Forthwind Offshore Demonstration Site,

Methil, Fife.

Section 36C Consent and Marine Licence

Variation Screening Request

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ACRONYMS / ABBREVIATION

Acronym / Abbreviation	Full Text
AEOSI	Adverse Impact on Site Integrity
CCA	Coastal Character Area
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Field
ES	Environmental Statement
GDL	Garden and Designed Landscapes
HAT	Highest Astronomical Tide
HDPE	High Density Polyethylene
LCT	Landscape Character Type
LDT	Levenmouth Demonstration Turbine
LLA	Local Landscape Area
MD-LOT	Marine Directorate Licensing Operations Team
MetMast	Meteorological Mast
MHWS	Mean High Water Springs
MMO	Marine Mammal Observer
MW	Megawatts
NnG	Neart na Gaoithe
OPEN	Optimised Environments Ltd
OWF	Offshore Wind Farm
ROC's	Renewables Obligation Certificates
RPM	Rotations per minute
SAC	Special Areas of Conservation
SAR	Search and Rescue
SLVIA	Seascape and Visual Impact Assessment
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Visibility

KEY TERMS & DEFINITONS

Term	Description
Allision	The act of striking or collision of a moving vessel against a stationary object
Baseline	Refers to existing conditions as represented by latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of development.
Cumulative effect	An additional change caused by the proposed development in conjunction with other similar developments or as a combined effect of a set of developments
Effect	The potential to threaten human life, health, property, or the environment.
Environmental Impact Assessment Report (EIAR)	The documentation presenting the full findings of the Environmental Impact Assessment (EIA).
Original Consent	This refers to the consented offshore turbine, the metmast, the interconnecting cable between the turbine and the metmast, and the offshore cable.
Proposed Variation	This refers to the change in heigh of the consented offshore turbine. The remaining elements (the metmast, the interconnecting cable between the turbine and the metmast, and the offshore cable) are the same as the Original Consent.
Receptor	A sufferer of an effect.
Significance of effect	A measure of the importance of an effect.

KEY REFERENCES AND WEBLINKS FOR THE CONSENTED FORTHWIND TURBINE

Reference	Weblink
Section 36 Consent	https://marine.gov.scot/sites/default/files/decision_notice_and_conditions_0.pdf
Marine Licence	https://marine.gov.scot/sites/default/files/ms-0009834_marine_licence.pdf
Environmental Impact Assessment Repot	https://marine.gov.scot/data/environmental-impact-assessment-report-forthwind-offshore-wind-demonstration-project-methil

1. INTRODUCTION

1.1. Background

The Proposed Forthwind Demonstration Development (hereafter the "Proposed Development") will be a single turbine located in the Firth of Forth just offshore from Methil, Fife, approximately 1.5 km from the line of mean high-water springs (MHWS) (Figure 1.1). As shown, there will also be a meteorological mast (hereafter "metmast") associated with the project, to be located around 622 m southwest of the proposed turbine (subject to 100m micro-siting). The Proposed Development is part of the Fife Energy Park, which is a joint venture between Scottish Enterprise and Fife Council and is home to a number of energy-related businesses and projects.

The project was awarded consent[1] by Scottish Ministers on 15 March 2023 with an intended operational period for the turbine of 25 years from the date of Final Commissioning. These consents (s.36 and marine licensing) apply to the Proposed Development which includes the offshore Wind Turbine Generator (WTG) and metmast, the communication and power cables between the WTG and metmast, the subsea export cable from the WTG to shore and associated project scour and cable protection infrastructure. The planning application for the onshore elements of the project has been submitted to Fife Council and is currently under consideration (23/01148/FULL)

Forthwind Ltd. (hereafter "the Applicant") now need to request to vary the rotor diameter of the turbine from 255 m to 280 m; an increase of 25 m which also affects the rotor radius, blade tip height and hub height parameters. All other turbine parameters and other offshore project elements remain the same as for the Consented Development. This report has been prepared to request a Screening Opinion from Marine Directorate Licensing and Operations Team (MD-LOT) with respect to the s.36C variations proposed and as set out within this document.

The parameter variations to the Proposed Development represents a very minor change from the Consented Development. An assessment of the increases in rotor diameter, rotor radius, blade tip height and hub height has been undertaken in respect of seascape, landscape, and visual impacts, as well as shadow flicker. For all other receptors assessed for the original project application, it is advised by HiDef Aerial Surveying Limited, (hereafter "HiDef") (commissioned to prepare this report on behalf of the Applicant) that the proposed variation does not result in any change to the conclusions on impact significance either under Environmental Impact Assessment (EIA) or Habitats Regulations Appraisal (HRA).

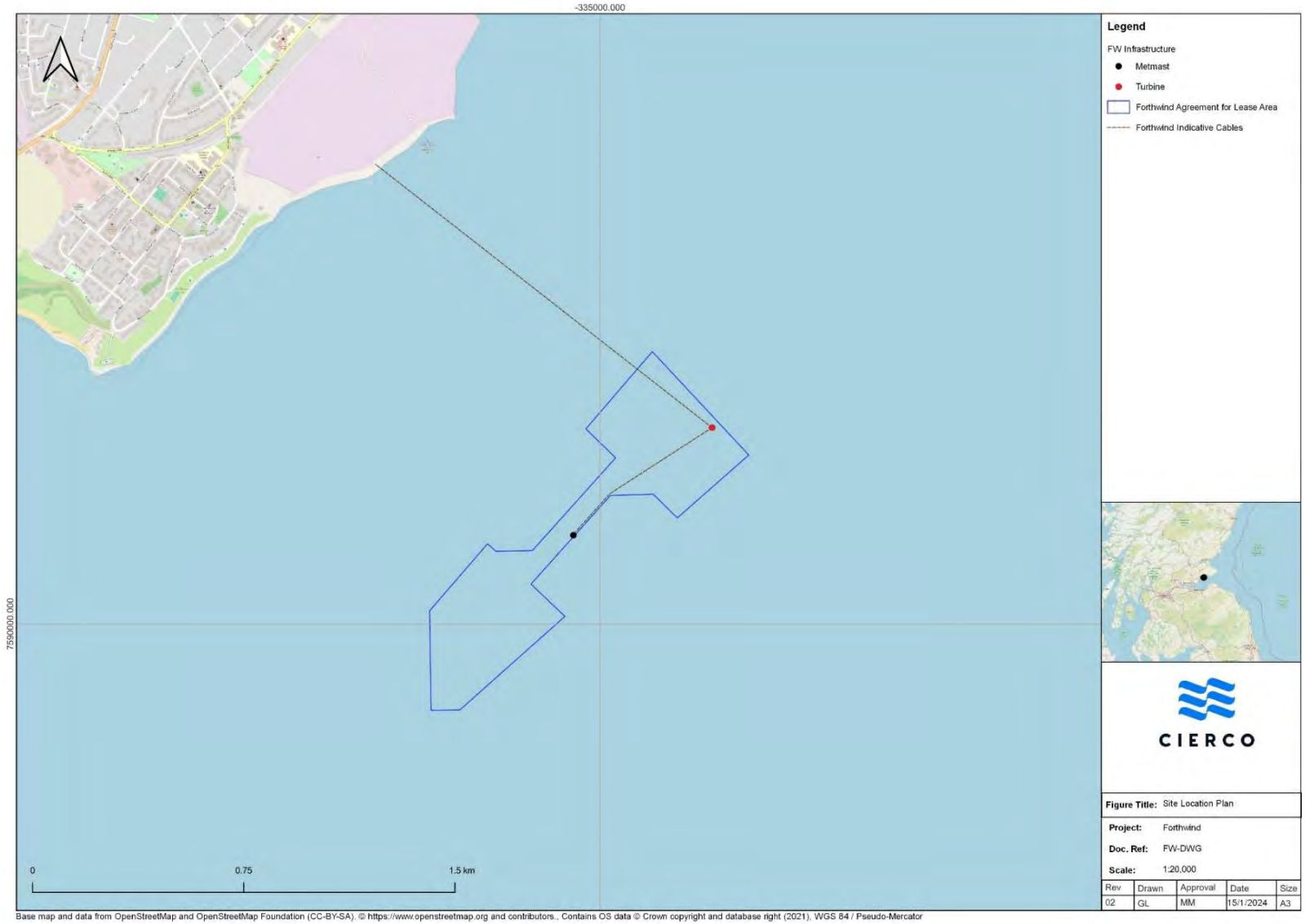
This Screening Report sets out the rationale and justification for this advice. Should MD-LOT determine under screening that the proposed rotor increase can be dealt with as a variation and not a full EIA, the Applicant intends to rely on the information provided in this Screening Report to also inform the subsequent variation application.

It is important to note that the purpose of the Proposed Development remains the same, which is to prove a new next generation wind turbine design in an offshore environment and to obtain certification and validation of the turbine design and technology. The Proposed Development will enable the Forthwind turbine to advance in several areas, including:

- Validating the offshore installation processes and purpose-made tools.
- Demonstrating the operation of the technology and tune the systems to reach highest efficiency.
- Utilising the turbine as a training platform for service personnel and procedures.
- Developing and validating the service processes and tools.
- Assessing loading, availability, and performance of the turbine.
- Demonstrating and evaluating grid compliance.
- Optimising the manufacturing process, not only in assembly but also at component suppliers; and
- Providing an opportunity to test and validate optimisation ideas in operating the turbine.

[1] Consent awarded under section 36 of the Electricity Act 1989 and part 4 of the Marine (Scotland) Act 2010

Figure 1.1 Forthwind Demonstration Project –– Consented Development



1.2. Proposed Forthwind Project Variation

The Applicant is proposing to vary the 2023 Consents to allow for changes to the turbine parameters of the single turbine. In order to do this the Applicant is proposing to submit a variation application to the Forthwind s.36 Consent under section 36C of the Electricity Act 1989. Additionally, if the variation of the s.36 Consent is granted then it is requested that the Marine Licence is also varied by Scottish Ministers, as per section 30 of the Marine (Scotland) Act 2010.

1.3. Report Purpose

This Screening Report has been prepared by HiDef on behalf of The Applicant to support a request for a Screening Opinion for the Variation from Scottish Ministers via the Marine Directorate Licensing Operations Team (MD-LOT). The document describes the Variation in detail and provides justification and supporting information to conclude that the Variation is not material and therefore does not require a new application or further full EIA (or HRA) in support of the s.36C variation application.

1.4. Report Structure

This document details the proposed variations to the s.36 Consent as well as the requirement of the variation and if the variation is expected to result in any changes to significant effects for the Consented Development.

The structure of the remaining document is as follows:

- Consent background and approach.
- Project description.
- Technical assessment and EIA comparison; and
- Conclusions and recommendations.

2. CONSENT BACKGROUND AND APPROACH

2.1. Consent Background

In 2015 The Applicant first received consent for the project which had the purpose "to demonstrate a new model of offshore wind turbine". The purpose remains the same, however, in this time there have been advancements in turbine technology which is the reason for the proposed variation (Table 2.1Annex C Table 2). The Proposed Development aims to test a turbine that is not currently commercially available by validating the following:

- Turbine and rotor performance.
- Turbine and rotor load simulation models.
- Rotor manufacturing processes.
- Turbine assembly processes.
- Offshore installation processes.
- Validation of the tooling and equipment specifically designed for the turbine.
- Development of the turbine supply chain (local and international).
- Maintenance and servicing arrangements.

Table 2.1 Consent Background to the Proposed Development

Date	Consent Background
July 2015	The original Marine Licence and Section 36 (s.36) applications were granted consent from Scottish Ministers for the installation and operation of two offshore wind demonstration turbines.
September 2018	Due to time constraints the Project was unable to secure the required investment before the Renewable Obligation Certificates (ROC's) qualification period ended.
April 2022	The Applicant applied for a new consent for a single demonstration turbine in the same location as the original 2015 consent.
March 2023	Consent was granted by Scottish Ministers for this updated turbine.
Present	The Applicant is now seeking to vary the consented (2023) project to allow for a further, slight (25 m) increase in turbine rotor diameter reflecting further improvements in turbine technology.

2.2. Proposed Consenting Approach and appropriateness of variation application

The Applicant is proposing to submit a variation application for the Proposed Development under section 36C of the Electricity Act 1989. They are seeking allowance from Scottish Ministers to vary the current s.36 Consent by refining the parameters and amending the associated marine license (licence number MS-00009834) under Section 30 of the Marine (Scotland) Act. The proposed variation is to allow for an increase in the consented maximum rotor diameter, rotor radius, height to blade tip and hub height as detailed in Section 3.1.

The Applicant will submit a variation application based on the guidance of Marine Scotland[2]: Application for Variation of section 36 consents (Marine Scotland, 2019). The guidance covers the range of project changes including WTG dimensions. The proposed changes are not likely to result in a development that is fundamentally different in terms of character, scale, or environmental impact from what is authorised by the existing 2023 consent. Based on the Marine Scotland guidance, the proposed changes should be appropriate to progress under a section 36C variation procedure.

[2] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2019/05/applications-variation-section-36-consents/documents/guidance-note-applications-variation-section-36-consents/guidance-note-applications-variation-section-36-consents/govscot%3Adocument/guidance-note-applications-variation-section-36-consents.pdf

2.3. Consideration of the need of EIA

The Applicant proposes that the variation is screened out of EIA regulations in line with the Environmental Impact (EIA) Regulations (the Electricity Works (EIA) (Scotland) Regulations 2017 (Electricity Works EIA Regulations).

As described under the Electricity Works EIA Regulations in the case of a s.36C variation application, consented projects only require an EIA if the proposed changes are expected to have "significant adverse effects on the environment".

3. PROJECT DESCRIPTION

3.1. Consented WTG Overview

The current s.36 Consent permits the development of a demonstration Offshore Wind Farm (OWF) in the Firth of Forth, located approximately 1.5km from MHWS off Methil as shown in Figure 1.1. The s.36 Consent includes the following parameters:

The construction of an offshore energy generating station, with a maximum generating capacity of 20 megawatts ("MW") of electricity. The offshore generating station shall comprise:

- A single three-bladed horizontal axis wind turbine generator (WTG) with the following parameters:
    a) A maximum hub height of 156 m above highest astronomical tide (HAT).
    b) A maximum height to blade tip of up to 280 m above HAT.
    c) A maximum rotor diameter of 255 m.
    d) A minimum blade tip clearance of 25m above HAT; and
    e) A blade width of up to 5.8 m.
- A metmast with a height of 160 m above HAT; Foundation for the WTG (either a jacket with a maximum of 4 pin piles or a monopile).
- Foundation for the metmast (monopile).
- Approximately 625 m of communications cable between the turbine and the metmast.
- Approximately 625 m of power cable between the turbine and the metmast.
- A subsea export cable running from the turbine to shore, approximately 1.5 km; and
- Scour and cable protection.

all as described in the Application. The total area within the Works site boundary is 9639 m^2.

3.2. Proposed Variation

The proposed variation only applies to the turbine itself, resulting in an increase to the rotor diameter and radius, the height to blade tip and hub height (Table 3.1). The blade width, pitch and rotor speed will remain the same for the turbine and all other aspects of the Proposed Development will remain the same as for the Consented Development.

Table 3.1 The proposed parameter changes, parameters in bold highlight the changes from the Consented Development

Change	Parameters	Consented turbine	Variation turbine
Increased size of rotor diameter and associated parameters	No. blades	3	3
	Rotor radius (m)	127.5	**140**
	Rotor diameter (m)	255	**280**
	Air gap (blade tip clearance; m)	25	25
	Height to blade tip (m)	280	**305**
	Hub height (m)	156	**181**

4. TECHNICAL ASSESSMENT

4.1. Overview

This section considers how the receptors assessed in the Consented Development EIAR may be impacted by the change in parameters to the Proposed Development and addresses whether additional information and assessment is recommended within the s.36C application (Table 4.1).

The proposed changes to the development include the 25 m increase in rotor diameter (12.5m increase in rotor radius) and the associated increases in height to blade tip and hub height. These changes are only minor and only apply to the single turbine. Therefore, the impacts to most of the assessed receptors remains unchanged with only SLVIA (Section 4.2) and shadow flicker (Section 4.3) requiring further assessment.

Annex C presents the European sites (Special Protections Areas and Special Areas of Conservation) and their qualifying interests that were assessed for the consented application, as referenced under Offshore Ornithology, Marine Mammals, and Fish and Shellfish in Table 4.1.

Annex D presents a summary of the mitigation measures included within the Consent, and considered in place for this Screening Request

Table 4.1 Assessment of implications of the variation to the Proposed Development

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
Seascape, landscape, and visual receptors (Assessed in Section 4.2).	Construction/Decommissioning		
	Erection of WTG tower, nacelle, and rotor and metmast. Laying of export cable and landfall of export cable. Construction of the transformer and ancillary buildings.	**Not Significant**	During construction and decommissioning of the Proposed Development the slight increase in vessel presence and activity in the Firth of Forth would be the same as the level assessed for the Consented Development. This increase in vessel activity would not be unusual for the area, and it would cease again once each stage is complete. A large crane and associated vessel would be required when constructing and decommissioning the Proposed Development. The presence of the crane and vessel would result in temporary changes to seascape character and visual amenity that would be the same as for the Consented Development. The export cable would be within a High-Density Polyethylene (HDPE) duct placed in a trench. The excavators used during this period would only present very localised and short-term effects that would be the same as for the Consented Development. The short-term nature of the construction and decommissioning effects would not be altered by the changes to the turbine parameters. Therefore, the significance of effect is assessed to remain as **Not Significant**.
	Dismantling of the turbine WTG and metmast		
	Operation and maintenance		
	Presence of the operational WTG and metmast in the Firth of Forth.	**Significant**	The Proposed Development would have the same distribution of significant effects on visual amenity, coastal and landscape character as was assessed for the Consented Development. It is limited to the local area where there is visibility of the WTG as shown in the ZTV Figures (Annex A; Figure 4.2.1a and Figure 4.2.1b), consisting of the following locations: • Viewpoints 1, 2, 3, 4, 6, 7 and 8. • Along parts of the Fife Coastal Path. • The southern areas of Buckhaven; the esplanade area of Leven; and at the shoreline of East and West Wemyss. • The shoreline area of Coastal Hills LCT (192).

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			• The shoreline, and eastern and elevated parts of West Wemyss within Wemyss Coast LLA; and • the nearest parts of the Fife coast to the Proposed Development within West Wemyss to Buckhaven (E) CCA and Leven Links (G) CCA. Despite the larger blade tip height and rotor diameter, the Proposed Development is assessed as having the same level of effect as the Consented Development at these locations and there will be no increase in the assessed magnitude of change. The proposed changes to the WTG scale will be noticeable from close range views but become barely discernible with increasing distance. The assessed level of effect will not change for any of the seascape, landscape, or visual receptors. As such, for those receptors that were assessed to have significant effects in the 2022 EIAR there would be no change in the level of effect and the effect would remain **Significant** as a result of the Proposed Development. Similarly, receptors assessed to have not significant effects for the Consented Development would remain **Not Significant** as a result of the Proposed Development.
Offshore Ornithology (including qualifying interests of Special Protection Areas)	Construction/Decommissioning		
	Disturbance to seabirds from construction activity	**Not significant**	The construction of the single turbine is expected to be short term and without any marked impacts on birds and prey species. The increased rotor diameter is not expected to dramatically alter the construction time frame and therefore, no further assessment is required as the impact is assessed to remain as **not significant in** EIA terms and remain with **no Adverse Impact on Site Integrity (AEOSI)** in HRA terms.
	Disturbance to prey from construction activity leading to effects on seabirds	**Not significant**	
	Operation and maintenance		
	Loss of SPA supporting habitat for seabirds, seaduck and divers	**Not significant**	A benthic survey confirmed there are no biotopes within the impact area that are of specific conservation importance and do not play an important role in supporting the seabirds, seaducks and divers that are qualifying interests of the Firth and Forth SPA. The loss of any habitat is considered to be negligible.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			The turbine location and impact area will remain the same as the Consented Development, the increase parameter changes will have no impact below the water surface or in the intertidal zone and therefore no further assessment is required, and the impact is assessed to remain as **not significant** in EIA terms and with **no AEOSI** in HRA terms.
	Collision Risk	**Not significant**	The original collision risk modelling predicted zero mortalities for all species assessed (kittiwake, herring gull, lesser black backed gull, common gull) except gannet for which there were two estimated mortalities during the breeding season (of the 150,518 individuals apportioned to the Bass Rock (Forth Islands SPA)[3]). It is not proposed to reduce or increase the minimum air gap of 25 m between the lowest sweep of the turbine blades and the sea. This is the critical area for seabird flight activity. Increasing the maximum turbine height from 280 m to 305 m is not predicted to result in any change to collision risk estimates, given the very limited occurrence of focal seabird species at this height. Also, the increases in advised avoidance rates as given in NatureScot guidance[4] will substantially reduce the estimate of all assessed species collisions. No further modelling or analysis should be required, and the significance of the collision risk impact is not expected to be altered by the variation, remaining as **not significant** in EIA terms and with **no AEOSI** in HRA terms.
	Displacement and barrier effects	**Not significant**	Estimated displacement mortalities were minimal for the seabird species assessed (using mean seasonal peaks derived from boat-based survey data); zero for razorbill, gannet, kittiwake, and European shag, one for puffin and six for guillemot. The 'buffer' radius utilised around the turbine was 2 km, giving a buffer zone (or circle) of 4 km diameter which is highly precautionary for a single turbine. The seabird displacement impacts quoted for the consented turbine are therefore 'worst case' and will not increase with the slight (25 m) increase in turbine height

[3] Forthwind: Offshore Ornithology 36C Technical Appendix - Collision Risk Modelling

[4] Guidance Note 7: Guidance to support Offshore Wind Applications: Marine Ornithology - Advice for assessing collision risk of marine birds | NatureScot

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			as this would not be expected to increase displacement distances beyond the impact zone used for assessment. While the available boat-based survey data was considered in respect of seaduck and diver species, assessment was ultimately undertaken using 'worst case' population estimates derived from a review of all available data for the area. A 100% displacement rate was applied to this population (with a 5% mortality rate then applied) and so the slight increase in turbine height (rotor diameter) cannot increase the rate of displacement beyond the 100% already used for assessment. Therefore, there is no change to assessed impacts in relation to sea ducks and divers. The applicant is also committed to undertaking post-consent monitoring in relation to seaduck and diver displacement as required under the s.36 consent conditions. Displacement and barrier impacts to all ornithological receptors are assessed to remain **not significant** in EIA terms and with **no AEOSI** in HRA terms.
	Disturbance of prey	**Not significant**	Any disturbance to prey is likely to be lower in the operational phase compared to the construction phase which is considered to be non-significant. The change in rotor diameter has no impact on prey species and the impact remains **not significant** in EIA terms and with **no AEOSI** in HRA terms.
Marine Mammals (including qualifying interests of Special Areas of Conservation)	Construction/Decommissioning		
	Underwater noise	**Not significant** with adoption of an environmental management plan during construction and a decommissioning plan	As mentioned in the EIAR there is no requirement for pre-construction geophysical surveys nor has any unexploded ordinance (UXO) been recorded on site, there is no significant noise generation during the preconstruction phase in respect to marine mammals (Section 7.7.1, Forthwind Offshore Demonstration Site EIAR). For the construction of the turbine and metmast foundations drilling will take place over one week's duration. The EIAR concluded that the localised and temporary nature of the drilling noise may have some disturbance impacts but would be unlikely to result in any mortality or any population level effects of the marine mammal species considered.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			These aspects of the project remain the same with the new project parameters and therefore do not require any further assessment the impact remains **not significant** in EIA terms and with **no AEOSI** in HRA terms.
	Vessel presence	**Not significant**	The EIAR concluded that the additional vessels required at the Consented Development will not be significant compared to the baseline and therefore will be unlikely to lead to significant disturbance of marine mammals or their prey species. This aspect of the project remains the same with the new project parameters and therefore does not require any further assessment. The impact remains **not significant** in EIA terms and with **no AEOSI** in HRA terms.
Commercial Fisheries	Construction/Decommissioning		
	Temporary loss or restricted access to traditional fishing grounds	**Minor significance** with dissemination of project information and ongoing liaison	During the construction phase, fishing vessels and gear will be displaced to a safe distance from construction activities. Additionally, the displacing fishers to adjacent areas could increase competition during the construction period. However, the timeframe of the construction project will likely remain the same as the Consented Development and therefore the impact remains of **minor significant** in EIA terms.
	Displacement of fishing activities into other areas		
	Safety issues for fishing vessels	**Minor significance** with dissemination of project information and ongoing liaison	Consultations highlighted that some fishing vessels used the Proposed Development site to transit through the Firth of Forth. The impact is assessed under Shipping and Navigation.
	Operation and maintenance		
	Complete loss or restriction access to traditional fishing grounds	**Minor significance** with dissemination of project information.	Although there will not be an exclusion zone, the physical presence of infrastructure could limit availability to some fishing areas, resulting in possible displacement and increased competition between fishers. The increased parameters will have no further impact on fishing activities then the Consented Development. Therefore, the impact remains of **minor significant** in EIA terms.
	Displacement of fishing activities into other areas		
	Safety issues for fishing vessels	**Minor significance** with dissemination of project information.	Consultations highlighted that some fishing vessels used the Proposed Development site to transit through the Firth of Forth. The impact is assessed under Shipping and Navigation.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
Cultural Heritage	Operation and maintenance		
	Effects on the settings of Heritage assets	**Minor significance**	The main concerns are that the Proposed Development may visually fragment the historic landscape due to indirect effects during each phase of the project. As the Proposed Development is a temporary structure, the indirect effects are considered to be temporary and will be easy to reverse at the end of the Proposed Developments life span. The increase in parameters may have a very small additional impact but the impact remains of **minor significant** in EIA terms.
	Decommissioning		
	Restoration of existing settings	**Not Significant** (Removal of effect)	
Fish and Shellfish (including diadromous fish as qualifying interests of Special Conservation Areas)	Construction/Decommissioning		
	Underwater noise	**Not Significant**	Most of the underwater noise produced during the construction period will be from the drilling which is expected to occur over a week. Any noise produced during decommissioning will be less than that during construction. Construction noise is expected to have very little effect on shellfish and fish without a swim bladder. Fish with a swim bladder will be able to detect the low frequency drilling sound, and sensitivity is considered medium. However, due to the low impact and short-term nature of the drilling the impact is considered non-significant. This aspect of the project remains the same with the new project parameters. It therefore does not require any further assessment and the impact remains **not significant** in EIA terms and with **no AEOSI** in HRA terms.
	Operation and maintenance		
	Underwater noise	**Not Significant**	The noise generated from the single operational turbine is considered insignificant above baseline conditions. The number of turbines will remain the same and therefore the impact remains **not significant** in EIA terms and with **no AEOSI** in HRA terms.
	EMF	**Not Significant**	The limited likelihood of electrosensitive fish and shellfish occurring along the cable route and the predicted low magnitude impact means that EMF effects are concluded to be non-significant.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			The turbine location will remain the same as the Consented Development and therefore no further assessment is required, and the impact is assessed to remain as **not significant** in EIA terms and with **no AEOSI** in HRA terms.
Airborne Noise	Construction/Decommissioning		
	N/A		
	Operation and maintenance		
	Operational noise levels comply with applicable noise limits	**Not significant** When selection of final turbine model is in line with noise limits	The proposed changes to the Proposed Development will be unlikely to lead to significant changes in noise levels. The Proposed Development will use the mitigation proposed for the Consented Development in order to achieve an acceptable noise level. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
	Cumulative noise levels exceed applicable noise limits in some case	**Not significant** With operational noise restrictions under specific condition	
Shadow Flicker (Assessment in Section 4.3).	Construction/Decommissioning		
	No shadow flicker effects will occur during construction or decommissioning.	N/A	N/A
	Operation and maintenance		
	Shadow flicker effects are under the assessed significance threshold (up to 30 hours per annum).	**Not significant**	The proposed design refinements will result in some minor changes in shadow flicker effects. The changes are small, and all representative receptors will still have an expected shadow flicker exposure (under an average sunshine hours scenario) of well under the significance criteria of 30 hours per annum. The impact is assessed to remain as **not significant** in EIA terms. Further information regarding the shadow flicker assessment for the Proposed Development is included in Section 4.3.
	Cumulative shadow flicker assessment	**Not significant** Shadow flicker effects attributed to the Levenmouth Demonstration Turbine	Cumulative shadow flicker exceedances were proven to be attributed to the Levenmouth Demonstration Turbine. The predicted shadow flicker levels from the Proposed Development are not significant and have not changed significantly from the Consented Development EIA Report. The impact is assessed to remain as **not significant** in EIA terms.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			Further information regarding the shadow flicker assessment for the Proposed Development is included in Section 4.3.
Shipping and Navigation	Construction/Decommissioning		
	Vessel displacement, collision risk and restrictions on port access for third-party vessels	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	The construction period that will take place over a two-to-three-month period will require a jack up vessel and a lifting vessel present. A cable lay vessel and possible support vessel will also be required. Any vessel displacement is expected to be limited to the proximity of the Proposed Development which may impact (low traffic) shipping routes 7 and 8. The proposed changes to the turbine will not cause any additional changes to the vessel displacement. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
	Disruption to pilotage services	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	The pilot boarding station for the Port of Methil is approximately 290m from the WTG location. Pilotage activities generally occur where vessels are anchored and would not occur in the vicinity of the Proposed Development. Although considered unlikely, any disruption to pilotage could disrupt access to the Port of Methil which would have commercial implication, there would also be a small risk of low-speed collisions. The proposed changes to the turbine will not cause any additional changes to the impacts on pilotage services. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
	Operation and maintenance		
	Vessel displacement, collision risk and restrictions on port access for third-party vessels	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	The physical structure during operation and the added presence of maintenance vehicles during maintenance activities may result in displacement of vessels. Similar to the construction phase, any vessel displacement is expected to be limited to the proximity of the Proposed Development. The proposed changes to the turbine will not cause any additional changes to the vessel displacement. Therefore, the impact is assessed to remain as **not significant** in EIA terms.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	Collison risk for third-party vessels	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	It is expected that vessels will have good awareness and alertness when navigating around the wind farm and an incident is very unlikely. It is also expected that any Allison event that did occur would be at low speeds due to the proximity to the coast and Port of Methil. The proposed changes to the turbine will not cause any additional changes to the Allision risk. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
	Increased grounding risk for third-party vessels	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	The cable will be buried where possible and will only have cable protection when burial is not an option. Any cable protection will not reduce the under keel clearance by more than 5% without consulting the Maritime and Coastguard Agency and Northern Lighthouse Board. The proposed changes to the turbine will not cause any additional changes to the cable protection and therefore risk of vessel grounding. As a result, the impact is assessed to remain as **not significant** in EIA terms.
	Disruption to emergency response and Search and Rescue (SAR) operations	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	From historical data it has been determined that the likelihood of an incident occurring in the proximity to the Proposed Development that requires an emergency response is high. However, with there only being two structures (the WTG and metmast), the Proposed development is not expected to affect likelihood of an incident or impede the capability of emergency responders. The proposed changes to the turbine will not cause any additional changes that could disrupt emergency responders and SAR operations. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
	Disruption to pilotage services	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	The pilot boarding station for the Port of Methil is approximately 290m from the WTG location. Pilotage activities generally occur where vessels are anchored and would not occur in the vicinity of the Proposed Development. Although considered unlikely, any disruption to pilotage could disrupt access to the Port of Methil which would have commercial implications, there would also be a small risk of low-speed collisions.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			The proposed changes to the turbine will not cause any additional changes to the impacts on pilotage services. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
	Prevention of use of existing aids to navigation	Broadly acceptable and therefore **Not Significant** with ongoing consultation with Forth Ports	Forth Ports were happy that the Proposed Development is located far enough away from any navigational features. It is highly unlikely that the worst-case scenario of a vessel running aground or collide with a structure. The proposed changes to the turbine will not cause any additional changes to navigational aids. Therefore, the impact is assessed to remain as **not significant** in EIA terms.
Socio Economic	Construction/Decommissioning		
	Disruption to community social, recreational, and everyday living	**Negligible**	Vessels will be used for transportation to minimise disruption on the local communities. The proposed changes to the Proposed Development will not impact the intended transportation method and therefore the impact is assessed to remain as **not significant** in EIA terms.
	The construction phase of the Proposed Development will create six jobs in project management and development, in addition to generating opportunities for up to 60 local workers to establish site facilities during the six-month construction.	**Minor (positive)** Emphasis upon local procurement of staff, goods, and services.	The Proposed Development is expected to create six jobs in site management and generate opportunities for 60 local workers. This remains the same as the consented development and therefore the impact is assessed to remain as **not significant** in EIA terms.
	There is a realistic opportunity for Scottish companies to supply a number of components and services to this project, equating to 44% of the total project costs.	**Moderate (positive)** Emphasis upon local procurement of staff, goods, and services.	A review concluded that Scottish companies would realistically be able to supply components to the project, that equates to 44% of the total project cost, having a significant impact on the Scottish supply chain. This aspect remains the same as the Consented Development and therefor the impact is assessed to remain as **not significant** in EIA terms.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	Operation and maintenance		
	In the context of this development, the visual impact or airborne noise impact will not have significant secondary socioeconomic effects.	**Minor**	Recreational resources are not expected to experience any direct effects during operation and public attitudinal studies resulted in a conclusion that it was reasonable to assume that the public would be in acceptance of the Proposed Development. Airborne noise is detailed in the airborne noise chapter and is not expected to have any significant impacts if the operation noise restrictions are imposed. The proposed changes to the Proposed Development will not impact this aspect of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	A possibility that visual impacts could lead to an impact on the local tourism sector.	**Negligible**	There are several wind farm developments along the coast within proximity of the Proposed Development and it is not expected that the addition of this single turbine will have any significant impact on local tourism. The proposed changes to the project will not impact this aspect of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	The Proposed Development will support the equivalent of up to six full-time maintenance and administrative staff.	**Minor (positive)** Emphasis upon local procurement of staff, goods, and services.	The Proposed Development is expected to create six jobs in site management, additionally, the skills development and experience gained from the Proposed Development will have benefits for employees and contractors as well as the Scottish supply chain development. These benefits of job creation and development of skills remains the same with the Proposed Development as the consented project. The impact is assessed to remain as **not significant** in EIA terms.
	The skills development and experience derived from the construction and operation of the Proposed Development will generate both direct beneficial effect to employees and contractors but also support the further development of the Scottish supply chain	**Moderate (positive)** Emphasis upon local procurement of staff, goods, and services.	

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	Enhancement opportunity exists to deliver wider skills development and training and the Proposed Development	**Moderate (positive)** Embedded commitment to working with local agencies and technician level training	As the Proposed Development's purpose is to demonstrate the feasibility of the prototype technology, the greatest benefit will result from future rollout of the technology. Which could enhance the local/Scottish supply chain and further develop skills and experience in Scotland. These benefits of Scottish supply chain enhancement and development of skills remains the same with the Proposed Development as the consented project. The impact is assessed to remain as **not significant** in EIA terms.
	The Proposed Development has the potential to enhance the level of content in future developments which can be sourced within the local/Scottish supply chain, with the direct and indirect economic development this can generate.	**Moderate (positive)** Emphasis upon local procurement of staff, goods, and services.	
	There is potential for the Forthwind technology to supply offshore wind farm developments including the Scottish Territorial Waters and the UK Government's Round 4 offshore sites	**Moderate (positive)**	A timely and successful demonstration of this prototype technology may encourage turbine manufacturers to establish component manufacturing facilities in Scotland if Forthwind technology is used in future wind farm developments. The benefits remain the same with the Proposed Development as the consented project. The impact is assessed to remain as **not significant** in EIA terms.
Benthic Ecology	Construction/Decommissioning		
	Seabed habitat disturbance	**Not significant**	There will be temporary disturbance to the seabed during the construction phase from the placement of the piles for the turbine and metmast as well as the jacking up and anchoring of vessels. The magnitude of the impact is limited both spatially and temporally and impacted species have high recoverability. The proposed changes to the turbine have no impact on the foundation piles, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Increased suspended sediment concentrations	**Not significant**	Construction activities which will occur intermittently over the three-to-six-month construction period, will increase the suspended sediment concentrations. The

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			sediment will likely be above background levels in close proximity to the Proposed Development and course sediments will settle close to the disturbance activity. Finer sediments will remain in the water column for longer, but the tides will naturally re-disperse any sediment build up, diluting it over a serval hours or days. Re-suspended sediment could impact benthic species by scouring or smother them, however benthic receptors are considered to high recoverability as well as low intolerance. The proposed changes to the turbine have no impact on the underwater construction activities, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Deposition of sediment plumes	**Not significant**	Fine sediments including silt and clay particle may stay in suspension, however it is thought that any sediment plumes associated with construction work will be small in magnitude. The proposed changes to the turbine have no impact on the underwater construction activities, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Underwaters noise and vibration	**Not significant**	Underwater noise to fish is covered in the fish and shellfish ecology section and there is not enough information on the impact of vibration effects to inform an assessment. Underwater noise may impact ability of invertebrates to detect predator and prey or sense activity of tides and currents which aid in their survival. However, effects are expected to be highly localised and short term, having no overall effect on benthic ecology. The proposed changes to the turbine have no impact on the underwater construction activities, therefore the impact is assessed to remain as **not significant** in EIA terms.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	Re-release of sediment bound contaminants	**Not significant**	The site samples show there was no evidence of highly contaminated conditions and therefore does not pose a risk according to OSPAR's Guidelines on Best Environmental Practice[5]. Marginal levels of arsenic were picked up in a single grab and the reason for the higher concentration was unknown. The sediment plumes which would regulate the release of contaminants would only be local and temporary. The proposed changes to the turbine have no impact on the underwater construction activities, therefor the impact is assessed to remain as **not significant** in EIA terms.
	Unplanned accidental spill and release of environmentally harmful substances	**Not significant**	If an accidental spill occurred, the impacts possible impacts would range in severity depending on several factors, including: • The nature of the release. • The dilution and dispersion of the substance; and • The availability to species. A worst-case accidental release could be highly impactful, however with mitigation in place such event is unlikely to occur. The proposed changes to the turbine have no impact on the underwater construction activities, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Intertidal temporary direct seabed habitat disturbance	**Not significant**	Breaching of the sea defences and excavation will cause disturbance to the intertidal environment. The site is already relatively exposed and therefore species will be more adapted and tolerant. The intertidal species are widespread through the region and therefore the overlap with the Firth of Forth SSSI, SPA and Ramsar site is not considered to be an issue. The proposed changes to the turbine have no impact on the underwater construction activities, therefore the impact is assessed to remain as **not significant** in EIA terms.

[5] OSPAR (2012). Guidelines on Best Environmental Practice (BEP) in Cable Laying and Operation (Agreement 2012-2). OSPAR 12/22/1, Annex 14.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	Intertidal temporary increased suspended solid concentrations, sediment deposition and release of contaminants	**Not significant**	Cable installation will take place at low tide, reducing resuspension of material, additionally the exposed nature of the site means there is unlikely to be much resuspended material during the flood tide and any impacts related to excess sediment would be short term. The proposed changes to the turbine have no impact on the underwater construction activities, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Operation and maintenance		
	Net loss of seabed habitat	**Not significant**	The spatial scale of disturbance to the seabed is very small, additionally, the area does not contain any biotopes that are geographically restricted or of specific conservation importance seabed disturbance is small and has no impact on any restricted of specific conservation importance biotopes. All impacts will be reversed upon decommission ng and removal of the structure and their scour protection. The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Introduction of new habitat	**Not significant**	Scour and cable protection will create new hard substrate along with the turbine and metmast infrastructure. When the hard material becomes colonised, there will be native (from the natural hard substate areas in the region) and possibly non-native and invasive species present, this addition of 'stepping stones' could aid in the spreading of non-native species. The contribution of the Proposed Development is unlikely to be significant given there are already artificial hard structures in the area. The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Changes in hydrodynamic regimes	**Not significant**	As the Proposed Development is small, it is not expected to have a significant effect on tidal levels or current speeds. Additionally, impacts would only last the duration of the project and would cease after decommissioning.

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Seabed habitat disturbance	**Not significant**	It is estimated that the turbine might be visited once every ten years for a significant maintenance visit involving a jack up vessel. Other maintenance vessels may also be used but it is anticipated that these will be small vessels (<15 m) which would anchor to the structure. None of the biotopes within the footprint of the turbine and metmast foundations or cabling area are considered rare, geographically restricted or of specific conservation importance. Effects on biotope diversity or designated nature conservation features are not therefore forecast and any effect on a biodiversity or the functional role of the habitats in question is highly unlikely. As stated in the Forthwind EIAR, the impact of a potential effect will be short-term and reversible and assessed as being of negligible significance. The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Electromagnetic field emissions	**Not significant**	EMF and heat emissions will occur along the 1.5km of export cable. The cable will either be buried or under protective rock or concrete, spatially separating species from the EMF and heat. There is some uncertainty around predicting the impact of EMF and heat on benthic species, however any impacts are likely to be highly localised. The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Heat emissions	**Not significant**	
	Unplanned accidental spill and release of environmentally harmful substances	**Not significant**	As with Construction/Decommissioning the severity of a spill would be determined by several factors: • The nature of the release. • The dilution and dispersion of the substance; and

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
			• The availability to species. A worst-case accidental release could be highly impactful, however with mitigation in place such event is unlikely to occur. The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
Miscellaneous Issues	Construction/Decommissioning		
	The GHG produced during construction of the turbine is relatively consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type and is fully in line with measures necessary to achieve the UK's trajectory towards net zero	**Minor significance**	Most of the greenhouse gas (GHG) emissions come from the manufacturing phase of the project. Using the Proposed Development to produce power rather than a Combined Cycle Gas Turbine would lead to 38,069.14 tonnes of CO2 eq. of avoided emissions each year. The proposed changes to the turbine have no impact on the underwater aspects of the project, therefore the impact is assessed to remain as **not significant** in EIA terms.
	Operation and maintenance		
	As per the IEMA guidance the project's GHG impacts are reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type – potentially reducing total CO_2 emissions by 40,000 tonnes/year or almost 1 million tonnes over its	**Not significant**	

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	lifetime. The turbine will provide a valuable contribution to ensuring decarbonisation is achieved well before 2050. The Forthwind project provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.		
	Beyond Asset Lifecycle		
	The establishment of the Forthwind Offshore Wind Demonstration has the potential to significantly enhance future more efficient low carbon deployment of technology providing a significant contribution to the growth of the offshore wind industry– both in Scotland and globally.	**Significant (positive)**	
Other Marine Users	Construction/Decommissioning		
	No potential effects resulting from the Proposed Development on military and civilian aviation activities, have been identified within this assessment.		
	Operation and maintenance		
	The MOD stated during consultation of the Consented Development that the turbine falls within Low Flying Area 16. In order to maintain aviation safety, the MOD requested that the Consented Development be fitted with aviation safety lighting, and that the MOD were to be		

Receptor	Impacts Assessed for Consented Development	Effect predicted in Consented Development	Implication of proposed design refinements
	notified 14 days prior to commencement of the works. The MOD also requested that as part of the Consent Condition, a Lighting and Marking Plan would be issued to the MOD six months prior to the commencement of the development for approval. The increased rotor diameter and blade-tip height won't materially alter the outcome of the previous assessment, or the consent condition. The Project is committed to engaging with the MOD and other relevant stakeholders (including the DIO and CAA) in respect of the turbine lighting requirements. Forthwind have notified both the DIO and CAA of the proposed changes, although no potential effects resulting from the Proposed Development on military and civilian aviation activities, have been identified within this assessment.		

4.2. Seascape, Landscape and Visual Review

4.2.1. Introduction

In March 2023 the Forthwind Demonstration Project (hereafter the Consented Development) was granted consent by Marine Scotland. This section of the Screening Report considers the potential seascape, landscape and visual effects associated with the Proposed Development to the Consented Development. Optimised Environments Ltd (OPEN) were appointed in December 2023 to review the potential seascape, landscape and visual effects associated with the Proposed Development.

The Consented Development allows for the construction of a single offshore wind turbine with maximum height to blade tip of 280 m above highest astronomical tide (HAT) with a maximum rotor diameter of 255 m. The Proposed Development would increase the size of the single offshore wind turbine to a maximum blade tip height of 305 m above HAT with maximum rotor diameter of 280 m (hereafter referred to as the Proposed Development).

The location of the turbine would not change, it would remain 1.5 km from the Mean High-Water Springs on the northern shore of the Firth of Forth, southeast of Methil as set out in the Figure 1.1 Site Location Plan of the 2022 Environmental Impact Assessment Report (hereafter the 2022 EIAR) and reflected in Figure 1.1 Forthwind Demonstration Project - Consented Development within this report.

This report seeks to identify any differences between the potential significant effects of the Proposed Development on seascape, landscape and visual receptors as compared to the effects set out in Chapter 5 of the 2022 EIAR. A Zone of Theoretical Visibility (ZTV) has been produced (Figure 4.2.1) to allow comparison of the extent of effects. Wireline views from fifteen of the 2022 EIAR viewpoints (Figures 4.2.2 to 4.2.16) have been produced to show the Proposed Development turbine overlaid with the Consented Development turbine for comparison.

4.2.2. Potential effects

4.2.2.1. Baseline

The baseline for coastal/seascape, landscape character and landscape designations in the 2022 EIAR were drawn from a number of sources, set out below, covering the 25 km detailed assessment study area.

The coastal/seascape character baseline in the 2022 EIAR was derived from published seascape character assessments contained in the following:

- Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005), *An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms.* Scottish Natural Heritage Commissioned Report No.103 (ROAME No. F03AA06).
- Forth and Tay Onshore Windfarm Developer Group (FTOWDG, 2011), *Scottish Offshore Wind Farms – East Coast Regional Seascape Character Assessment: Aberdeen to Holy Island.*; and
- Forthwind Ltd (2015). *ForthWind Offshore Wind Demonstration Project, Environmental Statement, Methil, Fife.*

The landscape character baseline in the 2022 EIAR was defined by the Scottish Landscape Character Types Map and Descriptions (NatureScot 2019). Those Landscape Character Types (LCTs) with strong coastal characteristics were cross-referenced the with relevant Coastal Character Area (CCA) drawn from the Forthwind 2015 EIAR.

There are no National Scenic Areas, National Parks, or Wild Land Areas within the Consented Development detailed assessment study area, however a number of local landscape designations are found within Fife and East Lothian as well a number of Garden and Designed Landscapes (GDLs). Fife Council last updated its Local Landscape Areas (LLAs) in February 2021 and East Lothian Council last updated its Special Landscape Areas SLAs in 2018.

Since the 2022 EIAR there have been no updates to the above sources, and in the intervening time no significant changes have occurred within these landscapes or coastal areas to significantly alter the baseline of these areas. As such, the baseline as set out in the 2022 EIAR remains accurate.

4.2.2.2. Cumulative baseline

There has been no change to the offshore cumulative baseline since the 2022 EIAR within the 50km radius seascape, landscape, and visual impact assessment (SLVIA) study area. The under construction Neart na Gaoithe (NnG) offshore wind farm was considered as part of the baseline in the 2022 EIAR (Figure 5.19) and the installation of offshore wind turbines within the NnG Wind Farm Area is presently ongoing. There has been limited change to the onshore cumulative baseline in Fife. However, the changes to the cumulative baseline are such that there is no potential for significant cumulative effects due to the location of proposed turbines being located in the northern part of Fife or beyond intervening landscape features that would screen views.

Wind energy developments in the Lammermuir and Moorfoot Hills in East Lothian were scoped out of the 2022 EIAR due to the limited potential for cumulative effects due to long distances with limited intervisibility with the Consented Development. Any changes to the pattern of wind energy development across this area would also not give rise to any significant effects as a result of the increased dimensions of the Proposed Development for the same reasons such that any changes are immaterial.

Operational wind turbines within the detailed assessment study area are shown in the wirelines in Figures 4.2.2 to 4.2.16 for context.

4.2.2.3. Findings of the 2022 EIAR

The 'Statement of Significance' in the 2022 EIAR highlights the significant effects that the Consented Development turbine would have on the coastal character, the landscape and visual resource, and the cumulative effects on these receptors. These are summarised below.

Significant visual effects were identified for the following viewpoints where the Consented Development would be seen in combination with the nearby Levenmouth Demonstration Turbine (LDT) and three existing oil rigs, whose massing and vertical scale, including a comparable lattice/jack, would form the main scale comparator within the medium to large-scale Firth of Forth:

- Viewpoint 1: Buckhaven, Shore Street.
- Viewpoint 2: East Wemyss, Fife Coastal Path.
- Viewpoint 3: West Wemyss, Fife Coastal Path.
- Viewpoint 4: Leven, Fife Coastal Path.
- Viewpoint 6: Kennoway.
- Viewpoint 7: Fife Coastal Path, Lundin Links; and
- Viewpoint 8: Lower Largo.

All seven of the above viewpoints have been included in the selection of viewpoints for which comparable wirelines have been produced as part of this screening request (Figures 4.2.2 to 4.2.16).

There were also significant effects found along Fife Coastal Path between East Wemyss and Buckhaven when moving eastward, and between Lundin Links and Buckhaven when moving westward. On these sections the Consented Development would be seen in the same view as the three oil rigs in the Forth and the comparably sized LDT.

Significant effects on landscape/coastal character were assessed to occur along the shoreline of the Coastal Hills LCT (192), where channelled views along the coastline occur from relatively undeveloped and natural sections of the coast.

Significant effects on seascape character were assessed for parts of West Wemyss to Buckhaven (E) CCA and Leven Links (G) CCA along the parts of the Fife coast closest to the Consented Development where it would extend the influence of large-scale wind turbines, albeit further offshore.

There would be significant effects on the shoreline, and eastern and elevated parts of West Wemyss of the Wemyss Coast LLA where there would be visibility of the Consented Development.

Significant effects were identified within the southern areas of Buckhaven, the esplanade area of Leven, and at the shoreline of East and West Wemyss. Although the Consented Development was noted to contrast with the small scale, traditional/historic settlements along the coast, it would not be uncharacteristic as it would relate to existing larger scale infrastructure within the setting of these settlements.

No significant cumulative effects were found with any under construction, consented or application cumulative developments in Chapter 5.10 Cumulative Effect Assessment of the 2022 EIAR. As such, cumulative effects are not considered further in this report.

4.2.3. Potential for changes in effects on views and visual amenity

4.2.3.1. Zone of Theoretical Visibility (ZTV)

A blade tip ZTV (Figure 4.2.1a) covering a 50 km study area has been produced to demonstrate the extent of theoretical visibility of the Proposed Development. The ZTV does not account for vegetation or build form that may obscure views in actuality but provides a worst-case representation of the areas where the Proposed Development would be visible.

The ZTV shows that theoretical visibility would be concentrated along the coastline and hinterland of the northern and southern Fifth of Forth coastlines. Within Fife theoretical visibility would extend across the lowland landscape that stetches from Kinghorn to Crail and across the hills inland, including the Lomond Hills. Gaps between hills extend theoretical visibility towards the northern part of Fife, and Perth and Kinross in concentrated areas around Auchtermuchty and west of Kinross. There would be theoretical visibility from the Sidlaw Hills north of the Firth of Tay. Theoretical visibility is concentrated across the low-lying southern Forth coastline and across the Lammemuir and Moorfoot Hills, and northern Pentland hills. There is extensive visibility throughout the Forth extending out to the North Sea including from islands within the Forth. Seascape and inland areas west of Kinghorn are shown to have no theoretical visibility due to the screening effect provided by Pettycur headland southwest of Kinghorn.

When compared to the Consented Development blade tip ZTV (Figure 5.8 of the 2022 EIAR) there are some slight increases in the spread of theoretical visibility throughout the 50 km study area. These are shown in the comparative ZTV in Figure 4.2.1b. The Proposed Development would be theoretically visible from lower down the slopes of hills across the northern part of the study area including the Sidlaw Hills, and from slightly more areas around Kinross and Auchtermuchty. There would be very limited change across the southern part of the study area. Overall, additional visibility of a 25 m taller turbine (305 m blade tip height), over and above that for the Consented Development (280 m blade tip) is shown to be very limited in Figure 4.2.1b. The extent and pattern of theoretical visibility is largely the same between the Consented Development and Proposed Development ZTVs.

4.2.3.2. Viewpoints

The Proposed Development turbine has a 25 m higher blade tip height, a 25 m larger rotor diameter and a 12.5 m higher hub height than the Consented Development. Wirelines from fifteen of the 2022 EIAR viewpoints have been produced to demonstrate the visual change in dimensions between the Consented Development and the Proposed Development (see Figures 4.2.2 – 4.2.16) together with the baseline photograph view. These wireline visualisations show the Consented Development turbine underlaid by the Proposed Development turbine in the same image to allow a direct comparison of the larger dimensions of the Proposed Development compared to the Consented Development. With reference to these wirelines, a review of the potential for changes in effects on views and visual amenity is presented in Table 4.2.1, along with the assessed significance of effect determined in the 2022 EIAR and potential change in significance of effect as a result of the Proposed Development.

Table 4.2.1 Description of change of Proposed Development in wireline visualisations

VP No.	Viewpoint	Approx. Dist	Description of Change	2022 EIAR Significance of Effect	Potential Change in Significance of Effect as a Result of the Proposed Development
1	Buckhaven, Shore Street	1.94 km	Viewpoint 1 in Buckhaven is the closest viewpoint to the Proposed Development taken from the closest shoreline looking across the Firth of Forth. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, at close range, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. Other elements such as the oil rigs and LDT in this view also provide a scale comparator. LDT is located further along the coast and would be seen in views to the northeast (the 53.5 degree wireline faces east-southeast).	Significant at a Major level	No change in significance
2	East Wemyss, Fife Coastal Path	3.56 km	Viewpoint 2 is taken on the Fife Coastal Path from the shoreline at East Wemyss. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, at relatively close range, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. Other elements such as the LDT and the oil rigs in the view act as scale comparators. The view looks across the Firth of Forth with LDT situated behind the next headland and is associated with the land, and not the sea, as the Proposed Development would be. The slightly taller Proposed Development turbine would be situated offshore, an appropriate receiving landscape that accounts for the slightly taller turbine height of the Proposed Development than the LDT.	Significant at a Major level	No change in significance
3	West Wemyss, Fife Coastal Path	5.77 km	Viewpoint 3 is taken on the Fife Coastal Path at West Wemyss. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. Other elements such as the LDT and the oil rigs in the view act as scale comparators. The Proposed Development would appear be located in	Significant at a Major/moderate level	No change in significance

VP No.	Viewpoint	Approx. Dist	Description of Change	2022 EIAR Significance of Effect	Potential Change in Significance of Effect as a Result of the Proposed Development
			front of the low-lying eastern coast of Fife, with the jacket appearing to be a similar height to the distant coastline. It would appear to be located in Largo Bay, with Largo Law to further to the west acting as an additional scale comparator.		
4	Leven, Fife Coastal Path	3.54 km	Viewpoint 4 is taken on the Fife Coastal Path from the shoreline at Leven. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, at relatively close range, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. Other elements such as the Methil Docks turbine, LDT and oil rigs in the view act as scale comparators. The Proposed Development would be seen offshore from the slight headland on which the two abovementioned turbines would appear to be located, accounting for the slight increase in height of the Proposed Development as the sea is an appropriate receiving landscape for taller turbines.	Significant at a Major level	No change in significance
6	Kennoway	5.11 km	Viewpoint 6 is taken from a slightly elevated location inland at Kennoway. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. Other elements such as the LDT would act as scale comparator and from this viewpoint appears to be a similar scale. From this vantagepoint the Proposed Development would be seen within the context of an industrial/ urban coastline with large sheds and the LDT between the viewpoint and the Forth, where oil rigs are anchored, such that the Proposed Development would be in keeping with this context.	Significant at a Moderate level	No change in significance
7	Fife Coastal Path, Lundin Links	5.99 km	Viewpoint 7 is taken on the Fife Coastal Path a location slightly inland at Lundin Links. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, at relatively close range, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022	Significant at a Major/moderate level	No change in significance

VP No.	Viewpoint	Approx. Dist	Description of Change	2022 EIAR Significance of Effect	Potential Change in Significance of Effect as a Result of the Proposed Development
			EIAR. The Proposed Development would be framed by oil rigs in the Forth on one side, and the LDT and Methil Docks turbine appearing to be located on the docks on the other which would act as scale comparators. Further, the Pentlands seen in the distance on the far side of the Forth would act as a further scale comparator. It would be seen within the context of these large-scale features along with the large-scale structures on the docks, and as such would not be out of context with the view.		
8	Lower Largo	6.87 km	Viewpoint 8 is taken from the shore at Lower Largo. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be clearly noticeable from this viewpoint, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development would appear to be located offshore between the oil rigs anchored in the Forth and the LDT appearing at the edge of the Methil Docks that form a headland from this vantagepoint. The distant landscape on the far side of the Forth would act as a further scale comparator.	Significant at a Major/moderate level	No change in significance
10	Largo Law Summit	9.07 km	Viewpoint 10 is taken from the summit of Largo Law. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be noticeable from this viewpoint, however it is not of such scale to materially increase the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development would appear offshore located within the Forth between the westerly most oil rig and the LDT located just offshore from the Methil Docks, both of which would act as scale comparators, along with the distant Pentland Mountains on the far side of the Forth. From this vantagepoint the LDT and oil rigs appear significantly shorter than the Proposed Development. Inland from Methil a number of onshore turbines are seen, which, along with the LDT, the Methil Docks turbine and the large-scale structures of the docks, the Proposed Development would not appear out of context located between this developed coastline and the anchored oil rigs.	Not significant at a Moderate level	No change in significance

VP No.	Viewpoint	Approx. Dist	Description of Change	2022 EIAR Significance of Effect	Potential Change in Significance of Effect as a Result of the Proposed Development
11	Kirkcaldy, Esplanade	12.10 km	Viewpoint 11 is taken from the esplanade at Kirkcaldy. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development which would be located between the LDT and oil rigs anchored in the Forth. These, and other elements, would act as scale comparators along with the summit of Largo Law to the northeast of the Proposed Development. The Proposed Development appears taller than any of these features, however it appears to be located within a bay and offshore from the Fife coast, an appropriate receiving landscape for taller turbines.	Not significant at a Moderate level	No change in significance
12	Earlsferry, Links Road	10.54 km	Viewpoint 12 is taken from Earlsferry Links Road. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The view looks across Earlsferry Links towards the settled Fife coast including the LDT and onshore wind turbines which act as scale comparators, along with the distant Fife coastline, oil rigs seen above the intervening links landscape and other landscape features. The Proposed Development would appear taller than both the rigs and wind turbines within this vista but would not be an uncharacteristic feature within the developed coastal context of Fife.	Not significant at a Moderate level	No change in significance
14	Kinghorn, Fife Coastal Path	14.11 km	Viewpoint 14 is taken from the Fife Coastal Path on the cliffs north of Kinghorn with open views across the Forth. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The LDT is visible, and would appear much smaller than the Proposed Development, acting as a scale comparator. Shipping activity is a prominent feature within	Not significant at a Moderate level	No change in significance

VP No.	Viewpoint	Approx. Dist	Description of Change	2022 EIAR Significance of Effect	Potential Change in Significance of Effect as a Result of the Proposed Development
			the firth, with the passing ships acting as further scale comparators along with other landscape features in the view. Within this developed context with movement from shipping the Proposed Development would not appear uncharacteristic.		
15	East Lomond Summit	16.06 km	Viewpoint 15 is taken from the summit of East Lomond. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development would be seen just offshore from the comparably shorter LDT and framed by two oil rigs anchored offshore. These and other landscape elements would act as scale comparators and would be seen within the wider context of the developed Fife coastline which includes onshore wind energy development such that the Proposed Development would be in keeping with the developed coastal landscape.	Not significant at a Moderate/minor level	No change in significance
18	Gullane Beach	17.30 km	Viewpoint 18 is taken from a slightly elevated location above Gullane Beach looking across the open expanse of the Forth. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development would be seen adjacent to the LDT which acts as a scale comparator along with other landscape features in the view. The high points of East and West Lomond to the east, and Largo Law to the west frame the developed section of coastline where the Proposed Development would be located. Both turbines would be skylined and form a cluster of development along with oil rigs anchored offshore, large sheds and onshore wind energy development such that the Proposed Development would be in keeping with the developed coastline character of Methil and Leven seen across the water.	Not significant at a Moderate/minor level	No change in significance
20	North Berwick	21.06 km	Viewpoint 20 is taken from the north of the Harbour at North Berwick. In comparison to the dimensions of the Consented Development, the larger blade	Not significant at a Moderate/minor level	No change in significance

VP No.	Viewpoint	Approx. Dist	Description of Change	2022 EIAR Significance of Effect	Potential Change in Significance of Effect as a Result of the Proposed Development
	(north of Harbour)		tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development would be seen across the Firth of Forth adjacent to the LDT which appears much shorter and acts as a scale comparator, along with the oil rigs anchored off the Fife coastline and other landscape elements in the view. The Firth of Forth with the islands offshore from the East Lothian coast and the developed coastline of Fife remain the focus of views.		
22	Carlton Hill, Edinburgh	25.79 km	Viewpoint 22 is taken from Carlton Hill in Edinburgh. In comparison to the dimensions of the Consented Development, the larger blade tip height, hub height and rotor diameter of the Proposed Development would be barely discernible from this viewpoint. The difference is so limited that it does not change the magnitude of change assessed for the Consented Development in the 2022 EIAR. The Proposed Development would be seen across the Forth from the developed coastline of Edinburgh and Leith including multistorey buildings, large sheds, and cranes. It would be seen on the distant Fife coastline with the LDT seen a short distance along the shoreline, which would act as a scale comparator along with other landscape features in the view. From this elevated vantagepoint seen beyond the intermittent large-scale structures of the cityscape of Edinburgh and Leith across the Forth on the distant Fife coastline, it would be in keeping with this developed context.	Not significant at a Moderate/minor level	No change in significance

4.2.3.3. Summary of change in effects on viewpoints and visual amenity

Based on the review of the above selected viewpoints undertaken in Table 4.2.1 and with reference to the figures shown in Figures 4.2.2. – 4.2.16 there would be no change in significance of effect as a result of the Proposed Development as compared to the Consented Development. Where a significant effect was found at viewpoints in the 2022 EIAR (found within 7 km of the Proposed Development/Consented Development) the increase in turbine dimensions would be noticeable, however this would not result in any change to the level of significance of effect as a result of the Proposed Development. These viewpoints include 1, 2, 3, 4, 6, 7 and 8. At the remaining viewpoint locations the change in height would be discernible. Due to the very limited change in the view, there would be no change to the level of significance of effect as a result of the Proposed Development. These viewpoints include 10, 11, 12, 14, 15, 18, 20 and 22.

In the 2022 EIAR significant effects were found along the Fife Coastal Path between East Wemyss and Buckhaven when moving eastward, and between Lundin Links and Buckhaven when moving westward (represented by viewpoints 2 and 7 respectively). The increase in dimensions would be noticeable from these sections of the Fife Coastal Path but it is judged that there would be no change in the significance of effect.

There would be a noticeable change in the views from southern areas of Buckhaven (viewpoint 1), the esplanade area of Leven (viewpoint 4), and at the shoreline of East and West Wemyss (viewpoints 2 and 3 respectively) due to the increase in dimensions of the Proposed Development. These areas of the settlements were found to be significantly affected in the 2022 EIAR, however, the increase in dimensions of the Proposed Development would not result in a change in the significance of effect.

Overall, it is considered that the increase in blade tip height and rotor diameter of 25 m is a small proportion of the overall height of the Consented Development turbine, with the larger proportions noticeable only in the closest viewpoints and by visual receptors from nearby coastal areas. The effects at close range, although notable, remain as assessed in the 2022 EIAR. The change in rotor dimension/blade tip height would not be distinguishable at longer distances, where at longer range, the difference between the proportions of the Proposed Development are indistinguishable from the Consented Development (and the effects also remain as assessed in the 2022 EIAR).

4.2.4. Potential for changes in effects on coastal character and landscape character

As there has been limited change to the baseline context, this section focusses on the potential for any changes or additional significant effects as a result of the proposed increase in dimensions of the Proposed Development on coastal character and landscape character. In general, an increase of 25 m in blade tip height/rotor diameter is considered to primarily result in potential change in visual effect, rather than changes in coastal/landscape character beyond those already identified for the Consented Development in the 2022 EIAR. Potential changes to coastal/landscape character are nevertheless considered here as some of the local coastal character receptors were found to be significantly affected by the Consented Development in the 2022 EIAR.

Viewpoints 2, 3 and 11 are located within the Coastal Hills LCT (192) where significant effects were found to occur along the shoreline. With reference to these viewpoints, the change in dimensions to the outlook along the shoreline would be noticeable or discernible but is judged not result in any changes in the significance of effects to this LCT.

Viewpoints 2 and 3 are located along the coast within West Wemyss to Buckhaven (E) CCA; viewpoint 7 is located close to the shore along the section of coast covered by Leven Links (G) CCA. As shown in the comparative wirelines for these viewpoints, the change in outlook from these CCAs would be noticeable but is not determined to change the significance of effect for these two CCAs.

The significant effects on the shoreline (as represented by viewpoint 3), and eastern and elevated parts of West Wemyss of the Wemyss Coast LLA would not change as a result of the increased turbine dimensions. There would be a noticeable change in the rotor diameter and blade tip height of the Proposed Development, however this would not change the significance of effect assessed for the Consented Development in the 2022 EIAR.

Overall, there will be no change to coastal/landscape character effects assessed in the 2022 EIAR as a result of the increase in blade tip height and rotor diameter of the Consented Development turbine as the amount of change is limited and the changes in turbine size are primarily visual effects, rather than coastal/landscape character effects.

4.2.5. Conclusion

Since the 2022 EIAR, which assessed the effects of the Consented Development on coastal/landscape, seascape and visual receptors, no significant changes have occurred to the baseline. As such the 2022 EIAR remains an accurate assessment of the effects of the Consented Development.

The wireline visualisations that have been produced show the Consented Development underlaid with the Proposed Development. The changes in turbine dimension were shown to range between noticeable at closer range to barely discernible at longer ranges. It is assessed that there would be no change to the level of effect for any coastal/landscape, seascape, or visual receptors as a result of the increase in turbine dimensions of the Proposed Development compared to those arising from the Consented Development. The distribution of significant effects would remain the same for the Proposed Development as was determined in the 2022 EIAR for the Consented Development.

As a result of this, the 2022 EIAR remains an accurate assessment for the Proposed Development as the outcome would not be materially different and it is considered that there is no need for a SLVIA to be produced as part of an EIAR. The change arising from the Proposed Development is not a material change in terms of significance and does change the outcome of the original EIAR assessment in any material way.

4.3. Shadow Flicker

4.3.1. Summary

The 2022 EIA Report concluded that there would be no significant impacts relating to shadow flicker. The Proposed Development will not lead to any material changes to impacts on residential properties with regards to shadow flicker effects. The sections below outline potential impacts of the Proposed Development and present a breakdown of the assessment conducted into shadow flicker in the 2022 ES compared to potential impacts from the Proposed Development.

4.3.2. Predicted Effects and Mitigation

The impact of the Forthwind Demonstration turbine with regards to Shadow Flicker was assessed in the 2022 EIA Report. The 2022 assessment took into account the following considerations with regards to shadow flicker:

- Turbine location.
- Turbine dimensions (rotor diameter and hub height).
- Locations of residential receptors.

4.3.2.1. Significance Threshold

No formal guidance is available regarding what levels of shadow flicker may be considered acceptable in the UK. However, 'Wind Energy Development Guidelines' published by the Northern Ireland Department of the Environment, Heritage, and Local Government (2009)187 states that:

" 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."

This assessment predicts the potential maximum effects that occur, and a likely maximum duration for effects once prevailing weather conditions are taken into account. The Northern Irish guidance threshold has been adopted for all residential receptors as a measure of assessing the significant of predicted shadow flicker effects. If shadow flicker effects are assessed to be over the 30 hours per year or 30 minutes a day threshold, effects will be considered as significant, however professional judgement will also be used in determining the level of significance.

A significance threshold of 30 hours per annum (based on the average annual sunshine hours result) was therefore adopted for the Consented Development, and the same threshold is adopted for the Proposed Development.

4.3.2.2. Predicted Effects from the 2022 EIA Report

An assessment of potential shadow flicker effects associated with the 2022 turbine dimensions was undertaken in line with Scottish Government guidance. The theoretical maximum and likely hours of shadow flicker occurrence per year was calculated for 32 representative receptors located within 10 x rotor diameters (2,550 m) of the Consented Development.

During the operational phase, it was calculated that 28 of the 32 assessed properties are expected to experience shadow flicker effects from the Consented Development; no likely effects are predicted to exceed the threshold of 30 hours per annum in line with recommended guidance. Therefore, the effects are not significant in terms of the EIA Regulations. No shadow flicker effects will occur during construction or decommissioning.

Cumulative shadow flicker effects are expected to surpass the 30 hour per annum threshold at 11 receptors. However, cumulative shadow flicker exceedances have been proven to be attributed to the Levenmouth Demonstration Turbine. No likely cumulative effects are predicted to exceed the shadow flicker thresholds from the Proposed Development. As such, cumulative shadow flicker effects from the Proposed Development are not significant in terms of the EIA Regulations.

It should be noted that flicker effects are expected to be further reduced in practice due to numerous factors, including screening and wind direction impacting on varying orientations of the turbine. The potential for shadow flicker effects at distances greater than 10 x rotor diameters from the Consented Development are unlikely and are deemed not significant. As the assessed properties are those that, for the most part, will have a clear, unobstructed view of the turbine with minimal screening, the assessment presents a worst-case scenario and any properties behind these will experience lesser shadow flicker effects.

With the implementation of micro-siting, shadow flicker due to the Consented Development is considered to remain not significant at the identified properties.

4.3.2.1. Proposed Mitigation from the 2022 EIA Report

In the event that complaints are made regarding shadow flicker effects and that these complaints are proven to constitute a Statutory Nuisance, then measures can be taken which would allow for shadow flicker to be reduced. A control system could be employed for those circumstances where shadow flicker could be attributed specifically to the Consented Development.

4.3.3. Implications of Project Parameter Changes

The key project changes relevant to the assessment of the Proposed Development with regards to shadow flicker are the larger rotor diameter and increased height to blade tip of the Proposed Development turbine. Shadow flicker modelling in Scotland is calculated with respect to the turbine location and dimensions, of which only the turbine dimensions have changed. The turbine location and dimensions then inform the study area and identification of receptors.

The changes in turbine dimensions are discussed in detail in Section 3 and the relevant element with regards to shadow flicker is that the turbine rotor diameter has increased from 255 m to 280 m, and the turbine height to blade tip has increased from 280 m to 305 m.

4.3.4. Updated Shadow Flicker Modelling

The shadow flicker model has been updated with the revised turbine dimensions as follows:

- • Turbine blade tip height has increased from 280 m to 305 m.
- • Turbine rotor diameter has increased from 255 m to 280 m. This has increased the “study area” from 2,550 m in the 2022 EIA Report, to 2,800m for the Proposed Development.

The shadow flicker model is run on a worst-case basis, which assumes the following:

- Weather conditions are such that shadows are always cast during each day of the year, i.e. bright sunshine every day.
- The turbine rotor will always be facing directly towards the property and that the property has a window directly facing the turbines, maximising the size of the shadow and hence the frequency and duration of the effect.
- The turbines will always be rotating; and
- There will be no intervening structures or vegetation (other than topography) that may restrict the visibility of the Proposed Development, preventing or reducing the effect.

The 2022 EIA Report adjusted the worst-case model for average sunshine hours from the nearest meteorological station; in this case Kirkcaldy6. The same adjustment of 32% has been applied to the Proposed Development model results.

The 2022 EIA Report used REsoft Windfarm Release 4.2.1.7, whereas this version uses ReSoft Windfarm Release 5.0.1.2.

Full details of the properties used in the model, their locations, orientation, dimensions, and height above ground and can be found in Technical Appendix 12a of the 2022 EIA Report.

4.3.4.1. Comparison of Results

Annex B: Figure 4.9.1 shows the increase in the shadow flicker study area between the 2022 turbine and the Proposed Development turbine. The study area has increased by approximately 250 m, which brings into the study area additional potential receptors when compared to the 2022 assessment. However, all these properties are located in similar areas that are further away from the Proposed Development turbine, and would experience shadow flicker on the same level, or lower, than the existing representative receptors. Therefore, the same 32 representative properties modelled in the 2022 EIA have been modelled here, with no additional receptors required.

Overall, there has been a small increase in the number of hours experienced at the representative receptors. Individually, some properties are predicted to experience slightly lower levels of shadow flicker compared to the 2022 EIA Report.

Annex B: Figure 4.9.2 shows the Proposed Development Shadow Flicker Results, the details of which are then shown in **Error! Reference source not found.**.

[6] At the closest weather station at Kirkcaldy, bright sunshine occurred for around 32% of daylight hours from January 1991 to December 2020. This factor of 32% of daylight hours will be used to calculate the likely hours of shadow flicker occurrence which will then be used as the basis for the assessment of significance effects.

5. CONCLUSION

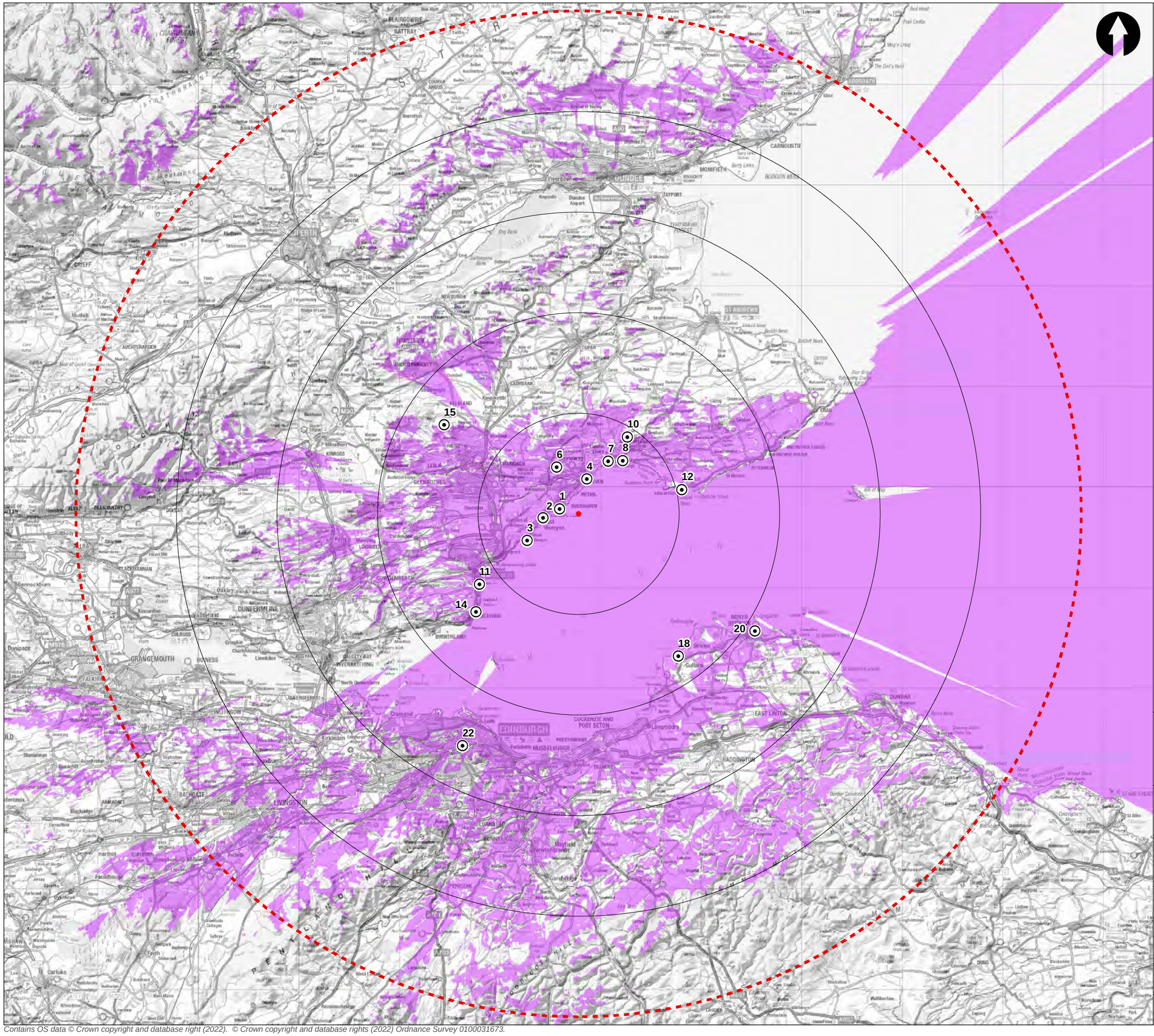
The EIAR comparison presented in Section 4.1, considers the potential effects of the proposed variations to the Project. This section explains why it is appropriate for the variation to be screened out of the requirement for an EIA when considering each receptor.

Each receptor is assessed against the impacts assessed in the 2022 EIAR which resulted in consents for the Consented Development. In the 2022 EIAR, impacts to all receptors were assessed to be either of minor significance or non-significant in EIA term, apart from the Seascape, Landscape and Visual Receptor. Additionally, there were no Adverse Effects on Site Integrity assessed under HRA for designated SPAs or SACs.

The Variation does not change the fundamental characteristics of the Proposed Development. As detailed in Section 4, the variation will not alter the significance level to any of the receptors compared to the Consented Development.

ANNEX A: SEACASPE, LANDSCAPE AND VISUAL FIGURES

Annex provided as separate documents.



Key:

- Proposed Turbine
- 10km Radii
- 50km Study Area
- Viewpoints
  - 1. Buckhaven, Shore Street
  - 2. East Wemyss, Fife Coastal Path
  - 3. West Wemyss, Fife Coastal Path
  - 4. Leven, Fife Coastal Path
  - 6. Kennoway
  - 7. Fife Coastal Path, Lundin Links
  - 8. Lower Largo
  - 10. Largo Law Summit
  - 11. Kirkcaldy, Esplanade
  - 12. Earlsferry, Links Road
  - 14. Kinghorn, Fife Coastal Path
  - 15. East Lomond Summit
  - 18. Gullane Beach
  - 20. North Berwick (north of Harbour)
  - 22. Calton Hill, Edinburgh
- Turbine Theoretically Visible (1x305m Blade Tip (above HAT))

Blade Tip:	305m (+HAT)	Observer height:	2m
DTM:	OS T5 / T50	Surface features:	Excluded
DTM resolution:	10m	Earth curvature:	Included

FORTHWIND OFFSHORE WIND FARM

REDESIGN SCREENING REPORT

Figure:

Figure 4.2.1a:
Blade Tip ZTV and 50km Study Area

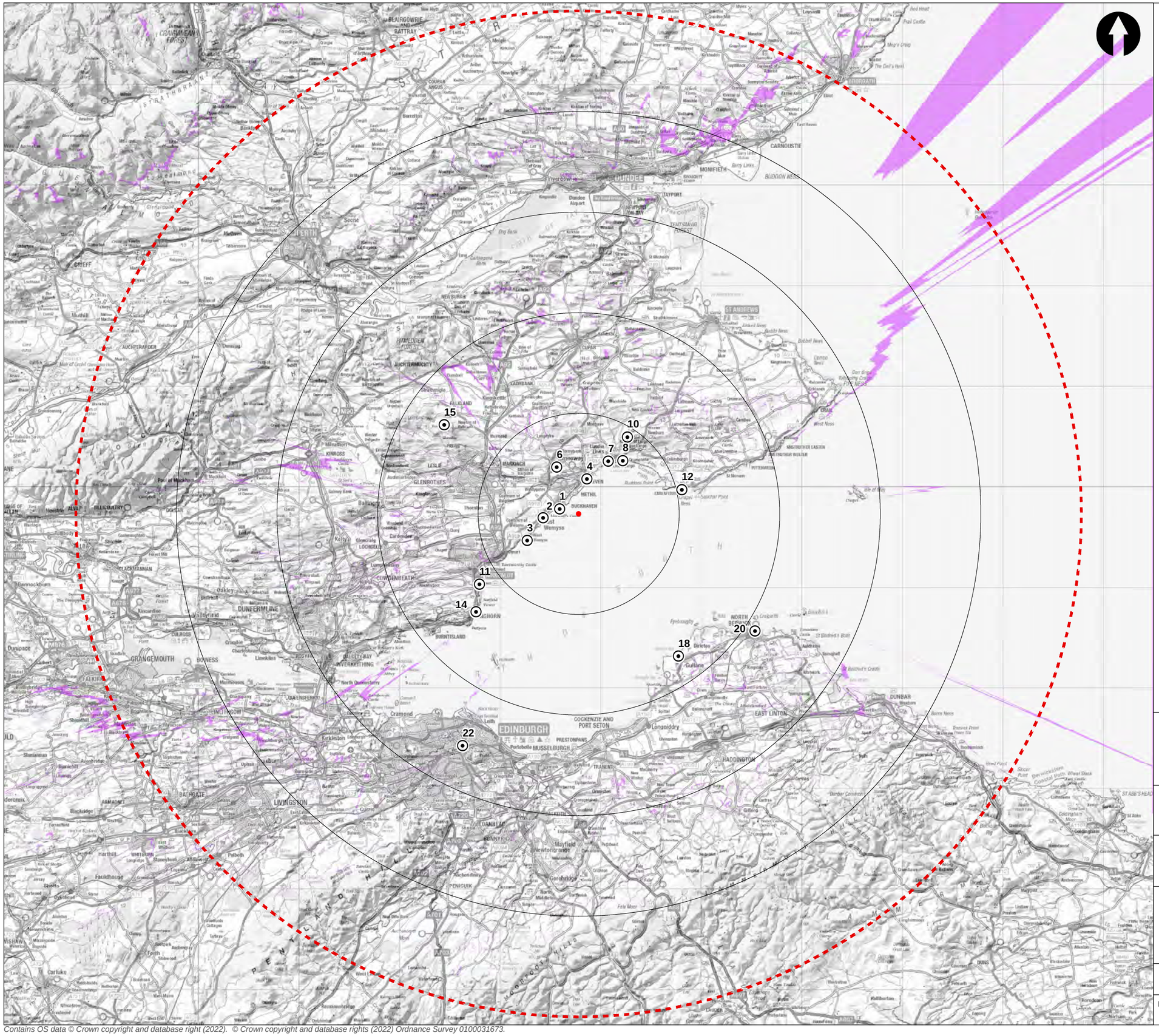
CIERCO

open optimised environments PART OF SLR

Scale: 1:370,000

0 2.5 5 10 km

Plot Size:	Co-ordinate System:	Figure No:	Rev.
A3	British National Grid	1	1



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  - 12. Earlsferry, Links Road
  - 14. Kinghorn, Fife Coastal Path
  - 15. East Lomond Summit
  - 18. Gullane Beach
  - 20. North Berwick (north of Harbour)
  - 22. Calton Hill, Edinburgh
- Additional areas of visibility of Proposed Variation (305m blade tip) over and above Original Consent (280m blade tip)

Blade Tip:	305m (+HAT)	Observer height:	2m
DTM:	OS T5 / T50	Surface features:	Excluded
DTM resolution:	10m	Earth curvature:	Included

FORTHWIND OFFSHORE WIND FARM

REDESIGN SCREENING REPORT

Figure:

Figure 4.2.1b: Proposed Variation ZTV (Additional Areas of Visibility)

CIERCO

open optimised environments PART OF SLR

Scale: 1:370,000

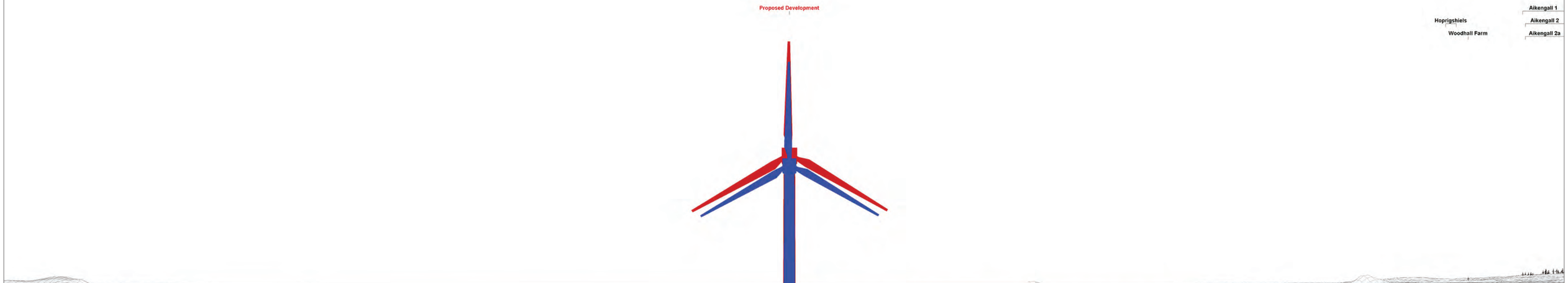
0 2.5 5 10 km

Plot Size:	Co-ordinate System:	Figure No:	Rev.
A3	British National Grid	2	1

OS reference:	E 335930 N 697809	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	7.13 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	104°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	1.94 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 15:04

Figure 4.2.2a:
Viewpoint 1: Buckhaven, Shore Street
Forth Wind

Comparative wireline showing Forthwind 'Original Consent' (blue) and 'Proposed Variation' (red)



Wireline drawing

View flat at a comfortable arm's length

OS reference:	E 335930 N 697809	**Horizontal field of view:**	53.5° (planar projection)
Eye level:	7.13 mAOD	**Principal distance:**	812.5 mm
Direction of view:	104°	**Paper size:**	841 x 297 mm (half A1)
Nearest turbine:	1.94 km	**Correct printed image size:**	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

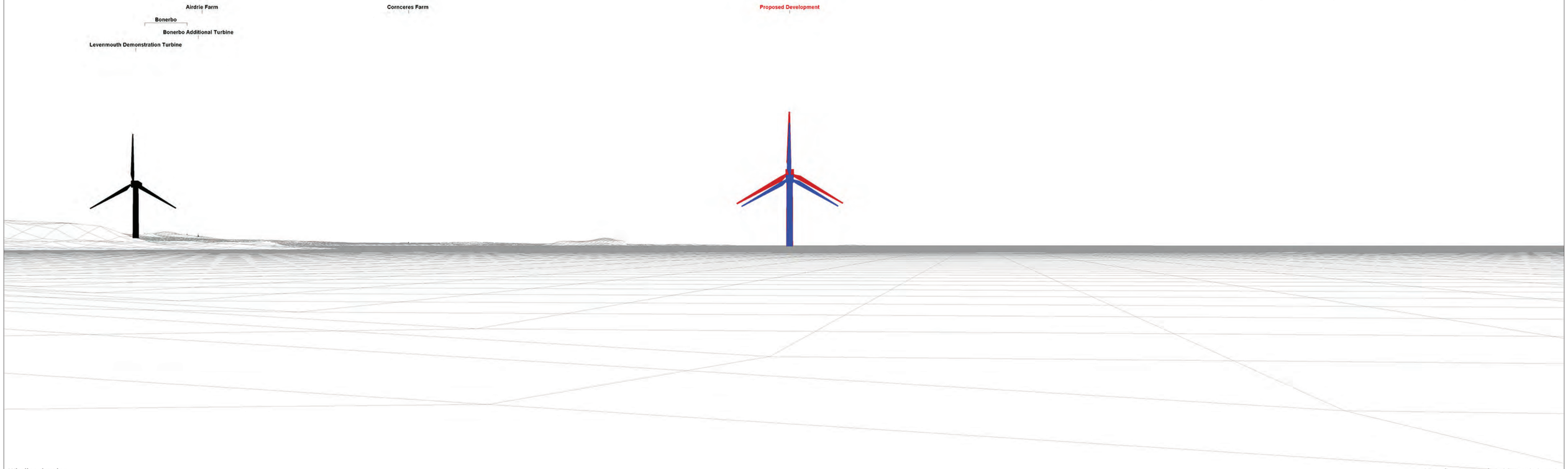
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.2b:
Viewpoint 1: Buckhaven, Shore Street
Forth Wind

OS reference:	E 334272 N 696911	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	5 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	83°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	3.56 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 14:38

Figure 4.2.3a:
Viewpoint 2: East Wemyss, Fife Coastal Path
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 334272 N 696911	**Horizontal field of view:**	53.5° (planar projection)
Eye level:	5 mAOD	**Principal distance:**	812.5 mm
Direction of view:	83°	**Paper size:**	841 x 297 mm (half A1)
Nearest turbine:	3.56 km	**Correct printed image size:**	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

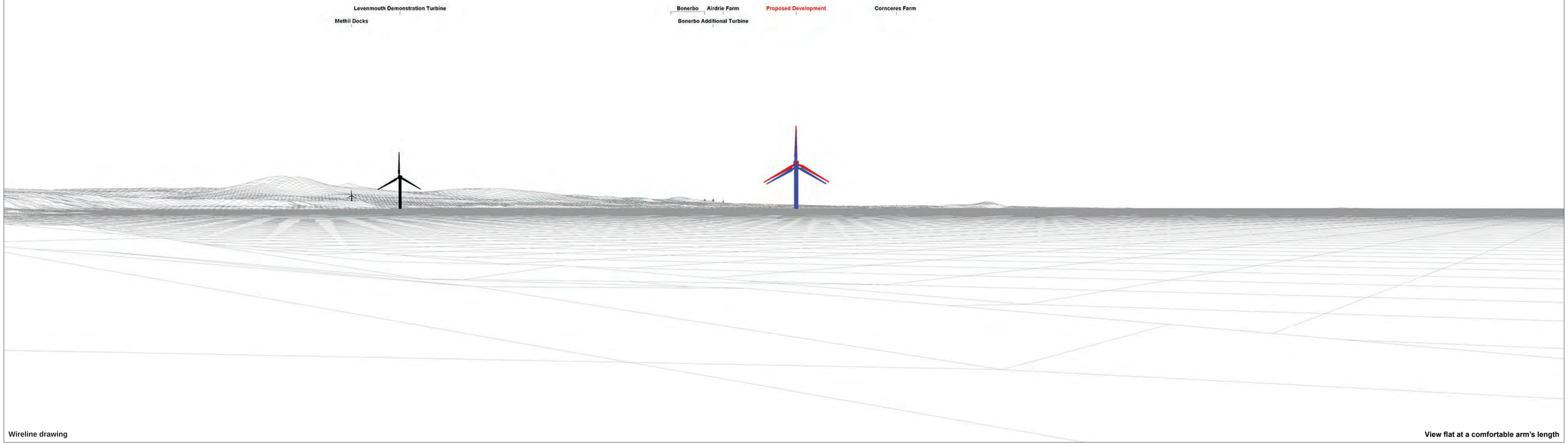
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.3b:
Viewpoint 2: East Wemyss, Fife Coastal Path
Forth Wind

OS reference:	E 332696 N 694664	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	6.9 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	62°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	5.77 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 14:13

Figure 4.2.4a:
Viewpoint 3: West Wemyss, Fife Coastal Path
Forth Wind

Comparative wireline showing Forthwind 'Original Consent' (blue) and 'Proposed Variation' (red)



Wireline drawing

View flat at a comfortable arm's length

OS reference:	E 332696 N 694664
Eye level:	6.9 mAOD
Direction of view:	62°
Nearest turbine:	5.77 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

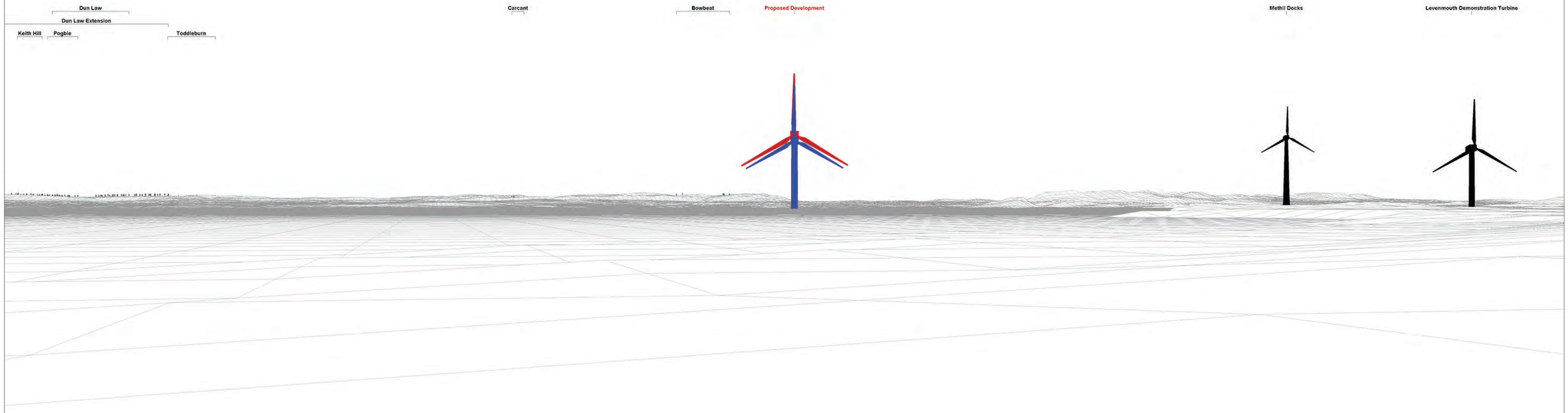
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.4b:
Viewpoint 3: West Wemyss, Fife Coastal Path
Forth Wind

OS reference:	E 338631 N 700779	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	5.47 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	193°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	3.54 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 08:41

Figure 4.2.5a:
Viewpoint 4: Leven, Fife Coastal Path
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference: E 338631 N 700779
Eye level: 5.47 mAOD
Direction of view: 193°
Nearest turbine: 3.54 km

Horizontal field of view: 53.5° (planar projection)
Principal distance: 812.5 mm
Paper size: 841 x 297 mm (half A1)
Correct printed image size: 820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.5b:
Viewpoint 4: Leven, Fife Coastal Path
Forth Wind

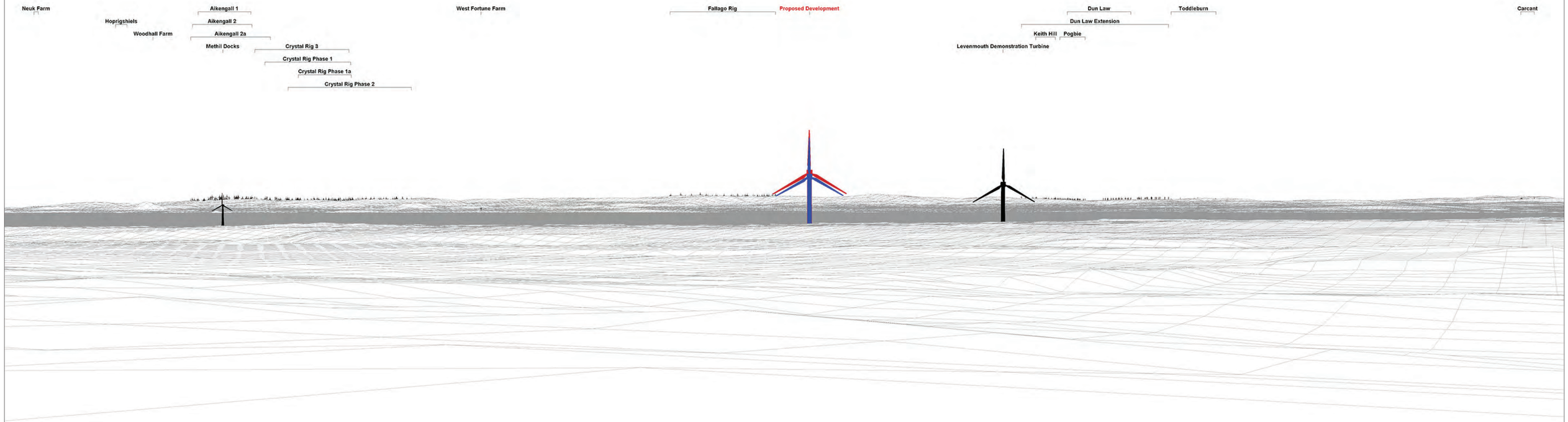
OS reference: E 335646 N 701963
Eye level: 55.8 mAOD
Direction of view: 154°
Nearest turbine: 5.11km

Horizontal field of view: 53.5° (planar projection)
Principal distance: 812.5 mm
Paper size: 841 x 297 mm (half A1)
Correct printed image size: 820 x 260 mm

Camera: Canon EOS 5D Mark II
Lens: 50mm (Canon EF 50mm f/1.4)
Camera height: 1.5 m AGL
Date and time: 23/06/16, 15:39

Figure 4.2.6a:
Viewpoint 6: Kennoway
Forth Wind

Comparative wireline showing Forthwind 'Original Consent' (blue) and 'Proposed Variation' (red)



Wireline drawing

View flat at a comfortable arm's length

OS reference:	E 335646 N 701963
Eye level:	55.8 mAOD
Direction of view:	154°
Nearest turbine:	5.11km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

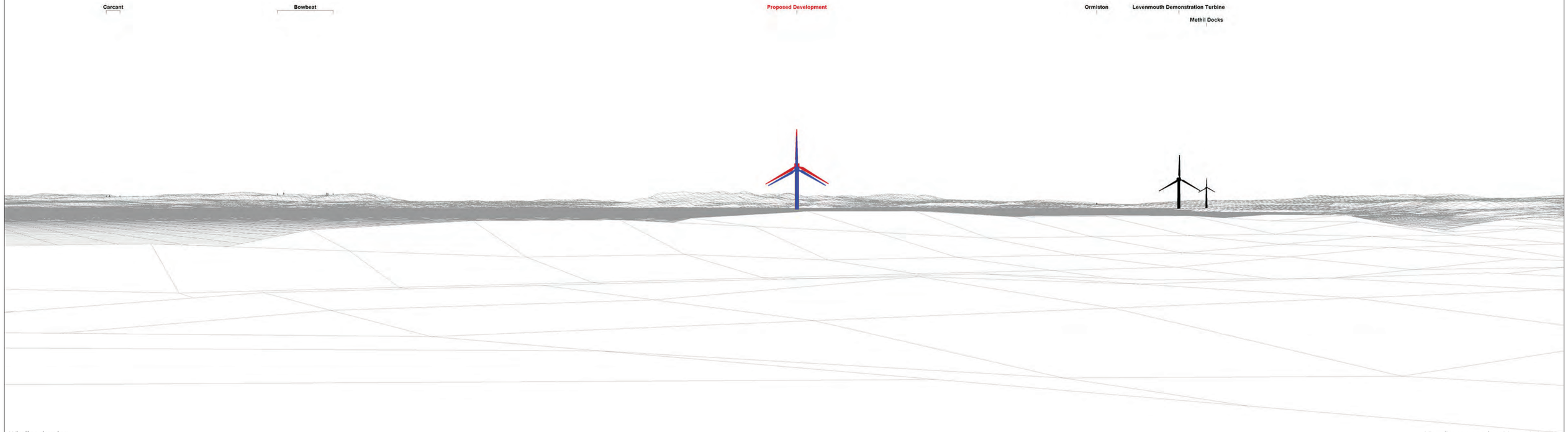
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.6b:
Viewpoint 6: Kennoway
Forth Wind

OS reference:	E 340760 N 702549	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	13.95 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	209°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	5.99 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 10:15

Figure 4.2.7a:
Viewpoint 7: Fife Coastal Path, Lundin Links
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 340760 N 702549
Eye level:	13.95 mAOD
Direction of view:	209°
Nearest turbine:	5.99 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

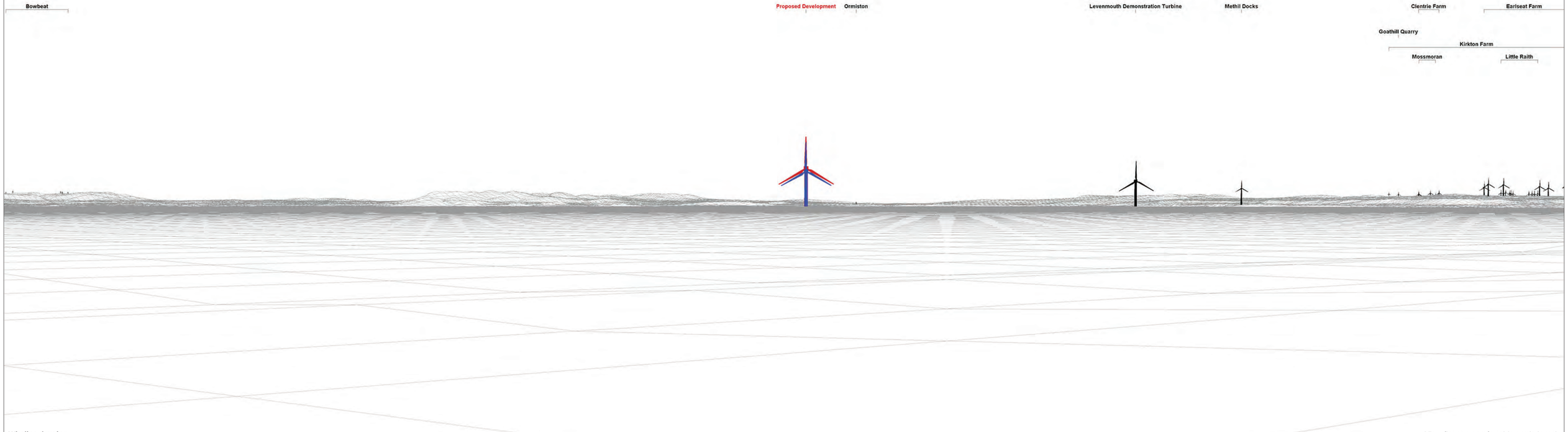
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.7b:
Viewpoint 7: Fife Coastal Path, Lundin Links
Forth Wind

OS reference:	E 342211 N 702611	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	5.85 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	219°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	6.87 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 12:41

Figure 4.2.8a:
Viewpoint 8: Lower Largo
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 342211 N 702611
Eye level:	5.85 mAOD
Direction of view:	219°
Nearest turbine:	6.87 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.8b:
Viewpoint 8: Lower Largo
Forth Wind

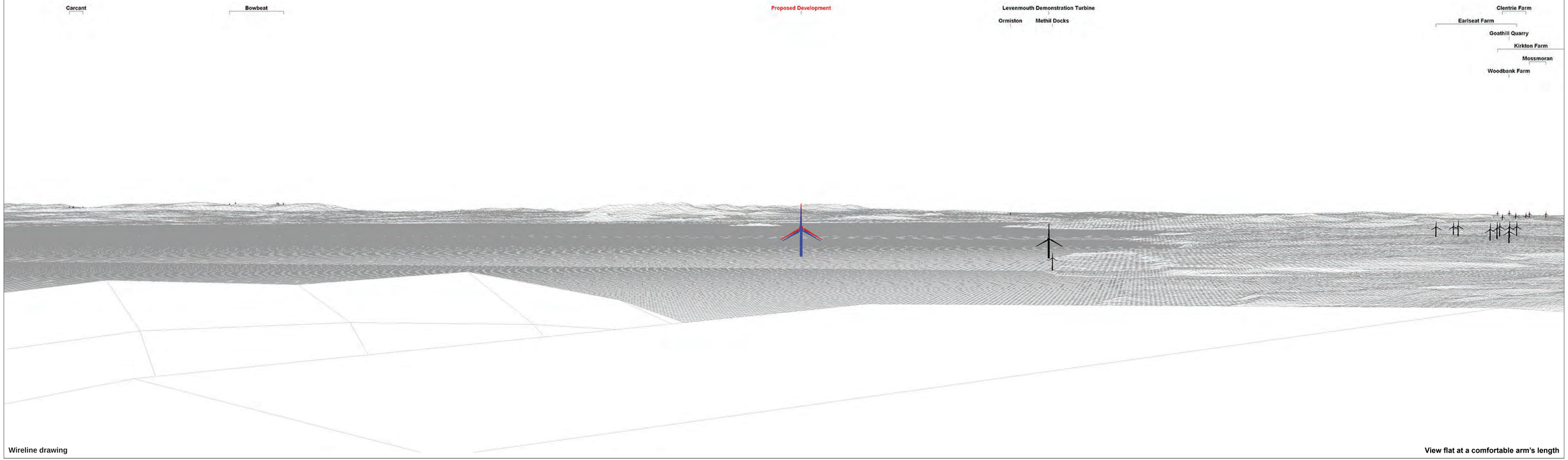
OS reference: E 342706 N 704977
Eye level: 289.86 mAOD
Direction of view: 212°
Nearest turbine: 9.07 km

Horizontal field of view: 53.5° (planar projection)
Principal distance: 812.5 mm
Paper size: 841 x 297 mm (half A1)
Correct printed image size: 820 x 260 mm

Camera: Canon EOS 5D Mark II
Lens: 50mm (Canon EF 50mm f/1.4)
Camera height: 1.5 m AGL
Date and time: 19/08/21, 12:03

Figure 4.2.9a:
Viewpoint 10: Largo Law Summit
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 342706 N 704977
Eye level:	289.86 mAOD
Direction of view:	212°
Nearest turbine:	9.07 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

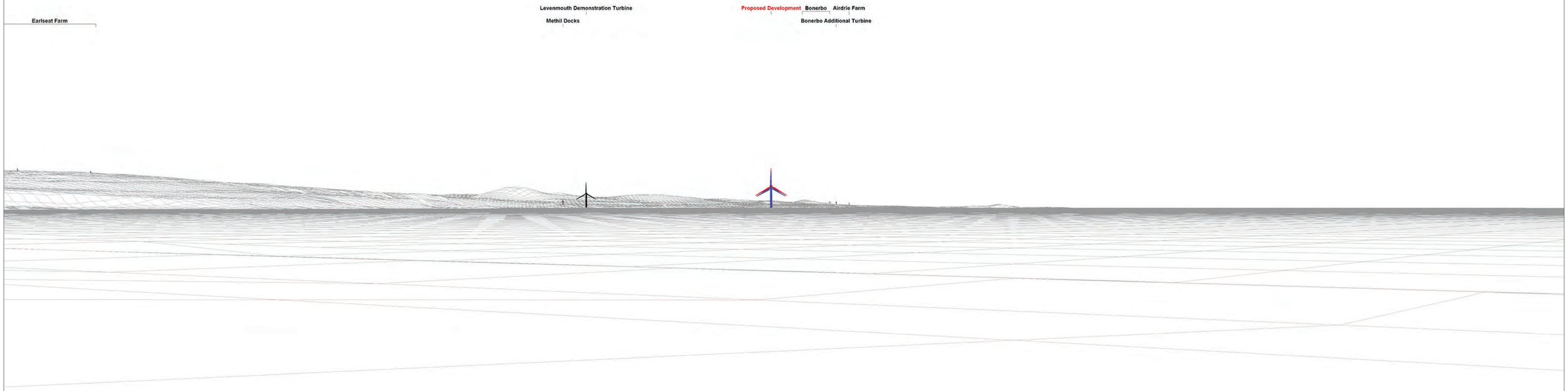
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.9b:
Viewpoint 10: Largo Law Summit
Forth Wind

OS reference:	E 327956 N 690308	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	4.3 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	55°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	12.10 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	23/06/16, 13:46

Figure 4.2.10a:
Viewpoint 11: Kirkcaldy, Esplanade
Forth Wind

Comparative wireline showing Forthwind 'Original Consent' (blue) and 'Proposed Variation' (red)



Wireline drawing

View flat at a comfortable arm's length

OS reference:	E 327956 N 690308
Eye level:	4.3 mAOD
Direction of view:	55°
Nearest turbine:	12.10 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.10b:
Viewpoint 11: Kirkcaldy, Esplanade
Forth Wind

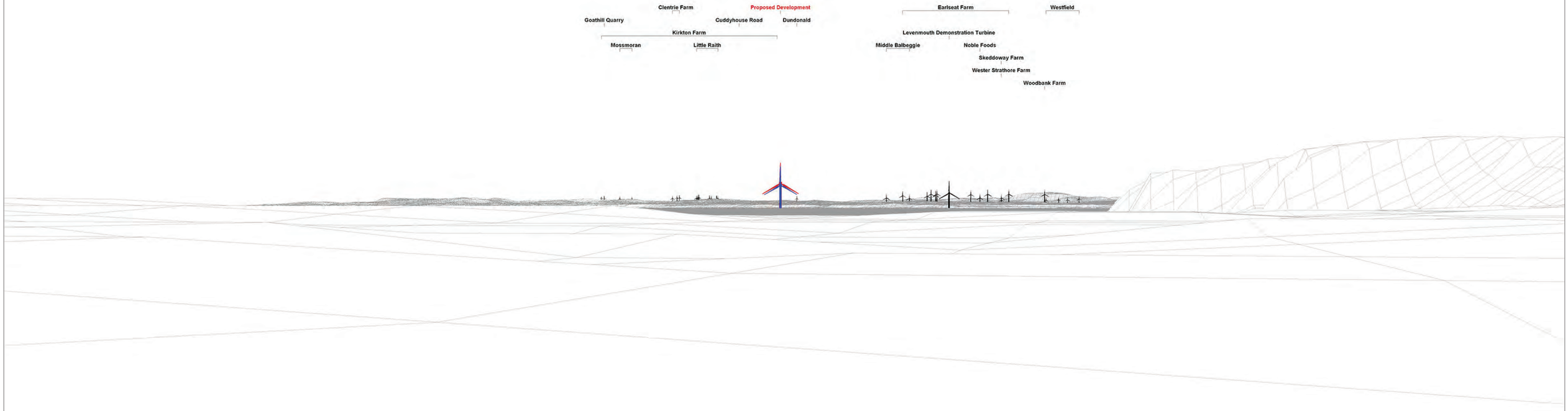
OS reference: E 348085 N 699732
Eye level: 12.05 mAOD
Direction of view: 257°
Nearest turbine: 10.54 km

Horizontal field of view: 53.5° (planar projection)
Principal distance: 812.5 mm
Paper size: 841 x 297 mm (half A1)
Correct printed image size: 820 x 260 mm

Camera: Canon EOS 5D Mark II
Lens: 50mm (Canon EF 50mm f/1.4)
Camera height: 1.5 m AGL
Date and time: 23/06/16, 11:40

Figure 4.2.11a:
Viewpoint 12: Earlsferry, Links Road
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 348085 N 699732
Eye level:	12.05 mAOD
Direction of view:	257°
Nearest turbine:	10.54 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

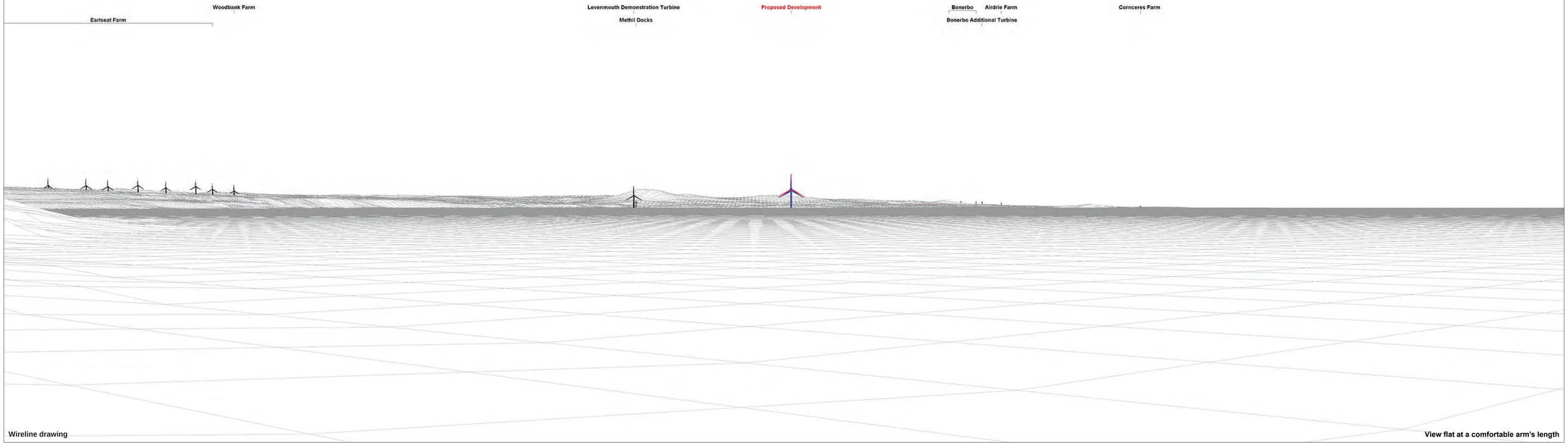
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.11b:
Viewpoint 12: Earlsferry, Links Road
Forth Wind

OS reference:	E 327614 N 687573	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 6D
Eye level:	9.6 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	46°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	14.11 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	08/09/21, 15:20

Figure 4.2.12a:
Viewpoint 14: Kinghorn, Fife Coastal Path
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 327614 N 687573
Eye level:	9.6 mAOD
Direction of view:	46°
Nearest turbine:	14.11 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

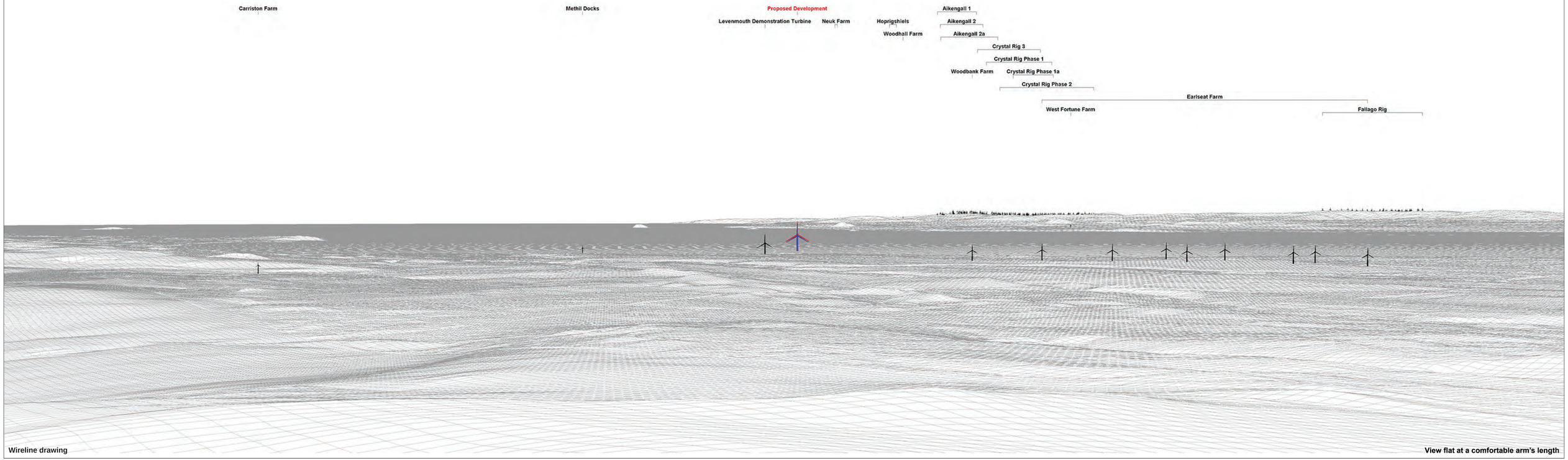
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.12b:
Viewpoint 14: Kinghorn, Fife Coastal Path
Forth Wind

OS reference:	E 324414 N 706197	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	442.67 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	123°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	16.06 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	26/08/21, 15:02

Figure 4.2.13a:
Viewpoint 15: East Lomond Summit
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 324414 N 706197
Eye level:	442.67 mAOD
Direction of view:	123°
Nearest turbine:	16.06 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

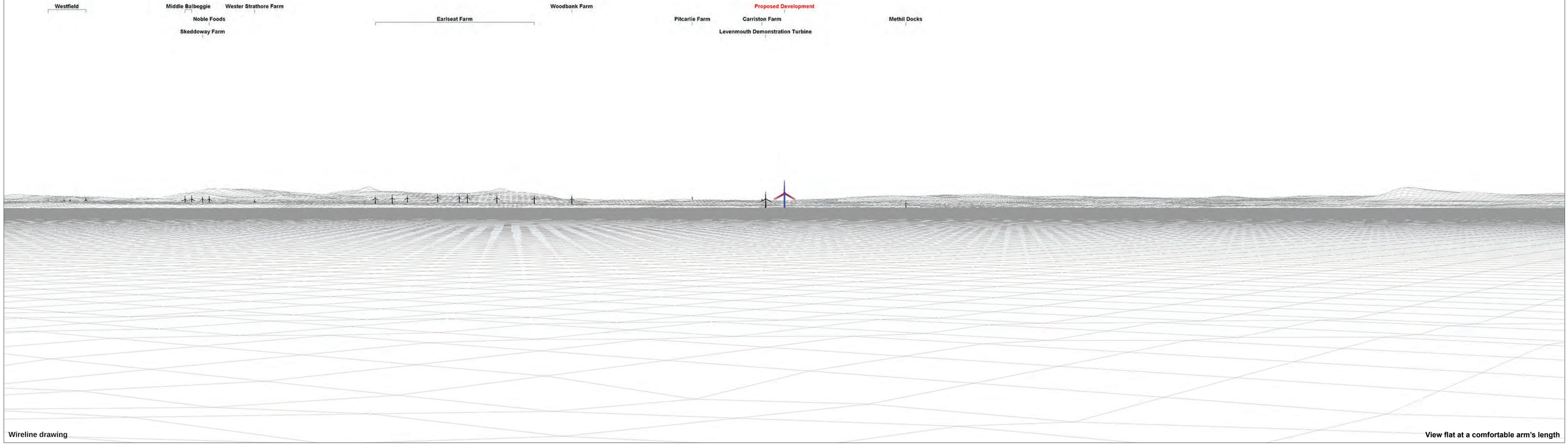
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.13b:
Viewpoint 15: East Lomond Summit
Forth Wind

OS reference:	E 347734 N 683161	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	20.07 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	325°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	17.30 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	10/08/21, 14:01

Figure 4.2.14a:
Viewpoint 18: Gullane Beach
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 347734 N 683161
Eye level:	20.07 mAOD
Direction of view:	325°
Nearest turbine:	17.30 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

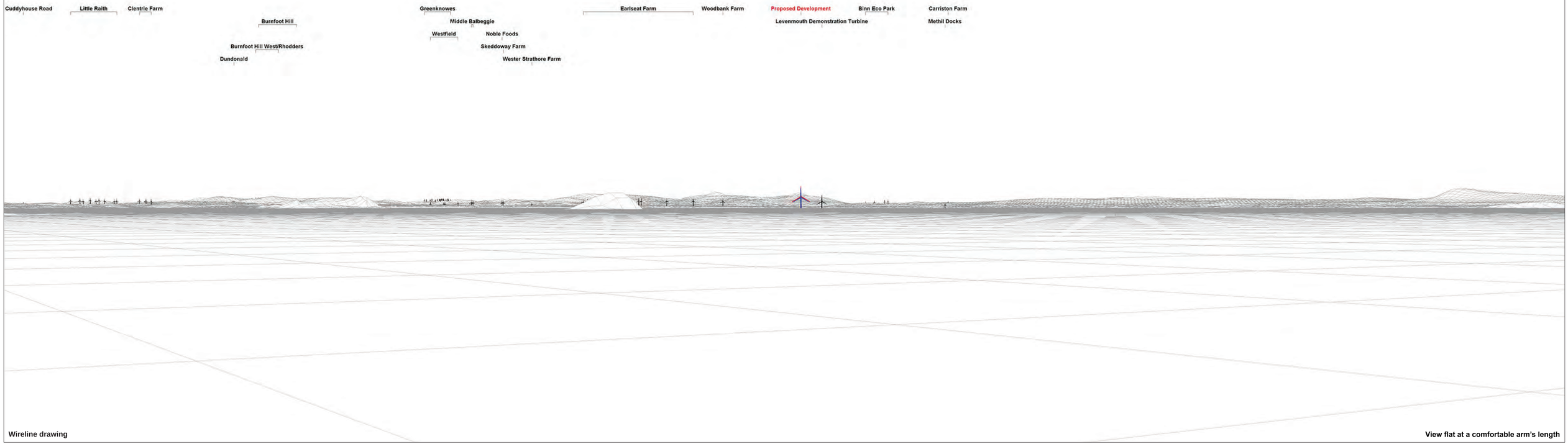
Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.14b:
Viewpoint 18: Gullane Beach
Forth Wind

OS reference:	E 355357 N 685672	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 5D Mark II
Eye level:	3.54 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	303°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	21.06 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	10/08/21, 12:44

Figure 4.2.15a:
Viewpoint 20: North Berwick (north of Harbour)
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)



Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 355357 N 685672
Eye level:	3.54 mAOD
Direction of view:	303°
Nearest turbine:	21.06 km

Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.15b:
Viewpoint 20: North Berwick (north of Harbour)
Forth Wind

OS reference:	E 326267 N 674270	**Horizontal field of view:**	53.5° (planar projection)	**Camera:**	Canon EOS 6D Mark II
Eye level:	97.33 mAOD	**Principal distance:**	812.5 mm	**Lens:**	50mm (Canon EF 50mm f/1.4)
Direction of view:	26°	**Paper size:**	841 x 297 mm (half A1)	**Camera height:**	1.5 m AGL
Nearest turbine:	25.79 km	**Correct printed image size:**	820 x 260 mm	**Date and time:**	29/09/21, 10:58

Figure 4.2.16a:
Viewpoint 22: Calton Hill, Edinburgh
Forth Wind

Comparative wireline showing Forthwind ‘Original Consent’ (blue) and ‘Proposed Variation’ (red)

Wireline drawing

View flat at a comfortable arm’s length

OS reference:	E 326267 N 674270
Eye level:	97.33 mAOD
Direction of view:	26°
Nearest turbine:	25.79 km

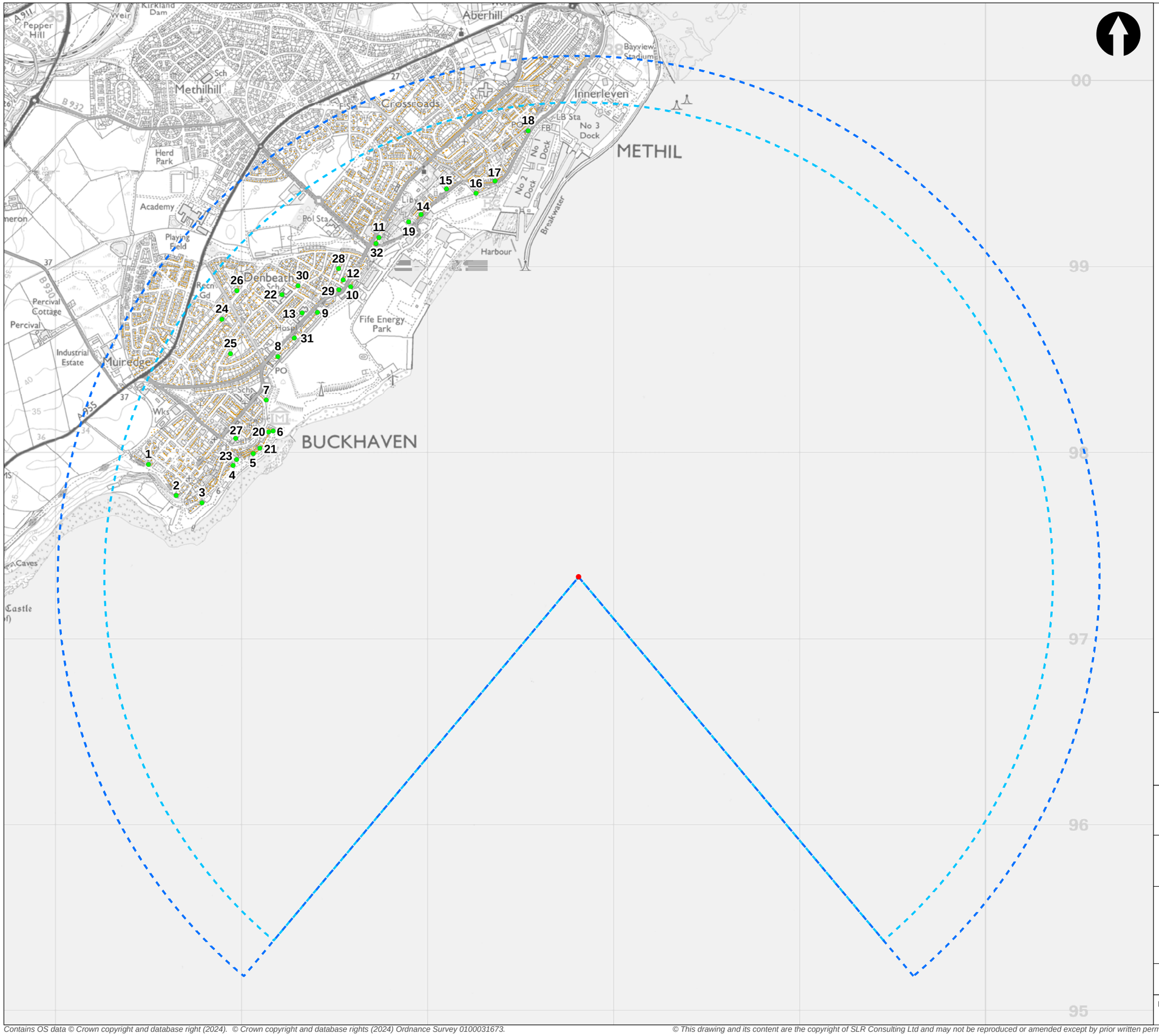
Horizontal field of view:	53.5° (planar projection)
Principal distance:	812.5 mm
Paper size:	841 x 297 mm (half A1)
Correct printed image size:	820 x 260 mm

Proposed Variation 305m blade tip height (280m rotor diameter)

Original Consent 280m blade tip height (255m rotor diameter)

Figure 4.2.16b:
Viewpoint 22: Calton Hill, Edinburgh
Forth Wind

ANNEX B: SHADOW FLICKER FIGURES



Key:

- Proposed Turbine
- Residential Property
- Residential Receptor
- 2.55km Consented Development Shadow Flicker Study Area
- 2.8km Proposed Development Shadow Flicker Study Area

FORTHWIND OFFSHORE WIND FARM

REDESIGN SCREENING REPORT

Figure:

4.8.1: Shadow Flicker Study Area

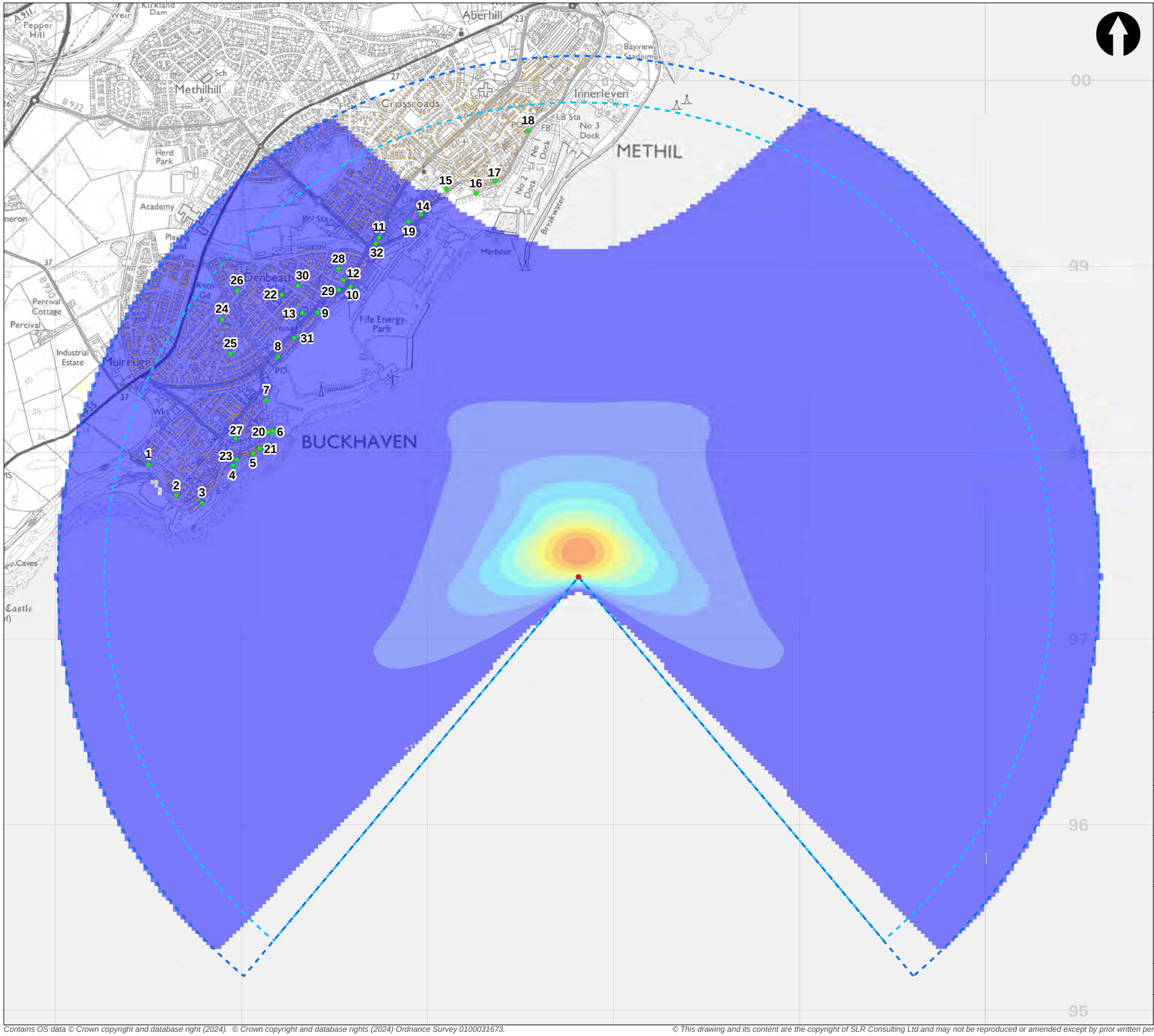
CIERCO

open optimised environments PART OF SLR

Scale: 1:20,000

0 125 250 500 Meters

Plot Size:	Co-ordinate System:	Figure No:	Rev.
A3	British National Grid	1	1



Key:

- Proposed Turbine
- Residential Property
- Residential Receptor
- 2.55km Consented Development Shadow Flicker Study Area
- 2.8km Proposed Development Shadow Flicker Study Area

Zone of Potential Shadow Flicker Influence (hours per year)

- 0 - 100
- 100 - 200
- 200 - 300
- 300 - 400
- 400 - 500
- 500 - 600
- 600 - 700
- 700 - 800
- 800 - 900
- 900 - 1,000
- 1,000 - 11,000
- > 11,000

FORTHWIND OFFSHORE WIND FARM

REDESIGN SCREENING REPORT

Figure:

4.9.2: Shadow Flicker Results

CIERCO

open optimised environments PART OF SLR

Scale: 1:20,000

0 125 250 500 Meters

Plot Size:	Co-ordinate System:	Figure No:	Rev.
A3	British National Grid	1	1

ANNEX C: SITES AND QUALIFYING FEATURES ASSESSED IN THE APPROPRIATE ASSESSMENT

Introduction

Here are the European sites and their qualifying interests that were assessed in the Appropriate Assessment (AA) undertaken by MS-LOT for the Forthwind project application consented on 15 March 2023.

The AA concluded that there would be no adverse effect on the site integrity of the Berwickshire and North Northumberland Coast Special Area of Conservation ("SAC"), Firth of Tay and Eden Estuary SAC, Isle of May SAC, Moray Firth SAC, River Teith SAC, Firth of Forth Special Protection Area ("SPA"), Forth Islands SPA and Outer Firth of Forth and St Andrews Bay Complex SPA from the Forthwind Limited ("Forthwind") proposal either in isolation or in combination with other plans or projects.

The proposed changes to the Forthwind turbine design, will not alter the conclusions of this AA and there will remain no adverse effect on the site integrity for each of the assessed SPAs and SACs (Annex C Table 2).

Annex C Table 2 – Consent Background to the Proposed Development

Site	Qualifying interests	Conservation objectives
Ornithology		
Outer Firth of Forth and St Andrews Bay Complex SPA	Gannet, Kittiwake, Herring gull, Guillemot, Razorbill, Puffin, European shag, Black-headed gull, Eider, Red-throated diver, Common scoter, Velvet scoter, Long-tailed duck, Red-breasted merganser, Goldeneye, Slavonian grebe	To ensure that the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status. To ensure that the integrity of the Outer Firth of Forth and St Andrews Bay Complex SPA is restored in the context of environmental changes by meeting the following objectives for each qualifying feature: • The populations of qualifying features are viable components of the site. • The distributions of the qualifying features throughout the site are maintained by avoiding significant disturbance of the species. • The supporting habitats and processes relevant to the qualifying features and their prey/food resources are maintained, or where appropriate restored, at the Outer Firth of Forth and St Andrews Bay Complex SPA.
Forth Island SPA	Gannet, Kittiwake, Herring gull, Lesser black-backed gull, Guillemot, Razorbill, Puffin, European shag	To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species
Firth of Forth SPA	Eider, Red-throated diver, Common scoter, Velvet scoter, Long-tailed duck, Red-breasted merganser, Goldeneye, Slavonian grebe	
Marine Mammals		
Berwickshire and North Northumberland Coast SAC	Grey seal	The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified. The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • the extent and distribution of qualifying natural habitats and habitats of the qualifying species • the structure and function (including typical species) of qualifying natural habitats • the structure and function of the habitats of the qualifying species

Site	Qualifying interests	Conservation objectives
		• the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • the populations of each of the qualifying species • the distribution of qualifying species within the site
Isle of May SAC		To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species
Firth of Tay and Eden Estuary SAC	Harbour seal	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species
Moray Firth SAC	Bottlenose dolphin	To ensure that the qualifying features of Moray Firth SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status. To ensure that the integrity of Moray Firth SAC is maintained or restored in the context of environmental changes by meeting the required objectives. For bottlenose dolphin: • The population of bottlenose dolphin is a viable component of the site. • The distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance. • The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained.

Site	Qualifying interests	Conservation objectives
Diadromous fish		
River Teith SAC	Atlantic salmon, Sea lamprey	To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species, including range of genetic types for salmon, as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species

ANNEX D: SUMMARY OF MITIGATION FROM CONSENTED DEVELOPMENT

All mitigation proposed identified in the 2022 EIA Report and subsequently granted in the s.36 consent will be implemented. No further mitigation associated with the anticipated change is proposed. For clarity the mitigation identified from the 2022 EIA Report and subsequently granted s.36 consent is presented in the table below.

Annex D Table 1 – Summary of Mitigation

Receptor	Mitigation	Monitoring
Seascape, Landscape and Visual impacts	Detailed siting, and reduction in the turbine numbers from two to one.	None
Ornithology	Reduction in the number of turbines. Tubular tower structure rather than a lattice structure. Use of soft-start during construction. Minimisation of vessel numbers on site, or ensuring vessels travel at reasonable speeds.	Pre/Post construction surveys.
Marine Mammals	Installation using drilled methods. Soft-start techniques, vessel management plans (as part of CEMP), burial of subsea cables, environmental management plan.	Pre/Post construction surveys.
Commercial Fisheries	Burial of cables or protected by other means. CEMP Infrastructure marked on charts Safety zones FIR and FLO appointed post consent	None proposed. Will follow best practice and Fisheries Working Group / MS advice / requirements.
Cultural heritage	Written Scheme of Investigation (WSI) Protocol for Archaeological Discoveries	None.
Fish & Shellfish Ecology	Installation using drilled pile techniques CEMP	None.
Airborne Noise	Selection of final turbine will be made o ensure relevant ETSU-R-97 noise limits are achieved.	None.
Shadow Flicker	None.	None.
Shipping and Navigation	Cable burial risk Charting of infrastructure Compliance with MGN. Development within a VTS area Guard vessel Lighting and marking Marine licence conditions Minimum blade tip clearance Promulgation of information	A Marine Control Centre Monitoring AIS CCTV monitoring of vessel activity Periodic AIS and radar monitoring by operation and maintenance vessels
Socioeconomics	None.	None.

Benthic Ecology	Re-use of ground preparation works if possible Foundation piles drilled not piled Pollution / Spill prevention plan Burial of subsea cables	Pre-construction benthic survey to inform the micrositing of the turbine, metmast and cable.
Military and aviation	None.	None.