FIFE ENERGY PARK OFFSHORE DEMONSTRATION WIND TURBINE
SCOPING REPORT

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1 INTRODUCTION

1.1 Purpose of the Scoping Report

This report constitutes the request for a Scoping Opinion for a proposed Fife Energy Park Offshore Demonstration Wind Turbine (hereafter referred as "the Development") Methil, Fife as shown in Figure 1. This Scoping Report has been prepared by Arcus Renewable Energy Consulting Ltd ("Arcus") on behalf of Scottish Enterprise (SE).

It is intended that an application for a Marine License for the proposed test facility will be made under Section 36 of the Electricity Act 1989 ("the Electricity Act") for the elements of the proposal below the Mean High Water Mark (MHWM) and a Town and Country Planning (Scotland) Act 1997 (as amended by The Planning etc. (Scotland) Act 2006) for those elements of the development above the MHWM. The duration of the consent is for a 5 year period. It is anticipated that this application will require an Environmental Impact Assessment ("EIA") under Schedule 2 of the Environmental Impact Assessment (Scotland) Regulations 2011. The findings of the EIA will be presented within an Environmental Statement ("ES") which will accompany the planning application.

This Scoping Report has been prepared with a view to providing a structure for consultation on the approach to the EIA and the content of the ES. It provides details on the key issues anticipated and outlines methodologies for the various technical assessments. The ES is anticipated to be submitted by the end of March this year, given the previous consent, and the necessity for this test facility to be operational by December 2012 in accordance with the turbine manufacturer's timescales.

1.2 The Applicant

Scottish Enterprise ("the Applicant") is Scotland's main economic development agency and aims to deliver a significant, lasting effect on the Scottish economy. Their role is to help identify and exploit the best opportunities for economic growth. Scottish Enterprise support ambitious Scottish companies to compete within the global marketplace and help build Scotland's globally competitive sectors. They also work with a range of partners in the public and private sectors to attract new investment to Scotland and to help create a world-class business environment.

1.3 Site Consent

An application was submitted by 2-B Energy in April 2010 and subsequently granted consent by Marine Scotland in November 2011 for a single two bladed wind turbine with an installed capacity of 6MW (hereafter referred as "the Consented Development"). The location of the turbine has been micro sited 25m to the southwest for the SE Development. The SE Development will differ to the Consented Development by providing a wider Rochdale Envelope that will allow the Development to encompass a wider range of turbine manufacturers with varying requirements, including slightly larger three bladed machines on tubular towers.

Given the Development site has already been granted consent by Marine Scotland for a similar proposal the scope of the ES will conform to that of the Consented Development. The ES will reflect the different turbine design accordingly although the rest of the scope will remain the same. Further details of the scope of works are provided in sections 4-11.

1.4 Application

Under Section 36 of the Electricity Act 1989, consent from the Secretary of State (for Trade and Industry) is required for the construction, extension or operation of a generating station with a generating capacity above 50MW. The Electricity Act 1989, Order 2001 reduced the generating threshold for offshore renewables in the territorial sea to above 1MW. This has been devolved in Scotland, under the Electricity Act 1989 (Requirement of Consent for Offshore Generating Stations) (Scotland) Order 2002 (Scottish Statutory Instrument 2002 No 407). Under this order the Scottish Ministers have functions as designated in the Renewable Energy Zone Order 2005.

As the Development is seeking to deploy a generator within Scottish waters above the 1MW threshold, permission must be sought under Section 36. A Section 36 application requires an Environmental Statement and therefore an Environmental Impact Assessment.

EIA is an iterative process of assessment and design, during which prediction and assessment of potential effects will inform the evolving design of the proposed Development. The proposed Development can then be refined in order to avoid or reduce potential environmental effects where predicted. During this process, impacts arising during the construction, five year operational period and decommissioning phases will be assessed and mitigated accordingly. This includes all temporary construction facilities and other buildings or structures which will be on site for the duration of the test facility, such as the control building or meteorological mast.

Appendix 1 lists out the consultees that will be consulted in relation to the Development. Public consultations will also take place in accordance with section 11 of this report.

2 ASSESSMENT OF ALTERNATIVES

2.1 Development Brief – The Project Need

The purpose of the Development is to test new and prototype turbine designs which would be used for future offshore wind farm projects. Prior to use on offshore sites for energy generation, new turbine designs must be tested and approved in accordance with the International Standard IEC 61400-12[1] "Wind turbine generator systems". One key output from the testing of prototype turbines is a certified power curve, which indicates the energy output from a turbine at a given wind speed. Once tested it is also important for developers and manufacturers to fully understand the performance of the turbines, and the practicalities of maintenance in order to maximise their effectiveness in generating power in the offshore environment.

Scotland has a significant offshore energy resource and the development of renewable power generation in the offshore environment is a key objective for the achievement of targets at a National, UK and European level. Within Scotland there are currently nine sites located within Scottish Territorial Waters which have been granted exclusivity by The Crown Estate for offshore wind projects, these are known as the Scottish Territorial Waters sites. In addition, The Crown Estate has designated a further nine zones for offshore wind development around the UK which are the Round 3 offshore wind farm zones). The Round 1 and 2 offshore wind farm zones are already operational or under construction and have the capacity to generate 8 GW of energy from the wind. The Round 3 sites are reported to have an additional capacity of up to 25 GW. Of the Round 3 sites, two are located in Scotland's Renewable Energy Zone. In addition Scottish energy companies, , are involved in consortia for the development of two of the further Round 3 sites within English waters.

The Round 3 sites in particular are further offshore than those which have been developed, or are under development in Rounds 1 and 2. Due to their distance from the shore the reliability of these turbines is even more important to prevent maintenance issues which would reduce the energy produced from these projects. As they are further offshore the logistical challenges and climatic conditions are likely to result in longer timescales for maintenance activities. The reliability of the turbines is central to securing funding for the progression of offshore projects.

A report for The Crown Estate[2] investigating the required approach to building the supply chain for the future offshore market, identified the need for confidence in the technology, and the development of reliable technology following issues with turbines on offshore development elsewhere such as specific turbines which had to be removed from the supply chain and the failure of numerous nacelles on a recent offshore project in Germany for example.

It also highlighted the need to strengthen relationships between developers and turbine suppliers in order to develop a reliable supply chain to deliver the programme of development for offshore projects in the UK.

In order to test the turbines, a site location is required which will provide an environment similar to the marine conditions which the turbines will operate once deployed offshore. Testing the turbines offshore presents logistical, health and safety and cost issues which would hinder the test process, including elongating the test period. As such, finding a test site which is both accessible, and which replicates the marine environment as closely as possible enables the testing of the machines whilst avoiding many of these logistical issues. The Scottish Government published a report in 2010 "Scotland's Offshore Wind Route Map: Developing Scotland's Offshore Wind Industry to 2020"[3]. This concluded that the direct economic potential of offshore wind market manufacturing could support up to an estimated 5180 jobs with an estimated economic impact of up to £294.5 million per year for the for Scotland's economy.

[1] International Standard IEC 61400-12 "Wind turbine generator systems" (2005).

[2] BVG Associates (February 2011). Towards Round 3: Progress in building the offshore wind supply chain.

[3] Scottish Government (2010). Scotland's Offshore Wind Route Map: Developing Scotland's Offshore Wind Industry to 2020

The opportunity to test new designs and gain certification of prototype turbines in facilities such as the Development, are a requirement for international turbine manufacturers who will be supplying turbines to the Scottish Territorial Waters, Round 3 and additional offshore projects in Europe and further afield. An IEC certified power curve for a turbine and reliability information are important pieces of information that turbine manufactures need to convince project funders of the energy output and reliability of their turbines.

The Applicant has had discussions with key turbine manufacturers and wishes to provide them the opportunity to test or certify their turbines at the Development; this will provide investment in the future development of the Scottish offshore industry.

The aim of the Development is therefore to provide a high quality turbine test facility in Scotland. This should increase the likelihood of investment in Scotland and the UK for manufacturing sites for turbines and other wind farm components.

On a macro scale the development of the offshore wind sites in Scottish Territorial Waters and the Round 3 Zones is key to the delivery of objectives on renewable energy generation which is central to combating climate change and delivering large scale environmental benefits.

3 THE PROPOSED DEVELOPMENT

3.1 Site Location

The proposed test facility is located at Fife Energy Park (FEP), Methil. The site comprises 133 acres of semi-derelict industrial land owned by Scottish Enterprise.

FEP was originally the site of the Wellesley Colliery which operated from 1890 until closure in 1964. The site was largely established by the deposition of colliery spoil, gradually reclaiming land from the sea. Following the closure of the mine, the site was developed in the 1970s as a North Sea Oil fabrication facility by Redpath de Groot Caledonian (RGC). RGC subsequently sold their interest to Kvaerner Oil & Gas who operated the yard until 2001 when it was mothballed.

In the main, the site produced drilling rigs for the offshore oil and gas industry and at its peak; over 2000 people were employed on the site.

A major redevelopment programme with investment totalling over £20M is currently underway. The vision for the FEP is to establish a state of the art industrial facility for renewable energy in Scotland, delivering excellence in engineering, fabrication and assembly. It will incorporate a vibrant local and national supply chain and host innovation in the supporting technologies, across the energy sector.

Interim works have been completed to a 300m stretch of coastal defences along the southern edge of the site where existing defences had been breached and material was starting to slip into the sea. A draft Coastal Defence Strategy for the entire Park has been developed along with detailed design work for the quayside and some sections of the coastal defences.

A comprehensive programme of earthworks and site platforming has been completed which has seen formation of engineered embankments between the Park and neighbouring residential properties along with formation of approximately 70 acres of new development land which is the focus for attracting new companies and investment onto the site.

3.2 Site Selection

The site is currently owned by SE and is largely derelict and disused. A similar application made by 2-B Energy has already been granted planning consent on the 18th November 2011, this was subject to an agreement with the Crown Estate.

Prototype offshore wind turbines require to be tested to identify early life reliability issues and to provide confidence in overall system performance. Coastal test sites are viewed as providing an optimal balance between ease of access, similarity to offshore wind regimes and exposure to marine air and spray. Coastal locations also provide suitable flat site areas and hard standing to allow temporary heavy crane options as well as heavy quayside against which marine vessel turbine transport can be berthed. Robust grid connection and acceptable spacing from residential properties are further requirements for offshore wind turbines testing locations. SE has undertaken its own research, as well as liaison with turbine manufacturers and regional development agencies in order to identify potential sites for an offshore turbine test facility. The site at Methil has been selected as one of the most favourable site for the development of this test facility for reasons such as its existing infrastructure, marine environment and meteorological conditions. This is also bolstered by the existing consent for a similar scheme at the site. SE's proposal, requests a wider 'Rochdale Envelope' allowing the Development to encompass a wider range of turbines to be tested.

3.3 The Test Facility

The purpose of the facility is to test prototype offshore wind turbines, which will be used to generate clean electricity from a renewable source of energy, the wind. The prototype turbines are designed for the far offshore wind farm locations identified within the Government's award of Round 3 offshore sites. Round 3 wind farms have the potential to generate one quarter of the UK's electricity demand. Within Scotland, up to 4.8 GW of generation is proposed.

Due to the hostile nature of the offshore environment the turbines need to be tested, proven and guaranteed in a location in which they are easily serviceable before being commercially deployed offshore. Turbine reliability is a key issue for the Round 3 sites, where access to the turbines for maintenance and repair may be limited by site metocean conditions. The onshore test site will provide easy access to the prototype turbines to allow improvements to be made in turbine design and reliability, and therefore provide more certainty in the delivery of the energy generated offshore.

The test facility infrastructure will include:

- One wind turbine and associated turbine foundations and crane pad;
- Permanent meteorological mast up to a period of 5 years;
- Grid connection (transformers, underground cables and substation); and
- A control and metering building.

During construction a temporary construction compound would also be required on site.

The exact details of the onshore infrastructure are still under consideration, this will be outlined in more detail in the ES. A separate application will be made to the Fife Council for these elements although they will be of a similar scale to that of the Consented Development.

3.4 Turbine

SE is developing the site for the purpose of testing prototype offshore wind turbines. The turbines will have a capacity of approximately 7MW and power produced will be fed into an onsite substation via underground cables. As the turbine is a prototype machine, the exact design may change although the overall height envelope will not be exceeded.

Further turbine details are as follows:

- Number of turbines 1
- Hub height up to a maximum of 110 metres (m)
- Rotor diameter up to a maximum of 172 metres (m)
- Maximum height to blade tip up to a maximum of 196 metres (m)
- Generating capacity up to 7 Megawatts (MW)
- The height above mean sea level to lowest sweep of turbine blade is 24.4m.

3.5 Access

Turbine components would either be delivered to the site by sea or manufactured on site. Exact access details will be confirmed as the EIA progresses.

3.6 Meteorological Met Mast

A permanent meteorological mast is required for power testing of the turbines and subsequently to provide a point for weather data collection, which will play an integral part in the running of the test facility. It is likely to be placed onshoreas close as possible to the prevailing windward side (south-westerly) of the turbine location and will be built to the same height as hub height (110 m). Further details of the permanent mast will be provided within the ES and can be seen in Figure 1. This will be part of a separate application made to the Fife Council.

A temporary mast will also be required at the same location as the turbine before construction of the turbine commences. This will be used to calibrate the adjacent met mast and will be installed for a period of 3 months. A separate Marine License will be submitted along with a Supporting Statement outlining the specification of the met mast and associated foundation. The foundation will be specific to the met mast and will be removed along with the met mast after the 3 month period lapses to allow construction of the turbine itself.

3.7 Grid Connection

Cabling will go up to the turbine from the existing transformer station and the 33kV lines within the existing FEP site.

The connection to the national grid falls under a separate consent process and will be subject to a separate environmental investigation and planning application. As such it will not be considered at length as part of this EIA.

3.8 Installation

The detailed design of the foundation will be determined once borehole data has been collected and analysed. The detailed design is anticipated to be available in June 2012 and will be submitted to Marine Scotland prior to construction, for assessment purposes an indicative design has been considered within the ES. For the purposes of this Scoping Report and the submission of the ES it is anticipated that the installation of the foundation and turbine may require a jack up barge to provide a stable platform for construction.

3.9 Decommissioning

The Development is designed to operate for up to five years, during which time the turbine components will be tested. At present, the testing is planned to be completed within this five year period after which the turbine will be decommissioned and removed from the site. This will be in accordance with Marine Scotland and agreed prior to any decommissioning activities taking place. Should further testing be required an application for consent to extent the operating period will be sought.

4 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

Landscape and visual effects are one of the key environmental issues associated with wind energy developments, and their assessment forms a central component of the ES.

The assessment will consider the separate but related issues of landscape character and visual amenity. It is the combined assessment of these two key facets of landscape which is referred to as the Landscape and Visual Impact Assessment (LVIA).

The effects on landscape character will consider:

- Effects on landscape resource that will result from the proposed development, and resultant changes to landscape character that may arise from these changes; and
- Effects on the perception of the landscape resource throughout the study area, whereby the perceived character or experience of the landscape (including designated areas) may be altered through the proposed development.

The effects on visual amenity will be assessed through the identification and assessment of the effects of the proposed development on a number of representative viewpoints (including settlements, routes and places of particular public importance). The findings of the assessment of the effects on these specific receptors will then be considered in the light of the spread of visibility identified to assess the overall effects on the visual amenity.

It is likely that each of these categories will include several different key elements and components (each of which is termed a landscape receptor), or in the latter case, viewpoints and routes (visual receptors), that may be affected by the Development.

It has been agreed, with Fife Council, that the cumulative assessment and number and location of viewpoints included as part of the initial ES for the Consented Development will be duplicated for this Development.

4.1 Baseline

The Development site will be located on the northern shore of the Firth of Forth on a brownfield site in Methil. The Fife Local Landscape Designation Review Final Draft Main Report Prepared for Fife Council by Land Use Consultants in association with Carol Anderson and the Small Town and Rural Development Group (November 2008) identifies several Local Landscape Areas (LLAs) in the area surrounding Methil including:

- East Neuk LLA, which stretches along the coast from the eastern end of Largo Bay to Crail. It also includes the inland areas around Kilconquhar and Balcaskie;
- Largo LLA, which encompasses Largo Law and Flagstaff Hill and extends to the east beyond the B941; and
- Wemyss Coastal LLA, which extends along the coast from Dysart to East Wemyss, extending inland as far as the A915.

Several of the settlements along the coast including Lower Largo, Elie and West Wemyss are designated, either entirely or in part, as Conservation Areas.

The main landscape and visual receptors include:

- The landscape and seascape character of the area;
- Residential receptors with coastal views including those immediately adjacent to the site (e.g. residences on Wellesley Road and College Street in Methil) and receptors at a greater distance (e.g. Lower Largo, West Wemyss and Kennoway) including those on the southern shore of the Firth of Forth (e.g. Gullane, Cockenzie and Port Seton);
- Recreational receptors including walkers using the Fife Coastal Path and surrounding area, walkers using the John Muir Way and surrounding area, cyclists using national Cycle Route 1 and Regional Cycle Route 63, users of the numerous golf courses along the shoreline;
- Transport receptors using the surrounding road network including tourists using the Fife Coastal Tourist Route;

- Receptors working at and utilising the businesses surrounding the Development site; and
- The setting of LLAs, Conservation Areas and Gardens and Designed Landscapes

The main issues during the construction, operation and decommissioning of the Development to be considered in the assessment are:

- The change in landscape and seascape character;
- Visual impact on receptors including residential and recreational receptors; and
- Impacts on existing skyline in views from the south.

Settings issues relating to nearby Listed Buildings, Conservation Areas and where views are possible to the Old and New Towns of Edinburgh World Heritage Site will be considered in Chapter 8 *Cultural Heritage and Archaeology* of the ES.

4.2 Methodology

Following the identification of each of the various landscape and visual receptors, the effect of the Development on each of them is assessed through a combination of the sensitivity of the receptor and the magnitude of the change to it.

The sensitivity will consider the following:

- The quality of the landscape or visual receptor available from each viewpoint, in terms of its physical state and condition, its integrity, and the extent to which it displays a distinctive character; and
- The value of the landscape or visual receptor, based on any designations that may apply and its importance to users, and on the presence of intrinsic aesthetic characteristics such as scenic quality or sense of place.

These considerations will be brought together to identify the sensitivity of the landscape or visual receptor, comprising an evaluation of its ability to accommodate the Development in terms of existing development, the pattern and scale of the landscape and the potential for mitigation.

The magnitude of any effect on each landscape or visual receptor will be identified based on the scale and degree of the change that will result from the Development.

The combined consideration of the sensitivity of the receptor and the magnitude of the effect on it will result in the determination of the effect of the Development upon each landscape receptor and view/route.

The assessment will identify which of the assessed effects are significant and describe the nature of these effects.

Given the nature of the Development is principally the same the visual impacts will reflect that of the Consented Development although updated to take into account the differences in design. Given the Development consists of a three bladed tubular tower turbine design compared with the 2 bladed lattice tower design of the Consented Development, visualisations will be completed and submitted as part of the ES. The viewpoint locations will reflect those already previously agreed during the 2-B application. These visual representations will be presented within the LVIA completed by the same Landscape Architect who also undertook the LVIA for the Consented Development to ensure consistency.

4.3 Cumulative Assessment

The cumulative assessment will consider all wind farms within the 15 km study area of the site that are built, consented, or in the planning process for which sufficient information including details of the size, location and number of turbine is publicly available. In addition other windfarms whose 15 km study area appreciably overlaps with the study area for the Development will be included where such an overlap may potentially give rise to significant effects on the landscape resource or visual amenity.

A series of cumulative visibility maps will be prepared to show the effect of the cumulative visibility of different wind farms in combination. The overlap of areas of cumulative visibility with mapped features identifies potential effects on receptors which will be further explored through landscape character and viewpoint assessments.

The other wind farms and wind farm proposals to be considered during the assessment will follow the scope of works used for the cumulative assessment of the Consented Development, updated in line with the current baseline situation, including any offshore sites which are being developed

5 ECOLOGY

Climate change is recognised as causing a loss of biodiversity and other effects on wildlife, some of which are irreversible. SNH supports renewable energy developments and seeks "*a strategic approach in which renewable energy development is guided towards the locations and the technologies most easily accommodated within Scotland's landscapes and habitats without adverse impact, and which safeguards elements of the natural heritage which are nationally and internationally important*"[4]. With regard to marine renewables, SNH '*...strongly encourages exploration of marine renewable energy resources...if sensitively designed and sited...*'[5]. Furthermore, a report by the Institute for European Environmental Policy, commissioned by the Royal Society for the Protection of Birds (RSPB), states that *"Well conceived and planned wind farms can give rise to local offsite nature conservation benefits..."*[6].

The Development is located within the Fife Energy Park (FEP), a former colliery site comprising mainly reclaimed substrate, in places sparsely colonised by ruderal plants. A comprehensive programme of earthworks and site platforming has been completed which has seen the formation of engineered embankments between the Park and neighbouring residential properties along with the formation of approximately 70 acres of new development land. This involved heavy machinery and significant earthworks. The shoreline associated with the Development has been subject to erosion and now consists of artificial rock armour or rip-rap to prevent further erosion of the coastline and colliery spoil.

5.1 Background Information

An ecological assessment has previously been presented in an Environmental Statement (ES) in support of a consented application by 2-B Energy for a test site for a large two-bladed turbine at the within25m of the proposed location (see Section 3.2). It is not anticipated that the potential effects of the Development will differ substantially from those assessed in relation to the previous application. This scoping section draws on information published in the public domain as part of earlier development proposals for the site, and this information will also form a key part for the baseline for the ecological assessment. These documents include:

- Methil Wind Turbine Demonstration Project. *Environmental Impact Assessment* – Scoping Report (2-B Energy/Arup 2009).
- Methil Offshore Wind Demonstration Wind Turbine. *Environmental Statement* – Chapter 7: Ecology (2-B Energy/Arcus Renewable Energy Consulting 2010).
- *Scoping opinion for the proposed Section 36 application for a wind turbine demonstration project located at Methil, Fife*. (Scottish Natural Heritage 2010).
- *SNH Position and Summary of Advice* (Letter to Marine Scotland) [in relation to Section 36 application for a wind turbine at Fife Energy Park] (Scottish Natural Heritage 2010).

5.2 Scope of Assessment

Given the existence of a large body of relevant material from the Consented Development and that the Development will take place mainly within the Fife Energy Park, there is unlikely to be a need for further extensive ecological studies. As such, it is proposed that the ecological component of the Environmental Statement (ES) will comprise:

- Review of existing publicly available information from earlier proposals;
- Desk Study and Consultation;

[4] SNH (2010) *Renewable Energy and the Natural Heritage*. SNH

[5] SNH (undated) *Marine renewable energy and the natural heritage: an overview and policy statement* . SNH Policy Statement No. 04/01

[6] Bowyer, C. *et al*. (2009), *Positive Planning for Onshore Wind: Expanding onshore wind energy capacity while conserving nature. A report by the Institute for European Environmental Policy commissioned by the Royal Society for the Protection of Birds*. Institute for European Environmental Policy (IEEP): London.

- Extended Phase 1 Habitat survey; and
- Ecological Impact Assessment.

5.3 Potential Effects of the Development

The ecological issues to be addressed in detail as part of the EIA process are the potential for indirect and direct effects on ecological receptors – particularly sites, species and habitats of nature conservation value – during the construction, operation and decommissioning of the Development.

The scale and location of the Development will limit potential ecological effects. Most of the infrastructure (excluding the turbine) will be located within the Fife Energy Park which therefore greatly reduces potential terrestrial and coastal ecological effects. The location of the single turbine – immediately below the Mean Low Water Spring – will also reduce potential effects to offshore (marine) receptors. A small section of elevated gantry may be constructed across the shoreline (between the access track and the turbine) thus crossing the SSSI, and so potential effects of this will form a key part of the assessment.

The key issues for the assessment of likely significant ecological effects relating to the Development are therefore likely to include the following:

- Loss and disturbance to terrestrial and marine habitats due to land take by the wind turbine and associated infrastructure.
- Disturbance of, and harm to, animals, particularly marine species, including the displacement of species from the proximity of the Development. Such disturbance may occur as a consequence of construction work or due to the presence of the operational Development within or near to species' home ranges.
- Potential legal offences are considered separately from ecological effects.

5.4 Designated Sites

Information about statutory designated sites was obtained from Scottish Natural Heritage[7] and JNCC[8]. A search radius of 20 km was used for the following sites:

- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs) [marine and coastal sites]; and
- Ramsar sites;

A search radius of 5 km was used for the following sites:

- Special Areas of Conservation (SACs) [onshore]; and
- Sites of Special Scientific Interest (SSSIs);
- National Nature Reserves (NNRs); and

The designated sites are shown in Figure 3 and summarised in Table 5.1. Sites designated for ornithological interest (SPA and Ramsar sites) are addressed in more detail in Section 6, below. Based on existing information from the Consented Development, there are no non-statutory designated sites within 5 km of the Development, although this will be confirmed during the rest of the desk study.

Table 5.1 Statutory Designated Sites

Site Name	Status	Distance & Direction	Description
SPA, SAC (coastal and offshore), Ramsar within 20 km			
Firth of Forth	SPA/Ramsar	Adjacent	Internationally important non-breeding assemblage of waterbirds.

[7] www.snh.gov.uk/publications-data-and-research/snhi-information-service/

[8] www.jncc.gov.uk

Site Name	Status	Distance & Direction	Description
Isle of May	SAC	15 km W	Island supporting internationally important breeding grey seal colony.
Forth Islands	SPA	13 km SE	Internationally important breeding seabird assemblage.
Firth of Tay & Eden Estuary	SAC/SPA/Ramsar	15 km NNE	Internationally important estuarine habitats supporting internationally important assemblages of breeding and non-breeding birds.
Cameron Reservoir	SPA/Ramsar	10 km NE	Internationally important winter roost for pink-footed goose.
Loch Leven	SPA/Ramsar	20 km W	Internationally important non-breeding assemblage of waterbirds.
SAC (onshore), SSSI, NNR and LNR within 5 km			
Firth of Forth	SSSI	Adjacent	Extensive mosaic of intertidal and coastal habitats supporting a diverse community

Particular consideration will be given within the ES to the relationship between the Development and the conservation objectives of the Firth of Forth SSSI/SPA/Ramsar given the close proximity of the Development to this designated site.

5.5 Desk Study

Key to the assessment process will be the collation of historical ecological records through a desk study and consultation. Records of protected, invasive and other notable species will inform the need for further surveys and provide a historical and regional context for the assessment. Existing data and information will be sought from, but not be limited to, the following:

- Scottish Natural Heritage;
- National Biodiversity Network[9];
- MarLIN[10];
- Fife Records Centre;
- Fife Biodiversity Action Plan; and
- UK Biodiversity Action Plan.

5.6 Habitat and Species Survey

An extended Phase 1 Habitat Survey will be conducted according to standard methods[11] which will classify, map and describe the habitats associated with the Development. The need for more detailed surveys, such as National Vegetation Classification (NVC)[12] and Marine Habitat Classification[13], is considered unnecessary given the range of habitats known to be present.

The survey will identify habitats and structures that have the potential to support animals of conservation concern (e.g. those that are legally protected, such as badgers, or included as priorities in BAPs). In addition to these general searches (which may highlight the need for further detailed surveys), a thorough search for evidence of otter will be undertaken.

[9] www.searchnbn.net

[10] www.marlin.ac.uk

[11] Joint Nature Conservation Committee (JNCC) (2003) *Handbook for Phase 1 habitat survey. A technique for environmental audit*. 2nd Edition. JNCC: Peterborough.

[12] Rodwell, J. S. *et seq*. (1992) *British Plant Communities Vols –-5,* Cambridge University Press: Cambridge

[13] Connor, D.W., Allen, J. H., Golding, N., Howell, K. L., Lieberknecht, L. M., Northen, K. O. and Reker, J. B. (2004) *The Marine Habitat Classification for Britain and Ireland* Peterborough: JNCC.

5.6.1 Marine Mammals

The available evidence suggests only limited marine mammal activity in the vicinity of the Development which, combined with the location and small (temporal and spatial) scale of the Development, considerably reduces the likelihood of effects to these species. No detailed marine mammal surveys are proposed, but a detailed desk study and consultations will provide the necessary baseline information against which to assess effects. The previous application was considered acceptable, in terms of effects to marine mammals, subject to the implementation of construction mitigation, and a similar approach will be recommended for this Development.

5.6.2 Fisheries

Existing information, including survey and consultation responses, suggests that fisheries are unlikely to be significantly affected by the Development and so no further surveys are proposed.

5.6.3 Other Animal Species

Existing information, including survey and consultation responses, suggests that bats are unlikely to be significantly affected by the Development and so no further surveys are proposed. No other species-specific surveys or assessment are considered necessary at this stage.

5.7 Ecological Assessment

Full details about the above surveys will be presented in the ES and will clearly describe all methods and results, including field surveys, desk study and consultations, as well as presenting all necessary figures, data tables and appendices, and other supporting information.

The ecological impact assessment within the ES will identify and classify the potential impacts of the Development on ecological interests in accordance with the prevailing guidance from the Institute of Ecology and Environmental Management (IEEM 2006)[14,15]. The assessment will also have regard of cumulative impacts with other wind turbine developments and will be carried out with reference to all relevant legalisation, policy and best practice, as well as other chapters of the ES. Details about mitigation, compensation, enhancement and monitoring will be presented, as required.

[14] IEEM (2006) *Guidelines for Ecological Impact Assessment in the United Kingdom*. IEEM: Winchester.

[15] IEEM (2010) *Guidelines for Ecological Impact Assessment in Britain and Ireland Marine and Coastal*. IEEM: Winchester.

6 ORNITHOLOGY

The Royal Society for the Protection of Birds (RSPB) considers climate change to be the greatest threat to bird life and therefore supports the development of wind energy developments in appropriate locations. They state that the available evidence shows that appropriately located wind energy developments do not pose a significant hazard for birds[16]. However, poorly sited wind energy developments can have adverse impacts on birds as a result of disturbance, habitat loss/damage or collision with the turbines, and the potential for these is analysed through a rigorous programme of survey and assessment.

The Development is located at the Fife Energy Park (FEP), which is semi-derelict industrial land with negligible semi-natural habitats present. It is a former colliery site, and the current landforms are re-shaped and remediated coal bings. The Development lies in a disturbed setting and is of limited suitability for the bird species associated with the Firth of Forth Special Protected Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI). The shoreline at this point, including the reshaped coal bings, has eroded considerably in recent years. The intertidal zone now consists of artificial rock armour or rip-rap, put in place to prevent further erosion of the coastline and colliery spoil. The Development would be located in shallow water on the seaward side of the sea defences.

An ornithological assessment has previously been presented in an Environmental Statement in support of a consented application by 2-B Energy for a test site for a large two-bladed turbine within 25m of the proposed location (see Section 3.2). Due to the lower rotor sweep from the new turbine (24.4 m as opposed to 47.6 m above sea level) there will be a rise in collision risk resulting from the installation of the current proposed turbine. It is not anticipated that the remaining potential effects of the Development will differ substantially from those assessed in relation to the previous application, because the Development is of a similar scale and within 25m from the original position.

The assessment for the Demonstration Turbine will make use of the baseline survey data collected for the previous application (see below). Although the data was collected several years ago the baseline data is unlikely to have changed markedly and it will be supplemented by Wetland Bird Survey (WeBS) data available from the British Trust for Ornithology (BTO). Further survey is not considered to be necessary. The turbine manufacturer is keen for the development to be operational by the end of 2012, this is only an additional 12 months behind the Consented Developments timescales. A meeting will be arranged between SNH and Arcus to confirm this methodology is satisfactory.

6.1 Designated Sites

The key designated sites that will need detailed consideration in the assessment are the Firth of Forth Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and Ramsar site; and the Forth Islands SSSI and SPA. Their locations are displayed in Figure 3.

6.1.1 Firth of Forth

The Firth of Forth is a large coastal area stretching from Alloa Inches in the River Forth to Fife Ness and Dunbar in the east and comprises a complex of estuaries, mudflats, rocky shorelines, beaches and saltmarshes. The mudflats are invertebrate rich and form important feeding grounds for the abundant waders and wildfowl. The Firth of Forth is notified as a SSSI, designated as a SPA and Ramsar site, and is covered by a Nature Conservation Order (NCO). The SPA and Ramsar designations are mainly in place due to the internationally and nationally important numbers of wintering waterbirds: red-throated diver, Slavonian grebe, golden plover, bar-tailed godwit, Sandwich tern (on passage), pink-footed goose, shelduck, knot, redshank, turnstone, great crested grebe, cormorant, scaup, eider, long-tailed duck,

[16] RSPB website: http://www.rspb.org.uk/ourwork/policy/windfarms/ accessed 10/01/2012.

common scoter, velvet scoter, goldeneye, red-breasted merganser, oystercatcher, ringed plover, grey plover, dunlin and curlew, with large numbers of wigeon, mallard and lapwing also adding to the assemblage. The SSSI citation also specifically mentions teal and regionally important populations of wintering pochard, pintail and purple sandpiper in addition to the species detailed in the SPA and Ramsar qualifications, and important breeding populations of eider, shelduck, ringed plover, fulmar, kittiwake and house martin.

The proposed location for the Development is outwith the SSSI/SPA/Ramsar site boundary, on the seaward side of the designated site. However, any constructed access and cabling route directly between the turbine and foreshore would cross part of the designated site. As noted above, the coastline and intertidal zone at the proposed location of the Development is artificial rock armour and rip rap, implemented as coastal defence. The intertidal mud- or sand-flats that constituted this part of the SSSI/SPA/Ramsar site (presumably as defined by the area mapped by Ordnance Survey between the mean high water spring and mean low water spring marks) no longer exist. As such, intertidal areas that would support cited wading bird species are not present in close proximity to the Development location, although birds could be at risk of collision as they fly between different areas of the designated site. Other cited waterbird species that make use of subtidal habitats would potentially be present and would potentially be at risk of displacement due to disturbance during construction.

6.1.2 Forth Islands

The Firth of Forth Islands are located in or near to the Firth of Forth and are designated as a SSSI and SPA. The SPA comprises a number of separate islands or island groups, principally Inchmickery (together with the nearby Cow and Calves) off Edinburgh, Long Craig, Fidra, Lamb and Craigleith together with the Bass Rock off North Berwick, and the much larger Isle of May in the outer part of the Firth. The site also includes additional other small islands. The islands support important numbers of a range of breeding seabirds, in particular terns, auks and gulls: Artic tern, roseate tern, common tern, Sandwich tern, gannet, shag, lesser black-backed gull and puffin, as well as an important assemblage of other breeding seabirds, including razorbill, guillemot, kittiwake, herring gull, cormorant and fulmar. The colony of gannets is the largest on the east coast of the UK. The seabirds feed outside the SPA in nearby waters, as well as more distantly in the North Sea. Therefore, although there would clearly be no direct effects on the Forth Islands SPA, the designated species may be affected by the Development through collision and displacement effects.

6.2 Desk Study and Consultation

Existing records of birds will be sought from, but not be limited to, the following:

- Royal Society for the Protection of Birds (RSPB);
- Scottish Natural Heritage (SNH);
- Scottish Raptor Study Group (SRSG);
- British Trust for Ornithology (BTO) – Wetland Bird Survey (WeBS) data;
- Scottish Ornithologists' Club (SOC);
- Local Bird Clubs;
- Local Records Centre; and
- National Biodiversity Network (NBN).

Further consultation will be undertaken with Scottish Natural Heritage to discuss the scope of the assessment.

6.3 Baseline Survey Data

Field surveys were carried out between September 2006 and September 2007 covering a large area within and along the coastline of the Fife Energy Park. Within that large area, data were collected within a grid of smaller survey areas, one of which covered the proposed location of the Development. The following surveys were carried out:

- Vantage Point Surveys: flight paths and heights of birds were recorded from a single vantage point overlooking the survey area, which was defined as a 330m × 330m square centred on the proposed turbine location. A total of nearly 122 hours of diurnal observations were made, ensuring that minimum recommended total survey effort (according to SNH guidelines[17]) was met or exceeded for each of the autumn, winter, spring and summer seasons. The data collected provide the baseline information to inform the collision risk assessment for the proposed Development.
- Activity Summary Survey: prior to commencing each vantage point survey, the numbers of all birds present within a wider survey area extending 230m-300m from the proposed turbine location were recorded. The data collected provide the baseline information to inform the assessment of potential displacement effects.

The surveys demonstrated that there was infrequent use of the habitats near the proposed turbine location and flight activity across the survey area at potential collision height (i.e. at the height of the sweep of the rotors) was also infrequent. The previous assessment predicted negligible magnitude effects on any species. No additional surveys are proposed for the Development, because it is of a similar scale and location to the test turbine that was the subject of 2-B Energy's consented application and it is considered that the existing data set will be sufficient to inform this assessment. The existing data are available in a format that will allow clear presentation of full details of survey methods, timing, conditions and results and it is intended that these will be presented in a Technical Appendix to the Environmental Statement (ES).

6.4 Ornithological Impact Assessment

Collision risk modelling will be carried out, the method and results of which will be clearly presented in the Technical Appendix to the ES.

The ornithological impact assessment within the ES will identify and classify the potential effects of the Development on ornithological interests in accordance with the prevailing guidance from the Institute of Ecology and Environmental Management (IEEM 2006)[18,19]. The assessment will also have regard of cumulative impacts with other wind turbine developments and will be carried out with reference to all relevant legalisation, policy and best practice, as well as other chapters of the ES. Details about mitigation, compensation, enhancement and monitoring will be presented, as required.

Due to the proximity of the Firth of Forth SPA and potential effects on species associated with the Forth Islands SPA, it is anticipated that a Habitats Regulations Assessment will also be required.

[17] SNH (2005 rev. 2010) *Survey methods for use in assessing the impacts of onshore windfarms on bird communities.*
[18] IEEM (2006) *Guidelines for Ecological Impact Assessment in the United Kingdom.* IEEM: Winchester.
[19] IEEM (2010) *Guidelines for Ecological Impact Assessment in Britain and Ireland Marine and Coastal.* IEEM: Winchester.

7 HYDROLOGY, HYDROGEOLOGY AND GROUND CONDITIONS

A hydrogeological desktop survey will be undertaken in order to update any changes to the baseline conditions and assess the potential effects of the Development, significance and the potential for mitigation. Based on the results of the ES from the Consented Development the likely significance of effects are anticipated to be negligible. As specified in the Consented Development appropriate mitigation measures will be followed particularly during construction. These will be outlined fully in the ES.

The desktop survey will include an appraisal of ground conditions at the Development, a survey of downstream hydrological processes and a records search. They will cover geology, hydrogeology, aquifer classification and vulnerability, water quality, coastal flooding, contaminated land and surface deposits.

Efforts will also be made to identify and assess the potential risk to any private water supplies and any known fisheries resources.

Appropriate maps and existing records will be referenced including, the British Geological Survey (BGS) Geoscience Data Index, the Hydrogeological Map of Scotland, and groundwater vulnerability maps. The Scottish Environmental Protection Agency (SEPA) and Marine Scotland will also be contacted to obtain further marine, surface and groundwater data. If necessary, field surveys or flow measurements will be undertaken.

Available information on the history of the site and its ground conditions including, where available, intrusive monitoring data and publically available data sources, will be reviewed and reported within the ES. It is anticipated that the scope of works will not exceed that specified in the ES of the Consented Development as this was granted consent by Marine Scotland in November 2011 and therefore considered acceptable.

Prior to construction geotechnical investigations will be undertaken at the location of the turbine base to confirm the design of the turbine foundations. Prior to commencement of the construction phase of the test facility, a Pre-Construction Method Statement will be agreed with SEPA.

8 CULTURAL HERITAGE AND ARCHAEOLOGY

For the purposes of the assessment cultural heritage interests are deemed to include both above ground (the built heritage) and below ground remains. The assessment will consider both direct and indirect (largely visual) effects upon the following cultural heritage receptors:

- Archaeology – above and below ground, designated or not. Consideration will be given to the potential for currently unknown (buried) archaeological remains to exist within the site; and
- Listed buildings, Conservation Areas and Inventoried Gardens and Designed Landscapes.

Data will be gathered from the following sources:

- Royal Commission on the Ancient and Historic Monuments of Scotland (RCHAMS) which includes the National Monuments Record of Scotland (NMRS);
- Historic Scotland's databases of listed buildings, Scheduled Monuments and monuments proposed for scheduling;
- The Inventory of Gardens and Designed Landscapes in Scotland (1988); and
- Aerial records of known sites and monuments;
- Aerial photographs and other cartographic information on pre-recent land uses;
- Sites and Monuments Records held by Fife Council, Scottish Sites and Monument Record (SSMR);
- The National Library of Scotland Map Collection, including their holdings of OS 1st Edition 6" map coverage;
- Methil Offshore Wind Demonstration Wind Turbine. Environmental Statement (2-B Energy/Arcus Renewable Energy Consulting 2010).Local Studies libraries and other archives as appropriate.

A study area of 1 km around the test facility will be used to collect data to inform on the archaeological potential of the site. Due to the industrial nature of the Development site it is unlikely that there is any buried archaeology or cultural heritage features within the site and at this stage it is believed that no direct effects will occur. As with the Consented Development, consultation with the Archaeologist for Fife Council during Scoping will aim to 'Scope Out' any direct effects and focus the assessment on indirect effects of the Development on the settings of nearby cultural heritage features.

For purposes of visual assessment, data on nationally designated cultural heritage features will be collected to a maximum of 15 km from the site centre.

There are no Scheduled Monuments (SMs), listed buildings or Inventoried Gardens and Designed Landscapes within the Development site and no other non-designated archaeological remains are recorded within the site.

Table 8.1 SMs within 5 km of the Site Boundary within indicative ZTV

Index No.	Name
817	Wemyss Caves
860	Macduff's Castle and Dovecote
861	Maiden Castle Motte, Windygate

There are approximately 190 listed buildings of all Categories within 5 km of the Development. The majority are Category C listed, and lie within the settlements of Methil, Buckhaven, Leven, Windygate, Kennoway and East Wemyss. Only two Category A listed buildings are predicted to lie within the ZTV and lie within approximately 5km of the Development (see table 8.2 below).

Table 8.2 Category A Listed Buildings within 5km

HBNUM	Name	Category
16699	Durie House (with courtyard, sundial and walled garden)	A
16709	Wemyss Castle	A

There are 13 Inventoried Gardens and Designed Landscapes within 15 km of the proposed site, however only two are situated within approximately 5 km. These are shown on the table below.

Table 8.3 Gardens and Designed Landscapes within 5km

Index No.	Name
2127	Lethem Glen
2132	Wemyss Castle

An assessment will be made of the potential indirect effects upon the setting of cultural heritage features including historic landscapes. This assessment will be made against the same ZTV used in the Landscape and Visual Assessment. Ranges, at which features will be subject to assessment, and the requirement for and nature of any supporting illustrative materials, will be agreed in consultation with Historic Scotland and the Fife Archaeologist.

The assessment will be supported by presentation of the data in assessment tables, with a gazetteer and location plan. The chapter will also include proposals for mitigation of any identified impacts where necessary.

Based on the Consented Development no significant effects are anticipated as there are no known archaeological features within the site, and there is little scope for there to be any unknown remains. Impacts on the cultural heritage assets within the area were considered as being of minor significance other than Macduff's Castle, although given the Development is for a temporary period of 5 years this is fully reversible upon removal of the turbine after the consent period. The ES for the Development will reflect the above as the baseline is unlikely to have changed.

9 NOISE

9.1 Introduction

Sources of noise during operation of a wind turbine are mechanical (from machinery housed within the turbine nacelle) and aerodynamic (from the movement of the blades through the air). Modern turbines are designed to minimise mechanical noise emissions from the nacelle through isolation of mechanical components and acoustic insulation of the nacelle. Aerodynamic noise is controlled through the design of the blade tips and edges. In most modern wind turbines, aerodynamic noise is also restricted by control systems which actively regulate the pitch of the blades.

While noise from the wind turbines does increase with wind speed, at the same time ambient background noise (for example wind in trees) usually increases at a greater rate. Planning conditions are used to enforce compliance with specified limits.

9.2 Operational Noise Assessment – Methodology

The assessment methodology for operational noise is described in ETSU-R-97 "The Assessment and Rating of Noise from Windfarms". The basic aim of ETSU-R-97 is to provide:

"Indicative noise levels thought to offer a reasonable degree of protection to windfarm neighbours, without placing unreasonable restrictions on windfarm development or adding unduly to the costs and administrative burdens on windfarm developers or local authorities".

The report makes it clear from the outset that any noise restrictions placed on a wind energy development should balance the environmental impact of the test facility against the national and global benefits which would arise through the development of renewable energy sources.

The specific methodologies involved in applying ETSU-R-97 to a proposed new development will be detailed in full in the ES but, in summary, these provide recommendations for noise limits relating to the existing levels of background noise for quiet day-time and night-time periods. This methodology will therefore be adopted for the assessment of the proposed Development.

To carry out a detailed assessment in accordance with ETSU-R-97, the following steps are required:

- Specify the type and location of the wind turbine;
- Identify the locations of the nearest, or most noise sensitive, neighbours;
- Measure the background noise levels as a function of site wind speed at the nearest neighbours, or at least at a representative sample of the nearest neighbours;
- Determine the quiet day time and night time criterion curves from the measured background noise levels at the nearest neighbours;
- Specify the type and noise emission characteristics of the wind turbines proposed for the site;
- Calculate the noise immission[20] levels due to the operation of the wind turbine as a function of site wind speed at the nearest neighbours;
- Compare the calculated wind turbine noise immission levels with the derived criterion curves and assess in the light of relevant planning requirements; and
- During the course of the assessment, details of the noise assessment procedure and selected survey locations will be reviewed in consultation with North Ayrshire Council's Environmental Health Department.

A baseline noise survey was carried out in 2010 at a selection of locations around the Development site in connection with the previous, now consented, application for a wind turbine type facility at the Energy Park. It is intended to apply the background noise levels

[20] 'Immission' means the noise occurring at a receiver location, whereas 'emission' is the total noise given out by a source.

resulting from this survey, and the noise limits derived from them in the application for the current development. Confirmation of the acceptability of this approach is requested from Fife Council Public Protection Department.

As the purpose of the Development is to test prototype turbines, the turbine noise emissions may not be known during the assessment process. Therefore, initial noise assessments will be based on theoretical turbine data for the type of turbine likely to be installed. Following the derivation of noise limits, the maximum permissible turbine noise emission which maintains compliance at each operational wind speed will be calculated. These maximum values will then be used to regulate noise emissions whilst maintaining flexibility throughout the testing process.

9.3 Prediction and Assessment of Wind Turbine Noise

Planning Advice Note 1/2011 (PAN 1/2011): Planning and Noise[21] provides advice to local planning authorities to prevent and limit the adverse effects of noise and promote the principles of good acoustic design in the context of a development's location. Appendix 1 of the associated Technical Advice Notes cites the guidance provided in the March/ April 2009 Edition of the Institute of Acoustics' Acoustics Bulletin[22] which set out a number of preferred procedures for the prediction and assessment of wind farm noise and the form in which certain information should be presented to support an environmental noise assessment for a proposed wind farm development. The authors of the article included members of the Noise Working Group responsible for the preparation of ETSU-R-97, and include those who represent developers, local authorities and third party groups. The recommendations in the article are intended to enhance the quality of wind farm noise assessments and usefully limit areas of disagreement between parties acting for developers and those acting for local authorities or third parties, and supplement the recommendations of ETSU-R-97. Whilst not adopted as Government policy, the recommendations of the article are generally agreed to represent good practice in the specific aspects that it addresses.

The following issues were addressed:

- The acquisition of baseline data;
- The prediction of wind turbine noise immission level at receptors locations; and
- The significance of low-frequency noise, infrasound and ground-borne vibration.

The recommendations of the new advice with respect to background noise data relate principally to the measurement and use of wind speed data, against which background noise measurements are correlated. The article recommends measuring wind speeds at two heights, H1 and H2, H1 being not less than 60% of the proposed turbine hub height and H2 being between 40% and 50% of proposed hub height. For each ten minute period the mean wind speed measured at height H1 should be corrected to hub height using a specified procedure, which takes account of the wind shear conditions occurring during that 10 minute period. The calculated hub height wind speed is then corrected to 10 m height using the procedure specified in BS EN 61400-11:2003[23] Section 8.1, which applies a standardised wind shear profile.

The above procedure effectively correlates background and wind turbine noise levels against hub height wind speeds, albeit referenced to a height of 10 m AGL. This eliminates a potential source of error that has been identified due to the use of 10 m wind speed measurements, where the turbine noise levels may be inaccurately quantified due to the wind shear conditions on site being different to those assumed in the measurement process. Such an approach was taken during the baseline noise survey for the Consented Development. In the event that the hub height of the turbine proposed in the current application varies substantially from that previously proposed, the relationships between wind speed and background noise and wind speed and noise limits will be adjusted.

[21] Scottish Government Advice http://www.scotland.gov.uk/Resource/Doc/212607/0114118

[22] Prediction and Assessment of Wind Turbine Noise: Agreement about relevant factors for noise assessment from wind energy projects, Bowdler et al, Acoustic Bulletin, Vol 34 No2 March/April 2009, Institute of Acoustics.

[23] BS EN (IEC) 61400-11:2003 Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques.

9.3.1 Prediction of Wind Turbine Noise Immission Levels

The Acoustic Bulletin article recommends the use of the ISO 9613-2 method in calculating the levels of wind turbine noise at receptor locations ('immission levels'), with the following specific measures:

- The turbine sound power levels should be stated, and whether these are measured levels, measured levels with an allowance for measurement uncertainty, warranted levels or generic level;
- The atmospheric conditions assumed should be stated, with 10°C and 70% Relative Humidity preferred;
- The ground factor assumed should be either:
- G=0 (hard ground), together with measured sound power levels; or
- G=0.5 (mixed ground); together with a receiver height of 4.0m and either manufacturer's warranted sound power levels, or measured sound power levels plus an allowance for measurement uncertainty.
- Barrier attenuation should not be included; and
- The predicted noise levels ($L_{Aeq,t}$) may be converted to the required $L_{A90,10min}$ by subtracting 2 dB.

The above procedure will be adopted during the detailed assessment of the Development.

9.4 Low Frequency Noise, Infrasound and Amplitude Modulation

A recent study[24], published in 2006, by Hayes McKenzie on behalf of the DTI investigated low frequency noise from wind farms. This study concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines. It also noted, however, that a phenomenon known as Aerodynamic Modulation was in some isolated circumstances occurring in ways not anticipated by ETSU-R-97.

A further study[25] was carried out on behalf of the Department for Business, Enterprise and Regulatory Reform by the University of Salford, which investigated the incidence of noise complaints associated with wind farms and whether these were associated with Amplitude Modulation (AM), defined as aerodynamic noise from wind turbines with a greater degree of fluctuation than normal at blade passing frequency.

The study concluded that AM has occurred at only a small number of wind farms (4 of 133) in the UK, and only for between 7% and 15% of the time. It also states that the causes of AM are not well understood as yet, and that prediction of the effect is not currently possible. On the basis of the Salford study, a formal statement[26] issued by the Government concluded that the issue was not sufficient to warrant further investigation or review of current practices, and that the methodologies set out in ETSU-R-97 remain the current standard of assessment.

The article published in the Institute of Acoustics' Acoustics Bulletin[27] concludes:

"…*there is no robust evidence that low frequency noise (including 'infrasound') or ground-borne vibration from wind farms, generally has adverse effects on wind farm neighbours*"

It is therefore not considered necessary to carry out specific assessments of low frequency noise, infrasound or amplitude modulation. However, further supporting information on these subjects will be provided in the ES.

[24] The Department for Trade and Industry, (2006) *'The measurement of low frequency noise at three UK windfarms'*, Hayes Mckenzie.

[25] The Department for Business, Enterprise and Regulatory Reform, (2007) *Research into aerodynamic modulation of wind turbine noise*, Report by University of Salford.

[26] Department for Business, Enterprise and Regulatory Reform, (2007) *Government statement regarding the findings of the Salford University report into Aerodynamic Modulation of Wind Turbine Noise* [online]. Available at: http://www.berr.gov.uk/files/file40571.pdf

[27] Ibid.

9.5 Construction Phase Noise

The following legislation and standards are of particular relevance to construction noise:

- The Control of Pollution Act 1974 (CoPA 1974);
- The Environmental Protection Act 1990 (EPA 1990); and
- BS 5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites.

CoPA 1974 provides Local Authorities in England, Scotland and Wales with powers to control noise and vibration from construction sites.

Section 60 of the Act enables a Local Authority to serve a notice to persons carrying out construction work of its requirements for the control of site noise. Section 61 of the Act allows for those carrying out construction work to apply to the Local Authority in advance for consent to carry out the works.

The EPA 1990 applies in the UK, and specifies mandatory powers available to Local Authorities in respect of any noise that either constitutes or is likely to cause a statutory nuisance, which is also defined in the Act. A duty is imposed on Local Authorities to carry out inspection to identify statutory nuisances, and to serve abatement notices against these. Procedures are also specified with regards to complaints from persons affected by a statutory nuisance.

BS 5228 provides guidance on controlling noise and vibration from construction sites. It:

- Refers to the need for the protection against noise and vibration of persons living and working in the vicinity of and those working on construction sites;
- Recommends procedures for noise and vibration control in respect of construction operations; and
- Stresses the importance of community relations, stating that early establishment and maintenance of these relations throughout the carrying out of site operations will go some way towards allaying people's fears.

The acceptability of construction noise is likely to be affected by the location of the site, relative to the noise sensitive premises; existing ambient noise levels; the duration and working hours of site operations; the characteristics of the noise produced and the attitude of local residents to the site operator.

It is common practice to manage construction noise through planning conditions, however due to the probable requirement for piling of turbine foundations on this site, it is proposed that a construction noise assessment be undertaken. The construction noise assessment will include the following:

- A review of the legislation and standards relating to construction noise;
- Calculation of the levels of construction noise likely to occur during construction, particularly as a result of piling and construction traffic; and
- Identification of appropriate noise control measures, should they be required.

9.6 Navigation

Navigation issues were considered as part of the Consented Development, as the application is fundamentally the same the it is anticipated that Development will not have any increased effects on navigation over those previously consented.

As specified in the Consented Development appropriate mitigation measures will be followed particularly during construction. These will be outlined fully in the ES.

10 OTHER ISSUES

10.1 Existing infrastructure

Wind energy developments have the potential to interfere with electro-magnetic signals passing above ground or existing infrastructure buried below ground. Consultation with relevant infrastructure providers is a routine part of wind farm development. Consultees generally include:

- Civil Airports including Glasgow International Airport and Glasgow Prestwick Airport[28] ;
- Ministry of Defence (MoD);
- Television and telecommunications providers including Ofcom, JRC, Atkins Global and Arqiva; and
- Water, gas and electricity utilities providers.

No issues were raised in the ES of the Consented Development but given the changing nature of the above, consultations will be re-commissioned.

10.2 Socio-Economics, Tourism & Recreation

The project forms an important part of the national government strategy in harnessing offshore wind and laying the foundations for securing foreign investment and becoming a key player in the renewables market in Europe.

A desktop socio-economic assessment will consider the potential local and national economic effects of the Development. It will also look at various existing surveys on public attitudes to wind energy developments to provide background information against which to assess the potential for significant effects. The assessment will have due regard for not only the direct economic impacts of the Development but also those indirect, longer term impacts associated with future manufacturing activities for which this Development is a critical step in progressing.

In respect of recreation and access, consultations will take place with organisations including Fife Council, Sustrans, Scotways and other relevant organisations. The latest figures will be used to update the findings of the Consented Development.

Socio-economic effects will be considered based on the guidance from Guidelines for Environmental Impact Assessment[29] and a Handbook for EIA[30] and considered against:

- The advantages of the FEP in relation to the local and national economy;
- Tourism and recreation;
- Land-use and ownership; and
- Public attitudes to wind farms.

10.3 Access and Traffic

Turbine components would be delivered to the site by sea or manufactured on site. Exact details will be confirmed as the EIA progresses. It is anticipated at this stage that general construction and operational access would be from the north, taken from the existing road turning south off the B931. This access point will not require access by abnormal loads vehicles therefore no significant traffic issues are anticipated and therefore it will not be considered further as part of the EIA process.

[28] Civil Aviation Authority (CAA) no longer respond pre-application windfarm enquiries. Civil Airports and Airfields have been identified in section 1.3 – Preplanning and Consultation based on guidance provided within CAP 764 – CAA Policy and Guidance on Wind Turbines, Available at (http://www.caa.co.uk/docs/33/Cap764.pdf) Accessed on 28/02/2011

[29] Institute of Environmental Management and Assessment (IEMA) (2004) *Guidelines for Environmental Impact Assessment*

[30] Scottish Natural Heritage (SNH) (2003) *A Handbook for Environmental Impact Assessment, Appendix 5: Guide to Outdoor Access Assessment,* SNH.

10.4 Shadow Flicker and Reflectivity

Reflectivity is the potential for the sun to 'glint' off structures which, in the case of wind turbines, can be an intermittent glint when the turbines are rotating. This effect can be minimised by selecting a matt coating for the wind turbines, designed to reduce the potential for reflection.

Scottish Government internet based advice[31] which replaces Planning Advice Note 45 (PAN 45) Renewable Energy Technologies describes shadow flicker as an effect that *'under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as "shadow flicker" It occurs only within buildings where the flicker appears through a narrow window opening'.*

In the UK, the shadow flicker effect is known to occur within 130 degrees either side of north relative to the turbine positions, as turbines do not cast long shadows on their southern side. It is also known that the effect is likely to occur within 10 rotor diameters[32].

An assessment will be undertaken to identify any potential shadow flicker effects in line with government guidance. Effects will be quantified using a computer model[33] during the EIA process and mitigation, if required, will be outlined.

10.5 CO_2 Displacement and Climate Change

There is significant concern in the market regarding the establishment of a supply chain to deliver the forthcoming offshore market. Development of a test site to progress this supply chain will minimise delays in the development of the offshore wind projects. Once operational the offshore wind projects will be able to produce energy from a renewable source which will in turn reduce the amount required to be produced from non-renewables such as fossil fuels. Energy generation from renewable sources is regarded as a central issue in tackling climate change with the reduction in energy consumption from fossil fuels. Furthermore, manufacturing of the turbine components within Scotland close to their point of use will minimise the carbon footprint associated with the transport of the turbine components to the development site. Whilst no accurate calculations can be performed without exact information on manufacturing and turbine sites, minimising transport distances is a key component of a carbon footprint calculation and is therefore likely to produce a positive effect.

[31] Scottish Government Advice http://www.scotland.gov.uk/Resource/Doc/212607/0114118

[32] Department of Local Communities and Government (DCLG) (2004) *Planning for Renewable Energy - Companion Guide to Planning Policy Statement* (PPS22). Available at http://www.communities.gov.uk/documents/planningandbuilding/pdf/147447.pdf (Accessed on 28/02/2011)

[33] WINDFARM Release, 4.1.2.2.

11 PUBLIC CONSULTATION

The Applicant is fully committed to a thorough engagement process aiming to ensure that communities are consulted and informed of developments during, and beyond, the EIA process on all their projects. This is achieved by a variety of methods as appropriate including public exhibitions, meetings and circulars. Public consultation will be incorporated into the iterative design process and recorded in appropriate sections of the ES. PAN 81 on Community Engagement provides advice on how communities should be properly engaged in the planning process and forms a basis for potential activities.

The Development is governed by the Town and Country Planning (Hierarchy of Development) (Scotland) Regulations 2009 and as such a pre-application consultation report will be prepared and submitted as part of the application. This will set out what sort of consultation has been carried out including who has been consulted, methods used and how the applicant has responded to comments.

All responses should be addressed to:

Arcus Renewable Energy Consulting Ltd

507-511 Baltic Chambers

50 Wellington Street

Glasgow

G2 6HJ

If you would like to discuss any issues raised within this report in more detail, or require any further information prior to responding to this Scoping Report, please contact John Hetherton at johnh@arcusrenewables.co.uk or alternatively write at the above address.

COMMONLY USED LIST OF ABBREVIATIONS

AGL – Above Ground Level

AM – Amplitude Modulation

BAP – Biodiversity Action Plan

BCT – Bat Conservation Trust

BGS - British Geological Survey

EIA – Environmental Impact Assessment

ES – Environmental Statement

JNCC – Joint Nature Conservation Committee

JRC – Joint Radio Company

LVIA – Landscape and Visual Impact Assessment

MCA – Marine Conservation Area

MoD – Ministry of Defence

MW – MegaWatt

NMRS – National Monument of Record Scotland

NOWTTF – National Offshore Wind Turbine Test Facility

OWIG – Offshore Wind Industry Group

PAN – Planning Advice Note

RAP – Renewables Action Plan

RSPB – Royal Society of Protection of Birds

SEPA – Scottish Environment Protection Agency

SM - Scheduled Monument

SMR – Sites and Monuments Records

SNH – Scottish Natural Heritage

SPA – Special Protection Area

SSE – Scottish and Southern Energy

SSSI – Site of Special Scientific Interest

TTTC – Through-the-Tidal-Cycle

ZTV – Zone of Theoretical Visibility

APPENDIX 1 – LIST OF CONSULTEES

Consultees to receive a copy of the scoping report

10 Metre & Under Fishermen's Association

Anstruther Harbour Marina

Association of Salmon Fishery Boards

British Telecom (Radio Network Protection Team)

Chamber of Shipping

Cockenzie & Port Seton Fishermen's Association

Crown Estate

Dysart Sailing Club

East Lothian Yacht Club

Elie & Earlsferry Sailing Club

Fife Council

Fife Creel Fishermen's Association

Fisherman's Mutual Association

Forth Ports Plc.

Historic Scotland

HSE

Largo Bay Sailing Club

Marine and Coastguard Agency

Marine Lighthouse Board

Marine Safety Forum

Marine Scotland

Maritime and Coastguard Agency

Methil Boat Club

Methil Creel Fishermen

Non-Affiliated Creel Fisherman

Northern Lighthouse Board (NLB)

Royal Yachting Association

RSPB

Scottish Canoe Associaiation

Scottish Fisherman's Federation

Scottish Fisherman's Organisation

Scottish Government

SEPA

SNH

The National Federation of Fishermans Organisations (NFFO)

Consultees consulted under their own arrangements

Arqiva (also responsible for National Grid Wireless Operations)

Atkins Global

BBC Research and Development

BAA Airport Safeguarding – Edinburgh Airport

ITC Office of Communications (OFCOM)

Joint Radio Company

MoD Defence Estates

National Air Traffic Services (NATS)

This list is not definitive. Should you be aware of any other organisations that would like to be included, please advise the project team.

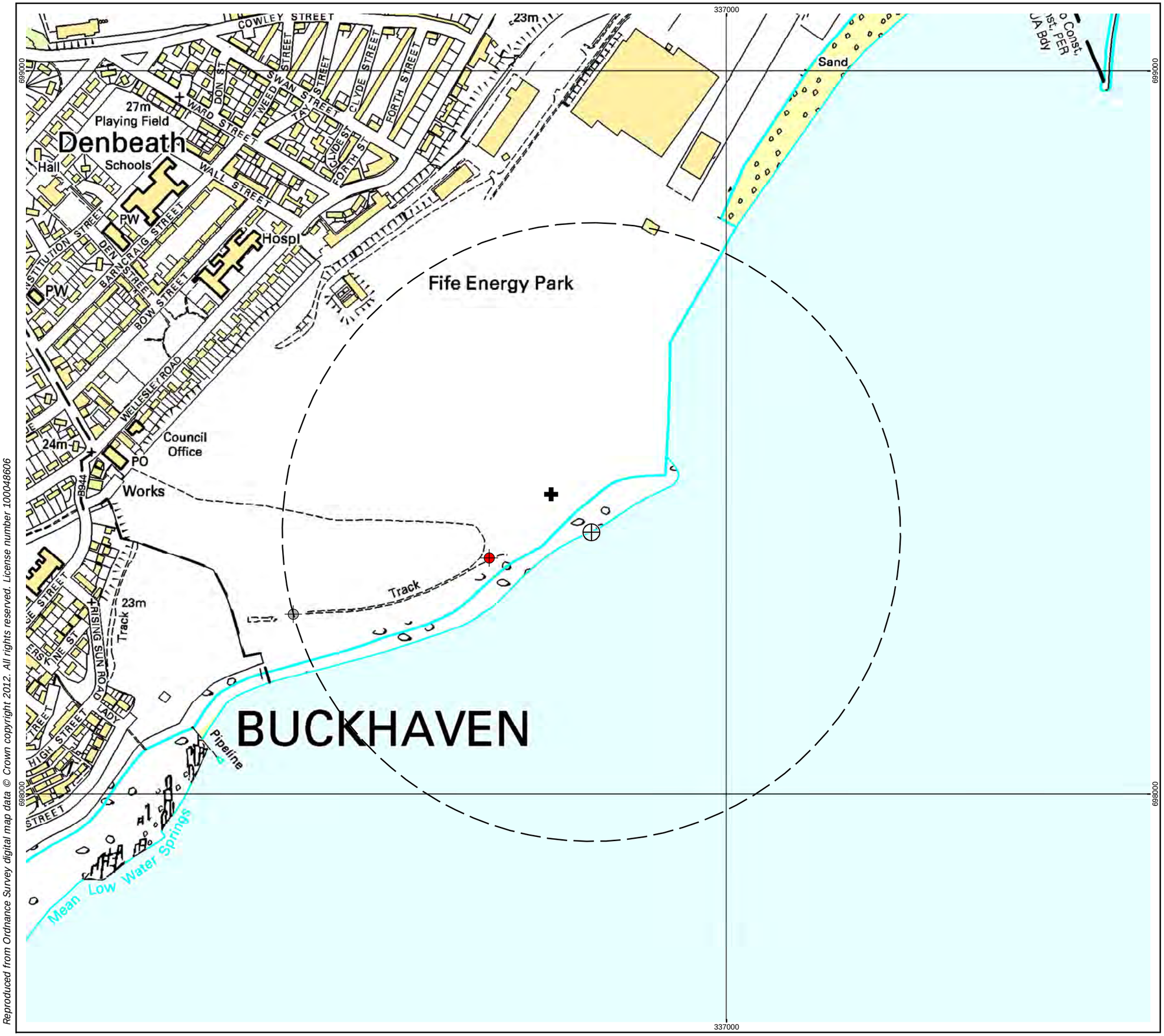
APPENDIX 2 – FIGURES

Figure 1 – Site Location

Figure 2 – Zone of Theoretical Visibility (ZTV)

Figure 3 – Statutory Ecological Designations

Figure 4 – Cultural Heritage Designations



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- Proposed Turbine Location
- Originally Proposed Met Mast Location
- Met Mast Location
- Lighting Tower
- 428m Buffer of Turbine 2.5 x Rotor Diameter

Proposed Turbine Location
336813 698362

Proposed Met Mast Location
336401 698249

2-B Application Proposed Turbine Location
336833 698377

1:5,000 Scale @ A3

0 100 200 m

N

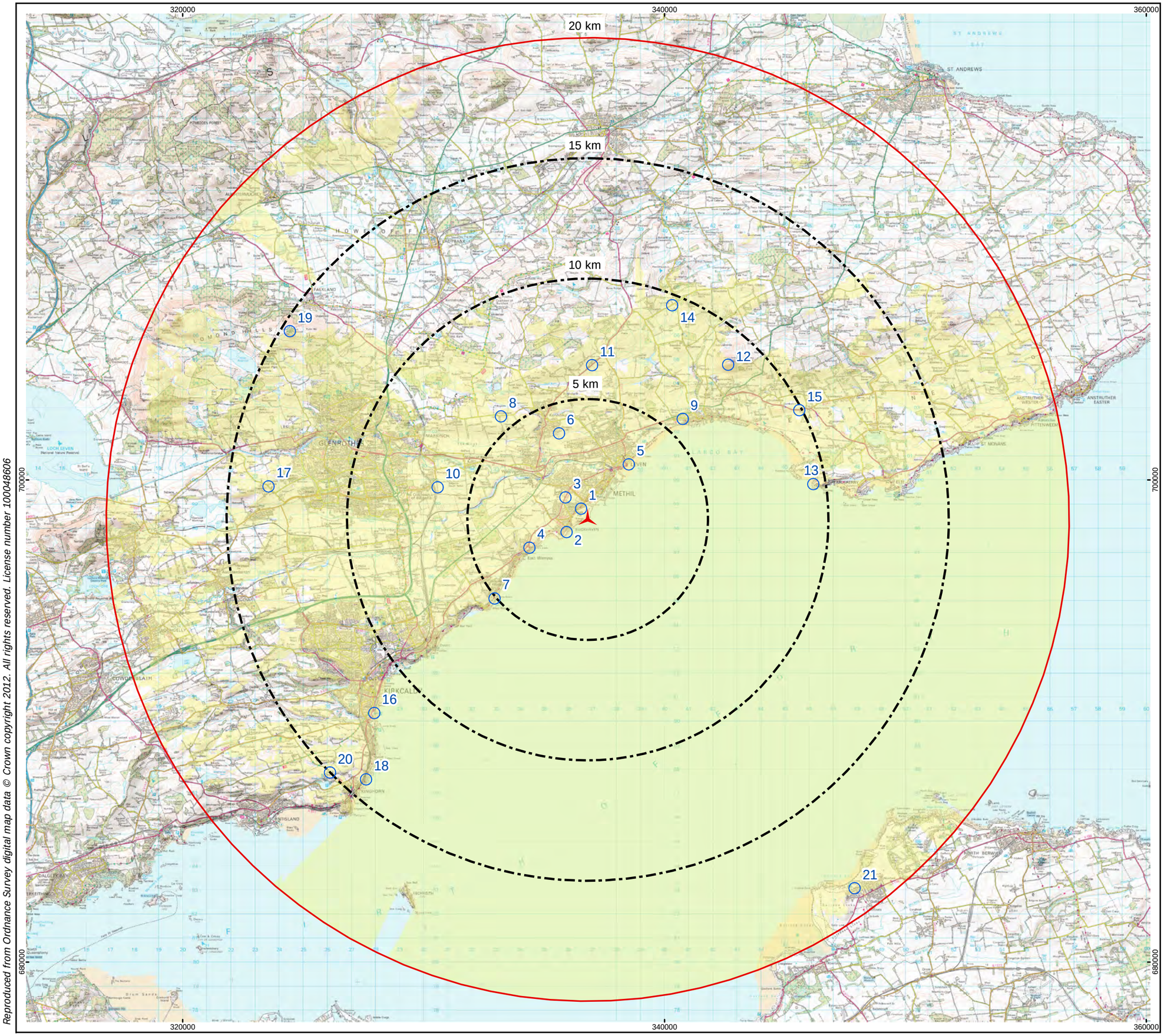
Produced: LHu
Reviewed: SC
Approved: JH

Ref: 867/ENV/002 | Revision: A

Date: 27/02/2012

Site Layout
Figure 1

Fife Energy Park Offshore Demonstration Wind Turbine (FEPODWT)



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Proposed Turbine Location

Zone of Theoretical Visibility to 195.6 m Tip Height

Viewpoint Location

1	336537	698810
2	335934	697837
3	335893	699282
4	334390	697193
5	338522	700654
6	335620	701940
7	332950	695083
8	333215	702644
9	340758	702541
10	330579	699699
11	336996	704771
12	342647	704790
13	346177	699830
14	340325	707255
15	345599	702900
16	327948	690334
17	323564	699741
18	327614	687574
19	324442	706174
20	326110	687866
21	347899	683064

1:150,000 Scale @ A3

0 2.5 5 km

N

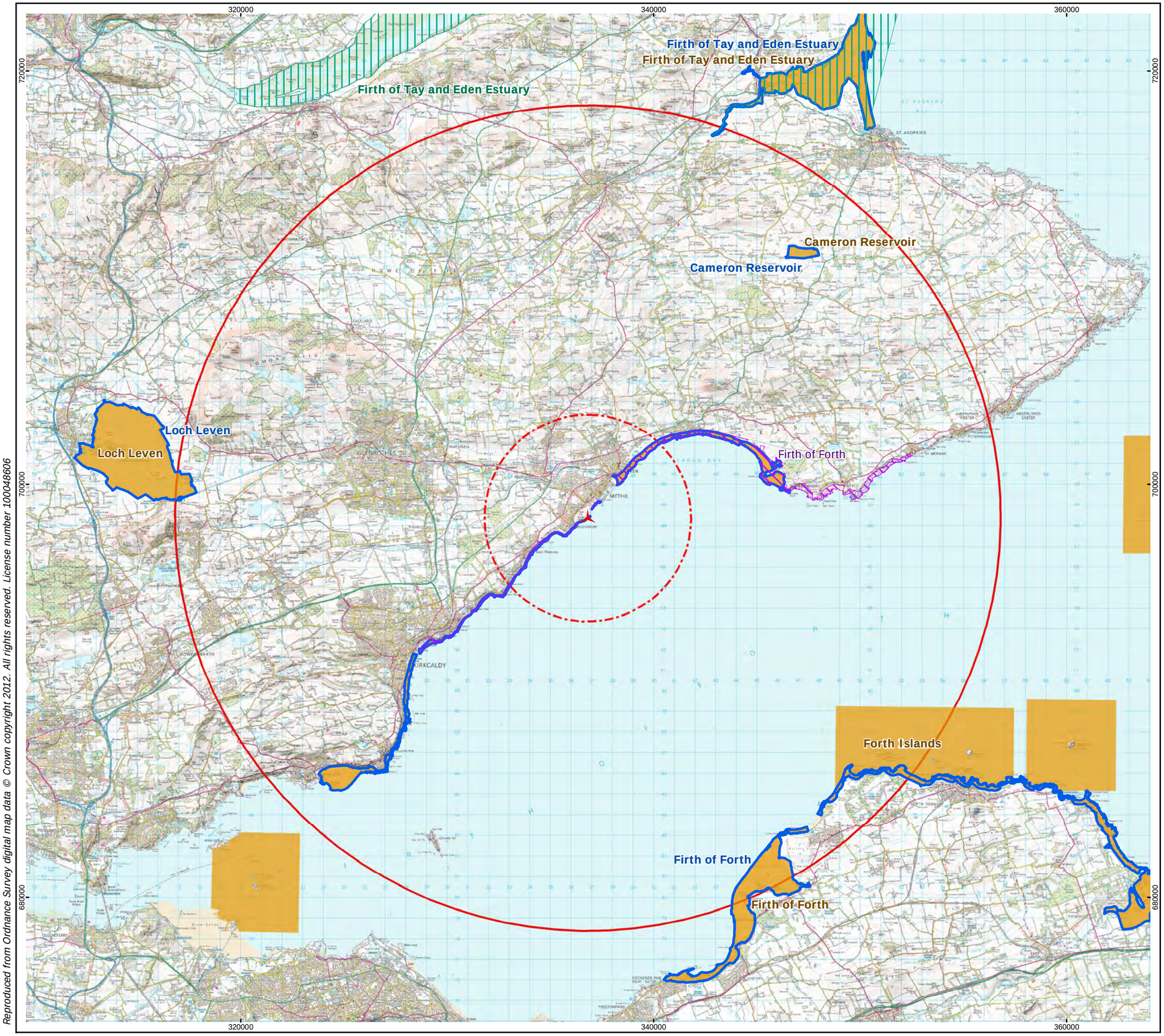
Produced: LHu
Reviewed: SC
Approved: JH

Ref: 867/ENV/006 | Revision: A

Date: 28/02/2012

Zone of Theoretical Visibility and Viewpoint Locations
Figure 2

Fife Energy Park Offshore Demonstration Wind Turbine (FEPODWT)



Proposed Turbine Location
5 km Radius of Turbine
20 km Radius of Turbine
SSSI
SAC
SPA
Ramsar

1:175,000 Scale @ A3

0 2.5 5 km

N

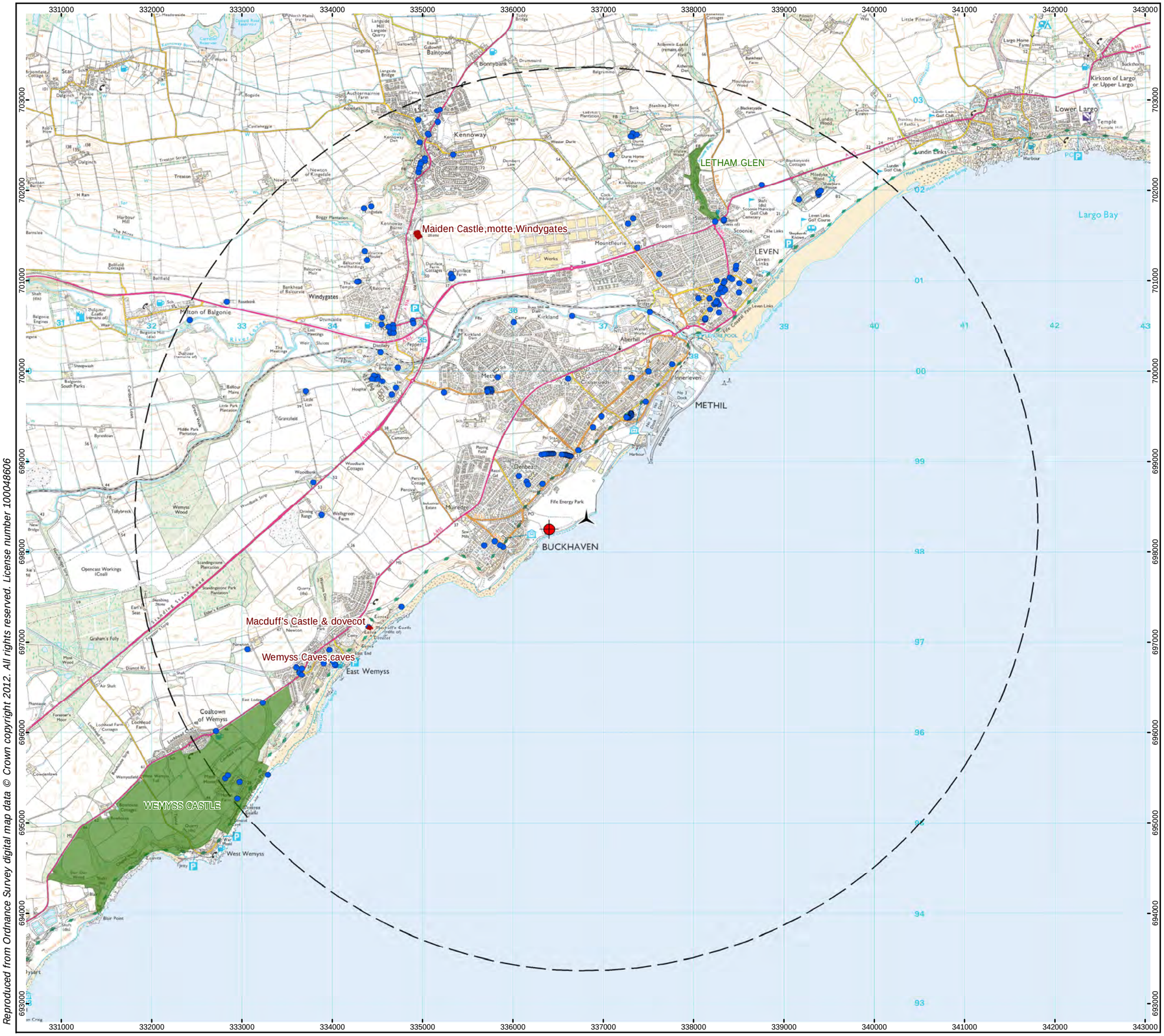
Produced: SC
Reviewed: LHu
Approved: JH

Ref: 867/ENV/001 | Revision: A

Date: 28/02/2012

Designated Ecological Sites
Figure 3

Fife Energy Park Offshore Demonstration Wind Turbine (FEPODWT)



arcus

- Proposed Turbine Location
- New Proposed Met Mast Location
- Listed Building
- 5km Buffer of Turbine Location
- Garden Designed Landscape
- Scheduled Monument

1:40,000 Scale @ A3

0 1 2 km

N

Produced: LHu
Reviewed: SC
Approved: JH

Ref: 867/ENV/003 | Revision: A

Date: 28/02/2012

Designated Cultural Heritage Assests Within 5km

Figure 4

Fife Energy Park Offshore Demonstration Wind Turbine (FEPODWT)