

CHAPTER 6 FLORA AND FAUNA

- Appendix 6.6 Winter Bird Survey

DRAFT

North South 400kV Interconnection Development

Meath Study Area (MSA)

Wintering Bird Study

Survey Period 7: 2013 – 2014

November 2014

TOBIN CONSULTING ENGINEERS



REPORT

PROJECT:

**North South 400kV Interconnection Development
Meath Study Area (MSA)
Wintering Bird Study
Winter Survey Period 7: 2013–2014**

CLIENT:

EirGrid
The Oval,
160 Shelbourne Road,
Ballsbridge,
Dublin 4.

COMPANY:

TOBIN Consulting Engineers
Block 10-4
Blanchardstown Corporate Park
Dublin 15
Ireland

www.tobin.ie

DOCUMENT AMENDMENT RECORD

Client: EirGrid Plc

Project: North South 400kV Interconnection Development

Title: Meath Study Area Wintering Bird Study
Winter Survey Period 7: 2013 – 2014

DRAFT

PROJECT NUMBER: 7339				DOCUMENT REF: 7339_MSA			
Revision	Description & Rationale	Originated	Date	Checked	Date	Authorised	Date
C	Issued	KH	06/11/14	MF	6/11/14	DG	6/11/14
B	Draft Report	RM	24/10/14	KH	24/10/14	DG	24/10/14
A	Draft Report	RM	30/07/14	KH	30/07/14	DG	30/07/14
TOBIN Consulting Engineers							

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY.....	1
2 INTRODUCTION.....	3
2.1 STUDY AREA	3
2.2 OBJECTIVES.....	4
2.3 BACKGROUND TO THIS STUDY	4
2.4 LITERATURE REVIEW.....	5
2.5 WHOOPER SWAN- IMPACTS DUE TO TRANSMISSION LINES – UK AND IRELAND.....	12
3 METHODOLOGY.....	15
3.1 DESKTOP SURVEY	15
3.2 CONSULTATION	15
3.3 FIELD SURVEY	15
4 RESULTS	22
4.1 WHOOPER SWANS	22
4.2 OTHER WINTERING BIRDS	34
5 CONCLUSION	36
5.1 WHOOPER SWAN.....	36
5.2 OTHER WINTERING BIRDS	36

TABLES, FIGURES & APPENDICES

TABLES

Table 3-1: Summary of field surveys undertaken between October 2013 and April 2014 in MSA. 16

Table 3-2: Survey Effort (nos. days surveyed) for identified or potential wintering bird sites in the study area..... 18

Table 3-3: Vantage Point survey date, location, period and effort 19

Table 4-1 Peak numbers of Whooper Swan recorded at both roosting and feeding sites per calendar month during Wintering Survey Period 7 22

Table 4-2: Sites where Whooper Swan recorded in 2013/ 2014, usage (forage and or roost), flightline recorded or probable (2007 – 2014 data) and maximum count 24

Table 4-3 Whooper Swans recorded during the Wintering Survey Period 7 Aerial Surveys 25

Table 1-1: Vantage point locations, dates, key observations and flightline details 27

Table 4-5 Other Bird Species (Maximum Count during WSP 7) 34

FIGURES

Figure 1 Whooper Swan Distribution Route Corridor Options 26

Figure 2: Flightlines WSP7 30

APPENDICES

Appendix 1 Bibliography

Appendix 2 2013 / 2014 Whooper Swan Survey Counts

1 EXECUTIVE SUMMARY

This report details a seventh year (WSP 7) of winter bird surveys (2013/2014) within a study area which includes an extensive part of County Meath. This report updates the findings of the six previous wintering bird surveys carried out to date (November 2007 – April 2014 inclusive). This study is to inform the overall Environmental Impact Assessment (EIA) for a proposed 400kV transmission line (referred to as “the preferred line route” herein) between the existing Woodland Substation in the south of the study area to where the proposed line intersects with the existing east-west oriented Flagford to Louth 220kV Over Head Line (OHL) in the north of the study area. A separate report is provided for the Counties Cavan and Monaghan Study Area (CMSA) section of the development.

Whooper Swan was identified at an early stage in the scoping process as a key species due to their known susceptibility to collision with powerlines. It is therefore important to identify areas used by this species and any flightlines relevant to the proposed development. Following the results of the seven years of survey; this report details a number of key sensitive locations which require consideration of potential impacts and mitigation in the EIS. Previous surveys to inform this report were carried out in 2007/2008 (WSP 1), 2008/2009 (WSP 2), 2009/2010 (WSP 3), 2010/2011 (WSP 4), 2011/2012 (WSP 5) and 2012/2013 (WSP 6).

The key survey findings to date relating to the identification of whooper swan sites and flight lines within the zone of influence of the proposed transmission line are summarised below.

1. A regular flight line crosses the proposed alignment between Tara Mines Tailing Ponds and the Fyanstown area (River Blackwater valley west of Navan). This flightline was confirmed in WSP 1, 2 (regular), 4, 5 and 7. The River Blackwater valley and Tara Mines Tailings ponds are a recognised nationally important site for Whooper Swans (NPWS and Birdwatch Ireland).
2. A regular flight line crosses the proposed alignment between Cruicetown and Whitewood Lough. This flightline was confirmed in WSP 1, 2, 3, 4, 6 & 7. A flightline from Cruicetown to foraging areas in WSP 5 does not cross the route although sites utilised were within 1 km. . This area is evaluated as of County Importance.
3. An irregular flight line crosses the alignment between Cruicetown and the Clooney area. This activity was recorded in WSP 4 and 6.
4. An irregular flight line crosses the alignment from fields at Clooney 2 towards Clooney Lough. This was recorded in WSP 5 and 6.
5. Flightlines not confirmed as crossing, but occurring close to the alignment (<1km) were noted in WSP 3 and 6 between Yellow River and Tara Mines Tailings Ponds.

6. A very irregular flight line was recorded as crossing the alignment from the area near Emlagh in a south east direction, likely to Tara Mines Tailing Ponds (similar to point 1 above). This was recorded in WSP 6 & 7.

The presence and pattern of use of other wintering birds in the study area are detailed in this report. Flightlines of known collision prone species such as Cormorant and Whooper Swan were examined as part of the studies and shown to be mainly associated with lake sites and river valleys.

DRAFT

2 INTRODUCTION

TOBIN Consulting Engineers herein referred to as TOBIN, undertook a winter bird study within the Meath Study Area (MSA) for the proposed North – South 400kV Interconnection Development over the winter 2013/2014 period, herein referred to as Wintering Survey Period 7 (WSP 7). The focus of this study is on Whooper Swans (*Cygnus cygnus*) but includes all potentially sensitive bird species in particular wintering wader and wildfowl species („Target“ species“ for survey). The winter bird surveys to date inform the assessment of potential impacts and proposed mitigation for the Environmental Impact Statement (Volume 3D, Section 6).

Progress on the project led to the identification of the preferred line route “alignment”. The identification of which considered a range of criteria including landscape, settlements, archaeology and ecology/ birds.

The study area does not include any Special Protection Areas for Birds and the closest such site, Strabannan-Braganstown SPA (Site Code: IE004091), is at a distance of 24km from the proposed alignment.

As detailed above, the primary target species identified for survey within the study area (based on desk review, consultation and surveys to date) is Whooper Swan. Secondary target species surveyed for included, Mute Swan, Wintering Duck (Wigeon, Mallard, Teal), Geese species (Greylag Geese), Waders (Golden Plover, Lapwing and Snipe), Cormorant, Grey Heron, Great Crested Grebe, Little Grebe and Moorhen.

This study updates results of previous studies conducted in 2007/2008 (WSP 1), 2008/2009 (WSP 2), 2009/2010 (WSP 3), 2010/2011 (WSP 4), 2011/2012 (WSP 5) and 2012/2013 (WSP 6).

2.1 STUDY AREA

The study area consists of the preferred line route in Co Meath extending from the existing woodland substation to approximately 4km west of Kingscourt where the preferred line route becomes the CMSA, as indicated in Figure 1.

The study area extends up to 15km east and west of the preferred line route to encompass important winter bird sites and to consider flightlines within this zone of potential influence.

The features of the study area which influence Whooper Swan distribution and hence areas to focus surveys relative to the preferred line route include:

1. Extensive arable fields, in particular where potatoes are grown. Areas of temporary flooding with potatoes are particularly attractive to flocks of whooper swan. These sites are irregularly used

and change over the winter and between years . Larger, improved grassland fields attract Whooper Swans in particular later in the winter / at spring passage migration time.

2. Roost sites are rare but well documented. These areas are a focus for Whooper Swan flightline survey as birds can undertake very extensive flights between roosts e.g. Tara Mines Tailings Ponds and forage areas (> 8km recorded).
3. Lake roost sites are scarce (typical roost sites) in the study area and where they do occur are a focus for survey. Whooper Swans recorded at smaller lake sites tend to occur in smaller family groups and roost and forage in the vicinity of the lake without extensive flightlines. Whitewood Lough is slightly different as larger groups can spread out further to forage at the Cruicetown (townland) area and surrounding large fields.
4. The River Blackwater valley is used regularly by flocks of whooper swan whose numbers regularly reach National importance (Source: NPWS, Birdwatch Ireland). The alignment crosses the Blackwater River valley near Navan at the townland of Teltown.
5. The extensive farmland south of Navan to Woodland has very limited evidence of Whooper Swan usage. Surveys in this area included the aerial survey and drive around survey focused on the larger river valleys (e.g. River Boyne) to aid in identifying any random/ unknown flocks that may sporadically occur.

2.2 OBJECTIVES

The objectives of this study were:

1. To determine the numbers and distribution of Whooper Swans and other wintering wildfowl and waders in a wider study area (refer to Figure 1) and to determine the location of significant sites for breeding birds. Also considered are other species of conservation concern potentially sensitive to the development.
2. To identify flight lines in this study area focussed on the preferred line route.
3. Based on data gathered during WSP 7, any new and/or additional information to previous survey findings is highlighted.
4. Based on all survey work to date (2007 – 2014) an evaluation of the importance of observed wintering bird sites (or complex of sites) is detailed in this report.
5. Detail sensitive locations for Whooper Swans (wildfowl) which require assessment of potential impacts and mitigation.

2.3 BACKGROUND TO THIS STUDY

In 2007, TOBIN were initially commissioned by EirGrid to undertake a winter bird study focusing on Whooper Swan within the study area for the winter period 2007/2008 (WSP 1). The aim of this survey was to identify any feeding or roosting sites within the study area and to record any regularly used flight lines.

TOBIN was commissioned to repeat this survey each winter since 2007. The purpose of this report is to detail the findings of WSP 7 so as to update findings from previous surveys and add data to inform the assessment of potential impacts and mitigation requirements on the preferred line route.

2.4 LITERATURE REVIEW

Whooper Swan is the key target winter bird species identified in the study area for consideration for the proposed development. A literature review was undertaken to compile known impacts of power lines for this species and others and to aid in identifying appropriate and proven mitigation measures.

Appendix 1 presents a bibliography of reviewed information sources which informed this report. In some cases footnotes are detailed with references within the report.

Whooper Swans are listed under Annex I of the EU Birds Directive (EU 79/409/EEC). EU Member States are required to maintain populations of rare and migratory bird species that are listed under Annex I by establishing designated areas – Special Protection Areas (SPA) - for the conservation of these species. Whooper Swans are further protected as they are listed under Annex II of the Berne Convention on the conservation of wildlife and natural habitats (commonly known as the Berne Convention), they are also amber listed in „Birds of Conservation Concern in Ireland 2014 - 2019 (Colhoun & Cummins., 2013) as the numbers of Whooper Swans that winter in Ireland are internationally important.

Whooper Swans are winter migrants to Ireland; generally arriving in October and leaving to return to their breeding grounds in late March/early April. The Whooper Swans that winter in Ireland breed in Iceland. The Irish Wetland Bird Survey (I-WeBS) office and the Irish Whooper Swan Study Group completed a National Whooper Swan Survey in 2010 which revealed that the national population of Whooper Swans wintering here had increased slightly since the last national survey completed in 2005 to a population of 15,049 birds. Any site that regularly holds 1% of this figure (c.150 Whooper Swans) is considered to be of national importance for Whooper Swans. Based on an international population estimate of 20,900¹, any site containing 210 birds or more is considered to be of international importance.

Wintering Whooper Swans are found mostly on lowland open farmland around inland wetlands and are regularly seen while feeding on grasslands and stubble. Whooper Swans usually feed during the daylight hours and leave the feeding sites at dusk to congregate at evening roosts (Owen *et al.* 1986 in Robinson *et al.*, 2004).

¹ Crowe, O. 2005. Ireland's Wetlands and their Waterbirds: Status and Distribution. BirdWatch Ireland, Newcastle, Co. Wicklow.

Whooper Swans are highlighted as being potentially prone to collision with transmission lines e.g. EirGrid Ecology Guidelines². This appears to be due to:

- Their relatively high wing loading, resulting in less manoeuvrability in flight;
- Behavioural risks, due to flying between their roosting and foraging areas (and between foraging areas); and

Flights are often in low light levels, i.e. pre-dawn and post-dusk periods, and therefore in poor visibility. Whooper Swans, tend to fly at heights at or just below the conductor height of transmission lines (field survey observations) typically 8 to 9m above ground level Griffen *et al.*, (2011).

Swans (including Whooper Swan, Bewick's Swan (*Cygnus columbianus*) and Mute Swan (*Cygnus olor*)) are frequently involved in power line collisions, including low voltage and high voltage lines (transmission lines) and this is the most commonly reported cause of swan death in the United Kingdom (MBEC 2006). The fact that swans often fly in flocks is undoubtedly also a contributory factor in determining collision rates. Higher levels of risk are associated with transmission lines that are located on main flight lines, either between roosts and feeding areas or within areas where feeding is concentrated. Whooper Swan is listed on Annex 1 of the Birds Directive. , The European Commission³ consider that "*The greatest problems to the Whooper Swan are disturbances, deterioration of habitat, illegal hunting and pollution by lead and pesticides and collision with powerlines seems not to be a serious threat.*"

The Avian Power Line Interaction Committee (1994)⁴ stated that most researchers agree collisions are not a biologically significant source of mortality for thriving populations of birds. Despite this, it is estimated that power lines are the second highest cause of bird collision mortality in the United States, second to buildings and windows. Other anthropogenic factors listed included automobiles, communication towers and wind turbines (Erickson *et al.*, 2005, taken from Avian Power Line Interaction Committee, 2012)⁵.

Internationally, the need to develop power line infrastructure in a bird-safe manner is becoming increasingly more recognised. In 2011, the United Nations Environment Programme (UNEP) for the African-Eurasian Waterbird Agreement (AEWA) and the Convention of Migratory Species (CMS) released a *Review of the Conflict between Migratory Birds and Electricity Power Grids in the African Eurasian Region* (CMS, 2011a) and the *Guidelines for Mitigating Conflict between Migratory Birds and Electricity Power Grids* (CMS 2011b). CMS (2011a) provides a summary of collision issues and hot spots in Europe, Asia, and Africa. Also in 2011, the Budapest Declaration on *Bird Protection and Power*

²Eirgrid 2011. Ecology Guidelines for Electricity Transmission Projects. A Standard Approach to Ecological Impact Assessment of High Voltage Transmission Projects

³http://ec.europa.eu/environment/nature/conservation/wildbirds/threatened/c/cygnus_cygnus_en.htm

⁴Avian Power Line Interaction Committee (APLIC) 1994. Mitigating Bird Collisions with Transmission lines: The State of the Art in 1994. Edison Electric Institute. Washington, D.C.

⁵Avian Power Line Interaction Committee (APLIC) 2012 Reducing Avian Collisions with Power lines: The State of the Art in 2012. Edison Electric Institute. Washington, D.C.

Lines (MME, 2011) was adopted by the participants of the Budapest Conference, Power Lines and Bird Mortality in Europe. The declaration aims for all new construction of power poles to be bird-safe by 2016 and all dangerous poles to be retrofitted by 2020⁵. The sensitive species outlined in these reports are not relevant to the study area and the design of the proposed development means electrocution of raptors specifically will not be an issue.

The Icelandic Whooper Swan population (population which winters in Ireland) is considered to be at favourable conservation status (source: JNCC) and populations in Ireland have increased between 2000 and 2005 by 11% (Crowe *et al.*, 2005) and by 6% between 2005 and 2010 (Boland *et al.*, 2010). This population increase is occurring in the context of an already extensive transmission line network throughout their wintering range including in Ireland suggesting that transmission lines are not a significant cause of mortality though local site conditions require consideration.

Review of Line Marking Effectiveness

Most studies highlight the earth wire as the main cause of collision for birds. This is because it is relatively more difficult to see and is located at the top of the pylon where Whooper Swans may miss it as they fly over. This is where flight diverters (e.g. Swan Flight Diverter) are installed. Diverters come in a wide range of types and specifications. Recommendations based on a comprehensive review of line markers available carried out for the Beaulieu Denny 400kV project for similar bird constraints/ species highlight that the best all round markers are Swan Flight Diverter (e.g. Dulmison or Tyco Electronics) constructed from high-impact grey PVC (UV stabilised) fitted at 10m intervals⁶. This or a similar product will be recommended for the proposed development.

Marking the earth wire with flight diverters (see Plate 1) has been shown in numerous studies to be a useful mitigation tool at reducing potential collision impacts with powerlines.

⁶<http://webcache.googleusercontent.com/search?q=cache%3AeD7Vxt8rNwJ%3Awww.dpea.scotland.gov.uk%2FDocuments%2FqJ2654%2FJ118922.pdf+swan+flight+diverters&hl=en&gl=ie>



Plate 1: Electricity line marked with swan flight diverters

Marking electricity lines with flight diverters is now a standard practise by electricity utility companies throughout the world for existing and new HV electricity line projects.

Tyco electronics, manufactures of the type of diverter proposed for this project, state that studies have shown that proper installation of bird flight diverters may reduce bird collisions by “up to 90%”⁷.

Examples of where “swan flight diverters” have been shown to reduce collisions or where they are being installed is detailed below.

- San Luis National Wildlife Refuge Complex, Merced County, California, USA⁸.
- Skagit County, Washington home to the largest wintering concentration of Trumpeter Swans (similar species to Whooper Swan see plate 2 below) in the United States. The Trumpeter Swan Society in USA “welcomed” proposals to mark lines here.

⁷ http://energy.tycoelectronics.com/rrg/dulm_rrg/232.pdf

⁸ <http://www.ventanaws.org/conservation/electricitylines.htm>



Plate 2: Trumpeter Swans

- In Minnesota, Xcel Energy of Minneapolis planned to install nearly 3,400 swan flight diverters in Minnesota and Wisconsin. The Teton Regional Land Trust (TRLT) is working with the Fall River Rural Electric Cooperative (FRREC) on the west side of Yellowstone to add or replace at least 120 bird diverters on electricity lines in areas frequented by Trumpeter Swans. The use of flight diverters again serves to highlight that these diverters are effective and accepted by the Trumpeter Swan conservation organisation in the USA for existing electricity lines.
- Swan flight diverters in areas where conflicts occur (Trumpeter swan collision impacts) were highlighted as “effective in minimising this threat” in Mitchell (1994) taken from Slater (2006)⁹.
- Initial findings indicated no collision-caused mortalities of trumpeter swan at sections of transmission line following installation of swan flight diverters at a site in Montana USA (2004/2005 study)¹⁰.
- Mackenzie Bradshaw Environmental Consultants - MBEC (2006) cite a large number of studies where the effectiveness of flight diverters at reducing collision risks by collision prone bird species including swans has been confirmed. Various studies showed a reduction in collisions of between 57 and 89%.
- Barrientos *et al.* (2011), reviewing 21 wire marking studies, similarly conclude that wire marking reduced bird mortality by 55-94%. Line marking is the likely mitigation which will be proposed for this project.
- Jenkins *et al.* (2010) conclude that, barring some notable exceptions, “*any sufficiently large form of marker (which thickens the appearance of the line at that point by at least 20 cm, over a length of at least 10-20 cm), placed with sufficient regularity (at least every 5-10 m) on either the ground wires (preferably) or the conductors, is likely to lower general collision rates by 50-80%*”.

⁹ Slater, G.L. (2006, August 17). Trumpeter Swan (*Cygnus buccinator*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/trumpeterswan.pdf>

¹⁰ http://www.trumpeterswansociety.org/docs/20th_conf/20becker_and_lichtenberg.pdf

- Frost (2008)¹¹, found that the installation of flight diverters on transmission lines adjacent to a sensitive lake location reduced mortalities of Mute Swan from a maximum of 21 (pre diverter installation) to one bird after markers were installed.
- Following the largest worldwide marking experiment to date, Barrientos et al. (2012) observed a small (9.6%) but significant decrease in the number of casualties after line marking compared to before line marking in experimental lines¹².
- The Beaulieu Denny 400kV project¹³ which was granted permission in 2010 in Scotland recommended flight diverters for stretches of line where a potential collision risk was determined. Bird flight diverters including swan flight diverters were recommended. This project passed close to or through SPA sites including South Tayside Goose Roost Ramsar and SPA (0.12km); Firth of Forth Ramsar and SPA (1.5km) and Drumochter Hills SPA (crosses). The abundance and diversity of collision prone bird species in the Scottish study area is significantly more than in the overall North South 400kV Interconnection Development study area (MSA and CMSA). For example the Goose Roost Ramsar and SPA site alone regularly supports over 20,000 waterfowl species which is greater than all larger wildfowl numbers in the MSA and CMSA. It is in the context of these high waterfowl numbers that the Scottish Government considered the line marking mitigation detailed in the EIS and consented planning.
- The Wildfowl & Wetlands Trust working with Electricity North West in West Lancashire UK (March 2014)¹⁴ are currently examining various types of line diverters for sections of alignment crossed by internationally significant numbers of Whooper Swan and Geese species. The use of diverters was expressed as a very positive approach for reducing impacts to swans and Geese as collisions with unmarked powerlines were considered “a major cause of death for them”. One type of plastic diverter, clipped on the power lines, is packed with crystals that absorb ultra-violet light by day to emit a purple ultraviolet light for 10 or 12 hours after nightfall. The birds can see the plastic roundels glowing violet by night. Fluorescent orange or yellow reflective materials flap in the wind to divert the birds by day. No data is yet available on the findings of this study (July 2014).

More recent updated draft guidelines produced by Bureau Wardenberg (2011) on approaches to avoid and mitigate impacts to migratory birds have been drafted. Some key mitigation approaches outlined are detailed below.

Since bird collisions have been recorded with the guy or stay wires of pylons the construction of self-supporting pylons which do not require stay wires is preferred. This is the case for this project.

¹¹ Frost D (2008). The use of ‘flight diverters’ reduces mute swan *Cygnus olor* collision with electricity lines at Abberton Reservoir, Essex, England Conservation Evidence (2008) 5, 83-91

¹² Barrientos R, Ponce C, Palacín C, Martín CA, Martín B, et al. (2012) Wire Marking Results in a Small but Significant Reduction in Avian Mortality at Power Lines: A BACI Designed Study. PLoS ONE 7(3): e32569. doi:10.1371/journal.pone.0032569

¹³ <http://webcache.googleusercontent.com/search?q=cache%3AeD7Vxxt8rNwJ%3Awww.dpea.scotland.gov.uk%2FDocuments%2FqJ2654%2FJ118922.pdf+swan+flight+diverters&hl=en&gl=ie>

¹⁴ <http://www.thelancashiremagazine.co.uk/news/north-west/warning-whooper-swans-from-iceland-about-lancashire-power-lines/>

Birds are believed to collide most often with the earth or shield wire (the thinnest wire at the top of the electricity line pylon). Removing this wire or designing electricity lines from the outset without this wire is therefore a potential collision mitigation measure (Brown *et al.*, 1987; Bevanger & Brøseth, 2001).

There is room for improvement in the efficacy of line marking devices. In order to achieve this improvement we need to look more closely at bird vision. Recently, Martin & Shaw (2010) and Martin (2011) conducted the first known research into avian visual fields related to electricity line collision. Key research findings and theoretical conclusions include:

- Birds' vision differs from humans in three main ways: colour vision, acuity and field of view;
- Birds' eyes are mostly placed laterally in the skull, birds' visual fields (*i.e.* where they can see) are extensive, and differ between species;
- Relative to humans, birds have small blind spots. However, these blind spots can render a bird blind in the direction of travel, if the head or eye is moved in a certain way;
- Birds have small binocular fields, particularly the cranes and bustards. Binocular vision is important for distance perception;
- Birds' highest visual acuity and colour vision is in their lateral visual field, birds' frontal vision may be tuned for detecting movement rather than spatial detail;
- Birds in flight in open habitats may „predict“ that there are no obstacles in front of them; and
- Birds may detect obstacles such as pylons, and fly towards them with the intention of veering away at the last minute
- Colour is probably less important than contrast;
- Movement of the device is likely to be important; and
- Markers that protrude vertically both above and below the conductor are likely important; since we suspect that many collisions may occur at night, devices that are nocturnally visible (through illumination, phosphorescence, ultraviolet radiation and other means) would be advantage.

This overall information will inform flight diverter type and approach for installation as relevant for the project.

Other wintering bird species in the study area are potentially sensitive to collisions with powerlines have also been observed to regularly feed in areas close to existing transmission lines, refer to Plate 3 below.

Mute Swan in particular, are prone to collision with power lines. In this regard, these species were also surveyed to identify potential collision hazards and line marking is proposed at these locations.

Sensitive species in the study area include:

- Mute Swan;

- Grey Heron;
- Cormorant;
- Wildfowl ducks (Moorhen, Mallard, Teal);
- Wildfowl Grebes (Great Crested Grebe and Little Grebe); and
- Waders (Golden Plover, Lapwing, Snipe).



Plate 3: Flock of Mute Swans which regularly forage in a field beside a Transmission Line in the CMSA study area.

2.5 WHOOPER SWAN- IMPACTS DUE TO TRANSMISSION LINES – UK AND IRELAND

Little information is currently available on the actual impacts of high voltage transmission lines on Whooper Swans and other collision prone species in Ireland and for that matter the UK. Any information regarding impacts are very general and anecdotal for example¹⁵, rather than scientifically based observational experiments and subsequent published reports detailing actual mortalities.

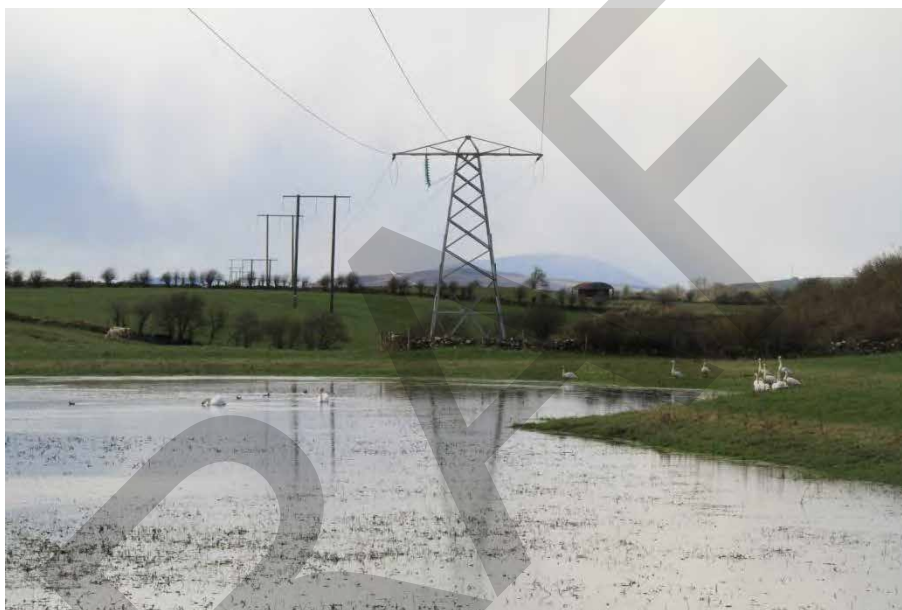
Several general observations can be highlighted which are important for determining potential impacts of a new transmission line development in the study area to wintering birds in particular Whooper Swans. These include:

1. Whooper Swans in the study area are utilising areas within an existing electricity line network. The extent of the existing wirescape across the MSA study area consists of approximately 329km of existing high voltage electricity lines (161km of 38kV, 101km of 110kV, 93km of 220kV and 4km of 400kV); refer to Figure 1, as well as thousands of kilometres of medium

¹⁵ <http://www.thelancashiremagazine.co.uk/news/north-west/warning-whooper-swans-from-iceland-about-lancashire-power-lines/>

voltage, low voltage and telephone overhead lines. While collisions undoubtedly occur and have been recorded during surveys, no significant impacts to the overall population is likely to be arising given Whooper Swan populations show a positive trend based on I-WeBS data between 2005 and 2010. In addition internationally significant numbers continue to use areas with transmission line infrastructure e.g. Toome Bridge (Northern Ireland) i.e. no displacement issue in this case (Hall *et al*, 2012).

2. Whooper Swans (swan species generally) currently exploit areas around existing low voltage (LV) and high voltage (HV) electricity lines throughout their range. Example sites include Toome Bridge Northern Ireland (HV transmission line) and two examples from County Mayo 110kV (refer to Plate 4 and 5 overleaf). Mute Swan regularly graze under electricity lines (13kV) close to Derryloobinagh Lough in Ballybay, County Monaghan (refer to Plate 3). It has been noted in 2013 that a collision occurred at the Ballybay site though only feathers were noted. The 13kV lines are clearly a local hazard for swans at this wetland site, though do not cause displacement.



Plates 4 and 5: Two images of flocks of Whooper Swan in temporary flood area under an 110kV transmission line in County Mayo

3. Line marking with flight diverters are proposed for sections of the final alignment where a potential localised risk of collision has been highlighted as part of this overall study. Line marking using bird flight diverters is standard mitigation practise internationally for example in countries including Scotland, USA, England and Norway. Flight diverters have been highlighted in various studies as an effective mitigation tool for reducing collisions by birds as detailed above.

3 METHODOLOGY

The methodology for WSP 7 broadly followed the methodology used during the previous six years of surveys. Given the very extensive area a number of key features and areas were identified to focus the survey work. Ongoing aerial surveys and drive round checks continually observed if any additional sites required survey.

3.1 DESKTOP SURVEY

An updated desk-based survey was undertaken to determine; up to date information on bird interactions with powerlines, current mitigation approaches, and information regarding Whooper Swan research. Additional information has been added to the previous desk study report; refer to section 2.2 and 2.3 above.

3.2 CONSULTATION

NPWS and Birdwatch Ireland have been informed over the course of the study regarding the survey findings and proposed mitigation. The most recent submission was received from Birdwatch Ireland regarding the project was received on 6th November 2013. A subsequent meeting was held with BirdWatch Ireland on 11th December 2013 during which impacts on Whooper Swan populations, appropriate mitigation and monitoring were discussed.

3.3 FIELD SURVEY

A total of 31 survey man days were conducted over 26 days between 31st October 2013 and 3rd April 2014. Three bird surveyors conducted the surveys in the MSA. All surveyors were fully experienced in the methodologies employed and at identifying target species in the study area.

The survey approach followed as far as possible standard methodologies suitable for identifying key concentrations of wintering wildfowl (WeBS) detailed in Gilbert *et al.*, (1998)¹⁶ and in particular concentrations and flightlines relative to the preferred line route (Vantage Point Surveys – based on SNH 2014¹⁷).

Table 3-1 below summarises location of survey, survey dates, type of survey conducted on each date and weather conditions.

¹⁶ Gilbert G., Gibbons D.W., Evans J, (1998). *Bird Monitoring Methods: A manual of Techniques for Key UK Species*. RSPB, Sandy.

¹⁷ Scottish Natural Heritage (2014) *Recommended bird survey methods to inform impact assessment of onshore wind farms*.

Table 3-1: Summary of field surveys undertaken between October 2013 and April 2014 in MSA.

Date	Location	Weather	WeBS (counts and checks presence at sites)	VP Watches Dawn	VP Watches Dusk
31/10/2013	All	Mild, bright, F 3-4	Yes (Full)		
21/11/2014	Teltown/ Tara Mines Tailings Ponds	Dry, calm, clear	Yes (Partial)	Yes	
22/11/2013	Teltown/ Tara Mines Tailings Ponds	Dry calm clear	Yes (Partial)		Yes
05/12/2013	Teltown/ Tara Mines Tailings Ponds	Windy, drizzle, Visibility < 5km.	Yes (Partial)		Yes
06/12/2013	Teltown/ Tara Mines Tailings Ponds	Dry, calm, clear	Yes (Partial)	Yes	
17/12/2013	Cruicetown	>10k Visibility, Mild	Yes (Full)		Yes
18/12/2013	Cloony Lough (Area)	>10k Visibility, Mild	Yes	Yes	
03/01/2014	All	Windy, F6-7, > 5k Visibility, flooding	Yes (Full)		
08/01/2014	Fyanstown	Mist, <1km visibility	Yes (Partial)		Yes
09/01/2014	Yellow River	Calm dry, clear	Yes (Partial)	Yes	
13/01/2014	Fyanstown	Dry, calm, cold, good visibility	Yes (Full)	Yes	
13/01/2014	Whitewood Lough	Dry, calm, cold, good visibility	Yes (Partial)		Yes
13/01/2014	Fyanstown	Dry, calm, cold, good visibility	Yes (Full)		Yes
14/01/2014	Whitewood Lough	Dry, calm, cold, good visibility	Yes (Partial)	Yes	
14/01/2014	Teltown/ Tara Mines Tailings Ponds	Dry, calm, cold, good visibility	Yes (Partial)	Yes	
30/01/2014	Teltown/ Tara Mines Tailings Ponds	Cold, > 10k visibility, calm	Yes (Partial)		Yes
03/02/2014	Emlagh	Dry, breezy, cool > 10k visibility	Yes (Full)		Yes
11/02/2014	Whitewood Lough	Dry, calm, cold, good visibility	Yes (Partial)	Yes	
12/02/2014	Emlagh	Cold, > 10k visibility, gale (F7-8)	Yes (Partial)		Yes
13/02/2014	Yellow River	Cold, F 3-4, > 10k visibility	Yes (Partial)	Yes	
14/02/2014	Balrath	Dry, calm, cool > 10k visibility	Yes (Partial)	Yes	
21/02/2014	Emlagh	Dry, calm, > 10k visibility	Yes (Partial)		Yes
24/02/2014	All	Dry, calm, > 10k visibility	Yes (partial)		

Date	Location	Weather	WeBS (counts and checks presence at sites)	VP Watches Dawn	VP Watches Dusk
04/03/2014	Whitewood Lough	Dry, calm, > 10k visibility	Yes (Partial)		Yes
05/03/2014	Whitewood Lough	Dry, calm, > 10k visibility	Yes (Partial)	Yes	
14/03/2014	Balrath	Mild, clear, > 10k visibility	Yes (Partial)		Yes
15/03/2014	Emlagh	Mild, clear, > 10k visibility	Yes (Partial)	Yes	
20/03/2014	River Boyne (Trim area)	Mild, clear, > 10k visibility	Yes (Partial)		Yes
28/03/2014	Whitewood Lough	Mild, clear, > 10k visibility	Yes (Partial)		Yes
02/04/2014	Lough Ballyhoe/Rahans	Mild, clear, > 10k visibility	Yes (Partial)		
03/04/2014	Lough Ballyhoe/Rahans	Mild, clear, > 10k visibility	Yes (Partial)	Yes	

Note: Full count indicate that the majority of sites (at least 90%) were surveyed on that day and a full check of all potential sites within 5km of the preferred line route was conducted.

Partial Counts were counts recorded on the way to vantage point survey and drive round check conducted of known sites used in the vicinity of the vantage point.

Given the large extent of the study area methodologies were tailored so as to maximise information on the location of Whooper Swans and likely / confirmed flightlines as relevant to the proposed development.

Three key methodologies were used which follow standard survey methods (see above) for assessing winter bird distribution and identifying flightlines.

3.3.1 Wetland Bird Survey (WeBS) and drive round survey Extensive driving surveys were carried out monthly of the entire study area; refer to Table 3-2 which indicates number of times specific areas with noteworthy wintering bird concentrations were checked. All noteworthy wintering bird sites are indicated in Figure 1 and all surveyed at least once/month.

Surveys were conducted of all potential wintering bird sites and sites identified through consultation and the desk study. All sites were scanned using binoculars and telescopes as appropriate, from vantage points on public roads. Likely habitats close to these sites were also checked, as were areas deemed suitable for Whooper Swans that were seen whilst driving between sites. Records were taken of numbers of Whooper Swans, weather conditions and habitat type. Other species of conservation concern were also noted if seen.

Table 3-2: Survey Effort (nos. days surveyed) for identified or potential wintering bird sites in the study area

Site	Location Relative to preferred line route	Nos. times surveyed 2013/ 2014
Balgeeth	8 - 10km west	10
* Ballybeg	8 - 10km west	14
Balrath	8 - 10km west	17
*Balrath Demense	8 - 10km west	17
Barfordstown	8 - 10km west	17
*Batterstown	7km east	11
Black Lough	12km west	6
Bloomsbury (Blackwater River Valley)	3 – 4 km east	20
Breakey Lough	2 – 3km west	13
Breaky Lough Little	2 – 3km west	13
Calliaghstown	8 - 10km west	8
Cannonstown	8 - 10km west	14
Carlanstown	5km west	16
Carnaross	10km west	13
Clooney lough	<1km east	17
*Clooney 2	< 1km west	19
Cookstown Great	5km west	12
Coolaliss	2 km west	16
Cruicetown	1km west	17
Cruicetown 2	1km west	19
* Cruicetown 3	1km west	4
Drakerath	< 1km west	14
Emlagh	3km west	17
Ervey Lake	2km east	9
Fordstown	9km west	8
Fyanstown (1 and 2) Area (Blackwater River Valley)	3 – 4km west	18
Grange (Blackwater River Valley)	4 - 5km west	16
Headford (Blackwater River Valley)	7 km west	14
Liscartan	2 km east	15
Lough Ramor callows	15km west	3
Mullagh Lough	12km west	4
Mullagheven Cross Rds	2km west	16
Newcastle Lough	2km east	10
Newtown	2km west	12
Nr Tara Mines	5km east	19
Pepperstown	9km west	16
Randelstown	2 – 3km east	15
Rahendrick	14 km west	13
Red Island	<1km west	9
River Boyne Valley	Runs east and west	8
SE of Trim	5 – 10km west	1
Sedenrath area (site 1 and 2) (Blackwater River Valley)	5 – 6km west	19
Tankardstown	1km east	18
Tara Mines Tailings Pond	2 – 3km east	14
Teltown (Blackwater River Valley)	0km	19
Tremblestown River Valley (Athboy area)	5 to 10km west	6
Whitewood Lough	< 1km east	16
Yellow River	2 – 3km east	15
Yellow River 2	1km	18

3.3.2 Vantage Point Surveys

In order to determine flight lines, dawn and dusk vantage point watches were conducted at various sites along the preferred line route, refer to Table 3-3 and Figure 1 which indicates site locations. A total of 24 dawn and dusk vantage points were conducted at 11 separate vantage point locations, Locations for survey were determined based on observed Whooper Swan sites and associated flightlines, roost sites in the vicinity of the preferred line route and; precautionary surveys at potential flightline locations e.g. larger river crossings.

In total 32 hours of dawn and dusk vantage point work were conducted. In addition to this time extensive checks were conducted in the vicinity of vantage points to identify if flocks of Whooper Swan were present in the wider area.

Table 3-3: Vantage Point survey date, location, period and effort

Date	Vantage Point (VP) Location	Survey Period	Duration (hours)
14/02/14	Balrath (Area)	Dawn	0.75
18/12/14	Cloony Lough (Area)	Dawn	2
03/01/14	Cloony Lough (Area)	Day	2
17/12/14	Cruicetown	Dusk	2
04/03/14	Cruicetown (Area)	Dusk	1.5
03/02/14	Emlagh	Dusk	1
12/02/14	Emlagh	Dusk	1
21/02/14	Emlagh	Dusk	0.5
15/03/14	Emlagh	Dawn	1
08/01/14	Fyanstown	Dusk	0.5
13/01/14	Fyanstown	Dawn	1
13/01/14	Headford (Estate)	Dusk	1
03/04/14	Rahans Lough	Dawn	3
20/03/14	River Boyne Valley	Dusk	1
06/12/14	Tara Mines Tailings Ponds	Dawn	1.3
14/01/14	Tara Mines Tailings Ponds	Dawn	1.5
22/11/13	Teltown	Dusk	1
05/12/14	Teltown	Dusk	1.25
30/01/14	Teltown	Dusk	1.25
14/01/14	Whitewood Lough	Dawn	1
11/02/14	Whitewood Lough	Dawn	1
05/03/14	Whitewood Lough	Dawn	0.5
28/03/14	Whitewood Lough	Dusk	1.25
13/02/14	Yellow River (area)	Dawn	1

Vantage Point locations were chosen based on known areas utilised by Whooper Swans, observed flocks (during drive around) and known roost sites nearby in which potential for flight lines, and hence collision risks, are most likely to arise. Potential sites (lakes and known forage areas) were checked before commencement of watches (at dusk) to determine where Whooper Swans are located and hence observe where these birds flew.

Dawn watches generally commenced before sunrise and continued into daylight. Similarly, dusk watches started before sunset and continued into night when Whooper Swans frequently fly. Whooper Swan can be detected in darkness as they are very vocal.

3.3.3 Aerial Survey

In addition to the field surveys two aerial surveys of the MSA were conducted during WSP 7 on the following dates:

- 4th March 2014; and
- 1st April 2014.

The focus of the survey was the preferred line route and up to 6km each side of the aircraft which could be viewed by 2 surveyors. In addition to the preferred line route the following areas were flown/surveyed:

1. Larger river valleys including the River Boyne (between Trim and Navan) and Blackwater (to west of Kells); and
2. The area around Balrath Demesne.

Due to very poor weather conditions it was not possible to conduct aerial surveys until later in the winter. These surveys allowed confirmation of total numbers of Whooper Swans and locations utilised including areas that cannot easily be surveyed during ground surveys. Hence this survey verified the accuracy of ground surveys. It also indicated any sites where more survey work was recommended regarding potential flight lines. The survey allowed a regional evaluation of Whooper Swan distribution and backed up the evaluation of key areas.

A four seat, single-engine light aircraft was used for the survey. The surveys were undertaken in conditions of good light and visibility, when flocks of Whooper Swans were detectable up to at least 6km either side of the aircraft. To minimise disturbance the plane avoided as much as possible flying below 1000 feet. Two experienced observers located Whooper Swans, counted them accurately and identified sites used by the Whooper Swans.

3.3.4 *Survey Constraints*

A number of minor constraints occurred with regard to conducting the surveys in line with standard guidance: Much of the study area is relatively low lying with limited view sheds from public roads.

- Weather conditions and associated visibility was generally adequate with swans up to 1km away readily identifiable. Visibility in particular will influence the adequacy of survey and all dates except 8th January 2014 had adequate visibility for survey work.

It is considered that despite these issues that the survey is robust and the bird counts and flightlines are accurate. Location distribution and numbers (of Whooper Swan) are supported by the aerial survey findings.

DRAFT

4 RESULTS

4.1 WHOOPER SWANS

4.1.1 Site Distribution

During the course of the 7 years of survey, 39 sites have been identified in the MSA as being utilised by Whooper Swan. An additional 16 sites are identified as historical sites, through public consultation or sites deemed to have high potential.

Details on Whooper Swan numbers recorded at all potential sites on each survey date during WSP 7 are provided in Appendix 2. 15 sites were recorded as used by Whooper Swan in WSP 7. The distribution and location of Whooper Swan sites in MSA for all survey years including WSP 7 is detailed in Figure 1.

The peak monthly counts in WSP 7 at all identified potential Whooper Swan sites are summarised in Table 4-1 below. This table details all sites where Whooper Swans have been recorded in MSA during 7 years of survey and other potential sites described above

Table 4-1 Peak numbers of Whooper Swan recorded at both roosting and feeding sites per calendar month during Wintering Survey Period 7

Site Name	October 2013	November 2013	December 2013	January 2014	February 2014	March 2014	April 2014	PEAK NOS.
* Ballybeg	0	0	7	0	0	0	0	7
Balrath	0	0	0	36	0	0	0	36
Balrath Demense	0	0	0	0	4	0	0	4
Bloomsbury	0	0	0	0	1	0	0	1
Breakey Lough				20	6			20
Carnaross	0	0	0	0	34	0	0	34
Cruicetown	0	0	0	60	20	51	0	60
* Cruicetown 3	0	0	0	5	0	0	0	5
Emlagh	0	0	0	0	10	0	0	10
Ervey Lough	0	0	0	10	0	0	0	10
Fyanstown (area)	0	0	0	110	30	0	0	110
Rahendrick	0	16	30	31	34	33	0	34
Sedenrath (area)	0	12	0	0	0	0	0	12
Teltown	0	5	5	0	0	0	0	5
Whitewood Lough	0	0	0	25	12	0	0	25
Athboy River Valley	0	0	0	0	0	0	0	0
Barfordstown	0	0	0	0	0	0	0	0
Black Lough	0	0	0	0	0	0	0	0
Cookstown Great	0	0	0	0	0	0	0	0
Donnapatrick	0	0	0	0	0	0	0	0
* Drumbaragh	0	0	0	0	0	0	0	0
Horans Cross Roads (small flood west of)	0	0	0	0	0	0	0	0
Knightbrook River Valley	0	0	0	0	0	0	0	0
Liscartan	0	0	0	0	0	0	0	0

Site Name	October 2013	November 2013	December 2013	January 2014	February 2014	March 2014	April 2014	PEAK NOS.
Mullagh Lough	0	0	0	0	0	0	0	0
Nr Tara Mines	0	0	0	0	0	0	0	0
Oristown	0	0	0	0	0	0	0	0
Randelstown	0	0	0	0	0	0	0	0
River Boyne Valley	0	0	0	0	0	0	0	0
Tankardstown	0	0	0	0	0	0	0	0
Wilkinstown Area	0	0	0	0	0	0	0	0

Notes: * = New Site 2013/2014.

0 = None recorded

DRAFT

The key observations (site usage, distance from preferred line route an relevant flightlines) in WSP 7 as relevant to the preferred line route detailed in Table 4-2 below. Flightlines are further detailed in section 4.1.2 below.

Table 4-2: Sites where Whooper Swan recorded in 2013/ 2014, usage (forage and or roost), flightline recorded or probable (2007 – 2014 data) and maximum count

Site	Foraging (F), Roost, Foraging and roost site (F+R)	Location Relative to preferred line route	Potential/ Confirmed roost site linked to foraging site	Flightline crossing preferred line route (WSP 7)	Flightline crossing preferred line route (WSP1 – WSP 6)	Maximum Count (2013/ 2014)
* Ballybeg	F	8 - 10km west	Tara Mines Tailings Ponds	Yes	No	7
Balrath	F	8 - 10km west	Balrath Demesne	No	No	36
*Balrath Demense	F+R	8 - 10km west	Balrath Demesne	No	No	4
Bloomsbury (Blackwater River Valley)	F	3 – 4 km east	Tara Mines Tailings Ponds	No	Potentially	1
Breakey Lough	F + R	2 – 3km west	Breakey Lough	No	No	20
Carnaross	F	13 km west	River Blackwater west Kells	No	No	34
Cruicetown	F + R	1km west	Cruicetown or Whitewood Lough	Yes	Yes	60
* Cruicetown 3	F	1km west	Cruicetown or Whitewood Lough	No	Yes	5
Emlagh	F	3km west	Fyanstown / Headford Estate	Potentially	No	10
Ervey Lake	F + R	2km east	Ervey Lake	No	No	10
Fyanstown (1 and 2) Area (Blackwater River Valley)	F + R	3 – 4km west	Tara Mines Tailings Ponds	No	Yes	110
Rahendrick	F + R	14 km west	Rahendrick or Headford Estate	No	No	34
Sedenrath area (site 1 and 2) (Blackwater River Valley)	F	5 – 6km west	Tara Mines Tailings Ponds	Yes	Potentially	12
Teltown (Blackwater River Valley)	F	0km	Tara Mines Tailings Ponds	Yes	Yes	5
Whitewood Lough	F + R	< 1km east	Cruicetown or Whitewood Lough	Yes	Yes	25

Note : * = new site 2013/ 2014

Whooper Swans observed in MSA were predominantly at foraging sites or foraging and roosting sites. Sites utilised tend to be small lakes/ floods in large arable or improved pasture fields or larger river floodplains.

Two new sites (Ballybeg and Cruicetown 3) were confirmed as supporting Whooper Swans during the course of this winter survey period. Emlagh (historical site) was confirmed as used in WSP7. Prior to WSP7 a flightline only was observed from the direction of Emlagh in WSP 6. All new sites consisted of foraging sites rather than roosts.

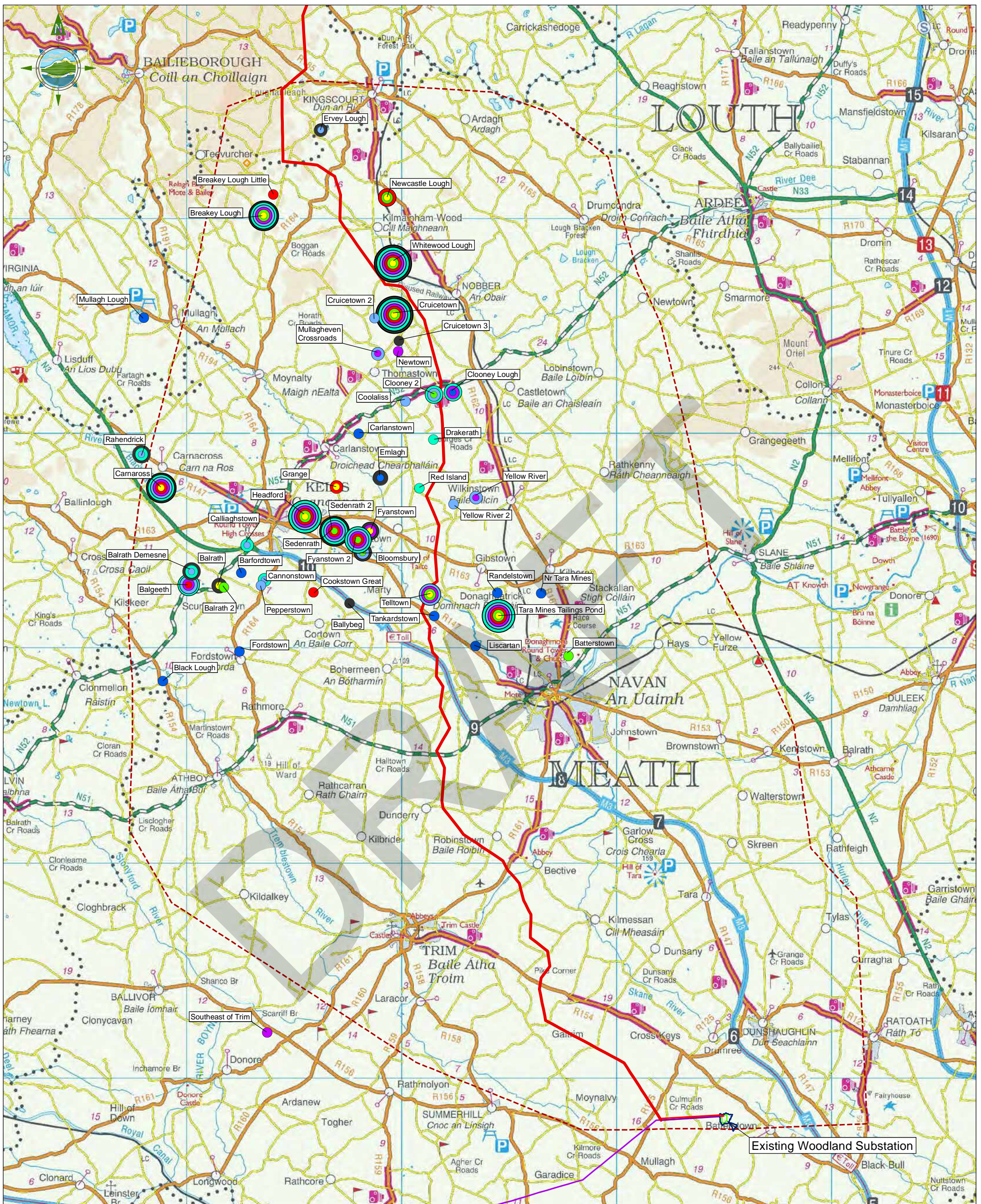
Figure 1 details all sites in the study area and years when Whooper Swan were recorded including WSP7.

The results of the two aerial surveys completed during WSP 7 to confirm Whooper Swan numbers and locations are outlined in Table 4-3 below.

Table 4-3 Whooper Swans recorded during the Wintering Survey Period 7 Aerial Surveys

Site Name	Grid Reference	04/03/14	01/04/14
Cruicetown	N795855	51	0

The only site where Whooper Swans were recorded during aerial surveys was at Cruicetown. Other swans species observed were confirmed as Mute Swans during follow up ground checks on the same days. No new sites were recorded during aerial surveys.



Legend

- Meath Study Area (MSA)
- Proposed Line Route

- Historical Swan site
- Swan sites recorded in Winter Survey Period 1: 2007/2008
- Swan sites recorded in Winter Survey Period 2: 2008/2009
- Swan sites recorded in Winter Survey Period 3: 2009/2010
- Swan sites recorded in Winter Survey Period 4: 2010/2011
- Swan sites recorded in Winter Survey Period 5: 2011/2012
- Swan sites recorded in Winter Survey Period 6: 2012/2013
- Swan sites recorded in Winter Survey Period 7: 2013/2014

NOTE:
Multi-year/period observation dots stacked.
Thickness of Route Line not to scale. Actual Route Corridor much narrower.

Scale @ A3: 1:160,000
0 0.5 1 2 3 4 5
Kilometres

Issue	Date	Description	By	Chkd
B	DEC 2014	Issued	G.F.	O.McA
A	JAN 2014	Issued	M.S.	E.C

NOTES
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD



Project:
NORTH-SOUTH 400 kV
INTERCONNECTION DEVELOPMENT

Title:
WHOOPEER SWAN DISTRIBUTION

Prepared by: G.Fil
Checked: O.McAlister
Date: December 2014

Project Director: Damien Grehan



Consulting, Civil and Structural Engineers, tel: +353-(0)1-8030 406
Block 10-4, Blanchardstown Corporate Park, fax: +353-(0)1-8030 409
Dublin 15, Ireland. e-mail: info@tobin.ie
www.tobin.ie

Issue:
6244 FIGURE 1 (MSA) B

4.1.2 Flight Lines during 2013/2014 (WSP 7)

Vantage point locations, survey date, survey time period, key observations and flightlines which crossed (or likely crossed) the preferred line route are detailed in Table 4-4 below. The summary of flightlines recorded in WSP 7 and during other years of survey is indicated in Figure 2.

Table 4-4: Vantage point locations, dates, key observations and flightline details

Vantage Point (VP) Location	Date (survey period)	Key Observations	Flight proposed preferred route	Crossed line route
Balrath (Area)	14/02/14	3 WS flew west and landed near flooded pond, then flew across to higher ground. Appear to have roosted on lake	No	
Cloony Lough (Area)	18/12/14	No WS in wider area or flightlines observed	No	
Cloony Lough (Area)	03/01/14	No WS in wider area or flightlines observed	No	
Cruicetown	17/12/14	No WS in wider area or flightlines observed	No	
Cruicetown (Area)	04/03/14:	51WS flew NE in 2 groups from Cruicetown, picked up on Whitewood Lough	Yes	
Emlagh	03/02/14	7WS flew SE, out of view. Moynalty river/ emlagh area checked but no WS audible or seen	Unlikely as flying towards Fyanstown though possibly went to Tara Mines Tailings Ponds (across preferred line route)	
Emlagh	12/02/14	2MS at river edge. No flightline observed	No	
Emlagh	21/02/14	11WS flew towards Moynalty river from north west (Carlanstown area) in two groups	No	
Emlagh	15/03/14	5MS at river edge. No flightline observed	No	
Fyanstown	08/01/14	110 WS foraging. No Flights observed	No	
Fyanstown	13/01/14	4WS (2 juvenile) flew from River Blackwater area, NE and landed in dip in field at Fyanstown	No	
Headford (Estate)	13/01/14	1 CA flying at Headford Lake (local flight)	No	
Rahans Lough	03/04/14	Whooper Swans observed at Lake edge	No	
Rahendrick	21/02/14	1 CA flew from north along River Blackwater	No	

Vantage Point (VP) Location	Date (survey period)	Key Observations	Flight proposed preferred route	Crossed line route
River Boyne Valley	20/03/14	No flightline observed	No	
Tara Mines Tailings Ponds	06/12/14	No flightlines observed	No	
Tara Mines Tailings Ponds	14/01/14	No flightlines observed	No	
Teltown	22/11/13	Both dawn and dusk: 5WS flew SW (7.30am) towards M3 and back at Dusk (5pm). Likely flock recorded at new forage site at Ballybeg beside motorway.	Yes (Teltown Area)	
Teltown	05/12/14	5WS flew NE across Balckwater Valley at Teltown, could be going Yellow River/ Tailings Pond areas	Yes (Teltown Area)	
Teltown	30/01/14	0 WS between Teltown, T mines tailings pond or Blackwater Valley towards headford. No flightlines observed	No	
Whitewood Lough	31/10/14	Cormorant flightline between Whitewood Lough along River to east.	No	
Whitewood Lough	14/01/14	37WS on lake at 7.30am. 5 flew SS/W towards hills. Then 25WS followed similar flight path. 7 WS remained on lake. Cruicetown area was checked from monument vantage point, 5 WS observed in flood SW- Cruicetown 3, across road. No WS seen or heard in Cruicetown.	Yes	
Whitewood Lough	11/02/14	2MS on lake, 8-13 swans on grass to SE of lake. Partial view, no positive ID. Rose and flew 100m, not 16in direction preferred line route	No	
Whitewood Lough	05/03/14	16WS observed flying south away from lake (possibly second group to leave). 33WS picked up at Cruicetown 2 (undulating land some possibly out of view)	Yes	
Whitewood Lough	28/03/14	1 H flew over Lake	No	
Yellow River (area)	13/02/14	No flightline observed	No	

Note: WS = Whooper Swan, MS = Mute Swan, CA = Cormorant, H = Grey Heron

A summary description of the key observations in WSP 7 at identified relevant locations where Whooper Swan concentrate in the study area is provided below.

River Blackwater Valley / Tara Mines Tailings Ponds

Whooper Swans at Fyanstown were noted walking towards the Blackwater River direction potentially to a flood area to roost at Grid Reference N782751. A separate short flightline was observed in this

direction indicating a potential roost site at the flood area detailed. No actual flights were observed from this location going towards Headford Estate or towards Tara Mines Tailings Ponds which would cross the preferred line route

A flightline was observed across Teltown (5 birds) probably from the Ballybeg townland area. This flight flew towards Tara Mines Tailings Ponds and crossed the preferred line route.

Balrath Demense / Balgeeth

The area around Balrath was a key location where Whooper Swan concentrated within 10km of the preferred line route. At dusk these birds often flew to a large pond area less than 0.5km north at Balrath Demense, meaning they did not come near the preferred line route.

Breakey Lough

Whooper Swans regularly feed on improved agricultural land adjacent to Breakey Lough and roost on the lake. No flightlines have ever been recorded to date (2007 – 2014) or are likely in this area relative to the preferred line route.

Cruicetown

Flight lines were confirmed during WSP 7 from Cruicetown to Whitewood Lough and a flight line was confirmed on at least four occasions as potentially crossing the preferred line route..

Clooney Lough/ Clooney 2/ Drakerath/ Red Island

No flightlines were recorded in this area during WSP 7.

Headford Estate (area)

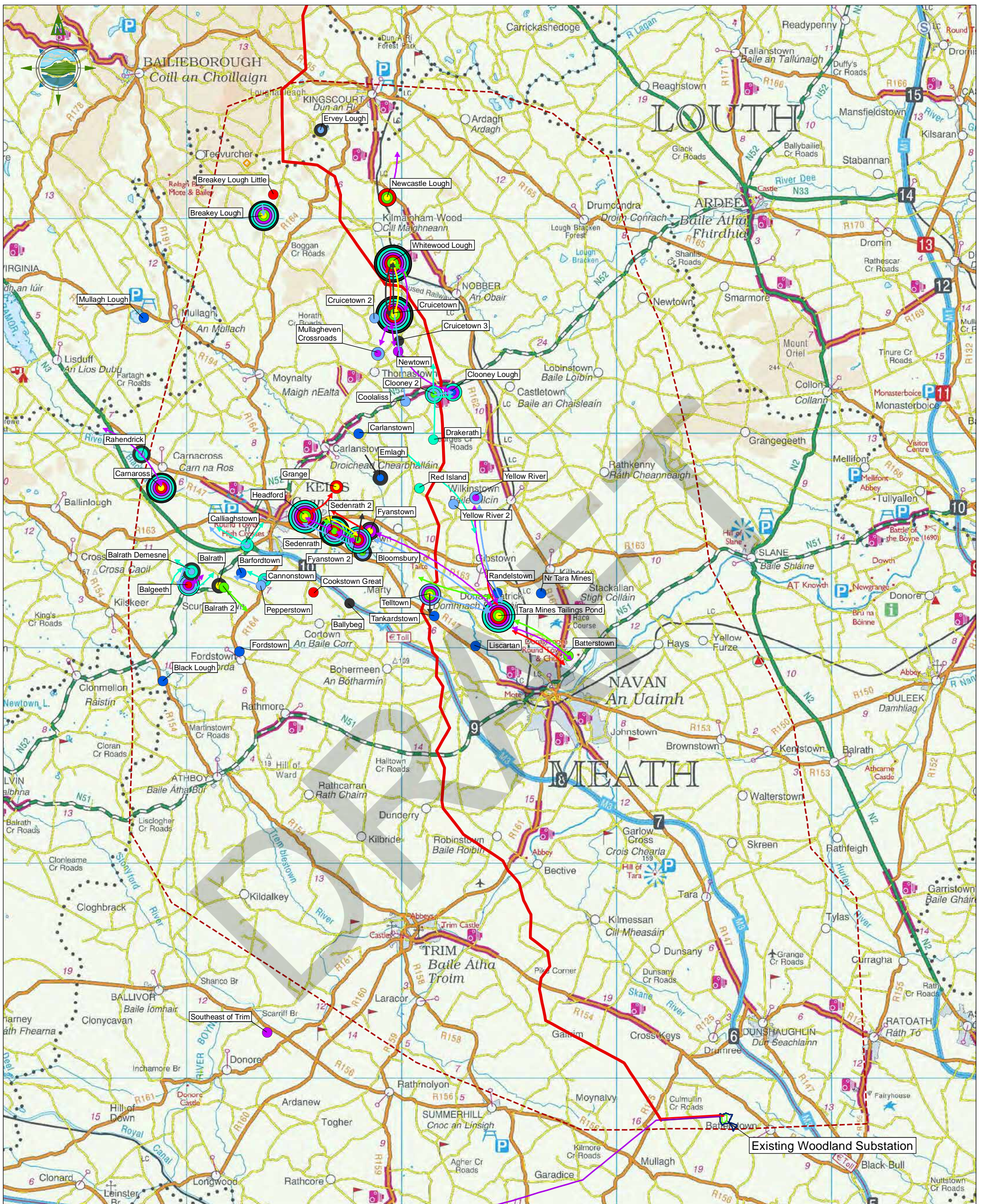
No flightlines were observed to Headford estate and no Whooper Swan were confirmed as roosting here during WSP7.

Summary

In summary, flightlines across the preferred line route were recorded at the following locations all of which were highlighted in previous survey years:

1. The Cruicetown / Whitewood Lough Area; and
2. The River Water Blackwater area near Teltown – flightline to the roost site at Tara Mines Tailings Ponds.

No new flightlines of significance were noted which have not been recorded in previous surveys.



Legend

Meath Study Area (MSA)

Proposed Line Route

- Historical Swan site
- Swan sites recorded in Winter Survey Period 1: 2007/2008
- Swan sites recorded in Winter Survey Period 2: 2008/2009
- Swan sites recorded in Winter Survey Period 3: 2009/2010
- Swan sites recorded in Winter Survey Period 4: 2010/2011
- Swan sites recorded in Winter Survey Period 5: 2011/2012
- Swan sites recorded in Winter Survey Period 6: 2012/2013
- Swan sites recorded in Winter Survey Period 7: 2013/2014
- Flight Lines 2007/2008
- Flight Lines 2008/2009
- Flight Lines 2009/2010
- Flight Lines 2010/2011
- Flight Lines 2011/2012
- Flight Lines 2012/2013
- Flight Lines 2013/2014

NOTE: Multi-year/period observation dots stacked. Thickness of Route Line not to scale. Actual Route Corridor much narrower.

Scale @ A3: 1:160,000

0 0.5 1 2 3 4 5

Kilometres

Issue	Date	Description	By	Chkd
B	DEC 2014	Issued	G.F.	O.McA
A	JAN 2014	Issued	M.S.	E.C

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING

2. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Client:

Project: NORTH-SOUTH 400 kV INTERCONNECTION DEVELOPMENT

Title: WHOOPER SWAN DISTRIBUTION FLIGHT LINES

Prepared by: G.Fil
Checked: O.McAlister
Date: December 2014

Project Director: Damien Grehan

Patrick J. Tobin & Co. Ltd.

Consulting, Civil and Structural Engineers, tel: +353-(0)1-8030 406
Block 10-4, Blanchardstown Corporate Park, fax: +353-(0)1-8030 409
Dublin 15, Ireland. e-mail: info@tobin.ie
www.tobin.ie

Issue: B

4.1.3 Summary of Key Observations made during WSP 7

During WSP 7, no site, or dispersed clusters of sites, contained internationally or nationally significant concentrations of Whooper Swans. The total numbers of Whooper Swans in the study area exceeded nationally significant levels²¹ (149) on one date (8th January 2014). Numbers were significantly lower on all other survey dates.

The largest flocks of Whooper Swans identified during WSP 7 were recorded in the Fyanstown area (max. 110 birds), Cruicetown (max. 60 birds), Balrath Demense areas (max. 36 birds), Rahendrick (max. 34 birds) and Breaky Lough (max. 20 birds). Sites used are similar to previous years survey findings and this survey confirms that these are regularly used sites. Flightlines in these areas were as expected and similar to previous surveys.

Outside these “regular” sites 2 new sites were noted and an irregular / historical site at Emlagh was more regularly used. Emlagh is a historically used site in the Moynalty river valley. A small flock (max. 10 birds) used this area in February 2014. The other 2 new sites Ballybeg and Cruicetown 3 were foraging sites used by low numbers.

In WSP 7 no significant usage was noted of the Cloony 2, Cloony Lough and other scattered foraging sites south of the N52 road to the Blackwater valley recorded in WSP 5 and 6.

Ervey Lake was used briefly by a small flock. Again this is a very irregularly used site and Whooper Swans tend to stay here both foraging and roosting limiting the nos. of potential flightlines

The Cruicetown area was surveyed during all aerial surveys in WSP 7. Whooper Swan numbers recorded during WSP 7 were relatively low (max 60) compared to years 2010 – 2011 when nationally significant numbers were recorded in March (Spring passage time). Numbers at this site since winter 2011/2012 have lowered (maximum count <75). It was noted that despite drainage works which have reduced the extent of the pond roost site here that Whooper Swan continue to use this site. They tend now to roost now on Whitewood Lough (or move here more regularly) which crosses the preferred line route. While Cruicetown was previously evaluated as nationally important, it does not currently justify this evaluation and is considered a county important site.

²¹ Boland *et al.*, (2010)

4.1.4 Evaluation of sites and key observations to date (WSP 1 – WSP 7)

The evaluation of Whooper Swan sites (based on ecological valuation criteria in NRA 2009²²) is detailed below with the key observations between WSP 1 – 7 inclusive (2007–2014). This assessment is based on the data recorded including site usage, flightlines etc

This evaluation and flightlines information are the key data for informing the impact assessment and mitigation in the EIS.

The most important site and clusters of linked sites in the study area are; Blackwater valley (between Kells and Navan), Cruicetown and Balrath. Whooper Swan sites are detailed below based on observations (2007-2014). This summary also Evaluates sites / clusters of sites based on survey to date.

1. The Blackwater valley (between Kells and Navan) typically has larger numbers than Cruicetown and all other sites detailed. Sites in the River Blackwater valley include; Fyanstown (roost and forage site), Headford (roost site), Tara Mines Tailings Pond (roosts site), Sedenrath (forage area) and Grange (irregular forage area). While numbers have dropped in recent years this area is the most important in the study area (based on maximum counts) and is considered Nationally Important. This area is relevant to the preferred line route as a flightline crosses.
2. Cruicetown (roost and forage area) is the most regularly used site. It is linked by flightlines to Whitewood Lough (roost site) and irregular forage areas at Newtown, Cruicetown 2 and Cruicetown 3. Numbers typically are under 60 birds - though in 2010 and 2011 – Nationally significant counts were recorded for short periods in March. This site is used generally in the later winter (after December) and in March concentrations can build up as birds gather here prior to further migration towards Iceland. Due to land drainage and decreased numbers in recent years this site cannot be considered now as Nationally important. It is still nevertheless a regularly used site and is considered County Important in particular as a staging area for migrating Whooper Swans. This area is relevant to the preferred line route as a flightline crosses the route corridor.
3. The Balrath demesne area is regularly used by numbers which do not reach National importance (highest count to date = 128 birds). Whooper Swans typically roost at a pond on Balrath Demesne or fly in the direction of Headford estate (alternative roost site) or using temporary flooding to roost in this area. Foraging sites linked to Balrath demesne include Balrath, Balgeeth, Cannonstown, Pepperstown and Calliaghstown. This area is considered County Important. This area is not relevant to the preferred line route being well removed.
4. Yellow River. The Yellow River area (Yellow River and Yellow River 2) consists of very extensive arable field planted with potatoes in some years. These can attract very large flocks

²² National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes

of Whooper Swan (including internationally significant counts of 225 in 2010 and nationally significant counts in 2010 and 2011). This site however is not used in some years at all e.g. WSP1, WSP2 and WSP7. This area is considered County Important. Whooper Swans were observed carrying out extensive flightlines to roost at Tara Mines Tailings Ponds from this site which avoids crossing the preferred line route. The preferred line route is nevertheless close to the Yellow River and the associated Yellow river 2 site (<1km).

5. Rahendrick and Carnaross . These sites are associated with the Blackwater River Valley west of Kells and are regularly used by a flock of 30 – 40 Whooper Swans. This area is not relevant to the preferred line route being well removed.
6. Breaky Lough – This lake and adjacent fields is used at least for short periods every winter by a flock of up to 46 birds. These birds do not conduct extensive daily flightlines and feed in adjacent fields while roosting on the Lake. This site is not relevant to the preferred line route as no regular flightlines occur or are likely and Whooper Swan stay close to the lake for extended periods.

locally important sites(irregularly used) include;

1. Cloony Lough and large arable fields dispersed in this area including Drakerath, Cloony 2 and Coolaliss. Whooper Swans in this area were observed as responding to a temporary roost (flooding) and food (potatoes) source in WSP 5 and 6. None were recorded in this area in WSP 2, WSP 3 and WSP 7. This area is relevant to the preferred line route as a flightline was recorded crossing the route corridor in some years.
2. Emlagh. This is an area of extensive flat fields in the Moynalty River Valley. It was identified by NPWS as a historic site although none were confirmed in this area (despite regular checks) until WSP 7. A flightline was observed towards the Blackwater valley and potential locations crossed are similar to the Blackwater and Yellow River area (see above).

4.2 OTHER WINTERING BIRDS

While the focal point of the study was Whooper Swans, other wintering bird species of conservation concern, and/or species which are potentially sensitive to transmission line development were also surveyed recorded. Table 4-5 below details peak counts of other bird species (not including Whooper Swan) recorded in WSP7.

Table 4-5 Peak counts of wintering bird species WSP 7 (excluding whooper swan)

Site Name	Other Bird Species (peak count during WSP 7)
Black Lough	Mute Swan (2)
Bloomsbury	Mute Swan (6)
Breakey Lough	Mute Swan (5), and Cormorant (10), Snipe (4)
Breakey Lough Little	Mute Swan (3)
Cruicetown	Mute Swan (2), Sparrowhawk
Cruicetown 2	Mute Swan (2), Cormorant (1)
Clooney 2 area	Mute Swan (2)
Drakerath area	Mallard (20)
Drumbaragh (south west of Kells) - Grid Ref: N693755)	Lapwing (80), Golden Plover (70)
Emlagh	Mute Swan (5), Teal (3), Kestrel
Ervey Lough	Mute Swan (4)
Fyanstown (area)	Golden Plover (200+), Lapwing (20+), Mute Swan (3). Gulls (Black Headed and Lesser Black Backed (100's)), Peregrine
Grange	Mute Swan (5)
Headford	Mute Swans (10), Cormorant (4)
Horans Cross - Grid Ref: N794956)	Teal (50)
Newcastle Lough	Mute Swan (20), Mallard (15), Cormorants (7) and Moorhen (1)
River Boyne Valley	Mute Swan (4)
Pepperstown	Wigeon/Teal (50+)
Rahendrick	Mallard (20), Wigeon (30), Lapwing (116), Cormorant (1) Mute Swan (3)
Tankardstown	Mute Swan (2)
Tara Mines Tailings Pond	Duck (Mallard predominantly) > 200 and gulls (Blackheaded and Lesser Black Backed) >500
Teltown	Mute Swan (3)
Whitewood Lough	Mute Swan (20), Great-Created Grebes (8), Lapwing (12), Mallard (6), Wigeon (2), Cormorant (10), Goldeneye (6) and Tufted Duck (5)
Yellow River	Gulls (200+)

The most important site for other species identified is Tara Mines Tailings Ponds, as large flocks of Golden Plover, ducks species and gulls concentrate here, at least occasionally for roosting. The Fyanstown area (in the River Blackwater valley) is used regularly by flocks of Golden Plover and

Lapwing. These observations were primarily made in the earlier years of survey. All other sites have relatively low numbers of common waterfowl. Whitewood, Breaky Lough, Ervey Lough, Fyanstown (wetland and fields) and Newcastle Lough are more noteworthy and can host relatively significant local concentrations of wildfowl and waders and thus are more important.

DRAFT

5 CONCLUSION

5.1 WHOOPER SWAN

This report highlights a number of key sensitive locations which require consideration of potential impacts and mitigation in the EIS.

The areas where Whooper Swan flightlines have been observed as crossing the preferred line route and hence where a collision risk is likely are summarised as follows;

- A regular flight line crosses the preferred line route from Tara Mines Tailing Ponds to the Fyanstown area (River Blackwater valley west of Navan). This flightline was confirmed in WSP 1, 2 (regular), 4, 5 and 7. The River Blackwater valley and Tara Mines Tailings ponds are a recognised nationally important site for Whooper Swans (NPWS and Birdwatch Ireland)
- A regular flight line crosses the preferred line route from Cruicetown to Whitewood Lough. This flightline was confirmed in WSP 1, 2, 3, 4, 6 & 7.
- An irregular flight line potentially crosses the preferred line route from Cruicetown to the Clooney area. This was recorded in WSP 4 and 6.
- An irregular flight line crosses the preferred line route from fields at Clooney 2 towards Clooney Lough. This was recorded in WSP 5 and 6.
- Flightlines were not confirmed as crossing the preferred line route in this area. However the preferred line route (<1km) is close. Large numbers (252 on one occasion) of Whooper Swan were noted in WSP 3 and 6. A flightline was confirmed between Yellow River and Tara Mines Tailings Ponds which does not cross the preferred line route.
- A very irregular flight line potentially crosses the preferred line route from the area around Emlagh going south east likely to Tara Mines Tailing Ponds (similar to point 1 above). This was recorded in WSP 6 & 7.

5.2 OTHER WINTERING BIRDS

Other wintering bird records of note and relevant locations are detailed in this report. Flightlines of other collision prone bird species such as Mute Swan were associated with lake sites away from the preferred line route. River valleys crossed by the alignment are also where flightlines of Cormorant and Mute Swan are concentrated.

Glossary

- CMSA Cavan Monaghan Study Area
- EIA Environmental Impact Assessment
- EIS Environmental Impact Statement
- EU European Union
- FRREC Fall River Rural Electric Cooperative
- IWSSG Irish Whooper Swan Study Group
- I-Webs Irish Wetland Bird Survey
- kV Kilovolts
- MBEC Mackenzie Bradshaw Environmental Consulting
- MSA Meath Study Area
- MV Medium Voltage
- NPWS National Parks and Wildlife Service
- OHL Over Head Line
- SPA Special Protection Area
- TRLT Teton Regional Land Trust
- WSP Winter Survey Period

Appendix 1

Bibliography

DRAFT

- Andrew R., Jenkins, Smallie, J. J., & Diamond M. (2010). Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. *Bird Conservation International*, 20, pp 263-278. doi:10.1017/S0959270910000122.
- Avian Transmission line Interaction Committee (APLIC) 1994. *Mitigating Bird Collisions with Transmission lines: The State of the Art in 1994*. Edison Electric Institute. Washington, D.C.
- Avian Power Line Interaction Committee (APLIC) 2012. *Reducing Avian Collisions with Power lines: The State of the Art in 2012*. Edison Electric Institute. Washington, D.C.
- Barrientos, R., Alonso, J.C., Ponce C. & Palacín, C., 2011. Meta-analysis of the effectiveness of marked wire in reducing avian collisions with power lines. *Conservation Biology*, published online June 2011.
- Barov, B., 2011. The impact of power lines on European bird populations. Presentation at "Powerlines and bird mortality International Conference, Budapest, Hungary (<http://www.mme.hu/termeszetvedelem/budapest-conference-13-04-2011/presentations.html>).
- Becker M.D & Lichtenberg J.S. (2005). Selected Papers of the 20th Trumpeter Swan Society Conference, Trumpeter Swan Restoration: Exploration and Challenges, Iowa. Retrieved from: http://www.trumpeterswansociety.org/docs/20th_conf/20becker_and_lichtenberg.pdf.
- Bevanger, K. & Brøseth, H., (2004). Impact of power lines on bird mortality in a subalpine area. *Animal Biodiversity and Conservation*, 27.2: 67–77.
- BirdWatch Ireland (2013). I-Webs Sites <http://www.arcgis.com/home/webmap/.html?webmap=d8ff53a745c64712bb49bab2b91acec2>.
- Boland H, McElwaine J, Henderson G, Hall C, Walsh A & Crowe O (2010). Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: results of the International Swan Census, January 2010. *Irish Birds* 9: 1-10 (2010)
- Bureau Waardenburg (2011). Draft Guidelines on how to avoid or mitigate impact of electricity power grids on migratory birds in the African-Eurasian region. http://www.unep-aewa.org/meetings/en/mop/mop5_docs/pdf/mop5_37_draft_electr_guidelines.pdf
- Colhoun K & Cummins S (2013) Birds of Conservation Concern in Ireland 2014–2019. *Irish Birds* 9: 523-544 (2013)
- Crowe O, McElwaine JG, Worden J, Watson GA, Walsh A & Boland H 2005. Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: Results of the International Swan census, January 2005. *Irish Birds* 7(4):483-488.
- Crowe O, Austin GE, Colhoun K, Cranswick PA, Kershaw M & Musgrove AJ. 2008. Estimates and trends of waterbirds wintering in Ireland, 1994/95 to 2003/04. *Bird Study* 55, 66-77.
- EU Guidance on wind energy development in accordance with the EU nature legislation. European Commission October 2010.

- Environmental Statement (2006). Proposed Beaulieu to Denny 400kV Overhead Transmission Line. Scottish Power and Scottish and Southern Energy.
- Fijn, R., Krijgsveld, K., Tijssen, W. s.l (2012). Habitat use, disturbance and collision risks of Bewick's Swans *Cygnus columbianus bewickii* wintering near a wind farm in the Netherlands. *Wildfowl*, 69:97-116, Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire.
- Frost D (2008). The use of „flight diverters“ reduces mute swan *Cygnus olor* collision with powerlines at Abberton Reservoir, Essex, England *Conservation Evidence* (2008) 5, 83-91.
- Gilbert G., Gibbons D.W., Evans J, (1998). *Bird Monitoring Methods: A manual of Techniques for Key UK Species*. RSPB, Sandy.
- Haas D, Nipkow M, Fiedler G, Schneider R, Haas W, Schürenberg B. 2005. Protecting birds from transmission lines. *Convention on the Conservation of European Wildlife and Habitats (Bern Convention)*. *Nature and environment*, No 140. Council of Europe Publishing.
- Hall, C., Glanville, J.R., Boland, H., Einarsson, O., McElwaine, G., Holt, C.A., Spray, C.J. and Rees, E.R. 2012. Population size and breeding success of Icelandic Whooper Swan *Cygnus cygnus*: Results of the 2010 International Census. *Wildfowl* 62: 73-96.
- Jenkins, A.R., Smallie, J. & Diamond, M., 2010. Avian collisions with power lines: a global review of causes and mitigation, with a South African perspective. *Bird Conservation International* (2010) 20: 263-278.
- JNCC (2013). Whooper Swan Conservation status link: <http://jncc.defra.gov.uk/pdf/UKSPA/UKSPA-A6-16.pdf>
- López-López P, Ferrer M, Madero A, Casado E, McGrady M (2011). Solving Man-Induced Large-Scale Conservation Problems: The Spanish Imperial Eagle and Power Lines. *PLoS ONE* 6(3): e17196. doi:10.1371/journal.pone.0017196.
- Lynas P., Newton S.F. & Robinson J.A. 2007. The status of birds in Ireland: an analysis of conservation concern 2008-2013. *Irish Birds* 8:149-166.
- Merne, OJ & Murphy, CW. 1986. Whooper Swans in Ireland, January 1986. *Irish Birds* 3(2):199-206.
- MBEC McKenzie Bradshaw (2006). Beaulieu Denny EIS – Tech Annex 22.22 -Review of Bird Collisions and Transmission lines.
- National Roads Authority (2009a). *Guidelines for Assessment of Ecological Impacts on National Roads Schemes*. Dublin.
- Newton S., Donaghy, A., Allen, D. & Gibbons, D. 1999. Birds of Conservation Concern in Ireland. *Irish Birds* 6:333-344
- Robinson, JA, K Colhoun, JG McElwaine & EC Rees. 2004. Whooper Swan *Cygnus cygnus* (Iceland population) in Britain and Ireland 1960/61 – 1999/2000. *Waterbird Review Series*, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Percival S (2003) *BIRDS AND WIND FARMS IN IRELAND: A REVIEW OF POTENTIAL ISSUES AND IMPACT ASSESSMENT*

<http://www.sustainableenergyireland.ie/uploadedfiles/RenewableEnergy/AssessmentMethodologyBirdsIreland.pdf>

- Rees, E.C (2012). Impacts of wind farms on swans and geese: a review. *Wildfowl*, 62:37-72, Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire.
- Robinson, JA, K Colhoun, JG McElwaine & EC Rees. 2004. Whooper Swan *Cygnus cygnus* (Iceland population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Scottish Natural Heritage (2013). Assessing Connectivity with Special Protection Areas (SPAs).
- Scottish Natural Heritage (2014) Recommended bird survey methods to inform impact assessment of onshore wind farms.
- Scottish Power and Scottish and Southern Energy (2006). Proposed Beaulieu to Denny 400kV Overhead Transmission Line. Scottish Power and Scottish and Southern Energy.
- Slater, G.L. (2006). Trumpeter Swan (*Cygnus buccinator*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Retrieved from: <http://www.fs.fed.us/r2/projects/scp/assessments/trumpeterswan.pdf>

Appendix 2

WSP 7: 2013 / 2014 Whooper Swan Survey Counts

DRAFT

Site	31/10/2013	21/11/2013	05/12/2013	17/12/2013	03/01/2014	08/01/2014	13/01/2014	14/01/2014	30/01/2014	03/02/2014	07/02/2014	11/02/2014	13/02/2014	14/02/2014	21/02/2014	24/02/2014	04/03/2014	14/03/2014	20/03/2014	28/03/2014	01/04/2014	02/04/2014
Athboy River Valley	NC	0	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	0	NC	NC	0	0
Balgeeth	NC	NC	NC	0	0	0	0	NC	NC	NC	0	NC	0	NC	NC	NC	0	NC	NC	0	0	0
* Ballybeg	0	0	0	7	0	NC	NC	NC	NC	0	NC	NC	NC	0	0	NC	0	0	0	0	0	0
Balrath	0	0	0	0	7	28	36	NC	NC	0	0	NC	0	NC	0	NC	0	0	0	0	0	0
Balrath Demense	0	NC	0	0	0	0	0	NC	NC	0	4	NC	4	3	0	NC	0	0	0	0	0	0
Barfordstown	0	0	NC	0	0	0	0	NC	NC	0	0	NC	0	0	0	NC	0	0	0	0	0	0
Batterstown	NC	0	NC	0	NC	NC	NC	NC	NC	NC	0	NC	0	NC	0	NC	0	0	0	0	0	0
Black Lough	NC	0	NC	NC	NC	0	NC	NC	NC	0	NC	NC	NC	NC	NC	NC	0	NC	NC	0	0	0
Bloomsbury	0	0	0	0	0	0	0	0	0	0	0	NC	0	1	0	NC	0	0	0	0	0	0
Breaky Lough	NC	0	0	NC	NC	NC	0	20	NC	0	0	NC	6	0	NC	NC	0	0	NC	0	0	0
Breaky Lough Little	NC	0	0	NC	NC	NC	0	0	NC	0	0	NC	0	0	NC	NC	0	0	NC	0	0	0
Calliaghstown	0	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	NC	NC	0	0	NC	0	0	0
Cannonstown	0	0	0	NC	NC	0	NC	NC	NC	NC	0	NC	0	0	0	NC	0	0	0	0	0	0
Carlanstown	0	0	0	NC	0	0	0	0	NC	0	0	NC	0	NC	0	NC	0	0	NC	0	0	0
Carnaross	NC	0	0	NC	NC	0	0	NC	NC	0	0	NC	NC	0	0	NC	0	NC	0	0	0	0
Clooney lough	0	0	0	0	0	0	0	0	NC	0	NC	NC	0	NC	0	0	0	0	NC	0	0	0
Clooney 2 (fields)	0	0	0	0	0	0	0	0	NC	0	NC	0	0	0	0	0	0	0	NC	0	0	0
Cookstown Great	NC	0	0	0	0	NC	0	NC	NC	NC	NC	NC	0	NC	0	NC	0	0	NC	0	0	0
Coolaliss	0	0	0	NC	0	0	0	NC	NC	0	0	NC	0	0	0	NC	0	0	NC	0	0	0
Cruicetown	0	0	0	0	60	NC	NC	50	NC	0	NC	0	6	0	0	20	51	28	0	0	0	0
Cruicetown 2	0	0	0	0	0	0	0	0	NC	0	NC	0	0	NC	0	0	0	0	0	0	0	0
* Cruicetown 3	NC	NC	NC	NC	NC	NC	NC	5	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	NC	0	0	NC
Donnapatrick	0	NC	NC	NC	0	NC	NC	0	0	NC	0	NC	NC	0	NC	0	0	0	0	0	0	0
Drakerath	NC	0	0	0	0	0	0	NC	NC	0	NC	0	0	0	NC	NC	0	0	NC	NC	0	0
* Drumbaragh	NC	NC	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	NC	NC	0	NC
Emlagh	0	0	0	NC	0	0	0	0	NC	7	6	NC	0	6	10	NC	0	0	NC	0	0	0
Ervey Lough	NC	0	0	NC	NC	NC	NC	10	NC	0	NC	0	0	NC	NC	NC	0	0	NC	0	0	0
Fordstown	NC	0	0	NC	NC	0	NC	NC	NC	0	NC	NC	NC	NC	NC	NC	0	NC	NC	0	0	0
Fyanstown (area)	0	0	0	0	0	110	4	0	0	0	0	NC	30	0	NC	NC	0	0	0	0	0	0
Grange	0	0	0	NC	0	0	0	0	0	0	0	NC	0	0	0	NC	0	0	NC	0	0	0
Headford	NC	0	0	0	NC	0	0	0	0	0	0	NC	NC	0	0	NC	0	0	0	NC	0	0
Horans Cross Roads (small flood west of)	NC	0	0	NC	NC	0	0	NC	NC	0	NC	NC	NC	NC	0	NC	0	NC	NC	NC	0	NC
Knightbrook River Valley	NC	NC	NC	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	NC	NC	0	0
Liscartan	NC	0	NC	0	0	0	0	NC	0	NC	NC	NC	0	0	0	NC	0	0	0	0	0	0
Lough Ramor callows	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	0	NC	NC	NC	0	NC
Mullagh Lough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	NC	NC	0	NC	NC	NC	0	0
Mullagheven CS.	NC	0	0	0	NC	0	0	NC	NC	0	NC	0	0	0	0	0	0	0	NC	0	0	0
Newcastle Lough	0	NC	NC	NC	NC	NC	NC	0	NC	NC	NC	0	0	0	NC	0	0	0	NC	0	0	0
Newtown	0	NC	NC	0	NC	NC	NC	NC	NC	0	NC	0	0	0	NC	0	0	0	NC	0	0	0
Nr Tara Mines	NC	0	0	0	0	0	0	0	0	0	0	NC	0	NC	0	0	0	0	0	0	0	0
Oristown	NC	0	0	NC	NC	0	0	NC	NC	0	NC	NC	NC	NC	0	NC	0	0	NC	NC	0	NC
Pepperstown	0	0	0	NC	0	0	0	NC	NC	NC	0	NC	0	0	0	NC	0	0	0	0	0	0
Rahendrick	NC	16	30	NC	31	22	8	NC	NC	25	0	NC	NC	34	34	NC	0	NC	33	NC	0	0
Randelstown	NC	0	0	0	0	0	0	0	NC	NC	0	NC	0	NC	NC	NC	0	0	0	0	0	0
Red Island	NC	NC	0	NC	NC	0	0	NC	NC	NC	0	NC	0	NC	NC	NC	0	0	NC	NC	0	0
River Boyne Valley	NC	NC	0	NC	NC	NC	NC	NC	NC	NC	0	NC	0	NC	NC	NC	0	0	0	0	0	0
Sedenrath (area)	0	12	0	0	0	0	0	0	0	0	0	NC	0	0	0	NC	0	0	0	0	0	0
SE of Trim																						0
Tankardstown	0	0	0	0	0	0	0	NC	0	0	0	NC	2MS	0	0	NC	0	0	0	0	0	0
Tara Mines T.P	0	0	0	0	NC	NC	NC	NC	0	0	NC	NC	0	NC	NC	0	0	0	0	0	0	0
Teltown	0	5	5	0	0	0	0	NC	0	0	0	NC	0	0	0	NC	0	0	0	0	0	0
Whitewood Lough	0	0	0	NC	NC	0	25	0	NC	0	0	0	0	0	0	12	0	0	NC	0	0	NC
Wilkinstown Area	NC	0	0	NC	NC	0	0	NC	0	0	0	NC	0	NC	0	0	0	0	NC	0	0	0
Yellow River	0	0	0	0	0	0	0	NC	NC	0	0	NC	0	0	0	0	0	0	NC	0	0	0
Yellow River 2	0	0	0	0	0	0	0	NC	NC	0	0	NC	0	0	0	0	0	0	NC	0	0	0

NC = Not Counted



TOBIN
Patrick J. Tobin & Co. Ltd.

INTERNATIONAL NETWORK

Galway
Fairgreen House,
Fairgreen Road,
Galway.
Ph +353 (0)91 565211
Fax +353 (0)91 565398
E-mail galway@tobin.ie

Dublin
Block 10-4,
Blanchardstown Corporate
Park,
Dublin 15.
Ph +353 (0)1 803 0406
Fax +353 (0)1 803 0409
E-mail dublin@tobin.ie

Castlebar
Market Square,
Castlebar,
Co. Mayo.
Ph +353 (0)94 902 1401
Fax +353 (0)94 902 1534
E-mail castlebar@tobin.ie

Krakow (Poland)
Ul. Cystersow 9,
31-553,
Krakow,
Poland.
Ph +4812353 8646
Fax +48123537329
E-mail poland@tobin.ie

Oxfordshire (UK)
CAB International
Nosworthy Way,
Wallingford,
Oxfordshire.
Ph +441491829327
Fax +441491833508
E-mail uk@tobin.ie

visit us @ www.tobin.ie