

## CHAPTER 6 FLORA AND FAUNA

- **Appendix 6.3 Hedgerow Impact Study**

DRAFT



# BENCHMARK HEDGEROW STUDIES

SEPTEMBER 2011

TOBIN CONSULTING ENGINEERS



## Benchmark Hedgerow Studies

<b>PROPOSAL:</b>	<b>Benchmark Hedgerow Studies</b>
<b>CLIENT:</b>	<b>EirGrid Plc</b> The Oval 160 Shelbourne Road Dublin 4 Ireland
<b>COMPANY:</b>	<b>TOBIN Consulting Engineers</b> Block 10-4, Blanchardstown Corporate Park, Dublin 15
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**DOCUMENT AMENDMENT RECORD**

<b>Client:</b>	EirGrid Plc
<b>Project:</b>	North South 400kV Interconnection Development
<b>Title:</b>	Benchmark Hedgerow Studies

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# 1 INTRODUCTION

TOBIN Consulting Engineers (herein referred to as TOBIN) undertook an evidence based field study, during spring and summer 2011, examining the impacts (permanent and temporary) to hedgerows/ linear woodland on field boundaries at existing transmission tower locations.

## 1.1 PURPOSE OF THE STUDY

The main aim of this study is to provide information on actual impacts of locating towers on hedgerows. This study investigated evidence of change to; habitats (hedgerows/ treelines/ linear woodland), typical flora species composition (woody species, ground flora), fauna (bats, breeding birds and badgers in particular); which may be linked to locating a tower in hedgerows. The study area in Counties Laois and Kildare is relatively similar and comparable to the County Meath section of the North South 400kV Interconnection Development.

The study aimed to:

- Provide evidence of existing impacts to hedgerows from transmission towers (steel lattice type);
- Determine based on evidence if the potential issue; loss of habitat connectivity is likely to arise from the North South 400kV Interconnection Development; and
- Based on the findings of the study provide recommendations for minimising / avoiding impacts and best practise approaches for the proposed North South 400kV Interconnection Development.

A range of parameters were recorded at each tower location to inform this study including:

- Hedgerow structure, management and flora composition;
- Fauna usage (foraging/ shelter and breeding sites) relative to existing towers. Groups investigated included bats, breeding birds, badgers and other common mammals as recorded;
- Describe and quantify as appropriate the impact from construction of tower and trimming;;
- Describe and quantify as appropriate evidence of impact from access tracks and other ancillary developments; and
- Describe evidence of change associated with trimming vegetation and any other operational procedures which may potentially impact hedgerows.

## 1.2 STUDY AREA DESCRIPTION

This study was conducted in agriculture-dominated landscape in Counties Kildare and Laois in habitats consistent with the County Meath section of the 400kV North South Interconnector Development.

The study areas chosen consisted of two main transmission line sections including

- Towers on the 400kV Moneypoint to Dunstown section; and
- Towers on the 220kV which link into the Taghadoe cross roads substation (near Maynooth, County Kildare).

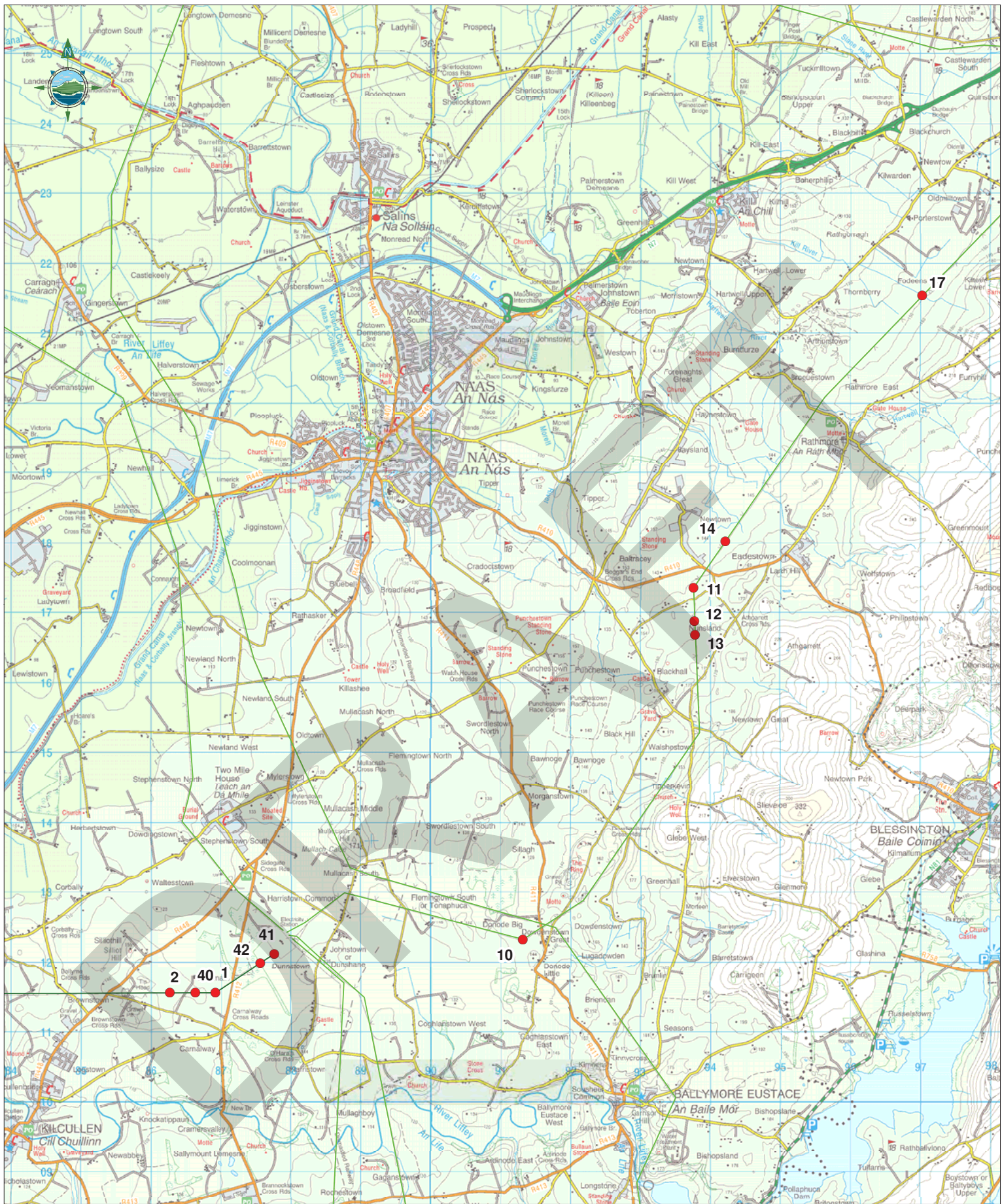
In addition 400kV towers around the Dunstown Power station were surveyed for bats only.

A map detailing tower locations is detailed in Figures 1 to 4 (See overleaf). A summary description of tower type, date of survey, survey type and county location is detailed in Table 1-1 herein.

**Table 1-1: Summary Details of Towers Surveyed**

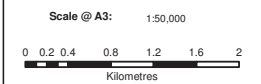
Location Tower Nos.	Survey Date	Survey Implemented	County	Tower Type
1	04/05/2011 and 30/06/11	Habitat/ Fauna and Bat	Kildare	Angle
2	04/05/2011 and 30/06/11	Habitat/ Fauna and Bat	Kildare	Intermediate
10	04/05/2011 and 26/07/11	Habitat/ Fauna	Kildare	Angle
11	05/05/2011	Habitat/ Fauna	Kildare	Angle
12	05/05/2011 and 26/07/11	Habitat/ Fauna	Kildare	Intermediate
13	05/05/2011 and 26/07/11	Habitat/ Fauna	Kildare	Intermediate
14	05/05/2011	Habitat/ Fauna	Kildare	Intermediate
17	05/05/2011	Habitat/ Fauna	Kildare	Intermediate
22	05/05/2011	Habitat/ Fauna	Kildare	Angle
25	05/05/2011	Habitat/ Fauna	Kildare	Intermediate
29	09/06/2011	Habitat/ Fauna	Laois	Intermediate
33	08/06/2011	Habitat/ Fauna	Laois	Intermediate
37	08/06/2011	Habitat/ Fauna	Laois	Intermediate
38	08/06/2011	Habitat/ Fauna	Laois	Intermediate
39	08/06/2011	Habitat/ Fauna	Laois	Intermediate
40	04/05/2011 and 30/06/11	Habitat/ Fauna	Kildare	Intermediate
43	26/07/2011	Habitat/ Fauna	Kildare	Intermediate
Dunstown substation and towers 41 and 42	30/06/2011	Bat	Kildare	Intermediate





**LEGEND**

- 220kV Line
- 400kV Line
- Towers on Hedgerows



D01	01.09.11	Draft	A.G.	R.M.
Issue	Date	Description	By	Chkd

**NOTES**  
 1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING  
 2. DISCOVERY SERIES TILES USED: OS2820, OS2822  
 3. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Client:

Project: **BENCHMARK HEDGEROW STUDIES**

Title: **ESB NETWORK & TOWER ON HEDGEROWS**

Prepared by: A.Gruschka  
 Checked: M.Hogan  
 Date: September 2011

Project Director: D.Grehan

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**LEGEND**

- 220kV Line
- 400kV Line
- Towers on Hedgerows

**Scale @ A3:** 1:50,000

0 0.2 0.4 0.8 1.2 1.6 2 Kilometres

DOI	Issue	Date	Description	By	Chkd
D01	01.09.11		Draft	A.G.	R.M.

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Client: **EIRGRID**

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6504 **FIGURE 2**

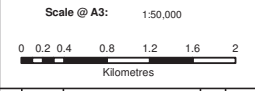
Issue: **D01**





**LEGEND**

- 220kV Line
- 400kV Line
- Towers on Hedgerows



Issue	Date	Description	By	Chkd
D01	01.09.11	Draft	A.G.	R.M.

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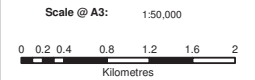
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Issue	Date	Description	By	Chkd
D01	01.09.11	Draft	A.G.	R.M.

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## 2 METHODOLOGY

### 2.1 APPROACH

An approach was determined following meetings and consultation between relevant experienced ecologists including Dr Pat Crushell (Wetland Surveys Ireland), Roger Macnaughton (TOBIN, Ecologist) and Dr Maeve Flynn (EirGrid). Dr Linda Patton of National Parks and Wildlife Services (NPWS) agreed with this survey proposal following a meeting held on 26<sup>th</sup> January 2011.

The stages to assessment were as follows

- An appropriate field data sheet was designed in consultation with the above mentioned ecologists (see above) and through review of available hedgerow survey reports, which have been carried out for a number of relevant counties<sup>1</sup>;
- A review was conducted of aerial images to determine where towers are located in hedgerows. A GIS specialist at TOBIN highlighted potential sites to survey i.e. locations where towers are located in existing hedgerows;
- A map was produced indicating tower locations and likely access approach;
- A review was conducted of relevant landowners through the land use registry<sup>2</sup>;
- Where possible landowners were contacted by phone;
- Where it was not possible to initially contact the landowner, a drive round was conducted and where it was possible to meet the landowner and agree access, then the hedgerow survey could be conducted. Hedgerow surveys were conducted during daylight hours by between two and three ecologists; and
- Bat field surveys were conducted at dusk on to darkness, at locations where no health and safety issues were likely to arise. In some cases these surveys were conducted at roads where transmission lines cross.

### 2.2 FIELD SURVEY

A total of 16 towers were eventually selected for the hedgerow habitat and general fauna survey, not including bats. Towers 1 and 2 were also surveyed for bat activity in addition to the hedgerow and general fauna survey.

Bat survey surveys only were conducted at Dunstown station (Co. Kildare) and two adjacent towers (41 and 42), and under a number of transmission line locations which cross roads in the vicinity of Towers 11, 12, 13 and 14. The details recorded at each tower location are provided in the field survey findings refer to Table 2.

In general the following were determined for each tower location;

- Detail hedgerow structure including average height, average width, density of ground cover, mature standard tree density (and species), gappiness, number of connections to other hedgerows, canopy shrub and field layer species and % cover, ground flora (presence woodland species and type), associated streams/ ditches (describe);
- Determine if tower has led to a general reduction in tree height and width of the hedge;
- Describe indicator species of disturbance and non disturbance;
- Measure permanent/ temporary impacts e.g. quantity of hedgerow removed;
- Describe evidence of hedgerow recovery;
- Describe mammal and bird/ other fauna species in proximity;
- Take photographs of vegetation and detail location on a map (at least 1:10000);
- Check habitat both side of tower and describe difference; and
- Record if streams/ drains or other watercourses present.

<sup>1</sup> E.g. **Meath**: Smith, G.F., Delaney, E., O'Hora, K., and O'Donoghue, P. (2011) *County Meath Tree, Woodland and Hedgerow Survey*. Report prepared for Meath County Council. Atkins, Dublin.

**Laois**: <http://www.laois.ie/mobile/YourCouncil/Publications/Heritage/FileDownload,1779,en.pdf>

**Kildare**: <http://www.hedgelaying.ie/images/1254463891.pdf>

<sup>2</sup> <http://www.landregistryireland.com/>

This information with any other site specific details noted allowed an evaluation of hedgerows Local Ecological Value.

Each hedgerow was summarised into one of three categories broadly based on NRA (2009)<sup>3</sup> and the *NRA – Ecological Criteria for Evaluation of Hedgerows* (2006)<sup>4</sup>, refer to Appendix 1.

This evaluation can be summarised briefly as follows;

- **High Value** – These hedgerows are relatively rare. They are generally a species rich robust and relatively wide hedgerow dominated by native species and generally include old “standard” trees and or associated watercourses. Woodland ground flora indicator species will typically be well represented. Protected mammal breeding sites (e.g. bats, badger, otter) are more likely to be present. These hedgerows tend to be old semi natural linear woodland habitats and many are associated with old town land boundaries. Many will have streams associated.
- **Moderate Value** – These hedgerows are the typical common hedgerows common in the Irish landscape. They will be variably managed with varying nos. of required criteria (see NRA 2006).
- **Low Value** – These are generally the most managed hedgerows and relatively species poor. Many have an overgrazed field layer and will have low to moderate woody species diversity. Many of these hedgerows will be remnant hedgerows. This type of hedgerow is also relatively common.

<sup>3</sup> National Roads Authority (2009). Guidelines for Assessment of Ecological impacts of National Road Schemes.

<sup>4</sup> Appendix 8: Ecological Criteria for Evaluation of Hedgerows



### 3 RESULTS

The findings including descriptions of hedgerow, fauna description, hedgerow evaluation, description of impact and other relevant information are detailed in Table 3.1. These results allowed a summary assessment of impacts to be determined which informed recommendations detailed herein.

A record of photographs for each tower, which informed the assessment, is provided in Appendix 2.

The criteria details determined for evaluating each towers local importance is detailed in Appendix 3

The survey noted 7 low value, 6 Moderate and 3 High value hedgerows. Generally high value hedgerows should be avoided or at least recommendations (see herein) should be implemented.

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**Table 3-1 Key findings for each tower location**

Location Tower Nos.	Tower Type	Land use	General description hedgerow at tower location	General Description of hedgerow either side of tower location	Fauna describe (all)	NRA Evaluation hedgerow overall	Description of differences at tower location relative to either side of tower
1	Angle	Arable	80M of hedgerow permanently removed as tower located at the meeting point of 3 hedgerows. No recovery noted. Grassy verge species present which are indicators of species poor neutral grassland habitat.	Robust species poor Managed hedgerow on bank. Woody species include hawthorn (dominant) and ash. Climbers incl. Ivy, rose and bramble. No woody ground flora. No ditch. Arable farmland.	Abandoned badger outlier sett at hedgerow to north. Bat survey conducted under tower noted Soprano and Common pipistrelle foraging along existing hedgerow under towers i.e. gap in hedge was not proving to be a barrier. Breeding territorial passerines birds noted including yellowhammer and blackbird nest near tower.	Low	Significant gap at tower location as hedge gone
2	Intermediate	Arable and livestock	Some elder and hawthorn trees remain under tower	Defunct species poor unmanaged hedgerow. Woody species include hawthorn (dominant) and ash. Climbers incl. Ivy, rose and bramble. No wood ground flora. No ditch. Arable and livestock (either side)	Bat survey conducted under tower. Individual Common and Soprano pipistrelle were noted foraging along existing hedgerow under towers i.e. gap in hedge was not proving to be a barrier.	Low	Hedgerow broadly retained under tower though less woody vegetation. Hedgerow generally grazed by sheep and not livestock proof
10	Angle	Livestock	35m of hedgerow permanently removed under tower, remnant cherry and ash pollards remain.	Treeline of cherry ash with hawthorn blackthorn understory. No significant climber or woody field layer. Sheep grazed.	Passerines. Bat survey conducted (close by) confirmed Common Pipistrelle actively foraging under powerline and along described hedgerow	Low	Significant gap at tower location as hedge gone
11	Angle	Livestock	Tower base surrounded by wood fence. Hedgerow (30m) replaced by bramble thicket.	Species poor hawthorn and elder unmanaged hedgerow. Damaged cattle. Some woodland ground flora. Livestock	Rabbits, passerines	Moderate	Loss of woody hedgerow species at tower location. Dense brambles maintain connectivity
12	Intermediate	Livestock	Hedgerow completely removed at 7m wide gap.	Species poor (rose, ivy, bramble, ash hawthorn) some woodland flora (e.g. viola, primula). Long term managed. Damaged by cattle.	Rabbits, passerines. No bat activity noted in this area during survey.	Moderate	Loss of woody hedgerow species at tower location.

Location Tower Nos.	Tower Type	Land use	General description hedgerow at tower location	General Description of hedgerow either side of tower location	Fauna describe (all)	NRA Evaluation hedgerow overall	Description of differences at tower location relative to either side of tower
13	Intermediate	Livestock	Hedgerow completely removed at 25m wide gap. No reinstatement.	Unmanaged sp poor dominated by apple ivy and hawthorn. Sheep grazed no field layer. Livestock	Two Common Pipistrelle actively foraging along hedgerows under powerline.	Low	Loss of woody hedgerow species at tower location. 25m gap at tower location no reinstatement
14	Intermediate	Livestock	Hedgerow completely removed at 12 m wide gap. No reinstatement. Fenced off	Species poor (hawthorn elder bramble and ivy) grazed sheep. No woodland flora. Livestock	Passerines. Rabbit	Low	Loss of woody hedgerow species at 12 m wide gap. No reinstatement.
17	Intermediate	Arable	Re-establishment gorse, ivy, elder, hawthorn, blackthorn and bramble thicket under tower	Unmanaged hedgerow dominated by hawthorn, elder, ash and gorse. Grazed sheep, agricultural weeds at field layer. Arable	None	Moderate	Change in dominant woody vegetation with establishment of relatively vigorous pioneer woody plant growth under tower. Hedgerow connectivity retained.
22	Angle	Arable	Re-establishment of hazel, ivy, elder, hawthorn, blackthorn and bramble thicket under tower. Notably hedgerow and rank grassland wider at tower location	Unmanaged dense relatively species rich hedgerow. Some large mature standards present. Agricultural and plant verge species predominate ground flora. Arable	Rabbit, passerines	Moderate	No real difference besides trimming. Re-establishment of hazel, ivy, elder, hawthorn, blackthorn and bramble thicket under tower. Notably hedgerow and rank grassland wider at tower location
25	Intermediate	Livestock	7m gap with main woody vegetation (hawthorn) gone. Dense briars as fenced off. Fenced at tower location means remnant hedgerow wider than surrounding at tower location.	Managed (trimmed) species rich (woody) hedgerow.	Rabbit, passerines (including yellowhammer)	Moderate	Loss of woody hedgerow species at 7 m gap with no significant hedgerow re-establishment
29	Intermediate	Livestock (meadows)	Tower straddles low managed hedgerow. Hedgerow structure largely retained	Relatively species poor (woody) managed hedgerow. Agricultural weeds (ground flora).	Passerines (including yellowhammer)	Low	No significant impact - hedge re-established/ not completely cleared

Location Tower Nos.	Tower Type	Land use	General description hedgerow at tower location	General Description of hedgerow either side of tower location	Fauna describe (all)	NRA Evaluation hedgerow overall	Description of differences at tower location relative to either side of tower
33	Intermediate	Livestock (meadows)	Tower straddles robust managed (sides only trimmed) hedgerow. Species rich with woodland ground flora. Noted that tower allows hedgerow to widen at the tower location. Hedgerow structure largely retained but height is lower (<4m) under the tower	Tall straggling semi mature ash dominates. Relatively species rich (blackthorn, ash, hawthorn, willow, gorse, honeysuckle, bramble, rose, ivy and privet). Some woodland ground flora (including primrose and lords and ladies)	Birds include common passerines. Rabbits.	High	Hedgerow has re-established or was not completely cleared. Hedgerow is wider at tower location.
37	Intermediate	Livestock	20m of hedgerow permanently removed under tower.	hedgerow either side of tower is managed and species poor (hawthorn dominated)	None close to tower	Low	Loss of woody hedgerow species as 20m of hedgerow permanently removed under tower. No recovery/reinstatement
38	Intermediate	Livestock (meadows)	20 - 30m of hedgerow permanently removed under tower. (Includes an access track). The tower is located at the meeting point 3 hedgerows meaning larger impact.	Robust unmanaged narrow species rich (woody and ground flora) hedgerow. Species include alder, spindle, rose, blackthorn, hazel, hawthorn, ivy and holly. hedgerow is located on a townland boundary	Birds include common passerines.	High	Loss of woody hedgerow species as 20 - 30m of hedgerow permanently removed under tower. (Including an access track).
39	Intermediate	Livestock (meadows)	Hedgerow at tower location dominated by pioneer woody species of disturbed ground. Tower means hedgerow wider at this location	Species rich hedgerow either side of tower (willow, ash, hazel, ivy, blackthorn, gorse, hawthorn and elder)	Birds include common passerines.	High	Change in hedgerow plant community at tower location includes pioneer woody species of disturbed ground. Hedgerow wider at tower location

Location Tower Nos.	Tower Type	Land use	General description hedgerow at tower location	General Description of hedgerow either side of tower location	Fauna describe (all)	NRA Evaluation hedgerow overall	Description of differences at tower location relative to either side of tower
40	intermediate	Arable and livestock	Hedgerow effectively gone at tower location (c.a. 10m). Low bramble and gorse at tower base. No taller woody vegetation compared to surrounds. More gappy 25-50% compared to either side (<5%)	South east of tower. Un-managed hedgerow. Woody species include hawthorn (dominant) blackthorn and ash. Climbers incl. Ivy, rose and bramble. No wood ground flora. No ditch	Breeding bird species noted (yellowhammer, chaffinch, goldfinch, long-tailed tit, blackbird). Heron noted flying through conductors. Bat survey conducted under tower. Individual Common and Soprano pipistrelle noted foraging along existing hedgerow under tower i.e. gap in hedge was not proving to be a barrier. A bat survey was conducted under 2 towers exiting the substation and the vicinity of the substation. Common pipistrelle in particular were noted feeding along woody vegetation edge, including under powerline and along treelines closeby. A minimum of 5 Common Pipistrelle, 1 Soprano pipistrelle, 1 leisler and 2 unidentified bat (species) were noted close to powerline infrastructure. They were attracted by mature tree lines and woodland edge. 3 deer spp. and grasshopper warbler were noted adjacent to powerlines. No evidence of avoidance or forage corridor loss noted due to the presence of powerlines and substation infrastructure.	Moderate	Hedgerow effectively removed at tower location (c.a. 10m). Low bramble and gorse at tower base. No taller woody vegetation compared surrounds. More gappy 25-50% compared to either side (<5%)
Dunstown station and Towers 41 and 42	intermediate						



## 4 IMPACTS

### 4.1 HEDGEROWS

The findings of this study determined that locating towers in hedgerows leads to a range of localised ecological impacts including habitat fragmentation which can largely be reduced by appropriate practises (see recommendations outlined herein). A scale of local impact (High Medium and Low) was observed during this study. This is summarised for all hedgerows in Table 4.1. The aim of any future development of transmission line infrastructure on hedgerows should be to achieve towards the **best** result regarding impacts as detailed in Table 4-1.

The key finding of this assessment is the relatively high number of towers (56%) with at least some measure of permanent hedgerow loss associated with past approaches to site clearance works for constructing the towers. No hedgerow reinstatement/ replanting occurred following completion of construction works.

As stated above, these impacts can be significantly reduced by ecological best practise approaches to site clearance and other mitigation.

No specific evidence of the impact of access tracks could be determined though a number of access tracks located in the tower gaps may have been associated with tower construction.

**Table 4-1 Observed Impacts of Existing Towers on Hedgerows**

Magnitude of Impact	Source of Impact	Nos. Hedgerows (% of total)	Description of impact
High	Complete hedgerow removal during construction – no reinstatement - permanent impact at tower location	9 (56%)	Between 7m up to 80m sections of hedgerow were observed to be permanently removed. Post construction land use management has prevented any establishment of hedgerow species. The impact is significantly greater at angle towers compared to intermediate towers
Medium	Cutting of hedgerow during construction. Post-construction management (grazing) prevents recovery. Remnant hedgerow re-established with gaps.	1 (6%)	Hedgerow was cut at site clearance stage and re-growth of pollarded trees occurred since. Overgrazing prevents significant recovery
Medium/ low	Clearance of hedgerow during construction. Loss of main hedgerow structure and replaced by pioneer woody vegetation species e.g. bramble, gorse.	3 (19%)	Typically hedgerow was completely cleared during construction. Post construction dense brambles, blackthorn, and gorse which are indicators of disturbance are dominant. Hawthorn, ash and other "typical" hedgerow species are rare. These sites tend to be fenced off and in some cases the presence of a tower allows the hedgerow to be wider at this location
Low	Limited hedgerow clearance during construction. Re-establishment/ recovery of hedgerow structure with permanent lowering of hedgerow height and in some cases widening of hedgerow.	3 (19%)	Full re-establishment of hedgerow has occurred / or hedgerow was never completely cleared. Impacts are typically limited to trimming below the tower

WORST



BEST

## 4.2 FAUNA

It was noted during surveys that relatively common bat species (including Leisler, Common pipistrelle, and Soprano Pipistrelle) actively forage under transmission lines. They were also noted foraging along hedgerows with an existing tower and across any gap in hedgerows associated with a tower location. Hence based on this assessment certainly commoner bat species are not affected and the issue of fragmentation of linear foraging corridors (hedgerows) and consequential disturbance to their feeding routes appears, based on this survey, not to be a significant issue. The recommendations herein relating to habitat re-instatement would reduce the potential for any adverse impacts on bats.

No badger breeding sites were noted under towers while a single un-occupied sett was located away from one tower. Populations of badger appear to be low generally in the survey area. No specific conclusions are therefore drawn regarding this species beyond recommending standard approaches for minimising disturbance with any new developments works.

Common breeding birds e.g. Robin, Wren, Bullfinch, Great tit, Long tailed tit, Blue tit, Song Thrush and Blackbird were noted holding territories in the vicinity of transmission towers. Also noted were Yellowhammer (Bird Watch Ireland red listed species of high conservation concern). As with other fauna, standard approaches for minimising impacts (see recommendations below) are relevant for breeding birds.

Common mammals including rabbit and fox signs were noted around transmission towers. Irish Hare have been noted resting under towers by the surveyor under other towers in County Kildare.

Generally no unexpected significant effects could be determined for fauna including bats, badger, breeding birds and common mammals. The main impact that potentially arises is the permanent loss of potential breeding and foraging sites when sections of hedgerow are permanently removed. Hence recommendations below are also relevant to fauna.

## 5 RECOMMENDATIONS

A number of recommendations are detailed herein for consideration in future transmission line developments including the 400kV North South interconnection development. These recommendations relate mainly to minimising impacts from constructing towers (and new access tracks), to hedgerow/linear woodland habitat. These recommendations are also relevant to fauna.

- Where possible trim hedgerow to required construction height rather than complete removal.
- Construct tower on hedgerow with the aim of straddling an existing hedgerow structure where possible and retaining as much as possible.
- Given the relatively small foundation footprint for towers, minimise as far as possible the length/volume of woody vegetation clearance.
- When clearing hedgerows during site preparation works it is recommended that the hedgerow root structure be retained.
- Avoid trampling and compaction by machinery (where possible) of soil around retained root structure
- Retain ecological clerk of works on site during clearance works to advise on minimising impacts and key ecological receptors to be aware of.
- Where complete clearance including significant disturbance to soil structure is required, replant hedgerow around tower or other suitable location close-by (in agreement with landowner) with the objective of retaining the integrity of the impacted hedgerow. Species should be low growing

woody vegetation species similar to those in remaining hedgerow and preferably of local provenance.

## 6 CONCLUSIONS

This study provides significant local based information on the existing impacts of locating towers on hedgerows. It is clear that a number of recommendations detailed above can significantly reduce permanent impacts from transmission line developments on hedgerows and these should be considered in any best practise guidelines for site clearance and re-instatement works for future transmission line developments, in particular the North South 400kV Interconnection Development.

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# APPENDIX 1

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## NRA Criteria for Evaluating Hedgerows

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## APPENDIX 8 ECOLOGICAL CRITERIA FOR EVALUATION OF HEDGEROWS

Check the principal characteristics of a sample 50m length of hedgerow to determine its ecological value.  
The greatest number of characters in one category defines the value.

Average shrub canopy height over 5m  
(note: a continuous line of mature trees over 5m is normally referred to as a treeline)  
Average width at ground level over 4m  
Dense ground cover  
Mature standard trees more than 5 per 50m length  
Gaps less than 10% per 50m length  
End connections to greater than 4 other hedges  
Dominant tree and shrub species mainly native  
Diversity of greater than 8 tree and shrub species  
Typical diverse woodland ground flora present  
Associated stream or drain with permanent water

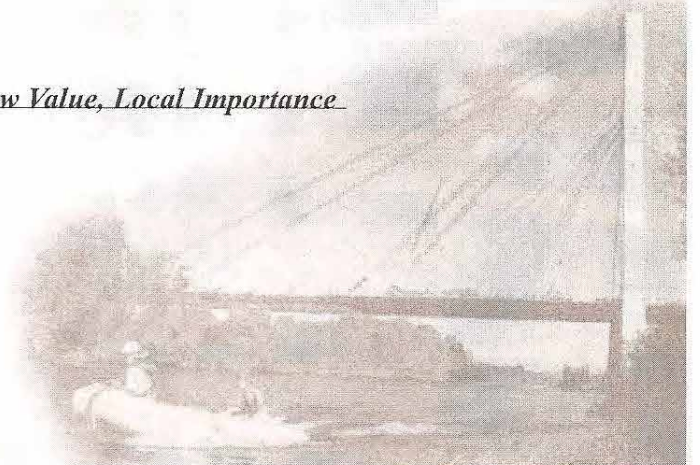
### *High Value, Local Importance*

Average canopy height 2 to 5m  
Average width at ground 2 to 4m  
Patchy ground cover  
Mature standard trees 1 to 5 per 50m length  
Gaps between 10-30% per 50m length  
End connections to 2 to 4 other hedges  
Dominant tree and shrub species mixed native and non-native  
Diversity of 5 to 8 tree and shrub species  
Some woodland ground flora species present  
Parallel stream or drain with seasonal water only

### *Moderate Value, Local Importance*

Average canopy height less than 2m  
Average width at ground less than 2m  
Little or no ground cover  
No mature standard trees  
Gaps more than 30% per 50m length  
End connections to less than 2 other hedges  
Dominant tree and shrub species mainly non-native  
Diversity of less than 5 tree and shrub species  
No woodland ground flora species present  
No parallel stream or drain

### *Low Value, Local Importance*





## APPENDIX 2



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Plates Indicating Each Surveyed Tower  
Location

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Location Tower Nos.	Plate	Description
1		<p>Angle tower with entire hedge removed and no significant recovery. Note existing managed hedgerow in background. This tower is located at the junction of 2 "low value" hedgerows.</p>
2		<p>Intermediate tower with limited woody vegetation recovery. Vegetation was pollarded rather than completely removed during construction.</p> <p>Hedgerow either side has low evaluation and is heavily grazed by sheep preventing recovery/ re-establishment.</p>

Location Tower Nos.	Plate	Description
10		<p>Intermediate tower with limited woody vegetation recovery. Some woody vegetation was pollarded rather than completely removed during construction.</p> <p>Hedgerow either side has low evaluation and is heavily grazed by sheep preventing recovery/ re-establishment.</p>
11		<p>Moderate value hedgerow. Tower base surrounded by wood fence. Hedgerow (30m) replaced by bramble thicket. Note fencing, to keep livestock out, allows some woody vegetation to re-establish</p>




Location Tower Nos.	Plate	Description
12		<p>Moderate value Hedgerow with section completely removed at 7m wide gap where tower located</p>
13		<p>Hedgerow completely removed at 25m wide gap where intermediate tower located. No reinstatement</p>




Location Tower Nos.	Plate	Description
14		<p>Hedgerow completely removed at 12 m wide gap where intermediate tower located. No reinstatement. Fenced off</p>
17		<p>Hedgerow connectivity retained at gap where tower straddles low hedgerow. Change in dominant woody vegetation with establishment of relatively vigorous pioneer woody plant growth under tower.</p>
22		<p>Moderate value hedgerow. No real difference under tower besides trimming. Re-establishment of hazel, ivy, elder, hawthorn, blackthorn and bramble thicket under tower. Notably hedgerow and rank grassland wider at tower location</p>

Location Tower Nos.	Plate	Description
25		<p>Moderate value hedgerow. Loss of woody hedgerow species at 7 m gap with no significant hedgerow re-establishment</p>
29		<p>Tower straddles a low managed hedgerow. Hedgerow structure largely retained</p>
33		<p>Intermediate tower straddling retained "High" value hedgerow. Note height of hedgerow below line (c.a. 3 – 4m) which is much lower than hedgerow either side.</p>



Location Tower Nos.	Plate	Description
37		<p>20m of hedgerow permanently removed under tower.</p>
38		<p>Intermediate tower in gap where hedgerow permanently removed and access track retained. High value species rich hedgerow either side.</p>
39		<p>Intermediate tower with disturbed ground species (gorse, bramble) dominating tower gap. High value hedgerow either side of tower has different woody vegetation to that under tower</p>

Location Tower Nos.	Plate	Description
40		<p>Hedgerow effectively gone at tower location (c.a. 10m). Low bramble and gorse at tower base. No taller woody vegetation compared to hedgerow either side.</p>

No photographs were taken at Dunstown power station and at towers 41 and 42 as a bat survey only was conducted and this was at night.

# APPENDIX 3

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Summary Hedgerow Evaluation at Tower Locations (NRA 2006)

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<b>Ecological Evaluation</b>																
	1	2	10	11	12	13	14	17	22	25	29	33	37	38	39	40
Structure Number																
<b>High Value</b>																
Height > 5m	1	1	1	1	1	1	1	1				1	1	1		1
Width at ground > 4m									1							1
Dense ground cover	1			1					1	1	1	1	1	1	1	1
Mature standard trees (more than 5 per 50 m length)																
Gaps less than 10% per 50 m length				1	1				1	1	1	1	1	1	1	1
End connections to > 4 other hedges																
Dominant tree and shrub species native	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Diversity of trees and shrubs > 8 species										1		1		1	1	
Diverse woodland ground flora														1		
Associated stream / drain with permanent water																
<b>Sub-total</b>	2	2	2	3	3	2	2	2	4	4	3	5	1	6	5	4
<b>Moderate Value</b>																
Canopy height 2-5 m					1				1	1					1	
Average width at ground 2-4 m			1	1				1		1	1	1				1
Patchy ground cover					1			1					1			
Mature standard trees (1-5 per 50 m length)									1	1						1







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