 site.

Target Bird Species

The potential presence of target bird species influences the survey design. In addition, the target species are the bird species that are given most attention during the survey. During Vantage Point (VP) watches, data is collected on target species to enable estimates to be made of: (i) the time spent flying over the wind farm site; (ii) the relative use of different parts of the wind farm site; and (iii) the proportion of flying time spent within the upper and lower height limits as determined by the proposed rotor diameter and rotor hub height (SNH, 2005). This data can then be used to inform collision risk modelling and other elements of an impact assessment.

The SNH Guidelines (SNH, 2005) made clear that "for proposed wind farm sites which lie outwith but close to the boundary of a [Natura 2000] site designated for its bird interest, then the bird interest for the designated site should be …. included as explicit targets for analysis of bird impacts. The distance over which such effects may be important will be related to the foraging ranges of the species concerned". This implies that all of the bird species that are qualifying features for nearby Natura 2000 sites should be included in the list of target species for the purposes of the survey. The updated SNH Guidelines (SNH, 2014) make this more explicit stating that "any flight activity of qualifying species [of an SPA] should be recorded [during VP watches]".

The applicant identified five Special Protection Areas (SPA) (a type of Natura 2000 site) within 15km of the Phase I and Phase II wind farm sites. Between them, these sites have 17 qualifying species of birds. These comprise seven species of migratory wintering wildfowl (swans, geese and ducks), three species of migratory wintering wader, three resident species of waterbird (not including divers), one resident species of gull, one species of migratory breeding duck, one species of migratory breeding tern and one breeding species of rail. There would be no particular reason to exclude any of these species from the list of target species during survey work however the relative likelihood of individual species being affected could influence the survey design.

The applicant selected just one species, the whooper swan, as a target species during its Vantage Point watches over the wind farm site in 2009/10 and 2011/12 and the method chosen, at least in 2009/10, was specific to this species (Larsen & Clausen, 2002). The selection of this

single species was made despite the known presence of other qualifying species near the wind farm site. These include golden plover (a qualifying species of all five SPAs), lapwing (a qualifying species of three of the SPAs) and black-headed gull (a qualifying species of the Middle Shannon Callows SPA) which were all observed near the Phase I site the previous winter.

The narrow focus on a single species may not matter if (i) the survey method was sufficient to also detect the other qualifying species and (ii) no other qualifying species were recorded on the wind farm site. An assessment of the survey methods is below. The applicant in its Further Information Response dated August 2011[10] (FERS, 2011) indicated with the words 'No records' that it had no observations of the qualifying species other than whooper swan on the Phase I wind farm site. However, the inclusion of the other qualifying species as target species during VP watches would give more confidence that these species were actually searched for and not observed, rather than simply not recorded. Certainly, one species, the snipe (which is not a qualifying species) for which the applicant has 'No records' was observed on the site during my brief site visit in 2016.

The more recent surveys in the winters of 2012/13 and 2014/15 were focused on a broader range of species, with data collected on numbers and occurrence at a number roosting and foraging sites. However, in winter 2012/13 little information was collected on bird species other than whooper swan and Greenland white-fronted goose and in 2014/15, when more data was collected on other bird species, information on flight activity was still restricted to whooper swan and Greenland white-fronted goose. These surveys were, again, too narrow in scope.

Survey Methods

The applicant has undertaken bird survey work at and around the Phase I of the wind farm development and this is summarised in Table A1. Unfortunately, the method used has not always been clearly explained by the applicant and there remains some uncertainty as to what was actually done and when. Questioning the applicant at the oral hearing in May 2016 did not provide much clarification on the methods used in the early bird survey work.

With knowledge of the qualifying species, it would have been clear in 2008 that a relevant approach to survey is set out under "Wintering and migratory waterfowl, notably geese and swans" of the SNH guidelines. Similarly, by the time of the 2014/15 surveys, the updated approach would have been available.

For the targeted whooper swan surveys, the applicant chose a specific methodology for this species based on one used in scientific research (Larsen & Clausen, 2002). This method is not incompatible with the SNH methodology for VP watches so can be considered broadly equivalent and capable of detecting other wintering and migratory waterfowl. The SNH methodology also includes surveys of roosting and foraging areas and it is not clear if this was done at the Phase I in the winters of in 2009/10 and 2011/12. However, roosting and foraging areas were the main focus of the surveys undertaken in the winters of 2012/13 and 2013/14 and there were also observations made at Lough Croan Turlough, Lough Feacle, Coolagary/ Cuilleenirwan Lough and the Ballyglass River Callows in 2008/9.

[10] Appendix 1 of Appendix D

In Table A1 below, a summary of the approach set out in the relevant SNH guidelines is set out next to the applicant's methodology.

Table A 1: Summary of bird survey work undertaken by the applicant to inform the assessment for Seven Hills Wind Farm Phase 1

Title	Period	No. of visits	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
Late Summer/Autumn Bird Survey 2008	Jul - Oct	6	First visit to assess habitats at each turbine location, subsequent visits lasting 4 – 6 hours with observations made at VPs (number and location unspecified, but it is possible that there was just one (VP5) inside the wind farm site with four others elsewhere). Target species apparently not selected and no flight lines etc recorded or presented. Total survey time: c. 30hrs in total but seemingly as little as 3 - 4hrs (1VP for 30-40 mins on 6 occasions) spent at the Phase I site over the summer/autumn.	For autumn migration, at least 36 hours of observation at each VP overlooking the wind farm site (September - November), minimum of one year. Flight lines and heights to be recorded for all target species, with observations also made for secondary species.
Winter Bird Survey 2008/9	Nov - Feb	16	Numerous VPs (number and location unspecified) were visited for a period of 20 minutes throughout the day. Target species apparently not selected and no flight lines etc. recorded or presented. Total survey time at each VP: Unclear but seemingly as little as 5hrs 20mins (1VP for 20mins on 16 occasions) spent at the Phase I site over the whole winter period, and the same amount of time spent at each of Lough Croan Turlough and Coolagary/ Cuilleenirwan Lough.	At least 36 hours of observation at each VP overlooking the wind farm site (October - March), minimum of one year. Target/ secondary species to be recorded as above. Survey of foraging/roosting areas at least twice per month: October to March for at least one winter or at least two winters if flocks are known to shift feeding or roosting sites. No specific survey distance was defined.
Spring/Summer Breeding Bird Survey 2009	Apr - June	6?[11]	Walkover survey radiating out from the VPs (number and location unspecified) used in winter plus casual observations made while driving from [vantage?] point to [vantage?] point. Target species apparently	For spring migration, at least 36 hours of observation at each VP overlooking the wind farm site (March – mid-May), minimum of one year. Target/ secondary

[11] EIS for Phase 2 states two visits per month in the same period but number of visits is not given in the EIS for Phase 1.

Title	Period	No. of visits	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
			not selected and no flight lines etc. recorded or presented. Total survey time: Unclear but it seems that surveys from VPs were not made.	species to be recorded as above.
Whooper Swan Surveys 2009/10 (There were also Whooper Swan surveys in winter 2010/11 but these were Phase II only).	Oct - Apr	13	Observations from one VP located in the centre of the site (or an alternative location) with one surveyor, morning obs. were from 15min before sunrise to 2 hours after and evening obs. were from 30mins before sunset to one hour after. Total survey time each VP[12]: 48hours 45minutes (3hours 45minutes x 13).	VPs as for the three bird surveys above (so 108hrs total from each VP) or, as an absolute minimum, 36 hours of observation at each VP overlooking the wind farm site (October - March) for a minimum of one year. Survey of foraging/roosting areas at least twice per month: October to March for at least one winter or at least two winters if flocks are known to shift feeding or roosting sites. No specific survey distance was defined.
Whooper Swan? Surveys 2011/12, referred to in Appendix 7 of the June 2012 AA report	Dec - Feb	6	Methods not known but most likely as above. The survey report has not been submitted in support of the application. Total survey time at each VP: assumed to be 22hours 30minutes (3hours 45minutes x 6).	As above.
Wintering Bird Survey 2012/13	Jan - Mar	14	Observations from multiple VPs for no fixed duration. The VPs were over the waterbodies rather than the wind farm sites and therefore designed to gather contextual information on roosting and foraging sites, rather than information to inform collision risk modelling. The survey focussed on whooper swan and Greenland white-fronted goose. Total survey time: Fourteen days of survey (so 4 – 5 days per month) were undertaken by two or three surveyors, including 50	As above.

[12] It is not completely clear from the reports if all three VPs were covered simultaneously. I have assumed that they were in the calculations.

Title	Period	No. of visits	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
			hours survey time from 'primary' VPs located at the wetland sites	
Wintering Bird Survey Oct 2014 to March 2015 244346 file	Oct - Mar	16	As for 2012/13. Total survey time: Sixteen days of survey (so 2 – 3 days per month) were undertaken by two surveyors (minimum), including 70 hours survey time from 'primary' VPs located at the wetland sites. This is the same 70hrs attributed to the Phase II site.	A minimum of 36 hours per year in the non-breeding season from each VP overlooking the wind farm site, with additional survey work during migration periods if needed[13]. Implies two years of survey are required. Feeding distribution surveys on a fortnightly basis of the wind farm site and 500m beyond[14]. Any known roost sites within 1km of the proposed wind farm should be surveyed fortnightly with the survey extending beyond 1km from the proposed wind farm site when necessary to provide contextual information on local population levels.

Number and Location of Vantage Points

The SNH guidelines set out some general principles in relation the number and location of VPs, as well as the area to be covered. These are as follows:

- The survey area should cover the area contained within a loop which encompasses the outermost turbines plus a buffer of 200 – 500m;
- VPs should be chosen such that no point of the survey area is further than 2km from a VP;
- VPs should be located outside the wind farm site;
- The survey arc should be a maximum of 180 degrees; and
- The number of VPs should be the minimum required to cover the whole survey area.

The number and location of VPs was not given for the first three seasons of survey (FERS, 2010). However, it seems that there was just one in the Phase I wind farm site, located towards the centre i.e. the same location used for the whooper swan surveys and labelled as VP5 on Figure 2 of the Baseline Ornithological Assessment for Phase 2 (FERS, 2011)). Furthermore,

[13] The requirements here reflect a change in the guidelines, with a shift in emphasis from undertaking a minimum of 36hrs from each VP in each of three seasons (autumn, winter and spring) to undertaking a minimum of 36hrs survey from each VP over multiple years and ensuring that adequate data is collected in spring and autumn. The SNH guidelines make clear that more than 36hrs of survey should be undertaken per year at sensitive sites.

[14] if the survey area lies within the core foraging distance of SPAs for these species or other major roosts [as it does in this case] unless it can be established from existing data that the area is not utilised for feeding.

there is no indication that any target species were selected and no information was provided on flight heights etc. of any bird species during these survey periods. It seems therefore that these surveys cannot be counted as serious VP surveys and may better be considered as reconnaissance surveys during which a simple species list was compiled, with the addition of some basic observations.

However, we do know that, for the Phase I site, there was just one VP location for the whooper swan survey. This was located in the centre of the wind farm site and that the surveyor attempted to cover a survey arc of 360 degrees. Given the SNH guidance, it seems likely that at least two VPs would be required to cover the wind farm site adequately and therefore the survey effort falls short of the guidelines in this regard.

Duration of Vantage Point Watches

The SNH guidelines have shifted in emphasis over the period during which the surveys were undertaken. Initially the requirement was for a minimum of 36 hours of observation at each VP during each of the relevant seasons (spring, summer, autumn and winter) and a minimum of one year of survey. Latterly, the requirement is a minimum of 36 hours of observation at each VP during the non-breeding season with additional observations during spring and autumn as needed to collect adequate data and more than one year of survey (implying that surveys spanning two years are standard). The guidelines make clear that more than 36 hours is expected for sensitive sites.

The SNH guidelines also make clear that the number of hours per survey should be stated as the number of hours of survey at each VP and not all the number of hours at all VPs added together so if there are two VPs surveyed for 36 hours then the survey time is stated as 36 hours and not 72 hours.

As set out above the whooper swan surveys in 2009/10 and 2011/12 would appear to have been the only surveys which come close to the SNH methodology for VP watches over the wind farm site. The time spent at the VP was 48hours 45minutes in year one and 22hours 30minutes in year two. If the latest SNH guidelines are used as the benchmark[15], then the absolute minimum per VP was exceeded in year one and not achieved in year two. The average of the two is just under 72hours and so could be judged to have meet the absolute minimum standard overall *if a single VP is considered adequate* to cover the whole of the wind farm site and these surveys gathered adequate information during the migratory periods. However, as set out above, two VPs are likely to be have been needed for adequate coverage in accordance with the guidelines which means that the total VP survey time is about half of the minimum set out in the SNH guidelines. Given the proximity of the Phase I site to Lough Croan Turlough, and the presence of migratory birds, more than the minimum survey time would be expected.

The surveys in winters 2012/13 and 2014/15 were not focussed on the wind farm site and therefore do not constitute VP watches over the wind farm site as described in the SNH

[15] Of course these guidelines were not in place at the time that these surveys were conducted. Using the earlier guidelines, it could be concluded that the survey undertaken in 2009/10 exceeded the minimum for a single VP if the spring and autumn periods were not important. However, if two VPs are required or if spring and autumn surveys are included then the survey effort again falls short by oneVP on the one hand and up to 72hours of observations on the other.

guidelines, and would better be considered as feeding distribution and roosting site surveys which were undertaken to provide contextual information.

Feeding Distribution/Roost Site Surveys

The SNH guidelines indicate that survey of foraging/roosting areas should be undertaken at least twice per month from October to March and for at least one winter or at least two winters if flocks are known to shift feeding or roosting sites. The first edition of the guidelines did not give specific distances however the third edition indicates that feeding distribution surveys and roost site surveys should cover the wind farm site and 500m or 1km beyond, respectively, with roost site surveys extending beyond 1km when necessary to provide contextual information on local population levels.

During the first two years of survey, it is not clear to how much effort was expended on locating the foraging and roosting sites of the qualifying species. However, very limited information was presented in the EIS and NIS, meaning that the necessary contextual information was not provided.

The more recent surveys, in winter 2012/13 and 2014/15 undertaken by the applicant appear to have been designed to address this deficiency. These surveys were focussed on the various wetland sites, including some of the SPAs, in the local area. In winter 2012/13, the survey was restricted to the last three months of the season. In 2014/15, 16 days were spent by two surveyors undertaking survey of foraging and roosting sites (including 70 hours spent at a number of vantage points overlooking such sites) which is equivalent to two to three visits per month. This would appear to be consistent with the SNH guidelines in terms of the number and the frequency of visits. However the study area is very large with 11 wetland sites covered altogether, meaning that the amount of survey effort per site is actually fairly limited. Moreover, the survey was focussed on areas away from the wind farm site which means that the wind farm site and the immediate 500m/1km may not have received adequate survey coverage to meet with the guidelines. Of particular concern are the two areas of seasonal flooding located within the wind farm site, which were observed during my site visit, but which are not mentioned by the applicant anywhere in its assessment. The potential use of the Phase I site at night by golden plover and lapwing has also not been addressed through survey work.

More importantly, the survey work in total still leaves a number of questions unanswered on the movements of various qualifying species to, from and around the local area. In particular, little information[16] is presented on the movements of the qualifying species of ducks, waders and gulls despite records of these species and some suggestion that these species either move between wetland sites locally or pass through in successive migratory movements during the winter period.

Age of Survey Data

The data used to make the assessment spans eight calendar years. However, the last year in which a VP survey was conducted over the wind farm site and for which we have data was more than five years ago. This data is therefore aged and therefore may not reflect the current situation.

[16] The applicant is instead relying on the topography, with birds preferring low lying areas, and wind farm avoidance behaviour by the birds.

Conclusion on Bird Survey Effort

It seems that the survey effort on and around the development site is somewhere below the minimum standards set out in the SNH guidelines. The key points of difference seem to be:

- The narrow focus of the surveys on whooper swan, rather than all qualifying species, during the VP watches over the wind farm site;
- The choice of just one VP rather than two VPs which would have been required to cover the wind farm site adequately in line with the SNH guidelines;
- The limited amount of time spent undertaking VP watches during spring and autumn migration periods; and
- The apparent lack of, or at least limited, foraging and roosting site surveys on the wind farm site and its immediate surrounding area, with particular reference to two areas of seasonal flooding which are located within the wind farm site.

In addition, no, or limited, information has been presented by applicant on the movements of qualifying species of gulls, waders and ducks, which reduces confidence in the assessment of risks to these species made by the applicant and also the assessment made in this document.

Appendix 2: Baseline Summary for SPA Qualifying Species

A004 Little Grebe

SPAs where Qualifying Feature: Lough Ree SPA.

Conservation Condition: Apparently unfavourable.

Other local sites: Lough Croan Turlough (peak count of 2 in winter 2014/15 (ECOFACT, 2015), Lough Funshinagh (five year peak mean of 9, I-WeBS).

Migratory behaviour: The migratory movements of the little grebe are not well understood. Some birds which breed in Northern Europe migrate to Britain and Ireland and it may also be the case that birds which breed in Britain migrate to Ireland during the winter. In Britain, some birds remain resident at their breeding areas during the winter while others apparently move on to coastal areas (Vinicombe, 1982) and same pattern is evident in Ireland (Birdwatch Ireland/Little Grebe, 2016). Migration to and from Lough Ree could therefore occur in any direction and at unknown flight heights. The wintering population in Ireland is estimated to be 2,345 (Crowe, et al., 2008).

Local movements: The little grebe was recorded by the applicant in small numbers at Lough Croan Turlough during the 2014/15 winter only in the months of December and January (ECOFACT, 2015). These birds may have originated from Lough Ree, and therefore form part of the qualifying population, but could equally have migrated into the area from further afield.

Observations on the Phase I site: None recorded (FERS, 2011).

Generic vulnerability to wind farm development: This species is not included in the list of 22 most sensitive species in Ireland (Mc Guinness, et al., 2015). Grebes are generally not considered vulnerable to collision with turbines (Langston & Pullan, 2004) and so far I have not been able to find any examples of mortality at wind farm sites for this species. There is no onshore figure for avoidance rates for little grebe (SNH, 2010) but the published avoidance rate for grebes in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: The population at Lough Ree is very small and apparently declining. The site synopsis describes this population as resident however the count at the time the site was designated appears to be a winter count and could therefore include birds which breed at Lough Ree and birds which breed elsewhere. Given the small population size, the loss of a small number of birds could result in discernible population level effects at Lough Ree. However, the population in Ireland overall is apparently stable overall, perhaps making it more likely that any losses at Lough Ree could potentially be offset by immigration from elsewhere.

A038 Whooper Swan (Cygnus cygnus)

SPAs where Qualifying Feature: River Suck Callows SPA, Lough Ree SPA and Middle Shannon Callows SPA

Conservation Condition: Apparently favourable on all three sites where a qualifying feature

Other local sites: Lough Feacle (peak count of 103 in winter 2014/15 (ECOFACT, 2015), also 117 in 2008/9 and 12 in 2011/12 I-WeBS), Lough Croan Turlough (34), Dysart (Thomas Street) Turlough (48, also c.70 in 2011/12 I-WeBS), Four Roads (11), Ballyglass River Callows (54), Corkip Lough (90) Coolagarry Lough (78), Castlehampton Turlough (119), Lough Funshinagh (29), Brideswell (65 in winter 2012/13 (ECOFACT, 2013)), Lisduff Turlough (five year peak mean of 3, I-WeBS), also Cranberry Lough pNHA (no count or date, Site Synopsis) and possibly Ballintury Turlough (Site Synopsis gives records from the 1980s).

Migratory behaviour: The whooper swan is almost exclusively a winter visitor to Ireland, with birds mainly present from October to March although the majority arrive in December/January. The birds that winter in Ireland breed in Iceland. The birds also move between Britain and Ireland during the winter season, with, for example, birds ringed in the Nene Washes and Martin Mere having been recorded in central Ireland (Wernham, et al., 2002). During migration, whooper swans fly both during the day and at night, often at low altitude but sometimes at higher altitude (recorded up to 1680m ASL) (Pennycuick, Einarsson, Bradbury, & Owen, 1996). This species is perhaps most likely to arrive at the Roscommon area in an arc extending clockwise from NNW to NE. The total wintering population in Ireland being around 15,000 birds (Boland, et al., 2010)

Local movements: The number of whooper swan changes through the winter months at each of the sites identified above. The applicant's data indicates that in the months when peak counts are at their highest on some sites they are at their lowest on others and vice versa (see Figure A1). The fluctuations in numbers at each site may be explained by local movements. The applicant documented movements between, for example, (i) Dysart (Thomas Street) Turlough and Lough Croan Turlough, (ii) Lough Feacle and Castlesampson Turlough, (iii) Lough Feacle and Ballyglass River Callows, (iv) Ballyglass River Callows and Coolagarry Lough, (v) Corkip Lough and Lough Feacle (ECOFACT, 2015). Some of the changes in numbers observed could also be explained by birds moving into and the out of the area, choosing various waterbodies when present. The lower sum of the peak counts in February when compared to January and March perhaps indicates that birds may arrive, move on then come back as part of their migration. As well as moving between wetland sites, whooper swans may make twice daily movements between their night time roosts and their daytime foraging areas. Whooper swan has been recorded foraging at distances of 3 to 4.5km from their roosts at two sites in Scotland (Pendlebury, et al., 2009).

Observations on the Phase I site: Whooper swan has been observed crossing the Phase I wind farm Phase 1 site. The observations made by the applicant are as follows:

- 17th February 2010 – 12 swans in total crossed the Phase 1 wind farm site, flying at heights of 15 – 20m AGL, so on one day out of 13 days of survey (FERS, 2010)
- 12th December 2011 – One swan crossed the wind farm site, 5m AGL, so on one day out of six (reported in the 2012 AA Report, survey report not submitted with the planning application)

- Winter 2013 – a flock is thought to have crossed the wind farm site on one occasion, but was not observed and so flight heights are not given, so on one visit out of 10 days of survey (ECOFACT, 2013).
- 25th November 2014 - Nine swans crossed the Phase 1 wind farm site whilst flying from Dysart (Thomas Street) Turlough to Lough Croan, no flight heights given, so on one day out of 16 days of survey (ECOFACT, 2015).

So it can be inferred from these results that an average of approximately 7.33[17] whooper swans cross the site an average of once every 11 days[18] during the winter season. This equates to around 16[19] days per season and 105[20] swan movements through the wind farm per year. However, the survey methods may have led to under-estimation of the number of swans crossing the wind farm site (see Appendix 1).

All of the observations given above were of birds flying below the rotor swept height however the applicant also observed a flock of 65 whooper swan flying at a height of c. 40m AGL (ECOFACT, 2013).

Generic vulnerability to wind farm development: The whooper swan is one of the 22 species considered to be most sensitive to wind farms in Ireland, with a species sensitivity score is 19.8 (4 x 4.95) during the winter (Mc Guinness, et al., 2015). This species has been assessed as having a high risk of collision, low risk of displacement and low risk of experiencing a barrier effect (Langston R. , 2010). Others have assessed this species as being at potential risk of displacement and collision (EC, 2011).

The observed displacement distances observed for this species are 200 to 400m. However this is for small turbines and there is the potential for displacement distances of up to 1km for larger turbines and also potential for numbers to be reduced in the wider vicinity (Rees, 2012).

A barrier effect has been observed for this species with birds making detours in excess of 200m in order to avoid a wind farm area. This could add significantly to repeated local movements but would is unlikely to be significant on longer, migratory flights (Rees, 2012).

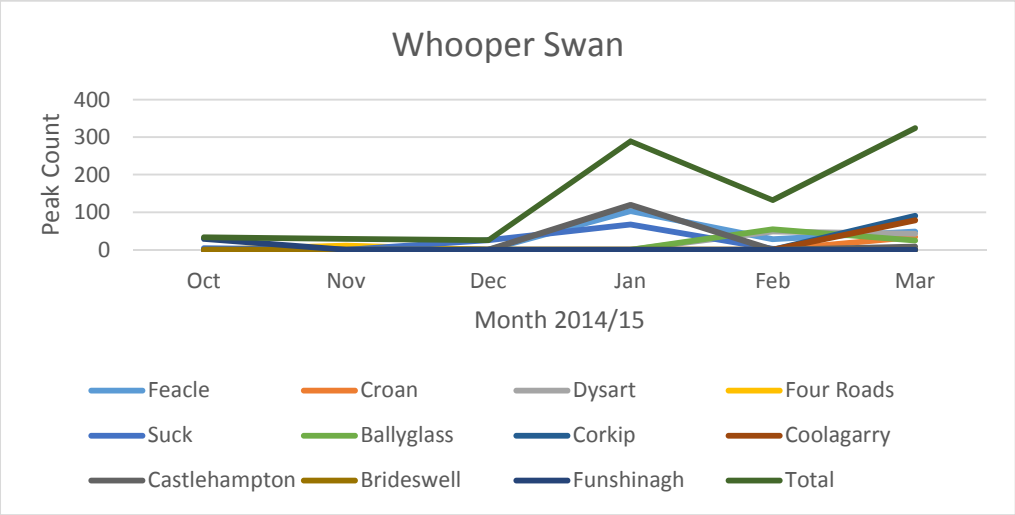
The main cause of death for whooper swan is thought to be flying accidents, mostly collisions with overhead wires (Brown, Linton, & Rees, 1992). In one study, approximately 10% of local flights were greater than 40m above ground level with the remainder below 40m above ground level (Larsen & Clausen, 2002) and another, more recent study with a smaller sample size found that up to 75% of flights were at heights equivalent to that swept by turbine rotors (35m to 125m AGL) (Ecology Consulting, 2014). There are previous incidents of mortality at wind farms (Hötker, Thomsen, & Köster, 2006) and swans are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004). The SNH avoidance rate for collision risk modelling is 98% (based on scientific studies) (SNH, 2010).

Vulnerability to population effects at the SPAs where a qualifying feature: The breeding population in Iceland is increasing and the wintering population in Britain and Ireland is doing the same (11% increase for Britain and Ireland between 2005 and 2010; 6% increase for Ireland in the same period) and this situation seems to be reflected locally, with all sites where this species

[17] (12+1+9)/3 = 7.333
[18] (13+6+16+10)/4 =11.25
[19] Season =180 days; 180/11 = 16
[20] 15x7 = 105

is a qualifying feature being showing a stable or increasing population. Against this background, low level additional mortality such as may arise from a wind farm is unlikely to lead to population declines either locally or on a wider scale.

Figure A 1: Whooper swan peak counts in 2014/15



A050 Wigeon (Anas penelope)

SPAs where Qualifying Feature: River Suck Callows SPA, Lough Ree SPA and Middle Shannon Callows SPA

Conservation Condition: Apparently favourable at the River Suck Callows SPA but apparently unfavourable at Lough Ree SPA and Middle Shannon Callows SPA

Other local sites: Feacle Lough (peak count of 240 in winter 2014/15 (ECOFACT, 2015), also 65 in 2008/9 and 145 in 2011/12 I-WeBS), Lough Croan Turlough (720), Dysart (Thomas Street) Turlough (180), Four Roads Turlough (120), Lough Funshinagh (40), Lisduff Turlough (five year peak mean of 17, I-WeBS) and possible also Ballintury Turlough (Site Synopses give records from the 1980s).

Migratory behaviour: Migratory birds are present in Ireland from late August to April, with numbers peaking in January. These birds breed in Iceland or Northern Europe and make stops in Britain before moving onto Ireland (Owen & Mitchell, 1988). This species is most likely to arrive in the Roscommon area in an arc extending clockwise from NNW to NE. Migratory flight heights are unknown. The total wintering population in Ireland is estimated to be 82,370 (Crowe, et al., 2008).

Local movements: The applicant's data reflects the national situation, albeit with numbers peaking in February in 2015, indicating that birds are arriving into the area from breeding grounds from September until February after which birds begin to leave the area. The applicant did not observe or report on any flights made by this species when arriving or departing the area or between sites. Its view is that dabbling ducks such as wigeon remain at their wintering sites for the duration of the winter (ECOFACT, 2015b) however there is some evidence of local movements for wigeon. For example, during the 2014/15 wintering bird survey, birds were present at Four Roads Turlough in November and each month from January to March but were not recorded there in December (two visits were made) and were recorded at Dysart (Thomas Street) Turlough only in January 2015 (visits were made during other months of the survey period). These observations could be consistent with birds moving around locally, however, it could also be the case that some birds arrive and then move on to other locations (Guillemain, Fritz, & Duncan, 2002). As well as moving between sites during the course of a season, wigeon may also commute between roosting and foraging areas. The mean distance travelled from the day roost site to night time foraging areas by wigeon recorded in two studies is between 2 and 3km (Legagneux, Blaize, Latraube, Gautier, & Bretagnolle, 2009). Other studies indicate that this species may travel up to 8km from the roost site to forage but seldom any further (Owen & Williams, Winter distribution and habitat requirements of Wigeon in Britain, 1976). Wigeon forage both during the day and at night.

Observations on the Phase I site: None (FERS, 2011).

Generic vulnerability to wind farm development: Wigeon is not included in the list of 22 most sensitive species in Ireland (Mc Guinness, et al., 2015). However, there is evidence of displacement of this species in the non-breeding season (EC, 2011).

The average distance of displacement for this species in the non-breeding season across nine studies was 311m (Hötker, Thomsen, & Köster, 2006).

Ducks are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) however I could not find any published records of mortality of this species at wind farms.

There is no onshore figure for avoidance rates for wigeon (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: The wintering population of wigeon has been declining in Ireland since the 1994, perhaps a result of warmer conditions further north and east, and this may be reflected in the apparently unfavourable conservation condition of this species at two of the SPAs where it is a qualifying feature. Like many of the qualifying species, it is unclear whether additional mortality such as that associated with a wind farm would be additive of compensatory. As wigeon numbers remain relatively high and fluctuate at these SPAs (and more widely), any low level additive mortality associated with the wind farm would be impossible to detect.

The wigeon is a quarry species in Ireland.

A052 Teal (Anas crecca)

SPAs where Qualifying Feature: Lough Ree SPA

Conservation Condition: Apparently unfavourable

Other local sites: Lough Croan Turlough (peak count of 445 in winter 2014/15 (ECOFACT, 2015)), Dysart (Thomas Street) Turlough (110), Four Roads Turlough (400), River Suck Caloows (40) and Ballyglass (60). Also recorded at Feacle Lough in earlier surveys (FERS, 2011) and there was a peak count of 39 in 2011/12 at Feacle Lough (I-WeBS), Lough Funshinagh (five year peak mean of 56, I-WeBS), Lisduff Turlough (five year peak mean of 13, I-WeBS). Possibly also Ballintury Turlough (Site Synopses give records from the 1980s).

Migratory behaviour: Ireland has a resident breeding population of teal which is joined in winter by migrants from Iceland, northern Europe, the Baltic States and Russia. Birds could therefore arrive at Lough Ree from an arc extending clockwise from NNW to NE, predominantly. The applicant recorded the birds locally from November to March. The wintering population in Ireland is estimated to be 45,010 (Crowe, et al., 2008). Migratory flight heights are not known.

Local movements: The applicant did not observe or report on any flights made by this species however the applicant's data indicates that there may be some local movements between sites locally. For example, birds were present at Four Roads Turlough in November 2014 followed by absence in December and then present again from January to March, as well as sporadic occurrences (present in one month only) at Dysart (Thomas Street) Turlough, Muckanagh (River Suck) and the Ballyglass River Callows. As with other species of duck, this variation may be explained by local movements or ducks passing through the area or a combination of the two (Caizergues, et al., 2011). In one study, an average of 17% of individuals changed roost site during the course of a winter (Legagneux, Blaize, Latraube, Gautier, & Bretagnolle, 2009) which indicates that local movements are likely and that there is a potential connection between the Lough Ree populations and that recorded at sites more local to the wind farm. As well as moving between sites, this species may move from a daytime roost to a night time foraging area (both waterbodies). The mean distance travelled from the day roost site to night time foraging areas by teal is 2.2km, with this species being more likely to leave the roost site at night to forage elsewhere than some other duck species (Legagneux, Blaize, Latraube, Gautier, & Bretagnolle, 2009).

Observations on the Phase I site: No records (FERS, 2011).

Generic vulnerability to wind farm development: Teal is not included in the list of 22 most sensitive species in Ireland. However, there are previous incidents of mortality at wind farms (Hötker, Thomsen, & Köster, 2006; Bevanger, et al., 2009) and ducks in general are considered vulnerable to collision with turbines (Langston & Pullan, 2004). There is no onshore figure for avoidance rates for teal (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: While the wintering population in Ireland fluctuates from year to year, it is apparently stable overall (I-WeBS). Conversely, the teal population at Lough Ree has apparently declined since the site was designated. However numbers remain relatively high at Lough Ree and locally, making it unlikely that low level additional mortality such as might arise from a wind farm would result in discernible effects on the population.

The teal is a quarry species in Ireland.

A053 Mallard (Anas platyrhynchos)

SPAs where Qualifying Feature: Lough Ree SPA

Conservation Condition: Apparently unfavourable

Other local sites: Lough Feacle (peak count of 4 in winter 2014/15 (ECOFACT, 2015), also 6 in 2011/12 and c.14 in 2013/14 I-WeBS), Lough Croan Turlough (50), Four Roads Turlough (60), Muckanagh (River Suck) (12) and Ballyglass Callows (5), Lough Funshinagh (five year peak mean of 48, I-WeBS), Lisduff Turlough (five year peak mean of 23, I-WeBS). Possibly also Ballinturly Turlough (Site Synopsis gives records from the 1980s).

Migratory behaviour: The mallard is a resident breeding species which is supplemented by birds that breed on the continent during the winter. Migrating birds perhaps most likely to arrive at Lough Ree from within an arc extending clockwise from the NW to the SE. The wintering population in Ireland is large, estimated to be 38,250 (Crowe, et al., 2008). Migratory flight heights are not known.

Local movements: The applicant's data indicates that birds come and go from the local wetland sites suggesting local movements between sites. For example, during the 2014/15 wintering bird surveys, birds were present at Lough Croan in September, February and March but not the other months of survey (minimum of two visits per month were made during all months). As with the other duck species, the applicant did not observe or report on any flights made by this species when arriving or departing the area or between sites. There is a possible connection with the wintering population at Lough Ree and the more local sites where this species was recorded. The applicant asserts that dabbling ducks, such as mallard, remain at their wintering sites all winter (ECOFACT, 2015b) however this is not supported by the data for mallard. The mean distance travelled from the day roost site to night time foraging areas by mallard recorded in one study is 1km, with an average of 27% of individuals changing roost site during the course of a winter (Legagneux, Blaize, Latraube, Gautier, & Bretagnolle, 2009). This gives rise to a possible connection with the wintering population at Lough Ree and the more local sites where this species was recorded.

Observations on the Phase I site: No records (FERS, 2010).

Generic vulnerability to wind farm development: The mallard is not included in the list of 22 most sensitive species in Ireland. However, it does seem to be potentially vulnerable to displacement and collision.

The average displacement distance from wind farms across nine studies was 161m (Hötker, Thomsen, & Köster, 2006).

There are previous incidents of mortality at wind farms (Hötker, Thomsen, & Köster, 2006; Bevanger, et al., 2009) including an apparent fatality of a mallard during local movements at night as a result of collision with a turbine (Krijgsveld, Akershoek, Schenk, Dijk, & Dirksen, 2009) and ducks are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004). There is no onshore figure for avoidance rates for mallard (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: The population in Ireland is apparently declining (I-WeBS) and this appears to be reflected in population at Lough

Ree. It is unclear whether low level additional mortality as might be caused by a wind farm would be additive or compensatory. As the population within the SPA is still fairly large, any change in as a result of additive mortality is likely to be impossible to detect.

The mallard is a quarry species in Ireland.

A056 Shoveler (Anas clypeata)

SPAs where Qualifying Feature: Lough Croan Turlough SPA and Lough Ree SPA

Conservation Condition: The conservation condition is apparently unfavourable at Lough Croan Turlough SPA and there are no recent records from Lough Ree, suggesting that this population is in unfavourable condition.

Other local sites: Lough Feacle (observed during the 2009/10 and 210/11 whooper swan surveys, no count provided (FERS, 2011), Four Roads Turlough (five year mean peak count of 46, I-WeBS), Lough Funshinagh (five year mean peak count of 27, I-WeBS), Lisduff Turlough (five year mean peak count of 3, I-WeBS). Possibly also Ballintury Turlough (Site Synopsis gives records from the 1980s).

Migratory behaviour: Ireland has a small breeding population with approximately 2,545 in winter (Crowe, et al., 2008) as a result of migration of birds which breed east of Ireland, especially Northern Europe (Wernham, et al., 2002). Migratory birds are present from August to April, with number peaking in the November to January period. The population at Lough Croan Turlough could be as much as 9% of the population that winters in Ireland. Birds are likely to arrive from an arc extending clockwise from the NNE to SE, however, no observations of departures or arrivals were made by the applicant and migratory flight heights are unknown. During cold weather, there is potential for this species to move from Lough Croan onwards to the south and west and also to return from this direction when conditions improve (Guillemain, Fritz, & Guillon, 2000).

Local movements: Shoveler was recorded only at Lough Croan Turlough by the applicant in 2014/15 (ECOFACT, 2015), with numbers building from November, reaching a peak in February (235) and then reducing in March (100). After arrival, at least the majority seem to remain at Lough Croan Turlough for the duration of the winter, departing in spring. It is the applicant's view that the shoveler remains at Lough Croan all winter long (ECOFACT, 2015b). However, it is also possible birds are moving on, to be replaced by others. There are also records of this species from four other waterbodies locally and so it is possible that local movements are being made between these waterbodies. Elsewhere, this species is known to forage more during the night than during the day (McNeil, Drapeau, & Goss-Custard, 1992); to make local movements between sites during the day (Briggs, Hill, & Gosler, 2012); and for about half of the wintering population to roost on one waterbody during the day but feed elsewhere during the night with the remainder using the same waterbody for roosting and foraging (Guillemain, Fritz, & Duncan, 2002). One study indicates that the birds may move 2-3 km from the day roost site to night time foraging areas (Johnson, Schmidt, & Taylor, 2014).

Observations on the Phase I site: No records (FERS, 2011)

Generic vulnerability to wind farm development: This species is not included in the list of 22 most sensitive species to wind farm development in Ireland. However, there is at least one record of a carcass of this species being found beneath a wind turbine (Graff, 2015) and ducks are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004). There is no onshore figure for avoidance rates for shoveler (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: The wintering population in Ireland and at Lough Croan Turlough appear to be stable which perhaps indicates a degree of resilience in the population. However, the overall population size is in Ireland is much lower than most of the other wintering duck species present locally which may make the shoveler more vulnerable to population level effects than other species. It is not clear whether any additional mortality such as might arise from the wind farm is likely to be additive or compensatory. The population at Lough Croan Turlough is in the low hundreds and is likely to fluctuate from year to year and therefore any additive mortality is likely to be impossible to detect.

The shoveler is a quarry species in Ireland.

A061 Tufted Duck (Aythya fuligula)

SPAs where Qualifying Feature: Lough Ree SPA

Conservation Condition: Apparently favourable

Other local sites: Feacle Lough (peak count 3) in December to February of the 2014/15 winter season (ECOFACT, 2015), also one pair recorded here in earlier surveys, considered by the applicant to be migrants returning to Iceland (FERS, 2011). There is a further peak count of c18 in winter 2013/14 from Feacle Lough (I-WeBS). Lisuff Turlough (five year mean peak count of 1, I-WeBS), Four Roads Turlough (1 in 2012/13, I-WeBS), Lough Croan Turlough (1 in 2012/13), Lough Funshinagh (five year mean peak count of 10, I-WeBS). Possibly also Ballintury Turlough (Site Synopsis give records from the 1980s).

Migratory behaviour: There is a resident breeding population in Ireland which is joined by birds which breed in Britain (especially Scotland) and Iceland. The migratory birds are perhaps most likely to arrive in an arc extending clockwise from NNW to SE. The wintering population in Ireland is estimated to be 36,610 (Crowe, et al., 2008).

Local movements: Birds were recorded by the applicant at Feacle Lough only in December to February 2014/15, suggesting that the birds could remain at this site during these months with local movements being limited. However, there are records from four or five other sites locally and other studies indicate that this species is very mobile during the winter (Wernham, et al., 2002), with local flights between roosting and feeding areas being made at night (Dirksen, Van der Winden, & Spaans, 1998). As with the other qualifying duck species, no observations were made by the applicant of tufted duck in flight. Connections between those observed at Feacle Lough to the Lough Ree population of tufted duck are feasible but not known.

Observations on the Phase I site: None (FERS, 2011).

Generic vulnerability to wind farm development: Tufted duck is not included in the list of 22 most sensitive species in Ireland. However, during flights between roosting and foraging areas, this species is considered to be at potential risk of experiencing a barrier effect and collision (EC, 2011).

Diving ducks in general had an average displacement distance of 219m (Hötker, Thomsen, & Köster, 2006).

The tufted duck is known to be able to take evasive action to avoid collisions with wind turbines (Dirksen, Van der Winden, & Spaans, 1998). However, this species is also known to fly mainly during darkness and at heights below 100m above ground level when moving between roosting and feeding areas (Dirksen, Van der Winden, & Spaans, 1998). Ducks are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) and there are previous incidents of mortality of tufted duck at wind farms (Hötker, Thomsen, & Köster, 2006). There is no published onshore figure for avoidance rates for tufted duck (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPA where a qualifying species: The population in Ireland is apparently stable, as is the population at Lough Ree. Numbers nationally and at Lough Ree are relatively high. Against this background, low level mortality from a wind farm is unlikely

to have a discernible effect on the population. However, this does not rule out the possibility of additive mortality.

It is a quarry species in Ireland.

A065 Common Scoter (Melanitta nigra)

SPAs where Qualifying Feature: Lough Ree only

Conservation Condition: Unfavourable

Other local sites: None.

Migratory behaviour: The common scoter is an uncommon breeding species in Ireland, with a total breeding population estimated to be just 38 breeding pairs (Hunt, Heffernan, McLoughlin, Benson, & Huxley, 2013). This includes a small population breeding at Lough Ree comprising five breeding pairs. Much larger numbers winters around the coasts of Britain and Ireland, with the wintering population of Ireland estimated to be 23,190 (Crowe, et al., 2008). The wintering population is made up of birds which breed in Ireland and those which breed in Iceland and Scandinavia. Given the coastal distribution during the winter, the birds which breed at Lough Ree could depart and arrive at Lough Ree from any direction. This species is known to undertake flights at night (Garthe & Hüppop, 2004). When not migrating, this species makes low flights over the water (approximately 1% of flights are at turbine height (Cook, Johnston, Wright, & Burton, 2012) but flight heights during migration over land are unknown.

Local movements: The common scoter is likely to remain at Lough Ree during the breeding season and it is not known from other sites locally.

Observations on the Phase I site: No records (FERS, 2010).

Generic Vulnerability to wind farm development: In Ireland, the species is ranked as one of the 22 species most sensitive to wind farm development during the breeding season and was given a sensitivity score of 17.9 (4 x 4.475) out of a possible maximum score of 32 (Mc Guinness, et al., 2015) and in another assessment to have a species sensitivity index outside the breeding season of 16.9 out of a theoretical maximum of 125 (Garthe & Hüppop, 2004). The common scoter has been assessed to be at low risk of collision, moderate risk of displacement and moderate risk of barrier effect (Langston R. , 2010) and also to have evidence of displacement, be at potential risk of experiencing a barrier effect and potential risk of collision (EC, 2011). Ducks are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) however I have not found any published reports of this species colliding with a turbine. There is no onshore figure for avoidance rates for common scoter (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: Low level additional mortality such as may arise from a wind farm would be likely to result in population level effects at Lough Ree because the population is so small and productivity is so low (each pair producing just 0.8 ducklings per pair at Lough Ree in 2012).

A067 Goldeneye (Bucephala clangula)

SPAs where Qualifying Feature: Lough Ree SPA

Conservation Condition: Apparently unfavourable

Other local sites: None known.

Migratory behaviour: Some of the birds which breed in Scotland, Fenno-Scandinavia and Russia winter in Ireland. Arrival at Lough Ree could therefore be predominately in an arc extending clockwise from NNE to E. The wintering population in Ireland is estimated to be 9,665 (Crowe, et al., 2008).

Local movements: None known. This species is restricted to aquatic habitats but can make flights between roosting and foraging areas in winter.

Observations on the Phase I site: No records (FERS, 2010).

Generic vulnerability to wind farm development: This species was not included in the list of 22 most sensitive species in Ireland. This species has been assessed to have low risk of collision, low risk of displacement and a moderate risk of a barrier effect (Langston R. , 2010) and, separately, a small risk of experiencing a barrier effect and collision. It has a rather low species sensitivity index of 15.8 (Langston R. , 2010). Goldeneye flies mainly during daylight and has been observed flying mainly at heights below 30m (Dirksen, Van der Winden, & Spaans, 1998). While ducks are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) I have not been able to find records of mortality for this species at wind farm sites. There is no published avoidance rate for this species (SNH, 2010) but the published avoidance rate for ducks in general offshore is 99.0% (Maclean, Wright, Showler, & Rehfisch, 2009).

Vulnerability to population effects at the SPAs where a qualifying feature: This species is declining but still has a relatively large wintering population in Ireland. However the numbers at Lough Ree are very small, with just 12 recorded in recent years (I-WeBS). Low level mortality could therefore have a perceptible effect on the local population.

It is a quarry species in Ireland.

A125 Coot (Fulica atra)

SPAs where Qualifying Feature: Lough Ree SPA

Conservation Condition: Apparently favourable

Other local sites: Lough Croan Turlough (peak count of 12 in winter 1014/15 (ECOFACT, 2015)), River Suck Callows (2 in 2007/8 I-WeBS), Lough Funshinagh (2 in 2011/12, I-WeBS), Feacle Lough (22 in 2013/14, I-WeBS). Also observed (numbers not stated) during the breeding season at Lough Croan and Feacle Lough (FERS, 2011).

Migratory behaviour: Coot is resident in Ireland, with the population supplemented in winter by birds which breed in northwest Europe, so birds are most likely to arrive in an arc extending clockwise from NNE to SE. Even though they happen on a large scale, migratory movements, and even local movement over short distances, are rarely observed and therefore must take place at night (Wernham, et al., 2002). Flight heights during migration are not known (Wright, 2012). The wintering population in Ireland is estimated to be 33,160 (Crowe, et al., 2008).

Local movements: Coot was recorded by the applicant at Lough Croan in February only during winter 2014/15 suggesting that the birds arrived and then moved on in the space of one month. These birds could be associated with Lough Ree but are equally likely to have arrived at Lough Croan from elsewhere. This species may even have breed at Lough Croan Turlough or Lough Feacle in some years.

Observations on the Phase I site: No records (FERS, 2011).

Generic vulnerability to wind farm development: The coot is not included in the list of 22 most sensitive species in Ireland (Mc Guinness, et al., 2015) however there are examples of coot collisions with turbines (Hötker, Thomsen, & Köster, 2006; Musters, Noordervliet, & Ter Keurs, 1996). There is no published avoidance rate for this species (SNH, 2010). The coot is restricted to waterbodies and so is only likely to be vulnerable to collision while on migration or when occasionally changing sites during the course of the winter. It is not known to make regular flights between roosting and foraging areas, like some of the bird species considered in this report.

Vulnerability to population effects at the SPAs where a qualifying feature: The wintering population in Ireland fluctuates from year to year but is stable overall and the wintering population is relatively high at Lough Ree. Any population effects as a result of low level mortality would be impossible to detect.

A140 Golden Plover (Pluvialis apricaria)

SPAs where Qualifying Feature: Four Roads Turlough SPA, Lough Croan Turlough SPA, Lough Ree SPA, River Suck Callows SPA and Middle Shannon Callows SPA.

Conservation Condition: Apparently unfavourable at all sites were a qualifying feature. The numbers recorded were generally substantially below the Baseline Reference Values although the applicant also recorded up to 3000 at Lough Croan Turlough in earlier surveys (FERS, 2011).

Other local sites: Lough Feacle (peak count 20 in winter 2014/15 (ECOFACT, 2015) and a peak count of 49 in 2008/9 and 30 in 2011/12 I-WeBS), Corkip Lough (20 in 2012/13 (ECOFACT, 2013), Dysart (Thomas Street) Turlough (100), Coolagarry (20), Castlehampton (30) and Garrynagram Turlough (present in 2012/13), Lough Funshinagh (five year mean peak count of 3,176, I-WeBS), Lisduff Turlough (five year mean peak count of 17, I-WeBS).

Migratory behaviour: Ireland has a small population of breeding golden plover, in the upland areas of the north and west. In winter, birds which breed in Iceland and the Faroe Islands migrate to Ireland, therefore birds are most likely to arrive in an arc clockwise from NW to NNE. The population trend of the population which breeds in Iceland is unknown. The wintering population was estimated to be a minimum of 154,000 in the period 1999 to 2004 (Crowe, et al., 2008).

Local movements: The applicant's data from the 2014/15 surveys indicate fairly sporadic presence near the waterbodies included in the survey which perhaps indicates a high degree of local mobility. Research from southern England indicates that individual flocks are faithful to a range which is 6-8km across and within which the birds are highly mobile (Fuller & Youngman, 1979). However, other studies have shown that individual birds can change sites locally during the course of a winter and that flocks may divide and move to separate sites (Gregory, 1987). This species forages both during the day and at night and that during the night flocks are smaller and more dispersed than during the day (Gillings, Fuller, & Sutherland, 2005). Foraging occurs on both grassland and arable land in lowland areas (Snow & Perins, 1998), with low lying areas, perhaps less than 100m above sea level, preferred (Fuller & Youngman, 1979).

Observations on the Phase I site: Golden plover was recorded near the site during winter surveys (Nov 08 – Feb 09 inclusive) but "not in the immediate area of the proposed development" (FERS, 2011). The location of the nearby locations and numbers are not shown on any map submitted by the applicant.

Generic vulnerability to wind farm development: There is evidence that this species can be displaced by wind farms and it is potentially vulnerable to both a barrier effect and collision (EC, 2011).

Although one study indicates that non-breeding golden plover could be displaced by up to 850m from a wind farm, most studies indicate displacement distances of very much less than this, the mean across all studies being 175m (Hötker, Thomsen, & Köster, 2006).

Waders were not generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) however the golden plover is considered to be potentially at risk of collision with wind turbines (EC, 2011) and there is speculation amongst researchers that the risk could be high during the breeding season, partly because they can commute at night as well as during the day (Pearce-Higgins, Stephen, Langston, & Bright, 2008). Night time activity also takes place

during the winter. There are incidents of mortality of golden plover at wind farms (Hötker, Thomsen, & Köster, 2006; Reitan, 2012; Bevanger, et al., 2008) and the species is considered to be one of the 22 most sensitive species in Ireland during the breeding season, with a sensitivity score of 22 (4 x 5.5) (Mc Guinness, et al., 2015). The SNH avoidance rate for collision risk modelling is 98% (which is the default value).

Vulnerability to population effects at the SPAs where a qualifying feature: The wintering population of Ireland is large and has shown something of a recovery in the last five years. However, there has been an overall decline of around 13% over the last 20 years (I-WeBS). Numbers locally also appear to fluctuate, to quite low levels in at least some years, but have generally diminished. Against this background, small scale population changes from low level additive mortality would be very difficult to detect. The golden plover has a low maturation age, is moderately long lived and has a low reproductive rate (age at first breeding = 1, maximum age = 15 and reproductive rate = 1.00 (Hötker, Thomsen, & Köster, 2006)). The low reproductive rate may make this species more vulnerable to additive mortality (EC, 2011).

It is a quarry species in Ireland although is apparently not widely hunted in Ireland (EC, 2009). Hunting elsewhere during the winter, which affects a different breeding population, is thought to potentially aggravate declines caused by other factors such as habitat loss. Mortality associated with wind farms could have a similar effect but not on the same scale.

A122 Corncrake (Crex crex)

SPAs where Qualifying Feature: Middle Shannon Callows SPA

Conservation Condition: Unfavourable

Other local sites: None.

Migratory behaviour: Breeding species present between April and September, wintering in Africa. The birds that breed (or bred?) in the Shannon Callows area are most likely to arrive from the south or south east. The corncrake usually migrates at night and probably flies at a fairly low height (Green and Riley, 1999).

Local movements: During the breeding season, males usually remain within 600m of their calling position and most females remain within 300m if the nest. Males may shift their calling position by up to 0.5km and females range more widely when not nesting (Stowe & Hudson, 1991) but would be expected to remain within the Shannon Callows during this part of the season.

Observations on the Phase I site: No records (FERS, 2010).

Generic vulnerability to wind farm development: This species is listed as one of the 22 most sensitive species in Ireland with a species sensitivity score is 17.9 (4 x 4.475) based on the breeding season. The species is regarded to be at high risk of experiencing a barrier effect and having high risk of collision (Langston R. , 2010). It has also been assessed as being at potential risk of habitat displacement and of collision. Provided a wind farm development is located more than 1km from breeding habitat, the risks to corncrake are probably very low during the main breeding season. The risk of a barrier effect and collision are most pronounced on migration, when the birds have previously been recorded colliding with light houses and power lines (Bright, 2006).

Vulnerability to population effects at the SPAs where a qualifying feature: The corncrake has undergone a large scale decline and range contraction and the population associated with the Shannon Callows is (or was) the only population in Ireland away from the west coast. The population is either very small (or perhaps now extinct) and therefore the death of even one bird is likely to be significant at the population level.

A142 Lapwing (Vanellus vanellus)

SPAs where Qualifying Feature: River Suck Callows SPA, Lough Ree SPA and Middle Shannon Callows SPA

Conservation Condition: Apparently unfavourable on all three SPAs

Other local sites: Feacle Lough (peak count of 25 in winter 2014/15 (ECOFACT, 2015) and a peak count of 102 in 2008/9 and 248 in 2011/12 I-WeBS), Lough Croan Turlough (44), Dysart (Thomas Street) Turlough (20), Four Roads Turlough (100), River Suck (Muckanagh) (100), Lough Funshinagh (five year peak mean of 1,634, I-WeBS), Lisduff Turlough (five year peak mean of 111, I-WeBS). Corraree Turlough (ECOFACT, 2013). Lapwing was also observed during the baseline winter surveys regularly utilising Feacle Lough in 'significant' numbers and feeding in wet grassland in the region surrounding Lough Croan in 'large' numbers (FERS, 2011). Possibly also Ballintury Turlough (Site Synopsis gives records from the 1980s).

Migratory behaviour: Lapwing is a resident species in Ireland, with the breeding population typically remaining in the country during the winter. These birds are joined by migrants that breed in Britain and Continental Europe, especially during cold winters. Resident birds could arrive at the Roscommon area from any direction but especially the north while migrants perhaps are most likely to arrive in an arc extending clockwise from NNE to SSE. In Ireland, the highest concentrations in winter are in the Western Midlands and along the River Shannon (Balmer, et al., 2013) which indicates significant migratory movements to these areas of Ireland. Migratory flight heights are not known. The total wintering population is estimated to be at 207,700 (Crowe, et al., 2008).

Local movements: The applicant's data indicates that there is some movement between local sites during the winter period. For example, birds were present at both Four Roads and Muckanagh (River Suck) in November but not in December and were again present at both sites in January and February. It is not known if the birds recorded more locally to the wind farm site are linked to the SPAs where this species is a qualifying feature. Unlike golden plover, lapwing do not appear to have distinct home ranges during the winter (Fuller & Youngman, 1979).

Observations on the Phase I site: None (FERS, 2011).

Generic vulnerability to wind farm development: The lapwing has been assessed as having evidence of being at risk from displacement, having a low potential risk of collision and being at potential risk of displacement (EC, 2011). During the breeding season, lapwing is considered to be one of the 22 species considered to be most vulnerable to wind farm development, with a species sensitivity score of 19.4 (4 x 4.225) (Mc Guinness, et al., 2015).

Although one study indicates that non-breeding golden plover could be displaced by up to 850m from a wind farm, most studies indicate displacement distances of very much less than this, the mean across all studies being 260m (Hötker, Thomsen, & Köster, 2006).

Waders are generally not considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) but there are examples of lapwing collisions with turbines (Hötker, Thomsen, & Köster, 2006).

Vulnerability to population effects at the SPAs where a qualifying feature: Although the wintering population in Ireland remains large, it is declining (perhaps 40% loss over the last 20 years) and this seems to be reflected locally where numbers appear to have reduced substantially.

Numbers in Ireland in winter appear are influenced by the weather and therefore fluctuate from year to year (I-WeBS). Against this background, low level additional mortality from a wind farm would be difficult to detect however it could contribute marginally to the apparent decline of this species at the three SPAs. The lapwing is low maturation age, is long lived and has a low reproductive rate and a declining population (age at first breeding = 1 or 2, maximum age = 25 and reproductive rate = 0.59 (Hötker, Thomsen, & Köster, 2006)), factors which perhaps make this species more vulnerable to additive mortality (EC, 2011).

A156 Black-tailed Godwit (Limosa limosa)

SPAs where Qualifying Feature: Middle Shannon Callows SPA

Conservation Condition: Apparently unfavourable

Other local sites: Four Roads Turlough (peak count of 4 in 2014/15 (ECOFACT, 2015)) and River Suck Callows (300 I-WeBS). A flock of 40 birds was observed feeding around Lough Feacle during the 2009/2010 Whooper Swan surveys and there was c.1 at Lough Feacle in 2013/14 (I-WeBS). Possible also Ballintury Turlough (Site Synopsis gives records from the 1980s).

Migratory behaviour: All the wintering black-tailed godwit that winter in Ireland breed in Iceland therefore birds are perhaps most likely to arrive at the Middle Shannon Callows from within an arc extending clockwise from NW to N. The wintering population in Ireland is estimated to be 13,880 (Crowe, et al., 2008).

Local movements: The occasional records of this species at Lough Feacle and Four Roads Turlough indicate that this species is either making local movements between sites or stopping while on migration. The record from Four Roads Turlough was in January, the month in which numbers are at their highest in Ireland. It is not known if the birds recorded more locally to the wind farm sites also make use of the Middle Shannon Callows.

Observations on the Phase I site: No records (FERS, 2011).

Generic Vulnerability to wind farm development: Black-tailed godwit is not included in the list of 22 most sensitive species in Ireland and waders are generally not considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004). It has been assessed as having a potential risk from habitat displacement and experiencing a barrier effect and a small risk of collision (EC, 2011).

I have not been able to find published records of mortality from collision with turbines for this species.

Vulnerability to population effects at the SPA where a qualifying feature: The wintering population of the Middle Shannon Callows SPA appears to be unfavourable and perhaps continuing to decline. Loss of one or two individuals could potentially compound that decline. The local situation appears to be contrary to general picture since the breeding population in Iceland and, therefore the wintering population in Britain and Ireland, is increasing and expanding its range (Balmer, et al., 2013). This species has a moderate maturation age, is moderately long-lived and has a low reproductive rate and the population locally is declining (age at first breeding = 1, maximum age = 15 and reproductive rate = 0.87 (Hötker, Thomsen, & Köster, 2006)), factors which perhaps make this species more vulnerable to additive mortality (EC, 2011).

A179 Black-headed Gull (Chroicocephalus ridibundus)

SPAs where Qualifying Feature: Middle Shannon Callows SPA

Conservation Condition: Apparently unfavourable

Other local sites: Feacle Lough (peak count of 10 in 2014/15 (ECOFACT, 2015) and a peak count of 84 in winter 2011/12 I-WeBS), Dysart (Thomas Street) Turlough (70), Four Roads Turlough (16), River Suck Callows (4/140 I-WeBS) and Lough Ree (122 I-WeBS), Lough Croan Turlough (five year peak mean of 15, I-WeBS), Lisduff Turlough (five year peak mean of 29, I-WeBS), Lough Funshinagh (five year peak mean of 26, I-WeBS). Small numbers of birds also observed frequently feeding in fields in near to Lough Feacle, number and location not specified, during earlier baseline surveys (FERS, 2011).

Migratory behaviour: Birds which breed in Iceland and Northern Europe spend the winter in Britain and Ireland. Birds could arrive from any direction perhaps principally from within an arc extending from the NW to SE (clockwise).

Local movements: Up to 70 came and went from the sites monitored by the applicant in 2014/15, indicating that this species makes at least occasional movements between local sites during the winter period. A proportion of those individuals recorded may also spend part of the winter at the Middle Shannon Callows, although there is no direct evidence of interchange between the Middle Shannon Callows and site more local to the wind farm. During the breeding season, this species typically forages within 15km of the breeding colony (Ratcliffe, Phillips, & Gubbay, 2000) and it is clearly capable of moving much greater distances when not breeding.

Observations on the Phase I site: No records (FERS, 2011).

Generic vulnerability to wind farm development: During the breeding season, the black-headed gull is considered to be one of the 22 most sensitive species to wind farm development in Ireland, species sensitivity score during the breeding season is 16.9 (4 x 4.225) (Mc Guinness, et al., 2015). Others have assessed this species as having a low risk of displacement, a low risk of experiencing a barrier effect and a low risk of collision (Langston R. , 2010).

Although one study indicates that non-breeding black-headed gull could be displaced by up to 850m from a wind farm, most studies indicate displacement distances of very much less than this, the mean across all studies being 97m and the general picture is that gulls are not displaced by wind farms (Hötker, Thomsen, & Köster, 2006).

Gulls, including black-headed gulls, are among the most frequently recorded victims of mortality at wind farms (Hötker, Thomsen, & Köster, 2006) including one possible fatality due to collision with a turbine of a bird making local movements during the day (Krijgsveld, Akershoek, Schenk, Dijk, & Dirksen, 2009). The SNH avoidance rate for collision risk modelling is 98% (default value).

Vulnerability to population effects at SPA where a qualifying feature: The wintering population of the Middle Shannon Callows SPA appears to be unfavourable and perhaps continuing to decline here and at all the other waterbodies locally. Loss of one or two additional individuals as a result of wind farm development would potentially compound that decline, although this would be difficult to detect as numbers are relatively high and appear to fluctuate widely from year to year (in last five years the maximum peak count for the Shannon Callows was 787 and the minimum peak count was 128). This species has a low maturation age, is long-lived and has a low

reproductive rate and a declining population locally (age at first breeding = 1, maximum age = 26 and reproductive rate = 1.25 (Hötker, Thomsen, & Köster, 2006)), factors which perhaps make this species more vulnerable to additive mortality (EC, 2011).

A193 Common Tern (Sterna hirundo)

SPAs where Qualifying Feature: Lough Ree SPA and Middle Shannon Callows SPA

Conservation Condition: Uncertain but assumed favourable

Other local sites: The only known local breeding colony is on the Black Islands at Lough Ree.

Migratory behaviour: Birds breeding in Ireland winter along the west coast of Africa and therefore birds arriving at Lough Ree and the Shannon Callows are likely to arrive from the south and depart southwards.

Local movements: Strongly associated with water and likely to remain at Lough Ree/River Shannon during the breeding season (when the turloughs will be mainly dry). Research at coastal sites in England showed that this species travelled less than 9km from the breeding colony while foraging (Perrow, Skeate, & Gilroy, 2011).

Observations on the Phase I site: No records (FERS, 2010).

Generic vulnerability to wind farm development: The common tern is considered to be one of the 22 most sensitive species to wind farm development in Ireland, with a species sensitivity score of 20.6 (4 x 5.15) during the breeding season. It has been assessed as having low risk of displacement, a low risk of experiencing a barrier effect and a moderate risk of collision (Langston R. , 2010) and also being at potential risk of habitat displacement, a small risk of a barrier effect and having evidence of being at risk of collision (EC, 2011).

Terns are generally considered to be vulnerable to collisions with turbines (Langston & Pullan, 2004) and there are examples of the common tern colliding with turbines (Hötker, Thomsen, & Köster, 2006). The SNH avoidance rate for collision risk modelling is 98% (default value).

Vulnerability to population effects at SPA where a qualifying feature: The population at Lough Ree appears to be stable (to 2012) however it numbers only 80 to 90 pairs. In these circumstances, the population could be vulnerable to low level additional mortality such as may result from a wind farm however it is equally possible that such mortality would be quickly offset by in-migration or increases in productivity at the colony.

A395 Greenland White-fronted Goose (Anser albifrons flavirostris)

SPAs where Qualifying Feature: Four Roads Turlough SPA, Lough Croan Turlough SPA and River Suck Callows SPA

Conservation Condition: Apparently unfavourable at all three sites

Other local sites: Ballinturly Turlough SAC (137 in 2011/12, 101 in 2012/13, but none recorded in 2013/14 and 2014/15 when there were limited and no monitoring visits, respectively (NPWS submission 8th December 2015)), Shannon Callows (16 in 2010/11 I-WeBS), formerly (or rarely?) Lough Ree (91 in 2006/7 I-WeBS), Little Brosna Callows (200 – 230 each winter from 2009/10 to 2012/13 I-WeBS), formerly or rarely Lough Funshinagh (no count, Site Synopsis states this site is used by the River Suck flock but not regularly; no records for the last five years, I-WeBS).

Migratory behaviour: The Greenland white-fronted goose breeds in Greenland and is winter visitor to Ireland, with birds present from October to March. Birds are likely to arrive in the Roscommon area from the north and depart northwards. During migration, individuals which winter further south in Co. Wexford make stops in Scotland and Iceland and possibly also elsewhere in Ireland (Fox, Glahder, & Walsh, Spring migration routes and timing of Greenland white-fronted geese-results from satellite telemetry, 2003; Warren, Walsh, Merne, Wilson, & Fox, 1992). The wintering population is estimated to be 10,266 of which 7,984 (78%) winter in Co. Wexford (Fox, Francis, Norris, & Walsh, 2015).

Local movements: Based on observations primarily at Wexford Slobs, the Greenland white-fronted goose is site faithful during winter and makes limited local movements. However, some birds change their wintering site either for whole winters at a time or during a single winter period (Wilson, Norriss, Walsh, Fox, & Stroud, 1991; Warren, Walsh, Merne, Wilson, & Fox, 1992). DAHG (NPWS) report (19th October 2015 submission) local movements of the River Suck population between three SPAs (Four Roads Turlough SPA, Lough Croan Turlough SPA and River Suck Callows SPA) and the various site synopsis indicate that this flock uses, or has used, the Middle Shannon Callows and Lough Funshinagh. Research from elsewhere indicates that birds on Islay and the Kintyre Peninsula in Scotland forage at distances up to 8km from their roost sites (Pendlebury, et al., 2009), with similar distances also observed in Norfolk (Johnson, Schmidt, & Taylor, 2014), and that greater White-fronted goose (of which the Greenland white-fronted goose is a sub-species) can move up to 36km between roosting and foraging sites in America (Ackerman, et al., 2006).

Examination of the data submitted by DAHG (NPWS) on 8th December 2015 indicates the following:

- In the study area, the geese are most often recorded at the River Suck Callows at Muckanagh (GR M815496). However, this site also receives the most monitoring visits.
- The birds come and go from Muckanagh throughout the winter season. Ignoring September and April, the birds were not recorded at Muckanagh on 11 out of 19 occasions in winter 2014/15, 9 of 17 in 2013/14, 6 of 12 occasions in 2012/13 and 16 of 27 occasions in 2011/12. The dates when birds were not recorded are spread throughout the winter season.
- During these same four winter periods, the geese were also recorded at Four Roads Turlough, Lough Croan and Ballinturly Turlough, and very occasionally elsewhere on the

River Suck Callows (Castlestrange, Cloonagh, Derrycahill, Dalysgrove and Killeroran). On the 17 occasions when Muckanagh, Four Roads Turlough and Ballinturly Turlough, were visited on the same day, the birds were recorded at either one of the sites (five occasions at Mackanagh, three at Four Roads Turlough and three at Ballinturly Turlough) or none of them (five occasions). On the six occasions when these three sites and Lough Croan were visited on the same day, the same sort of pattern is evident (never at more than one site, one occasion at each of Muckanagh, Four Roads Turlough and Ballinturly Turlough, none at Lough Croan Turlough and none of the sites on three occasions).

- The applicant's data shows a similar pattern in the 2014/15 winter season, with the birds being recorded at Four Roads Turlough in November and Muckanagh in December, January and March and no records at the monitored sites in October or February. During this same season, the NPWs has records of birds at Lough Croan Turlough in December and at Four Roads Turlough in December and January as well as absences from Muckanagh during parts of these months and the presence of birds at Muckanagh in October and November (when the applicant did not record any).
- Based on its observations, the applicant believes that there are flightpaths which are used occasionally by this species between (i) the River Suck at Muckanagh and Four Roads Turlough and (ii) the River Suck at Muckanagh and a location further to the north (ECOFACT, 2015).

In addition to the movements described above, the site synopsis for the Middle Shannon Callows states the following: "Small numbers of Greenland White-fronted Goose (listed on Annex I of the EU Birds Directive) use the Shannon Callows (average 21, peak 55) and these are generally associated with larger flocks which occur on the adjacent Little Brosna Callows and River Suck Callows". Sixteen birds were recorded at the Shannon Callows in 2011/12 but there are no subsequent records. The Little Brosna Callows consistently holds around 200 birds each winter.

The data is patchy however it looks as though a flock is present comprising an average of around 40 birds, but up to around 140 birds, which regularly moves between Muckanagh (River Suck Callows), Four Roads Turlough, Lough Croan, Ballinturly Turlough and another site or sites, perhaps within the River Suck Callows or the River Shannon Callows. This assessment is contrary to the view expressed by the applicant in its winter 2013/14 bird survey report (ECOFACT, 2015) in which it is stated that 'the River Suck flock of Greenland White-fronted Geese remained almost exclusively on the River Suck Callows'. The sites where this species was most frequently recorded lie just to the north of the Phase 1 Wind Farm site. However, when sites with occasional records are included, the range of the River Suck population encompasses the whole of the River Suck valley from Dalysgrove in the south and to Ballinturly in the north, extending westwards to Lough Croan and potentially south to the Shannon Callows and the Little Brosna Callows.

The applicant appears to have understated the degree to which the birds move between sites and the use by the birds of Lough Croan.

Observations on the Phase I site: A flock of 52 Greenland White-fronted Geese was observed crossing the Phase 1 site in 2013. These birds originated from Lough Croan Turlough and took

flight following disturbance by a farm worker. The birds flew in the direction of the River Suck, apparently above the height of the turbine rotors (ECOFACT, 2013).

Generic Vulnerability to wind farm development: The Greenland white-fronted goose is ranked as one of the 22 species most sensitive to wind farm development in Ireland, with a species sensitivity score of 16.9 (4 x 4.225) during the winter season.

This species has been assessed as having a moderate risk of displacement, a low risk of experiencing a barrier effect and a moderate risk of collision (Langston R. , 2010) and also having evidence of indications of risk for displacement and being potentially at risk from collision (EC, 2011).

Displacement distances of 200-400m have been recorded however this was for a small turbines and there is some evidence that displacement distances increase with turbine height, with larger turbines potentially causing displacement at distances up to 1km. There is some evidence that in addition to complete displacement of birds close to the wind farm, numbers of birds in the wider vicinity are also reduced (Rees, 2012).

There is evidence from constructed wind farms that the white-fronted goose (not the Greenland sub-species) experienced a barrier effect. Data from other swans and geese suggest that between 50% and 100% of flocks observed during the daytime avoid entering the wind farm, making a detour of a few hundred metres when making local movements and several kilometres while on migration.

Geese are generally considered to be vulnerable to collision with turbines (Langston & Pullan, 2004). There are records of various geese colliding with turbines (Hötker, Thomsen, & Köster, 2006) including White-fronted geese (Rees, 2012) The SNH recommended avoidance rate for collision risk modelling is 99.8% (based on scientific studies).

Vulnerability to population effects at the SPA where a qualifying feature: Unlike the whooper swan population, the population of Greenland White-fronted goose is declining; the global population declined from 29,473 in 2003 to 24,895 in 2006 and then 18,854 in 2015. The population in Ireland has been more stable in recent years with the population in 2015 (10,266) being about the same as it was in 2006 (10,608). The population that winters in Roscommon also appears to be recently stable however it is substantially reduced from that around the time the River Suck Callows was designated as an SPA. Breeding productivity is very low however with the population which winters in Ireland showing just 6.1% breeding success in 2014 (meaning 6.1% of the birds recorded were this year's young) (Fox, Francis, Norris, & Walsh, 2015). The general decline and low breeding productivity mean that the wintering population in Roscommon is likely to be susceptible to even small increases in adult mortality. This species has moderate maturation age, is long-lived, has a low reproductive rate and has a declining population (Age at first breeding = 2, maximum age = 17 and reproductive rate = 0.66 (Hötker, Thomsen, & Köster, 2006)), factors which perhaps make this species more vulnerable to additive mortality (EC, 2011).

Appendix 3: Favourable Conservation Condition

Conservation Objectives for the Natura 2000 sites

The site conservation objectives include the phrase "to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA…". The objectives, to maintain or restore favourable conservation *condition*, apply at the level of the Natura 2000 network and at the level of an individual Natura 2000 sites.

The same document states that "the maintenance of …species within Natura 2000 sites at a favourable conservation *condition* will contribute to the overall maintenance of favourable conservation *status* of [that] species at a national [and European] level".

Favourable Conservation Condition

The Conservation Objectives for each of the SPAs relevant to this assessment do not define favourable conservation condition, either as concept or as set of values. Thus, for these particular Natura 2000 sites, the NPWS has not given a benchmark or target against which to assess whether or not the species population is in favourable condition or not. The conservation objectives are therefore described as generic.

This is not the case for all Natura 2000 sites in Ireland. For some Natura 2000 sites, the NPWS has given a set of targets against a set of attributes for each qualifying feature. These targets define favourable conservation condition, with the feature being in favourable conservation condition if all the targets are met. These are referred to as site-specific conservation objectives.

The reason that some Natura 2000 sites have site-specific conservation objectives, and therefore targets, and others do not, seems to be that that the NPWS have simply not completed the work.

Favourable Conservation Status

Under the Habitats Directive, Favourable Conservation *Status* (FCS) applies at the national level (although it has historically also been applied at the site level). The concept is defined in the Conservation Objectives for each SPA. FCS for a species is defined as being achieved when, amongst other things, the species is maintaining itself on a long term basis as a viable component of its natural habitat.

Favourable Reference Values at the National Level

At the national level, reporting on habitats and species of community interest is required under Article 17 of the Habitats Directive and Article 12 of the Birds Directive. There is a set of guidance documents for member states on each. These are:

- Assessment and reporting under Article 17 of the Habitats Directive: Explanatory Notes and Guidelines for the period 2007 – 2012 (ETCBD, 2011).
- Assessment and reporting under Article 12 of the Birds Directive: Explanatory Notes and Guidelines for the period 2008 – 2012 (N2K Group, 2011)

The first of these documents sets out the concept of Favourable Reference Values (FRVVs, one each for Range, Population and Area) in the context of evaluating conservation status at the

national level under the Habitats Directive. FRVs are thresholds and they are used to inform the assessment of conservation status. The guidance makes clear that the FRVs for a species population must be at least the population when the Habitats Directive came into force. The general approach in Ireland has been to set the FRVs as the population when the Directive came into force i.e. 1994 (Institute for European Evironmental Policy, 2015).

Under the Birds Directive member states are required to report on the population size of birds and to take measures to maintain those populations at an appropriate level which corresponds to their "*ecological, scientific and cultural requirements*" which could be construed as being equivalent to FCS and BRVs under the Habitats Directive. Under the Birds Directive, member states are not required to compare current population levels with an appropriate population level as part of the reporting process. Despite this, some Member States (not Ireland) have determined appropriate population levels for wild birds and in some of these states, the appropriate population levels are referred to as FRVs (Brambilla, Gustin, & Celada, 2011). They are non-binding.

Some member states have used FRVs and appropriate populations set at the national level to inform the setting of targets at the site level. It is understood that the Ireland has done this in relation to FRVs and the setting of targets for SACs and that this is the basis for the site-specific conservation objectives described above (Institute for European Evironmental Policy, 2015).

With funding from the EU, Birdlife International are applying the FRV concept to bird populations at individual SPAs where the term is equivalent to a target population size for the SPA and the value is used to determine whether populations at the SPA are in favourable conservation [condition] (Tye, Christodoulou-Davies, Papazoglou, & Apostolidou, 2014).

The approach used in this report

In undertaking the assessment set out in this report, we are in the unfortunate position of having a site level conservation objective to maintain or restore favourable conservation condition of the bird species without a definition of what constitutes favourable condition e.g. there is no stated target population size or FRV at the site level (or even the national level).

However, the NPWS have produced site-specific conservation objectives for 36 other SPAs in Ireland. The approach taken in each case is the same. For each qualifying bird species, two attributes have been selected. These are (i) population trend and (ii) distribution. Both of these refer to the position within the SPA. Each attribute then has a target. These are (i) long term population trend stable or increasing and (ii) no significant decrease in the range, timing, and intensity of use of areas, other than that occurring from natural patterns of variation. If these two targets are met, then the population is in favourable condition. The site-specific conservation objectives also have a target in relation to the area of wetland habitat for waterbirds. The target for this attribute is that the permanent area occupied by the wetland habitat should be stable and not significantly less than a specified area, other than that occurring as a result of natural patterns of variation.

For each of the SPAs which have site specific conservation objectives, there is a supporting document which sets out the current conservation condition for each qualifying species and the methods used. The methodology followed by the NPWS is as set out below:

1. Determine the average five year peak mean for each qualifying feature of the SPA during the first five years of the Irish Wetland Bird Survey (I-WeBS). These years are 1995/6 to

1999/00. This is referred to as the baseline period and the five year peak mean is referred to as the baseline reference value and it is equivalent to a site-level FRV.

2. Use subsequent I-WeBS count data to determine the population trend using a modelling method, the key comparison being between the five year peak mean for the baseline period and five year peak mean the last five years. The difference in the numbers of birds recorded during these period is used to calculate a trend i.e. a percentage increase or decrease since the baseline period.
3. The conservation condition of each qualifying population is then determined as follows:
    a. Population is stable or increasing = favourable condition
    b. Population decline in the range 1.0 – 24.9% from the baseline reference value = intermediate (unfavourable)
    c. Population decline in the range 25.0 – 49.9% from the baseline reference value = unfavourable population
    d. Population decline in the range > 50.0 from the baseline reference value = highly unfavourable population
4. A separate assessment is carried out on distribution within the SPA.

So, the approach set out in this report is to follow broadly the same methodology as the NPWS when it has made assessments of favourable condition in support of site-specific conservation objectives. The key differences are (i) that the modelling software has not been used to calculate trends and instead a simple comparison has been made between the baseline reference value and the current population; (ii) the qualifying populations have been classified as being favourable or unfavourable without using the three sub-divisions of unfavourable. This simplified approach is sufficient to know whether the population is favourable or unfavourable and therefore which of the conservation objectives apply.

For habitats, the baseline reference was taken to be the extent shown on the Natura 2000 data form for each site, in the absence of quantified target areas.