



**Appropriate Assessment  
Report**

**Seven Hills Windfarm  
Phase II**

For

**An Bord Pleanála**

Project No.: IABP105/001

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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 (EIS), or, if buried, could be classed as exempted development and therefore not subject to a planning application. The applicant in for each phase of the Seven Hills Wind farm is Galetch Energy Developments Ltd.
- 1.1.2** This report sets out an assessment of Phase II of the wind farm under the Habitats Directive. It also includes consideration of Phase I 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 development has a complex planning history. The current position is that a previous decision to grant consent for the project was set aside by the High Court because the decision making process did not comply with the Habitats Directive. It is therefore necessary for the applications to be considered again.
- 1.1.5** There are a number of objectors to the development. These include the National Parks and Wildlife Service (NPWS), a division of the Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs (DAHRRGA<sup>1</sup>). 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<sup>2</sup>. 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.

<sup>1</sup> Previously the Department of the Arts, Heritage and the Gaeltacht (DAHG)

<sup>2</sup> See for example the letter from DAHG dated 19<sup>th</sup> October 2015.

## 2. Natura Impact Statements

**2.1.1** The applicant has prepared two Natura Impact Statements for the Seven Hills Wind Farm Phase II, these are:

- Natura Impact Statement & Appropriate Assessment as required under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC). Seven Hills Wind Farm Phase II. Moore Group, 12<sup>th</sup> July 2011, included as Appendix 7.3, Chapter 7 of the EIS (Moore Group, 2011).
- Seven Hills Wind Farm Phase 2 Report to inform the Appropriate Assessment process. Ecofact Environmental Consultants Ltd. 6<sup>th</sup> 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 (ECOFAC, 2012b).

**2.1.2** The June 2012 AA report included both a Screening Assessment and an Impact Assessment, including an assessment of cumulative impacts. It is assumed to have superseded the 2011 assessment prepared by Moore Group.

**2.1.3** However, the June 2012 AA report was based on survey work undertaken prior to that date and therefore 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 (ECOFAC, 2013).
- Proposed Seven Hills (Phase 2) Wind Farm, Co. Roscommon: Wintering Bird Survey October 2014 to March 2015. Ecofact Environmental Consultants Ltd. (ECOFAC, 2015c).

**2.1.4** Therefore, the information presented in the 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** The 2013 wintering bird survey was submitted in relation to the Phase I site but relevant to both Phase I and Phase II. 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.

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

- Proposed Seven Hills wind farm (Phase II): Ornithological assessment report July 2011. Forest, Environmental Research and Services Ltd. Included as Appendix 8.1 of the EIS (FERS, 2011) and the summary of this work presented in the EIS.
- Seven Hills (Phase 1 & Phase 2) Overview of Environmental Information Submitted on Avifauna. Irish Wind Construction Management (IWCM) now Galetech Energy Services (IWCM, 2015).

- 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.

**2.1.7** 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. 18<sup>th</sup> 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 II, pages 12 to 45. 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 II and elsewhere, including chapter 3 of the EIS. In summary, the development comprises:

- Nineteen GE 2.5xl MW wind turbines in two clusters, with the lowest turbine at 71m above sea level (ASL) to the highest at 107m 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<sup>-1</sup> and 25ms<sup>-1</sup>. The turbines are separated by an average distance of approximately 510m.
- A substation comprising a building and compound, measuring approximately 30m by 67m.
- 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 20m (0.38ha in total for the Phase II site) during the operational stage and a turbine base extending approximately 2.8m underground, occupying an area of approximately 300m<sup>2</sup> (0.57ha in total for the whole Phase II site).
- Site access tracks totalling 11,886m and 5m wide (5.9ha in total) and 1m deep, constructed in a similar manner to agricultural tracks.
- Underground cabling totalling 11,442m, alongside the access tracks.
- Temporary construction compounds and access tracks. Three temporary compounds are proposed (one near turbine 7 (TC2 - 922m<sup>2</sup>), one near turbine 10 (TC1 - 2226m<sup>2</sup>) and one near turbine 17 (TC3 - 2270m<sup>2</sup>) with a total area of 0.54ha.
- Temporary hard-standing areas for cranes next to each turbine. The latter will measure 950sq.m (1.8ha in total for the Phase II site) and will incorporate the hard permanent hard-standing at each turbine location (so the temporary hard standing will be 1.42ha in total for the Phase II site).

**3.4.2** The planning application boundary encompasses a 58ha 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 300ha, or about 260ha excluding the land between the turbine clusters. From an ornithological perspective, it is the latter areas which matter and therefore references to the Phase II site in this report are generally a reference to the 300ha 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 14,492 vehicle movements with 'much reduced' vehicle movements (number not specified in the EIS) during the operational stage. The site entrance will be on a minor road (L7535) off the R363 to the east of Cuillineerwan (approximately 1.5km east of the Ballyglass River Callows). The likely access route for construction traffic would be from Athlone towards Dysart along the R362/R363 and then southwards along the minor road for about 500m to the site entrance.

**3.4.5** The construction period is expected to last 12 - 18 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 II. The site is described as comprising "predominantly of improved agricultural grassland with some

semi-natural [unimproved] calcareous grassland, scrub and hedgerow habitat". The calcareous grassland is extensive, with over 200ha mapped by the applicants. The field boundaries are predominantly stone walls.

### *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 34 of the June 2012 AA report for Phase II. A further Natura 2000 site, the Ballinturly Turlough, lies to the north of the 15km search area for Phase II but inside the equivalent search area for Phase I.
- 3.5.5** A summary of each of these Natura 2000 sites is provided in Table 1 below. There are two types of Natura 2000 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	Distance to Phase II site (closest point)
NA/ 002214	Killeglan Grassland SAC	Species -rich calcareous grassland with orchids.  Qualifying features: 6210 Orchid-rich calcareous grassland	0.6km
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	0.8km

Site Code SPA/SAC	Site Name & designation	Brief Description & Qualifying Features	Distance to Phase II site (closest point)
		Rhynchosporion vegetation, 91D0 Bog Woodland	
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'.	2.3km
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.	3.2km
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.	4km
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.	5.8km
004140/ 001637	Four Roads Turlough SPA and SAC (also known as Cloonlaughnan Turlough)	Turlough which is important for wintering waterfowl.  Qualifying features: two named species of wintering waterbirds and 'wetland and waterbirds'; 3180 Turloughs.	7.5km
004064/ 000440	Lough Ree SPA and SAC	Very large lake of importance for plants/vegetation, breeding and wintering waterfowl and fish.  Qualifying features: thirteen named species of breeding birds and wintering waterbirds and 'wetland and waterbirds'; 3150 Natural eutrophic lakes with Magnopotamion or	8.5km

Site Code SPA/SAC	Site Name & designation	Brief Description & Qualifying Features	Distance to Phase II site (closest point)
		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 <i>Lutra lutra</i> (Otter).	
NA/ 000609	Lisduff Turlough SAC	Turlough with botanical interest, also important for wintering wildfowl. Qualifying features: 3180 Turloughs.	11.3km
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 ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> ), 8240 Limestone pavements, 91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> , 1355 <i>Lutra lutra</i> (Otter).	11.8km
NA/ 000588	Ballinturly Turlough SAC	Turlough of interest for its vegetation and breeding and wintering birds. Qualifying features: 3180 Turloughs.	15.7km

NA = Not Applicable

- 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 conservation condition of the qualifying features for the relevant Natura 2000 sites is set out in Tables 2 to 10, 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 Special Protection Areas

beyond the 15km distance if these are used 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, 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 of construction activity, including disturbance of birds foraging outside the SPAs ('disturbance effects');
- Direct loss of feeding or roosting habitat outside the SPAs as well as disturbance and displacement of wintering birds, as a result of the presence of the turbines, 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 they 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.

**3.6.5** All of the identified impact mechanisms could, in some circumstances, lead to effects on the bird populations concerned.

### **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 II proposal. This is because there is the potential for the qualifying bird species of the at least the nearest SPA (River Suck Callows) 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 those SACs within the 15km buffer which are wetlands and definitely hydrologically connected to the wind farm sites and for those SPAs within the buffer which are wetlands and definitely hydrologically connected to the wind farm sites or are less than c.8km away from the proposed development. The justification for the c.8km 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** Its conclusion was that the effect of the development on the following Natura 2000 sites should be considered in the further assessment:

- Ballynamona Bog and Corkip Lough SAC;
- River Suck Callows SPA;
- Castlesampson Esker SAC;
- Lough Funshinagh SAC
- Lough Croan Turlough SPA and SAC;
- Four Roads Turlough SPA and SAC.

**3.7.6** The applicant initially considered Lough Ree SPA and the Middle Shannon Callows SPA, which are both within 15km of the wind farm site, but then excluded these sites 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, River Shannon Callows SAC and Lisduff Turlough SAC were discounted by the applicant because of a lack of a hydrological link and the overall distance between these sites and the Phase II site. Potential effects on the Ballinturly Turlough SAC were not considered by the applicant in its 2012 AA Report for Phase II (or any other assessment in relation to Phase II) and so this site was also excluded from further assessment by the applicant.

**3.7.7** However, in its 19<sup>th</sup> October 2015 submission, the DAHG 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 in the same way.

**3.7.8** Similarly, at least 6 of the qualifying species of the Middle Shannon Callows SPA have been recorded at waterbodies closer to the wind farm sites, which indicates that further consideration should also be given to this designated site.

**3.7.9** The applicant makes an assessment of potential cumulative effects at the screening stage (Section 3.4.3, pages 44 and 45 of the 2012 AA report for Phase II). 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 I 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, Co. Roscommon (19km north east of the Phase I



site and 4.5km from Lough Ree), which is currently under construction). Considering these additional projects supports the case for Lough Ree SPA to be considered in the appropriate assessment.

**3.7.10** There is also the potential for significant cumulative effects from Phase I and Phase II wind farm developments on SPAs beyond this zone, as set out in paragraphs 3.5.7 and 3.5.8 above.

**3.7.11** The effect of hydrological changes on the Natura 2000 sites is being assessed separately and by another consultant, Mr. Keohane. In summary, Mr. Keohane identified potential connectivity between the Phase II site and Ballynamona Bog/Corkip Lough SAC, Castlesampson Esker SAC, Lough Funshinagh SAC, Lough Ree SPA/SAC, the River Shannon Callows SAC and Killeglan Grassland SAC (as well as the River Suck Callows SPA). As set out above, the applicant identified the first three of these as requiring further assessment but discounted effects on Lough Ree SAC and the River Shannon Callows SAC. Mr. Keohane's report does not suggest likely significant effects arising from hydrological changes on the Lough Ree SAC and the River Shannon Callows SAC. Moreover, the distance between the Phase II wind farm and these two SACs, and the small scale of the Phase II wind farm relative to their large catchments, indicate that significant effects on the SAC qualifying features of these two sites are unlikely.

**3.7.12** Killeglan Grassland SAC was screened in by the applicant on page 17 and in Table 3 on page 30 of the 2012 AA report but was then screened out by the applicant in further consideration of the impacts at screening stage on pages 39 and 40. However, given the short distance and the hydrological link, and potential ecological link, between this SAC and the Phase II site, further assessment is considered necessary.

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

**3.7.14** 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 14,492 additional vehicle movements predicted during the construction stage for Phase II and presumably a similar or somewhat reduced number during the de-commissioning stage. The Phase I wind farm would generate a further 13,154 vehicle movements along this same section of road. Vehicle movements along the R363 potentially puts this SAC at further risk from air pollution and accidental spillages, despite not being hydrologically connected to the Phase II site. However, this SAC lies just beyond the distance at which significant effects are most 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 Phase II wind farm project should be subject to an appropriate assessment.

- 3.8.2** There is also broad agreement that the appropriate assessment for the Phase II wind farm should include consideration of the effects on the River Suck Callows SPA, Lough Croan Turlough SPA and Four Roads Turlough SPA.
- 3.8.3** Lough Ree SPA should also be considered further. This can be justified solely on the basis of the views of NPWS however it is clear that there is the potential for populations of qualifying bird species of Lough Ree to also use waterbodies more local to the wind farm sites. The latter point also applies to the Middle Shannon Callows SPA and so this SPA should also be included in the appropriate assessment, especially when considering the potential for cumulative effects arising from both Phase I and Phase II.
- 3.8.4** 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.
- 3.8.5** Finally, there are six SACs (Killeglan Grassland SAC, Ballynamona Bog/Corkip Lough SAC, Castlesampson Esker SAC, Lough Funshinagh SAC, Lough Ree SAC and the River Shannon Callows SAC) which are potentially hydrologically linked to the Phase II site (Keohane, 2016). It is not possible at this stage to conclude that there is not likely to be significant effects on the first four of these Natura 2000 sites however the last two can be screened out of further assessment on the basis of distance and catchment scale.
- 3.8.6** The applicant also included consideration of Lough Croan Turlough SAC and Four Roads Turlough SAC however as these are not hydrologically linked to the Phase II site, and are greater than 4km distant, the SAC features of these sites can be excluded from further assessment. Conversely, Killeglan Grassland SAC is potentially hydrologically linked to the Phase II site and therefore some further consideration would seem necessary.

## 4. Appropriate Assessment

### 4.1 Applicant's Assessment

4.1.1 The applicant completed an impact assessment as part of the 2012 AA report for Phase II, on pages 48 to 85. This provides a description of six of the seven Natura 2000 sites that it selected for further assessment (Ballynamona Bog and Corkip Lough SAC; River Suck Callows SPA; Castlesampson Esker SAC; Lough Funshinagh SAC; Lough Croan Turlough SPA and SAC; and Four Roads Turlough SPA and SAC) 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 include consideration of 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

#### *Killeglan Grassland SAC (002214)*

##### *Brief Description*

4.3.1 A brief description of Killeglan Grassland SAC is provided in Table 1 of this report.

##### *Qualifying Features*

4.3.2 The qualifying features of the Killeglan Grassland 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 Killeglan Grassland SAC**

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App Obs
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	50.19	-	-

BRV = Baseline Reference Value, which is taken to be the extent of the habitat stated on the Natura 2000 data form.

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 objective for Killeglan Grassland SAC 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 2 above.

*Conservation Condition*

- 4.3.4 According to the Natura 2000 standard data form, the Killeglan Grassland Lough SAC is in favourable condition, it having been assigned category A - 'excellent conservation'.

*Ballynamona Bog and Corkip Lough SAC (002339)*

*Brief Description*

- 4.3.5 A brief description is provided in of Ballynamona Bog and Corkip Lough SAC is provided in Table 1 of this report and a fuller description is provided in the 2012 AA report for Phase II, pages 17 and 35.

*Qualifying Features*

- 4.3.6 The qualifying features of the Ballynamona Bog and Corkip Lough SAC are set out in Table 3 below.

**Table 3: Qualifying features of the Ballynamona Bog and Corkip Lough SAC**

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App Obs
3180	Turloughs	48.95	-	-
7110	Raised Bog (Active)	12.0	-	-
7120	Degraded Raised Bog	1.08	-	-
7150	Rhynchosporion vegetation	0.3	-	-
91D0	Bog Woodland	7.34	-	-

See explanatory note under Table 2.

*Conservation Objectives*

- 4.3.7 The conservation objective for Ballynamona Bog and Corkip Lough SAC 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 3 above.

*Conservation Condition*

- 4.3.8 According to the Natura 2000 standard data form, the Turlough at Ballynamona Bog and Corkip Lough SAC is in favourable condition, it having been assigned category B - 'good conservation'. The bog woodland is also in this category, while the remaining habitats may be in unfavourable condition, having been assigned category C - 'average or reduced conservation'.

### River Suck Callows SPA (004097)

#### Brief Description

- 4.3.10** 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 II, page 37. Further information on the qualifying species is provided in Appendix 2.

#### Qualifying Features

- 4.3.11** 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 ( <i>Cygnus cygnus</i> )	124*	187	67 (15)
A050	Wigeon ( <i>Anas penelope</i> )	1,203*	2,857	320 (0)
A140	Golden Plover ( <i>Pluvialis apricaria</i> )	1,850**	1,134	15 (Present)
A142	Lapwing ( <i>Vanellus vanellus</i> )	3,640*	1,638	100 (Present)
A395	Greenland White-fronted Goose ( <i>Anser albifrons flavirostris</i> )	386***	168	79 (105)
A999	Wetland and Waterbirds	-	-	-

'BRV' = Baseline Reference Value which is taken to be the five year peak mean given on the site synopsis for birds and the extent for habitats or the extent of the habitat, as appropriate. See Appendix 3 for further explanation.

'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.

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.

\* 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

- 4.3.12** 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*

**4.3.13** 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 around the time that the site was designated in 1996. This means that the comparison between the 'BRV' and the current five year peak mean may not be reliable.

**4.3.14** 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.

*Castlesampson Esker SAC (001625)*

*Brief Description*

**4.3.15** A brief description of Castlesampson Esker SAC is provided in Table 1 of this report and a fuller description is provided in the 2012 AA report for Phase II, pages 35 and 36.

*Qualifying Features*

**4.3.16** The qualifying features of Castlesampson Esker SAC are set out in Table 5 below.

**Table 5: Qualifying features of Castlesampson Esker SAC**

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App Obs
3180	Turloughs	6.55 ha	-	-
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	100.48 ha	-	-

See explanatory note under Table 2.

*Conservation Objectives*

**4.3.17** The conservation objective for Castlesampson Esker 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 5 above.

*Conservation Condition*

**4.3.18** According to the Natura 2000 standard data form, the Turlough at Castlesampson Esker is in unfavourable condition, it having been assigned category C - 'average or reduced conservation' while the grassland is in favourable condition, it having been assigned category A - 'excellent conservation'.

*Lough Funshinagh SAC (000611)*

*Brief Description*

**4.3.19** A brief description of Lough Funshinagh SAC is provided in Table 1 of this report and a fuller description is provided in the 2012 AA report for Phase II, pages 36 and 37.

*Qualifying Features*

**4.3.20** The qualifying features of Lough Funshinagh SAC are set out in Table 6 below.

**Table 6: Qualifying features of Lough Funshinagh Turlough SAC**

Annex I/II code	Qualifying Feature	'BRV'	5 year peak mean	App Obs
A038	Turloughs	432.86 ha	-	-

See explanatory note under Table 2.

*Conservation Objectives*

**4.3.21** The conservation objective for Lough Funshinagh 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 6 above.

*Conservation Condition*

**4.3.22** According to the Natura 2000 standard data form, Lough Funshinagh Turlough is in favourable condition, it having been assigned category A - 'excellent conservation'.



### Lough Croan Turlough SPA (004139)

#### Brief Description

- 4.3.23** Lough Croan Turlough SPA is described in Table 1 of this report and in more detail on page 37 and 38 of the 2012 AA report for Phase II. Further information on the qualifying species is provided in Appendix 2.

#### Qualifying Features

- 4.3.24** The qualifying features of the Lough Croan Turlough SPA are set out in Table 7 below.

**Table 7: Qualifying features of the Lough Croan Turlough SPA**

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

See explanatory notes under Table 4.

#### Conservation Objectives

- 4.3.25** 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 7.
  - 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.

#### Conservation Condition

- 4.3.26** 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.
- 4.3.27** 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.

*Four Roads Turlough SPA (004140)*

*Brief Description*

- 4.3.28** A brief description of Four Roads Turlough SPA is provided in Table 1 of this report and a fuller description is provided in the 2012 AA report for Phase II, page 38. Further information on the qualifying species is provided in Appendix 2.

*Qualifying Features*

- 4.3.29** The qualifying features of the Four Roads Turlough SPA are set out in Table 8 below.

**Table 8: Qualifying features of the Four Roads Turlough SPA**

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

See explanatory notes under Table 4.

*Conservation Objectives*

- 4.3.30** The conservation objectives for the Four Roads Turlough SPA are the same as for Lough Croan Turlough, with the relevant qualifying features shown in Table 8.

*Conservation Condition*

- 4.3.31** The available data for golden plover and Greenland white-fronted goose indicates that the population of these species at Four Roads Turlough is 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.

### Lough Ree SPA (004064)

#### Brief Description

- 4.3.33 A brief description of Lough Ree SPA is provided in Table 1 of this report and fuller description is provided in the 2012 AA report for Phase II, page 25. Further information on the qualifying species is provided in Appendix 2.

#### Qualifying Features

- 4.3.34 The qualifying features of Lough Ree SPA are set out in Table 9 below.

**Table 9: 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 ( <i>Tachybaptus ruficollis</i> )	34*	19	-
A038	Whooper Swan ( <i>Cygnus cygnus</i> )	89	99	-
A050	Wigeon ( <i>Anas penelope</i> )	1475	749	-
A052	Teal ( <i>Anas crecca</i> )	912	231	-
A053	Mallard ( <i>Anas platyrhynchos</i> )	675	252	-
A056	Shoveler ( <i>Anas clypeata</i> )	40	0	-
A061	Tufted Duck ( <i>Aythya fuligula</i> )	661	760	-
A065	Common Scoter ( <i>Melanitta nigra</i> )	35	5 pairs, 17 birds	-
A067	Goldeneye ( <i>Bucephala clangula</i> )	137	12	-
A125	Coot ( <i>Fulica atra</i> )	250	524	-
A140	Golden Plover ( <i>Pluvialis apricaria</i> )	2035	205	-
A142	Lapwing ( <i>Vanellus vanellus</i> )	3870	1443	-
A193	Common Tern ( <i>Sterna hirundo</i> )	90**	Min. 80***	-
A999	Wetland and Waterbirds	-	-	-

See explanatory notes under Table 4.

\* 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*

- 4.3.35** 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 9.

*Conservation Condition*

- 4.3.36** 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.

### *Middle Shannon Callows SPA (004096)*

#### *Brief Description*

- 4.3.38** 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*

- 4.3.39** The qualifying features of the Middle Shannon Callows SPA are set out in Table 10 below.

**Table 10: Qualifying features of the Middle Shannon Callows SPA**

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

See explanatory notes under Table 4.

\* 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*

- 4.3.40** 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 10.

#### *Conservation Condition*

- 4.3.41** 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.

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

##### *Special Protection Areas*

- 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 II. This covers the six 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 Killleglan Grassland SAC, Lough Ree SPA and the Middle Shannon Callows 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 and separately for hydrology and hydrogeology (Keohane, 2016).
- 4.5.3 The applicant's survey of the Phase II site appears to have included sufficient vantage points (if that at Lough Feacle was used to monitor the wind farm site, rather than Lough Feacle) and sufficient hours of observation from each vantage point, for the winter season. However, the survey effort appears to have fallen short of that set out in the SNH guidelines because (i) it was too narrowly focused on just one of the qualifying species; (ii) there was insufficient time spent undertaking vantage point surveys in autumn and spring; and (iii) insufficient effort was made to record birds, such as golden plover and lapwing, foraging on or near the wind farm site. This

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 II site and observed just one of the seventeen species flying over the wind farm site, whooper swan. 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;
- Disturbance through human activity is major issue affecting the whooper swan population currently, causing additional flight activity;
- On a small number of occasions each year, birds of conservation importance will interact with the proposed development site, including whooper swans flying from the Ballyglass River Callows to Lough Feacle; and
- Based on some conservative assumptions, and without considering any mitigation, one whooper swan could collide with a turbine every 20.25<sup>3</sup> years to every 30.3 years during the operation of the wind farm.

**4.5.5** 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 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 II 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) also make flights across the wind farm site from time to time, even if this is principally through the valley separating the two clusters of turbines.

**4.5.6** 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 II site is not used regularly for foraging by any of the seventeen qualifying species; (ii) that the Phase II site does not lie on a flight path that is used daily between a roosting and foraging area; (iii) the Phase II site or nearby areas may occasionally be used for foraging by some species even though this behaviour has not been recorded by the applicant and (iv) that the Phase II site may be flown over occasionally by other qualifying species even though this also was not recorded by the applicant.

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<sup>3</sup> The applicant used a number of scenarios to model collision risk. For whooper swan, the lowest figure (20.25 years) quoted here is based on flight speeds of 22.22ms<sup>-1</sup>, 100% wind farm operation, an avoidance rate of 98%, a flock size of 50 and 10 flights through the wind farm per annum and the higher figure (30.3 years) is based flight speeds of 22.22ms<sup>-1</sup>, 90% wind farm operation, an avoidance rate of 98%, a flock size of 50 and 10 flights through the wind farm per annum, with further adjustment of 25.9% which is based on whooper swan flight heights.

4.5.7 Based on the premises set out in 4.4.6 above, I set out below an assessment of the risks that the qualifying species are affected by the impacts set out in 4.3.1 above. The basic question being asked in Section 4 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

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

#### *Hydrology and Hydrogeology*

4.5.9 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 II] 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 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 until more detailed investigations have been completed, suffice to say that impacts on turlough habitats are remain uncertain. This includes the qualifying feature of ‘Waterbirds and Wetland habitats’ for the SPAs which include turloughs.

#### *Killeglan Grassland SAC (002214)*

4.5.10 The semi-natural [unimproved] calcareous grassland, on the Phase II site and that present within the Killeglan Grassland SAC were most likely once contiguous and of the same habitat type. Agricultural improvement has fragmented the grasslands but they can still be viewed as an ecological unit, with the potential for the grasslands on the Phase II site to support that at Killeglan Grassland SAC and vice versa.

4.5.11 Six of the proposed turbines are located within the semi-natural [unimproved] calcareous grassland on the Phase II site and there would also be impacts on this habitat as a result of the constriction of the access tracks. The applicant has identified 367ha of the grassland in the local area, excluding that in the SAC. A total of 3.62ha of this would initially be lost as a result of the development with about a quarter of this reinstated once construction is complete. This amount of loss would not affect the ability of this grassland to provide a supporting function for the Killeglan Grassland SAC.

4.5.12 Further investigations with respect to hydrology and hydrogeology are required in order to complete the assessment.



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*Ballynamona Bog and Corkip Lough SAC (002339)*

- 4.5.13 Further investigations with respect to hydrology and hydrogeology are required in order to complete the assessment.

*River Suck Callows SPA (004097)*

*Construction Stage - Direct impacts*

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

*Construction Stage - Indirect impacts*

*Disturbance and Displacement of Wintering Birds*

- 4.5.15 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, Rehfish, & 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.
- 4.5.16 The closest point of the River Suck Callows to the Phase II site is 2.3km 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.
- 4.5.17 However, the possibility of the birds foraging on or nearer to the Phase II site needs to be considered as it is comfortably within the potential foraging range from the River Suck Callows for all of its qualifying species. Furthermore, four of the qualifying species of the River Suck Callows have been recorded at Lough Feacle, which is 480m from the nearest proposed turbine on Phase II site and 300m from the position of the proposed anemometer, and one of the species, whooper swan, has been recorded at the Ballyglass River Callows, which is approximately 1km from the Phase II site at its nearest point. The Phase II site is clearly within the foraging range for whooper swan, wigeon, golden plover and lapwing when these species are present at Lough Feacle and for whooper swan when present at the Ballyglass River Callows. A link between the populations of these species at River Suck and those at Lough Feacle and, for whooper swan, the Ballyglass River Callows has not been established but seems likely, given the potential for all of these species to change sites during the course of the winter. In line with the precautionary principle, such a link is assumed.
- 4.5.18 The **whooper swan** feeds in inland waters and on improved pasture and arable land, typically low-lying and wet areas, such as callows, but also on drier and more elevated ground, as the photos taken by the applicant testify (ECOFAC, 2013). The Phase II site is split across two hills, with the turbine bases located between 71m ASL and 107m ASL with very little that could be described as low lying and wet. However, there are records of birds feeding in the fields to the north of Lough Feacle (location not mapped). The land around Lough Feacle is around 55m to 60m ASL which rises fairly gradually from here to the nearest proposed turbine (Turbine 16) at approximately 86m ASL and 480m distant, with the other turbines proposed on the Lough Feacle side of the wind farm being on higher ground. It is not clear at what point on this slope the grassland would cease to be used as foraging habitat by the swans but the applicant reports

that this species is generally to be found grazing within 500m of a waterbody. Foraging at such a distance from Lough Feacle would put the birds at risk of disturbance during the construction stage but it seems more likely that the birds will generally remain on lower ground closer to the Lough. On the other side of the wind farm is another site used by the whooper swan; the Ballyglass River Callows. Parts of these callows are about 1km from the Phase II site, with the ground rising similarly towards the Phase II site. Given the proximity (i.e. less than or about 1km) of Lough Feacle and the Ballyglass River Callows to the Phase II site, but still considerable distance (i.e. more than 500m), risk of disturbance and displacement during the construction stage is considered to be **low**.

- 4.5.19** There is no suitable wetland habitat on the Phase II site for **wigeon**. However, this species is known to use Lough Feacle and may forage on grassland around the Lough, perhaps to a distance of 100m away. This could bring the birds within 400m or so of the Phase II site. As this is still a considerable distance from where construction activity will take place, the risk of wigeon being disturbed or displaced during the construction stage is considered to be low, and the risk that it is the specific birds associated with the River Suck Callows are affected is likely to be **very low**.
- 4.5.20** A typical home range for a **golden plover** flock is 6 to 8km and this species is known to forage on improved 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 improved grassland within and close to the Phase II site has the potential to provide foraging habitat for golden plover, both during the day and, perhaps most likely, at night. However, the applicant has no records of this bird species on the Phase II site and there are other areas around the River Suck (and Lough Feacle) where this species may forage. On balance, the risk of displacement or disturbance of this species during the construction stage is considered to be **medium**.
- 4.5.21** 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 II site however there remains the possibility that the Phase II site, or land in proximity to it, is occasionally used as foraging habitat by this species. Like golden plover, the risk of displacement or disturbance during the construction stage is assessed to be **medium**.
- 4.5.22** **Greenland white-fronted goose** is found at the River Suck Callows, and other wetland sites locally, but there are no records of this species using Lough Feacle. This species forages at distances of up to 8km from its roost site and so this again this puts the Phase II site well within foraging range for birds associated with the River Suck Callows. 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). However, the wind farm is located on considerably higher ground (from around 70m ASL to 105m ASL) than the River Suck Callows (40 - 45m ASL) and is therefore unlikely to be used by the geese. Certainly, there are no records of them doing so. There is a small area of lower lying land about 1km from the wind farm site along the Ballyglass River Callows but there are no records of the geese using this area either (the nearest recorded location is about 4.5km distant). The risk of displacement during the construction stage is therefore considered to be **very low**.

### *Operational stage - Indirect impacts*

#### Disturbance and Displacement of Wintering Birds

- 4.5.23** Many bird species, especially in the non-breeding season, avoid the area within a wind farm and a zone around it. The degree of avoidance varies from species to species and may also be related to the size of the turbines. For large turbines, this zone could extend for up to 1km from the turbines for some species. Beyond the zone avoided by the birds almost completely may be an outer zone within which birds are present but the numbers are reduced as a result of the wind farm. As set out above, Lough Feacle is around 480m from the nearest turbine, with approximately half of this waterbody within 800m of the wind farm and the majority within 1km of the wind farm. This places Lough Feacle within a zone where disturbance and displacement of birds could occur as a result of operational wind farms. The effect may be exacerbated by the proposed anemometer which would be positioned 300m from Lough Feacle.
- 4.5.24** For **whooper swan**, the potential displacement distance from an active wind farm of large turbines is up to 800m with possible reductions in abundance beyond this distance. Lough Feacle lies partly within 800m of the nearest turbines and the Ballyglass River Callows lie just beyond 1km. The risk of displacement is therefore **medium** with some birds potentially put off using these two sites.
- 4.5.25** For **wigeon**, the potential complete displacement distance from an active wind farm of large turbines is estimated to be 500m (the average complete displacement distance recorded is 311m but this appears to be derived from turbines with a lower hub height than proposed for the Phase II wind farm). Lough Feacle is mostly beyond 500m from the turbines but there is still the potential for some birds to be displaced beyond 500m. Wigeon may also forage on the grassland around the Lough. The risk of displacement is considered to be **low**.
- 4.5.26** The assessment for golden plover, lapwing and Greenland white-fronted goose is as for the construction stage.

#### Barrier Effect

- 4.5.27** 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.
- 4.5.28** The River Suck Callows extends for 70km of which only a short section, say 4km, is in proximity to the Phase II site, the closest point being 2.3km away. Birds departing or arriving from this section of the Callows could potentially encounter the Phase II site whilst making local movements to or from other sites. The proposed wind farm is 4.2km across at its widest point, the western cluster being 2.3km and the eastern cluster being 1.4km across at their widest. The barrier effect is likely to extend at least 200m from the wind farm for most species, so increasing the figures given above to 4.6km, 2.7km and 1.8km, respectively. However, the turbines are

quite widely spaced, being separated, blade tip to blade tip, by over 400m 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.

- 4.5.29** The **whooper swan** has been recorded at most of the local wetland sites. There is a fairly regular route used by the swans through the valley between the turbines when travelling from Lough Feacle to Lough Croan Turlough. The narrowest gap between the turbines here is 850m which means that the minimum distance that a swan could be from a turbine when passing through the valley is 425m. Elsewhere, the whooper swan has been reported to make less flights through the zone which extends for 200m around the turbines than outside this zone and typically, but not always, avoid the immediate 100m around the wind turbine (Ecology Consulting, 2013). On that basis, a gap of 850m should allow the birds to continue passing through the valley unhindered, there being a 450m wide corridor which is more than 200m from the turbines.
- 4.5.30** Depending on the point of origin, the Phase II site lies on a direct path between parts of the River Suck Callows and several of the wetland sites from which it has been recorded. These are Lough Feacle, Corkip Lough, Castlesampson and Lough Ree. The minimum distance for a bird travelling from the River Suck Callows, at the point where it meets the Ballyglass River, to Lough Feacle is 5.6km currently, whereas a bird making the same journey but travelling around the wind farm site would need to cover 6.4km to 9km, depending on whether the route taken was through the valley between the turbines or around the east or west of the turbines, which is a 14% to 60% increase in the journey distance. The applicant has one record of the swans making a similar journey, with birds moving across the wind farm site from the Ballyglass Callows to Lough Feacle (and one record of the same journey being made via a different route). This particular journey would see the biggest proportional increase in journey distance if the birds detour around the wind farm and so other routes which may be taken by the swans would not be affected as much. Given the proximity of the River Suck Callows and Lough Feacle to the Phase II site and the recorded movements of swans across the wind farm site, but also taking into account the wide spacing between the turbines, the risk of a barrier effect being experienced by the River Suck population of whooper swan is considered to be **medium**.
- 4.5.31** Whilst the applicant has no records of **wigeon**, **golden plover** and **lapwing** making a journey across the Phase II site, these species also occur at the River Suck Callows and at Lough Feacle. 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 II site, the risk that these birds occasionally experience a barrier effect is considered to be **medium**.
- 4.5.32** Although the Phase II site lies on a direct route between parts of the River Suck Callows and three sites (Lough Ree, Lough Funshinagh and the Middle Shannon Callows) where the **Greenland white-fronted goose** has been recorded, these sites do not appear to be currently used by the geese, or if they do, it is only on an occasional basis. Moreover, the distance between the River Suck Callows and these sites is greater than 10km and so the extent of any detour around the Phase II is not likely to represent a significant increase in the journey distance. The risk of a barrier effect is therefore considered to be **negligible**.

## Collision

- 4.5.33** 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.
- 4.5.34** **Whooper swan** was recorded flying over the Phase II site on eight occasions by the applicant during its survey work, with one of these being across an area proposed for turbines and the remainder of the flights being through the valley, as described above. As set out in Appendix 2, 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 and Phase II wind farm sites 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 II 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 was 35m to 125m AGL at the study site) (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 Phase II site by this species to be within the area swept by the turbine rotors.
- 4.5.35** The applicant has undertaken a collision risk assessment for this species, based 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 of birds flying through the area proposed for turbines (i.e. excluding those flying through 'the valley') are of a flock size of 22 and suggest a flight frequency of four times per annum, see Appendix 2. Using these parameters, and an avoidance rate of 98%, the collision risk assessment indicates that four swans could be killed 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 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**.
- 4.5.36** **Wigeon, golden plover and lapwing** have not been recorded on or flying over the Phase II 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 II 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 II site, and how numerous these species can be in some years, 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**.

4.5.37 The Phase II site does not appear to lie on a route which might be used by the **Greenland white-fronted goose** population on even an annual basis and therefore the risk of collision with the turbines is considered to be **negligible**.

Summary Table

**Table 11: Summary of the Construction and Operational Impacts on River Suck Callows (004097)**

Species	Disturbance	Displacement	Barrier	Collision
Whooper swan	Low	Medium	Medium	Medium
Wigeon	Very low	Low	Medium	Medium
Golden plover	Medium	Medium	Medium	Medium
Lapwing	Medium	Medium	Medium	Medium
Greenland white-fronted goose (GWFG)	Very low	Very low	Negligible	Negligible

*Castlesampson Esker SAC*

4.5.38 As for Ballynamona Bog and Corkip Lough SAC.

*Lough Funshinagh SAC*

4.5.39 As for Ballynamona Bog and Corkip Lough SAC.

*Lough Croan Turlough SPA (004139)*

*Construction Stage - Direct impacts*

4.5.40 There would clearly be no direct impacts on the qualifying features of Lough Croan Turlough SPA during the construction stage, since the Phase II site and Lough Croan Turlough are separated by a distance of 4km.

*Construction Stage - Indirect impacts*

Disturbance and displacement of wintering birds

4.5.41 Lough Croan Turlough lies well beyond the distance (considered to be up to 1km) 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 II site.

4.5.42 One of the qualifying species at Lough Croan Turlough, **shoveler**, occurs at its highest concentrations locally at Lough Croan Turlough during the winter period. However, it has also been recorded at Lough Feacle which is nearer than 1km but still around 480m from the Phase

II site. As this species is aquatic, the risk of disturbance and displacement during the construction stage is **low**.

- 4.5.43** For golden plover and Greenland white-fronted goose, the risks are as set out under the River Suck Callows.

#### *Operational stage - Indirect impacts*

#### Disturbance and displacement of wintering birds

- 4.5.44** The risks of disturbance and displacement during the operational stage for the three qualifying species is essentially the same as for the construction stage.

#### Barrier Effect

- 4.5.45** The Phase II site lies on a direct route between Lough Croan Turlough and each of the following sites: Lough Feacle, Corkip Lough, parts of the River Suck Callows and parts of the Middle Shannon Callows. However, any birds moving between these sites would be able to make use of the valley between the two clusters of turbines, which creates a clear pathway between Lough Croan Turlough and all of these sites and those further to the south. This means that any detour made by birds using this route is not likely to represent a significant increase in the journey distance.

- 4.5.46** As set out above, **shoveler** has been recorded at Lough Feacle and so this species could experience a barrier effect if making local movements between Lough Croan Turlough and Lough Feacle. As described for whooper swan, any birds making this journey could make use of the valley between the two clusters of turbines, rather than make a complete detour around the wind farm. This species may also encounter the Phase II wind farm if Lough Croan Turlough is being used as a staging post by birds which spend part of winter further south. The pattern of migration for this species is not well understood (Arzel, Elmberg, & Guillemain, 2006) and this species has been recorded moving on to other sites elsewhere, especially during periods of cold weather. In this event, a detour around the Phase II site would not add significantly to the journey. The risk of shoveler experiencing a barrier effect is therefore **very low**.

- 4.5.47** While **golden plover** moving directly from Lough Croan Turlough to any other site are unlikely to experience a barrier effect, as described in paragraph 4.5.45 above, there is the possibility of this population experiencing a barrier effect if it associates with the population found at the River Suck Callows, as described in paragraph 4.5.31. Given the degree of separation, the risk that the population associated Lough Croan Turlough experiences a barrier effect is considered to be **low**.

- 4.5.48** As the Phase II site does not appear to lie on a route which might be used by the **Greenland white-fronted goose** population on even an annual basis, the risk of this species experiencing a barrier effect is considered to be **negligible**.

#### Collision

- 4.5.49** As set out in paragraph 4.5.46 above, **shoveler** which move between Lough Croan Turlough and Lough Feacle and which stopover at Lough Croan Turlough while on migration to or from sites

further south could encounter the Phase II wind farm site. Neither behaviour has been recorded by the applicant. However, 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). 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 II site if the birds cross the wind farm site.

**4.5.50** As the Phase II site lies 4km from Lough Croan Turlough, and the birds could depart in any direction, the probability of any birds encountering the Phase II site during migratory flights seems to be low and at least most of those which encounter the wind farm site would be expected to avoid collision with a turbine. The risk that a small number of shoveler arriving at or leaving Lough Croan Turlough collide with a turbine at the Phase II site over the 25 years of the operational stage is therefore **very low**. There are no flight lines on which to base a collision risk assessment and the applicant has not provided such an assessment.

**4.5.51** The risks of collision for **golden plover** and the **Greenland white-fronted goose** are as set out under River Suck Callows.

#### Summary Table

**Table 12: Summary of the Construction and Operational Impacts on Lough Croan Turlough (004139)**

Species	Disturbance	Displacement	Barrier	Collision
Shoveler	Low	Low	Very low	Very low
Golden plover	Medium	Medium	Low	Medium
GWFG	Very low	Very low	Negligible	Negligible

#### *Four Roads Turlough SPA (004140)*

##### *Construction Stage - Direct impacts*

**4.5.52** 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

**4.5.53** Four Roads Turlough SPA is located 7.5km away from the Phase II site and is therefore well beyond the distance at which birds using the SPA are likely to be disturbed as result of construction activity. The Phase II site is at the end of the potential foraging range for the two qualifying bird species of Four Roads Turlough, golden plover and Greenland white-fronted goose, which means that any birds roosting at Four Roads Turlough are unlikely to range as far as the Phase II site.

**4.5.54** **Golden plover** is a highly mobile species which is known to change sites elsewhere during the winter and so it is more than possible that there is some association between populations found



at Four Roads Turlough, Lough Croan Turlough, the River Callows and Lough Feacle. The potential for displacement is therefore as set out under the River Suck Callows, i.e. **medium**.

- 4.5.55** It is near certain that it is one **Greenland white-fronted goose** flock that uses the Four Roads Turlough, Lough Croan Turlough and the River Suck Callows. Therefore, the assessment for Four Roads Turlough SPA is the same as that set out for these species at the River Suck Callows, with respect to construction activity i.e. **very low**.

*Operational stage - Indirect impacts*

**Disturbance and Displacement of Wintering Birds**

- 4.5.56** As for the construction stage.

**Barrier Effect**

- 4.5.57** Four Roads Turlough lies 1.6km to the north west of Lough Croan Turlough. Given the closeness of these two sites, the assessment of barrier effects for golden plover and Greenland white-fronted goose is as set out for Lough Croan Turlough.

**Collision**

- 4.5.58** 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 13: Summary of the Construction and Operational Impacts on Four Roads Turlough (004140)**

Species	Disturbance	Displacement	Barrier	Collision
Golden plover	Medium	Medium	Low	Medium
GWFG	Very low	Very low	Negligible	Negligible

**Lough Ree SPA (004064)**

*Construction Stage - Direct impacts*

- 4.5.59** There would be no direct impacts on Lough Ree SPA.

*Construction Stage - Indirect impacts*

**Disturbance and Displacement of Wintering Birds**

- 4.5.60** The closest point of Lough Ree to the Phase II site is 8.5km away and therefore well beyond the distance at which any qualifying species present would experience disturbance and displacement from construction activity. The Phase II site is also beyond the likely foraging range of for these species while they are using Lough Ree.

- 4.5.61** Lough Ree has thirteen qualifying species of bird altogether, of which eight have been recorded at Lough Feacle, which is much closer to the Phase II site. These species are whooper swan, wigeon, teal, mallard, tufted duck, coot, lapwing and golden plover. It is not known if the Lough Ree populations are linked to those recorded more locally to the Phase II site but it is a possibility and in line with the precautionary principle should be assumed. A further two of the Lough Ree qualifying species have been recorded at waterbodies closer to the site, these are little grebe and shoveler. The nearest recorded location for these two species is Lough Croan Turlough. The remaining three species are not known to occur at waterbodies closer to the Phase II site.
- 4.5.62** The **little grebe** is not known to use waterbodies within 1km of the Phase II site and so the risk of disturbance and displacement during the construction stage is **negligible**.
- 4.5.63** An assessment for **whooper swan** is set out under the River Suck Callows where the risk of displacement was considered to be medium. However, given the degree to which Lough Ree is removed from the Phase II site, the risk that the specific birds associated with Lough Ree experience displacement is likely to be **low**.
- 4.5.64** An assessment for **wigeon** is also set out under the River Suck Callows and the conclusion was that the risk of displacement for this species was **very low**. The same assessment applies to **teal, mallard, tufted duck** and **coot** although these last three species at least are generally tolerant of human activity and so the risk is even lower.
- 4.5.65** An assessment for **shoveler** is set out under Lough Croan Turlough with the conclusion that the risk of disturbance during the construction stage is low. Given the degree to which Lough Ree is removed from Lough Feacle, the risk of disturbance and displacement of the specific birds associated with Lough Ree during the construction stage is **very low**.
- 4.5.66** The risks of displacement for **golden plover** and **lapwing** are as set out under the River Suck Callows, although the risks that birds associated with Lough Ree are affected is lower than stated due to the degree of separation.

*Operational stage - Indirect impacts*

**Disturbance and Displacement of Wintering Birds**

- 4.5.67** Displacement of birds from Lough Feacle and the surrounding area needs to be considered, as these birds may be linked to the Lough Ree populations. For **whooper swan, wigeon, golden plover** and **lapwing**, the assessment is as set out for the River Suck Callows, albeit that the level of risk is reduced to **very low for wigeon and low for all the other species**.
- 4.5.68** For **little grebe** the assessment is as for the construction stage i.e. **negligible**.
- 4.5.69** **Teal, mallard, tufted duck, shoveler** and **coot** may experience disturbance and displacement when present at Lough Feacle. Average complete displacement distances from wind farms are available for mallard and tufted duck and these are 161m and 219m respectively. The average complete displacement distances are likely to be in a similar order for teal, shoveler and coot. However, these distances draw on studies which include wind farms comprised of smaller

turbines. As those proposed at Phase II are large turbines, complete displacement distances are likely to be above average. On that basis, complete displacement could be expected in zone extending to, say, 500m around the wind farm for these species. There is also a probability that bird numbers are reduced at greater distances. Lough Feacle is approximately 480m distant from Phase II (or 300m if the proposed anemometer is included), although most of the Lough is greater than 500m distant. Therefore, we would not expect these species to be displaced completely from Lough Feacle as a result of the Phase II wind farm but there is a risk of partial displacement. Given the degree of separation between Lough Ree and Lough Feacle, the risk that the specific populations associated with Lough Ree are affected is considered to be **very low**.

#### Barrier Effect

- 4.5.70** The Phase II site does not lie on a direct path between Lough Ree and most of the other waterbodies present in the locality. The exception being a small section of the River Suck Callows and Lough Feacle, from the northern half of Lough Ree only. Any detour made by the birds to avoid the Phase II 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.
- 4.5.71** Again, eight of the qualifying species for Lough Ree have been recorded closer to the Phase II site at Lough Feacle. If these populations are linked and these birds also move between, say, the River Suck Callows and Lough Feacle then there is a possibility of the barrier effect for the Lough Ree populations. The qualifying species of Lough Ree which have been recorded at both River Suck Callows and Lough Feacle are whooper swan, wigeon, teal, mallard, coot, golden plover and lapwing. Tufted duck has not been recorded at the River Suck Callows however it has been recorded at both Lough Feacle and Lough Croan Turlough.
- 4.5.72** Assessments have already been provided, under the River Suck Callows, for whooper swan, wigeon, golden plover and lapwing, although given the degree to which Lough Ree is removed from the Phase II site, the risks of any barrier effect acting on the Lough Ree population must be lower than stated for the other sites considered above.
- 4.5.73** The Phase II site does not lie on a direct path between any of the wetland sites used by **little grebe**. The risk that this species experience a barrier effect is therefore **negligible**.
- 4.5.74** **Teal** occurs in large numbers locally and is a species which is generally known to be mobile. This species may cross the Phase II site occasionally, in the same manner as whooper swan, and therefore could experience a barrier effect. **Mallard** and **coot** are less numerous locally and are generally more sedentary and so perhaps less likely to make occasional flights over the Phase II site. Taking into account the degree of separation between Lough Ree and the Phase II site, the risks of the specific Lough Ree populations of these three species experiencing any barrier effect whilst making local movements is considered to be **very low**.
- 4.5.75** **Shoveler** and **tufted duck** has been recorded at both Lough Croan Turlough and Lough Feacle but not the River Suck Callows. As set out previously, the direct route between Lough Croan Turlough and Lough Feacle passes through the gap, or valley, between the two clusters of

turbines. The risk that this species experiences a barrier effect is therefore considered to be **negligible**.

**4.5.76** 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 or depart to their breeding (if a wintering species at Lough Ree) or wintering grounds (if a breeding species at Lough Ree) from Lough Ree in either a northerly, the easterly or southerly direction and would therefore not encounter the Phase II wind farm while on migration. 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 II site, the probability of any of these birds (including **common scoter**, **goldeneye** and **common tern**) encountering the Phase II 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

**4.5.77** Assessments for whooper swan, wigeon, golden plover and lapwing have already been provided under the River Suck Callows and an assessment for shoveler has been provide under Lough Croan Turlough. Once again the risks to the Lough Ree population are likely to be lower than is stated in these assessments due to the degree to which the Phase II site is separated from Lough Ree.

**4.5.78** Any **little grebe** moving directly between Lough Ree and Lough Croan Turlough would not encounter the Phase II site and so only birds moving on from Lough Croan (or less likely Lough Ree) to wintering sites elsewhere could potentially encounter the Phase II site. Moreover, 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**.

**4.5.79** **Teal** occurs in quite high numbers locally and these birds appear to make local movements between waterbodies during the winter season and make migratory movements through the local area. As this species occurs at both the River Suck Callows and Lough Feacle, movements between these sites and others could take birds across the Phase II site. Ducks are generally considered to be at risk of collision with turbines (Langston & Pullan, 2004) and therefore this species could be at risk if it passes through 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**.

**4.5.80** As with teal, **mallard** appear to make local movements between the wetland sites. This species could also be at risk if it flies through the wind farm site. However, as this species is infrequent locally, 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**.

**4.5.81** **Shoveler** moving between Lough Croan Turlough and Lough Feacle would be expected to make use of the valley between the turbines and therefore the risk of collision is **negligible**.

**4.5.82** **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**.

**4.5.83** 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 II site while making longer migratory movements are very low and therefore the risk of collision for these birds is **negligible**.

*Summary Table*

**Table 14: Summary of the Construction and Operational Impacts on Lough Ree (004064)**

Species	Disturbance	Displacement	Barrier	Collision
Little grebe	Negligible	Negligible	Negligible	Negligible
Whooper swan	Low	Low	Low	Very 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	Negligible	Negligible
Tufted duck	Very low	Very Low	Negligible	Negligible
Common Scoter	Negligible	Negligible	Negligible	Negligible
Goldeneye	Negligible	Negligible	Negligible	Negligible
Coot	Very low	Very Low	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*

**4.5.84** There would be no direct impacts on the Middle Shannon Callows SPA during the construction stage.

*Construction Stage - Indirect impacts*

*Disturbance and Displacement of Wintering Birds*

**4.5.85** The closest point of the Middle Shannon Callows to the wind farm site is 11.8km 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 II site is well beyond the foraging range of any of the qualifying species while roosting within the Middle Shannon Callows.

**4.5.86** Once again, displacement and disturbance could only occur if these populations also use sites much closer to the Phase II site. Of the eight qualifying species of the Middle Shannon Callows, six have been recorded at wetland sites closer to the Phase II 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, under the River Suck Callows, although the level of risk for the Middle Shannon Callows populations will be lower than stated for the River Suck Callows.

**4.5.87** The nearest recorded location for **black-tailed godwit** is Lough Feacle, although it is recorded there infrequently. The black-tailed godwit is a wetland species and there is no suitable habitat on the Phase II site meaning that this species is likely to remain close to the Lough when present. The risk of displacement for black tailed godwit during the construction stage is therefore considered to be **very low**.

**4.5.88** Although the applicant has no records of **black-headed gull** using the Phase II site, seven birds were recorded flying overhead in 2009 and some of the habitat on the site is suitable for this common and, during the winter, widespread species. Even if it does use the Phase II 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**.

#### *Operational stage - Indirect impacts*

#### Disturbance and Displacement of Wintering Birds

**4.5.89** Assessments for whooper swan, wigeon, golden plover and lapwing have already been provided, under the River Suck Callows, although the risks must be lower given the degree to which the Middle Shannon Callows are removed from the Phase II site.

**4.5.90** The average complete displacement distance is not readily available for **black-tailed godwit** and so this is assumed to be similar to that for other wader species, which have an average of 221m. As noted above, the proposed turbines are larger than average and therefore the complete displacement distance is likely to be above average. Complete displacement therefore could be expected be say 500m but, as above, there may be a reduction in numbers beyond this distance. Lough Feacle is approximately 480m from the nearest turbine at the Phase II site but most of the Lough is beyond 500m. There is clearly a risk of partial displacement from Lough Feacle during the operational stage but, due to the degree of separation, the risk to the Middle Shannon Callows is considered to be **low**.

**4.5.91** The **black-headed gull** is not susceptible to displacement by wind farms and therefore the risk to this species from displacement is **negligible**.

#### Barrier Effect

- 4.5.92** The Phase II site does not lie on a direct path between the Middle Shannon Callows and most of the other waterbodies present in the locality. The exceptions being Four Roads Turlough and Lough Croan Turlough, for the section of the Middle Shannon Callows between Banagher (R356 bridge) and Clonmacnoise. A detour to avoid the wind farm by any birds flying from the Middle Shannon Callows to either of the other two sites 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 under the River Suck Callows above; whooper swan, wigeon, golden plover and lapwing.
- 4.5.93** **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 II site lies between Lough Feacle and both Four Roads Turlough and Lough Croan Turlough, however, the valley between the two turbine clusters would enable direct passage along the direct route between these wetland sites and in any case any detour to avoid the wind farm would not add significantly to the journey distance. However, this species has also been recorded at the River Suck Callows and it is possible that birds moving between a section the River Suck Callows and Lough Feacle will make a detour around the wind farm site. Given the small numbers recorded at Lough Feacle and the degree to which these sites are removed from the Middle Shannon Callows, the risk of a barrier effect on the Middle Shannon Callows population is **very low**.
- 4.5.94** **Black-headed gull** has been recorded in reasonable numbers at most of the waterbodies locally including Lough Croan Turlough, Four Roads Turlough and Lough Feacle and it has also been recorded flying over at VP2 which is within the Phase II 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.
- 4.5.95** The probability of birds on migration, including **corncrake**, to or from the Middle Shannon Callows encountering the Phase II 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

- 4.5.96** Assessments of collision for whooper swan, wigeon, golden plover and lapwing have already been provided, under the River Suck Callows, although the risks must be lower given the degree to which the Middle Shannon Callows are separated from the Phase II site.
- 4.5.97** As described above under barrier effect, it is only any **black-tailed godwit** moving between parts of the River Suck Callows and Lough Feacle which are likely to encounter the Phase II wind turbines, since direct routes between other sites used by this species pass through the valley between the two clusters of turbines. Given that this species is relatively uncommon at Lough Feacle, 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**.
- 4.5.98** Gulls are among the most frequently recorded victims of collisions with turbines which must be a reflection of their abundance and lack of macro-avoidance behaviour. As the **black-headed gull** is fairly numerous locally, is likely to make local movements between sites and has previously been recorded from VP2 which is within the Phase II site, there is a risk that a small number

collide with a turbine over the 25 years of the operational stage. Given the degree of separation between the Phase II site and the Middle Shannon Callows, the risk that for the Middle Shannon population specifically is judged to be **low**.

**4.5.99** 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 15: Summary of the Construction and Operational Impacts on Middle Shannon Callows (004096)**

Species	Disturbance	Displacement	Barrier	Collision
Whooper swan	Low	Low	Low	Very 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
Black-tailed godwit	Very Low	Low	Very low	Negligible
Black-headed gull	Negligible	Negligible	Negligible	Low



## 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 II 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 I are all within a 25km radius of the Phase II site and therefore should be considered for cumulative effects.

**Table 16: Summary of projects considered for 'in-combination' effects**

	Seven Hills Phase II	Seven Hills Phase I	Skrine	Sliabh Bawn	TOTAL
No. of Turbines	19	16	2	20	57
Wind farm size	400ha	200ha	40ha?	833ha	1473ha
Habitat Types	Grassland	Grassland	Grassland	Woodland	-
SPAs within 15km or so of wind farm and also the Phase II 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	-

- 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.

### *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 use 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. At the moment, there are no certain<sup>4</sup> records of golden plover or lapwing using any of this land for foraging but given its proximity to two wetland sites used by these species, it seems 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 number 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 II 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 is unlikely.

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<sup>4</sup> There are records of golden plover feeding in fields to the north of proposed turbines at the Phase I site but it is unclear at what distance

## 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 for Phase II. This considered the potential effects of the development in light of the mitigation measures proposed by the applicant. This contrasts 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 4.6 and 4.7. 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 a 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 operational 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. 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 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. 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<sup>5</sup>.

**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 4.6 and 4.7?
- 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, 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.

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<sup>5</sup> Population declines are often detected in less favourable areas first.

### *River Suck Callows SPA (004097)*

- 4.7.12** Two of the qualifying species at the River Suck Callows appear to have populations significantly above the Baseline Reference Value and are therefore in favourable condition. These are whooper swan and wigeon.
- 4.7.13** The whooper swan was assessed as being at low risk of disturbance during construction, medium risk displacement during operation and of experiencing a barrier effect, and medium risk of collision. 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 operating period. The population is above the Baseline Reference Value (by 63 individuals) but 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 numbers will remain above the Baseline Reference Value. Therefore, without mitigation there is **a very low risk that the Phase II wind farm, alone and in combination, would contravene the conservation objectives for whooper swan at the River Suck Callows (i.e. it is uncertain).**
- 4.7.14** Wigeon was assessed as being at very low risk of disturbance, low risk of displacement, medium risk of experiencing a barrier effect and 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 (by 1654 birds). Therefore any low level mortality arising from the wind farm, even if 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 II wind farm would **not interfere with the conservation objectives for wigeon.**
- 4.7.15** The golden plover population at the River Suck Callows was assessed as being at medium risk of disturbance, displacement, experiencing a barrier effect and collision, both as a result of the Phase II development on its own and in combination with the other developments. 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 the River Suck Callows 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 II wind farm would contravene the conservation objectives for golden plover (i.e. it is uncertain).**
- 4.7.16** The lapwing population was assessed as being at medium risk of disturbance, 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 II wind farm interferes with the conservation objectives for lapwing (i.e. it is uncertain).**
- 4.7.17** For **Greenland white-fronted goose**, the risks of disturbance and displacement are very low and the risks of a barrier effect and of collision at the Phase II site are negligible. Although this

species is apparently in unfavourable condition, the risks of mortality associated with the Phase II wind farm are so low that it is possible to conclude that the Phase II wind farm would **not interfere with the conservation objectives** for this species.

*Lough Croan Turlough SPA (004139)*

- 4.7.18 The shoveler population at Lough Croan Turlough was assessed as being at low risk of disturbance and displacement when present at Lough Feacle and very low risk of experiencing a barrier effect and collision with a turbine as a result of the Phase II wind farm, alone and in combination with other developments. The population of this species is apparently in unfavourable condition at Lough Croan Turlough although numbers above the Baseline Reference Value have been present recently. The risk of mortality associated with the Phase II wind farm are low enough that it can be concluded that **the Phase II wind farm would not contravene the conservation objectives for shoveler.**
- 4.7.19 The conclusion for golden plover is the same as that set out for the River Suck Callows i.e. there is **a medium risk that the Phase II wind farm would contravene the conservation objectives for golden plover (i.e. it is uncertain).**
- 4.7.20 The conclusion for **Greenland white-fronted goose** is also the same as for the River Suck Callows i.e. the Phase II wind farm would **not interfere with the conservation objectives** for this species.

*Four Roads Turlough SPA (004140)*

- 4.7.21 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 the River Suck Callows above.

*Lough Ree SPA (004064)*

- 4.7.22 The little grebe population is assessed as being at negligible risk from the Phase II wind farm and therefore it can be concluded that the Phase II 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 II 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 risks were all assessed to be very low. The population of these species at Lough Ree is apparently in unfavourable condition. It is not known whether any additional mortality associated with the wind farm would be additive or compensatory and therefore it is uncertain whether such mortality would interfere with the conservation objectives for Lough Ree. However, the risk of such mortality over the 25

year period directly affecting the Lough Ree population is so low that we can safely conclude that the Phase II 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 of negative effects were either very low or negligible. The population associated with Lough Ree is apparently in unfavourable condition, however, given the very 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, there is a very low risk of disturbance and displacement of birds from Lough Feacle. However, very small numbers of this species have been recorded there and given the apparent favourable condition of the Lough Ree population, it can be concluded that the Phase II wind farm **would not contravene the conservation objectives for tufted duck at Lough Ree.**
- 4.7.28** For **common scoter and goldeneye**, the risks of mortality associated with the wind farm 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 II wind farm **would not contravene the conservation objectives for coot.**
- 4.7.30** The assessment for **golden plover** and **lapwing** are as for the River Suck Callows albeit that the **risk of contravening the conservation objectives is low** rather than medium.
- 4.7.31** The final species, **common tern**, the risks are negligible and therefore the Phase II wind farm **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 is the same as that set out for Lough Ree.
- 4.7.35** For **black-tailed godwit**, the risks were assessed to be very low for disturbance and low for displacement (while using Lough Feacle), very low for barrier effect and negligible for collision. This species population is in unfavourable condition and given the more sporadic occurrence of this species on wetland sites closer to the wind farm, the link between these birds and the Middle Shannon Callows seems more likely than for the populations of the other qualifying species of the Middle Shannon Callows. The risks identified above are unlikely to translate into mortality of individuals, much less have any effect on the population at the Middle Shannon Callows. Therefore it can be concluded that **the conservation objectives for this species would not be contravened by the Phase II development.**

4.7.36 For the population of black-headed gull associated with the River Shannon Callows, the risks were considered to be negligible for disturbance, displacement, and experiencing 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 II wind farm contravenes the conservation objectives** for this species.

#### 4.8 Step Four: Mitigation Measures

##### *Development Layout*

4.8.1 In order to reduce impacts on whooper swan moving between Lough Feacle and Lough Croan Turlough, the layout of the development includes a gap between two clusters of turbines on the direct route between these two sites. This arrangement should also have the effect of reducing potential impacts on other qualifying species moving between the two sites.

##### *Construction Management*

4.8.2 The applicant sets out measures to control pollution, noise and waste in section 4.3.1.1, pages 86 to 90 of the 2012 AA report for Phase II. It is accepted that good construction practice can adequately control risks to the SACs and SPAs. This can be ensured through appropriate planning conditions, subject to more detailed assessment on hydrology.

4.8.3 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 is 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 22), where a construction period of 12 -18 months is given, so clarification of the applicant's intentions is required.

##### *Turbine Design*

4.8.4 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*

4.8.5 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 93 to 94 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.

4.8.6 NPWS have 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 demonstrate that the system will work as described by the applicant. However, 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 bird fatalities at wind farms 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*

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

#### *Grassland Management Plan*

- 4.8.8 The applicant has prepared a management plan (Appendix G of the June 2012 Request for Further Information Response) which deals with the management of the grasslands within the Phase II site. Such a management plan could, indirectly, have a beneficial effect on the Killeglan grasslands. However, the management plan as drafted is not sufficient to achieve such a benefit.

#### 4.9 *Conclusions on Site Integrity*

- 4.9.1 The Phase II 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 II 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 II 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 Lough Feacle (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, the overall risk that the conservation objectives are contravened, taking into account the mitigation proposed by the applicant, is considered to be low to medium. The highest risk lies with golden plover and lapwing at the River Suck Callows. There are lower risks that the conservation objectives for wigeon (at Lough Ree) and black-headed gull (at the Middle Shannon Callows) are contravened, because these species also make use of Lough Feacle, which is less than 1km from the proposed turbines. The principal reason that a 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 II on its own). This species also makes use of Lough Feacle but its population at the River Suck is in favourable condition.

**4.9.6** The risk of contravening the conservation objectives of any SPA is lower for the Phase II site than for the Phase I site. This is because the Phase II site is further from an SPA and a corridor has been created between the two turbine clusters that make up the Phase II site, enabling birds to travel between Lough Croan Turlough and Lough Feacle without encountering the wind turbines.

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

- 1. Undertaking additional survey work at the Phase II 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 II 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 turbines which are proposed to be within 800m, or the four turbines within 1km, of Lough Feacle, and removing or moving the anemometer which is proposed within 300m of Lough Feacle;
- 5. 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.
- 6. Committing to measures to improve the conservation condition of the qualifying species at the Natura 2000 sites in order to improve the resilience of these populations.

**4.9.8** My view is that the fifth 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.

**4.9.9** My view is that the sixth 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.

**4.9.10** This sixth 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 200 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.

**4.9.11** 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.

**4.9.12** 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) have 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, 2010/11 and 2011/12 and the method chosen 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 II 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. 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 during the survey work and not observed, rather than simply not recorded.

The more recent surveys in the winters of 2012/13 (for Phase I) 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 II 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.

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 in the winters of 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.

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

**Table A1: Summary of bird survey work undertaken by the applicant to inform the assessment for Seven Hills Wind Farm Phase II**

Title	Period	No. of days	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
Late Summer/Autumn Bird Survey 2008	Jul - Sep	6	<p>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 (VP2) inside the wind farm site with four others elsewhere). Target species apparently not selected and no flight lines etc recorded or presented.</p> <p>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 II site over the summer/autumn.</p>	<p>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.</p>
Winter Bird Survey 2008/9	Nov - Feb	16	<p>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.</p> <p>Total survey time: Unclear but seemingly as little as 5hrs 20mins (1VP for 20mins on 16 occasions) spent at the Phase II site over the whole winter period, and the same amount of time spent at each of Lough Croan Turlough and Coolagary/Cuilleenirwan Lough.</p>	<p>At least 36 hours of observation at each VP overlooking the wind farm site (October - March), minimum of one year.</p> <p>Target/secondary species to be recorded as above.</p> <p>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.</p>
Spring/Summer Breeding Bird Survey 2009	Apr - June	6	<p>Walkover survey radiating out from the VPs (number and location unspecified) used in winter plus casual observations</p>	<p>For spring migration, at least 36 hours of observation at each</p>

Title	Period	No. of days	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
			<p>made while driving from [vantage?] point to [vantage?] point. Target species apparently not selected and no flight lines etc. recorded or presented.</p> <p>Total survey time: Unclear but it seems that surveys from VPs were not made.</p>	<p>VP overlooking the wind farm site (March - mid-May), minimum of one year.</p> <p>Target/secondary species to be recorded as above.</p>
Whooper Swan Surveys 2009/10	Oct - Apr	13.5	<p>Observations from two VPs located within the wind farm site and a third VP at Lough Feacle, 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.</p> <p>Total survey time at each VP<sup>6</sup>: 52hours 30minutes (3hours 45minutes x 13.5).</p>	<p>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 (October - March) for a minimum of one year.</p> <p>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.</p>
Whooper Swan Surveys 2010/11	Nov - Feb	7.5	<p>As above.</p> <p>Total survey time at each VP: 28hours (3hours 45minutes x 7.5).</p>	As above.
Whooper Swan? Surveys 2011/12, referred to in Appendix 7 of the June 2012	Dec - Feb	6	<p>Methods not known but most likely as above. The survey report has not been submitted in support of the application.</p>	As above.

<sup>6</sup> 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 days	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
AA report but report not submitted			Total survey time at each VP: 22hours 30minutes (3hours 45minutes x 6).	
Wintering Bird Survey 2012/13 (for the Phase I site however the results are relevant)	Jan - Mar	14	<p>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.</p> <p>Total survey time: Fourteen days of survey (so 4 - 5 days per month) were undertaken by two or three surveyors, including 50 hours survey time from 'primary' VPs located at the wetland sites.</p>	As above.
Wintering Bird Survey Oct 2014 to March 2015	Oct - Mar	16	<p>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.</p> <p>Sixteen days of survey (so 2 - 3 days per month) were undertaken by two surveyors (minimum), including 70 hours survey time from 'primary' VP's.</p>	<p>A minimum of 36 hours per year in the non-breeding season from each VP, with additional survey work during migration periods if needed<sup>7</sup>.</p> <p>Feeding distribution surveys on a fortnightly basis of the wind farm site and 500m beyond<sup>8</sup>.</p> <p>Any known roost sites within 1km of the proposed wind farm should be</p>

<sup>7</sup> 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.

<sup>8</sup> 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.

Title	Period	No. of days	Applicant's Method	Summary of available SNH Guidelines for wintering & migratory waterfowl (SNH, 2005; SNH, 2014)
				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 land within a loop around 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.

During the first three seasons of survey, it seems that there was just one VP in the Phase II wind farm site, located towards the centre of the western part i.e. the same location used for the whooper swan surveys and labelled as VP2 on Figure 2 of the Baseline Ornithological Assessment for Phase II (FERS, 2011)). Furthermore, 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, there were three VPs located around the Phase II site for the whooper swan survey. Provided that these were all focused on the wind farm site (rather than over Lough Feacle, as one of them may well have been) then these would appear to have been adequate in number to have covered the whole site. Their position does not quite correspond to the guidance given in the SNH guidelines, however, the arrangement is close enough.

**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-needing 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 at 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. Therefore, 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 would appear to have been the only survey which comes close to the SNH methodology for VP watches over the wind farm site.

The time spent at the VP was 52hours 30minutes in year one, 28hours in year two and 22hours 30minutes in year three. If the latest SNH guidelines are used as the benchmark<sup>9</sup>, then the minimum per VP was exceeded in year one and not achieved in year two or three. The average of the three is 34hours which is just under the minimum specified per year of survey. As three years of surveys were undertaken, rather than two, the survey time could be judged to have met the minimum standards if all three VPs were focused on the wind farm sites and adequate data was collected during the spring and autumn migration periods.

The surveys in 2013 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 guidelines, and would better be considered as feeding distribution and roosting site surveys which were focused on the Natura 2000 sites and other local waterbodies.

#### *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 three years of survey, it is not clear to how much effort was expended on locating the foraging and roosting sites of the qualifying species within the wind farm site. Certainly, it would not have been possible to see the whole of the wind farm site, at ground level, from VP2. 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 2012/13 (for Phase I) and 2014/15 undertaken by the applicant appear to have been designed to address this deficiency. These surveys were focused 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

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<sup>9</sup> 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 spring and autumn surveys are included then the survey effort again falls short by up to 56hours of observations.



two surveyors undertaking a 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 wetland 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.

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<sup>10</sup> 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 VPs were conducted over the wind farm site and for which we have data was more than four years ago. This data is therefore aged and may not reflect the current situation.

#### *Conclusion on Bird Survey Effort*

It seems that the survey effort on and around the development site is broadly in line with the standards set out in the SNH guidelines except for:

- The narrow focus of the surveys on whooper swan, rather than all qualifying species, during the VP watches over the wind farm site;
- 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 (to 1km).

In addition, no, or limited, information has been presented by the 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.

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<sup>10</sup> The applicant is instead relying on the topography, with birds preferring low lying areas, and wind farm avoidance behaviour by the birds.

## 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, 2015c), 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 the 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, 2015c). 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 II site:** Recorded in and around the survey area during the winter and breeding seasons but specific location not given (FERS, 2011). Assumed to be off-site as this species is aquatic.

**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, & Rehfish, 2009).

**Vulnerability to population effects at the SPAs were a qualifying feature:** The population at Lough Ree is very small and apparently declining. The site synopsis describes this population as resident however the BRV appears to be derived from 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, 2015c), 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) (Pennycuik, 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, 2015c). 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 have 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 II site:** Whooper swan has been observed passing through 'the valley' which separates the two clusters of turbines on the Phase II site. The observations made by the applicant are as follows:

- 17<sup>th</sup> December 2009 - Seven swans flying through valley at heights of 10 - 20m AGL (FERS, 2011);
- 1<sup>st</sup> February 2010 - 17 swans flying through valley at heights of 10 - 20m AGL (FERS, 2011);

- 3<sup>rd</sup> February 2011 - six swans flying through valley at heights of 5 - 15m AGL (FERS, 2011);
- 12<sup>th</sup> December 2011 - four swans flying through valley at heights of 5 - 15m AGL (ECOFACT, 2012b);
- 13<sup>th</sup> February 2012 - five swans in total flying through valley, three at heights of 5 - 15m AGL (ECOFACT, 2012b);
- 14<sup>th</sup> February 2012 - six swans in total flying through valley, three at heights of 5 - 15m AGL (ECOFACT, 2012b);
- 17<sup>th</sup> February 2015 - seven swans in total flying from Ballyglass River Callows to Lough Feacle, apparently through the valley (ECOFACT, 2015c)

In addition, on 5<sup>th</sup> March 2015, a flock of 22 swans were observed passing through the western part of the Phase II site (i.e. through the area of proposed turbines) while moving from the Ballyglass River Callows to Lough Feacle.

So it can be inferred from these results that an average of approximately 7.55<sup>11</sup> whooper swans pass through 'the valley' an average of once every 6 days<sup>12</sup> during the winter season. This equates to around 30<sup>13</sup> days per season and 226<sup>14</sup> swan movements through the valley per year, assuming a season lasts for six months. However, the survey methods may have led to under-estimation of the number of swans passing through this valley, particularly in relation to the 2014/15 survey (see Appendix 1). The minimum gap between the turbines on either side of this valley is approximately 850m (blade tip to blade tip) and so the maximum distance a bird flying through the valley could be from the turbines is 425m.

Flights through the areas proposed for turbines appear to be much less frequent with one observation in 43 days of survey, equivalent to 4 flights per season and, based on a flock size of 22 birds, 88 flights per annum.

This species has also been observed grazing in fields to the north of Lough Feacle (ECOFACT, 2013), the specific location is not given but could be 400m to 550m from the nearest turbine location.

**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). Other have assessed this species as being at potential risk of displacement and collision (EC, 2011).

The 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).

<sup>11</sup>  $(7+17+6+4+5+6)/6 = 7.55$

<sup>12</sup>  $(13.5+7.5+6+16)/7 = 6.14$

<sup>13</sup> Season = 180 days;  $180/6 = 30$

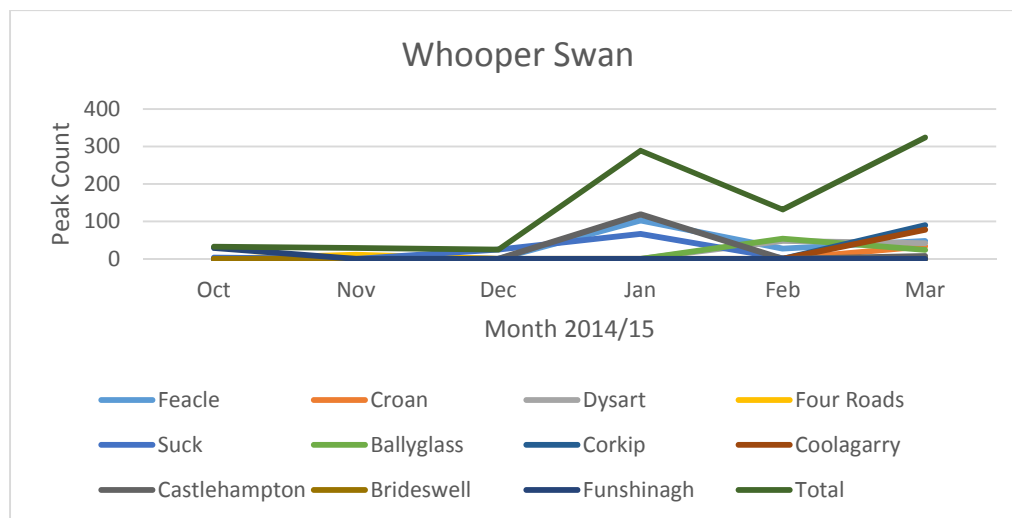
<sup>14</sup>  $30 \times 7.55 = 226$

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 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). 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 is a qualifying feature 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 A1: Whooper swan abundance



*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:** Lough Feacle (peak count of 240 in winter 2014/15 (ECOFACT, 2015c), 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 observation 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, 1976). Wigeon forage both during the day and at night.

**Observations on the Phase II site:** Recorded 'in and around the survey area' during the winter season (FERS, 2011). Assumed to be off-site as locations given are Lough Feacle and Lough Croan.

**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, & Rehfish, 2009).

**Vulnerability to population effects at the SPAs were 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 or 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, 2015c)), Dysart (Thomas Street) Turlough (110), Four Roads Turlough (400), River Suck Caloows (40) and Ballyglass River Callows(60). Also recorded at Lough Feacle in earlier surveys (FERS, 2011) and there was a peak count of 39 in 2011/12 at Lough Feacle (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 in 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 Ballyglass. 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 II site:** Recorded 'in and around the survey area' during the winter season (FERS, 2011). Assumed to be off-site as locations given are Lough Feacle and Lough Croan.

**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 (Hötter, Thomsen, & Köster, 2006; Bevanger, et al., 2009; Ecology Consulting, 2013) 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, & Rehfish, 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, 2015c), 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 River 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 II site:** Recorded in and around the survey area during all seasons but specific location not given (FERS, 2011). Assumed to be off-site as this species is aquatic.

**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).

**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 the population at Lough Ree. It is unclear whether low level additional mortality that might be caused by a wind

farm would be additive or compensatory. As the population within the SPA is still fairly large, any change 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 were recorded only at Lough Croan Turlough by the applicant in 2014/15 (ECOFACT, 2015c), 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 remain 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 II site:** Recorded 'in and around the survey area' during the winter season (FERS, 2011). Assumed to be off-site as locations given are Lough Feacle and Lough Croan.

**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).

**Vulnerability to population effects at the SPAs where a qualifying feature:** The wintering population in Ireland and at Lough Croan Turlough appears to be stable which perhaps indicates a degree of resilience in the population. However, the overall population size 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:** Lough Feacle (peak count 3) in December to February of the 2014/15 winter season (ECOFACT, 2015c), 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 Lough Feacle (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 Lough Feacle 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 Lough Feacle to the Lough Ree population of tufted duck are feasible but not known.

**Observations on the Phase II site:** Recorded 'in and around the survey area' during the winter season (FERS, 2011). Assumed to be off-site as the locations given is Lough Feacle.

**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 (Hötter, 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 (Hötter, Thomsen, & Köster, 2006). There is no published onshore figure for avoidance rates for tufted duck (SNH, 2010).

**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 II site:** Not recorded (FERS, 2011).

**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 II site:** Not recorded (FERS, 2011).

**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 a 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 fly mainly during daylight and have 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).

**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, 2015c)), River Suck Callows (2 in 2007/8 I-WeBS), Lough Funshinagh (2 in 2011/12, I-WeBS), Lough Feacle (22 in 2013/14, I-WeBS). Also observed (numbers not stated) during the breeding season at Lough Croan and Lough Feacle (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 II site:** Recorded 'in and around the survey area' during the breeding season (FERS, 2011). Assumed to be off-site as locations given are Lough Feacle and Lough Croan.

**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 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 golden plover 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 II site:** Recorded 'in and around the survey area' during the winter season, with Lough Croan and Lough Feacle given as locations, as well as being regularly observed in significant numbers in low-lying wet grassland, alongside lapwing, 'while driving between vantage points' but the actual locations are not given (FERS, 2011). However, there is little or no habitat on the Phase II site that could be described as low-lying wet grassland. Observations are therefore assumed to be off-site only.

**Generic vulnerability to wind farm development:** There is evidence that this species can be placed 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 (Hötter, 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).

Despite being a quarry species in Ireland it is apparently not widely hunted in the country (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.

### *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 of 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:** Not recorded (FERS, 2011).

**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 of 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:** Lough Feacle (peak count of 25 in winter 2014/15 (ECOFACT, 2015c) 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). Corraee Turlough (ECOFACT, 2013). Lapwing was also observed during the baseline winter surveys regularly utilising Lough Feacle 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 II site:** Recorded 'in and around the survey area' during the winter season, with Lough Croan and Lough Feacle given as locations, as well as being regularly observed in significant numbers in low-lying wet grassland, alongside golden plover, near to Lough Croan (FERS, 2011). Observations are therefore assumed to be off-site only.

**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 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 (Hötter, 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 (Hötter, 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 to be 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, although it could contribute marginally to the apparent decline of this species at the three SPAs. The lapwing has a low maturation age, is long lived and has a low reproductive rate as well as 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, 2015c)) 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). Possibly also at 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 II site:** Recorded 'in and around the survey area' during the winter season, with Lough Feacle given as the only location (FERS, 2011). Observations are therefore assumed to be off-site only.

**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:** Lough Feacle (peak count of 10 in 2014/15 (ECOFACT, 2015c) 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, although 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 sites during the winter period. It is not confirmed but a proportion of those individuals recorded may also spend part of the winter at the Middle Shannon Callows. 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 II site:** Recorded 'in and around the survey area' during the winter season, with Lough Feacle given as the primary location (FERS, 2011) but also observed from VP2 during the baseline surveys which implies that the species flew over the Phase II site (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 local waterbodies. 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:** Not recorded (FERS, 2011).

**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 (Hötter, 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 that which 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, Derrycacill, 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 (5 occasions at Muckanagh, 3 at Four Roads Turlough and 3 at Ballinturly Turlough) or none of them (5 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, 1 occasion at each of Muckanagh, Four Roads Turlough and Ballinturly Turlough, none at Lough Croan and none of the sites on 3 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 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 flock believes there to be an occasionally used flight path between the River Suck at Muckanagh and Four Roads Turlough and also between River Suck at Muckanagh and a location further to the north (ECOFACT, 2015c).

In addition to the movements described above, the site synopsis for the Middle Shannon Callows states the following: "Small numbers of Greenland Whitefronted 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 that is present is comprised of 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, 2015c) 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:** Not recorded (FERS, 2011; ECOFACT, 2015c).

**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 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 has been substantially reduced since 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 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 (FRVs, 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 Environmental 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 FRVs 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 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 Environmental 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 species 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, which 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.