

Table 3 - Delivery requirements

ITEM	NEEDS	DESCRIPTION	MOVEMENTS	
			SINGLE	INCL. RETURN
Access track (approx 765m required)	Stone (1.8T/m ³ . 20T/HGV)	765m track with a 4m running surface width, 4.5m base width and 0.45m overall thickness = 1,463m ³ . With 10% contingency = 1,609m ³ or 2,897T.	145	290
	Geo-grid (10 rolls/HGV)	Assuming geogrid is supplied in 50m by 5m rolls, for 765m of access track, 15.3 rolls required.	2	4
Hard-standing	Stone	Area of 700m ² x fill depth 0.45m = 315m ³ . With density of 1.8T/m ³ = 567T.	29	58
	Geo-grid	For 700m ² of hardstanding, 2.8 rolls required.	Included above	
Turbine Foundations	Rebar	Included below in foundation embedments.	0	0
	Concrete (8m ³ /HGV)	Turbine foundation = 140m ³ of concrete.	18	36
	Foundation embedments (20T/HGV)	The embedments bolt the turbine to the foundation & have a mass of 18T.	1	2
Cable Trenches	Cable (500m a drum, 8 drums/HGV)	Approx 5m of cable trench required between the turbine and substation. Given a three phase network this equates to 15m of cable, (1 drum.)	1	2
	Backfill sand (1.6T/m ³ . 20T/HGV)	The electrical cabling will be protected by up to 250mm of sand, prior to backfill from previously excavated arisings. With a trench width of 0.45m = 0.5625m ³ or 0.9T.	1	2
Soil arisings (20T/HGV)		Assuming a square slab foundation, 13m wide excavated 1.4m under original ground level = 237m ³ of soil for removal. Assuming wet soil (density 2T/m ³) = 473T. Note: top soil will be retained by the landowner for use on the farm, and a quantity of subsoil will be used for back fill. As such, this is worst case.	19	38
Substation	Foundation concrete (8m ³ /HGV)	The substation foundation dimension 5.1m X 3.5m (depth 0.4m) would require 7.1m ³ of concrete.	1	2
	Building	GRP structure delivered ready assembled.	1	2
Plant and equipment		General plant and equipment required to construct the turbine e.g diggers and earth movers. A total of 2 deliveries assumed.	2	4
Crane		300T telescopic crane and 90T tail crane are required for erection.	6	12
Turbine components	Tower	2 tower sections required.	2	4
	Nacelle	One nacelle, weight 10T.	1	2
	Blades	3 blades, delivered each on one trailer, max length 26.2m	3	6
	Controller	Within standard HGV delivery nominal weight.	1	2
	Hub	One hub, with mass 9.3T.	1	2
	Generator/Drive Train	One generator, of weight 30T.	1	2
TOTAL			235	470

Note: HGV movements assume a 20T load per HGV unless otherwise stated. All figures are presented to 3 significant figures.

Co-operative Wind Turbine at Shafton Two Gates

Table 4 - Typical Construction Timetable

CONSTRUCTION PHASE	ACTIVITY	TOTAL MOVE-MENTS	PROGRAMME MONTH			
			1	2	3	4
Mobilisation	Delivery/ Removal of plant, equipment.	4	2			2
Site Access and Infrastructure	Construction/ upgrade of site access track and hardstanding area	352	176	176		
	Construction of substation	4		2	2	
	Trench excavation and cable laying	4		4		
Construction of turbine foundations	Excavation of foundation	38		38		
	Rebar and embedments installation	2		2		
	Concrete pouring	36		36		
	Concrete curing			x	x	
Turbine Erection	Delivery and removal of crane	12				12
	Delivery and erection of wind turbine	18				18
	Internal electrical works and commissioning					
Site Restoration	Reinstatement of site soils and disposal of excess					
	Seeding of reinstated areas (as required)					
	Site access restoration (as required)					
TOTAL		470	178	258	2	32



Movement



Removal (if not within the same month)

- 1.97 The delivery of the turbine elements will constitute a total of nine deliveries (18 movements in total, including return journeys), all in month four.
- 1.98 It is proposed therefore that the movement of the largest loads be restricted, wherever possible, to off-peak periods on weekdays to reduce impacts on local road users. Off-peak is considered to be between 09:00 and 15:00. A short section of the route requires specific large vehicles to move contraflow (see **Paragraph 1.101**). It is possible that, should the Police and/or Highways Authority recommend, these deliveries will occur at night to minimise potential disruption to road users.
- 1.99 It will be noted that some turbine component deliveries will be larger than the 18.65m / 44T threshold that constitutes the need for police notifications and permissions. As these thresholds mean that these specific deliveries only are classified as abnormal loads, full authorisations will be sought.
- 1.100 The decommissioning of the turbine at the end of its life will be a reduced reverse version of the construction process.

Proposed Delivery Route

1.101 It is anticipated that the delivery route for all construction traffic will be as follows:

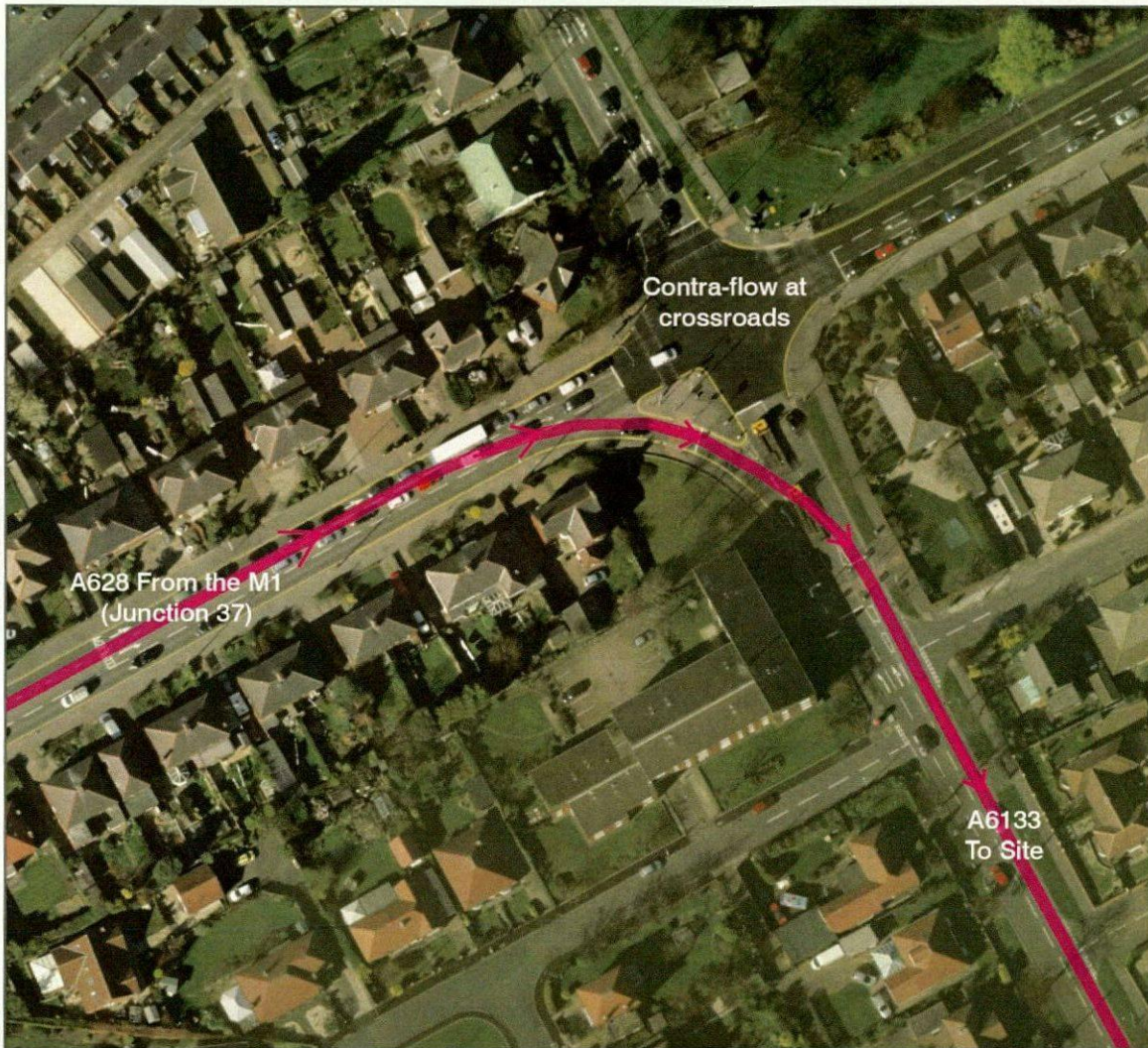
- There is a good major road network in the approach to site, therefore deliveries will exit the A1(M) at Junction 37 and join the A628 eastbound, towards Barnsley;
- After travelling approximately 450m on the A628 deliveries will make a right-hand turn to travel south-eastbound on the A6133 'Broadway'. It will be necessary for vehicles carrying the turbine components to travel contraflow at this junction in order to avoid the need to temporarily remove street furniture. An aerial view of this junction is shown in **Plate 9** to demonstrate the path to be taken by large vehicles;
- Continuing on the A6133 for approximately 3.3km, the road changes name firstly to Keresforth Hill Road then to Park Road and finally to Cemetery Road, at the end of which deliveries will turn right (although following an approximately straight path) onto the A635, Doncaster Road;
- After approximately 1.2km the road passes under a railway line, where there are no height restrictions for vehicles on the carriageway and therefore turbine components and other construction vehicles for the proposed development will pass with no issue;
- At the next junction (a roundabout on the A635 with the A633 and B6100) approximately 600m east of the railway bridge, deliveries will continue eastbound and on the A635 by taking the second exit after entering the roundabout;
- Deliveries will continue on the A635 ('Doncaster Road' and temporarily named 'Saltersbrook Road' on the northern outskirts of Darfield) for approximately 6.0km, bypassing the north of Darfield;
- At this point deliveries will take a left hand turn (first exit) at the roundabout with the A6195, 'Dearne Valley Parkway' to temporarily travel northbound. After approximately 415m another left hand turn (first exit on the roundabout) will be made to continue on the A6195, 'Park Spring Road' in a north-westerly direction;
- Continuing on the A6195, deliveries will pass straight over three roundabouts, spanning approximately 5.1km. After the third roundabout, vehicles will make a left hand turn off the A6195, 'Engine Lane', into 'Ferry Moor Lane' where the site entrance off the public highway is straight ahead.

1.102 Given the width of existing turns on the route to site, it is anticipated that turbine components can be delivered to site without modification of the highway. Vehicles are likely to require escort along the route. Subject to the recommendations of the Police and Highways Authority, the section requiring contraflow vehicle movement could be undertaken at nighttime to minimise disruption to road users.

1.103 The access route is shown in graphic form in **Figure 11** and **Figure 12** shows details of the site entrance.

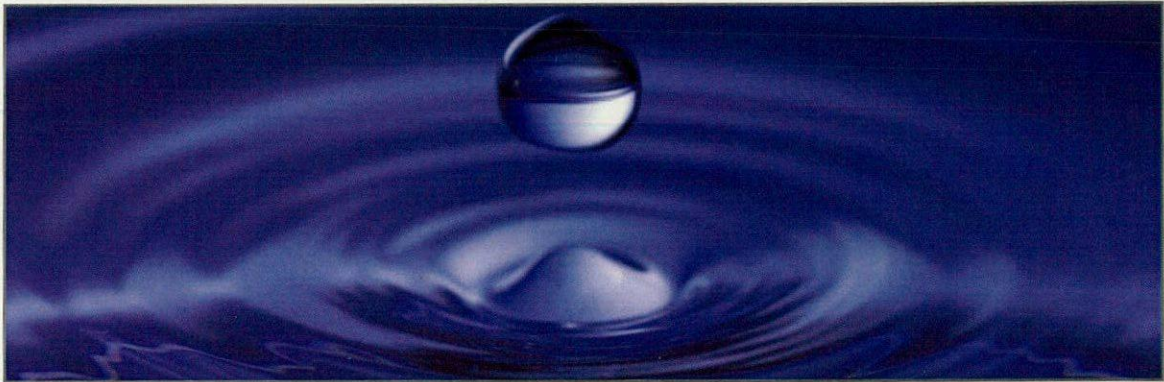
Co-operative Wind Turbine at Shafton Two Gates

Plate 9 - Aerial View of the A628 / A6133 Junction



© GetMapping. Not to Scale.

- 1.104 The existing onsite access track crosses the a public footpath on several occasions. Banksmen will be present to ensure the safety of users of the footpath during deliveries.



Geology and Soils, Hazardous Substances & Flood Risk

Site Geology and Soils

- 1.105** The British Geological Survey (2013) provides information on the geological formations across the UK. At the location of the proposed turbine, the geology is listed as:
- Superficial deposit - None recorded.
 - Bedrock - Pennine Middle Coal Measures Formation - Sandstone (and Mudstone and Siltstone). Sedimentary Bedrock formed approximately 308 to 314 million years ago in the Carboniferous Period. Local environment previously dominated by swamps, estuaries and deltas.
- 1.106** In addition, the Natural Environment Research Council (2013) in collaboration with the British Geological Survey and Centre for Ecology and Hydrology provide information on the soil deposits across the UK. At the proposed site location, the soil parent material, texture and depth is listed as a combination of:
- Sandstone: Loamy to Sandy Loam: Intermediate - Shallow; and
 - Mudstone and Sandstone: Clayey Loam to Sandy Loam: Intermediate - Shallow.
- 1.107** A full site investigation will be undertaken, by a competent contractor, prior to construction to ensure the load-bearing capacities of the sub-strata and detailed foundation design.
- 1.108** The soils excavated during construction and decommissioning will be stored in accordance with MAFF, 2000, Good Practice Guidelines. Wastes arising will be used, wherever possible, in the reinstatement of the site.
- 1.109** Any excess stored material will be disposed of off-site in accordance with Environment Agency guidance.
- 1.110** All vehicles will be required to keep to site tracks and hardstandings to avoid potential degradation of top soils through compaction.

Contaminated Land Assessment

- 1.111** A desk based contaminated land assessment has been undertaken of the site area,

covering the turbine location and access track. The Nott Group has undertaken a site walkover survey, a review of available information and developed a conceptual model in accordance with the current Contaminated Land Legislation.

- 1.112 The assessment found the site is currently occupied by an open area of reclaimed industrial land, grassed with a number of trees and shrubs. Two separate coal seams are mapped to outcrop at surface within the site boundary. The site is also affected by geological faulting. The bedrock geology is designated as a 'secondary A' aquifer. The nearest surface water feature is an unnamed secondary river approximately 62m east of the site.
- 1.113 The historical review indicates that the site had been occupied by fields and a highway from 1854 until 1904. From 1904 the north eastern part of the site was occupied by a railway embankment while the rest of the site remained unchanged until 1972. In 1972 the centre of the site was occupied by slurry ponds (infilled from approximately 1984). From 1982 the northern part of the site was occupied by open cast 'workings' and the central and southern parts of the site were occupied by refuse/slag heaps. From 1984 the central parts of the site were occupied by colliery works and the southern parts of the site were occupied by a 'spoil heap'. From approximately 2002 until the present day the site has been occupied by open industrial reclaimed land.
- 1.114 On site sources of potential contamination include made ground, infilled ground, former colliery works and a former railway line while a number of offsite sources have also been identified which include former colliery works, infilled ground, made ground and a historic landfill.
- 1.115 The risk assessment undertaken indicates that there is generally a low risk of contaminated land issues associated with the development. However, the assessment has identified medium risks associated with construction workers, a nearby surface watercourse and the proposed foundations of the structures. These risks can be mitigated by the use of the appropriate personnel protective equipment (PPE), appropriate construction techniques (limits surface water discharges) and soil testing prior to the design of the foundations and concrete specification.
- 1.116 It is recommended that representative soil samples are taken with follow up chemical testing for disposal classification purposes and to assess what protective measures are required for the construction workers. Concrete classification testing to BRE standards is also recommended to specify the appropriate concrete for the foundations.
- 1.117 FOR THE FULL REPORT PLEASE SEE **APPENDIX 3** OF THE CD APPENDIX.

Mining Risk Assessment

- 1.118 The Coal Authority holds information on the location of coal mining activities in England. Using the interactive mapping facility on the Department of Energy and Climate Change website (DECC, 2013c) it is possible to identify the location of the proposed site in relation to the 'Coal Mining Development Referral Areas'. The majority of Barnsley District is within a 'Coal Mining Reporting Area' where standing advice from the Coal Authority applies. The proposed single wind turbine at Shafton is located within the Notts area of referral. This means that there is one or more recorded

coal mining related feature which have the potential for instability or a degree of risk to the surface from the legacy of coal mining operations.

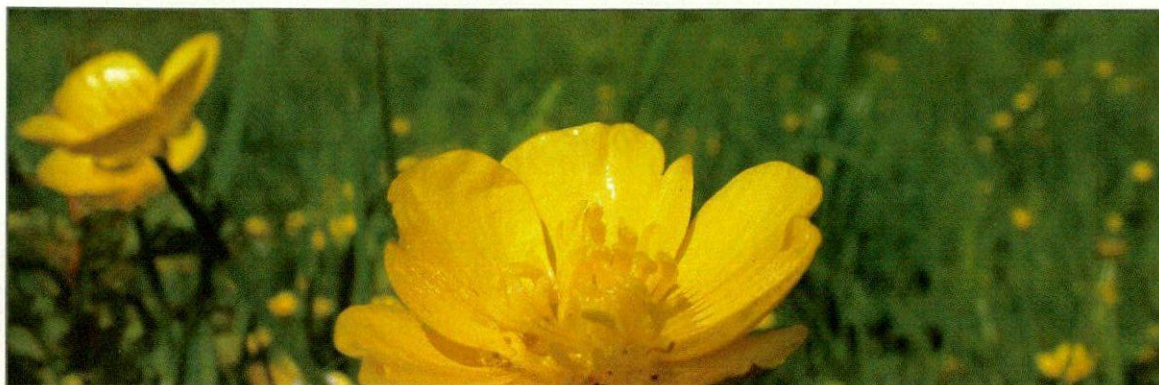
- 1.119 Given the proposed site's location within the referral area, due to its former use for coal mining, a Coal Mining Risk Assessment was undertaken by Dunelm Geotechnical and Environmental.
- 1.120 A copy of the full Coal Mining Risk Assessment Report is contained at **Appendix 3** of the CD Appendices.

Hazardous Substances

- 1.121 Any substances classed by regulation as hazardous (such as fuels, coolants, oils and lubricants) used during the construction, operation (either during normal operations, scheduled maintenance or on the occasion of a major component replacement or repair) and decommissioning will be used and disposed of in accordance with guidelines and regulations governing use of the material.
- 1.122 All site work for the proposed turbine should comply with the Construction (Design and Management) Regulations, approved code of practice (Heath and Safety Executive, 2007) and the Renewable UK, 2010, Health and Safety Guidelines for Onshore and Offshore Wind.

Flood Risk

- 1.123 The proposal lies within the catchment area of the River Dearne, in Flood Zone 1 which is defined as 'an area of little or no risk with an annual probability of flooding from rivers and the sea of < 0.1%.'
- 1.124 Paragraph 100 of the National Planning Policy Framework (NPPF) (DCLG, 2012a) discusses development and flood risk. Technical Guidance on flood risk is published alongside the NPPF in a document that replaces, but retains the key elements of, Planning Policy Statement 25 (PPS25) - Development and Flood Risk. This states that a Flood Risk Assessment (FRA) should be undertaken for development within Flood Zone 1 only if the development area is larger than 1ha (DCLG, 2012b).
- 1.125 For this proposal the impermeable area of development is the turbine foundation at 169m² and the combined substation/ external transformer foundation at 15.8m². This totals 185m² or 0.0185ha (to 3 S.F.). The semi-permeable area of development is 0.414ha (to 3 S.F.) representing the new/ upgraded access track at 4 140 m² (to 3 S.F.) and the hardstanding at 700m². As such, a flood risk assessment is not required.



Ecology

- 1.126 The proposal has been subject to an ecological assessment by E³ Ecology Ltd. This assessment has comprised the following survey assessment works:
- Extended Phase I Habitat and Protected Species Survey; and
 - Great Crested Newt Survey.
- 1.127 These surveys have all been undertaken in accordance with current best practice guidance, that is 'Guidelines for Ecological Impact Assessment produced by the Institute of Ecology and Environmental Management (IEEM, 2006) and by experienced ecological consultants.
- 1.128 The assessment has been supported by an ecological desktop study in consultation with the Barnsley Biological Records Centre, designed to identify records of protected species within approximately 2km and nature conservation areas of ornithological interest within 2km of the proposed development.
- 1.129 Summaries of the impacts on each of the ecological receptors noted are provided in this document, with the full report (including the legislative and policy context) available at **Appendix 4**. Recommendations to ensure that any impacts are avoided or mitigated are provided where necessary, along with an overall ecological conclusion of residual impacts of the proposed development.

Nature Conservation Sites

- 1.130 The following protected areas and areas designated for their nature conservation interest lie within approximately 2km of the survey area:
- Carlton Mains Brickwork SSSI: This operational clay pit lies just to the south of Grimethorpe, six kilometres east of Barnsley. The special interests are within the Coal Measures strata, exposed by the extraction of clay. They include one of the best available exposures of the Top Marine Band (Westphalian C, Middle Carboniferous) in the Pennines coalfields. It has yielded an anomalous Myalina-facies fauna, a shelly fauna which contrasts with the Anthracoceras/pectinoid facies fauna found elsewhere in this area of Yorkshire. The Top Marine Band is the highest Coal Measures marine band in Britain, and is the last evidence of normal marine conditions in this country during the Carboniferous Period. A site of considerable scientific interest.

Habitats

- 1.131 The field survey of the proposed site was conducted using the methodology of the JNCC Phase 1 survey, as outlined in their habitat-mapping manual. Each habitat was assessed by a trained surveyor and then mapped with target notes where appropriate. Extended Phase 1 Survey was undertaken on the 5th March 2013.
- 1.132 The quality of field data will be affected by the season of the survey, with some plant species only being evident or identifiable at certain seasons. However, it is considered that the period in which the work was undertaken would have enabled a full assessment of the site.
- 1.133 **Figure 13** presents the findings of the Extended Phase 1 Habitat Survey.
- 1.134 As part of the Extended Phase 1 Survey, the risk of protected species being present was assessed from the consultation responses, field signs and local knowledge. If present, any trackways regularly used by badger and deer were mapped, and any badger sett usage assessed by the presence of freshly dug earth and/or bedding at the entrance. Habitats were surveyed for potential to support reptiles. Wetlands if present were reviewed for their potential use by great crested newt, otter and water voles, with particular attention paid to possible otter sprainting sites and resting areas.

Semi Improved Grassland

- 1.135 The site and surrounding area comprise a wide expanse of coarse semi improved grassland. The sward was in general short, likely due to the time of year. Species present include cock's foot (*Dactylis glomerata*), Yorkshire Fog (*Holcus lanatus*), false oat-grass (*Arrhenatherum elatius*), Poa sp. Festuca sp., Agrostis sp, white clover (*Trifolium repens*), sow thistle sp. (*Sonchus sp.*), ribwort plantain (*Plantago lanceolata*), creeping thistle (*Cirsium arvense*), broadleaf dock (*Rumex obtusifolius*), curled dock (*Rumex crispus*) creeping buttercup (*Ranunculus repens*), broad leaved willowherb (*Epilobium hirsutum*), vetch sp. (*Vicia sp.*), ragwort (*Senecio jacobaea*), dandelion agg. (*Taraxacum agg.*), birds foot trefoil (*Lotus corniculatus*), soft rush (*Juncus effusus*) and common knapweed (*Centaurea nigra*).

Hedgerow

- 1.136 There are two areas of hedgerow present to the west of the site. The sections are mature and largely intact. Dominated by hawthorn (*Crataegus monogyna*) and occasional elder (*Sambucus nigra*) and blackthorn (*Prunus spinosa*).

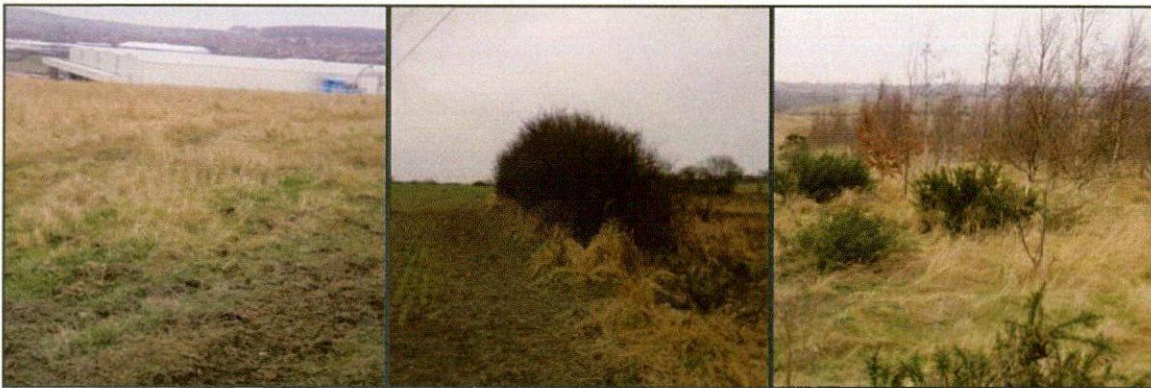
Plantation

- 1.137 There are a number of immature broadleaf plantations within the wider site. The trees are approximately 3m in height and well-sealed, supporting a negligible risk for roosting bats. The following tree species were recorded cherry (*Prunus sp.*), pedunculate oak (*Quercus robur*), silver birch (*Betula pendula*), alder (*Alnus glutinosa*) and holly (*Ilex aquifolium*) and blackthorn (*Prunus spinosa*).

Scattered Scrub

- 1.138 Areas of immature scattered scrub are present within the grassland. Species present include willow (*Salix sp*), silver birch *Betula pendula*, broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*).
- 1.139 A selection of photos taken during the survey work are contained in **Plate 10** and show the typical habitat on and around site. These, Target Notes, and further photographs, are also contained at **Appendix 4**.

Plate 10 - Selection of Site Photos Showing Typical Habitat



Protected Species

- 1.140 A summary of the species records is contained at **Appendix 4**.

Badger

- 1.141 Habitats within the site boundary provide foraging habitat for badgers. It is likely that badgers are present within the local area, although consultation identified no recent records, and it is possible that they may forage within the site at times from setts in the wider area

Bats

- 1.142 There are no suitable roost locations within 250m of the proposed turbine location. The hedgerows and ditches around the western extremities of the site and throughout the local area provide potential commuting routes and may link areas of better quality habitat, such as the larger areas of wetland to the north. The buffer between the turbine tip and features that may be used by bats will be greater than 50m, in line with Natural England guidance.
- 1.143 Woodland, hedgerow and open water habitats provide good foraging opportunities for bats, however the open nature of the site is likely to limit the diversity and abundance of bats in the area and it is therefore considered that the proposed development will have no significant effects at a population level. The grassland within which it is proposed to locate the turbine is open and exposed and will provide only low value

foraging habitat.

Great Crested Newt

- 1.144 There are a number of water bodies in the wider area suitable for this species. Consultation identified records of this species within the ponds less than 100m to the west of the proposed turbine location. Great crested newt surveys have been undertaken between April and June 2013. ALL DETAILS CAN BE FOUND WITHIN THE SEPARATE GREAT CRESTED NEWT SURVEY REPORT AT **APPENDIX 4**.

Otter

- 1.145 There are a number of water bodies in the wider area that may be used at times by otter. The habitats within which it is proposed to locate the turbine and access track is considered unsuitable for this species and as such they are considered absent from the site.

Water Vole

- 1.146 No evidence indicating the presence of water vole was recorded during phase 1 survey. There is a low risk that this species is using the water bodies in the wider area, however the habitats within which it is proposed to locate the turbine and access track are considered unsuitable for this species and as such they are considered absent from the site.

Reptiles

- 1.147 Habitats on the edges of the site are potentially suitable for supporting small numbers of reptiles, with tall ruderal/coarse grassland, scrub, ditches and hedgerow providing a range of foraging, cover and basking opportunities.
- 1.148 Due to the nature of the proposed development field and given the small development footprint and the nature of the habitats to be directly affected, the risk of works harming or disturbing reptiles is concluded to be negligible.

Other

- 1.149 Brown hare and hedgehog (both UK BAP species) are likely to utilise the site, though will be unaffected by the proposed development.

Birds

- 1.150 The proposed development area and adjacent land are likely to support an urban/farmland assemblage typical to the area and habitats present. The water bodies in the wider area are likely to attract a range of wintering wildfowl species, with a number recorded during the survey.
- 1.151 During the walkover survey, a total of 20 species were recorded from either the proposed development site, or the immediate area. These species were: carrion crow, kestrel, red legged partridge, mallard, woodpigeon, skylark, lapwing, lesser

redpoll, widgeon, magpie, dunnoek, blue tit, blackbird, greenfinch, grey partridge, starling, gadwall, grey heron, pied wagtail and green woodpecker.

- 1.152 The nature of the site is likely to limit the breeding assemblage to ground nesting species such as skylark and grey partridge.
- 1.153 In terms of species at an elevated risk of collision with turbines the wider area is also likely to support a range of common raptors, including kestrel, buzzard and sparrowhawk and potentially scarcer raptors such as red kite and peregrine that may pass over the site less frequently. In addition, barn owl and occasionally short eared owl may forage over the site at times. None of the habitats within the development area will support the breeding of any of these species.
- 1.154 The ponds and waterbodies within the wider area are likely to support a range of wildfowl species in moderate numbers throughout the winter. The ponds closest to the proposed turbine location may be frequented on occasion, though it is considered that the larger ponds to the north are more suitable and will be frequented in greater numbers, in part due to the fact that there was evidence of the wildfowl being fed.
- 1.155 Geese and swans may pass through the wider area during migratory times of year however such movements are likely to be at a much greater height than the proposed turbine. From a review of the wider landscape, the area within which it is proposed to locate the turbine does not lie on an obvious flightline between roosting and/or feeding area and the nature of the site is likely to preclude it from providing a winter foraging resource.
- 1.156 A full list of species that would be expected to occur either on-site or within the immediate surrounding area is provided at **Appendix 4**.

Impact Assessment

- 1.157 Potential impacts of the development in order of conservation significance are:

Temporary Disturbance (construction period)

- 1.158 Construction works will cause short-term disturbance of the development area and this is likely to have a minor short-term impact on wildlife using the site and adjacent land.
- 1.159 Given the nature of the site, this is concluded likely to be limited to the following:
- Loss of a limited area of habitat of up to parish ecological value; and
 - Disturbance and displacement/harm of very small numbers of nesting, foraging and/or loafing birds, species typical of arable land and hedgerow habitat.
- 1.160 However, given the limited construction footprint and extent of similar habitat in the surrounding landscape it is not considered that the above disturbance and displacement would have a significant impact on local populations.

Operational impacts (long term)

- 1.161 Wildfowl and raptors are the key bird groups considered at particular risk of collision

with operational turbines.

- 1.162 Due to their small numbers and their role as keystone predators, raptor populations are especially vulnerable to losses. Although such species are known to inhabit the wider area, the surrounding habitat provides limited suitable nesting opportunities for these raptors to breed. This combined with the fact that the sites feeding opportunities are limited mean that activity levels through the site will be at a low level.
- 1.163 Although wildfowl utilise the wider area in winter, with moderate numbers present on the water bodies to the north, the distance from these features is considered great enough to prevent any significant impact.
- 1.164 The potential impacts on local bird populations through collisions are limited by the scale of the development, with only a single turbine representing an easy target to avoid. As such, no impacts significant at a population level are predicted.
- 1.165 Site design has ensured a 50m buffer is maintained between the turbine blade tips and the areas of woodland and hedgerows present. This, combined with the lack of potential bat roost sites in the vicinity of the proposed turbine (man-made structures or mature trees) and the location within an area of exposed grassland, leads to the conclusion that the risk of potential long term impacts on local bat populations of the operational turbine through direct collision mortality and indirect effects such as barotrauma is likely to be low.
- 1.166 Pipistrelle bats are the most likely species to be found foraging within an area such as this open arable land, albeit at low levels, and both common and soprano pipistrelles are common within this area of Yorkshire. These species are classed by Natural England as populations with only a low risk of being threatened due to impacts from wind turbines.

Proposed Mitigation and Habitat Enhancement

- 1.167 The following elements of mitigation will be incorporated into the proposed development:
- Any required vegetation clearance works to be undertaken outwith the bird nesting season (March to August inclusive), unless a checking survey by an appropriately qualified ornithologist confirms that active nests are absent.
 - Any excavations that are left overnight will include a ramp of 45 degrees or less on one face to allow badgers and other wildlife to climb out should they fall into the excavation.
 - Specific great crested newt mitigation can be found within the 2013 GCN survey report.

Great Crested Newt Survey Summary

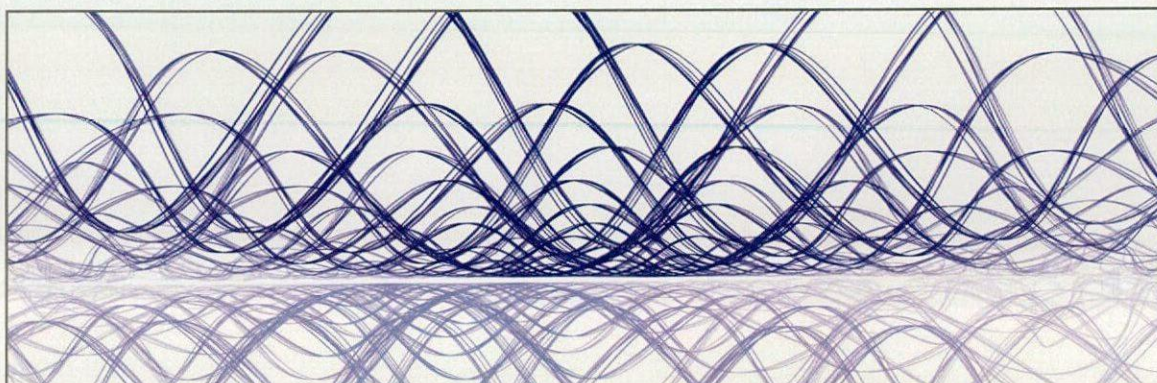
- 1.168 There are a number of ponds in the wider area with 6 recorded within 250m and a further 2 within 500m. Consultation highlighted the presence of great crested newts within the ponds to the west, approximately 100m distant from the turbine location. The ponds vary in their suitability to support great crested newts but are generally

above average based on their HSI scores.

- 1.169 Survey recorded small numbers of great crested newts within 2 ponds to the west of the site, within 250m of the site boundary, however no great crested newts were recorded within the other ponds within the survey area.
- 1.170 Given the results of the survey, the nature and suitability of the ponds, distance from the site, size of the site, habitats recorded on site and linkages between the ponds and the site it is considered that the proposals will have the following impacts on the species:
- A moderate risk of causing harm or disturbance to individual great crested newts in their terrestrial phase.
 - A loss of small amounts of optimal habitat to the development that is likely to provide a foraging resource to the local population.
 - A limited impact on dispersal routes between the breeding ponds and the local area as a result of the development.
 - No breeding ponds will be lost to the proposals.
- 1.171 In order to address the above impacts, the following mitigation and compensation strategy will be employed:
- 1.172 All works on site will proceed to a detailed method statement in order to minimise the risk of causing harm to great crested newts.

Conclusion

- 1.173 Overall, it is not considered that ecological concerns are a significant constraint to the proposed development.
- 1.174 FOR THE FULL REPORT AND DETAILS OF THE SURVEYS UNDERTAKEN, PLEASE SEE **APPENDIX 4** OF THE CD APPENDIX.



Noise

- 1.175 A noise assessment was undertaken by experts on wind turbine noise, Ion Acoustics Ltd. This is a summary of the findings of the report, which is included in full in **Appendix 5** of the CD appendix.
- 1.176 Wind turbines are not noisy in absolute terms. It is possible to stand at the base of a turbine tower and hold a normal conversation. The proposed Shafton Wind Turbine is far from residential properties and the maximum noise level at the closest residential property is predicted to be around 34 dB L_{A90} . This is put into context in **Table 5** below and by reference to the National Noise Incidence Survey carried out in 2000 / 2001 (Skinner and Grimwood, 2002), which indicated that 54% of the population were exposed to daytime noise levels at, or above, 55 dB $L_{Aeq, 16\text{hour}}$ and 67% of the population were exposed to night-time noise levels exceeding 45 dB $L_{Aeq, 8\text{hour}}$.
- 1.177 For these people, wind turbine noise would rarely be audible. However, in the countryside and away from busy roads there may be little other noise to mask the noise of wind turbines and, in these circumstances, noise must be controlled to protect amenity.

Table 5 - Noise from Wind Farms Compared with Other Sources

SOURCE / ACTIVITY	INDICATIVE NOISE LEVEL dB(A)
Threshold of pain	120 - 140
Jet aircraft at 250m	105
Pneumatic drill at 7m	95
Truck at 30mph at 100m	65
Busy general office	50 - 60
Car at 40mph at 100m	55
Wind farm at 500m	35 - 45
Quiet bedroom	20
Rural night-time background	20 - 40
Threshold of hearing	0

- 1.178 Wind turbine noise comprises: aerodynamic noise from the turbine blades interacting with the wind and mechanical noise from the gearbox (if present) and generator.

Over recent years, turbine manufacturers have succeeded in substantially reducing the mechanical noise sources so that for most modern turbines, aerodynamic noise predominates. Aerodynamic noise is characterised as a broadband sound not unlike wind blowing through trees, but modulated by a regular swishing sound. As the distance from the turbines increases, the swishing becomes less prominent.

- 1.179 In addition to the operational noise assessed in this report, there will be a short-term noise impact from the construction of the wind turbine. This is not considered here as any construction noise generally occurs during the daytime and is short-term in nature.
- 1.180 The proposed 500kW EWT DW 54 wind turbine will 'cut-in' and start producing power at a hub height wind speed of approximately 2.5m/s. The turbine has no gearbox and therefore the rotational speed can vary from around 12 to 28rpm. The noise and power output increases with increasing wind speed until the rated power is reached at a wind speed of about 10m/s. Above this, noise levels flatten off and there is little or no increase with wind speed, as the turbine blades are pitched to shed energy and maintain the rated electrical power. To prevent damage, the turbine will shut down when the average wind speed exceeds 25m/s at hub height.

Planning Guidance

- 1.181 The following planning documents are adhered to in the assessment of potential noise impacts of the proposed Shafton Wind Turbine:
- National Planning Policy Framework (NPPF);
 - National Policy Statement for Renewable Energy Infrastructure (EN-3);
 - ETSU-R-97; and
 - The Acoustics Bulletin Article March / April 2009.
- 1.182 A full description of the relevant parts of these planning policy documents is provided at **Appendix 5**.

Methodology

- 1.183 The methodology by which the noise from wind turbines should be assessed is contained in ETSU-R-97, The Assessment and Rating of Noise from Wind Farms (ETSU/DTI, 1996), as referred to in National Policy Statement for Renewable Energy Infrastructure (EN-3) (DECC, 2011b).
- 1.184 For single turbine schemes (such as this one), or for remote sites a long way from residential properties, ETSU-R-97 reports the opinion of the noise working group that: *'if the noise is limited to an L_{A90} 10min of 35dB(A) up to wind speeds of 10m/s at 10m height, then this condition alone would offer sufficient protection of amenity and background noise surveys would be unnecessary'*. Therefore, for this scheme, the proposed noise limit is 35 dB L_{A90} for wind speeds up to 10m/s at 10m height.
- 1.185 The ETSU limits are set in terms of the L_{A90} noise parameter. This is defined as the noise level exceeded for 90% of the measurement time. It is taken to represent the 'background noise', that is the underlying noise level in the absence of short-term events.

- 1.186 Where audible tones are present in the noise spectrum, ETSU-R-97 stipulates that a tonal penalty of up to 5 dB should be added to the predicted noise levels. The magnitude of the tonal penalty depends on the audibility of the tone. A tone is associated with the 500kW EWT DW 54 turbine at a wind speed of 5m/s (only) at 10m height. According to EWT, the tone warrants a +2.5 dB penalty under the ETSU-R-97 rating system. Therefore the assessment includes a +2.5 dB tonal penalty at a wind speed of 5m/s.
- 1.187 ETSU-R-97 does not prescribe a calculation method for predicting wind turbine noise. The noise assessment for the proposed turbine at Shafton used the prediction method ISO 9613-2 'Attenuation of sound during propagation outdoors', with certain input parameters and limitations stipulated in the agreement between various noise consultants reported in the Acoustics Bulletin article of March/April 2009 (Bowdler *et al.*, 2009).
- 1.188 The propagation model, described in Part 2 of the ISO 9613 Standard, allows noise levels to be predicted for short-term downwind conditions (i.e. for wind blowing from the proposed turbine towards the houses). This provides a worst-case scenario and when the wind is blowing in the opposite direction, noise levels will be significantly reduced from those predicted.
- 1.189 Downwind noise predictions have been carried out according to the ISO 9613-2 methodology. The predictions have been carried out in terms of a contour plot shown in **Plate 11**, and predictions at nearby residential locations shown in **Table 7**. The distances from the houses to the turbine are also shown.

Table 6 - Predicted Downwind Noise Levels

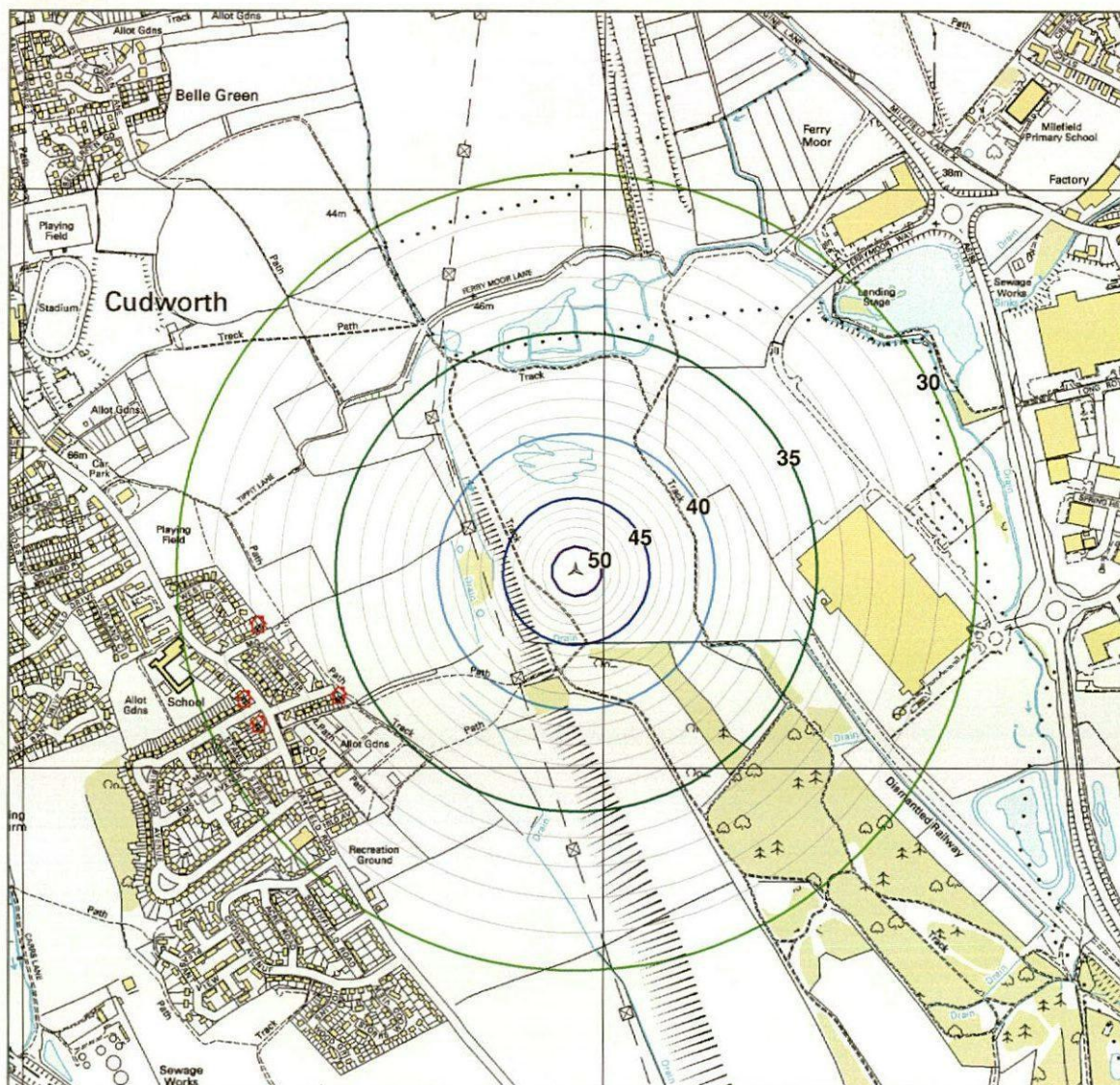
NAME	EASTING	NORTHING	DISTANCE TO TURBINE (m)	PREDICTED NOISE LEVEL (dB L _{A90}) AT 10m/S AT 10m HEIGHT
Moorland Terrace nearest house	439546	408118	464	33.9
West View nearest house	439407	408241	556	32.2
Stanley Street nearest house	439407	408069	610	31.2
Birkwood Avenue nearest house	439383	408113	615	31.2

- 1.190 The nearest residential properties are those in Moorland Terrace, Cudworth south-west of the turbine. There are several houses at this location, and noise predictions have been made for the nearest house which is around 460 metres from the proposed turbine. There are several houses in West View, Stanley Street and Birkwood Avenue; the nearest property in each case has been used for the noise predictions.
- 1.191 It should be noted that predictions have been made assuming downwind propagation,

Co-operative Wind Turbine at Shafton Two Gates

which, for these locations, will not occur often since this will require north-easterly winds. Noise levels under upwind conditions are generally much lower, by as much as 10dB and therefore noise levels under the prevailing wind condition (assumed to be south-westerlies) will be much lower than indicated in **Table 6** for most of the time. Therefore it is likely that traffic noise and other urban noise sources will dominate the noise climate at these locations. There are no nearby residential properties to the east or north-east of the turbine which will be affected by the prevailing south-westerly wind conditions.

Plate 11 - Downwind Noise Contours dB LA90 at 10m/s at 10m Height



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It should be noted that these contours represent worst-case downwind conditions and assume no attenuation from any barriers. Noise levels for upwind propagation will be significantly lower.