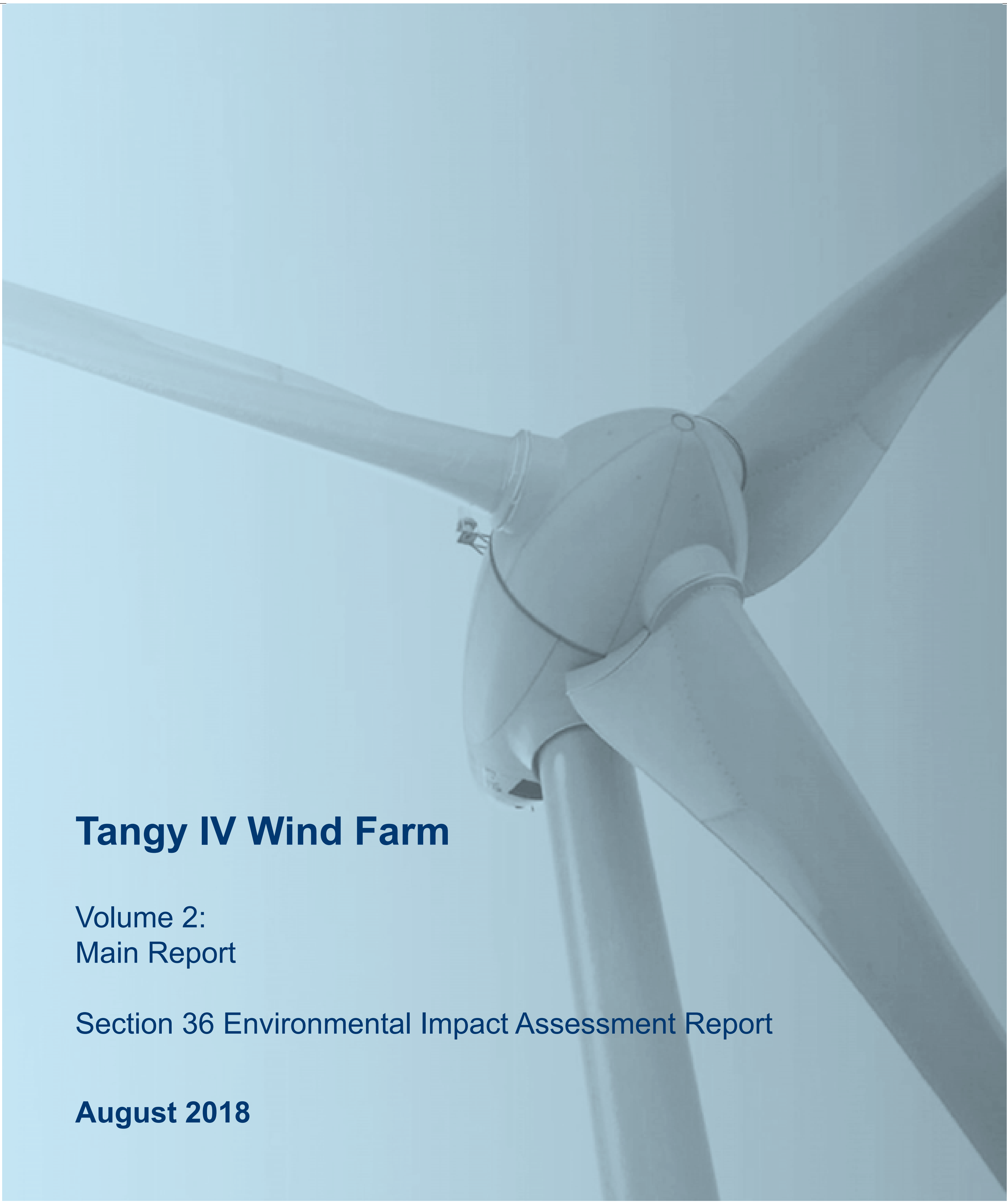

Tangy IV Wind Farm

Volume 2:
Main Report

Section 36 Environmental Impact Assessment Report

August 2018

VOLUME 2 MAIN REPORT: TABLE OF CONTENTS

Chapter 13: Cultural Heritage

Chapter 14: Noise

Chapter 15: Access Traffic and Transport

Chapter 16: Land Use, Socio-Economics and Recreation

Chapter 17: Shadow Flicker

Chapter 18: Aviation

Chapter 19: Summary of Impacts and Schedule of Mitigation

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

Abbreviation	Expanded Term / Definition
ABC	Argyll and Bute Council
ABLWECS	Argyll and Bute Wind Farm Landscape Capacity Study 2017
ACE	Area Capacity Evaluation
ADT	Average Daily Traffic
AEP	Annual Exceedance Probability
AIP	Aeronautical Information Package
ALR	Abnormal Load Route
ALV	Abnormal load vehicle
AOD	Above Ordnance Datum
APQ	Area of Panoramic Quality – a regional level landscape designation identified by Argyll and Bute Council.
ARSG	Argyll Raptor Study Group
Ash	Ash Design and Assessment
ASPT	Average Score Per Taxon
ATC	Automatic traffic counts
BAP	Biodiversity Action Plan
BBPP	Breeding Bird Protection Plan
BCT	Bat Conservation Trust
BGS	British Geological Survey
BMWP	Biological Monitoring Working Party
BoCC	Birds of Conservation Concern
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAR	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended
CDM	Construction (Design and Management) Regulations (2015)
CEMP	Construction Environmental Management Plan
CEnv	Chartered Environmentalist
CHORD	Argyll and Bute Council's programme for regeneration and economic development
CIEEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CIRIA	Construction Industry Research and Information Association
CITB	Construction Industry Training Board
CLVIA	Cumulative Landscape and Visual Impact Assessment – the assessment of the landscape and visual effects of the proposed development as an addition to a theoretical baseline including other wind farms which are operational, consented or the subject of an active planning application or appeal.

Abbreviation	Expanded Term / Definition
CO_2	Carbon dioxide
Core Path	Recreational routes identified by Planning Authorities considered to provide the public reasonable access throughout their area.
CoWR	Control of Woodland Removal
CP	compensatory planting
CRAA	Collision Risk Analysis Area
CRM	Collision Risk Model
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
Cumulative Effects	Effects arising from the addition or combination of the proposed development with other reasonably foreseeable similar developments. May be experienced in combination, concurrently or sequentially.
CWS	County Wildlife Site
DAS	Design and Access Statement
Designated Landscape	Areas of landscape identified as being of importance at international, national or local levels, either defined by statue or identified in development plans or other documents.
dB	Decibel. A unit of level derived from the logarithm of the ratio between a value and a reference value typically used to describe acoustic quantities. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound level.
dB(A)	A-weighted decibel. A frequency weighting applied to noise levels to mimic the human ear's response to sound.
DECC	Department of Energy and Climate Change (now Department for Business Energy and Industrial Strategy (BEIS)
DfT	Department for Transport
DME	Distance Measuring Equipment
DMRB	Design Manual for Roads and Bridges
DTM	Digital Terrain Model
DVAR	Dynamic Volt-Amp Reactive
DVOR	Doppler Very High Frequency Omni-Range
EC	European Commission
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
ECU	Energy Consents Unit
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EIA Regulations	Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017
EIA Report	Environmental Impact Assessment Report
EPS	European Protected Species
ES	Environmental Statement

Abbreviation	Expanded Term / Definition
EU	European Union
Existing Tangy I and II	Existing Tangy I and II Wind Farm (operational)
FCS	Forestry Commission Scotland
FES	Forest Enterprise Scotland
GDL	A landscape or garden included on the Inventory of Gardens and Designed Landscapes
GI	Ground Investigation
GIS	Geographical Information System
GLVIA3	Guidelines for Landscape and Visual Impact Assessment (Third Edition) – Best practice guidance for undertaking LVIA.
GMT	Greenwich Mean Time
GPG	Good Practice Guide
GPP	SEPA Guidance for Pollution Prevention 5 (2018 Edition)
GVA	Gross Value Added
GWDTE	Groundwater Dependent Terrestrial Ecosystem
ha	Hectare
HER	Historic Environment Record
Heritage Asset	Those parts of the historic environment that have significance and are worthy of consideration in planning matters are referred to as heritage assets. Heritage assets include standing, buried or submerged remains, buildings, parks and gardens and areas, sites and landscapes including designated sites and those identified by the local planning authority. World Heritage Sites, Scheduled Monuments, Listed Buildings, protected wreck sites, Inventory Gardens and Designed Landscapes, Inventory Battlefields and Conservation Areas are all heritage assets.
HES	Historic Environment Scotland
HESPS	Historic Environment Scotland Policy Statement (2016)
HGV	Heavy goods vehicle
HL	Hoare Lea
HLA	Historic Landscape Assessment
HMP	Habitat Management Plan
HSE	Health and Safety Executive
HSI	Habitat Suitability Index
ICAO	International Civil Aviation Organisation
ICOMOS	International Council on Monuments and Sites
IEA	Institute of Environmental Assessment
IEMA	Institute of Environmental Management and Assessment
IFP	Instrument Flight Procedure
IGDL	Inventory Garden and Designed Landscape
IOA	Institute of Acoustics
IOF	Important Ornithological Feature
JNCC	Joint Nature Conservation Committee

Abbreviation	Expanded Term / Definition
km	Kilometres
kph	Kilometres per hour
LCT	Landscape Character Type – An area defined within the Landscape Assessment of Argyll and the Firth of Clyde (ERM 1996) with a particular consistency of landscape character.
LDP	Local Development Plan
LMP	Land Management Plan
LNR	Local Nature Reserve
LTFP	Long Term Forest Plan
LUPS-GU31	SEPA Guidance on Assessing the impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017 Edition)
LVIA	Landscape and Visual Impact Assessment – the assessment of the effects of a development on the existing landscape and visual amenity resource.
m	Metre
m^2	Metres squared
m^3	Metres cubed
Magnitude (of change)	A term that combines judgements about the size and scale of the effect, the extent of the area over which occurs, whether it is reversible or irreversible and whether it is short or long term in duration
Methodology	The specific approach and techniques used for a given study
Mitigation by design	Embedded mitigation, changes made as a consequence of the design process
Mitigation measures	Measures including any process, activity or design process to avoid, reduce, remedy or compensate for adverse impacts of a development.
MIEMA	full membership of Institute of Environmental Management and Assessment
MOD	Ministry of Defence
mph	miles per hour
MS	Mountaineering Scotland
MSA	Minimum Safe Altitude
MSS	Marine Scotland Sciences
MW	megawatt
NBN	National Biodiversity Network
NCI	Nature Conservation Importance
NDB	Non-Directional Beacon
NDRs	Non-Domestic Rates
NHZ	Natural Heritage Zone
NIEA	Northern Ireland Environment Agency
NMRS	National Monuments Record of Scotland
NNR	National Nature Reserve
NO_2	nitrogen dioxide

Abbreviation	Expanded Term / Definition
NPF3	National Planning Framework 3
NRHE	National Record of the Historic Environment
NRW	Natural Resources Wales
NSA	National Scenic Area – a national level designation applied to those landscapes considered to be of outstanding scenic value and requiring protection in the national interest.
NSR	Non-Statutory Register
NTEM	National Trip End Model
NTS	Non-Technical Summary
NVC	National Vegetation Classification
OEMP	Outline Ecological Management Plan
OHS	Outer Horizontal Surface
OLS	Obstacle Limitation Surface
OS	Ordnance Survey
OSGB	Ordnance Survey of Great Britain
PACR	Pre-Application Consultation Report
PAN	Planning Advice Note
PAWS	Plantations on Ancient Woodland Sites
PM_{10}	Particulate matter
PMP	Peat Management Plan
PPS18	Best Practice Guidance for Planning Policy Statement 18 Renewable Energy (Department of Environment Northern Ireland, 2009)
PSI	Percentage Silt Tolerance
PSR	Primary Surveillance Radar
PSRA	Peat Stability Risk Assessment
PWS	Private Water Supply
Ramboll	Ramboll Environmental and Health UK Limited
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
REAP	Renewable Energy Action Plan
Rebar	Steel reinforcement
Repowering	In the context of the Tangy IV wind farm, repowering is used to describe the process of decommissioning existing turbines and their replacement with new turbines, both within the existing site and extending the site by increasing the footprint to include neighbouring land ownerships and by increasing the tip height and generation capacity.
Residual Effects	Effect of development after mitigation/mitigation by design or design proposals are taken into account.
RSPB	Royal Society for the Protection of Birds
RTCs	Road traffic collisions
SAC	Special Area of Conservation
SCADA	Supervisory control and Data Acquisition
SEPA	Scottish Environmental Protection Agency

Abbreviation	Expanded Term / Definition
Setting	Setting is more than the immediate surroundings of a site or building, and may be related to the function or use of a place, or how it was intended to fit into the landscape of townscape, the view from it or how it is seen from areas round about, or areas that are important to the protection of the place, site or building (SPP 2014).
SFAL	Shadow flicker assessment location
SFCC	Scottish Fisheries Coordination Centre
SG	Supplementary Guidance
SHEP	Scottish Historic Environment Policy
SI	Site investigation
Significance	A measure of importance or gravity of the environmental effect, defined by significance criteria to the environmental topic
SLA	Special Landscape Area - a regional level landscape designation identified by North Ayrshire Council.
SM	Scheduled Monuments
SMR	Scottish Sites and Monuments Record
SNCI	Site of Nature Conservation Importance
SNH	Scottish Natural Heritage – Statutory body to advise government and planning officials on landscape and natural heritage issues.
SNIFFER	Scottish and Northern Ireland Forum for Environmental Research
SNWI	Semi-natural woodland inventory, a non-statutory designated site
SPA	Special Protection Area
SPAD	The Scottish Palaeoecological Database
SPG	Supplementary Planning Guidance
SPP (Planning)	Scottish Planning Policy (2014 Edition)
SSE	Scottish and Southern Energy
SSE Renewables	SSE Renewables Developments (UK) Limited
SSEG	SSE Generation Ltd
SSEPD	Scottish and Southern Energy Power Distribution
SSR	Secondary Surveillance Radar
SSSI	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
Tangy III	Consented Tangy III Development, August 2018
TEMPRO	Trip End Model Presentation Program
The 1989 Act	Electricity Act 1989
The 2017 EIA Regulation	Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017
The applicant	SSE Generation Limited, the Developer
The proposed development	Proposed Tangy IV Wind Farm Development – repowering the site by decommissioning the existing 22 turbines and replacing them with a 16 turbine wind farm with a maximum tip height up to, but not exceeding 149.9 m
TMP	Traffic Management Plan

Abbreviation	Expanded Term / Definition
TPO	Tree Preservation Order
UKBAP	UK Biodiversity Action Plan
UKFS	UK Forestry Standard
VP (Landscape and Visual)	Viewpoint
VP (Ornithology)	Vantage Point
WFD	Water Framework Directive
Wireline/wireframes	A computer-generated line drawing of the DTM and the proposed development from a known location.
WLA	Wild Land Area – Areas defined by SNH as comprising the greatest and most extensive areas of wild characteristics within Scotland.
WoSAS	West of Scotland Archaeology Service
ZTV	Zone of Theoretical Visibility – a computer generated diagram which uses topographical information to illustrate areas within which views of a development may be theoretically obtained.

PREFACE

SSE Generation Limited (the applicant) has applied for consent[1] for the proposed Tangy IV Wind Farm, comprising 16 turbines and associated infrastructure, 3 km north of Kilkenzie, Kintyre, Scotland.

The applicant proposes to redevelop the existing Tangy I and Tangy II Wind Farms, replacing the existing 22 turbines with a 16 turbine wind farm with a maximum tip height up to, but not exceeding 149.9 m ('the proposed development').

The applicant has provided an Environmental Impact Assessment Report (EIA Report) to accompany the application. The EIA Report comprises the following sections:

- Volume 1: NTS;
- Volume 2: Main Report;
- Volume 3a: Figures;
- Volume 3b: Visualisations; and
- Volume 4: Technical Appendices.

Additional documentation that will be submitted with the application includes:

- Design and Access Statement;
- Pre-Application Consultation Report; and
- Planning Statement.

The EIA Report and additional documents will be available for viewing on the Scottish Government Energy Consents online portal (http://www.energyconsents.scot/Default.aspx) and also at the following locations:

- Argyll and Bute Council, Customer Service Point, 1A Manse Brae, Lochgilphead, PA31 8RD, Mon – Fri from 9am – 12.30 and 1.30 – 4pm;
- Argyll and Bute Council, Burnett Building, Customer Service Point, St. John Street, Campbeltown, PA28 6BJ, Mon – Fri from 9am – 12.30 and 1.30 – 4pm; and
- Tayinloan Post Office, Tayinloan Store, Tayinloan, Tarbert, PA29 6XG, Monday to Friday: 10am to 1pm.

The EIA report can also be viewed at the Scottish Government Library at Victoria Quay, Edinburgh, EH6 6QQ.

A paper copy of the Non-Technical Summary is available free of charge. A copy of the EIA report is available on DVD at a cost of £10. A printed copy of the EIA Report can be provided upon request (£450). Copies of the documents may be obtained from the applicant by contacting:

Murray West

SSE
1 Waterloo Street
Glasgow
G2 6AY

Or by email at: murray.west@sse.com

Further detail on the project is available on the applicant's website: www.sse.com/tangy-repower.

[1] An application for consent for the proposed development will be made to the Scottish Ministers under section 36 of the Electricity Act 1989, along with a request for a direction that planning permission be deemed to be granted under section 57(2) of the Town and Country Planning (Scotland) Act 1997 as amended

Any representations to the application may be submitted via the Energy Consents Unit website at www.energyconsents.scot/Register.aspx; by email to the Scottish Government, Energy Consents Unit mailbox at representations@gov.scot; or by post to the Scottish Government, Energy Consents Unit, 4th Floor, 5 Atlantic Quay, 150 Broomielaw, Glasgow, G2 8LU, identifying the proposal and specifying the grounds for representation. Written or emailed representations should be dated, clearly stating the name (in block capitals), full return email and postal address of those making representations. Only representations sent by email to representations@gov.scot will receive acknowledgement.

All representations should be received not later than 26 October 2018, although Ministers may consider representations received after this date.

Any subsequent additional information which is submitted by the applicant will be subject to further public notice in this manner, and representations to such information will be accepted.

1. INTRODUCTION

1.1 Introduction

1.1.1 This Environmental Impact Assessment Report (EIA Report) is submitted by 'the applicant', SSE Generation Ltd (SSEG), holder of a generation licence. The EIA report has been prepared on behalf of the applicant, by SSE Renewables Developments (UK) Limited (SSE Renewables), to accompany an application for consent[2] for the proposed Tangy IV Wind Farm, located on the west coast of the Kintyre Peninsula, Argyll and Bute, Scotland, as shown on Figure 1.1. The applicant proposes a repowering and extension to the existing Tangy I and Tangy II Wind Farms, replacing the existing 22 turbines with a 16 turbine wind farm with a maximum tip height up to, but not exceeding 149.9 m ('the proposed development').

1.1.2 This EIA Report has been prepared in accordance with the requirements of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the 2017 EIA Regulations'), subject to the transitional provisions set out in Part 12 of the 2017 EIA Regulations. This EIA Report presents information on the likely significant environmental effects of the proposed development. The EIA Report also informs the reader of the nature of the proposed development and the measures proposed to protect the environment during site preparation (including decommissioning of the existing turbines), construction, operation and decommissioning.

1.2 Project Background and Need

1.2.1 Tangy I began generating electricity in 2004, and following an extension to include Tangy II, currently comprises 22 turbines, each with 0.85MW capacity, and maximum generation capacity of 18.7 megawatts (MW). The existing consent for the site expires in August 2022. Turbine technology has significantly advanced since Tangy I and Tangy II 'existing Tangy' became operational with early turbine models having been superseded by much more efficient machines. The existing turbines on Tangy are reaching the end of their operational life. The applicant therefore wishes to submit a new application to remove the existing turbines and upgrade the site with new wind turbine generators to realise its greater generating potential.

1.2.2 In November 2014, Tangy III Wind Farm Environmental Statement (ES), 'the ES (2014)', was submitted with a planning application under the Town and Country Planning (Scotland) Act 1997, as amended, to Argyll and Bute Council (ABC) for the construction and operation of a new 16 turbine wind farm with a maximum tip height of 125 m. Following a post-submission variation to remove turbine 8 from the turbine layout, planning permission for 15 turbines was granted in June 2015 and is referred to here as 'the consented development'. Based on the technology available in November 2014, the consented development would have a maximum installed capacity of up to 34.5 MW.

1.2.3 In order to maximise the energy yield of the site and increase the site's contribution to Scottish renewable electricity generation targets, the applicant is now proposing an increased tip height of up to 149.9 m, based on the same 16 turbine layout previously submitted. Based on current technology, this would provide an installed capacity of up to 80 MW. The proposed development is now referred to as the proposed Tangy IV Wind Farm.

1.3 Key Terms

1.3.1 To ensure clarity in the EIA Report, the following terms are used:

- application boundary: the red line application boundary as shown on Figure 1.1.

[2] An application for consent for the proposed development will be made to the Scottish Ministers under section 36 of the Electricity Act 1989, along with a request for a direction that planning permission be deemed to be granted under section 57(2) of the Town and Country Planning (Scotland) Act 1997 as amended.

- the proposed development: the infrastructure of the proposed Tangy IV Wind Farm as described in detail in Chapter 5: Description of the Development, including but not limited to: wind turbines, electrical cabling, access tracks, anemometer masts, substations, operations building, borrow pits, construction compound and construction laydown area.
- site: the area within the application boundary within which the proposed development lies; and
- study area: the area(s) over which desk based or field assessments have been undertaken. The study area varies depending on timing of surveys and the nature of the potential effects within each discipline, as informed by professional guidance and best practice regarding EIA. The study areas are therefore explained within the methodology section of the relevant chapters.

1.3.2 A glossary of terms is also included at the front of this EIA Report.

1.4 Development Context

Site Setting

1.4.1 The site is located approximately 9 km north-west of Campbeltown, Kintyre's largest settlement. The closest villages are Bellochantuy, 2 km north-west of the site, and Kilchenzie, 3 km south of the site. The site is a combination of forestry and agricultural land currently used for commercial forestry, grazing and renewable electricity generation. The highest point within the application boundary is Cnocan Gean, north-east of the existing wind farm at a height of 200 m Above Ordnance Datum (AOD). In general, the elevation of the site ranges from about 90 m to 200 m AOD. The site slopes down to the west, south and north-west.

1.4.2 The site also contains several small watercourses/burns, many of which are connected to Tangy Loch, which is approximately 230m south-east of the site boundary at its closest point.

1.4.3 Access to the site is via an unnamed road running in a north-east-southwest direction past Tangy Farm and Breakachy, joining Tangy Mill Road to the south, which connects to the A83 at Drum Farm. The A83 runs to the west and south of the site providing access to the coast, Campbeltown Harbour and Machrihanish to the south, and to Tarbert and the rest of mainland Scotland to the north.

1.4.4 There are no major roads within the site, although there are forest tracks and approximately 3.7 km of tracks that service the existing wind farm.

Environmental Sensitivities

1.4.5 The site is located on an upland area and comprises coniferous forest to the north and grassland to the south, although other habitats are present. There are a number of small watercourses and burns on site (e.g. Tangy Burn and Allt na Creamn), as shown on Figure 12.1.

1.4.6 Figure 1.2 shows ecological designations within the vicinity of the site.

1.4.7 There is no development proposed within areas designated for ecological protection at international, national or local scale. In the wider area, Tangy Loch, located adjacent to the site to the south-east, is designated as a Site of Special Scientific Interest (SSSI) and is a part of the Kintyre Goose Roosts Special Protection Area (SPA) and Ramsar site due to the presence of nationally important aquatic plant life (Slender naiad *najas flexilis*) and the Greenland White-fronted Goose (*Anser albifrons*). The Kintyre Goose Roosts SPA and Ramsar sites, and Kintyre Goose Lochs SSSI, that cover Tangy Loch also include Lussa Loch, located approximately 1km north-west of the site.

1.4.8 Other designated sites in the wider area that are designated for non-ornithological features are the Machrihanish Dunes SSSI, approximately 3 km to the southwest of the site, which is designated for geomorphological features (sand dunes) and associated biological features (dune habitats and flora); and Bellochantuy and Tangy Gorges SSSI approximately 1 km southwest of the site, designated for quaternary geology and geomorphological features.

1.4.9 Ornithological surveys have indicated the presence, on or around the site, of Greenland white-fronted geese, greylag geese, merlin, peregrine, hen harrier, short-eared owl and herring gull.

1.4.10 The site is not covered by any national landscape policy designations. The North Arran National Scenic Area (NSA) is located approximately 22 km to the north-east, whilst the Knapdale and Jura NSAs are each approximately 40 km distant from the site to the north and north-west respectively.

1.4.11 The West Kintyre (Coast) Area of Panoramic Quality (APQ), designated as such within the Argyll and Bute Local Development Plan (2015), is located approximately 300 m to the west of the site, and covers the A83 road corridor.

1.4.12 There are no Scheduled Monuments (SM) within the site boundary. The Tangy Loch Fortified Dwelling SM sits outside the site to the south-east and Killocraw Cairns SMs are also located approximately 0.5 km to the north-west of the site boundary.

1.5 About the Applicant

1.5.1 SSE is a British energy company, headquartered in Perth, Scotland, with a team of around 21,000 employees. This EIA Report is submitted by the applicant, SSE Generation Ltd, holder of a generation licence. This EIA Report has been prepared, on behalf of the applicant by SSE Renewables Developments (UK) Limited. SSE Renewables is the renewable energy division of SSE and is responsible for the development and construction of the SSE Group's renewable energy projects across Great Britain, Ireland and continental Europe, including offshore and onshore wind farms, hydro, marine, biomass and solar projects.

1.5.2 SSE is maintaining and investing in a diverse portfolio of renewable generation plant. In all, SSE has 3,826 MW of renewable energy generation capacity (onshore wind, offshore wind, hydro, pumped storage and biomass) of which 3,091 is in Great Britain (at March 2017).

1.6 Project Team

1.6.1 The assessment of environmental effects and management of the EIA process has been undertaken by a team of experienced environmental specialists as follows:

- Ramboll Environmental and Health UK Limited (Ramboll) – EIA management and Ecology;
- Montague Evans – Planning;
- Ash Design + Assessment (Ash) – Landscape and Visual;
- MacArthur Green Ltd. – Ornithology;
- SLR – Geology, Soils and Peat;
- WSP – Surface Water;
- AOC Archaeology – Cultural Heritage;
- Hoare Lea Acoustics – Noise;
- Arcus – Traffic and Transport;
- McKay Forestry – Forestry (land use);
- BiGGAR Economics – Socio-economic;
- TNEI – Shadow Flicker; and
- Pager Power – (aviation).

1.6.2 The EIA team has wide experience of the development of proposals for wind farms and the assessment of their likely significant effects. The EIA team has worked closely with the applicant, which has extensive experience of wind farm design, construction and operation.

1.6.3 In accordance with regulation 5(5) of the EIA regulations, by appointing Ramboll the applicant has ensured that the EIA Report has been prepared by 'competent experts'. The EIA Report has been compiled and approved by professional EIA practitioners at Ramboll, holding relevant undergraduate and post-graduate degrees, full membership of IEMA (MIEMA) and Chartered Environmentalist (CEnv) status with the Society for the Environment. The EIA Report meets the requirements of the Institute of Environmental Management and Assessment (IEMA) EIA Quality Mark scheme. This is a voluntary scheme operated by IEMA that allows organisations to be make a commitment to excellence in EIA and to have this commitment independently reviewed on an annual basis.

1.6.4 Each of the impact assessment chapters provides details of the relevant professional memberships of the authors, code of practice followed, assessment methodology used, including the specific criteria for defining the sensitivity of the baseline environment, quantifying the magnitude of change and for assessing whether the effects are deemed significant or not significant under the terms of the EIA Regulations.

1.7 References

The Electricity Act 1989, c29.

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, No.101.

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.

Town and Country Planning (Scotland) Act 1997, c8.

Argyll and Bute Council (2015) Adopted Local Development Plan, March 2015.

2. ENVIRONMENTAL IMPACT ASSESSMENT

2.1 Introduction

2.1.1 The proposed development is categorised as a 'schedule 2' development under the Electricity Works (Environmental Impact Assessment (Scotland) Regulations 2017 ("the 2017 EIA Regulations"). If schedule 2 development is likely to have significant environmental effects because of factors such as its nature, size or location, it is considered an 'EIA development'. This can be confirmed via a request to the Scottish Government for a Screening Opinion under Regulation 8(1) of the EIA Regulations. In this case, the applicant has decided to submit an EIA Report with its application for consent for the proposed development without seeking a Screening Opinion.

2.1.2 The applicant submitted a request for a Scoping Opinion from the Scottish Ministers on 28th April 2017, under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000. The request was accompanied by a Scoping Report, prepared on behalf of the applicant, which set out a summary of the proposals; identified the likely significant environmental effects, and summarised the proposed scope of the EIA. The Scoping Report was simultaneously issued to a list of statutory and non-statutory consultees.

2.1.3 Regulation 40(1) of the 2017 EIA Regulations states that where the developer submitted a request for a scoping opinion before 16 May 2016, the EIA report should be prepared in accordance with the modifications contained with the transitional provisions of the 2017 EIA Regulations. In particular, the scope and level of detail of information to be contained in the EIA report is determined by reference only to the scope and level of detail of information which immediately prior to 16 May 2017 had to be included in an environmental statement in accordance with regulation 4(1) and schedule 4 of Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.

2.1.4 This EIA report has been prepared in accordance with the relevant provisions of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Electricity Works (Environmental Impact Assessment (Scotland) Regulations 2017, referred to together as 'the 2017 EIA Regulations'.

2.1.5 A Scoping Opinion was received from the Scottish Ministers in October 2017. The Scoping Opinion was provided with reference to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, subject to the transitional provisions set out in Part 12. EIA Chapter 7: Scoping and Consultation, provides a summary of the scoping and consultation process and responses received.

2.2 Assessment Methodology

2.2.1 The EIA Report provides impact assessment chapters for the relevant factors specified in regulation 4(3) and Schedule 4 of the EIA Regulations where they are likely to be significantly affected, taking account of the description of the proposed development and the mitigation by design.

2.2.2 Each impact assessment chapter will describe the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium- term and long-term, permanent and temporary, positive and negative effects of the proposed development.

2.2.3 In this EIA Report, the term 'impact' is used to refer to physical constructions or disturbance that may impact the surrounding environment (e.g. erection of a steel tower is an impact). 'Effects' has been used to refer to the effect that physical constructions may have on the surrounding environment (e.g. physical disturbance to habitats/ habitat loss/ fragmentation due to the erection of a steel lattice tower is an effect).

2.2.4 Unless qualified elsewhere, the following interpretation is applied with regard to effects. Short-term effects are those which extend over a short period only and, in the context of the wind farm, are typically those associated with the construction or decommissioning periods or other limited periods. Other temporary effects which persist for less than the life of the wind farm are described as medium-term, with those extending to the full lifetime of the wind farm described as long-term. Any effects which persist beyond the life of the wind farm are considered permanent. Effects with a duration of up to and including long-term are considered reversible, whereas permanent effects are considered irreversible. Where permanent or long-term effects occur, this has been identified.

2.2.5 Assessment criteria are required in order to evaluate environmental effects. Significance is generally determined through a combination of the sensitivity of a receptor to an effect and the magnitude of the change. This process is summarised as follows:

- identification of baseline conditions of the site and its environs, including the sensitivity of receptors which may be affected by changes in the baseline conditions;
- consideration of the magnitude of potential changes to the environmental baseline;
- assessment of the significance of effect, taking into account sensitivity of receptors and magnitude of change;
- identification of appropriate mitigation measures; and
- assessment of significance of residual effects taking account of any mitigation measures.

2.2.6 The above approach does not, however, apply to all disciplines addressed in the EIA Report; for example, where best practice guidance recommends an alternative approach for a specific discipline. Each of the impact assessment chapters provides details of the assessment methodology used, including the specific criteria for defining the sensitivity of the baseline environment, quantifying the magnitude of change and for assessing whether the effects are deemed significant or not significant under the terms of the EIA Regulations.

Baseline Conditions

2.2.7 The assessment of each environmental effect is undertaken with reference to baseline conditions, which are described in the relevant technical chapter. This describes the existing environmental conditions at the site and in the wider area as pertinent to the particular environmental parameter. The 'no development' future baseline scenario is described in Chapter 4 (Site Selection and Alternatives), however is not discussed further in each technical chapter.

2.2.8 Data was collected through site visits and field surveys, statutory and non-statutory consultation, and review of maps, records, information and reports. This EIA Report has been prepared using survey data collected for the ES (2014) which has been reviewed and reused where appropriate and, where necessary, additional surveys were undertaken for the proposed development in 2016 and 2017. Each technical chapter provides a description of the baseline data used and identifies any difficulties encountered in compiling the required information and the main uncertainties involved.

Assessment of Effects

Sensitivity/Importance of Receptors

2.2.9 The sensitivity of the baseline conditions was defined according to the relative importance of existing environmental features within or in the vicinity of the site, or by the sensitivity of receptors which would potentially be affected by the proposed development.

2.2.10 Criteria for the determination of sensitivity (e.g. high, medium, or low) or of importance (e.g. international, national, regional or authority area) were established based on prescribed guidance, legislation, statutory designation and/or professional judgement. The criteria for each environmental parameter are provided in the relevant chapter of the EIA Report.

Magnitude of Change

2.2.11 The magnitude of change to environmental baseline conditions was identified through detailed consideration of the proposed development, taking due cognisance of any legislative or policy standards or guidelines, and/or the following factors:

- the degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- the scale or degree of change from the existing situation;
- whether the effect is temporary or permanent, indirect or direct, short term, medium term or long term;
- any in-combination effects; and
- potential cumulative effects.

2.2.12 In some cases, the likelihood of impact occurrence may also be relevant, and where this is a determining feature of the assessment this is clearly stated.

Mitigation

2.2.13 Section 38 and Schedule 9 of the Electricity Act 1989 (“the 1989 Act”) sets out that when formulating a proposal to construct a generating station, the applicant:

- *shall have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiological features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and*
- *shall do what he reasonably can to mitigate any effect that the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.*

2.2.14 Through the evolution of the proposals, the applicant has been mindful of the above obligations under the 1989 Act, and has sought to identify appropriate mitigation measures and strategies as part of the design of the proposed development. Mitigation by design was considered as an integral part of the overall design strategy for the 16 turbine development layout proposed in the ES (2014) (e.g. altering and refining the site layout to reduce watercourse crossings or avoid areas of deep peat, sensitive species and/or habitats). The 16 turbine development layout in the ES (2014) was considered to represent the optimised layout taking account of reducing potential environmental effects, alongside technical and cost requirements. Mitigation by design is incorporated into the proposed development as described in Chapter 5 (Description of the Development).

2.2.15 Where complete avoidance of potential effects was not feasible during refinement of the site design, additional mitigation measures are identified in the relevant chapters to reduce or offset effects. These additional mitigation measures are summarised in Chapter 18 (Schedule of Mitigation). Where appropriate, monitoring measures are also proposed to provide a mechanism to ensure that the proposed mitigation measures perform as required.

Residual Effects and Statement of Significance

2.2.16 The significance of effects as reported in this EIA Report take account of all proposed mitigation (these are therefore termed 'residual effects'). In general, the residual effect has been described as Negligible, Minor, Moderate or Major and Significant or Not Significant. Each chapter of the EIA Report sets out the methodology used to combine the sensitivity of receptor and the predicted magnitude of change to arrive at a residual effect. Where possible, the assessment of residual effects are based on accepted criteria and relevant guidance, and augmented by professional judgement. The criteria for distinguishing between Significant and Not Significant effects are included within each chapter of the EIA Report.

2.2.17 The EIA Regulations require consideration of the 'likely significant effects'. However, the EIA Regulations do not provide a definition of what constitutes a significant environmental effect. This is because the significance of effects can only be determined on a development by development, site by site basis according to the environmental parameter under consideration, and the context in which the relevant assessment is made. During preparation of this EIA Report, effects were considered to be 'significant' in accordance with the EIA Regulations where the assessment results indicated Moderate or higher residual effect. A 'Statement of Significance' is provided at the end of each chapter to clearly identify those effects considered to be significant.

2.2.18 Unless otherwise stated, reported effects are considered to be adverse. However, it should be noted that some effects, such as change to the landscape and visual environment, may be subjectively viewed as either positive or adverse. Where any effects can be interpreted, this is highlighted and an explanation provided.

Cumulative Effects

2.2.19 In accordance with the EIA Regulations, the assessment has considered 'cumulative effects'. These are effects that result from incremental changes caused by past, present or reasonably foreseeable actions together with the proposed development. For the cumulative assessment, two types of effect have been considered:

- The combined effect of individual effects, for example noise, airborne dust or traffic on a single receptor; and
- The combined effects of several developments that may on an individual basis be insignificant but that cumulatively may have a significant effect.

2.2.20 The identification and assessment of cumulative effects in respect of the landscape and visual impact assessment (LVIA) in Chapter 8 (Landscape and Visual) considers other built or consented wind farms and wind farms subject to an application with a likelihood of intervisibility. The projects considered for this LVIA were identified in consultation with SNH and Argyll and Bute Council (ABC).

Assumptions and Limitations

2.2.21 A number of assumptions have been made during preparation of the EIA Report, which are set out below. Assumptions specific to certain environmental aspects are discussed in the relevant chapters of the EIA Report.

- The principal land uses adjacent to the site remain as they are at the time of the application submission. At the time of writing there are no known planning applications on land adjacent to the site.
- Information provided by third parties, including publicly available information and database is correct at the time of its provision.

2.2.22 The assessment has been subject to the following limitations:

- baseline conditions have been assumed to be accurate at the time of the physical surveys but, owing to the dynamic nature of the environment, conditions may change during the site preparation, construction and operational phases; and
- the assessment of cumulative effects has been reliant on the availability of information on other developments.

2.2.23 Notwithstanding these limitations, the information presented within the EIA Report is considered to meet the requirements of the EIA Regulations and is sufficient to accompany an application for consent under section 36 of the Electricity Act 1989.

2.3 EIA Report Structure

2.3.1 This EIA Report comprises a number of volumes as detailed below.

Volume 1: Non-Technical Summary

2.3.2 The Non-Technical Summary (NTS) summarises in non-technical language the findings of the EIA as reported in the EIA Report: Written Statement.

Volume 2: Written Statement

2.3.3 The written statement (this document) contains two parts:

- Part 1 (EIA Report Chapters 1-7) describes the project and the legal and policy framework within which the application will be determined. This includes details of how the project was selected and how the design and layout has evolved through the environmental assessment to reflect and mitigate potential effects.
- Part 2 (EIA Report Chapters 8-18) contains the individual assessments undertaken for the identified environmental issues, with Chapter 18 (Schedule of Mitigation) providing a summary of all proposed mitigation. The complete assessment of the likely significant effects of the proposed development is contained within this document, and is supported by technical appendices.

Volume 3: Part A – Figures

2.3.4 Volume3, part A includes A3 size figures for all chapters.

Volume 3: Part B – Visual Representations

2.3.5 Volume3, part B includes the Visual Representations to support the landscape and visual assessment, and the assessment of indirect (setting) effects on cultural heritage assets. The visual representations are elongated figures printed at 297 mm x 890 mm.

Volume 4: Technical Appendices

2.3.6 Volume 4 provides supporting raw data, survey information, result tables, as well as standard methodologies or terminology required to support the assessment made in Volume 2: Written Statement.

Supporting Documents

2.3.7 The following documents are not part of the EIA Report, but have been provided as supporting documents to the Section 36 application.

Planning Statement

2.3.8 A Planning Statement has been prepared which considers the wind farm proposals in the context of adopted and emerging planning policies and other material considerations, identifying areas of policy support and/or conflict, and concluding with recommendations about the overall acceptability of the proposals in relation to the planning context.

Pre-Application Consultation Report (PACR)

2.3.9 A PACR has been prepared to summarise the consultation activities undertaken prior to submission of the application. This is not a formal requirement of a Section 36 application. Notwithstanding, the applicant has opted to submit a PACR to provide additional information.

Design and Access Statement (DAS)

2.3.10 A DAS has been prepared to summarise the design evolution and consideration of alternatives undertaken prior to submission of the application. This is not a formal requirement of a Section 36 application. Notwithstanding, the applicant has opted to submit a DAS to provide additional information.

2.4 References

BACTEC International Ltd. (2012). Explosive Ordnance Threat Assessment in respect of The Kintyre Peninsula, Scotland for SSE Renewables Developments (UK) Ltd. Ref 3848TA, 26 March 2012.

ETSU R 97. The Assessment and Rating of Noise from Windfarms, Final ETSU R 97 Report for the Department of Trade & Industry. UK Noise Working Group, 1997.

The Electricity Act 1989, c29

Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.

3. RENEWABLE ENERGY POLICY CONTEXT

3.1 Introduction

3.1.1 The Climate Change (Scotland) Act 2009 as amended, sets targets to reduce Scotland's emissions of seven greenhouse gases by at least 42% by 2020 and 80% by 2050, compared to the 1990-1995 baseline. The Scottish Government (2018) Climate Change Plan outlines a new interim target of reducing greenhouse gas emissions by 66% by 2032 against the baseline. The Scottish Energy Strategy also includes a new 2030 'whole system' target for the equivalent of 50% of Scotland's heat, transport and electricity consumption to be supplied by renewable sources. Both the Scottish Government (2017a) Energy Strategy and the Onshore Wind Policy Statement (2017b) recognise that onshore wind projects must play a vital role in decarbonising electricity, heat and transport systems and meeting the emissions reduction targets.

3.2 European Commission Climate Change Policy

3.2.1 The European Commission (2015) '2030 Framework for Climate and Energy Policies' contains the following headline commitments:

1) A binding European Union (EU) target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990 (i.e. without the use of international carbon trading);
2) A binding EU target of at least 27% of all energy consumed to come from renewable energy consumed in 2030; and

3.2.2 In addition, an indicative target was set at the EU level, of at least 27% improvement in energy efficiency in 2030 compared to projections of future energy consumption.

3.2.3 The latest update provided by the European Commission (2017) on progress towards the 40% emissions reduction target confirms that in 2016 the EU greenhouse gas emissions were 23% below the 1990 baseline. The report anticipates that the 2030 target will be met. The evaluation of climate policies confirmations that the reductions achieved to date are mainly driven by innovation, including the use of low-carbon technology such as renewable energy.

3.3 UK Climate Change and Renewable Energy Policy

3.3.1 The UK Climate Change Act 2008 committed the UK to reducing greenhouse gas emissions by at least 80% by 2050 compared to a 1990 baseline, through the use of a series of five year 'carbon budgets'. The recent Clean Growth Strategy (Department for Business, Energy and Industrial Strategy, 2017), reports that the UK exceeded its emission reduction targets for the 2008 – 2012 carbon budget and expects to exceed the emission reduction target for the 2013 – 2022 period.

3.3.2 The Climate Change (Scotland) Act 2009 received Royal Assent on 4 August 2009. The Climate Change (Scotland) Act 2009 aims for an 80% reduction in Scotland's GHG emissions by 2050 and includes an interim target of a 42% reduction by 2020 (compared to 1990 levels for carbon dioxide, nitrous oxide and methane and 1995 levels for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride).

3.3.3 The Scottish Government Climate Change Plan (2018) outlines a new target of reducing greenhouse gas emissions by 66% by 2032. The Scottish Energy Strategy also includes a new 2030 'whole system' target for the equivalent of 50% of Scotland's heat, transport and electricity consumption to be supplied by renewable sources.

3.3.4 As at March 2015 (Scottish Government, 2015), Scotland had 7.4 GW of installed renewable electricity generation capacity, with an additional 8.9 GW of capacity currently under construction or consented, the majority of which is expected from wind generation, both onshore and offshore (approximately 4.2 GW for each category). Taking into account pipeline projects in planning, the total renewable capacity in Scotland was estimated to be 20.7 GW (March 2015).

3.3.5 The Scottish Energy Strategy (Scottish Government, 2017) recognises that the onshore wind sector will continue to play a vital role in decarbonising electricity, heat and transport systems; however, it also recognises the need to deliver a route to market. This means that there is an increasing need to seek the "*extension and replacement of existing sites with new and larger turbines*" (Scottish Government, 2017a, p.44). Furthermore, the Onshore Wind Policy Statement acknowledges that the contribution from onshore wind must continue to grow, which again means seeking opportunities to deploy larger turbines.

3.3.6 The proposed development would comprise of turbines newer and larger than existing Tangy I and Tangy II Wind Farms and would provide additional installed capacity of up to approximately 80 MW, contributing to meeting legal obligations seeking to increase the proportion of electricity which is to be derived from renewable sources.

3.4 References

Climate Change (Scotland) Act 2009, URL: https://www.legislation.gov.uk/asp/2009/12 (accessed 30/07/2018).

Department for Business, Energy and Industrial Strategy (2017) Clean Growth Strategy URL: https://www.gov.uk/government/publications/clean-growth-strategy (accessed 30/07/2018).

European Commission (2017 Two years after Paris – Progress towards meeting the EU's climate commitments, URL: https://ec.europa.eu/clima/policies/strategies/progress_en (accessed 30/07/2018).

European Commission (2015) 2030 Climate and Energy Policy Framework. October 2014, URL: https://ec.europa.eu/clima/policies/strategies/2030_en (accessed 05/07/2018).

Climate Change Act. (c.27) URL: http://www.legislation.gov.uk/ukpga/2008/27/contents (accessed: 05/07/2018).

Climate Change (Scotland) Act 2009. ULR: http://www.legislation.gov.uk/asp/2009/12/contents (accessed: 05/07/2018).

Scottish Government (2015a) 2020 Routemap for Renewable Energy in Scotland – Update. September 2015, URL: http://www.gov.scot/Topics/Business-Industry/Energy/RoutemapUpdate2015 (accessed 05/07/2018).

Scottish Government (2017a) Scottish Energy Strategy: The Future of Energy in Scotland. December 2017, URL: http://www.gov.scot/Publications/2017/12/5661/0 (accessed 05/07/2018).

Scottish Government (2017b) Onshore Wind Policy Statement. December 2017, URL: https://beta.gov.scot/publications/onshore-wind-policy-statement-9781788515283/ (accessed 05/07/2018).

Scottish Government (2018) Climate Change Plan – the Third Report on Policies and Proposals 2017-2032. February 2018, URL: http://www.gov.scot/Publications/2018/02/8867 (accessed 05/07/2018).

4. SITE SELECTION AND ALTERNATIVES

4.1 Introduction

4.1.1 This chapter outlines the applicant's site selection process and provides an overview of the site design considerations and evolution of the application layout based on the description provided for the consented Tangy III Wind Farm in the Tangy III Environmental Statement (ES) (2014). The Tangy III ES (2014) considered a range of alternative turbine heights and layouts. The description of the 'reasonable alternatives', and the main reasons identified for the selection of the chosen option in the ES (2014), are considered to remain valid for the proposed development as required under Schedule 4 of the EIA Regulations. The only additional alternative considered in the context of this EIA is the proposed increase in tip height.

4.2 Approach to Site Selection

4.2.1 The proposed development is one within a wider programme of development by the applicant. Site selection factors taken into account during identification of sites include a range of criteria, such as wind speed, access to grid connection, landscape and recreational designations, site topography, ecological sensitivities, ornithological interests, noise and water features.

4.2.2 At Tangy, the site benefits from the presence of an existing local turbine tower manufacturing factory, upgraded harbour facilities, and an existing operational wind farm with exceptional wind resource, and associated infrastructure.

4.2.3 There is also the opportunity to increase the efficiency of the current wind farm through replacement of the existing turbines. Turbine technology has significantly advanced since Tangy I and Tangy II became operational, with early turbine models having been superseded by much more efficient machines. In addition, since the original development of Tangy I and Tangy II there is now an opportunity to extend the site into neighbouring landownerships.

4.2.4 The proposed development is designed to utilise the important resource at Tangy of a high wind speed over coastal moorland, combined with the benefits of using an existing wind farm site and associated existing infrastructure.

4.3 No Development Alternative

4.3.1 The 'no development' scenario is considered to represent the current baseline situation as described in the individual chapters of this EIA Report. In the 'do nothing' alternative scenario, either the current operational Tangy I and Tangy II Wind Farm would continue generating electricity (potentially through an application to extend the duration of the existing consent), or the consent for Tangy III (consented August 2018[1]) would be implemented. In line with the scoping opinion (Scottish Government, 2017) the baseline taken for the purposes of the EIA is the current operational site conditions with Tangy I and Tangy II in operation.

4.4 Alternative Technologies Considered

4.4.1 Section 4.2 notes that the site was identified as being suitable for repowering through a formal site selection process by the applicant. A wind farm is considered to be the most suitable renewable energy technology for the Tangy site due to its location, the wind resource available and the presence of the existing Tangy I and II Wind Farm.

[1] Planning permission for 15 turbines with tip height of 130 m granted in August 2018 by Argyll and Bute Council

4.5 Design Strategy and Design Evolution

Overview of Approach

4.5.1 The purpose of a wind farm is to harness the energy of the wind and convert this to electricity. The process of turbine siting is a balance between maximising energy yield and minimising potential for negative environmental effects. The main environmental parameter affecting design is often landscape and visual effect, but other factors such as noise, ornithology and ecological effects can also carry considerable weight.

4.5.2 Changes made as a consequence of the design process are considered 'embedded' mitigation. The design of the wind farm layout is a vital part of the EIA process, as it is the stage where the biggest contribution can be made to prevent or mitigate potential effects.

4.5.3 The submitted design for Tangy IV is the same final 16 turbine layout as proposed for Tangy III in the Tangy III ES (2014). The Tangy III layout was developed through a series of iterations, informed by the baseline environmental surveys, technical considerations and consultations to ensure that it is appropriate for the site. The Tangy IV layout has been informed by updated baseline environmental surveys, however no changes to the layout were deemed necessary by the applicant from those selected as part of the Tangy III EIA process.

4.5.4 The design development process can be summarised in three key stages of design evolution, as set out from Paragraph 4.5.5. Further information with regard to environmental and technical considerations is then provided from Paragraph 4.5.23 to 4.5.43.

Design Evolution

4.5.5 Figures 4.1a-c summarise the six iterations of the Tangy III Wind Farm design evolution. The following paragraphs summarise the key design changes.

4.5.6 The Tangy III Wind Farm was redeveloped from August 2012 to August 2018. A range of alternative turbine layouts, heights and densities were considered. Following an appraisal of environmental constraints and opportunities, along with an evaluation of technical and economic factors, a planning application[2] was made in 2015 for a wind farm with a generation capacity less than 50 MW, comprising 16 turbines at 125 m tip height.

4.5.7 Tangy III Wind Farm was granted planning permission in June 2015. While the Tangy III ES (2014) assessed a 16 turbine scheme, consent was granted for a 15 turbine scheme (with Turbine 8 removed). In addition, the Tangy III ES (2014) was based on the forestry on the site being clear felled. Following the consent, agreement was reached with Forestry Commission Scotland to clear fell the existing forestry on the site and replant to a key hole design.

4.5.8 Subsequently the applicant applied to vary[3] the conditions of the consent for the Tangy III wind farm in April 2018, increasing the tip height by 5 m to 130 m. Argyll and Bute Council granted planning permission for the 15 turbines at 130 m tip height in August 2018.

4.5.9 The proposed Tangy IV development has now been optimised using currently available technology so as to realise the potential generation capacity from the exceptional wind resource available at the site. The applicant is now seeking to increase the tip height to 149.9 m, thus increasing the generation capacity to more than 50 MW, with potential to deliver more than four times the current energy generation than the existing site. As a result, the applicant is now applying for consent under s36 of the Electricity Act 1989. The proposed post-consent changes include:

- turbine 8 is reintroduced, resulting a total of 16 turbines;
- maximum wind turbine tip height is increased from 125 m to up to, but not exceeding 149.9 m; and

[2] Under the Town and Country Planning (Scotland) Act 1997, as amended
[3] under section 42 of the Town and Country Planning (Scotland) Act 1997 as amended

- indicative wind turbine rotor diameter increased from 105m to approximately 130m.

4.5.10 Following further assessment of turbine 8 (T8), review of previous consultation feedback and previous comments from the Argyll and Bute Council planning committee in support of including T8, it was determined that there was no significant benefit to the removal of T8 with respect to reducing environmental effects, therefore the decision was made to include it in the scope of this EIA Report and application.

4.5.11 Figures 4.2, 4.3 and 4.4 illustrate the difference between the previously consented 125 m turbines (consented June 2015) and the proposed 149.9 m turbines. For comparative purposes, the figures show the baseline panorama (showing the existing Tangy I and Tangy II Wind Farm), with a wireline of the Tangy I and Tangy II Wind Farm, a wireline of 2014 EIA Layout (i.e. the 16 turbine layout at 125 m tip height) and a wireline of the proposed development (i.e. a 16 turbine layout at 149.9 m tip height) (Sheet 2), and a photomontage of the proposed development (Sheet 3).

4.5.12 In addition, the post consent changes include some minor changes to track alignment and the relocation of a temporary construction compound. All other aspects of the proposed development, such as turbine locations, hardstanding's and access track layout remain unchanged from the ES (2014), Figure 4.1c.

Ornithological Considerations

4.5.13 MacArthur Green commenced ornithological surveys in April 2012 and two full years of ornithological data were collected with surveys finishing in March 2014. These surveys indicated a number of important bird species were present at or around the proposed development, with the most important being Greenland white-fronted goose due to its association with the nearby Kintyre Goose Roosts SPA. Hen harrier, merlin, herring gull and greylag geese were also recorded a number of times and usually within particular areas. Other important species that were recorded (but only very rarely) were peregrine and short-eared owl. Curlew and oystercatcher were the only notable wader species to breed within the study area.

4.5.14 Ornithological considerations have informed the design from a very early stage in the project development. For instance, due to the presence of an established Greenland white-fronted goose flight path to the east of the proposed development to their main roosting location at Lussa Loch (north-east of the site), an eastern limit was placed on the extent of the proposed development in order to maintain a buffer distance between the site and the goose flight path (so that the flight path is not obstructed by any wind turbines) and thereby limit any potential effects. Furthermore, the removal of three potential turbines on the western extent of the proposed development has also meant an area of concentrated raptor and gull activity has been avoided.

Landscape and Visual Considerations

4.5.15 Landscape and visual considerations have driven the layout design from an early stage. Project landscape architects ASH have worked closely with the applicant and statutory consultees to shape the design of the proposed development.

4.5.16 Early landscape and visual considerations included site analysis, comparison of turbine scale and geometry, identification of sensitive viewpoints, landscapes and potential receptors and the review of local and national guidance documents. This led to advice which then shaped the description of the proposed development which was included in the scoping report.

4.5.17 Following receipt of the scoping opinion for the proposed Modified Tangy III Wind Farm (now referred to as the proposed Tangy IV wind farm), additional consultation was undertaken to discuss landscape and visual matters with ABC and SNH. Comments from all consultees have been taken into consideration in developing the layout design (see Chapter 7).

Other Environmental Considerations

4.5.18 Potential environmental constraints were identified through an initial desk-based analysis of the site using a Geographical Information System (GIS) to map any environmental designations. Additional constraints were identified as part of the EIA process through desk based assessment, consultation and site surveys.

4.5.19 GIS mapping has been used to define the application boundary which has taken into account environmental designations. There are no national or international designations which fall within the application boundary. Local designations (or non-designated sites of local value) which were identified within or in the vicinity of the application boundary include cultural heritage features.

Terrestrial Habitats

4.5.20 As a design principle, ecologically sensitive areas have been avoided as far as possible, and loss of habitat has been minimised by careful design of the access track layout and utilisation of existing access tracks where possible. This has been informed by detailed surveys, specifically Phase 1 Habitat survey and NVC survey. The survey data were used to determine sensitivity classification of terrestrial habitats in accordance with guidance from SEPA and SNH. This included consideration of habitats consistent with those on Annex 1 of the European Union Council Directive 92/43/EEC (EC Habitats Directive), UKBAP priority habitats and habitats which are considered by SEPA to be Groundwater Dependent Terrestrial Ecosystems (GWDTEs). Further details can be found in EIA Report Chapter 10 (Ecology and Nature Conservation).

Watercourses

4.5.21 The minimisation of watercourse crossings and avoidance where possible of works in close proximity to watercourses was a key objective of the site layout. Accordingly, all known watercourses as shown on 1:10,000 OS mapping were identified (and confirmed where possible during site survey), and a 50m 'buffer' applied. Although this is more than would generally be necessary as a means of pollution control, it ensures the layout does not unnecessarily encroach on sensitive habitats adjacent to watercourses and provides the maximum practicable buffer whilst allowing some degree of flexibility for micrositing (i.e. without encroaching on the watercourses). Further details on the assessment on potential effects on watercourses can be found in EIA Report Chapter 12 (Surface Water).

Cultural Heritage

4.5.22 Cultural heritage features were included in the GIS analysis, with files sourced from the National Monuments Record of Scotland (NMRS), Scottish Sites and Monuments Record (SMR) and West of Scotland Archaeology Service (WOSAS). In addition, 1st edition OS maps, pre-1850s maps from the National Library of Scotland and aerial photographs from the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) were checked. Further details can be found in EIA Report Chapter 13 (Cultural Heritage and Archaeology).

Noise

4.5.23 The noise environment in the area surrounding the site is characterised by 'natural' sources, such as wind disturbed vegetation, birds, animals, water flow noise and also from the existing Tangy I and II Wind Farm. Road traffic noise from the A83 also contributes to baseline background noise at residential properties within the vicinity of the site (refer to Chapter 14: Noise).

4.5.24 Potential noise impacts of the proposed development have been a consideration since the initial design stages, and the proposed layout has been developed to ensure compliance with acceptable limits for wind turbine operational noise as defined in ETSU-R-97.

Technical Considerations

Distance from Public Roads

4.5.25 A typical safety set back from public roads is 1.5 times the height of the proposed turbine (224.85 m). The nearest turbine to a public road is at a distance of approximately 1.2 km.

Spacing

4.5.26 Spacing of turbines is a key consideration during wind farm layout development; turbines are generally arranged at a minimum distance apart to limit the effect of wake turbulence which can lead to increased fatigue loads. In order to minimise these fatigue loads, turbine spacing is normally bigger along the prevailing wind direction than across it. The minimum spacing varies from site to site and between turbine models (depending on manufacturer guidance). The spacing chosen at this site is based on modelling assumptions and is designed to maximise the energy yield from the wind farm while keeping fatigue loads within the turbines' design envelope. The proposed turbine spacing for the proposed development remains unchanged from the consented Tangy III Wind Farm.

Wind Capture

4.5.27 Wind capture (i.e. the ability to harness energy from wind) is affected by various issues such as wind speed, the prevailing wind direction, and local topography. A range of computer software analyses were undertaken to optimise the design of the proposed development where possible to ensure that the selected turbine locations maximise the opportunity to harness wind energy.

Ground Conditions

4.5.28 The suitability of ground conditions was considered during development of the site layout, with areas of peat and steep gradients identified. Peat depth was determined through four phases of preliminary site Ground Investigation (GI) including peat probing. Five phases of peat probing were undertaken to inform the design development:

- Phase 1 in September 2013, based on the scoping layout.
- Phase 2 in November 2013 based on the post-scoping layout A.
- Phase 3 in March 2014 based on the post-scoping layout B.
- Phase 4 in June 2014 to capture final design refinements.
- Phase 5 Additional peat probing was undertaken in March 2018 (to recent guidance) to determine final location of the temporary construction compound, turbine positions and refined access to T8 and T10.

4.5.29 Peat probes were taken across the site, particularly along potential access tracks routes, at proposed turbine locations and potential compound and substation locations. The majority of the site is recorded to have peat depths of 0 - 0.5m as shown on Figure 1.6 of Appendix 11.1: Peat Stability Risk Assessment (PSRA). The calculated mean peat depth across the recorded deposits is 0.55 m, with a maximum recorded peat depth of approximately 3.6 m in a deep pocket of peat recorded on the north-eastern boundary of the study area. The proposed development has been designed to avoid/minimise interaction with peat as far as practicable. As described above, the principal design changes that have been made to avoid interaction with areas of deep peat are the relocation of access tracks and other project infrastructure (e.g. construction compound).

4.5.30 Where wind farm infrastructure is proposed in areas where peat is present, data have been augmented by the peat probing. The results of the desk-based assessment, GI and gradient analysis informed a peat stability assessment and enabled the site layout to be refined to avoid, where possible, known areas of high risk using a risk matrix. Figures 4.1a-c illustrates the evolving turbine design, access track layout and other site infrastructure layout. Appropriate mitigation measures have been developed to reduce peat slide risk. Details on the assessment of peat stability are contained in EIA Report Chapter 11 (Geology, Soils and Peat) and Appendix 11.1 (Peat Stability Risk Assessment (PSRA)).

4.5.31 The access track layout was developed to be technically feasible for use by both construction and operation vehicles, taking into consideration the existing environmental constraints, and using available mapping data to ensure that gradients were less than 1:11. As noted previously, a primary design requirement was to use as much of the existing infrastructure as possible to maximise synergies with other land uses and to avoid or reduce environmental effects.

4.6 References

Scottish Government (2017) Energy Consents Unit Scoping Opinion on behalf of the Scottish Ministers under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, SSE Generation Limited, Tangy IV Wind Farm, 16 October 2017.

5. DESCRIPTION OF DEVELOPMENT

5.1 Introduction

5.1.1 This chapter describes the proposed development, including installed components and site layout. Information regarding the construction, operation and decommissioning phases is also provided.

5.1.2 The indicative layout of the proposed development is shown on Figure 5.1. The operational wind farm will include the following key components, which are described in further detail in this chapter:

- 16 turbines of up to, but not exceeding, 149.9 m tip height with external transformers;
- hardstanding area at each turbine base with an approximate area of 1,800m^2;
- three permanent meteorological masts and associated hardstand areas;
- up to two site substations (one new substation and possible retention of the existing Tangy I and Tangy II Wind Farm substation);
- one operations control building with parking and welfare facilities;
- a total 11 km of onsite access tracks with associated watercourse crossings (of which approximately 7.4 km are new access tracks and 3.6 km are upgrades to existing tracks); and
- onsite underground cabling.

5.1.3 In addition to the above components of the operational wind farm, the construction phase will involve the following:

- temporary construction compound and laydown areas (option for on-site concrete batching);
- temporary meteorological masts;
- temporary telecoms infrastructure;
- forest removal and subsequent replanting;
- dismantling of existing turbines and associated reinstatement (turbine bases to ground level and approximately 2.1km of redundant access tracks); and
- up to 4 borrow pits.

5.1.4 These key components of the proposals for the construction and operational phases of the wind farm are described further in Section 5.3 (Operational Phase Components and Maintenance) and Section 5.4 (Construction Phase Components).

5.1.5 It is estimated that the maximum permanent development footprint of the wind farm will be approximately 13.74 ha. During the construction period, it is estimated that a further 15.98 ha will be temporarily required which will be reinstated following completion of the works. These land-use requirements are set out in Table 5.1.

Table 5.1: Land Use* **estimation based on current site information**

Wind Farm Component	Temporary Land Use (m^2)*	Permanent Land Use (m^2)*
Turbines	26390	5027
Hardstands	9504	28800
New Cut Track	16648	47723
New Float Track	15388	14811
Existing Tangy I/II Track (to be upgraded and retained)	10698	30659
Existing Tangy I/II Track (for construction only, then reinstated)	6407	0

Table 5.1: Land Use* estimation based on current site information		
Wind Farm Component	**Temporary Land Use (m^2)***	**Permanent Land Use (m^2)***
Existing Forest Track (to be upgraded)	1479	4239
Passing Places (4x4 vehicles)	0	3480
Passing Places (turbine transports)	0	660
Borrow Pits	710662	0
Temporary Construction Compound	10000	0
Construction Laydown Area	10000	0
Ops Building and Compound	0	2500
Substations	0	4200
Met Masts	0	2100
Total (m2)	**817176**	**144198**
Total (ha)	**82**	**14**

5.2 Site Access

5.2.1 A summary of vehicular access to the site is provided below, with full details of the assessment of effects on the local road network provided in Chapter 15 (Access, Traffic and Transport).

5.2.2 The construction and operations access to the site would be from the A83 to the south of the site and connects to Campbeltown and the B842 and B843 roads. It is envisaged that the turbine components would be delivered to the port facilities at Campbeltown and transported to the site via the A83. The B843 provides access to Machrihanish and to CS Wind UK, where turbine towers could be transported to the site.

5.2.3 Timber haulage from site will use the route from the A83 at Kilchenzie, temporarily upgraded as required, detailed in Chapter 15, (Access Traffic and Transport). Traffic accessing the site from the north via the A83, will continue southbound past Westport and Low Ballevain and turn left at Kilchenzie to access the site via the upgraded route. Most onward timber transport will be by sea utilising the timber handling facilities at Campbeltown harbour.

5.3 Operational Phase Components

Wind Turbines

Turbine Specification

5.3.1 The wind farm proposal comprises 16 three-bladed horizontal axis wind turbines. The turbines are computer controlled to ensure that at all times each turbine faces directly into the wind. As a result of this, the appearance of the wind farm will change with changes in wind direction. Table 5.2 provides a list of the proposed turbine locations.

Table 5.2: Proposed Turbine Locations		
Turbine ID	**Easting**	**Northing**
1	167315	628150
2	167860	628240
3	167392	628558
4	168349	628427
5	168850	628597
6	167456	628996

Table 5.2: Proposed Turbine Locations		
Turbine ID	**Easting**	**Northing**
7	167517	629424
8	167555	629887
9	168130	629820
10	168650	629740
11	169185	629495
12	169000	628979
13	168475	628908
14	167951	628835
15	168040	629307
16	168573	629327

5.3.2 A range of turbines are currently available within the proposed maximum tip height parameter of up to 149.9 m. The final choice of turbine will be dependent on commercial agreements and available technology at the time of construction, but will be within the maximum dimensional envelope of up to 149.9 m blade tip height. For the purposes of assessment, an indicative rotor diameter of up to 130 m rotor diameter and 91.5 m hub height were used. Where it has been necessary to select a specific representative turbine model or component size for the purposes of undertaking the environmental assessment, this has been highlighted in the individual assessment chapter. Figure 5.2 shows indicative turbine dimensions and elevations. Based on currently available technology, the generating capacity could be up to 80 MW for the site.

5.3.3 The turbines will generate electricity in wind speeds between approximately 4 and 25 m/s (9 to 56 mph). At wind speeds greater than this the turbines will shut down for self-protection.

5.3.4 The turbine towers will be of tapering tubular steel construction. The blades will be made from fibre-reinforced epoxy. The finish of the turbines is expected to be semi-matt pale grey colour, to be agreed in consultation with Argyll and Bute Council (ABC), within the required technical parameters.

5.3.5 A transformer will be required for each turbine, and depending on the turbine specification selected these may be contained within the turbine towers, or located adjacent to each turbine. These are typically 4m x 3m area and 2m in height (if located adjacent to the turbine, and would be sited within the standard hardstanding area as shown on Figure 5.3).

Turbine Installation

5.3.6 Turbine towers, blades and nacelles are likely to be transported via trailers with self-steering rear axles (refer to Plate 5.1). The tower sections and other turbine components will be stored either at a designated laydown area or at each turbine hardstanding until turbine erection commences.

Plate 5.1: Typical Haulage Vehicle for Turbine Delivery

Turbine Bases

Foundations

5.3.7 A typical foundation arrangement for the candidate turbine is shown on Figure 5.3, although these will vary depending on the turbine selection and ground conditions at each turbine site. Site-specific designs will therefore be developed once the turbine is selected and detailed intrusive ground investigations are undertaken at the construction phase.

5.3.8 Construction of the turbine foundations will generally require the excavation of subsoil and rock to a specified formation level, usually around 4m below existing ground level. The formation will be levelled off prior to the in-situ casting of a steel-reinforced concrete foundation. Foundations are likely to be circular with a diameter of approximately 20m. The depth of the excavation will depend on the depth to bedrock, with the sides 'battered' back to ensure that they remain stable during construction. Each foundation will require approximately 550m^3 of concrete and 70 tonnes of steel reinforcement.

5.3.9 The foundation inserts will then be cast into a central concrete up-stand section, to which the turbine tower will later be bolted. The excavated area will be back-filled with compacted layers of graded material from the original excavation, and capped with peat or soil. Locally around the turbines the finished surface will be capped with crushed aggregate to allow for safe personnel access around the base of the turbine.

5.3.10 Plate 5.2 illustrates the typical construction of turbine foundations.

Plate 5.2: Construction of Turbine Foundations

5.3.11 Temporary drainage will be incorporated into the design to divert surface water from the foundation, and various cable ducts and other ancillaries will also be installed.

Hardstandings

5.3.12 As shown on Figure 5.3, the turbine foundations will be located within a hardstanding area, dimensions for which vary considerably, and will depend on the turbine manufacture specification. The hardstanding areas accommodate the cranes required for construction, and provide a laydown area adjacent to each turbine location. The hardstanding areas will therefore be sufficiently level to ensure safe operation of the cranes required to erect the turbines. The final detail of the hardstanding will depend on the exact specification of the cranes chosen by the contractor. It is anticipated that a large crawler or wheeled/mobile crane (estimated 1000 tonne capacity) will be required for turbine erection, with one smaller 160 tonne pilot crane assisting with the lift procedure. It is anticipated that the temporary hardstanding area required at each turbine during construction would be approximately 2394m^2(permanent area plus a third).

5.3.13 It is anticipated that an area approximately 1,800m^2 will be required permanently for the hardstanding area at each turbine. The optimal layout (to minimise land take) for the current candidate turbine is shown on Figure 5.3.

5.3.14 Turning areas will be constructed at a number of turbines to allow unloaded delivery vehicles to turn safely and exit the site.

Plate 5.3: Existing Tangy Turbine Hardstanding and Turning Area

Access Tracks

Access Track Specification

5.3.15 The access track layout is shown on Figure 5.1 with indicative plans and cross-sections shown on Figure 5.4. The proposed access tracks are a total of approximately 11 km in length with a 6 m wide running surface. Of this 11 km, approximately 3.6 km are existing tracks from the Tangy I and II Wind Farm that are currently 3 m wide and would be widened by 3 m and have their surface upgraded to provide a 6m wide running surface. Approximately 493 m of existing forest track may be temporarily used to gain access to the site of Borrow Pit C.

5.3.16 Of the 7.4 km of new tracks to be constructed, it is currently expected that approximately 5.5 km would be a 'cut' design and 1.9km of a 'floating' design (see Paragraph 5.3.18 to 5.3.22 below). All tracks will be designed to incorporate passing places; both for 4x4 traffic and turbines. It is anticipated that for 4x4 traffic, five passing places will be required every kilometre i.e. approximately every 200 m, and they would be approximately 15m long and 3m wide with 5m splays. There would be three turbine passing places on the whole site and they would be approximately 50 m long and 4 m wide with 5 m splays).

Table 5.3: Access Tracks* **estimation based on current site information**

Track Type	**Total Length (m)**		
New (Cut)	5,549	Total New Tracks: 7,473	Total Tangy IV Tracks: 11,039
New (Float)	1,924		
Existing Tangy I/II (Retained for Tangy IV)	3,566		
Existing Tangy I/II (Reinstated)	2,136		
Existing Forest (For Borrow Pit Access Only)	493		

5.3.17 As described in Chapter 4: Site Selection and Alternatives, the access track layout has been designed taking into account a range of environmental and technical constraints. This included a requirement to maintain appropriate gradients (<11%) for construction and turbine delivery vehicles and avoid watercourses and deeper peat where possible.

Access Track Construction

5.3.18 Figure 5.4 provides the indicative access track specifications. Site access tracks will be constructed with locally (on site) won graded stone and imported geotextiles (where necessary) with the surface course comprising durable graded crushed rock, also sourced from on-site borrow pits. This will match the existing site access roads/tracks in form and appearance. Plate 5.4 shows an existing access track within Tangy Wind Farm.

Plate 5.4: Existing Site Access Tracks

5.3.19 Depending on local ground conditions, access tracks will be constructed using either a 'floating track' or a 'cut track' design. Figure 5.1 shows the indicative locations of cut and floated track which will be refined post consent during the detailed design phase.

- Generally, a 'floating track' design will be utilised on the site in areas of deep peat and where technically feasible. This will incorporate geotextile material laid onto the surface at a width to suit the road width, which will greatly increase the resistance to prevent the tracks settling into the ground. A layer of approximately 800 mm of crushed stone will then be laid on the geotextile to form the track, which produces a steep stone batter with the edges of the site track raised above the surface. This style of track is typically used in peaty areas across Scotland including other wind farm developments as well as public roads.

- In areas of shallow or no peat (0-1m), a 'cut track' design will be utilised for which the topsoil and peat will be stripped to expose a suitable foundation horizon on which to build the track. The track will then be constructed by laying and compacting crushed rock (obtained from suitable on-site borrow pits) to the required level. Given the variable and undulating topography across the site, it is likely that earthworks (cuttings and embankments) will be required to achieve the required gradients for tracks and crane hardstandings. Cutting slopes will be designed to reflect the existing landscape and topography and will likely range from gradients of 1:1 to 1:2. The upper soil/peat horizon, together with any vegetation, will be placed to one side for later reinstatement, if appropriate.

5.3.20 The average peat depth across the site, confirmed through peat probing, is generally shallow (<1m) with some areas of deeper peat up to 3m and small areas of >3m deep peat, refer to Figure 11.6 and Table 3.3 in Appendix 11.1. It is therefore anticipated that of the 8km of new access tracks to be constructed, the majority (approximately 5km) will be of cut track design. A peat depth summary plan and details of peat depth probing are provided in Appendix 11.1. Where appropriate, peat and other similar material from excavations on site will be placed along both sides of the site track and allowed to regenerate naturally, reducing the visual effect of these tracks. As described in Sections 5.4 (Construction Phase Components) and Section 5.7 (Site Management) of this chapter, excavated peat will also be used to restore other parts of the site, including borrow pits, reinstated access tracks, cable trenches and turbine foundations.

5.3.21 In the isolated areas of deeper peat, it is anticipated that a floating track design would be used, where deemed technically feasible. The typical cross-sectional detail of a floating track design is provided on Figure 5.4. The benefits of a floating track design are that it provides a firm surface over very soft terrain without the need to excavate large volumes of peat. In addition, there is minimal disruption of the sub-surface flow of water within the peat body, and no new channels are formed by which water can drain from the peat mass which can result in damage to the peat. Approximately 2km of access tracks will be of floating design to reduce volume of peat excavated and to mitigate against potential peat instability, as described further in Appendix 11.1 (Peat Stability Risk Assessment (PSRA)).

5.3.22 The typical cross-sectional detail of a cut track design is provided on Figure 5.4. As explained in EIA report Chapter 4 (Site Selection and Alternatives), the layout of the proposed development was refined during the design process to avoid, where possible, areas of elevated peat slide risk. The majority of the access tracks will be of cut design due to the relatively shallow peat depth (<1m) encountered on the site.

Access Track Drainage

5.3.23 Construction of site tracks requires robust drainage. Run-off will be diverted away by ditches into swales and settlement lagoon/ponds to attenuate flows and remove sediments before discharging to land. Further details are provided in Appendix 5.1 outline Construction Environmental Management Plan (CEMP). Existing drainage infrastructure will be utilised where possible, as described in Chapter 12 (Surface Water).

5.3.24 The tracks will have an engineered crossfall to shed surface water into adjacent ditches. Where practical, interceptor (cut-off) ditches will be formed on the upslope side of the track to collect and divert clean water away from the tracks. Refer to Figure 5.4: Indicative Access Track Detail.

5.3.25 Cross drains will be installed at regular intervals to prevent flooding / surcharging of trackside drainage and maintain hydraulic pathways. As far as possible, these will coincide with naturally occurring drainage channels.

5.3.26 The proposed routes for the site tracks have been designed to minimise watercourse crossings by a combination of avoidance and by using existing crossings wherever possible. Due to the re-use of existing tracks in the proposed design only one new watercourse crossing is required for the proposed development. An appropriate crossing will be designed to suit each location, dependent on the width of the crossing, the nature of the substrate, other local conditions and the amount of traffic that will use it. These crossings will be designed based on best practice, including:

- SEPA (2015)WAT-PS-06-02 Culverting of Watercourses, V2, June 2015;
- WAT-SG-25:SEPA (2010), Engineering in the Water Environment, Good Practice Guide, Construction of River Crossings, Version 2;
- Scottish Executive (2000): River Crossings and Migratory Fish: Design Guidance;
- The Water Environment (Controlled Activities) Regulations (Scotland) 2011, as amended (referred to hereafter as 'CAR');
- Construction Industry Research and Information Association (CIRIA) (2005): C650: Environmental Good Practice on Site; and
- CIRIA C689 Culvert Design and Operation Guide

5.3.27 Further details of the proposed watercourse crossings and the environmental controls afforded by the above legislation and guidance are included in EIA report Chapter 12 (Surface Water).

Substation

5.3.28 The proposed development includes a new substation building and DVAR (Dynamic Volt-Amp Reactive) building containing the isolators, circuit breakers and transformers and the Supervisory Control and Data Acquisition (SCADA) system. Workshop and welfare facilities for maintenance staff will also be provided. These facilities will be surrounded by a steel palisade security fence or similar. An indicative design for the substation is shown on Figure 5.5. The existing substation that is currently in use for the Tangy I and II Wind Farm is also expected to be retained as part of the proposed development.

Meteorological Masts

5.3.29 Three permanent meteorological masts will be erected to collect meteorological data for the operational life of the wind farm. Table 5.4 indicates the proposed locations for the permanent meteorological masts and a typical elevation is shown on Figure 5.7 and the proposed locations are included on Figure 5.1. It is assumed that each mast will have a concrete base of 10m x 10m, in addition to a 600m^2 crane pad for mast erection.

Table 5.4: Permanent Meteorological Mast locations

Mast	**Proposed Location (Easting, Northing)**
1	167086, 628020
2	167283, 628797
3	168636, 628414

5.3.30 Up to four temporary meteorological masts for the purposes of Power Performance Testing are proposed. The exact locations of these masts are determined in agreement with the turbine supplier so the exact locations cannot be identified at this stage. In general terms, the masts will be erected in pairs as follows. Two will be located on turbine locations, the 'turbine masts'. These turbine masts will be on the extremities of the wind farm, and are most likely to be on the south or west of the site. The remaining two masts, the 'reference masts' will be located approximately 2.5

rotor diameters upwind of their respective turbine masts. The temporary masts will be erected early in the construction programme and will record data for several months before turbine erection. Prior to the turbines being constructed, the turbine masts will be decommissioned and removed, with the reference masts being removed after a period of one to two years following turbine commissioning.

Electrical Infrastructure

On-site Cabling

5.3.31 Turbines are likely to be connected by a single electrical circuit 'array', with the output connecting to the substation. The cabling for this will be laid in trenches of varying width (depending on the number of cables) and approximately 1m in depth alongside the site tracks. These trenches will also carry earthing and communications cables. Details of the trenches are shown on Figure 5.9. It is unlikely that the existing cabling in place for the Tangy I and II turbines will be suitable for re-use due to its size and electrical capacity, and therefore it has been assumed that new cabling will need to be laid to all Tangy IV turbines.

5.3.32 Cables will be laid in trenches with sand or in-situ peat, and the trenches will then be backfilled with excavated sub-soil and peat topsoil. Earthing cables and communications cables will be included in the same trench.

Grid Connection

5.3.33 The proposed site substation will step up the voltage for transmission to the grid network. An application has been made to National Grid to provide a grid connection route to the site. At the time of application, a grid connection offer for 39.1MW has been received from Scottish and Southern Energy Power Distribution (SSEPD), with the connection route north-west to Carradale substation. This is in addition to the existing Tangy I and II connection capacity of 18.7MW.

5.4 Construction Phase Components

Principal Site Operations

5.4.1 Construction onsite will consist of the following principal operations:

- phased forest felling to facilitate construction;
- construction of additional access tracks required for the proposed development;
- excavation of aggregates from on-site borrow pits for track, turbine base and hardstanding construction;
- construction of temporary hard standing and temporary office and welfare facilities;
- dismantling of the existing 22 turbines (Tangy I and II);
- reinstatement of redundant turbine bases and access tracks;
- construction of new turbine foundations;
- construction of permanent crane hardstandings;
- excavation of trenches and cable laying, adjacent to the access tracks;
- connection of distribution and telecommunications cables;
- erection and commissioning of turbines; and
- reinstatement of borrow pits and the temporary construction compound areas.

Forest Clearance

5.4.2 The northern part of the site includes an area of commercial plantation forest. The proposed development includes clear felling of approximately 270.5 ha of forest within the site boundary. Replanting will be carried out on site, to a keyhole design, with growth up to 10 m in height.

5.4.3 Forest felling will be undertaken in a number of ways, including conventional harvesting and whole tree chipping or mulching for un-merchantable crops. Activities will be carried out with the use of standard forestry equipment, with merchantable timber being removed from site. Lop and top (branch wood and small dimension timber) and tree stumps would remain on site as is standard forestry practice, unless otherwise specified.

5.4.4 Further information regarding changes to forest use is provided in Chapter 16 (Land Use, Socio-economics and Recreation).

Construction Compounds and Laydown Areas

5.4.5 One temporary construction compound and one laydown area will be required, providing site accommodation, materials and small component storage, car parking and welfare facilities as shown on Figure 5.8 (at the locations shown on Figure 5.1). The configuration of the compound and laydown area will depend on the contractor specification; therefore, for the purposes of this assessment a search area has been identified. The proposed compound and laydown area are each likely to be no more than approximately 100m x 100m, and would be located in the identified search areas shown on Figure 5.1 which have been selected taking into account environmental considerations such as watercourse buffers, ground conditions and landscape effects.

5.4.6 It will be necessary to provide a temporary borehole water supply and foul drainage and this is considered further in Chapter 12 (Surface Water).

5.4.7 Approximately 550 m^3 of concrete and 70 tonnes of steel reinforcement will be required for each turbine foundation. At this stage, it has been assumed that concrete batching will be undertaken off site. The vehicle movements associated with importing concrete have been taken into account in the traffic assessment in Chapter 15 (Access, Traffic and Transport) and the traffic noise assessment in Chapter 14 (Noise) in order to reflect a potential worst case scenario. However, it is possible that concrete batching could be undertaken on site, which would require a temporary concrete batching plant to be established. Should this approach be adopted, the temporary concrete batching plant would be located on the temporary construction laydown area and would require a water abstraction point from one or more of the watercourses on site. Water abstraction would be subject to either registration or a licencing application to SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended.

5.4.8 Traffic movements as a result of construction activities are considered in the assessment, for further details refer to Chapter 15 (Access, Traffic and Transport).

Decommissioning and Reinstatement of Tangy I and II Wind Farm

5.4.9 Decommissioning and reinstatement of Tangy I and II will comprise:

- Removal of the 22 existing wind turbines and towers to ground level.
- Reinstatement of turbine bases/foundations.
- Removal of approximately 2.2km of access tracks and reinstatement of former track routes.

5.4.10 The decommissioning of the existing turbines will need to be managed in order to ensure that no significant impact on the environment occurs. The following sections provide information on how the applicant intends to manage potential and actual environmental risks. Environmental management for the decommissioning of Tangy I and II, and the construction of Tangy IV is described in detail in Appendix 5.1 (CEMP) and in the topic assessment chapters of this EIA report.

5.4.11 The proposed methodology for reinstatement is described in Appendix 5.1 (CEMP), however is summarised here for each of the key components. It is possible that the existing substation would be retained and used as part of Tangy IV, so decommissioning of the substation and associated buildings is not described.

Turbines and Foundations

5.4.12 The existing 22 turbines will be decommissioned, dismantled and removed from the site in their largest component parts and transported, by public road, either to Campbeltown harbour where they will be loaded onto a suitable sea vessel, or by public road to another destination. These components may be sold on, re-used or recycled.

5.4.13 The existing reinforced concrete foundation of each tower cannot be re-used as part of the new turbine foundations and will largely be left in-situ with the top 1m of the foundation being broken down to just below ground level. Where the existing turbine foundations fall within the infrastructure for Tangy IV, the foundations will be capped using stone and where the foundation falls outside the new infrastructure, a topsoil cap will be used to reinstate the area to ground level and left to re-vegetate naturally from the indigenous vegetation.

Access Tracks and Cabling

5.4.14 As described in more detail in the CEMP (see Appendix 5.1), redundant tracks will be broken out and stone excavated for reuse on site as part of the construction works for Tangy IV. Tracks will be reinstated with suitable sub-soil/topsoil. Seeding may be required if suitable vegetation turfs are not available. Seed mix will be approved by the ECoW prior to reinstatement works commencing.

5.4.15 It is not proposed to re-use the existing electrical cables that are in place as part of the Tangy I and II infrastructure, however, to minimise ground and habitat disturbance it is not proposed to remove them, and they will be left in situ.

Materials

5.4.16 Reinstatement will be undertaken by use of either:

- soil material generated on site during the repowering construction works; or
- imported soil and topsoil (it is not currently anticipated that this would be required due to the likely availability of soil material on site).

Transport

5.4.17 Any areas of the public road that require protection during any abnormal load movements, as part of the removal of the decommissioned turbines, will be identified and protection measures will be agreed with the roads authority. It should be noted that the new turbines to be installed for Tangy IV are larger than those that would be removed from Tangy I and II, and therefore the swept path analysis that has been conducted for the transport of the new turbines will take into account the removal of the existing turbines and no specific assessment needs to be conducted. The results of the swept path analysis are discussed in Chapter 15: (Access, Traffic and Transport).

Waste Management

5.4.18 The applicant will prepare a draft Site Waste Management Plan (SWMP) to be agreed prior to commencement of the decommissioning works. The plan will detail waste types and disposal routes/final destinations in accordance with current regulations and guidance.

5.4.19 The decommissioning of turbine components with regard to disposal and/or end-use will be undertaken in line with best practice and the waste hierarchy. In order to minimise the impact on the surrounding habitats and species, and to reduce the volume of potential waste materials generated as part of the decommissioning works, the applicant proposes to remove those components and materials which will be replaced as part of the repowering works.

5.4.20 Where possible, turbine components will be re-used (sold on) or recycled off-site and concrete broken out from existing turbine foundations and hardstanding areas will be re-used on site (e.g. in the construction of Tangy IV). Where this is not possible, materials will be assessed for potential reuse off-site or recycling.

Borrow Pits

Predicted Extraction Requirements

5.4.21 It is estimated that approximately 130,850m^3 of stone (excluding aggregate for concrete) will be required to be excavated from the borrow pits for construction of the proposed development (including access tracks and surface course, structural fill beneath turbine foundations, and hardstandings at turbine bases and compounds). An additional 9,900m^3 is expected to be recovered from reinstatement of existing infrastructure (e.g. Tangy I and II access tracks that will be removed and reinstated). It is anticipated that all new stone material will be sourced from on-site borrow pits.

Borrow Pit Locations

5.4.22 Proposed locations of the borrow pits are shown on Figure 5.1. Information on the borrow pits is presented in Table 5.5. The volumes provided in Table 5.5 are considered to be indicative of the maximum volume of stone each borrow pit would provide but this is subject to detailed ground investigation and design during the pre-construction design phase. The total available volume of stone is significantly greater than the anticipated volume of stone required to be extracted to construct the development (estimated at 130,850m^3). The purpose of this is to allow for identification of preferential borrow pits (quality of stone / slope stability / overburden removal etc.) during detailed design. As such, it is unlikely that all borrow pits would be used during construction, and not all of the available stone from each borrow pit would need to be extracted. Therefore, the borrow pit indicative working areas shown on Figure 5.1 can be considered a worst case scenario. Further details are provided in Appendix 11.2 (Borrow Pit Search Report) and Figures 11.8 to 11.11.

Table 5.5: Borrow Pits

Borrow Pit Reference[1]	Easting	Northing	Required rock Yield[2] (m^3)
BPA	168376	628342	37,750
BPB	167824	628102	37,750
BPC	167066	629148	37,750
BPE	168876	628658	37,750

Note 1: Borrow Pit D was removed from the layout design during layout design optimisation

Note 2: Assumes a total maximum required rock yield of 151,000m3 equally divided between the four potential borrow pit locations

5.4.23 Environmental considerations have influenced the position, size and shape of the new borrow pit to minimise the effect on ecology, hydrology and landscape, and to allow successful reinstatement measures to be put in place as appropriate. Noise issues associated with stone extraction are addressed in Chapter 14 (Noise). Temporary land-use required for the borrow pits is assessed in Chapter 16 (Land Use, Socio-economics and Recreation).

5.4.24 Using on site borrow pits will reduce the haulage distances required. The borrow pits will require the use of plant to both win and crush the resulting rock to the required grading. It is anticipated that rock will be extracted by breakers and some blasting may be required.

Borrow Pit Reinstatement

5.4.25 Following construction, the borrow pits will be reinstated (part filled and contoured, as indicated on the borrow pit drawings (refer to Appendix 11.2).

5.4.26 The reinstatement of the borrow pits will take place along the following principles:

- Borrow pits will be landscaped, reducing sheer rock faces and generally graded to more gentle profiles appropriate to the landscape character and existing natural surrounding landform.

- Suitable site-won material (e.g. original borrow pit overburden, peat or suitable materials excavated in other areas of the site) will be used to backfill and contour areas of the borrow pits.
- Reinstated borrow pits will be covered with peat turves / vegetated top layers. Where insufficient turves are available to provide a complete cover, the area will either be allowed to regenerate naturally (or seeded with a native grass seed mix. The seed mix will either be collected from the site or commercially sourced and approved by an Ecological Clerk of Works (refer to Chapter 10: Ecology and Nature Conservation).
- Borrow pit reinstatement plans will be prepared by the Principal Contractor prior to reinstatement, detailing origin, type and volumes of material to be used in the borrow pit reinstatements, together with topographical levels prior to and following reinstatement.

Construction Programme

5.4.27 It is expected that many of the above operations will be carried out concurrently, although predominantly in the order identified. This will minimise the overall length of the construction programme such that it is limited to approximately 22 months. The indicative Construction Programme, as illustrated in Table 5.6, is subject to change, dependant on forestry and decommissioning activity phasing. This period is however dependent on weather and ground conditions experienced at the site. It is proposed that construction activities be limited to the working hours of 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays.

Table 5.6: Indicative Construction Programme																						
Activities	**Month**																					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
Forestry Mobilisation																						
Forest Keyhole																						
Forest Clear Fell																						
Principal Contractor Mobilisation																						
Borrow Pits																						
Upgrade Existing Track																						
Construct New Track																						
Turbine Base/Hardstanding Construction (x16)																						
Wind Turbine Generator Decommissioning (x22)																						
Wind Turbine Generator Base Breakout																						
Reinstatement Track																						
Substation Construction																						
Operations Building Construction																						
Wind Turbine Generator Installation (x16)																						
Borrow Pit Restoration																						
Site Restoration																						

5.4.28 Site reinstatement will be programmed and carried out to allow rehabilitation of disturbed areas as early as possible in order to minimise storage of excavated material on vegetation.

Construction Working Practices

5.4.29 An outline Construction Environmental Management Plan (CEMP) has been provided in Appendix 5.1 of this EIA report. The principal objective of this document is to provide environmental management information for the construction stage and to detail measures to aid in preventing, minimising and controlling the associated adverse environmental effects. Furthermore, the CEMP will provide information on all environmental commitments (e.g. as made as part of the EIA/ES) and planning conditions, together with industry best practice measures. The CEMP will form part of the contract documents between the applicant and the appointed construction contractor.

5.4.30 An updated CEMP and will be agreed with the relevant statutory bodies prior to commencement of construction works. The CEMP will then be implemented and adhered to by the appointed Principal Contractor, unless otherwise agreed in writing with the Planning Authority / relevant Consultees.

Environmental Management

5.4.31 The Principal Contractor will have overall responsibility for environmental management on the site. As noted previously, the CEMP provided in Appendix 5.1 will be updated by the applicant to accommodate any specific measures required by the planning conditions or other pre-construction surveys to be undertaken during the post-consent / detailed design phase of the development. The services of specialist advisors e.g. Ecological Clerk of Works will be retained as appropriate to be called on as required to advise on specific issues. The Principal Contractor and applicant will ensure construction activities are carried out in accordance with the mitigation measures outlined in this EIA report.

5.4.32 In order to ensure all mitigation measures outlined within this EIA report (refer to Chapter 18: Schedule of Mitigation) are carried out on site, contractors will be required to implement and adhere to, and if necessary update (and obtain written approval from the planning authority), the following documents for adherence to throughout the construction process:

- CEMP; and
- Traffic Management Plan.

5.4.33 It should be noted that the applicant will provide the Contractor with an updated version of the CEMP as part of the main civil works contract.

5.4.34 A copy of any conditions of consent will be incorporated into all relevant tender documents and CEMP as appropriate. The selection criteria for the main civil works construction contractor will include their record in dealing with environmental issues, and provision of evidence that they have incorporated all environmental requirements into their method statements.

Waste Management

5.4.35 Waste management is addressed in detail in the CEMP (refer to Appendix 5.1), and proposals for managing excavated stone and material are described in Paragraph 5.4.27 above. All wastes to be removed from site will be segregated on site and removed to suitable recycling facilities or disposed of to a suitably licensed waste management facility, in accordance with current waste management regulations and best practice applicable at the time.

Site Reinstatement

5.4.36 Reinstatement in this section is referring to reinstatement of temporary works areas used during the construction of Tangy IV. Decommissioning and reinstatement of Tangy I and II is described separately above.

5.4.37 Reinstatement works are generally undertaken during construction (and immediate post-construction phase) and aim to address any areas of ground disturbance and changes to the landscape as part of the construction works. Reinstatement is undertaken as soon as possible following the construction works in each area, such as the re-dressing of road and track verges and turbine bases (and other areas that may be disturbed as a result of the construction process). Re-seeding and hydro-seeding may be part of reinstatement measures where redressing proves unsuccessful. The proposed methods for reinstatement are summarised below.

5.4.38 Reinstatement will be undertaken to provide a natural ground profile to tie-in with existing undisturbed ground levels to prevent the collection of surface water. It will be undertaken wherever practical at the earliest opportunity, to minimise storage of turf and other materials and to provide completed reinstatement in a timely manner. Typically, reinstatement will include the following operations:

- soil and vegetation temporarily stored during construction will be replaced as intact as possible once construction is complete. Movement of material will be kept to a minimum, i.e. where possible materials excavated will be utilised for reinstatement in the same area. Reinstatement with original materials temporarily stored will be undertaken in reverse order of excavation.
- Utilising vegetated turf is the most suitable finish for reinstated areas as it uses only plant material found on the site, thus conserving genetic biodiversity, and retaining the structure and composition of the original plant communities. In addition, this forms a stable mat over reformed ground, thus reducing erosion.
- Bare peat areas will be allowed to re-vegetate naturally as experience elsewhere has shown that un-seeded peat is likely to develop a vegetation community close to that on adjacent undisturbed ground (derived from the existing seed bank) more quickly than peat re-seeded with a predominantly grass mix.
- On 'floating' site tracks, site-won vegetation turves and suitable top / sub-soil or peat from other excavations on site (i.e. from the cut sections of the site track and from the turbine and hard standing areas) will be placed over the batters or edges of the tracks. It is anticipated that these areas will easily re-root and that vegetation cover will develop over time.

5.4.39 Site tracks and hardstanding areas at each turbine location will be retained for use in ongoing maintenance operations (including component replacement as necessary) and decommissioning of the wind farm. The edges will as far as possible be blended to the adjacent contours, natural vegetation being allowed to re-establish.

5.4.40 Any other temporary hardstanding areas will be re-graded with suitable peat or soil to a natural profile and reinstated as appropriate.

5.4.41 All construction equipment and other temporary infrastructure will be removed from site and the temporary storage areas will be reinstated as necessary. All waste will be removed from site in accordance with the site Waste Management Plan (as part of the CEMP) and in line current waste management regulations.

5.5 Site Operation and Maintenance

Site Operations

5.5.1 One operation building is proposed, as shown on Figure 5.10 (at the locations shown on Figure 5.1). This will provide site accommodation for materials, welfare facilities, office space, electrical controls and car parking. The building will be located within the construction compound search area near the site entrance and within the substation search area (refer to Figure 5.1). The configuration of the building will depend on the turbine specification and any operational requirements for the site. These specifications will follow best practice and the latest health and safety procedures for the operation of wind farms. For the purposes of this assessment search areas have been identified rather than defining specific locations, as the required standards may change between now and any potential consent.

Employment

5.5.2 It is anticipated that full-time staff will be employed to manage and operate the wind farm.

5.5.3 Routine maintenance and servicing will be carried out on each turbine approximately twice a year, in addition to the initial service three months after commissioning. On average two people will take five days to service each turbine.

5.5.4 At regular periods oil and components will require changing, increasing the service time per machine. Gearbox oil changes are required approximately every 20 months. Blade inspections are carried out as required (normally somewhere between every two and five years). Appropriate maintenance works will be carried out immediately following any unexpected events on site, such as failure of a generator or gearbox.

5.5.5 There will be no public vehicular access to the site.

Track Maintenance

5.5.6 Frequency of track maintenance depends largely on the volume and nature of the traffic using the track, with weathering of the track surface also having an appreciable effect. Heavy plant is particularly wearing and ongoing track maintenance will be undertaken as necessary throughout the year. Safe access will be maintained all year round. Stone would be won from the borrow pits during the construction phase and stored for use during regular track maintenance.

Tangy IV Wind Farm Decommissioning

5.5.7 The decommissioning period for a wind farm of this size is estimated to be six months.

5.5.8 Following the period of wind farm operation, decommissioning of the wind farm will be undertaken or the site would be repowered. When decommissioning is required, this is anticipated to involve the activities listed below:

- Dismantling and removal of the turbines, met masts and site substations and operations buildings.
- Removal to 1m below ground level of the turbine and met mast foundations.

5.5.9 Detailed decommissioning proposals will be established and agreed with relevant authorities prior to commencement of decommissioning activities. This will take cognisance of guidance available at the time.

5.5.10 The decommissioning effects have been taken into account in each of the specialist assessments contained in this EIA report.

5.6 Health and Safety and Related Issues

5.6.1 Health and safety will be initially addressed as part of the Pre-Construction Information Pack prepared by the CDM Co-ordinator for the project under the Construction (Design and Management) Regulations 2015. The contractor will be required to prepare a Construction Phase Health and Safety Plan and forward information to the CDM Co-ordinator during the works to enable the Health and Safety File to be completed.

5.6.2 Turbines are designed to be safe and are built to withstand extreme wind conditions. The turbines selected for the proposed development will have a proven record in terms of safety and reliability.

5.6.3 Day to day operational and maintenance activities will be coordinated via the Control Building and in consideration of the Estates operational requirements, where appropriate.

5.6.4 In accordance with section 6(1)(g) of the Land Reform Act 2003, general public access rights are removed throughout the construction period for health and safety reasons.

5.6.5 An Operations and Maintenance Manual for the design life of the wind farm will be prepared, which will cover all operational and decommissioning procedures.

5.7 Residues and Emissions

5.7.1 Table 5.7 details the anticipated residues and emissions associated with the proposed development, as required by Schedule 4 of the EIA Regulations.

Table 5.7: Residues and Emissions

Topic	Potential Residue/ Emission
Water	All surface water runoff from the proposed development would be captured by a SuDS to control the rate, volume and quality of discharge in to the water environment. All discharges would be subject to regulations in accordance with a pollution prevention plan to be approved under the CAR, and subject to a Construction Site License to be issued by SEPA. No significant residues or emissions have been identified.
Air	Due to the nature of the proposed development no significant point source or diffuse air emissions would be produced during its construction or operation. The proposed development would generate renewable electricity and would therefore displace CO_2 emissions associated with electricity generation from non renewable sources. The Scottish Government Carbon Calculator for Wind Farm on Peatlands was used to calculate a payback period for the proposed development based on the full development lifecycle. The results of this assessment are contained in Appendix 5.2: Carbon Balance Assessment and indicate that the proposed development would have an expected payback period of 1.8 years (maximum of 4.2 years) compared to grid mix of electricity generation. The proposed development would save approximately 94,611 tonnes of carbon dioxide per year (compared to a typical grid mix of electricity supply). Appendix 5.2 also provides an assessment of the carbon balance for the existing Tangy I and II Wind Farm. The assessment for the existing wind farm indicates that the development would have an expected payback of 3 years (maximum of 3.5 years) relative to a current (2018) grid mix of electricity generation. This therefore indicates that the existing wind farm has had a net beneficial effect in reducing carbon dioxide emissions for at least 11 years (so far). The existing Tangy I and Tangy II Wind Farm is estimated to have saved approximately 15,258 tonnes of carbon dioxide per year (compared to a typical grid mix of electricity supply).
Noise and Vibration	The wind turbines would generate noise during operation, and the noise levels would vary according to the wind speed, within an agreed noise limit designed to protect residential amenity at nearby dwellings. Further details are presented in Chapter 14: Noise. There would be no vibration emissions associated with the proposed development.
Light	Construction compounds and working areas (during construction) may require lighting. The substation and control buildings are likely to be equipped with passive infra-red sensor controlled security lighting. These would illuminate the sub-station compound area when activated. Any effect would be temporary and not expected to be significant during normal operation of the proposed development, especially given the presence of existing lighting on the Tangy I and Tangy II Wind Farm operational site. The applicant would seek to agree suitable lighting scheme with Highlands and Islands Airports Limited. For the purposes of this EIA Report, it has been assumed that the lighting strategy would use low intensity (35 candela), omni-directional lights, mounted on the nacelle of cardinal turbines. Further detail on the assessment of light emissions is provided in Chapter 8: Landscape and Visual. It was agreed that lighting effects would not lead to significant visual effects on the

Table 5.7: Residues and Emissions	
Topic	**Potential Residue/ Emission**
	basis that the lighting would be similar to that present within the existing operational site. Further details on the aviation impacts are provided in Chapter 17: Aviation.
Soil pollution/ Waste	The power generation aspect of the proposed development would not produce any significant waste emissions or pollutants. However, the general operation and maintenance has the potential to produce a small amount of waste. This is likely to be restricted to waste associated with the control building from employees and visiting contractors and waste gearbox oils and lubricants. No soil pollution is anticipated. Peat excavated during construction would be managed in accordance with a Peat Management Plan (PMP). The Stage 1: PMP is provided in Appendix 11.2.

5.8 References

CIRIA (2005). Construction Industry Research and Information Association (CIRIA) (2005): C650: Environmental Good Practice on Site.

CIRIA (2010). Construction Industry Research and Information Association (CIRIA) (2010): C689: Culvert design and operation guide.

Construction (Design and Management) Regulations (CDM) (2015). www.legislation.gov.uk.

Land Reform (Scotland) Act 2003.

Scottish Executive (2000). River Crossings and Migratory Fish: Design Guidance.

SEPA (2015). Culverting of Watercourses: WAT-PS-06-02.

SEPA (2010). Engineering in the Water Environment, Good Practice Guide, Construction of River Crossings, Version 1: WAT-SG-25.

The Water Environment (Controlled Activities) Regulations (Scotland) 2011. URL: http://www.legislation.gov.uk/ssi/2011/209/contents/made

6. PLANNING POLICY CONTEXT

6.1 Introduction

6.1.1 This chapter identifies the relevant planning policy considerations for the proposed development, including reference to national, regional and local policies as well as other material considerations.

6.1.2 It is important to note that this chapter does not include an assessment of the proposed development's compliance with the policy framework. Further details of the planning decision making framework, and extent to which the proposed development satisfies this framework, are included within the Planning Statement. The Planning Statement has been submitted as part of the application package, but does not form part of the EIA Report.

Legislative Background

6.1.3 The application is categorised as a 'Schedule 2' development under the Electricity Works (Environmental Impact Assessment (Scotland) Regulations 2017 (the EIA Regulations).

National Planning Framework

6.1.4 The National Planning Framework 3 (NPF3) was laid in the Scottish Parliament on 23 June 2014 and is currently under review. This framework sets out a long term vision for the development of Scotland, with a focus on supporting sustainable economic growth and the transition to a low carbon economy. NPF3 is the spatial framework that informs development and investment decisions of the Scottish Government and guides Scotland's spatial development over the next 20 to 30 years. The central vision is set out over four key aspects; a successful, sustainable place; a low carbon place; a natural, resilient place; and a connected place. Paragraph 1.3 explains that the spatial strategy of the framework supports this vision by identifying '*where there will be opportunities for growth and regeneration, investment in the low carbon economy, environmental enhancement and improved connections across the country*.'

6.1.5 In setting out strategic development priorities to support the Scottish Government's central purpose of promoting sustainable economic growth, the NPF3 seeks to encourage a greener Scotland. A key aim of the framework is that '*Natural and cultural assets are respected, they are improving in condition and represent a sustainable economic, environmental and social resource for the nation. Our environment and infrastructure have become more resilient to the impacts of climate change*' (Paragraph 1.2).

6.1.6 NPF3 is committed to achieving a low carbon place and seeks to achieve at least an 80% reduction in greenhouse gas emissions by 2050. Additionally, NPF3 aims to reduce the total final energy demand by 12% by 2020. Within this, the target is for 30% of overall energy demand (heat, transport and electricity) to be from renewables by 2020, including generating the equivalent of at least 100% of gross electricity consumption from renewables, with an interim target of 50% by 2015.

6.1.7 Paragraph 3.23 of NPF3 states the Scottish Government's position that '*Onshore wind will continue to make a significant contribution to diversification of energy supplies*', but notes the role of SPP in setting out the approach to preparing spatial frameworks which will guide wind farm development to appropriate locations. It also states the Scottish Government's position that wind farms should be avoided in National Parks and National Scenic Areas. In line with reduction of social and spatial inequalities in Scotland, NPF3 aims to achieve at least 500 MW of renewable energy in community and local ownership by 2020 and work to secure greater benefits from commercial-scale developments.

Scottish Planning Policy (SPP) – June 2014

6.1.8 Scottish Planning Policy (SPP) was published in June 2014 and sets out national planning policies which reflect Scottish Ministers' priorities for the operation of the planning system and for the development and use of land.

6.1.9 This document sets out four planning outcomes which explains how planning should support the vision of the Scottish Government:

- A successful, sustainable place – supporting sustainable economic growth and regeneration, and the creation of well-designed, sustainable places;
- A low carbon place – reducing our carbon emissions and adapting to climate change;
- A natural, resilient place – helping to protect and enhance our natural and cultural assets and facilitating their sustainable use;
- A more connected place – supporting better transport and digital connectivity.

6.1.10 The principal and relevant subject policies contained in the consolidated SPP are listed in table 6.1.

Table 6.1: Scottish Planning Policy (SPP) (June 2014)

Subject	**SPP Paragraph**	**Summary**
Sustainability	Paragraphs 24 - 35	The SPP's central purpose is to focus government and public services on creating a more successful country through increasing sustainable economic growth. This can be achieved through the planning system by supporting economically, environmentally and socially sustainable places and responding to economic issues, challenges and opportunities. SPP states that policies and decisions should be guided by a number of key principles. These include the following: • supporting delivery of energy infrastructure; • supporting climate change mitigation and adaptation including taking account of flood risk activity; • protecting, enhancing and promoting access to cultural heritage, including the historic environment; • protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment; and • avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality.
Placemaking	Paragraphs 36-57	Placemaking is a creative, collaborative process that includes design, development, renewal or regeneration of our urban or rural built environments. Planning should take every opportunity to create high quality places by taking a design-led approach through the joint consideration of the relationships between higher quality places. Placemaking is supported through, amongst others, optimising the use of existing resources, using land within or adjacent to settlements for a mix of uses, developing brownfield land and locating development where investment in growth or improvement would have most benefit.
Promoting Rural Development	Paragraphs 74-91	• Promote a pattern of development that is appropriate to the character of the particular rural area and the challenges it faces. • encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality; and • support an integrated approach to coastal planning

Table 6.1: Scottish Planning Policy (SPP) (June 2014)		
Subject	**SPP Paragraph**	**Summary**
Valuing the Historic Environment	Paragraphs 135-151	Recognises that the historic environment is a key cultural and economic asset which planning has an important role to play in maintaining and enhancing the distinctive and high-quality, irreplaceable historic places. Planning authorities should safeguard designated and non-designated historic environments including individual assets such as scheduled monuments and archaeological resources; related settings and the wider cultural landscape. The Government's Scottish Historic Environment Policy (SHEP) and the Managing Change in the Historic Environment guidance note series, both published by Historic Scotland, should also be taken into account for development.
Delivering Heat and Electricity	Paragraphs 152-174	Sets out the Scottish Ministers' commitment to increasing the amount of electricity generated from renewable sources. The targets for 2020 are: for 30% of overall energy demand from renewable sources; 11% of heat demand from renewable sources; and the equivalent of 100% of electricity demand from renewable sources. SPP paragraphs 161 – 166 which relate specifically to onshore wind developments are discussed in more detail in paragraphs 17-19 of this chapter. The SPP states that '*Proposals to repower existing wind farms which are already in suitable sites where environmental and other impacts have been shown to be capable of mitigation can help to maintain or enhance installed capacity, underpinning renewable energy generation targets. The current use of the site as a wind farm will be a material consideration in any such proposals.'*
Valuing the Natural Environment	Paragraphs 193 - 218	Indicates that planning authorities should conserve and enhance international, national and locally designated sites and protected species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services to communities. Plans should address potential effects of development on the natural environment and authorities should apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur.
Flood Risk and Drainage	Paragraphs 254-268	Sets out a precautionary approach to flood risk from all sources by safeguarding flood storage and conveying capacity. Planning authorities are required to take into account probability of flooding and associated risks when determining planning applications and preparing development plans, and developers should take flood risk into account prior to committing to development.
Promoting Sustainable Transport and Active Travel	Paragraphs 269 – 291	Sets out the planning policy on sustainable transport to optimise the use of existing infrastructure and reduce the need to travel by providing safe and convenient opportunities for walking, cycling and travel by public transport. Development plans and development management decisions should also take account of the implications of development proposals on traffic, patterns of travel and road safety.

6.1.11 SPP states at paragraph 154 that the planning system should:

- support the transformational change to a low carbon economy, consistent with national objectives and targets, including deriving:
  - 30% of overall energy demand from renewable sources by 2020;

- 11% of heat demand from renewable sources by 2020; and
- the equivalent of 100% of electricity demand from renewable sources by 2020.

6.1.12 Paragraph 155 of the SPP advises that development plans should seek to ensure that an area's full potential for renewable energy is achieved, giving due regard to relevant environmental, community and cumulative impact considerations. Paragraph 156 states that strategic development plans should support national priorities and address cross boundary issues.

6.1.13 Onshore wind is discussed in paragraphs 161 to 166 and advises that planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities.

6.1.14 Table 1 sets out three groups:

- Group 1 contains areas where wind farms will not be accepted, i.e. National Parks and National Scenic Areas;
- Group 2 lists areas of significant protection such as those that will cause environmental or visual impacts; and
- Group 3 includes sites that would be acceptable for wind farms subject to detailed consideration against identified policy criteria.

SPP advises that proposals for energy infrastructure developments should always take account of spatial frameworks for wind farms. Consideration will be given to the following (list not exhaustive):

- landscape and visual impacts, including effects on wild land;
- the scale of contribution to renewable energy generation targets;
- effects on the natural heritage, including birds;
- impacts on aviation and defence interests and seismological recording;
- effects on hydrology, the water environment and flood risk; and
- net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.

Development Plan Framework

6.1.15 The development lies wholly within the Argyll and Bute area. The adopted development plan comprises the Argyll and Bute Local Development Plan – 26th March 2015.

6.1.16 The Local Development Plan (LDP) takes account of projected changes in our population, our economic circumstances and opportunities, our transport and infrastructure needs, our housing needs, the impacts of climate change, the need to protect and enhance our outstanding natural, built and cultural heritage and the overarching need to improve our quality of life for workers, residents and visitors to our area.

6.1.17 The LDP provides a list of key objectives with the overall vision for Argyll and Bute to be economically successful, outward looking, highly adaptable and enjoying an outstanding natural and historic environment. The key objectives for the Council include:

- *"Key Objective D - To support the continued diversification and sustainable growth of Argyll and Bute's economy with a particular focus on our sustainable assets in terms of renewables, tourism, forestry, food and drink, including agriculture, fishing, aquaculture and whisky production;*
- *Key Objective E – That we can successfully accommodate sustainable economic growth without harming our outstanding environment; and*
- *Key Objective I - To address the impacts of climate change in everything we do and reduce our carbon footprint."*

6.1.18 In terms of renewable energy and development, the Council notes at paragraph 4.1.7 that the LDP supports renewable energy related development in accordance with national and local planning guidance.

6.1.19 Policy LDP 6 is in respect of supporting the sustainable growth of renewables and states:

"The Council will support renewable energy developments where these are consistent with the principles of sustainable development and it can be adequately demonstrated that there would be no unacceptable significant adverse effects, whether individual or cumulative, including on local communities, natural and historic environments, landscape character and visual amenity, and that the proposals would be compatible with adjacent land uses. A spatial framework for wind farms and wind turbine developments over 50 metres high in line with Scottish Planning Policy will be prepared as Supplementary Guidance."

This will identify:

- Areas where wind farms will not be acceptable.
- Areas of significant protection.
- Areas which may have potential for wind farm development.

All applications for wind turbine developments will be assessed against the following criteria:

- Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.
- The scale of contribution to renewable energy generation targets.
- Effect on greenhouse gas emissions.

Cumulative impacts arising from all of the considerations below:

- Impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker.
- Landscape and visual impacts, including effects on wild land.
- Effects on the natural heritage, including birds.
- Impacts on carbon rich soils, using the carbon calculator.
- Public access, including impact on long distance walking and cycling routes and those scenic routes identified in the NPF.
- Impacts on the historic environment, including scheduled monuments, listed buildings and their settings.
- Impacts on tourism and recreation.
- Impacts on aviation and defence interests and seismological recording.
- Impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised.
- Impacts on road traffic.
- Impacts on adjacent trunk roads.
- Effects on hydrology, the water environment and flood risk.
- The need for conditions relating to the decommissioning of developments, including ancillary infrastructure, and site restoration.
- Opportunities for energy storage.
- The need for a robust planning obligation to ensure that operators achieve site restoration.

6.1.20 Further information and detail on matters relating to the growth of renewables. A spatial framework for onshore wind energy developments will be provided in Supplementary Guidance.

6.1.21 The Council also notes in paragraph 4.5.1 that: *"The Council is keen to ensure that Argyll and Bute continues to make a positive contribution to meeting the Scottish Government's targets for renewable energy generation."*

6.1.22 The other policies of note are as follows in Table 6.2:

Table 6.2: LDP Policies

Policy	**Summary**
LDP DM1 – Development within the Development Management Zones	The proposed development is situated within LDP designated areas 'Countryside Zone' and 'Very Sensitive Countryside.' Policy LDP DM1 parts (E) and (F) are therefore applicable: Part (E) gives encouragement to sustainable forms of development within the Countryside Zone up to small scale on appropriate sites, including the open countryside as well as small scale infill, rounding off, redevelopment and change of use of existing buildings. Large scale development may be supported if it accords with an Area Capacity Evaluation (ACE). There is a presumption against development that seeks to extend an existing settlement into the Countryside Zone. Part (F) (i) notes that development within Very Sensitive Countryside will be encouraged if it is renewable energy related.
LDP 3 – Supporting the Protection, Conservation and Enhancement of our Environment	Policy LDP 3 provides an overarching aim for protection, conservation and enhancement of the environment, through giving full consideration to UK and European conservation legislation (e.g. the Habitats Directive and Wildlife and Countryside Act). For all development management zones Argyll and Bute Council will assess applications for planning permission with the aim of protecting, conserving and where possible enhancing the built, human and natural environment. The proposed development is also expected to be consistent with all other LDP policies and Supplementary Guidance (SG) where relevant. Policies that support LDP 3 (provided within the SG) and are relevant to the proposed development include: • SG LDP ENV 1 – Development Impact on Habitats, Species and Biodiversity (i.e. biological diversity). • SG LDP ENV 2 – Development Impact on European Sites. • SG LDP ENV 4 – Development Impact on Sites of Special Scientific Interest (SSSIs). • SG LDP ENV 6 – Development Impact on Trees/Woodland. • SG LDP ENV 7 – Water Quality and the Environment. • SG LDP ENV 11 – Protection of Soil and Peat Resources. • SG LDP ENV 13 – Development Impact on Areas of Panoramic Quality (APQs). • SG LDP ENV 14 – Landscape. • SG LDP ENV 19 – Development Impact on Scheduled Ancient Monuments. • SG LDP ENV 20 – Development Impact on Sites of Archaeological Importance.
LDP 5- Supporting the Sustainable Growth of Our Economy	Argyll and Bute Council will support the development of new industry and business which helps deliver sustainable economic growth throughout our area by:- • taking full account of the economic benefits of any proposed development; • ensuring that the different spatial needs and locational requirements of the various sectors and scales • of business are able to be met within the context of the settlement and spatial strategy; • focussing regeneration activity and promoting environmental enhancement; and by • safeguarding existing industrial and business areas for employment uses. Argyll and Bute Council will give particular priority to new business and industry development in our business allocations, established business and industry areas and economically fragile areas. Further information and detail will be provided in Supplementary Guidance in relation to support for business and industry, including the main potential growth sectors of marine and coastal, tourism, renewables and forestry developments.

Table 6.2: LDP Policies	
Policy	**Summary**
LDP STRAT 1 – Sustainable Development	In preparing new development proposals, developers should seek to demonstrate the following sustainable development principles, which the planning authority will also use in deciding whether or not to grant planning permission: a) Maximise the opportunity for local community benefit; b) Make efficient use of vacant and/or derelict land including appropriate buildings; c) Support existing communities and maximise the use of existing infrastructure and services; d) Maximise the opportunities for sustainable forms of design including minimising waste, reducing our carbon footprint and increasing energy efficiency; e) Avoid the use of locally important good quality agricultural land; f) Utilise public transport corridors and active travel networks; g) Avoid the loss of important recreational and amenity open space; h) Conserve and enhance the natural and built environment and avoid significant adverse impacts on biodiversity, natural and built heritage resources; i) Respect the landscape character of an area and the setting and character of settlements; j) Avoid places with significant risk of flooding, tidal inundation, coastal erosion or ground instability; and k) Avoid having significant adverse impacts on land, air and water environment.
LDP 9 - Development Setting, Layout and Design	The Council will require developers and their agents to produce and execute a high standard of appropriate design in accordance with the following criteria: Development Setting (A) Development shall be sited and positioned so as to pay regard to the context within which it is located. Development Layout and Density (B) Development layout and density shall effectively integrate with the urban, suburban or countryside setting of the development. Layouts shall be adapted, as appropriate, to take into account the location or sensitivity of the area. Developments with poor quality or inappropriate layouts or densities including over development and overshadowing of sites shall be resisted. Development Design (C) The design of developments and structures shall be compatible with the surroundings. Particular attention shall be given to massing, form and design details within sensitive locations such as National Scenic Areas, Areas of Panoramic Quality, Greenbelt, Very Sensitive Countryside, Sensitive Countryside, Conservation Areas, Special Built Environment Areas, Historic Landscapes and Archaeologically Sensitive Areas, Historic Gardens and Designed Landscapes and the settings of listed buildings and Scheduled Ancient Monuments. Within such locations, the quality of design will require to be higher than in other less sensitive locations and, where appropriate, be in accordance with the guidance set out in "New Design in Historic Settings" produced by Historic Scotland, Architecture and Place, Architecture and Design Scotland. (D) The design of buildings shall be suitably adapted to meet the reasonable expectations for special needs groups. (E) The design of shopfronts/adverts shall be compatible with their surroundings with particular care take with regard to size, use of materials, colour and cumulative impacts where applicable. Energy efficient design and sustainable building practice is strongly encouraged. Further information and detail will be provided in Supplementary Guidance in relation to sustainable siting and design, and to shopfront and advertising design principles.

Table 6.2: LDP Policies	
Policy	**Summary**
LDP 10 – Maximising our Resources and Reducing our Consumption	The Council will support all development proposals that seek to maximise our resources and reduce consumption and where these accord with the following: • The settlement strategy; • Sustainable design principles; • Minimising waste and/or contributing to recycling; • Minimising the impact on the water environment both in terms of pollution and abstraction; • Avoiding areas subject to flood risk or erosion; • Minimising the impact on biodiversity and the natural environment; • Safeguarding our mineral resources and minimising the need for extraction; • Avoiding the loss of trees and woodland; • Contributing to renewable energy generation; • Avoiding the disturbance of carbon rich soils; and • Safeguarding our best agricultural land. Further information and detail will be provided in Supplementary Guidance in relation to the following matters: resources and consumption; addressing climate change; minerals; renewable energy; and sustainable design.
LDP 11 – Improving our Connectivity and Infrastructure	Argyll and Bute Council will support all development proposals that seek to maintain and improve our internal and external connectivity and make best use of our existing infrastructure by ensuring that: • rights of way and public access are safeguarded; • public access within the development is delivered, as appropriate, ensuring that any special mobility and safety requirements are addressed; • consideration is given to the promotion of access to adjoining areas, in particular to the foreshore, core path network and green network; • integration of the development with existing and potential public transport is taken fully into account; • the proposed development is accessible by a range of modes of transport, including walking, cycling, public transport and car; • an appropriate standard of access is delivered to serve new developments, including off-site highway improvements where appropriate; • maximum and minimum car parking standards are applied; • the location and design of new infrastructure is appropriate; • standards for drainage, sewage, waste water and water supply are applied; and • new telecommunication proposals are encouraged where they comply with the criteria established in SG LDP TEL 1; Further information and details will be provided in Supplementary Guidance in relation to the following matters: transport, including core paths; telecommunications; and infrastructure.

6.2 Supplementary Planning Guidance and Other Policy Documents

Renewable Energy SPG (March 2016)

6.2.1 The Council has prepared Supplementary Guidance on Renewable Energy which provides further details on the factors which the Council will take into consideration when determining application for renewable energy related development.

6.2.2 The SPG discusses the National Planning Framework 3, SPP and also Policy LDP 6 of the adopted LDP. Furthermore, the SPG also considers the following:

Argyll and Bute Renewable Energy Action Plan

6.2.3 The Council's Renewable Energy Action Plan (REAP) states:

"Argyll and Bute will be at the heart of renewable energy development in Scotland by taking full advantage of its unique and significant mix of indigenous renewable resources and maximising the opportunities for sustainable economic growth for the benefit of its communities and Scotland."

6.2.4 In addition, there are a number of priorities for the REAP to deliver:

- Optimise the development of the Renewable Energy Sector in Argyll and Bute in a manner that promotes sustainable economic development and recognises the need for co-existence with other economic activities, our environment and our communities.
- Work with partners to secure capacity within the transmission network in order to unlock the future potential of our considerable renewable energy assets and provide confidence to investors.
- Assist in the prioritisation and promotion of supporting physical and transport infrastructure investment to enable the growth of the Renewable Energy Sector.
- Foster a partnership approach to securing local socio-economic and community benefit for the communities across Argyll and Bute.

Argyll and Bute Economic Development Action Plan

6.2.5 The aims of the REAP are reflected in the Council's Economic Development Action Plan which seeks to promote:

- creation of higher value jobs and incomes;
- private and public inward investment;
- sustainable economic benefits in more peripheral, remote and fragile communities;
- community benefit funds that promote local development; and
- economic benefits to businesses and households through the generation and consumption of renewable energy.

Wind Energy Developments

6.2.6 The Argyll and Bute Spatial Framework for onshore wind energy developments has been produced in accordance with Groups 1 to 3 outlined in SPP.

6.2.7 The proposed development is predominantly within group 3, with a small area of group 2 mapped on the southern side of the existing Tangy I and Tangy II wind farm, designated as such due to the likely presence of class 1 priority peatland habitat[1]. Mitigation proposals to address the potential for significant effects on peatland habitats are provided in Appendix 5.1 (Construction Environmental Management Plan), Chapter 10 (Ecology and Nature Conservation) and Appendix 11.2 (Peat Management Plan).

Planning (Scotland) Bill

6.2.8 The Planning (Scotland) Bill was introduced to Parliament on 4 December 2017. The purpose of the Bill is to strengthen the planning system's contribution to inclusive growth and empowering communities.

Scottish Energy Strategy

6.2.9 The Scottish Energy Strategy was published in December 2017 and sets out the Scottish Government's vision for the future energy system in Scotland.

6.2.10 The Strategy sets two new targets for the Scottish energy system by 2030:

[1] URL: http://map.environment.gov.scot/Soil_maps/?layer=10 (accessed 20/08/2018)

- The equivalent of 50% of the energy for Scotland’s heat, transport and electricity consumption to be supplied from renewable sources; and
- An increase by 30% in the productivity of energy use across the Scottish economy.

6.2.11 Scotland’s energy priorities to 2050 is built around six priorities which includes renewable and low carbon solutions. The Strategy notes that 54% of Scotland’s electricity needs were met from renewables in 2016.

6.2.12 Page 81 of the strategy notes that: “*onshore wind is another key component of the big industrial opportunity that renewables create for Scotland. The sector supports an estimated 7,500 jobs in Scotland, generating more than £3 billion in turnover in 2015*.”

6.3 References

Argyll and Bute Council (2015). Local Development Plan.

Argyll and Bute Council (2016). Supplementary Planning Guidance.

Scottish Government (2014). National Planning Framework 3 A Plan for Scotland: Ambition, Opportunity, Place. Scottish Government.

Scottish Government (2014). Scottish Planning Policy. Scottish Government.

Scottish Government (2017). Planning (Scotland) Bill. Scottish Government.

Scottish Government (2017). Scottish Energy Strategy: The future of energy in Scotland.

7. SCOPING AND CONSULTATION

7.1 Introduction

7.1.1 This chapter describes the scoping and consultation process undertaken from the purposes of the EIA. In addition it provides a summary of the key issues raised by consultees and reports the conclusions reached as a result of consultations and desk studies.

7.1.2 There is no statutory requirement for pre-application consultation under Section 36 of the Electricity Act 1989, however, as a responsible developer, SSE undertakes extensive pre-application consultation activities to inform the EIA process. A Pre-Application Consultation Report (PACR) has been prepared by Ramboll on behalf of SSE Generation Ltd (the applicant) for this proposed development.

7.1.3 The purpose of scoping and pre-application consultation is to:

- Ensure that statutory consultees and other bodies with a particular interest in the environment are informed of the proposal and provided with an opportunity to comment at an early stage in the EIA process;
- Obtain baseline information regarding existing environmental site conditions;
- Establish key environmental issues and identify potential effects to be considered during the EIA;
- Identify those issues which are likely to require more detailed study and those which can be justifiably excluded from further assessment; and
- Provide a means of confirming the most appropriate methods of assessment.

7.2 Scoping

7.2.1 A request for a scoping opinion was submitted on behalf of the applicant, dated 28th April 2017, in accordance with Regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 to the Energy Consents Unit. At that stage the proposed development was referred to as the Modified Tangy III Wind Farm. The scoping report provided an outline description of the proposed development and the site location, set out the perceived likely environmental effects that could result from a wind farm development at this site, and the assessment process by which these issues would be evaluated.

7.2.2 SSE Generation Ltd. received the scoping opinion from the Energy Consents Unit on behalf of the Scottish Ministers on 16th October 2017. A register of consultation responses along with an explanation of how the EIA Report has responded to the issues raised is provided in Appendix 7.1.

7.2.3 Following submission of the request for a scoping opinion, all relevant consultees were re-contacted to agree the level of assessment, survey area and survey timings as well as the preferred method of presenting information. Further details on consultations are included within specific chapters and within the technical appendices where relevant.

7.2.4 Pre-application meetings were held with representatives of Scottish Government (Energy Consents Unit), Argyll and Bute Council, SEPA and Scottish Natural Heritage.

Public Consultation

7.2.5 Public consultation is a key element of the environmental assessment process, and as part of the wider consultation process. Public exhibitions were held as follows:

- Tayinloan Village Hall – Monday 6th August 2018;
- Machrihanish Village Hall – Tuesday 7th August 2018; and
- Campbeltown Town Hall, Tuesday 7 August 2018.

7.2.6 The public exhibitions provided information regarding the proposed development to local residents. The events were advertised in the local press and advertised on local notice boards. Community councils, local councillors, MSPs and MPs were advised in advance of these exhibitions in writing. Local community councils consulted included:

- Campbeltown Community Council;
- East Kintyre Community Council;
- Southend Community Council;
- The Laggan Community Council; and
- West Kintyre Community Council.

7.2.7 The information available included plans of the proposed site layout, information boards explaining the potential environmental effects, along with an explanation of the consenting process and the current project stage within that process. A Zone of Theoretical Visibility (ZTV) plan was provided to illustrate theoretical turbine visibility within 35 km. Representatives of SSE Renewables and a landscape architect from ASH Design + Assessment were also available to provide additional information and answer queries. The exhibition boards and information leaflet were made available on the Applicant's website (www.sse.com/tangy-repower). The exhibition material and adverts are also contained in the PACR.

Summary of Consultation Issues

7.2.8 Through the scoping and consultation processes, the following likely environmental issues were identified for detailed assessment and reporting in the ES:

- Landscape and Visual;
- Ornithology;
- Ecology;
- Geology, Soil and Hydrogeology;
- Surface Water;
- Cultural Heritage;
- Noise;
- Access Traffic and Transport;
- Land-use, Socio-economics and Recreation;
- Shadow Flicker and
- Aviation.

7.2.9 Table 7.1 below lists the environmental parameters subject to environmental assessment and identifies which consultees identified issues or provided information in order to inform the EIA process.

Table 7.1: Matrix of Key Consultee Issues

Consultee	Comments/Issues Raised/Baseline Data Provided												
	Landscape & Visual	Ornithology	Ecology	Geology, Soil & Hydrology	Surface Water	Cultural Heritage	Noise	Access Traffic and Transport	Land-use, Socio-economics and Recreation	Shadow Flicker	Aviation	No Comments or Issues Raised	No Response Received
Argyll & Bute Council	■	■	■	■		■		■	■		■		
SEPA			■	■	■				■				
SNH	■	■	■										
HES						■							
FCS									■			■	
Transport Scotland								■					
BT												■	
Glasgow Prestwick Airport												■	
JRC												■	
MOD												■	
RSPB		■	■										
Scottish Water					■							■	
West Kintyre CC	■	■						■	■				
Marine Scotland			■		■								
Fisheries Management Scotland			■		■								
Argyll District Salmon Fisheries Board													■
CAA													■
The Crown Estate													■
NATS Safeguarding													■
MCS													■
Visit Scotland													■
John Muir Trust													■

Scottish Wildlife Trust													■
Nuclear Safety Directorate (HSE)													■
ScotWays													■

7.3 References

Scottish Executive (2013). Planning Advice Note (PAN) 1/2013: Environmental Impact Assessment

The Electricity Act (1989). www.opsi.gov.uk.

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000. http://www.opsi.gov.uk

The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013. http://www.opsi.gov.uk

8. LANDSCAPE AND VISUAL

Executive Summary

This chapter provides an assessment of the potential impacts on the landscape character and visual amenity of the area resulting from the introduction of the proposed development. The assessment has been prepared in line with current guidance.

Desk and field based appraisals of the landscape and visual context of the study area established a 40 km study area and an 11 km detailed study area.

Part of the site is an operational wind farm (Tangy I and II) which has an existing landscape and visual impact on the area. This wind farm would be removed as part of the proposed development and replaced with a reduced number of turbines (16 compared to 22 in the existing scheme) which would occupy a larger footprint and, from some locations, result in an improved visual composition.

Throughout the previously consented Tangy III Wind Farm and proposed Tangy IV Wind Farm (i.e. the proposed development) design process, various turbine sizes and layout designs were considered, as detailed in the Design Statement. As a result, reductions in potential landscape and visual effects have been achieved, particularly through increasing the distance between the western extent of the proposed development and the west coast of Kintyre, thereby better associating the site with the upland interior of Kintyre and minimising potential impacts on this sensitive, locally designated coastline (West Coast of Kintyre Area of Panoramic Quality).

The landscape character assessment has concluded that the majority of landscape effects in relation to the proposed development are anticipated to be **not significant**. No significant effects are anticipated for any of the landscape designations assessed. **Potential significant effects** have been identified for two of the six Landscape Character Types (LCTs) which make up the 11 km detailed study area: Bay Farmland and Upland Forest-Moor Mosaic. The proposed development is anticipated to be noticeable and locally intrusive, rather than a dominating feature, as such these effects are considered to be **moderate**. These effects would be limited to an area of around 8 km from the proposed development, and are mostly within 6 km. Beyond this distance, all effects are anticipated to be **not significant**.

An assessment of cumulative landscape effects took into account the potential addition of the proposed development to a baseline scenario which includes all operational and consented wind development projects within 60 km of the proposed development and those either at application or appeal stage within the planning process. This assessment concluded that there would be **no significant cumulative effects** to designated landscapes. **Potential significant cumulative effects** were identified for two LCTs: Rocky Mosaic and Upland Forest-Moor Mosaic. These effects relate to a potential increase in prominence and frequency of wind farm development when moving through the landscape and potential surrounding effect in some locations. However, the effect is assessed as **moderate**. **No significant cumulative effect** is predicted for any other LCT within the detailed study area.

The visual assessment has identified that during construction and operation, potential effects would be **significant** at 16 of the 27 viewpoints, at 3 of the 10 settlements and 4 of the 17 routes included in the assessment. In the settlements of Machrihanish, Drumlemble and Glenbarr, the proposed development would result in **significant** visual effects but would be unlikely to affect receptors in properties or outdoor receptors which are not currently affected by existing Tangy I and II development. Similarly, for receptors on the A83, including Core Path C304; and B843 and Core Path C085, the stretches of road potentially affected by the proposed development are similar to those affected by the existing Tangy I and II development. For receptors on other routes

assessed to receive significant visual effects, the proposed development would introduce areas of new or notably increased visibility.

The cumulative visual assessment has identified that potential cumulative visual effects would be **significant** at 5 of the 11 viewpoints and on 1 of the 11 routes included in the cumulative assessment.

In summary the Landscape and Visual Impact Assessment (LVIA) has confirmed that the proposed development would result in significant effects on landscape character and visual amenity, limited to Rocky Mosaic and Upland Forest-Moor Mosaic landscape character types within 8 km of the proposed development, and significant effects on visual amenity at 16 of the 27 viewpoints, at 3 of the 10 settlements and 4 of the 17 routes. The majority of the study area would not experience significant landscape and visual effects.

8.1 Introduction

8.1.1 This chapter describes the key components, features and characteristics that contribute to the quality and perception of the landscape character and visual amenity within the appropriate study areas, as defined in Section 8.2, and assesses the potential effects that the introduction of the proposed development may have on them.

8.1.2 Although closely related, assessments on landscape character and visual effects have been considered separately for reasons of clarity. The following distinction is quoted from Page 21 of Guidelines for Landscape and Visual Impact Assessment (Third Edition) (GLVIA3):

- *"assessment of landscape effects: assessing effects on the landscape as a resource in its own right;*
- *"assessment of visual effects: assessing effects on specific views and on the general visual amenity experienced by people".*

8.1.3 The assessment on landscape character evaluates the implications of the proposed development in terms of direct effects on key landscape components and features. It also considers the extent to which loss of features and the introduction of the project would influence perception of local character within the study area and its implications for wider regional landscape character. The character of the landscape relates to the natural process and human activities that have been at work for a long time and which have shaped the land to its present form.

8.1.4 The assessment of visual effects describes and evaluates the potential change in views of the existing landscape during construction and once in operation, and the extent to which these could affect residents, visitors and users of the landscape.

8.1.5 Many of the aspects which contribute to the landscape character and visual amenity (e.g. cultural heritage, land use and ecology) are the subject of separate chapters and assessments in this EIA Report. However, their contribution to, and influence on, landscape and visual considerations have been addressed within this assessment.

8.1.6 The landscape and visual assessment has been undertaken by chartered Landscape Architects at ASH design+assessment Ltd.

8.2 Scope of Assessment

8.2.1 The aim of the Landscape and Visual Impact Assessment (LVIA) is to identify, predict and evaluate potential key effects arising as a result of the proposed development. In line with the scoping and subsequent consultee responses, the following potential issues have been assessed:

- The direct and indirect effect of the proposed wind turbines, associated structures (see Chapter 5: Description of Development for a full description of the proposed development) and required access tracks on the baseline landscape of the site and the wider landscape resource.
- The cumulative effects of the proposed development in relation to other operational, consented and proposed wind farms identified within a 60 km radius of the site.

8.2.2 Advice on landscape and visual issues has been core to the design process, as described in the Design Statement. This advice included turbine scale and geometry, turbine and site layouts and reinstatement measures. Because of this, there is no separate landscape and visual mitigation proposed. The assessed effects therefore represent 'residual effects', i.e. with mitigation measures in place.

Zone of Theoretical Visibility

8.2.3 A Zone of Theoretical Visibility (ZTV) was generated to illustrated areas where the proposed development would theoretically be visible, see Figures 8.1.1 (at A3) and 8.1.2 (at A1). This ZTV was overlaid with a ZTV of the existing Tangy I and II Wind Farms (see Figure 8.2) to identify areas of new theoretical visibility. The ZTV has been produced using ArcGIS software. Detailed technical information on the methods for production of ZTVs is included in Appendix 8.1. Analysis of the ZTV, appraisal of the site and potential receptors, and reference to best practice guidance has informed the definition of the study area and identification of potential receptors for inclusion in the assessment.

Study Areas and Receptors

8.2.4 The study area defined for the landscape character and visual impact assessments extends 40 km from the outermost proposed turbines and is shown on Figure 8.3. This follows good practice guidance set out on Page 12 of Visual Representation of Windfarms Good Practice Guidance (SNH 2017) and allows for assessment of the relationship between the project and the wider area in terms of potential significant effects on landscape character and visual amenity. The study area is not intended to suggest a limit beyond which the wind farm would not be visible; rather it is the most likely limit of any potential significant effects.

8.2.5 Following an initial site appraisal and review of early design information, it was considered that the majority of potential significant effects on landscape character would be likely to occur within 11 km of the project periphery. This was informed by Zone of Theoretical Visibility (ZTV) analysis (see Figures 8.1.1, 8.1.2 and 8.3) and review of draft wirelines. For this reason the detailed assessment of landscape character and visual effects concentrates on this area (referred to hereafter as 'the detailed study area'). However, due to their heightened sensitivity and value, all nationally important or designated areas, such as National Scenic Areas, located within the overall 40 km study area were considered within the assessment.

8.2.6 The following table provides an indicative breakdown of potential landscape and visual receptors across the two study areas described above.

Table 8.1: Study Area per Assessment

Assessment	**Category**	**Wider Study Area (0-40 km)**	**Detailed Study Area (0-11 km)**
Landscape Assessment	Landscape Designations	●	
	Landscape Character Types		●
Visual Assessment	Receptors in Settlements	●	
	Receptors on Routes (A and B roads, ferry routes, long distance recreational routes, e.g. National Cycle Route and Kintyre Way)	●	
	Receptors on Core Paths		●

Existing Wind Farms within the Baseline

8.2.7 A number of existing wind farms are currently operational within the study area. It should be noted that the baseline for the LVIA considers all existing operational wind farms, as identified on Figure 8.4, but does not include consented or application sites, as these are considered within the baseline for the cumulative assessment, in line with best practice.

Scope of Cumulative Assessment

8.2.8 As part of landscape character and visual assessments it is also important to consider potential cumulative effects. In line with Figure 1 of Assessing the Cumulative Impact of Onshore Wind Energy Developments (SNH, 2012) a search area 60 km radius from the proposed site has been used to identify sites which may contribute to potential cumulative effects. Within this area, 28 other operational, consented and wind development application or appeal sites have been identified for inclusion in the cumulative assessment, see Figure 8.4. This is representative of the cumulative baseline scenario between the 12th and 14th February 2018. The effects within the 40 km study area have been assessed, in line with SNH cumulative assessment guidance (SNH 2012).

8.2.9 It should be noted that the existing Tangy I and II Wind Farm forms part of the cumulative baseline, as agreed in consultation with Energy Consents Unit (ECU) and detailed in their Scoping Opinion (see Appendix 8.2), and the removal of these turbines as part of the proposed development is considered within the cumulative landscape and visual assessment (CLVIA).

Scoping and Consultation

8.2.10 As described in Chapter 7 (Scoping and Consultation) of this EIA Report, an extensive consultation exercise, including scoping, has been undertaken pre-application for the proposed development. The pre-application consultation responses relevant to the landscape and visual assessments are contained in Appendix 8.2. The key points raised can be summarised as follows:

- The baseline for the LVIA should contain the existing operational Tangy I and II Wind Farm as confirmed by ECU in their Scoping Opinion;
- The visual assessment should include receptors at viewpoints agreed with consultees;
- Single frame photographs used for Tangy III ES (2014) can be re-used, to illustrate context;
- Viewpoint photography used for Tangy III ES (2014), can be reused where relevant, detailed in Appendix 8.1;
- The Assessment of Potential Lighting Effects should be scoped out;
- Consideration of the Argyll and Bute Landscape Wind Energy Capacity Study (2017) should be made;
- Main alternatives and the design process should be detailed;
- The assessment should include consideration of potential cumulative landscape and visual effects;
- The technical output informing the assessments (e.g. photography, visualisations and Zone of Theoretical Visibility drawings) should be prepared to the appropriate standards;
- The landscape assessment should include consideration of the landscape character of designated and non-designated landscapes;
- All aspects of the proposed development should be assessed in the LVIA, including forest felling and planting; and
- Consultation advice for Tangy III (March 2015) should be referred to.

8.2.11 The landscape and visual assessments have been carried out in line with these points and landscape and visual matters have been a key consideration in the development of the wind farm design. For further details of the evolution of the design during the EIA process refer to Chapter 4 (Site Selection and Consideration of Alternatives) and the Design Statement which accompanies this EIA Report as a supporting document.

Effects Scoped Out of the Assessment

8.2.12 Effects arising from the process of decommissioning the existing Tangy I and Tangy II Wind Farms have been scoped out since they are likely to be of a similar nature to construction issues but of a smaller scale and shorter duration. Where the assessment refers to potential construction impacts, these are also considered representative of predicted decommissioning effects.

8.2.13 In June 2014, SNH published a map of 'Wild Land Areas' (WLAs) which shows an area of North Arran, similar in location but smaller in area than the North Arran NSA, identified as having potential wild land characteristics.

8.2.14 When the area was visited, it was noted that several existing wind farms, e.g. Deucheran Hill and Beinn an Tuirc (Phases 1 and 2), already have an effect on its character. It is not considered that the proposed development, at a similar angle of view and greater distance than Beinn an Tuirc, would alter this. A wild land assessment has therefore been scoped out of the assessment, in consultation with SNH.

8.2.15 For the assessment of potential cumulative effects, and in accordance with best practice, no sites at Scoping stage have been included, nor have those with turbines with a blade tip of less than 30m above ground level.

8.2.16 Following consultation with SNH and ECU, an assessment of visible turbine lighting effects has been scoped out as the potential for significant effects is considered very unlikely.

8.3 Policy and Legislation

8.3.1 The assessment has taken account of international, national, regional and local statutory designations, regulations, strategies, national planning policies and the relevant policies from the statutory development plans for the area in which the proposed development would be located. A detailed review of planning policy has been undertaken and is presented in Chapter 6 (Planning Policy Context). The main legislative framework and policies of relevance to the subjects of landscape character and visual amenity are outlined below.

Legislation

8.3.2 The following pieces of primary legislation relate to landscape as a specific interest and to the broader biological and cultural aspects of the natural heritage:

- Countryside (Scotland) Act 1967;
- Wildlife and Countryside Act 1981;
- Natural Heritage (Scotland) Act 1991;
- Town and Country Planning (Scotland) Act 1997;
- Nature Conservation (Scotland) Act 2004;
- Planning etc. (Scotland) Act 2006; and
- Historic Environment (Amendment) Scotland Act 2014.

National Policy and Guidance

8.3.3 National planning policy and guidance relevant to landscape and renewable energy includes:

- National Planning Framework for Scotland 3 (NPF3);
- Scottish Planning Policy (SPP), 2014;
- Scottish Government Online Planning Guidance for Onshore Wind Turbines (last updated May 2014);
- Planning Advice Note 60 – Planning for Natural Heritage (PAN 60), 2000; and
- Scottish Energy Strategy: The future of energy in Scotland (2017).

Regional Policy

8.3.4 The proposed development site falls within Argyll and Bute Council Planning Authority area. Current development management policy within this area is covered by the Argyll and Bute Local Development Plan, 2015.

Argyll and Bute Local Development Plan, 2015

8.3.5 Key policy in relation to landscape and visual amenity comprises the following:

- Policy LDP STRAT 1 - Sustainable Development;
- Policy LDP 3 – Supporting the Protection, Conservation and Enhancement of our Environment; and
- Policy LDP 6 – Supporting the Sustainable Growth of Renewables.

8.3.6 In addition, the following Supplementary Guidance documents contain policy of relevance to Landscape and Visual Amenity:

- SG LDP ENV 9 – Development Impact on Areas of Wild Land;
- SG LDP ENV 12 – Development Impact on National Scenic Areas;
- SG LDP ENV 13 – Development Impact on Areas of Panoramic Quality; and
- SG LDP ENV 14 – Landscape.

Argyll and Bute Landscape Wind Energy Capacity Study, 2017 (ABLWECS)

8.3.7 The ABLWECS assesses the sensitivity of landscape character types and National Scenic Areas to different sizes of wind turbine development. The aim of the study is to inform strategic planning for wind energy development and to provide guidance to be used when considering specific development proposals. The study was originally undertaken in 2012 but updated in 2017.

8.3.8 The ABLWECS uses the landscape character types and units identified in the Landscape Assessment of Argyll and the Firth of Clyde (Environmental Resources Management (ERM) SNH Review no 78 (1996)) and considers the potential capacity to accommodate wind turbine developments of different heights. However, it notes that "*some flexibility of turbine heights may need to be applied when considering individual applications"*. It should be noted that the ABLWECS considers a baseline which includes existing operational and consented wind farm developments. It therefore considers the Consented Tangy III Wind Farm as part of the baseline.

8.3.9 The proposed development would fall within the typology 'Very Large Turbines', defined as those over 130 m tall. The ABLWECS identifies Upland Forest Moor Mosaic unit 6 (within which the proposed development would be located) as having a high-medium sensitivity to Very Large Turbines. This therefore comprises the area shown to have greatest opportunity for this turbine typology as all other areas considered have been identified as high sensitivity. High-medium sensitivity is described as:

- "*A number of key landscape characteristics are vulnerable to change. Development would undermine some important defining aspects of landscape character and/or visual amenity and/or may result in significant cumulative effects with other wind farm developments. A limited amount of development may be able to be accommodated in very small parts of some landscape character types/areas however*."

8.3.10 The ABLWECS also gives consideration to opportunities for repowering existing wind farm developments. In this respect it notes, *"There may be some very limited opportunities to accommodate wind turbines between 130 m and 150 m high as part of repowering of existing wind farms sited within the central part of the Kintyre peninsula. However, more detailed assessment would be needed to fully consider potential effects on key sensitivities including cumulative effects with other wind farms. Any increases in the size of turbines should not result in considerably more* *widespread and significant effects arising on coastal fringes on the east and west sides of the peninsula and on Gigha and/or Arran."*

8.3.11 It also notes that, "*Redesign of wind farm developments as part of the repowering process, including altering the layout/number of turbines, may offer opportunities to avoid exacerbating effects on adjacent more sensitive landscapes and on views and reduce cumulative effects."*

8.3.12 The ABLWECS identifies a number of sites which are considered as unsuitable for repowering due to their location. These sites do not include Tangy, although it should be noted that the ABLWECS baseline included Tangy as a repowered site (consented Tangy III).

8.4 Principles of Landscape and Visual Impact Assessment

Assessment Guidance

8.4.1 The LVIA has been prepared with reference to GLVIA3. Reference has also been made to relevant guidelines and reports issued by national and local bodies. These include assessment methodology guidance, local and regional planning documents and capacity studies. A full list is contained in Section 8.14 (References) at the end of this chapter.

Professional Judgement

8.4.2 GLVIA3 places a strong emphasis on the importance of professional judgement in identifying and defining the significance of landscape and visual effects. As part of this assessment, professional judgement has been used in combination with structured methods and criteria to evaluate value, sensitivity, and magnitude and significance of effect. The assessment has been undertaken and verified by two Chartered Landscape Professionals to provide a robust and consistent approach.

Key Stages of Assessment

8.4.3 Methods promoted by GLVIA3 require an appreciation of the existing environment and the ability of its key components to accept the change proposed, an understanding of the potential effects which could occur and how these could affect the key components and the potential to mitigate adverse effects. There are five key stages to the assessment:

- Establishment of the baseline;
- Appreciation of the proposed development;
- Identification of key landscape and visual receptors;
- Identification of potential effects; and
- Assessment of effect significance.

8.4.4 Although separated out above for the purpose of explanation, this is rarely a step-by-step process and so stages will often overlap, restart and recur as the design develops and consultation proceeds.

8.4.5 While the process for understanding the development is similar for both the landscape and visual assessments, the methodologies for each are distinct and are therefore described separately in Sections 8.6 and 8.10 respectively.

8.5 Landscape Assessment Methodology

8.5.1 As mentioned above, the landscape character and visual assessments are separate components of an LVIA. The following sections relate to the methodology for landscape character assessment only. The methodology for the visual assessment is provided in Section 8.10.

Establishment of the Landscape Baseline

8.5.2 Determining the landscape baseline condition is necessary in order to understand the landscape and how sensitive it is to the proposed change. The landscape character baseline has been defined through a combination of desk study, site appraisal and consultation (see Appendix 8.2 and Section 8.7). Detailed consultation regarding the baseline (which includes the existing Tangy I and II) was conducted with ECU, see Appendix 8.2.

Desk Study

8.5.3 The assessment has taken account of national, regional and local policy and guidance relating to landscape character and relevant to the proposed development. A full list of sources is provided at in Section 8.15 (References) at the end of this chapter.

Field Survey

8.5.4 Site visits took place between March and April 2018 in order to confirm and augment the understanding of the baseline gained through desk study, including the identification of landscape value and sensitivity to change. This involved photography, note taking and drafting of landscape character assessment tables.

Relative Landscape Value

8.5.5 The relative value of the landscape is an important consideration in informing judgement of the significance of effects. Value concerns the perceived importance of the landscape, when considered as a whole and within the context of the study area. Landscape Value is established through consideration of the following factors:

- presence of landscape designations, other inventory or registered landscapes/landscape features or identified planning constraints;
- the scenic quality of the landscape;
- perceptual aspects such as wildness or tranquillity;
- conservation interests such as cultural heritage features or associations, or if the landscape supports notable habitats or species;
- recreational value; and
- rarity, either in the national or local context, or if it is considered to be a particularly important example of a specific landscape type.

8.5.6 It should be noted that absence of a designation does not necessarily mean that a landscape or component is not highly valued as factors such as accessibility and local scarcity can render areas of nationally unremarkable quality highly valuable as a local resource. Criteria for the allocation of perceived Landscape Value are outlined in Table 8.2 below:

Table 8.2: Landscape Value

Landscape Value	Criteria
High	• the landscape is closely associated with features of international or national importance which are rare within the wider context; • the landscape is of high scenic quality and forms a key part of an important designated landscape or planning constraint; and/or • the landscape is an example of a scarce resource within the local context and is of considerable local importance for its scenic quality, recreational opportunities or cultural heritage associations.
Medium	• the landscape is associated with features of national or regional importance which are relatively common in the wider context;

Table 8.2: Landscape Value	
Landscape Value	**Criteria**
	• the landscape forms part of a designated landscape or is associated with other features of importance but is not rare or distinctive within the local context; and/or • the landscape is one of a number within the local context appreciated for its scenic quality, recreational opportunities or cultural heritage associations.
Low	• The landscape characteristics are common within the local and regional context and the landscape is not associated with any particular features or attributes considered to be important; • The landscape is of poor scenic quality and is not appreciated for any recreational or cultural associations.

Appreciation of the Proposed Development

8.5.7 Appreciation of the proposed development involves the accumulation of a thorough knowledge of the proposed development, its nature, scale and location within the baseline landscape, and any peripheral or ancillary features proposed. Analysis of the proposed activities and changes which would take place leads to an understanding of the potential effects that may occur on the landscape resource.

8.5.8 As part of this process, a Zone of Theoretical Visibility (ZTV) diagram (refer to Figures 8.1.1, 8.1.2 and 8.3), has been consulted to inform the potential range of effects.

Identification of Key Landscape Receptors

8.5.9 The identification of landscape receptors is the first step in the analysis of the potential for significant landscape effects to occur. Landscape receptors comprise key characteristics or individual features which contribute to the value of the landscape and have the potential to be affected by the proposed development. Landscape receptors are identified through analysis of baseline characteristics when considered in relation to the effects which could result from development of the type proposed and may include Special Qualities (SNH 2010) or key characteristics of designated landscapes or landscape character types.

Landscape Sensitivity to Change

8.5.10 Sensitivity to change considers the nature of the landscape and its ability to accommodate development of the type proposed without compromising its key characteristics and components. There are two aspects which are considered when establishing the sensitivity:

- Value: the baseline value of the landscape and the contributory value of individual landscape receptors to the landscape as a whole; and
- Susceptibility to Change: the ability of landscape receptors to accommodate development of the type proposed without changing the intrinsic qualities of the landscape as a whole.

8.5.11 Landscape sensitivity to change has been evaluated with reference to the subject areas above and using a three-point scale, detailed in Table 8.3 below.

Table 8.3: Landscape Sensitivity	
Landscape Sensitivity	**Criteria**
High	A highly valued landscape of particularly distinctive character susceptible to relatively small changes of the type proposed.
Medium	A reasonably valued landscape with a composition and characteristics tolerant of some degree of change of the type proposed.

Table 8.3: Landscape Sensitivity	
Landscape Sensitivity	**Criteria**
Low	A relatively unimportant landscape which is potentially tolerant of a large degree of change of the type proposed.

Identification of Potential Landscape Effects

8.5.12 The second step in the assessment process involves the identification of potential effects which may occur as a result of the interaction of the proposed development with the identified landscape receptors. The assessment takes into account direct effects upon existing landscape elements, feature and key characteristics and also indirect effects which may occur secondary to changes affecting another landscape component or area. The ZTV is used as a tool to gauge the extent of potential indirect change, supported by targeted field surveys. For more information on the use and limitations of ZTV diagrams refer to Section 8.2.3 and Appendix 8.1.

Magnitude of Change

8.5.13 Magnitude of change concerns the degree to which the proposed development would alter the existing elements and characteristics of the landscape. The appraisal of magnitude involves consideration of the nature and scale of the change which would occur in relation to the identified potential effects and also the duration and potential reversibility of the effect. These changes are then considered to evaluate a magnitude rating for the LCT as a whole. Magnitude of change has been evaluated using a four-point scale, detailed in Table 8.4 below.

Table 8.4: Magnitude of Landscape Change	
Magnitude of Landscape Change	**Criteria**
High	Notable change in landscape characteristics over an extensive area ranging to a very intensive change over a more limited area.
Medium	Perceptible change in landscape characteristics over an extensive area ranging to notable change in a localised area.
Low	Virtually imperceptible change in landscape characteristics over an extensive area or perceptible change in a localised area.
Negligible	No discernible change in any landscape characteristics or components

8.5.14 Consideration is given to the potential for change to vary over time by describing the magnitude of change during both the construction and operational phases.

Assessment of Significance of Landscape Effect

8.5.15 Evaluation of the predicted level of significance of effect has been carried out through analysis of the magnitude of change in relation to the identified sensitivity and using a degree of professional judgement. The assessment takes into account effects upon existing landscape elements, features and key characteristics and assesses the extent to which these would be lost or modified, in the context of their importance in determining the existing baseline character.

8.5.16 The prominence of the proposed development in the landscape will vary according to the prevailing weather conditions. The assessment has been carried out, as is recommended good practice, by assuming the ‘worst case’ scenario, i.e. on a clear bright day in winter, when neither foreground deciduous foliage nor haze can interfere with the clarity of the view obtained.

8.5.17 Significance of effect has been evaluated using the scale detailed in Table 8.5 below.

Table 8.5: Landscape Effect	
Landscape Effect	**Criteria**
Major	The proposed development is at considerable variance with the landform, scale and pattern of the landscape and would be a dominant feature, resulting in considerable reduction in scenic quality and large scale change to the intrinsic landscape character of the area.
Moderate	The proposed development is out of scale with the landscape, or inconsistent with the local pattern and landform and may be locally dominant and/or result in a noticeable reduction in scenic quality and a degree of change to the intrinsic landscape character of the area.
Minor	The proposed development does not quite fit with the scale, landform or local pattern of the landscape and may be locally intrusive but would result in an inappreciable reduction in scenic quality or change to the intrinsic landscape character of the area.
Negligible	The proposed development sits well within the scale, landform and pattern of the landscape and/or would not result in any discernible reduction in scenic quality or change to the intrinsic landscape character of the area.

8.5.18 The above criteria and levels of significance represent points on a continuum. Where required, interim ratings, such as minor-moderate, have been used to indicate the anticipated significance of effect.

8.5.19 For the purposes of the assessment effects with a rating of moderate or above are significant in the context of the EIA Regulations.

Limitations of the Landscape Assessment

8.5.20 A blade-tip ZTV has been prepared and is shown on Figure 8.1.1 and 8.1.2. It indicates those parts of the study area from which there may be views of the proposed development. The use and limitations of ZTVs is described in Appendix 8.1. The scope of assessment is based on the assumptions laid out in Section 8.2.

8.6 Baseline Landscape Conditions

Site Description and Context

8.6.1 Refer to Figure 8.3 for a plan showing the site location and surrounding area.

8.6.2 Currently, part of the site is in use as an operational wind farm. Tangy I began generating electricity in 2003 with 15 turbines and following an extension of 7 turbines in 2007, Tangy II, the site currently comprises 22 turbines. The remainder of the site comprises farmland and coniferous plantation. It is located approximately 9 km north-west of Campbeltown on the Kintyre peninsula, in Argyll & Bute.

8.6.3 The site covers a height range of approximately 150m to 190m AOD, separated from the peninsula's west coast by a bluff slope. Slopes below the site are noticeably steeper than the site itself and incised by small burns, largely fed by the nearby Tangy Loch. The aspect of the site is generally south to south-west.

8.6.4 Land to the north rises towards a local high point known as Cnoc Buidhe (NGR NR 695 308, 312m AOD) and is in use for commercial coniferous forest plantation. To the south is Aros Moss: an area of low-lying, largely flat and agricultural land occupied by a number of farmsteads, Campbeltown Airport and CSWind UK manufacturing facility site. A ribbon of beaches, small bays and rocky outcrops and raised beach is located along the coast to the west.

8.6.5 The Kintyre peninsula is approximately 60 km long, from Tarbert to Southend, and 14 km wide. It includes an undulating, upland spine featuring several small lochs and with landcover dominated by moorland and coniferous plantation. Where topography allows, the uplands are bordered by a pastoral fringe and there is a thin coastal strip of rocky outcrops, headlands and sandy bays. In places, glens stretch inland, punctuating the coastline. Immediately south of this upland area is Aros Moss, a pronounced area of flat, fertile land, and, further south, another area of undulating upland forest-moorland.

8.6.6 Approximately 4 km off the west coast of Kintyre is the small island of Gigha. Also to the west of Kintyre, the study area includes the south-eastern edge of Islay; this is a rocky coastline with several whisky distilleries fed by the peat moorland lochs inland.

8.6.7 East of Kintyre, in the Firth of Clyde, is Arran: an island which straddles the Highland Boundary Fault resulting in pronounced granite mountains in the north and rolling moorland in the south. Similar to Kintyre, it includes a settled, pastoral coastal fringe with several bays, rocky outcrops and steep coastal slopes. It is smaller in overall size than Islay and entirely within the study area.

8.6.8 Arran is part of the North Ayrshire local authority area while the rest of the study area is in Argyll & Bute.

8.6.9 Existing wind farms are present within the existing landscape, mostly concentrated within the upland interior of the Kintyre peninsula. Smaller developments are scattered around more coastal areas including turbines associated with farm properties and a four turbine development on Gigha.

Landscape Designations

8.6.10 Landscapes can be ascribed an international, national, regional or local designation which recognises the importance of the landscape for its outstanding scenic interest or attractiveness. These designations include National Parks (NPs), National Scenic Areas (NSAs), areas on the Inventory of Gardens and Designed Landscapes (GDLs) and local designations such as Special Landscape Areas (SLAs) and Areas of Panoramic Quality (APQ). All areas within the overall study area which are so designated are shown on Figures 8.5.1 and 8.5.2.

8.6.11 Initial review of designated landscapes within the study area has identified the following for inclusion within the assessment, being those where it is considered there may be potential for landscape effect. The rationale for this selection is detailed in Appendix 8.3.

- National Context:
  - North Arran NSA.
- Regional Context:
  - East Kintyre Coast APQ;
  - Mull of Kintyre APQ;
  - West Kintyre Coast APQ

8.6.12 In addition to the above, the regionally designated North Arran SLA covers a similar area to the North Arran NSA. This area has therefore not been considered separately but effects relating to the NSA can also be considered to refer to the SLA.

National Context

8.6.13 National Scenic Area (NSA) is a national level designation applied to those landscapes considered to be of outstanding scenic value and requiring protection in the national interest. There are 40 NSAs in Scotland and they comprise approximately 13% of its land area. NSAs are defined by their 'Special Qualities' which have been documented by Scottish Natural Heritage (SNH) in their Commissioned Report No. 374: The Special Qualities of the National Scenic Areas (SNH, 2010). One NSA has been identified for inclusion in the assessment.

North Arran NSA

8.6.14 Within the study area the North Arran NSA is approximately 19 km to the east of the proposed development at its closest point. This is a large area (approximately 305 km^2), covering in excess of half of the island and its surrounding coastal waters and falls entirely within the 40 km study area (see Figure 8.5.1).

8.6.15 The Special Qualities of the North Arran NSA are given (Pages 59-62 of SNH, 2010) as:

- A mountain presence that dominates the Firth of Clyde;
- The contrast between the wild highland interior and the populated coastal strip;
- The historical landscape in miniature;
- A dramatic, compact mountain area;
- A distinctive coastline with a rich variety of forms;
- One of the most important geological areas in Britain;
- An exceptional area for outdoor recreation; and
- The experience of highland and island wildlife at close hand.

Regional Context

8.6.16 Local authorities have the power to designate landscapes which they feel are worthy of protection at a regional or local level within their planning documents. These regionally identified areas comprise a non-statutory designation. The nomenclature of these regional level designations differs between Local Authority. Within the study area, the term Area of Panoramic Quality (APQ) has been used within Argyll and Bute, whilst Special Landscape Area (SLA) is used within North Arran. However, only APQs have been identified for inclusion within this assessment (see Appendix 8.3)

8.6.17 There are no published designation descriptions or defined special qualities for the APQs. The key characteristics which are considered to contribute to the importance of these areas have therefore been identified by ASH.

8.6.18 Three APQs have been identified as potentially experiencing effects relating to the proposed development (see Appendix 8.3) and have therefore been included in the assessment. The location of these areas is shown on Figure 8.5.1.

East Kintyre Coast APQ

8.6.19 This APQ follows the east coast of Kintyre, from an area north of Macringan's Point to the settlement of Carradale. It covers an area of approximately 12 km^2 and, at its closest point, would be located approximately 7.5 km from the proposed development.

8.6.20 The east coast of the peninsula is rougher and more varied in character than the west coast and the changing topography, occasional woodland enclosure, settlement and pronounced glen mouths leading inland combine to create an interesting landscape.

8.6.21 This APQ features long, narrow sections of rugged coastline, often with a strong visual connection with Arran, and punctuated by broad valleys.

8.6.22 Key characteristics and potential landscape receptors identified for this APQ comprise:

- Long sections of narrow and rugged coastline;
- Strong visual connection with Arran / open sea vistas;
- Clustered lowland settlement with dispersed homes occupying east facing slopes; and
- Pronounced and broad valleys which open out, punctuating and adding interest and context to the coast.

Mull of Kintyre APQ

8.6.23 The Mull of Kintyre APQ covers the width of the peninsula and extends from the southern coast as far north as the summits of the hills which mark the southern extent of Aros Moss. It covers an area of approximately 155 km^2. At its closest point, the designated area would be approximately 11 km from the proposed development.

8.6.24 Within this designated area, there are several rounded hills bordered by steep and rocky slopes which lead down to the coast, with sharp cliffs in places. Land use is a mixture of plantation, agriculture and open moorland.

8.6.25 In the north, the APQ features a series of large, dominant hills which separate the south of the APQ (i.e. the Mull) from Aros Moss to the north, separated by a series of enclosed and sometimes settled valleys, with the rounded hilltops above (e.g. Glen Breackerie, Strone Glen and Conie Glen).

8.6.26 In the south, the Mull of Kintyre features an accessible coastline stretching between Carskey and Brunerican Bay, Southend and Mill Park. This is a rare landscape of contrasting cliffs and coastal plain. Elsewhere, the coastline of the APQ often comprises exposed and rugged cliffs with moorland above.

Settlement is generally focussed on the sheltered areas of the south coast and sections of the east coast.

8.6.27 Key characteristics and potential landscape receptors identified for this APQ comprise:

- Dominant series of large hills separating Aros Moss to the north from the southern coastal edge and providing a backdrop to both landscapes (e.g. The Slate, Tirfergus Hill and Kerran Hill);
- Enclosed and sometimes settled valleys, with rounded hilltops above (e.g. Glen Breackerie, Strone Glen and Conie Glen);
- Accessible, diverse eastern and southern coastline of contrasting cliffs and coastal plain, raised beach, rock-bound bays and scattered settlement;
- Exposed and rugged western cliffs; and
- Moorland hills with qualities of wildness in the south-western part of the APQ.

West Kintyre Coast APQ

8.6.28 This designation marks a ribbon along the west coast of Kintyre, stretching from north of Clachan to Westport Beach. It covers an area of approximately 21 km^2 and includes rocky slopes and outcrops, raised beach agricultural land, mixed woodland and dispersed settlement to either side of the A83 route. At its closest point, the designated area is located approximately 1.5 km from the nearest proposed turbine.

8.6.29 Slopes, steep in places (particularly the south), separate this area from the upland interior of Kintyre and so focus tends to be directed either along the coast or out to sea and the nearby islands of Gigha, Islay and Jura.

8.6.30 Throughout the APQ, there is a strong connection with the sea and nearby islands, with views directed in some areas by the distinctive landform; steep, bluff slopes separate the interior uplands from the raised beach and rocky coast.

8.6.31 In the south, there is a pronounced contrast between the exposed, and at times rocky, character of the coastal strip and pastoral areas nearby. However, in the vicinity of Rhunahaorine Point, there is an almost level landscape, where the sky opens up to match the scale of the sea and the scale of the nearby uplands stands out.

8.6.32 While the coast follows quite a straight line, the bluff slope is relatively sinuous and this provides space for distinct pockets of secluded development.

8.6.33 Key characteristics and potential landscape receptors identified for this APQ comprise:

- Strong connection with the sea and nearby islands, directed in some areas by distinctive landform. Steep, bluff slopes separate the interior uplands from the rocky coast;
- Contrast of exposed, and at times rocky, character of the coastal strip and pastoral areas nearby;
- Distinct pockets of secluded settlement in the south where space permits, such as at Bellochantuy; and
- Contrasting expansive and almost level landscape in the vicinity of Rhunahaorine Point, where the sky opens up to match the scale of the sea and scale of the nearby uplands stands out.

Landscape Character

8.6.34 The Landscape Assessment of Argyll and the Firth of Clyde (Environmental Resources Management, 1996), part of the SNH suite of national landscape character assessment documents, identify six landscape character types within the detailed study area. Initial review has identified five of these for inclusion within the assessment as potentially being affected by the proposed development (see Appendix 8.3) as follows:

- Bay Farmland;
- Low Coastal Hills;
- Rocky Mosaic;
- Sand Dunes and Machair; and
- Upland Forest-Moor Mosaic.

8.6.35 Locations of the above LCTs are shown on Figure 8.6.1 and 8.6.2.

Bay Farmland

8.6.36 Part of the site access route would occur within this landscape character type (using existing roads in the vicinity of Drum Farm). It is found in one location within the detailed study area (see Figure 8.6.1) and it is the only example contained in the Landscape Assessment of Argyll and the Firth of Clyde.

8.6.37 The LCT comprises a distinctive agricultural plain stretching from east to west across the Kintyre peninsula, contrasted by enclosing rounded hills to the north and south. There is an obvious historic pattern of roadside settlement (e.g. Stewarton & Kilchenzie) and scattered farmsteads throughout. RAF Machrihanish (so named in the Argyll and Bute LDP) and Campbeltown Airport create a prominent area of focus within the open agricultural plain which contrast with the rural character.

8.6.38 Key characteristics and potential landscape receptors identified for this LCT comprise:

- Distinctive agricultural plain contrasted by the enclosing rounded hills to the north and south;
- Historic pattern of roadside settlement with scattered farmsteads contrasting with RAF Machrihanish and Campbeltown airport; and
- Expansive vistas across the flat, open farmland.

Low Coastal Hills

8.6.39 This landscape character type occurs in two locations in the detailed study area to the east of the proposed development (see Figure 8.6.1). It is also found on the south coast of Kintyre and at Sanda Island.

8.6.40 The LCT comprises an uneven landform of broad undulating values and rounded hills with rocky outcrops. Within the study area, there is a strong visual connection with the adjacent Rocky Mosaic LCT and with Arran. However, it is more open than Rocky Mosaic, allowing greater space and opportunity to connect with surroundings, and features an attractive combination of pasture with broadleaf and mixed woodland groups in lower lying areas.

8.6.41 Commercial plantation can be found on upper slopes and is a characteristic of adjoining LCTs and may be considered distracting.

8.6.42 Key characteristics and potential landscape receptors identified for this LCT comprise:

- Diverse combination of pasture with broadleaf and mixed woodland groups in lower lying areas;
- Strong visual connection with nearby Rocky Mosaic LCT and Arran;
- More open than adjacent Rocky Mosaic, allowing greater space and opportunity to connect with surroundings;
- Plantation on upper slopes is a characteristic of adjoining LCTs and more of a detracting feature; and
- Framed views up through glens into the upland interior.

Rocky Mosaic

8.6.43 This landscape character type is found in six separate locations within the detailed study area (see Figure 8.6.1) and is also found in several other coastal areas of Kintyre, Knapdale and Loch Fyne.

8.6.44 This LCT is a relatively small scale landscape comprised of areas of uneven, hummocky landform with rocky outcrops and narrow glens. It features a rocky, indented coastline with offshore islands and small sandy bays and occasional cliffs, in places backed by areas of raised beach which are contained by steep bluff slopes, and occasional distinctive rounded knolls.

8.6.45 Throughout this LCT there is a strong connection with the sea and nearby islands, directed in some areas by the distinctive landform of steep bluff slopes. On areas of raised beach or undulating ground available above and below the slopes, pasture and rough grazing can be found.

8.6.46 Despite their rough character, these areas are often relatively easily accessible and so have developed as important transportation routes, e.g. A83 and B842. Along these routes, there is a pattern of scattered/dispersed roadside settlement.

8.6.47 Key characteristics and potential landscape receptors identified for this LCT comprise:

- Exposed coastal locations with steep sea cliffs or bluff slopes adjacent to the coastal shelf;
- Undulating pasture and rough grazing within raised beach areas or above cliff tops;
- Scattered / dispersed settlement pattern;
- Important transportation route in places, e.g. A83 and B842 with valued seaward views;
- Dramatic topography often leads to a distinct separation from adjacent landscape character types both in terms of visibility and accessibility; and
- Strong connection with the sea and nearby islands, directed in some areas by distinctive landform. Raised beach and steep, bluff slopes separate the interior uplands from the rocky coast.

Sand Dunes and Machair

8.6.48 This LCT is located in one location within the detailed study area and covers the wide beach and dunes of Machrihanish Bay to the south-south-west of the proposed development (see Figure 8.6.1).

8.6.49 The LCT is comprised of an expansive linear stretch of sandy beach, backed by a rolling stretch of dunes inhabited by marram grasses with grassy stretches of grassy links areas beyond. Parts of this LCT are maintained as a golf course and stretches of mown and maintained fairways and greens contrast with the rougher dune areas. This is a low lying, open and exposed coastal landscape with expansive seaward vistas and a close relationship with the sea.

8.6.50 Key characteristics and potential landscape receptors identified for this LCT comprise:

- Sandy beach with undulating dunes and grassy links beyond;
- Mown and maintained golf course fairways and greens contrast with rough coastal grasslands;
- Expansive seaward and coastal vistas; and
- Sense of openness and exposure but with small scale intimacy within dune slacks.

Upland Forest-Moor Mosaic

8.6.51 This is the LCT within which the proposed development would be located and covers the majority of the inland uplands within the study area. It also covers two smaller upland areas in the south of the detailed study area (see Figure 8.6.1) and can be found extensively within Kintyre, Knapdale, the slopes above Loch Fyne and the Isles of Colonsay, Coll and Tiree.

8.6.52 This is a large scale LCT comprised of rounded hills and undulating plateau areas overlaid with a distinctive pattern of coniferous forest plantation mixed with moorland on high ground and marked regularly by a series of upland lochs of varying scale. Within the forest plantation, there is often greater space between coupes, meaning that the forest is more open than is typically encountered within commercial forest plantation. Distinctive rounded hills around the southern fringes of the LCT bordering the Bay Farmland LCT accommodate scattered settlement served by rural roads. However, topography has resulted in some areas of sharp transition between upland and coastal areas and so, in places, there is quite a remote upland character, despite close proximity to the settled fringes and transport routes. In addition to the interior uplands within this LCT, there are several secluded, pastoral valleys (usually settled) running east to west or vice versa.

8.6.53 Within the study area, commercial wind energy development is a notable existing feature of this LCT.

8.6.54 Key characteristics and potential landscape receptors identified for this LCT comprise:

- Dispersed or scattered settlement pattern resulting in secluded homes;
- Remote upland character, despite close proximity to settled fringes and transport routes;
- Secluded, pastoral valleys (usually settled) running east to west or vice versa;
- Series of upland lochs of varying scale;
- Distinctive pattern of coniferous plantation mixed with moorland on high ground;
- Series of rounded hills (e.g. Ranachan Hill) which are distinct from the main upland ‘spine’ of Kintyre in their open outlook and cultural heritage importance; and
- Existing pattern of commercial wind energy development.

8.7 Landscape Effects Evaluation

8.7.1 The extent to which the proposed development would affect the existing landscape varies depending on the individual components of the project and the ability of the existing landscape to accommodate these various components.

8.7.2 The following section describes the assessment of the effects that the proposed development would have on landscape designations and landscape character identified within the baseline. The detailed assessment is provided in Appendix 8.5 with the key points being outlined in the following paragraphs. The assessment considers impacts during construction and also in the longer term during the operational phase, in accordance with the criteria outlined in Section 8.6.

Landscape Designations

8.7.3 The assessment of effects on landscape designations included one NSA and three APQs as shown on Figures 8.5.1 and 8.5.2. The assessment concluded that no significant effects were likely to occur to any of the designated landscapes assessed. A summary of the results is provided below:

National Context

North Arran NSA

(This assessment should also be considered relevant to the North Arran SLA).

8.7.4 The boundary of the NSA lies at around 19 km from the closest structure part of the proposed development with areas sharing potential intervisibility of the proposed development being at least 20 km distant. Potential effects would be limited to the appearance of turbines on the far western and south-western horizon in expansive sea vistas from elevated areas. Existing wind turbines are already present within these views at Beinn an Tuirc and Deucheran Hill and it is unlikely that the distant appearance of additional turbines at Tangy would result in any discernible reduction in the Special Qualities and value of the NSA.

8.7.5 The effect is therefore anticipated to be **negligible** during both construction and operation and **not significant** in term of the EIA Regulations.

Regional Context

East Kintyre Coast APQ

8.7.6 The existing Tangy I and II Wind Farm is not visible from this APQ. Only a very small part of the APQ would be potentially indirectly affected by the proposed development near Peninver at the mouth of the Glen Lussa broad valley. The turbines would appear in inland views, framed within this valley. This would be a minimal, very localised change. Whilst it may affect the visual appeal of this particular inland valley view, it would not alter the most valued aspects of the coastal landscape and is considered unlikely to lead to any noticeable reduction in the landscape qualities of the APQ as a whole.

8.7.7 The effect is therefore anticipated to be **negligible** during both construction and operation and **not significant** in term of the EIA Regulations.

Mull of Kintyre APQ

8.7.8 Small parts of this APQ would theoretically obtain intervisibility with the proposed development, mostly from elevated ground in the central hills. These areas are already affected to some degree by the existing Tangy I and II turbines and small single turbines south of Campbeltown. The turbines associated with the proposed development would be noticeably larger, and may have an effect of appearing to bring the northern Kintyre Hills closer. Whilst this is not necessarily negative, it would potentially increase the prominence of wind turbines along parts of the northern boundary of the APQ. However, this would be a very localised effect and valued coastal aspects of this landscape would be unaffected.

8.7.9 A **minor** effect is anticipated for this APQ during both construction and operation, which is considered **not significant** in term of the EIA Regulations.

West Kintyre Coast APQ

8.7.10 The ZTV indicates that there may be small areas of intervisibility of the proposed development within this APQ with turbine blades and tips appearing intermittently above the bluff slopes which enclose the narrow coastal strip. There is relatively limited visibility of existing Tangy I and II turbines in this area, mostly comprising the appearance of blade tips only above bluff slopes. The proposed development would affect a greater area of the APQ with larger sections of turbine blades and sometimes hubs appearing skylined (seen above the skyline). Wider but more distant intervisibility would be theoretically shared with the more open landscapes further north towards Rhunahaorine Point. However, the proposed development would appear distant and barely perceptible from this distance. The appearance of moving blades above the bluff slope would be infrequent but large and locally distracting where they are experienced, interrupting the skyline of the inland backdrop. This would lead to a noticeable change to views in these small areas resulting in a range of isolated significant visual effects (see Appendix 8.7: Visual Assessment Tables) but the wider coastal experience and valued coastal aspect of the APQ would remain largely unaffected. The contribution of a small number of infrequently obtained significant visual effects from individual viewpoints is considered unlikely to lead to a significant effect on the integrity and value of the APQ overall.

8.7.11 The effect on the APQ is therefore anticipated to be **minor-moderate** during both construction and operation which is considered to be **not significant** in term of the EIA Regulations.

Landscape Character Types

8.7.12 Five LCTs within the 11 km study area have been included in this assessment. Of these, three were assessed as likely to experience only non-significant effects. Two LCTs were identified as potentially receiving significant effects to some parts of their area within the 11 km detailed study area. Detailed assessment for these LCTs is contained in Appendix 8.5 and is summarised below.

Bay Farmland

8.7.13 Potential effects to this landscape would be indirect, affecting the context of containing hills to the north. The proposed development would comprise a replacement to the existing Tangy I and II Wind Farm which is present within this context but would be noticeably larger and affecting a larger part of the containing horizon when seen from southern and western parts of the LCT, bringing its influence closer to this LCT. The increase in scale of the turbines and occupied area of the context is likely to appear a more prominent feature where visible and would affect a slightly larger part of the LCT.

8.7.14 In some locations, the proposed development would appear larger on the enclosing hills and turbine tips would more frequently form the highest part of the horizon when compared to the existing Tangy I and II Wind Farm, potentially diminishing the height of the enclosing hills. Whilst this may affect the perception of these hills, it would not necessarily affect the sense of containment and would result in a change to only one part of the wider context.

8.7.15 The landscape effect is anticipated to be **moderate** during construction and operation of the proposed development and therefore **significant** in terms of the EIA Regulations.

Low Coastal Hills

8.7.16 Potential effects on this LCT would be very limited with only one small area near the mouth of Glen Lussa potentially sharing intervisibility with the proposed development. The proposed development would appear within framed views inland along Glen Lussa which currently do not feature any wind turbines. Whilst it may become a noticeable focus within these views, it would not affect the generally seaward valued aspects of this LCT nor its perceived scale. The area potentially affected comprises a relatively small part of the LCT and therefore changes would be localised.

8.7.17 The landscape effect is anticipated to be **minor** during both construction and operation which is considered to be **not significant** in terms of the EIA Regulations.

Rocky Mosaic

8.7.18 This LCT comprises six different units within the detailed study area. Potential for effects is indicated by the ZTV within four of these which cover the west coast and rocky coastline and hills around Machrihanish and Campbeltown. These four areas would potentially be affected in different ways.

8.7.19 From LCT units further from the proposed development including those to the south around Machrihanish and Campbeltown, the larger scale turbines and greater area of the landscape backdrop occupied by turbines would be evident in some parts of the context. This may affect a slightly larger area then is affected by the existing Tangy I and II Wind Farm leading to a perceptible degree of change within this backdrop, but is considered unlikely to result in a noticeable change to the valued characteristics of these areas.

8.7.20 Landscape effect within these units is anticipated to be **minor** during construction and operation which is considered **not significant** in terms of the EIA Regulations.

8.7.21 For the western shoreline LCT unit between Glenbarr and Westport, there would intermittently be the appearance of noticeably larger wind turbines on the skyline. In the north of this area around Glenbarr, this increase in height would result in the wind farm becoming a more prominent feature on the skyline and greater focal point, appearing closer and potentially diminishing the perceived scale of the landform. Further south, along the coast there would be the intermittent appearance of larger turbine blades above the skyline within the elevated agricultural areas above the raised beach and infrequently above the enclosing bluff slopes from areas of raised beach. These areas currently have only limited effect or more localised effect from the existing Tangy I and II Wind Farm. Turbines would be likely to appear large and may disrupt the sense of perceived separation between the interior uplands and the coastal rocky mosaic area. Whilst this change would be noticeable, it would be localised and would not affect the more valued coastal aspects of the LCT unit.

8.7.22 The combined influence of the larger turbines on the elevated coastal farmland areas and periodically from areas of raised beach within the western coastal LCT unit, is anticipated to lead to a **minor-moderate** effect during construction and operation between Glenbarr and Westport (up to around 8 km from the proposed development) which is considered **not significant** in terms of the EIA Regulations.

8.7.23 For this LCT resource as a whole within the study area, the combined effects on all areas is considered to be **minor** and **not significant**.

Sand Dunes and Machair

8.7.24 The existing Tangy I and II wind turbines are prominent within the landscape context and coastal vistas on the hills to the north. The proposed development would appear noticeably larger and more imposing within this context with the turbines potentially appearing greater in height than the hills on which they are situated. This may form a distracting feature when looking north along the beach or create a greater focus in views across the beach from areas such as Machrihanish. However, given the prominence of the existing Tangy I and II turbines, it would not result in a very noticeable change to landscape characteristics. The effect would be limited in its extent, affecting only a small part of the surrounding context and not affecting the more valued seaward aspect.

8.7.25 Landscape effect on the Sand Dunes and Machair LCT is considered **minor** and **not significant** in terms of the EIA Regulations.

Upland Forest-Moor Mosaic

8.7.26 The proposed development would be located within this LCT and the existing Tangy I and II Wind Farm is currently present within this LCT.

8.7.27 Wind turbines are already a feature of this LCT so would not become a new characteristic. The proposed development would involve removal of some existing turbines and replacement with fewer turbines of larger scale and across a greater footprint. The ZTV suggests nearby intervisibility within around 2 km of the proposed development and intermittent visibility within glens up to around 5 km away, and across higher hills and ridges beyond, up to around 9 km. Most of these areas already have intervisibility with the existing Tangy I and II Wind Farm but new areas would be affected including around Lussa Loch and Glen Lussa, although parts of the existing Beinn and Tuirc 1 and 2 Wind Farm are already visible around parts of Lussa Loch. The coniferous forest plantation character would often limit the influence and prominence of wind turbines in these areas (although this is a changing situation due to forestry operations). Where present as a feature in the landscape, the proposed development would appear larger than the existing Tangy I and II Wind Farm and would be more prominent in some areas, particularly from open areas and when seen in relation to existing hills. In the latter case the larger turbines may sometimes appear to diminish the height and distinction of hills. This effect would occur in close proximity, in relation to hills such as Ranachan Hill on the southern fringes of the LCT, and also when seen more distantly on the horizon from the north. In some locations, in the core of the LCT where other existing turbines are present, the greater size and footprint of the proposed development may contribute to an encircling impression with gaps and distance between Tangy and other developments being less noticeable due to the larger scale and footprint. In these areas wind turbines may be seen as a more continuous and defining feature of the landscape.

8.7.28 During construction, felling and construction works would appear similar to existing forestry operations, but likely to be greater in intensity and area affected, forming a more noticeable area of activity.

8.7.29 The effect on this LCT is therefore anticipated to be **moderate** during construction and operation which is considered to be **significant** in term of the EIA Regulations. This effect is anticipated in relation to the increased effect in the glens and around the hills of the southern fringes of the LCT area and is expected to extend to around 6 km from the proposed development. Beyond this distance, the effect is predicted to be **minor** and **not significant** in terms of the EIA Regulations.

Summary of Potential Effects on Landscape Designations and LCTs

8.7.30 The effects on designated landscapes and LCTs within the 40 and 11 km study areas is summarised in Table 8.6 below. As described in Section 8.5.19, those effects of a moderate level or greater are considered significant in terms of the EIA Regulations.

Table 8.6: Summary of Potential Effects on Landscape Designations and LCTs

Landscape Designations	**Potential Effect (Not Significant)**				**Potential Effect (Significant)**		
	Scoped out	**Negligible**	**Minor**	**Minor - Moderate**	**Moderate**	**Moderate - Major**	**Major**
Jura NSA	X						
Knapdale NSA	X						
North Arran NSA		X					
North Arran WLA	X						
Achamore House - GDL	X						
Brodick Castle GDL	X						
East Kintyre Coast APQ		X					
Knapdale / Melfort APQ	X						
Mull of Kintyre APQ			X				
South and East Islay APQ	X						
South-west Islay APQ	X						

Table 8.6: Summary of Potential Effects on Landscape Designations and LCTs

Landscape Designations	Potential Effect (Not Significant)				Potential Effect (Significant)		
	Scoped out	Negligible	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
West Kintyre Coast APQ				X			
Holy Island Special Landscape Area (SLA)	X						
Pladda SLA	X						
North Arran SLA		X					
LCT							
Bay Farmland					X		
Hidden Glens	X						
Low Coastal Hills		X					
Rocky Mosaic			X(L)	X(L)			
Sand Dunes and Machair			X				
Upland Forest-Moor Mosaic					X(L)		

L – donates that the effect would be localised to only part of the resource within the study area.

8.7.31 As can be noted from the summary table, the majority of landscape effects in relation to the proposed development are anticipated to be **not significant** and **no significant effects** are anticipated for any landscape designations. Potential **significant effects** have been identified for two of the six LCTs which make up the 11 km detailed study area: Bay Farmland and Upland Forest-Moor Mosaic. These effects are anticipated to result from the increased appearance of the larger turbines on the southern edge of the forested upland core of Kintyre which forms a context and backdrop to surrounding agricultural fringes, foothills and valleys, and the low-lying landscape of Aros Moss. However, effects are considered **moderate** and **significant** as the proposed development is anticipated to be noticeable and locally intrusive, rather than a dominating feature. These effects would be limited to an area of around 8 km from the proposed development, and are mostly within 6 km. Beyond this distance all effects are anticipated to be **minor or below** and would be **not significant**.

8.8 Cumulative Landscape Assessment

8.8.1 Cumulative effects are those that occur as a result of the construction of more than one development of similar type within the landscape. In terms of landscape character, cumulative landscape effects may result where a number of wind energy developments combine, increasing the prevalence of wind turbines within a landscape to an extent where they may become a defining characteristic. The likely significance of these effects relates to the number of wind developments affecting the landscape, their scale, the inter-relationship between their respective visual envelopes and the sensitivity and capacity of the particular landscape to accommodate this type of development.

Cumulative Landscape Methodology

8.8.2 The methodology for the cumulative landscape assessment is based on that described in SNH guidance: Assessing the Cumulative Impact of Onshore Wind Energy proposed development, SNH, March 2012. The assessment considers the potential for combined effects to designated landscapes and LCTs relating to the addition of the proposed development to the baseline wind energy development scenario which may be experienced both from static locations and whilst moving through the landscape.

8.8.3 The cumulative assessment considers the landscape character of the LCTs and designated landscapes identified for inclusion in the landscape character assessment. However, areas identified as likely to have a negligible effect in the landscape assessment have not been included as a negligible effect could not contribute to a significant cumulative effect. Areas are evaluated using a tabular format in accordance with the process outlined below.

8.8.4 The cumulative landscape assessment has involved five key stages:

- Evaluation of the capacity of the identified landscape to accommodate wind farm development;
- Identification and analysis of the baseline wind energy development scenario;
- Evaluation of the cumulative landscape sensitivity to change;
- Evaluation of the potential magnitude of landscape change to the baseline scenario resulting from the proposed development;
- Assessment of the potential cumulative landscape effects arising from the addition of the proposed development to the baseline scenario.

Evaluation of Landscape Capacity

8.8.5 SNH guidance on cumulative assessment describes the need for an understanding of whether the proposed wind farm crosses the threshold of acceptability for the total number of wind farms in an area. The capacity of the landscape to accommodate multiple wind farms has been evaluated using baseline data collected during the landscape assessment. Consideration has been given to the scenic quality, value and sensitivity to change of the relevant designated site or LCT. The Argyll and Bute Landscape Wind Energy Capacity Study (Carol Anderson Landscape Architects, 2017) has also been consulted to inform the identification of the cumulative capacity value.

8.8.6 A cumulative capacity value has been attributed to each area based on a three point scale from High to Low as follows:

Table 8.7: Cumulative Capacity Value Criteria

Cumulative Capacity Value	Criteria
High	The landscape has the potential to accommodate multiple wind farms/wind turbines without significant loss of key characteristics or features.
Medium	The landscape has the potential to accommodate some wind farms/wind turbines but there is the potential for key characteristics or features to be locally dominated or eroded by the presence of wind turbines.
Low	The landscape would have few opportunities for wind farm/wind turbine development which would not dominate or erode key characteristics or features.

Evaluation of the Baseline Wind Energy Development Scenario

8.8.7 Baseline information on operational, consented and proposed (application) wind developments within the 60 km cumulative search area has been collected and the baseline wind energy development scenario defined, as detailed in Section 8.2.

Evaluation of the Cumulative Landscape Sensitivity to Change

8.8.8 An evaluation of sensitivity to change has been attributed to each landscape designation and LCT based on analysis of the actual baseline scenario in relation to the identified capacity value of the landscape to accommodate wind farm development. This is based on a three point scale from High to Low as detailed in Table 8.8 below.

Table 8.8: Cumulative Landscape Sensitivity	
Cumulative Landscape Sensitivity	**Criteria**
High	The baseline wind farm/wind turbine scenario is very close to or achieves the identified capacity of the area resulting in little opportunity for additional development without significant effects occurring.
Medium	The baseline wind farm/wind turbine scenario leaves some opportunity for additional development within the landscape without significant effects resulting.
Low	The baseline wind farm/wind turbine scenario leaves considerable opportunity for additional development within the landscape without significant effects resulting.

Evaluation of the Cumulative Magnitude of Landscape Change

8.8.9 Magnitude of change concerns the measurement of change which would occur due to the addition of the proposed development into the baseline wind development scenario. This is identified based on the consideration of the potential nature, size, scale and location of the proposed change within the context of the existing baseline scenario. The evaluation of the magnitude of change is based on the criteria outlined in the main landscape assessment methodology.

Assessment of Potential Cumulative Landscape Effects

8.8.10 Assessment of potential cumulative effects is based on analysis of the relationship between the cumulative sensitivity to change and the magnitude of change and is made using a degree of professional judgement. It should be noted that the cumulative effect assessed is the result of the addition of the proposed development to the existing baseline scenario. In this case, this also includes the removal of the existing Tangy I and II turbines, which would be replaced by the proposed development. Cumulative landscape effects are assessed against the scale detailed in Table 8.9 below.

Table 8.9: Cumulative Landscape Effect	
Cumulative Landscape Effect	**Criteria**
Major	The addition of the proposed development to the cumulative baseline scenario would result in the capacity of the landscape to accommodate wind energy development being reached and the combined appearance of wind turbines in the landscape becoming a dominant and character defining feature.
Moderate	The addition of the proposed development to the cumulative baseline scenario would increase the appearance of wind turbines in the landscape to the extent that they may become locally dominant, but the proposed development would not exceed the overall capacity of the landscape to accommodate wind energy development.
Minor	The addition of the proposed development to the cumulative baseline scenario would add to the appearance of wind turbines in the landscape but would not result in a noticeable change to key landscape characteristics.
Negligible	The addition of the proposed development to the cumulative baseline scenario would not result in any discernible increase in the appearance or dominance of wind turbines in the landscape.

8.8.11 The above criteria and levels of significance represent points on a continuum. Where required, interim ratings, such as minor-moderate, have been used to indicate the anticipated significance of effect.

8.8.12 For the purposes of the assessment, effects with a rating of moderate or above are significant in the context of the EIA regulations.

Limitations of Cumulative Landscape Assessment

8.8.13 Due to the uncertainty of construction activity timing for the proposed development and other such activity, temporary structures, tracks and activity relating to construction have not been considered within the cumulative assessment. The cumulative assessment therefore focuses on the potential effects during operation relating to the main permanent structures (wind turbines).

8.8.14 Sites at Scoping stage have not been included within the assessment due to the uncertainty as to whether such proposals will continue through the planning process and the lack of certainty regarding the form such proposals would take (thereby preventing meaningful assessment).

8.8.15 Since the number of wind energy development applications made or withdrawn changes frequently, the cumulative baseline scenario is representative of the situation between 12th and 14th February 2018. All new applications, applications withdrawn and addendums to current projects taken place since this period have therefore not been considered in this assessment.

8.8.16 The cumulative assessment has considered only those wind turbine developments of 30 m tip height or greater as it is considered that smaller turbines would be unlikely to result in significant cumulative effects in association with the proposed development.

Cumulative Baseline Scenario

8.8.17 The cumulative baseline scenario comprises 28 operational, consented/under construction and proposed (application/appeal) wind developments within 60 km of the proposed development, as illustrated on Figure 8.4 and detailed in Appendix 8.7. As noted in limitations above, these developments have been identified following a review of data from Argyll and Bute Council, North Ayrshire Council and South Ayrshire Council within the 60 km search area between 12th and 14th February 2018; only those developments with turbines of 30 m tip height and above are included; and sites at Scoping stage are excluded.

8.8.18 Due to the nature of the proposed development being the re-powering of an existing site, the following should be noted:

- The existing Tangy I and II Wind Farm forms part of the cumulative baseline scenario. The removal of these turbines forms part of the proposed development and is therefore considered as part of the cumulative landscape assessment; and
- The consented Tangy III Wind Farm is excluded from the cumulative baseline scenario, as it would not be present in conjunction with the proposed development. Its inclusion would therefore be misleading.

8.8.19 Cumulative ZTVs showing the visual envelope of the proposed development and those of cumulative wind developments have been produced to identify areas of combined and sequential visibility (refer to Figures 8.10.1 to 8.10.4.13). These demonstrate that the cumulative baseline scenario is one of relatively widespread visibility of wind farms within the 40 km study area and the wider landscape beyond.

Cumulative Landscape Effects Evaluation

8.8.20 The detailed cumulative assessment of LCTs and landscape designations is presented in Appendix 8.8. The following section provides a summary of the results and key issues highlighted by the assessment. As detailed in paragraph 8.8.3, only those designated areas and LCTs identified as having a minor effect or greater in the main landscape character assessment have been included in the cumulative assessment.

Landscape Designations

8.8.21 Two designated landscapes have been considered in the cumulative assessment:

- Mull of Kintyre APQ; and
- West Coast of Kintyre APQ.

8.8.22 The assessment has identified that the cumulative landscape effect on both areas would be **not significant** in terms of the EIA Regulations. The potential effects are summarised as follows:

Mull of Kintyre APQ

8.8.23 Under the cumulative baseline scenario, this APQ is predominantly influenced by a series of developments along the hills in the north which would be seen from high points and along the APQ's northern border including Tangy I and II, Beinn and Tuirc 1, 2 and 3 and, more distantly Achadaduie and Blary Hill. The proposed development would replace Tangy I and II within this context. The proposed development would appear larger and closer than the cumulative baseline sites and there would be small areas of new intervisibility with wind development. This may slightly increase the influence of wind energy development on the northern fringes of the APQ.

8.8.24 The effect is assessed as being **minor** on this APQ which is considered **not significant** in terms of the EIA Regulations.

West Coast of Kintyre APQ

8.8.25 This cumulative baseline scenario would result a variety of wind farm developments indirectly influencing this APQ. Gigha and Gigha Extension have the greatest influence, being seen within the coastal context. Other wind farms may appear within the inland context intermittently with the northern part of the APQ being most affected by Killean Estate and Clachaig Glen and the southern part being infrequently influenced by Tangy I and II and occasionally Beinn and Tuirc 1, 2 and 3 or Achadaduie seen through glens. The proposed development would replace Tangy I and II within this context but would be larger and more prominent. The appearance of the proposed development is limited to the southern part of the APQ whilst other sites are more prominent in the north. This would result in wind turbines within the inland landscape being a relatively frequent feature throughout the APQ but this would not be a notable change, as the existing Tangy I and II turbines are already present, although to a lesser degree.

8.8.26 The cumulative effect on this APQ has been assessed as being **minor-moderate** and **not significant** in terms of the EIA Regulations.

Landscape Character

8.8.27 Four LCTs have been considered in the cumulative assessment as follows:

- Bay Farmland;
- Rocky Mosaic;
- Sand Dunes and Machair; and
- Upland Forest-Moor Mosaic.

8.8.28 Of these areas, two were assessed as having a potential cumulative landscape effect which would be potentially **significant** in terms of the EIA Regulations and two were assessed as having an effect would be **not significant**. These effects are summarised as follows:

Potential Significant Cumulative Effects to LCTs

Rocky Mosaic LCT

8.8.29 This LCT is in six separate units within the detailed study area. Effects to those units in the south and east of the detailed study area were found to be **not significant**. Effects on the western coastal unit have been assessed as potentially **significant**.

8.8.30 In the western coastal LCT unit an area around Glenbarr has the greatest influence from the cumulative baseline sites with Achadaduie and Blary Hill being prominent and close in the eastern context and Beinn and Tuirc 1 beyond them. Further influence is experienced by Killean Estate, Clachaig Glen and Airigh to the north, Gigha and Gigha Extension to the west and Tangy I and II to the south. Further down the coast, Tangy I and II continues to be occasionally evident to the south and Gigha within the coastal context to the north. The proposed development would replace Tangy I and II within this baseline context and would appear similar, but larger and more frequently seen from the raised beach and elevated farmland areas. This would result in turbines being more prominent in southerly views forming a greater impression of surrounding from the northern area around Glenbarr and resulting in turbines being a more frequent feature of the landscape when moving through the LCT unit.

8.8.31 The cumulative effect on this LCT has therefore been assessed as **moderate** and **significant** in terms of the EIA Regulations for the western coastal unit, and **minor** and **negligible** for southern and eastern units respectively, both considered to be **not significant**.

Upland Forest-Moor Mosaic LCT

8.8.32 Most of the cumulative baseline sites are set within the northern unit of this LCT with Beinn an Tuirc 1, 2 and 3, Blary Hill, Achadaduie and Tangy I and II within the detailed study area and Clachaig Glen, Killean Estate and Deucharan Hill indirectly affecting it from outwith the detailed study area. These baseline sites have considerable influence on the character of the LCT, particularly its northern part although the southern part is often influence only by Tangy I and II and to some extent Beinn an Tuirc 3. The proposed development would replace Tangy I and I within this LCT. There would be a smaller number of turbines but these would be larger and cover a greater footprint. In the south part of the LCT unit this may give an impression of drawing wind energy development closer to the foothills and glens north of Campbeltown and would slightly increase the area within which wind turbines would be evident; into Glen Lussa for example. Further north the effect would be lesser due to reduced visibility of the proposed development and the greater influence of other sites. However, in some locations, the larger turbines would be more prominent and may give a greater sense of being surrounded.

8.8.33 From the southern LCT unit the proposed development would replace Tangy I and II but would appear closer, and larger, slightly increasing the perception of wind turbines on the northern hills. This may potentially contribute to a greater distinction between the two LCT units with one being defined by presence of wind energy development and the other by its absence.

8.8.34 The cumulative effect on this LCT has been assessed as **moderate** and **significant** in terms of the EIA Regulations.

Cumulative Effects to LCTs considered to be Not Significant

8.8.35 For all remaining LCTs within the detailed study area (including the Bay Farmland, Sand Dunes and Machair and southern and eastern units of the Rocky Mosaic LCT), the cumulative effect has been assessed as between **negligible** and **minor-moderate**. These effects are **not significant** in terms of the EIA Regulations. Whilst there may be a perceptible increase in the influence of wind energy development within the surrounding context of these areas, this is considered unlikely to result in wind turbines becoming a greater character defining feature of these LCT areas.

Summary of Cumulative Landscape Effects

8.8.36 The cumulative landscapes effects identified for the proposed development are summarised in Table 8.10 below.

Table 8.10: Summary of Cumulative Landscape Effects on Landscape Designations and LCTs

Landscape Designations	Potential Effect (Not Significant)			Potential Effect (Significant)		
	Negligible	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
Mull of Kintyre APQ		X				
West Kintyre Coast APQ			X			
LCT						
Bay Farmland			X			
Rocky Mosaic	X(L)	X(L)		X(L)		
Sand Dunes and Machair		X				
Upland Forest-Moor Mosaic				X		

L – donates that the effect would be localised to only part of the resource within the study area.

8.9 Visual Assessment Methodology

8.9.1 As previously noted, while following a similar process, the landscape character and visual impact assessments are separate components of an LVIA. The following sections relate to the methodology for visual assessment only.

Establishing the Visual Amenity Baseline

8.9.2 Determining the visual amenity baseline condition is necessary in order to understand the views available and experienced in the study area, as well as how sensitive these are to the proposed change. The baseline described has been determined through a combination of desk study, site appraisal and consultation (refer to Appendix 8.4 and Section 8.7).

Establishing the Zone of Theoretical Visibility

8.9.3 The ZTV defines the effective boundaries within which views of the proposed turbines could potentially be obtained. As detailed in Appendix 8.1 (Technical Methodologies), the ZTV has been prepared using ArcGIS (Version 10.3). This produces an analysis of a computer-based model that uses landform as the key determinant of availability or obstruction of view. The landform model is based on Ordnance Survey (OS) Terrain 5 digital terrain model (DTM).

8.9.4 It should be noted that the computer model does not take into account features such as trees or woodland, buildings and other structures, or local landform which can vary the ZTV locally and therefore the ZTV is not representative of visual effect in itself. Nevertheless, the ZTV is a useful tool in assisting with the identification of areas of potential visual effect.

Identification of Visual Receptors

8.9.5 For there to be a visual effect, there needs to be a viewer. Individuals experiencing views from locations such as buildings, recognised routeways and popular viewpoints used by the public have been included in this assessment. Those experiencing views are referred to as receptors.

8.9.6 The ZTV for the proposed development was reviewed to aid identification of potential receptors likely to experience visual effects from the proposed development (the methodology and limitations of the ZTV are discussed in Appendix 8.1). Visual receptors identified during the desk-based assessment were then validated by site survey.

8.9.7 Site recording involved the completion of standardised recording forms and annotation of 1:25,000 and 1:50,000 Ordnance Survey plans, supported by a photographic record of views from key receptor locations.

Visual Sensitivity to Change

8.9.8 Sensitivity to change considers the nature of the receptor and the viewing expectation of those using that receptor. The importance of the aspect of the view which would be changed contributes to the sensitivity evaluation.

8.9.9 Sensitivity to the change proposed has been evaluated using a three-point scale, detailed in Table 8.11 below.

Table 8.11: Visual Sensitivity

Visual Sensitivity	**Criteria**
High	Where the appearance of the proposed development would affect or alter an important part of a highly valued, impressive or well composed view with no detracting features.
Medium	Where the appearance of the proposed development would affect or alter a fairly important part of a valued or pleasing view or a notable part of a less well composed view with some detracting features
Low	Where the appearance of the proposed development would affect or alter an unimportant part of the overall view or would affect or alter a view which is of limited value or poorly composed, with numerous detracting features

8.9.10 The scale above does not apply an automatic sensitivity to each receptor type (e.g. all residents at home being of high sensitivity or all employees in the workplace being of medium sensitivity). Such an approach would not allow for consideration of a receptor's available outlook or expectation. As explained in GLVIA3 Paragraph 6.35 (P.114) when discussing sensitivity scales, "*division is not black and white and in reality, there will be a graduation in susceptibility to change. Each project needs to consider … the extent to which (receptor's) attention is likely to be focused on views and visual amenity*".

Magnitude of Change

8.9.11 Magnitude of change concerns the extent to which the existing view would be altered by the proposed development. Magnitude of change has been evaluated using a four-point scale, detailed in Table 8.12 below:

Table 8.12: Magnitude of Visual Change

Magnitude of Visual Change	**Criteria**
High	Where the proposed development would cause a very noticeable change in the existing view
Medium	Where the proposed development would cause a noticeable change in the existing view
Low	Where the proposed development would cause a perceptible change in the existing view
Negligible	Where the proposed development would cause a largely imperceptible change in the existing view

Assessment of Significance of Visual Effects

8.9.12 The level of visual effect identified concerns the importance of changes resulting from the proposed development. Evaluation of the effect and determination of significance is based on consideration of the magnitude of change in relation to sensitivity, taking into account proposed mitigation measures, and is established using professional judgement. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

8.9.13 The prominence of the proposed development in the view will vary according to the prevailing weather conditions. The assessment has been carried out, as is best practice, by assuming the 'worst case' scenario i.e. on a clear, bright day in winter, when neither foreground deciduous foliage nor haze can interfere with the clarity of the view obtained.

8.9.14 Although relatively common practice for some LVIA, the use of matrices in determining effect significance has not been promoted as recommended practice in GLVIA3 (nor the previous edition). As explained in Section 8.5.3, use of professional judgement is now promoted as a more appropriate means of determining significance. Significance has been evaluated using the scale detailed in Table 8.13 below.

Table 8.13: Visual Effect

Visual Effect	**Criteria**
Major	The proposed development would become a prominent and very detracting feature and would result in a very noticeable deterioration to an existing highly valued and well composed view.
Moderate	The proposed development would introduce some detracting features to an existing highly valued view or would be more prominent within a pleasing or less well composed view, resulting in a noticeable deterioration of the quality of view.
Minor	The proposed development would form a perceptible but not detracting feature within a pleasing or valued view or would be a prominent feature within a poorly composed view of limited value, resulting in a small deterioration to the existing view.
Negligible	The proposed development would form a barely perceptible feature within the existing view and would not result in any discernible deterioration to the view.

8.9.15 The above criteria and levels of significance represent points on a continuum. Where required, interim ratings, such as minor-moderate, have been used to indicate the anticipated significance of effect.

8.9.16 For the purposes of the assessment, effects with a rating of moderate or above are significant in the context of the EIA regulations.

Limitations of the Visual Assessment

8.9.17 The use and limitations of ZTV diagrams is explained in Appendix 8.1. The scope of assessment is defined in Section 8.2 where key assumptions for the LVIA are set out. Limitations of the cumulative visual assessment are noted in the cumulative visual methodology

8.9.18 During site visits, the assessment of visual effects has been undertaken from public roads, footpaths or open spaces for each receptor and assumptions have been made, in the case of settlements for example, about the types of rooms and about the types and importance of views from these rooms. For there to be a visual effect, there is the need for a viewer and therefore only buildings that are in use have been assessed. Derelict buildings or those considered to be unoccupied at the time of the survey were not assessed.

8.9.19 Wireline diagrams generated using the software 'Resoft Windfarm' (Version 4.2.5.2) and 'True View Visuals' have also been used as a tool to aid assessment, to illustrate potential views from receptors. However, as with ZTV diagrams, they represent a 'bare ground' model and do not show all intervening obstructions, surface features or context; hence the advantage of pairing them with baseline photography.

8.10 Baseline Visual Conditions

8.10.1 The baseline landscape and its broad visual context are described in the relevant sections above. Visual receptors included in this assessment are identified in this section. Appendix 8.3 details the scope of the visual assessment scope and contains an explanation of which receptors have been included and excluded from the assessment.

8.10.2 As described in paragraph 8.2.7, there are various operational wind farms in the study area. The visual assessment baseline therefore includes the operational wind farms illustrated on Figure 8.4 and listed in Appendix 8.4, but not consented or application sites.

Visual Receptors

8.10.3 As outlined in Appendix 8.1, a ZTV for the proposed development (calculated at maximum blade tip height of 150m) was established to identify areas of potential visibility. A review of the ZTV, in conjunction with an initial site appraisal led to the identification of visual receptors within the 40 km study area:

- at Viewpoints;
- in Settlements; and
- on Routes.

Receptors at Viewpoints

8.10.4 27 viewpoints within the 40 km study area have been identified in consultation with Argyll & Bute Council, SNH and ECU for inclusion in the visual assessment. These viewpoints are intended to be representative of the views obtained by visual receptors in the area within which they are located or illustrative of worst-case views from the locality. Refer to Appendix 8.3 for details of the selection process and details on photography, and for reference, relevant Tangy III VP numbering. Details of the chosen viewpoints are provided in Table 8.14 below and the locations are shown on Figure 8.10.1 – 8.10.2.

8.10.5 For all land-based viewpoints, baseline panoramas, wirelines (including cumulative wirelines) and photomontages have been produced as per the current guidance, Visual Representation of Windfarms (SNH, 2017, Version 2.2). For water-based viewpoints (VPs 4, 16, 24), single frame baseline photographs and wirelines (including cumulative wirelines) have been produced for reference purposes, as agreed in consultation with SNH and as previously produced in Tangy III ES (2014). Details of visualisation production is included in Appendix 8.1 (Technical Methodologies). Visualisations are provided in Figures 8.9.1.1 to 8.9.27.5.

Table 8.14: Viewpoints included in Visual Assessment

Viewpoint		**OS Grid Reference**	**Reason for Inclusion**
VP 1	A83 at Glenbarr Burial Ground	166435, 634642	To represent views from the A83 road in the APQ and illustrate views from burial ground. (See Figures 8.9.1.1-5)
VP 2	Glenbarr War Memorial	167006, 637068	To represent views from northern Glenbarr settlement and illustrate views from receptors visiting this memorial or travelling along the A83, to the north of the site. (See Figures 8.9.2.1-5)

Table 8.14: Viewpoints included in Visual Assessment			
Viewpoint		**OS Grid Reference**	**Reason for Inclusion**
VP 3	Barr Glen	167811, 637021	To represent views from the public road and scattered properties in the western part of Glen Barr (but is not representative of views from Glenbarr settlement), to the north of the proposed development. (See Figures 8.9.3.1-5)
VP 4	Islay Ferry Route	157264, 651562[1]	To illustrate views from a point on the ferry route between Kennacraig and Port Ellen (Islay), an important transport route for residents and tourists, to the north-west of the proposed development. (See Figures 8.9.4.1-4)
VP 5	Gigha (South Pier)	164358, 646336	To illustrate open views from the coast of southern Gigha, on the South Pier, to the north of the proposed development (but is not representative of views from Ardminish). (See Figures 8.9.5.1-5)
VP 6	Machrihanish (Little Scone)	163578, 620717	To represent views from Machrihanish settlement, taken from a coastal location by Little Scone and the B843, to the south-west of the proposed development. (See Figures 8.9.6.1-5)
VP 7	Stewarton	169658, 619904	To illustrate open views from Stewarton settlement, at the junction between the B842 and B843 roads, to the south of the proposed development. (See Figures 8.9.7.1-5)
VP 8	Southend Road	168430, 617436	To represent elevated views from the B842 approaching Stewarton, including some nearby scattered properties with similar views, to the south of the proposed development. (See Figures 8.9.8.1-5)
VP 9	Campbeltown (Ralston Road).	171240, 619830	To illustrate open views from south-western periphery of Campbeltown, to the south-east of the proposed development (but is not representative of views from most of Campbeltown). (See Figures 8.9.9.1-5)
VP 10	Beinn Ghuilean	172081, 618567	To illustrate elevated views from a hillside seating area south of Campbeltown and south-east of the proposed development. (See Figures 8.9.10.1-5)
VP 11	High Peninver	175049, 625512	To illustrate views from a rural glen and local road to the east of the proposed development. (See Figures 8.9.11.1-5)
VP 12	Bord a Dubh (Kintyre Way)	172677, 631495	To illustrate views from an elevated point north-east of the proposed development on the Kintyre Way near Bord a Dubh, which include views of Lussa Loch (on the Carradale Campbeltown section). (See Figures 8.9.12.1-5)
VP 13	A' Cruach (Kintyre Way)	175480, 632209	To illustrate views from an elevated point north-east of the proposed development on the Kintyre Way near A'Chruach (on the Carradale to Campbeltown section), within coniferous plantation. (See Figures 8.9.13.1-5)

[1] Coordinate amended since Tangy III ES 2014 and Tangy IV Scoping (in line with ES 2014 Tangy III LVIA Figure 8.9.4a-b)

Table 8.14: Viewpoints included in Visual Assessment

Viewpoint		OS Grid Reference	Reason for Inclusion
VP 14	Allt a Choire	172512, 627307	To illustrate a glimpsed view from an elevated point east of the proposed development within coniferous forest plantation on a forestry track, which was previously signposted as part of the Kintyre Way. (See Figures 8.9.14.1-5)
VP 15	Ballywilline (Kintyre Way)	171121, 623637	To illustrate views from a local road and the Kintyre Way to the south-east of the proposed development, including views from those properties at Calliburn with similar views. (See Figures 8.9.15.1-5)
VP 16	Kilbrannan Sound	182725, 620605[2]	To illustrate views from a point on the ferry route between Ardrossan and Campbeltown, an important transport route for residents and tourists, to the south-east of the proposed development. (See Figures 8.9.16.1-4)
VP 17	Breakachy	167131, 626896	To represent close-range elevated views from the south-west of the proposed development. (See Figures 8.9.17.1-5)
VP 18	Skeroblingarry (Kintyre Way)	170855, 626808	To represent views from a section of public road and the Kintyre Way near Skeroblin Cruach, to the south-east of the proposed development. (See Figures 8.9.18.1-5)
VP 19	Drumlemble	166311, 619742	To represent views from northern periphery of Drumlemble settlement on the A83 road, to the south of the proposed development. (See Figures 8.9.19.1-5)
VP 20	Rhunahaorine Point (Kintyre Way)	169198, 648901[3]	To represent distant views from a beach on the west Kintyre coast to the north of proposed development on the Kintyre Way. (See Figures 8.9.20.1-5)
VP 21	B842 North of Peninver	176185, 625499	To illustrate views from a short section of the coastal B842 road to the east of the proposed development and views from some scattered properties to the north of Peninver settlement. (See Figures 8.9.21.1-5)
VP 22	Campbeltown Airport	168416, 622058	To illustrate views from a transport hub arrival/departure point, to the south of the proposed development. (See Figures 8.9.22.1-5)
VP 23	Beinn Bharrain	189510, 642235	To illustrate elevated views from a mountain summit on Arran, to the north-east of the proposed development. (See Figures 8.9.23.1-5)
VP 24	Sea near Machrihanish	164727, 625567[4]	To illustrate views from water-users in Machrihanish Bay, to the south-west of the proposed development. (See Figures 8.9.24.1-4)
VP 25	Ranachan Hill	168901, 624998	To illustrate elevated views from a nearby high point to the south of the proposed development. (See Figures 8.9.25.1-5)

[2] Coordinate amended since Tangy III ES 2014 and Tangy IV Scoping (in line with ES 2014 Tangy III LVIA Figure 8.9.19a-b)
[3] Coordinate amended since Tangy III ES 2014 and Tangy IV Scoping (in line with ES 2014 Tangy III LVIA Figure 8.9.23a-c)
[4] Coordinate amended since Tangy III ES 2014 and Tangy IV Scoping

Table 8.14: Viewpoints included in Visual Assessment			
Viewpoint		**OS Grid Reference**	**Reason for Inclusion**
VP 26	Westport Beach	165467, 626294	To illustrate worst-case views from the north-eastern end of Westport Beach (but not representative of views from most of the beach). (See Figures 8.9.26.1-5)
VP 27	Machrihanish Dunes	165901, 624231	To represent views from Machrihanish Dunes golf course, taken from near clubhouse. (See Figures 8.9.27.1-5)

8.10.6 Wirelines for three additional viewpoints have been included in Figures 8.11.1.1 to 8.11.3.2. These three viewpoints (Ballygrogan Picnic Site, Goatfell and Kilberry Road) are not included in this visual assessment but have been included for reference purposes in agreement with consultees since they were assessed in the Tangy III ES (2014).

Receptors in Settlements

8.10.7 The visual assessment also considers receptors in settlements identified in the local authority development plans within the 40 km study area and, where applicable, comments have been made to include receptors in scattered properties near settlements. Settlement names reflect those in the local development plans. Receptors in the following settlements are included in the visual assessment (refer to Appendix 8.3 for details of the selection process):

- Ardminish (Gigha);
- Campbeltown;
- Drumlemble;
- Glenbarr;
- Kilchenzie;
- Killeonan/Knocknaha;
- Machrihanish;
- Peninver;
- RAF Machrihanish; and
- Stewarton.

Receptors on Routes

8.10.8 The visual assessment considers receptors on major transport and recreational routes identified in within the 40 km study area; and core paths within the 11 km study area. Receptors on the following routes are included in the visual assessment (refer to Appendix 8.3 for details of the selection process):

- A83, including Core Path C304;
- B842, including Core Path C084 and part of NCR78;
- B843 and Core Path C085;
- Kennacraig to Port Askaig (Islay) Ferry;
- Kennacraig to Port Ellen (Islay) Ferry;
- Ardrossan to Campbeltown Ferry;
- Tayinloan to Ardminish (Gigha) Ferry;
- Kintyre Way: Clachan to Tayinloan;
- Kintyre Way: Tayinloan to Carradale;

- Kintyre Way: Carradale to Campbeltown and Section of Core Path C088;
- Kintyre Way: Campbeltown to Dunaverty and Section of Core Path C081;
- Kintyre Way: Southend to Machrihanish and Section of Core Path C090;
- Core Path C089;
- Core Path C086;
- Core Paths C087, C447 & C448;
- Core Path C082; and
- Core Path C083.

8.10.9 Potential effects have been assessed for receptors on each of these routes (refer to Appendix 8.6) and a further description of the potential significant effects is provided in Section 8.12.

Modifying Influences

8.10.10 The prevalence of coniferous forest plantation in the study area will result in a landscape which is regularly changing. This has the potential at alter perception of the proposed development, particularly affecting visibility of turbine elements. Forestry plans and practices have been considered as part of the assessment process.

8.11 Visual Effects Evaluation

Receptors at Viewpoints

8.11.1 Receptors at 27 viewpoints within the 40 km study area have been included in this assessment. The locations for these are shown on Figure 8.7 and visualisations are shown on Figures 8.9.1 to 8.9.27. Assessment for receptors at these viewpoints is contained in Appendix 8.6 and is summarised below in Table 8.15.

Table 8.15: Summary of Viewpoint Assessment

Viewpoint		**Visual Effect (During Construction & Operation)**	**Visual Effect Significance (During Construction & Operation)**
VP1	A83 at Glenbarr Burial Ground	Moderate-Major	Significant
VP2	Glenbarr War Memorial	Moderate	Significant
VP3	Barr Glen	Moderate	Significant
VP4	Islay Ferry Route	Negligible	Non-significant
VP5	Gigha (South Pier)	Minor –Moderate	Non-significant
VP6	Machrihanish (Little Scone)	Moderate	Significant
VP7	Stewarton	Moderate	Significant
VP8	Southend Road	Moderate	Significant
VP9	Campbeltown (Ralston Road)	Minor-Moderate	Non-significant
VP10	Beinn Ghuilean	Moderate	Significant
VP11	High Peninver	Moderate-Major	Significant
VP12	Bord a Dubh (Kintyre Way)	Moderate	Significant
VP13	A' Cruach (Kintyre Way)	Moderate	Significant
VP14	Allt a Choire	Minor-Moderate	Non-significant
VP15	Ballywilline (Kintyre Way)	Moderate	Significant

Table 8.15: Summary of Viewpoint Assessment

Viewpoint		Visual Effect (During Construction & Operation)	Visual Effect Significance (During Construction & Operation)
VP16	Kilbrannan Sound	Minor	Non-significant
VP17	Breakachy	Major (in construction); Moderate-Major (in operation)	Significant
VP18	Skeroblingarry (Kintyre Way)	Minor	Non-significant
VP19	Drumlemble	Moderate	Significant
VP20	Rhunahaorine Point (Kintyre Way)	Negligible	Non-significant
VP21	B842 North of Peninver	Minor	Non-significant
VP22	Campbeltown Airport	Minor	Non-significant
VP23	Beinn Bharrain	Negligible-Minor	Non-significant
VP24	Sea near Machrihanish	Moderate	Significant
VP25	Ranachan Hill	Major (in construction); Moderate-Major (in operation)	Significant
VP26	Westport Beach	Negligible	Non-significant
VP27	Machrihanish Dunes	Moderate	Significant

8.11.2 Receptors at viewpoints outside of the 11 km study area and at viewpoints more contained by landform and/or coniferous forest plantation (11 of 27 viewpoints) were identified as likely to receive **non-significant** visual effects.

8.11.3 Receptors at viewpoints located within approximately 10.8 km (16 of 27 viewpoints) were identified as likely to receive **significant** visual effects during construction and operation. For receptors at these viewpoints, the proposed development would be noticeable in valued parts of the view, and from most locations would be seen where the existing Tangy I and II is currently visible. Whilst the proposed turbines would be larger in scale than the existing Tangy I and II turbines (where visible), they would frequently be perceived as a small part of the overall view. A summary of the assessment for receptors at these viewpoints are detailed in the following section.

VP1: A83 at Glenbarr Burial Ground

8.11.4 This VP represents views from the A83 in the APQ and illustrates views from the burial ground to the north of the proposed development. Visualisations are presented in Figures 8.9.1.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 4.9 km.

8.11.5 The principal view for travellers is in the direction of travel (i.e. north or south). Main views for other receptors at this location are panoramic, towards the sea to the north, west and south, along the coast. The blades of existing Tangy I and II turbines are visible on the skyline to the south. The settlement of Bellochantuy is also visible to the south. The walled burial ground features in the foreground of westerly coastal views with a distinctive Victorian gothic style gate. Islay and Jura are visible on the horizon to the north-west and views to the east are contained by bluff slope. Given the existing visibility of wind turbine blade tips in main views towards Tangy, it is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.6 The number of turbines theoretically visible and the horizontal spread of the wind farm in southerly main views above bluff slopes would be unchanged when compared to the existing wind farm, although the increased scale of the turbines would result in blade hubs as well as blade tips being visible and they would appear noticeably larger and prominent in the view than existing

Tangy I and II turbines. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.7 Therefore, there would be a medium-high magnitude of change and **moderate-major** and **significant** visual effect during construction and operation.

VP2: Glenbarr War Memorial

8.11.8 This VP represents views from northern Glenbarr settlement and illustrates views from receptors visiting this memorial or travelling along the A83, to the north of the proposed development. Visualisations are presented in Figures 8.9.2.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 7.2 km.

8.11.9 The principal view for travellers is in the direction of travel (i.e. north or south). Main views for other receptors at this location are panoramic, but focussed south and north. In main elevated views to the south, the road drops down towards the mouth of Glen Barr with rolling pasture and settlement visible either side of this and existing Tangy I and II turbines visible on the skyline above the coniferous plantation. In main elevated views to the north, the road slopes down and along the coast, through fields. In side views to the east, the monument is the primary focus in the foreground, and turbines at Beinn an Tuirc Phase 1 can be seen inland, on the skyline. In side views to the west, views are over fields towards the sea with Gigha, Jura and Islay visible in the distance, including existing turbines on Gigha. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.10 The number of turbine tips and hubs theoretically visible would decrease while the horizontal spread of the wind farm in southerly main views would increase when compared to the existing wind farm. The increased scale of the turbines would result in blade hubs as well as blade tips being visible above plantation on the skyline. The proposed turbines would appear noticeably larger than the existing Tangy I and II turbines in main views but would be a small part of the overall panoramic view. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be perceptible.

8.11.11 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP3: Barr Glen

8.11.12 This VP represents views from the public road and scattered properties in the western part of Glen Barr (but is not representative of views from Glenbarr settlement), to the north of the proposed development. Visualisations are presented in Figures 8.9.3.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 7.1 km.

8.11.13 Main views are channelled along the valley: north-east along the valley and south-west along the valley towards the sea. In views to the south-west, some existing Tangy I and II turbines are visible to the south as blade tips on the skyline, partially screened by coniferous forest plantation. In views to the north-east, wind turbines at Beinn an Tuirc Phase 1 are clearly visible on this skyline. Side views across the valley are of mixed woodlands, agricultural fields, scattered farmsteads, conifer plantations and open moorland. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.14 The proposed turbines would be visible as blades and some hubs above coniferous forest plantation on the skyline and would be noticeably larger than the existing turbines. The horizontal spread of the wind farm in southerly views would increase when compared to the existing wind farm. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.15 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP6: Machrihanish (Little Scone)

8.11.16 This VP represents views from Machrihanish settlement, taken from a coastal location by Little Scone and the B843, to the south-west of the proposed development. Visualisations are presented in Figures 8.9.6.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 8.3 km.

8.11.17 Main views are to the north across Machrihanish Bay along the sandy beach and west coastline of Kintyre. Views include scattered properties along the distant coast and more concentrated development visible at Campbeltown airport and RAF Machrihanish. The southern edge of Kintyre's interior upland forms the skyline beyond with large blocks of conifer woodland and the existing Tangy I and II Wind Farm visible on the skyline. Oblique, side and rear views also include buildings of Machrihanish settlement and the B843 road. Side and oblique views to the north-west and west extend across the sea, including the islands of Gigha, Islay and Jura. It is considered that there would be a high sensitivity to change from this viewpoint.

8.11.18 The proposed turbines would be visible in main northerly views on the skyline in front of coniferous forest plantation. The number of turbines theoretically visible would decrease while the horizontal spread would increase when compared with the existing wind farm. The composition of the wind farm would be an improvement to the existing turbines, however, they would appear noticeably larger in the view than the existing Tangy I and II turbines. Construction activities would be visible in main views and it is also likely that the removal and replanting of conifer plantation and some ancillary elements such as transformers may be perceptible. However, given the intervening distance it is not likely that access tracks would be seen, following ground reinstatement measures.

8.11.19 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP7: Stewarton

8.11.20 This VP illustrates open views from Stewarton settlement, at the junction between the B842 and B843 roads, to the south of the proposed development. Visualisations are presented in Figures 8.9.7.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 8.5 km.

8.11.21 The main views from this VP are to north across Aros Moss, over pasture, scattered farms towards the distinct Ranachan Hill. Blades of an existing turbine at Tangy I and II can be seen on this skyline, above coniferous plantation. Two existing turbines are present in the foreground and Campbeltown airport and associated infrastructure are in the midground. Side and rear views to the east and south are largely contained by local topography and nearby housing. It is considered that sensitivity to change would be medium from this viewpoint.

8.11.22 The proposed turbines would be visible in main northerly views on the skyline. The number of turbine tips theoretically visible would increase, while the number of hubs theoretically visible would decrease when compared with the existing wind farm. The increased scale of the turbines would be more prominent on the skyline and would occupy a larger part of the view either side of Ranachan Hill. They would be seen above two existing domestic scale wind turbines in the foreground. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.23 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP8: Southend Road

8.11.24 This VP represents elevated views from the B842 approaching Stewarton, including those nearby scattered properties with similar views, to the south of the proposed development. Visualisations are presented in Figures 8.9.8.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 10.8 km.

8.11.25 From this location, the main views are elevated expansive northerly views across Aros Moss. Views are panoramic, but directed north along road and include scattered farmsteads and settlement amongst low flat fields with dry stone walls or post and wire fences. The upland skyline in the distance consists of conifer plantation and moorland. Existing Tangy I and II wind turbines are visible on the skyline to the north, above coniferous forest plantation. Oblique views south-east and north-west are of enclosing foreground hill sides with moorland and/ or enclosed fields. Rear views to south-west are of the elevated road with mature hedgerows and wooded hill skyline in background. It is considered that sensitivity to change would be medium from this viewpoint.

8.11.26 The proposed turbines would be visible in main northerly panoramic views on the skyline. The number of turbines theoretically visible would decrease while the horizontal spread would increase compared to the existing wind farm. The turbines would appear more prominent on the skyline. Other permanent elements of the proposed development (e.g. felling/replanting) and construction activity would be visible, but tracks would not be at this angle.

8.11.27 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP10: Beinn Ghuilean

8.11.28 This VP illustrates elevated views from a hillside seating area south of Campbeltown and south-east of the proposed development. Visualisations are presented in Figures 8.9.10.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 10.5 km.

8.11.29 Main panoramic views are north over Campbeltown, with Campbeltown Loch and Crosshill Loch prominent in views. Beyond this area, there is an attractive juxtaposition between Aros Moss and the upland interior of Kintyre beyond. Existing turbines at Tangy I and II are visible here along with several agricultural scale turbines. To the east, Arran is visible in some conditions but distant. Topography and coniferous plantation contains long range views to the east, south and west. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.30 The proposed turbines would be visible in main panoramic views. The number of turbine tips and hubs theoretically visible would decrease while the horizontal spread would increase compared to the existing wind farm. The turbines would appear larger and more prominent on the skyline than the existing Tangy I and II turbines. Construction activities would be visible in main views but at a distance. It is also likely that the removal of conifer plantation and some ancillary elements such as transformers may be perceptible. However, given the intervening distance it is not likely that access tracks would be seen following reinstatement measures.

8.11.31 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP11: High Peninver

8.11.32 This VP illustrates views from a rural glen and local road to the east of the proposed development. Visualisations are presented in Figures 8.9.11.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 6.9 km.

8.11.33 Main views are channelled along the valley and local road to the east and west. Views to the east are towards the sea and Arran. Views to the west are up the valley towards higher hills, looking across fields of open pasture and woodland blocks near the Lussa Water and scattered farmsteads. The Glen Lussa power station and associated pipeline are visible on the valley floor, and wood pole lines pass through the valley in a variety of directions. Coniferous plantation has been planted on the valley slopes and can be seen extending along the upland interior to the north. Existing Tangy I and II Wind Farm is not visible. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.34 There is currently no visibility of the existing Tangy I and II turbines from this view point, so all changes would represent an increase in visibility when compared with the existing view. The proposed turbine blades and hubs would be very noticeable along the horizon of main, framed westerly views (where existing Tangy I and II turbines are currently not visible). Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.35 Therefore, there would be a medium-high magnitude of change and **moderate-major** and **significant** visual effect during construction and operation.

VP12: Bord a Dubh (Kintyre Way)

8.11.36 This VP illustrates views from an elevated point north-east of the proposed development on the Kintyre Way near Bord a Dubh, which include views of Lussa Loch (on the Carradale to Campbeltown section). Visualisations are presented in Figures 8.9.12.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 4.0 km.

8.11.37 Main elevated views are to the south-west along a forested valley, towards Lussa Loch and loch-side property with meandering river along valley floor. Rear and side views are contained by valley sides and mature plantation. Existing Tangy I and II turbines are not visible. It is considered that there would be a high sensitivity to change from this viewpoint.

8.11.38 There is currently no visibility of the existing Tangy I and II turbines from this view point, so all changes would represent an increase in visibility when compared with the existing view. The proposed turbine blades and hubs would be noticeable on the horizon of main, framed views to the south-west above coniferous forest plantation and they would be relatively large in scale. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.39 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP13: A'Cruach (Kintyre Way)

8.11.40 This VP illustrates views from an elevated point north-east of the proposed development on the Kintyre Way near A'Chruach (on the Carradale to Campbeltown section), within coniferous plantation. Visualisations are presented in Figures 8.9.13.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 6.9 km.

8.11.41 Main elevated views are along a forested valley to the south-west, towards existing Tangy I and II turbines which are visible on the skyline in a dip in the landform and are the focus of the view. Forestry access tracks, blocks of mature trees, open moor and recently planted areas of conifers can be seen across a large area. In side views to the north-west, existing turbines at Beinn an Tuirc 2 are prominent on the skyline. Rear and side views are contained by valley sides and mature plantation. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.42 The proposed turbines would be seen in main views with existing turbines in side views in relatively close proximity (Beinn an Tuirc Phase 2). The number of turbine tips and hubs theoretically visible would decrease while the horizontal spread would increase compared to the existing Tangy I and II Wind Farm. The proposed turbines would appear noticeably larger in the main view, on the skyline than the existing Tangy I and II turbines. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would be barely perceptible.

8.11.43 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP15: Ballywilline (Kintyre Way)

8.11.44 This VP illustrates views from a local road and the Kintyre Way, to the south-east of the proposed development including views from those properties at Calliburn with similar views. Visualisations are presented in Figures 8.9.15.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 5.5 km.

8.11.45 Main views are along the road to the north and south. Main views north are open, over undulating moorland and pastureland to coniferous plantation, above which existing Tangy I and II turbine blades are visible on the horizon. They are small in relation to other landscape features and not a prominent feature within the view. Main views south are towards the intensive agriculture of the low-lying Aros Moss, the western extents of Campbeltown and wooded hills beyond. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.46 The proposed turbine blades and hubs would be visible in main views to the north on the skyline, above coniferous forest plantation. The number of turbine tips and hubs theoretically visible would decrease while the horizontal spread would increase compared to the existing Tangy I and II Wind Farm. They would be more noticeable than the existing turbines and would occupy a larger part of the northerly view. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.47 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP17: Breakachy

8.11.48 This VP represents close-range elevated views from the south-west of the proposed development. Visualisations are presented in Figures 8.9.17.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 1.3 km.

8.11.49 Main views are to the north, towards the existing Tangy I and II turbines which are prominent and nearby in the view. To the north and east, the transition from pastoral fields to open moor and the characteristic plantation of the uplands can be seen clearly. This features a rolling topography with broadleaf woodland adjacent to valleys and scattered farmsteads. There is a narrow view to the nearby coast, channelled west along a valley. Nearby intervening topography prevents this visual connection elsewhere. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.50 The number of turbines theoretically visible and the horizontal spread would be unchanged when compared to the existing Tangy I and II Wind Farm. However, the proposed turbines would be noticeably larger in main views to the north, in close proximity. Construction activity and removal of conifer plantation would be noticeable and some access tracks and ancillary elements such as transformers would be visible.

8.11.51 Therefore, during construction there would be a high magnitude of change and **major** and **significant** visual effect that would reduce in the long term to medium-high magnitude of change and **moderate-major** and **significant** visual effects during operation.

VP19: Drumlemble

8.11.52 This VP represents views from the northern periphery of Drumlemble settlement on the A83 road, to the south of the proposed development. Visualisations are presented in Figures 8.9.19.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 8.5 km.

8.11.53 This viewpoint is at a roadside bus stop within a settlement south of the proposed development. Orientation of properties within the settlement is such that the main view is north across Aros

Moss. This includes flat, low-lying and open pastoral fields with occasional farmsteads and Kintyre's upland interior beyond the distinct hills which mark its southern extent. Campbeltown Airport and existing turbines at Tangy I and II are also in this view. The pattern of open farmland and rounded hills continues to the east. Nearby properties largely contain views to the south and west. It is considered that there would be a high sensitivity to change from this viewpoint.

8.11.54 The proposed turbines would be visible in main northerly views on the skyline and would be noticeably larger in comparison with the existing Tangy I and II turbines. The change in visual composition would also be noticeable. These changes would be seen as part of a panoramic view. Construction activities and the removal of conifer plantation and some ancillary elements such as transformers may be perceptible. However, given the intervening distance it is not likely that access tracks would be seen following ground reinstatement measures.

8.11.55 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP24: Sea near Machrihanish

8.11.56 This VP illustrates views from water-users in Machrihanish Bay, to the south-west of the proposed development. Visualisations are presented in Figures 8.9.24.1-4. The approximate distance between the viewpoint and the nearest visible proposed turbine is 7.2 km.

8.11.57 This is a viewpoint with 360° panoramic main views from open water representative of views for those aboard recreational watercrafts. The nearest view of land is to the west coast of the Kintyre, particularly the beach at Links of Machrihanish. To the north is a more rugged stretch of coastline and the island of Gigha is visible on the skyline. The settlement of Machrihanish is visible to the south and there are also views to the north coast of Ireland. Beyond the links there are views of Campbeltown Airport and associated infrastructure and, to the north, existing turbines at Tangy I and II can be seen. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.58 The proposed turbines would be visible in northerly views on the skyline in front of coniferous forest plantation. They would appear noticeably larger and prominent in the view than the existing Tangy I and II turbines. Construction activities would be visible and it is also likely that the removal of conifer plantation and some ancillary elements such as transformers would be visible. However, given the intervening distance it is not likely that access tracks would be seen following ground reinstatement measures.

8.11.59 Therefore, there would be a medium magnitude of change and **moderate** and **significant** visual effect during construction and operation.

VP25: Ranachan Hill

8.11.60 This VP illustrates elevated views from a nearby high point to the south of the proposed development. Visualisations are presented in Figures 8.9.25.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 3.4 km.

8.11.61 There are 360° panoramic views from this rounded hilltop and open views to the extensive upland interior of Kintyre nearby across a mosaic of moorland and plantation. In views to the north, wind turbines at Tangy I and II and Beinn an Tuirc Phases 1 & 2 are noticeable. In views to the east, a patchwork of undulating moor and improved pasture is visible with scattered farmsteads and a small area of west Arran in the distance. Campbeltown can be seen to the south-west. There are also extensive views across Aros Moss, the settled lowland farmland to the south, with Campbeltown Airport and nearby infrastructure and settlement prominent in views. To the west, the agricultural upland fringe can be seen adjacent to gentle slopes and Machrihanish Bay with Islay on the horizon. Agricultural scale wind turbines are visible here. It is considered that there would be a medium sensitivity to change from this viewpoint.

8.11.62 The proposed turbines would be visible in close proximity and would appear noticeably larger in the scale than the existing Tangy I and II turbines. However, turbine composition would be improved with turbines better spaced and with reduced instances of turbine blades clashing or stacking. The proposed turbine at the left of view would be further inland than that of the existing wind farm, pulling back from the coast and improving the relationship with the upland interior. Removal of conifer plantation would be noticeable and access tracks and ancillary elements such as transformers may be visible.

8.11.63 Therefore, during construction there would be a high magnitude of change and **major** and **significant** visual effect that would reduce in the long term to medium-high magnitude of change and **moderate-major** and **significant** visual effects during operation.

VP27: Machrihanish Dunes

8.11.64 This VP represents views from Machrihanish Dunes golf course, taken from near the clubhouse. Visualisations are presented in Figures 8.9.27.1-5. The approximate distance between the viewpoint and the nearest visible proposed turbine is 4.2 km.

8.11.65 There are wide panoramic main views from this VP across open dunes and coastal views to west and south. Northerly views are towards the Kintyre uplands. Existing Tangy I and II turbines are visible on the horizon, occupying a small part of the view. It is considered that there would be a medium sensitivity to change from this viewpoint. In northern views, proposed turbines would be visible on the skyline. The number of turbine tips and hubs theoretically visible would decrease while the horizontal spread would increase compared to the existing Tangy I and II Wind Farm. The proposed turbines would be noticeably larger than the existing turbines but they would take up a relatively small portion of the overall view. Other permanent elements of the proposed development (e.g. felling/replanting, new tracks or ancillary elements) and construction activity would not be visible.

8.11.66 Therefore, there would be a high magnitude of change and **moderate** and **significant** visual effect during construction and operation.

Receptors in Settlements

8.11.67 Receptors in 10 settlements within the 40 km study area have been included in this assessment. Receptors in 34 settlements within the 40 km study area were not included in the assessment, as described in Appendix 8.3. The locations for these are shown on Figures 8.8.1 and 8.8.2. Assessment for receptors in these settlements is contained in Appendix 8.7 and is summarised below in Table 8.16.

8.11.68 The assessment reflects the worst-case visual effect for receptors in each settlement. Details of those receptors affected are included in Appendix 8.7.

Table 8.16: Summary of Settlement Assessment

Settlement	Visual Effect (During Construction & Operation)	Visual Effect Significance (During Construction & Operation)
Ardminish	Minor	Non-significant
Campbeltown	Minor-Moderate	Non-significant
Drumlemble	Moderate	Significant
Glenbarr	Moderate	Significant
Kilchenzie	Minor	Non-significant
Killeonan / Knocknaha	Minor	Non-significant
Machrihanish	Moderate	Significant

Table 8.16: Summary of Settlement Assessment		
Settlement	**Visual Effect (During Construction & Operation)**	**Visual Effect Significance (During Construction & Operation)**
Peninver	Minor	Non-significant
RAF Machrihanish	Minor-Moderate	Non-significant
Stewarton	Minor-Moderate	Non-significant

8.11.69 Receptors in 7 of 10 settlements included in the assessment were identified as likely to receive **non-significant** visual effects due to the effects of distance, screening from landform and coniferous forest plantation, sensitivity and directions of main views and the visual context of the existing Tangy I and II Wind Farm.

8.11.70 Receptors in 3 of 10 settlements included in the assessment were identified as likely to receive **significant** visual effects during both construction and operation. These settlements are all located within approximately 7-10 km of the proposed development, where it would be noticeable in some main views, on the skyline from the south (Drumlemble and Machrihanish) and north (Glenbarr), where existing Tangy I and II turbines are currently visible. A summary of the assessment for receptors in these settlements are detailed in the following section.

Drumlemble

8.11.71 This is a settlement which appears to have originally developed along the south side of the B843 as a row of semi-detached cottages, in close proximity to one another, oriented to the north. A former village hall and farm are positioned to the north of the road and partially restrict views from these cottages. There are now several rows of 20th Century cottages to the south of this originating group, set down from the road and with views to the plain blocked by the older properties.

8.11.72 Main views are north across Aros Moss towards Campbeltown Airport and existing Tangy I and II Wind Farm on the skyline. From properties south of the B843, views are across the B843 road, parking area with roadside properties in foreground. Similar views are obtained from some other scattered properties situated to the east and west of the main settlement core, along the B843.

8.11.73 The approximate distance between Drumlemble and the proposed development is 9.5 km. From properties potentially affected, the main views are towards the proposed development and the affected view is an important one. There is therefore a high visual sensitivity to change from these receptors.

8.11.74 The ZTV suggests that the proposed development would be visible from the whole of the settlement. In reality, the proposed turbines would be visible on the skyline (in a manner similar to that shown by VP19) principally from those properties adjacent to the B843. The change in scale and visual composition would be noticeable in comparison with the existing turbines. They would not be visible from the newer properties to the south, due to screening from other buildings.

8.11.75 This would be a noticeable change in the existing view, both during and after construction, and so a medium magnitude of change. When compared to the existing view, there would be some new detracting features within the highly valued view and so a **moderate** and **significant** visual effect.

Glenbarr

8.11.76 The settlement of Glenbarr is located to the east of the A83. It is divided into two distinct clusters. Northern Glenbarr features a row of semi-detached, 20th Century housing. Southern Glenbarr comprises a street of cottages, a local store and attached garden centre with frontages oriented to look east or west. Further south, in the valley base and close to the Barr Water, is Glenbarr Abbey (a large 18th Century property).

8.11.77 Main views from receptors in northern Glenbarr are elevated and to the south, across an adjacent field, to the forested ridge and slopes at Blary Hill, south of Barr Glen, with existing Tangy I and II Wind Farm seen above coniferous forest plantation. Main views from receptors in southern Glenbarr are more contained and are oriented east-west. There are some views of the existing Tangy I and II Wind Farm in views from side windows and from public areas.

8.11.78 The approximate distance between Glenbarr and the proposed development is 7.5 km. The receptors in the northern Glenbarr would be affected in their main view, while receptors in southern Glenbarr would be affected in side views. There is therefore a medium-high visual sensitivity to change from these receptors.

8.11.79 The proposed development would not be visible from Glenbarr Abbey or southernmost properties in Glenbarr. From properties in the more elevated part of southern Glenbarr, the proposed turbines would be visible on the skyline as full turbines above coniferous forest plantation. They would be seen in side views from properties partially screened by neighbouring buildings and/or vegetation and in main views from the road. From northern Glenbarr, full turbines would be visible on the skyline, above coniferous forest plantation in a manner similar to that indicated by VP2. They would appear noticeably larger in the view than existing Tangy I and II and would create more of a focal point, but would be a small part of the overall view.

8.11.80 This would be a noticeable change in the existing view, both during and after construction, and so a medium magnitude of change. When compared to the existing view, there would be some new detracting features within the valued view and so a **moderate** and **significant** visual effect.

Machrihanish

8.11.81 This is a linear coastal settlement, located on the B843, by Machrihanish Bay. The Ugadale Hotel and Machrihanish Golf Club are situated at the centre of the village while houses with large gardens, set back from the road, are located to their east. To their west, gardens are smaller or absent and with additional, more recent, building phases to the south of the historic properties. A small number of houses are positioned to the north of the B843 at this western extent.

8.11.82 Main open views are north along the coast, across the Links of Machrihanish, towards Aros Moss, the Kintyre Uplands and existing Tangy I and II Wind Farm. Main views from properties to the south of the clubhouse and hotel are largely introverted views. These views are likely to be reflective of views from some other scattered properties around Machrihanish, along and near the B843.

8.11.83 The approximate distance between Machrihanish and the proposed development is 9.0 km. The affected view for receptors is important and so there is a high visual sensitivity to change.

8.11.84 The proposed turbines would be visible in main views on the skyline, above the coniferous forest plantation and would be noticeably larger in scale than the existing turbines. The proposed turbines would be screened by buildings from receptors in properties in southern Machrihanish.

8.11.85 This would be a noticeable change in the existing view, both during and after construction, and so a medium magnitude of change. When compared to the existing view, there would be some new detracting features within the highly valued view and so a **moderate** and **significant** visual effect.

Receptors on Routes

8.11.86 Receptors on 17 routes within the 40 km study area have been included in this assessment. Receptors on 12 routes within the 40 km study area were not included in the assessment, as described in Appendix 8.3. The locations for these are shown on Figures 8.7 and 8.8.1 and/or 8.8.2. Assessment for receptors on these routes is contained in Appendix 8.6 and is summarised below in Table 8.17.

Table 8.17: Summary of Route Assessment		
Route	**Visual Effect (During Construction & Operation)**	**Visual Effect Significance (During Construction & Operation)**
A83, including Core Path C304	Moderate	Significant
B842, including Core Path C084 and part of NCR78	Minor-Moderate	Non-significant
B843 and Core Path C085	Moderate	Significant
Kennacraig to Port Askaig (Islay) Ferry	Negligible	Non-significant
Kennacraig to Port Ellen (Islay) Ferry	Negligible	Non-significant
Ardrossan to Campbeltown Ferry	Minor	Non-significant
Tayinloan to Ardminish (Gigha) Ferry	Minor	Non-significant
Kintyre Way: Clachan to Tayinloan	Negligible	Non-significant
Kintyre Way: Tayinloan to Carradale	Negligible	Non-significant
Kintyre Way: Carradale to Campbeltown and Section of Core Path C088	Moderate	Significant
Kintyre Way: Campbeltown to Dunaverty and Section of Core Path C081	Negligible	Non-significant
Kintyre Way: Southend to Machrihanish and Section of Core Path C090	Minor-Moderate	Non-significant
Core Path C089	Minor-Moderate	Non-significant
Core Path C086	Moderate	Significant
Core Path C087, C447, C448	Minor-Moderate	Non-significant
Core Path C082	Negligible	Non-significant
Core Path C083	Minor-Moderate	Non-significant

8.11.87 Receptors on the majority of routes within the study area (13 of 17 routes included in the assessment) would receive **non-significant** visual effects. This is due to screening from coniferous forest plantation.

8.11.88 Receptors on routes within approximately 11 km of the proposed development (4 of 17 routes included in the assessment) were identified as likely to receive **significant** visual effects during construction and operation. A summary of the assessment for receptors on these routes are detailed in the following section.

A83, including Core Path C304

8.11.89 This is the principal road north and south for those on the Kintyre Peninsula and within the study area, connects Campbeltown with Corranbuie, near West Tarbert. Outside the study area, it runs via Tarbert on the shores of Loch Fyne to Tarbet near Loch Lomond. Within the study area, the A83 carries traffic along (or close to) the west coast of Kintyre and, as such, views are often focussed out to sea, where the islands of Gigha, Islay and Jura are prominent features. The road passes through an Area of Panoramic Quality (APQ) between Clachan and Westport Beach, minus a section around Glenbarr. A short section of the A83 at Glenbarr is also Core Path C304 (Glenbarr School Route).

8.11.90 Figures 8.7 and 8.8.1/8.8.2 show the extent of the route potentially affected by the proposed development (5.1 km of a 51 km route). VP1 (A83 at Glenbarr Burial Ground) and VP2 (Glenbarr War Memorial) are located alongside the A83 and are illustrative representative of views which could be obtained at points along the route.

8.11.91 The ZTV suggests that the proposed turbines would potentially be visible from the relatively short section of the A83 between the area around Glenbarr War Memorial (also a Core Path) and south of Glenbarr Burial Ground and, intermittently, between the coastline south of Bellochantuy and Westport Beach. Turbines would appear on the skyline and would be noticeably larger in view than the existing Tangy I and II Wind Farm. The extent would be similar to that currently affected by the existing wind farm. In addition, there is new visibility in the vicinity of Drum Farm and Kilchenzie (although assessment has found that from the A83 at Kilchenzie, potential visibility arising at these locations would be minimal, with some blade tips on the horizon).

8.11.92 Where views of the proposed development would occur, they are often channelled by adjacent topography and at close proximity. Although there are generally views of the existing Tangy I and II Wind Farm at these locations, it is considered that there would be a high sensitivity to change here. At the affected points, the change described would result in a noticeable change in the existing view during construction and operation. There would be some new detracting features within the view and so a **moderate** and **significant** visual effect.

B843 and Core Path C085

8.11.93 This is a short road and Core Path C085 (Stewarton to Machrihanish) connecting the settlements of Stewarton and Machrihanish, passing through the settlement of Drumlemble.

8.11.94 Figures 8.7 and 8.8.2 shows the extent of the route potentially affected by the proposed development (7.3 km of a 7.3 km route). VP6 (Machrihanish, Little Scone), VP7 (Stewarton) and VP19 (Drumlemble) are located alongside the B843 and are representative of side views which could be obtained from the route.

8.11.95 The ZTV suggests that the proposed turbines would be visible from the whole of this route. In the majority of areas, the proposed development is perpendicular to the direction of travel and proposed turbines would be visible on the skyline in mostly side/oblique views and some main views. Turbines would be noticeably larger than the existing Tangy I and II turbines, but would be a small part of the overall view. In places, construction activities would be visible and it is likely that the removal of conifer plantation and some ancillary elements would also be visible. However, given the intervening distance it is not likely that access tracks would be seen following ground reinstatement measures.

8.11.96 There would be a medium sensitivity to change. The proposed development would result in a noticeable change in the existing view, both during and after construction, and so a medium magnitude of change. When compared to the existing view, there would be some new detracting features within the valued view and so a **moderate** and **significant** visual effect.

Kintyre Way: Carradale to Campbeltown and Section of Core Path C088

8.11.97 From Carradale, this section of the Kintyre Way follows minor roads and paths to rocky shore at Waterfoot and then passes Torrisdale Castle via access roads before joining forestry tracks and climbing out of Torrisdale Glen and crossing hills before dropping back down and into Saddell Glen. It then runs west through Saddell Glen before climbing once again along forestry access tracks to A’ Cruach and joining Core Path C088 (Campbeltown to Claonaig). It then follows the line of the Bordadubh Water, a small watercourse which feeds Loch Lussa. At Loch Lussa, the route joins a public road to the east of the proposed development, joins the A83 and passes into Campbeltown.

8.11.98 Figures 8.7 and 8.8.1/8.8.2 show the extent of the route potentially affected by the proposed development (7.7 km of a 32 km route). VP12 (Bord a Dubh), VP13 (A' Cruach), VP15 (Ballywilline) and VP18 (Skeroblingarry) are located alongside this section of the Kintyre Way and illustrate a variety of views experienced along this section.

8.11.99 ZTV analysis indicates that the proposed development would theoretically be visible along this route between A' Cruach and the north of Lussa Loch and the south of Lussa Loch and Ballywilline. In reality, turbines would be visible in intermittent views, but screened from views in other sections (for instance, near Lussa Loch) by coniferous forestry and landform. Where visible, turbines would appear large in scale, particularly at closest points (e.g. VP18) where receptors would feel very close to the wind farm. Turbines would therefore be glimpsed to varying degrees whilst travelling along this route, with the large turbines prominent at points.

8.11.100 Given existing wind turbines which affect the view from this route, there would be a medium sensitivity to change. The change described would result in a noticeable change in the existing view, both during and after construction, and so a medium magnitude of change. When compared to the existing view, there would be some new detracting features within the highly valued view and so a **moderate** and **significant** visual effect.

Core Path C086

8.11.101 Core Path C086 (Links of Machrihanish) is a coastal path that runs along the Links of Machrihanish where there are open, panoramic views along the beach, across the golf course and out to sea. The existing Tangy I and II Wind Farm is visible on the skyline to the north and Machrihanish settlement visible to the south. The buildings of Campbeltown Airport are visible from some sections of the path.

8.11.102 Figure 8.7 and 8.8.2 show the extent of the route potentially affected by the proposed development (6 km of a 6.2 km route). VP26 (Westport Beach) illustrates views from the northernmost end of this route, but does not represent views from the majority of the route.

8.11.103 ZTV analysis suggests that the proposed development would be theoretically visible along the majority of this route, in open, panoramic views. Receptors on the northernmost section of this route at Westport Beach would experience limited views of the proposed development (e.g. VP26) or no views. From the majority of the route, the proposed turbines would be seen in main views drawn along the coast, across Machrihanish Bay, appearing larger than the existing wind turbines at Tangy I and II, which are currently visible. New tracks, ancillary features, forest felling and replanting may be perceptible from some locations, as would construction activities, but in the distance.

8.11.104 There would be a medium sensitivity to change. The change described would result in a noticeable change in the existing view, both during and after construction, and so a medium magnitude of change. When compared to the existing view, there would be some new detracting features within the highly valued view and so a **moderate** and **significant** visual effect.

Summary of Visual Effects

8.11.105 The findings of the visual assessment are summarised in Table 8.18 below. The assessment found that visual effects would be **significant** for receptors:

- at 16 of 27 viewpoints during both construction and operation, all located within the 11 km study area;
- in 3 of 10 settlements during both construction and operation, all located within the 11 km study area; and

- on 4 of 17 routes during both construction and operation, for receptors located within the 11 km study area.

Table 8.18: Summary of Visual Assessment

Receptor Group	Scoped Out of LVIA	Visual Effects													
		During Construction							During Operation						
		Negligible	Negligible - Minor	Minor	Minor - Moderate	Moderate	Moderate - Major	Major	Negligible	Negligible - Minor	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
Receptors at Viewpoints	-	3	1	4	3	11	3	2	3	1	4	3	12	4	
Receptors in Settlements	34			4	3	3					4	3	3		
Receptors on Routes	12	6		2	5	4			6		2	5	4		

8.12 Cumulative Visual Assessment

8.12.1 Cumulative effects are those that occur as a result of the construction of more than one development of similar type within the landscape. In terms of visual amenity, cumulative visual effects may result where a number of wind energy developments combine, to increase the appearance and prominence within a particular view. The likely significance of these effects relates to the number of wind developments visible and their scale, location and inter-relationship to each other within the view.

Cumulative Visual Assessment Methodology

8.12.2 The methodology for the cumulative visual assessment is based on that described in SNH guidance (SNH, 2012). The assessment considers the potential for combined views of wind developments from receptors at selected viewpoints and on routes. Combined views of wind energy development may be either 'in combination' (where turbines from different developments would be observable at the same time[5]) or 'in succession[6]' (where an observer would be required to turn to experience multiple developments). The assessment also considers the potential for sequential effects experienced from receptors on routes where different wind developments become visible whilst moving through the landscape. Sequential impacts may be occasional, frequent or constant.

8.12.3 The cumulative visual assessment has involved four key stages:

- Identification and analysis of the baseline wind energy development scenario from receptors at each viewpoint/ route;
- Evaluation of the cumulative visual sensitivity to change;
- Evaluation of the potential magnitude of visual change to the baseline scenario resulting from the proposed development; and

[5] Sites visible **in combination** with the Development refer to those that are visible within the observer's arc of vision with the Development. That is, within a 90° field of view of the Development, where the Development may be on the edge of the 90° field of view. Sites within 60-90° would be within the observer's peripheral field of view and are marked accordingly.

[6] Site visible **in succession** with the Development refer to those that are visible when the observer turns their head away from the Development.

- Assessment of the potential cumulative visual effects arising from the introduction of the proposed development to the baseline scenario.

Identification and Analysis of the Baseline Wind Energy Development Scenario

8.12.4 Analysis of the baseline involves an appreciation of the existing view within the context of the baseline wind development scenario, which assumes that all consented and proposed (application) wind developments have been constructed. Proposed sites are taken to be those for which planning applications have been submitted, or where the applications have gone to appeal.

8.12.5 Baseline information on operational, consented and proposed (application) wind developments within the 60 km cumulative search area has been collected and the baseline wind energy development scenario defined, as detailed in 8.8.17 to 8.8.18.

8.12.6 For visual receptors, identification of the baseline cumulative visual context involves consideration of the scale, location and nature of the baseline wind developments within the view, the proportion of the view which is occupied by wind turbines and the potential importance of this part of the view to the viewer.

Evaluation of the Cumulative Visual Sensitivity to Change

8.12.7 The evaluation of sensitivity to change concerns the nature of the existing view in the context of the baseline wind development scenario, and the potential for further wind turbines to be accommodated within that view without significantly altering, obstructing or dominating the view. An evaluation of sensitivity to change has been attributed to each receptor based on a three-point scale, detailed in Table 8.19. Where a view would fall into two different categories a degree of professional judgement is employed.

Table 8.19: Cumulative Visual Sensitivity

Cumulative Visual Sensitivity	Criteria
High	Where wind energy developments within the cumulative baseline scenario are well accommodated within a valued or well composed view and/or the proposed changed landscape forms an important part of the view.
Medium	Where wind energy developments within the cumulative baseline scenario are present but not prominent in the existing view, and/or the proposed changed landscape forms a less important part of the view.
Low	Where wind energy developments within the cumulative baseline scenario are prominent in an existing view and/or the changed landscape forms an unimportant part of the view

Evaluation of the Cumulative Magnitude of Visual Change

8.12.8 Magnitude of change concerns the measurement of change which would occur as a result of the introduction of the proposed development into the baseline wind development scenario. This is identified based on the consideration of the potential nature, size, scale and location of the proposed change within the existing view, and in relation to the existing wind farms/turbines within the view. The evaluation of the magnitude of change is based on the criteria outlined in the main visual assessment methodology.

Assessment of Potential Cumulative Visual Effects

8.12.9 Assessment of potential cumulative effects is based on analysis of the relationship between the cumulative sensitivity to change and the magnitude of change and is made using a degree of professional judgement. It should be noted that the cumulative effect assessed is the result of the addition of the proposed development to the existing baseline scenario. In this case, this also includes the removal of Tangy I and II turbines, which would be replaced by the proposed development. Cumulative visual effects are assessed against the scale detailed in Table 8.20 below.

Table 8.20: Cumulative Visual Effect	
Cumulative Visual Effect	**Criteria**
Major	The addition of the proposed development to views of the baseline cumulative scenario would result in a very noticeable increase in wind turbines to the extent whereby they would become a dominating or obstructive feature within the view.
Moderate	The addition of the proposed development to views of the baseline cumulative scenario would result in a noticeable increase in wind turbines to the extent whereby they would become prominent but would not dominate or obstruct the view.
Minor	The addition of the proposed development to views of the baseline cumulative scenario would result in a perceptible increase in wind turbines but would not increase the prominence of wind farms/turbines as a feature in the view.
Negligible	The addition of the proposed development to views of the baseline cumulative scenario would not result in any discernible increase in the appearance of wind turbines in the view.

8.12.10 The above criteria and levels of significance represent points on a continuum. Where required, interim ratings, such as minor-moderate, have been used to indicate the anticipated significance of effect.

8.12.11 For the purposes of the assessment effects with a rating of moderate or above are significant in the context of the EIA regulations.

Limitations of Cumulative Visual Assessment

8.12.12 The limitations of the cumulative visual assessment are consistent with those described in 8.8.13 to 8.8.16 for the cumulative landscape assessment.

Cumulative Baseline Scenario

8.12.13 The cumulative baseline scenario is defined in 8.8.17 to 8.8.19 and detailed in Appendix 8.4.

Receptors at Viewpoints

8.12.14 11 viewpoints within the 40 km study area have been identified for inclusion in the cumulative visual assessment. Analysis of the cumulative ZTVs led to the identification of cumulative viewpoints, selected from those used for the visual impact assessment. These viewpoints have been selected to give a representational overview of potential cumulative effects from different directions and locations within the overall study area. See Appendix 8.3 for details of the selection process. Only viewpoints with potential combined visibility have been selected as only these have the potential to experience cumulative impacts.

8.12.15 These viewpoints include a cross section of distant and close proximity views from most directions and are representative of the range of cumulative impacts expected from the introduction of the proposed development (which includes removal of the existing Tangy I and II Wind Farm) within the cumulative baseline scenario. A list of viewpoints included in the CLVIA are provided below (refer to Appendix 8.3 for details of the selection process; and Table 8.14 in the LVIA section for descriptions and OS grid references):

- VP2: Glenbarr War Memorial;
- VP3: Barr Glen;
- VP5: Gigha (South Pier);

- VP6: Machrihanish (Little Scone);
- VP8: Southend Road;
- VP10: Beinn Ghuilean;
- VP12: Bord a Dubh (Kintyre Way);
- VP13: A'Cruach (Kintyre Way);
- VP16: Kilbrannan Sound;
- VP17: Breakachy; and
- VP25: Ranachan Hill.

Receptors on Routes

8.12.16 In addition to receptors at viewpoints, receptors on 11 routes within the 40 km study area with potential visibility of the proposed development and at least one other wind development have been identified and assessed for sequential cumulative impacts. Only those routes identified as having a minor effect or greater in the main visual assessment have been included in the cumulative assessment, as it is considered that a negligible effect could not contribute to a significant cumulative effect. Receptors on the following routes are included in the cumulative visual assessment (refer to Appendix 8.3 for details of the selection process):

- A83, including Core Path C304;
- B842, including Core Path C084 and part of NCR78;
- B843 and Core Path C085;
- Ardrossan to Campbeltown Ferry;
- Tayinloan to Ardminish (Gigha) Ferry;
- Kintyre Way: Carradale to Campbeltown and Section of Core Path C088;
- Kintyre Way: Southend to Machrihanish and Section of Core Path C090;
- Core Path C089;
- Core Path C086;
- Core Paths C087, C447, C448; and
- Core Path C083.

Cumulative Visual Effects Evaluation

8.12.17 A cumulative assessment of receptors at viewpoints and on routes within the 40 km study area is presented in Appendix 8.8. The following section provides an overview of cumulative visual effects, focusing on those assessed to be significant.

Receptors at Viewpoints

8.12.18 Receptors at 11 viewpoints within the 40 km study area have been included in this assessment. The locations for these are shown on Figure 8.10.1 – 8.10.3 and visualisations are shown on Figures 8.9.1.1 to 8.9.27.5. Cumulative assessment for receptors at these viewpoints is contained in Appendix 8.7 and is summarised below in Table 8.21.

Table 8.21: Summary of Cumulative Viewpoint Assessment

Viewpoint		**Cumulative Visual Effect**	**Cumulative Visual Effect Significance**
VP2	Glenbarr War Memorial	Moderate	Significant
VP3	Barr Glen	Minor	Non-significant
VP5	Gigha (South Pier)	Minor	Non-significant

Table 8.21: Summary of Cumulative Viewpoint Assessment			
Viewpoint		**Cumulative Visual Effect**	**Cumulative Visual Effect Significance**
VP6	Machrihanish (Little Scone)	Moderate	Significant
VP8	Southend Road	Moderate	Significant
VP10	Beinn Ghuilean	Minor	Non-significant
VP12	Bord a Dubh (Kintyre Way)	Moderate	Significant
VP13	A' Cruach (Kintyre Way)	Minor	Non-significant
VP16	Kilbrannan Sound	Minor	Non-significant
VP17	Breakachy	Minor	Non-significant
VP25	Ranachan Hill	Moderate	Significant

8.12.19 Receptors at 5 of the 11 viewpoints within the cumulative assessment were identified as likely to receive **significant** cumulative visual effects. A summary of the assessment for receptors at these viewpoints are detailed in the following section.

VP2: Glenbarr War Memorial

8.12.20 Cumulative wirelines illustrating the views from VP2 are shown in Figure 8.9.2.3a-c. Some cumulative turbines shown in this visualisation would be visible 'in combination' with the proposed development and some 'in succession' (i.e. by the viewer turning to a different direction). The approximate distance between the viewpoint and the nearest visible turbine from the proposed development is 7.2 km.

8.12.21 Main views are north or south along the road with side views west out to sea and east towards the Glenbarr War Memorial. In views south, existing Tangy I and II tips are visible on the skyline above coniferous forest plantation. Side views up Glen Barr to the east also include turbines of Blary Hill, Auchadaduie and Beinn an Tuirc (Phase 1). Side views east over the sea also include Gigha and Gigha Extension. Sensitivity to additional change would be medium.

8.12.22 In main views to the south, turbines at the proposed development would be seen above the coniferous forest plantation in place of existing Tangy I and II but would be larger. When seen in combination with the cluster of wind developments at Beinn an Tuirc (Phase 1), Blary Hill and Auchadaduie , the proposed development would result in a noticeable increase in wind turbines in southerly views whereby they would become prominent but would not dominate or obstruct the view.

8.12.23 The proposed development would therefore result in a **moderate** and **significant** cumulative visual effect.

VP6: Machrihanish (Little Scone)

8.12.24 A cumulative wireline illustrating the view from VP6 is shown in Figure 8.9.6.3. All cumulative turbines shown in this visualisation would be visible 'in combination' with the proposed development and there would be no further turbines visible 'in succession' (i.e. by the viewer turning to a different direction). The approximate distance between the viewpoint and the nearest visible turbine from the proposed development is 8.3 km.

8.12.25 Main views are to the north across Machrihanish Bay along the sandy beach and west coastline of Kintyre with Tangy I and II Wind Farm visible on the skyline. In addition, some blades and hubs of turbines at Beinn an Tuirc (Phase 3) would be visible on the skyline above/between coniferous forest plantations. Beinn and Tuirc (Phases 1 and 2) are largely screened by coniferous forest plantation. Turbines of Gigha and Gigha Extension may be perceptible in the distance in certain weather conditions. The prominence, positioning and scale of wind turbines within the baseline cumulative scenario has resulted in sensitivity to additional change being low.

8.12.26 Turbines at the proposed development would be noticeable above the upland interior and set back from the coastal slopes and rounded hills. They would be larger and more prominent in the cumulative scenario than the existing Tangy I and II. They would be closer than other developments, and therefore of greater perceived scale.

8.12.27 The proposed development would therefore result in a **moderate** and **significant** cumulative visual effect.

VP8: Southend Road

8.12.28 Cumulative wirelines illustrating the views from VP8 are shown in Figures 8.9.8.3a-d. Cumulative turbines shown in these visualisations would be visible 'in combination' with the proposed development. The approximate distance between the viewpoint and the nearest visible turbine from the proposed development is 10.8 km.

8.12.29 Main elevated expansive northerly views across Aros Moss. Views are panoramic, but directed north along road and include scattered farmsteads and settlement amongst low flat fields with dry stone walls or post and wire fences. The upland skyline in the distance consists of conifer plantation and moorland. Wind turbines at Tangy I and II and Beinn an Tuirc (Phases 1 and 2) are visible on the skyline to the north. Turbines of Beinn an Tuirc (Phase 3) would also be visible on the skyline, and some tips of Blary Hill and Killean Estate may be visible above coniferous forest plantation. Sensitivity to additional change would be low-medium.

8.12.30 Turbines at the proposed development would be noticeable along the interior upland skyline (in place of existing Tangy I and II), beyond rounded hills and set back from the western Kintyre coast to the west of the other cumulative baseline sites. The proposed development would be larger and appear closer than other wind farms and occupy a slightly larger portion of the view than the existing Tangy I and II turbines leading to a slightly increased presence of wind turbines in the view.

8.12.31 The proposed development would therefore result in a **moderate** and **significant** cumulative visual effect.

VP12: Bord a Dubh (Kintyre Way)

8.12.32 Cumulative wirelines illustrating the views from VP12 are shown in Figures 8.9.12.3a-d. The one other wind farm shown in these visualisations would be visible 'in succession' (i.e. by the viewer turning to a different direction). The approximate distance between the viewpoint and the nearest visible turbine from the proposed development is 4 km.

8.12.33 Main elevated views are to the south-west along a forested valley, towards Lussa Loch and loch-side property with meandering river along river floor. Beinn an Tuirc (Phase 3) would be visible in rear views in relatively close proximity, above valley sides and mature plantation, partially screened/filtered by some foreground trees. Sensitivity to additional change would be medium.

8.12.34 Turbines at the proposed development would be noticeable on the horizon of main, framed views to the south-west above coniferous forest plantation (where existing Tangy I and II is not currently visible). With Beinn an Tuirc (Phase 3) prominent in rear views, the proposed development would introduce turbines to a new part of the view and may create more of a surrounding impression. However, wind turbines would not become a newly dominating feature of the view.

8.12.35 The proposed development would therefore result in a **moderate** and **significant** cumulative visual effect.

VP25: Ranachan Hill

8.12.36 Cumulative wirelines illustrating the views from VP25 are shown in Figures 8.9.25.3a-c. The majority of turbines shown in these visualisations would be visible 'in combination' with the proposed development. Two single turbines would be visible 'in succession' (i.e. by the viewer turning to a different direction). The approximate distance between the viewpoint and the nearest visible turbine from the proposed development is 3.4 km.

8.12.37 From this viewpoint, turbines from operational, consented and application sites would be visible above the uplands in clusters in the long distance (Deucheran Hill) and the middle distance (Beinn an Tuirc Phases 1, 2 and 3). The importance of view and the prominence, positioning and scale of wind turbines within the baseline cumulative scenario has resulted in sensitivity to additional change being medium.

8.12.38 Turbines at the proposed development would replace existing Tangy I and II within the view. Due to their increased scale, they would increase the prominence of wind turbines within this part of the view but this would not result in wind turbines becoming newly prominent in this view as a whole. The proposed development would result in turbines being visible in another part of the upland interior, continuing the pattern of distinct development clusters. They would be closer than other developments and of greater perceived scale. They would therefore result in a **moderate** and **significant** cumulative effect.

Receptors on Routes

8.12.39 Receptors on 11 routes within the 40 km study area have been included in this assessment. The locations for these are shown on Figures 8.8.1 and 8.8.2. Assessment for receptors on these routes is contained in Appendix 8.6 and is summarised below in Table 8.22.

Table 8.22: Summary of Cumulative Route Assessment

Route	Cumulative Visual Effect	Cumulative Visual Effect Significance
A83, including Core Path C304	Minor	Non-significant
B842, including Core Path C084 and part of NCR78	Minor-Moderate	Non-significant
B843 and Core Path C085	Moderate	Significant
Ardrossan to Campbeltown Ferry	Negligible	Non-significant
Tayinloan to Ardminish (Gigha) Ferry	Minor	Non-significant
Kintyre Way: Carradale to Campbeltown and Section of Core Path C088	Minor-Moderate	Non-significant
Kintyre Way: Southend to Machrihanish and Section of Core Path C090	Minor	Non-significant
Core Path C089	Minor	Non-significant
Core Path C086	Minor-Moderate	Non-significant
Core Path C087, C447, C448	Minor	Non-significant
Core Path C083	Minor	Non-significant

8.12.40 Receptors on one of the 11 routes included in the assessment were identified as likely to receive **significant** cumulative visual effects. A summary is detailed in the following section.

B843 and Core Path C085

8.12.41 This is a short, public road and Core Path connecting the settlements of Stewarton and Machrihanish, via Drumlemble.

8.12.42 Various wind energy developments included in the cumulative baseline scenario, including Tangy I and II, are visible from this route on the northern skyline at varying distances. Sensitivity to additional change is medium.

8.12.43 Turbines at the proposed development would replace Tangy I and II to the north, in a similar direction to other wind developments, but would be closer, larger and more prominent. The increased scale of the proposed development would be noticeable for receptors on this road (in place of existing Tangy I and II), and would increase the prominence of wind developments within the cumulative baseline scenario although wind turbines would not become a dominant or obstructive feature of the view.

8.12.44 The resulting magnitude of change would be medium and the cumulative visual effect would be a **moderate** and **significant** visual effect**.**

Summary of Cumulative Visual Effects

8.12.45 The findings of the cumulative visual assessment are summarised in Table 8.23 below. The assessment found that cumulative visual effects for receptors at 5 of 11 viewpoints and on 1 of 11 routes included in the cumulative visual assessment would be **significant**.

Table 8.23: Summary of Cumulative Visual Assessment

Receptor Group	Scoped Out of CLVIA (from LVIA)	Cumulative Visual Effects During Operation						
		Negligible	Negligible - Minor	Minor	Minor - Moderate	Moderate	Moderate - Major	Major
Receptors at Viewpoints	16			6		5		
Receptors on Routes	6	1		6	3	1		

8.13 Summary

8.13.1 The landscape character assessment has identified that the majority of landscape effects in relation to the proposed development would be **not significant**. **No significant effects** are anticipated in relation to landscape designations. Potential **significant effects** have been identified for two of the six LCTs which make up the 11 km detailed study area: Bay Farmland and Upland Forest-Moor Mosaic. These effects are anticipated to result from the increased appearance of the larger turbines on the southern edge of the forested upland core of Kintyre which forms a context and backdrop to surrounding agricultural fringes, foothills and valleys, and the low-lying landscape of Aros Moss. However, effects are considered to be **Moderate and Significant** as the proposed development is anticipated to be noticeable and locally intrusive, rather than a dominating feature. These effects would be limited to a radius of around 8 km from the proposed development, and are mostly within a 6 km radius. Beyond this distance all effects are anticipated to be **minor or below** and would be **not significant**.

8.13.2 The cumulative landscape character assessment, has found that there would be a potential **significant** cumulative effect on one designated landscape: West Coast of Kintyre APQ and parts of two LCTs: Upland Forest Moor Mosaic; and Rocky Mosaic. These effects relate to a potential increase in prominence and frequency of wind farm development when moving through the landscape and potential surrounding effect in some locations, and in the case of Rocky Mosaic which is found in several locations within the detailed study area, would affect only the western, coastal unit of the LCT. The effect in both cases is assessed as **moderate and significant**. **No significant** cumulative effect is predicted for any other LCT within the detailed study area.

8.13.3 The visual assessment has identified that, during construction and operation, potential effects would be **significant** for receptors at 16 of the 27 viewpoints, at 3 of the 10 settlements and on 4 of the 17 routes included in the assessment.

8.13.4 The cumulative visual assessment has found that potential effects would be **significant** for receptors at 5 of the 11 viewpoints and on 1 of the 11 routes included in the assessment.

8.14 References

Argyll & Bute Council (2015). *Argyll and Bute Local Development Plan*. Argyll & Bute Council Development Services.

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9. ORNITHOLOGY

Executive Summary

This chapter reports on the potential impacts on the baseline ornithological conditions recorded within and around the proposed development resulting from the introduction of the proposed development and presents an assessment of likely significant effects on identified target species' populations.

Baseline surveys recorded a range of target species: barnacle goose, black grouse, common sandpiper, curlew, goldeneye, Greenland white-fronted goose, greylag goose, hen harrier, herring gull, merlin, osprey, oystercatcher, peregrine falcon, red-throated diver, short-eared owl, snipe, whooper swan and woodcock (records detailed per species in Section 9.4). Each of these species was considered as part of the Environmental Impact Assessment, however based on the assessment methodology detailed in Section 9.3, the level of activity recorded for each species and the results of the collision risk modelling, Greenland white-fronted goose was the only Important Ornithological Feature (IOF) identified at risk of potential significant effects that was taken forward into the Environmental Impact Assessment (with the remaining species scoped out of the assessment). Due to the proximity of the Kintyre Goose Roosts Special Protection Area (SPA) and the potential for connectivity, Greenland white-fronted goose was also assessed under the Habitats Regulations.

For Greenland white-fronted goose, effects related to direct and indirect habitat loss, construction disturbance and displacement, operational displacement, collision risk and cumulative effects were all considered as part of the assessment. The assessment concluded that **No Significant effects** (under EIA) or Adverse Effects on Integrity (under HRA) were found as a result of the project alone, cumulatively or in-combination with other projects.

Although no adverse impacts were predicted for the Greenland white-fronted goose (SPA population), mitigation is proposed to ensure all reasonable measures to avoid disturbance to roosting geese at Lussa Loch and Tangy Loch will be taken. This mitigation may include (but is not limited to) restrictions to vehicular movements and works with the potential to cause disturbance in the hour before dawn and the hour after dusk between 30th September and 30th April inclusive.

9.1 Introduction

9.1.1 This chapter considers the potential effects on ornithology associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

9.1.2 The assessment has been carried out by MacArthur Green.

9.1.3 Effects on flora and non-avian fauna are addressed separately in Chapter 8: Ecology.

9.1.4 This chapter is supported by:

- Appendix 9.1: Ornithology:
  - Annex A: Ornithological Legal Protection;
  - Annex B: Ornithological Survey Methodology;
  - Annex C: Ornithological Survey Effort and General Information;
  - Annex D: Ornithological Survey Results;
  - Annex E: Collision Risk Assessments;
  - Annex F: Review of the Effects of Artificial Light on Birds in Relation to Deployment of Obstruction Lighting on Wind Turbines;
  - Annex G: Tangy I and Tangy II Wind Farms Historical Information and Data.

9.1.5 Figures 9.1 – 9.27 are referenced in the text where relevant.

9.2 Scope of Assessment

Project Interactions

9.2.1 The footprint of the proposed development stretches across the operational Tangy I and Tangy II Wind Farm plus additional forested land to the north (Figure 9.2). Therefore, whilst the proposed development could be considered as a 'repowering' of Tangy I and Tangy II, the additional land to the north of the current operational wind farm could be considered as a 'new' project and overall, could be considered to fall within both SNH (2014, 2017) *Recommended bird survey methods to inform impact assessment of onshore wind*, and SNH (2014b[1]) *Repowering onshore wind farms: bird survey requirements*. Consequently, in addition to using the baseline data gathered for the consented Tangy III Wind Farm proposals (April 2012 to March 2014), additional ornithology surveys were undertaken for Tangy IV (September 2016 to November 2017) across the same survey areas as the baseline surveys for Tangy III to ensure a robust dataset. This approach was detailed in the Modified Tangy III Scoping Report (Table 6.1)[2] with additional flight activity surveys also undertaken. In their scoping response (dated 26th June 2017, Table 9.1), SNH stated that, *"We are content with the updates that are proposed for the bird survey. The extensive previous surveys of much of this area do provide supporting context."*.

[1] A new version of this guidance was recently released as a consultation draft in June 2018: *Assessing the impact of repowered wind farms on nature.*

[2] Modified Tangy III wind farm scoping report, April 2017, Section 6.2.

Study Area

9.2.2 The study area was defined as the site boundary/turbine layout plus the relevant survey buffer[3] (which reflects the survey undertaken), within which both desk-based and field surveys were undertaken. Details of the spatial and temporal extent of each survey are described in Section 9.4 of this chapter, Appendix 9.1 and associated Annexes (A to G) and Figures (9.1 to 9.27).

9.2.3 Following the completion of field surveys, the Collision Risk Analysis Area (CRAA) was defined for the purpose of estimating possible collisions with turbines. The CRAA was created by using Delaunay triangulation[4] to create a wind farm area which was then buffered by 500 m (Figure 9.3). Using a larger area around the turbines accounts for possible inaccuracies in the recording of flightlines and ensures the assessment is precautionary.

Scoping and Consultation

9.2.4 Table 9.1 details relevant scoping and consultation issues. Full details on the consultation responses can be reviewed in Appendix 2.1: Consultation Register.

Table 9.1: Consultation Responses

Consultee and Date	Summary of Response	Comment/Action Taken
Argyll and Bute Council 4th July 2017	Accepted proposed assessment approach and recommended views of SNH and RSPB are sought.	SNH and RSPB responses detailed below.
Scottish Natural Heritage (SNH) 26th June 2017	Content with the proposed additional bird surveys and the inclusion of the Tangy III baseline data. Requested further detail on how the reanalysis of the Tangy III data for collision modelling will deal with the larger turbines of Tangy IV and commented that if it proved difficult to reanalyse the data that further flight activity surveys may be required.	The assessment includes the Tangy III baseline data (April 2012 to March 2014) in the updated collision risk modelling. As noted by SNH, these original baseline data were collected using height bands 0-20m, 21-125m and >126m. In order to account for the increase in upper tip height to 150m the revised collision risk modelling makes the precautionary assumption that all flights recorded in the >126m height band were below 150m (i.e. all the flights recorded in the upper band have been considered at potential collision height). An additional year of flight activity surveys (September 2016 to November 2017) was also gathered using the same agreed vantage point locations. Flights were recorded using revised height bands in order to account for the higher turbine heights (0-20m, 21-40m, 41-100m, 101-150m, >151m). In addition to estimating collision risk, these data will be compared with the original baseline data to provide context for the precautionary assumption about flights recorded above 125m in the original data.

[3] Buffers for field surveys are based on SNH (2014) guidance.

[4] Delaunay triangulation is a form of mathematical/computational geometry where a given set of points (in this case the turbine locations) are all joined to create discrete triangles. Further information is available here: https://uk.mathworks.com/help/matlab/math/delaunay-triangulation.html

Table 9.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
Royal Society for the Protection of Birds (RSPB) 26th May 2017	Advised updated breeding bird surveys for hen harrier and red-throated diver should be undertaken in line with SNH 2014 guidance.	Surveys during the 2017 breeding season included updated surveys for breeding waders and scarce breeding birds (including but not limited to hen harrier and red-throated diver). Surveys followed SNH 2014 guidance in addition to survey methodology detailed by Gilbert *et al*. (1998) and Hardey *et al*. (2013).
	Advise increased precautionary approach to turbine set back around Tangy Loch of 1 km for roosting Greenland white-fronted geese.	As with the Tangy III design, the closest turbine to Tangy Loch (Turbine 5 for the Tangy IV proposed development), is 1 km away.
	Advise the EIA should assess the potential future use of the restructured forest and open ground by hen harrier.	Considered in paragraphs 9.4.43 to 9.4.53.
	Advise that turbines should not be located within 400 m of black grouse lek sites.	No turbines are within 400 m of the two black grouse leks located (paragraph 9.4.11).
	Due to the proximity of the Kintyre Goose Roosts SPA and potential for overflying Greenland white-fronted geese, sufficient information must be provided in the assessment to enable a Habitats Regulations Assessment (HRA) to be undertaken.	Sufficient information has been included in the assessment (Section 9.5) to allow for an HRA to be undertaken.
	Expect mitigation during the construction period to include timing constraints within sensitive breeding periods and during the period where Tangy Loch may be in use as a roost by Greenland white-fronted geese.	Refer to paragraph 9.5.23.
	Expect mitigation during the operational period to consider lighting issues related to attracting night-flying geese/birds.	Refer to paragraph 9.5.23, bullet point three. Refer also to Appendix 9.1 Annex F for a review by Prof. Bob Furness of artificial lighting and the potential impacts on birds.
	Cumulative assessment to be undertaken in line with SNH 2012 cumulative guidance.	Cumulative assessment undertaken in line with SNH 2012 guidance (paragraphs 9.5.63 to 9.5.77).

Effects to be Assessed

9.2.5 The following effects have been assessed in full in relation to construction, operation and decommissioning of the proposed development; and decommissioning of the existing Tangy I and Tangy II Wind Farms during the construction period of the proposed development:

9.2.6 Direct habitat loss for birds through construction of the proposed infrastructure.

9.2.7 Displacement of birds through indirect loss of habitat where birds avoid the proposed development and its surrounding area due to construction, turbine operation and maintenance and visitor disturbance. Displacement can also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds.

9.2.8 Habitat modification due to change in land cover (e.g. deforestation or effects on hydrology), and consequent effects on bird populations.

9.2.9 Death or injury of birds through collision with turbine blades, overhead wires (if any), anemometer masts, or fences (if any) associated with the proposed development.

9.2.10 Cumulative effects of the proposed development in the context of other nearby regulated projects or activities.

Effects Scoped Out of Assessment

9.2.11 No effects were scoped out prior to commencement of surveys.

9.2.12 On the basis and findings of the survey work undertaken, the professional judgement of MacArthur Green, experience from other relevant projects and policy guidance or standards, effects on a number of target species have been scoped out. A total of 73 bird species were recorded at, or within respective survey buffers, to the proposed development site during the ornithological surveys (Appendix 9.1 Annex D). Following recommendations in SNH (2018), effects on all target species of Low Nature Conservation Importance (as defined by Table 9.2 below) have been scoped out.

9.3 Methodology

Legislation, Policy and Guidance

9.3.1 The legislation and policies which are directly relevant to the assessment of ornithological effects have been summarised below. Refer to Chapter 6 (Planning Policy Context), for detailed planning policies relevant to the proposed development.

9.3.2 The assessment has been undertaken in line with the following European legislation and guidance:

- Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive);
- Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (Habitats Directive);
- Environmental Impact Assessment Directive 85/337/EEC (as amended); and
- Wind energy developments and Natura 2000 (EC 2011).

9.3.3 The following national legislation, policy and guidance has been considered as part of the assessment:

- Birds of Conservation Concern 4 (Eaton *et al*. 2015);
- Chartered Institute of Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. CIEEM, Winchester;
- Circular 1/2017; The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Policy Advice Note PAN 1/2013 – Environmental Impact Assessment (Scottish Government 2013);
- Scottish Natural Heritage (2000) Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action. SNH Guidance Note. SNH;
- Scottish Natural Heritage (2005, revised 2010) Survey methods for use in assessing the impacts of onshore windfarms on bird communities;
- Scottish Natural Heritage (2009) Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees;
- Scottish Natural Heritage (2011) Dealing with Construction and Breeding Birds;

- Scottish Natural Heritage (2012a) Assessing the Cumulative Impact of Onshore Wind Energy Developments;
- Scottish Natural Heritage (2012b) Post-construction management of windfarms on clear-felled forestry sites; reducing the collision risk for Hen Harrier, Merlin and Short-eared Owl from Special Protection Areas;
- Scottish Natural Heritage (March 2013) Avoidance Rates for Wintering Species of Geese In Scotland At Onshore Wind Farms;
- Scottish Natural Heritage (May 2013) Geese and wind farms in Scotland: new information;
- Scottish Natural Heritage (August 2013, revised 2014a) Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms;
- Scottish Natural Heritage (2014b, consultation draft released June 2018) Guidance Note, Repowering onshore wind farms: bird survey requirements;
- Scottish Natural Heritage (2016) Assessing connectivity with Special Protection Areas (SPAs);
- Scottish Natural Heritage (February 2018) Assessing Significance of Impacts from Onshore Wind Farms Out-with Designated Areas;
- SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation; Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds (‘the Habitats and Birds Directives’). Revised Guidance Updating Scottish Office Circular No 6/1995;
- The Argyll and Bute Local Biodiversity Action Plan;
- The Nature Conservation (Scotland) Act 2004 (as amended);
- The Scottish Biodiversity List; and
- The Wildlife and Countryside Act 1981 (as amended).

Method of Baseline Characterisation

Desk based research and data sources

9.3.4 The following data sources were considered as part of the assessment:

- SNH Sitelink (https://gateway/snh.gov.uk/sitelink/);
- Argyll Raptor Study Group; and
- Tangy I Wind Farm and Tangy II Wind Farm Environmental Statements, associated ES data, and subsequent ornithological monitoring reports.

Field survey techniques

9.3.5 As detailed in paragraph 9.2.1, in addition to the baseline surveys undertaken for Tangy III (April 2012 to March 2014), further surveys were undertaken between September 2016 and November 2017. The data from both blocks of surveys is considered as one data set below.

9.3.6 Ornithological surveys were undertaken to establish the baseline ornithological conditions at the proposed development site (plus appropriate buffers). Fieldwork commenced in April 2012 and was completed in November 2017. Within this period, surveys were undertaken between April 2012 to March 2014 and October 2016 to November 2017. These provided data covering three breeding seasons (2012, 2013 and 2017) and four non-breeding seasons (2012/2013, 2013/2014, 2016/2017 and 2017/2018[5]).

9.3.7 The following surveys were undertaken within the relevant survey areas (see Appendix 9.1, Annexes C and D for details):

[5] 2017/18 survey did not cover the entire breeding season (Sept-Nov only).

- Flight activity surveys – April 2012 to March 2014 and October 2016 to November 2017 (Figure 9.3 details viewshed areas);
- Scarce Breeding Bird Surveys (SBBS), survey area within the site boundary plus a 2 km buffer (Figure 9.2) – spring/summer 2012, 2013 and 2017;
- Black grouse surveys, survey area within the site boundary plus a 1.5 km buffer (Figure 9.2) – spring 2012, 2013 and 2017;
- Breeding Bird Surveys (BBS), survey area within the site boundary plus a 500 m buffer (Figure 9.2) – spring/summer 2012 and 2017;
- Winter Walkover (WWO) surveys, survey area within the site boundary plus a 500 m buffer (Figure 9.2) – winter 2012/2013 and 2016/2017;
- Goose Roost Surveys, survey area within the site boundary plus a 500 m buffer (Figure 9.2) – winter 2012/2013 and 2013/2014; and
- Woodland Point Count Surveys, survey area within the site boundary (Figure 9.4) – spring/summer 2012 and winter 2012/2013.

9.3.8 Field surveys were conducted following the relevant recommended SNH (2014a) Guidance as detailed above. Appendix 9.1, Annex B provides details of the survey methodologies.

Effects Evaluation Methodology

9.3.9 The assessment method follows the process set out in the relevant provisions of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (together, 'the EIA Regulations') and guidance on implementation of the Birds and Habitats Directive (SERAD, 2000).

9.3.10 The ways in which birds may be affected (directly or indirectly) by the construction and operation of the proposed development are:

- Direct habitat loss through construction of the wind farm (e.g. turbine bases, etc.).
- Indirect habitat loss due to birds avoiding the wind farm and its surrounding area. This may occur as a result of disturbance during construction, operation and maintenance and also due to increased visitor disturbance.
- Habitat modification due to associated changes in land cover (e.g. tree felling or effects on hydrology leading to altered suitability for foraging, breeding, etc).
- Barrier effects in which birds avoid the wind farm and are therefore forced to take alternative routes to feeding or roosting grounds.
- Death or injury through collision with turbine blades, overhead wires (if any), met masts, or fences (if any) associated with the wind farm.
- Any of the above effects acting cumulatively with those from other wind farm plans and projects (i.e. operational developments and those currently in the planning process).

Methodology for assessing likely significant effects on a Special Protection Area (SPA)

9.3.11 As detailed in paragraph 9.4.3, the Kintyre Goose Roosts SPA and the Arran Moors SPA are within 20 km (Figure 9.1) of the proposed development, however connectivity is only considered to potentially exist between the proposed development and the Kintyre Goose Roosts SPA (paragraph 9.4.6).

9.3.12 The method for assessing the significance of a likely effect on an SPA is different from that employed for wider-countryside ornithological interests (detailed below). The Habitats Directive is transposed into domestic legislation by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland). Regulation 48 includes a number of steps to be taken by the competent authority before granting consent (these are referred to here as a Habitats Regulations Appraisal, HRA). In order of application, the first four are:

- Step 1. Consider whether the proposal is directly connected to or necessary for the management of the SPA (Regulation 48(1)(b)).
- If not, Step 2. Consider whether the proposal, alone or in combination, is likely to have a significant effect on the SPA (Regulation 48(1)(a)).
- If so, Step 3. Make an Appropriate Assessment of the implications for the SPA in view of that SPA's conservation objectives (Regulation 48(1)(a)).
- Step 4. Consider whether it can be ascertained that the proposal will not adversely affect the integrity of the SPA ("Integrity Test") having regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given (Regulation 48(5) and 48(6)).

9.3.13 It has already been established that the proposed development does not meet the criteria for Step 1. The assessment on the integrity of the SPA in relation to the proposed development is presented in this chapter. The results of baseline surveys and scientific conclusions presented in this chapter are used to inform the appraisal process, and potentially for the competent authority to conduct an Appropriate Assessment, if required.

9.3.14 The Kintyre Goose Roosts SPA conservation objectives are detailed below:

"*(1) To avoid deterioration of the habitats of the qualifying species (Greenland white-fronted goose) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and*

(2) To ensure for the qualifying species that the following are maintained in the long term:

(a) Population of the species as a viable component of the SPA;

(b) Distribution of species within the site;

(c) Distribution and extent of habitats supporting the species;

(d) Structure, function and supporting processes of habitats supporting the species; and

(e) No significant disturbance of the species."

Methodology for assessing wider-countryside ornithological interests

9.3.15 The evaluation for wider-countryside interests (interests unrelated to SPAs, but including SSSIs) involves the following process:

- Identifying the potential effects of the proposed development;
- Considering the likelihood of occurrence of potential effects where appropriate;
- Defining the sensitivity of a feature to effects via the Nature Conservation Importance (NCI) of the bird populations present and establishing each population's Conservation Status;
- Establishing the Magnitude of the likely effect (both spatial and temporal);
- Based on the above information, making a judgement as to whether or not the identified effect is significant with respect to the EIA Regulations;
- If a potential effect is determined to be significant, suggesting measures to mitigate or compensate the effect where required; and
- Considering residual effects after mitigation, compensation or enhancement.

Sensitivity

9.3.16 Determination of the level of sensitivity of a feature is based on a combination of the feature's NCI and Conservation Status, described in the sections below.

Methods used to evaluate the NCI of bird populations

9.3.17 There are three levels of NCI as detailed below in Table 9.2 – 'Important Ornithological Features (IOFs)' (CIEEM 2016) are those target species with High or Moderate NCI.

Table 9.2: Determining Factors of an Important Ornithological Feature's NCI	
Importance	**Definition**
High	Populations receiving protection due to inclusion as features of an SPA, proposed SPA, Ramsar Site, SSSI or which would otherwise qualify under selection guidelines. Species present in nationally important numbers (>1% national breeding population).
Moderate	The presence of target species listed in Annex 1 of the Birds Directive (but population does not meet the designation criteria under selection guidelines). The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). The presence of species noted on the latest Birds of Conservation Concern (BoCC) 'Red' list (Eaton *et al*. 2015). Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the windfarm. Species present in regionally important numbers (>1% regional breeding population).
Low	All other species' populations not covered by the above categories.

Methods used to evaluate conservation status of bird populations

9.3.18 As defined by SNH, the Conservation Status of a species is, "the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest (which for the purposes of the Birds Directive is the EU)" (SNH 2018).

9.3.19 Conservation Status is considered favourable under the following circumstances (SNH 2018):

- "*Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats";*
- *"The natural range of the species is not being reduced, nor is it likely to be reduced for the foreseeable future"; and*
- *"There is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis*".

9.3.20 SNH states that "*an impact should therefore be judged as of concern where it would adversely affect the existing favourable conservation status of a species or prevent a species from recovering to favourable conservation status, in Scotland*" (SNH 2018).

9.3.21 The relevant scale for breeding species is considered to be the appropriate Natural Heritage Zone (NHZ), in this case the Argyll West and Islands (NHZ 14). However, for some populations, insufficient information on the NHZ population may exist. In these circumstances the regional or national population estimate is used. For wintering or migratory species, the national population is often considered to be the relevant scale for determining effects on the Conservation Status (SNH 2018) and this approach is used in this assessment.

Impact Magnitude

9.3.22 An impact is defined as a change to the abundance and/or distribution of a population as a result of the wind farm. Effects can be adverse, neutral or beneficial.

9.3.23 In determining the magnitude of impacts, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

9.3.24 The sensitivity of individual species to disturbance during relevant behaviours is considered when determining spatial and temporal magnitude of effect and is assessed using guidance including Bright *et al*. (2006), Hill *et al*. (1997) and Ruddock and Whitfield (2007).

9.3.25 Impacts are judged in terms of magnitude in space and time. There are five levels of spatial and temporal impacts as detailed in Table 9.3 and Table 9.4 below respectively.

Table 9.3: Spatial Magnitude of Impact	
Spatial Magnitude	**Definition**
Very High	Total/near total loss of a bird population due to mortality or displacement. Total/near total loss of productivity in a bird population due to disturbance. Guide: >80% of population lost through additive mortality.
High	Major reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 21-80% of population lost through additive mortality.
Moderate	Partial reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 6-20% of population lost through additive mortality.
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 1-5% of population lost through additive mortality.
Negligible	Very slight reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the “no change” situation. Guide: <1% population lost through additive mortality.

Table 9.4: Temporal Magnitude of Impact	
Temporal Magnitude	**Definition**
Permanent	Effect continuing indefinitely beyond the span of one human generation (taken as approximately 30 years), except where there is likely to be substantial improvement after this period. Where in this case, Long Term may be more appropriate.
Long Term	Approximately 15-30 years or longer (see above).
Medium Term	Approximately 5-15 years.
Short Term	Up to approximately 5 years.
Negligible	Very minor (<6 months) or no temporal effect.

Effects Significance

9.3.26 The predicted significance of the effect has been determined through a standard method of assessment based on professional judgement, considering both sensitivity (i.e. each bird species' relative sensitivity to a particular effect) and magnitude of impact. The significance criteria used in this assessment are listed in Table 9.5.

Table 9.5: Determining Significance of Effects	
Significance of Effect	**Definition**
Major	The impact is likely to result in a long term significant adverse effect on the integrity of a feature.
Moderate	The impact is likely to result in a medium term or partially significant adverse effect on the integrity of a feature.
Minor	The impact is likely to adversely affect a feature at an insignificant level by virtue of its limitations in terms of duration or extent, but there will probably be no effect on its integrity.

Table 9.5: Determining Significance of Effects	
Significance of Effect	**Definition**
Negligible	No impact.

9.3.27 'Major' and 'Moderate' impacts are considered to be Significant in accordance with the EIA Regulations.

9.3.28 'Minor' and 'Negligible' impacts are considered to be Not Significant in accordance with the EIA Regulations.

Assessing Cumulative/In-combination Effects

9.3.29 The significance of cumulative and/or in-combination effects is assessed following the same methodology as detailed above for the proposed development alone (paragraphs 9.3.9 to 9.3.28). The assessment follows SNH (2012a) guidance for cumulative assessment.

Limitations of Assessment

9.3.30 Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to impacts. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

9.4 Baseline Conditions

Current Baseline

Context

9.4.1 This section describes the existing conditions within the ornithological study area comprising:

- Statutory nature conservation designated sites for birds within 20km of the proposed development;
- Birds recorded during baseline ornithology surveys (refer to Appendix 9.1 for full details);
- Data available from Tangy I (1993-94) and Tangy II (1994/95 to 2003/04) Environmental Statements and associated post-construction monitoring (2005/06) is referenced where relevant below; and
- Historic breeding records provided by the Argyll Raptor Study Group (ARSG).

9.4.2 The baseline data recorded for each target species is detailed per species below and the rationale for scoping each species in or out of the assessment is also included at this point.

Designations

9.4.3 Information gathered from the consultation exercise revealed that there are no statutory conservation designations within the proposed development but the proposed development is within 20 km of two SPAs (Figure 9.1):

- Kintyre Goose Roosts SPA (Table 9.6) (underpinned by Kintyre Goose Roosts Ramsar, Tangy Loch SSSI, Kintyre Goose Lochs SSSI and Rhunahaorine Point SSSI) – various distances to the north, east and south east (Table 9.8); and
- Arran Moors SPA (Table 9.7) (underpinned by Arran Moors SSSI) – 19.4 km to the east.

Table 9.6: Summary of Qualifying Features of the Kintyre Goose Roosts SPA/Ramsar (and Tangy Loch SSSI[a], Kintyre Goose Lochs SSSI[b] and Rhunahaorine Point SSSI[c])			
Feature	**Qualifying Feature Category**	**Status6**	**Description**
Greenland white-fronted goose *Anser albifrons flavirostris* Non-breeding	SPA, SSSI[a], SSSI[b], SSSI[c]	Favourable Maintained: April 2014	Wintering population of international importance: winter peak mean (1991/92 – 1995/96) of 2,300 representing 8% of the world population and 16% of the GB population. The SPA comprises two main populations which roost and feed within different sections of the SPA: • To the north, birds that use Rhunahaorine Point, Loch an Fhraoich and Loch Garasdale roosts and which feed on improved agricultural land around Rhunahaorine Point; and • To the south, birds that use Loch Lussa, Tangy Loch and Black Loch roosts and which feed on improved agricultural land around Laggan.
Little tern *Sternula albifrons* *Breeding*	SSSI[c]	Unfavourable Declining: May 2017	Largest little tern breeding colony in Kintyre, nine to 25 pairs present between 2006 and 2009. Previously this population was assessed as Favourable Maintained in July 2010. However, no little terns are known to have nested at this site in any year since 2013 (annual Argyll Bird Reports and Argyll Bird Club database).

Table 9.7: Summary of Qualifying Features of the Arran Moors SPA (and SSSI)			
Feature	**Qualifying Feature Category**	**Status7**	**Description**
Hen harrier *Circus cyaneus* Breeding	SPA, SSSI	Favourable Maintained: July 2009	Breeding population of European importance: annual average of 21 breeding females (1994-1998) representing 4% of the GB population.
Breeding bird assemblage	SSSI	Favourable Maintained: July 2013	Moorland that provides a diverse range of breeding and foraging habitats for a nationally important breeding bird assemblage including red-throated diver *Gavia stellata*, golden eagle *Aquila chrysaetos*, peregrine falcon *Falco peregrinus* and short-eared owl *Asio flammeus*.

Table 9.8: Distances between the proposed development[8] and the Composite Parts of the Kintyre Goose Roosts SPA, Ramsar and underpinning SSSIs		
Section	**Compass Direction**	**Distance**
Tangy Loch	South east	500 m
Lussa Loch	East	1.5 km
Black Loch	South east	6.1 km
Loch an Fhraoich	North	18.0 km
Rhunahaorine Point	North west	19.2 km
Loch Garasdale	North	22.2 km

6 According to http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8614
7 According to http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8614
8 Distances measured from nearest turbine to nearest section of SPA site boundary.

9.4.4 SNH (2016) lists hen harrier foraging distances from a nest site during the breeding season as between 2 km (core range) and 10 km (maximum range). Based on these distances, connectivity for hen harrier can be discounted between the proposed development and the Arran Moors SPA (19.4 km).

9.4.5 SNH (2016) also details goose winter foraging ranges and Greenland white-fronted geese are considered to range 5-8 km from their night roosts. Based on these distances and considering the distances to the various designated components of the Kintyre Goose Roosts SPA (Table 9.8), connectivity for Greenland white-fronted goose can be discounted between the proposed development and the Loch an Fhraoich, Rhunahaorine Point and Loch Garasdale components of the Kintyre Goose Roosts SPA. However, connectivity must be considered for the Tangy Loch, Lussa Loch and Black Loch components of the Kintyre Goose Roosts SPA.

9.4.6 Based on the above considerations, Arran Moors SPA has been scoped out of the assessment. Due to the connectivity of the proposed development to Tangy Loch, Lussa Loch and Black Loch, the Kintyre Goose Roosts SPA is scoped into the assessment.

Barnacle Goose

9.4.7 Flight activity surveys recorded one flight of six individuals (Figure 9.12, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Annual collision risk for the worst case turbines (across the five candidate models) was 0.0021 (equivalent to one bird every 475 years).

9.4.8 One flock of five barnacle geese was also recorded on Lussa Loch in July 2017. The timing of this record suggests that these may have been feral or escapee birds, since the migratory populations normally are on their Arctic breeding grounds between April and September.

9.4.9 Migratory populations of barnacle goose are listed in Annex 1 of the EU Birds Directive and as Amber in the BoCC list and the species is therefore of Moderate NCI. Considering this species' low on-site activity and negligible predicted risk of collision, **barnacle goose is scoped out of the assessment**.

Black Grouse

9.4.10 Four black grouse were noted in the wider area in spring 1994 as part of baseline surveys for Tangy I Wind Farm.

9.4.11 Targeted black grouse surveys undertaken during the 2012 and 2013 breeding seasons located no lekking grouse within 1.5 km of the proposed development, however surveys within the same survey area located two small leks during 2017 surveys (Figure 9.24). Lek 1 recorded a maximum of two males and one female and is approximately 930 m from the nearest proposed turbine and 825 m from the nearest infrastructure (track). Lek 2 recorded a maximum of three males (and no females) and is over 2.5 km from the nearest proposed turbine or infrastructure.

9.4.12 Black grouse is listed as Red in the BoCC list and is therefore of Moderate NCI. Considering this species' low onsite activity and that no leks are within 750 m of the proposed development[9], **black grouse is scoped out of the assessment**.

Common Sandpiper

9.4.13 Flight activity surveys recorded nine flights (Figure 9.15, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons), however none of these flights were considered to be 'at-risk'[10] and consequently no collisions were predicted.

[9] Recommended construction disturbance buffer for black grouse, operational disturbance buffer is 500 m.

[10] 'At-risk' is defined as – a flight having at least part of its duration (i) at Potential Collision Height (PCH) ; (ii) within the CRAA; and (iii) recorded within the 2 km viewshed of the associated VP.

9.4.14 Breeding bird surveys in 2012 and 2017 identified one and two territories respectively however no territories were located within the 500 m study area (Figure 9.20), with common sandpiper activity focused on the edges of Tangy Loch and Lussa Loch. This mirrored breeding bird survey results from 1993 which recorded breeding common sandpiper concentrated around Tangy Loch.

9.4.15 Common sandpiper is listed as Amber in the BoCC list and is therefore of Low NCI. Considering this species' low on-site activity, zero predicted risk of collision and Low NCI, **common sandpiper is scoped out of the assessment.**

Curlew

9.4.16 Flight activity surveys recorded 22 flights (Figure 9.5, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, 17 were included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The annual collision rate for the worst case turbine (of the five under consideration) was 0.0674 (equivalent to one bird every 14.8 years, or 1.69 birds across a 25-year lifespan of the wind farm).

9.4.17 Wilson *et al*. (2015) estimate there were 207 breeding pairs of curlew within NHZ 14. At an annual adult mortality of 0.264 (BTO BirdFacts) there will be a loss of 109.3 birds per year from the NHZ population. The additional predicted loss of 0.0674 birds a year due to collision would therefore equate to an additional mortality of 0.06% which is considered to be of **negligible** magnitude (Table 9.3).

9.4.18 Breeding bird surveys in 2012 and 2017 identified three and two territories respectively with two territories each year located within the 500 m study area (Figure 9.16 and Figure 9.17). Of these territories within the 500 m study area, one nest in both 2012 and 2017 was located under 50 m from an installed turbine. Whilst it has been suggested that curlew nest densities may be reduced within 800 m of wind turbines (Pearce-Higgins *et al.* 2008), more recent evidence (Whitfield *et al.* 2010) offers little support to the hypothesis that breeding curlew are displaced by operational turbines (even at 200 m). In addition, more recent research suggests that breeding curlew are not sensitive to disturbance and that there is no correlation between nesting success and turbine proximity (Whitfield *et al*. 2010). There is direct evidence of this at Tangy I and Tangy II where one curlew territory has been recorded within 50 m of a turbine during the 2012 and 2017 baseline surveys, indicating that curlew at the proposed development have continued to breed within the vicinity of operational turbines further supporting the apparent insensitivity to disturbance in this species, and possibly indicating habituation to the presence of turbines.

9.4.19 Breeding bird surveys in 1993 recorded breeding curlew concentrated around Tangy Loch.

9.4.20 Curlew is listed as Red in the BoCC list and is therefore of Moderate NCI. Considering this species' breeding activity levels within the 500 m study area and the available information regarding breeding disturbance, the additional suitable habitat available outwith the proposed development, and negligible predicted risk of collision, **curlew is scoped out of the assessment**.

Goldeneye

9.4.21 Goldeneye were recorded in low numbers on Tangy Loch during the 2012/2013 and 2016/2017 winter walkover surveys.

9.4.22 Goldeneye is listed in Schedule 1 of the Wildlife and Countryside Act and as Amber in the BoCC list and is therefore of Moderate NCI. Considering this species' very low on-site activity and no predicted risk of collision, **goldeneye is scoped out of the assessment**.

Golden Eagle

9.4.23 Flight activity surveys recorded one flight of a juvenile across the entire flight activity survey period (three breeding and four non-breeding seasons; Figure 9.16, detailed in Appendix 9.1 Annex D Table D-1), however this flight was not considered to be 'at-risk'[10] and consequently no collisions were predicted.

9.4.24 No other golden eagles were recorded across the whole survey period (April 2012 to March 2014 and October 2016 to November 2017) and there are no known territories within 6 km of the proposed development[11].

9.4.25 Golden eagle is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act, as Green in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity, no breeding activity within 6 km and no predicted risk of collision, **golden eagle is scoped out of the assessment**.

Greenland White-fronted Goose

9.4.26 Flight activity surveys recorded 132 flights[12] across the entire flight activity survey period (three breeding and four non-breeding seasons; Figure 9.6, detailed in Appendix 9.1 Annex D Table D-1). Of these, nine were included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The mean annual nonbreeding collision rate for the worst case turbine (of the five candidate models) was 0.0382 (equivalent to one bird every 26.2 years).

9.4.27 Comparing flight activity gathered from all surveys, flight activity levels were comparable between the 2012/2013 and 2016/2017 non-breeding seasons (Table 9.9), however there was a slight increase in flight activity between the operational wind farm and Tangy Loch and Lussa Loch (i.e. closer to the operational Tangy I and Tangy II wind farm and the proposed development, Figure 9.6 and Figure 9.26) during the 2016/2017 non-breeding season (six of the nine flights included in the collision modelling were recorded during the 2016/2017 non-breeding season).

9.4.28 Of the nine flights included in the collision modelling, two were recorded crossing over the operational Tangy I and Tangy II Wind Farms, however of the combined total recorded flight time of 170 seconds, only nine were spent flying within rotor swept heights (between 100 m – 150 m) with the rest of the time flying above 150 m. No other surveys recorded Greenland white-fronted goose flights crossing the operational Tangy I and Tangy II Wind Farm (Figure 9.6 and Figure 9.26).

Table 9.9: All Greenland White-Fronted Goose[13] Flight Records per Season

Season	Number of Flights	Average Flock Size	Flock size Range
2012/2013 Recorded between September 2012 and mid-May 2013	67	146	7 – 1000
2013/2014 Recorded between September 2013 and March 2014	36	77	6 – 230
2016/2017 Recorded between October 2016 and mid-May 2017	68	126	3 – 810
2017/2018 Recorded between September and November 2017	3	15	1 – 24

9.4.29 Figure 9.26 details all recorded goose activity (Greenland white-fronted goose, greylag goose, barnacle goose and grey goose, the latter for birds which could only be identified as either greylag or Greenland white-fronted goose), and it is clear that the majority of flight activity was focussed around Tangy Loch and Lussa Loch, with flights predominantly located between the two lochs and heading south west away from Tangy and Lussa Lochs.

[11] Nearest known eyries are 10-15 km to the south and 10km to the north.
[12] Of these, 57 were only recorded as grey goose (i.e. it was not possible to distinguish to species). As a precautionary measure, these have been considered as both greylag and Greenland white-fronted geese for the purposes of the collision modelling – only one of the nine flights considered in the collision modelling was of a 'grey goose'.
[13] NB: this includes birds recorded only as grey goose (refer to footnote 7).

9.4.30 Many of the goose flights recorded in the 2012/2013 non-breeding season were of large flocks numbering several hundred birds flying along the same flight path within minutes of each other as they commuted to or from the Lussa Loch roost. The largest observations were of approximately 1,000 geese leaving Lussa Loch and heading south towards the Laggan (a large lowland area favoured for grazing located between Campbeltown and Machrihanish) on the morning of 11th December 2012, and at dusk on the 6th February 2013 when approximately 1,320 grey geese bypassed the proposed development to the east and south-east on their way into Lussa Loch. During the 2013/2014 non-breeding season, no flights passed over the proposed development and all were travelling to or from Lussa Loch.

9.4.31 Goose roost surveys near Tangy Loch (south-east of the proposed development) during the 2012/2013 non-breeding season recorded a further 11 flights totalling 520 birds. Two records of Greenland white-fronted geese over Tangy Loch as shown were recorded on 7th January 2013 when a total of 70 birds spent time circling over the loch in dense mist, apparently disorientated. Goose roost surveys during the 2013/2014 non-breeding season recorded a further 21 flights totalling 1,670 birds, again mainly oriented south/north and passing to the east of the proposed development.

9.4.32 The only other flight records of Greenland white-fronted (or grey geese) were two incidental observations; on the 4th November 2013 when 480 birds (comprising six groups following the same flight path) flew into Tangy Loch, and on 10th January 2014 120 birds were observed flying towards Lussa Loch along the established flight path to the east of the proposed development.

9.4.33 Greenland white-fronted geese were recorded roosting and loafing on Tangy Loch on only four occasions; 150 birds landed on Tangy Loch on 26th November 2012, 480 birds landed on Tangy Loch on 4th November 2013, 12 birds were recorded on Tangy Loch on 26th October 2016 during flight activity surveys and 24 birds were recorded on Tangy Loch on 9th October 2017 during flight activity surveys.

9.4.34 In summary, 144 records of Greenland white-fronted geese (including those records of grey goose) were recorded across the baseline survey period (April 2012 to March 2014 and October 2016 to November 2017). Nine flights were within 500 m (i.e. the CRAA) of the proposed development and two overflew the operational Tangy I and Tangy II wind farm. This closely mirrors the data collected for Tangy I and Tangy II Wind Farms and from post-construction monitoring which indicates an established flight path to the east with very few flights over the proposed development or into Tangy Loch.

9.4.35 As also found by previous studies for Tangy I and II, it would appear that Lussa Loch is the main roosting loch for this sub-population of geese as virtually all goose flights recorded were either coming from, or heading into, Lussa Loch. These flights also all seem to take the same general and established flight path taking a line south or south-west along the valley to the south of, and over, Tangy Loch and by Skeroblin Hill and Skeroblin Cruach. Figure 9.26 details all the goose flight data collected across the baseline surveys (April 2011 to March 2014 and October 2016 to November 2017) and these observations indicate that goose flights are almost all located outside the collision risk area.

9.4.36 Tangy Loch was seldom used and this corresponds with the Site Management Statement (SNH, undated a) for Tangy Loch SSSI which notes that "*Greenland white-fronted geese do not, at present, use Tangy Loch as a regular roost site. For reasons not clearly understood, it appears that the geese now use the nearby Lussa Loch as their preferred roost site, with Tangy Loch as an infrequently used satellite roost. No on-site factors can currently be linked to the decrease in goose usage of Tangy Loch. There is no evidence that the recently constructed Tangy Wind Farm and associated power lines have affected goose usage of Tangy Loch*".

9.4.37 The Kintyre Goose Roosts SPA and Ramsar had a 1991/92 - 1995/96 winter peak mean of 2,300 Greenland white-fronted geese, 8% of total world population; 16% of GB and was last assessed in 2014 as Favourable Maintained. The condition of the notified natural feature of Kintyre Goose

Lochs SSSI was monitored between November 2000 and March 2004. Numbers of Greenland white-fronted geese at the site have been maintained. The average of the international field counts, 2000-01 to 2003-04 was 2,208, an increase of 0.36% on the baseline figure (1990/01 – 1994/95 winter peak mean). Crabtree *et al.* (2010) however estimated from winter counts that the peak Kintyre population of Greenland white-fronted goose in the winter of 2009/2010 was 3,360 individuals, and the population was stable.

9.4.38 Greenland white-fronted goose is listed in Annex 1 of the EU Birds Directive, as Red in the BoCC list and is the designated feature of the Kintyre Goose Roosts SPA (Table 9.6) and is therefore of High NCI. Given this species' High NCI, the proximity of the Tangy Loch, Lussa Loch and Black Loch components of the Kintyre Goose Roosts SPA, and (on the basis of the Habitats Regulations) that a Likely Significant Effect cannot be ruled out, **Greenland white-fronted goose is scoped in to the assessment.**

Greylag Goose

9.4.39 Flight activity surveys recorded 100 flights[14] (Figure 9.7, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, 21 were included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The mean non-breeding season[15] collision rate for the worst case turbine was of 0.4642 (equivalent to one bird every 2.2 non-breeding seasons).

9.4.40 Whilst the Icelandic and resident greylag geese are indistinguishable in the field, the Icelandic greylag goose population is now considered to overwinter almost exclusively in Orkney (Mitchell *et al.* 2010) and it is therefore appropriate to assume that greylag geese recorded in Argyll are part of the resident Scottish breeding population. Mitchell et *al.* (2010) estimated a north and west Scottish greylag goose population of 34,500 birds. At an annual adult mortality of 0.17 (BTO BirdFacts) the natural mortality is around 5,865 birds per year from the north and west Scottish population. The additional predicted loss of 0.4642 birds a year due to collisions would therefore equate to an additional mortality of 0.008% which is considered to be of **negligible** magnitude (Table 9.3).

9.4.41 Winter walkovers during the 2012/2013 non-breeding season recorded 24 greylag geese in flight to the west of the proposed development (Figure 9.21) and targeted surveys to monitor goose roosting behaviour at Tangy Loch recorded three flocks of greylag geese (totalling 45, six and eight birds, Figure 9.25).

9.4.42 Two populations of greylag goose can be found in Scotland, of which the relevant one for this assessment is the resident population (listed as Amber in the BoCC list and therefore of Low NCI). Considering this species' low on-site activity, low NCI and negligible predicted risk of collision, **greylag goose is scoped out of the assessment**.

Hen Harrier

9.4.43 Flight activity surveys recorded 24 flights (Figure 9.8, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, 14 were included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The mean annual collision rate for the worst case turbine model was 0.0008 (equivalent to one bird every 1,209 years).

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[14] Of these, 57 were only recorded as grey goose (i.e. it was not possible to distinguish to species). As a precautionary measure, these have been considered as both greylag and Greenland white-fronted geese for the purposes of the collision modelling – only one of the 21 flights considered in the collision modelling was of a 'grey goose'.

[15] Flight activity surveys exclusively recorded greylag geese during the non-breeding season for geese (1st September to 14th May, SNH 2014).

9.4.44 Hen harriers were recorded infrequently within the 2 km study area during scarce breeding bird surveys, with one record in 2012, one record in 2013, and six records in 2017 (Figure 9.22). Winter walkover surveys also recorded hen harrier on one occasion in February 2013 (Figure 9.21). we found no evidence of breeding within 2 km of the proposed development and the ARSG have no records of breeding within 2 km of the proposed development.

9.4.45 There was no evidence of breeding hen harrier presented in historical data. Results from Tangy I Wind Farm indicated that hen harriers occasionally hunted over the area but did not breed there.

9.4.46 Hen harrier activity was focussed in three main areas around the proposed development; the open ground to the north west of the site boundary (east of the Killocraw and North Lagalgarve properties), the area around Tangy Loch as far west as the eastern side of the current operational Tangy I and Tangy II), and around the central section of Lussa Loch (along the open ground along the edges of the loch and adjacent areas of clear felled forest) (Figures 9.8, 9.21 and 9.22).

9.4.47 The proposed development is situated across open ground (i.e. the ground including and surrounding the operational Tangy I and Tangy II) and commercial conifer plantation (predominantly closed canopy). Felling is therefore planned for parts of the plantation within the site boundary (Figure 16.1). The forest will be clear felled and replanted to a key hole design to allow for the construction of tracks/turbine pads and clearance for the rotor swept areas (Figure 16.2). Of the 463.86 ha of woodland within the site boundary, 270.75 ha would be felled. Replanting on the site will include 196.35 ha of productive conifer plantation, with an additional 3.50 ha of native broadleaf planting. 31.7 ha is proposed to be retained as open ground around turbines/tracks, and 30.43 ha will be designed open ground[16].

9.4.48 SNH guidance (2012b) on post-construction management of wind farms on clear felled forest sites indicates that when the forest is removed, the ground between wind rows regenerates quickly to produce a sward dominated by rank grass, often with small self-seeded trees. This is ideal habitat for hen harrier prey such as short-tailed field vole and, in the earlier stages, meadow pipit. The rank vegetation on clear felled sites can therefore provide suitable foraging habitat for hen harrier and is likely to increase the attractiveness of the site to this species and, in turn, lead to a potential increased collision risk.

9.4.49 The existing habitat within the forest rides at the proposed development is generally a mix of wet modified bog, wet heath, dry heath and marshy grassland habitats (Figure 10.2) which may also support suitable foraging habitat for hen harrier. The felling of plantation could therefore open up the ride network (on a temporary basis until the restocked plantation matures) which could increase the attractiveness of the ride habitats to foraging hen harriers. It should be noted however that because the forest will be approximately 40 years old across most of its extent at the time of felling, much of the understory vegetation will have been shaded out and lost for a considerable period of time, thereby rendering the site to be of poor quality vole habitat and limiting the ability for quick regeneration of suitable habitat.

9.4.50 Whilst it is acknowledged that the felling associated with the proposed development could create additional suitable habitat for foraging hen harriers, the potential creation of relatively small additional areas of moderately suitable habitat is considered unlikely to generate substantial changes in the level of hen harrier activity at the proposed development (especially considering there have been no recorded nesting attempts within 2 km across the entire survey period).

9.4.51 SNH (2012b) also suggests two possible approaches to estimate the post-felling collision risk to hen harrier:

- Use flight activity data over non-forested area of the survey area as a surrogate for future use of the cleared area; or

[16] It should be noted that a reasonable portion of this is already open ground as it comprises of pre-existing forest rides and watercourse boundaries.

- Multiply pre-felling collision risk by a factor to take account of increased use of the site after felling.

9.4.52 As a collision risk was generated for hen harrier (0.0008, paragraph 9.4.43), the second approach has been considered. Approximately 31 % of the current forested habitat within the site boundary is proposed to be cleared for the proposed development (i.e. for tracks and turbine areas). As a precautionary approach it has been assumed that this will double the amount of open habitat available. Consequently, the hen harrier activity and collision risk may also be doubled. This would generate an adjusted predicted collision risk of 0.0016. Wilson *et al*. (2015) estimate that there were 125 breeding pairs of hen harrier within NHZ 14. At an annual adult mortality of 0.19 (BTO BirdFacts) there will be a loss of 47.5 birds per year from the NHZ population. This worst case predicted loss of 0.0016 birds a year due to collision would therefore equate to an additional mortality of 0.003% which is considered to be of **negligible** magnitude (Table 9.3).

9.4.53 Hen harrier is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act, as Red in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity, no recorded breeding activity, negligible predicted risk of collision, and the limited effects of the removal of areas of forest, **hen harrier is scoped out of the assessment**.

Herring Gull

9.4.54 Flight activity surveys recorded 42 flights (Figure 9.9, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, 14 were included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The mean annual collision rate for the worst case turbine model was 0.1869 (equivalent to one bird every 5.4 years).

9.4.55 Wilson *et al*. (2015) estimated that there may be 9,372 breeding pairs of herring gull within NHZ 14 and considering an annual adult mortality of 0.12 (BTO BirdFacts) this would equate to a loss of 2,249.3 birds per year from the NHZ population. The additional predicted loss of 0.1869 birds a year due to collision would therefore equate to an additional mortality of 0.008%.

9.4.56 Breeding bird surveys during the 2013 and 2017 breeding seasons incidentally recorded herring gull on Tangy Loch and foraging (often in mixed gull flocks) in fields that border the application boundary to the north west to south. No evidence of breeding was recorded. Winter walkover surveys during the 2012/2013 and 2016/2017 non-breeding seasons also recorded herring gull (Figure 9.21).

9.4.57 Herring gull is listed as Red in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity and low predicted risk of collision, **herring gull is scoped out of the assessment.**

Merlin

9.4.58 Flight activity surveys recorded eight flights (Figure 9.17, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, two were included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The mean annual collision rate for the worst case turbine model was 0.00001 (one bird every 75,129 years).

9.4.59 Merlin was only recorded on one occasion within the 2 km study area during scarce breeding bird surveys in 2013 (Figure 9.22). we found no evidence of breeding within 2 km of the proposed development and the ARSG have no records of breeding within 2 km of the proposed development.

9.4.60 Merlin activity was focussed on the open ground to the north west of the site boundary (east of the Killocraw and North Lagalgarve properties, Figure 9.17) with one flight also recorded on the open ground adjacent to the operational Tangy I and Tangy II. Merlins prefer to hunt in open ground or along forest edges (SNH 2012b) and, like hen harrier, the currently forested nature of the northern half of the proposed development is considered to be of relatively low suitability for merlin.

9.4.61 As detailed in paragraphs 9.4.47 to 9.4.50 for hen harrier, the removal of forest for the proposed development could create additional suitable habitat for merlin (SNH 2012b). However, as detailed above for hen harrier, the fragmented and relatively small amount of potentially suitable additional habitat created for the proposed development is unlikely to generate substantial changes in the level of merlin activity at the proposed development (especially considering there have been no recorded nesting attempts within 2 km across the entire survey period).

9.4.62 As for hen harrier, SNH (2012b) suggests two possible approaches to estimate the post-felling collision risk to merlin:

- Use flight activity data over non-forested area of the survey area as a surrogate for future use of the cleared area; or
- Multiply pre-felling collision risk by a factor to take account of increased use of the site after felling.

9.4.63 As a collision risk was generated for merlin (0.00001, paragraph 9.4.58), the second approach has been considered. Approximately 31 % of the current forested habitat within the site boundary is proposed to be cleared for the proposed development (i.e. for tracks and turbine areas). As a precautionary approach it has been assumed that this will double the amount of open habitat available. Consequently, the merlin activity and collision risk may also be doubled. Wilson *et al*. (2015) estimate that there were 13 breeding pairs of merlin within NHZ 14. At an annual adult mortality of 0.38 (BTO BirdFacts) there will be a loss of 9.88 birds per year from the NHZ population. The additional worst case predicted loss of 0.00002 birds a year due to collision would therefore equate to an additional mortality of 0.0002% which is considered to be of **negligible** magnitude (Table 9.3).

9.4.64 Merlin is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act and as Red in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity, absence of breeding, negligible predicted risk of collision, and the limited effects of the removal of areas of forest, **merlin is scoped out of the assessment**.

Osprey

9.4.65 Ospreys were not recorded over the course of flight activity surveys between April 2011 to March 2014 and October 2016 to November 2017. Consequently, no collisions were predicted.

9.4.66 Scarce breeding bird surveys during the 2017 breeding season located an osprey nest to the north east of the proposed development (Confidential Figure 9.23) however the nest is over 2.5 km from the nearest proposed turbine. Ospreys were recorded fishing over Lussa Loch on two occasions during the 2017 breeding season surveys (Figure 9.22) with no records of osprey activity during 2012 and 2013 surveys.

9.4.67 Osprey is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act and as Amber in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity, no breeding activity within 2 km and zero predicted risk of collision, **osprey is scoped out of the assessment**.

Oystercatcher

9.4.68 Flight activity surveys recorded two flights (Figure 9.10 detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, one was included in the collision risk modelling as they were within the appropriate viewshed and the CRAA (refer to Appendix 9.1, Section 4.1.1 for further detail). The mean annual collision rate for the worst case turbine model was 0.0027 (equivalent to one bird every 364 years).

9.4.69 Breeding bird surveys in 2012 and 2017 identified one territory during 2012 (Figure 9.20) and no breeding evidence in 2017. The territory identified during 2012 was located within the 500 m study area. The oystercatcher territory was relatively close (approximately 90 m) to an existing operational turbine (and 91 m from a proposed turbine).

9.4.70 Oystercatcher is listed as Amber in the BoCC list and is therefore of Moderate NCI. Considering the low level of breeding activity within the 500 m study area, the presence of additional suitable habitat available outwith the proposed development, and no predicted risk of collision, **oystercatcher is scoped out of the assessment**.

Peregrine Falcon

9.4.71 Flight activity surveys recorded five flights (Figure 9.11, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Of these, four were included in the collision risk modelling. The mean annual collision risk for the worst case turbine model was 0.0154 (equivalent to one bird every 65 years).

9.4.72 Peregrine falcons were recorded infrequently within the 2 km study area during scarce breeding bird surveys, with no records in 2012, one record in 2013, and three records in 2017 (Figure 9.22). We found no evidence of breeding within 2 km of the proposed development and the ARSG have no records of breeding within 2 km of the proposed development.

9.4.73 Peregrine falcon is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act and as Green in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity, absence of breeding and negligible predicted risk of collision, **peregrine falcon is scoped out of the assessment.**

Red-throated Diver

9.4.74 Flight activity surveys recorded one flight of an individual (Figure 9.13, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons), however this flight was not considered to be 'at-risk'[10] and consequently no collisions were predicted.

9.4.75 Red-throated divers were occasionally recorded fishing and loafing on Tangy Loch with three records during the 2013/2014 non-breeding season and two during the 2017 breeding season. No breeding behaviour or evidence of breeding was recorded during any surveys during the 2012, 2013 or 2017 breeding seasons.

9.4.76 Red-throated divers were recorded on Tangy Loch in March and April of 2002, 2003, and 2004. Pairs were present in 2002 and 2004 but there are no data on whether these birds were breeding and it is not known whether they bred on Tangy Loch, or (as is more likely) were using it for loafing or fishing.

9.4.77 Red-throated diver is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act and as Green in the BoCC list and is therefore of Moderate NCI. Considering this species' minimal on-site activity, absence of breeding and no predicted risk of collision, **red-throated diver is scoped out of the assessment.**

Short-eared Owl

9.4.78 Short-eared owl was not recorded over the course of flight activity surveys between April 2011 to March 2014 and October 2016 to November 2017. Consequently, there were no predicted collisions.

9.4.79 Short-eared owl was only recorded on one occasion within the 2 km study area during scarce breeding bird surveys in 2012 (Figure 9.22). We found no evidence of breeding within 2 km of the proposed development and the ARSG have no records of breeding within 2 km of the proposed development.

9.4.80 Short-eared owl is listed in Annex 1 of the EU Birds Directive and as Amber in the BoCC list and is therefore of Moderate NCI. Considering this species' minimal on-site activity, absence of breeding and no predicted risk of collision, **short-eared owl is scoped out of the assessment.**

Snipe

9.4.81 Flight activity surveys recorded three flights (Figure 9.18, detailed in Appendix 9.1 Annex D Table D-1) between October 2016 and November 2017. Prior to October 2016, snipe was only recorded in the secondary species flight activity summaries (2012/2013 surveys, one record of an individual; 2013/2014 surveys, four records totalling 11 birds) and consequently these flights could not be included in the collision modelling. For the three later flights considered at risk of collisions, the mean annual collision risk for the worst case turbine model was 0.0118 (equivalent to one bird every 85 years).

9.4.82 Wilson *et al*. (2015) estimated 1,289 breeding pairs of snipe within NHZ 14 and considering an annual adult mortality of 0.519 (BTO BirdFacts) this would equate to a loss of 1,337.9 birds per year from the NHZ population. The additional predicted loss of a worst case of 0.0118 birds a year due to collision would therefore equate to an additional mortality of 0.001%.

9.4.83 One potential breeding snipe territory was located during 2017 surveys, however it was on the edge of Tangy Loch and outwith the 500 m study area (bird flushed from stream, Figure 9.20). Three snipes were also recorded during the 2016/2017 non-breeding season surveys (Figure 9.21).

9.4.84 Breeding bird surveys related to the baseline surveys for Tangy I in 1993 recorded breeding snipe concentrated around Tangy Loch.

9.4.85 Snipe is listed as Amber in the BoCC list and is therefore of Moderate NCI. Considering this species' negligible collision risk and no breeding activity within 500 m of the proposed development, **snipe is scoped out of the assessment**.

Whooper Swan

9.4.86 Flight activity surveys recorded one flight of an individual bird (Figure 9.14, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). This flight was not at risk of collision (above rotor height) therefore no collisions were predicted.

9.4.87 Surveys for goose roosting activity during the 2013/2014 non-breeding season recorded 14 whooper swans leaving Tangy Loch in two groups, heading west (Figure 9.25).

9.4.88 Whooper swans were recorded infrequently during surveys for Tangy II over the winters of 2001/2002, 2002/2003, 2003/2004 and early 2007. A single bird was noted on Tangy Loch on 29th January 2002, and on 17th February 2004 three birds were recorded flying into Tangy Loch. In January 2007 two whooper swan flights were recorded (both of three birds), one group flew from Lussa Loch and landed on Tangy Loch (approaching from the east) and the second group approached from the west (destination was unconfirmed). In April 2007 a flight of two whooper swans was recorded north of the wind farm. There are no records of whooper swans overflying the proposed development in any of the historical data available.

9.4.89 Whooper swan is listed in Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act and Amber in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity and no predicted risk of collision, **whooper swan is scoped out of the assessment.**

Woodcock

9.4.90 Flight activity surveys recorded one flight of an individual (Figure 9.19, detailed in Appendix 9.1 Annex D Table D-1) across the entire flight activity survey period (three breeding and four non-breeding seasons). Woodcock was not identified to be 'at-risk' during collision risk modelling and consequently there were no predicted collisions.

9.4.91 Woodcocks were also recorded on one occasion (November 2012) during woodland point counts and on one occasion (two birds) during the 2012/2013 winter walkovers (Figure 9.21).

9.4.92 Woodcock is listed as Red in the BoCC list and is therefore of Moderate NCI. Considering this species' low on-site activity, no record of breeding and no predicted risk of collision, **woodcock is scoped out of the assessment.**

Future Baseline

9.4.93 In the absence of the proposed development, and the continuation of current land management in the wider area, the bird assemblage recorded during baseline surveys is likely to remain relatively consistent over the long-term, although with a continuation of commercial rotational forestry practices, abundances and distributions of species are likely to vary through time.

Summary

9.4.94 A summary of the IOFs identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment is given in Table 9.10, together with the justification for inclusion.

9.4.95 All other IOFs detailed in section 9.4 have been scoped out due to very low or zero predicted collision risks and/or breeding activity recorded during baseline surveys and lack of habitat suitability within the proposed development.

Table 9.10: Summary of Feature Sensitivity for species scoped in to the assessment

Feature	Sensitivity	Justification
Greenland white-fronted goose and Kintyre Goose Roosts SPA (Tangy Loch, Lussa Loch and Black Loch)	High NCI[17]	Designated feature of the Kintyre Goose Roosts SPA and recorded during baseline surveys. Lochs listed are within 8 km of the proposed development and connectivity cannot be ruled out.

9.5 Effects Evaluation

Basis of Assessment

9.5.1 This section provides an assessment of the likely effects of the proposed development on the IOFs identified through the baseline studies and scoped-in assessment. The assessment of effects is based on the project description outlined in Chapter 4: Project Description and is structured as follows:

- Construction effects – disturbance;
- Operational effects – collision risk;
- Operational effects – displacement;
- Decommissioning effects; and
- Cumulative/In Combination effects.

Project Assumptions

9.5.2 The assessment below also makes the following assumptions:

- All electrical cabling between the proposed turbines and the associated infrastructure will be underground in shallow trenches which would be reinstated post-construction and, in most cases, follow the proposed access tracks.
- Any disturbance areas around permanent infrastructure during construction will be temporary and areas will be reinstated or restored before the construction period ends. The only

[17] As defined in paragraph 9.4.38.

excavation in these areas will be for cabling as noted above and otherwise may only be periodically used for side-casting of spoil until reinstatement.

- To ensure all reasonable precautions are taken to avoid negative effects on ornithological interests during construction and decommissioning, the developer will appoint a suitably qualified Ecological Clerk of Works (ECoW) prior to the commencement of construction and decommissioning and they will advise the developer and the Principal Contractor on all ornithological matters (with the assistance of a suitably qualified/licenced ornithologist if required). The ECoW will be required to be present on the site during the construction and decommissioning periods and will carry out monitoring of works and briefings with regards to any ornithological sensitivities on the site to the relevant staff within the principal contractor and subcontractors.
- A Breeding Bird Protection Plan (BBPP) will be implemented during construction and decommissioning of the proposed development. The BBPP will detail measures to safeguard breeding birds known to be in the area. The BBPP shall include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding bird activity in the vicinity of the construction/decommissioning works.
- Work on the proposed development, including tree clearance and construction of the site access tracks, turbine hard standings and site compound and erection of the turbines is predicted to last up to 22 months. The number of bird breeding seasons potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The breeding season of most birds at the proposed development extends from April to July (Forrester *et al.* 2007). For the purposes of this assessment it is assumed that, for any given species of bird, construction activities would commence during the breeding season and would therefore potentially affect breeding for a maximum of two years, assuming that construction will take approximately 22 months.

Likely Significant Effects

9.5.3 For the purposes of this assessment, Greenland white-fronted goose effects also require consideration within the context of the Kintyre Goose Roosts SPA via the HRA process. The Magnitude of Effect is therefore considered within the context of the Kintyre Goose Roosts SPA population in addition to the wider countryside population. With regards to the HRA (as detailed above in paragraphs 9.3.11 to 9.3.14), and as previously stated, the proposed development is not directly connected to, or necessary for the management of, the SPA (Step 1) and it is considered likely to have a significant effect, either alone or in combination, on the SPA (Step 2). Step 3 requires an Appropriate Assessment to be undertaken of the implications for the SPA in view of that SPA's conservation objectives. This chapter provides information to inform the Appropriate Assessment.

Predicted Effects: Construction

9.5.4 The main potential effects of construction activities across the proposed development are the displacement and disruption of breeding/wintering and foraging birds as a result of noise and general disturbance over a short-term period (either the duration of a particular construction activity within working hours, or the duration of the whole construction period).

9.5.5 Effects on breeding/wintering birds would be confined to areas surrounding temporary construction compounds, turbines, tracks and other infrastructure. Relevant information has been consulted for the purposes of this assessment, and although much of the scientific evidence of the effects on birds in relation to construction activities have produced inconsistent conclusions, as a broad generalisation, larger bird species such as raptors, or those that feed in flocks in the open tend to be more susceptible to disturbance than small birds living in structurally complex habitats (such as woodland, scrub and hedgerow) (Hill *et al.* 1997).

9.5.6 Direct habitat loss will also occur due to the construction of the proposed development, which will be both short-term (e.g. temporary compounds, laydown areas) and long-term (access tracks and turbines). This may impact on breeding or foraging individuals.

Greenland White-Fronted Goose

9.5.7 For the purposes of this assessment, the effect is considered within the context of the Kintyre Goose Roosts SPA as all the Greenland white-fronted geese recorded are assumed to be components of the SPA population (and associated SSSIs).

9.5.8 The information presented here may also inform an appropriate assessment should SNH advise the competent authority that this is required.

9.5.9 To establish the impact of the proposed development on the integrity of an SPA, it is necessary to consider the relevant conservation objectives which may be affected. The conservation objectives for the Kintyre Goose Roosts SPA are outlined in paragraph 9.3.15.

9.5.10 **Effect – Roosting and Flight Path Displacement:** In light of the proposed development's proximity to the SPA, conservation objectives 1, 2a, 2b and 2e are considered relevant. Conservation objectives 2c and 2d are not relevant and are therefore scoped out of the HRA.

9.5.11 Construction phase activities may displace birds from flying between their roosting and foraging grounds or disturb roosting birds by virtue of increased activity within the proximity of the SPA/local area.

9.5.12 **Nature Conservation Importance and relevant Conservation Status:** as an Annex 1 and BoCC Red listed species, with connectivity to an SPA, Greenland white-fronted goose is classified as High NCI. The Greenland white-fronted goose is a very localised winter visitor to Scotland with the 2016 British spring count reported as 10,286 (of which 5,183 were recorded on Islay, Goose News Issue 16). About 30 locations in Scotland (mostly on the west coast) provide safe roost sites from which birds travel out to forage in nearby wetland or grass pasture (Forrester *et al.* 2007). The majority of the Scottish sites are in Argyll, with the highest numbers on Islay (5,183 birds in Spring 2016, Goose News Issue 16). The distribution is linked to what was ancestrally their peat bog habitat, and although now they feed most commonly on agriculturally improved grasslands, there is usually a link to traditional peat bog or loch roost sites. In autumn, birds may briefly use feeding areas away from their traditional wintering sites, but re-sightings of marked birds show very high between-year wintering site fidelity. The Scottish population increased from around 7,000 birds in the early 1980s (numbers that had been depleted by shooting) to a peak of around 22,000 in 1998/99, after which numbers have declined despite protection (Forrester *et al.* 2007). The initial rise in numbers was due to a ban on hunting from 1981, however breeding productivity in Greenland declined consistently from the early 1980s, and the productivity in recent years has not been enough to replace mortality (Stroud *et al*. 2012). The breeding population has declined by about 30% between the 1990s and 2010 (Stroud *et al*. 2012). This poor breeding success may relate to the spread of Canada geese in Greenland but this is uncertain. Twelve sites in Scotland have been designated as SPAs for this species and it is Red-Listed under international conservation criteria and is a priority for action in the UK. The present conservation status is considered Unfavourable in Scotland due to this recent large decline in numbers and prolonged low breeding success.

9.5.13 The Kintyre Goose Roosts SPA and Ramsar supports a wintering population of international importance with a mean winter peak (1991/92 – 1995/96) of 2,300 representing 8% of the world population and 16% of the GB population and was last assessed in 2014 as **Favourable Maintained**. The condition of the notified natural feature of Kintyre Goose Lochs SSSI was monitored between November 2000 and March 2004. Numbers of Greenland white-fronted geese at the site have been maintained. The average of the international field counts, 2000-01 to 2003-04 was 2,208, an increase of 0.36% on the baseline figure (1990/01 – 1994/95 mean winter peak). Crabtree *et al*. (2010) however, estimated from winter counts that the peak Kintyre population of Greenland white-fronted goose in the winter of 2009/2010 was 3,360 individuals, and that the population was stable.

9.5.14 **Magnitude of Effect:** Greenland white-fronted geese were recorded across all surveys (mainly VP and goose roost surveys) across 174 recorded flights during the 2012/2013, 2013/2014, 2016/2017 and 2017/2018 non-breeding seasons. Of these, only nine flights passed within 500 m of the proposed development (i.e. within the CRAA) and only four crossed the airspace where the proposed development would be (two overflew the operational Tangy I and Tangy II wind farm). Virtually all flight activity was associated with flights to and from Lussa Loch (1.5 km east to the closest turbine), which is considered the main roosting loch for this sub-population of geese, and along a long and well-established north-south flight path to the east of the proposed development. This flight path is consistent with a large body of historical data and evidence that indicates this is the preferred and established route to and from Lussa Loch. Disturbance to roosting geese at Lussa Loch is not considered likely, given the distance of the loch from the proposed development and the natural visual and noise screening that the local topography, retained forest both within and outwith the application boundary to the east provides.

9.5.15 Tangy Loch (approximately 500 m from the proposed development) is a rarely used roosting loch for these geese and there are only four instances of geese landing, or being observed, on Tangy Loch recorded during baseline surveys (9.4.33). On the two occasions when geese came in to land on Tangy Loch the approach flight to the loch was from the south-east (i.e. south of Tangy Loch and therefore the proposed development). The recent survey findings of infrequent use of Tangy Loch match the evidence gathered over the past 20 years that this is a rarely used satellite roosting site for Greenland white-fronted geese and it is more likely to be used by small numbers of greylag geese (SNH, undated a; Lawrence, 2004).

9.5.16 Given how infrequently Tangy Loch is used as a roost, any disturbance effects on this roost are likely to be minimal as any birds that may use it will likely, in light of any possible disturbance effects upon approach, alter their course and continue on to the nearby and main roost site at Lussa Loch.

9.5.17 The proposed development is within the site of the existing Tangy I and Tangy II Wind Farms, the first of which has been in operation for almost 20 years, and as noted by SNH (undated) there is no evidence to indicate that the construction of these wind farms caused any disturbance or flight activity displacement during construction. Forest felling has been undertaken in the vicinity of Lussa Loch in the recent past without any obvious effects, and therefore it may be reasonably assumed the construction of the proposed development will also have minimal effect on goose flight activity.

9.5.18 During construction, goose flightlines may shift slightly further away from the proposed development to keep further away from any construction disturbance at the proposed development. This would not result in any additional energetic costs since the flight deviation will be insignificant in the context of their normal daily activities. Under the worst-case construction scenario, disturbance will occur over 20 months, which could affect up to three non-breeding seasons (albeit partially).

9.5.19 Within the context of the wider population, the construction effect on the Greenland white-fronted goose population is therefore considered to be **Negligible** spatial and **Short Term** temporal.

9.5.20 Within the context of the Kintyre Goose Roosts SPA, the construction effect on the Greenland white-fronted goose population associated with the SPA is therefore considered to be **Negligible** spatial and **Short Term** temporal.

9.5.21 **Significance of Effect:** based on the considerations above and prior to any mitigation, the significance of effect on the wider countryside Greenland white-fronted goose population is considered to be **Negligible** and therefore **Not Significant** in the context of the EIA Regulations.

9.5.22 Whilst a Likely Significant Effect could not be ruled out for Greenland white-fronted goose, the magnitude of effect (arising from construction) is considered to be minimal and therefore there is **no potential for an Adverse Effect on the Integrity of the Kintyre Goose Roosts SPA** under the Habitat Regulations (9.3.11 to 9.3.14).

9.5.23 **Proposed Mitigation:** Although no significant effects are predicted, a number of mitigation measures will be put in place during the winter period to ensure all reasonable measures are taken to avoid disturbance to commuting flights of, or roosting, Greenland white-fronted geese in the area:

- Prior to the commencement of works an agreed timetable for construction, which takes account of the need to protected geese using Tangy Loch or Lussa loch from disturbance during building works, shall be submitted and approved by Argyll and But Council in consultation with SNH. The duly approved timetable shall be adhered to be contractors for the duration of the construction period;
- Any construction works, vehicular traffic, or other activity shall be confined to the period 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries would only take place outside these times with the prior consent of the local authority and police. Those activities that are unlikely to give rise to noise audible at the site boundary may continue outside of the stated hours; and
- Any blasting shall be confined to Monday to Friday, between the hours of 10:00 and 16:00. Blasting on Saturday mornings shall be a matter for negotiation between contractor and the local authority.

9.5.24 The Ecological Clerk of Works (ECoW) will oversee the implementation of the above mitigation measures.

9.5.25 **Residual Construction Effects:** given that no mitigation is required, the residual effects of construction disturbance on wintering Greenland white-fronted goose remain as above (i.e. **Not Significant**), however the proposed mitigation will ensure that construction disturbance is minimised still further below the predicted effect level.

Predicted Effects: Operation – Collision Risk

9.5.26 Birds that utilise the airspace within the turbine area at potential collision heights during the lifetime of the proposed development will be at risk of collision with turbines. The risk of collision with moving wind turbine blades is related to the amount of flight activity over the site, the topography of the site, the species' behaviour, and the ability of birds to detect and manoeuvre around rotating turbine blades.

9.5.27 Band *et al.* (2007) describe a method of quantifying potential bird collisions with onshore turbines, in which: (i) the activity rate per unit area per season is extrapolated; (ii) the likelihood of a collision with a blade for a bird passing through the rotor swept area is calculated; and (iii) an 'avoidance rate' is applied to account for behavioural adaptation of birds to the presence of turbines. This results in a figure for the likely mortality rate at the wind farm which is then assessed within the context of the species' relevant populations to determine the significance of any losses. Collision Risk Modelling (CRM) results are presented per species (including those scoped out) in Table 9-3 to Table 9-8 in **Appendix 9.1** with details of all the collision modelling output located in **Appendix 9.1, Annex E**.

Greenland White-Fronted Goose

9.5.28 The HRA process, as described above in Construction Effects, is applicable here for collision mortality effects on Greenland white-fronted geese. SPA conservation objectives 1 and 2a are considered relevant.

9.5.29 **Effect:** wintering Greenland white-fronted geese flying into and out of Tangy Loch and Lussa Loch may be subject to collision risk with turbines, which could affect the SPA, regional and Scottish population size. Following collision risk modelling, a highest mean non-breeding season collision risk for Greenland white-fronted goose of 0.0382 was predicted (one bird every 26.2 years; further details can be found in **Appendix 9.1, Annex E**.

9.5.30 Given the presence of the existing Tangy I and Tangy II Wind Farm, there is potential that the collision rate has been underestimated for the proposed development as a consequence of reduced goose flight activity within the current Wind Farm (i.e. that the existing Wind Farm has altered goose flight paths that would, in the absence of the Wind Farm, have flown over the area covered by the existing Wind Farm and therefore been included in the collision modelling for the proposed development). To account for this, a precautionary adjustment to the predicted collision rate has been undertaken by subtracting the area of the operational Tangy I and Tangy II Wind Farms (77ha) from the area of the Tangy IV CRAA (602.4ha) to obtain an estimate of the CRAA for just the new development area (525.4ha). The collision risk for this reduced CRAA was calculated from that for the complete CRAA, by multiplying the original estimate by the area of the total CRAA divided by the area of the reduced CRAA[18]. This generates an adjusted annual collision rate for Greenland white-fronted goose of 0.0438 (one bird every 22.8 years).

9.5.31 **Nature Conservation Importance and relevant Conservation Status:** Greenland white-fronted goose is considered to be of High NCI. The Scottish population is considered to be in an Unfavourable Conservation Status, however the SPA population (and indeed the regional Argyll population) was considered as of April 2014 to be Favourable Maintained (paragraph 9.5.12).

9.5.32 **Magnitude of Effect:** Greenland white-fronted goose adult annual survival rate over the period 1982-2007 was estimated at 0.88 (Trinder 2010). Geese are relatively long-lived, slow breeding species, and as such population growth is most sensitive to change in the adult survival rate. Changes to this rate have a proportionally much greater effect on the risk of population decline than changes to either juvenile survival or reproduction (Trinder, 2010).

9.5.33 The British wintering population has been most recently estimated as 10,286 birds of which 5,183 overwinter on Islay (Goose News Issue 16). Considering the population outwith Islay (5,103), at an annual adult mortality of 0.12 (Trinder 2010) this indicates a minimum loss of 612 birds per year (this assumes adult mortality for all age classes – in reality younger birds will have higher mortality). The additional predicted loss of 0.0438 birds per year due to collision would therefore equate to an additional mortality of 0.007 % which is considered to be of **negligible** magnitude (Table 9.3).

9.5.34 The SPA population is estimated to be 2,300 birds, which at an annual adult mortality of 0.12 (Trinder 2010) indicates a minimum loss of 276 birds per year (assuming adult mortality), the additional predicted loss of 0.0438 birds per year due to collision would therefore equate to an increase in mortality of 0.016% which is considered to be of **negligible** magnitude (Table 9.3).

9.5.35 Wintering geese have been assessed as having a very high turbine collision avoidance rate at onshore wind farms, with an avoidance rate of 99.8% advised by SNH (SNH 2013a and 2013b). This would indicate that if geese were to fly near the proposed development during the operational period, the risk of collision would be very low and unlikely to be of a level that would be noticeable against annual background mortality rates. There are no reported collisions of geese associated with the existing Tangy I and II Wind Farm projects.

9.5.36 Within the context of the wider population, the magnitude of collision effect on the Greenland white-fronted goose population is therefore considered to be **Negligible** spatial and **Long Term** temporal.

9.5.37 Within the context of the Kintyre Goose Roosts SPA and SSSIs, the magnitude of collision effect on the Greenland white-fronted goose population is therefore considered to be **Negligible** spatial and **Long Term** temporal.

[18] i.e. (602.4/525.4) X 0.0382

9.5.38 **Significance of Effect:** based on the considerations above and prior to any mitigation, the significance of effect on the wider countryside Greenland white-fronted goose population is considered to be **Negligible** and therefore **Not Significant** in the context of the EIA Regulations.

9.5.39 Whilst a Likely Significant Effect could not be ruled out for Greenland white-fronted goose, the magnitude of effect (arising from operation) is considered to be minimal and therefore there is **no potential for an Adverse Effect on the Integrity of the Kintyre Goose Roosts SPA** under the Habitat Regulations (9.3.11 to 9.3.14).**Proposed Mitigation:** none required, however it is proposed that operational monitoring should be undertaken of Greenland white-fronted goose roosting activity (and flight paths) at Tangy Loch and Lussa Loch (see Section 9.6).

9.5.40 **Residual Operational Effects:** given that no mitigation is required, the residual effects of collisions on wintering Greenland white-fronted goose remain as above (i.e. **Not Significant**).

Predicted Effects: Operation – Displacement

Evidence of displacement of breeding and non-breeding birds in general

9.5.41 The displacement of nesting and foraging birds from the proposed development has the potential to extend beyond the construction phase, as described above, and to occur during the operational phase. It is recognised that disturbance may occur due to maintenance activities throughout the operational phase, although since these are likely to be of shorter duration and smaller extent than construction activities, effects will be lower than those predicted for construction effects (see previous section).

9.5.42 Displacement away from operational turbines has been found to occur in a number of individual wind farm studies, although the effects vary considerably between sites and species. Devereux *et al*. (2008) showed that wind farms had no, or at most a minimal, effect on the local distribution of wintering farmland birds and across a range of breeding bird species but predominantly waders and passerines at upland wind farms, Pearce-Higgins *et al.* (2012) found no displacement effects on any bird species at operating wind farms, other than where such displacement had already occurred during construction, and for some species the effects during construction were reversed during operation with numbers returning to pre-construction numbers. Consistent with the findings of Pearce-Higgins *et al*. (2012), Hale *et al*. (2014) found no evidence of displacement due to wind turbines in breeding grassland songbirds. However, Sansom *et al.* (2016) suggested that breeding golden plovers may be affected by operational turbines up to 400 m away.

9.5.43 A North American study of redheads (which are ducks) found that breeding numbers at ponds within the wind farm were reduced by 77% compared to the situation pre-construction despite a three-fold increase in breeding numbers in the area outwith but near to the wind farm (Lange *et al*. 2018), suggesting that breeding ducks avoided nesting within the wind farm area itself.

9.5.44 An additional consideration is the displacement of birds from larger areas where the turbines act as a barrier to bird movement. The likelihood of this effect occurring tends to increase with wind farm size, where large turbine arrays can force birds to alter their regular flight-paths, resulting in an increase in distance flown and so energy expended. However, a review of the literature suggests that none of the barrier effects identified so far have significant effects on populations (Drewitt and Langston, 2006). This was also the conclusion from modelling of energy costs to those bird species most likely to be sensitive to barrier effects (large and long-lived breeding birds such as seabirds) by Masden *et al.* (2010).

9.5.45 Pearce-Higgins *et al*. (2009) observed certain species experiencing localised population increases with proximity to wind farm infrastructure installations, so while some birds may be displaced locally, others may benefit from the introduction of new structures into the habitat, or some other consequence of construction. This finding was further supported by Pearce-Higgins *et al*. (2012) who reported significant increases in breeding numbers of skylarks and stonechats at wind farms.

Evidence of Displacement of Geese by Wind Farms

9.5.46 Rees (2012) reviewed evidence for behavioural responses of geese to wind farms in literature published up to early 2012. She concluded that there was insufficient evidence at that time to determine whether landscape-scale displacement of foraging geese occurred as a result of wind farms. However, she concluded that geese tend to avoid foraging within 100 m of wind turbines, and that geese tended to alter flight direction when between 5 and 1 km distant, to avoid entering wind farms and so may experience a barrier effect. This was confirmed by Plonczkier and Simms (2012), who used radar to track flights of geese near to an operational offshore wind farm, and concluded that geese showed very high macro-avoidance, over 94% of flocks adjusting their flight direction to avoid entering the wind farm.

9.5.47 Rees (2012) concluded that available evidence at that time was insufficient to assess the scale or extent of displacement of geese. Since then, several detailed studies have improved the evidence base. While Larsen and Madsen (2000) found that pink-footed geese tended to avoid foraging within 100 m of wind turbines, Madsen and Boertmann (2008) showed that these birds demonstrated habituation to the presence of turbines, foraging in 50% smaller avoidance distances than they had initially shown when the wind farms first became operational. Habituation of foraging habitat use by geese and other birds to the presence of operational wind farms has also been shown by Farfan *et al*. (2017).

9.5.48 Zehtindjiev *et al*. (2017) concluded that wind farms in agricultural habitat did not cause any displacement at a landscape scale of red-breasted geese wintering in Bulgaria. Harrison *et al*. (2018) did find local displacement by wind turbines of white-fronted geese wintering in Bulgaria, but considered that the displacement was very small scale, with densities reduced <100 m from turbines. The main determinant of foraging goose density in their study was distance from the roost site rather than presence of wind farms or other human structures such as roads and power lines which had only very local effects (Harrison *et al*. 2018).

Greenland White-Fronted Goose

9.5.49 **Effect – Roosting and Flight Path Displacement:** the conservation objectives relevant to this effect are 1, 2a, 2b and 2e. The turbines and operational activities (e.g. turbine maintenance) may displace birds from flying between their roosting and foraging grounds or disturb roosting birds by virtue of increased activity within the proximity of the SPA/local area. Field surveys and historical data have indicated the main roosting loch for Greenland white-fronted geese and the subpopulation in the vicinity of the proposed development is Lussa Loch, with Tangy Loch being a very infrequently used satellite roost. There is an established roost flight path in a well-defined corridor to the east of the proposed development.

9.5.50 **Nature Conservation Importance and relevant Conservation Status:** Greenland white-fronted goose is of High NCI. The Scottish population is considered to be in an Unfavourable Conservation Status, however the SPA population (and indeed the regional Argyll population) is considered as of April 2014 to be Favourable Maintained (paragraph 9.5.12).

9.5.51 **Magnitude of Effect:** Figure 9.26 details all goose flight activity recorded across all surveys. The flight paths to and from Lussa Loch is to the east of the proposed development over Skeroblin Cruach which corroborates with a substantial body of historical data over the past 20 years, indicating that this is the established flight path of the geese over a number of goose generations (Appendix 9.1 Annex G). Goose flight paths around Tangy Loch (mainly of greylag goose and grey goose), either crossed east/west below the operational Tangy I and Tangy II (and therefore also the proposed development) or headed south on a broad front around Skeroblin Hill (Figure 9.26). Only four Greenland white-fronted goose flights were recorded crossing the proposed development (with two of these crossing the operational Tangy I and Tangy II at height). These four flights account for a small proportion of the total flight activity (2.3 %), therefore displacement effects on commuting geese are unlikely to have an effect as the geese tend to use the well-established flight paths as described and rarely overly the proposed development.

9.5.52 Tangy Loch (approximately 500 m from the proposed development) is a rarely used roosting loch for these geese and there are only four instances of geese landing, or being observed, on Tangy Loch recorded during baseline surveys (9.4.33). On the two occasions when geese came into land on Tangy Loch the approach flight to the loch was from the south-east (i.e. from below Tangy Loch and therefore the proposed development). The recent survey findings of infrequent use of Tangy Loch match the evidence gathered over the past 20 years that this is a rarely used satellite roosting site for Greenland white-fronted geese and it is more likely to be used by small numbers of greylag geese (SNH, undated a; Lawrence, 2004).

9.5.53 The historical data consulted only makes one observation of four Greenland white-fronted geese altering their flight path as result of the existing turbines at Tangy I wind farm. This small flock was within the context of more than an estimated 13,500 goose movements recorded over the 2002/2003 winter surveys. These geese made a measured diversion to the north-east around the wind farm area and continued on their original course, however this would appear to be an infrequent occurrence and any energy costs of any extra flight or flight deviation will be insignificant in the context of their normal daily activities.

9.5.54 In keeping with most other studies of displacement, it appears that geese have a low sensitivity to disturbance at operational wind farms and at most maintain a buffer of a few hundred metres but often much less (Larsen and Madsen 2000, Madsen and Boertmann 2008), although more so with regards daily commutes between roosts and feeding sites (Rees 2012). They will occasionally fly through wind farms (Rees 2012) but they have been found to show high macro-avoidance (tending to fly around rather than through wind farms; Plonczkier and Simms 2012), and to be highly adept at avoiding individual turbines (SNH 2013a, SNH 2013b). Given the distance of the proposed development site from the established flight path and roost sites, and that a wind farm has been operational on the same site since the mid-1990s to which the geese may have habituated to without apparent effect on the population or their behaviour it implies any avoidance of the area close to turbines would be of long-term temporal and negligible spatial magnitude at the population or subpopulation level.

9.5.55 Within the context of the wider population, the operational displacement effect on Greenland white-fronted goose population is therefore considered to be **Negligible** spatial and **Short Term** temporal.

9.5.56 Within the context of the Kintyre Goose Roosts SPA, the operational displacement effect on the Greenland white-fronted goose population associated with the SPA is therefore considered to be **Negligible** spatial and **Short Term** temporal.

9.5.57 **Significance of Effect:** based on the considerations above and prior to any mitigation, the significance of effect on the wider countryside Greenland white-fronted goose population is considered to be **Negligible** and therefore **Not Significant** in the context of the EIA Regulations.

9.5.58 Whilst a Likely Significant Effect could not be ruled out for Greenland white-fronted goose, the magnitude of effect (arising from operational displacement) is considered to be minimal and therefore there is **no potential for an Adverse Effect on the Integrity of the Kintyre Goose Roosts SPA** under the Habitat Regulations (9.3.11 to 9.3.14).

9.5.59 **Proposed Mitigation:** none required, however it is proposed that operational monitoring should be undertaken of Greenland white-fronted goose roosting activity (and flight paths) at Tangy Loch and Lussa Loch (see Section 9.6).

9.5.60 **Residual Operational Effects:** given that no mitigation is required, the residual effects of collisions on wintering Greenland white-fronted goose remain as above (i.e. **Not Significant**).

Predicted Effects: Decommissioning

9.5.61 Decommissioning effects, because of the long timeframe until their occurrence (around 25-30 years), are difficult to predict with confidence. For the purpose of this chapter they are considered to be similar to those of construction effects in nature, but of shorter duration, with the result being a restored habitat within an area where displaced birds will be able to return. Thus, effects assessed during construction are considered to apply to decommissioning.

9.5.62 An equivalent mitigation strategy to that described in paragraph 9.5.23 will ensure any displacement to Greenland white-fronted geese associated with Tangy Loch and Lussa Loch is kept to a minimum.

Predicted Effects: Cumulative & In-Combination

9.5.63 This section presents information about the potential cumulative and in-combination effects of the proposed development combined with other nearby existing or proposed projects or activities that are subject to an EIA process.

9.5.64 SNH (2012) provides guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance. According to SNH, *"The key principle for all cumulative impact assessments is to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process".*

9.5.65 Cumulative effects may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative effects, such as collision risk may be summed quantitatively, but according to SNH (2012), "*In practice some effects, such as levels of disturbance or the barrier effect, may need considerable additional research work to assess impacts quantitatively. A more qualitative process may need to be applied until this quantitative information is available, e.g. from post-construction monitoring or research*".

9.5.66 For the cumulative assessment, the NHZ level is considered practical and appropriate for breeding species of wider countryside interest. For the in-combination assessment (required for the HRA) and considering the SNH (2016) connectivity guidance, projects within 8 km of the Kintyre Goose Roosts SPA are considered.

9.5.67 The assessment uses a three-tiered approach based on the levels of likelihood and confidence that a particular project will be consented and combine with the proposed development to act on an IOF to create a cumulative effect. The tiered process of assessment, ordered in descending likelihood of cumulative effects takes the following form:

1. The proposed development with existing and in-construction projects;
2. The proposed development with operational, in-construction and approved projects; and
3. The proposed development with operational, in-construction, approved and in-planning projects.

9.5.68 Wind farm projects at scoping stage have been scoped out as they do not have sufficient information on potential impacts to be included, as the baseline survey period is ongoing, or results have not been published. Projects that have been refused or withdrawn have also been scoped out.

9.5.69 Small projects with three or fewer turbines have also been excluded as often these projects are not subject to the same level of detail of ornithological assessment, and so there are no directly comparable data. Because of the small scale of such projects, effects are likely to be negligible on the IOFs assessed here. Other small-scale renewable projects such as micro hydro schemes have also been scoped out for similar reasons.

9.5.70 SNH's Natural Spaces website[19] was accessed to download the Onshore Wind Farm Proposals GIS Shapefile (version 21 June 2018), which presents the location of wind farms across Scotland, to provide the initial scope for this assessment. Further internet searches were required to check and update the status of some projects.

[19] https://gateway.snh.gov.uk/natural-spaces/

9.5.71 Following the Assessment of Likely Significant Effects on the Kintyre Goose Roosts SPA, in-combination effects on the SPA for Greenland white-fronted goose have been considered below. Table 9.11 provides a summary of the wind farm projects within 8 km for the SPA – for a number of cases projects did not undertake collision modelling for Greenland white-fronted goose (likely due to very low or no activity recorded during baseline surveys) or no relevant information could be sourced, indicated by 'N/A' in the table.

Table 9.11: Scoped-In Wind Farm Projects Within 8 km of the SPA

Project	**Status**	**Number of Turbines**	**Information Available for Greenland White-Fronted Goose Collision Estimates**
Auchadaduie WF	Application	3	0
Beinn an Tuirc Phase 1	Installed	46	N/A
Beinn an Tuirc Phase 2	Installed	19	0.005 at 95 % avoidance rate (the actual collision risk estimate at Beinn an Tuirc Phase 2 was nil as no at risk flights passed through the wind farm area; the 0.005 collision risk estimate was based on alternative scenario modelling where all flights recorded were modelled as passing through the wind farm area if they had been displaced or disorientated by low cloud or mist conditions). Converted to 99.8% avoidance rate the annual collision risk is 0.0002.
Beinn and Turic Phase 3	Approved	18	N/A
Blary Hill	Installed	14	N/A
Clachaig glen	Application	14	N/A
Cour	Installed	10	0.018 at 99.8 % avoidance rate.
Deucheran Hill	Installed	9	N/A
Eascairt WF - Kintyre	Application	13	N/A
Gigha Community WF	Installed	4	N/A
Killean	Application	17	0.04 at 99.8% avoidance rate (1 every 15.6 years). Observed flight activity was multiplied by 28% to account for unobserved night time activity.
Low Ugdale	Application	-	N/A

9.5.72 Of the twelve other wind farms considered, three predicted a collision risk for Greenland white-fronted goose: Cour Wind Farm, Beinn an Turic Wind Farm Phase 2 and the proposed Killean Wind Farm. Cour Wind Farm lies 21.5 km to the north east of the proposed development but 5-6 km from the Loch Garasdale and Loch an Fhraoich components of the Kintyre Goose Roosts SPA. Beinn an Turic Wind Farm Phase 2 lies 7 km to the north east of the proposed development (and north of Lussa Loch) and adjacent to Beninn an Turic Phase 1. An actual collision risk of nil was predicted for Beinn an Turic Phase 2, however scenario collision modelling (under low cloud or mist conditions with a 95 % avoidance rate) did predict a low collision risk for Greenland white-fronted goose. Converted to the current goose avoidance rate of 99.8 %, the revised collision risk from the scenario modelling is 0.0002 per year. A collision risk of 0.04 at 99.8% avoidance rate was estimated for Killean Wind Farm. This collision risk value includes a 28% increase to account for hypothetical and unobserved night time activity.

9.5.73 No Greenland white fronted goose flights were observed at nine wind farms. The absence of flights is likely due to the habit of geese to use regular flight paths either on migration or between roosts and feeding locations, with only irregular flights likely to deviate away from these established routes, possibly as a result of poor visibility or strong wind conditions. Many of the wind farms included in the cumulative assessment are located either outside migration routes or away from routes between roosting locations and feeding areas. As a result, geese are not expected to fly over these areas regularly.

9.5.74 The maximum annual Greenland white-fronted collision rate associated with the proposed development was predicted to be 0.0438 (one every 22.8 years). When also including the predicted collision rate from all installed and approved projects (converted to a 99.8 % avoidance rate if required, Table 9.12), an in-combination annual collision rate of 0.102 (one every 9.8 years[20]) is predicted. This equates to a 0.037% increase in the baseline mortality.

Table 9.12: In-Combination Collision Effects for Projects within 8 km of the Kintyre Goose Roosts SPA: Predicted Annual Collision Rates		
Species		Greenland white-fronted goose
SPA Population		2,300
Collision Rate	**Installed**	0.0182
	Approved	0
	Application	0.04
	Tangy IV	0.0438
	Total	0.102
Background Adult Mortality Rate		0.12
Adult mortality rate including cumulative collisions		0.120044
Increase in mortality rate due to cumulative collisions (%)		0.037 %
Increase in mortality rate due to Tangy IV (%)		0.016 %

9.5.75 This additional mortality is of a negligible magnitude and any cumulative increase is likely to have a virtually undetectable effect on the risk of population decline (e.g. see population viability analysis in Trinder 2010).

9.5.76 Overall, despite general declines in Greenland white-fronted goose numbers for a number of natural reasons (Stroud *et al*. 2012), the Kintyre Goose Roosts SPA population is still considered to be in **Favourable** conservation status (March 2014) and as such, the in-combination effect on the Greenland white-fronted goose population associated with the SPA is therefore considered to be **Negligible** spatial and **Long Term** temporal.

9.5.77 Therefore, whilst a Likely Significant Effect could not be ruled out for Greenland white-fronted goose, the magnitude of effect (arising from in-combination collisions) is considered to be negligible and therefore there is **no potential for an Adverse Effect on the Integrity of the Kintyre Goose Roosts SPA** under the Habitat Regulations (9.3.11 to 9.3.14).

9.6 Monitoring

9.6.1 During construction, a goose roost survey will be undertaken weekly between September and April to ensure there are no disturbance effects on geese using either Tangy Loch or Lussa Loch to roost and their associated commuting flights. The surveys would be undertaken by an appointed

[20] Note: this includes the precautionary scenario modelling from Beinn an Turic Phase 2 and the 28% of additional hypothetical activity at Killean.

ornithologist (or the ECoW if suitably qualified) in the vicinity of Tangy Loch and in the direction of the established flight path from Lussa Loch, at dawn and dusk. The results would be used to detail any effects on geese and inform any further mitigation measures if they are deemed to be required in light of any disturbance effects.

9.6.2 Goose flight activity monitoring vantage point surveys should be carried out post-construction to collect data on goose flight activity during the operational period. It is recommended these surveys be carried out in years 1, 2, 5, 10 and 15 during the operational period.

9.7 Summary

9.7.1 A summary of the predicted effects (unmitigated) for Greenland white-fronted goose are detailed in Table 9.13. Mitigation has been proposed during construction (and decommissioning) to minimise any potential impact on roosting geese (paragraph 9.5.23) and monitoring is detailed in Section 9.6.

Table 9.13: Summary of Predicted Effects

	Construction/ Decommissioning	Operation – Collision	Operation – Displacement	In-Combination	Residual
Greenland white-fronted goose	Negligible, Not Significant No potential to adversely affect the integrity of the Kintyre Goose Roosts SPA	Negligible, Not Significant No potential to adversely affect the integrity of the Kintyre Goose Roosts SPA	Negligible, Not Significant No potential to adversely affect the integrity of the Kintyre Goose Roosts SPA	Negligible, Not Significant No potential to adversely affect the integrity of the Kintyre Goose Roosts SPA	Negligible, Not Significant No potential to adversely affect the integrity of the Kintyre Goose Roosts SPA

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10. ECOLOGY AND NATURE CONSERVATION

Executive Summary

This chapter provides an assessment of the potential impacts on ecology and nature conservation resulting from the proposed development. The assessment has been prepared with reference to the Guidelines for Ecological Impact Assessment in the United Kingdom published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016).

Ramboll Environment and Health UK Limited (Ramboll) completed a full suite of ecology surveys in the summer of 2013, with an update survey undertaken in January 2018 to confirm that conditions on site remain unchanged.

The 2013 surveys identified peatland habitats on site which have been degraded and modified through afforestation and grazing. Ground Water Dependent Terrestrial Ecosystems (GWDTE) are also present. However, the proposed development has been designed to avoid peatland habitats and GWDTE, where possible, thereby minimising impact through turbine location and access track route selection.

The Construction Environmental Management Plan (CEMP) sets out proposed measures to minimise disturbance to ecological features throughout the construction period and is provided as Appendix 5.1: CEMP.

The Habitat Management Plan (HMP) sets out proposed measures for habitat restoration and creation and is provided as Appendix 10.6. Proposed measures include the restoration of 27.7 ha of peatland habitat and the creation of 3.5 ha of native broadleaved woodland.

Following the implementation of the proposed mitigation measures detailed in this chapter, the residual effects on ecological features are considered to be **not significant**, and are therefore **not significant** in accordance with the EIA Regulations.

10.1 Introduction

10.1.1 This chapter considers the potential effects on ecology and nature conservation resulting from impacts associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the ecological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects, on ecological features;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the significance of residual effects remaining following the implementation of mitigation.

10.1.2 The assessment has been carried out by Ramboll in accordance with the CIEEM Ecological Impact Assessment (EcIA) guidelines (CIEEM, 2016). All surveys were completed by Ramboll with the exception of fish surveys, which were undertaken by Waterside Ecology.

10.1.3 Effects on ornithological features are addressed separately in Chapter 9: Ornithology.

10.1.4 This chapter is supported by:

- Appendix 10.1: Survey Methodology and Detailed Results;
- Appendix 10.2: Bat Survey Analysis;
- Appendix 10.3: Freshwater Invertebrate Results;
- Appendix 10.4: Fish Habitat Survey Report;
- Appendix 10.5: Badger Protection Plan; and
- Appendix 10.6: Habitat Management Plan (HMP).

10.1.5 Figures 10.1 – 10.13 are referenced in the text, where relevant. Figure 10.9: Badger Sett is confidential and should not be shared with members of the public.

10.2 Scope of Assessment

Project Interactions

10.2.1 The proposed development has an increase in turbine height and rotor diameter in comparison to the Tangy III ES (2014). However, the footprint of the proposed development remains unchanged from that presented and assessed in the Tangy III ES (2014). As a result, potential impacts upon the majority of ecological features previously recorded in the ecological study area are likely to remain unchanged. A walkover survey was undertaken to assess the current conditions of the site and ground-truth previous survey results with the previous Tangy III ES (2014). The data from those surveys completed in support of the Tangy III application have been used alongside new data collected during the ground truthing update walkover to assess the potential impacts on ecological features.

Ecological Study Area

10.2.2 The ecological study area for this assessment includes the site boundary, as shown on Figure 10.1: Designated Sites, and appropriate buffer distances beyond the site boundary, e.g. up and downstream on watercourses, as shown on Figure 10.12: Fish Survey.

10.2.3 The ecological study area also includes a desk study area, which gathered information from within the site boundary and included a 10 km buffer around the site boundary.

Scoping and Consultation

10.2.4 Full details on the consultation responses can be reviewed in Appendix 7.1: Consultation Register. Table 10.1: Consultation Responses summarises relevant scoping and consultation responses specific to ecology and nature conservation.

Table 10.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
Argyll and Bute Council (ABC) 05/07/2017	The scale and layout of the proposed development should be designed so as to minimise the impact on key environmental features and sites designated for their ecological qualities.	The layout of the proposed development has been designed to avoid habitats with the highest ecological value, where possible, as described in Section 10.6: Mitigation by Design.
Scottish Natural Heritage (SNH) 26/06/2017 SNH (continued)	There was a high level of pipistrelle registers and this would indicate that standard buffering, together with a period of post-construction survey to ascertain the need for a curtailment regime, is likely to be necessary.	Standard buffering is detailed in Section 10.6.15 and 10.6.16, respectively. Although no significant effects are predicted on bats, a dedicated search for bat carcasses would be carried out on a monthly basis within a 50 m radius of each turbine, as discussed in Appendix 10.6: Habitat Management Plan. Searches would be undertaken by the applicant following the standard Scottish and Southern Energy (SSE) protocol.
	As badgers could be affected by the proposed development, there should be the provision of a more specific badger protection plan before determining any application.	A badger protection plan is provided in Appendix 10.5: Badger Protection Plan.
	Measures to protect Tangy Loch Special Site of Scientific Interest (SSSI) must include further site investigation on peat slide risk and implementation of pollution prevention measures detailed in a site-specific CEMP.	Further assessment of peat stability and protection measures are detailed in Chapter 11: Geology, Soils and Peat and Appendix 11.1: Peat Stability Risk Assessment. Mitigation includes a detailed intrusive ground investigation prior to construction, following tree removal and the inclusion of construction practices to avoid peat slide.
Scottish Environment Protection Agency (SEPA) 26/05/2017	GWDTE are protected under the Water Framework Directive and therefore the layout and design of the proposed development must avoid impact on such areas. The following information must be included in the submission:	The layout of the proposed development does not avoid impacts on all GWDTE areas, therefore this chapter provides further assessment of the likely effects on GWDTE.

Table 10.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
	a) A map demonstrating that all GWDTE are outwith a 100 m radius of all excavations shallower than 1 m and outwith 250 m of all excavations deeper than 1 m and proposed groundwater abstractions. If micrositing is to be considered as a mitigation measure, the distance of survey needs to be extended by the proposed maximum extent of micrositing. The survey needs to extend beyond the site boundary where the distances require it.	The GWDTE present in the ecological study area are shown on Figure 10.4: GWDTE, with appropriate 100 m and 250 m buffers around new cut access tracks and turbines, respectively. Not all GWDTE are outwith these buffers. However, many of those within the buffers are considered to have developed as a result of activities to construct Tangy I and II.
	b) If the minimum buffers above cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. We are likely to seek conditions securing appropriate mitigation for all GWDTE affected.	The suggested buffers were not achieved for all GWDTE areas, therefore this chapter provides further assessment of the likely effects on GWDTE, with mitigation described in Section 10.6, and residual effects described in Section 10.7.
Royal Society for the Protection of Birds (RSPB) 26/05/2017 RSPB (continued)	The ES should include details of proposals for mitigation/enhancement in relation to important habitats and species on this site. These should consider measures to enhance woodland biodiversity through increased provision of native tree species/open space. Compensatory planting should be seen as an opportunity to deliver priority biodiversity habitats and achieve aims within the Argyll and Bute Woodland and Forestry Strategy. We would welcome the restoration of suitable areas of bog/peat and increased planting of native tree species in suitable areas within and surrounding the proposed development for biodiversity gain. Ideally, any off- or on-site compensatory planting required should be included as part of the ES so the impacts can be assessed. A detailed Habitat Management Plan (HMP) should be submitted with any application containing detailed ecological justification for any proposals.	Mitigation is described in Section 10.6. Further detail on habitat management is provided in Appendix 10.6: Habitat Management Plan and Ch 16, Table 16.6 Land use - forestry Compensatory planting for the removal of coniferous plantation is detailed in Chapter 16: Land Use, Socio-economics and Recreation. Appendix 10.6: Habitat Management Plan, proposes measures for broadleaved woodland creation and peatland restoration. Further details on compensatory planting can be found in Chapter 16: Land Use, Socio-economics and Recreation.
Marine Scotland 26/05/2017	The Developer should carry out up to date fish population surveys for the presence and abundance of fish species within and downstream of the proposed development.	Although the fish surveys were undertaken in 2013, the habitat is considered to remain unchanged since these were completed. Brown trout *Salmo trutta* were the only species recorded within the proposed development. As the unchanged habitats are likely to support a similar

Table 10.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
		population recorded during the previous surveys, the previously developed mitigation is considered to remain valid and the surveys have not been updated.

Effects to be Assessed

10.2.5 This chapter considers effects on:

- designated sites;
- habitats, particularly sensitive habitats such as peatlands and wetlands, from habitat loss and fragmentation;
- groundwater dependent terrestrial ecosystems; and
- protected faunal species, such as badger *Meles meles*, otter *Lutra lutra*, pine marten *Martes martes*, bat species and water vole *Arvicola amphibius*.

10.2.6 The chapter assesses cumulative effects as arising from the addition of the proposed development to other similar developments which are the subject of a valid planning application. Operational, under construction and consented (not yet constructed) developments are considered as part of the baseline.

Effects Scoped Out of Assessment

Habitats

10.2.7 Habitats of less than local value are scoped out from further consideration in this assessment on the basis that effects on these habitats would not be considered significant in terms of the EIA regulations given their low ecological value. This includes improved and neutral grassland habitats, bracken *Pteridium aquilinum* and scrub habitat.

Invertebrates

Surveys of this species group are considered unnecessary as the EcIA adopts a precautionary approach and includes appropriate mitigation, where required, to avoid significant effects.

Amphibians

10.2.8 The densities of amphibian populations within the proposed development are considered to be low due to the limited availability of suitable habitat. Where suitable habitat is present, amphibians have been assumed to be present even where no field records exist. Measures to control transfer of chytridiomycosis, an infectious disease of amphibians caused by the chytrid ***Batrachochytrium dendrobatidis*****, are considered unnecessary and are scoped out of further assessment.**

Disease Transfer

10.2.9 No common juniper *Juniperus communis* was recorded in the ecological study area, therefore biosecurity measures for the control of *Phytophthora austrocedrae*, a fungus-like organism which infects the plant via the roots and causes foliage to decline and eventually die, is considered unnecessary and **disease transfer impacts are scoped out of further assessment**.

10.3 Methodology

Overview

10.3.1 This section describes the methodology used to assess the significance of potential effects upon the ecological features on or near the site. The methodology is based on CIEEM (2016) 'Guidelines for Ecological Impact Assessment in the United Kingdom'.

10.3.2 Whilst considering a range of potential outcomes that could arise from implementation of the proposed development, the assessment reports the impacts and subsequent effects considered to be likely. It is these likely effects that the applicant is obliged to report, and that Scottish Ministers are obliged to consider (Schedule 4 of the EIA Regulations). The underlying approach comprises:

- identification of the ecological features to be assessed and determination of baseline conditions;
- evaluation of the ecological features identified;
- identifying and characterising activities likely to cause significant effects as a result of the proposed development;
- evaluating the ecological significance of the predicted likely effects on the feature at an appropriate geographical scale;
- where significant effects are likely, define mitigation, including prevention, reduction and compensation for any significant adverse effects; and
- assessing the ecological significance of likely residual effects (after mitigation has been taken into account).

Method of Baseline Characterisation

Desk Surveys

10.3.3 A desk study to collect existing baseline data about the site and the surrounding area, such as the location of designated sites or other natural features of potential ecological importance, was undertaken, drawing upon the following data sources:

- SNH Sitelink[1]; and
- MAGIC website[2].

10.3.4 The Argyll and Bute Biodiversity Action Plan (BAP) (ABC 2010-2015)[3] was consulted for the likely presence of key protected species. Supplementary information on the site and its surroundings was obtained from aerial images available from Google™ Earth Pro. The Environmental Statements (ES) for the existing Tangy I and Tangy II Wind Farms, and the Tangy III ES (2014) were also consulted.

Field Survey Techniques

10.3.5 Full details of field survey methodology are provided in Appendix 10.1: Survey Methodology and Detailed Results.

10.3.6 The following surveys were undertaken as part of the proposed Tangy III development:

- Extended Phase 1 habitat survey and National Vegetation Classification (NVC) survey in April and June 2013;
- Great crested newt *Triturus cristatus* presence-absence surveys between May and July 2013;

[1] URL: https://gateway.snh.gov.uk/sitelink/
[2] URL: http://magic.defra.gov.uk/
[3] This plan has not yet been updated.

- Bat activity surveys between April and October 2013;
- Protected species surveys for Otter, Water Vole, Pine Marten and Wildcat between April and June 2013;
- Red squirrel survey from April to June 2013;
- Badger survey completed from April to June 2013;
- Reptile survey from April to June 2013;
- Aquatic invertebrate survey and freshwater pearl mussel *Margaritifera margaritifera* survey completed in October 2013; and
- Electrofishing survey in August 2013.

10.3.7 An extended Phase 1 habitat survey was undertaken in January 2018 to update the previous Tangy III survey results for the proposed development.

Effects Evaluation Methodology

Criteria for Assessing Importance of Ecological Features

10.3.8 Habitats and species (i.e. ecological features) identified within the ecological study area have been assigned ecological values using the standard CIEEM scale that classifies ecological features within a defined geographic context (CIEEM, 2016). The classification uses recognised and published criteria where the habitats and ecological study area are assessed in relation to their size, diversity, naturalness, rarity, fragility, typical-ness, connectivity with surroundings, intrinsic value, recorded history and potential value (Ratcliffe, 1977 and Wray et al, 2010). Table 10.2: Geographic Importance provides details of the frame of reference used in this assessment.

Table 10.2: Geographic Importance

Geographic Importance	Examples
International	Internationally designated sites including Special Areas of Conservation (SAC), Ramsar sites, Biogenetic Reserves, World Heritage sites, Biosphere Reserve, candidate SACs and potential Ramsar sites; discrete areas which meet the published selection criteria for international designation but which are not themselves designated as such; or a viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas which are essential to maintain the viability of a larger whole. Resident or regularly occurring populations of species which may be considered at an International level, such as European Protected Species (EPS), the loss of which would adversely affect the conservation status or distribution of the species at an international level; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
National	Nationally designated sites SSSI, National Nature Reserves (NNR), Marine Nature Reserves; discrete areas which meet the published selection criteria for national designation (e.g. SSSI selection guidelines) but which are not designated as such; or areas of a key habitat type identified in the UK Post-2010 Biodiversity Framework (UK Government, 2012). Resident or regularly occurring populations of species which may be considered at the national level, such as species listed in Schedules 5 and 8 of the Wildlife and Countryside Act (1981), the loss of which would adversely affect the conservation status or distribution of the species across Britain or Scotland; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
Regional	Areas of a habitat type identified in the Regional BAP; viable areas of habitat identified as being of Regional value in the appropriate Natural

Table 10.2: Geographic Importance	
Geographic Importance	**Examples**
	Area Profile (or equivalent); or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Resident or regularly occurring populations of species which may be considered at an international level, or at the national level, the loss of which would adversely affect the conservation status or distribution of the species across the region; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
County	Designated sites at the local authority level in Scotland including statutory Local Nature Reserves (LNR) and non-statutory Local Nature Conservation Sites; or discrete areas which meet the published selection criteria for designation but which are not designated as such. Resident or regularly occurring populations of species which may be considered at the local authority level, the loss of which would adversely affect the conservation status or distribution of the species across the local authority area.
Local	Features of local value include areas of habitat or populations/communities of species considered to appreciably enrich the habitat resource within the immediate surrounding area, for example, species-rich hedgerows. Resident or regularly occurring populations of species which may be considered at an international level, or at the national level, the loss of which would adversely affect the conservation status or distribution of the species across the immediate surrounding area; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.

10.3.9 A wide range of sources can be used to assign importance to ecological features, including legislation and policy. In the case of designated nature conservation sites, their importance reflects the geographic context of the designation. For example, sites designated as SACs are recognised as being of importance at an international level. Ecological features not included in legislation and policy may also be assigned importance due to, for example, local rarity or decline, or provision of a functional role for other ecological features. Professional judgement is used to assign such importance.

Criteria for Assessing Ecological Impacts

10.3.10 The potential impacts on designated sites, habitats and species have been considered in relation to the proposed development. The impacts have been assessed without consideration of any specific mitigation measures that might be employed. The assessment of likely ecological impacts has been made in relation to the baseline conditions of the ecological study area. The likely impacts of development activities upon ecological features have been characterised according to several variables detailed in Table 10.3.

Table 10.3: Impact Characterisation	
Parameter	**Description**
Direction	Impacts are either adverse (negative) or beneficial (positive).
Magnitude	This is defined as high, moderate, low or negligible, with these being classified using the following criteria:

Table 10.3: Impact Characterisation	
Parameter	**Description**
	High: Total/near total loss of a population due to mortality or displacement or major reduction in the status or productivity[4] of a population due to mortality or displacement or disturbance. Total/near total loss of a habitat. Medium: Partial reduction in the status or productivity of a population due to mortality or displacement or disturbance. Partial loss of a habitat. Low: Small but discernible reduction in the status or productivity of a population due to mortality or displacement or disturbance. Small proportion of habitat lost. Negligible: Very slight reduction in the status or productivity of a population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Slight loss of habitat that is barely discernible from the habitat resource as a whole.
Extent	The area over which the impact occurs.
Duration	The time for which the impact is expected to last prior to recovery of the ecological feature or replacement of the feature by similar resource (in terms of quality and/or quantity). This is expressed as a short-term, medium-term, or long-term effect relative to the ecological feature that is impacted.
Reversibility	Irreversible impacts: permanent changes from which recovery is not possible within a reasonable time scale or for which there is no reasonable chance of action being taken to reverse it. Reversible impact: temporary changes in which spontaneous recovery is possible or for which effective mitigation (avoidance/cancellation/reduction of effect) or compensation (offset/recompense/offer benefit) is possible.
Frequency and timing	The number of times an activity occurs will influence the resulting effect (if appropriate, described as low to high and quantified, where possible). The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. the badger breeding season.

10.3.11 The assessment only describes those characteristics relevant to understanding the ecological impact and determining the significance of the effect.

Risk Analysis for Bat Species

10.3.12 Risk analysis of bat species found to be present in the ecological study area determined the level of risk to both individuals and populations, following technical advice published by Natural England (2014).

10.3.13 Low, medium and high risk categories were used to classify the degree of risk to, and therefore the sensitivity of, individual bats from wind turbines based on information on their flight patterns, foraging strategies and echolocation calls collected during the bat surveys. Similarly, the classifications of low, medium and high were used to classify the risk to bat populations based on relative population size for each species, and therefore their likely sensitivity.

[4] Status is defined as the conservation status of the species and indicates whether the species is likely to become extinct in the near future. Productivity is defined as the rate of population growth.

10.3.14 Tables 10.4: Individuals of Bat Species Likely to be at Risk from Wind Turbines and 10.5: Populations Likely to be Threatened Due to Risk from Wind Turbines show the risk to bats from wind turbines on an individual level and on a population level as published by Natural England (2014).

Table 10.4: Individuals of Bat Species Likely to be at Risk from Wind Turbines

Low Risk	**Medium Risk**	**High Risk**
Myotis sp.	Common pipistrelle *Pipistrellus pipistrellus*	Noctule *Nyctalus noctule*
Long-eared bats *Plecotus sp.*	Soprano pipistrelle *P. pygmaeus*	Leisler's *N. leisleri*
Horseshoe bats *Rhinolophus sp*.	Serotine *Eptesicus serotinus*	Nathusius pipistrelle *Pipistrellus nathusii*
	Barbastelle *Barbastella barbastellus*	

Table 10.5: Populations Likely to be Threatened Due to Risk from Wind Turbines

Low Risk	**Medium Risk**	**High Risk**
Myotis sp.	Serotine	Noctule
Long-eared bats	Barbastelle	Leisler's
Horseshoe bats		Nathusius pipistrelle
Common pipistrelle		
Soprano pipistrelle		

Effects Significance

10.3.15 Significant effects are assessed with reference to the geographical importance of the ecological feature. However, the scale of significance of an effect may not be the same as the geographic context in which the feature is considered important. For example, an effect on a species which is on a national list of species of principal importance for biodiversity may not have a significant effect on its national population.

10.3.16 For the purposes of EcIA, apart from in exceptional circumstances, a significant effect is only considered to be possible where the feature in question is considered to be of regional, national or international importance. That is not to say that impacts from the proposed development could not result in effects on features of county or local importance[5], simply that those effects are not considered significant under EIA Regulations.

10.3.17 The potential for significant effects, in the absence of mitigation, has been determined with reference to the geographic conservation importance and the criteria in Table 10.2. By referring to the criteria in Table 10.3, the assessment seeks to characterise the magnitude of the effects in space and time. Except in exceptional circumstances, effects characterised as negligible or low magnitude would typically be short term and reversible. Therefore, even if the feature is of regional, national or international conservation importance, a negligible or low magnitude effects is not likely to be significant. Moderate and high magnitude effects, are likely to be medium to long term, and possibly irreversible. Where the feature is of regional, national and international

[5] It is noted that the CIEEM (2016) Guidelines for Ecological Impact Assessment allow for effects to be categorised as 'significant' at any geographic scale e.g. from local to international, however in the context of the EIA Regulations, an effect on features of local and county conservation importance, are, in general, not considered significant under the EIA regulations.

conservation importance, moderate and high magnitude effects are, in general, likely to be significant.

10.3.18 Mitigation and/or compensation is proposed for all effects considered significant under the EIA Regulations. Where appropriate, as a good practice measure, additional controls and/or compensation may be proposed for effects on features of county or local importance, or where required in relation to protected species where legislation may require actions to protect populations or individuals.

10.3.19 Residual effects are characterised as either adverse (negative) or beneficial (positive) and either **significant** or **not significant**, taking account of mitigation and/or compensation proposals.

Assessing Cumulative Effects

10.3.20 Cumulative effects can result from individually insignificant but collectively significant effects taking place over a period of time or concentrated in a location. Cumulative effects are particularly important in EcIA as many ecological features are already exposed to background levels of threat or pressure and may be close to critical thresholds where further impacts could cause irreversible decline and significant effects. Further impacts can also make habitats and species more vulnerable or sensitive to change.

10.3.21 Developments included in the cumulative impact assessment are the following types of future development where environmental information is available:

- proposals for which consent has been applied that are awaiting determination in any regulatory process (not necessarily limited to planning permission);
- projects which have been granted consent (not limited to planning permissions) but which have not yet been started;
- proposals which have been refused permission but which are subject to appeal and the appeal is undetermined; or
- to the extent that their details are in the public domain, proposed projects that will be implemented by a public body but for which no consent is needed from a competent authority.

Limitations of Assessment

10.3.22 It should be noted that the availability and quality of the data obtained during desk studies is reliant on third party responses. This varies from region to region and for different species groups. Furthermore, the comprehensiveness of data often depends on the level of coverage, the expertise and experience of the recorder and the submission of records to the local recorder.

10.3.23 The habitat and faunal surveys provide a snapshot of ecological conditions and do not record plants or animals that may be present in the ecological study area at different times of the year. The absence of a particular species cannot definitely be confirmed by a lack of field signs and only concludes that an indication of its presence was not located during the survey effort. However, surveys in 2013 were undertaken during optimal periods for identifying flowering plants or locating faunal species' field signs and there are not considered to be any limitations on the data derived. The update survey in 2018 was undertaken in January, outwith the optimal period for surveying habitats and water vole. However, as no signs of water vole were recorded in 2013 and the habitats were considered to have minimal importance for this species and were found not to have changed in the 2018 surveys, this is not considered to be a limitation to the data derived.

10.3.24 The protected species survey area, particularly for badger, was restricted as areas of the forest were inaccessible due to the forest density. However, all forest edges were surveyed for mammal paths, which were followed where present. As such, the survey results are considered to be robust and sufficient for the purpose of preparing this assessment.

10.4 Baseline Conditions

Current Baseline

Designations

10.4.1 Ornithological designations are considered in Chapter 9: Ornithology. There are no statutory ecological designations present in the ecological study area. The following sites are located within 10 km of the nearest proposed turbine as shown on Figure 10.1: Designated Sites.

10.4.2 Tangy Loch SSSI boundary is located less than 100 m to the south east of the closest turbine (although the loch itself is approximately 500 m to the south east of the nearest turbine) and is an important oligotrophic loch supporting slender naiad *Najas flexilis*, a nationally rare aquatic plant.

10.4.3 Machrihanish Dunes SSSI is located over 2 km from the nearest turbine to the south-west of the proposed development and is important for its sand dunes. Due to its distance from the proposed development and the main A83 road acting as a barrier, this site is not considered further in this assessment.

10.4.4 Woodland listed on the semi-natural woodland inventory (SNWI) is a non-statutory designated site and is located in the north of the ecological study area, as shown on Figure 10.1: Designated Sites. However, this area of woodland is no longer semi-natural and has been replaced by coniferous plantation. No areas of ancient woodland occur in the ecological study area.

Field Surveys

10.4.5 Detailed results of field surveys are provided in Appendix 10.1: Survey Methodology and Detailed Results. A summary of the ecological features recorded in the ecological study area is provided in this section.

Phase 1 Habitat Survey

10.4.6 The Phase 1 Habitat Map is shown on Figure 10.2: Phase 1 Habitat Survey. The habitats in the ecological study area are dominated by coniferous plantation, marshy grassland, improved grassland and wet modified bog. Two areas in the east comprise recently felled forest. The forest fire breaks consist of areas of wet and dry heath as well as marshy grassland and wet modified bog.

NVC Surveys

10.4.7 Figure 10.3: NVC Survey shows the NVC habitats present in the ecological study area. Table 10.6: GWDTE provides information on the area and sensitivity of each habitat that is groundwater dependent, with their locations shown on Figure 10.4: GWDTE. The NVC habitats that are not considered to be GWDTE are detailed in Appendix 10.1: Survey Methodology and Detailed Results.

10.4.8 Much of the existing Tangy I and II Wind Farm is covered in a carpet of rushes (*Juncus sp*.). While these species are present due to their ability to colonise disturbed land, habitats dominated by rushes tend to be classified as GWDTE. In the ecological study area, the *Juncus* dominated M23 is classified as a highly GWDTE by SEPA. However, the M23 habitat in the ecological study area is largely a species poor wet grassland as a result of grazing pressures and is considered to be of low importance. Much of, the M23 rush pasture adjacent to the existing Tangy I and II Wind Farms has formed as a direct result of the disturbance of habitats caused by construction.

10.4.9 No habitats of greater than local value have been identified on site. There are examples of peatland habitats, such as M15, M16 and M19, that may be considered to have greater ecological value but the examples in the ecological study area are degraded and modified by afforestation and grazing. The examples of GWDTE in the ecological study area have been similarly altered or, as described previously, are only present as a result of previous developments.

Table 10.6: GWDTE						
Habitat Code	**Name**	**Area (ha)**	**Details**	**Groundwater Dependency**	**Sensitivity**	**Importance**
M15	*Scirpus cespitosa-Erica tetralix* wet heath	12.42	More than half of the fire breaks in the coniferous plantation, as well as parts of the open area south-west of the plantation, contain M15 wet heath.	Moderate	Moderate	Local
M15/ M25/ W2	*Scirpus cespitosa-Erica tetralix* wet heath/ *Molinia caerulea-Potentilla erecta* mire/ *Salix cinerea-Betula pubescens-Phragmites australis* woodland	0.12	A small section of the fire break towards the northern part of the ecological study area contains a mix of M15/M25 heath/mire, and W2 woodland.	Moderate	Moderate	Local
M15/ W23/ MG10	*Scirpus cespitosa-Erica tetralix* wet heath/ *Ulex europaus-Rubus fructicosus* scrub/ *Holcus lanatus-Juncus effusus* rush-pasture	0.14	Immediately to the north-west of the M15/M25/W2 mixture, the habitat changes to a M15 wet heath, W23 scrub and MG10 rush pasture mosaic.	Moderate	Moderate	Local
M16	*Erica tetralix-Sphagnum compactum* wet heath	1.08	An area of M16 wet heath is located in the north-eastern part of the existing wind farm.	High	High	Local
M16a	*Erica tetralix-Sphagnum compactum* wet heath, typical sub-community	4.56	A few large areas of M16a wet heath are located on the northern section of the existing wind farm.	High	High	Local
M16d	*Erica tetralix-Sphagnum compactum* wet heath*, Juncus squarrosus-Dicranum scoparium* sub-community	5.91	Large parts of the field located on the western edge of the existing wind farm consist of M16d wet heath.	High	High	Local
M23	*Juncus effusus/acutiflorus-*	68.2	The largest NVC community in the ecological study	High	Moderate	Local

Table 10.6: GWDTE						
Habitat Code	**Name**	**Area (ha)**	**Details**	**Groundwater Dependency**	**Sensitivity**	**Importance**
	Galium palustre rush-pasture		area is M23 rush pasture, which is present in several fire breaks as well as in fields and adjacent to infrastructure on the existing wind farm.			
M23/ M25	*Juncus effusus/acutiflorus-Galium palustre rush-pasture/ Molinia caerulea-Potentilla erecta* mire	0.24	A small section of a fire break in the east of the ecological study area contains a mosaic of M23 rush pasture and M25 mire.	High	Moderate	Local
M23/ M15	*Juncus effusus/acutiflorus-Galium palustre* rush-pasture/ *Scirpus cespitosa-Erica tetralix* wet heath	0.42	A section of a fire break in the coniferous plantation contains M23 rush pasture and M15 wet heath.	High	Moderate	Local
M25	*Molinia caerulea-Potentilla erecta* mire	11.83	Large parts of the ecological study area, including many fire breaks in the west of the coniferous plantation and fields on the existing wind farm, contain M25 mire.	Moderate	Moderate	Local
M5/ W23/ MG1	*Carex rostrata-Sphagnum squarrosum* mire/ *Ulex europaus-Rubus fructicosus* scrub/ *Arrhenatherum elatius* grassland	0.11	A small area in the north contains a mosaic of M5 mire, W23 scrub and MG1 grassland.	High	High	Local
M6	*Carex echinata-Sphagnum recurvum/auriculatum* mire	0.07	A fire break near the east of the ecological study area contains M6 mire.	High	High	Local
M6c	*Carex echinata-Sphagnum recurvum/auriculatum* mire, *Juncus effusus* sub-community	0.17	A small section of a fire break towards the northern part of the coniferous	High	High	Local

Table 10.6: GWDTE						
Habitat Code	**Name**	**Area (ha)**	**Details**	**Groundwater Dependency**	**Sensitivity**	**Importance**
			plantation contains M6c.			
MG10	*Holcus lanatus-Juncus effusus* rush-pasture	9.27	Large parts in the north-west of the ecological study area, including several fire breaks, contain MG10 rush pasture.	Moderate	Low	Local
MG9	*Holcus lanatus-Deschampsia cespitosa* grassland	0.83	A few sections along the Allt nan Creamh contain MG9 grassland.	Moderate	Low	Local
MG9/ MG10	*Holcus lanatus-Deschampsia cespitosa* grassland/ *Holcus lanatus-Juncus effusus* rush-pasture	1.46	Two fire breaks in the east of the ecological study area contain a mosaic of MG9 grassland and MG10 rush-pasture.	Moderate	Low	Local
U4/ M15	*Festuca ovina-Agrostis capillaris-Galium saxatile* grassland/ *Scirpus cespitosa-Erica tetralix* wet heath	0.57	A fire break in the west of the coniferous plantation consists of a mosaic of U4 grassland and M15 wet heath.	Moderate	Moderate	Local

Protected Species

10.4.10 Protected species surveys recorded the following[6]:

- Three otter spraints on the Allt nan Creamh, as shown on Figure 10.8: Otter and Pine Marten Survey;
- Two outlier badger setts, one with three active entrances, the other with a single inactive entrance approximately 50 m to the south of the active sett, as shown on confidential Figure 10.9: Badger Sett.
- Four bat species comprising common pipistrelle, soprano pipistrelle, Leisler's bat and Daubenton's bat. Overall bat activity within the site boundary was low, with the highest abundance recorded outwith the site boundary along the broadleaved woodland to the south and by Tangy Loch. Only two passes of Leisler's bat were recorded (one probable and one confirmed), with the remaining activity dominated by common species at low and medium risk of effects from wind farms at a population level. Full details of the results of the bat surveys are provided in Appendix 10.2: Bat Survey Analysis;
- Possible pine marten scat in the coniferous plantation to the south of the Allt nan Creamh, as shown on Figure 10.8: Otter and Pine Marten Survey;

[6] All records are from 2013 except for the potential pine marten scat identified in 2018.

- Four sightings of common lizard *Zootoca vivipara*, three within the coniferous plantation in the centre of the proposed development and one in the open habitat around the existing wind turbines in the south of the proposed development, as shown on Figure 10.13: Reptile Survey;
- Palmate newt *Lissotriton helvetica* in pond 3, as shown on Figure 10.5: GCN;
- Brown trout in Tangy Burn. Full details of the results of fish surveys are provided in Appendix 10.4: Fish Habitat Survey Report; and
- Freshwater invertebrate assemblage showing good water quality at all six sites. Full details of the results from freshwater invertebrate surveys are provided in Appendix 10.3: Freshwater Invertebrate Results.

Future Baseline

10.4.11 The future baseline of the ecological study area is unlikely to be different from the current baseline. The coniferous plantation is likely to be harvested by clear fell methods before the trees reach maturity at 40-70 years. Without the proposed development, the forest would be felled within approximately the next decade. These areas are then typically restocked for another rotation of the process to begin.

10.4.12 The peatland and grassland habitats are considered unlikely to change significantly in the absence of the proposed development as the open habitats of the existing Tangy I and II Wind Farms would continue to be impacted and shaped by afforestation and grazing. The majority of habitats are already modified by surrounding coniferous plantation and farming practices, which are expected to continue. Therefore, the distribution of species present within the ecological study area is unlikely to change significantly in the future. Temporary to long term displacement of forest species is likely as coniferous plantations are clear felled and replanted and species recolonise the previously displaced area.

Ecological Importance

10.4.13 The ecological features identified as being sensitive to the proposed development and that have been ‘scoped-in’ to the assessment are given in Table 10.7: Importance of Ecological Features, together with the justification for their inclusion:

Table 10.7: Importance of Ecological Features

Ecological Feature	Importance	Justification
Tangy Loch SSSI	National	This is a statutory designated site for the presence of slender naiad, a plant protected under the EC Habitats Directive (EU, 1994) and the Wildlife and Countryside Act (UK Government, 1981). The proposed development has a potential hydrological connection to the SSSI.
Habitats (M5/W23/MG1, M6, M6c, M15, M15/M25/W2, M15/W23/MG10, M16, M16a, M16d, M19, M20, M23, M23/M25, M23/M15, M25, MG10, MG9, MG9/MG10, U4/M15 and U4)	Local	These habitats are considered to be groundwater dependent and could be affected by the proposed development. Some of the examples identified on site are likely to have developed as a result of previous works to construct Tangy I and II. GWDTE are sensitive to changes in hydrology and hydrogeology and are a priority under the EU Water Framework Directive (EU, 2000). The examples of these habitat types within the ecological study area are of

Table 10.7: Importance of Ecological Features		
Ecological Feature	**Importance**	**Justification**
		varying condition and subject to modification but do include areas of increased diversity.
Bat Species	County	Bats are a EPS under the EC Habitats Directive (EU, 1994). Bat activity is low across the ecological study area and is dominated by common species that are at a low risk of adverse effects on their populations, although at a medium risk of adverse effects on individuals. However, Leisler's bat is a notable species due to its rarity in Scotland, although only two records (one probable and one confirmed) were recorded across the entire survey period in the ecological study area during surveys in 2013.
Otter	Local	Otters are a EPS under the EC Habitats Directive (EU, 1994). Otter activity was recorded along the Allt na Creamh. Although no protected resting or dwelling places were recorded in the ecological study area, the species could be disturbed by the proposed development.
Badger	Local	Badgers and their setts are protected under the Protection of Badgers Act (UK Government, 1992). Signs of badger activity were low. A single active sett occurs approximately 75 m from the proposed development and disturbance of this sett is possible.
Pine marten	Local	Pine marten are protected under Schedule 5 of the Wildlife and Countryside Act (UK Government, 1981). A possible, single scat was recorded in the coniferous plantation of the ecological study area, although No protected dens were recorded.
Fish species (brown trout)	Local	Brown trout are a priority species in the UK Post-2010 Biodiversity Framework (UK Government, 2012). Spawning brown trout were recorded in the ecological study area, with limited spawning habitat present in Tangy Burn. Any further damage to this habitat as a result of the proposed development could be detrimental to local brown trout populations.
Reptiles (common lizard)	Local	All reptiles are protected under the Wildlife and Countryside Act (UK Government, 1981) from intentional killing or injury. Four common lizard sightings were recorded in the ecological study area and injury or death of common lizard could occur as part of the proposed development.

10.5 Effects Evaluation

10.5.1 This section considers the potential impacts and associated effect significance of the decommissioning of the existing Tangy I and II Wind Farms and all associated infrastructure not considered for re-use on the proposed development (Tangy IV), as well as the installation and operation of the Tangy IV wind turbines, their access tracks and other associated infrastructure, as described in Chapter 5: Description of Development.

Construction Impacts

Habitats

10.5.2 Construction activities have the potential to result in adverse impacts that directly degrade or destroy terrestrial habitat as a result of, for example, excavation, compaction, or modification (e.g. vegetation removal, covering). Alternatively, there could be indirect impacts as a result of, for example, dewatering, or from the accidental release of fuels, lubricants or other chemicals. Construction could cause changes in drainage patterns resulting in the degradation of existing habitats, particularly GWDTE. Some aquatic habitats could be adversely affected indirectly as a result of accidental releases of silt, fuel, lubricants or chemicals, such as Tangy Loch SSSI. Some activities could cause permanent degradation or destruction, for example where turbine foundations are constructed or permanent new access tracks are formed, but in most cases, adverse effects would be temporary.

10.5.3 In particular, pollution or siltation impacts from activities around turbine 5 and borrow pit E have the potential to have an adverse impact upon Tangy Loch SSSI and the slender naiad plants occurring there.

10.5.4 Table 10.8: Areas of Habitats Affected by Proposed Development shows the habitat area lost directly to and indirectly affected by turbines, tracks and other infrastructure, and the percentage of the total area those habitats comprise. The habitats with the highest percentage of potential direct loss are U4, M19 and M15. The habitats with the highest percentage of potential indirect loss are M6, U4/M15 mosaic and M15.

Table 10.8: Area of Habitats Affected by Proposed Development

		Direct Effect – Habitat Loss		Indirect Effect – Habitat Modification[7]	
Habitat Code	**Habitat Size in Ecological Study Area (ha)**	**Area Lost (ha)**	**Percentage Loss (%)**	**Area Modified (ha)**	**Percentage Modified (ha)**
H12	9.57	0.05	0.52	0.13	1.36
M6	0.07	0.005	7.14	0.01	14.29
M15	12.42	1.13	9.10	0.65	5.23
M16a	4.56	0.008	0.18	0.09	1.97
M19	13.17	1.28	9.72	0.37	2.81
M20	25.03	0.23	0.92	0.35	1.40
M23	68.20	2.52	3.70	1.60	2.35
M23/M15	0.42	0.01	2.38	0.02	4.76

[7] A 10 m buffer around the areas of direct habitat loss has been used to calculate the indirect habitat modification as this is considered to represent the likely area indirectly affected by the proposed development.

Table 10.8: Area of Habitats Affected by Proposed Development					
		Direct Effect – Habitat Loss		**Indirect Effect – Habitat Modification[7]**	
Habitat Code	**Habitat Size in Ecological Study Area (ha)**	**Area Lost (ha)**	**Percentage Loss (%)**	**Area Modified (ha)**	**Percentage Modified (ha)**
M25	11.83	0.27	2.28	0.21	1.78
MG7	45.27	3.33	7.36	1.17	2.59
MG10	9.27	0.02	0.22	0.04	0.43
U4	12.71	2.12	16.68	0.42	3.31
U4/M15	0.57	0.02	3.51	0.06	10.53
Totals	**214.17**	**9.81**	**4.58**	**4.33**	**2.02**

10.5.5 The only habitats that have a direct loss of greater than 5% are U4, M19, M15, MG7 and M6, with a potential loss of 2.12 ha, 1.28 ha, 1.13 ha, 3.33 ha and 0.005 ha, respectively. The only habitats that have an indirect modification of greater than 5% are M6, U4/M15 mosaic and M15, with a potential modification of 0.01 ha, 0.06 ha and 0.65 ha, respectively. M6 is a highly GWDTE with a high sensitivity rating and M15 and the U4/M15 mosaic are moderately GWDTE with moderate sensitivity ratings. U4, MG7 and M19 are not GWDTE.

10.5.6 The pre-mitigation assessment has identified a combination of permanent and temporary (reversible) adverse impacts on the habitats of the ecological study area. The impacts from accidental pollution events could be both direct, on for example the habitats themselves, and indirect on the species utilising those habitats. The pre-mitigation assessment concludes that these impacts could lead to an adverse effect at the local level in terms of habitat loss and/or modification, which is considered to be **not significant** under the EIA Regulations. Effects on Tangy Loch SSSI could be **significant** at the national level, which is significant under the EIA Regulations. Mitigation is specified to address potential effects on the Tangy Loch SSSI in Section 10.6.

Bat Species

10.5.7 As no bat roosts would be disturbed or destroyed as a result of construction activities, no impacts are predicted. Construction has the potential to result in a short term, low magnitude impact upon bats which forage infrequently in the forest, however that would **not result in a significant effect**.

Otter

10.5.8 Construction activities in the vicinity of the watercourses in the north to the north-west of the proposed development have the potential to disturb otters as a result of noise, vibration or light as otter are known to be present from spraints recorded along the Allt nan Creamh. This would be a localised, short term, low magnitude impact on this species. As a result, the effect of construction of the proposed development on otter is considered to be **not significant**.

Badger

10.5.9 Two outlier setts were recorded but only one was active at the time of the 2018 survey. The existing coniferous plantation in proximity to the sett would be felled to facilitate the wind farm construction and would likely result in disturbance of the sett. The change in habitat type with the felling of the forest and replanting to a key-hole design may also impact badger, potentially beneficially in the longer term. No other activity was recorded within the woodland.

10.5.10 Construction activities would likely have a localised, short term, low magnitude disturbance impact on this species. Neither sett would be destroyed. As a result, the effect of construction of the proposed development on badger is considered to be **not significant**.

Pine Marten

10.5.11 Construction of the proposed development would result in the permanent loss of forest habitat suitable for use by pine marten. However, only one potential pine marten scat was found on site. That notwithstanding, this is considered to be a low magnitude impact in the context of the available habitat resource remaining in the ecological study area and in the surrounding area. Construction activity would also likely have a localised, low magnitude disturbance impact on this species, potentially present at a low level in the ecological study area, with no records in 2013 and a single scat recorded in the 2018 survey. As a result, the effect of construction on pine marten is considered to be **not significant**.

Fish

10.5.12 Construction impacts have the potential to result in the degradation or destruction of aquatic habitats inhabited by fish, either directly by excavation or compaction, or indirectly by pollution from the accidental release of fuels, lubricants or other chemicals as well as changes in drainage patterns and silt released into aquatic habitats. The degradation of aquatic habitats could kill fish directly or change the chemical composition of the habitat. Pollution or sediments from construction runoff could also enter watercourses in the ecological study area and impact fish species in the larger watercourses that drain them, particularly Tangy Burn where brown trout were recorded. The pre-mitigation assessment concludes that this could lead to an adverse effect on fish species at the local level but this effect is considered to be **not significant** under the EIA Regulations as it is a local level feature.

Reptiles

10.5.13 Construction activities could result in the direct disturbance or injury/accidental death of individual reptiles. Construction activities could also have the potential to degrade or destroy reptile habitat either directly as a result of, for example, excavation, compaction, or modification (e.g. vegetation removal, covering) or indirectly as a result, for example, of dewatering, or from the accidental release of fuels, lubricants or other chemicals. Some activities could cause permanent degradation or destruction, for example where turbine foundations are constructed or permanent new access tracks are formed, but in most cases, impacts would be temporary and the effects are considered to be **not significant**.

Operational Impacts

Habitats

10.5.14 Operational impacts on habitats are considered possible through accidental spillage of fuels, chemicals and lubricants during maintenance works that have the potential to enter terrestrial and aquatic habitats, leading to habitat loss or degradation. In the absence of mitigation, this could be an adverse effect on habitats at the local level but this effect is considered to be **not significant** under the EIA Regulations. Effects on Tangy Loch SSSI could be **significant** at the national level, which is significant under the EIA Regulations.

Bat Species

10.5.15 The main operational impact on bat species is direct collision with wind turbines leading to bat fatalities. Bat mortality can also result from internal haemorrhage due to indirect barotrauma (Baerwald *et al.*, 2008).

10.5.16 The current low level of activity by any bat species in the ecological study area indicates that effects associated with either direct collision and indirect barotrauma are unlikely as only two passes of Leisler's bat, a species at high risk from the effects of wind farms on its population, were recorded, with the remaining low level of activity dominated by species at medium or low risk from the effects of wind farms at a population level. Therefore, based on the low total bat activity, the increased likelihood of a bat fatality associated with increased swept area is not considered to represent a significant effect.

10.5.17 Indirect impacts of wind turbines on bats also include disturbance and displacement from foraging, commuting or migrating areas. As bat activity is considered to be low in the ecological study area, the effects are predicted to be **not significant**.

Otter

10.5.18 Fuel and chemical spills from service vehicles and plant have the potential to enter watercourses and adversely impact otters by degrading the aquatic habitat and either directly killing fish species or indirectly killing their invertebrate prey and changing the chemical composition of the watercourses. This could be an adverse effect on otter at the local level but this effect is considered to be **not significant** under the EIA Regulations as it is a local level feature.

Badger

10.5.19 No adverse operational impacts on badger are predicted. It is possible that the removal of coniferous plantation in the ecological study area may create new foraging areas for badger and result in a beneficial effect on this species, although this effect is considered to be **not significant** due to the low magnitude of the impact and the low badger activity recorded in the ecological study area.

Pine Marten

10.5.20 No adverse operational impacts or effects on pine marten are predicted as no further habitat suitable for use by this species would be lost, with all wind farm activities occurring from access tracks and infrastructure established during construction.

Fish

10.5.21 Fuel and chemical spills from service vehicles and plant have the potential to enter watercourses and adversely impact fish species by degrading the aquatic habitat, and either directly killing fish species or killing their invertebrate prey and changing the chemical composition of the watercourses. In the absence of mitigation, these could lead to adverse effects at the local level but these effects are considered to be **not significant** under the EIA Regulations as they involve a local level feature.

Reptiles

10.5.22 No operational impacts on reptiles are predicted as no further habitat suitable for use by this species group would be lost, with all wind farm activities occurring from access tracks and infrastructure established during construction.

Decommissioning Impacts

10.5.23 The proposed development would involve both the decommissioning of the existing Tangy I and II Wind Farms in the southern part of the ecological study area as well as the decommissioning of the proposed development at the end of its lifetime. Decommissioning impacts would involve personnel and machinery accessing locations across the ecological study area to dismantle and remove infrastructure, including turbines, hardstanding and site buildings, as detailed in Chapter 5: Description of the Proposed Development. The existing wind turbines and towers would be removed to ground level, with the concrete foundations left in-situ and broken down to approximately 1 m below ground level. The existing electrical cables would be left in-situ to minimise habitat disturbance. It is possible that the existing substation would also be retained. Approximately 2.2 km of access tracks would be removed and the habitat reinstated. These impacts would be short-term, intermittent and temporary and last weeks or months at any given location. Existing access tracks would be used to access the infrastructure to be decommissioned. As a result, no effects on habitats are predicted, with habitats allowed to recover and regenerate following the removal of infrastructure.

10.5.24 There may be a temporary and short term disturbance impact on protected species in the ecological study area but as this will be restricted to the access tracks and other infrastructure, the effect of this is considered to be **not significant**.

10.6 Mitigation

Mitigation by Design

10.6.1 The layout of the proposed development has, where possible, been designed to avoid those habitats of highest ecological value and highest sensitivity to effects. In the area of the existing Tangy I and II Wind Farms, existing infrastructure would be reused for tracks for the proposed development. New turbines have been placed outwith areas of high groundwater dependence, where possible, with the majority placed within the coniferous plantation to the north of the existing Tangy I and II Wind Farms. It should be noted that where turbines are placed in areas of GWDTE, the habitat is considered to be of low importance, with rushes dominating more because of disturbance and surface water than the groundwater dependence of the habitat.

10.6.2 M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire, which is a highly GWDTE and considered highly sensitive, would be avoided as much as possible along the forest firebreak towards the eastern part of the ecological study area in order to reduce the direct habitat loss of 0.005 ha (7.14%) and the indirect modification of 0.01 ha (14.29%) expected without mitigation. As described in Chapter 4: Site Selection, the design evolution has taken into account areas of deep peat that would typically support this type of habitat, and the turbine locations and access track routes have been selected to avoid areas of deep peat, where possible. Where peat depth is >1 m, track construction would be of a floating design rather than a cut design, in order to minimise the disturbance to peat. Measures already taken into account during design include track micro-alignment to avoid deep peat and, where required, features would be incorporated into the track, such as hydrological culverts to minimise the potential effects on the hydrological characteristics of the M6 mire habitat. Further details of hydrological mitigation to reduce the significance of potential adverse effects on the hydrology are described in Chapter 12: Surface Water.

10.6.3 Infrastructure and turbine locations within the current coniferous plantation to the north of the site have been chosen to avoid the areas of deepest peat where the main areas of remnant peatland occur.

Mitigation during Construction

Tangy Loch SSSI

10.6.4 Peat slide risks on Tangy Loch SSSI and the required mitigation measures are discussed in Appendix 11.1: Peat Stability Risk Assessment. A detailed intrusive ground investigation following tree removal and prior to construction will inform relevant good practice measures to reduce peat slide risks. Such mitigation measures will be included in the CEMP.

Protected Species

10.6.5 A protected species survey, following best practice guidance, would be completed within eight months prior to the start of construction, particularly focusing on badger, otter and pine marten, which may be present to be present, but including surveys for e.g. water voles. This would identify any protected species within the proposed development area not recorded during previous surveys, such as water vole. Depending on the time of survey and the start of construction works, a suitably qualified ecologist would be appointed to survey areas where reptiles may be found. Any reptiles discovered during the survey would be moved to suitable areas outwith the construction area. If the work is undertaken outwith the active months for reptiles, the ecologist would search for suitable hibernation sites for relocation. All such work would be undertaken in accordance with approved method statements.

10.6.6 Prior to work in the area of the known active badger sett (which is expected to comprise forestry clearance due to the volume of windthrow in this area), the measures described in Appendix 10.5: Badger Protection Plan would be followed to allow forestry clearance within 20 m of the active sett. A further survey of the single entrance sett prior to construction would determine if it is active, in which case the same protection measures would be applied. If found inactive, no protection measures would be required for this sett.

CEMP

10.6.7 An outline CEMP is included as Appendix 5.1: Construction Environmental Management Plan. The CEMP would be further developed post-consent and pre-construction to include protection and mitigation measures, as well as monitoring programmes, for all predicted and potential environmental impacts identified.

10.6.8 The CEMP would include measures to control levels of disturbance during the construction period, including set-back distances for construction works from badger setts, measures to avoid impacts on mature broadleaved woodland along the access track with the potential to support roosting bats, measures to protect Tangy Loch SSSI and wider measures relating to operational hours and construction site management.

10.6.9 All watercourses and ponds within the site boundary would have appropriate buffers, as agreed with SEPA. Exclusion zones within which construction activities would not occur, with the exception of works such as tracks crossing over watercourses, would be established and demarcated during the construction phase, where necessary. At all watercourse locations, appropriate pollution response spill kits and silt mitigation measures would be installed as described within the CEMP, in line with current good practice guidance

Mitigation during Operation

Watercourse and Aquatic Habitat Pollution Prevention Measures

10.6.10 The risk of pollution from surface runoff to watercourses and aquatic habitats, such as Tangy Loch SSSI, would be prevented by ensuring that runoff control measures, such as interceptor drains and silt traps to assist in maintaining water quality, are in place. Additionally, interceptor drains would be used to control the flow of any runoff from operation activities.

Mitigation during Decommissioning

Habitat Reinstatement - Decommissioned Areas

10.6.11 Areas of wind farm infrastructure such as turbines and tracks to be removed as part of the decommissioning of the existing Tangy I and II Wind Farms would be reinstated. Where tracks would not be upgraded to be used in the proposed development, they would be reinstated to allow recolonisation of natural habitats. It is likely that recolonisation would include M23 rush pasture and M23/M25 mire habitats as they are the habitats found around the sections of track to be removed. More details on the proposed approach to decommissioning and reinstatement are set out in Appendix 5.1: Construction Environmental Management Plan.

Good Practice Measures

Habitat Restoration

10.6.12 Active restoration of the peatland habitats in the ecological study area would be carried out in line with Appendix 10.6: Habitat Management Plan. Active restoration is defined here as the process of actively encouraging the regeneration of degraded peatland habitats. A total of 27.7 ha of peatland would be restored in deforested areas.

10.6.13 M15 *Scirpus cespitosus-Erica tetralix* wet heath, which is located throughout most of the firebreaks in the coniferous plantation and parts of the open area adjacent to the south-west part of the plantation, as well as M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire, which is located over large areas of the fire breaks in the middle of the site and areas on the northern part of the existing wind farm, are both likely to regenerate. It is assumed that the modified peatland under the forest was once classifiable as M15 and M19 and that these habitats are likely to regenerate following tree removal. However, it is likely that before reaching such plant communities, there would be periods of rush and grass dominance as typically seen on previous deforested sites.

Forestry Replanting

10.6.14 A total of 270.5 ha of coniferous plantation is required to be felled. Replanting would be to a keyhole design and would be predominantly Sitka spruce *Picea sitchensis*, selecting a slow growing provenance. This second rotation would be felled at 10 m in tree height. An area of approximately 3.50 ha of native broadleaf woodland planting is proposed to increase the biodiversity value of the site, see Appendix 10.6: Habitat Management Plan.

Bats

10.6.15 Forestry replanting would use a minimum buffer of 50 m from the turbine blade tip (the edge of the rotor swept area) to the nearest part of any habitat feature, to avoid creating an edge habitat near the turbines that would be attractive to bats, as specified in Natural England (2014) guidance. For this assessment, this guidance has been used to calculate the buffer distance required using the largest potential turbine specification, with a blade length of 65 m and a hub height of 85 m, and a tree height of 10 m, which equates to a buffer of approximately 87 m from the turbine blade tips.

10.6.16 Compensatory planting outwith the site would also be required to account for areas designed to accommodate the proposed wind farm infrastructure (including the bat buffers) where replanting is prevented. Further details on compensatory planting can be found in Chapter 16: Land-Use, Socioeconomics and Recreation.

Habitat Management Plan

10.6.17 Appendix 10.6: Habitat Management Plan provides details of the proposed restoration of 27.7 ha of peatland habitat and the creation of 3.50 ha of native broadleaved woodland.

10.7 Residual Effects

Construction - Habitats

10.7.1 Implementation of the proposed CEMP would avoid likely significant adverse effects from pollution events on Tangy Loch SSSI, with no residual effects predicted.

10.7.2 Following completion of construction of the proposed development (including reinstatement work), residual adverse effects are anticipated for the short to medium term (approximately five to ten years), until habitats have re-established. Permanent habitat loss would occur in peatlands (2.98 ha), coniferous plantation (11.44 ha) and GWDTE (3.98 ha) due to the excavation of turbine bases, other infrastructure and access tracks. This effect is considered to be of low magnitude due to the small footprint involved. As a result, no significant residual effects are predicted.

10.7.3 Approximately 27.7 ha of peatlands would be restored following deforestation as part of the compensation for forest removal. Forest replanting (on and off-site), including the creation of 3.53 ha of broadleaved woodland, would further meet compensatory planting obligations and provide a local beneficial effect. As a result, no significant residual effects are predicted.

10.7.4 While habitat types present in the ecological study area are considered to be GWDTE as a result of their habitat classification, they are noted to be predominantly of low conservation value, with rushes dominating because of high levels of existing habitat modification. The GWDTE are considered to be predominantly surface water dependent are not in contact with potential sources of groundwater. Nevertheless, the proposed track construction includes proposed measures to maintain hydrologic connectivity, where required, to minimise effects on GWDTE. As a result, no significant residual effects are predicted for GWDTE.

10.7.5 Overall, with the completion of the mitigation and good practice measures detailed in this chapter, whereby the most ecologically valuable and sensitive habitats have been avoided and measures to reduce impacts on all other habitats of higher value and sensitivity have been employed, the effects on habitats are considered to be **not significant**.

Construction – Protected Species

10.7.6 Overall, with the completion of the mitigation and good practice measures detailed in this chapter such as pre-construction protected species survey, the effects on protected species are considered to be **not significant**.

Construction - Fish

10.7.7 Following implementation of mitigation, such as the implementation of pollution prevention measures proposed in the CEMP, no residual effects are predicted on aquatic habitats or fish.

Operation - Habitats

10.7.8 Good practice pollution prevention measures would avoid likely adverse effects from pollution events in terrestrial and aquatic habitats. No residual effects on Tangy Loch SSSI or habitats have been identified (**not significant**). The proposed broadleaved woodland creation and peatland restoration would enhance the ecological study area by increasing the biodiversity value and providing suitable habitat for bat species, birds, mammals and reptiles. This could potentially result in a significant residual beneficial effect.

Operation – Protected Species

10.7.9 No residual effects on protected species have been identified for the operational phase of the proposed development (**not significant**).

Operation – Fish

10.7.10 No residual effects on fish have been identified for the operational phase of the proposed development (**not significant**).

Decommissioning

10.7.11 There would be no significant decommissioning effects pre-mitigation and, consequently, no residual decommissioning effects would occur.

Cumulative Effects

10.7.12 This section considers the potential for cumulative effects on habitats and species from those proposed, applied and consented schemes closest to the site by first describing the known conditions on each of those sites and then summarising the cumulative effect with the proposed development.

Beinn an Tuirc

10.7.13 Located approximately 2.5 km to the east of the proposed development, Beinn an Tuirc wind farm (Phase 3) contains similar habitats to the ecological study area. Potential effects considered are loss of GWDTE, pollution of habitats from run-off and spillages and tree felling of coniferous plantation. Most of the potential effects are not considered to have a cumulative effect with other committed developments in the area following mitigation. The HMP would have potential positive effects on peatland habitats. It is likely that some loss of GWDTE would occur despite the mitigation measures and, combined with the losses from the proposed development, would amount to a combined low percentage of GWDTE habitat loss.

Auchadaduie

10.7.14 Located approximately 5 km north of the proposed development, Auchadaduie wind farm is at the consented stage. Small areas of marshy grassland, semi-improved acid grassland, watercourses and broadleaved plantation were recorded on the site. Otter signs were found along Barr Water, but no bat activity was recorded and the site was considered unsuitable for foraging/roosting habitat. Mitigation included a 50 m buffer from the blade tips of the turbines to the forest edge and pre-construction surveys. No significant effects were predicted.

10.7.15 The proposed development in this assessment would lead to the temporary disturbance of otter and no significant effects on bats. The design also includes a 50 m buffer from the blade tips to planted forestry and pre-construction surveys for protected species, including otter. As a result, no cumulative effects are predicted.

Blary Hill

10.7.16 Located approximately 5 km north-east of the proposed development, Blary Hill wind farm is at the consented stage and the site comprises mostly coniferous plantation. Surveys recorded blanket bog, wet heath, bat species, otter, Atlantic salmon, brown trout and reptiles that may be affected by the wind farm. However, careful siting of the proposed development and its associated infrastructure would avoid significant effects on these ecological features. As a result, cumulative effects with the proposed development in this assessment are not predicted.

Deucheran Hill

10.7.17 Located approximately 14 km north-east of the proposed development, Deucheran Hill wind farm (operational) contains habitats that are similar to the ecological study area. Effects on habitats were considered to be negligible after adoption of ecologically sensitive construction methods for turbine base and track construction. As a result, no cumulative effects are predicted.

Summary of Cumulative Effects

10.7.18 Following SNH's strategic locational guidance (SNH, 2009) the proposed development falls within Zone 2 of medium natural heritage sensitivity that comprises 55 % of Scotland's land area. The main cumulative effects are considered to be a small loss of peatland habitats, some of which might be considered to be GWDTE. However, as a result of the felling of areas of coniferous plantation, an area (27.7 ha) of degraded peatland is proposed for restoration. The restoration of this peatland could result in an overall beneficial cumulative effect on habitats.

10.7.19 Taking into account the relative low cumulative effects of the surrounding proposed wind farm developments with the proposed development, no significant cumulative effects are considered to occur.

10.8 Post Construction Monitoring

10.8.1 Although no significant effects are predicted on bats, a dedicated search for bat carcasses would be carried out on a monthly basis within a 50 m radius of each turbine, as detailed in Appendix 10.6:

Habitat Management Plan. Searches would be undertaken by the applicant following the standard SSE protocol.

10.9 Summary of Assessment Conclusions

10.9.1 Table 10.9: Assessment Summary shows the summary of potential effects of the proposed development, with mitigation measures and the predicted residual effects.

Table 10.9: Assessment Summary					
Ecological Feature	**Potential Impact**	**Pre-Mitigation Effect Significance**	**Mitigation/Good Practice Measures Proposed**	**Implementation**	**Residual Effect Significance**
Construction					
Habitats, including GWDTE	Habitat loss or modification/degradation	Adverse but not significant	Avoidance of sensitive habitats, micrositing, reduction of impacts on GWDTE	Design and CEMP	Not significant
Aquatic habitats, Tangy Loch SSSI and fish	Accidental pollution or siltation of water bodies and habitats	Adverse on aquatic habitats and fish but not significant Significant adverse effect on Tangy Loch SSSI	Exclusion zones around watercourses agreed with SEPA and pollution and siltation prevention measures	CEMP	Not significant
Bat species	Loss of foraging habitat	Adverse but not significant	N/A	N/A	Not Significant
Otter	Disturbance	Not significant	Pre-construction protected species survey, exclusion zones around watercourses agreed with SEPA and pollution and siltation prevention measures	CEMP	Not significant
Badger	Disturbance	Not significant	Pre-construction protected species survey and badger protection plan to minimise disturbance to setts	ECoW present on site during construction/felling works around badger setts	Not significant
Pine marten	Habitat loss and disturbance	Not significant	Pre-construction protected species survey	ECoW	Not significant
Reptiles	Disturbance and accidental killing/injury of reptiles	Not significant	Pre-construction survey and ECoW present to translocate any reptiles	ECoW present on site during construction in suitable reptile habitats	Not significant
Operation					

Table 10.9: Assessment Summary

Ecological Feature	Potential Impact	Pre-Mitigation Effect Significance	Mitigation/Good Practice Measures Proposed	Implementation	Residual Effect Significance
Habitats	Habitat restoration and creation	Significant beneficial effect	Restoration of 27.7 ha of peatland habitat and the creation of 3.53 ha of native broadleaved woodland	HMP	Significant beneficial effect
Aquatic habitats, Tangy Loch SSSI, otter and fish	Pollution or siltation of water bodies and habitats	Adverse but not significant for habitats, otter and fish Significant adverse effect for Tangy Loch SSSI	Pollution and siltation prevention measures	Spill kits stored on site (e.g. in central store in ops building) and carried in site vehicles when undertaking maintenance works	Not significant
Bat species	Mortality from collision or barotrauma and disturbance or displacement	Not significant	Maintenance of an 87m buffer between forestry replanting and turbines. Compensatory planting would also include areas of increased biodiversity with the planting of broadleaved species. Compensatory planting could provide new foraging and commuting areas	HMP	Not significant, potential for beneficial effect from compensatory planting
Badger	New foraging areas produced from removal of coniferous plantation	Beneficial but not significant	N/A	N/A	Beneficial but not significant
Pine marten	None predicted	N/A	N/A	N/A	N/A
Reptiles	None predicted	N/A	N/A	N/A	N/A
Decommissioning					

Table 10.9: Assessment Summary					
Ecological Feature	**Potential Impact**	**Pre-Mitigation Effect Significance**	**Mitigation/Good Practice Measures Proposed**	**Implementation**	**Residual Effect Significance**
Habitats	Habitat reinstatement	Not significant	Regeneration of habitats following removal of wind farm infrastructure and access tracks	CEMP	Not significant

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11. GEOLOGY, SOILS AND PEAT

Executive Summary

This chapter provides an assessment of the potential impacts on the geological setting resulting from the introduction of the proposed development. The assessment has been prepared with reference to environmental legislation, planning policy and general guidance. The effects on the site geology, soils and peat are considered **not significant** under the EIA regulations.

A review of the previous data that supported the 2014 application (Tangy III ES (2014)) was undertaken and been used as a basis of this report, updated with limited new data to accommodate minor modifications to the original layout. The potential effects of the proposed development on the local geological environments were then identified.

A range of potential effects from the proposed development has been considered, including physical damage to protected geological sites, reduced groundwater quality, contamination exposure to human health and ecological systems, damage to and/or loss of peat environment, chemical attach on buried concrete, and damage to on and off-site infrastructure. If the effect is not deemed significant it has been scoped out of the assessment.

Various mitigation measures are recommended as part of the pre-construction site investigation (SI) works and also as part of the Construction Environmental Management Plan (CEMP). Available measures range from carrying out detailed intrusive ground investigations, to implementing recognised good practice measures during the construction.

The assessment took into account appropriate and targeted mitigation during the construction phase such as the development and implementation of a CEMP and use of best practice construction techniques. The central conclusion being that where these measures are applied, the residual impact and effects would not be raised above low or negligible and therefore were assessed as **Not Significant** in the context of the EIA Regulations.

The effects on the site geology, soils and peat are therefore considered to be **not significant** under the EIA regulations.

11.1 Introduction

11.1.1 This chapter provides an assessment of the potential effects from the proposed development on the geology and ground conditions. The specific objectives of the chapter are to:

- describe the geological, soil and peat baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects, on geology, soil and peat features;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the significance of residual effects remaining following the implementation of mitigation.

11.1.2 The significance of potential effects from the proposed development has been assessed by considering two factors: the sensitivity of the receiving environment and the potential magnitude of impact, should that effect occur. The assessment methodology has also been informed by experience of carrying out such assessments for a range of wind farm and other developments, knowledge of the water environment characteristics in Scotland and cognisance of good practice. This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of potential effects presented by the proposed development. Criteria for determining the significance of effect are provided in Table11-2, Table 11-3 and Table 11-4.

11.1.3 Effects on surface water and private water supplies are addressed separately in Chapter 12: Surface Water.

11.1.4 This chapter is supported by:

- Appendix 11.1: Peat Stability Risk Assessment.
- Appendix 11.2: Borrow Pit Search Report.
- Appendix 11.3: Peat Management Plan.

These are included as stand-alone reports and have been updated from original submission to address minor changes in layout design which could impact the findings.

11.1.5 Figures 11.1 – Figure 11.12 are referenced in the text where appropriate.

11.2 Scope of Assessment

Study Area

11.2.1 The site boundary, as defined in Chapter 5 (Description of Development), was the focus of the geological and ground condition study. Details of the proposed development are illustrated in Figure 5.1.

Receptors

11.2.2 The following receptors have been initially addressed as part of this assessment:

- Protected Geological Sites.
- Groundwater Resources.
- Construction workers primarily (Human Health).
- Peat Environment.
- Buried Concrete Structures.
- Infrastructure, On and Offsite.

11.2.3 Construction practices shall be managed through the wider context of a CEMP. The outline CEMP (Appendix 5.1) will be further developed post-consent and implemented, maintained and updated by the appointed principal contractor.

11.2.4 A full understanding of the geological setting of the proposed development is required as part of the Environmental Impact Assessment (EIA) process. The sequence of soils and rocks which are present beneath the proposed development may influence the design and methods of construction required. The geology of a site can also be fundamental to controlling topography, geomorphology, hydrology and hydrogeology of the environment.

11.2.5 Sites may be designated for their scientific importance for geology. Local Geodiversity Sites can represent locations important for geology, geomorphology and soils outside statutorily protected reserve areas and Sites of Special Scientific Interest (SSSI).

11.2.6 The presence of ground contamination on development sites may have the potential to impact the proposed development and sensitive environmental receptors. A preliminary assessment of ground contamination has been undertaken in order to complete the impact assessment. The site however has been reviewed utilising historical plans and there is no evidence of any past uses which could give rise to contamination, and hence could impact receptors as a consequence of construction works. As a consequence, risk to human health of construction workers from contamination has been scoped out of the assessment.

11.2.7 Geohazards are similarly a key aspect of the EIA and can include as examples compressible ground, deeply weathered bedrock, natural geological subsidence and landslide hazards. A comprehensive assessment of salient geohazards has been carried out as part of the impact assessment process.

11.2.8 Specific focus on peat deposits is included in this assessment, no other significant geohazards have been identified. Appendix 11.1 (Peat Stability Risk Assessment) documents a comprehensive risk assessment process which has been undertaken for the proposed development. The Peat Stability Risk Assessment has been carried out in accordance with the current published guidance: Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments, 2nd Edition, Scottish Government 2017. The Appendices have been reviewed in line with the updated guidance and scoping comments.

Scoping and Consultation

11.2.9 Table 11.1 below summarises the scoping responses relevant to the Geology & Ground Conditions Chapter. Further detail is provided in Appendix 7.1: Register of Scoping Responses.

Table 11.1: Summary of Scoping Responses

Consultee	**Summary of Response**	**Where & How Addressed**
Scottish Environment Protection Agency (SEPA) October 2017	• SEPA accept the modifications being proposed to the consented (Tangy III) site design are unlikely to prejudice our interests. • A Private Water Supply (PWS) assessment should be carried out in accordance with the Land Use Planning System Guidance Notes 4 and 31. • The layout and the general principles for commissioning must demonstrate waste minimisation and compliance with the waste regulatory position. • Site Layout -all maps must be provided at an adequate scale with which to assess the information.	• Noted. • PWS assessment is provided in Chapter 12: Surface Water. • The principles of waste management during construction are detailed in Appendix 5.1: CEMP. • Site Layout Maps are provided at appropriate scales – see Volume 3a: Figures. • Details of the site layout and interactions with the water environment are illustrated in Figure 12.1.

Table 11.1: Summary of Scoping Responses		
Consultee	**Summary of Response**	**Where & How Addressed**
	• Engineering activities in water environment - The site layout must be designed to avoid impacts upon the water environment. • Watercourse crossings must be designed to accommodate the 0.5% Annual Exceedance Probability (AEP) flows. • Peat - The planning submission must a) demonstrate how the layout has been designed to minimise disturbance of peat and consequential release of CO2 and b) outline the preventative/mitigation measures to avoid significant drying or oxidation of peat throughout. • GWDTE & Existing groundwater abstractions the layout and design of the development must avoid impact on such areas. • Forestry - we prefer a site layout which avoids large scale felling as this can result in large amounts of waste material and a peak in release of nutrients which can affect local water quality. • Borrow Pits - The submission must provide sufficient information to address SPP policy on borrow pits. • Pollution prevention and environmental management - One of SEPA's key interests is pollution prevention - a schedule of mitigation must be submitted.	• EIAR Chapter 12: Surface Water provides an assessment of the hydrology baseline and potential significant effects. • This chapter - Chapter 11: Geology, Soil and Peat provides an assessment of the peat baseline and potential significant effects. Summary of mitigation can be found Appendix 11.3: Peat Management Plan. CO2 emissions are addressed in Chapter 5: Description of Development. • The GWDTE present in the ecological study area are assessed in Chapter 10: Ecology and shown on Figure 10.4: GWDTE (Volume 3a: Figures). • Felling is illustrated in Figure 16.1 and Replanting in Figure 16.2 in Volume 3a: Figures. • A borrow pit assessment is included in Appendix 11.2. • Pollution prevention measures are detailed in the CEMP (Appendix 5.1).

11.2.10 The potential for contamination on site has been scoped out as there are no potential sources of contamination from past uses based on typical locality and review of historical ordnance survey plans.

11.3 Methodology

Policy, Legislation and Guidance

11.3.1 The following guidance has been reviewed and incorporated into the study of geology soils and peat conditions at the site:

- Peat Landslide Hazard & Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments, 2nd Edition - Scottish Government, 2017.
- Developments on Peatland - Guidance on the assessment of peat volumes, re-use of excavated peat and the minimisation of waste -, Scottish Renewables, SEPA, 2012.
- Guidance on the developments on Peatland - Site Survey, Scottish Government Guidance, Soil Survey of Scotland, 2017, Scottish Government, SNH & SEPA.
- Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland, Forestry Commission Scotland (FCS), Scottish Natural Heritage (SNH), 2010.

- Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads Over Peat, FCS, 2006.
- Good Practice During Windfarm Construction, A joint publication by; Scottish Renewables, SNH, SEPA, FCS, 2015 Version 3.
- CIRIA C552: Contaminated Land Risk Assessment - A guide to good practice, DJ Rudland, RM Lancefield, PN Mayell, CIRIA London, 2001.

Desk Study

11.3.2 A review of published information on historical site uses and environmental conditions for the site has been undertaken. Information was obtained from the following sources:

- Ordnance Survey Map Data; (www.magic.defra.gov.uk).
- British Geological Survey Map Data (www.bgs.ac.uk).
- The Coal Authority & Mine Explorer (www.coal.decc.gov.uk).
- British Geological Survey Sheet 12, Campbeltown, 1: 50,000 scale.
- 5m Resolution Digital Terrain Model.
- Appendix 11.1 Peat Landslide Hazard and Risk Assessment.

11.3.3 These primary data sources have been used to inform the assessment of potential effects on the geology and ground conditions at the site and any mitigation measures which may be required.

Field Survey

11.3.4 A combined peat survey and ground condition survey was conducted by Natural Power between September 2013 and June 2014, undertaken to previous guidance (2007). Additional peat probing was undertaken by SLR in March 2018 (to current guidance) to determine final location of the temporary construction compound and refined access to T8 and T10. The temporary construction compound moved into a location with no significant peat and the turbine locations at T8 and T10 did not change.

11.3.5 An initial peat probing survey was carried out in order to gather peat depth distribution data on a 100 m grid within the proposed development. Data was collected during September 2013.

11.3.6 A detailed peat probing exercise was conducted across an early design iteration of the proposed development during November 2013. Final phases of peat probing, and surveys were completed in June 2014, with a few additional points collected to finalise design in March 2018.

11.3.7 Peat core sampling was undertaken at each proposed wind turbine location for visual inspection and Von Post classification (Von Post and Grunland, 1926). Up to three full depth peat cores were obtained from suitable locations at each proposed turbine location.

11.3.8 A detailed account of the peat surveys and peat stability risk assessment is provided in Appendix 11.1.

Impact Assessment Methodology

11.3.9 In order to determine whether an effect is significant, the sensitivity of a potential receptor and the scale of effect are assessed. Receptor sensitivity, magnitude of effect and significance criteria has been developed for the geology, soils and peat assessment of the proposed development. These are detailed in Table 11.2 and 11.3. The assessment has been undertaken with cognisance of the guidance set out in paragraph 11.3.1 (Policy Legislation & Guidance). Expert evaluation by suitably qualified engineering geologists and engineers has also been applied as part of the assessment to determine sensitivity, magnitude and significance.

Sensitivity of Receptor

11.3.10 The sensitivity of the receiving environment (i.e. the baseline quality of the receiving environment) is defined as its ability to absorb an effect without a detectable change. It can be considered through a combination of professional judgement and a set of pre-defined criteria which are set out in Table 11-2. Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at that associated level of sensitivity.

<u>*Receptor Sensitivity*</u>

Table 11.2: Criteria for Assessing Sensitivity Criteria

Sensitivity	Criteria
Not Sensitive	Receptor would not be affected by the proposed development.
Low	Low sensitivity geological receptors e.g. • Receptor is a minor/secondary aquifer or unproductive strata. • Peat less than 0.5m deep and not extensive in coverage across the Development. • Not a peatland habitat/unlikely to be a peatland habitat.
Medium	Medium sensitivity geological receptors e.g. • Receptor is locally designated for its geology importance through the Scottish geo-diversity designation. • Receptor is a minor aquifer providing private water supplies for agricultural use, with limited connectivity (ground water dependency) to surface water systems. • Evidence of low level contaminants or point sources which are unlikely to represent Significant Harm. • Mean peat depths are greater than 0.5m deep and will require excavation in isolated areas across the proposed development. • Areas that may be defined as a peatland habitat.
High	High sensitivity geological receptors e.g. • Receptor is designated for its geological importance on a national statutory basis e.g. Site of Special Scientific Interest (SSSI) or subject to an international designation. • Receptor is a major aquifer and provides locally or regionally important groundwater resources or supports sensitive river ecosystems. Development in a groundwater source protection zone and there is a strong groundwater dependency for terrestrial ecosystems. • Contamination is present and is likely to represent Significant Harm. • High sensitivity land use in terms of contamination of ground. • Average peat depths greater than 0.5m and excavated extensively for foundations and access tracks across the proposed development. • Priority Peatland Habitats.

Magnitude of Effect

11.3.11 For the assessment of effects on geological setting, the magnitude of an effect is considered. Magnitude of effect is determined based on a wide variety of criteria with principally duration (timing), size and the development scale relative to the receptor being affected considered by the assessment. Permanent effects are considered irreversible and lasting for the lifespan of the proposed development and beyond. Temporary effects are reversible or cease to affect the potential receptors at key points within the timeline of the proposed development. Direct effects arise from the construction and operation of the proposed development, whilst indirect effects are related to the development and may change after the proposed development has been constructed.

Table 11.3: Magnitude Criteria	
Magnitude	**Criteria**
Negligible	• Little of no change from baseline conditions.
Minor	• Detectable short-term change to protected geological site or hydrogeological conditions. • Development changes site conditions and resulting exposure to contamination represents a low risk to receptors*. • Development unlikely to be affected by geohazards and unlikely to alter any geohazards on or near the site.
Moderate	• Evident change (short to medium term) to protected geological site or hydrogeological conditions resulting in temporary or consequential changes to baseline. • Development changes site conditions and resulting exposure to contamination represents a moderate risk to receptors*. • Development may be affected by geohazards or could alter a geohazard on or near the site.
Major	• Large scale change to protected site or hydrogeological receptor. Change likely to be permanent or long term. • Development changes site conditions and resulting exposure to contamination represents a high or very high risk to receptors*. • Development represents a near or certain probability of encountering geohazards and/or altering geohazards over a wider area.

*Based on the risk definitions in CIRIA C552 Contaminated Land Risk Assessment A Guide to Good Practice (2001) (CIRIA C552) using a qualitative risk assessment.

Significance of Effect

11.3.12 The 'Significance of Effect' scale is defined in Table 11.4. For the purposes of the geology and ground conditions assessment the duration has been classified as:

- Temporary Short term - construction/de-commissioning (ground works).
- Temporary Long term - operational phase.

Table 11.4: Example Matrix for Determination of Significance of Effect			
Sensitivity / Magnitude	**Low**	**Medium**	**High**
Negligible	Negligible	Low	Low
Minor	Low	Low	Moderate
Moderate	Low	Moderate	High
High	Moderate	High	High

11.3.13 Effects of moderate significance and above are considered significant in the context of EIA Regulations. The assessment of Residual effects is based on accepted criteria and relevant guidance and augmented by professional judgement.

Limitations and Assumptions

11.3.14 The limitations of the assessment are bound by the 3rd party data sources listed below:

- Geological data sources, BGS maps and online BGS databases (including geoindex) consulted have been assumed as accurate in their geological content and mapping, however, the accuracy and completeness of supplied information cannot be guaranteed. The data has been reviewed as part of the updated chapter to ensure compliance with guidance.

11.3.15 Parts of the proposed development that are currently populated by dense forestry for commercial harvesting have not been investigated due to limited accessibility. The assessment for the proposed design layout provided however is considered robust and the level of investigation undertaken appropriate for an EIA. There are no areas proposed for development that have not been surveyed.

11.4 Baseline Conditions

Designations

11.4.1 There are no recorded geological designations within the proposed development or within 100 m of the boundary of the proposed development.

11.4.2 Bellochantuy and Tangy Gorges are located approximately 700 m west of the site boundary [NR 659278] and are designated as a Geological Conservation Review Site. Although located outside of the Development, the Tangy Burn watercourse, which is partially sourced within the development, flows through the identified Tangy Gorge designated site. Bellochantuy and Tangy Gorges are a tripartite site SSSI for quaternary geology and geomorphology, and the closest component sites are situated approximately 700 m south-west and 2.3 km north-west of the site boundary. These two sites are two discrete gorge features on the western coastline of the Kintyre Peninsula.

Desk Study - Geology

Superficial Geology

11.4.3 Beneath the peat, although spatially variable in its extent, a variety of glacial deposits are understood to be present. These materials are remnants from the last glacial retreat. All are erosional, transported sediments of glacial diamicton, sands and gravels, cobbles and boulders in a matrix of clay and silt. The rock fragments within these deposits are understood to originate from the surrounding country bedrock formations. Glacial deposits can be deposited under a wide variety of conditions including: lodgement (ice contact), glacio-fluvial (sub/en - glacial), ablation (melt-out) and in-situ weathering processes. Particle size composition can be highly variable.

11.4.4 Peri-glacial head deposits may also be obscured by the blanket peat. These deposits may comprise clay, sand and gravel in proportions which depend on the upslope provenance of material. These deposits are poorly sorted and poorly stratified and formed during the post glacial period predominantly by solifluction (down slope freeze/thaw transport and deposition) and/or hill wash and soil creep. Sand and gravel may exist locally with lenses of silt, clay or peat and organic material.

11.4.5 Alluvium may be present across parts of the site in proximity and restricted to watercourses. These deposits generally comprise differing proportions of clay, silt, sand and gravel, all transported and deposited under relatively recent fluvial environmental conditions.

11.4.6 Figure 11.3 depicts the BGS digital geological mapping data for the superficial geological units beneath the study area.

Bedrock Geology

11.4.7 The bedrock geology comprises of the Stonefield Schist Formation on the western area of the site. According to the British Geological Society this is a metamorphic bedrock formed approximately 542 to 1000 million years ago. This formation was originally sedimentary in origin and has been later altered by low-grade metamorphism to its current facies.

11.4.8 The Eastern area of the site consists of the Glen Sluan Schist Formation. The British Geological Society describes this formation as "*metamorphic bedrock approximately 542 to 1000 million years ago in the period. Originally sedimentary rocks formed in deep seas. Later altered by low-grade metamorphism.*"

11.4.9 The central region of the site has two bedrock formations developed as linear sub-crops orientated in a north-west to south-east direction. The eastern band is the Loch Tay Limestone Formation. The British Geological Society describes this formation as a "*metamorphic bedrock formed approximately 542 to 1000 million years ago in shallow carbonate seas. Later altered by low-grade metamorphism.*" The western band is the Neoproterozoic Basic Minor Intrusion Suite, Amphibolite & Horneblende Schist. The British Geological Society describes this formation as a "*metamorphic bedrock formed approximately 542 to 1000 million years ago in the Neoproterozoic period*."

11.4.10 Figure 11.4 depicts the BGS digital geological mapping data for the solid geological units beneath the study area.

Structural Geology and Tectonic Features

11.4.11 There are two regional faults located south and east of the proposed development. The fault on the eastern side of the site runs south-west to north-east with past movement affecting units on the western side of the structure. The fault to the south of the site is inferred and may be an anticlinal axis indicating large scale structural folding of bedrock units across the Kintyre peninsula. Faults can often be associated with a zone of weakness within the rock mass and additionally may act as a preferential flow pathway for groundwater flow. It should be highlighted that these structures are understood to not be active and seismic hazards have not been included as part of this assessment. The listed faults on the BGS maps are not within the vicinity of the infrastructure, although unmapped faults may lie within the site boundary.

Peat Probing Survey

11.4.12 The peat probing surveys undertaken across the proposed development identify localised areas of peat which are greater than 1.5 m deep, as illustrated in Figure 11.5. The areas of peat greater than 1.5 m deep are typically found in the upland areas of the site and in discrete pockets with shallow groundwater levels. The probing surveys recorded peat depths less than 1.5 m deep across the majority of the site. Improved grazing land within the southern part of the proposed development is generally devoid of peat cover with the exception of minor pockets of peat present adjacent to isolated wet flush areas. The calculated mean peat depth across the recorded deposits is 0.55 m, with a maximum recorded peat depth of approximately 3.6 m in a deep pocket of peat recorded on the north-eastern boundary of the study area. The mapped distribution of peat deposits across the study area is based on the interpolation of peat depth data collected during all phases of field survey, illustrated in Appendix 11.1. The peat encountered across the site is typically brown pseudo-fibrous peat with a thin surface of peaty topsoil. With a moderate amount of decomposition and large content of root structure; typical Von Post Classification values range between [H4] to [H7].

Peat Stability

11.4.13 The peat stability baseline was assessed based on the site walkover survey, supported by terrain mapping and desk study review of the geological setting (Figures 11.2 & 11.3). Following this process there are concluded to be no signs of active peat slide instability. This includes no evidence for tension cracking on peat slopes. A subtle and relict natural peat slide deposit has been recorded on the northern periphery of the operational wind farm, however this feature is deemed to be isolated and limited in extent. The feature represents a zone of weathered peat affected by its position close to a watershed line where a slow process of erosion has produced a small area of disturbed peat. This feature is not considered to be active nor has the existing operational wind farm impacted the stability of this area. Peat depth, slope angle and in-situ undrained shear strength of the peat deposits was recorded for the site and preliminary slope stability undertaken for the present site conditions.

11.4.14 The detailed Peat Stability Risk Assessment for the proposed development has been provided as Appendix 11.1. Therein the baseline data collected on the proposed development site is presented and analysed.

Ground Contamination

11.4.15 The site walkover, review of previous data and the assessment of historical plans (for past uses which could give rise to contamination) has not indicated any signs of land contamination across the proposed study area.

11.4.16 Agricultural use of agro chemicals in the surrounding land may also be a possible source of contamination (e.g. pesticides/herbicides), however this is considered to be of low sensitivity to the geological setting, particularly with the limited extent of arable farming.

Hydrogeology

11.4.17 The BGS Hydrogeological Map of Scotland shows the area of the proposed development to be in a region where 'there are fractured or potentially fractured rocks that do not have a high primary permeability, or other formations of variable permeability. Although these formations will seldom produce large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers and in turn lochs. An assessment of any potential groundwater dependent private water supplies has been provided within Chapter 12 (Surface Water), and assessment of a PWS in vicinity of Borrow Pit C has been completed. These sources are very localised as a consequence of the fractured nature of the rock and so potential impact to a PWS can be potentially mitigated.

11.4.18 Connectivity of the groundwater systems within the peat, superficial glacial deposits and underlying solid geology are likely to be compartmentalised across the study area. The groundwater flow regime established in the peat mass is likely to be complex and highly variable governed by terrain and peat material properties. Typically, groundwater flows may be concentrated within the upper acrotelmic peat layers. Static groundwater bodies or groundwater with an extended residence time may exist in the lower catotelmic peat layers. Desiccation cracking, fissures and eroded peat pipes within the peat mass may facilitate increased flows of groundwater through a fracture style flow regime analogous to that observed in bedrock units. Finally, there may be a concentration of groundwater flow along the base of the peat deposit, at the interface with underlying superficial glacial or alluvial deposits.

11.4.19 A separate and similarly heterogeneous groundwater flow regime is likely to exist within the superficial deposits beneath the site. In general, within glacial till, groundwater may be confined to 'perched' pockets of granular materials with transmission via seepage and intra-granular flow. Weathered horizons and lenses of sand and gravel are likely to provide the pathways for groundwater flow within the superficial deposits across the study area. It is therefore difficult to predict and model the linkages between the superficial and bedrock geology groundwater systems. It is highly probable that the two systems broadly operate as compartmentalised regimes with only sporadic and slow or delayed interactions.

11.4.20 The SEPA superficial aquifer map and bedrock aquifer maps (2004) indicate that the bedrock and superficial aquifers underlying the site are dominated by fracture flow with low productivity. The hydrogeological map also suggests that the site is generally underlain by impermeable rocks without groundwater at shallow depth. In the vicinity of Tangy Loch there is a band of concealed aquifers with limited potential and without significant groundwater. Therefore, the published sources of hydrogeological information show that flows are dominantly in fissures and fractures and unlikely to be extensive across the site. Based on this, the hydrological and hydrogeological conditions of the site conducive to potentially support GWDTEs are not extensive and limited to isolated areas.

11.4.21 The groundwater regime would be confirmed by intrusive ground investigations carried out post-consent during the pre-construction phase of the proposed development.

Geotechnical Considerations

11.4.22 Wind turbine foundation types depend upon a number of factors, including:

- Depth of superficial deposits and depth to engineering bedrock level.
- Rock mass strength of the underlying bedrock geology.
- Groundwater conditions.

11.4.23 As part of a detailed site investigation (post-consent), the distribution of superficial deposits would be determined across the infrastructure alignment. This would provide detailed information for the depth and composition of deposits beneath infrastructure locations. A geotechnical drilling investigation would determine the rock mass properties at each turbine foundation and within the potential borrow pit areas.

Future Baseline

11.4.24 In reference to the geological setting there are no known or predicted future processes (other than the wind farm) which are likely to change baseline conditions. No significant information gaps are noted in the geological assessment.

11.5 Effects Evaluation

Construction Phase

11.5.1 Activities that are likely to occur on-site during the construction phase of development and which could involve interaction with geology and ground conditions are included below:

- Soil stripping and excavation of superficial materials;
- Removal and harvesting of trees
- Excavation for foundation and sub-structures;
- Storage of materials and stockpiling of excavated soils on-site;
- Re-use of excavated material on-site or imported materials for re-profiling and access track capping;
- Vehicle and plant machinery movements in close proximity to watercourse crossings;
- Drainage works and cable trenching;
- Construction of crane hardstand areas, turbine foundations, temporary construction compound, substation/control building and access tracks including culverting works;
- Removal of existing (Tangy I and II) wind turbines, partial removal of access tracks, other infrastructure and reinstatement of surrounding ground conditions; and
- Storage, handling and use of chemicals, such as oils, lubricants, fuels etc.

Operational Phase

11.5.2 Activities that are likely to occur on-site during the operational phase of development and which could involve interaction with geology and ground conditions includes:

- Small scale storage of chemicals, such as oils or lubricants for electrical infrastructure; and
- Storage of excavated and/or restored materials including peat, glacial till and rock.

Decommissioning Phase

- Activities likely to be taking place on-site during the final decommissioning stage which could involve interaction with the geology and ground conditions includes:
- Removal of wind turbines, access tracks and other infrastructure on a scale of operations similar to the construction phase of development;
- Replacement of material from excavated infrastructures (turbine foundations, crane pads etc.); and
- Limited storage of chemicals, such as oils, lubricants, fuels etc.

Receptors

11.5.3 The assessment of effects on the geology and ground conditions includes consideration of a wide variety of receptors. The assessment has considered the following:

- Protected geological sites (scoped out as no sites are present);
- Groundwater resources;
- Construction Workers (human health);
- Peat environment;
- Buried concrete structures;
- Infrastructure on-site; and
- Infrastructure off-site.

Impact Assessment

Peat Stability

11.5.4 The proposed development occupies an upland area with complex terrain and widespread blanket peat cover in the central part of the site. The preliminary peat stability assessment has examined the proposed turbine locations and associated infrastructure locations with a series of pre and post mitigation peat stability hazard zonation maps presented within Appendix 11.1.

11.5.5 The mean peat depth recorded across the infrastructure location is calculated to be 0.55m with a maximum peat depth of 3.6m recorded in discrete pockets centrally across the forested upland plateau. The design and optimisation of the proposed layout is such that these deeper zones of peat are not impacted by the proposed development.

11.5.6 The peat stability risk assessment (Appendix 11.1) confirms that ground conditions for all proposed turbine locations are calculated to be stable for the present site conditions. For the predicted construction condition, where best practice methods will be applied, there is determined to be a negligible probability of translational slide failure based on the factor of safety analysis.

11.5.7 The overarching semi-quantitative peat slide hazard risk assessment has assigned an insignificant to significant ranking for peat failure events across proposed turbine measures for the case of no applied control measures (pre-mitigation). Three proposed turbine locations T8, T9 and T10 have been assessed to be at 'Serious' hazard of peat instability for the case of no applied control measures. This is attributed to multiple contributory factors including peat depth, slope angle and the overriding factor being a close proximity to a main watercourse on the northern section of the proposed Development (Figure 11. 1and 11.2).

11.5.8 It is highlighted that the preliminary peat stability assessment of proposed turbine location T8 is based on interpolated peat depth and slope data. This is a result of this section of the site being inaccessible through wind-blown forestry, preventing safe access for field survey. A refined risk assessment of this location will therefore be undertaken post consent, following clear access into this area.

11.5.9 The overall peat stability impact away from the higher risk areas has been presented in Appendix 11.1. There are prevailing peat depths of 0.0 - 0.5m which contributes to a negligible likelihood of peat failure. The majority of the site is classified under the slope geometry of 4 - 8^{o} which does contribute to an elevated likelihood of peat failure. The impact on peat land is additionally elevated across the site due to the frequency of mapped watercourses. The un-mitigated impact is therefore concluded to be high as the watercourses act as offsite receptors, entraining peat material in an uncontrolled failure event. With the application of the stated control measures the mitigated impact is determined to be Low.

Summary of Pre-Mitigation Effects

11.5.10 The potential effects for the proposed development are tabulated in Table 11.5 with comments on mitigation to ensure significance of impact is low to negligible:

Table 11.5: Summary of Pre-mitigation Effects

Receptors	Groundwater Resources	Human Health	Peat Environment	Buried Concrete Structures	Infrastructure Onsite	Infrastructure Offsite
Potential Effect(s)	Reduced water quality through de-watering, pollution, modification of hydrogeology.	Exposure of construction workers to contaminated land. Contamination of ground water sourced private water supplies.	Loss of Peat as Carbon Sink through peat instability. Impact on sensitive watercourses through peat instability.	Chemical Attack	Failure of foundations and infrastructure due to land instability. Failure of infrastructure due to faulted strata. Compressible ground causes excessive settlement.	Subsidence or damage to buildings or structures due to construction activity.
Sensitivity of Receptor	Medium to High (PWS)	High	Low	Low	Low	Low
Magnitude of Impact	Minor	Minor	Moderate	Minor	Moderate	Negligible
Significance of Impact	Low	Low	Low	Low	Low	Negligible
Duration	Short Term & Temporary	Short Term & Temporary	Long Term & Permanent	Long Term & Permanent	Long Term & Permanent	Long Term & Permanent
Direct or Indirect	Direct	Direct	Direct	Direct	Direct	Indirect
Comments / Mitigation	Proposed development highly unlikely to affect groundwater resource, Chapter 12 outlines the mitigation to protect a Private Water Supply near Borrow Pit C.	Carry out Geo-Environmental Study pre-construction.	Effects on areas of deep peat limited by avoidance by project infrastructure where possible and use of floating track design where peat >1m. Mean peat depth across the proposed development calculated to be 0.55m. Application of control measures to reduce peat stability risk to acceptable levels.	Carry out detailed ground investigation and design foundations to correct concrete specification.	No evidence of ground instability within vicinity of proposed infrastructure; Carry out geotechnical site investigation and design.	Infrastructure excavations are remote from residential dwellings.

11.6 Environmental Management and Mitigation Measures

11.6.1 Table 11.5 summarises the potential effects on geology and ground conditions as low or negligible and not significant in the current setting. However, the requirement for further mitigation, as part of the construction process is outlined below and is detailed in the CEMP.

11.6.2 A site-specific outline Construction Environmental Management Plan (CEMP) is provided in Appendix 5.1. The CEMP will be further developed post-consent / pre-construction and implemented, maintained and updated by the appointed principal contractor.

11.6.3 The CEMP is a management tool to identify issues which may arise as part of the construction process and where it could impact the current geological setting. Mitigation will include but not be limited to the following issues and will be an on-going working document.

- Avoidance of arisings being placed as local concentrated loads on peat slopes without first establishing the stability condition of the ground and slope system. Stockpiling on pockets of deep peat and in close proximity to steep slopes shall be avoided.
- Avoidance of uncontrolled and concentrated surface water discharge onto peat slopes. All water discharged from excavations during construction phase shall be directed away from all sensitive areas and shall be managed by a suitably designed site drainage management plan.
- All excavations where required shall be adequately supported to prevent collapse and the destabilising ground adjacent to excavations.
- Environmentally compliant drainage designs for the proposed development will form a primary control and mitigation measure for maintaining surface hydrology and shallow groundwater flow during the lifespan of the scheme. This is discussed in detail within Chapter 12 (Surface Water).
- The pre-mitigation peat hazard will be reduced to a manageable 'Significant' hazard level through routine application of control measures. These are highlighted below and discussed further within Appendix 11.1:
- Undertake detailed intrusive ground investigation gathering additional basal peat contact data and where possible acquire high quality geotechnical data in order to refine and update the peat stability risk assessment.
- Maintain the hydrological regime within the local area preventing surface ponding of water on peat deposits and ensuring there is no build-up of pore pressures within the peat. No surcharge loading of peat slopes, with no overburden or temporary peat storage across any high-risk construction areas.
- Monitoring and assessment throughout pre-construction and construction phase considering the changing properties of stockpiled materials including the effects of weathering.
- Ensuring experienced geotechnical personnel throughout investigation, construction and operational monitoring.

Monitoring

11.6.4 A Geotechnical Engineer will maintain a geotechnical risk register, including peat slide risks, for the duration of the construction works phase. The Geotechnical Engineer will undertake regular inspections of relevant areas and provide recommendations as required to the Principal Contractor. Details on the Geotechnical Engineer's role will be provided in the CEMP.

11.7 Residual Effects

11.7.1 Where correct best practice is applied in environmental management and mitigations applied in line with the requirements of the site ground conditions it is not envisaged that there would be any significant effects as prescribed in Table 11.4.

11.8 Cumulative Effects

11.8.1 There are no anticipated effects on the local geology or hydrogeological regime envisaged from any known nearby developments. No cumulative effects are therefore anticipated at this stage.

11.9 Summary

11.9.1 A summary of the EIA Assessment and overall significance of potential impacts following mitigations is set out in Table 11.6:

Table 11.6: Summary of Assessed Significance of Impacts to Identified Receptors

Receptor	Significance of Impact
Protected Geological Sites	None
Groundwater Resources	Low
Human Health	Low
Peat Environment	Low
Buried Concrete Structures	Low
Infrastructure Onsite	Low
Infrastructure Offsite	Negligible

11.9.2 Suitable and targeted mitigation will be applied to ensure that residual effects will be no greater that ‘low’ as described above. A standalone and separate peat stability assessment has been undertaken which has identified a risk of peat slide where development proceeds without adequate control measures. Full details including a comprehensive range of conclusions and recommendations have been provided within Appendix 11.1. Therein specialist mitigation measures are proposed to reduce the risk to insignificant levels.

11.9.3 The effects on the site geology, soils and hydrogeological conditions are therefore **not significant** under the EIA regulations.

11.10 References

Peat Landslide Hazard & Risk Assessments – Best Practice Guide for Proposed Electricity Generation Developments, Scottish Government, 2007.

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12. SURFACE WATER

Executive Summary

This chapter considers the potential impacts on the surface water environment associated with the construction, operation and decommissioning of the proposed development.

This assessment has considered the potential for significant effects on surface water quality, fisheries and recreation, flood risk, public water supplies and private water supplies (PWS). The assessment was made with reference to the assessment provided in Chapter 12 of the Tangy III Environmental Statement (ES, 2014) followed by a review of any changes in policy, legislation and guidance and baseline conditions, along with consideration of the significance of effects for the proposed development. Based on this assessment it was concluded that, with the exception of PWS source locations within 250 m of the proposed development, there would be no potential for significant effects. All other non-significant effects have been scoped out.

The assessment of the potential for the proposed development to impact PWS considered 14 PWS source locations within 1 km of the site[1]. Following further baseline characterisation using desk assessment, site survey, questionnaires and local consultations, the potential for impacts on 13 of the 14 PWS source locations was scoped out of further assessment on the basis that they are located out with the 250 m groundwater protection buffer (as per SEPA's Guidance LUPS-GU31).

Due to the presence of dense forestry, PWS source location 2, which serves two properties (Lagalgarve Farm (2A) and Tangytavil (2B)), was subject to further assessment to consider potential impacts associated with Borrow Pit C. Therefore, based on conceptual site modelling, it was concluded that depending on the hydrogeological connection between PWS2 and Borrow Pit C, there is the potential for either 'no effect' or 'adverse effects' on the quality and quantity of supply.

Following a precautionary approach, it is therefore concluded that there could be the potential for effects of high magnitude. However, in order to mitigate the potential for significant effects, the applicant proposes to agree contingency plans that would ensure security of supply to the two properties in the unlikely event that there is a significant effect on the quality or quantity of supply. Security of supply would be provided through the use of either temporary or permanent replacement of groundwater supply. Following the application of these proposed mitigation measures, the effect on the supply of water to the residential receptors would be considered **not significant**.

[1] The PWS and property IDs are described in Table 12.4 and locations are illustrated in Figure 12.1

12.1 Introduction

12.1.1 This chapter considers the potential effects on surface water quality, fisheries and recreation, flood risk, public water supplies and private water supplies (PWS) associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- Describe the baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including direct, indirect and cumulative effects;
- Describe the mitigation measures proposed to address likely significant effects; and
- Assess the significance of residual effects remaining following the implementation of mitigation.

12.1.2 The assessment has been carried out by chartered water and environment professionals of WSP in accordance with the Chartered Institution of Water & Environmental Management code of ethics.

12.1.3 Effects on hydrogeology and peat are addressed separately in Chapter 11: Geology, Soil and Hydrogeology and effects on Groundwater Dependent Terrestrial Ecosystems are addressed in Chapter 10: Ecology.

12.1.4 This chapter is supported by:

- Appendix 12.1: SEPA Correspondence;
- Appendix 12.2: Private Water Supplies; and
- Appendix 12.3: Conceptual Site Model.

12.1.5 Figure 12.1 is referenced in the text where relevant.

12.2 Scope of Assessment

Project Interactions

12.2.1 The proposed development will introduce physical changes which may alter the hydrological characteristics of the site which may impact on water supplies, watercourse flows and flood risk. During the construction phase and to a lesser extent during the operational phase, potential sources of pollution may be present on site which could impact upon water quality and fisheries.

Scoping and Consultation

12.2.2 As part of the EIA Scoping exercise for the proposed development, it was proposed that the surface water topic be scoped out based on the findings of the Tangy III surface water assessment and the limited nature of the infrastructure changes when compared to Tangy IV. The Tangy III ES (2014) concluded that there were no likely significant effects on the surface water environment in terms of the EIA Regulations. It was also proposed that further information regarding PWS sources and assessment be provided pre-construction. Table 12.1 summarises the responses to the scoping request which were provided within the Scottish Government Scoping Opinion, and which are relevant to the surface water environment.

12.2.3 Full details on the consultation responses can be reviewed in Appendix 2.1: Consultation Register.

Table 12.1: Consultation Responses

Consultee and Date	Summary of Response	Comment/Action Taken
Scottish Government 16/10/2017	*Tangy IV Scoping Opinion.* The EIA Report should reflect the assessment of all likely significant environmental effects of the proposed Tangy IV. Where assessment areas are scoped out based on conclusions from prior knowledge (such as Tangy III) the following must be considered: - Are impacts comparable; - Has policy context changed; and - Has baseline condition changed.	All likely significant environmental effects have been considered. Where assessment areas have been scoped out based on conclusions from prior knowledge this has taken account of changes in policy, legislation and guidance, and baseline condition; and has only where impacts are comparable. See Section12.3 Scope of Assessment - Effects scoped out of assessment.
SEPA 26/05/2017	*Tangy IV Scoping Opinion.* Further to SEPAs response to the Tangy III application and subsequent correspondence, the following information is required. - Additional site investigation works to locate PWS sources for four properties with recorded supplies for which sources have yet to be located; and to understand the implications to the source and quantity of these supplies. - Further assessment on the potential impacts of the private water supply within 250 m of the 'working area' of Borrow Pit C in line with Land Use Planning System Guidance Notes 4 (Appendix 2) and 31; or relocation of the borrow pit to be at least 250m from the PWS. - For pumping from borrow pits compliance with GBR2 or GBR5 under the Water Environment Controlled Activities (Scotland) Regulations 2011 (as amended) is required. If quantities greater than 10 m^3/day a CAR permit may be necessary.	See Section12.5 Baseline Conditions. See Section 12.6: Effects Evaluation. See Outline Construction Environmental Management Plan (CEMP) (Appendix 5.1).
Scottish Water 22/05/2017	*Tangy IV Scoping Opinion.* Requested consideration of potential impacts on Drinking Water Protected Areas and public water supply intakes in the area, notably Glen Lussa Water catchment. A distribution main runs alongside the A83 and the access roads for the site. Protection measures should be implemented to ensure it is protected.	These intakes were assessed in the Tangy III ES (2014). Temporary and permanent infrastructure is not located within the respective drinking water catchments and effects are negligible. The distribution mains location shall be confirmed, and appropriate measures agreed with Scottish Water for crossing the asset or other works in close proximity to avoid damage.

Table 12.1: Consultation Responses

Consultee and Date	Summary of Response	Comment/Action Taken
Marine Scotland Sciences (MSS) 26/05/2017	*Tangy IV Scoping Opinion*. MSS advises the developer to carry out up to date site characterisation surveys of the watercourses potentially impacted by the proposed development. Including surveys of hydrochemistry to include turbidity and flow data, and fish populations (the presence and abundance of fish species) to inform the assessment.	As infrastructure and construction compounds are located out with a 50m watercourse buffer (with the exception of watercourse crossings) and robust water protection mitigation measures are included within the Schedule of Mitigation and CEMP, additional surveys are not proposed at this time. A commitment has been made for pre-construction, construction and post-construction monitoring. Fish populations are discussed in Chapter 10: Ecology of this EIA Report.
Fisheries Management Scotland 15/05/2017	*Tangy IV Scoping Opinion.* Consultation with the Argyll District Salmon Fisheries Board and the Argyll Fishery Trust is requested.	The proposed development infrastructure and construction compounds are located out with a 50m watercourse buffer (with the exception of watercourse crossings) and robust water protection mitigation measures are included within CEMP. Argyll District Salmon Fisheries Board consulted during scoping. Fish populations are discussed in Chapter 10: Ecology of this EIA Report.
Argyll District Salmon Fisheries Board 16/10/2017	*Tangy IV Scoping Opinion.* No response.	None applicable.

12.2.4 Correspondence between SEPA and the applicant in 2015 concluded the following; the final letter from SEPA dated 22nd June 2015 is provided in Appendix 12.1:

- that the PWS in the vicinity of Borrow Pit A were not at risk as they were not located within 250 m of the borrow pit 'working area', but instead within the borrow pit 'search area'. SEPA were satisfied that borrow pit A was out with the buffer zone and did not require further assessment.; and
- Additional quantitative hydrogeological assessment should be carried out to demonstrate that the risk to the PWS from Borrow Pit C is not significant.

Effects to be Assessed

12.2.5 The potential effects of the proposed development on PWS in relation to the following have been assessed / reported:

- Impacts from Borrow Pit C on PWS; and
- PWS source information relating to four properties with groundwater-fed PWS registered with Argyll & Bute Council for which sources had not previously been located.

Effects Scoped Out of Assessment

12.2.6 The Tangy III ES (2014) Chapter 12: Surface Water assessed the impact of the proposed development on surface water quality, fisheries and recreation, flood risk, public water supplies and PWS. The assessment took into account mitigation measures in terms of both 'mitigation by design' and best practice construction management outlined in an accompanying Construction

Environmental Management Plan. It concluded that there were no potentially significant effects on the surface water environment in terms of the EIA Regulations.

12.2.7 Table 12.2 presents a summary of the assessment of predicted construction effects from the Tangy III ES (2014) study. Temporary minor adverse effects were identified in relation to construction impacts on surface water quality at Tangy Loch SSSI; due to its high sensitivity. Temporary minor adverse effects were also identified for specific PWS in proximity to borrow pits during the construction phase.

12.2.8 The significance of operational residual effects within the Tangy III ES (2014) was the same as illustrated in Table 12.2 for all receptors with the exception of PWS for which all were predicted to have negligible residual effects.

12.2.9 The changes to the design for the proposed development are very limited and do not impinge on waterbody or PWS protection or assessment buffers. As such it is considered that these design changes do not materially affect the conclusions of the Tangy III ES (2014).

12.2.10 A review of current baseline conditions and relevant policy, legislation and guidance has also been undertaken to ensure that the findings of the Tangy III ES (2014) remain valid, the documents which were considered are listed below Table 12.2. There have been no relevant legislative or guidance changes in the interim which materially change the findings; nor has the baseline materially changed, with the exception of the PWS in the vicinity of Borrow Pit C, as discussed in paragraph 12.2.5.

12.2.11 Effects of the proposed development on water quality, fisheries and recreation, flood risk, public water supplies and PWS in general (other than those being assessed) have therefore been scoped out as not having the potential for significant effects. The construction management measures to protect the water environment are outlined in the Construction Environmental Management Plan (CEMP) which accompanies this EIA Report (see Appendix 5.1).

Table 12.2: Assessment of Predicted Construction Effects

Potential Effects	**Identified Receptor** [1]	**Significance of Residual Effect** [2]			
		Water Quality	**Fisheries and Recreation**	**Flooding**	**Water Supplies**
Leakages and Spillages Sediment Entrained Runoff Increase in Runoff Modifications to Surface Drainage Patterns Impediments to Surface Water Flow Modifications to Groundwater Flow and Levels	Allt na Creamh	Negligible	Negligible	Negligible	
	Allt na Ceardaich	Negligible	Negligible	Negligible	
	Tangy Burn	Negligible	Negligible	Negligible	
	Allt a Ghoirtein	Negligible	Negligible	Negligible	
	Allt Harvie	Negligible	Negligible	Negligible	
	Tangy Loch SSSI	Minor Adverse	Negligible	Negligible	
	Scottish Water Peninver WTW				Negligible
	PWS Sources PWS1 PWS10, PWS11 and PWS9				Negligible
	PWS Sources PWS2, PWS4, PWS5, PWS6, PWS7, PWS12, PWS13				Minor Adverse

[1] private water supply IDs have been updated in line with the IDs used within this chapter and accompanying appendices. The list is provided in Table 12.4.

[2] terminology for residual effects revised to be in line with that used within this EIA Report.

12.2.12 Relevant legislation, policy and guidelines updated or published since the Tangy III ES (2014) comprise:

- Argyll and Bute Local Development Plan 2015 March 2015 (Ref. 12.1);
- Water Environment (Miscellaneous) (Scotland) Regulations 2017 (Ref. 12.2);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR): A Practical Guide (February 2018) (Ref. 12.2);
- SEPA Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017) (LUPS-GU31) (Ref. 12.4);
- The UK Forestry Standard (2017); Forestry Commission (Ref. 12.5);
- SEPA's Engineering in the water environment: good practice guide for River crossings (2010) (Ref. 12.6);
- Culverting of Watercourses – Position Statement and Supporting Guidance (2015) (Ref. 12.7); and
- SEPA Guidance for Pollution Prevention (GPP) 5: Works and maintenance in or near water (2018) (Ref 12.8).

12.2.13 None of the updates to the above documents or new documents materially affect the findings of the Tangy III ES (2014) with regard to surface water. However, some construction guidance has changed in the intervening period and is addressed as follows:

- The guidance for CAR has been changed regarding the licencing requirements for surface water run-off from a construction site. Considering the size of the construction footprint, there is the potential for a CAR licence to be required, subject to consultation with SEPA; and
- The UK Forestry Standard 2017 recommends a minimum width for buffer areas around private water supply abstraction points of 50 m. This will be adhered to and is included within the outline CEMP/forestry chapter.

12.3 Methodology

Overview

12.3.1 The methodology for this chapter has been tailored to focus on the following:

- Acquisition of data relating to private water supplies within the vicinity of the site; notably the four sources which were not previously located; and
- Potential impacts of Borrow Pit C on one private water supply.

Method of Baseline Characterisation

12.3.2 Private water supply data was gathered using the following methods:

- Consultation with Argyll & Bute Council Environmental Health Department to obtain data on recorded PWS within 2 km of the site;
- Questionnaires posted to properties within 1 km of the site which had PWS recorded with the local authority and properties with no record of PWS, but which were unlikely to be on mains supply due to their location; and
- Targeted interviews with property owners and a site walkover survey of PWS sources conducted between 12th – 15th March 2018.

12.3.3 Data to inform the conceptual site model was gathered as follows:

- An overview of the local catchments to Borrow Pit C;
- Collation of data provided through PWS consultations;
- Compilation of soils, geological and hydrogeological information;
- Ordnance Survey Map data at 1:10,000, 1: 25,000 and 1: 50,000 scales;
- The British Geological Survey (BGS) Digital Mapping; and
- Information gathered from the site walkover survey.

12.3.4 Full details of the survey methodology are detailed in Appendix 12.2: Tangy IV Private Water Supply Survey.

Effects Evaluation Methodology

12.3.5 The assessment of likely effects as a result of the proposed development has taken into account both the construction and operation phases. The significance level attributed to each effect has been assessed based on the magnitude of change due to the proposed development and the sensitivity of the affected receptor/receiving environment to change, as well as a number of other factors that are outlined in more detail in Chapter 2: Environmental Impact Assessment. Magnitude of change and the sensitivity of the affected receptor/receiving environment are both assessed on a scale of high, medium, low and negligible.

12.3.6 The sensitivity of local water supply sources, including private water supplies, where there is no alternative to private supplies and it is used for drinking water, is considered to be 'High' locally.

12.3.7 Magnitude has been assigned using the criteria detailed in Table 12.3 with respect of this topic.

Table 12.3: Effect Magnitude Criteria

Sensitivity	Surface Water Definition
High	Fundamental change to hydrological conditions (including deterioration in water quality and hydromorphological quality) resulting in temporary or permanent consequential changes such as altering water body's existing Water Framework Directive (WFD) ecological status and increasing pressure to meet WFD targets.
Medium	Detectable change to hydrological conditions resulting in non-fundamental or partial, temporary or permanent consequential changes. Some deterioration in water quality likely to temporarily impact to most sensitive receptor.
Low	Detectable but minor change to hydrological conditions. Drinking water or Water Framework Directive Standards are not exceeded and level of change is unlikely to affect the most sensitive receptor.
Negligible	Non-detected, unquantifiable or unqualifiable change in hydrological conditions (including water quality).

12.3.8 A Conceptual Site Model was prepared to help understand the relationship between Borrow Pit C and PWS 2 (previously PWS B in the Tangy III ES (2014)) and to aid in the identification of likely significant effects. This is provided in Appendix 12.3: Conceptual Site Model.

12.4 Baseline Conditions

12.4.1 Table 12.4 presents a summary of the private water supplies within 1 km of the site. Figure 12.1 illustrates the location of the PWS sources, the properties supplied and proximity to proposed development infrastructure, and more detail and photography is provided in Appendix 12.2. PWS shaded grey are located within 250 m of excavations.

Table 12.4: Private Water Supplies

PWS Source ID	Properties supplied	Source Type	Approximate distance to nearest source to excavations (m)	Use
1	Killocraw Farm (1A) Tighavullin Farm (1B)	Well	592 to Turbine 8	Domestic & livestock
2	Lagalgarve Farm (2A) Tangytavil (2B*)	Unknown but likely to be either a spring or shallow groundwater collector system. The source is believed to incorporate collector pipes but their presence and extent have not been verified.	244 from source collection point to borrow pit working area	Domestic, livestock & commercial
3	Am Fasgadh (3A)	Spring	1134 to Borrow Pit C working area	Domestic
4	Tighnamoile (4A) Tangymoil Farm (4B)	Spring	792 to Borrow Pit C working area	Domestic & livestock
5	Killarow Cottage (5A) Tangy Glen Cottages (5 properties) (5B) Maleen (5C)	Spring	779 to Turbine 1	Domestic
6	Killarow Farm (6A) Tigh-Na-Mara (6B)	Spring	779 to Turbine 1	Domestic & livestock
7	Tangy Mill (7A)	Spring	576 to Turbine 1	Commercial
8	High Balevain Farmhouse (8A)	Spring	1642 to Turbine 1	Domestic & dairy cattle
9	Breakachy Farmhouse (9A)	Borehole	1365 to Turbine 1	Domestic
10	Drumalea Farm (10A) Drumalea Farm Cottage (10B)	Dammed stream	634 to Borrow Pit B working area	Domestic & livestock (CAR/R/1014147)
11	Breakachy Cottages (3 properties) (11A) High Balevain Farm (8A)	Spring(s)	610 to Borrow Pit B working area	Domestic & livestock
12	Tangy Wind Farm (12A)	Groundwater Collector	255 to Turbine 2*	Commercial
13	Tangy Farm (13A) Dalnaspidal (13B) TangyLea (13C)	Spring	254 to Turbine 4*	Domestic, commercial & livestock
14	Gobagrennan (14A)	Spring	1603 to Turbine 11	Domestic & livestock

*The turbine location will be microsited to ensure that the turbine foundation is not located within 250 m of the private water supply.

12.4.2 Table 12.4 confirms that 13 of the 14 PWS sources identified within 1 km of the site are out with the 250 m groundwater protection buffer for excavations greater than 1m (as per SEPA's Guidance LUPS-GU31. PWS source locations for PWS5, PWS9 and PWS11 were located as part of the baseline characterisation and are either spring or borehole supply and are located at distances greater than 500 m from proposed development infrastructure (see Figure 12.1). Additionally, PWS9 and PWS11 are separated from proposed development excavations by a watercourse. PWS5 is not located down-gradient from the nearest infrastructure; the nearest up-gradient infrastructure being located at a distance of approximately 900 m. Considering these distances and intervening hydrological environment, the impacts on these private water supplies are not considered further.

12.4.3 PWS2 is located within 250 m of proposed development infrastructure (see Figure 12.1) requiring excavations greater than 1 m (as per SEPA's Guidance LUPS-GU31) and is subject to further assessment in section 12.5.

12.4.4 Private water supplies for potable use, where no alternative supply is available are considered to be high sensitivity receptors.

12.5 Effects Evaluation

Potential Effect

12.5.1 This evaluation of effects specifically investigates the potential for likely significant effects on PWS2 from Borrow Pit C, the working area for which is located within 250m of the PWS.

According to the information gathered during the field survey through interview with the resident who uses PWS2, the mapped PWS2 source location is understood to comprise a collection tank for groundwater outflow from a system of collector pipes buried below ground. The tank has been located as part of the PWS survey and is approximately 244 m from the proposed borrow pit working area. However, the location (and presence) of an underground pipe network has not been verified due to the dense forestry surrounding the tank. The zone of contribution for PWS2 therefore has the potential to be located less than 250 m from Borrow Pit C and potentially within the same surface water catchment. It was not possible to definitively confirm the extent of the zone of contribution/pipe network without felling the forest, and then completing intrusive investigations which would carry the risk of inadvertently damaging any pipes.

12.5.2 A Conceptual Site Model (CSM) has been prepared to investigate the potential interaction between PWS2 and Borrow Pit C, which is provided in Appendix 12.3. The model considered a number of different scenarios for which the zone of contribution from Borrow Pit C ranged from 0% to 8% of the total area of contribution to PWS2. It concluded that, depending on the hydrogeological connection between PWS2 and Borrow Pit C, there is the potential for either 'no effect' or 'adverse effects' on quality and quantity of supply to this receptor.

12.5.3 Following a precautionary approach, it is therefore concluded that there is the potential for effects of high magnitude as follows:

- Adverse construction effects on both quality and quantity of private water supply during the use of the borrow pit related to the creation of preferential pathways for groundwater away from the water supply zone of contribution; or introduction of contaminants into the groundwater supply; and
- Adverse operational phase effects relating to quantity of private water supply should the direction of groundwater flow be altered.

12.5.4 As this receptor is considered to be of high sensitivity the effect has the potential to be significant.

12.6 Mitigation Measures

12.6.1 The following measures would be put in place to maintain quality and quantity of a potable supply for the users of PWS2. These are in addition to the good practice water quality protection measures included within the CEMP:

- The applicant intends to identify a long-term sustainable solution for the PWS2 water supply and will seek to establish the PWS users' current needs regarding water use and quantities, post-consent. The applicant will seek the PWS users' input and support for any protection or mitigation measures relating to the PWS' infrastructure and will strive to maintain, if not improve, the current PWS water quality and quantity. The applicant accepts that the protection of the PWS to the satisfaction of SEPA and the PWS users will be required as part of the consent/pre-commencement Planning Condition.

12.6.2 As part of good practice within the CEMP and in line with LUPS-31 on-going monitoring of the PWS2 groundwater supply will be undertaken to demonstrate whether the quality of groundwater and/or hydrological connectivity is being maintained taking cognizance of SEPA Technical Guidance Note 1: The Monitoring of Infrastructure with Excavations Less than 1m Deep within 100m of Sensitive Receptors (Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystem). Monitoring will take place before, during and after construction; with timescales to be agreed with SEPA. If required and as agreed with the PWS user, temporary water supply will be made available for use from the outset and throughout the construction period, should PWS2 be temporarily adversely affected.

12.7 Residual Effect

12.7.1 Following the application of the mitigation measures above, no likely significant effects are anticipated.

12.8 Monitoring

12.8.1 The minimum water quality monitoring programme requirements are outlined in the CEMP (v1.0 July 2018) and described in Section 12.7.

12.9 References

Argyll and Bute Council (2015), *Argyll and Bute Local Development Plan March 2015*. Lochgilphead: Argyll and Bute Council

Scottish Government (2017), *Water Environment (Miscellaneous) (Scotland) Regulations 2017*. Edinburgh: Scottish Government

SEPA (2018), *The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR): A Practical Guide, February 2018*. Stirling: SEPA

SEPA (2017), *Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems.* Stirling: SEPA

Forestry Commission (2017), *The UK Forestry Standard (2017*). Edinburgh: Forestry Commission

SEPA (2010), *Engineering in the water environment: good practice guide for River crossings*. Stirling: SEPA

SEPA (2015), *Culverting of Watercourses – Position Statement and Supporting Guidance*. Stirling: SEPA

SEPA, Natural Resources Wales (NRW), the Northern Ireland Environment Agency (NIEA) (2018), *SEPA Guidance for Pollution Prevention 5: Works and maintenance in or near water*. Stirling: SEPA, NRW, NIEA

13. CULTURAL HERITAGE

Executive Summary

This chapter provides the results of the assessment of cultural heritage and archaeological features (referred to as ‘assets’) potentially affected by the proposed development.

The assessment has been prepared by AOC Archaeology Group with reference to the standards of professional conduct outlined in the Chartered Institute for Archaeologists' (CIfA) Code of Conduct, the CIfA Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology, the CIfA Standards and Guidance for Historic Environment Desk Based Assessments. The scope of the assessment meets the requirements of current planning policy and advice as set out in Scottish Planning Policy (SPP), Historic Environment Scotland Policy Statement (HESPS) and Planning Advice Note (PAN) 2/2011 ‘Planning and Archaeology’.

A desk-based study was completed to identify cultural heritage assets within the site. A walkover survey was completed in 2014, with an update survey undertaken in February 2018. The desk-based study and surveys identified 46 cultural heritage assets within the site.

All designated assets and sites of potential national importance, as identified in the Historic Environment Record, within the defined study areas and from which one or more turbines of the proposed development would be visible, were assessed for potential operational (settings) effects. Potential operational effects on the settings of 98 heritage assets have been considered in detail as part of this assessment. **Two moderate and significant operational effects** have been identified.

The proposed development layout and infrastructure have been finalised such as to avoid any direct effects upon known heritage assets within the site and consequently no significant direct effects have been identified on known cultural heritage assets during the construction of the proposed development. In some areas the proposed felling of forestry would occur in close proximity to known heritage assets. Within these areas the known heritage assets will be surveyed and fenced off under archaeological supervision prior to the commencement of forestry operations. To mitigate the potential for previously unrecorded assets to be impacted during the construction phase, an archaeological watching brief will be maintained on a representative proportion of ground-breaking works across the site. Any remains encountered will either be preserved in situ or will be recorded and removed as appropriate.

Following the implementation of the proposed mitigation measures detailed in this chapter, there would be **no significant direct or cumulative residual direct effects**. There would be a **moderate and significant residual operational effect** on the setting of two assets. In each case the effect, although significant, would not be at a level that would threaten the protection of the asset.

13.1 Introduction

13.1.1 This chapter considers the potential effects on cultural heritage and archaeology associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the cultural heritage baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects, on cultural heritage;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the significance of residual effects remaining following the implementation of mitigation.

13.1.2 The assessment has been carried out by AOC Archaeology Group and in accordance with the standards of professional conduct outlined in the Chartered Institute for Archaeologists' (CIfA) Code of Conduct, the CIfA Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology, the CIfA Standards and Guidance for Historic Environment Desk Based Assessments, Field Evaluations and other relevant guidance.

13.1.3 This chapter is supported by:

- Appendix 13.1: Site Gazetteer;
- Appendix 13.2: Establishing the setting of an asset; and
- Appendix 13.3: Detailed assessment of Operational (settings) Effects.

13.1.4 Figures 13.1 – 13.3 and 13.3.1-.1 -13.3.34 are referenced in the text where relevant.

13.1.5 Figures 13.3.5.1-13.3.15.3 are referenced in Appendix 13.3 where relevant.

13.2 Scope of Assessment

13.2.1 This EIA Report has been prepared using baseline information and survey data collected for the Tangy III Environmental Statement (ES) (2014) which has been reviewed and reused where appropriate and, where necessary, additional surveys have been undertaken. This chapter provides an assessment of potential effects on cultural heritage and archaeological assets, including archaeological sites and monuments, historic buildings and historic landscapes that may be affected by the proposed development. Where relevant, mitigation measures are proposed to address likely significant effects. Residual effects remaining, following the implementation of mitigation, are identified and assessed.

Study Area

13.2.2 Two study areas were identified for this assessment:

- A 5 km study area for the assessment of potential effects on the setting of all designated heritage assets, including Scheduled Monuments; Listed Buildings; Inventoried Gardens and Designed Landscapes; Inventoried Battlefields and Conservation Areas as well Non-Statutory C (Almost Certainly of National Importance) and V (Probably of National Importance) assets as identified by the West of Scotland Archaeology Service (WoSAS) Historic Environment Record (HER). This study area is covered by the Zone of Theoretic Visibility (ZTV) and was also used to assess potential for unknown buried remains; and
- A 10 km study area for the assessment of potential effects on setting of nationally significant heritage assets which have potential inter-visibility with the proposed development including; Scheduled Monuments; Category A Listed Buildings; Inventoried Gardens and Designed Landscapes; Inventoried Battlefields and Conservation Areas as well as non-designated assets

of potential national importance 'C and V assets' as identified on the Non-Statutory List by the WoSAS HER. This study area is covered by the Zone of Theoretic Visibility (ZTV).

Scoping and Consultation

13.2.3 Scoping and consultation responses were sought from consultees and organisations. These are outlined in EIA Report Chapter 7: Scoping and Consultation. A summary of those pertaining to Cultural Heritage and Archaeology are summarised in Table 13.1.

13.2.4 Full details on the consultation responses can be reviewed in Appendix 2.1: Consultation Register.

Table 13.1: Consultation Responses

Consultee and Date	**Summary of Response**	**Comment/Action Taken**
Historic Environment Scotland (HES) 26th May 2017	Scoping Response As the footprint of the extant turbines will be retained and reused there are unlikely to be any direct impacts. Given the increased height of the proposed turbines, recommend in the first instance that in order to assess any likely indirect impacts a ZTV be used. Individual assessment of setting is also advised. Particular attention is advised with regard the setting of Kilocraw Cairn, 450m ESE of (SM3664- **Site 21**) and Tangy Loch, fortified dwelling (SM3180-**Site 27**). HES's predecessor body Historic Scotland did not agree with the conclusions of the setting impacts in the ES in 2014, however it is noted they did not object. Historic Environment Scotland's Managing Change in the Historic Environment: Setting (2016) makes some key changes to the guidance on the setting of nationally significant designated assets including; "Whether or not the site is visited do not change its inherent setting", and "sites need not be visually prominent to have a setting". HES further advised that potential cumulative impacts are scoped in to the report and that incremental impacts are assessed.	Direct effects on known heritage assets scoped out of assessment ZTV provided by the Developer (February 2018) and used as basis for selecting assets for assessment (see Figures 13.2 and 13.3). Detailed reassessment of these assets undertaken. Visualisation Figures are included and referenced in the text where appropriate (Figure 13.3.1. and 13.3.2.2). Settings assessment carried out in consideration of Historic Environment Scotland *Managing Change in the Historic Environment: Setting* (2016). Detailed assessment of setting of each asset undertaken (Sections 13.6.5-13.6.21 and Appendix 13.3). Cumulative effects assessed on an asset by asset basis.
WoSAS 28th January 2018	Agreed that the main consideration would be the extent to which the effects of the proposed development on the setting of the assets in the surrounding area may be changed by installing taller turbines. Requested that ES look in detail at changes to the ZTV as more turbines would potentially be visible from each asset and also across a wider area.	EIA Report Chapter 13 section 13.6.5-13.6.21 and Appendix 13.3 considers potential changes to setting of the assets which would result from taller turbines. Detailed analysis of updated ZTV undertaken with reference to heritage assets EIA Report Chapter 13 section 13.6.5-13.6.21 and Appendix 13.3 and Figures 13.2 and 13.3.

Effects to be Assessed

13.2.5 Assessment of effects on cultural heritage assets was undertaken, taking cognisance of the following guidance:

- Scottish Planning Policy (Scottish Government, 2014);
- Historic Environment Scotland Policy Statement (HESPS) (HES 2016a);
- Planning Advice Notes (PAN) for Scotland in particular PAN 2/2011 'Archaeology and Planning' (Scottish Government 2011); and
- Managing Change in the Historic Environment: Setting (HES, 2016b).

13.2.6 This assessment considers the potential effects on hitherto unknown archaeological remains during the construction phase of the proposed development and effects on the setting of heritage assets (e.g. changes as a result of visual intrusion) arising from the operational phase of the proposed development.

Effects Scoped Out of Assessment

13.2.7 Table 13.2 provides a summary of issues scoped out of the assessment:

Table 13.2: Issues scoped out of the EIA

Potential Effect	Basis for scoping out
Direct effects on known heritage assets within the site	Consideration of known heritage constraints early in the design process has allowed for the avoidance of direct effects on known assets through design in all cases.
Effects on the settings of designated heritage assets outside the ZTV	Assessment of the potential for indirect effects upon the settings of designated heritage assets was only undertaken in those cases where the assets fell within the proposed development's finalised ZTV. The majority of designated assets where no visibility is predicted have been scoped out. However, consideration was given to those assets that fall out with the ZTV but where key views towards them might be impacted by the proposed development. A total of 100 heritage assets within the identified study areas were found to be out with the ZTV and thus excluded from further assessment.
Effects on the settings of Inventory Battlefields, Inventory Gardens and Designed Landscapes and World Heritage	There are no Inventory Battlefields, Inventory Gardens and Designed Landscapes or World Heritage Sites located within 10 km of the proposed development.
Effects arising from decommissioning	Effects arising from the process of decommissioning have been scoped out since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. However, the results of decommissioning (i.e. the removal of the wind farm) are taken into account in assessing ongoing and operational effects, where appropriate.
Effects on the settings of non-designated heritage assets	Assessment of the potential for indirect effects upon the settings of non-designated heritage assets was only undertaken where these assets both fell within the ZTV and their assessment was specifically requested by the local planning authority or other consultees at scoping.

13.3 Methodology

Overview

13.3.1 This assessment is based on publicly available data sources and an Historic Environment Record (HER) extract provided by the West of Scotland Archaeology Service (WoSAS) (received in January

2018). All designated heritage assets located within 5 km of the proposed development were identified and all nationally important assets were identified between 5 km and 10 km. A ZTV (Figures 13.2 and 13.3) has been used to identify the heritage assets which would have views of the proposed development.

13.3.2 AOC Archaeology Group is a Registered Archaeological Organisation of the CIfA. This status ensures that there is regular monitoring and approval by external peers of our internal systems, standards and skills development.

Method of Baseline Characterisation

Desk Surveys

13.3.3 For the purposes of this assessment, information was gathered from the following sources:

- National Map Library of Scotland: For old Ordnance Survey maps (1st & 2nd Edition, small- and large- scale) and pre-Ordnance Survey maps;
- Historic Environment Scotland: For National Record Historic Environment (NRHE) data, World Heritage Site data, Scheduled Monument data, Listed Buildings data, Inventory Garden and Designed Landscape data, and Inventory Battlefield data;
- West of Scotland Archaeology Service (WoSAS) Historic Environment Record (HER); and
- Tangy III Environmental Statement (2014).

13.3.4 Each heritage asset referred to in the text is listed in the Appendix 13.1: Site Gazetteer and shown on Figures 13.1-13.3. Each heritage asset has been assigned a 'Site No.' unique to this assessment, and the gazetteer includes information regarding the type, period, grid reference, NRHE number, HER number, statutory protective designation, and other descriptive information, as derived from the consulted sources.

Field Survey Techniques

13.3.5 Informed by the results of the 2014 assessment, a visit was made to the site to confirm ground conditions had not changed in the intervening period.

13.3.6 Informed by the results of the desk study, an assessment of effects on setting was carried out via site visits to designated heritage assets within the ZTV. Visits were made to heritage assets considered within the settings assessment in February 2018 to establish the current setting of the assets, establish elements of setting that contribute to their cultural value and to assess their sensitivity to change. A photographic record was made.

Effects Evaluation Methodology

Receptor Sensitivity

13.3.7 HESPS (HES 2016a) notes that to have cultural significance, an asset must have a particular ‘artistic; archaeological; architectural; historic; traditional (factors listed in the 1979 Act[1]); aesthetic; scientific; [and/or] social [significance] – for past, present or future generations’. Heritage assets also have value in the sense that they ‘...create a sense of place, identity and physical and social wellbeing, and benefit the economy, civic participation, tourism and lifelong learning’ (Scottish Government 2014b). For clarity and to avoid confusion with the EIA term ‘significant’, the term ‘cultural value’ will be used throughout this assessment though, as outlined above, it is acknowledged that this is the same as ‘cultural significance’ as defined in HESPS.

13.3.8 All heritage assets have some value; however, some assets are judged to be more important than others. The level of that importance is, from a cultural resource management perspective, determined by establishing the asset’s capacity to inform present or future generations about the

[1] Ancient Monuments and Archaeological Areas Act 1979

past. In the case of many heritage assets their importance has already been established through the designation (i.e. scheduling, listing and inventory) processes applied by HES.

13.3.9 The criteria used to establish importance in this assessment are presented in Table 13.3 and are drawn from Appendices 1-6 of HESPS which outline the criteria for establishing National Importance.

Table 13.3: Criteria for Establishing Cultural Heritage Importance

Importance	**Criteria**
International	World Heritage Sites.
National	Scheduled Monuments (as protected by the Ancient Monuments and Archaeological Areas Act 1979 ("the 1979 Act"). Category A Listed Buildings (as protected by the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 ("the 1997 Act")). Inventory Gardens and Designed Landscapes (as protected by the 1979 Act, as amended by the Historic Environment (Amendment) (Scotland) Act 2011 ("the 2011 Act"). Inventory Battlefields (as protected by the 1979 Act, as amended by the 2011 Act). Non-Designated Assets considered to be of National Importance including, fine, little-altered examples of some particular period, style or type (as protected by SPP, 2014).
Regional	Category B Listed Buildings (as protected by the 1997 Act). Conservation Areas (as protected by the 1997 Act). Major examples of some period, style or type, which may have been altered (as protected by SPP, 2014). Non-Designated assets of a type which would normally be considered of national importance that have been partially damaged (such that their ability to inform has been reduced) (as protected by Paragraph 137 of SPP, 2014).
Local	Category C Listed Buildings (as protected by the 1997 Act). Lesser examples of any period, style or type, as originally constructed or altered, and simple, traditional sites, which group well with other significant remains, or are part of a planned group such as an estate or an industrial complex (as protected by SPP, 2014). Cropmarks of indeterminate origin (as protected by SPP, 2014). Non-Designated assets of a type which would normally be considered of regional importance that have been partially damaged or asset types which would normally be considered of national importance that have been largely damaged (such that their ability to inform has been reduced) (as protected by SPP, 2014).
Negligible	Relatively numerous types of remains. Find spots of artefacts that have no definite archaeological remains known in their context. Non-Designated assets of a type which would normally be considered of local importance that have been largely damaged (such that their ability to inform has been reduced). The above assets are protected by Paragraph 137 of SPP, 2014).

13.3.10 HESPS indicates that the relationship of an asset to its setting or the landscape makes up part of its contextual characteristics. SPP does not differentiate between the importance of the asset itself and the importance of the asset's setting. Indeed, under paragraph 143 on Scheduled Monuments it states that '*where there is potential for a proposed development to have an adverse effect on a scheduled monument or on the integrity of its setting, permission should only be granted where there are exceptional circumstances*'. However, it is widely recognised (e.g. Historic England 2017) that the importance of an asset is not the same as its sensitivity to changes to its setting. Elements of setting may make a positive, neutral or negative contribution to the value of an asset. Thus, in determining the nature and significance of impacts upon assets and their settings by the proposed development, the contribution that setting makes to an asset's value and importance, and thus its sensitivity to changes to setting, need to be considered.

13.3.11 This approach recognises the importance of preserving the integrity of the setting in the context of the contribution that setting makes to the experience, understanding and appreciation of a given asset. It recognises that setting is a key characteristic in understanding and appreciation of some, but by no means all, assets. Indeed, a nationally important asset does not necessarily have high sensitivity to changes to its setting.

13.3.12 The criteria for establishing an asset's relative sensitivity is detailed in Table 13.4. This table has been developed based on AOC's professional judgement and experience in assessing setting impacts. It has been developed with reference to the policy and guidance noted above including SPP, HESPS, the Xi'an Declaration and Historic Environment Scotland's guidance on the setting of heritage assets.

Table 13.4: Criteria for Establishing Sensitivity of a Heritage Asset to Changes to its Setting

Relative Sensitivity	**Criteria**
High	An asset whose setting contributes substantially to an observer's understanding, appreciation and experience of it should be thought of as having High Sensitivity to changes to its setting. This is particularly relevant for assets whose setting, or elements thereof, contribute directly to their significance (e.g. form part of their Key or Contextual Characteristics (HES 2016a, Annex 1). For example, an asset which retains an overtly intended relationship with its setting and the surrounding landscape. These may be, but not limited to, assets such as ritual monuments which have constructed sightlines to and/or from them or structures intended to be visually dominant within a wide landscape area e.g. castles, tower houses, prominent forts etc. Setting is the way in which the surroundings of a historic asset or place contribute to how it is experienced, understood and appreciated. Therefore, an asset, which relies heavily on its modern surroundings for its understanding, appreciation and experience, is of high sensitivity. In particular, an asset whose setting is an important factor in its protection and in retention of its cultural value (as per SPP definition of setting) should be thought of as having a High Sensitivity to changes to its setting.
Medium	An asset whose setting contributes moderately to an observer's understanding, appreciation and experience of it should be thought of as having Medium Sensitivity to changes to its setting. This could be an asset for which setting makes a contribution to value, but whereby its value is derived mainly from its other qualities (ibid). This could for example include assets which had an overtly intended relationship with their setting and the surrounding landscape but where that relationship (and therefore the ability of the assets' surroundings to contribute to an understanding, appreciation and experience of them) has been moderately compromised either by previous modern intrusion in their setting or the landscape or where the asset itself is in such a state of disrepair that the relationship cannot be fully understood. An asset, the current understanding, appreciation and experience of which, relies partially on its modern setting regardless of whether or not this was intended by the original constructors or users of the asset. An asset whose setting is a contributing factor in its protection and the retention of its cultural value.
Low	An asset whose setting makes some contribution to an observer's understanding, appreciation and experience of it should generally be thought of as having Low Sensitivity to changes to its setting. This may be an asset whose value is mainly derived from its other characteristics and whereby changes to its setting will not materially diminish our understanding, appreciation and experience of it. This could for example include assets which had an overtly intended relationship with their setting and the surrounding landscape but where that relationship (and therefore the ability of the assets' surroundings to contribute to an understanding, appreciation and experience of them) has been significantly compromised either by previous modern intrusion to its setting or the landscape or where the asset itself is in such a state of disrepair that the relationship cannot be determined.

Table 13.4: Criteria for Establishing Sensitivity of a Heritage Asset to Changes to its Setting

Relative Sensitivity	Criteria
Marginal	An asset whose setting makes minimal contribution to an observer's understanding, appreciation and experience of it should generally be thought of as having Marginal Sensitivity to changes to its setting. This may include assets for which the original relationship with their surrounding has been lost, possibly having been compromised by previous modern intrusion, but who still retain cultural value in their intrinsic and possibly wider contextual characteristics.

13.3.13 The determination of an asset's sensitivity to changes to its setting is first and foremost reliant upon the identification of its setting, including those elements that appreciably contribute to an understanding, appreciation and experience of it. The criteria set out in Table 13.4 are intended as a guide. Assessment of individual assets is informed by knowledge of the asset itself; of the asset type if applicable, and by site visits to establish the current setting of the assets. This allows for the use of professional judgement and each asset is assessed on an individual basis. It should be noted that individual assets may fall into a number of the sensitivity categories presented above, e.g. a country house may have a high sensitivity to alterations within its own landscaped park or garden, but its level of sensitivity to changes may be less when considered within the wider landscape context.

13.3.14 In establishing the sensitivity of an asset to changes to its setting, the setting must first be identified. Appendix 13.2 outlines the range of factors considered when establishing the setting of an asset. These have been used as a guide in assessing each asset from known records and in the field.

Impact Magnitude

13.3.15 The magnitude of indirect effect is an assessment of the magnitude of change to the setting of any given asset, in particular, those elements of the setting that inform its cultural value. Table 13.5 outlines the main factors requiring consideration when assessing magnitude of indirect (setting) impact.

Table 13.5 Factors Affecting Magnitude of Change in Setting	
Site Details	**Importance of detail for assessing magnitude of change**
1) Proximity to the proposed development (distance to nearest turbine)	Increasing distance of an asset from the proposed development will, in most cases, diminish the effects on its setting.
2) Visibility of development (based on ZTV model, site visits, photomontages and wireframes where appropriate)	The number of turbines that will be intervisible with the asset and the height to which each turbine will be visible will directly affect the magnitude of impact on its setting. The proportion of the view from each asset which will feature turbines will also affect the magnitude of impact. The existence of features (e.g. tree belts, forestry, landscaping or built features) that could partially or wholly obscure the proposed development from view will also affect the magnitude of impact.
3) Complexity of landscape	The more visually complex a landscape is, the less prominent the proposed development may appear within it. This is because where a landscape is visually complex the eye can be distracted by other features and will not focus exclusively on the new development. Visual complexity describes the presence, extent, character and scale of the existing built environment (HES 2016b) and the extent to which there are various land types, land uses, and built features producing variety in the landscape and how the proposed development compares to and fits in with this.
4) Design of the Development	This refers to the scale of the proposed change relative to the scale of the historic asset or place and its setting (HES 2016b). Depending on the individual asset, the design of the proposed development could affect the perception of dominance or foci of a particular asset and its relationship with other cultural and natural features within the landscape (SNH 2009). For example, whether the turbines would be seen against the skyline or against a backdrop of hills may affect the perception of the prominence of an asset and/or the proposed development.

13.3.16 It is acknowledged that Table 13.5 primarily deals with visual factors affecting setting. While the importance of visual elements of settings, e.g. views, intervisibility, prominence etc., are clear, it is also acknowledged that there are other, non-visual factors which could potentially result in setting impacts. Such factors could be other sensory factors, e.g. noise or smell, or could be associative (HES 2016b). Where applicable, these are considered whilst concluding the magnitude of impact.

13.3.17 The prediction of magnitude of impact upon setting will be based upon the criteria set out in Table 13.6. In applying these criteria, particular consideration is given to the relationship of the proposed development to those elements of setting which have been defined as most important in contributing to the ability to understand, appreciate and experience the heritage assets and their value. HES's guidance on setting indicates that adverse impacts upon the setting of a heritage asset will result from changes to that setting which would affect the ability to understand, experience and appreciate an asset. It notes several ways in which developments might impact upon the setting of heritage assets. Using AOC's professional judgement and experience, Table 13.6 sets out a guide to establish the extent to which changes can compromise setting such that the ability to understand, appreciate and experience the asset in question and its cultural value is reduced.

Table 13.6 Criteria for Establishing Magnitude of Setting Impact	
Relative Sensitivity	**Criteria**
High	Direct and substantial visual impact on a key sightline to or from a ritual monument or prominent fort. Direct and substantial visual impact on a key ‘designed-in’ view or vista from a Designed Landscape or Listed Building.

Table 13.6 Criteria for Establishing Magnitude of Setting Impact	
	Direct severance of the relationship between an asset and its setting. An impact that changes the setting of an asset, such that it threatens the protection (SPP 2014) of the asset and the understanding of its cultural value.
Medium	Oblique visual impact on an axis adjacent to a key sightline to or from a ritual monument or prominent fort but where the key sightline of the monument is not obscured. Oblique visual impact on a key 'designed-in' view or vista from a Designed Landscape or Listed Building. Partial severance of the relationship between an asset and its setting. Notable alteration to the setting of an asset beyond those elements of the setting which directly contribute to the understanding of the cultural value of the asset. An impact that changes the setting of an asset such that the understanding of the asset and its cultural value is marginally diminished.
Low	Peripheral visual impact on a key sightline to or from a ritual monument, prominent fort, designed landscape or building. Slight alteration to the setting of an asset beyond those elements of the setting which directly contribute to the understanding of the cultural value of the asset. An impact that changes the setting of an asset, but where those changes do not materially affect an observer's ability to understand, appreciate and experience the asset.
Marginal	All other setting impacts.
None	No setting impact anticipated.

Effects Significance

13.3.18 The predicted level of indirect effect on the setting of cultural heritage assets is judged to be the interaction of the asset's sensitivity to changes in its setting (Table 13.4) and the magnitude of the impact (Table 13.6) and also takes into consideration the importance of the asset (Table 13.3). A qualitative descriptive narrative is also provided for each asset to summarise and explain each of the professional value judgements that have been made.

13.3.19 The interactions determining level of effect on settings of the assets in question is shown in Table 13.7.

Table 13.7: Level of Indirect Effect based on Inter-Relationship between the Relative Sensitivity of the Heritage Asset and the Magnitude of Impact

		Relative Sensitivity			
		High	**Medium**	**Low**	**Marginal**
Impact Magnitude	**High**	Major	Moderate	Minor-Moderate	Minor
	Medium	Moderate	Minor-Moderate	Minor	Negligible
	Low	Minor-Moderate	Minor	Negligible	Neutral
	Marginal	Minor	Negligible	Neutral	None

The effects recorded in light grey highlighted cells are considered to be 'significant'

Assessing Cumulative Effects

13.3.20 Cumulative effects, in this context, are considered to be additional effects resulting from the placing of the proposed development alongside other operational, consented or proposed wind farms within the landscape. In terms of cultural heritage, it is necessary to consider whether the effects of cumulative developments in conjunction with the proposed development would result in an additional cumulative change upon the settings of heritage assets, beyond the levels predicted for the proposed development alone.

13.3.21 Operational cumulative effects are assessed using the same criteria as used in determining effects resulting from the proposed development and Tables 13.4, 13.5, 13.6 and 13.7 and have been guided by Scottish National Heritage's published guidance for 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (2012).

13.3.22 In determining the degree to which a cumulative effect may occur as a result of the addition of the proposed development into the cumulative baseline a number of factors are taken into consideration including:

- the distance between wind farms;
- the interrelationship between their Zones of Theoretical Visibility (ZTV);
- the overall character of the asset and its sensitivity to wind farms;
- the siting, scale and design of the wind farms themselves;
- the way in which the asset is experienced;
- the placing of the cumulative wind farm(s) in relation to both the individual proposal being assessed and the heritage asset under consideration; and
- the contribution of the cumulative baseline schemes to the significance of the effect, excluding the individual proposal being assessed, upon the setting of the heritage asset under consideration.

13.3.23 This assessment is based upon a list of operational or consented developments along with sites where permission has been applied for. Cumulative developments are listed in Chapter 8: Landscape and Visual Impact. While all have been considered, only those which contribute to, or have the possibility to contribute to, cumulative effects on specific heritage assets are discussed in detail. Additionally, given the emphasis SNH place on significant effects, cumulative effects have only been considered for those assets where the effects upon the setting from the proposed development, alone, have been judged to be an effect of Minor-Moderate level or greater. The setting of assets which would have an effect of less than Minor-Moderate significance are unlikely to reach the threshold of significance as defined in Table 13.7.

Limitations of Assessment

13.3.24 This assessment is based upon data obtained from publicly accessible archives as described in the Data Sources in Section 13.4.1 and site visits. Site visits were undertaken in February 2018. Historic Environment Record (HER) data was received on 5th February 2018 and National Record for the Historic Environment data was downloaded from HES in May 2018. This assessment does not include any records added after this date.

13.4 Baseline Conditions

Current Baseline

Context

13.4.1 The site is located within open pasture moorland and conifer plantation on a low plateau used currently and historically for sheep grazing. The site is a combination of forest agricultural land and wind farm, with areas of deep and shallow peat and areas of blanket bog. It is currently used for commercial forestry activities, grazing and renewable electricity generation. In the south-east of the site, an area of *'medieval/ post-medieval settlement remains'* is identified by Historic Landscape Assessment (HLA) mapping (HES) that pre-date the agricultural improvements of the 18th or 19th century survive in marginal areas, with ruinous buildings, curvilinear boundaries, and rig cultivation. An area of '*traditional 17th to 18th century peat cutting'* is located in the centre of the site, south of the commercial forestry plantation. The operational Tangy Wind Farm is characterised by the HLA (HES) as *'late 20th century to the present power station'*. The Scottish Palaeoecological Database (SPAD) does not record any palaeoecological assets within the site.

Designated Assets

13.4.2 There are no designated assets registered by HES (World Heritage Sites; Scheduled Monuments; Inventoried Battlefields; Inventoried Gardens and Designed Landscapes; and Conservation Areas) located within the site.

13.4.3 Within the site as shown on Figure 13.1 there are:

- Two heritage assets (Sites 13 & 120) deemed to be of '*almost certain National Importance'* (C) as recorded on the Non-Statutory Register held by WoSAS; and
- 18 assets of '*probable National Importance* (V) as recorded on the Non-Statutory Register held by WoSAS.

13.4.4 Within the 5 km study area, as shown on Figure 13.2, there are:

- 29 Scheduled Monuments;
- two Category B Listed Building;
- two Category C Listed Buildings; and
- 73 Non-Statutory Designated C and V assets as defined by WoSAS.

13.4.5 Designated assets within the defined 5 km and 10 km study areas that were judged to be potentially subject to changes in their settings and/or occurred within the ZTV were subject to further assessment and site visits. Heritage assets identified as falling within the blade tip ZTV and shown on Figures 13.2 and 13.3 include:

- 41 Scheduled Monuments;
- 53 assets from the HER Non-Statutory Register of assets of potential National Importance; and
- Three Listed Buildings (one which is Category A Listed).

Non-Designated Assets

13.4.6 There are 26 non-designated assets within the site. The assets range in date from the prehistoric to the modern period. Assets of probable prehistoric date include five cup marked stones (Sites 4, 6, 8 and 9), a burnt mound (Site 2) and a possible cist (Site 14). Fifteen of the non-designated assets (Sites 5, 11 and 131-143) are shielings of likely medieval to post-medieval date. A further five assets (Sites 1, 15-17 and 20) were recorded from historic mapping and relate to the sites of structures of likely post-medieval origin which are no longer extant.

Future Baseline

13.4.7 Future baselines (without the proposed development) would largely be expected to mirror the current baseline. Any alteration to the baseline condition of the heritage assets within the site would likely relate to very gradual deterioration of upstanding structures as a consequence of natural weathering and, in some cases, stock grazing. Heritage assets located within the afforested parts of the site would be at risk from potential further disturbance from forestry operations caused either by further tree and root growth or by the eventual disturbance that may be caused as a consequence of planned, rotational future clear felling. As a result, the current baseline is taken as the basis for the construction effects assessment presented here.

13.4.8 The setting of the site may be altered in the future through the construction and operation of the other proposed wind farm developments. The potential effects of these turbines will be discussed in detail under cumulative effects.

Summary of Baseline and Receptor Sensitivity

13.4.9 Table 13.8 provides a summary of the number of heritage assets within the respective study areas for direct and indirect effects.

Table 13.8: Summary of Heritage Assets		
Number of Assets	**Category**	**Total with Study Area**
2	Almost certain National Importance' (C) as recorded on the Non-Statutory Register held by WoSAS	46 assets within the site (See Figure 13.1)
18	Probable National Importance (V) as recorded on the Non-Statutory Register held by WoSAS.	
26	Non-designated assets	
29	Scheduled Monuments;	106 assets within the 5 km study area (see Figure 13.2)
2	Category B Listed Building;	
2	Category C Listed Buildings	
73	Non-Statutory Designated C and V assets as defined by WoSAS	
41	Scheduled Monuments.	97 assets within the 5 – 10 km study area (see Figure 13.3)
3	Listed Buildings (one of which is Category A Listed)	
53	Non-Statutory Designated C and V assets.	

13.4.10 The potential for likely significant indirect effects on the setting of three heritage assets has been identified and as such detailed assessment of these features is presented in Section 13.7 below. A summary of the receptors identified as being sensitive to the proposed development and potentially subject to significant effects and which have been 'scoped-in' to the assessment are given in Table 13.6. The effects on the remaining 94 heritage assets are considered unlikely to be significant and detailed assessment of these assets is provided in Appendix 13.3.

Table 13.9: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
Killocraw Cairn (Site 21)	High	The 2014 ES predicted a Moderate and significant effect on the setting of this asset. Detailed assessment of potential settings effects will thus be required.
Killocraw cup marked stone (Site 22)	Medium	The 2014 ES predicted a Moderate and significant effect on the setting of this asset. Detailed assessment of potential settings effects will thus be required.
Tangy Loch Fortified Dwelling (Site 27)	High	The 2014 ES predicted a Moderate and significant effect on the setting of this asset. Detailed assessment of potential settings effects will thus be required.

13.5 Effects Evaluation

Development Characteristics

- Potential direct effects on known or unknown buried archaeological remains, in the case of the proposed development, relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during ground breaking works (including excavation, construction and other works associated with the proposed development) on this site.
- During the operational phase there is a potential for adverse indirect effects upon the settings of a range of heritage assets within 10 km of the site.

13.6 Mitigation Measures

- The proposed development layout includes 'mitigation by design', whereby the layout design has taken into account environmental sensitivities and constraints including the presence of known cultural heritage assets.
- No Significant direct effects are predicted and consequently no mitigation is required. It is recognised that there is a potential for inadvertent damage to both known and unknown archaeological remains; this is addressed in section 13.7.1: Additional Good Practice.
- No direct mitigation is possible for operational (setting) effects. Potential offset measures are considered in section 13.7.3.

Additional Good Practice

13.6.1 The forest clearance required for the construction the proposed development has the potential to impact upon the locations of several known heritage assets. The forest clearance required for the construction of Turbine 9 would occur in close proximity to Sites 10 and 46-60 a cluster of shielings along the Allt Nan Creamh Burn. In order to prevent inadvertent damage to these shielings during clearance operations, all visible remains will be photographed, surveyed and fenced off under archaeological supervision, in advance of forestry operations. The hut circle at Allt Naan Creamh (Site 3) and cup marked stone at Tangymoil (Site 13) will also be photographed, surveyed and fenced off under archaeological supervision in advance of forestry operations, to prevent any inadvertent damage. Forestry operations in the vicinity of these known assets will be undertaken in a controlled fashion, with relevant risk assessments, monitored by the Ecological Clerk of Works (ECoW) and an archaeologist to ensure that known assets are not damaged. Sites 3 and 13 are located within areas proposed for re-planting. The fencing of these assets should therefore be maintained throughout the felling and re-planting periods to ensure that they are not damaged though encroachment of vegetation.

13.6.2 Given the use of the north of the site for commercial forest plantation, the potential for undisturbed buried archaeological assets within the afforested areas is low. However, within the south of the site there has been limited previous ground disturbance. Although located within a remote upland area, which was likely never a focus of concentrated settlement, deposits of peat have the potential to mask archaeological deposits associated with known shielings and land management practices. There is therefore judged to be a medium potential for previously undiscovered archaeological remains in the south of the site. To mitigate the potential for previously unrecorded assets to be impacted during the construction phase, an archaeological watching brief will be maintained on a representative proportion of ground-breaking works associated with the construction of the proposed development. The areas to be monitored will include all areas of peat >1 m and proposed borrow pit locations, all of which are located in close proximity to known heritage assets (Sites 14, 15 and 16). The purpose of such works will be to identify any hitherto unknown archaeological remains threatened by the proposed development, to assess their value and to mitigate any impact upon them either through avoidance or, if preservation in situ is not feasible, through preservation by record. Depending upon the results of any watching brief works there is the potential that further works such as excavation and post-excavation analyses could be required. Details of mitigation will be agreed in consultation with WoSAS through a Written Scheme of Investigation.

Offsetting

13.6.3 As an impact upon setting is ultimately an impact upon the ability of the surroundings of the monument to contribute to an observer's understanding, appreciation and experience, good practice measures which would increase the understanding, appreciation and experience of the assets and the wider archaeology of the area, are therefore an appropriate way to partially offset such impacts. In the case of the proposed development, a further archaeological survey would partially contribute to offset potential impacts of the proposed development on the setting of heritage assets in its vicinity. This assessment has identified a concentration of archaeological features in the north of the site; they include a group of 15 shielings on the banks of the Allt Nan Creamh burn, hut circles and a cup marked stone. Little information is currently known about the condition and extent of these features and how they relate to other possible contemporary assets known both within the site and the wider landscape. The removal of forestry in the immediate vicinity of these assets would provide an opportunity for the undertaking of a survey designed to create a detailed record of each of the individual assets and may also further our understanding of the development of the wider historic landscape and the interrelationships between heritage assets within that landscape. Dissemination of the results of this survey would improve access to information on the assets identified and surveyed. This would serve to increase both the understanding of the historic landscape of the site and the wider area, thereby increasing knowledge and appreciation of the local heritage.

13.7 Residual Effects

Effects on Killocraw Cairn (Site 21)

Receptor Sensitivity

13.7.1 Killocraw cairn is a ritual prehistoric burial monument, which survives as a low grassy mound approximately 13.5 m in diameter and 1 m high. The cairn is set within an area of rough grazing, situated in an elevated position on a small knoll, which in turn is located on a broad ridge which runs north to south. There are open views inland and extensive views out to sea and along the Kintyre coast from the cairn. Views west from the cairn towards the coast are most extensive as shown on Figure 13.3.3.3 and the eye is draw in this direction. The ground rises to the east of the cairn and features commercial forest plantation which currently blocks views of the operational turbines at Tangy I and II Wind Farm (Figure 13.3.1-4).

13.7.2 The monument is a typical early prehistoric burial cairn and is legible as a monument deliberately sited to have visibility over a wide area and also to be visible across the landscape (although the cairn can now only be appreciated at relatively close quarters). The cairn is part of a group of monuments including another scheduled cairn (Site 43) 275m to the north-east, and a cup-marked boulder (Site 22) 450 m to the north-east. Views north-east from the cairn also feature an abandoned post-medieval stone built dwelling (Figure 13.3.1.3c). There are also numerous potentially nationally important cup-marked stones (Sites 62-73) in the vicinity, many of which are located within forestry plantation and survive as discrete features not visible from the cairn. Key attributes of the setting that contribute to its cultural value are related to the expansive views, its prominent elevated location and the relationship with other important prehistoric heritage assets locally. The cairn is of High sensitivity to changes in its setting.

Predicted Ongoing and Operational Impacts

13.7.3 As the appended wireframe (Figure 13.3.3.2-3) and photomontage (Figure 13.3.3.4) show, the proposed development would be visible south-east of the cairn, within an area currently occupied by commercial forestry plantation. All 16 of the proposed development turbines would be visible to hub height. The nearest turbine would be located 1.1 km to the south-east. At this distance the turbines would appear as prominent features. The proposed development turbines would also be visible in the backdrop in views to the cairn on approach to it from the north and west. The relationship between the cairn and other potentially contemporary monuments to the north-east would not be interrupted and the proposed development would appear offset from the sightline between these monuments.

13.7.4 The physical and topographic separation between the proposed development (which is at 1.1 km) would allow for the visual prominence of the cairn within its setting to be understood and it would remain possible to appreciate the key features of the landscape character that contribute to the understanding of its setting (including the broad ridgeline/ foothills and expansive coastal landscape and seascape to the north and west) along with the presence of the proposed development. The proposed development would therefore represent a notable alteration to the setting of the cairn beyond those elements of the setting which directly contribute to the understanding of its cultural value. The magnitude of effect would be Medium. The level of effect would be Moderate and significant.

13.7.5 Although significant, the effect would not be at a level that could threaten the protection of the asset. This is because a large proportion of the cairn’s value lies in its intrinsic characteristics and in the high research potential offered by its buried remains in particular, which would not be affected by the proposed development. Furthermore, the critical relationship between the cairn and coast and also contemporary monuments to the north-east would remain uninterrupted.

Predicted Cumulative Effects

13.7.6 As the appended photomontages (Figures 13.3.3.4) show, Killocraw cairn has existing visibility with operational cumulative developments at Gigha and Gigha extension located over 17 km to the north. The consented developments at Auchadaduie and Blary Hill would also be theoretically visible beyond commercial forestry north of the cairn, as would the application developments at Killean Estate and Clachain Glen. All of these turbines would be seen north of the cairn and not in the same view as the proposed development. The proposed development would thus increase the arc of view in which wind farm development would be visible from the cairn and would also, owing to its greater proximity, appear larger and more prominent in comparison to the more distant cumulative developments. The interrelationship between Killocraw cairn and other contemporary monuments within the landscape to the north-east would not be affected by the wider increase in surrounding wind farm development. The magnitude of cumulative impact would be low. The level of cumulative effect would be Minor-Moderate and **not significant**.

Effects on Killocraw Cup Marked Stone (Site 22)

Receptor Sensitivity

13.7.7 Killocraw cup marked stone (Site 22) is part of a wider group of 14 cup and ring marked stones, constituting the largest concentration of monuments of this type in Kintyre. Extensive studies of cup and ring marked stones in Scotland and Northern England (Bradley, 1997; Beckensall, 2005) have analysed the placement of such features in the landscape. Bradley has argued that given the similarity between the sitings of many cup and ring marked stones, the idea that their setting is irrelevant is statistically improbable. Rock Art, he argues, was set, most often, on ridges or at the entrance to valleys for a particular reason. However, as the function of cup-marked and cup and ring marked stones is unknown, it is difficult to define their original or authentic setting and it is near impossible to understand their intended relationship with the surrounding built and natural features. Bradley also argues that impressively ornate cup and ring marked stones tend to be placed on highly visual rock outcroppings, while simpler cup markings tend to be on less visible low boulders. Bradley notes that 50% of the time the stones, on which simple cup motifs are carved, are not visible from as close as 50 m. Current research, however has led to a contemporary appreciation of this type of monument which relies partially upon their current visual setting.

13.7.8 The large hog backed Killocraw cup-marked stone is a discrete monument located on a west facing slope in an area of rough open moorland, on the western edge of a coniferous forestry plantation which rises behind the stone to the east. The monument is afforded extensive views west over rough grazing and out along the Kintyre coast. Other prehistoric monuments, including the two Killocraw cairns (Sites 21 and 43), are visible from this asset as are two boulders (Sites 69 and 70) bearing shallow cup marks (although the cup marks themselves cannot be seen from this monument). The boulder is also sited in close association with a further 12 cup marked stones (Sites 62- 68) which are set within commercial forestry plantation and which cannot be seen from the boulder. The placement of these stones in close proximity to one another and with some intervisibility with other monuments across this area of landscape contributes to an understanding of them as ritual monuments (which is the currently favoured interpretation). Although the setting of the stone has been somewhat compromised by the placement of commercial forest plantation in the immediate vicinity and although it is not visible from any distance across the landscape, it is recognisable as a ritual monument placed in association with nearby contemporary monuments of the same type. The Killocraw cup-marked stone is judged to be of Medium sensitivity to changes in its setting.

Predicted Ongoing and Operational Impacts

13.7.9 The current setting of this asset is dominated by adjacent commercial forest plantation set on rising ground immediately to its east. The boundary of the forest plantation is aligned north to south due east of the monument and currently restricts views into the site. As the appended wireline (Figure 13.3.4.2) shows all 16 turbines of the proposed development are theoretically visible from this monument. All turbines would theoretically be visible to hub height and the nearest turbine would be located at a distance of 1.1 km and would thus appear as a prominent feature in views from the monument and on approach to it from the north and west. Actual visibility of the proposed development would be blocked in part by the intervening forest plantation which is located north of the site and would continue to dominate the setting of the stone with glimpses of turbines possible on approach to the stone from the west. Future felling of the plantation adjacent to the stone would result in visibility of all turbines.

13.7.10 The proposed development would be located out with the key elements of the setting of this monument which is defined by the pasture and forestry within which it is set, the elevated location overlooking the coast and intervisibility with nearby contemporary prehistoric ritual monuments. The proposed development would not feature in views between the stone and the 13 other cup-marked stones which form part of a cluster of ritual monuments in the local landscape. The proposed development would not affect the ability of an observer to understand and appreciate the monument in its current setting. Future removal of the forest, beyond the site boundary, which would allow for visibility of the proposed development, would result in increased visibility of the proposed development. However, removal of the forest adjacent to the stone would also potentially visually reconnect Killocraw cup-marked stone (Site 22) with other contemporary cup-marked stones (Sites 62-68) currently within the forestry and thus allow for a better understanding of this cluster of monuments within the local landscape. The magnitude of impact would be Medium. The level of effect would be Minor- Moderate and **not significant**.

Predicted Cumulative Effects

13.7.11 As the appended visualisations (Figures 13.3.4.3) show, Killocraw cup marked stone has existing theoretical visibility with operational cumulative developments at Gigha and Gigha extension located over 17 km to the north. The consented developments at Auchadaduie and the application development at Clachain Glen would also be theoretically visible to the north, although the intervening forests north-east of the monument would likely block any visibility of these cumulative developments. Where visible the cumulative developments would be visible north of the monument and not in the same view as the proposed development. The proposed development would increase the arc of view in which wind farm development would be visible from the stone and would also, owing to its greater proximity, appear much larger and more prominent in scale in comparison to the more distant developments. The interrelationship between the cup-marked stone and other contemporary cup marked stones within the local landscape and forests to the north-east would not be affected by the wider increase in surrounding wind farm development. The magnitude of cumulative impact would be Low. The level of cumulative effect would be Minor and **not significant**.

Effects on Tangy Loch Fortified Dwelling (Site 27)

Receptor Sensitivity

13.7.12 The remains of Tangy Loch Fortified Dwelling (Site 27) are presumed to be the subject of a charter grant by John, Bishop of the Isles to the Earl and Countess of Argyll in 1576 and it is indicated as a dwelling place on maps from the 17^{th} century when the Tangy estate was held by the MacEachan family. The island is constructed of small boulders with traces of an outer kerb. The island was formerly connected to the south-west shore of the loch a causeway paved with stones. The causeway is now submerged and not visible owing to the raising of the level of the loch by about 1.2m in the 18th century in order to facilitate the operation of Tangy Mill (Site 34). The island is thus accessible only by boat and as such the setting of the asset was assessed from the loch shore from where the island appears to be manmade but internal structures cannot be seen or understood.

13.7.13 The dwelling is located within Tangy Loch, which is set within a topographic bowl within the landscape, drained to the west by the Tangy Burn. Commercial forest plantation extends from the hills down to the south-west and south-east shores of the loch, restricting access to the shore from this direction. The defined topographic bowl in which the loch is set creates an enclosed setting for the monument and views out to the wider landscape are limited to glimpses west towards the coast along Tangy Burn when approaching the monument from the north-east. The immediate setting of the dwelling comprises the loch and loch shore with the wider setting extending to include afforested hill slopes to the north and south and views west along the Tangy Burn, including operational turbines at Tangy I and II Wind Farm, towards the coast. The setting of the monument within a waterbody contributes to the understanding of the asset as a defensive monument constructed in an isolated location with excellent surveillance opportunities. Therefore, the enclosed island setting of the monument contributes to an understanding of its cultural value and it is of High sensitivity to changes within its setting.

Predicted Ongoing and Operational Impacts

13.7.14 As shown on the appended photomontage (Figure 13.4.1), the removal of the Tangy I and II turbines and their replacement with those of the proposed development would increase the horizontal and vertical extent in which views of turbines would be seen. All turbines would be visible to hub height. The nearest turbine would be located 947 m from the monument and would thus appear as a prominent feature in views from the island itself and in views towards the island from the loch shore (see Figures 13.3.1.1-4 and Figures 13.3.2.1-3). The associated reduction and restocking of the forestry would also change setting of the monument.

13.7.15 An understanding of this monument as a fortified dwelling is gained from its position within the loch and also in part from its sheltered and enclosed situation within a topographic bowl in the landscape. The proposed development would represent a notable alteration to the setting of the monument beyond those elements which directly contribute to an understanding and appreciation of its cultural value, i.e. the loch itself, but would encroach upon the wider topographic landscape setting. The proposed development would not adversely affect the ability to understand the monument's relationship within its landscape setting and would not alter the key relationship between the monument and the loch within which it is set. The magnitude of impact would be Medium. The level of effect would be Moderate and **significant**.

13.7.16 Although significant, the effect would not be at a level that could threaten the protection of the asset. This is because a large proportion of the dwelling's value lies in its intrinsic characteristics and in the high research potential offered by its upstanding remains and submerged causeway which would not be affected by the proposed development. Furthermore, the critical relationship between the dwelling, island and loch would not be disrupted.

Predicted Cumulative Effects

13.7.17 The enclosed topographic bowl in which the monument is set restricts views out to the wider landscape and no cumulative developments would be visible from the monument and as such no cumulative effects are predicted.

13.8 Monitoring

13.8.1 There would be no direct effects on known archaeological remains. Any hitherto unknown remains would either be preserved in situ or recorded and removed in advance of construction of the proposed development. Monitoring during operation is therefore not considered necessary.

13.9 Summary

13.9.1 This assessment has considered the likely significant effects on archaeology and cultural heritage assets associated with the construction and operation of the proposed development.

13.9.2 This assessment has identified 46 cultural heritage assets within the site through desk-based assessment. The assets range in date from the prehistoric to the modern period.

13.9.3 A total of 78 Scheduled Monuments, 109 assets on the Non-Statutory Register and one Conservation Area are located within 10 km of the site. Eleven Listed Buildings are located within 5 km of the site. All designated assets and sites of potential national importance, as identified in the HER, within the defined study areas and from which one or more turbines of the proposed development would be visible were assessed for potential operational (settings) effects. Using this method, a total of 98 assets were selected for detailed settings assessment (see Figures 13.2 and 13.3) and site visits were undertaken in February 2018, to establish and assess the current settings of each asset and how the proposed development may affect them.

13.9.4 The proposed development layout and infrastructure have been finalised such as to avoid any direct effects upon known heritage assets within the site and consequently **no significant direct effects** have been identified on known cultural heritage assets during the construction of the proposed development. In some areas the proposed felling of forestry would occur in close proximity to known heritage assets. Within these areas the known heritage assets will be surveyed and fenced off under archaeological supervision prior to the commencement of forestry operations. Sites 3 and 13 are located within areas proposed for re-planting and as such fencing of these assets should be maintained following felling to ensure that the locations of these assets and a buffer around them are not re-planted.

13.9.5 To mitigate the potential for previously unrecorded assets to be impacted during the construction phase, an archaeological watching brief will be maintained on a representative proportion of ground-breaking works across the site. Any remains encountered will either be preserved in situ or will be recorded and removed as appropriate.

13.9.6 Following the completion of construction, no further groundworks would be undertaken and as a consequence no residual direct effects would occur as a result of the construction of the proposed development.

13.9.7 Potential operational effects on the settings of 98 heritage assets have been considered in detail as part of this assessment. Two Moderate and significant operational effects have been identified. In each case the effect, although significant, would not be at a level that would threaten the protection of the asset.

13.9.8 No significant cumulative effects are predicted and consequently there would be no significant residual cumulative effects.

13.9.9 Residual effects on cultural heritage are summarised in Table 13.7

Table 13.7: Summary of Residual Effects			
Likely Significant Effect	**Mitigation**	**Means of Implementation**	**Outcome/Residual Effect**
Construction			
N/A	N/A	N/A	N/A
Operational			
Moderate effect on setting of Killocraw cairn	N/A	N/A	Moderate
Moderate effect on setting of Tangy loch	N/A	N/A	Moderate
Decommissioning			
N/A	N/A	N/A	N/A

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14. NOISE

Executive Summary

Hoare Lea (HL) has been commissioned by the applicant to undertake a noise assessment for the construction and operation of the proposed Tangy IV Wind Farm ('the proposed development'). Noise will be emitted by equipment and vehicles used during decommissioning of the existing Tangy I and II Wind Farm, construction and eventual decommissioning of the proposed Tangy IV Wind Farm and by the turbines during operation. The level of noise emitted by the sources and the distance from those sources to the receiver locations are the main factors determining levels of noise at receptor locations.

Construction noise has been assessed by a desk-based study of a potential construction programme and by assuming the wind farm is constructed using standard and common methods. Noise levels have been calculated for receiver locations closest to the areas of work and compared with guideline and baseline values. Construction noise, by its very nature, tends to be temporary and highly variable and therefore much less likely to cause adverse effects. Various mitigation methods have been suggested to reduce the effects of construction noise, the most important of these being restricting the hours of working to be from 07:00 to 19:00 from Monday to Friday and from 07:00 to 13:00 on Saturdays. It is concluded that noise generated through construction activities, or related to construction stage traffic movements, will not have a significant effect.

Decommissioning (including both the decommissioning of the existing Tangy I and II Wind Farm and the eventual decommissioning of Tangy IV Wind Farm) is likely to result in less noise than during construction of the proposed development. The construction phase has been considered to have minor noise effects, therefore de-commissioning will, in the worst case, also have minor noise effects.

Operational turbines emit noise as the rotating blades pass through the air. This noise can sometimes be described as having a regular 'swish'. The amount of noise emitted varies depending on the wind speed. When there is little wind the turbine rotors will turn slowly and produce lower noise levels than during high winds when the turbine reaches its maximum power output and maximum rotational speed. Background noise levels at nearby properties will also change with wind speed, increasing with wind speed due to factors such as wind in trees and around buildings.

Noise levels from the operation of the turbines have been predicted for those locations closest to the site. Noise surveys have been undertaken to establish existing baseline background noise levels at a number of properties in the area. Noise limits have been derived from the data using the measured noise levels, following the method stipulated in national planning guidance. Predicted operational noise levels have been compared to the limit values to demonstrate that turbines of the type and size which would be installed can operate within the limits. It is concluded that operational noise levels from the wind farm will be within levels deemed, by national guidance, to be acceptable for wind energy schemes and therefore **not significant** under the terms of the EIA Regulations.

14.1 Introduction

14.1.1 This chapter considers the potential noise effects of the proposed development on the residents of nearby dwellings resulting from impacts associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the noise baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects, on noise-sensitive receptors;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the significance of residual effects remaining following the implementation of mitigation.

14.1.2 The assessment has been carried out by acoustics specialists of Hoare Lea in accordance with the Institute of Acoustics good practice guidelines (IOA, 2013).

14.1.3 This chapter is supported by:

- Appendix 14.1: Technical Report.

14.1.4 Figures provided in Appendix 14.1 are referenced in the text, where relevant.

14.2 Scope of Assessment

Study Area

14.2.1 Noise and vibration which arises from the construction of a wind farm is a factor taken into account when considering the total effect of the proposed development. However, in assessing the effects of construction noise, it is accepted that the associated works are of a temporary nature. The main work locations for construction of the turbines are distant from the nearest noise sensitive residences and are unlikely to cause significant effects. The construction and use of access tracks may, however, occur at lesser separation distances. Assessment of the temporary effects of construction noise is primarily aimed at understanding the need for dedicated management measures and, if so, the types of measures that are required.

14.2.2 Once constructed and operating, wind turbines may emit two types of noise. Firstly, aerodynamic noise is a ‘broad band’ noise, sometimes described as having a characteristic modulation, or ‘swish’, which is produced by the movement of the rotating blades through the air. Secondly, mechanical noise may emanate from components within the nacelle of a wind turbine. This is a less natural sounding noise which is generally characterised by its tonal content. Traditional sources of mechanical noise comprise gearboxes or generators. Due to the acknowledged lower acceptability of tonal noise in otherwise ‘natural’ noise settings such as rural areas, modern turbine designs have evolved to ensure that mechanical noise radiation from wind turbines is negligible. Aerodynamic noise is usually only perceived when the wind speeds are fairly low, although at very low wind speeds the blades do not rotate or rotate very slowly and so, at these wind speeds, negligible aerodynamic noise is generated. In higher winds, aerodynamic noise is generally masked wind-related sources of noise in the natural noise environment of noise-sensitive locations. The level of this natural ‘masking’ noise relative to the level of wind turbine noise determines the subjective audibility of the wind farm. The primary objective of this noise assessment is therefore to establish the relationship between wind turbine noise and the naturally occurring masking noise at residential dwellings lying around the proposed development and to assess these levels of noise against accepted standards.

14.2.3 The study area for the operational noise assessment extends out to the nearest residential properties to the proposed development site. Since the potential operational noise impacts of the proposed development will reduce with distance from the site, it is not necessary to consider properties beyond these nearest residential receptors. The assessment of construction noise has considered the same assessment properties as well as residential dwellings along the construction traffic route in relation to construction traffic noise.

14.2.4 Assessment of the operational noise effects accounts for the cumulative effect of the proposed development and the consented Beinn an Tuirc III site, approximately 4 km to the east of the proposed development. Other, more distant wind farms, including Beinn an Tuirc I (approximately 7.5 km from the proposed development) and Beinn an Tuirc II (approximately 6 km from the proposed development) were not considered. For the avoidance of doubt, the existing Tangy I and Tangy II turbines would be removed prior to the Tangy IV turbines becoming operational and therefore the operational effects of these turbines are not considered in this assessment.

Scoping and Consultation

14.2.5 Prior to undertaking the background surveys for the assessment of the consented Tangy III Wind Farm, a summary of the proposed monitoring locations was forwarded to the Environmental Health Department of Argyll and Bute Council for comment and were subsequently agreed to be representative for the purposes of an ETSU-R-97 assessment.

14.2.6 In particular, the use of proxy locations to represent baseline noise levels at various properties around the proposed development was discussed. At the time of this survey, the existing Tangy I and Tangy II turbines were operational and, as such, it was not possible to obtain measurements in the vicinity of the existing site without these measurements being influenced to some degree by noise from the existing turbines. Hence, proxy locations were discussed and agreed with Argyll and Bute Council Environmental Health Department that are far enough from the existing turbines not to be affected by noise from Tangy I and Tangy II, but can be considered representative of baseline noise levels in the vicinity of the proposed development.

14.2.7 Following submission of the Tangy III ES (2014), a representative of the Environmental Health Department of Argyll and Bute Council reviewed the noise assessment and agreed with the findings.

14.2.8 At scoping stage, it was proposed that the previous baseline survey undertaken in 2013 as part of the assessment of the Tangy III Wind Farm could still be used to assess the proposed development as it remained representative of the area. A representative of the Argyll and Bute Council Environmental Health Department confirmed that this would be acceptable (by email on 07 June 2018).

14.3 Methodology

Planning Policy and Advice Relating to Noise

14.3.1 A number of relevant planning documents and standards have been referenced in the assessment, and a full list of references is provided at the end of this chapter:

- Scottish Planning Policy 2014 (SPP).
- Planning Advice Note PAN1/2011: Planning and Noise.
- Technical Advice Note: Assessment of Noise (accompanying PAN1/2011).
- Web based planning advice on Onshore wind turbines.
- ETSU-R-97 The Assessment and Rating of Noise from Wind Farms.

- Institute of Acoustic's (IOA) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, 2013 (GPG).
- BS 5228:2009 Noise control on construction and open sites, BS 5228-1 noise and BS 5228-2 vibration, 2009 (amended 2014).
- Planning Advice Note PAN50: Controlling the Environmental Effects of Surface Mineral Workings, 1996.
- Calculation of Road Traffic Noise, HMSO Department of Transport, 1988.
- Design Manual for Roads and Bridges, Volume 11, section 3, Part 7, Traffic Noise and Vibration, The Highways Agency, Transport Scotland, 2011.

Construction Noise

14.3.2 For detailed guidance on construction noise and its control, the Technical Advice Note accompanying PAN1/2011 refers to British Standard BS 5228:2009 (amended 2014) as relevant when used within the planning process. Analysis of construction noise impacts has been undertaken in accordance with BS 5228 Code of practice for noise and vibration control on construction and open sites, 2009 which provides methods for predicting construction noise levels on the basis of reference data for the emissions of typical construction plant and activities. These methods include the calculation of construction traffic along access tracks and haul routes and construction activities at fixed locations including the bases of turbines, construction compound, substation or borrow pits. The construction noise assessment has been based on indicative data for the types of plant likely to be used during the construction works, as presented in BS 5228.

14.3.3 Based on the range of guidance values set out in BS 5228, other reference criteria and in recognition of the relatively low ambient noise typically observed in rural environments, impact significance criteria have been derived (see Table 1 of Appendix 14.1) and are reproduced below.

Table 14.1: Construction Noise Significance Criteria

Impact	Condition
Major	Construction noise is greater than 72 dB $L_{Aeq,T}$ for any part of the construction works or exceeds 65 dB $L_{Aeq,T}$ for more than 4 weeks in any 12 month period.
Moderate	Construction noise is less than or equal to 65 dB $L_{Aeq,T}$ throughout the construction period, with periods of up to 72 dB $L_{Aeq,T}$ lasting not more than 4 weeks in any 12 month period.
Minor	Construction noise is generally less than or equal to 60 dB $L_{Aeq,T}$, with periods of up to 65 dB $L_{Aeq,T}$ lasting not more than 4 weeks in any 12 month period.
Negligible	Construction noise is generally less than or equal to 55 dB $L_{Aeq,T}$, with periods of up to 60 dB $L_{Aeq,T}$ lasting not more than 4 weeks in any 12 month period.

14.3.4 When considering the impact of short-term changes in traffic, associated with the construction activities, on existing roads in the vicinity of the proposed development, reference can be made to the criteria set out in the Design Manual for Roads and Bridges (DMRB). A classification of magnitudes of changes in the predicted traffic noise level calculated using the by the Calculation of Road Traffic Noise (CRTN) methodology is set out for short-term changes, such as those associated with construction activities: changes of less than 1 dB(A) are considered negligible, 1 to 3 dB(A) is minor, 3 to 5 dB(A) moderate and changes of more than 5 dB(A) constitute a major impact. This classification can be considered in addition to the criteria of Table 14.1.

14.3.5 Moderate and Major impacts are considered 'significant' in the context of the EIA Regulations.

14.3.6 Some of the dwellings considered are financially involved with the proposed development and are as a result much less likely to be affected in practice by noise from the construction activities associated with the proposed development, and this will be taken into account in this chapter.

Operational Noise

14.3.7 The ETSU-R-97 assessment procedure has been used as advised in the Scottish Government's Online Renewables Planning Advice: it specifies noise limit criteria at the nearest properties based on existing background noise levels and their variation with wind speed.

14.3.8 Noise limits are defined in terms of the $L_{A90,10min}$ noise indicator (a definition of the $L_{A90,10min}$ index is given in Appendix 14.1, Annex A). The ETSU-R-97 assessment procedure generally prescribes separate day-time limits and night-time limits which are determined in part based on measured baseline background noise levels.

14.3.9 The noise limits defined in ETSU-R-97 relate to the total wind farm noise occurring at a dwelling owing to the combined noise of all operational wind turbines in the vicinity. The assessment therefore considers the combined operational noise of the proposed development with other wind farms in the area, to be satisfied that the combined cumulative noise levels are within the relevant ETSU-R-97 criteria.

14.3.10 To undertake the assessment of noise impact in accordance with the methodology in ETSU-R-97, the following steps are required:

- specify the number and locations of the wind turbines;
- 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 a representative sample of the nearest neighbours;
- determine the day time and night time noise limits from the measured background noise levels at the nearest neighbours;
- specify the type and noise emission characteristics of the wind turbines;
- calculate noise immission levels due to the operation of the turbines on the proposed development as well as the contribution to cumulative noise immission levels from other nearby wind farms as a function of site wind speed at the nearest neighbours; and
- compare the calculated wind farm noise immission levels with the derived noise limits and assess in the light of planning requirements.

14.3.11 This methodology has therefore been adopted for the present assessment and is described in more detail in Appendix 14.1. Technical guidance on best practice in the application of the ETSU-R-97 methodology, as described in an Institute of Acoustics Good Practice Guide has also been referenced.

14.3.12 Note that in the above, and subsequently in this chapter, the term 'noise emission' relates to the sound power level actually radiated from each wind turbine, whereas the term 'noise immission' relates to the sound pressure level (the perceived noise) at any receptor location due to the combined operation of all wind turbines on the proposed development.

14.3.13 The acceptable limits for wind turbine operational noise are defined in ETSU-R-97. Consequently, the test applied to operational noise is whether or not the calculated cumulative wind farm noise immission levels at nearby noise sensitive properties are within the noise limits derived in accordance with ETSU-R-97. If predicted noise levels are within the ETSU-R-97 criteria, operational noise is considered acceptable; if predicted noise levels are above the ETSU-R-97 criteria, operational noise is considered unacceptable. Unacceptable noise levels are considered 'significant' in the context of the EIA Regulations.

14.3.14 Full details of the operational noise assessment, including details of the noise output of the wind turbine that has been assumed for this project and the calculation parameters on which predictions have been based, can be found in Appendix 14.1.

14.3.15 Operational noise modelling has been undertaken using predictions which accord with guidance on best practice published in the IOA GPG using the ISO 9613-2 (1996) standard. The noise model accounts for geometric spreading, atmospheric and ground attenuation, as well as barrier and ground effects.

14.3.16 The IOA GPG also allows for directional effects to be taken into account within the noise modelling: under upwind propagation conditions between a given receiver and the windfarm the noise immission level at that receiver can be as much as 10 dB(A) to 15 dB(A) lower than the level predicted using the ISO 9613-2 model. Whilst these directional effects would result in lower predicted noise immission levels in some wind directions, predictions have been made assuming downwind propagation from every turbine to every receptor at the same time. This will give a worst-case, in some cases conservative, estimation of noise levels, as in practice receptors will not necessarily be downwind of all turbines under all wind conditions.

14.3.17 Appendix 14.1 details the assumed noise emission levels for the turbines on the proposed development and the Beinn An Tuirc III Wind Farm. For the proposed development, the Siemens SWT-DD-120 was assumed as a candidate turbine model, with a hub height of 90 m. This model is considered representative of the upper end of the noise emissions for the type of turbine which could be installed at the site. This was determined following a review of five potential candidate turbines which would be available to install within the dimensions of the proposed development: predictions for the Siemens SWT-DD-120 model were higher than the other candidates considered and it was therefore retained on a conservative basis.

14.3.18 The predictions for the Beinn An Tuirc III Wind Farm are based on a 2.3 MW Siemens 2.3-VS93 turbine, with an additional factor of +3 dB added to the emission data to account for potential increases allowed under the consent for that wind farm. These assumptions are in line with guidance in the IOA GPG on robust emission levels as input to these predictions.

Baseline Conditions

Field Survey

14.3.19 The baseline background noise monitoring was conducted from 13th September 2013 to the 6th October 2013, a period of 3 weeks. Since then, there have not been significant changes to the noise environment in the study area and these measurements therefore remain representative of background noise levels in the area, as agreed in consultation with Argyll and Bute Council.

14.3.20 The following monitoring locations were agreed as being appropriate with the Environmental Health Department of Argyll and Bute Council. Representatives of Argyll and Bute Environmental Health also attended during the installation of the noise monitoring equipment to agree final installed monitoring locations.

- Killocraw (166031, 630687).
- Drum Farm (167140, 625475).
- Gobagrennan (170591, 628598).
- Corrylach (170526, 630384).

14.3.21 The potential effects of the existing Tangy I and II wind farms on measured baseline background data were suitably excluded by selecting survey locations that were at sufficiently large distances from the existing turbines. The resulting separation distance of approximately 2 km or more was considered, based on professional judgement and site observations, sufficient to exclude a measurable influence of the existing Tangy turbines on the measured background noise levels. This methodology and the monitoring locations selected were discussed and agreed with Argyll and Bute Council prior to the monitoring being undertaken.

14.3.22 Due to equipment failure, the survey period at Gobagrennan was extended until the 5th November 2013. Two weeks of data were hence obtained at Gobagrennan, with three weeks of data obtained at all other monitoring locations. The total survey period is in excess of the minimum of one week required by ETSU-R-97, and a suitably representative range of wind conditions was obtained.

14.3.23 Full details of the monitoring locations and equipment used can be found in Appendix 14.1. In some instances, the results obtained from the survey positions have been used to represent the background environment expected to occur at other nearby assessment locations. This approach is consistent with the guidance provided by ETSU-R-97. Locations where such representations have been made, and the source of the representations, are given in Table 3 of Appendix 14.1.

14.3.24 At some of the monitoring locations, a variation in baseline noise levels with wind direction was apparent. At Killocraw, this was due to the more exposed character of the location in westerly winds. At Drum Farm, marginally higher levels were experienced when downwind of the small wind turbines located on the other side of the farm. As such, the survey data were filtered to exclude these wind directions which resulted in elevated noise levels. The data were also filtered to remove the effects of rain. All excluded data points are shown in charts E.1 to E.8 in Annex E of Appendix 14.1.

Limitations and Assumptions

14.3.25 The derived noise limits were based on previous baseline measurements, as agreed in consultation with the local authority. As described above, these are still considered representative of the area in the absence of any significant changes and therefore represent a suitable basis for the assessment.

14.4 Baseline Conditions

14.4.1 The ETSU-R-97 assessment method requires noise data to be related to wind speed data at a standardised height of ten metres. Wind speeds were measured on an 80-metre-high meteorological mast located within the boundary of the site during the baseline noise survey. Values of wind speed at 80 m and 60 m above ground level were used to derive wind shear values, which in turn were used to calculate the wind speeds at the hub height of 90m. These hub height wind speeds were then ‘standardised’ to a height of 10 metres, as per the GPG’s recommendations. Full details of the calculation method are given in Appendix 14.1 (Annex F).

14.4.2 Figures D1 to D4 in Appendix 14.1 show the range of wind conditions experienced during the noise survey period. During the quiet daytime and night time periods wind speeds were of up to 18 m/s. The wind was observed to be directed most frequently from the north-west during the survey period, with a wind direction from the south-east also being common. This is generally in line with the long-term wind rose for the site.

14.4.3 Figures E.1 to E.8 contained in Appendix 14.1 show the results of the background noise measurements at each of the four monitoring locations. The background noise data are presented in terms of $L_{A90,10min}$ noise levels plotted as a function of standardised wind speed. Two plots are shown for each location, one for quiet daytime periods and the other for night time periods, both derived in accordance with ETSU-R-97.

14.4.4 Data from all survey locations were inspected to identify periods which may have been influenced by extraneous noise sources, giving rise to atypical and elevated levels, which were excluded. ETSU-R-97 also suggests that any data that may have been affected by rainfall be excluded from the analysis. The meteorological mast had a rain gauge installed during the noise survey period; data from this gauge were therefore used to exclude those periods where rain was indicated.

14.4.5 Following removal of these data points, best fit lines were generated using a polynomial of a maximum of 3rd order. These lines of best fit were then used to derive the noise limits required by ETSU-R-97 that apply during the daytime and night time periods up to 12 m/s. To assess the potential noise impact of the proposed development, the noise limits have been set either at the prevailing measured background level plus 5 dB, or at the relevant fixed lower limit, whichever is the greater, in accordance with the ETSU-R-97 methodology.

14.4.6 During daytime, a fixed limit value of 38 dB(A) has been adopted, approximately in the middle of the possible range of daytime fixed limit values referenced in ETSU-R-97. This is considered wholly appropriate for this scheme, based on the relatively large potential generating capacity of the proposed development and the relatively low number of receptor locations that would be affected by noise from the proposed development. The majority of the receptor locations are to the south of the proposed development and would therefore be infrequently downwind of the proposed development. The daytime noise limits in the consent for the Tangy III Wind Farm had a lower fixed limit of 38 dB(A). The proposed development represents an increase to the already significant energy output of the Tangy III Wind Farm, reinforcing the case that a 38 dB(A) lower fixed limit is appropriate for the proposed development.

14.4.7 During night-time, the ETSU-R-97 limit of 43 dB(A) has been adopted as specified in ETSU-R-97. For financially involved properties, the lower absolute limit becomes 45 dB(A) during both day and night. The resulting ETSU-R-97 noise limits are summarised in Table 4 and Table 5 of Appendix 14.1.

14.5 Potential Effects

Predicted Construction Noise and Vibration Effects

14.5.1 The level of construction noise that occurs at the surrounding properties will be highly dependent on a number of factors such as the final construction programme, equipment types used for each process, and the plant operating conditions that prevail during construction. It is not practically feasible to specify each and every element of the factors that may affect noise levels, therefore it is necessary to make reasonable allowance for the level of noise emissions that may be associated with key phases of the construction.

14.5.2 In order to determine representative emission levels for this study, reference has been made to the scheduled sound power data provided in BS 5228. Based on experience of the type and number of plant usually associated with the key phases of constructing a wind farm, the scheduled sound power data have been used to deduce the upper sound emission level over the course of a working day. In determining the rating applicable, it has generally been assumed that the plant will operate for between 75% and 100% of the working day. In many instances, the plant would actually be expected to operate for a reduced percentage of the day, thus resulting in noise levels lower than predicted in this assessment.

14.5.3 Table 6 of Appendix 14.1 lists the key construction activities, the associated type of plant normally involved, the expected worst-case sound power level over a working day for each activity, the property which would be closest to the activity, and the predicted noise level. Comparing the predicted noise levels to the range of background noise levels measured around the proposed development suggests that the noisier construction activities would be audible at various times throughout the construction phase. During the construction of the initial upgrade of a portion of the site access track and extraction of rock from the nearest borrow pit, noise levels of up to 63 dB(A) were predicted at Tangy Farm. The likely short-term nature of these activities, combined with the financially involved nature of this location, mean that the effects are likely to be **minor adverse** at most in practice and **not significant**.

14.5.4 Other receptor locations are located further from the construction activities; for example, Tangylee (which is also financially involved) is approximately 520 m and Hazels Cottage approximately 720 m from the nearest borrow pit, with predicted noise levels from the use of the borrow pit being 60 dB(A) and 57 dB(A) respectively, and therefore equating to a **minor adverse impact (not significant)**. The above impacts are similar to those assessed in the 2014 ES for the consented Tangy III Wind Farm.

14.5.5 Calculations have also been undertaken to establish the potential noise impacts of construction traffic on local roads. The results of these calculations are presented in section 5.1 of Appendix 14.1 and demonstrate that the noise impacts of construction traffic on the local road network will be, at worst, minor.

14.5.6 The nature of works and distances involved in the proposed construction activities are such that the risk of significant effects relating to ground borne vibration are very low (excluding blasting, which is considered below). Occasional momentary vibration can arise when heavy vehicles pass dwellings at very short separation distances, but again this is not sufficient to constitute a risk of significant impacts in this instance.

Construction Noise and Vibration Effects – Blasting

14.5.7 Because of the difficulties in predicting noise and air overpressure resulting from blasting operations, these activities are best controlled with the use of good practice during the setting and detonation of charges, as set out in Appendix 14.1.

14.5.8 The transmission and magnitude of ground vibrations associated with blasting operations at borrow pits are subject to many complex influences including charge type and position, and importantly, the precise nature of the ground conditions (material composition, compaction, discontinuities) at the source, receiver, and at every point along all potential ground transmission paths. Clearly any estimation of such conditions is subject to considerable uncertainty, thus limiting the utility of predictive exercises. Mitigation of potential effects of these activities is best achieved through on site testing processes carried out in consultation with the Local Authorities, as described in Appendix 14.1 and set out below in the proposed mitigation measures (section 14.6).

Predicted Decommissioning Noise and Vibration Effects

14.5.9 Decommissioning works (both of the existing Tangy I and II turbines and the future decommissioning of the Tangy IV turbines) would be expected to generate noise and vibration impacts of a similar or lesser magnitude to the proposed construction works. The construction phase has been considered to have minor noise effects at most, therefore de-commissioning will, in the worst case, also have minor noise effects.

Predicted Wind Farm Operational Noise Effects

14.5.10 Appendix 14.1 sets out the details of operational noise predictions for the proposed development. These predictions assume the use of noise-reduced operation for three of the turbines of the proposed development.

14.5.11 Table 11 in Appendix 14.1 sets out the calculated wind farm noise immission levels at the 16 noise assessment locations. The calculated noise immission levels are also shown in Figures E1 to E32 in Appendix 14.1 overlaid on the daytime and night time noise limit curves. The assessment shown in tabular form in Table 14.2 and 14.3 below shows that the predicted wind farm noise immission levels meet the ETSU-R-97 derived noise limits under all wind speeds and at all locations.

Table 14.2: Comparison of the ETSU-R-97 Derived Daytime Noise Limits with the Predicted $L_{A90,T}$ Wind Farm Noise Immission Levels from the Proposed Development Only at Each Noise Assessment Location. Negative values indicate the predicted immission level is below the limit.

Property	Standardised Ten Metre Wind Speed, m/s								
	4	5	6	7	8	9	10	11	12
Breakachy	-12.4	-8.1	-4.4	-3.4	-3.5	-5.1	-6.9	-8.8	-10.7
Corrylach	-19.1	-14.8	-10.6	-7.2	-6.7	-9.1	-11.7	-14.2	-16.3
Drumalea	-17.2	-12.9	-8.8	-6.0	-4.3	-4.2	-6.4	-8.9	-11.8
Gobagrennan	-16.3	-12.0	-7.8	-4.5	-2.0	-3.3	-5.5	-7.7	-9.7
Hazels Cottage	-10.7	-6.4	-2.7	-1.8	-2.0	-3.5	-5.3	-7.2	-9.1
High Ballevain Cottage	-18.8	-14.5	-10.4	-7.6	-5.8	-5.7	-7.9	-10.4	-13.3
Killarow	-20.0	-15.7	-11.6	-8.8	-7.2	-7.1	-7.1	-7.1	-7.7
Killocraw	-17.5	-13.2	-9.0	-5.7	-3.3	-3.1	-5.3	-7.8	-10.7
South Lagalgarve	-16.6	-12.3	-8.1	-5.0	-2.8	-2.6	-4.8	-7.3	-10.2
Tangy Farm	-12.1	-7.8	-3.6	-1.3	-0.4	-0.3	-0.7	-2.6	-4.5
Tangy Glen Cottages	-15.3	-11.0	-6.9	-4.1	-2.5	-2.3	-4.5	-7.0	-9.9
Tangy Mill	-13.8	-9.5	-5.4	-2.7	-1.3	-1.1	-3.3	-5.8	-8.7
Tangy Mill Croft	-15.3	-11.0	-6.9	-4.1	-2.5	-2.4	-4.6	-7.1	-10.0
Tangylee	-14.3	-10.0	-5.8	-3.4	-2.3	-2.2	-2.6	-4.5	-6.4
Tangymoil	-19.2	-14.9	-10.7	-7.7	-5.9	-5.7	-5.7	-5.7	-6.3
Tigh na Mara	-14.1	-9.8	-5.6	-2.7	-1.0	-0.9	-3.1	-5.6	-8.5

Table 14.3: Comparison of the ETSU-R-97 Derived Night-time Noise Limits with the Predicted $L_{A90,T}$ Wind Farm Noise Immission Levels from the Proposed Development Only at Each Noise Assessment Location. Negative values indicate the predicted immission level is below the limit.

Property	Standardised Ten Metre Wind Speed, m/s								
	4	5	6	7	8	9	10	11	12
Breakachy	-17.4	-13.1	-8.9	-6.2	-4.6	-4.5	-5.9	-8.5	-11.3
Corrylach	-24.1	-19.8	-15.6	-12.2	-9.7	-9.5	-11.1	-14.6	-18.4
Drumalea	-22.2	-17.9	-13.8	-11.0	-9.3	-9.2	-9.2	-9.2	-9.2
Gobagrennan	-21.3	-17.0	-12.8	-9.5	-7.0	-6.8	-6.8	-6.8	-7.8
Hazels Cottage	-15.7	-11.4	-7.2	-4.6	-3.1	-2.9	-4.3	-6.9	-9.7
High Ballevain Cottage	-23.8	-19.5	-15.4	-12.6	-10.8	-10.7	-10.7	-10.7	-10.7
Killarow	-20.0	-15.7	-11.6	-8.8	-7.2	-7.1	-7.1	-7.1	-7.1
Killocraw	-22.5	-18.2	-14.0	-10.7	-8.3	-8.1	-8.1	-8.1	-8.1
South Lagalgarve	-21.6	-17.3	-13.1	-10.0	-7.8	-7.6	-7.6	-7.6	-7.6
Tangy Farm	-12.1	-7.8	-3.6	-1.3	-0.4	-0.3	-0.3	-2.3	-5.1
Tangy Glen Cottages	-20.3	-16.0	-11.9	-9.1	-7.5	-7.3	-7.3	-7.3	-7.3

Table 14.3: Comparison of the ETSU-R-97 Derived Night-time Noise Limits with the Predicted $L_{A90,T}$ Wind Farm Noise Immission Levels from the Proposed Development Only at Each Noise Assessment Location. Negative values indicate the predicted immission level is below the limit.									
Tangy Mill	-18.8	-14.5	-10.4	-7.7	-6.3	-6.1	-6.1	-6.1	-6.1
Tangy Mill Croft	-20.3	-16.0	-11.9	-9.1	-7.5	-7.4	-7.4	-7.4	-7.4
Tangylee	-14.3	-10.0	-5.8	-3.4	-2.3	-2.2	-2.2	-4.2	-7.0
Tangymoil	-19.2	-14.9	-10.7	-7.7	-5.9	-5.7	-5.7	-5.7	-5.7
Tigh na Mara	-19.1	-14.8	-10.6	-7.7	-6.0	-5.9	-5.9	-5.9	-5.9

14.6 Mitigation

Proposed Construction Noise Mitigation Measures

14.6.1 To reduce the potential effects of construction noise, the following types of mitigation measures are proposed:

- Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle deliveries to the site would be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries would only take place outside these times with the prior consent of the local authority and the Police. Those activities that are unlikely to give rise to audible noise at the site boundary may continue outside of the stated hours.
- All construction activities shall adhere to good practice as set out in BS 5228.
- All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain fitted at all times.
- Where flexibility exists, activities will be separated from residential neighbours by the maximum possible distances.
- A site management regime will be developed to control the movement of vehicles to and from the proposed development site.
- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels.

14.6.2 The potential noise and vibration effects of blasting operations will be reduced according to the guidance set out in the relevant British Standards PAN50 Annex D and discussed below:

- Blasting should take place under strictly controlled conditions with the agreement of the relevant authorities, at regular times within the working week, that is, Monday to Friday, between the hours of 10.00 and 16.00. Blasting on Saturday mornings shall be a matter for negotiation between the contractor and the local authorities;
- Vibration levels at the nearest sensitive properties are best controlled through on site testing processes carried out in consultation with the Local Authorities. This site testing based process would include the use of progressively increased minor charges to gauge ground conditions both in terms of propagation characteristics and the level of charge needed to release the requisite material. The use of onsite monitoring at neighbouring sensitive locations during the course of this preliminary testing can then be used to define upper final charge values that will ensure vibration levels remain within the criteria set out previously, as described in BS 5228 2 and BS 6472 2 2008;
- Blasting operations shall adhere to good practice as set out in BS 5228 2 and in PAN50, Annex D, Paragraph 95, in order to control air overpressure.

Proposed Operational Noise Mitigation Measures

14.6.3 The selection of the final turbine to be installed at the site would be made on the basis of enabling the relevant noise limits (Tables 14.4 and 15.5 below) to be achieved at the surrounding properties. Satisfactory control of cumulative noise immission levels would be achieved through enforcement of individual consent limits for each of the individual wind farms.

14.7 Monitoring

14.7.1 It is proposed that if planning consent is granted for the proposed development, conditions attached to the planning consent should include the requirement that, in the event of a valid noise complaint, noise levels resulting from the operation of the wind farm are measured in order to demonstrate compliance with the conditioned noise limits. Such monitoring should be done in full accordance with ETSU-R-97 and include penalties for any relevant characteristics of the noise (e.g. tones).

14.7.2 The relevant noise limits which are considered appropriate for the proposed development are those set out in Tables 15 and 16 of Appendix 14.1, reproduced below in Tables 14.4 and 14.5. These were determined to maintain compliance with the overall ETSU-R-97 noise limits, taking into account the consented limits for the Beinn An Tuirc III Wind Farm, as detailed in Appendix 14.1. Satisfactory control of cumulative noise immission levels would be achieved through enforcement of individual consent limits for each of the individual wind farms.

Table 14.4: Daytime L_{A90} Noise Limits Applicable to the proposed development (only)

Property (* indicates financial involvement)	**Standardised Ten Metre Wind Speed, m/s**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Breakachy	38.0	38.0	38.5	40.2	41.9	43.6	45.4	47.3	49.2
Corrylach	35.0	35.0	35.0	35.0	37.0	39.6	42.2	44.7	46.8
Drumalea	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
Gobagrennan	37.0	37.0	37.0	37.0	37.0	38.5	40.7	42.9	44.9
Hazels Cottage	38.0	38.0	38.5	40.2	41.9	43.6	45.4	47.3	49.2
High Ballevain Cottage	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
Killarow*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.6
Killocraw	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
South Lagalgarve	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
Tangy Farm*	45.0	45.0	45.0	45.0	45.0	45.0	45.4	47.3	49.2
Tangy Glen Cottages	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
Tangy Mill	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
Tangy Mill Croft	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6
Tangylee*	45.0	45.0	45.0	45.0	45.0	45.0	45.4	47.3	49.2
Tangymoil*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.6
Tigh na Mara	38.0	38.0	38.0	38.0	38.0	38.0	40.2	42.7	45.6

Table 14.5: Night-time L_{A90} Noise Limits Applicable to the proposed development (only)									
Property (* indicates financial involvement)	**Standardised Ten Metre Wind Speed, m/s**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Breakachy	43.0	43.0	43.0	43.0	43.0	43.0	44.4	47.0	49.8
Corrylach	40.0	40.0	40.0	40.0	40.0	40.0	41.6	45.1	48.9
Drumalea	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Gobagrennan	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	43.0
Hazels Cottage	43.0	43.0	43.0	43.0	43.0	43.0	44.4	47.0	49.8
High Ballevain Cottage	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Killarow*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Killocraw	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
South Lagalgarve	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Tangy Farm*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	47.0	49.8
Tangy Glen Cottages	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Tangy Mill	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Tangy Mill Croft	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Tangylee*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	47.0	49.8
Tangymoil*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Tigh na Mara	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0

14.8 Residual Effects

Residual Construction Noise Effects

14.8.1 With the application of the mitigation measures outlined in Section 14.6 of this Chapter, residual construction noise impacts are predicted to be, at worst, **minor adverse** and therefore, **not significant** in the context of the EIA Regulations.

Residual Operational Noise Effects

14.8.2 Operational noise levels are predicted to comply with noise limits derived in accordance with ETSU-R-97 at all properties. The basis of the ETSU-R-97 method is to define acceptable noise limits to offer reasonable protection to residents in areas around wind farm developments. At some locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible; however, operational noise immission levels are acceptable in terms of the guidance recommended by planning policy for the assessment of wind farm noise. As such, operational noise effects from the proposed development are considered to be **not significant** in the context of the EIA Regulations.

14.9 Cumulative Effects

14.9.1 The cumulative operational noise effects of the proposed development and Beinn an Tuirc III Wind Farm have been considered in detail in Appendix 14.1. These calculations have demonstrated that, even assuming downwind propagation from all turbines to all receptor locations, cumulative operational noise levels would only be marginally higher (of the order of 0.5 dB or less) than noise levels predicted due to the operation of the Tangy IV at the majority of receptor locations. This represents a negligible increase according to relevant guidance on the subject.

14.9.2 The exceptions to this are the receptor locations at Gobagrennan and Corrylach. The predictions at these locations are particularly conservative as they assume simultaneous downwind propagation from all turbines. As the Tangy IV turbines are to the west of both Gobagrennan and Corrylach, whereas the proposed Beinn an Tuirc III turbines are to the east of these properties, these receptor locations are unlikely to be downwind of both the proposed Tangy IV and Beinn an Tuirc III turbines simultaneously.

14.9.3 In any case, even on this conservative basis, the predicted cumulative noise levels at these locations remained compliant with the derived ETSU-R-97 limits (as shown in the assessment of Tables 13 and 14 of Appendix 14.1).

14.9.4 In conclusion, cumulative operational noise levels remained within the relevant ETSU-R-97 criteria and therefore **not significant**.

14.10 Statement of Significance

14.10.1 The significance of the predicted noise impacts is summarised in Table 14.6.

Table 14.6: Summary Table of Effects

Potential Effect	Evaluation of Effect
Construction Noise	Noise levels have been predicted using the methodology set out in BS 5228. Based on assessment criteria derived and supported by a range of noise policy and guidance, overall construction noise levels are considered to represent at worst a **minor adverse** impact, and therefore considered **not significant** in EIA terms. Decommissioning works (both of the existing Tangy I and II turbines and the future decommissioning of the Tangy IV turbines) would be expected to generate noise impacts of a similar or lesser magnitude to construction works and therefore are again considered **not significant** in EIA terms.
Operational Noise	Noise criteria have been established in accordance with ETSU-R-97. It has been shown that these criteria are achievable with a commercially available turbine suitable for the site. The basis of the ETSU-R-97 method is to define acceptable noise limits thought to offer reasonable protection to residents in areas around wind farm developments. At some locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible; however, operational noise immission levels are acceptable in terms of the guidance commended by planning policy for the assessment of wind farm noise, and therefore considered **not significant** in EIA terms.

14.11 References

Scottish Planning Policy (SPP), Scottish Government, 2010.

Planning Advice Note 1/2011: Planning & Noise, Scottish Government, March 2011.

Onshore Wind Turbines (http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables/Onshore).

ETSU R 97, the Assessment and Rating of Noise from Wind Farms, Final ETSU-R-97 Report for the Department of Trade & Industry. The Working Group on Noise from Wind Turbines, 1997.

Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Institute of Acoustics, May 2013.

PAN1/2011 Technical Advice Note – Assessment of Noise, Scottish Government, March 2011.

Control of Pollution Act, Part III, HMSO, 1974.

BS 5228 Noise and Vibration Control on Construction and Open Sites, Parts 1 to 4.

BS 5228 1:2009 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'.

BS 5228 2:2009 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'.

Planning Advice Note 50: Controlling the Environmental Effects of Surface Mineral Workings, 1996.

BS 6472 2:2008: Guide to evaluation of human exposure to vibration in buildings - Part 2: Blast-induced vibration.

Calculation of Road Traffic Noise, HMSO Department of Transport, 1988.

Design Manual for Roads and Bridges, Volume 11, section 3, Part 7, Traffic Noise and Vibration, The Highways Agency, Transport Scotland, 2011.

15. ACCESS TRAFFIC AND TRANSPORT

Executive Summary

This chapter of the EIA Report considers the effect of land based transportation to the proposed development associated with construction, operation and decommissioning. Receptors sensitive to change in traffic flow and composition, located on or near to the proposed delivery route are identified. The effects considered are as follows: Traffic Generation, Accidents and Safety, Driver Delay, Pedestrian Amenity, Severance, Noise and Vibration, Hazardous Loads, Visual Effects, Air Quality and Cumulative Effects.

Baseline traffic flow conditions were established by three automatic traffic counts conducted during May 2018. The anticipated traffic generated during the peak week(s) of construction of the development was then estimated and compared to the measured baseline. In accordance with The Institute of Environmental Assessment Guidelines, the percentage change in overall traffic flow or HGV traffic flow compared with baseline was compared against an upper 30% threshold, and a lower 10% threshold in areas of high sensitivity. Areas where the predicted change exceeded these thresholds were considered in detail.

Three locations where the increase in overall traffic, or HGV traffic, is predicted to exceed the relevant threshold were identified. Major significant effects are predicted to occur on the unnamed road between the A83 and the site entrance in relation to traffic generation and in relation to driver delay. Moderate significant effects are predicted to occur at Glenbarr and Rhunahaorine primary schools in relation to pedestrian amenity.

In relation to the identified areas of significant effects, mitigation measures are provided in the Outline Traffic Management Plan (Appendix 15.2) and are outlined within Section 15.8 of this report. It is anticipated that following implementation of the specified mitigation the significance of the identified effects will be reduced to low and **not significant**. All other effects are predicted to be negligible and **not significant**.

15.1 Introduction

15.1.1 This chapter considers the potential effects on Traffic and Transport associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe baseline transport infrastructure and traffic flow conditions within the study area;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

15.1.2 The assessment has been carried out by Arcus Consultancy Services Ltd (Arcus) and in accordance with guidance from the Institution of Civil Engineers and the Chartered Institution of Highways & Transportation.

15.1.3 This chapter is supported by:

- Appendix 15.1: Abnormal Load Route Assessment
- Appendix 15.2: Outline Traffic Management Plan

15.1.4 Figures 15.1 – 15.3 are referenced in the text where relevant.

15.2 Scope of Assessment

Project Interactions

15.2.1 The proposed development has the potential to cause effects on Access, Traffic and Transportation resources within the study area as a result of:

- increased traffic flows;
- changes to the traffic composition;
- congested roads;
- journey delays;
- reduction in safety; and
- degradation of road surface.

Study Area

15.2.2 The site is located approximately 12 km north-west of Campbeltown, Argyll & Bute. No public roads are located within the site. The assessment study area extends to the routes which will be used by construction vehicles between the site and the nearest major trunk road, in this case the A83. Due to its proximity to the site, and its importance as a significant trunk road, the A83 itself will also be considered by this assessment.

15.2.3 Wind turbine components will be delivered by abnormal load vehicle (ALV) from Campbeltown Harbour via the Abnormal Load Route (ALR), this is indicated on Figure 15.1. Other materials are likely to be delivered by heavy goods vehicle (HGV) and will originate from a variety of locations, it is likely that a number of HGV deliveries will approach the site from the north via the A83, although some may also originate from the south.

Scoping and Consultation

15.2.4 Consultation responses received relevant to this assessment are summarised in Table 15.1.

15.2.5 Full details on the consultation responses can be reviewed in Appendix 2.1: Consultation Register

Table 15.1: Consultation Responses

Consultee and Date	Summary of Response	Comment/Action Taken
The Scottish Government	It is Scottish Ministers' view that, in all of the circumstances of the present case, the baseline for the purpose of assessment should be the operational Tangy I and Tangy II wind farm (scenario 2). The decommissioning of Tangy I and Tangy II should therefore be assessed as an integral part of the construction of the proposed Tangy IV, being delivered as a single project.	Decommissioning of Tangy I and Tangy II has been fully considered within this chapter of the EIA Report, Chapter 15 Access Traffic and Transport
Transport Scotland	As the proposal includes a larger turbine model to that assessed in the previous ES, we understand that an updated swept path analysis study will be undertaken and we can confirm that Transport Scotland would wish to review the outcome of this study. In addition, a detailed Traffic Management Plan (TMP) will be produced prior to the commencement of construction works. The TMP would provide detail of materials, plant, equipment, components and labour required on site during the construction and operation phases of the development. This is welcomed. As all other elements of the proposal remain unchanged from the consented application, the SR indicates that it is proposed to scope out any assessment of environmental impacts on the local and trunk road network. Transport Scotland considers this to be an acceptable approach.	An updated Abnormal Load Route Assessment has been undertaken for the increased turbine specification and is included in Appendix 15.1 to this EIA Report. An Outline Traffic Management Plan has been developed and is included in Appendix 15.2 to this EIA Report.
Argyll and Bute Council	The EIA Report should include: a plan showing the proposed access point and haul route; a Traffic Management Plan, which should include details of all materials, plant, equipment, components and labour required during the construction, operation and decommissioning phases; and a detailed Method Statement in relation to access and transport of materials, plant and equipment.	These elements have been considered within this chapter of the EIA Report. An Outline Traffic Management Plan has been developed and is included in Appendix 15.2 to this EIA Report.
West Kintyre Community Council	We accept traffic surveys were carried out in 2014 but believe further surveys should be carried out, more especially because there is a strong likelihood that more than one windfarm will be under construction within the area at the same time resulting in a significant increase in the use of HGV's on the A83 which is the only road we on West have for all aspects of daily living, public transport and deliveries etc.	An updated baseline assessment has been undertaken which includes traffic surveys carried out in May 2018, this is detailed in Section 15.5 of this EIA Report

Effects to be Assessed

15.2.6 This assessment considers the following Access, Traffic and Transport effects which have the potential to occur during construction of the Development:

- Traffic Generation;
- Accidents and Safety;
- Driver Delay;
- Pedestrian Amenity;
- Severance;
- Noise and Vibration;
- Hazardous Loads;
- Visual Effects;
- Air Quality; and
- Cumulative Effects

Effects Scoped Out of Assessment

15.2.7 Traffic associated with operation of the Development is expected to be low and is unlikely to give rise to any appreciable traffic effects. Assessment of operational traffic has therefore been scoped out of this assessment.

15.2.8 Effects arising from the process of decommissioning have been scoped out since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. However, the results of decommissioning (i.e. the removal of the existing wind farm) are taken into account as the infrastructure forms part of the construction operations of the proposed development and is therefore included within the assessment of construction effects.

15.3 Methodology

Overview

15.3.1 Baseline traffic flow conditions were established at key locations on routes within the study area. Traffic surveys were undertaken at three locations on routes within the vicinity of the Development. Background traffic growth between the survey date and the anticipated year of construction was applied to the baseline flows.

15.3.2 A desk based assessment of the capacity of routes was undertaken. This study utilised online mapping resources to establish road geometry and layout. Guidance from the Department for Transport (DfT), the Design Manual for Roads and Bridges (DMRB), was used to estimate the capacity of routes from this information.

15.3.3 Sensitive receptors within the study area were identified following a site visit, and through the use of online mapping. This study identified receptors likely to be sensitive to changes in traffic flow or HGV composition.

15.3.4 The anticipated Development traffic was calculated and the construction programme used to determine the peak month of construction, from a delivery perspective, and the average number of deliveries expected throughout the project.

15.3.5 The percentage increase in traffic flow, and HGV composition, on the selected routes was calculated using the factored baseline traffic flow and the anticipated construction traffic.

A screening process was undertaken, as recommended in the Institute of Environmental Management & Assessment – Guidelines for the Environmental Assessment of Road Traffic (the Institute of Environmental Assessment (IEA))1993.

Method of Baseline Characterisation

Baseline Traffic Flow

15.3.6 Baseline traffic flow conditions were established at key locations within the vicinity of the site to enable comparison with the expected Development traffic. Automatic traffic counts (ATCs) were undertaken at three locations from the 16th to the 22nd of May 2018.

15.3.7 ATC locations are indicated on Figure 15.2. These locations were selected so as to enable assessment of all routes that might be used by Development construction traffic, this includes abnormal delivery vehicles approaching from Campbeltown and other traffic which may approach from the north.

Estimation of Road Capacity

15.3.8 A desk study, including review of online mapping resources, was undertaken to assess the capacity of roads within the study area. Geometric parameters of each road were established, and a review of other factors which might influence road capacity was undertaken. This information was then used to make an estimate of the capacity of each road, referring to the Design Manual for Roads and Bridges[1] (DMRB).

Future Baseline Scenarios

Traffic Growth

15.3.9 Background traffic growth will occur on the local road network irrespective of whether or not the Development is constructed. Projected baseline traffic flows for the expected year of construction were calculated by applying traffic growth factors from the National Trip End Model (NTEM) forecasts using the Trip End Model Presentation Program (TEMPRO). NTEM and TEMPRO are designed by the Department for Transport (DfT) and provide forecasts of traffic growth over time for use in local and regional transport models. NTEM and TEMPRO are the industry standard tool for estimating traffic growth.

15.3.10 A traffic growth factor of 1.0028 was calculated for routes in the study using the geographical location of the Development, the baseline year (2018) and the proposed year of construction (2020). The baseline traffic flow information collected for each route was then multiplied by the growth factor to give the estimated traffic flow for the year of construction.

Effects Evaluation Methodology

Receptor sensitivity

15.3.11 Table 15.2 indicates the criteria used to assess the sensitivity of routes and other receptors within the study.

Table 15.2: Receptor Sensitivity

Sensitivity	Description
High	Receptors of greatest sensitivity to changes in traffic flow, would include: People whose livelihood depends upon unrestricted movement within their environment including commercial drivers and companies who employ them, local residents, schools and colleges. Accident hotspots would also be considered
Medium	Traffic flow sensitive receptors, would include: People who pass through the area habitually, but whose livelihood is not wholly dependent on free access. Would also typically include: congested junctions, community services, parks, businesses with roadside frontage, and recreation facilities.
Low	Receptors with some sensitivity to changes in traffic flow:

Table 15.2: Receptor Sensitivity	
Sensitivity	**Description**
	People who occasionally use the road network. Would also typically include: public open spaces, nature conservation areas, listed buildings, tourist attractions, residential roads with adequate footway provision and places of worship.
Negligible	Receptors with very low sensitivity to traffic flows: People not sensitive to transport effects. Would also refer to receptors that are sufficiently distant from the affected roads and junctions.

Impact magnitude

15.3.12 The magnitude of the effect of increase in traffic flow is a function of the existing traffic volumes on routes and the percentage increase in flow as a result of the Development.

15.3.13 The Institute of Environmental Assessment (IEA) Guidelines suggest two broad principles, to be used as a screening process to delimit the scale and extent of assessment. These are:

- Rule 1 – include road links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

15.3.14 Where the predicted increase in traffic flow is lower than these thresholds then the significance of the effects can be considered to be low or not significant and further detailed assessments are not warranted. Consequently, where the predicted increase in traffic flow is greater than these thresholds, the effects are considered to be potentially significant, and assessed in greater detail.

15.3.15 These guidelines are intended for the assessment of environmental effects of road traffic associated with major new developments giving rise to traffic generation, as opposed to short-term construction. In the absence of alternative guidance and, as the traffic generation during the operational phase is very low, these guidelines have been applied to assess the short-term construction phase of the Development.

15.3.16 It is worth noting that on roads where existing traffic levels are generally low (e.g., rural roads and some unclassified roads), any increase in traffic flow may result in a predicted increase that would be higher than the IEA (1993) guideline thresholds. In these situations, it is important to consider any increase in terms of overall traffic flow in relation to the capacity of the road before making a conclusion in EIA terms.

15.3.17 Any change in traffic flow which is greater than the thresholds set out in the IEA (1993) guidelines would be subject to further analysis using this method to establish if the increased traffic flow is within the capacity of the road. In instances where traffic flow is higher than the IEA (1993) guideline thresholds but within the capacity limits of the road, and the potential magnitude on receptors is minor or negligible, this increase would generally be considered as not significant. It is acknowledged that capacities can be reduced by local conditions.

15.3.18 The criteria used to assess the magnitude of change are presented in Table 15.3.

Table 15.3: Magnitude of Effect	
Magnitude	**Description**
Major	The proposals could result in an appreciable change in terms of length and/or duration to the present traffic routes or schedules or activities, which may result in hardship.
Moderate	The proposals could result in changes to the existing traffic routes or activities such that some delays or rescheduling could be required, which cause inconvenience.

Table 15.3: Magnitude of Effect	
Magnitude	**Description**
Minor	The proposals could occasionally cause a minor modification to routes, or a very slight delay in present schedules, or on activities in the short-term.
Negligible	No effect on movement of road traffic above normal level.

Effects significance

15.3.19 Two broad principles outlined within the IEA Guidelines are used as a screening process to limit the scale and extend of the assessment as detailed in 15.3.13.

15.3.20 For the purposes of this assessment and in accordance with the criteria set out within the IEA guidelines, the scale (magnitude) of any increase in traffic flows on a particular section of the road network as a result of the Development construction activities will determine the significance of any effects associated with such increases. For example, an increase in traffic flows of more than 90% on a particular section of the road network, will likely have a major effect on the road section being assessed.

15.3.21 An assessment has been made of the significance of further effects taking into account the importance / sensitivity of the receptor, the magnitude of effect, the duration/ persistence of the effect and the likelihood of the effect occurring. The criteria used to make judgements on the importance/sensitivity of the receptor(s) is presented in Table 15.2. The criteria used to determine the significance of effects is detailed in Table 15.4.

Table 15.4: Effect Significance Matrix					
Magnitude of Effect	**Sensitivity of Receptor**				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	Major	Major	Moderate	Moderate	Minor
Moderate	Major	Moderate	Moderate	Minor	Negligible
Minor	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

15.3.22 Where the significance of effects has been assessed as major or moderate these are considered as **significant** in terms of the EIA Regulations. Effects assessed as minor or negligible have been considered **not significant** in terms of the EIA Regulations.

Assessing cumulative effects

15.3.23 Cumulative effects were considered and have been assessed using the same significance criteria as the Development effects, as indicated in Table 15.4. The magnitude of cumulative effects is taken as the sum of all identified cumulative effects, and those of the Development, which is assessed against the criteria presented in Table 15.3.

Limitations of assessment

15.3.24 Baseline traffic for the anticipated year of construction has been estimated using road traffic growth forecasts published by the DfT. It is possible that unforeseen events for example changes in roads, ferry routes/timetables or visitor attractions may cause growth, or decline, out with the forecasted percentages.

15.4 Baseline Conditions

Baseline Traffic Flow

15.4.1 Baseline traffic flow data was collected at three locations, as shown on Figure 15.2, between the 16th and 22nd of May 2018. The results of the ATCs are summarised in Table 15.5.

Table 15.5: Existing Average Daily Traffic (ADT)					
Ref	**Road**	**Location**	**Total ADT**	**HGV ADT**	**%HGV**
1	A83	South of Kilchenzie	1892	435	23
2	A83	South of Low Ballevain	1717	412	24
3	Unnamed Road	South of High Ballevain Farm	90	16	18

Traffic Growth

15.4.2 Projected baseline traffic flows for the expected year of construction (2020) have been calculated by applying growth factors from the National Trip End Model (NTEM) forecasts.

Table 15.6: Projected Average Daily Traffic (ADT) – 2020					
Ref	**Road**	**Location**	**Total ADT**	**HGV ADT**	**%HGV**
1	A83	South of Kilchenzie	1897	436	23
2	A83	South of Low Ballevain	1722	413	24
3	Unnamed Road	South of High Ballevain Farm	90	16	18

Road Capacity

15.4.3 Typical capacity values for a variety of road types are provided within the Design Manual for Roads and Bridges (DMRB) [1], in which capacity is defined as the maximum sustainable flow of traffic passing in one hour under favourable road and traffic conditions and depends on the road type, width and speed limit defined in kilometres per hour (kph). Table 15.7 gives the estimated capacity of each of the roads within the study.

15.4.4 The unnamed road south of High Ballevain Farm is a narrow single-track road with infrequent and informal passing places. The theoretical capacity of single track roads is difficult to accurately estimate and is dependent on the road geometry and the intervisibility of the passing places, however an estimate is provided within the guidance and is given in Table 15.7.

Table 15.7: Theoretical Road Capacities				
Road	**Type**	**Speed Limit (kph)**	**Capacity (vehicle/hour/direction)**	**Two – Way Hourly Flow**
A83	Rural – Typical Single 7.3m	96	1200	2400
Unnamed Road	Rural – Poor Single 4m	96	140	280

Road Traffic Collision Assessment

15.4.5 A study of all reported road traffic collisions (RTCs) within the last five years within the vicinity of the site entrance and on the ALR between the site and Campbeltown Harbour was undertaken. Eight RTCs in total were identified within this study of which two were identified as ‘serious’, meaning that they resulted in hospitalisation of one or more casualties, all other RTCs were recorded as ‘slight’. No fatal RTCs were recorded in the study. None of the RTCs in the study involved a HGV.

15.4.6 The two serious RTCs occurred on the A83, none of these were in the vicinity of the junction with the Unnamed Road proposed for use in the ALR and none involved a HGV. In both incidents a single vehicle left the left the carriageway and did not collide with any other vehicle.

Other Sensitive Receptors

15.4.7 A number of other receptors of medium or high sensitivity to changes in traffic have been identified and are detailed in Table 15.8. These receptors are either located directly on the proposed delivery routes, or are located close to and require access to these routes. The sensitivity of these receptors has been estimated using the criteria outlined in Table 15.2.

Table 15.8: Other Sensitive Receptors

Receptor	Sensitivity	Justification
Aqualibrium Leisure Centre, Campbeltown	Medium	Located directly on ALR. Access to the centre requires use of this route. Centre is used by habitual users although is not considered lifeline.
Residential and commercial properties in Campbeltown and on A83 to Unnamed Road at Site.	High	A number of residential and commercial premises front directly onto the ALR on the A83. Residents and businesspersons require unrestricted access to this road for their livelihoods.
Campbeltown Ferry Terminal and Commercial Harbour	High	Both the ferry terminal and commercial harbour are accessed directly from the ALR. Users of these facilities are likely to require unrestricted access.
Campbeltown Airport and adjacent manufacturing facilities	High	Both the airport and the adjacent manufacturing facilities are reliant on the ALR the A83 for access to destinations to the north. They are likely to require unrestricted access to this route.
Machrihanish Dunes Golf Course	Medium	Access to this location from the north requires use of the ARL the A83. This attraction is used by habitual users although is not considered lifeline.
Residential properties and farms located on the A83 north of Site	High	A number of residential and farm premises front directly onto the A83 or are located adjacent to it, this includes (but is not restricted to) the settlements of Bellochantuy, Glenbarr, Tayinloan and Clachan. Residents and farms require unrestricted access to this road for their livelihoods.
Glenbarr and Rhunahaorine Primary Schools	High	These schools front directly onto the A83 and staff and students are required to use the A83 for part of their journey to and from the schools. These receptors may be highly sensitive to changes in HGV traffic volume.

Summary

15.4.8 A summary of the receptors identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment are given in Table 15.9, together with the justification for inclusion:

Table 15.9: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
A83	High	This is a trunk road of national significance and provides a lifeline link to communities on the Kintyre Peninsula.
Unnamed Roads from A83 to Site	High	These roads provide access to number of farms and residential properties and users are likely to require unrestricted access to them for their livelihoods.
Other sensitive receptors identified in Table 15.8	Medium/High	A number of other receptors which front directly onto, or require access via, the A83 were identified. These include residential properties, commercial and leisure facilities and transport hubs. Users may require unrestricted access to these routes for their livelihoods, or in the case of leisure facilities users are habitual and may be inconvenienced by adverse effects on the route.

15.5 Anticipated Construction Development Traffic

15.5.1 A detailed programme of anticipated construction development traffic is provided in Figure 15.3. The following subsections provide detail for each element of work. A summary is provided at the end of this section.

Forestry Operations

15.5.2 Forestry machinery and equipment will be mobilised at the commencement of the construction and removed following completion of forestry operations. This is expected to be delivered on two low loader vehicles, totalling four HGV vehicle movements at the commencement and a further four movements following completion.

15.5.3 Forestry keyholing will be undertaken at the commencement of construction in order to prepare suitable areas at each turbine location for the construction of crane hardstandings, blade laydown areas, foundations and connecting access tracks. Following completion of keyholing forestry operations will commence clear-felling the remainder of the site.

15.5.4 In total, approximately 101,000m^3 of timber is expected to be felled and removed from site. This will result in 4,595 loads of timber (22 tonnes per vehicle) leaving the site. This equates to a total of 9,190 vehicle movements over a period of 17 months.

15.5.5 Table 15.10 indicates the anticipated total number of vehicle movements associated with forestry operations.

Table 15.10: Anticipated Vehicle Movements – Forestry				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Equipment Delivery/Removal	HGV Low Loader	1, 20	8*	4*
Forestry Keyholing	HGV Timber Wagon	3-7	2435	541
Forestry Clear Felling	HGV Timber Wagon	7-19	6755	541
Overall			**9198**	**541**

***Includes transporter vehicle leaving and then returning to site during demobilisation**

Site Mobilisation and Demobilisation

15.5.6 HGV and other vehicle movements will be required during site mobilisation. This will involve the erection of welfare facilities, delivery of site vehicles and importation of plant and equipment including equipment for processing material from the on-site borrow pits. The majority of these movements will be as HGVs and low loaders which will deliver and then depart the site empty.

15.5.7 During site demobilisation the majority of this equipment will be removed from site. Vehicle movements for demobilisation will result from empty HGVs and low loaders travelling to site and then departing loaded. Table 15.11 indicates the anticipated number of vehicle movements associated with site mobilisation and demobilisation.

Table 15.11: Anticipated Vehicle Movements – Site Mobilisation/Demobilisation				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
On-site vehicles	Car/LGV**	7, 22	30	15
Construction Compound	HGV Low Loader	7, 22	120*	60*
Borrow Pit Equipment	HGV Low Loader	7, 22	168*	84*
Overall			**318**	**159**

***Includes transporter vehicle leaving and then returning to site during demobilisation**

****Self-propelled vehicles which arrive in one month and depart in another**

Access Track Construction

15.5.8 All stone required for construction of the access tracks is expected to be sourced from on-site borrow pits and processed on site. Therefore, there are not anticipated to be any vehicle movements associated with the importation of stone for access track construction.

15.5.9 Two teams are expected to operate during access track construction. Each team may utilise an excavator, roller and four dumper trucks. It is assumed that the excavators and rollers will be delivered to the site via low loaders at the commencement of this operation and will therefore generate two vehicle trips each for delivery and another two trips during removal, the dumper trucks will be self-propelled to and from the site.

15.5.10 Other materials will require to be imported regularly throughout construction of the access tracks such as geo-membrane, drainage pipes and culvert sections.

15.5.11 Table 15.12 indicates the anticipated number of vehicle movements associated with access track construction.

Table 15.12: Anticipated Vehicle Movements – Access Track Construction

Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Plant Delivery	HGV Dump Truck**	9, 17	16	8
	HGV Low Loader (Excavators/Rollers)	9, 17	8*	4*
Material Deliveries	HGV	10-16	28	4
Overall			**52**	**12**

***Includes transporter vehicle leaving and then returning to site following completion of access tracks**

****Self-propelled vehicles which arrive in one month and depart in another**

Turbine Foundation Construction

15.5.12 Each turbine foundation will be formed from ready-mix concrete imported to site. Each foundation will be poured in one continuous session over a single day, with 16 non-consecutive days required in total.

15.5.13 Each foundation will comprise 550m^3 of concrete, which will require 60 or 90 ready-mix vehicle loads, assuming a capacity of 9m^3 or 6m^3 per vehicle respectively. A worst case scenario has been assumed where 90 vehicles per foundation are required. This will result in a total of 2,880 vehicle movements over the 5 months of this phase of works.

15.5.14 Additionally, 1,120 tonnes of steel reinforcement (rebar) will be required, this will result in a 118 HGV movements over this period. Table 15.13 indicates the anticipated number of vehicle movements associated with turbine foundation construction.

Table 15.13: Anticipated Two-Way Vehicle Movements – Turbine Foundation Construction

Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max (daily/monthly)**
Concrete Delivery	Ready Mix HGV	13-17 (16 days)	2,880	90 (daily)
Rebar Delivery	HGV	13-17	118	26 (monthly)
Overall			**2998**	-

15.5.15 This assessment will consider the effect on individual days in which concrete pouring occurs (90 movements per day). It has been assumed that rebar deliveries will be distributed throughout each month of this phase of works.

Decommissioning of Existing Wind Turbines

15.5.16 The 22 existing wind turbines which comprise the Tangy I and Tangy II Wind Farms are to be removed during construction of the Development. These turbines will be dismantled and removed from site during a three month period.

15.5.17 Abnormal load vehicles will be required to remove certain components from these turbines. It is anticipated that five abnormal load vehicles will be required per turbine, resulting in a total of 220 vehicle movements through the duration of this phase of works. It has also been assumed that two escort vehicles will be required to accompany each abnormal load vehicle, resulting in 440 vehicle movements.

15.5.18 A further two HGV loads per turbine will be required for the removal of ancillary equipment resulting in 88 HGV movements.

15.5.19 Additional traffic will be generated by the removal of other items such as turbine transformers, the substation and control room. These movements are anticipated to number 100 movements over the duration of this phase of works.

Table 15.14: Anticipated Vehicle Movements – Turbine Decommissioning				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Turbine Removal	Abnormal Load Vehicle	15-18	220	72
	Escort Cars/Vans	15-18	440	144
	HGV	15-18	88	29
Removal of Other Equipment	HGV	15-18	100	34
Overall			**848**	**279**

Substation Construction

15.5.20 Material for construction of the substation compound is assumed to be won from on site borrow pits. Electrical components and switchgear will require to be imported, and is predicted to total 40 HGV movements over the eight-month phase of this element.

15.5.21 Two transformers will require to be delivered by abnormal load vehicle due to their weight, this will result in four vehicle movements. Two escort vehicles are assumed to accompany each abnormal load vehicle resulting in eight vehicle movements. Table 15.15 indicates the number of vehicles associated with substation construction.

Table 15.15: Anticipated Vehicle Movements – Substation Construction				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Electrical Components and Switchgear Delivery	HGV	13-21	40	5
Transformer Delivery	Abnormal Load Vehicle	13-21	4	2
	Escort Car/Van	13-21	8	4
Overall			**54**	**11**

Electrical Cabling Delivery

15.5.22 Electrical cabling for wind farm power distribution will require to be delivered and will constitute 48 HGV movements over the period of delivery. Table 15.16 indicates the number of vehicle movements associated with electrical cabling delivery.

Table 15.16: Anticipated Vehicle Movements – Electrical Cabling Delivery				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Electrical Cabling Delivery	HGV	14-21	48	6

Turbine Delivery

15.5.23 Turbines will be delivered as separate components the majority of which will require to be transported by abnormal load vehicle. The towers will be transported in three separate sections and each of the three blades will be transported individually. Two further abnormal load vehicles will be required to transport the nacelle and hub. For the 16 turbines, 128 abnormal load vehicle deliveries will be required which will result in 256 vehicle movements. Following delivery of components, the abnormal load vehicles are able to retract to the size of a standard HGV vehicle for the return journey.

15.5.24 Two escort vehicles are likely to be required to accompany each abnormal load which will result in a worst case of 512 additional vehicle movements. In practice this figure may be reduced where abnormal load vehicles approach the site in convoy and fewer than two escort vehicles per abnormal load are required.

15.5.25 Additionally, 32 HGV vehicle movements will be required for the delivery of turbine accessories and ancillary equipment. Table 15.17 indicates the number of vehicle movements that are expected for turbine delivery.

Table 15.17: Anticipated Vehicle Movements – Turbine Delivery				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Turbine Components	Abnormal Load Vehicle	17-22	256	52
	Escort Cars or Vans	17-22	512	102
Accessories and Ancillary Equipment	HGV	17-22	32	6
Overall			**800**	**160**

Crane Delivery

15.5.26 A large crawler or track mounted crane of approximately 1,000 tonne capacity will be required for turbine erection along with an additional 160 tonne pilot crane. The crawler crane will be transported in component form and assembled on site. This will require approximately 52 HGV movements to be undertaken prior to the commencement of turbine delivery. The pilot crane will be self-propelled although will constitute an abnormal load vehicle due to its weight.

15.5.27 Both cranes will remain on site for the duration of the turbine assembly phase and will also be used for the decommissioning of the old turbines. Table 15.18 indicates the number of vehicle movements associated with crane delivery.

Table 15.18: Anticipated Vehicle Movements – Crane Delivery				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Crawler Crane	HGV	17,22	52	26
Pilot Crane	Abnormal Load Vehicle**	17,22	2	1
Overall			**54**	**27**

****Self-propelled vehicle which will arrive in one month and depart in another**

Fuel Delivery

15.5.28 Fuel will require regular delivery to the site regularly throughout the construction period and is expected to total 8 movements. Table 15.19 indicates the number of vehicle movements associated with fuel delivery.

Table 15.19: Anticipated Vehicle Movements – Fuel Delivery				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Fuel Delivery	HGV Fuel Tanker	7-22	8	1

Construction Personnel and Staff

15.5.29 It is anticipated that an average of 40 staff will be required on site per day throughout the construction phase, months 3-22. For the purposes of this assessment the most recent available Scottish private vehicle occupancy rate[2] of 1.57 people per vehicle was used.

15.5.30 Assuming a 26 day working month, this is expected to result in a total of 13,240 vehicle trips for staff over the course of construction of the Development. Table 15.20 indicates the number of vehicle movements associated with staff.

Table 15.20: Anticipated Vehicle Movements – Staff				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Staff	Car or Minibus	3-22	21,184	1324

Summary

15.5.31 Table 15.21 provides a summary of all deliveries expected for the duration of construction of the Development.

Table 15.21: Anticipated Vehicle Movements – Summary				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Forestry				
Equipment Delivery/Removal	HGV Low Loader	1, 20	8*	4*
Forestry Keyholing	HGV Timber Wagon	3-7	2435	541
Forestry Clear Felling	HGV Timber Wagon	7-19	6755	541
Subtotal			**9198**	**541**
Site Mobilisation/Demobilisation				
On-site vehicles	Car/LGV**	7, 22	30	15
Construction Compound	HGV Low Loader	7, 22	120*	60*
Borrow Pit Equipment	HGV Low Loader	7, 22	168*	84*
Subtotal			318	159
Access Track Construction				
Plant Delivery	HGV Dump Truck	9, 17	16	8
	HGV Low Loader (Excavators/Rollers)	9, 17	8*	4*
Material Deliveries	HGV	10-16	28	4
Subtotal			**52**	**12**
Turbine Foundation Construction				
Concrete Delivery	Ready Mix HGV	13-17 (16 days)	2880	90 (daily)

Table 15.21: Anticipated Vehicle Movements – Summary				
Operation	**Vehicle Type**	**Operational Months**	**Total**	**Max Monthly**
Rebar Delivery	HGV	13-17	118	26 (monthly)
Subtotal			**2998**	
Turbine Decommissioning				
Turbine Removal	Abnormal Load Vehicle	15-18	220	72
	Escort Cars/Vans	15-18	440	144
	HGV	15-18	88	29
Removal of Other Equipment	HGV	15-18	100	34
Subtotal			**848**	**279**
Substation Construction				
Electrical Components and Switchgear Delivery	HGV	13-21	40	5
Transformer Delivery	Abnormal Load Vehicle	13-21	4	2
	Escort Car/Van	13-21	8	4
Subtotal			**54**	**11**
Electrical Cabling Delivery				
Electrical Cabling Delivery	HGV	14-21	48	6
Turbine Delivery				
Turbine Components	Abnormal Load Vehicle	17-22	256	52
	Escort Cars or Vans	17-22	512	102
Accessories and Ancillary Equipment	HGV	17-22	32	6
Overall			**800**	**160**
Crane Delivery				
Crawler Crane	HGV	17,22	52	26
Pilot Crane	Abnormal Load Vehicle**	17,22	2	1
Overall			**54**	**27**
Fuel Delivery				
Fuel Delivery	HGV Fuel Tanker	7-22	8	1
Staff and Construction Personnel				
Staff	Car or Minibus	7-22	21,184	1324
Total HGV and Abnormal Load Movements (excluding Concrete Delivery)			10,536	781
Total HGV Movements for Concrete Delivery (16 non-consecutive Days)			2880	90 (daily)
Total Car and Van Movements			22,174	1520
Overall Total			**35,590**	**2877**

***Includes transporter vehicle leaving and then returning to site following completion of access tracks**

****Self-propelled vehicles which arrive in one month and depart in another**

15.6 Assessment of Effects

Traffic Generation

15.6.1 A detailed breakdown of the distribution of vehicle movements in each month, and for each element of work, throughout the construction phase of the Development is included in Figure 15.3. The peak month of construction, from a traffic perspective, was identified and was used to predict the traffic increase on routes within the study area. A worst case scenario in which all predicted traffic passes each location within the study was assumed.

15.6.2 From inspection of the predicted traffic movements, the peak month for vehicle flows is expected to be month 17 where there will be 2,877 vehicle movements in total. This is comprised of 96 abnormal load movements, 685 HGV movements (excluding concrete delivery) and 1520 car or van movements.

15.6.3 In addition, concrete deliveries are scheduled to be undertaken during this month and will comprise 90 HGV movements per day over a maximum of 13 non-consecutive days (assuming a 26 day working month). This would result in a total of 1170 HGV movements associated with concrete delivery. In practice the number of concrete deliveries during this month can be expected to be significantly less as in total there will be only 16 non-consecutive days of concrete delivery distributed over a 5 month period.

15.6.4 Table 15.22 details the anticipated vehicle flow in the peak month on days with no concrete deliveries and the percentage increase above the predicted baseline at each point within the study.

Table 15.22: Predicted Average Daily Traffic – No Concrete Delivery

Location	Total Vehicles			HGV Only*		
	2020 Baseline	Peak Month	% Increase	2020 Baseline	Peak Month	% Increase
1 - A83 South of Kilchenzie	1897	1986	5	436	466	7
2 – A83 South of Low Ballevain	1722	1811	5	413	443	7
3 – Unnamed Road South of High Ballevain Farm	90	179	98	16	46	185

***For the purposes of this estimation abnormal load vehicles are included in HGV**

15.6.5 Table 15.23 details the anticipated vehicle flow in the peak month on days where concrete deliveries will take place, this will occur on a maximum of 13 non-consecutive days although is expected to be significantly less than this.

Table 15.23: Predicted Average Daily Traffic – During Concrete Delivery

Location	Total Vehicles			HGV Only*		
	2020 Baseline	Peak Month	% Increase	2020 Baseline	Peak Month	% Increase
1 - A83 South of Kilchenzie	1897	2076	9	436	556	28
2 – A83 South of Low Ballevain	1722	1900	10	413	533	29

Table 15.23: Predicted Average Daily Traffic – During Concrete Delivery						
Location	**Total Vehicles**			**HGV Only***		
	2020 Baseline	**Peak Month**	**% Increase**	**2020 Baseline**	**Peak Month**	**% Increase**
3 – Unnamed Road South of High Ballevain Farm	90	269	198	16	136	739

***For the purposes of this estimation abnormal load vehicles are included in HGV**

15.6.6 As detailed in paragraph 15.4.18 a screening exercise was undertaken in order to determine which routes warrant detailed assessment. Given that each route within the study contains a number of high sensitivity receptors (summarised in Table 15.9) the lower threshold of significance (10%) was used. Using this criteria and considering the percentage increases presented in Tables 15.22 and 15.23, it can be seen that there is a potential for effects in the following cases:

1. On the unnamed road between the A83 and the site entrance throughout construction of the Development as a result of both total traffic increase and HGV increase; and
2. On the A83 at both locations during concrete delivery days as a result of HGV increase.

15.6.7 The following subsections detail considerations for each of the above cases.

1 - Unnamed Road from A83 to Site Entrance

15.6.8 Total traffic on this route is predicted to increase by 98% during the peak month, with a 185% increase in HGV traffic. During concrete pouring days total traffic is predicted to increase by 269% and HGV traffic by 739%. Analysis of the overall construction programme, presented in Figure 15.3, indicates that the increase in traffic on this route is likely to be above the 10% threshold for the duration of construction of the Development.

15.6.9 This route provides the only access to a number of farms and residential properties. It is too narrow for two vehicles to safely pass on much of its length and has infrequent and informal passing places. It is therefore highly sensitive to changes in traffic flow and composition.

15.6.10 It is considered that there is a potential for a major adverse effect on receptors on this route as a result of increased traffic for the duration of construction of the Development, the significance of this effect is considered to be major and **significant.**

2 – A83 During Concrete Delivery as a Result of HGV Increase

15.6.11 HGV traffic on the A83 north and south of the unnamed road to site is predicted to increase by 29% and 28% respectively on concrete pouring days. Concrete pouring will occur on 16 non-consecutive days spread over a four month period, out with these 16 days the increase in HGV traffic is predicted to be a maximum of 7% for the remainder of the duration of construction.

15.6.12 It is worth noting that the predicted traffic level on the A83 during concrete pouring days of 2076 vehicles per day is significantly less that the theoretical capacity of the road as detailed in Table 15.7, 2400 vehicles per hour.

15.6.13 The number of days during which traffic will exceed the 10% threshold of significance is limited (16 non-consecutive days) and the upper 30% threshold will not be exceeded at any time. There is sufficient residual capacity on the road. It is therefore considered that the overall effect on receptors on the A83 will be negligible and that this effect will be minor and **not significant.**

Accidents and Safety

15.6.14 The road traffic collision assessment identified a number of collisions within the last five years within the vicinity of the development. None of these incidents involved a HGV or occurred at the site entrance or at the junction between the unnamed road and the A83. Two serious incidents were identified, both of which involved a single car leaving the carriageway and not colliding with another vehicle. No trends could be identified from the data. In the absence of any other identifiable factors, an increase in traffic flow or change in composition is not sufficient to affect a change in safe operation of the road network.

15.6.15 It is therefore considered that the temporary increase in overall traffic, and HGVs, for the duration of construction of the Development is not likely to result in an effect on accidents and safety. The effect on accidents and safety is considered to be negligible and **not significant.**

Driver Delay

15.6.16 The A83 is operating significantly below its theoretical capacity and is predicted to do so throughout the course of construction of the Development. The effect of a general increase in traffic on driver delay on this route is therefore considered to be negligible and **not significant.**

15.6.17 There is predicted to be a significant increase in traffic flow and HGV composition on the unnamed road between the A83 and the site entrance. Although this road is currently operating significantly below capacity, as it is narrow and has infrequent and informal passing places there is a potential for driver to delay to occur during periods of intensive delivery. It is therefore considered that the potential for driver delay to occur on this route is Moderate and due to the high sensitivity of receptors on this route the significance of this effect should be considered major and **significant.**

15.6.18 Some driver delay is expected to occur on routes due to the slow movement of abnormal load vehicles between Campbeltown Harbour and the site entrance. Abnormal load deliveries will be timed to avoid peak times and due to the short distance between Campbeltown Harbour and the junction to the unnamed road towards site the expected effect on driver delay is negligible and **not significant.**

Pedestrian Amenity

15.6.19 Pedestrian amenity, fear and intimidation can be affected by changes to traffic flow and composition. The unnamed road between the A83 and the site entrance does not have pedestrian footways and it is considered unlikely that there is any significant pedestrian traffic on this route. The effect of increased traffic on pedestrian amenity on this route is therefore considered to be negligible and **not significant.**

15.6.20 The A83 is a nationally significant trunk road with an existing high composition of HGV traffic (18% - 24%). It does not have pedestrian footways on most of its length except where it passes through settlements. The route passes directly by the front of Glenbarr and Rhunahaorine Primary Schools, however in both cases the schools do not have pedestrian footways connecting to them and it is considered unlikely that students would walk to school.

15.6.21 Traffic increase and HGV composition is only predicted to increase above the threshold of significance for 16 non-consecutive days throughout the duration of construction of the Development and at other times the increase will be negligible. It is considered that during concrete pours the effect of increased traffic and HGV composition may have a moderate effect on pedestrian amenity at the primary schools, and due to their high sensitivity this significance of this should be considered moderate and **significant.**

Severance

15.6.22 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The A83 passes through a number of settlements which have the potential to be affected by severance, however the A83 is a trunk road of national significance and the effect of construction traffic is short term and exceeds the threshold of significance for only 16 non-consecutive days over the duration of construction of the Development. It is therefore considered that the effect on severance is negligible and **not significant.**

Noise and Vibration

15.6.23 Ground-borne vibration resulting from heavy goods vehicle and turbine delivery vehicle movements is generally only likely to be significant where vehicles traverse discontinuities, such as rough surfaces (including pot-holes) or speed-humps.

15.6.24 The DMRB Volume II[3] identifies that there is no evidence that suggests traffic induced vibrations are a source of significant damage to buildings.

15.6.25 Airborne vibrations resulting from low frequency sound emitted by vehicle engines and exhausts can result in detectable vibrations in building elements such as windows and doors and cause disturbance to local people. However due to the short-term temporary nature of the increase in traffic movements, and the fact that the increase in traffic is predicted to be negligible for all but 16 days of construction, it is considered that the effect of vibration upon receptors along the route would be negligible and **not significant.**

Hazardous Loads

15.6.26 Fuel will be regularly transported to the site, although this will occur only eight times over the duration of construction of the Development. All fuel will be transported by suitably qualified contractors and all regulations for the transportation and storage of hazardous substances will be observed. No other hazardous substances are expected to be transported to site.

15.6.27 It is therefore considered that the effect of the transportation of hazardous substances is negligible and **not significant.**

Visual Effects

15.6.28 The movements of ALVs could be considered visually intrusive. This effect would be short-term and would only occur during the movement of abnormal loads. It is therefore considered the visual effect as a result of the ALVs upon receptors along the routes would be negligible and **not significant.**

Air Quality

15.6.29 Maintaining good local air quality is essential for the human health and overall quality of life for people living in the area. Road transport accounts for a significant proportion of emissions of a number of pollutants including carbon dioxide (CO2), nitrogen dioxide (NO2) and particulate matter (PM10). Nitrogen oxide emissions are also of concern for nearby vegetation and ecosystems.

15.6.30 The DMRB gives guidance on matters relating to air quality in Volume 11 Section 3 and advises that significant impacts to local air quality may be found in the following cases:

- Where the road alignment will change by 5 m or more; or
- daily traffic flows will change by 1,000 AADT or more; or
- Heavy Duty Vehicle flows will increase by 200 AADT or more; or
- daily average speed will change by 10 km/hr or more; or
- peak hour speed will change by 20 km/hr or more.

15.6.31 Given the assessment of the expected volume of construction traffic it is considered that none of the above criteria have been met or exceeded. It is therefore considered that the effect of the increase in traffic on local air quality would be negligible and **not significant**.

15.6.32 It should also be noted that due to the temporary nature of the increase in vehicles using the proposed access route, any effects on local air quality will be short term and reversible.

Cumulative Effects

15.6.33 Significant cumulative effects may occur during construction of the Development where this overlaps with construction of another nearby development. Proposed developments which have the potential to result in cumulative effects are:

- Auchadaduie (3 turbines);
- Beinn An Tuirc (Phase 3) (19 turbines); and
- Blary Hill (14 turbines).

15.6.34 Table 15.24 provides daily traffic generation figures that have been assumed for each of the identified developments. Exact traffic data is not available for the identified developments and in order to provide a reasonable assessment, it has been assumed that traffic generation for each project will be in proportion to that generated by the Tangy IV proposals (calculated pro-rata, per turbine). Traffic relating to the delivery of concrete during foundation pours has not been included as it is assumed that, given the relative impacts, these events will be timed to ensure they do not coincide. It is unlikely that the local capacity for concrete production could accommodate several pours coinciding in any case.

Table 15.24 Extrapolated Cumulative Peak Daily Traffic Generation

Site	Number of Turbines	HGV	LGV	Total
Tangy IV	16	30	59	89
Beinn An Tuirc (Phase 3)	19	36	70	106
Blary Hill	14	26	52	78
Auchadaduie	3	6	11	17

15.6.35 The traffic associated with the three identified cumulative developments will primarily be related to the import of materials. It is assumed that all traffic will utilise the A83 and will not therefore further affect the minor roads within the study area. This would only apply to the Tangy IV development.

15.6.36 As with assessment of the proposed development, 100% of all generated traffic has been applied to the survey locations to assess a worst case scenario. In reality a significant proportion of the traffic associated with the identified developments will arrive from the north and not feature within the study area for this assessment. The cumulative increases are summarised in Table 15.25.

Table 15.25: Cumulative Extrapolated Average Daily Traffic – No Concrete Delivery

Location	Total Vehicles			HGV Only*		
	2020 Baseline	Peak Month	% Increase	2020 Baseline	Peak Month	% Increase
1 - A83 South of Kilchenzie	1897	2187	15	436	534	22
2 – A83 South of Low Ballevain	1722	2012	17	413	511	24

***For the purposes of this estimation abnormal load vehicles are included in HGV**

15.6.37 It can be seen from Table 15.25 that the addition of all construction traffic on the A83 results in a maximum increase of 17% over existing flows. A maximum increase of 24% is predicted for HGV traffic.

15.6.38 Even based on the robust assumption of each development being simultaneously constructed and all traffic utilising the A83 within the study area, the increase in all traffic on the A83 is below the 30% threshold. The additional volume of traffic falls well below the predicted theoretical capacity of the A83 and therefore the road network is not anticipated to experience any operational issues.

15.6.39 The increase is marginally greater when considering just HGV traffic. The effect magnitude is still below the 30% threshold. The overall impact will be less than during the concrete delivery peak days of the proposed development.

15.6.40 All developments are consented and could potentially be completed prior to the commencement of Tangy IV in the proposed year of construction (2020). The likelihood of all wind farms being constructed at the same time very is low. Furthermore, the likelihood of 100% of all HGV traffic from the three identified sites travelling on the A83 within the study area is also very low. Given the potential scale of the cumulative effect, it is proposed that a routeing strategy in conjunction with the contractors TMP is provided along with construction schedule to Argyll and Bute Council prior to construction to ensure that any possible effects are reduced. There is sufficient residual capacity on the road. It is therefore considered that the overall effect on receptors on the A83 will be negligible and that this effect will be minor and **not significant**.

15.7 Mitigation

15.7.1 Three potentially significant effects were identified in Section 15.6. An outline Traffic Management Plan (TMP) has been prepared and is included in Appendix 15.2. This TMP provides detailed mitigation measures to address each of the identified significant effects, and general operation practices and policies relating to transport which are to be adopted for the duration of construction of the proposed development.

15.7.2 A summary and assessment of residual effects is provided for each significant effect below.

Effect of Traffic Generation on the Unnamed Road from A83 to Site Entrance

15.7.3 A major significant effect is predicted to occur as a result of traffic generation on this route. This route is narrow and has infrequent and informal passing places. The TMP provides detailed mitigation measures.

15.7.4 It is considered that following implementation of the mitigation measures detailed in TMP the residual effect of increased traffic on this route will be low and **not significant.**

Driver Delay on the Unnamed Road from A83 to Site Entrance

15.7.5 A major significant effect on driver delay is predicted to occur as a result of increased traffic on this route. Mitigation measures are provided in the TMP and are as the previous section. It is considered that following the implementation of these measures the residual effect on driver delay on this route will be low and **not significant.**

Pedestrian Amenity at Glenbarr and Rhunahaorine Primary Schools

15.7.6 A moderate and significant effect on pedestrian amenity is predicted to occur during concrete pouring days as a result of increased traffic and HGV composition at these schools. The TMP provides detailed mitigation measures as follows:

- The applicant and the appointed contractor will provide written notice to these schools in advance of concrete pouring days and indicate that there is a potential for an effect on pedestrian amenity; and

- The applicant and their appointed contractor shall consult with these schools to identify any specific mitigation measures which might be adopted on concrete pouring days. Given the location of each of these schools on the A83, and their small size, it is reasonably possible that no staff or students walk to school. If is established that this is the case then no mitigation measures are likely to be required.

15.7.7 It is also possible that some or all concrete pouring days may occur during school holidays, in which case mitigation will not be required.

15.7.8 It is considered that following implementation of the above measures the residual effect of increased traffic on pedestrian amenity will be low and **not significant.**

Additional Good Practice

15.7.9 Additional good practice measures are detailed in the TMP included in Appendix 15.2.

15.8 Summary

15.8.1 The environmental effects as a result of traffic generated during the construction phase of the Development are predicted, following implementation of the outlined mitigation measures, to result in **no significant residual effects** in the context of the EIA regulations.

15.9 References

[1] Department for Transport (2013) - Design Manual for Roads and Bridges, Chapter 3, Volume 15, Section 1, Part 5
[2] The Scottish Government (2011) – High Level Summary of Statistics Trend, Car Occupancy – Available at http://www.gov.scot/Topics/Statistics/Browse/Transport-Travel/TrendCarOccupancy [Accessed 13/06/2018]
[3] The Design Manual for Roads and Bridges Volume II, Section 3 Annex 5 'Research into Traffic Noise and Vibration'.

16. LAND USE, SOCIO-ECONOMICS AND RECREATION

Executive Summary

This chapter considers potential effects on land use, socio-economic activity, tourism and recreation during construction and operation of the proposed development.

The land within the site application boundary is predominantly upland grazing and energy generation with commercial forestry. The southern section of the site is already used for wind power generation (Tangy I and II Wind Farm), with 22 operational turbines.

The proposed development will alter the existing land use, with some permanent (approximately 13.74 ha) and some additional temporary (15.98 ha) land take to accommodate the turbines, associated structures and access tracks.

The coniferous plantation woodland on the site will be felled to enable the proposed development. Replanting of to a keyhole design will take place following the construction phase.

Renewable energy brings competitive advantages and opportunities for economic development within Argyll and Bute. This is particularly important for Campbeltown, one of the most fragile economies in Scotland. Both the Campbeltown Community Action Plan and the West Kintyre Community Action Plan identify income from renewable energy as an important source of income for economic regeneration. Argyll and Bute Council also recognises onshore wind farm development as an opportunity to create employment and attract investment.

The applicant is committed to using local contractors and services where possible and has been operating an 'Open for Business' site since 2012. The site provides a platform which allows local suppliers to apply for opportunities provided by the applicant and other companies in the supply chain.

It is estimated that awarded contracts during construction of the wind farm could equate to £120 million. The associated potential for direct benefit and induced employment creation is expected to create **moderate and significant beneficial effects** at a local scale in Kintyre.

The potential tourism effects of the proposed development have been considered in detail with reference to the most recent and robust evidence available on the potential impact of wind farms on tourism, including a report by BiGGAR Economics undertaken in 2017. None of this suggests that wind farms are likely to have a significant detrimental effect on tourism.

16.1 Introduction

16.1.1 This chapter considers the potential effects on land use, socio-economics and recreational use associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

16.1.2 The socio-economics assessment has been carried out by BiGGAR Economics. There are no recognised standards, guidelines or methodologies for assessing wind farm effects on land use, socio-economics and recreation for the purposes of an EIA. Therefore, the assessment has been based on professional judgement, and industry publications such as a report undertaken by BiGGAR Economics on behalf of RenewableUK (RenewableUK, 2015). Inputs on forestry have been provided by Neil McKay Forestry Consultant Ltd. The key guidelines in assessing the forest implications are the Scottish Government's Control of Woodland Removal Policy and the UK Forestry Standard, the governments' approach to sustainable forestry.

16.1.3 Effects on landscape and visual amenity are addressed in Chapter 8: Landscape and Visual Impact.

16.1.4 This chapter is supported by:

- Appendix 16.1: Long Term Forest Plan;

16.1.5 Figures 16.1 – 16.2 are referenced in the text, where relevant.

16.2 Scope of Assessment

Project Interactions

16.2.1 It is expected that the proposed development will result in a partial change to land use, generate economic activity and employment in the area. Potential effects on tourism and recreation assets, are also considered.

Study Area

16.2.2 The assessment in this chapter covers three key topics and accordingly the study area for each individual aspect has been defined based on the nature of the potential effects arising from the proposed developments:

- The study area for the land use assessment covers the area within the site application boundary where direct and indirect effects on land use may occur.
- The study areas for the socio-economic assessment are as follows:
  - the local area (Kintyre Peninsula) – defined by Scottish data zones of the Kintyre Peninsula, S02001380 and S02001379;
  - the local authority area (Argyll and Bute); and
  - the national area (Scotland).
- The study area for the recreational assessment includes both the area within and up to 2 km from the site application boundary.

Scoping and Consultation

16.2.3 Relevant consultee, their responses and how their responses have been addressed are summarised in Table 16.1: Consultation Responses

16.2.4 Full details on the consultation responses can be reviewed in Appendix 7.1: Register of Scoping Responses.

Table 16.1: Consultation Responses

Consultee and Date	**Summary of Response**	**Comment/Action Taken**
Argyll and Bute Council – 4th July 2017	• Consider the net economic impact. • Public access on long distance walking and cycling routes and scenic routes. • Consider impacts on tourism and recreation. • Consider opportunities for energy storage.	• Net economic impact considered in Socio-economic effects – see Table 16.15. • Public access considered in Effects on Tourism/Recreation Assets - see Table 16.16. • Tourism and recreation impacts considered - see Table 16.16. • Noted.
Forestry Commission Scotland – 24th May 2017	• Advised to prepare a Long-Term Forest Plan. • Consider scope to reduce felling. • Any felling/compensatory planting to comply with UK Forestry Standard.	• Long Term Forest Plan prepared. Felling and replanting proposals are illustrated in Figure 16.1 and Figure 16.2. • Felling proposals/land use change and compliance with policy. addressed at paragraph 16.3.11, 16.4.1 and Table 16.6.
West Kintyre Community Council – 25th May 2017	• Robust assessment undertaken incorporating views of Mountaineering Scotland and the Ramblers Association.	• Literature review in Effects on Tourism/Recreation Assets from paragraph 16.5.49 – 16.5.73.

Effects to be Assessed

16.2.5 The following key effects were identified for consideration in this assessment:

- direct and indirect effects during development and construction on employment and economic activity;
- direct and indirect effects during operation on employment and economic activity;
- direct and indirect effects during construction and operation on forest management activity;
- the direct effects of the community benefit schemes, once the proposed development is operational;
- the contribution of Non-Domestic Rates (a tax which is paid on non-domestic property);
- direct and indirect effects on tourism and recreation assets during operation; and
- direct and indirect effects on tourism accommodation during operation.

Effects Scoped Out of Assessment

16.2.6 Effects arising from the process of decommissioning have been scoped out since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. However, the results of decommissioning (i.e. the removal of the wind farm) are taken into account in assessing ongoing and operational effects where appropriate.

16.3 Methodology

Overview

Assessment of Economic Effects

16.3.1 As noted, there are no recognised standards, guidelines or methodologies for assessing the effects of windfarms on socio-economics, tourism and recreation for the purposes of an EIA. Therefore, to identify and assess the significance of predicted economic effects, the assessment has been based on professional judgement of the degree of change resulting from the proposals, using methods commonly used in EIAs for proposed renewable energy developments, as outlined in Table 16.2.

16.3.2 Assessment of economic effects was undertaken using a model that has been developed by BiGGAR Economics specifically to estimate the economic effects of windfarm developments. This model was also the basis of an assessment of the economic effects of the UK onshore wind sector for the then Department of Energy and Climate Change (DECC) and RenewableUK in 2012 ((Department of Energy and Climate Change, RenewableUK, 2012)), which was subsequently updated in 2015 ((RenewableUK, 2015)). These assessments were based on case studies of the local, regional and national economic effects of wind farms that have been developed in the UK in recent years.

16.3.3 This approach is now considered industry best practice in the assessment of the economic effects of the onshore wind sector, having been used in reports for the DECC and RenewableUK. This model has been used by BiGGAR Economics to assess the economic effects of numerous windfarms across the UK and the results have been accepted as robust by reporters appointed by Scottish Ministers, at several public inquiries.

16.3.4 To estimate the economic effects that could result from construction and operation, data on the scale of the work, such as the size and capacity of the wind turbines, grid connections, sub-stations etc., was estimated based on industry averages and then adapted to the circumstances of this proposed development.

16.3.5 The starting point for estimating the likely economic activity supported by the proposed development was to consider the level of expenditure during the construction and operational phase. The next step was to break this expenditure down to its main components and make reasonable assumptions about what would be expected to accrue to the main contractors and sub-contractors.

16.3.6 These assumptions were based on two main sources. The first was the analysis undertaken in the 2015 report on behalf of RenewableUK, which draws on the experience of what happened in developments elsewhere in the UK. This report examined the size and location of contracts for the development, construction, and operation and maintenance of existing windfarms. The second source was a bespoke analysis of the economies of the relevant study areas, specifically undertaken for this assessment. This was based on analysis of local and national statistics.

16.3.7 Applying these assumptions to the initial expenditure provided an estimate of the amount of each component contract that could be secured by companies in Kintyre, Argyll and Bute and Scotland. There are two sources of economic activity: the first arising from each of the component contracts and the jobs they support; the second is from the anticipated spending in the relevant study areas of people employed in these contracts (the income effect).

16.3.8 In addition, the following effect have also been assessed:

- Public finances – the proposed development will have an effect on Scotland's public finances due to the Non-Domestic Rates (NDRs) generated for the Government; and
- Community fund – the proposed development will be expected to have an effect on the community through a community benefit fund (Scottish Government is currently undertaking formal consultation on community benefits).

Evidence Base of Wind Farms and Tourism

16.3.9 As both Renewable energy and tourism are important sectors in the Scottish economy, which are sometimes thought to be in conflict, the link between wind energy developments and tourism in Scotland has been reviewed, informed by the following reports:

- Wind Farms and Tourism Trends, BiGGAR Economics (BiGGAR Economics, 2017);
- The Economic Impacts of Wind Farms on Scottish Tourism (Glasgow Caledonian University/Moffat Centre, 2008);
- A Report on the achievability of the Scottish Government's renewable energy targets (Scottish Parliament Economy, Energy and Tourism Committee, 2012);
- Wind Farms and Changing Mountaineering Behaviour in Scotland, Mountaineering Council of Scotland (Mountaineering Scotland, 2014); and
- Wind Farms and Mountaineering Behaviour in Scotland, Mountaineering Council of Scotland (Mountaineering Scotland, 2016).

Analysis of Tourism and Recreation Assets in the Region

16.3.10 An overview of the tourism and recreation assets is provided in the tourism context section, and the potential effect of the proposed development was considered by assessing the potential effects on local tourism and recreation assets based on the significance criteria in Table 16.2: Significance Criteria. The potential effect on accommodation providers in the area was assessed using the same method.

Assessment of Land Use Change (Forestry)

16.3.11 The three forest units occupying ground within the proposed development site are at the "restructuring" stage in the forest cycle, when the tree crops have reached a stage where they are ready for felling and replanting. Forest Enterprise Scotland has commenced felling and replanting areas within the proposed development boundary to an approved Land Management Plan; this plan incorporates the felling and replanting requirements for the proposed development within the redline boundary. One of the private forests has an approved Forest Plan but has not commenced the felling programme and the other private owner has not made any separate Forest Plans at this stage, although the woodland has suffered significant wind throw.

16.3.12 "Restructuring" in the management of forests is seen as the opportunity to redesign woodland, planted some forty years previously to current environmental standards.

16.3.13 The proposed Tangy Wind Farm Long Term Forest Plan (LTFP) provides the forest growing stock data using sub compartment information provided by the forest managers, where available, supplemented with aerial photography and LiDAR data as well as site survey. The LTFP follows the guidelines incorporated within the UK Forest Standard, with greater emphasis given to designed open ground and non-productive areas including the restoration of peatland where the current timber yield is low (below Yield Class 8) and on peat (where peat depth is greater than 50 cm). The area to be occupied by wind farm infrastructure and associated unplanted areas is identified and in accordance with the Control of Woodland Removal Policy has been accepted as requiring a matched area of planting off site by the applicant. The applicant currently owns a plot of land exceeding this area to the west of Campbeltown with the intention of meeting the compensatory planting commitments.

16.3.14 The LTFP therefore records the current forest position and a replanted design adopting current environmental standards and accommodating the requirements of renewable energy generation. The loss of woodland area on site will be matched off site as Compensatory Planting.

Method of Baseline Characterisation

Desk Surveys

16.3.15 To understand the baseline conditions for the assessment of effects on socio-economic, tourism and recreation the following has been undertaken;

- a review of national, regional and local economic strategies;
- an analysis of socio-economic statistics for the relevant study areas;
- an analysis of tourism statistics in the relevant study areas; and
- identification of local tourism and recreation assets, and accommodation providers.

Field Survey Techniques

16.3.16 No field survey was considered necessary as part of the socio-economic and tourism assessment.

Effects Evaluation Methodology

Impact Significance

16.3.17 The significance of the change has been assessed using the economic model described above which considers the local, regional and national economic effects that will be generated by the proposed development.

16.3.18 The significance of the effects on tourism and recreation assets was assessed with reference to the evidence from previous research on the effect of wind farms on tourism, and experience from similar existing and proposed developments elsewhere.

16.3.19 The significance criteria outlined in Table 16.2: Significance Criteria would also be used to assess cumulative effects. Moderate and major effects would be considered to be significant in the context of the EIA Regulations, whereas minor and negligible effects would not be considered significant in the context of the EIA Regulations.

Table 16.2: Significance Criteria

Effect	Description
Major	Major loss/improvement to key elements/features of the baselines conditions such that post development character/composition of baseline condition will be fundamentally changed. For example, a major long-term alteration of socio-economic conditions, a major reduction/improvement of recreational assets, or a substantial change to tourism spend.
Moderate	Loss/improvement to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline condition will be materially changed. For example, a moderate long-term alteration of socio-economic conditions, a moderate reduction/improvement in the recreational asset, or a moderate change to tourism spend.
Minor	Changes arising from the alteration will be detectable but not material; the underlying composition of the baseline condition will be similar to the pre-development situation. For example, a small alteration of the socio-economic conditions, a small reduction/improvement in the recreational asset, or a small change in tourism spend.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a “no change” situation.

Limitations of Assessment

16.3.20 The assessment is based on the experience of comparable developments elsewhere and a review of the local socio-economic context. In order to maximise the economic effects associated with the proposed development, it will be necessary for local contractors to engage with the opportunities that arise, which can be aided by the applicant, increasing awareness of these opportunities.

16.4 Baseline Conditions

Land Use

16.4.1 The site application boundary, which also defines the land use study area boundary, is shown on Figure 16.1. The study area is predominantly managed commercial forestry with the existing Tangy I and II Wind Farm located to the south. There are also areas of managed agricultural grazing land within the site application boundary.

16.4.2 The southern section of the site is already used for wind power generation (Tangy I and II Wind Farm), with 22 turbines. The first 15 turbines were erected in 2002 (Tangy I Wind Farm), and the site was extended in 2011 (Tangy II Wind Farm). The nearest villages to the site are Bellochantuy (approximately 2.8 km north-west of the site), West Darlochan (approximately 4 km south of the site) and Kilchenzie (approximately 3.1 km south of the site). Campbeltown is the largest town in the Kintyre peninsula and is located approximately 9 km to the south-east of the site.

16.4.3 The existing site is accessed via the A83, Tangy Mill Road and an access track that serves the Tangy I and II Wind Farm and numerous properties. The A83 is a strategic route for the peninsula, connecting Campbeltown with Tarbet, linking both mainland and island communities with Argyll and Bute and the larger populated areas of the Central Belt.

16.4.4 There are no residential properties within the site application boundary.

16.4.5 The forests within the study area are under three separate ownerships and management, two units are privately owned by different parties. The third central section is National Forest Estate managed by Forest Enterprise Scotland (FES). All are established productive conifer forests typical of traditional upland plantations in the west of Scotland. The overriding influence on the forests performance and character is its coastal location affected by a mild wet but very windy climate on generally waterlogged soils. Forest rotation length is largely determined by terminal height and the onset of windthrow.

16.4.6 The family owned Lagalgarve forest is the most westerly and extends to the lower slopes. This presents some earlier established plantations which are now over-mature and have significant sections of windthrow. No felling or replanting has taken place in this area to date and no stand-alone Forest Plan has been drawn up.

16.4.7 Forest Enterprise Scotland manages the state-owned section which forms part of the West Lussa Forest. Within this forest there has been felling and restocking under a Land Management Plan (LMP) 2018-2027 (Forestry Commission Scotland, 2017). The LMP has made provision within the felling and replanting plans for the proposed development. Part of the study area within the proposed development area has been felled and replanted with further areas planned for felling imminently.

16.4.8 Tangy Forest is managed by a forest investment company and at present is entering into the timber production phase. Some windthrow is already present. Tangy Forest has an approved Long-Term Forest Plan (Case No: 4886194) dated August 2013; no felling has taken place to date. Data is provided by the land owners or their managers where available. Additional information is drawn from LiDAR and aerial photography and ground survey.

16.4.9 Lagalgarve forest was planted in two stages in 1975 and 1988, other than burnside open space with some broadleaves the species composition is predominantly Sitka spruce with some Lodgepole pine. Within the West Lussa Forest the area of proposed development was planted in the mid 1970's. Some felling and restocking has taken place in the north, replanted in 2010, and the east, replanted in 2014. The predominant species is Sitka spruce. Lodgepole pine was planted on the deeper peat areas in 1975. Replanting in 2010 is recorded as Sitka spruce and the 2014 records show Sitka spruce and Norway spruce. There is no broadleaved element within this section and there are no ancient or semi natural woodlands recorded. The entire Tangy Forest was planted in 1986 with Sitka spruce and a component of only 0.5% broadleaf species. There are no ancient or semi-natural nor Plantations on Ancient Woodland Sites (PAWS) within the proposed development area.

16.4.10 Tree growth is variable with the highest performance within Lagalgarve Forest but consequently suffering from wind throw with low growth rates on some areas of deep peat. Yield Class ranges from below YC8 to YC 22. The average for the area is YC 14-16.

Timber Harvesting and Marketing.

16.4.11 Almost all timber within the areas to be felled is of a marketable size and quality; a proportion of sawlogs will be produced from the larger material while the small roundwood is currently in demand by other end users.

16.4.12 This part of the west of Scotland is designated as a 'pest-free area' in relation to the great spruce bark beetle (*Dendroctonus micans*) out of which wood and bark can be moved without treatment under the EU plant passport regime. The current position from the Kintyre peninsula relies on the ability to transport roundwood by sea. Current small roundwood market options therefore include Ireland, the rest of the UK and over recent years to Scandinavia. The Scottish log market includes Ridings sawmill at Cardross and the extensively developed BSW Timber K2 sawmill at Kilmallie, Corpach near Fort William. Timber transport from these forests make use of the upgraded pier facilities at Campbeltown, which by merit of catering for larger vessels with deeper draughts, is the best timber handling facility available, on the west coast of Scotland.

Socio-Economic Context

Scotland's Economic Strategy

16.4.13 In March 2015, the Scottish Government published its economic strategy with the two main purposes of increasing competitiveness and tackling inequality. The Scottish Government has outlined four main priorities to achieve these aims:

- investing in Scotland's people, infrastructure and assets;
- promoting inclusive growth, which creates opportunity through a fair and inclusive jobs market, and regional cohesion to provide economic opportunities across all of Scotland;
- fostering a culture of innovation, which is open to change and new ways of doing things; and
- enabling Scotland to take advantage of international opportunities.

Energy in Scotland

16.4.14 In 2015, 59% of all electricity in Scotland was generated renewably, with a target of producing 100% from renewable sources by 2020 (Scottish Governemnt, 2017).

16.4.15 Additionally, the Scottish Government has emphasised the importance of communities benefitting from renewable energy generation, including through community benefit funds and shared ownership.

Argyll and Bute Council's Economic Development Action Plan – 2013 to 2018

16.4.16 The Economic Development Action Plan sets out how the council will focus its resources most effectively to generate sustainable economic growth. In particular, the plan highlights the importance of Argyll and Bute's 'abundance of sustainable economic assets especially in terms of renewable energy, quality food and drink and tourism'.

16.4.17 The Plan centres around four main concepts, making Argyll and Bute Competitive, Connected, Collaborative, and Compelling. It also lists notable development priorities, which include:

- unlocking the potential of renewable energy assets;
- regenerating main towns, and smaller rural and island communities;
- working with key industries, including renewables, tourism and food; and
- attracting economically active individuals and families.

16.4.18 The Plan also highlights factors of competitive advantage unique to the area, and able to secure Scotland's long-term economic growth. These are discussed in relation to four larger areas within the Local Authority area, including Mid-Argyll, Kintyre and the Islands. Important factors include:

- renewable energy resources and a record of innovation in renewables – in particular the Machrihanish Airbase, which is now home to CS Wind, a wind turbine tower manufacturing facility;
- key infrastructure, such as Campbeltown's harbour and airport – these can open up the Irish Sea for offshore renewable investment;
- sustainable economic assets – such as the distilleries of Campbeltown;
- a unique heritage, provenance and authenticity – such as Dunadd and Kilmartin Glen; and
- proximity to the Central Belt, which is ideal for supply electricity to urban areas (Argyll and Bute Council, 2012).

Argyll and Bute Strategic Economic Development Action Plan, 2016/21

16.4.19 Argyll and Bute Strategic Economic Development Action Plan sets out the area's priorities, with particular regard to infrastructure. It focuses on the investments necessary to address issues raised during a set of consultation workshops. The plans bring Argyll and Bute's framework in line with the Scottish Government's, and addresses issues such as improving the digital network, improving transport links, supporting entrepreneurship and the economy, and making Argyll and Bute an all year-round tourism destination (Argyll and Bute Council, 2015).

Campbeltown Community Action Plan

16.4.20 The Campbeltown Community Action Plan was prepared by the South Kintyre Development Trust and covers 2012 – 2017 (South Kintyre Community Development Trust, 2011). The Action Plan describes the town as it was in 2012 and describes that Campbeltown has been identified as an 'area of employment deficit' by Highlands and Islands Enterprise. The area has suffered due to the closure of major employers in the area, such as the RAF at Machrihanish, shipbuilding companies and the clothing manufacturer Jaeger.

16.4.21 The main strategies and priorities to improve the situation in Campbeltown are highlighted in the Action Plan. These are:

- town and waterfront regeneration;
- developing cultural and recreational assets;
- improving access into and within South Kintyre;
- education, training and jobs;
- learning, skills and well-being;
- service delivery and organisation; and
- housing, infrastructure and renewable energy.

16.4.22 The strategy and priority of education, training and jobs is one that is most important when considering the town's classification as an area of employment deficit. The Action Plan highlights that jobs and training opportunities need to be linked to the assets and strengths of South Kintyre and lists renewable energy as one of these strengths. The actions to address the housing, infrastructure and renewable energy strategy include using income from renewable energy to support other aspects of the community.

16.4.23 The recognition of Kintyre's growing renewables industry has driven infrastructure improvement projects within Campbeltown, led by the Kintyre Renewables Hub and Argyll and Bute Council's programme for regeneration and economic development (CHORD). Improvement works include road re-design and pier upgrades to facilitate access for the transportation of component parts between Wind Towers and the harbour.

West Kintyre Community Action Plan 2017-2023

16.4.24 The West Kintyre Community Action Plan (West Kintyre Community Council, 2017) sets out the priorities for West Kintyre, as described by members of the community, which fall under four categories:

- Health and wellbeing;
- Communications and transport;
- Young people and families; and
- Development and enterprise.

16.4.25 Particularly important to local people were the idea of setting a community run bus service, encouraging local groups to advertise events, attracting young people and developing local infrastructure. This includes supporting further development of the Kintyre Way and encouraging wind farms to open tracks and paths to the interior.

16.4.26 The Windfarm Trust is mentioned several times as an important partner, funding solar panels and energy efficiency measures for local village/church halls as well as repairs of damage caused by flooding.

Population

16.4.27 The population of the local area (as defined by data zones S02001380 and S02001379 of the Kintyre Peninsula) is about 7,600 and comprises 8.7% of the population of Argyll and Bute, which is 87,130, as shown in Table 16.3: Population of Study Areas. Campbeltown is the fourth largest settlement in Argyll and Bute with 4,701 inhabitants. The population is older in the local area, with 27.0% of the population older over 65, than both Argyll and Bute (24.7%), and Scotland (18.5%). The working age population is also comparably smaller, with 57.6% of the population aged 16-64, compared to 60.1% in Argyll and Bute, and 64.6% in Scotland.

16.4.28 Although detailed projections are not available for the local area it is expected that the population of Argyll and Bute will decrease by 8.0% between 2014 and 2039, compared to population growth of 6.6% in Scotland.

Table 16.3: Population of Study Areas

	Local Area	**Local Authority Area**	**Scotland**
Population	7,591	87,130	5,404,700
Under 16	15.4%	15.2%	16.9%
16 – 64	57.6%	60.1%	64.6%
65+	27.0%	24.7%	18.5%
Expected Population Growth (2014-2039)	-	-8.0%	6.6%

Source: Scottish Neighbourhood Statistics, 2016. National Records Scotland (2017), Population Projections for Scottish Areas (2014-based).

Jobs and Employment

16.4.29 The proportion of Argyll and Bute's working age population who are economically active is 79.1%, higher than the 77.3% in Scotland (if Argyll and Bute had the same rate as Scotland, there would be about 900 fewer economically active people). The unemployment rate in Argyll and Bute is 1.9%, which is lower than the 4.4% rate in Scotland. The claimant count is 1.7% in Argyll and Bute, compared to 2.3% in Scotland. However, the median annual income in Argyll and Bute is £25,554, compared to £28,371 in Scotland, a difference of £2,800.

Table 16.4: Economic Indicators			
	Local Area	**Local Authority Area**	**Scotland**
Economic Activity Rate*	-	79.1%	77.3%
Unemployment Rate*	-	1.9%	4.4%
Claimant Count (% of working age)	-	1.7%	2.3%
Average Annual Income***	-	25,554	28,371

Source: *ONS (2018), Annual Population Survey, Oct 2016 – Sep 2017. **ONS (2018), Claimant Count, December 2017 ***ONS (2018), Annual Survey of Hours and Earnings, 2017.

16.4.30 The main industries of employment in the study areas are shown in Table 16.5: Industrial Structure. The combined employment of public administration and defence, education and health (sectors which represent the public sector) is 35.1% in the local area, higher than in Argyll and Bute (32.1%) and Scotland (29.1%). Public administration and defence is 10.2% of the economy, compared to 6.0% in Scotland and 9.0% in Argyll and Bute.

16.4.31 Accommodation and food services, as well as retail, represent proportionally lower employment, with 7.4% and 8.7% of employment respectively than in Argyll and Bute, and Scotland. In Argyll and Bute, they represent 15.4% and 9.0%, and in Scotland they represent 7.3% and 9.0%. Jobs in these industries are typically associated with the tourism industry.

16.4.32 The local area has a larger proportion of jobs in transport and storage (8.2%) and wholesale trade (7.2%) than in Argyll and Bute (5.1% and 2.1%) and Scotland (4.2% and 3.0%). The Kintyre peninsula is located on the West Coast, with an airport and recently expanded harbour.

16.4.33 Manufacturing is an important component of the local area's economy accounting for 9.8% of employment, higher than 4.5% in Argyll and Bute, and 7.0% in Scotland. Much of this employment is in CS Wind, which manufactures towers for wind turbines at its facility at Machrihanish.

Table 16.5: Industrial Structure			
	Local Area	**Local Authority Area**	**Scotland**
Agriculture & Forestry	2.0%	2.3%	2.9%
Mining and Quarrying	0.3%	0.4%	1.2%
Manufacturing	9.8%	4.5%	7.0%
Electricity, gas, steam and air conditioning	1.1%	0.8%	0.7%
Water supply, sewerage, waste	0.3%	0.3%	0.7%
Construction	3.8%	5.8%	5.4%
Trade in motor vehicles	1.0%	1.5%	1.9%
Wholesale trade	7.2%	2.1%	3.0%
Retail trade	8.7%	9.0%	9.0%
Transportation and storage	8.2%	5.1%	4.2%
Accommodation and food services	7.4%	15.4%	7.3%
Information and communication	1.1%	1.0%	2.9%
Financial and insurance activities	1.0%	0.6%	3.3%
Real estate activities	1.6%	1.8%	1.5%
Professional, scientific and technical services	4.3%	4.5%	6.9%

Table 16.5: Industrial Structure			
Administrative and support services	1.6%	7.7%	7.3%
Public administration and defence	10.2%	9.0%	6.0%
Education	9.8%	7.7%	7.3%
Human health and social work	15.1	15.4%	15.9%
Art, entertainment and recreation	4.1%	3.8%	3.1%
Other service activities	2.1%	2.1%	2.1%
Total	3,050	39,000	2,588,000

ONS (2017), Business Register and Employment Survey 2016

Tourism and Recreation

Tourism Economy

16.4.34 In 2016, there were 14.4 million trips to Scotland, of which 38% are from Scotland, 43% are from elsewhere in the UK, and 19% are from overseas. Overseas tourism spend was £1.85 billion.

16.4.35 There was a total of 1.8 million tourist trips in Argyll, Loch Lomond, Stirling and the Trossachs in 2016, of which 50% were from Scotland, 33% are from elsewhere in the UK, and 17% are from overseas. Total overseas expenditure was £94 million.

16.4.36 Within Argyll and Bute in 2015, the total sustainable tourism employment was 6,500, and in 2014 Gross Value Added (GVA) within the sustainable tourism sector was £126.7 million (VisitScotland, 2017).

Local Attractions

16.4.37 VisitScotland and Explore Argyll list things to do in Argyll and The Isles and identify key local attractions that are located within approximately 10 km of the site application boundary (VisitScotland, 2018) (Explore Argyll and the Isles, 2018) (Explore Kintyre, 2018). These include festivals such as:

- Mull of Kintyre Music Festival – this occurs annually in August;
- Kintyre Songwriters Festival;
- Gintyre;
- Kintyre Way Ultra – a 35-mile ultra-marathon/73-mile cycling event (Kintyre Way Ultra Website, 2018); and
- Scottish One Act Festival.

16.4.38 They also include attractions in Campbeltown such as:

- Campbeltown Heritage Centre – this museum is open all year;
- Campbeltown distilleries – three of which are open to the public;
- Campbeltown Cross – this is a medieval cross situated in Campbeltown;
- Campbeltown Museum;

16.4.39 They also include attractions on the west coast of Kintyre such as:

- West Port beach;
- Glenbarr Abbey Macalister Clan Visitor Centre;
- Glenbarr Garden Centre;
- Machrihanish Golf Club and Machrihanish Dunes Golf Club;
- Anne Stewart Knitwear – a shop specialising in traditional west coast of Scotland hand knitting.

16.4.40 They also include long distance routes such as;

- the Caledonia Way; and
- the Kintyre Way – including the Kintyre Ultra, an ultra-marathon that follows the Kintyre Way from Tayinloan to Campbeltown, which emphasises the challenging, varied terrain, and 'stunning scenery with views across the sea to Arran, Islay, Jura and Gigha' (Kintyre Way Ultra, 2018).

16.4.41 There are two golf courses located amongst the sand dunes to the south-west of the application boundary: Machrihanish Golf Club and Machrihanish Dunes Golf Club. The Machrihanish Golf Club was established in 1876 whilst the Machrihanish Dunes Golf Club opened in 2009. Both courses are popular destinations for golfers from all over the world and are frequently included in the top 100 courses list in the UK and Ireland.

16.4.42 Westport beach is located off the A83, approximately 2.3 km south-west of the site and is popular with walkers and surfers in the local area (Explore Argyll and the Isles, 2018).

16.4.43 There are three operational distilleries in Campbeltown (Springbank, Glengyle and Glen Scotia). Campbeltown is classified as one of the whisky producing regions of Scotland, along with regions such as Speyside and Islay.

16.4.44 The Caledonia Way is a recently completed 381 km cycle route from Campbeltown to Inverness. The first of the three legs is between Campbeltown and Oban, and provides an opportunity to explore the Kintyre Peninsula as well as Lorn and Knapdale. According to the Sustrans website '...there are fantastic views of the islands of Jura and Arran, with pretty harbours, castles, abbeys and ancient stones to explore' (Sustrans, 2018).

16.4.45 The Kintyre Way is a popular local attraction for walkers and also provides access to important cultural heritage assets such as Saddell Abbey, Tarbert Castle and Skipness Castle, as well as the lighthouse at the Mull of Kintyre (Kintyre Way, 2018). A 2015 emergency funding proposal from Mid Argyll, Kintyre and the Islands Area Committee claims that 2,500 visitors walk the Kintyre Way each year, which is estimated to bring £1 million into the local economy (Mid Argyll, Kintyre and the Islands Area Committee, 2015).

16.4.46 The section of the Kintyre Way between Tayinloan and Carradale passes through the operational Deucheran Hill Wind Farm. When describing this section of the route, the Kintyre Way website states, this '...is a very varied and satisfying walk which even takes you through the Deucheran Wind Farm letting you see the turbines working' (Kintyre Way, 2018). Further information on the Kintyre Way as a recreational facility is provided below in the section covering walking, cycling and horse riding.

16.4.47 The recreational value of the site itself is limited. According to the West Lussa forest LMP: '*Recreational activity is limited within the forest with few formal recreation sites*' and '*Local Tourism businesses linked to the forest are limited'* with much of this business is related to the Kintyre Way, which '*mainly follows the forest road network from Guesdale in the north to Gobagrennan*'. Tangy Long-Term Forest Plan agrees that "the area has very limited recreational activity."

Accommodation

16.4.48 The nearest accommodation to the proposed development is Dalnaspidal Guest House, which includes a self-catering cottage. The guest house is approximately 900m to the south of the site.

16.4.49 Accommodation facilities identified at Campbeltown include six hotels, one hostel, four bed and breakfasts and fourteen self-catering facilities (VisitScotland, 2018) (Explore Argyll and the Isles, 2018) (Explore Kintyre, 2018).

16.4.50 Accommodation out-with Campbeltown within 10 km of the proposed development and located along the west coast of the peninsula includes, but may not be limited to:

- Self-catering – Barmain Cottage, Beachfront Lodge, Belloch Cottage, Bruntholme, Carraig, Charlie's Cottage, Craigmore East, East Drumlemble, Failte, Gigha/Islay/Jura Cottages, High Trodigal, Island View Holiday Cottage, Langa Cottage, Lochside Lodge, Kildalliog Estate Cottages, Oatfield House, Rhoin Farm, Rothmar East, the Sheiling, Shore Cottage, Skerrivore, Tangy Mill, the Village Hall;
- Machrihanish Holiday Park – Caravan park;
- Killieguer Caravan Site – Caravan park;
- The Putechan – Hotel;
- The Ugadale Hotel & Cottages – Hotel; and
- Argyll Hotel, Bellochantuy – Hotel.

16.4.51 Accommodation located along the east coast of the peninsula includes, but may not be limited to:

- Peninver Sands Holiday Park – Caravan park;
- Craiglussa – Self-catering;
- Shore Cottages – Self-catering;
- Ashbank Hotel, Carradale – Hotel;
- Carradale Hotel, Carradale – Hotel;
- Dinvalanree, Carradale – Hotel;
- Mingulay, Carradale – Self-catering; and
- Star Gazer Cottage, Carradale – Self-catering.

Walking, Cycling and Horse Riding

16.4.52 The Walkhighlands website lists 17 walks in the Kintyre peninsular, including The Kintyre Way (Walkhighlands, 2018). The Kintyre Way (opened in 2006) is a long-distance path and is the only designated path located in the vicinity of the proposed development. The path provides walkers with access to the entire length and breadth of the Kintyre peninsula and is approximately 144 km long. The current route of the Kintyre Way passes through the study area to the west of Lussa Loch.

16.4.53 A section of the Kintyre Way is also designated as a proposed core path (C088: Campbeltown to Cloanig). This section is approximately 53 km in length. During consultation between the applicant and The Kintyre Way (part of the Long and Winding Way Company Ltd), the possibility of re-routing the path partially through the proposed development was investigated in relation to the Tangy III application (2014).

16.4.54 Core paths within the south-east section of the study area include:

- C084 – Campbeltown to Stewarton (2.7 km in length);
- C086 – Machrihanish to West port (6.2 km in length);
- C087 – Sound of Kintyre housing to beach (1.7 km in length);
- C447 – Darlochan to Stewarton (1.5 km in length);
- C448 – Stewarton to Clochkeil, Campbeltown (4.1 km in length); and
- C085 – Stewarton to Machrihanish (7.0 km in length).

16.4.55 There are no rights of way within the study area.

16.4.56 National Cycle Route 78 (the Caledonia Way) passes through the Kintyre peninsula, connecting Inverness in the north to Campbeltown in the south. At its closest point, the route is approximately 8.9 km from the proposed development. The cycle route is approximately 381 km long and passes to the east of the proposed development via the B842 (Sustrans, 2018).

16.4.57 There are no formal cycleways or equestrian routes within the study area, however it has been assumed that the Kintyre Way may be used by cyclists and equestrians, subject to standing restrictions during lambing and when shooting activities are taking place.

Shooting/Deer Stalking/Fishing

16.4.58 Lussa Loch and Tangy Lochs are used by anglers for their populations of brown trout and are located approximately 3 km east and 350 m south-east respectively from the site application boundary (Welcome to Scotland, 2018).

16.4.59 The Killean Estate is located approximately 15 km north of the site application boundary, south of Tayinloan, and offers game and bird shooting throughout the year. It also promotes fishing on the estate with the Killean Estate website (Killean Estate, 2018) stating that:

'The fishing opportunities on the Killean Estate are fantastic, with two lochs and a secluded pond offering good numbers of brown trout.'

Water Sports

16.4.60 Westport Surf School is based in Mid Argyll Swimming Pool in Lochgilphead and frequently uses the beach at Westport for its activities to the west of the site application boundary.

Summary

16.4.61 The population of Kintyre is relatively older than the population of Scotland and the median wages of Argyll and Bute are relatively lower than for Scotland. Areas identified as providing potential future growth include renewables (especially the tower factory at Machrihanish), and tourism, and revenue from community benefit funds can support this growth. Important elements of the area's tourism offering include Campbeltown's distilleries, festivals, the coastline (including golf) and long-distance routes. Tourist accommodation is clustered in Campbeltown, and on either coast.

16.5 Effects Evaluation

Basis of Assessment

Proposed Development Characteristics

16.5.1 The proposed development is expected to consist of 16 turbines of up to 149.9m in height and an installed capacity of up to 80 MW.

Land Use Mitigation

16.5.2 Based on review of the proposals and of the potential effects, the following measures will be implemented to avoid or reduce effects on land use:

- liaison with landowners regarding the timing of works;
- restriction of construction plant and personnel to working areas to reduce disturbance and vegetation damage;
- liaison with local community and local authority to inform traffic management measures to maintain access to the A83 and minimise disruption to the local road network; and
- land not required for the operation of the proposed development, will be returned to the landowner for uses compatible with operational activities.

16.5.3 The Scottish Government Policy on the Control of Woodland Removal (CoWR), which was published by the Forestry Commission Scotland, states the conditions for woodland removal with or without the requirements for compensatory planting (CP) (Forestry Commission, 2009). The CoWR describes that compensatory planting is most likely to be appropriate where it would contribute significantly to:

- helping Scotland mitigate and adapt to climate change;
- enhancing sustainable economic growth or rural/community development;
- supporting Scotland as a tourist destination;
- encouraging recreational activities and public enjoyment of the outdoor environment;

- reducing natural threats to forests or other land; and
- increasing the social, economic or environmental quality of Scotland's woodland cover.

16.5.4 The proposed forest management within the proposed development has been developed through consultation with Forestry Commission Scotland. The Long-Term Forest Plan details the felling of a reduced area within the site boundary and the replanting to a keyhole design including bat buffer clearance. The area of woodland loss is subject to offsite compensatory planting. The applicant currently owns a plot of land exceeding this area to the west of Campbeltown with the intention of meeting the compensatory planting commitments.

16.5.5 In 2015 a revised 'Guidance to Forestry Commission Scotland (FCS) staff on implementing the Scottish Government's Policy on Control of Woodland Removal' was published (Forestry Commission, 2015). This guidance document sets out a framework for calculating the net area of compensatory planting and addresses the practicalities of location, standards and methods, and timing, as described below.

16.5.6 To achieve the highest net public benefit and subject to the relevant conditions, agreements or approvals, compensatory planting can be undertaken on appropriate sites anywhere in Scotland. However, local planning authorities may require compensatory planting within their own area.

16.5.7 Local forestry and woodland strategies and related guidance should be used to help identify suitable areas for tree planting, and compensatory planting must be carried out in accordance with good forestry practice defined by the UK Forestry Standard (Forestry Commission, 2017).

16.5.8 Although direct planting will normally be preferable, proposals for the use of natural regeneration should be considered where this is silviculturally feasible and capable of enforcement. Compensatory planting is anticipated to take place within approximately 5 years of woodland removal.

Socio-Economics Enhancement

16.5.9 It is also expected that there will be measures to enhance the socio-economic effect of the proposed development.

16.5.10 The applicant has made other commitments to the regional and national economy to realise the opportunities that wind farm developments provide. As well as providing economic effects through employment and investment, these investments will create effects through the supply chain. As part of this commitment, the applicant has also previously procured tower sections for a number of its wind farm projects from the CS Wind facility at Machrihanish (previously Wind Towers Ltd), a manufacturer of turbine towers. Though it is understood that employment has recently decreased at the Machrihanish facility, a previous case study undertaken by BiGGAR Economics found that CS Wind (then Wind Towers) made purchases from 46 companies in Argyll and Bute worth £0.2 million in turnover, including purchase worth £0.2 million from 34 companies in South Kintyre. Many of these companies are small and medium enterprises. The presence of CS Wind has contributed to infrastructure improvements to the local area including upgrading the road to Campbeltown to trunk road status and improving the harbour.

16.5.11 Local firms will have the opportunity to tender for construction and operational services due to the applicant's commitment to use local suppliers, contractors and services where possible and available. The applicant has adopted the Engineering Construction Industry Training Board (CITB) Training Charter to ensure that when appointing contracts, consideration is given to the training and development approach in the assessment of tenders. In addition to this, the applicant makes significant effort to raising awareness of the type of roles that contractors could secure from local people. The applicant will also examine tender offer commitments to employ people from the local community that have been trained from local colleges.

16.5.12 The applicant wants to become the best in the Highlands and Islands at engaging with the local and SME communities and be the most 'Open for Business' company in the region. Therefore, it has set up an open4business site, which facilitates trade and engagement between the applicant and local suppliers and service providers. It will provide a platform for the applicant to promote opportunities originating in the region and will allow local suppliers to have visibility of the opportunities provided by the applicant, register as a supplier and respond to notices free of charge. Users of the site can then also advertise their own opportunities such as sub-contracting work for projects by the applicant. They can also use the portal to advertise their own opportunities to the local supplier base.

Tourism Mitigation

16.5.13 To mitigate any potential effects on tourism during the construction of the wind farm, the local community would be regularly updated, and plans would be implemented to ensure they are informed of the anticipated construction traffic movements and its potential effects.

Recreation Mitigation

16.5.14 Information will also be provided for local users regarding construction or decommissioning activity to reduce any effects experienced.

16.5.15 Contractors will liaise with the landowners to minimise the disruption to any activities on private land where possible.

16.5.16 No specific mitigation is proposed with regard to recreation during operation as no significant effects are anticipated.

Effects on Land Use

16.5.17 The woodland area within the proposed development site is comprised of three ownerships amounting to some 463.86 ha. These woodlands form part of extensive upland productive conifer forests within this part of Kintyre, for example the National Forest Estate, West Lussa Forest is comprised of 2,482 ha of forest, out of 7,999 ha of forest which comprise Lussa Forest on Kintyre (Forestry Commission Scotland, 2017). These forests provide significant harvested timber with limited recreational use. Following consultation with Forestry Commission Scotland a Long-Term Forest Plan has been created detailing felling and replanting to a keyhole design.

16.5.18 Felling will be carried out over some 270.75 ha within the site, of which 199.85 ha will be replanted post construction. The balance of the area comprises of designed open ground (30.43 ha) in accordance with UK Forestry Standards. Peatland restoration (27.72 ha) will be undertaken in accordance with Forestry Commission Scotland Practice Guide, *Deciding the future management options for afforested deep peatland* (2015). Where woodland is not replanted on site due to permanent infrastructure and bat buffer clearance areas around each turbine, the equivalent area will be planted offsite as compensatory planting (31.73 ha). Off-site planting will be through the normal channels of approval with Forestry Commission Scotland and follow the UK Forestry Standard (UKFS) guidelines.

Table 16.6: Land use - Forestry

	(ha)
Total woodland area within the site boundary	463.86
Felling required for the proposed development	270.75
Replanting on site (Productive conifer 196.35ha, native broadleaf 3.50ha)	199.85
Designed open ground (UKFS)	30.43
Permanent infrastructure including bat clearance areas not planted	31.73
Compensatory Planting offsite matching the area of woodland loss	31.73

16.5.19 Existing sections of access track used for the existing wind farm will be upgraded, resulting in some land use on either side to increase the running surface width to between 7.7 m and 8.6 m and to incorporate passing places, for both turbines and 4 x 4 vehicles; further details are provided in Chapter 5 (Description of Development).

16.5.20 There may be temporary disruption to the area along local roads such as the A83 due to construction vehicles accessing the site, refer to Chapter 15 (Access, Transport and Traffic) for a detailed assessment of the effects on access.

16.5.21 **Error! Reference source not found.**It is estimated that the maximum temporary land use requirements during construction would be approximately 82 ha. It is expected that any construction impact, would be short-term and would not materially impact on the existing land use at the site. Most of the impacts will be reversed in the long term with reinstatement, replanting on site and Compensatory Planting being undertaken, and the new/upgraded access tracks will have a positive impact. Therefore, the effect of temporary land use is assessed as **minor and not significant**.

Predicted Ongoing and Operational Effects

16.5.22 It is estimated that the maximum permanent development footprint of the proposed development will be approximately 14 ha. Within the forest area the amount of land to accommodate the permanent infrastructure and the unplanted ground associated with bat clearance buffer zones will be 31.73 ha, however as stated, the forests are currently in the restructuring phase and are considered to be able to tolerate this proposed change.

16.5.23 During decommissioning of the proposed development, the turbines, turbine bases, met masts, substation and operations buildings would be removed, with approximately 3.62ha of land re-instated and restored. It is currently anticipated that the access tracks would be retained post decommissioning resulting in a permanent loss of 6.26 ha (refer to ES Chapter 5: Description of the Development for further details).

16.5.24 The land use change proposed would not materially impact on the existing land use at the site. As such it is expected that the land use change will be **negligible and not significant**.

Summary of Effects on Land Use

16.5.25 A summary of effects on land use is considered in Table 16.7: Summary of Land Use Effects.

Table 16.7: Summary of Land Use Effects

Asset	Type of Effect	Effect	Mitigation	Significance
Land use	Construction	Minor effect given forests are already in restructuring phase. Overall change to land use considered to be not material.	Liaise with stakeholders, restrict plant and personnel, and minimise disruption to road network.	Minor
Land use	Operation	Negligible permanent land use requirement of 14 ha. Forests are already in restructuring phase and will be replanted to a key hole design.	Replanting, peatland restoration and designed open ground. The balance of woodland loss (31.73ha) to be planted off site as Compensatory Planting.	Negligible

Source: BiGGAR Economics Analysis.

Socio-Economic Effects

Construction Effects

16.5.26 As set out in Section 16.3 Methodology, the first step to estimating the potential effect of the proposed development was to estimate the potential cost. The total development and construction cost of the proposed development is estimated by multiplying the expected installed capacity, up 80 MW, by the industry average for the development and construction cost per MW. The average development and construction cost is £1.5 million (RenewableUK, 2015). Therefore, the total capital cost associated with the proposed development was estimated to be £120 million.

16.5.27 Development and construction are split into four main categories:

- development and planning;
- construction/infrastructure;
- turbines; and
- grid connection.

16.5.28 The proposed development is not a standard onshore wind development as the project will include the repowering of the site, which has been included in the construction/infrastructure stage of the development. However, the costs of the repowering are expected to be offset by savings during the balance of plant and grid connection stages of the proposed development. The estimated division of the total capital spend is given in Table 16.8: Development and Construction Expenditure by Contract Type – Construction Phase. This shows that the grid connections and feasibility and planning phases of the development incur a smaller proportion of the capital development and the construction/infrastructure is greater.

Table 16.8: Development and Construction Expenditure by Contract Type – Construction Phase

	RenewableUK %	**Tangy IV %**	**Value (£m)**
Feasibility and Planning	10.2%	5.4%	6.48
Construction/Infrastructure	25.6%	31.8%	38.16
Turbines	57.8%	57.8%	69.36
Grid Connections	6.3%	5.0	6
Total	**100%**	**100%**	**120**

Source: BiGGAR Economics assumption based on previous experience.

16.5.29 The next stage is estimating the geographical distribution of the economic effect is to consider the value of each contract that could be awarded in each study area. These estimates are based on an analysis of the industries and businesses that are located in each area and previous studies undertaken by BiGGAR Economics, including the report for RenewableUK.

16.5.30 The analysis of the Argyll and Bute economy found that it would be in a strong position to take advantage of contracts in mechanical and electrical engineering as part of the construction phase. There would also be opportunities for the manufacturing sector, particularly for the turbine towers, which are expected to be manufactured in Kintyre. The potential proportion of component contracts that could be secured in each of the study is given in Table 16.9: Proportion of Components that Could be Secured in Each Study Area - Construction.

Table 16.9: Proportion of Components that could be Secured in Each Study Area - Construction

	Kintyre	**Argyll and Bute**	**Scotland**
Feasibility and Planning	**7%**	**9%**	**90%**
Project development	10%	10%	90%
Legal and financial	0%	5%	90%

Table 16.9: Proportion of Components that could be Secured in Each Study Area - Construction			
Project management	15%	15%	90%
Construction/Infrastructure	**5%**	**20%**	**95%**
Civil & project management	10%	20%	95%
Roads	0%	20%	95%
Substation buildings	0%	20%	95%
Turbine foundations	0%	20%	95%
Landscaping/Forestry/Fencing	0%	40%	95%
Mechanical & Electrical Installation	0%	20%	95%
Turbines	**12%**	**12%**	**12%**
Tower Manufacture	100%	100%	100%
Other Manufacture	0%	0%	0%
Assembly	5%	10%	10%
Transport	10%	10%	10%
Grid Connections	**0%**	**10%**	**100%**
Engineering Services	0%	10%	100%
Construction	0%	10%	100%
Electrical Components	0%	10%	100%
Industrial equipment & machinery	0%	10%	100%
Total	**9%**	**14%**	**47%**

Source: BiGGAR Economics assumption based on previous experience.

16.5.31 Based on this analysis it was estimated that the local area could secure contracts worth £10.8 million, which is equivalent to 9% of the total value of the capital expenditure, and support 95 job years. The largest opportunity in the local area would be in turbine contracts (including the towers), which could be worth £6.8 million and support 59 job years.

16.5.32 Argyll and Bute could secure contracts worth £16.8 million, which is equivalent to 14% of the total value of the capital expenditure, and support 142 job years. The largest opportunities will be from the turbine related contracts, which could be worth £7.1 million and support 61 job years, and the construction/infrastructure related contracts, which could be worth £6.5 million and support 55 job years.

16.5.33 The largest opportunity in Scotland would be during the construction/infrastructure phase of the development and Scotland could secure contracts worth £30.5 million and support 252 job years. In total, Scotland could secure contracts worth £56.4 million, which is equivalent to 47% of the total capital expenditure, and support 471 job years. This is shown in Table 16.10: Estimated Size of Contract that be Secured in Each Study Area - Construction.

Table 16.10: Estimated Size of Contract that could be Secured in Each Study Area - Construction						
	Kintyre		**Argyll and Bute**		**Scotland**	
	£m	Job years	£m	Job years	£m	Job years
Feasibility and Planning	0.5	4.9	0.6	5.7	5.8	61.5
Construction/Infrastructure	2.1	21.9	7.5	63.0	36.1	298.2
Turbines	8.3	71.9	8.2	69.9	8.4	72.2
Grid Connections			0.6	3.4	6.0	39.1
Total	**10.8**	**95**	**16.8**	**142**	**56.4**	**471**

Source: BiGGAR Economics assumption based on previous experience.

16.5.34 The people who are directly employed during the development and construction of the proposed development will have an effect on the wider economy through the spending of their wages. The induced effect is a result of the increased turnover in the businesses where these wages are spent. Previous work by BiGGAR Economics (Department of Energy and Climate Change, RenewableUK, 2012) found that the average salary in the onshore wind sector was £34,600. Therefore, the 471 job years in Scotland would result in £17.1 million being paid in salaries to workers during the development and construction phase.

16.5.35 In order to estimate the geographic effect of the staff spending it was necessary to make assumptions regarding where the wages would be spent. It was assumed that the workers in Kintyre would spend 35% of their income in Kintyre, workers in Argyll and Bute would spend 45% of their wages in Argyll and Bute, and those in Scotland would spend 74% of their wages in Scotland, as shown in Table 16.11: Estimated Effects of Wages and Spend in the Local Economy.

Table 16.11: Estimated Effects of Wages and Spend in the Local Economy						
	Kintyre		**Argyll and Bute**		**Scotland**	
	£m	Job years	£m	Job years	£m	Job years
Effect of Wages	0.3	7	0.7	13	3.5	71

Source: BiGGAR Economics analysis.

16.5.36 The total economic effect during the development and construction phase of the proposed development was found by summing the direct contract effects and the induced effect from staff spending, see Table 16.12: Total Benefits of Development and Construction Contracts.

Table 16.12: Total Benefits of Development and Construction Contracts						
	Kintyre		**Argyll and Bute**		**Scotland**	
	£m	Job years	£m	Job years	£m	Job years
Total	11.1	102	17.5	155	59.9	542

Source: BiGGAR Economics analysis.

16.5.37 As outlined in Section 16-7, the total employment in Kintyre is about 3,050, of which 300 jobs are in manufacturing, and it is estimated that over the duration of the development and construction could support 102 job years of employment. On this basis, the potential effects in Kintyre would be **moderate beneficial and significant**.

16.5.38 Total employment in Argyll and Bute is about 39,000, of which about 1,750 jobs are in manufacturing. As the number job years supported is expected to be 155 it is expected that the effect would be **minor beneficial and not significant**.

16.5.39 The significance in the Scottish economy is expected to be **negligible and not significant.**

Predicted Ongoing and Operational Effects

16.5.40 The annual spend on operations and maintenance during the lifespan of the proposed developments is dependent on the total installed capacity. The study undertaken on behalf of RenewableUK has found that the average annual operation and maintenance cost per MW was about £60,000. Therefore, the estimated annual cost of operations and maintenance based on a capacity of up to 80 MW would be is £4.8 million. It has been estimated that Kintyre could secure 20% of the operations and maintenance contracts, which are estimated to be worth £0.96 million every year. Argyll and Bute could secure 35% of the contracts awarded which are estimated to be £1.68 million every year. Scotland could secure 90% of total operations and maintenance, which would amount to £4.32 million every year.

16.5.41 There will also be effects due to wages spent in the study areas. This spend could add an annual £0.2 million to the Scottish economy, and 5 jobs. The total operations and maintenance effect is estimated to be £0.96 million and 8 jobs in Kintyre, £1.78 million and 13 jobs in Argyll and Bute, and £4.52 million and 37 jobs in Scotland, as shown in Table 16.13: Total Benefits of Operational and Maintenance Contracts. These jobs include both on-site operational jobs and those supported by the operational and maintenance contracts (for example, on the maintenance of the site and the servicing of turbines), which will be based off-site, elsewhere in the Kintyre, Argyll and Bute and Scottish economies. These will include employees, contractors and those providing goods and services in the wider supply chain.

Table 16.13: Total Benefits of Operational and Maintenance Contracts

	Kintyre		Argyll and Bute		Scotland	
	£m	Job years	£m	Job years	£m	Job years
Annual Direct Effect	0.96	7	1.68	12	34.32	32
Annual Induced Effect	<0.1	1	0.1	1	0.2	5
Total Annual Effect	**0.96**	**8**	**1.78**	**13**	**4.52**	**37**

Source: BiGGAR Economics analysis.

16.5.42 Based on the benefits described in Table 16.13, it is expected that the effect will be **minor beneficial and not significant** in Kintyre, and **negligible and not significant** across the other two study areas.

Community Benefit

16.5.43 The applicant’s policy on community investment is currently under review. The Scottish Government is set to consult on arrangements for community ownership and community benefit during 2018 and the applicant is engaging positively in this process. As a responsible developer, the applicant aims to maximise the benefit for local communities where possible. It is anticipated that any community benefit funding would have a beneficial effect at a local scale in Kintyre. Community benefit is not a material consideration in EIA, and therefore the significance has not been assessed.

16.5.44

Non-Domestic Rates

16.5.45 The proposed development will be liable for non-domestic rates, the payment of which will contribute directly to public sector finances. Guidance from the Scottish Assessors Association from 2010 recommends a Load Factor of 25% for the area considered and a rateable value of £18,557 (Scottish Assessors Association, 2010).

16.5.46 Given that the proposed development will be up to 80 MW, it is estimated that the total rateable value will be £1.48 million. Given a poundage rate of £0.492 per £1 of rateable value (Argyll and Bute Council, 2018) it is estimated that the proposed development could contribute £0.73 million annually to public finances. However, the actual contribution will depend on variables such as the actual load factor, and the potential for any relief from non-domestic rates.

Table 16.14 Non-Domestic Rates

	Value
Rateable value per MW (£)	18,557
Poundage rate	£0.492
Annual Contribution (£m)	0.73

Source: BiGGAR Economics analysis.

16.5.47 It is expected that any increase in non-domestic rates will provide a **negligible beneficial effect (not significant).**

Summary of Effects on Socio-Economics

16.5.48 A summary of socio-economic effects is considered in Table 16.15: Summary of Socio-economic Effects.

Table 16.15: Summary of Socio-economic Effects

Economy/Organisation	**Type of Effect**	**Effect**	**Mitigation**	**Effect**
Kintyre economy	Construction	Construction impact of £11.1 million and 102 job years.	applicant will make efforts to employ and train local people.	Moderate (beneficial) – significant.
Argyll and Bute economy	Construction	Construction impact of £17.5 million and 155 job years.	applicant will make efforts to employ and train local people.	Minor (beneficial) – not significant.
Scotland economy	Construction	Construction impact of £59.9 million and 542 job years.	applicant will make efforts to employ and train local people.	Negligible (beneficial) – not significant.
Kintyre economy	Operational	Annual operational impact of £0.96 million and 8 jobs.	applicant will make efforts to employ and train local people.	Minor (beneficial) – not significant.
Argyll and Bute economy	Operational	Annual operational impact of £1.78 million and 13 jobs.	applicant will make efforts to employ and train local people.	Negligible (beneficial) – not significant.
Scotland economy	Operational	Annual operational impact of £4.52 million and 37 jobs.	applicant will make efforts to employ and train local people.	Negligible (beneficial) – not significant.
Government	Operational	Estimated £0.73 million in non-domestic rates annually.	n/a	Negligible (beneficial) – not significant.

Effects on Tourism/Recreation Assets

Wind Farms and Tourism Evidence

16.5.49 The most comprehensive study of the potential effects of windfarms on tourism was undertaken by the Moffat Centre at Glasgow Caledonian University in 2008 (Glasgow Caledonian University/Moffat Centre, 2008). The study found that, although there may be minor effects on tourism providers and a small number of visitors may not visit Scotland in the future, the overall effect on tourism expenditure and employment would be very limited. This study is now about 10 years old and, in that time, windfarms have become a more common feature in Scotland. As such, it would be expected that any negative effects on the tourism economy would now be apparent.

16.5.50 However, the Moffat Centre study was based on what could happen, rather than what has happened. In 2017 BiGGAR Economics undertook a study into the effects of already constructed wind farms on tourism at the national, regional and local level (BiGGAR Economics, 2017). This was an updated study of a report previously published in 2016.

16.5.51 Tourism employment was considered over the period 2009 to 2015, a six-year period over which Scotland and almost all local authorities increased the number of wind farms, while employment in sustainable tourism also grew significantly. The analysis found no correlation between tourism employment and the number of turbines at the national or local authority level.

16.5.52 The study also considered the impact on employment at a much smaller, more granular level, in data zones up to 15 kilometres from developments. The sites considered were constructed between 2009 and 2015. As these sites did not exist in 2009, comparing employment in 2009 and 2015 was considered an effective measure of the effect of wind farms on local employment, while excluding construction impacts, such as wind farm related employees staying in local accommodation.

16.5.53 At the local authority level in these smaller areas, no link was found between the development of a wind farm and tourism related employment. In 21 out of the 28 areas considered employment in this sector grew. In 22 of the areas, employment either grew faster or decreased less than the rate for the relevant local authority as a whole.

16.5.54 Overall, the conclusion of this study was that published national statistics on employment in sustainable tourism demonstrate that there is no relationship between the development of onshore wind farms and tourism employment at the level of the Scottish economy, at the local authority level, nor in the areas immediately surrounding wind farm development. The findings of this research are in accordance with that of the Scottish Parliament's Economy, Energy and Tourism Committee's findings in 2012 (Scottish Parliament Economy, Energy and Tourism Committee, 2012), when they concluded that there is no robust, empirical evidence of a negative link between windfarm development and tourism.

16.5.55 In 2014, the Mountaineering Council of Scotland, now Mountaineering Scotland (MS) undertook a survey of its members (Mountaineering Scotland, 2014), which found that the presence of windfarms discouraged some members from visiting those areas and suggested that this would reduce the scale of Scottish tourism. However, the survey has drawn criticism, including from its own members as the questions were considered leading and the results biased (as the report on the survey recognises itself) and the survey may not represent the views of all hill walkers or tourists more generally, as it targeted members of MS or the British Mountaineering Council.

16.5.56 In 2016, MS conducted a new survey of its members (Mountaineering Scotland, 2016), which aimed to address some of these issues. It found that for 75% of respondent's windfarms had no effect on their walking and climbing plans. However, 22% responded that they would go as often but avoid areas with windfarms, 1% would go to the mountains less often. However, 2% of respondents said they would go to the mountains more often to see windfarms.

16.5.57 Overall, there is no research evidence that shows that fears of negative effects on the tourism economy in Scotland as a result of windfarms have been realised when the windfarms have been developed.

16.5.58 Within that overall context, the following assessment nevertheless considers whether there might be any specific effects on individual tourism assets. This assessment considers whether the proposed development could result in changes that could lead to changes in the behaviour of tourists that might result in effects on the tourism economy.

Tourism/Recreation Assets

16.5.59 The tourism/recreation assets identified in the section are split by category/geography on Kintyre. Therefore, although each individual asset is considered individually, they are assessed as a group:

- Festivals;
- Campbeltown attractions;
- West Coast of Kintyre tourism and recreation assets; and
- walking routes.

Construction effects

16.5.60 Construction is expected to have limited effects on the festivals identified, Campbeltown, the West coast tourism assets or the walking routes. Therefore, the effect is assessed as **negligible and not significant**.

Predicted Ongoing and Operational Impacts

16.5.61 The festivals which have been identified as taking place in Kintyre include focus either on the region's cultural and musical heritage, such as the Mull of Kintyre Music Festival, or food and drink, e.g. Gintyre, and neither of these aspects are expected to change following the construction of the proposed development. Therefore, the effect is assessed as **negligible and not significant**.

16.5.62 Campbeltown is one of the main tourism towns in Argyll and Bute, with its main attractions being buildings such as heritage centre, museum and distilleries. There is also the Campbeltown Cross. As these attractions rely on Campbeltown's history, heritage and food and drink offering, rather than landscape or scenery, the effect is assessed as **negligible and not significant**.

16.5.63 The attractions on the west coast of Kintyre are based either on heritage, for example Glenbarr and Anne Stewart Knitwear, or the local environment and landscape, such as the golf clubs or West Port beach. It is not likely that there will be an impact on the heritage tourism assets.

16.5.64 Although the golf clubs are based to an extent on the landscape, they rely more on the proximity of the ocean, and the local environment of the dunes, which makes the courses links courses. Machrihanish Dunes is also 6 km from the proposed development and Machrihanish Golf Club is 7-10 km from the site.

16.5.65 Westport Beach is at its furthest 9 km from the proposed development and 2.3 km at its closest, and it stretches over 9-10 km. VisitScotland describes it as 'one of the most beautiful beaches in the west coast of Scotland', and the 'biggest sand dune area in Argyll' (VisitScotland, 2018). These factors will not be affected by the presence of the proposed development. Therefore, the Therefore, the effect is assessed as **minor and not significant**.

16.5.66 While part of the appeal of the Kintyre Way and the Caledonia Way is the landscape, which may be changed as a result of the proposed development, they span 140 km and 381 km respectively and therefore any landscape impact will be very limited. Additionally, passing through Deucheran Hill Wind Farm is advertised as a positive on the Kintyre Way website (Kintyre Way, 2018). Effects on other walking routes are expected to be minimal. Therefore, the effect is assessed as **minor and not significant**.

Summary of Effects on Tourism/Recreation Assets

16.5.67 A summary of effects on tourism/recreation assets is considered in Table 16.16: Summary of Effects on Tourism/Recreation Assets.

Table 16.16: Summary of Effects on Tourism/Recreation Assets

Assets	Type of Effect	Effect	Mitigation	Effect
Festivals	Construction	No predicted effect	n/a	Negligible
Campbeltown tourism/recreation	Construction	No predicted effect	n/a	Negligible
West coast tourism/recreation	Construction	No predicted effect	n/a	Negligible
Walking routes	Construction	No predicted effect	n/a	Negligible
Festivals	Operation	No predicted effect	n/a	Negligible
Campbeltown tourism/recreation	Operation	No predicted effect	n/a	Negligible
West coast tourism/recreation	Operation	Some landscape impacts	n/a	Minor
Walking routes	Operation	Some landscape impacts	n/a	Minor

Effects on Tourism Accommodation

16.5.68 The tourism accommodation providers in the following locations have been assessed:

- Campbeltown accommodation;
- west coast of Kintyre accommodation; and
- east coast of Kintyre accommodation.

Construction Effects (Beneficial)

16.5.69 It is expected that the construction of the proposed development will have no negative effect on accommodation on the Kintyre peninsula. However, it is likely to have a positive impact on accommodation in Campbeltown, the west coast and the east coast, as the workers stay at local accommodation during the construction of the proposed development. Therefore, it is assessed a **minor (beneficial)** effect in Campbeltown, the west coast and the east coast.

Predicted Ongoing and Operational Impacts

16.5.70 It is considered unlikely that tourism accommodation in Campbeltown, which is generally in built up areas, will have any views of the proposed development, nor that this would affect what attracts visitors to stay in Campbeltown: the atmosphere and the heritage. Therefore, the effect is assessed as **negligible and not significant**.

16.5.71 There are numerous accommodation facilities on the west coast, and several have views of the existing development. These will continue to have views of the proposed development once operational, however given the existing views it is expected that at the effect will be **minor and not significant**.

16.5.72 The majority of accommodation facilities on the east coast, in particular Carradale do not have views of the existing development and this is not expected to change. Therefore, the effect is assessed as **negligible and not significant**.

Summary of Effects on Tourism Accommodation

16.5.73 A summary of effects on tourism accommodation is considered in Table 16.17 Summary of Tourism Accommodation Effects.

Table 16.17 Summary of Tourism Accommodation Effects

Providers	Type of Effect	Effect	Mitigation	Effect
Campbeltown accommodation	Construction	Workers staying at local accommodation	n/a	Minor (beneficial)
West coast accommodation	Construction	Workers staying at local accommodation	n/a	Minor (beneficial)
East coast accommodation	Construction	Workers staying at local accommodation	n/a	Minor (beneficial)
Campbeltown accommodation	Operation	No predicted effect	n/a	Negligible
West coast accommodation	Operation	Some landscape impacts	n/a	Minor
East coast accommodation	Operation	No predicted effect	n/a	Negligible

16.6 Summary

16.6.1 It is expected that there will minor effects associated with land use during construction, moderate, minor and negligible benefits in the economy, and negligible or minor (beneficial) effects on tourism and recreation. Table 16.18 provides a summary of the predicted construction stage effects.

Table 16.18: Summary of Construction Effects			
Asset/Economy/ Organisation/Providers	**Predicted Effect**	**Mitigation**	**Effect**
Productive conifer forests	Felling of 270.75ha of productive conifer forest	Forest Plan details the felling operations in accordance with UKFS	Minor and not significant
Kintyre economy	Construction impact of £11.1 million and 102 job years	applicant will make efforts to employ and train local people	Moderate (beneficial) and significant
Argyll and Bute economy	Construction impact of £17.5 million and 155 job years	applicant will make efforts to employ and train local people	Minor (beneficial) and not significant
Scotland economy	Construction impact of £59.9 million and 542 job years	applicant will make efforts to employ and train local people	Negligible (beneficial) and not significant
Festivals	No predicted effect	n/a	Negligible and not significant
Campbeltown tourism/recreation	No predicted effect	n/a	Negligible and not significant
West coast tourism/recreation	No predicted effect	n/a	Negligible and not significant
Walking routes	No predicted effect	n/a	Negligible and not significant
Campbeltown accommodation	Workers staying at local accommodation	n/a	Minor (beneficial) and not significant
West coast accommodation	Workers staying at local accommodation	n/a	Minor (beneficial) and not significant
East coast accommodation	Workers staying at local accommodation	n/a	Minor (beneficial) and not significant

Source: BiGGAR Economics analysis.

16.6.2 It is expected that there will be negligible effects associated with land use during operation, minor or negligible benefits in the economy, and minor or negligible effects on tourism and recreation. Table 16.19 provides a summary of the operational effects.

Table 16.19: Summary of Operational Effects

Asset/Economy/ Organisation/Providers	Predicted Effect	Mitigation	Effect
Productive conifer forests	Permanent on site woodland loss of 31.73ha.	Compensatory planting offsite matching the woodland loss area.	Negligible and not significant.
Kintyre economy	Annual operational impact of £0.96 million and 8 jobs.	applicant will make efforts to employ and train local people.	Minor (beneficial) and not significant.
Argyll and Bute economy	Annual operational impact of £1.78 million and 13 jobs.	applicant will make efforts to employ and train local people.	Negligible (beneficial) and not significant.
Scotland economy	Annual operational impact of £4.52 million and 37 jobs.	applicant will make efforts to employ and train local people.	Negligible (beneficial) and not significant.
Government	Estimated £0.73 million in non-domestic rates annually.	n/a	Negligible (beneficial) and not significant.
Festivals	No predicted effect.	n/a	Negligible and not significant.
Campbeltown tourism/recreation	No predicted effect.	n/a	Negligible and not significant.
West coast tourism/recreation	Some landscape impacts.	n/a	Minor and not significant.
Walking routes	Some landscape impacts.	n/a	Minor and not significant.
Campbeltown accommodation	No predicted effect.	n/a	Negligible and not significant.
West coast accommodation	Some landscape impacts.	n/a	Minor and not significant.
East coast accommodation	No predicted effect.	n/a	Negligible and not significant.

Source: BiGGAR Economics analysis.

16.7 References

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17. SHADOW FLICKER

Executive Summary

This chapter provides an assessment of the potential shadow flicker impacts on residential amenity resulting from the proposed development. TNEI Services Ltd completed a desk-based study to identify potential receptors, followed by a site survey in March 2018 to confirm conditions on site.

The shadow flicker assessment has been undertaken to consider the maximum tip height of 149.9m and rotor diameter of 130 m. An assessment area of 1,300 m around each turbine was considered (based on a study area of 10 rotor diameters) and seven receptors were found within the area potentially susceptible to shadow flicker.

There is no standard for the assessment of shadow flicker in Scotland and there are no guidelines with which to quantify what exposure levels would represent a significant versus not significant effect. In the absence of specific guidelines, and for consistency with the approach taken for the assessment for Tangy III (Tangy III ES (2014)), the assessment has considered the *'Best Practice Guidance for Planning Policy Statement 18 (PPS18) Renewable Energy'* (Department of Environment Northern Ireland, 2009) from Northern Ireland, which states: *"It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day"*. As such, properties where shadow flicker would potentially exceed these thresholds would be subject to significant effects.

The assessment has demonstrated that the likely number of shadow flicker hours experienced at all seven shadow flicker assessment location (SFAL), taking into account typical sunshine hours for the area, is below 30 hours per year. The highest predicted likely level of shadow flicker at any SFAL is 15.4 hours per year (at Killarow Farm – SFAL2).

The maximum amount of shadow flicker which could theoretically occur in a single day, not taking into account cloud coverage, is approximately 31 minutes (experienced at Tangy Mill – SFAL4).

It is recommended that, in order to protect the amenity of local residents, the turbines be programmed to shut down during periods when shadow flicker could occur. Accordingly, the impact from shadow flicker is predicted to be **not significant**.

17.1 Introduction

17.1.1 This chapter considers the potential shadow flicker effects at nearby buildings associated with the operation of the proposed development. The specific objectives of the chapter are to:

- describe the baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

17.1.2 The assessment has been carried out by TNEI Services Ltd.

17.1.3 This chapter is supported by:

- Appendix 17.1: Shadow Flicker Assessment.

17.1.4 Figure 17.1 is referenced in the text where relevant.

17.2 Scope of Assessment

Project Interactions

17.2.1 Under certain combinations of geographical position, times of day and year, the sun may pass behind the turbine rotor and cast a shadow flicker over the windows of neighbouring buildings. When the blades rotate and the shadow passes a window, to a person within that room, the shadow appears to flick on and off; this effect is known as ‘shadow flicker’. This phenomenon occurs only within buildings where the flicker appears through a window aperture and in the UK typically occurs only in buildings within 130 degrees either side of north relative to a turbine.

Study Area

17.2.2 A study area of 1,300m from each turbine, 130 degrees either side of north, was selected for this assessment. This is based upon ten times the maximum rotor diameter (130 m) that would be used within the proposed development in order to present a worst case scenario (i.e. the largest possible study area).

Scoping and Consultation

17.2.3 A summary of the consultation response in relation to shadow flicker is included within Table 17.1 below.

17.2.4 Full details on the consultation responses can be reviewed in Appendix 7.1: Consultation Register.

Table 17.1: Consultation Responses

Consultee and Date	**Summary of Response**	**Comment/Action Taken**
The Scottish Governments Energy Consents Unit, 16 October 2017	A shadow flicker assessment should be undertaken to assess the *‘consequences for the occupiers of property.’*	This chapter summarises the findings of the shadow flicker assessment which is included in full in Appendix 17.1: Shadow Flicker Assessment

Effects to be Assessed

17.2.5 This chapter summarises the potential shadow flicker effects at properties located within the study area detailed above and shown on Figure 17.1.

Effects Scoped Out of Assessment

17.2.6 Where moving shadows are cast over the ground, rather than through the windows of a building, this is known as 'shadow throw'. There are no guidelines to quantify the effect and no requirement to assess 'shadow throw'. Therefore, 'shadow throw' has not been considered further in this assessment.

17.2.7 There are no other nearby wind turbines which may result in shadow flicker at the seven SFALs identified in Table 17.1, therefore cumulative shadow flicker could not occur and has not been considered further in this assessment.

17.3 Methodology

Overview

17.3.1 The specialist computer software 'WindFarm' (ReSoft, 1997-2014) has been used to identify the potential area susceptible to shadow flicker. The software identifies the study area for the assessment based on candidate turbine dimensions and orientations.

17.3.2 As outlined above, the study area where shadow flicker could potentially occur has been limited to 1,300m and 130 degrees either side of north around the proposed turbine locations, as illustrated on Figure 17.1. Buildings located outside 130 degrees either side of north have been excluded from the analysis, as there is no direct path between the sun, the turbine and these buildings where shadow flicker could occur.

17.3.3 There is no standard for the assessment of shadow flicker in Scotland and there are no guidelines which quantify what exposure levels would be acceptable. In assessing the potential shadow flicker impacts of the proposed development, the following guidance and policy documents have been considered:

- Scottish Planning Policy (SPP) (June 2014);
- Web Based Renewable Advice: 'Onshore Wind Turbines' (last updated May 2014); and
- Department of Energy and Climate Change (DECC): 'Update of UK Shadow Flicker Evidence Base'.

17.3.4 The documents outlined above are discussed in detail within the Shadow Flicker Assessment Technical Report (refer to Appendix 17.2).

Method of Baseline Characterisation

Following the identification of the study area a desktop assessment was undertaken in order to identify all potential buildings within that area. This information formed the basis for the site survey which was undertaken in order to assess all of the receptors identified.

Effects Evaluation Methodology

17.3.5 In order to quantify the effect of shadow flicker, the results of the building survey and desktop analysis were input into 'WindFarm' along with the latitude and longitude of the proposed development. The shadow flicker module of WindFarm calculates times throughout the year when a turbine viewed from the window of a house is in line with the sun and therefore when the potential for shadow flicker exists.

17.3.6 As detailed above, there is no standard for the assessment of shadow flicker in Scotland and there are no guidelines which quantify what exposure levels would represent a significant versus not significant effect. In the absence of specific guidelines, and for consistency with the approach taken for the assessment for Tangy III (Tangy III ES (2014)), the assessment has considered the *'Best Practice Guidance for Planning Policy Statement 18 (PPS18) Renewable Energy'* (Department of Environment Northern Ireland, 2009) from Northern Ireland, which states:

17.3.7 'It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day.'

17.3.8 As such, properties where shadow flicker would potentially exceed these thresholds would be subject to significant effects.

17.4 Baseline Conditions

Current Baseline

17.4.1 A site survey was undertaken on 14 March 2018 in order to identify all buildings (located within the study area and determine the number of windows, their size and orientation in relation to the proposed development. Where two or more receptors were located in very close proximity all the windows were modelled as a single shadow flicker assessment location (SFAL), seven SFALs were included in the assessment. Details of the Shadow Flicker Assessment Locations are included within Table 17.1 below and are also shown on Figure 17.1. A more detailed description of each SFAL is included in Table 4.1 of Appendix 17.1.

Table 17.1 Shadow Flicker Assessment Locations

Shadow Flicker Assessment Location	Easting	Northing	Approximate distance to nearest turbine*
SFAL1 - Tangymoil	166244	628594	1148
SFAL2 – Killarow Farm	166269	628025	1053
SFAL3 – Tigh Na Mara	166079	628171	1236
SFAL4 – Tangy Mill	166275	627740	1117
SFAL5 - Tangylee	167489	627768	419
SFAL6 – Tangy Glen Cottages	166067	627768	1305
SFAL7 – Tangy Mill Croft	166125	627650	1290

*distance as measured to the closest point to the facade on the building.

17.5 Effects Evaluation

17.5.1 Table 17.2 summarises the shadow flicker modelling results and details the predicted frequency of occurrence of shadow flicker at the worst case window for each SFAL. Figures A1.3 to A1.9 within Appendix 17.2: Shadow Flicker Assessment illustrate the times of the year and times of the day when shadow flicker could theoretically occur at the most affected window of each property where shadow flicker was predicted to occur.

Table 17.2 Maximum Theoretical Shadow Flicker Occurrence for each Property

Location (Window ID)	Times when Shadows May Occur (GMT)	Months when Shadows May Occur	Maximum Minutes of Shadow per Day	Mean Minutes of Shadow per Day	Maximum Theoretical Hours per Year	Likely Hours per Year
SFAL1 - Tangymoil (12)	05:09 - 08:13	February - May, July - October	28:12	21:36	45	14.4
SFAL2 - Killarow Farm (03)	04:48 - 06:29	April - August	30:36	24:36	48.2	15.4

Table 17.2 Maximum Theoretical Shadow Flicker Occurrence for each Property						
SFAL3 - Tigh Na Mara (01)	06:18 - 06:48	April, August - September	26:24	21:00	9.8	3.1
SFAL4 - Tangy Mill (04)	05:02 – 05:44	May - August	31:12	27:00	36.6	11.7
SFAL5 - Tangylee (NA)	N/A	N/A	00:00	00:00	0	0
SFAL6 - Tangy Glen Cottages (07)	05:16 – 05:55	May, July - August	26:24	20:24	18.4	5.9
SFAL7 - Tangy Mill Croft (08)	04:57 – 05:35	May - July	27:36	24:00	30.7	9.8

17.5.2 A detailed list of potential for shadow flicker occurrence at each receptor is included in Annex 3 of Appendix 17.2: Shadow Flicker Assessment.

17.5.3 The calculations do not take account of certain factors that would reduce the duration of shadow flicker:

- No account of climatic conditions such as clouds or precipitation has been made;
- Objects surrounding the windows may block the view to the turbines such as trees or buildings have been disregarded;
- The turbine rotors may not always be aligned to face-on to the window; and
- The rotors may not always be turning (i.e. no account has been taken of calm winds or shut-down periods).

17.5.4 When the sun is close to the horizon, at dawn and dusk, the intensity of the sun’s rays is reduced and is less likely to cast distinct shadows. It is generally considered that when the sun is lower than 2° above the horizon, that shadow flicker is unlikely to occur. This parameter has been included in the calculations.

17.5.5 The maximum theoretical occurrence of shadow flicker at any of the SFALs amounts to 48.2 hours per year at the most affected window at Killarow Farm (SFAL2); at all other SFALs the maximum theoretical occurrence of shadow flicker will be below this value.

17.5.6 The times of day when shadow flicker could occur at all SFALs are between 04:48 and 06:48 (GMT) during the months of April through to September. At all SFALs, shadow flicker could only occur early in the morning between these times; the effects of shadow flicker will therefore be potentially less or not noticeable to inhabitants at these times if there is overlap with periods of sleep.

17.5.7 The distribution of shadow flicker occurrence for the other seven SFALs is illustrated in Figures A1.3 to A1.9 within Appendix 17.1: Shadow Flicker Assessment.

17.5.8 The instances of shadow flicker would always be less than that predicted by the model as these are based on a worst case scenario. The occurrence of shadow flicker is only possible during the operation of the wind turbine (i.e. when the rotor blades are turning) and when the sky is clear enough for the sun to cast shadows. It is important to consider the following facts when making an assessment:

- Climatic conditions dictate that the sun is not always shining. Met Office data gives actual sunshine hours for the area to be 32% of total daylight hours[1]. Cloud cover during other times may obscure the sun and prevent shadow flicker occurrence. While some shadow may still be

[1] Calculated based on figures available at https://www.metoffice.gov.uk/public/weather/climate/ for Campbelltown, 1412.5 hours of sunshine a year (1412.5/4380*100 = 32%) (last accessed 16/03/2018).

cast under slightly overcast conditions, no shadow at all would be cast when heavy cloud cover prevails; and

- Objects such as trees or walls may surround windows and obscure the view of the turbine and hence prevent or limit shadow flicker. At the assessed locations, woodland and farm buildings may obstruct the view of the turbines, which has not been considered in this assessment. During operation, the turbine rotors would automatically orientate themselves to face the prevailing wind direction. This means the turbine rotors would not always be facing the affected window and in fact would sometimes be 'side-on' to the window. Very little of the blade movement would be visible during such occurrences and therefore the potential for shadow flicker is reduced.

17.5.9 As detailed above, shadow flicker can only occur during daylight hours and when the sky is clear. The total theoretical hours per year given in Table 17.2 above assume all hours of daylight are with clear skies. For the most affected window at Killarow Farm (SFAL2), the total theoretical shadow flicker hours are 48.2 hours per year. Using historical data provided by the Met Office, the total theoretical hours can be adjusted to reflect a more realistic case. Actual sunshine hours are given to be 32% of all daylight hours; therefore, the potential 'likely' hours of shadow flicker per year may be reduced to approximately 15.4 hours. This value does not take account of other factors listed in Section 17.5.8 above which would reduce levels further. The figure is given only as a guide to illustrate the difference between theoretical and 'likely' hours and does not account for other factors which may reduce the levels further.

17.5.10 A comparison has been undertaken of the predicted shadow flicker hours against values included in the *'Best Practice Guidance for Planning Policy Statement 18 (PPS18) Renewable Energy'* (Department of Environment Northern Ireland, 2009) and it was found that there is the potential for the maximum theoretical predictions of shadow flicker to exceed the thresholds of 30 hours per year and 30 minutes per day.

17.5.11 The highest likely level of shadow flicker (taking into account climactic conditions discussed above) that may occur at the most affected receptor (Killarow Farm - SFAL2) is approximately 15.4 hours per year (at the most affected window), which is below the threshold of 30 hours per year. Likely levels of shadow flicker occurrence are below 30 hours per year at all seven SFALs.

17.5.12 The likely levels of yearly shadow flicker occurrence are determined based on annual average climate data, and it would therefore not be appropriate to apply these same factors to daily predicted levels. Both Killarow Farm (SFAL2) and Tangy Mill (SFAL4) could potentially experience maximum levels of shadow flicker in excess of 30 minutes per day.

17.6 Mitigation and Monitoring

17.6.1 In the absence of any Scottish guidelines on acceptable levels of shadow flicker, the thresholds outlined in the *'Best Practice Guidance for Planning Policy Statement 18 (PPS18) Renewable Energy'* (Department of Environment Northern Ireland, 2009) have been adopted.

17.6.2 Mitigation measures are available to counteract shadow flicker occurrence to reduce the possibility of nuisance. One of the most effective mitigation strategies is shutting down selected turbines using turbine control systems during periods when shadow flicker could theoretically occur and during certain weather conditions. Therefore, in order to protect the amenity of local residents, the turbines would be programmed to shut down during periods when shadow flicker could occur.

17.7 Residual Effects

17.7.1 No significant effects have been identified, however proposed mitigation would be implemented, such that there would be no shadow flicker effects and accordingly the impact from shadow flicker would be **not significant.**

17.8 Summary

17.8.1 This chapter has assessed the potential shadow flicker effects associated with the proposed development. It has been identified that the maximum theoretical occurrence of shadow flicker amounts to 48.2 hours per year, although taking into account climactic conditions would reduce this to 15.4, at the most affected window at Killarow Farm (SFAL2). The times of day when shadow flicker could occur are between 04:48 and 06:48 (GMT) during the months of April through to September. At all SFALs, shadow flicker could only occur early in the morning between these times; the effects of shadow flicker will therefore be potentially less or not noticeable to inhabitants at these times if there is overlap with periods of sleep. However, in order to protect the amenity of local residents, the turbines would be programmed to shut down during periods when shadow flicker could occur, accordingly the impact from shadow flicker would be **not significant**.

List of Figures

17.9 References

Scottish Government 'Onshore Wind Turbine' Guidance, 28 May 2014

Department of Energy and Climate Change (2011). Update of UK Shadow Flicker Evidence Base. Parsons Brinkerhoff on behalf of the Department of Energy and Climate Change

Best Practice Guidance for Planning Policy Statement 18 (PPS18) Renewable Energy (Department of Environment Northern Ireland, 2009

Met Office Website

18. AVIATION

Executive Summary

The potential impacts of the proposed development on aviation and radar in the surrounding area have been assessed and the technical reports are appended to this chapter. This assessment has included military and civil interests. The relevant navigation aids are located on or near Campbeltown Aerodrome. These are a Non-Directional Beacon (NDB); a Doppler Very High Frequency Omni-Range (DVOR); and Distance Measuring Equipment (DME).

There are **no significant impacts** anticipated on these navigation aids, following technical assessment in accordance with industry practice and the appropriate guidance (see References and appendices at the end of this chapter).

An aerodrome physical safeguarding assessment has been carried out for Campbeltown Aerodrome, due to its proximity to the proposed development. This was completed in accordance with the methodology published by the Civil Aviation Authority (CAA) and has shown that the turbines would breach the Outer Horizontal Surface (OHS) associated with the airport. This is the only Obstacle Limitation Surface (OLS) to be affected. This breach is not considered significant because the terrain at the proposed development location breaches the OHS; the existing Tangy I and II turbines currently breach the OHS; therefore, **no significant increase in impact** is predicted as a result of the proposed development.

No increase in minimum sector altitudes would be required as a result of the proposed development. The missed approach procedure for aircraft approaching runway 11 has been considered in accordance with International Civil Aviation Organisation (ICAO) guidance, **no impact** on this procedure is predicted based on the technical assessment (see Appendix 17.3 to this chapter).

No significant impacts on radar installations or military low flying are predicted due to the location of the proposed development. Since no significant impacts are predicted, no mitigation requirements have been identified.

18.1 Introduction

18.1.1 This chapter considers the potential effects on aviation associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the baseline, with specific consideration of the existing wind developments (Tangy I and II);
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

18.1.2 The assessment has been carried out by Pager Power Limited in accordance with International Civil Aviation Organisation (ICAO) requirements.

18.1.3 This chapter is supported by:

- Appendix 18.1: Aviation and Radar Risk Assessment; and
- Appendix 18.2: Instrument Flight Procedure Assessment.

18.2 Scope of Assessment

Project Interactions

18.2.1 The proposed development will introduce new physical structures (turbines) in the area, that are larger than the existing ones at the site. Large structures can affect aviation infrastructure in predominantly two ways, because they can:

- present a collision risk for aircraft; and
- block and/or reflect radio signals from radar installations and other navigation aids.

Study Area

18.2.2 The Study Area for aviation issues is defined by individual impacts. For aerodrome physical safeguarding, which is protection against collision risks, the study area is approximately 20 kilometres (km) from any proposed turbine. For en-route radar, the Study Area extends to more than 100 km from the proposed development. Appendix 18.1 contains the technical report that identifies the relevant installations that have been considered.

18.2.3 The installations that have required the most assessment are located at or near Campbeltown Aerodrome, within 10 km of the proposed development.

Scoping and Consultation

18.2.4 The applicant has consulted with relevant aviation stakeholders as described in Table 18.1.

Table 18.1: Consultation Responses

Consultee and Date	Summary of Response	Comment/Action Taken
Defence Infrastructure Organisation (DIO) 22/05/2017	The MOD has no objection to the proposal. In the interests of air safety, the MOD will request that the development should be fitted with MOD accredited 25 candela omni-directional red lighting or infrared lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point.	Visible lighting, as agreed with Highlands and Islands Airport Limited (HIAL) will be included on cardinal (T1, T8 and T11) turbines.

Table 18.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
	Defence Infrastructure Organisation Safeguarding wishes to be consulted and notified of the progression of planning applications to verify that it will not adversely affect defence interests."	
NATS Safeguarding	No response received to scoping request.	This chapter presents an assessment of potential aviation effects.
Civil Aviation Authority	No response received to scoping request.	This chapter presents an assessment of potential aviation effects.
Highlands and Islands Airports Limited 19th March 2018	HIAL confirmed that the proposal is acceptable subject to steady red 32 candela omnidirectional lighting being fitted to cardinal turbines T1, T8 and T11.	Lighting strategy agreed with HIAL.

Effects to be Assessed

18.2.5 Table 18.2 sets out the assessed effects. Appendices 18.1 and 18.2 present the technical reports containing the assessment.

Table 18.2: Effects to be Assessed	
Installation / Feature	**Potential Effect**
Campbeltown Aerodrome Obstacle Limitation Surfaces (OLSs)	An OLS is an imaginary surface that is defined in three dimensions at a licensed aerodrome. Multiple OLSs are defined for safety purposes. Infringement of an OLS can signify a potential collision risk.
Doppler Very High Frequency Omni-Range (DVOR)	There is a DVOR, which is a navigation aid, located near Campbeltown Aerodrome. Wind turbines can block or reflect the signals emitted from a DVOR, impacting its effectiveness.
Distance Measuring Equipment (DME)	There is a DME, which is a navigation aid, located near Campbeltown Aerodrome. Wind turbines can block or reflect the signals emitted from a DME, impacting its effectiveness.
En-Route Radar	En-Route radar throughout the UK are operated and safeguarded by NATS, formerly National Air Traffic Services. The specific radar that have been assessed are Tiree and Lowther Hill. Wind turbines can block or, more importantly, reflect radar signals. This can cause radar clutter and/or bearing errors along with other issues under particular circumstances.
Instrument Flight Procedures (IFPs)	The published procedures at Campbeltown Aerodrome have been assessed. In particular, the missed approach procedure for aircraft approaching from the east has been considered in detail, because aircraft following this procedure would pass nearest the proposed development.
Minimum Safe Altitudes (MSA)	The MSA for an aircraft is influenced by the elevation of nearby obstacles. It is necessary to consider the effect of tall structures on MSAs.

Table 18.2: Effects to be Assessed	
Installation / Feature	**Potential Effect**
Military Low Flying	The Ministry of Defence (MOD) carries out military low flying for training purposes over the United Kingdom. Some areas are more sensitive than others, within the most critical areas the presence of over-ground obstacles must be carefully managed for safety reasons.

Effects Scoped Out of Assessment

18.2.6 Table 18.3 sets out the effects that have been scoped out of assessment.

Table 18.3: Effects Scoped Out of Assessment		
Installation / Feature	**Potential Effect**	**Reason for Scoping Out**
On-airfield radar (used for air traffic control)	Radar clutter could occur due to reflection of the radar signal by wind turbines.	On-airfield radar for managing traffic at a particular aerodrome are typically safeguarded against wind developments within 30 km. In the case of military aerodromes, this range can be extended. There is no on-airfield radar in the vicinity of the proposed development that would require assessment.
Meteorological radar	Meteorological radar, used for monitoring and predicting precipitation levels, can be affected by wind turbines reflecting and/or blocking the radar signal.	Meteorological radar installations are typically safeguarded against wind developments within 30 km. There is no meteorological radar in the vicinity of the proposed development that would require assessment.

18.2.7 Effects arising from the process of decommissioning have been scoped out since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. However, the results of decommissioning (i.e. the removal of the proposed development) are taken into account in assessing ongoing and operational effects where appropriate.

18.3 Methodology

Overview

18.3.1 The potentially affected installations have been identified based on a database of infrastructure, published sources and inspection of relevant aviation maps. This highlighted the aerodromes, radar installations, navigation aids and military low flying zones that require consideration.

18.3.2 Technical assessments were carried out using sophisticated computer modelling and a digital terrain database. The relevant guidance from the Civil Aviation Authority (CAA) and the International Civil Aviation Organisation (ICAO) was followed (see References at the end of this chapter and the technical assessments within the appendices).

18.3.3 The results of the technical assessments have been made available to the relevant stakeholders for discussion purposes.

Method of Baseline Characterisation

Desk Surveys

18.3.4 The primary sources of information for the technical assessments were:

- Pager Power's database of installations – continuously updated based on stakeholder consultation, field surveys and official publications;

- NATS Aeronautical Information Package – which includes coordinate information for navigation aids at licensed aerodromes;
- the applicant's provided information pertaining to the existing and consented developments at the proposed development location; and
- relevant aviation charts.

18.3.5 The technical analysis has been informed by:

- a digital terrain database – based on OSGB 36 datum that is interpolated by a sophisticated weighted algorithm;
- radar line of sight analysis that includes earth curvature and atmospheric refraction; and
- safeguarding criteria specified within CAA and ICAO publications (see References at the end of this chapter and the appendices).

<u>*Field Survey Techniques*</u>

18.3.6 No field surveys were required as part of the analysis.

Effects Evaluation Methodology (NB this is still under methodology subheading)

<u>*Receptor sensitivity*</u>

18.3.7 Each receptor has been designated a sensitivity based on its ability to absorb change. Table 18.4 defines the sensitivity categories that have been applied.

Table 18.4: Receptor Sensitivity Categories

Sensitivity	**Definition**
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

<u>*Impact Magnitude*</u>

18.3.8 The magnitude of each potential impact has been classified based on the findings of the technical analysis. Table 18.5 defines the magnitude categories that have been applied. Effects have been considered in the context of the existing developments at the site (Tangy I and II).

Table 18.5: Impact Magnitude Categories

Magnitude	**Definition**
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one or more key characteristics, features or elements.

Table 18.5: Impact Magnitude Categories	
Magnitude	**Definition**
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
No Change	No loss or alteration of characteristics, features or elements; no observable impact.

Effects Significance

18.3.9 The combination of receptor sensitivity and impact magnitude determines the overall impact significance, as shown in Table 18.6. Moderate, Major and Substantial effects are considered to be significant under the EIA Regulations.

Table 18.6: Significance of Impact					
Sensitivity	**Magnitude**				
	No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Negligible	Negligible	Negligible	Minor	Minor	Minor
Low	Negligible	Minor	Minor	Minor	Moderate
Medium	Negligible	Minor	Minor	Moderate	Major
High	Negligible	Minor	Moderate	Major	Substantial
Very High	Negligible	Minor	Moderate	Major	Substantial

Assessing Cumulative Effects

18.3.10 The proposed development was considered in isolation – however the effects of the existing developments and the consented development were considered as part of the overall assessment.

Limitations of Assessment

18.3.11 All analysis is desk-based, no site surveys have taken place. This does not significantly affect the certainty of the results because the information sources are reliable and have, where appropriate, been cross-checked using multiple sources.

18.3.12 The assessment of the missed approach procedure (see Appendix 18.2) has been undertaken in accordance with the available appropriate guidance. HIAL may require an external assessment from the CAA to confirm the findings at a later stage.

18.4 Baseline Conditions

Current Baseline

Context

18.4.1 The existing Tangy I and II developments are operational at the proposed development location. This means there are currently twenty-two operational turbines with a tip height of 75 metres above ground level at the proposed development location.

18.4.2 The potential impact of the proposed development has been considered in the context of the existing turbines. This is appropriate because the goal is to capture any increase in impact caused by the proposed development relative to the existing baseline.

Designations

18.4.3 There are no relevant designations that affect the aviation analysis.

Future Baseline

18.4.4 No predicted changes to the current baseline have been incorporated into the analysis.

Summary

18.4.5 A summary of the receptors identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment are given in Table 18.7, together with the justification for inclusion:

Table 18.7: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Campbeltown Aerodrome Outer Horizontal Surface	Medium	This OLS is constructed to minimise potential collision risks and extends over the proposed development area.
Campbeltown Aerodrome DVOR	Medium	Navigation aids at this range can be affected by large wind turbines.
Instrument Flight Procedures	Medium	The presence of large obstructions near IFPs requires assessment to minimise risk to aircraft.
NATS DME	Medium	Navigation aids at this range can be affected by large wind turbines.
NATS Lowther Hill Radar	Medium	Radar performance can be affected by wind developments, the NATS Lowther Hill radar provides coverage in the area of the proposed development.
NATS Tiree Radar	Medium	Radar performance can be affected by wind developments, the NATS Tiree radar could provide coverage in the area of the proposed development.
Minimum Sector Altitudes	Medium	An MSA is affected by the elevation of obstacles in the area, MSAs are defined at the proposed development location.
Military Low Flying	Low	Military Low Flying takes place throughout the UK and potential effects due to large obstructions must be assessed. The 'low' sensitivity has been assigned based on the importance categories defined by the MOD for wind developments specifically. In other locations within the UK the sensitivity would be higher.

18.5 Effects Evaluation

Basis of Assessment

Proposed Development Characteristics

- The technical analysis has been undertaken based on a turbine tip height of up to 149.9 metres above ground level.
- All assessments have been undertaken based on the 'bare-earth' case i.e. without consideration of screening from trees or buildings. This is the most conservative approach, particularly for radar line of sight assessments because additional obstructions would reduce the predicted impact of the proposed development.

Mitigation Measures

- No significant direct effects are predicted and consequently no mitigation is required.

Additional Good Practice

18.5.1 It is good practice to liaise with the relevant stakeholders, in this case HIAL and MOD, during the construction phase, where relevant. For example, the presence of tall cranes etc. should be communicated to HIAL and MOD when construction works are started.

Effects on Campbeltown Aerodrome Outer Horizontal Surface

Receptor Sensitivity – Campbeltown Aerodrome OHS

- This receptor sensitivity is classified as '**Medium**'.
- Infringements of an OHS can be operationally accommodated, in particular as the terrain itself at the proposed development location infringes the OHS.

Construction Effects – Campbeltown Aerodrome OHS

18.5.2 The impact magnitude during construction is classified as '**Minor**'. The terrain at the proposed development location infringes the OHS, as do the 22 existing Tangy I and Tangy II wind turbines. By definition, any turbine components or construction equipment at the site will comprise a further breach of this surface. However, this is highly unlikely to affect the aerodrome operationally because the situation will not be materially different than the current baseline.

18.5.3 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on Campbeltown Aerodrome OHS

18.5.4 The impact magnitude during operation is classified as '**Minor**'. The terrain at the proposed development location infringes the OHS, as do the22 existing Tangy w I and Tangy II wind turbines. The proposed development will breach this surface by a greater margin than the existing turbines. However, this is highly unlikely to affect the aerodrome operationally because the situation will not be materially different than the current baseline.

18.5.5 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on Campbeltown Aerodrome OHS

18.5.6 Secondary effects are not predicted.

Predicted Cumulative Effects on Campbeltown Aerodrome OHS

18.5.7 The effects of the proposed development have been considered in isolation.

Summary of Effects on Campbeltown Aerodrome OHS

18.5.8 The infringement of the OHS is not significant and does not require mitigation.

Effects on Campbeltown Aerodrome DVOR

Receptor Sensitivity

- This receptor sensitivity is classified as '**Medium**'.
- DVOR beacons emit radio signals that can be blocked or reflected by obstructions, including terrain. Such beacons are tolerant to certain levels of obstruction in the surrounding environment, for example the elevated terrain in the direction of the proposed development.

Construction Effects

18.5.9 The impact magnitude during construction is classified as '**Minor**'. There are no published procedures at Campbeltown Aerodrome that are reliant on the DVOR. Furthermore, the potential impact of the proposed development is only marginally greater than the impact of the existing turbines. Overall, the presence of the proposed development would not give rise to a significant change from the baseline conditions.

18.5.10 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts – Campbeltown Aerodrome

18.5.11 The impact magnitude during operation is classified as '**Minor**'. There are no published procedures at Campbeltown Aerodrome that are reliant on the DVOR. Furthermore, the potential impact of the proposed development is only marginally greater than the impact of the existing turbines. Overall, the presence of the proposed development would not give rise to a significant change from the baseline conditions.

18.5.12 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on Campbeltown Aerodrome DVOR

18.5.13 Secondary effects are not predicted.

Predicted Cumulative Effects on Campbeltown Aerodrome DVOR

18.5.14 The effects of the proposed development have been considered in isolation.

Summary of Effects on Campbeltown Aerodrome DVOR

18.5.15 The infringement of the OHS is not significant and does not require mitigation.

Effects on Campbeltown Aerodrome Instrument Flight Procedures

Receptor Sensitivity – Campbeltown Aerodrome IFP

- This receptor sensitivity is classified as '**Medium**'.
- This is because any impacts that conflict with IFP safeguarding rules require the IFP to be changed.

Construction Effects – Campbeltown Aerodrome IFP

18.5.16 The impact magnitude during construction is classified as '**Negligible**'. This is because the proposed development will not conflict with the safeguarding criteria for the IFPs at Campbeltown Aerodrome.

18.5.17 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on Campbeltown Aerodrome IFP

18.5.18 The impact magnitude during operation is classified as '**Negligible**'. This is because the proposed development will not conflict with the safeguarding criteria for the IFPs at Campbeltown Aerodrome.

18.5.19 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on Campbeltown Aerodrome IFP

18.5.20 Secondary effects are not predicted.

Predicted Cumulative Effects on Campbeltown Aerodrome IFP

18.5.21 The effects of the proposed development have been considered in isolation.

Summary of Effects on Campbeltown Aerodrome IFP

18.5.22 The proposed development's impact on the IFP is not significant and does not require mitigation.

Effects on NATS DME

Receptor Sensitivity – NATS DME

- This receptor sensitivity is classified as '**Medium**'.
- DME beacons emit radio signals that can be blocked or reflected by obstructions, including terrain. Such beacons are tolerant to certain levels of obstruction in the surrounding environment, for example the elevated terrain in the direction of the proposed development.

Construction Effects – NATS DME

18.5.23 The impact magnitude during construction is classified as '**Minor**'. The terrain at the proposed development location infringes the OHS, as do the 22 existing Tangy I and Tangy II wind turbines. By definition, any turbine components or construction equipment at the site will comprise a further breach of this surface. However, this is highly unlikely to affect the aerodrome operationally because the situation will not be materially different than the current baseline.

18.5.24 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on NATS DME

18.5.25 The impact magnitude during operation is classified as '**Minor**'. The elevated terrain in the direction of the proposed development will already affect the DME's performance. The potential impact of the proposed development is only marginally greater than the impact of the existing turbines. Overall, the presence of the proposed development would not give rise to a significant change from the baseline conditions.

18.5.26 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on NATS DME

18.5.27 Secondary effects are not predicted.

Predicted Cumulative Effects on NATS DME

18.5.28 The effects of the proposed development have been considered in isolation.

Summary of Effects on NATS DME

18.5.29 The impact on the NATS DME is not significant and does not require mitigation.

Effects on NATS Lowther Hill Radar

Receptor Sensitivity – NATS Lowther Hill Radar

- This receptor sensitivity is classified as '**Medium**'.
- Radar are designed to operate in a dynamic environment. The NATS En-Route radar network is able to accommodate many obstructions (including wind developments) within its areas of coverage.
- The NATS Lowther Hill Radar can therefore be described as having moderate capacity to absorb change without significantly altering its present character.
- The NATS Lowther Hill Radar comprises a Primary Surveillance Radar (PSR) and a collocated Secondary Surveillance Radar (SSR). The SSR would not be affected due to the separation distance, and the assessment has focussed on the PSR.

Construction Effects – NATS Lowther Hill Radar

18.5.30 The impact magnitude during construction is classified as '**Negligible**'. Any effects on the radar would be caused by the spinning rotor of a turbine within radar line of sight. Whilst the turbines are not rotating, there will be no perceptible impact on the radar.

18.5.31 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on NATS Lowther Hill

18.5.32 The impact magnitude during operation is classified as '**Negligible**'. Only one of the sixteen turbines is predicted to be within radar line of sight by a margin of less than two metres. Due to the separation distance of more than 100 kilometres, perceptible impacts are not predicted.

18.5.33 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on the NATS Lowther Hill Radar

18.5.34 Secondary effects are not predicted.

Predicted Cumulative Effects on the NATS Lowther Hill Radar

18.5.35 The effects of the proposed development have been considered in isolation.

Summary of Effects on the NATS Lowther Hill Radar

18.5.36 The potential impact on the NATS Lowther Hill Radar is not significant and does not require mitigation.

Effects on NATS Tiree Radar

Receptor Sensitivity – NATS Tiree Radar

- This receptor sensitivity is classified as '**Medium**'.
- Radar are designed to operate in a dynamic environment. The NATS En-Route radar network is able to accommodate many obstructions (including wind developments) within its areas of coverage.
- The NATS Tiree Radar can therefore be described as having moderate capacity to absorb change without significantly altering its present character.
- The NATS Tiree Radar comprises a Primary Surveillance Radar (PSR) and a collocated Secondary Surveillance Radar (SSR). The SSR would not be affected due to the separation distance, and the assessment has focussed on the PSR.

Construction Effects – NATS Tiree Radar

18.5.37 The impact magnitude during construction is classified as '**Negligible**'. Any effects on the radar would be caused by the spinning rotor of a turbine within radar line of sight. Whilst the turbines are not rotating, there will be no perceptible impact on the radar.

18.5.38 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on NATS Tiree Radar

18.5.39 The impact magnitude during operation is classified as '**Negligible**'. The NATS Tiree Radar will not have radar line of sight to the proposed development and no impacts are predicted.

18.5.40 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on the NATS Tiree Radar

18.5.41 Secondary effects are not predicted.

Predicted Cumulative Effects on the NATS Tiree Radar

18.5.42 The effects of the proposed development have been considered in isolation.

Summary of Effects on the NATS Tiree Radar

18.5.43 The potential impact on the NATS Lowther Hill Radar is not significant and does not require mitigation.

Effects on Minimum Sector Altitudes

Receptor Sensitivity – Minimum Sector Altitudes

- This receptor sensitivity is classified as '**Medium**'.
- An MSA is designed to ensure an aircraft maintains sufficient clearance above obstacles in the area. If this clearance cannot be maintained, the MSA must increase.

Construction Effects – MSA

18.5.44 The impact magnitude during construction is classified as '**Negligible**'. The MSA to the north of Campbeltown Aerodrome is between 3,700 and 4,000 feet above mean sea level. The maximum turbine blade tip within the proposed development will be approximately 1,212 feet above mean sea level. The required clearance is 300 metres (984 feet). No turbine components or cranes are predicted to affect the MSA during construction.

18.5.45 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on MSA

18.5.46 The impact magnitude during construction is classified as '**Negligible**'. The MSA to the north of Campbeltown Aerodrome is between 3,700 and 4,000 feet above mean sea level. The maximum turbine blade tip within the proposed development will be approximately 1,212 feet above mean sea level. The required clearance is 300 metres (984 feet).

18.5.47 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on MSA

18.5.48 Secondary effects are not predicted.

Predicted Cumulative Effects on MSA

18.5.49 The effects of the proposed development have been considered in isolation.

Summary of Effects on MSA

18.5.50 No impacts on the MSA are predicted and no mitigation is required.

Effects on Military Low Flying

Receptor Sensitivity – Military Low Flying

- This receptor sensitivity is classified as '**Low**'.
- Military Low Flying takes place throughout the UK. In some areas, such as Tactical Training Areas, obstacles must be very carefully managed, and development of tall structures can be highly restricted. By contrast, the area containing the proposed development is not a high priority for Military Low Flying.
- The Military Low Flying areas can therefore, in this context, be described as tolerant of change without detriment to its character.

Construction Effects – Military Low Flying

18.5.51 The impact magnitude during construction is classified as '**Negligible**'. The proposed development is located in a 'low priority low flying area less likely to raise concerns'. Furthermore, the existing turbines at the site location are not affecting Military Low Flying, and the MOD responded to the scoping consultation to confirm no objection to proposals for sixteen turbines with a height of 149.9 metres at the proposed development location.

18.5.52 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Ongoing and Operational Impacts on Military Low Flying

18.5.53 The impact magnitude during construction is classified as '**Negligible**'. The proposed development is located in a 'low priority low flying area less likely to raise concerns'. Furthermore, the existing turbines at the site location are not affecting Military Low Flying, and the MOD responded to the scoping consultation to confirm no objection to proposals for sixteen turbines with a height of 149.9 metres at the proposed development location.

18.5.54 The resulting significance of impact, in accordance with Table 18.6, is **Minor** and **not significant**.

Predicted Secondary Effects on Military Low Flying

18.5.55 Secondary effects are not predicted.

Predicted Cumulative effects on Military Low Flying

18.5.56 The effects of the proposed development have been considered in isolation.

Summary of Effects on Military Low Flying

18.5.57 No impacts on Military Low Flying are predicted and no mitigation is required.

18.6 Monitoring

18.6.1 No monitoring requirements have been identified.

18.6.2 No mitigation monitoring requirements have been identified, because no mitigation measures are required.

18.7 Summary

18.7.1 No significant aviation impacts are predicted. No mitigation requirement has been identified.

18.7.2 Table 18.8 summarises the assessment results for each receptor.

Table 18.8: Summary of Assessment Findings

Receptor	**Sensitivity**	**Magnitude of Impact**	**Significance of Impact**	**Mitigation Requirement**
Campbeltown Aerodrome Outer Horizontal Surface	Medium	Minor	Minor	None
Campbeltown Aerodrome DVOR	Medium	Minor	Minor	None
Instrument Flight Procedures	Medium	Negligible	Minor	None
NATS DME	Medium	Minor	Minor	None
NATS Lowther Hill Radar	Medium	Negligible	Minor	None
NATS Tiree Radar	Medium	Negligible	Minor	None
Minimum Sector Altitudes	Medium	Negligible	Minor	None
Military Low Flying	Low	Negligible	Minor	None

18.8 References

- Civil Aviation Authority (2014), CAP 168 Licensing of Aerodromes, Edition 10.
- Civil Aviation Authority (2017), CAP 777 Licensing of Aerodromes, Version 4.
- Civil Aviation Authority (2016), CAP 764 Policy and Guidelines on Wind Turbines, Version 6.
- ICAO (2006), Procedures for Air Navigation Services, Aircraft Operations, Volume II. Construction of VISUAL AND Instrument Flight Procedures, Fifth Edition.
- NATS AIP (digital resource, various publication dates).

19. SUMMARY OF IMPACTS AND SCHEDULE OF MITIGATION

19.1 Introduction

19.1.1 The purpose of this chapter is to summarise the mitigation measures proposed in each of the chapters to avoid, reduce, or offset impacts which would otherwise give rise to significant residual environmental effects.

19.1.2 The main aim of the design process was to 'design out' potential for environmental effects as far as possible. This chapter does not summarise 'mitigation by design'.

19.1.3 The majority of the pre-construction and construction phase mitigation would be delivered through the proposed Construction Environmental Management Plan (CEMP). The outline content of the proposed CEMP is provided in Appendix 5.1: Construction Environmental Management Plan. Further detail on specific mitigation measures to be included in the CEMP is contained in each of the technical chapters, where relevant.

19.2 Summary of Mitigation and Residual Effects

19.2.1 The predicted effects and mitigation measures have been compiled into Table 19.1. They are presented in the order in which they appear within this EIA Report.

- Landscape and Visual;
- Ornithology;
- Ecology and Nature Conservation;
- Geology, Soil and Peat;
- Surface Water;
- Cultural Heritage;
- Noise;
- Access Traffic and Transport;
- Land-use, Socio-economics and Recreation;
- Shadow Flicker; and
- Aviation.

Table 19.1: Summary of Mitigation and Residual Effects

Topic	Potential likely Significant Effect (without mitigation)	Mitigation Measures	Effect	Timing	Residual Effect
Landscape and Visual (Chapter 8)	**Construction and Operation:** The assessment confirms that potential significant and cumulative effects are limited to two of the six Landscape Character Types (LCTs) and to an area within 8 km of the proposed development. The majority of the study area would not experience significant landscape effects. Potential significant visual effects have been identified for 16 of the 27 viewpoints, at three of the 10 settlements and four of the 17 routes, however it is noted that significant effects would be unlikely to affect receptors in the Settlements which are not currently affected by the existing Tangy I and II Wind Farm. Similarly, receptors on the affected routes are similar to those affected by the existing Tangy I and II Wind Farm. The majority of the study area would not experience significant effects on visual amenity.	Advice on landscape and visual issues has been core to the design process including turbine scale, geometry, turbine and site layouts and reinstatement measures. Because of this, there is no additional landscape and visual mitigation proposed.	Not applicable.	Not applicable.	Potential significant and cumulative effects have been identified for two of the six Landscape Character Types (LCTs). Potential significant visual effects for 16 of the 27 viewpoints, at 3 of the 10 settlements and 4 of the 17 routes. Potential significant cumulative visual effects at 5 of the 11 viewpoints and on 1 of the 11 routes. It is noted that significant effects would be unlikely to affect receptors in the Settlements or on assessed route which are not currently affected by the existing Tangy I and II Wind Farm. Overall the majority of the study area would not experience significant effects on landscape character or visual amenity.
Ornithology (Chapter 9)	No potential significant effects identified and no potential for an adverse effect on the integrity of the Kintyre Goose Roosts SPA.	**Construction:** Although no significant effects are predicted, a number of mitigation measures will be put in place during the winter period to ensure all reasonable	Reduction and/or avoidance of non-significant effects.	Pre-Construction, Construction, Post-Construction and Operation.	No significant effects.

Table 19.1: Summary of Mitigation and Residual Effects

		measures are taken to avoid disturbance to commuting flights of, or roosting, Greenland white-fronted geese in the area: • Prior to the commencement of works an agreed timetable for construction, which takes account of the need to protect geese using Tangy Loch or Lussa Loch from disturbance during building works, shall be submitted and approved by Argyll and Bute Council in consultation with SNH. The duly approved timetable shall be adhered to by contractors for the duration of the construction period; • Any construction works, vehicular traffic, or other activity shall be confined to the period 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries would only take place outside these times with the prior consent of the local authority and police. Those activities that are unlikely to give rise to noise audible at the site boundary may continue outside of the stated hours; and • Any blasting shall be confined to Monday to Friday, between the hours of 10:00 and 16:00. Blasting on Saturday mornings shall be a matter for negotiation between contractor and the local authority. The ECoW will oversee the implementation of the above mitigation measures.			

Table 19.1: Summary of Mitigation and Residual Effects

		Operation: Operational monitoring should be undertaken of Greenland white-fronted goose roosting activity (and flight paths) at Tangy Loch and Lussa Loch. It is recommended these surveys be carried out in years 1, 2, 5, 10 and 15 during the operational period.			
Ecology and Nature Conservation (Chapter 10)	**Construction:** Permanent and temporary (reversible) adverse impacts on habitats. Direct impact on habitats and indirect impacts on species from accidental pollution. Adverse effect at the local level of habitat loss and/or modification. **Operation:** Accidental spillage during maintenance works could lead to potential habitat loss or degradation.	**Construction:** Mitigation through development design was implemented, where possible, to avoid those habitats of highest ecological value and highest sensitivity to effects. Peat slide risks on Tangy Loch SSSI and the required mitigation measures are discussed in Appendix 11.1: Peat Stability Risk Assessment and embedded in Appendix 5.1: CEMP. Other relevant good construction practice measures are included in Appendix 5.1: CEMP. A protected species survey would be completed within eight months prior to the start of construction. A suitably qualified ecologist would be appointed to survey areas where reptiles may be found. Any reptiles discovered during the survey would be moved to suitable areas outwith the construction area. If the work is undertaken outwith the active months for reptiles, the ecologist would search for suitable hibernation sites for relocation. All such work would be undertaken in	Reduction and/or avoidance of significant effects.	Pre-Construction, Construction, Post-Construction, Operation and Decommissioning.	No likely residual significant effects anticipated.

Table 19.1: Summary of Mitigation and Residual Effects					
		accordance with approved method statements. Prior to work in the area of the known active badger sett (which is expected to comprise forestry clearance due to the volume of windthrow in this area), the measures described in Appendix 10.5: Badger Protection Plan would be followed to allow forestry clearance within 20 m of the active sett. A further survey of the single entrance sett prior to construction would determine if it is active, in which case the same protection measures would be applied. If found inactive, no protection measures would be required for this sett. **Operation:** The risk of pollution from surface runoff to watercourses and aquatic habitats, such as Tangy Loch SSSI, would be prevented by ensuring that runoff control measures, such as interceptor drains and silt traps to assist in maintaining water quality, are in place. Additionally, interceptor drains would be used to control the flow of any runoff from operation activities. **Decommissioning:** Areas of wind farm infrastructure such as turbines and tracks to be removed as part of the decommissioning of the existing Tangy I and II Wind Farms would be reinstated. Where tracks would not be upgraded to be used in the proposed development, they would be reinstated to			

Table 19.1: Summary of Mitigation and Residual Effects					
		allow recolonisation of natural habitats. It is likely that recolonisation would include M23 rush pasture and M23/M25 mire habitats as they are the habitats found around the sections of track to be removed. More details on the proposed approach to decommissioning and reinstatement are set out in Appendix 5.1: CEMP. Habitat restoration, woodland replanting and bat carcass searches would be completed in accordance with Appendix 10.6: Habitat Management Plan.			
Geology, Soil and Peat (Chapter 11)	No potential significant effects identified	Though not significant, requirement for further mitigation, as part of the construction phase for managing peat slide risk and peat handling/reinstatement are described in Appendix 11.1 and Appendix 11.3 respectively. The good practice mitigation measures described therein would be implemented through Appendix 5.1: CEMP.	Not applicable.	Not applicable.	No significant effects.
Surface Water (Chapter 12)	**Construction:** Potential effects of high magnitude on PWS2 relating to both quality and quantity of PWS during the use of borrow pit C. **Operation:** Potential effects of high magnitude on PWS2 relating to quantity of PWS should the direction of groundwater flow be altered.	The mitigation measures below are proposed in addition to the good practice water quality protection measures included within the CEMP (Appendix 5.1). The applicant intends to identify a long-term sustainable solution for the PWS2 water supply and will seek to establish the PWS users' current needs regarding water use and quantities, post-consent. The applicant will seek the PWS users' input and support for any protection or	Reduction and/or avoidance of significant effects.	Pre-Construction, Construction, Post-Construction and Operation.	No likely residual significant effects anticipated.

Table 19.1: Summary of Mitigation and Residual Effects

		mitigation measures relating to the PWS' infrastructure and will strive to maintain, if not improve, the current PWS water quality and quantity. The applicant accepts that the protection of the PWS to the satisfaction of SEPA and the PWS users will be required as part of the consent/pre-commencement Planning Condition. As part of good practice within the CEMP and in line with LUPS-31 on-going monitoring of the PWS2 groundwater supply will be undertaken to demonstrate whether the quality of groundwater and/or hydrological connectivity is being maintained taking cognizance of SEPA Technical Guidance Note 1: The Monitoring of Infrastructure with Excavations Less than 1m Deep within 100m of Sensitive Receptors (Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystem). Monitoring will take place before, during and after construction; with timescales to be agreed with SEPA. If required and as agreed with the PWS user, temporary water supply will be made available for use from the outset and throughout the construction period, should PWS2 be temporarily adversely affected.			
Cultural Heritage (Chapter 13)	**Construction:** Potential direct effects on known or unknown buried archaeological remains, in the case of the proposed development, relate to the possibility	**Construction and Operation:** Mitigation through development design was implemented to avoid or minimise potential significant cultural heritage effects.	Reduction and/or avoidance of significant effects.	Pre-Construction, Construction, Post-Construction and Operation.	Predicted residual significant effect is predicted for Killocraw Cairn (Site 21) and Tangy Loch Fortified Dwelling (Site 27). Although significant,

Table 19.1: Summary of Mitigation and Residual Effects

	of disturbing, removing or destroying in situ remains and artefacts during ground breaking works (including excavation, construction and other works associated with the proposed development) on this site. **Operation:** During the operational phase there is a potential for adverse indirect effects upon the settings of a range of heritage assets within 10 km of the site	No Significant direct effects are predicted and consequently no mitigation is required. It is recognised that there is a potential for inadvertent damage to both known and unknown archaeological remains. In order to prevent inadvertent damage to heritage assets within the coniferous plantation woodland during clearance operations, all visible remains will be photographed, surveyed and fenced off under archaeological supervision, in advance of forestry operations. All areas of peat >1 m and proposed borrow pit locations, all of which are located in close proximity to known heritage assets (Sites 14, 15 and 16), will be subject to archaeological monitoring. The purpose of such monitoring will be to identify any hitherto unknown archaeological remains threatened by the proposed development, to assess their value and to mitigate any impact upon them either through avoidance or, if preservation in situ is not feasible, through preservation by record. No direct mitigation is possible for operational (setting) effects. Potential offset measures are considered in Chapter 13.			the effect would not be at a level that could threaten the protection of the asset.
Noise (Chapter 14)	No potential significant effects identified	**Construction:** Though not significant, mitigation measures are proposed to reduce potential effects of construction noise and	Reduction and/or avoidance of non-significant effects.	Pre-Construction, Construction,	No likely residual significant effects anticipated.

Table 19.1: Summary of Mitigation and Residual Effects					
		potential noise and vibration effects of blasting operations. Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle deliveries to the site would be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries would only take place outside these times with the prior consent of the local authority and the Police. Those activities that are unlikely to give rise to audible noise at the site boundary may continue outside of the stated hours. All construction activities shall adhere to good practice as set out in BS 5228. All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain fitted at all times. Where flexibility exists, activities will be separated from residential neighbours by the maximum possible distances. A site management regime will be developed to control the movement of vehicles to and from the proposed development site. Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels.		Post-Construction and Operation.	

Table 19.1: Summary of Mitigation and Residual Effects					
		The potential noise and vibration effects of blasting operations will be reduced according to the guidance set out in the relevant British Standards PAN50 Annex D and discussed below: • Blasting should take place under strictly controlled conditions with the agreement of the relevant authorities, at regular times within the working week, that is, Monday to Friday, between the hours of 10.00 and 16.00. Blasting on Saturday mornings shall be a matter for negotiation between the contractor and the local authorities; • Vibration levels at the nearest sensitive properties are best controlled through on site testing processes carried out in consultation with the Local Authorities. This site testing based process would include the use of progressively increased minor charges to gauge ground conditions both in terms of propagation characteristics and the level of charge needed to release the requisite material. The use of onsite monitoring at neighbouring sensitive locations during the course of this preliminary testing can then be used to define upper final charge values that will ensure vibration levels remain within the criteria set out previously, as described in BS 5228 2 and BS 6472 2 2008;			

Table 19.1: Summary of Mitigation and Residual Effects					
		• Blasting operations shall adhere to good practice as set out in BS 5228 2 and in PAN50, Annex D, Paragraph 95, in order to control air overpressure. **Operation:** The selection of the final turbine to be installed at the site would be made on the basis of enabling the relevant noise limits to be achieved at the surrounding properties. Satisfactory control of cumulative noise immission levels would be achieved through enforcement of individual consent limits for each of the individual wind farms.			
Access Traffic and Transport (Chapter 15)	**Construction:** Major adverse effect on receptors as a result of increased traffic for the duration of construction of the proposed development. Potential for driver delay on the unnamed road between the A83 and the site entrance. Moderate effect on pedestrian amenity at the primary schools. **Operation:** None predicted.	**Construction:** An outline Traffic Management Plan (TMP, Appendix 15.2) has been prepared to provide detailed mitigation measures to address each of the identified significant effects, and general operation practices and polices relating to transport. Mitigation measures proposed in TMP include, but are not limited to: • The applicant and the appointed contractor will provide written notice to schools affected (Glenbarr and Rhunahaorine Primary School) in advance of concrete pouring days and indicate that there is a potential for an effect on pedestrian amenity. • The applicant and their appointed contractor shall consult with these schools to identify any specific	Reduction and/or avoidance of significant effects.	Pre-Construction, Construction and Post-Construction.	No likely residual significant effects anticipated.

Table 19.1: Summary of Mitigation and Residual Effects

		mitigation measures which might be adopted on concrete pouring days. • Given the location of each of these schools on the A83, and their small size, it is reasonably possible that no staff or students walk to school. If is established that this is the case then no mitigation measures are likely to be required.			
Land-use, Socio-economics and Recreation (Chapter 16)	**Construction:** Moderate beneficial and significant socio-economic (employment) effects in Kintyre. Minor beneficial tourism (accommodation) effects in Campbeltown, the west coast and east coast. **Operation:** None predicted.	**Construction:** • liaison with landowners regarding the timing of works to minimise disruption to any activities on private land where possible; • restriction of construction plant and personnel to working areas to reduce disturbance and vegetation damage; • liaison with local community and local authority to inform traffic management measures to maintain access to the A83 and minimise disruption to the local road network; • regularly update the community of plans implemented to ensure they are informed of the anticipated construction movements and its potential effects; • information provided for local users regarding construction or decommissioning activity to reduce effects experienced; and	Reduction and/or avoidance of non-significant adverse effects. Enhancement of significant beneficial effects.	Pre-Construction, Construction, Post-Construction and Operation.	Moderate beneficial and significant socio-economic (employment) effects in Kintyre. Minor beneficial tourism (accommodation) effects in Campbeltown, the west coast and east coast.

Table 19.1: Summary of Mitigation and Residual Effects

		• Measures to enhance the socio-economic effect of the proposed development. **Operation:** • land not required for the operation of the proposed development, will be returned to the landowner for uses compatible with operational activities; and • Measures to enhance the socio-economic effect of the proposed development			
Shadow Flicker (Chapter 17)	No potential significant effects identified	Mitigation measures are available to counteract shadow flicker occurrence to reduce the possibility of nuisance. One of the most effective mitigation strategies is shutting down selected turbines using turbine control systems during periods when shadow flicker could theoretically occur and during certain weather conditions. Therefore, in order to protect the amenity of local residents, the turbines would be programmed to shut down during periods when shadow flicker could occur.	Reduction and/or avoidance of non-significant effects.	Operation.	No likely residual significant effects anticipated.
Aviation (Chapter 18)	No potential significant effects identified	Not applicable	Not applicable.	Not applicable.	No significant effects.

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