



**Cyfoeth
Naturiol
Cymru**
**Natural
Resources
Wales**

Seascape and visual sensitivity to offshore
wind farms in Wales:

Strategic assessment and guidance

Stage 1- Ready reckoner of visual effects related to turbine size

Simon White, Simon Michaels and Helen King, White
Consultants

Report No 315

About Natural Resources Wales

Natural Resources Wales' purpose is to pursue sustainable management of natural resources. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

Evidence at Natural Resources Wales

Natural Resources Wales is an evidence based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

This Evidence Report series serves as a record of work carried out or commissioned by Natural Resources Wales. It also helps us to share and promote use of our evidence by others and develop future collaborations. However, the views and recommendations presented in this report are not necessarily those of NRW and should, therefore, not be attributed to NRW.

Report series: NRW Evidence Series
Report number: 315
Publication date: March 2019
Contract number: N/A
Contractor: White Consultants: Environment Ltd in association with Northumbria University
Contract Manager: L. Skates
Title: **Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance. Stage 1- Ready reckoner of visual effects related to turbine size**
Author(s): **White, S. Michaels, S. King, H.**
Restrictions: None

Distribution List (core)

NRW Library, Bangor	2
National Library of Wales	1
British Library	1
Welsh Government Library	1
Scottish Natural Heritage Library	1
Natural England Library (Electronic Only)	1

Distribution List (others)

Will be circulated to relevant parties electronically

Recommended citation for this volume:

White, S. Michaels, S. King, H. 2019. Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance. Stage 1- Ready reckoner of visual effects related to turbine size. NRW Evidence Series. Report No: 315, 94pp, NRW, Bangor.

Contents

1.	Crynodeb Gweithredol.....	7
1.1.	Cefndir.....	7
1.2.	Dull Gweithredu	7
1.3.	Casgliadau	8
1.4.	Adolygiad o archwiliadau ac ymholiadau.....	9
1.5.	Crynodeb.....	9
2.	Executive Summary.....	13
2.1.	Background.....	13
2.2.	Approach.....	13
2.3.	Findings.....	14
2.4.	Review of examinations and inquiries	15
2.5.	Summary.....	15
3.	Introduction.....	17
3.1.	Background and the brief.....	17
3.2.	Report structure	18
4.2.	Focus and limitations of the report.....	19
5.	Policy Context.....	19
5.1.	National policy.....	19
5.2.	Welsh policy	19
5.3.	UK marine policy	20
5.4.	Welsh marine policy.....	20
6.	Review of relevant guidance and studies	23
6.1.	Guidelines and reports.....	23
6.2.	Guidance on the assessment of the impact of offshore wind farms: seascape and visual impact report, (DTI, 2005).....	24
6.3.	Guidelines for Landscape and Visual Impact Assessment (GLVIA3) (2013)	26
6.4.	IEMA Special Report – The state of environmental impact assessment practice in the UK, 2011.	27
6.5.	Offshore With Energy Generation: Phase 1 proposals and environmental report, DTI, BMT Cordah, 2003.....	28
6.6.	UK Offshore Energy Strategic Environmental Assessment 2 (DECC), March 2011	29
6.7.	UK Offshore Energy Strategic Environmental Assessment 3 (DECC), March 2016.....	30
7.	Seascape and visual impact assessments (SVIA) analysis	31
7.1.	Our approach	31
7.2.	Cumulative effects	32
7.3.	Turbine heights and the Rochdale Envelope.....	32
7.4.	Reliability of SVIA evidence	33
7.5.	Selection of SVIAs	33
7.6.	SVIAs reviewed	33
7.7.	Analysis of SVIAs.....	34
7.8.	SVIA findings	36

8.	Wireframe analysis to establish buffers for 350m high turbines	38
8.1.	Introduction	38
8.2.	Method	38
8.3.	Findings.....	39
9.	Exploration of examination and public inquiry findings.....	48
9.1.	Rampion.....	48
9.2.	Navitus Bay.....	49
9.3.	Race Bank.....	51
9.4.	Walney Extension	51
9.5.	Burbo Bank extension.....	52
10.	Discussion and Conclusions.....	53
10.1.	Background.....	53
10.2.	Approach.....	53
10.3.	Findings.....	54
10.4.	Review of examinations and inquiries	54
10.5.	Summary.....	55
	References	61
11.	Appendices.....	62
	Appendix A: SVIA Analyses	63
	Appendix B: Glossary.....	87
	Data Archive Appendix.....	94

List of Figures

Figure 1	Marine Plan areas, offshore windfarm zones, national landscape designations and Heritage coasts
Figure 2	Consented and operational offshore windfarms
Figure 3	Buffers to National Parks and AONBs: Low magnitude of effect
Figure 4	Buffers to National Parks and AONBs: Medium magnitude of effect
Figure 5	Buffers to National Parks and AONBs off North Wales: Low magnitude of effect
Figure 6	Buffers to National Parks and AONBs off North Wales: Medium magnitude of effect
Figure 7	Buffers to National Parks and AONBs off North Wales: Low magnitude of effect off North Wales
Figure 8	Buffers to National Parks and AONBs off North Wales: Medium magnitude of effect off North Wales
Figure WS1	Low magnitude of effects scenario: 6m viewer height
Figure WS2	Low magnitude of effects scenario: 22m viewer height
Figure WS3	Low magnitude of effects scenario: 100m viewer height
Figure WS4	Medium magnitude of effects scenario: 6m viewer height
Figure WS5	Medium magnitude of effects scenario: 22m viewer height
Figure WS6	Medium magnitude of effects scenario: 100m viewer height
Figure WS7	Low magnitude of effects scenario- plan view
Figure WS8	Medium magnitude of effects scenario- plan view

List of Tables

Table 1 DTI report magnitude of change: names, descriptors and definitions	24
Table 2 DTI report significance of effects	25
Table 3 IEMA guidance on deriving significance of effects	27
Table 4 IEMA guidance on deriving significance of effects	28
Table 5 OESEA 2009 SVIA analysis.....	29
Table 6 OESEA 2009 Threshold for significance for turbines of English seascape development scenario at 22 m ASL	29
Table 7 Distribution of percentage days visibility for weather stations over a 10 year period	30
Table 8 Terms for Magnitude of Effect.....	32
Table 9 Su.....	35
Table 10 Summary of distances at which low and medium magnitude of effect occur	36
Table 11 Distances at which average low magnitude of visual effect occurs for different heights of turbine.....	36
Table 12 Distances at which average medium magnitude of visual effect occurs for different heights of turbine.....	37
Table 13 The effect of curvature of the Earth on turbine visibility	38
Table 14 Rampion- Comparative photomontage extracts of views from Cuckmere Haven ...	49
Table 15 Navitus Bay: comparison of visual impact of TAMO between assessors and ExA.	50
Table 16 Summary of distances at which low and medium magnitude of effect occur	54

1. Crynodeb Gweithredol

1.1. Cefndir

Ym mis Tachwedd 2018, penodwyd White Consultants gan Gyfoeth Naturiol Cymru (CNC) i gynnal asesiad strategol a pharatoi canllawiau ar gyfer sensitifrwydd morwedd a gweledol i ffermydd gwynt ar y môr yn ardal cynllun morol Cymru.

Ym mis Tachwedd 2018, penodwyd White Consultants gan Gyfoeth Naturiol Cymru (CNC) i gynnal asesiad strategol a pharatoi canllawiau ar gyfer sensitifrwydd morwedd a gweledol i ffermydd gwynt ar y môr yn ardaloedd Cynllun Morol drafft Cymru.

Mae i'r prosiect dair rhan ac, er cyflawnrwydd, dylid ystyried y rhain gyda'i gilydd. Yr adroddiad hwn yw'r rhan gyntaf ac mae'n gyfrifydd parod o effeithiau gweledol sy'n dangos y pellterau argymelledig oddi wrth Barciau Cenedlaethol ac Ardaloedd o Harddwch Naturiol Eithriadol (AHNEoedd) mewn perthynas â thyrbinau o wahanol uchderau hyd at 350m at flaen y llafn. Mae Polisi Cynllunio Cymru (PCC10) yn datgan y dylid rhoi pwys mawr ar ddibenion statudol Parciau Cenedlaethol ac AHNEoedd, yn cynnwys gwarchod a gwella'u harddwch naturiol a'u nodweddion arbennig. Mae hyn yn berthnasol i'r gweithgareddau sydd y tu mewn i'r ardal ddynodedig, neu yn y lleoliad.

1.2. Dull Gweithredu

I bob pwrpas, mae'r briff yn gofyn i'r astudiaeth ymchwilio a mapio'r byfferau ar gyfer tyrbinau o wahanol uchderau sydd eu hangen er mwyn osgoi effeithiau andwyol sylweddol ar dderbynyddion gweledol arfordirol sensitif iawn. Fodd bynnag, mae arwyddocâd effaith mewn Asesiadau o Effeithiau Morwedd a Gweledol (AEMGau) yn ddyfarniad a fydd yn amrywio yn dibynnu ar nifer o newidynnau a meini prawf. Felly mae'r adroddiad hwn yn mabwysiadu'r ymagwedd mai maint y newid ar dderbynyddion gweledol mewn AEMGau yw'r penderfynydd mwyaf cyson o ran yr effeithiau tebygol a achosir gan ffermydd gwynt ar y môr.

Yr amrediadau a ystyriwyd at ddibenion y briff yw effeithiau o feintiau isel a chanolig. Ar y cyd â derbynydd sensitif iawn, mae effaith o faint isel yn debygol o arwain i effaith o bwysigrwydd 'cymedrol'. Mae effaith o faint canolig yn debygol o arwain i effaith o bwysigrwydd 'mawr-cymedrol'. Mae ymchwil a chanllawiau'n dangos bod effaith cymedrol yn gallu bod yn effaith sylweddol, a bod mawr-cymedrol yn cael ei ddsbarthu fel effaith sylweddol yn y mwyafrif llethol o AEMGau.

Mae AEMGau ar 23 o ffermydd gwynt ar y môr cymwys wedi cael eu dadansoddi yn nyfroedd Cymru, Lloegr a'r Alban. Mae'r pellter cyfartalog a mwyaf ar gyfer effaith o faint isel a chanolig wedi cael eu cofnodi. Mae'r effeithiau cronus wedi cael eu nodi hefyd a'u defnyddio lle mae fferm wynt yn estyniad i arâe fawr bresennol.

Mae'r dadansoddiad o AEMGau yn ystyried effeithiau tyrbinau sydd hyd at 300m o uchder yn unig oherwydd y nifer gyfyngedig o AEMGau cymwys oedd ar gael yn ystod y cyfnod ymchwil. Felly mae dadansoddiad ffrâm wifren wedi cael ei gynnal ar gyfer tyrbinau 350m o uchder.

Mae'r senarios fframiau gwifren yn dangos aráe o dyrbinau gwynt 350m o uchder wedi'u cyfodod ag araeau o dyrbinau 145m a 225m lle mae pob un yn ymddangos fel pe baent o'r un uchder. Mewn theori, byddai hyn yn golygu y byddai'r tyrbinau 350m o uchder ar y pellter a gyfrifwyd yn cael effaith weledol debyg, i bob pwrpas, er gwaethaf y ffactorau cyfnewidiol sy'n effeithio ar welededd dros bellter, fel tawch.

1.3. Casgliadau

Mae casgliadau cyfunol yr AEMG a'r dadansoddiad ffrâm wifren fel a ganlyn ac yn cael eu dangos yn **Nhabl 1 a Diagramau 2 a 3 isod, a Ffigurau 3 a 4:**

Tabl 1 Crynodeb o gasgliadau'r dadansoddiad AEMG

Amrediad o uchderau tyrbinau at flaen y llafn (m)	Effaith o faint isel		Effaith o faint canolig	
	Pellter Cyfartalog km	Pellter Mwyaf km	Pellter Cyfartalog km	Pellter Mwyaf km
107-145	22.6	27.3	14.0	15.0
146-175	24.4	26.5	18.8	20.8
176-225	28.5	32.0	22.0	26.7
226- 300	41.6	52.7	27.9	31.4
301-350	44.0	-	32.8	-

Diagram 2: Pellterau lle mae effaith weledol o faint isel gyfartalog yn digwydd ar gyfer tyrbinau o wahanol uchderau

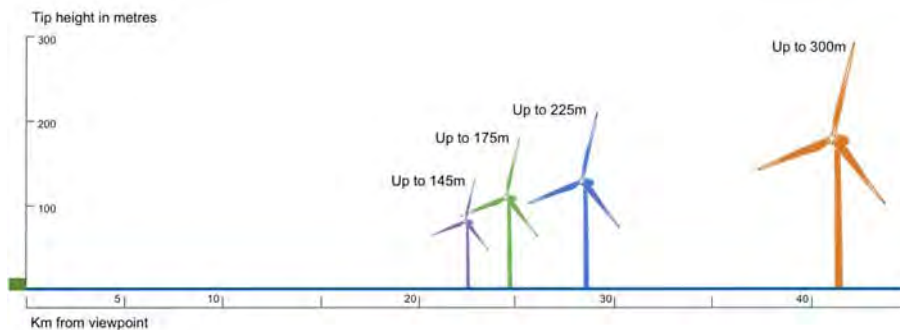
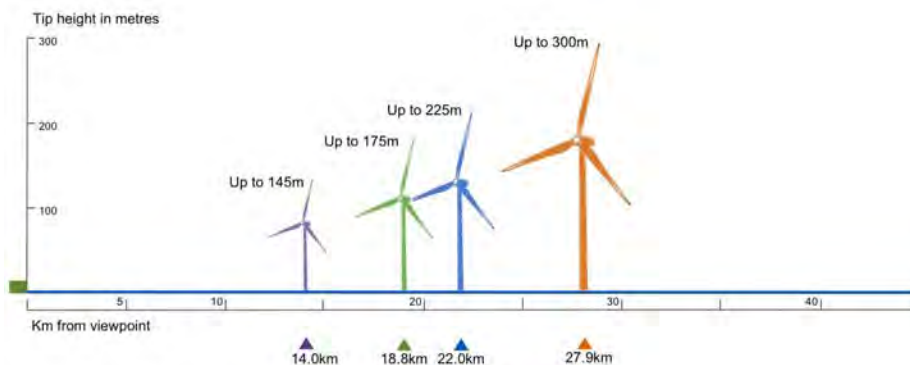


Diagram 3: Pellterau lle mae effaith weledol o faint canolig gyfartalog yn digwydd ar gyfer tyrbinau o wahanol uchderau



Y gymhareb fras iawn rhwng uchder a phellter tyrbinau o ran effaith o faint isel cyfartalog yw 1:133 a 1:100 o ran effaith o faint canolig cyfartalog.

Mae'n rhaid ystyried y pellterau hyn yn ofalus am y rhesymau canlynol:

- Barn aseswyr yw AEMGau, ac nid barn adolygwyr awdurdodau statudol neu drydydd partion.
- Mae cymryd cyfartaledd o'r effeithiau o faint isel a chanolig yn golygu nad yw'r achos gwaethaf yn cael ei ystyried. Felly mae yna botensial ar gyfer effeithiau sylweddol ar y pellterau hyn.
- Mae pellterau byfferau o faint canolig yn arwydd bod tebygrwydd o effeithiau sylweddol ar dderbynnydd sensitif iawn o ran maint tyrbinau gwynt ar y pellter penodedig, neu lai. Mae potensial ar gyfer effeithiau sylweddol y tu hwnt i'r pellter hwn hefyd.
- Mae pellterau byfferau o faint isel yn arwydd bod tebygrwydd nad oes unrhyw effeithiau sylweddol ar dderbynnydd sensitif iawn o ran maint tyrbinau gwynt ar y pellter penodedig, neu y tu hwnt iddo. Fodd bynnag, mae'n debygol y bydd rhai effeithiau y tu hwnt i'r pellter hwn. Nid yw'r effeithiau hyn yn rhai dibwys.

1.4. Adolygiad o archwiliadau ac ymholiadau

Mae nifer o archwiliadau ac ymholiadau wedi cael eu hymchwilio mewn perthynas â ffermydd gwynt ar y môr sy'n rhyngweladwy naill ai â Pharciau Cenedlaethol neu AHNEoedd. Dyma'r casgliadau:

- Mae'n amlwg bod Awdurdodau Archwilio ac Arolygwyr o'r farn bod pob achos yn cael ei ystyried yn ôl ei deilyngdod.
- Mae paneli Awdurdodau Archwilio ac Arolygwyr yn cydnabod bod effeithiau o faint canolig sy'n arwain i effeithiau sylweddol mawr/cymedrol yn rhai sylweddol.
- Mae'r ffactorau yr ystyriwyd eu bod yn lleihau niwed gan yr Arolygwyr neu'r Awdurdodau Archwilio yn cynnwys bod y ffermydd gwynt yn weladwy yn anaml iawn o'r ardaloedd dynodedig, p'un ai'r tir yw ffocws pennaf yr ardal ddynodedig, a lle mae datblygiadau sylweddol fel pwerdai neu ardaloedd trefol wedi'u lleoli ar yr arfordir neu ar y môr, er enghraifft ffermydd gwynt ar y môr presennol.
- Mae'r ffactorau yr ystyriwyd eu bod yn cynyddu niwed yn cynnwys lle mae gan yr ardaloedd dynodedig yr effeithir arnynt nodweddion arbennig sy'n gysylltiedig â'r arfordir a'r môr, lle mae ffermydd gwynt yn cael eu cynnig yn agos iawn at arfordir yr ardaloedd dynodedig hyn, lle yr effeithir ar amryfal ardaloedd dynodedig, a lle mae ffactorau eraill fel tyrbinau sy'n gorgyffwrdd yn weledol (hyd yn oed â meintiau llai) yn amlwg.

1.5. Crynodeb

I grynhoi:

- Mae'r ymchwil hwn yn dangos perthynas rhwng uchder tyrbinau gwynt ar y môr a'r radd o effeithiau gweledol.
- Caiff hyn ei fesur yn nhermau maint yr effeithiau gweledol, a phan gaiff y rhain eu cyfuno â derbynnydd gweledol sensitif iawn, maent yn dangos y pellterau lle mae effeithiau gweledol sylweddol yn debygol.

- Mae'r pellterau sy'n cynrychioli'r radd o effaith weledol o feintiau isel a chanolig yn adlewyrchu i ba raddau bydd yr effeithiau gweledol sylweddol 'posibl' a 'thebygol' ar dderbynyddion sensitif yn digwydd.
- Mae'r amrediad o bellterau ag effaith o faint isel yn fwy priodol i'w defnyddio fel ymagwedd ragofalus er mwyn osgoi effeithiau andwyol sylweddol.
- Y gymhareb fras iawn rhwng uchder a phellter tyrbinau o ran effaith o faint isel yw 1:133 ac 1:100 o ran effaith o faint canolig (felly bydd arae o dyrbinau 200m o uchder yn debygol o gael effaith weledol sylweddol hyd at bellter o 20km).
- Gan yr ystyrir mai'r crynhoad yw'r mwyaf cynhwysfawr hyd yma ar y pwnc penodol hwn, mae'n darparu sail resymol ar gyfer trafodaethau ynglŷn â'r radd o effeithiau gweledol sylweddol tebygol.
- Mae hyn ar sail y ffaith fod:
 - Y crynhoad o dystiolaeth yn ymwneud â chynlluniau tyrbinau gwynt ar y môr blaenorol yn y Deyrnas Unedig, mewn araeau mawr, ar wahanol uchderau a phellterau i ffwrdd.
 - Mae'r derbynyddion gweledol sensitif a ddefnyddir i ddiffinio byfferau yng Nghymru yn dirweddau dynodedig (Parciau Cenedlaethol ac AHNEoedd).
 - Mae'r dystiolaeth ar ffurf nifer o wahanol ddyfarniadau proffesiynol a ddefnyddiwyd mewn asesiadau o effeithiau morwedd a gweledol (AEMGau) a/neu mewn Ymchwiliad Cyhoeddus.
 - Mae dyfarniadau'r AEMGau yn seiliedig ar fwy o ffactorau nag uchder tyrbinau a'u pellter i ffwrdd yn unig – ond er gwaethaf hyn, mae'r crynhoad yn dangos patrwm.
- Gan y gall manylion penodol pob datblygiad a phob derbynydd gweledol sensitif amrywio, ni ddylid defnyddio'r crynhoad hwn i rwystro trafodaeth bellach ar sail pob cynllun unigol yn ei dro.

Dylid rhoi ystyriaeth i'r canlynol:

- Ni ellir trin yr holl AHNEoedd a Pharciau Cenedlaethol yn yr un ffordd – mae eu nodweddion arbennig yn bwysig er mwyn medru deall eu perthynas â'r arfordir a'r môr cyfagos.
- Gall tyrbinau bach gael llawn cymaint o effaith â thyrbinau mawr yn dibynnu ar ffactorau eraill fel gradd a threfniant. Felly, dylid trin yr amrediad effaith o faint canolig ar gyfer tyrbinau hyd at 175m o uchder â phwyll oherwydd, mewn rhai achosion, gall yr effeithiau fod yn fwy sylweddol.
- Nid yw effeithiau o faint isel hyd yn oed yn golygu nad yw datblygiad yn weladwy. Gallai hyn fod yn amhriodol yn y safleoedd mwyaf sensitif lle mae ffermydd gwynt ar y môr yn sefyll yn union o flaen dynodiadau ac yn weladwy o lawer o safbwyntiau a hefyd yn agos at y penrhynion a'r ynysoedd gorllewinol. Yn y safleoedd mwy sensitif, efallai mai'r ymagwedd ddewisol fyddai osgoi rhyngweledd ac unrhyw effeithiau gweledol andwyol sy'n uwch na dibwys.
- Dylid ystyried byfferau gweledol ar uchder tyrbinau fel rhan yn unig o effeithiau morwedd a gweledol. Mae ffactorau eraill yn cael eu harchwilio yn yr adroddiadau Cam 2 a 3.

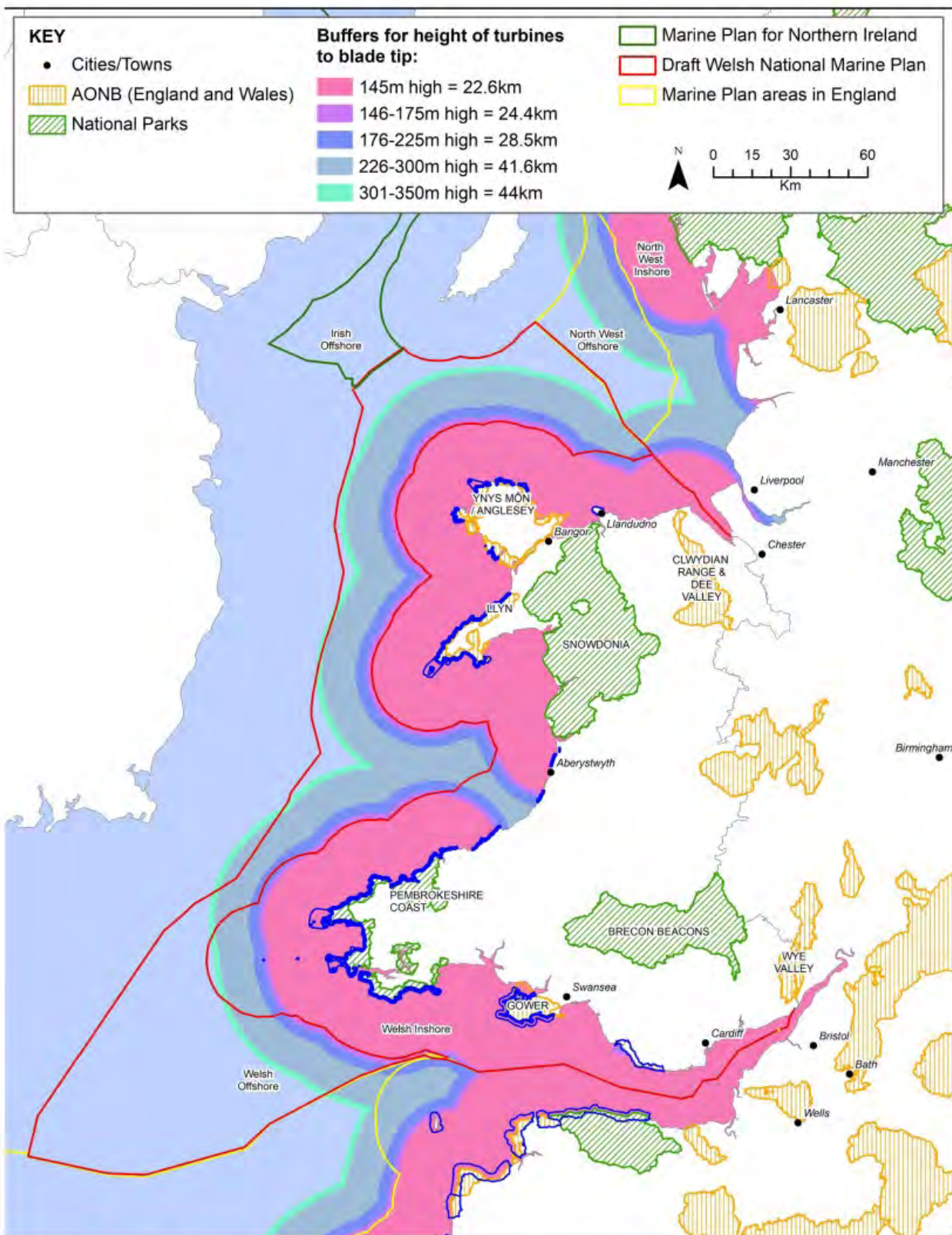
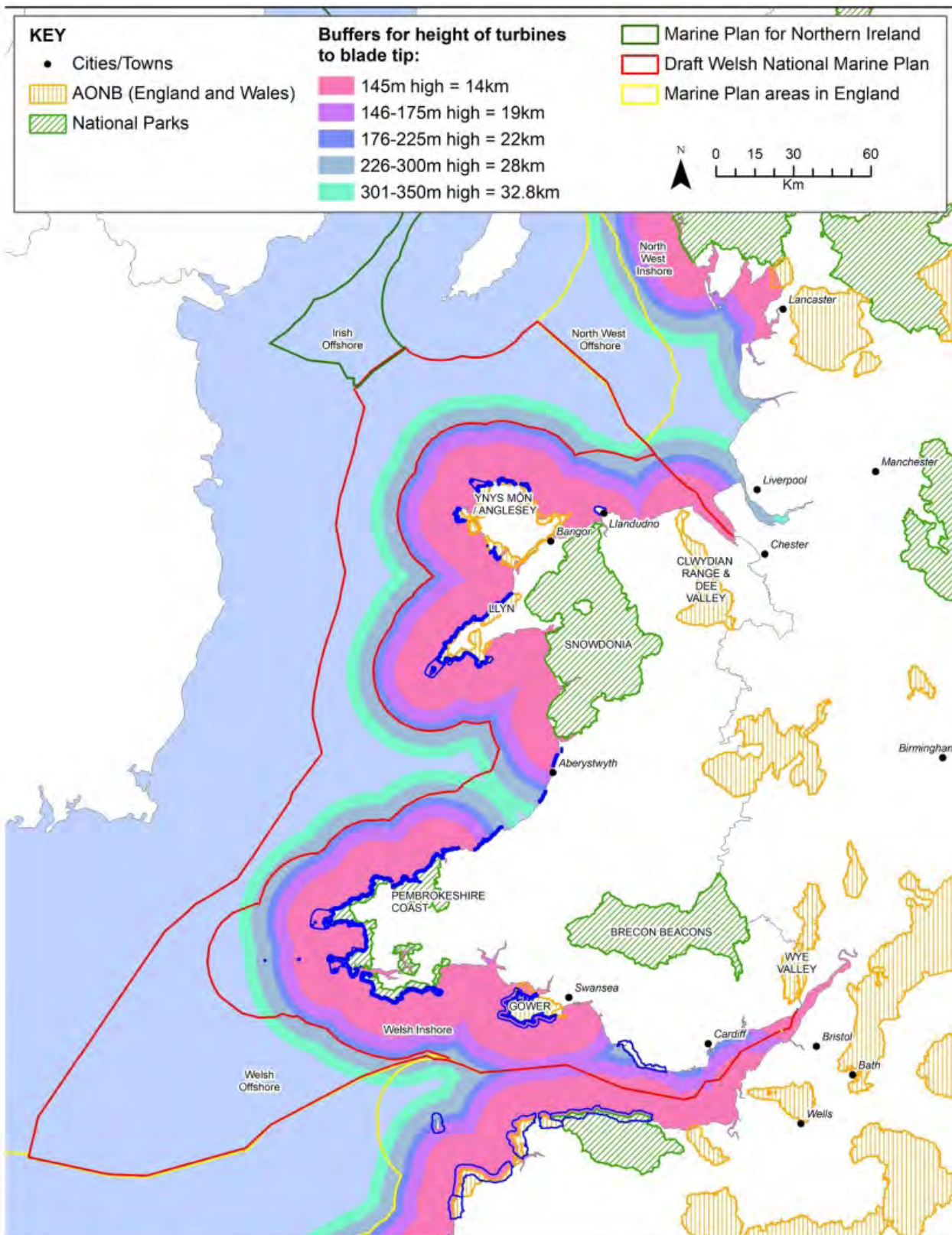


Figure 3
Buffers to National Parks and AONBs: Low magnitude of effect

white CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0, from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

28/03/19 | v6 | Drawn: HK | Checked SW



white CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0. from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

28/03/19 | v5 | Drawn: HK | Checked SW

Figure 4
Buffers to National Parks and AONBs: Medium magnitude of effect

2. Executive Summary

2.1. Background

Natural Resources Wales (NRW) appointed White Consultants in November 2018 to undertake a strategic assessment and prepare guidance for seascape and visual sensitivity to offshore wind farms in Wales' marine plan area.

Natural Resources Wales (NRW) appointed White Consultants in November 2018 to undertake a strategic assessment and prepare guidance for seascape and visual sensitivity to offshore wind farms in Wales' draft Marine Plan areas.

The project is in three parts which for completeness should be considered together. This report is the first part and is a visual effects ready reckoner showing the recommended distances from National Parks and Areas of Outstanding Natural Beauty (AONBs) in relation to different turbine heights up to 350m to blade tip. Planning Policy Wales (PPW10) states that great weight should be given to the statutory purposes of National Parks and AONBs including conserving and enhancing their natural beauty and their special qualities. This applies to both activities that lie within, or in the setting, of the designated area.

2.2. Approach

The brief effectively requires the study to research and map buffers for different heights of turbines required to avoid significant adverse effects on high sensitivity coastal visual receptors. However, the significance of effect in Seascape and Visual Impact Assessments (SVIAs) is a judgement that will vary depending on a number of variables and criteria. Therefore this report takes the approach of using magnitude of change on visual receptors in SVIAs as the most consistent determinant of likely effects of offshore windfarms.

The ranges considered for the purposes of the brief are low and medium magnitudes of effect. Combined with a high sensitivity receptor, a low magnitude of effect is likely to result in an effect of 'moderate' significance. A medium magnitude of effect is likely to result in an effect of 'major-moderate' significance. Research and guidance indicate that a moderate effect can potentially be significant, and that major-moderate is classified as significant in the vast majority of SVIAs.

The SVIAs of 23 suitable offshore wind farms have been analysed in England, Wales and Scotland's waters. Both the average and maximum distance for low and medium magnitude of effect have been recorded. Cumulative effects have also been noted and used where a windfarm is an extension to an existing large array.

The SVIA analysis only considers the effects of turbines up to 300m high due to the limited number of suitable SVIAs available during the research period. Therefore a wireframe analysis for 350m high turbines has been carried out.

The wireframe scenarios show an array of 350m high wind turbines in juxtaposition with arrays of 145m and 225m turbines where they all appear the same height. In theory, this would mean that the 350m high turbines at the located distance would

potentially have a similar visual effect notwithstanding variable factors that affect visibility over distance such as haze

2.3. Findings

The combined findings of the SVIA and wireframe analysis are as follows and are shown in **the Table 1 and Diagrams 2 and 3 below and Figures 3 and 4:**

Table 1 Summary of SVIA analysis findings

Range of turbine heights to blade tip (m)	Low magnitude of effect		Medium magnitude of effect	
	Average Distance km	Maximum Distance km	Average Distance km	Maximum Distance km
107-145	22.6	27.3	14.0	15.0
146-175	24.4	26.5	18.8	20.8
176-225	28.5	32.0	22.0	26.7
226-300	41.6	52.7	27.9	31.4
301-350	44.0	-	32.8	-

Diagram 2: Distances at which average low magnitude of visual effect occurs for different heights of turbine

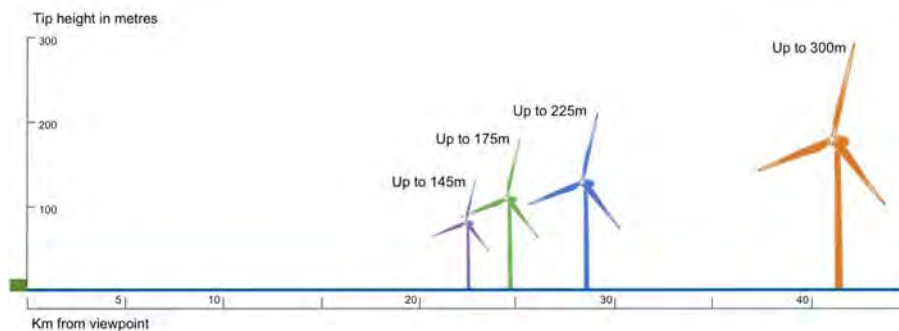
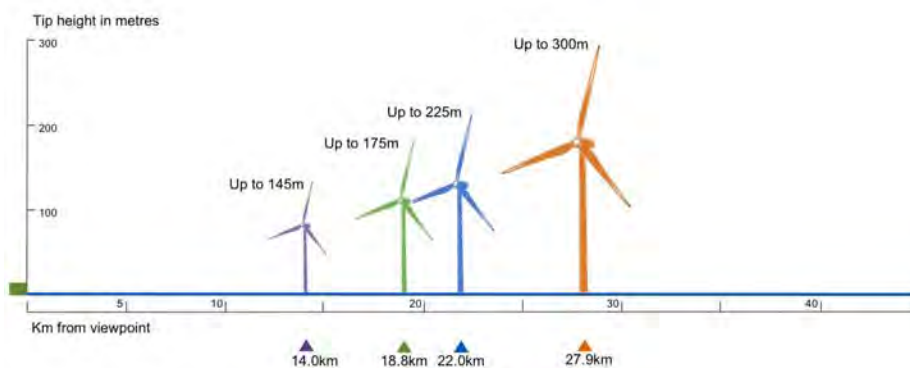


Diagram 3: Distances at which average medium magnitude of visual effect occurs for different heights of turbine



A very approximate ratio between turbine height and distance for an average low magnitude of effect is 1:133 and 1:100 for average medium magnitude of effect.

These distances need to be considered carefully for the following reasons:

- SVIAs are opinion of assessors, not necessarily statutory authority or third party reviewers.

- Taking an average of low and medium magnitude of effects means that the worst case is not taken. There is therefore potential for significant effects at these distances.
- Medium magnitude buffers are an indication that there is a likelihood of significant effects on a high sensitivity receptor for the size of wind turbine at, or less than, the distance stated. There is also potential for significant effects beyond.
- Low magnitude buffer distances are an indication that there is a likelihood that there are no significant effects on a high sensitivity receptor for the size of wind turbine at, or beyond, the distance stated. However, there are likely to be some effects beyond. The effects are not negligible.

2.4. Review of examinations and inquiries

A number of examinations and inquiries have been researched relating to offshore windfarms which are inter-visible with either National Parks or AONBs. Conclusions are:

- It is clear that Examining Authorities and Inspectors take the view that each case is considered on its own merit.
- Medium magnitude of effects leading to major/moderate significant effects are accepted as significant by Examining Authority panels and Inspectors.
- Factors which have been considered by Inspectors or Examining Authorities to reduce harm include a very limited number of views from designated areas, whether a designated area relates mainly to the land, and where there are significant developments such as power stations or urban areas located on the coast or offshore, such as existing offshore windfarms.
- Factors which have been considered to increase harm include where the designated areas affected have special qualities relating to the coast and sea, where wind farms are proposed directly off the coast of these designated areas, where multiple designated areas are affected and where other factors such as visual overlapping of turbines (even with smaller sizes) are apparent.

2.5. Summary

In summary:

- This research indicates a relationship between the height of offshore wind turbines and the extent of visual effects.
- This is measured in terms of the magnitude of visual effects, which when combined with a high sensitivity visual receptor, indicate distances at which significant visual effects are likely.
- Distances representing the extent of low and medium magnitudes of visual effect reflect the extents of 'possible' and 'probable' significant visual effects on sensitive receptors occurring.
- The low magnitude of effect range of distances are more appropriate to use as a precautionary approach to avoiding significant adverse effects.
- A very approximate ratio between turbine height and distance for average low magnitude of effect is 1:133 and 1:100 for average medium magnitude of effect (so an array of 200m high turbines is likely to have a significant visual effect up to 20km distance).

- As the digest is understood to be the most comprehensive to date on this specific topic, it provides a reasonable basis for discussions about the extent of likely significant visual effects.
- This is on the basis that:
 - The digest of evidence relates to past cases for UK offshore wind turbines, in large arrays, at different heights and distances away.
 - The sensitive visual receptors used to define buffers in Wales are designated landscapes (National Parks and AONBs).
 - The evidence is in the form of a number of different professional judgements used in seascape and visual impact assessments (SVIAs) and/or at Public Inquiry
 - The SVIA judgements are based on more factors than only turbine height and distance away – but despite this, the digest indicates a pattern.
- As the specifics of each development and each sensitive visual receptor can vary, this digest must not be used to close down further discussion on a case by case basis.

The following should be taken into consideration:

- Not all AONBs and National Parks can be treated the same- their special qualities are important in understanding their relationship to the coast and related sea.
- Smaller turbines can have as large an effect as larger turbines depending on other factors such as extent and arrangement. Therefore, the medium magnitude of effect range for turbines up to 175m high should be treated with caution as in some cases effects may be larger.
- Even low magnitude of effects do not mean that development is not visible. This may not be appropriate in the most sensitive situations where offshore windfarms are directly out to sea from designations and visible from many viewpoints and also off the western peninsulas and islands. In the more sensitive situations avoiding intervisibility and any adverse visual effects above negligible may be the preferred approach.
- Visual buffers based on turbine height should be considered as only part of seascape and visual impact. Other factors are explored in the Stage 2 and 3 reports.

3. Introduction

3.1. Background and the brief

Natural Resources Wales (NRW) appointed White Consultants in November 2018 to undertake a strategic assessment and prepare guidance for seascape and visual sensitivity to offshore wind farms in Wales' marine plan area.

The brief states that the project aims are to:

- To undertake strategic assessment and mapping of areas of visual sensitivity to offshore windfarm development around the coast of Wales, which NRW can use to inform ongoing discussions with the Crown Estate and others, including Welsh Government and developers, about the leasing and consenting of any new areas for offshore wind.
- To prepare a short siting guidance paper in relation to seascape and visual effects of offshore wind farms aimed at an audience of developers, marine planners and NRW staff.

The project is in three parts, of which this report is the first. The parts are:

- A visual effects ready reckoner showing the recommended distances from National Parks and Areas of Outstanding Natural Beauty (AONBs) in relation to different turbine heights.
- A guidance note setting out what offshore windfarm developers need to know in relation to seascape and visual effects at their site search stage.
- A seascape sensitivity assessment for offshore windfarms in Wales' Marine plan area.

These parts are complementary to each other and should be considered together in order to inform the best location for future offshore wind farm locations, in terms of seascape and visual matters.

The brief sets out the following requirement for the ready reckoner study:

- Consider the relationship between distance offshore of wind turbines, and the magnitude of visual effects on sensitive coastal visual receptors.
- Research should draw on any available past research and a review of past offshore wind farm developments including any precedents accepted at public inquiries, in order to demonstrate a reasonable consensus.
- Draw out from the research a pattern or 'ready-reckoner' model showing a distance v height relationship to the magnitude of visual effects.
- Assume that turbine height to tip will range up to 350 metres. Height variation should be reflected in the ready-reckoner model.
- Create a GIS map layer showing the spatial pattern that emerges in Welsh seascapes if the distance versus turbine height ready reckoner model is applied in relation to National Parks and AONBs.

3.2. Report structure

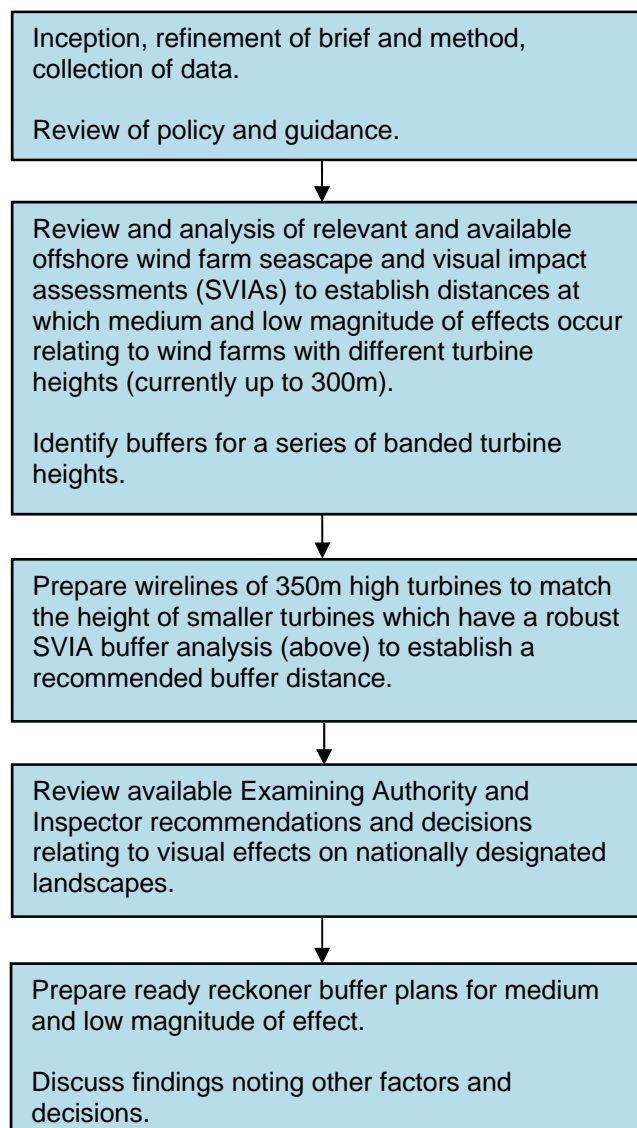
This report sets out the broad study approach in Chapter 2, a brief policy context in Chapter 3, a review of relevant guidance and previous studies in Chapter 4, the findings of the seascape and visual impact assessments (SVIA) analysis in Chapter 5, the findings of the wireframe analysis in Chapter 6, discussion of examination and public inquiry decisions in Chapter 7, and finally an overall discussion and preliminary conclusions in Chapter 8. The detailed analyses of the SVIAs are in Appendix A.

The study is a technical exercise and the report uses a number of technical terms for precision and as a means for reaching conclusions. These terms are defined in the Glossary in Appendix B.

4. Study approach and process

4.1. Process

The study process is summarised below:



4.2. Focus and limitations of the report

The brief effectively requires the study to research and map buffers for different heights of turbines up to 350m high required to avoid significant adverse effects on high sensitivity coastal visual receptors. This study focusses on potential recommended buffers for National Parks and AONBs which are accorded the greatest weight in relevant legislation. It is acknowledged that other sensitive receptors need to be considered in relation to offshore windfarms including Heritage Coasts, World Heritage Sites and point features such as coastal forts. These will be considered in subsequent reports.

This report has a scope limited to analysing assessed visual effects only, and organising this information in relation to turbine height only. Turbine height is only one factor in determining the magnitude of the effect and thence the likely significance of effect. Other factors include the extent of a windfarm in relation to the view, the relationship with the coastal/seascape setting and character and with other developments including windfarms. Therefore this report has to be read with the two other forthcoming parts of the study as well as good practice guidance in order to optimally locate and design development.

The research into SVIAs was completed in late December 2018.

5. Policy Context

5.1. National policy

The UK Government produces National Policy Statements (NPSs) under the Planning Act (2008) which sets out Government policy for the development of Nationally Significant Infrastructure Projects (NSIPs). National policy statements EN-1 and EN-3 address national infrastructure planning in relation to renewable energy including offshore wind farms with an output above 100MW. Nationally designated landscapes are confirmed as having the highest status of protection and their statutory purposes should be taken into consideration. Inspectors and Examining Authorities make their recommendations to the Secretary of State in respect of these developments.

5.2. Welsh policy

The Well-being of Future Generations (Wales) Act 2015 aims to improve the long term social, economic and environmental and cultural well-being of Wales. It covers all of Wales and the inshore marine planning region.

Planning Policy Wales (PPW10) states that NRW is responsible for ensuring that statutorily designated sites are properly protected and managed. In development planning, great weight should be given to the purposes of National Parks and AONBs including conserving and enhancing their natural beauty and their special qualities. This applies to both activities that lie within, or in the setting, of the designated area (6.3.5-6.3.9). Many of these designations in Wales are located on the coast and

some of their most important special qualities relate to the setting provided by the sea. For instance Pembrokeshire Coast's qualities include its coastal splendour, islands, remoteness, tranquillity and wildness. In the Llyn AONB qualities include the connection between land, coast and sea.

5.3. UK marine policy

The Marine and Coastal Access Act (2009) provides the framework for marine planning in Wales and across the UK. It sets Welsh Ministers as the Marine Plan authority for the Welsh Inshore and Offshore regions. The UK Marine Planning Policy Statement (MPS) provides the framework for preparing marine plans including the Welsh National Marine Plan. When considering the impact of an activity it states that the marine plan authority (MPA) *'should take into account existing character and quality, how highly it is valued and its capacity to accommodate change...'*(2.6.5.3).

For any development relatively close to nationally designated areas such as National Parks, AONBs and Heritage Coasts, the MPA should have regard to the specific statutory purposes.

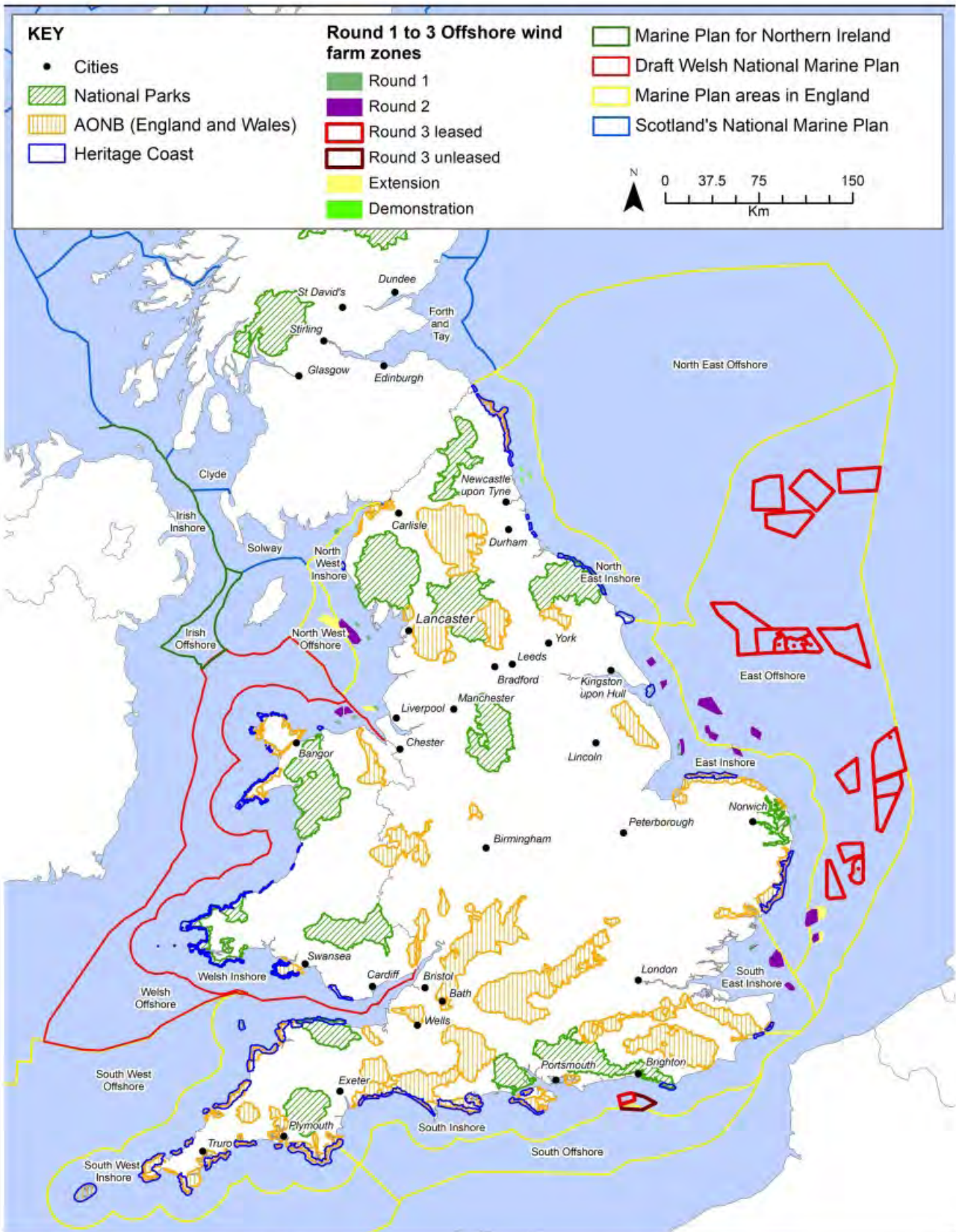
The UK Offshore Energy Strategic Environmental Assessment (OESEA) process considers and informs decisions and plans and programmes for potential future offshore energy at a UK level, and is supported by Welsh Government. This reinforces the need for a strategic and consistent view in cross-border areas such as in the Bristol Channel and in North Wales.

The Crown Estate has already facilitated three rounds of offshore wind development with extensions with many windfarms being implemented (see Figure 1). The UK Government has now announced an intention to deploy further offshore wind developments up to a maximum additional capacity of up to 7GW in England and Wales. In addition to running a programme to facilitate extensions of existing windfarms in England and Wales, The Crown Estate have announced leasing Round 4 to determine further areas of sea bed that might be leased for new offshore wind. These include the North Wales region but also includes Anglesey as an area for further consideration. These are shown in Figure 2. The Crown Estate are mapping constraints and will consider seascape and visual resources as part of this process.

5.4. Welsh marine policy

The draft Welsh National Marine Plan supports (where appropriate) further commercial development of offshore wind over the next 5 to 10 years (page 179) but does not allocate specific resource areas for wind. Policy ELC 01 Low carbon energy states that proposals for wind energy are strongly encouraged. In order to understand future opportunities relevant public authorities should, in liaison with the sector and other interested parties, collaborate to:

- Collect evidence to support understanding of environmental constraints and opportunities.
- Support understanding of optimal sites and offshore wind developments across Wales.



white
 CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0, from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

08/03/19 | v4 | Drawn: HK | Checked SW

Figure 1
 Rounds 1-3 offshore windfarm zones, marine plan areas, national landscape designations and Heritage coasts

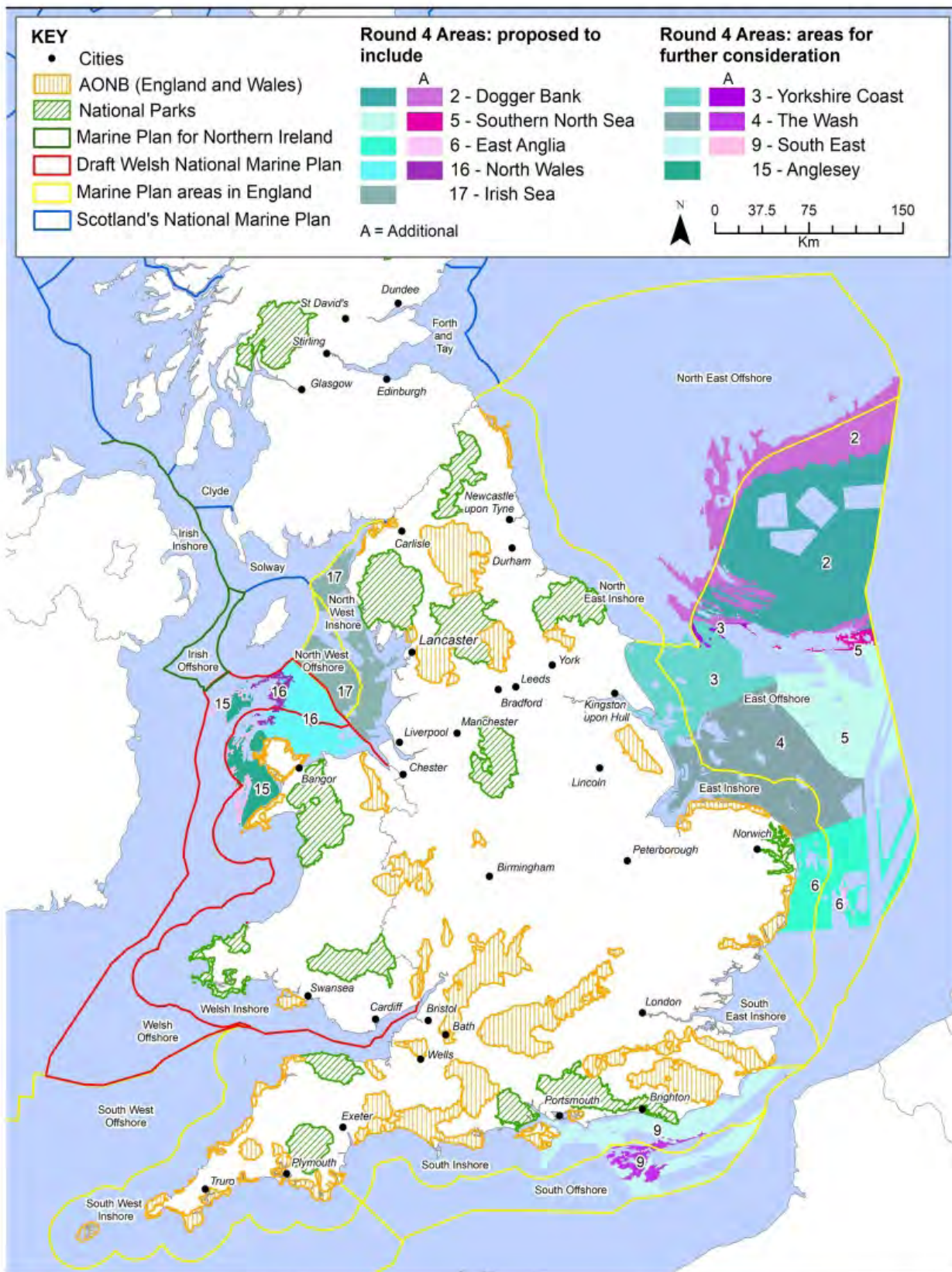


Figure 2
Round 4 offshore windfarm zones, marine plan areas, national landscape designations and Heritage coasts

white CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0 from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

08/03/19 | v3 | Drawn: HK | Checked SW

Relevant evidence should be made widely available to support planning and decision-making. This study is intended to contribute to this evidence base.

The draft Marine Plan policy on Designated landscapes (SOC_6) states that proposals that demonstrate that they are compatible with the purposes and special qualities for which National Parks or AONBs have been designated are encouraged.

The Seascapes policy (SOC_7) indicates that proposals should demonstrate how potential impacts on seascapes been taken into consideration at an early stage. In order of preference adverse impact should be avoided, minimised or mitigated. National Marine Character areas which divide up and describe the seascape of the inshore region are referred to. Whilst these have wider relevance to the location of marine energy they are an additional consideration to, and do not inform, the visual buffers identified in this study.

The Historic assets policy (SOC_5) has a similar test to the seascapes policy. Proposals should demonstrate how potential impacts on historic assets and their settings have been taken into consideration.

6. Review of relevant guidance and studies

6.1. Guidelines and reports

The most relevant guidelines and reports taken into consideration in this study are as follows:

- Guidance on the Assessment of the Impact of Offshore Windfarms: seascape and visual impact report, DTI, 2005.
- Guidelines for Landscape and Visual Impact Assessment, Edition 3, (GLVIA 3) LI and IEMA, 2013.
- IEMA Special Report – The state of environmental impact assessment practice in the UK, IEMA, 2011.
- Offshore With Energy Generation: Phase 1 proposals and environmental report, DTI, BMT Cordah, 2003.
- UK Offshore Energy Strategic Environmental Assessment 2, DECC, March 2011.
- UK Offshore Energy Strategic Environmental Assessment 3, DECC, March 2016.

Other guidance which helps inform the study in a broader sense includes:

- An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms (Scottish Natural Heritage commissioned report 103, 2005)- a ground-breaking document led by Dr John Benson forming the basis of subsequent UK guidance including the 2005 DTI report above.
- Sensitivity of Welsh seascapes to offshore renewable energy developments (Countryside Council for Wales Policy Research Report number 08/5, 2009, Briggs and White)- guidance for wind, wave and tidal energy upto 24km offshore within the framework of original CCW seascape guidance.

- NECR 105 (Natural England)- current broad brush guidance on seascape character assessment.
- Offshore renewables- guidance on assessing the impact on coastal landscape and seascape (Scottish Natural Heritage, March 2012)- informing scoping assessments.
- Topic Paper 6 (Countryside Agency, 2002)- concerning strategic landscape sensitivity and capacity and under review.

The key guidance is discussed below.

6.2. Guidance on the assessment of the impact of offshore wind farms: seascape and visual impact report, (DTI, 2005)

This document is referred to specifically in relation to offshore windfarms in EN – 3. The purpose of the seascape assessment method is to inform environmental impact assessment of specific schemes and therefore focuses at a detailed level. As it predates NECR105 and GLVIA3 it is dated in some respects. However, most of the principles hold and this comprehensive document also has relevance at strategic level.

Key views are regarded as an essential component of data collected using a 35km seaward limit of visual significance.

Useful definitions of magnitude of change are set out to assist consistency of approach in Table 5 of the DTI report.

Table 1 DTI report magnitude of change: names, descriptors and definitions

Magnitude/ size class	Other terms used	Name	Descriptors – appearance in central vision field	Definition
Very Large	High, very high substantial, very substantial,	Dominant	Commanding, controlling the view, foremost feature, prevailing, overriding	Proposed offshore wind farm causes very large alteration to key elements / features / characteristics of the baseline seascape or visual conditions (pre-development) such that there is a fundamental change.
Large	Medium-high, moderate - substantial	Prominent	Standing out, striking, sharp, unmistakable, easily seen	Proposed offshore wind farm causes large alteration to key elements / features / characteristics of the baseline seascape or visual conditions (pre-development) such that there is an unmistakable change.
Moderate	Medium	Conspicuous	Noticeable, distinct, catching the eye or attention, clearly visible, well defined	Proposed offshore wind farm causes moderate alteration to elements / features / characteristics of the baseline seascape or visual conditions (pre-development) such that there is a distinct change.
Small	Low, slight, minor	Apparent	Visible, evident, obvious, perceptible, discernible, recognisable	Proposed offshore wind farm causes small loss or alteration to elements / features / characteristics of the baseline seascape or visual conditions (pre-development) such that there is a perceptible

Magnitude/ size class	Other terms used	Name	Descriptors – appearance in central vision field	Definition
Very Small	Low, slight or minor- negligible	Inconspic- uous	Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite, subtle	Proposed offshore wind farm causes very small loss or alteration to elements / features / characteristics of the baseline seascape or visual conditions (pre-development) such that there is a distinguishable change.
Negligible		Faint	Weak, not legible, near limit of acuity of human eye	Proposed offshore wind farm causes negligible loss or alteration to elements / features / characteristics of the baseline seascape or visual conditions (pre-development) such that there is no legible change.

Source: Table 5 (DTI report) - Magnitude of change: names, descriptors and definitions

These terms are considered to remain valid and are used frequently in SVIAs.

Significance is derived from combining the sensitivity of a receptor and the magnitude of change. Table 6 of the DTI report sets out how this is suggested in the guidance:

Table 2 DTI report significance of effects

Landscape and visual sensitivity	Magnitude of change				
	Very large	Large	Moderate	Small	Very small
Very high	Major	Major	Major	Major/ moderate	Moderate
High	Major	Major	Major/ moderate	Moderate	Moderate/ minor
Medium	Major	Major/ moderate	Moderate	Moderate/ minor	Minor
Low	Major/ moderate	Moderate	Moderate/ minor	Minor	Minor/none
Very low	Moderate	Moderate/ minor	Minor	Minor/none	None

Source: Table 6 (DTI Report) - Significance of effects

Note

- Boxes shaded red/pink are considered to be significant effects,
- Boxes shaded amber are potentially significant.
- Boxes not shaded are considered to be not significant.

This indicates that major and major/moderate effects are significant. It is stated that effects of moderate significance are most likely to be not significant, but it is feasible that they could be judged as significant, depending on the particular circumstances arising. It summarises effects of moderate significance as being potentially significant in the table notes.

6.3. Guidelines for Landscape and Visual Impact Assessment (GLVIA3) (2013)

GLVIA3 defines seascape as per the UK Marine Policy Statement and states that any assessment should carefully consider the relationship between land and sea in coastal areas and also take account of possible requirements to consider the open sea (2.9). Methods to assess the character of seascapes are being developed and the latest available guidance should be referred to. The guidance text does not refer to the DTI (2005) guidance for assessing offshore windfarms. As such it is not considered to supersede it and both documents are relevant in the context of other emerging guidance and studies. A review of SVIAs for individual windfarms bears out this approach (eg Navitus, Rampion, Burbo Banks Extension).

GLVIA3 sets out the principle of determining significance of effect through combining the sensitivity of receptor with the magnitude of effect.

The main differences with DTI 2005, which was based on GLVIA 2, are that the landscape/seascape sensitivity is explicitly derived from combining the susceptibility of the receptor to a type and scale of development with the value of an area. The latter is divided into international, national, local or community value. This therefore builds in an increased emphasis on value which is relevant to National Parks and AONBs.

The magnitude of seascape or visual effect (6.38-6.41) is stated as combining consideration of the scale or size of effect with the extent of the area affected and duration/reversibility of that effect. The size or scale of effect includes consideration of:

- the scale of change in the view including the proportion of the view occupied by the proposed development
- the degree of contrast or integration
- the nature of the view in terms of the relative amount of time over which it will be experienced on whether views will be full, partial or glimpses.

The geographical extent of the visual effect is likely to reflect:

- the angle of view in relation to the main activity receptor,
- the distance of the viewpoint from the proposed development
- the extent of the area over which the change would be visible (combining a number of viewpoints such as on a coastal footpath or over a designated area).

The duration and reversibility of visual effects considers the amount of time that the development is likely to be present and whether it can be removed at the end of that

period. Offshore windfarms would normally be in position for 25 years and so this can be considered to be long term but reversible.

The first two factors of scale of change and extent overlap. For instance, the distance of a viewpoint from the proposed development will determine the scale of change in the view.

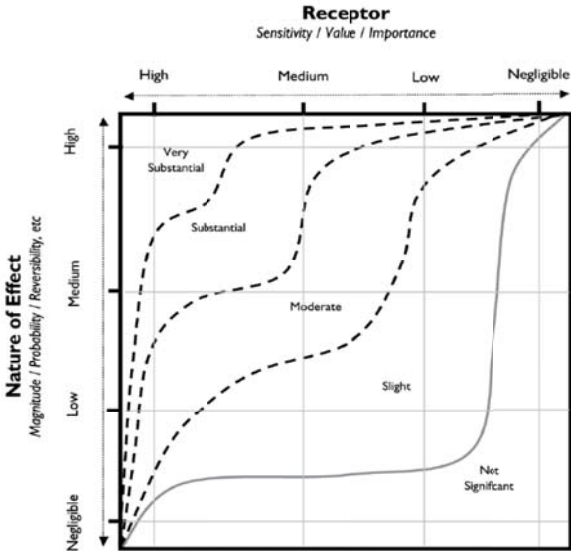
The relative weighting of the three main factors are not specifically discussed in the guidance. There are some practitioners who give them equal or almost equal weight. This means that there is potential for the overall magnitude of effect to be less than the scale of effect alone. However, others give most weight to the scale of effect and extent (in terms of distance). As offshore windfarms are long-term, the overall magnitude of effect is therefore often at the same level as the scale of effect. For a study of this nature, it is sensible to take the precautionary approach and consider that the scale of effect in an SVIA is likely to be at a similar level to the magnitude of effect.

GLVIA 3 discusses cumulative effects, setting out the alternative approaches of assessing the combined effects of existing and proposed developments or just the additional cumulative effects of a given development. Neither approach is given more weight than the other. This study considers that the combined effects of developments is the most important measure to inform this report’s findings where a windfarm extension is assessed.

6.4. IEMA Special Report – The state of environmental impact assessment practice in the UK, 2011.

GLVIA3 discourages the use of matrices on their own to derive significance from sensitivity and value but IEMA has issued guidance which complements the approach. The diagram below gives greater flexibility for interpretation of significance but is generally in line with the DTI report Table 6 above.

Table 3 IEMA guidance on deriving significance of effects



Derived from Figure 6.3, page 61- IEMA Special Report – The state of environmental impact assessment practice in the UK, 2011.

6.5. Offshore With Energy Generation: Phase 1 proposals and environmental report, DTI, BMT Cordah, 2003

The assessment of seascape draws on the Hill et al (2001) CCW guidance applied within the constraints of a strategic desk based study. Seascape units are defined characterised and attributed sensitivity. The potential for major, medium and minor effects are defined in distance bands based on CCW guidance and further work by Briggs (2003). This is based on information viewing land from the sea. The conclusions were that:

- Up to 10km away we can see field patterns, clusters of buildings, woodlands etc
- Up to 24km we can see broad colours and textures representing towns and forests etc and large manmade structures such as power stations and turbines.
- Above 24km we struggle to see recognisable detail on land.

Based on this information low or no risk areas for offshore wind farms are identified by combining sensitivity with these likely visual impacts. It is important to note that turbines are expected to be a maximum of 160m high to blade tip.

The significance of effect is a product of sensitivity of seascape unit and magnitude of effect in accordance with GLVIA (2002) guidelines. The following magnitudes of effects were derived from CCW guidance and consultation (p5-1):

- Substantial/high effect: 0-8km
- Moderate/medium effect: 8-13km
- Minor/low effect: 13-24km
- Negligible effect: 24km+

The resulting table of significance in the report is shown in Table 2.3 of the report.

Table 4 IEMA guidance on deriving significance of effects

Seascape unit sensitivity	Significance of effect		
	Possible minor or no effect – Preferred Areas	Possible medium effects threshold	Possible major effects threshold
Low/no sensitivity	8km+ offshore	N/A*	<8km offshore
Medium sensitivity	8km+ offshore	8-13km offshore	<8km offshore
High sensitivity	24km+ offshore	13-24km offshore	<13km offshore

Source: Table 2.3 (DTI BMT Cordah report) - Effects of proposed development for different seascape unit sensitivities

(Note: it is considered that one box of the table is incorrect- medium sensitivity/preferred area should read 13km+, not 8km +)

In order to avoid significant effects the outer limits of each of these ranges are applied i.e. 8km the closest distance for low sensitivity coasts, 13km for medium sensitivity coasts and 24km for high sensitivity coasts. The latter could therefore be considered to apply to National Parks and AONBs.

Comments on Approach

The distances for magnitude of effects were derived from initial research by CCW and others without the benefit of assessment of wind farm proposals such as seascape and visual impact assessments (SVIAs) or a review of constructed offshore wind farms. It is also worth noting that CCW's consideration of distances greater than 12 nautical miles offshore was generally curtailed by the limits of their remit.

The Round 2 SEA (2003) report implies that effects of moderate significance are significant. This differs from the conclusions of the DTI report (2005) which considers that effects of major and major/moderate significance are significant, but that moderate effects are most likely not to be significant, although may be in certain circumstances. As a result of this potential and the brief's requirement to establish the minimum distance where there are no significant effects to shoreline observers, the precautionary approach is taken i.e. effects of moderate significance are considered as significant.

6.6. UK Offshore Energy Strategic Environmental Assessment 2 (DECC), March 2011

The OESEA report (DECC, 2009) addressed the visual impacts of turbines of 2-3.6MW and 5-6MW turbines. The results from the SVIA analysis are as follows (Table 2.1):

Table 5 OESEA 2009 SVIA analysis

	2-3.6MW	5-6MW
Average (Average) distance where medium magnitude of effect occurred	10.1km	14.2km
Average (Maximum) distance where medium magnitude of effect occurred	11.9km	15.0km
Average (Average) distance where low magnitude of effect occurred	17.0km	25.8km
Average (Maximum) distance where low magnitude of effect occurred	21.2km	32.0km

Source: White Consultants (2009)

Source: Table 2.1 OESEA report (DECC, 2009)

Based on a wireline assessment of similar sized wind farms with three different turbine sizes, the following indicative conclusions are drawn (page 130):

Table 6 OESEA 2009 Threshold for significance for turbines of English seascape development scenario at 22 m ASL

Turbine size	Height to blade tip	Height to nacelle	Threshold of significance for seascape units of high sensitivity	Threshold of significance for seascape units of medium sensitivity
3.6MW	137m	83.5m	18km	13km
5MW	175m	112.5m	24km	18km
10MW	190m	115m	24km	18km

Source: White Consultants (2009)

Note: Based on development scenarios of 50 (10MW), 98 (5MW) and 155 (3.6MW) turbines in a grid pattern separated by 550m.

Source: Table 2.2 OESEA report (DECC, 2009)

6.7. UK Offshore Energy Strategic Environmental Assessment 3 (DECC), March 2016

This document aims to help to inform licensing and leasing decisions in Round 3 by considering the environmental implications of potential activities including offshore windfarms. The seascape and visual section (page 283-324) sets out issues such as the effect of the curvature of the Earth, aspect of view (sunset in Wales's case), intervisibility of sea and land, haze and meteorological factors affecting visual range, consideration of visual buffers and European experience.

The report explores haze and meteorological factors affecting visual range. The report quotes the SNH (2005) report (after Husar and Husar, 1998) in suggesting that haze may limit visual range in Wales to 26km (Table 5.24).

This appears to be countered by published Meteorological Office data below which indicate that visibility can exceed 35 km, albeit on limited days of the year (see Table 7 below).

Table 7 Distribution of percentage days visibility for weather stations over a 10 year period

Weather Stations	Visibility Distance (km)							
	0-5	6-10	11-15	16-20	21-25	26-30	31-35	35+
St Athan, South Wales % days of visibility- cumulative totals	100	88.4	73.2	56.3	39.2	24.2	7.1	3.2
Rhyl, North Wales % days of visibility- cumulative totals	100	91.7	78.6	68.3	53.4	35.3	15.9	10

Source: OESEA 3, 2016, Table 5.25 Distribution of percentage days visibility for coastal weather stations over a 10 year period

The report states that rainfall incidence, sunshine hours and propensity for fog provide additional meteorological factors in determining relative visibility of offshore structures. Turbines located 30km from shore may be visible only on limited occasions when haze and precipitation are low and sunshine remains bright.

7. Seascape and visual impact assessments (SVIA) analysis

7.1. Our approach

This chapter considers the Seascape, Landscape and Visual Impact Assessments (SVIAs) carried out as part of the Environmental Impact Assessments (EIAs) for Round 1 to 3 zones and Scottish Territorial Waters (STW) wind farm developments.

Figures 1 and 2 shows the location of the zones and proposals respectively in England and Wales. The study analyses offshore windfarms off the UK coast, including Wales, England and Scotland. The reason is to obtain data on as many relevant SVIAs as possible and try to optimise the potential for achieving robust data and to maximise consensus. However, buffers are only put forward relating to Welsh national landscape designations and to nearby national designations in England.

As already stated, the main objective for analysing the Seascape, Landscape and Visual Impact Assessments (SVIAs) of individual offshore wind farms is to help avoid significant adverse effects on the purposes and special qualities of National Parks and AONBs.

The DTI guidance (2005) states that 'A viewpoint assessment should be carried out to identify and evaluate the potential effects on available views and visual amenity arising from the proposed offshore wind farm at specific representative locations in the study area'. The conclusions on the degree of effect on these viewpoints will also inform the expected effect on seascape character. In order to meet the EIA requirements, the choice of viewpoints must go through consultation with the local authority and key stakeholders whilst also taking into consideration comments made during public consultation.

The magnitude of change to receptors is broadly assessed in a standardised way based on GLVIA 3 and DTI (2005). The factors which influence magnitude of effect include the height, extent and nature of development, the distance of development from a viewpoint, the degree of change in a view, the degree of contrast or integration, the angle of view of a receptor, the extent of area over which changes would be visible, the duration, reversibility and nature of effect.

Inevitably there is some variation in how the magnitude of change is defined in the SVIAs reviewed. The majority tend to follow the definitions as suggested by the GLVIA (2002 and 2013) and SNH (2005) as set out in their Table 5. Assessments may use other terms for magnitude. Our interpretation of these definitions is set out below in Table 8.

The range considered for the purposes of the brief is low and medium magnitudes of effect. Combined with a high sensitivity receptor a low magnitude of effect is likely to result in an effect of moderate significance. A medium magnitude of effect is likely to result in an effect of major moderate significance. As already discussed, moderate can be significant and major moderate is classified as significant in the vast majority of SVIAs.

Table 8 Terms for Magnitude of Effect

Magnitude/size class used in this report	Other terms used for magnitude
Very high	Very large or very substantial, high or substantial. (Assessments may not differentiate between very large and large)
High	Large or substantial, medium- high or moderate – substantial. (Assessments may not differentiate between very large and large)
Medium	Moderate
Low	Small, slight, minor.
Low-negligible	Very small, slight-negligible, minor-negligible

7.2. Cumulative effects

Some offshore windfarms have been assessed in SVIAs against a baseline of no other existing windfarms present. However, in other cases windfarms have been assessed in SVIAs against a baseline of existing or consented offshore windfarms. This occurs particularly where there are extensions to existing windfarms. The magnitude of effects are likely to be considered to be less against this baseline than if there are no other wind farms present unless the proposed wind farm is significantly larger in height and extent than the existing wind farm/s. Overall, this factor can depress the magnitude of effect and therefore reduce the distances at which different levels of effects can occur.

The alternative is to consider the cumulative assessment of the proposed and existing windfarms. SVIAs take different approaches to cumulative assessment. Some consider the additional effect of the proposed development over and above existing similar development while others consider the combined cumulative effects. The former approach is not helpful in the analysis of potential buffers but we consider that the combined approach is relevant. We have used this in one instance (the Walney extension) where the proposed wind farm links to three earlier windfarms in one block.

7.3. Turbine heights and the Rochdale Envelope

Many SVIAs assess the effects of a range of sizes of turbines in order to explore the best option and give developers and decision makers a choice. The ‘Rochdale Envelope’ is a pragmatic approach used in EIAs/SVIAs to define the maximum parameters of a wind as part of the consenting process ie the worst case scenario of the highest turbine height and the greatest extent. We have taken the highest of any turbine heights assessed into the analysis as this would normally be expected to have the greatest effect. We note both heights in our detailed analysis in Appendix A. However, it should be noted that sometimes proposals for higher turbine heights with greater spacing and potentially less extent are considered to have less visual/seascape impact than lower turbine height options with closer spacing and greater extent. This provides another note of caution in the application of the SVIA analysis.

7.4. Reliability of SVIA evidence

The SVIAs have been carried out by a range of consultancies and individuals with a range of experience in judging effects of wind turbines offshore. They do not necessarily reflect the views of statutory authorities or third parties. The study team have not verified the accuracy of judgements through on-site visits as part of this study although some of the windfarms have been assessed for statutory authorities as part of other commissions. These have revealed that some SVIA judgements possibly understate the magnitude of effect in some cases. Therefore the results derived from the analysis have to be considered with a degree of caution.

7.5. Selection of SVIAs

The research has been carried out in order to maximise the number of relevant windfarms and therefore the number of viewpoints assessed. It has not been limited to only windfarms that may affect viewpoints within National Parks and AONBs. It is hoped that this will lead to a more robust dataset than one relying on significantly fewer viewpoints.

The criteria used to select suitable developments/SVIAs for analysis are:

- Where development is located close enough to the coast for visual effects on coastal receptors to be assessed as part of the SVIA.
- Commercial size of windfarm (not small developments/pilots of, say, 2 turbines, such as Beatrice Demonstration or Dounreay)
- Availability of SVIAs from web sources
- Suitability of assessment in the SVIA.

For the Rounds 1 and 2 wind farms, Lincs wind farm was identified as an anomaly to the rest of the SVIAs with a much lower set of distances for the magnitudes of change. This was because two Round 1 Wind Farms had been included within the baseline assessment. Therefore, the scheme has been omitted.

Some windfarms are too far away from the coast to contribute relevant SVIA data. These include the Dogger Bank windfarms, Hornsea 1 and 2, East Anglia ONE and THREE.

Current windfarms with larger turbines in early planning or scoping stages such as Hornsea 4 and East Anglia TWO do not have completed SVIAs and so cannot be included.

7.6. SVIAs reviewed

The SVIAs analysed up to the end of December 2018 are as follows:

Round 1

- Kentish Flats
- North Hoyle

Round 2

- Docking Shoal
- Gabbard
- Gunfleet Sands 2
- Gwynt y Môr
- London Array 1
- Sheringham
- Thanet
- Walney
- West of Duddon Sands
- Westermost Rough A

Round 3

- Atlantic Array
- Moray East
- Moray West
- Navitus Bay
- Rampion Offshore

STW Sco 1

- Beatrice Offshore
- Hywind Scotland Pilot Park (demonstration)
- Inch Cape
- Neart na Gaoithe

Extensions

- Burbo Bank Offshore Extension
- Walney Offshore Extension

7.7. Analysis of SVIAs

The individual analyses of SVIAs are in [Appendix A](#) in alphabetical order. For each windfarm the proposed output, number of turbines, turbine heights and nearest distance from the coast are recorded. SVIA viewpoints are selected which relate to coastal receptors and the distance from the nearest turbine, the sensitivity of receptor, magnitude of effect and significance of effect are recorded. The maximum and average distance where low and medium magnitude of effect are calculated. In addition, any combined cumulative effects from viewpoints are recorded.

The results from the twenty three SVIA viewpoint assessments are collated in Table 9. The windfarms are arranged in groups of similar turbine heights which relate to commonly used turbine outputs. The maximum and average distances at which there would be low and medium magnitude of effect on receptors for each SVIA are summarised and then, themselves averaged for each group.

Table 9: Summary analysis of visual effects													
Windfarm	Round	Status	Max. turbine height to blade tip (m)*	No. of turbines	Maximum windfarm capacity (MW)	Nearest coast km	Existing windfarms in baseline?	No. of SVIA viewpoints	Low magnitude of effect		Medium magnitude of effect		
									Average Distance km	Maximum Distance km	Average Distance km	Maximum Distance km	
North Hoyle	1	Implemented	107	30	60	7.5	n	12	18.3	21.8	11.2	13.5	
Gunfleet Sands 2	1	Implemented	128	22	173	8.5	y	8	14.0	19.6			
Gwynt y Môr	2	Implemented	140	160	576	18	y	35	28.0	35.8	14.3	15.3	
Kentish Flats	1	Implemented	140	30	90	8	n	13	21.1	27.9	11.2	12.1	
Docking Shoal	2	Withdrawn	145	177	540	14	y	8	31.6	31.6	19.1	19.1	
								Averages	22.6	27.3	14.0	15.0	
West of Duddon Sands	2	Implemented	150	139	389	14	y	18	23.2	26.3	11.0	14.6	
Thanet	2	Implemented	150	100	300	11	n	10	21.5	27.7	17.5	17.5	
Gabbard	2	Implemented	170	140	504	23	n	6			31.0	33.5	
Sheringham	2	Implemented	172	88	317	17	n	26	23.5	25.0	19.2	21.0	
Westermost Rough A	2	Implemented	172	35	210	8	n	9	32.6	32.6	15.3	17.5	
London Array 1	2	Implemented	175	271	630	21	y	18	21.0	21.0			
								Averages	24.4	26.5	18.8	20.8	
Hywind Scotland pilot	Demo	Implemented	178	5	30	23	n	7	25.9	29.0			
Atlantic Array	3	Withdrawn	180	278	1390	14	n	36	28.5	37.5	20.0	27.5	
Beatrice Offshore	Sco 1	In construction	194	142	588	22	n	16	33.1	33.1	22.2	25.6	
Nearnt na Gaoithe	Sco 1	Consented	197	128	448	15	y	21	33.8	39.0	28.0	28.0	
Navitus Bay	3	Refused	200	121	970	10	n	12	28.2	28.2	19.5	23.1	
Walney 1	2	Implemented	202	93	186	15	y	18	23.2	23.4	16.5	18.8	
Moray East	3	In constrct'n	204	186	1116	22	n	22	43.0	49.0	27.0	34.0	
Rampion	3	In constrct'n	210	175	400	13	n	29	26.4	29.5	19.9	30.0	
Walney extension**	2.5	Implemented	222	207	750	19	y	17	21.0	21.0	29.5	31.3	
Burbo Bank extens'n	1	Implemented	223	36	254	7	y	18	21.7	30.6	15.1	22.0	
								Averages	28.5	32.0	22.0	26.7	
Moray West	3	Submitted	285	86	751	22	y	25	47.0	53.0	26.0	28.0	
Inch Cape	Sco 1	Consented	291	72	1000	15	y	26	36.1	52.4	29.7	34.8	
Notes	* Turbine tip height maximum assessed in SVIA				** cumulative impacts used in main table				Averages	41.6	52.7	27.9	31.4

7.8. SVIA findings

The average figures for the distance at which low and medium magnitude of effect for each range of turbine heights is shown below.

Table 10 Summary of distances at which low and medium magnitude of effect occur

Range of turbine heights to blade tip (m)	Low magnitude of effect		Medium magnitude of effect	
	Average Distance km	Maximum Distance km	Average Distance km	Maximum Distance km
107-145	22.6	27.3	14.0	15.0
146-175	24.4	26.5	18.8	20.8
176-225	28.5	32.0	22.0	26.7
226- 300	41.6	52.7	27.9	31.4

As the maximum distance for a level of effect is greater than the average, and is sometimes an isolated figure, the average is considered to be the most robust figure to reflect a consensus. However, the maximum distances should not be ignored as they may represent effects which could be significant for high sensitivity receptors (eg Navitus).

The average distances are illustrated in Tables 11 and 12 and the related buffers are shown in Figures 3 and 4.

Table 11 Distances at which average low magnitude of visual effect occurs for different heights of turbine

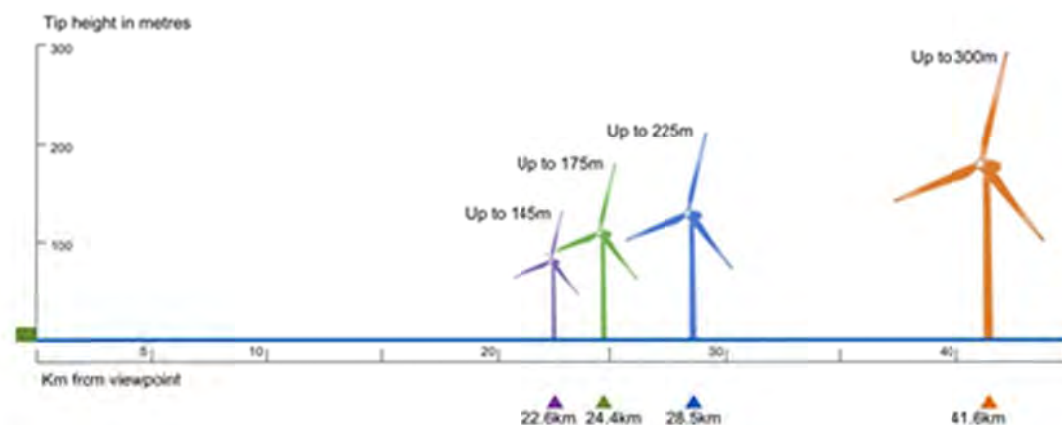
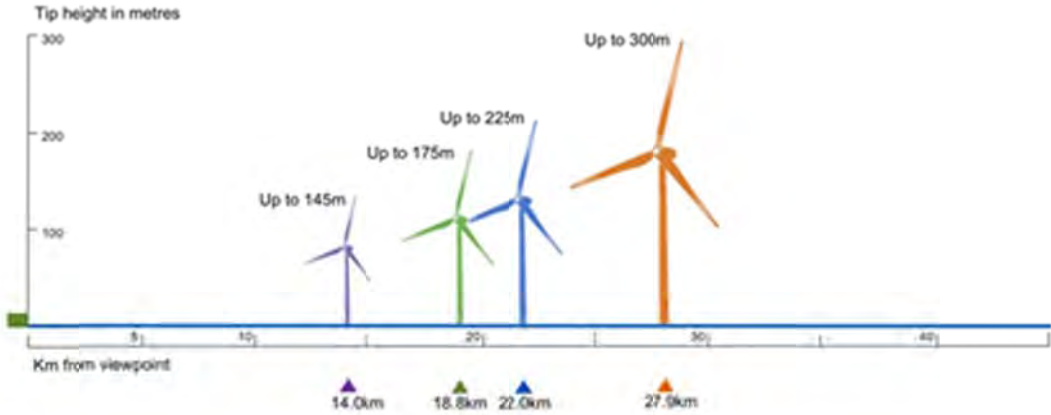


Table 12 Distances at which average medium magnitude of visual effect occurs for different heights of turbine



A very approximate ratio between turbine height and distance for an average low magnitude of effect is 1:133 and 1:100 for average medium magnitude of effect.

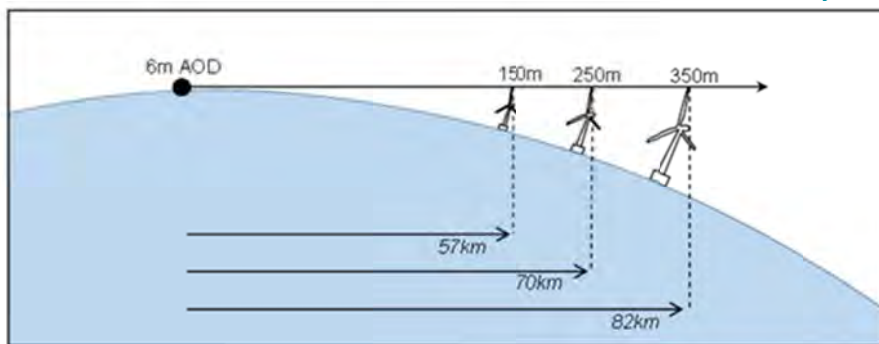
8. Wireframe analysis to establish buffers for 350m high turbines

8.1. Introduction

The SVIA analysis only considers the effects of turbines up to 300m high due to the limited number of suitable SVIAs currently available for larger turbines. There are also only two assessments which consider the effects of turbines in the range between 226m and 300m high. It is therefore appropriate to supplement the SVIA analysis of potential visual effects with a comparative wireframes analysis using the most robust SVIA data.

At greater distances out to sea the curvature of the Earth becomes a contributory factor in determining how much of each turbine can be seen. However, as the diagram below illustrates, 350m high turbines would need to be 82km offshore to theoretically be screened in full when viewed from 6m AOD. At this distance visibility modifiers, such as atmospheric interference, would have a more significant effect in any case.

Table 13 The effect of curvature of the Earth on turbine visibility



The distance at which the structure dips below the horizon increases when the height of the viewer increases. As the coasts of Wales, particularly designated areas, usually have a cliff or slopes adjacent to the coast the wireframes also explore views from 22m AOD and 100m AOD where a greater proportion of the turbine structure can be seen.

8.2. Method

The SVIA analysis has established robust distance data for various sizes of turbines including upto 145m high and 176-225m high. Our aim is to prepare wireframe scenarios showing an array of 350m high wind turbines in juxtaposition with arrays of 145m and 225m turbines where they all appear the same height. In theory, this would mean that the 350m high turbines at the located distance would potentially have a similar visual effect notwithstanding visibility modifiers.

The wireframes have been prepared using a virtual cylindrical projection of 700 field of view with a viewing distance of around 33-47cm for an A3 or A2 sheet. This produces a geometrically accurate image. SNH (2014) guidance on wind farm

visualisations recommends that photomontages should be viewed at a comfortable arm's length and wirelines at an A1 paper width (820mm). Therefore, these wireframe images are not intended for assessment in themselves and we make no judgement other than based on the SVIA derived analysis.

The scenarios are:

- Low magnitude of effects scenario- 145m turbine group at 22.6km nearest point from shore + 225m turbine group at 28.5km from shore + 350m turbines group to match height of others
- Medium magnitude of effects scenario- 145m turbine group at 14km from shore + 225m turbine group at 22km from shore + 350m turbines group to match height of others

The 145m high turbine array appears higher than the 225m high array in the medium magnitude of effects scenario when viewed at 6m AOD but lower when viewed from 100m AOD. However, overall, the 145m array appears smaller than the 225m array for the same level of effect in most views. We have matched the 350m turbines to the 225m turbines height at the middle viewing height of 22m AOD for both low and medium magnitude of effect scenarios. This is because the 225m group/range distance has the larger number of SVIAs underpinning it and is closer in size to the 350m turbine. The 350m high turbines appear slightly higher when viewed from 100m AOD and slightly lower when viewed from 6m AOD.

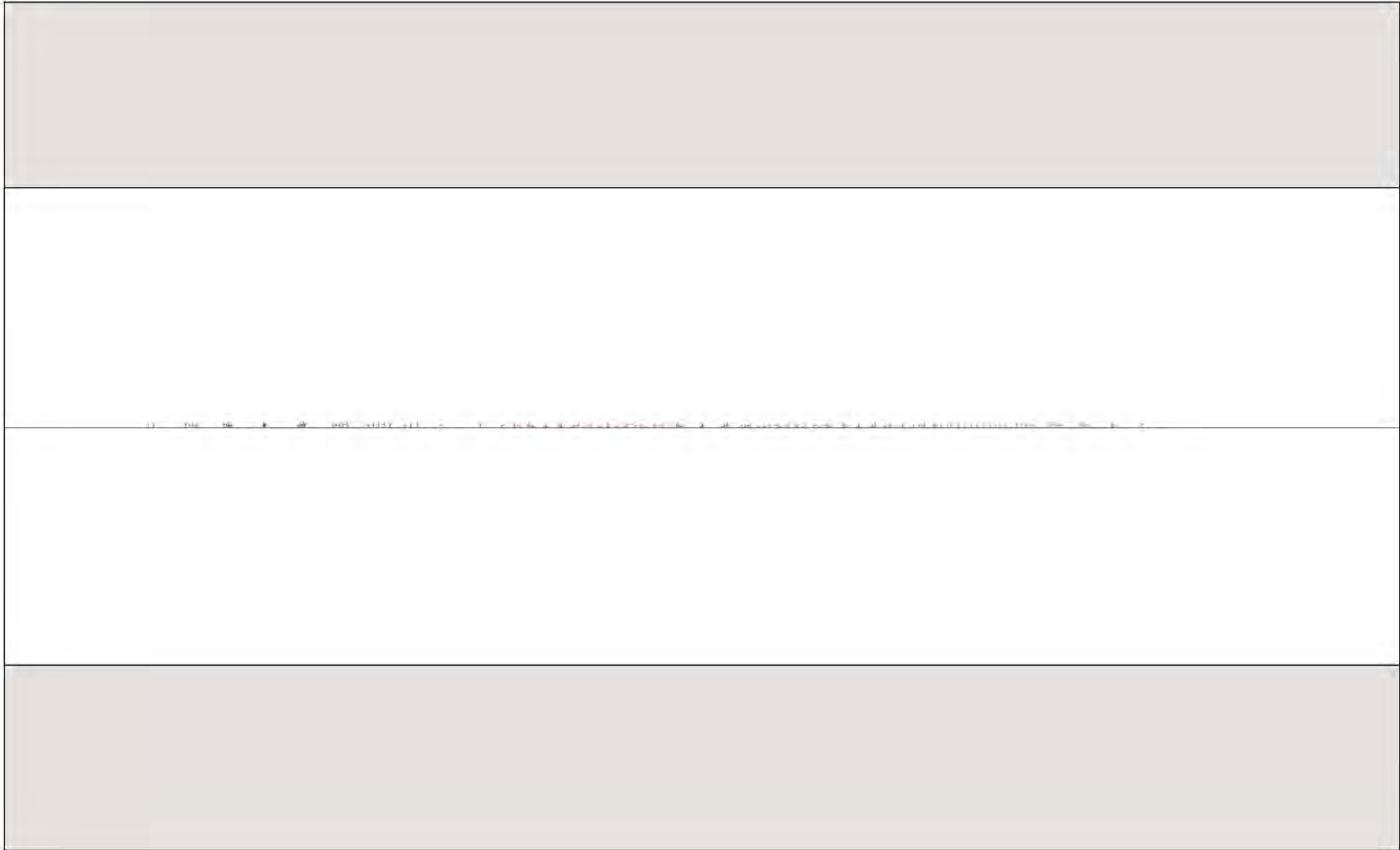
The scenarios are illustrated in [Figures WS1-WS8](#).

8.3. Findings

The 350m high turbine array would be at the following distances offshore to have the following effects:

- Low magnitude of effects- 44km from shore
- Medium magnitude of effects- 32.8km from shore

This appears to be proportionally in line with the assessed effects of 300m high turbines in the SVIA analysis (41.6km and 27.9km respectively).



www.whiteconsultants.co.uk
Tel: 029 2236 2416

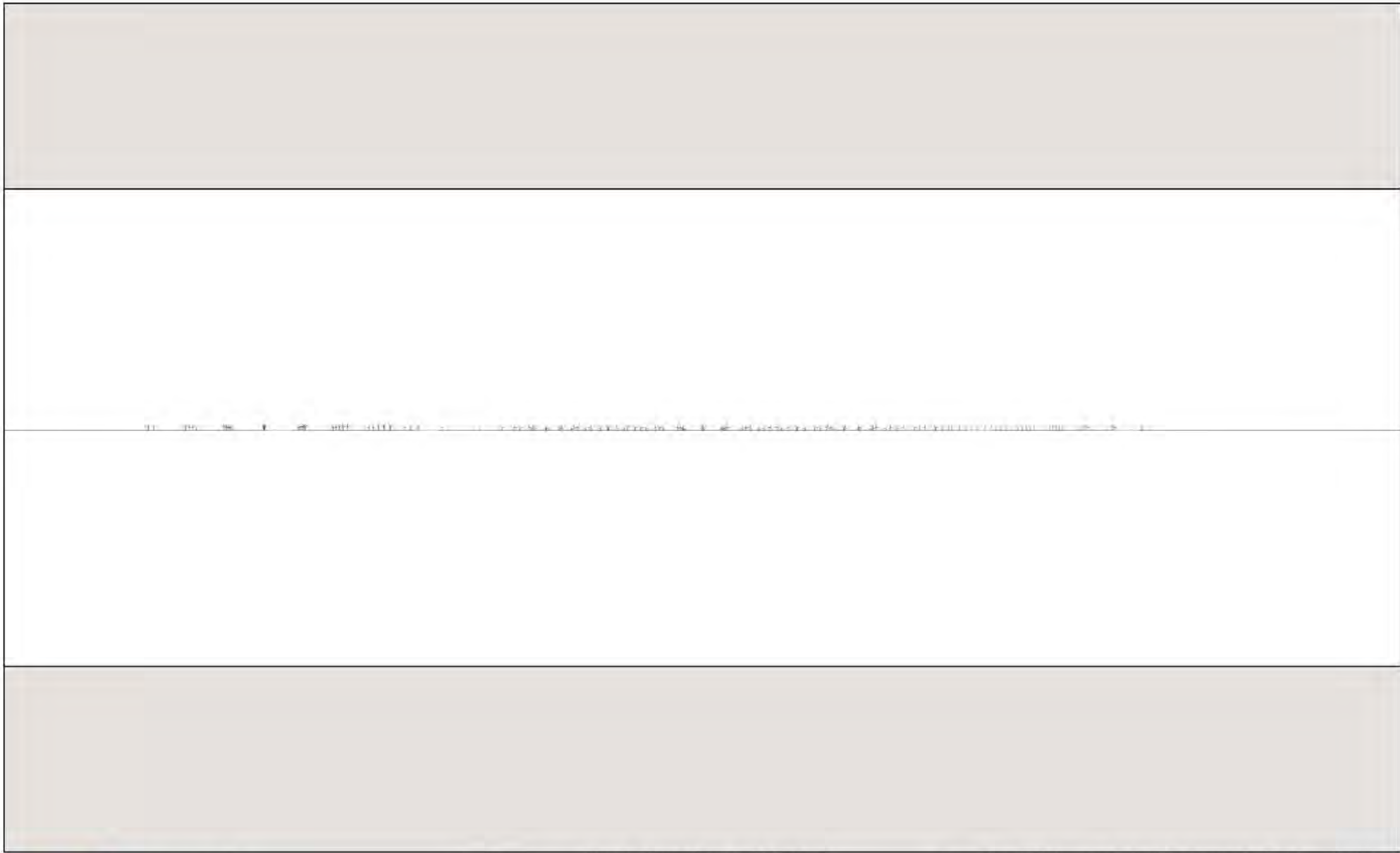
Key:
— 350m turbines
— 225m turbines
— 145m turbines

Viewing distance: 33cm for A3 sheet, 47cm for A2, 66cm for A1
 Horizontal field of view: Cylindrical Projection 70°
 Distance to horizon: 9.4km
 Turbine height to blade tip: 350m, 225m, 145m
 Height to hub: 190m, 127.5m, 87.5m
 Number of turbines: 70, 35, 35
 Distance to turbines: 44.0km, 28.5km, 22.6km

Title: **Figure WS1: Low magnitude of effects scenario: 6m viewer height**

Date: March 2019
 Status: Final

Notes: An earth's radius of 7430km has been used to account for the combined effects the earth's curvature and light refraction



www.whiteconsultants.co.uk
Tel: 029 2236 2416

Key:



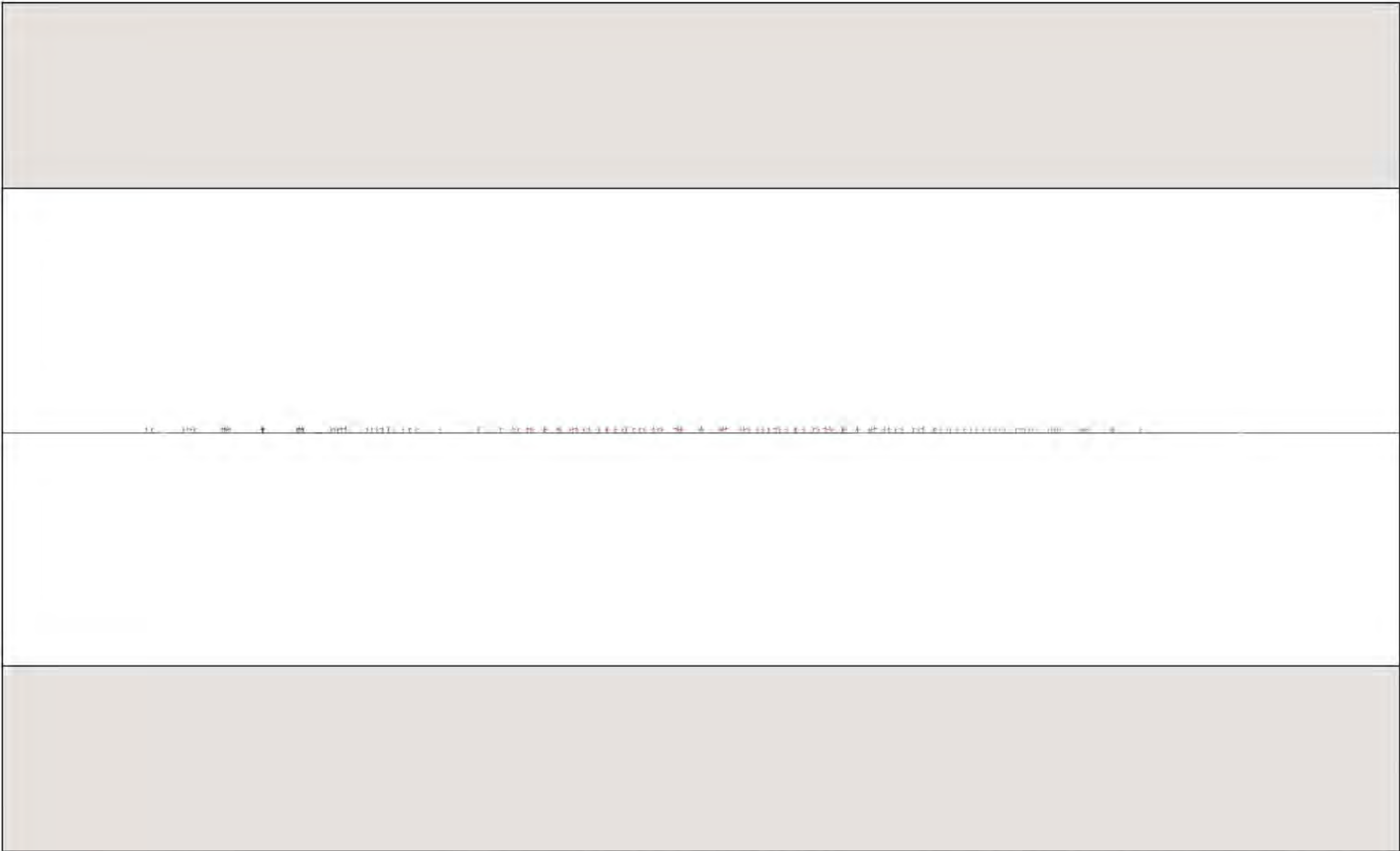
350m turbines
225m turbines
145m turbines

Viewing distance: 33cm for A3 sheet, 47cm for A2, 66cm for A1
Horizontal field of view: Cylindrical Projection 70°
Distance to horizon: 9.4km
Turbine height to blade tip: 350m, 225m, 145m
Height to hub: 190m, 127.5m, 87.5m
Number of turbines: 70, 35, 35
Distance to turbines: 44.0km, 28.5km, 22.6km

Title: **Figure WS2: Low magnitude of effects scenario: 22m viewer height**

Date: March 2019
Status: Final

Notes: An earth's radius of 7430km has been used to account for the combined effects the earth's curvature and light refraction



www.whiteconsultants.co.uk
Tel: 029 2236 2416

Key:
— 350m turbines
— 225m turbines
— 145m turbines

Viewing distance: 33cm for A3 sheet, 47cm for A2, 66cm for A1
Horizontal field of view: Cylindrical Projection 70°
Distance to horizon: 9.4km
Turbine height to blade tip: 350m, 225m, 145m
Height to hub: 190m, 127.5m, 87.5m
Number of turbines: 70, 35, 35
Distance to turbines: 44.0km, 28.5km, 22.6km

Title: **Figure WS3: Low magnitude of effects scenario: 100m viewer height**

Date: March 2019
Status: Final

Notes: An earth's radius of 7430km has been used to account for the combined effects the earth's curvature and light refraction



www.whiteconsultants.co.uk
Tel: 029 2236 2416

Key:

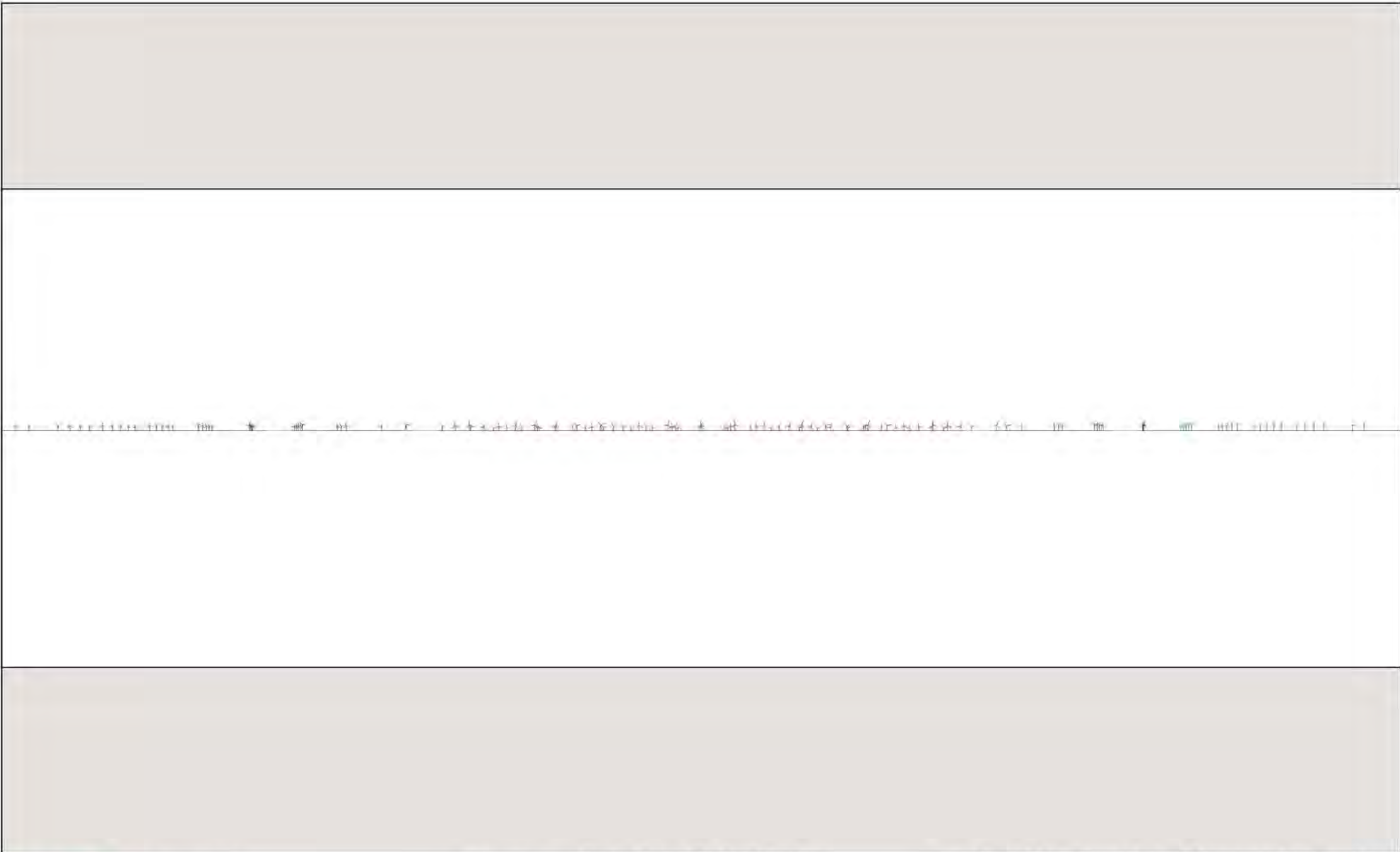
- 350m turbines
- 225m turbines
- 145m turbines

Viewing distance: 33cm for A3 sheet, 47cm for A2, 66cm for A1
 Horizontal field of view: Cylindrical Projection 70°
 Distance to horizon: 9.4km
 Turbine height to blade tip: 350m, 225m, 145m
 Height to hub: 190m, 127.5m, 87.5m
 Number of turbines: 70, 35, 35
 Distance to turbines: 32.8km, 22.0km, 14.0km

Title: **Figure WS4: Medium magnitude of effects scenario: 6m viewer height**

Date: March 2019
 Status: Final

Notes: An earth's radius of 7430km has been used to account for the combined effects the earth's curvature and light refraction



www.whiteconsultants.co.uk
Tel: 029 2236 2416

Key:

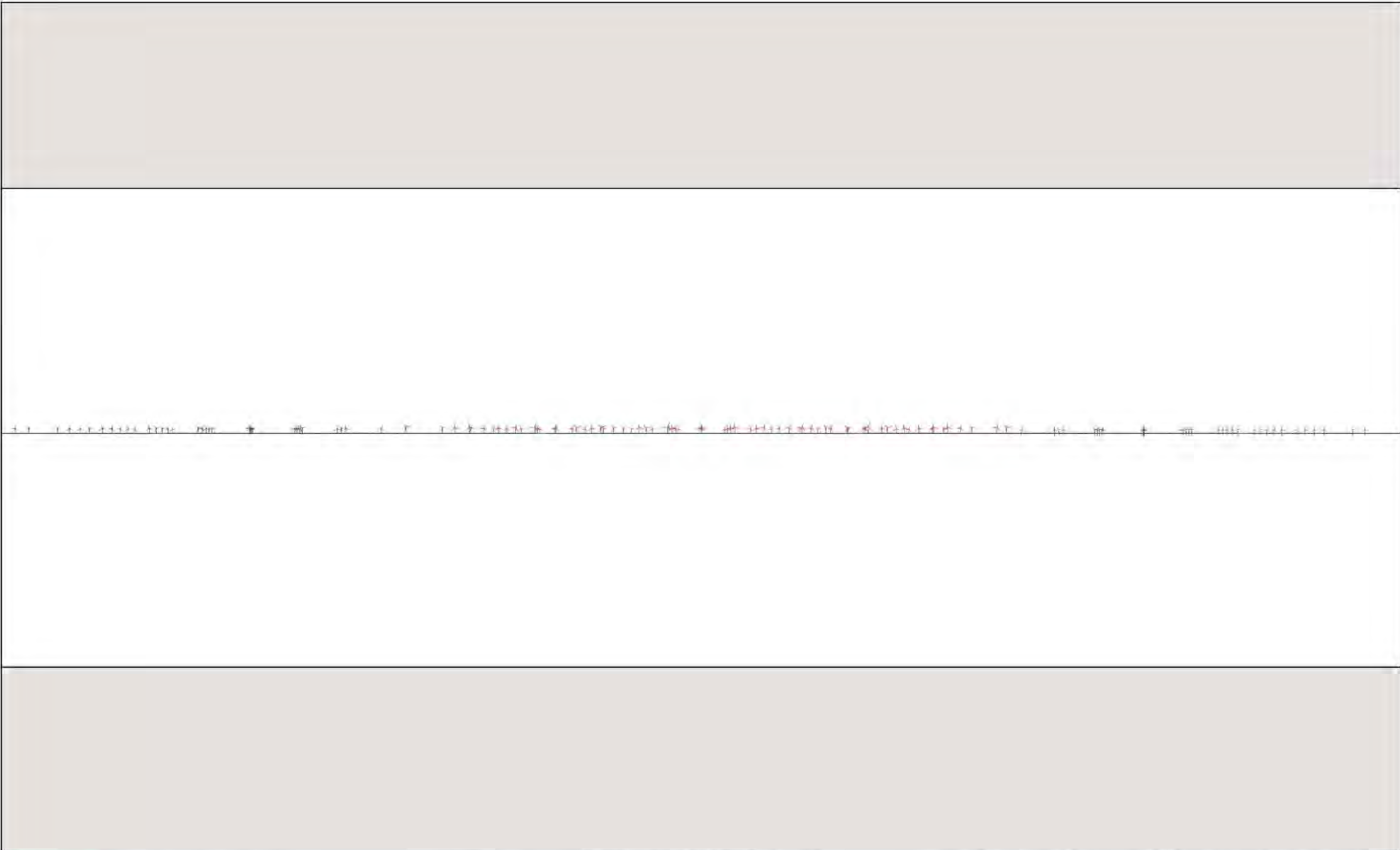
- 350m turbines
- 225m turbines
- 145m turbines

Viewing distance: 33cm for A3 sheet, 47cm for A2, 66cm for A1
 Horizontal field of view: Cylindrical Projection 70°
 Distance to horizon: 9.4km
 Turbine height to blade tip: 350m, 225m, 145m
 Height to hub: 190m, 127.5m, 87.5m
 Number of turbines: 70, 35, 35
 Distance to turbines: 32.8km, 22.0km, 14.0km

Title: **Figure WS5: Medium magnitude of effects scenario: 22m viewer height**

Date: March 2019
 Status: Final

Notes: An earth's radius of 7430km has been used to account for the combined effects the earth's curvature and light refraction



www.whiteconsultants.co.uk
Tel: 029 2236 2416

Key:
— 350m turbines
— 225m turbines
— 145m turbines

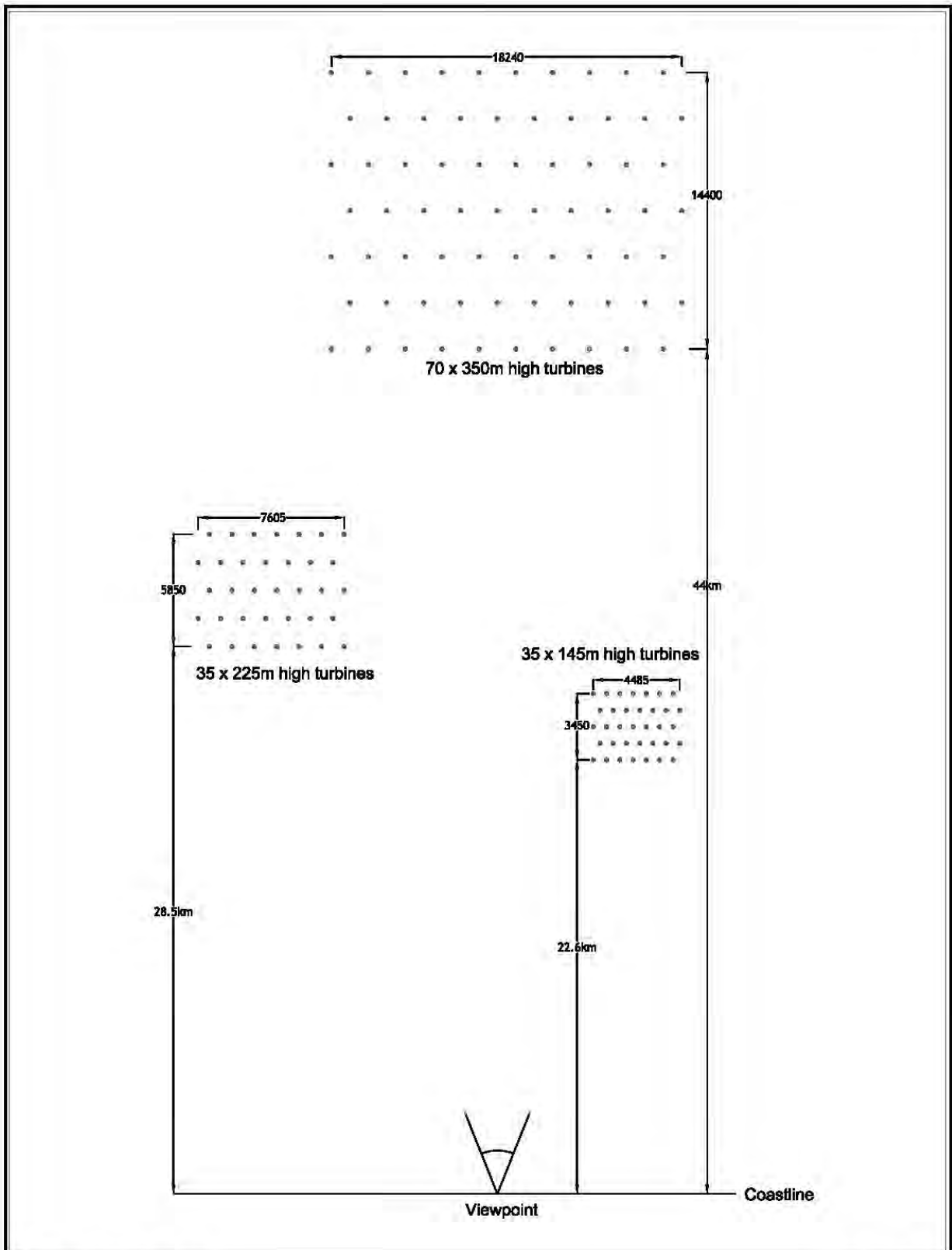
Viewing distance: 33cm for A3 sheet, 47cm for A2, 66cm for A1
Horizontal field of view: Cylindrical Projection 70°
Distance to horizon: 9.4km
Turbine height to blade tip: 350m, 225m, 145m
Height to hub: 190m, 127.5m, 87.5m
Number of turbines: 70, 35, 35
Distance to turbines: 32.8km, 22.0km, 14.0km

Title: **Figure WS6: Medium magnitude of effects scenario: 100m viewer height**

Date: March 2019

Status: Final

Notes: An earth's radius of 7430km has been used to account for the combined effects the earth's curvature and light refraction



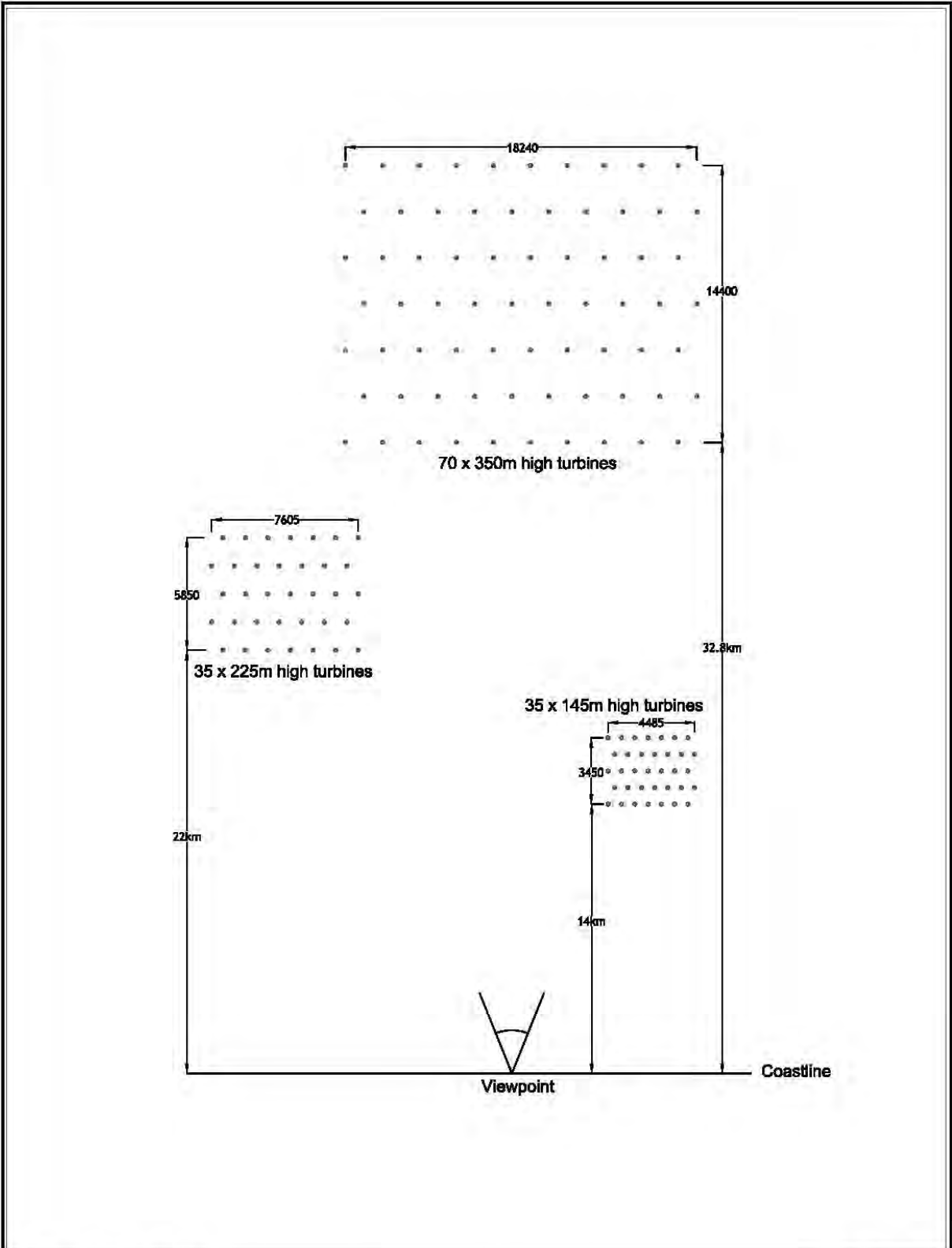
All Dimensions in metres
unless otherwise stated



www.whiteconsultants.co.uk
Tel: 029 2236 2418

Plan View
Scale 1: 250,000

Figure WS7: Low magnitude of effects scenario



All Dimensions in metres
unless otherwise stated



www.whiteconsultants.co.uk
Tel: 029 2236 2418

Plan View
Scale 1: 250,000

Figure WS8: Medium magnitude of effects scenario

9. Exploration of examination and public inquiry findings

A number of offshore windfarms have been proposed or located with intervisibility with National Parks or AONBs. These have been considered at examination or public inquiry and the panel or inspectors have made comments about the visual effects and associated impact on the designations. A selection exploring a range of situations in England and Wales is discussed below.

9.1. Rampion

Rampion offshore windfarm was given development consent in July 2014. The development control order (DCO) specified that no turbine would exceed 210m above LAT or exceed a rotor diameter of 172m. The number of turbines was not specified but the extent of the windfarm was. The final approved layout extended around 13km by 6km.

The layout of the windfarm went through a number of iterations and three options were considered in the SVIA to determine a worst-case scenario (founded upon the 'Rochdale envelope' approach). These were for 3.6MW, 4 MW 165m to blade tip at close spacings and 7 MW 210m to blade tip turbines at wide spacings. The worst case was considered in the SVIA to be the 3.6 MW array because it extended further than the 4MW array but formed a denser array than the 7 MW option.

The windfarm is located to the south of Brighton. The South Downs National Park is located to the north beyond the urban area and only reaches the coast 20km to the north east.

The SVIA study area was formed on the basis that the development over 35 km would be unlikely to result in a perceptible change to seascape or landscape character. The SVIA stated that the magnitude of change to the character and setting of the National Park (and the Heritage Coast) as medium and the level/significance of effect as major/moderate. 10 of the 17 viewpoints associated with the National Park or Heritage Coast were stated as undergoing a major significance of effects. These were primarily oblique views along the coast looking at the narrower edge of the array. Most effects were agreed by the parties but the conclusions on how to act on these were not agreed.

Two options showing a reduced array were developed- Option F with 175 3.6MW (165m to blade tip) and Option D with 100 7MW turbines (210m to blade tip) (see extracts of photomontages in Figure 7.4 below). At the examination Natural England's evidence initially considered that Option D would be likely to be worse than Option F but at the hearing, put under some pressure to decide by the Examining Authority (ExA) panel, agreed that Option F did represent the worst case (Planning Inspectorate, 2014, 4.329). This was mainly due to the spread of turbines being considered to be more intrusive than the height. However, this spread was only apparent from the east, from the more sensitive receptors such as Cuckmere Haven where the National Park meets the Heritage Coast, rather than from the receptors to the north such as Brighton. Otherwise the main difference was the wider spacing between turbines of the larger turbine array, albeit with larger structures.

Whilst the National Park Authority considered that the effects could only be mitigated by removing the array altogether Natural England indicated that effects could be mitigated by locating it at a greater distance from the more sensitive parts of the National Park and Heritage Coast to the north east. There was discussion about the term 'remote' and Natural England stated, when pressed by the panel, that anything over 20km could be considered to be remote. By way of mitigation the applicant proposed a reduced array area and a 'structures exclusion zone' to the east increasing the distance from Cuckmere Haven beach from 17.5km to 20.2km, from Birling Gap from 19.6km to 22.8km and from Beachy Head from 23.3km to 25.8km. The level of significant effects were agreed to remain the same. Natural England stated that they believed that the revised array would still compromise and be in conflict with the National Park landscape/seascape objectives. However, when considered as part of a wider package of mitigation measures, the ExA panel concluded that the 20km structures exclusion zone would provide an important contribution to reducing the visual effect on the National Park and Heritage Coast (Planning Inspectorate, 2014, 4.356).

The size of array actually constructed is further still from the National Park/ Heritage Coast and uses a relatively small turbine of 3.45 MW 140m high.

Table 14 Rampion- Comparative photomontage extracts of views from Cuckmere Haven



Top image: Option F with 175 3.6MW turbines. Bottom image: Option D with 100 7MW turbines
Source: Rampion offshore wind farm: Additional visualisations of the array to include structures exclusion zone, E.On, 2013

9.2. Navitus Bay

Navitus Bay wind farm was refused consent in June 2015. The final application layout was for 194 x 5MW 165m high turbines or 121 x 8MW 200m high turbines.

This represented a reduction in size from the West of Wight Round 3 zone and the original layout option considered.

The SVIA study area was for up to 45 km from the array. The SVIA was prepared on the basis that the 8MW turbine option was the worst case due to the greatest theoretical extent of visibility. These were reduced to a 'turbine area mitigation option' (TAMO) of a maximum 105 turbines (if 6MW) during the course of the examination period (Planning Inspectorate, 2015, 7.4.5). The TAMO layout extended around 12.5km by 9.5km at its widest points.

The large number of national designations intervisible with the proposal were regarded by the ExA panel as fundamental to the balance of judgement. They focused their attention on the receptors held to contribute to the qualities for which the AONBs or National Park designations were founded (The Planning Inspectorate, 2015, 7.3.8). The designations were:

- Dorset AONB and associated Heritage Coast
- Isle of Wight AONB and associated Heritage Coast
- New Forest National Park

The TAMO extended the distance from these designated areas from the original proposal. These included the Dorset AONB and Purbeck Heritage Coast at Durlston Head from 14.3km to 18.8 km to the north west and St Adhelm's Head from 19km to 23.2 km; the Isle of Wight AONB and Heritage coast: Tennyson Coast at The Needles from 17.6 km to 21.9km to the north east; and the New Forest National Park at Hurst Castle from 22.9km to 27.1 km to the north east.

The TAMO SVIA found that there was a significant effect on only one stretch of designated coast (within Dorset AONB- Old Harry Rocks to St Adhelm's Head) with a medium effect on a high sensitivity receptor resulting in a major-moderate effect. Picking up from the Rampion examination, the applicant claimed that anything over 20 km could be classed as 'remote' and that significant impacts on receptors would not occur at this distance or above. The panel disagreed with both points in relation to the Navitus Bay proposal as each case had to be looked at its own merits and the context of the project was considered to be different from Rampion.

In relation to visual effects the ExA panel disagreed with the appellant's assessment to an extent considering that there were more significant effects (see Table 15 for detailed comparison). In addition, the panel considered that the array had a significant effect on a view from Hurst Castle in the New Forest National Park at a distance of 27km as it interfered with the view of the Needles.

In respect of effects on the Dorset AONB and related Heritage Coast the panel considered that the proposal would be an imposing feature affecting key qualities of tranquillity, remoteness and uninterrupted panoramic views. It would maintain a continuous presence in views along the exceptional undeveloped coastline (including views from 19-23.5 km) and cause significant harm to the core qualities of the AONB and the heritage coast and the way they are experienced (7.4.38).

In respect of the Isle of Wight AONB and related Tennyson Heritage Coast, the panel considered that significant harm would be largely confined to sub-area A1 of the AONB. However because of the relative proximity to distinctive features such as The Needles (22km) and Tennyson Monument (23km) and Down and the role they play in the wider visual experience of the AONB, the qualities of the designations would be unacceptably and significantly harmed.

In respect of the New Forest National Park the panel felt that there was a significant effect on the view from Hurst Castle. However, other views along the Solent Way were not considered significant and effects on the qualities of the National Park as a whole would not be significantly affected. This was agreed with the Natural England. This is not surprising as Hurst Castle is at the most southerly point of the Park and the majority of the Park is inland or orientated south-east towards the Solent.

9.3. Race Bank

The wind farm was given development consent in July 2012 by the Secretary of State without an inquiry. It was for 116 x 5MW wind turbines generating an output of upto 508MW. The development was located 27km offshore from the Norfolk Coast AONB at its nearest point.

The SVIA considered cumulative impacts of the proposed development alongside other offshore windfarms- Lynn and Dowsing, Lincs, Sheringham Shoal and the proposed Docking Shoal. It stated that the development would add a significant number of turbines into the seascape. The effects on Norfolk Coast AONB, when considered on its own and in conjunction with the other windfarms, was stated to be of minor significance on the coast reducing to negligible moving inland.

In response to concerns about visual impact the developer referred to the DTI BMT Cordah 2003 SEA report (mentioned earlier in this report) quoting 24km as a distance beyond which a low effect could be expected.

The Secretary of State concluded that cumulative visual impact of the proposed Development when viewed alongside other wind farm projects was not likely to be so significant that it required the Secretary of State to withhold consent for the Development.

Subsequent to this issue being raised the Developer amended the Original Application to reduce the proposed project in scale and gave a commitment to use a smaller number of larger turbines. The Secretary of State considered that these modifications together should have the effect of reducing the visual extent of the proposed Development.

9.4. Walney Extension

The windfarm was given development consent in August 2014. It was for upto 110 x 222m high 7MW turbines amounting to 750MW running north west from existing arrays at Walney 1 and 2 and West of Duddon Sands and with other windfarms such as Ormonde and Barrow closer to the coast. In addition, the oil and gas platform at

Douglas is in the area. The development was located 19km away from the Cumbrian coast at its nearest point and 25km to the Lake District National Park.

The SVIA considered that the individual effects on the main assessed viewpoint in the National Park at 28km (Black Combe, Bootle Fell) would be medium-low magnitude resulting in a major/moderate to moderate significance effect. Overall, the effects on the National Park were considered negligible. With regard to combined cumulative effects, the effect on Black Coombe was considered to be upto major/moderate, depending on the scenario. The cumulative effect on the National Park was considered to remain negligible.

The ExA panel visited the area including Black Combe when visibility was good to variable. They stated that their experience served to underline the influence of meteorological and atmospheric conditions in limiting visibility. They were in general agreement with the SVIA's predicted magnitude of impact and considered that the experience of Black Combe would be unlikely to be diminished due to the development.

9.5. Burbo Bank extension

The windfarm was given development consent in August 2015. It was for 36 x upto 223m high 7.5MW turbines running west from an existing array. The development is located 15km away from the northern edge of the Clwydian Range AONB at its nearest point. The highly linear and narrow AONB itself extends south beyond the 40km SVIA study area boundary.

The SVIA considered that the individual and combined cumulative effects on the nearest assessed viewpoint in the AONB at 18.43km (Craig Fawr) would be medium magnitude resulting in a major/moderate significance effect. The other viewpoint assessed, Moel Famau at 34.5km, was considered to undergo negligible effects. Overall, the effects on the AONB were considered negligible.

No specific instances of harm to the values of the AONB were raised in representations or evidence at the inquiry. The Inspector commented that he was satisfied that the proposal would be viewed from the northernmost extent of the AONB inland from Prestatyn and from upland outlooks in the Clwydian Range (4.133). However, these locations also provided views to other offshore wind farm developments and to substantial industrial and port development in Merseyside, Deeside and Cheshire. He considered that large areas of the AONB were affected by the application proposal to only the most minimal extent or not at all. In this context, he found that the purposes of the AONB designation would not be compromised by the application proposal.

10. Discussion and Conclusions

10.1. Background

Planning Policy Wales (PPW10) states that great weight should be given to the purposes of National Parks and AONBs including conserving and enhancing their natural beauty and their special qualities. This applies to both activities that lie within, or in the setting, of the designated area. Many of these designations in Wales are located on the coast and some of their most important special qualities relate to the setting provided by the sea. Some of the most sensitive locations are the far west peninsulas and islands.

The brief requires a visual effects ready reckoner showing the recommended distances from National Parks and Areas of Outstanding Natural Beauty (AONBs) in relation to different turbine heights.

10.2. Approach

The brief effectively requires the study to research and map buffers for different heights of turbines required to avoid significant adverse effects on high sensitivity coastal visual receptors. However, the significance of effect in SVIAs is a judgement made by assessors and will vary depending on a number of variables and criteria. Therefore this report takes the approach of using magnitude of change on visual receptors in SVIAs as the most consistent determinant of likely effects of offshore windfarms.

The range considered for the purposes of the brief is low and medium magnitudes of effect. Combined with a high sensitivity receptor a low magnitude of effect is likely to result in an effect of moderate significance. A medium magnitude of effect is likely to result in an effect of major moderate significance. Research and guidance indicate moderate can potentially be significant and major moderate is classified as significant in the vast majority of SVIAs.

The research has been carried out in order to maximise the number of relevant offshore windfarms and therefore the number of viewpoints assessed. It has not been limited to windfarms that may affect viewpoints within National Parks and AONBs. The SVIAs of 23 suitable windfarms have been analysed in England, Wales and Scotland's waters. Both the average and maximum distance for low and medium magnitude of effect have been recorded. Cumulative effects have also been noted and used where a windfarm is an extension to an existing large array.

The SVIA analysis only considers the effects of turbines up to 300m high due to the limited number of suitable SVIAs currently available for larger turbines. Therefore a wireframe analysis for 350m high turbines has been carried out.

The wireframe scenarios show an array of 350m high wind turbines in juxtaposition with arrays of 145m and 225m turbines viewed from 6m, 22m and 100m AOD. Comparing these, we have matched the 350m turbines to the 225m turbines height at the middle height of 22m AOD for both low and medium magnitude of effect

scenarios. In theory, the 350m high turbines at the located distance would potentially have a similar visual effect to the 225m turbines notwithstanding visibility modifiers.

10.3. Findings

The combined findings of the SVIA and wireframe analyses are as follows and are shown in Figures 3 and 4, and enlarged to focus on North Wales in Figures 5 and 6:

Table 16 Summary of distances at which low and medium magnitude of effect occur

Range of turbine heights to blade tip (m)	Low magnitude of effect		Medium magnitude of effect	
	Average Distance km	Maximum Distance km	Average Distance km	Maximum Distance km
107-145	22.6	27.3	14.0	15.0
146-175	24.4	26.5	18.8	20.8
176-225	28.5	32.0	22.0	26.7
226- 300	41.6	52.7	27.9	31.4
301-350	44.0	-	32.8	-

These distances need to be considered carefully for the following reasons:

- SVIAs are opinion of assessors, not necessarily statutory authority or third party reviewers.
- Taking an average of low and medium magnitude of effects means that the worst case is not taken. There is therefore potential for significant effects at these distances.
- Medium magnitude buffers are an indication that there is a likelihood of significant effects on a high sensitivity receptor for the size of wind turbine at, or less than, the distance stated. There is also potential for significant effects beyond.
- Low magnitude buffer distances are an indication that there is a likelihood that there are no significant effects on a high sensitivity receptor for the size of wind turbine at, or beyond, the distance stated. However, there are likely to be some effects beyond. The effects are not negligible.

10.4. Review of examinations and inquiries

A number of examinations and inquiries have been researched relating to offshore windfarms which are inter-visible with either National Parks or AONBs. Conclusions are:

- It is clear that Examining Authorities and Inspectors take the view that each case is considered on its own merit.
- Medium magnitude of effects leading to major/moderate significant effects are accepted as significant by Examining Authority panels and Inspectors.
- Factors which have been considered by Inspectors or Examining Authorities to reduce harm include a very limited number of views from designated areas, whether a designated area relates mainly to the land, and where there are significant developments such as power stations or urban areas located on the coast or offshore, such as existing offshore windfarms.
- Factors which have been considered to increase harm include where the designated areas affected have special qualities relating to the coast and sea, where wind farms are proposed directly off the coast of these designated areas,

where multiple designated areas are affected and where other factors such as visual overlapping of turbines (even with smaller sizes) are apparent.

10.5. Summary

In summary:

- This research indicates a relationship between the height of offshore wind turbines and the extent of visual effects.
- This is measured in terms of the magnitude of visual effects, which when combined with a high sensitivity visual receptor, indicate distances at which significant visual effects are likely.
- Distances representing the extent of low and medium magnitudes of visual effect reflect the extents of 'possible' and 'probable' significant visual effects on sensitive receptors occurring.
- The low magnitude of effect range of distances are more appropriate to use as a precautionary approach to avoiding significant adverse effects.
- A very approximate ratio between turbine height and distance for average low magnitude of effect is 1:133 and 1:100 for average medium magnitude of effect (so an array of 200m high turbines is likely to have a significant visual effect up to 20km distance).
- As the digest is understood to be the most comprehensive to date on this specific topic, it provides a reasonable basis for discussions about the extent of likely significant visual effects.
- This is on the basis that:
 - The digest of evidence relates to past cases for UK offshore wind turbines, in large arrays, at different heights and distances away.
 - The sensitive visual receptors used to define buffers in Wales are designated landscapes (National Parks and AONBs).
 - The evidence is in the form of a number of different professional judgements used in seascape and visual impact assessments (SVIAs) and/or at Public Inquiry
 - The SVIA judgements are based on more factors than only turbine height and distance away – but despite this, the digest indicates a pattern.
- As the specifics of each development and each sensitive visual receptor can vary, this digest must not be used to close down further discussion on a case by case basis.

The following should be taken into consideration:

- Not all AONBs and National Parks can be treated the same- their special qualities are important in understanding their relationship to the coast and related sea.
- Smaller turbines can have as large an effect as larger turbines depending on other factors such as extent and arrangement. Therefore, the medium magnitude of

effect range for turbines up to 175m high should be treated with caution as in some cases effects may be larger.

- Even low magnitude of effects do not mean that development is not visible. This may not be appropriate in the most sensitive situations where offshore windfarms are directly out to sea from designations and visible from many viewpoints and also off the western peninsulas and islands. In the more sensitive situations avoiding intervisibility and any adverse visual effects above negligible may be the preferred approach.
- Visual buffers based on turbine height should be considered as only part of seascape and visual impact. Other factors are explored in the Stage 2 and 3 reports.

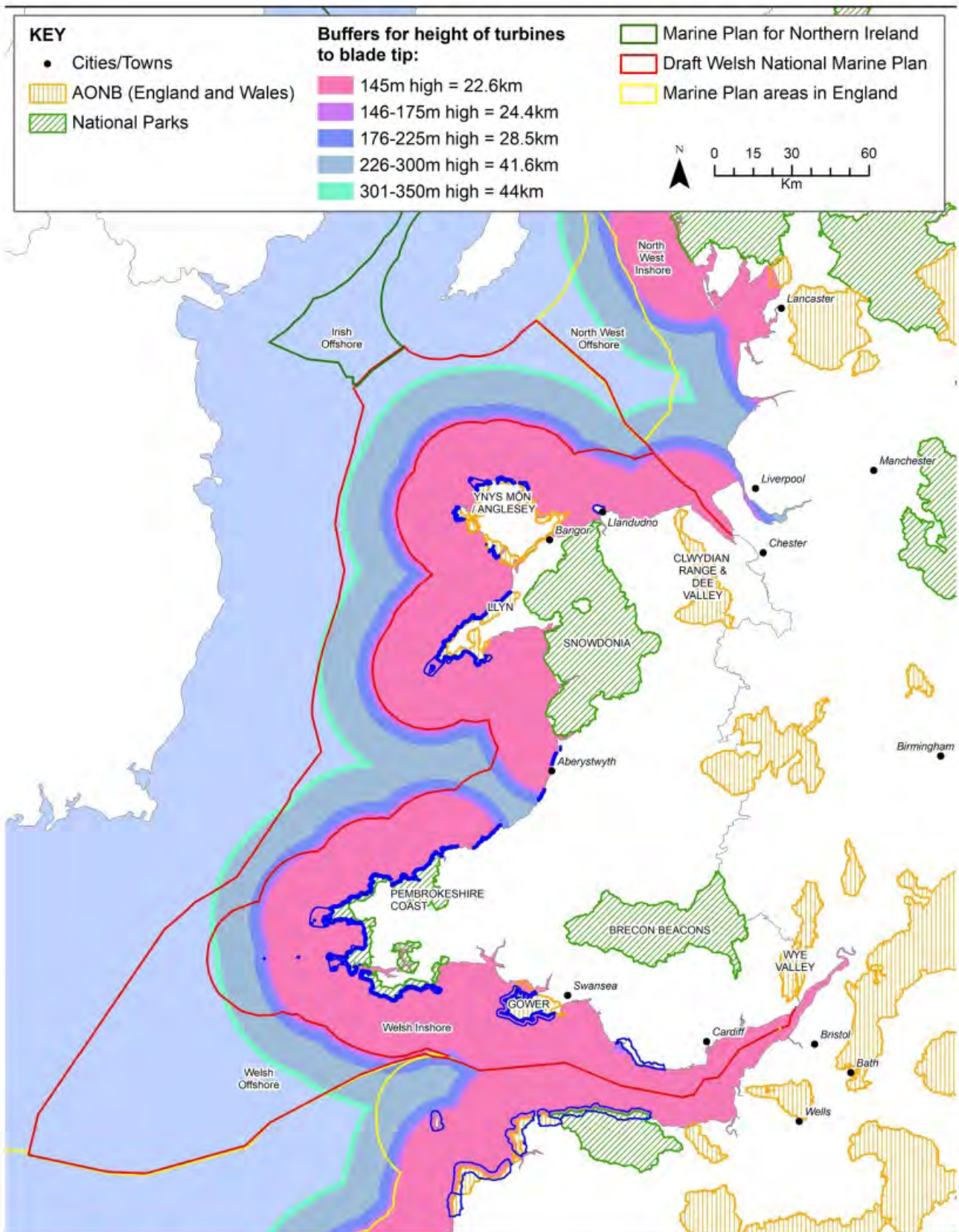


Figure 3
Buffers to National Parks and AONBs: Low magnitude of effect

white CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0. from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

28/03/19 | v6 | Drawn: HK | Checked SW

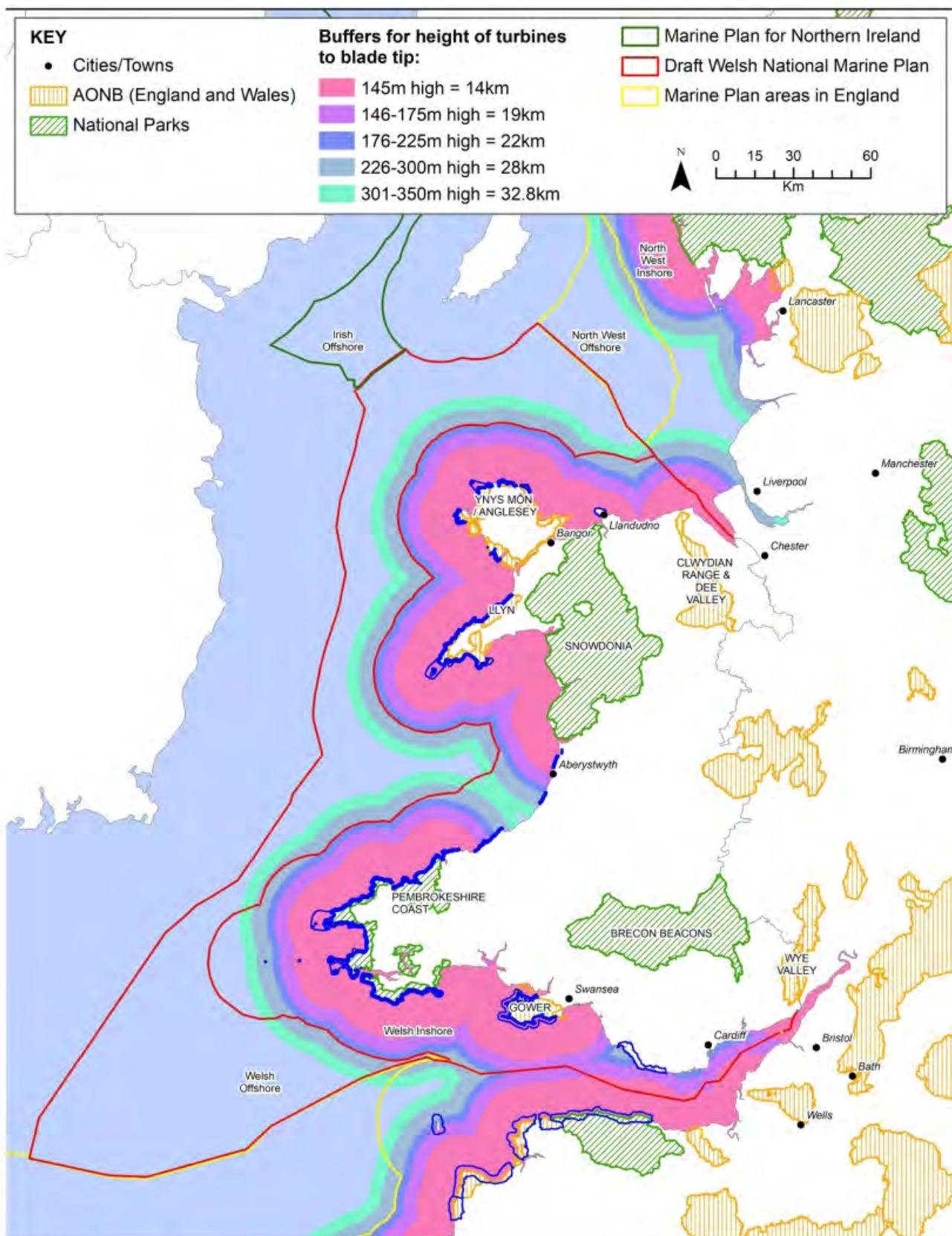


Figure 4
Buffers to National Parks and AONBs: Medium magnitude of effect

white CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0. from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

28/03/19 | v5 | Drawn: HK | Checked SW

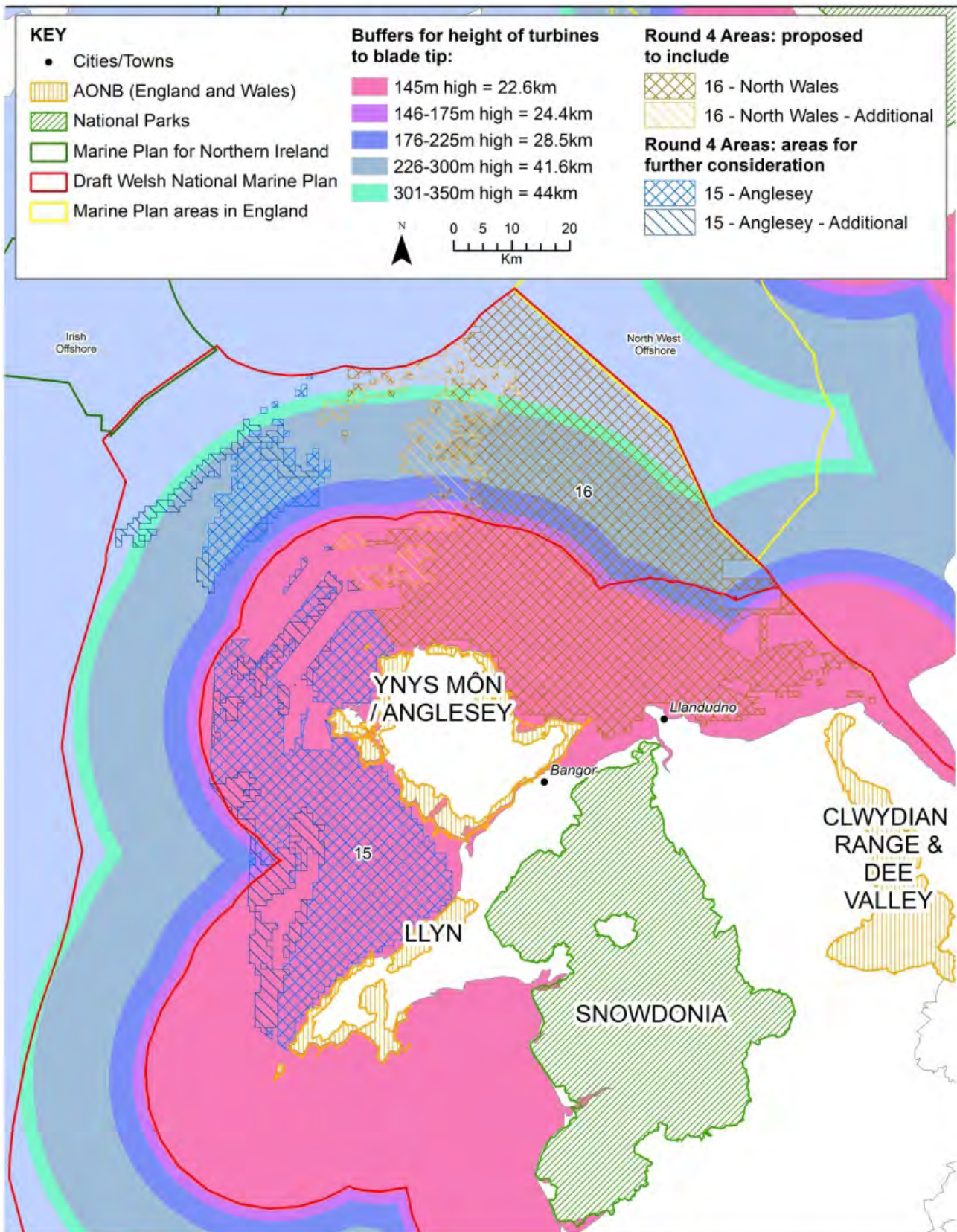


Figure 5
Buffers to National Parks and AONBs off North Wales:
Low magnitude of effect

white CONSULTANTS
www.whiteconsultants.co.uk

Contains public sector information, licenced under the Open Government Licence v3.0. from UKHO, MMO, Natural England and Natural Resources Wales. Contains Ordnance Survey Data © Crown copyright and database right (2018). The Crown Estate © Crown copyright (2018).

28/03/19 | v4 | Drawn: HK | Checked SW

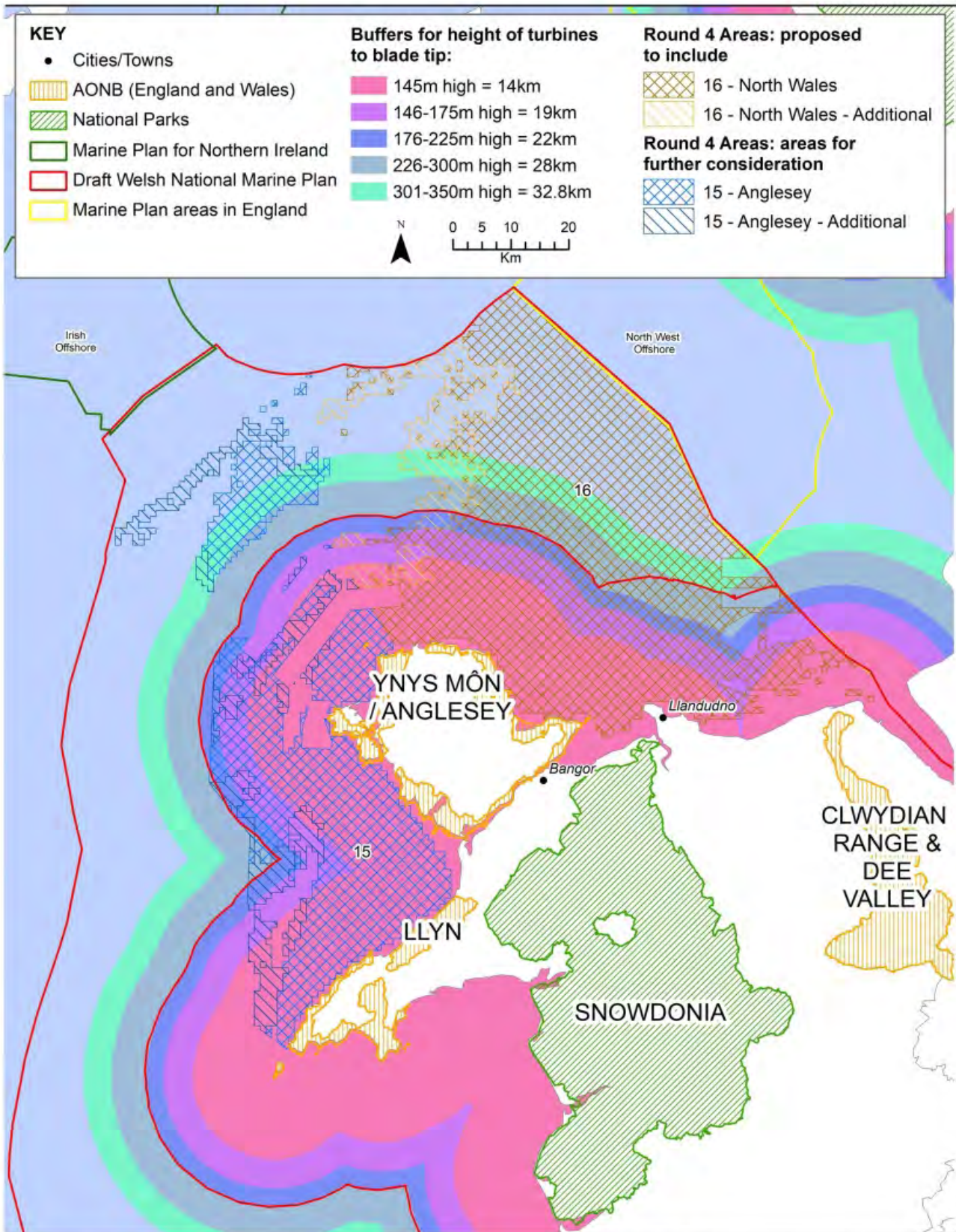


Figure 6
Buffers to National Parks and AONBs off North Wales:
Medium magnitude of effect

References

- Countryside Agency. 2002. Topic Paper 6: Techniques and criteria for judging capacity and sensitivity.
- Countryside Council for Wales. Briggs and White. 2009. Sensitivity of Welsh seascapes to offshore renewable energy developments (Countryside Council for Wales Policy Research Report number 08/5).
- DECC. March 2011. UK Offshore Energy Strategic Environmental Assessment 2.
- DECC. March 2016. UK Offshore Energy Strategic Environmental Assessment 3.
- DTI. 2005. Guidance on the Assessment of the Impact of Offshore Windfarms: seascape and visual impact report.
- DTI. BMT Cordah. 2003. Offshore With Energy Generation: Phase 1 proposals and environmental report.
- IEMA. 2011. IEMA Special Report – The state of environmental impact assessment practice in the UK.
- LI and IEMA. 2013. Guidelines for Landscape and Visual Impact Assessment. Edition 3. (GLVIA 3).
- Natural England. 2012. An approach to seascape character assessment. NECR 105.
- Scottish Natural Heritage. 2005. An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms (Scottish Natural Heritage commissioned report 103).
- Scottish Natural Heritage. March 2012. Offshore renewables-guidance on assessing the impact on coastal landscape and seascape.

11. Appendices

Appendix A: SVIA Analyses

Scheme name	Atlantic Array		
Document	Atlantic Array Offshore Wind Farm Draft ES Volume 1 Chapter 12		
Data source	RWE npower renewables		
Status	Withdrawn		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW		1390	
No. of turbines		278	modelled on worst case scenario
Turbine blade tip height (m)		180	
Distance from nearest coast km		14	

Effect

Note: only land-based viewpoints with small or medium MoE listed

No other windfarms present or proposed

(terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of proposed change)	Significance of effect (daytime)
9 Caldey Island	27.5	High	Medium	Minor-moderate
18 Spaniard Rocks	28.0	High	Small	Minor
2 St Govan's head	28.0	Very high	Small	Moderate
23a Rhossili Downs	25.0	High	Medium	Moderate-major
26 Worms Head	23.5	Very high	Medium	Major-substantial
29 Port Eynon	24.0	High	Medium	Minor-moderate
3 Broad Haven	29.0	High	Small	Minor
34 Cefn Bryn	30.0	High	Small	Minor
35 Three Cliffs Bay	31.5	High	Small	Minor
36 Pwlldu Head	32.5	High	Small	Minor
37 Mumbles Head	37.5	High	Small	Minor
4 Stackpole Head	28.5	High	Small	Minor
54 Highveer Point	31.0	High	Small	Minor
55 Silkenworthy Knap	30.0	High	Small	Minor
56 Holdstone Down	28.0	High	Small	Minor
58 Little Hangman	24.5	Very high	Small	Minor
64 Capstone Point	19.0	High	Medium	Minor-moderate
66 Higher Slade	17.5	High	Medium	Minor-moderate
67 Lee Bay	16.5	High	Small	Minor
68 Bull Point	15.0	High	Medium	Minor-moderate
69 NW of Morteheoe	15.0	High	Medium	Minor-moderate
7 Manorbier	29.0	High	Small	Minor
70a Potters Hill	16.5	High	Small	Minor
71 Putsborough Sand	17.5	Very high	Medium	Moderate
72 Baggy Point	16.0	High	Medium	Minor-moderate
73 Saunton Down	19.5	High	Medium	Minor-moderate
74 Braunton Burrows	22.5	High	Small	Minor
75a Westward Ho	26.5	High	Small	Minor
77 Peppercombe	30.0	High	Small	Minor
78 Buck's Mills	30.0	High	Small	Minor
79 Clovelly Harbour	28.5	Very high	Small	Minor
8 Lydstep point	29.0	High	Small	Minor
82 Windbury Head	26.5	High	Medium	Minor-moderate
83 West Titchbury	25.5	High	Medium	Minor-moderate
90a Blegberry	27.5	Medium	Small	Minor
92 Bursdon Moor	33.0	High	Small	Minor
93 Embury Beacon	34.5	High	Small	Minor

Analysis	km
Max. distance where Low MoE occurred	37.5
Av. Distance where Low MoE occurred	28.5
Max. distance where Medium MoE occurred	27.5
Av. distance where Medium MoE occurred	20.0

low = small

Combined Cumulative Effect

No other windfarms present or planned

Scheme name	Beatrice Offshore Wind Farm		
Document	E S Section 14 Wind Farm Seascape, Landscape and Visual April 2012		
Data source	http://www.marinedataexchange.co.uk		
Status	Under construction		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	588		
No. of turbines	83	142	
Turbine blade tip height (m)		198.4	
Distance from nearest coast km	22		

Effect

No other windfarms present or taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect	Significance of effect
1 Duncansby Head	36.74	High	Low to negligible	Moderate to negligible
2 Keiss Pier	27.35	High medium to low	Low to negligible	Moderate to negligible (residents)
3 Sortat	32.49	High	Negligible to none	Negligible to none
4 Wick Bay	18.04	High	Medium	Major to Moderate
5 Sarclet	13.93	High (residents)	High	Major (Residents)
6 Hill O Many Stanes	16.78	High to medium	High	Major to major-moderate
7 Lybster	19.27	High	High to medium	Major to major-moderate
8 Latheron A9	22.98	Medium to low	Medium	Moderate to moderate-minor
9 Dunbeath	25.62	High (residents)	Medium	Major to moderate (residents)
10 Whailgoe Steps	33.06	High (residents)	High	Major (residents)
11 Scaraben	33.06	High	Low	Moderate
12 Navidale	38.05	High medium to low	Low to negligible	Moderate-minor
13 Catchory	29.48	High medium (residents)	Negligible	Negligible
14 Minor Rd Stemster Hill	26.28	Medium to low	Medium to low	Moderate to minor
15 Aberdeen-Orkney Ferry route	19.73	Medium to low	Low to none	Moderate-minor
16 Aberdeen-Orkney Ferry route	29.74	Medium to low	Low to none	Moderate-minor

Analysis	km
Max. distance where Low MoE occurred	33.06
Av. Distance where Low MoE occurred	33.06
Max. distance where Medium MoE occurred	25.62
Av. distance where Medium MoE occurred	22.21

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
1 Duncansby Head	36.74	High	Negligible	Negligible
2 Keiss Pier	27.35	High medium to low	Low to negligible	Moderate to negligible (residents)
3 Sortat	32.49	High	Negligible to none	Negligible to none
4 Wick Bay	18.04	High	None	None
5 Sarclet	13.93	High (residents)	Low	Moderate
6 Hill O Many Stanes	16.78	High to medium	Medium	Major to Moderate
7 Lybster	19.27	High	Low	Moderate
8 Latheron A9	22.98	Medium to low	Low	Moderate-minor to minor
9 Dunbeath	25.62	High (residents)	Medium	Major-moderate (residents)
10 Whailgoe Steps	33.06	High (residents)	Low	Moderate (residents)
11 Scaraben	33.06	High	Low	Moderate to moderate-minor
12 Navidale	38.05	High medium to low	Low to negligible	Moderate to negligible (residents)
13 Catchory	29.48	High medium (residents)	High-Medium	Negligible
14 Minor Rd Stemster Hill	26.28	Medium to low	Medium to low	Moderate to minor

Analysis (cumulative)	km
Max. distance where Low MoE occurred	33.06
Av. Distance where Low MoE occurred	24.46
Max. distance where Medium MoE occurred	25.62
Av. distance where Medium MoE occurred	21.20

Scheme name	Burbo Bank Offshore Extension Wind Farm		
Document	ES Volume 2 - Chapter 20: Seascape, Landscape and Visual Impact Assessment March 2013 p 49-71		
Data source	http://infrastructure.planninginspectorate.gov.uk/projects/north-west/burbo-bank-extension-offshore-wind-farm/		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	254		
No. of turbines	32	36	
Turbine blade tip height (m)	187	141-223	
Distance from nearest coast km	7		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect	Significance of effect
1 Leasowe Common	7.91	High	High-medium	Major-moderate
2 Hoylake, Near Hilbre Point	8.41	High	High-medium	Major-moderate
3 Crosby Coastguard Station	9.85	High (residents & visitors)	Low	Moderate
4 Fort Perch Rock, New Brighton	11.01	Medium (visitors)	Medium	Moderate
5 Formby - Beach	11.18	High	Medium	Moderate
6 Point of Ayr	12.25	High	High-medium	Major-moderate
7 Thurstaston Common	13.36	High	Medium	Moderate
8 Gwespyr	14.41	High	Medium	Major-moderate
9 Prestatyn (near Nova Centre)	15.33	Medium	Medium	Moderate
10 Craig Fawr, Clywdian Range	18.43	High	Medium	Major-moderate
11 Clieves Hill	20.31	High (residents & visitors)	Low	Moderate
12 Southport Pier	21.99	High (visitors)	Medium	Moderate
13 Pensarn/ Abergele	26.40	Medium (visitors)	Low	Moderate-minor
14 Moelfre Isaf	30.06	High (walkers)	Low	Moderate
15 St Anne's Pier	30.22	Medium (visitors)	Low-negligible	Negligible
16 Starr Gate, Blackpool	32.68	High (residents)	Low-negligible	Negligible
17 Moel Famau, Clwydian Range	24.53	High (walkers)	Negligible	Negligible
18 Great Ormes Head	37.80	High (visitors)	Negligible	Negligible

Analysis	km
Max. distance where Low MoE occurred	30.6
Av. Distance where Low MoE occurred	21.7
Max. distance where Medium MoE occurred	22.0
Av. distance where Medium MoE occurred	15.1

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of change)	Significance of effect (Predicted impact)
5 Formby - Beach	11.18	High	Medium	Moderate
6 Point of Ayr	12.25	High	High-medium	Major-moderate
10 Craig Fawr, Clywdian Range	18.43	High	Medium	Major-moderate
13 Pensarn/ Abergele	26.40	Medium (visitors)	Low	Moderate-minor
17 Moel Famau, Clwydian Range	24.53	High (walkers)	Negligible	Negligible

Analysis (cumulative)	km
Max. distance where Low MoE occurred	26.40
Av. Distance where Low MoE occurred	26.40
Max. distance where Medium MoE occurred	18.43
Av. distance where Medium MoE occurred	14.81

Scheme name	Docking Shoal Offshore Wind Farm Development		
Document	Seascape and Visual Assessment October 2007 p 51+		
Data source	http://www.marinedataexchange.co.uk		
Status	Withdrawn		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	540		
No. of turbines		177 (worst case)	
Turbine blade tip height (m)		145	
Distance from nearest coast km	14		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (sensitivity to change)	Magnitude of effect (Magnitude of operational visual effect)	Significance of effect (Effect significance)
1 Chapel St Leonards	22.90	medium to low	low	minor to moderate
2 Skegness	20.30	low to medium	low to medium	minor to moderate
3 Gibraltar Point	22.10	medium to low	low	minor to moderate
4 Candlebury Hill	31.60	low	negligible	negligible
5 St Edmunds Point	24.80	medium to low	low to medium	moderate to minor
6 Brancaster Bay	19.10	medium	medium	moderate
7 Blakeney Point	17.60	medium to high	medium to low	moderate
8 Docking	26.30	low to medium	low	minor

Analysis	km
Max. distance where Low MoE occurred	31.6
Av. Distance where Low MoE occurred	31.6
Max. distance where Medium MoE occurred	19.1
Av. distance where Medium MoE occurred	19.1

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (magnitude of cumulative effects)	Significance of effect (Significance of impact)
1 Chapel St Leonards	22.90	medium to low	low	minor
6 Brancaster Bay	19.10	medium	medium to high, to low	Moderate to major, to minor or negligible
7 Blakeney Point	17.60	medium to high	medium to high, to low	Moderate to major, to minor or negligible

Analysis (cumulative)	km
Max. distance where Low MoE occurred	22.90
Av. Distance where Low MoE occurred	22.90
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

Scheme name	Greater Gabbard		
Document	Greater Gabbard Offshore Wind Farm ES - SLVIA Chapter 10.3		
Data source	https://tethys.pnnl.gov/publications/greater-gabbard-offshore-wind-farm-environmental-statement , 4COffshore		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	504		
No. of turbines	140	141	
Turbine blade tip height (m)	131	170	
Distance from nearest coast km	23		

Effect

No other windfarms taken into consideration

(terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of change - worst case)	Significance of effect (Significance of impact)
VP1 Orford Castle	28.00	High	Moderate-substantial	Not significant
VP2 Old Felixstowe Seafront	33.50	High	Moderate-substantial	Not significant
VP3 Aldeburgh seafront	29.00	High	Substantial	Not significant
VP4 North of Alderton	32.50	Moderate	Moderate-substantial	Not significant
VP5 Orford Ness nr lighthouse	25.00	High	Substantial	Not significant
VP6 Shingle Street	30.50	High	Moderate-substantial	Not significant

Analysis	km
Max. distance where Low MoE occurred	n/a
Av. Distance where Low MoE occurred	n/a
Max. distance where Medium MoE occurred	33.50
Av. distance where Medium MoE occurred	31.00

includes moderate-substantial

includes moderate-substantial

Combined Cumulative Effect

Chapter 10.5 indicates very limited effects, minor or none

Scheme name	Gunfleet Sands 2		
Document	Gunfleet Sands 2 Offshore Wind Farm Environmental Statement 2007 Section 12		
Data source	https://tethys.pnnl.gov		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	173		
No. of turbines	22		extension to Gunfleet 1 - as built 48 in total
Turbine blade tip height (m)	128		
Distance from nearest coast km	8.5		

Effect

Other windfarms present or planned are taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity to change)	Magnitude of effect (Magnitude of change)	Significance of effect
Cliff top, The Naze	13	Medium - low	Medium - low	Moderate - Minor
Greensward, Frinton-on-Sea	9.5	Medium - low	Medium - low	Moderate - Minor
Public Footpath, Great Holland	10	Medium - low	Medium - low	Moderate - Minor
Radar Tower, Holland Haven	8.3	Medium - low	Medium - low	Moderate - Minor
Seafront Promenade, Clacton-on-Sea	8.9	Low	Low	Minor
Sea Defence, Seawick	10.1	Low	Low	Minor
Beach at West Mersea	19.6	Medium - low	Low	Minor
Bradwell Bird Observatory	17.5	Medium	Low	Minor - Moderate

Analysis	km
Max. distance where Low MoE occurred	19.6
Av. Distance where Low MoE occurred	14.0
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

Combined Cumulative Effect

No viewpoint data

12.7.9

The cumulative magnitude of effect of the Round 1 offshore wind farms with the GS2 development is therefore considered to be Low. When combined with a generally Low - Medium sensitivity to change to the GS2 development the significance of cumulative effect is considered to be Minor with the generally open exposed and remote foreshore areas providing some capacity for change. The cumulative impact is then generally reduced further inland and to the north.'

Scheme name	Gwynt y Mor		
Document	Gwynt y Môr Offshore Wind Farm Environmental Statement Chapter 10		
Data source	https://tethys.pnnl.gov/		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	576		
No. of turbines	160		
Turbine blade tip height (m)	140		
Distance from nearest coast km	18		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
Bull Bay	42.3	Moderate	Negligible	Insignificant
Point Lynas	37.1	Moderate to High	Negligible	Slight
Mynydd Eilian	38	Moderate to High	Negligible	Slight
Moelfre Headland	35	Moderate to High	Negligible	Slight
Ref Wharf Bay	35.9	Moderate to High	Negligible	Slight
Bwrdd Arthur	30.9	Moderate to High	Small	Slight to Moderate
Penmon Point	28	Moderate to High	Small	Slight to Moderate
Beaumaris	32.2	Moderate	Small	Slight
Bangor Pier	35.8	Low to Moderate	Small	Insignificant
Carnedd Llywelyn	36.7	High	Negligible	Slight
Llanfairfechan	27.8	Moderate	Negligible	Insignificant
Conwy Mountain	21.4	Moderate to High	Small to Medium	Moderate
Great Orme Summit	16.2	Moderate to High	Small to Medium	Moderate
Great Orme Summit	15.8	Moderate to High	Small to Medium	Moderate
Great Orme Rest and Be Thankful	16	Moderate to High	Small to Medium	Moderate
Llandudno Promenade monument	16.2	Moderate	Medium to Large	Moderate to Substantial
Llandudno Promenade conf centre	16.2	Moderate	Medium to Large	Moderate to Substantial
Llandudno Promenade Paddling Pool	15.7	Low to Moderate	Medium to Large	Moderate
Rhos-on-Sea	14.3	Low to Moderate	Medium	Slight to Moderate
Bryn Euryn	15.7	Moderate	Small to Medium	Slight to Moderate
Mynydd Marian	15.3	Low to Moderate	Medium	Slight
Abergale (Pensarn Station)	13.9	Low	Medium to Large	Slight to Moderate
Rhyl Aquarium	13.1	Low	Medium to Large	Slight to Moderate
Graig Fawr	15.9	Moderate to High	Small to Medium	Moderate
Prestatyn Nova Centre	12.7	Low	Medium	Slight
Gwaenysgor	14.9	Low to Moderate	Medium	Slight to Moderate
Point of Ayr	14.6	Moderate	Small to Medium	Slight to Moderate
Thurstaston Common	24.5	Moderate to High	Small	Slight to Moderate
Grange Hill	21.1	Moderate	Small	Slight
Hilbre Point	19.1	Moderate	Small to Medium	Slight to Moderate
New Brighton	25.7	Low	Small	Insignificant
Crosby	28	Low	Small	Insignificant
Formby Point	26.4	Moderate to High	Small	Slight to Moderate
Southport Pier	37	Low	Negligible	Insignificant
Snowdon Summit	54.9	High	Negligible	Insignificant
Blackpool Tower	47.7	Low	Negligible	Insignificant

Analysis	km
Max. distance where Low MoE occurred	35.8
Av. Distance where Low MoE occurred	28.0
Max. distance where Medium MoE occurred	15.3
Av. distance where Medium MoE occurred	14.3

Combined Cumulative Effect

Chapter 12.6 16 not found online

Scheme name	Hywind Scotland Pilot Park		
Document	Hywind Scotland Pilot Park Environmental Statement -SLVIA March 2015 Statoil		
Data source	http://www.statoil.com/en/EnvironmentSociety/Environment/impactassessments/NewEnergy/IntWind/Pages/HywindScot		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	30		
No. of turbines	5	5	
Turbine blade tip height (m)	159-178		
Distance from nearest coast km	23		

Effect

No other windfarms present or taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (sensitivity of viewpoint)	Magnitude of effect	Significance of effect (level of impact)
1 Scotstown Head	26.0	High	Minor	Minor
2 Gable Braes, Peterhead	23.0	High	Minor	Minor
3 Slains Castle Car Park	26.0	Medium	Minor	Minor
4 Near A950 Thunderton	29.0	Medium	Minor	Minor
5 Peterhead Bay	25.4	Medium/high	Minor	Minor
6 Reform Tower	25.6	Medium/high	Minor	Minor
7 Stirling Hill	26.2	Medium/high	Minor	Minor

Analysis	km
Max. distance where Low MoE occurred	29.00
Av. Distance where Low MoE occurred	25.89
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

note Low taken to be 'Minor', Medium taken as 'Moderate'

Combined Cumulative Effect no data found

In ES:

Subject to the exact extent and configuration of the ZTVs for these developments, a degree of cumulative and in combination impact may potentially occur relating to simultaneous or successive visibility. However, due to the low magnitude of change relating to any visibility should it occur, deriving from the very long separation distances both between the developments under consideration, and between each development and the receptors being assessed, it is not considered that any of these would result in a significant effect.

Scheme name	Inch Cape		
Document	ES Human Environment Chapter 12 7 Appendix 12 C		
Data source	http://www.inchcapewind.com		
Status	Consented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW		1000	
No. of turbines		40 - 72	
Turbine blade tip height (m)		291	
Distance from nearest coast km	15		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity of visual receptor)	Magnitude of effect (Magnitude of change)	Significance of effect (Effect on visual amenity)
1 Garron Point	43.7	High	Low	Minor/moderate
5 Montrose	20.0	High	High	Major
6 Braehead of Lunan	19.5	High	High	Major
9 Minor Road S of Cairnconon Hill	27.0	Moderate	High	Moderate/major
10 Clifftop Path N of Victoria Park	18.6	High	High	Moderate/major
11 Arbroath Signal Tower	19.7	High	High	Moderate/major
4 Cairn o' Mount	42.9	High	Low	Minor/moderate
8 White Caterthun Hill Fort	38.8	High	Low	Moderate
13 Dodd Hill	38.0	High	Low	Minor/moderate
15 Dundee Law	43.7	High	Low	Moderate
17 Strathkinness	39.4	High to moderate	Low	Minor/moderate
19 Largo Law	48.4	High	Low	Minor/moderate
20 B9131 South of Dunino	36.2	Moderate	Low	Minor/moderate
22 Anstruther Easter	36.4	High	Low	Moderate
26 North Berwick Law	52.50	High	Low	Moderate/major
2 A92, North of Inverbervie	30.0	High to moderate	Medium	Moderate/major
3 Beach Road, Kirkton	24.1	High	Moderate	Moderate/major
12 A92 East of Muirdrum	25.2	High to moderate	Moderate	Moderate/major
14 Carnoustie	26.7	High	Moderate	Moderate
16 Tentsmuir	33.4	High	Moderate	Moderate/major
18 St Andrews, East Scores	34.8	High	Moderate	Moderate/major
21 Kingsbarns	30.6	Moderate	Moderate	Moderate
23 Fife Ness, Lochaber Rock	28.32	High	Moderate	Moderate/major
24 Isle of May	34.40	High	Moderate	Moderate/major
7 Brechin	31.7	Moderate	Negligible	Negligible
25 Dunbar	51.00	High	Negligible	Minor/moderate

Analysis	km
Max. distance where Low MoE occurred	52.40
Av. distance where Low MoE occurred	34.77
Max. distance where Medium MoE occurred	34.80
Av. distance where Medium MoE occurred	29.72

Includes medium and moderate

Combined Cumulative Effect

There are no parts of the study area where the Inch Cape WTGs will be visible only with these two application and scoping stage wind farms, which would only be seen in the south west part of the study area. In this context and particularly given the considerable distance between these two proposed wind farms, it is considered that the effects of the Inch Cape WTGs and OSPs with the baseline of operational and consented wind farms and these two proposed wind farms, would be no greater than the effects assessed for Inch Cape with the operational and consented developments included in the assessment.'

Scheme name	Kentish Flats		
Document	Kentish Flats Environmental Statement 8.5.10		
Data source	GREP UK		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	90		
No. of turbines	30		
Turbine blade tip height (m)	115	140	
Distance from nearest coast km	8		

Effect

No other windfarms present or taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of change)	Significance of effect (Significance of change)
1 St Peters Chapel	30.9		Negligible	Moderate/Minor
2 Pier at Southend-on-Sea	23.7		Slight	Moderate/Minor
3 Warden	12.1		Moderate	Moderate
4 Whitstable (Tankerton)	9.6		Substantial	Major/Moderate
5 Whitstable (Bayview Hill)	12		Moderate	Moderate
6 Heme Bay Museum	8.7		Substantial	Major/Moderate
7 Margate	18.8		Slight	Moderate/Minor
8 North Downs Way	26.9		Slight	Moderate/Minor
9 Shoeburyness	19		Slight	Moderate/Minor
10 Thanet, A256 neat Westwood	20.6		Slight	Minor
11 Reculver / Saxon Shore Way	9.5		Moderate	Major/Moderate
12 Sheerness	20.5		Slight	Moderate/Minor
13 Faversham	18.5		Slight	Minor

Analysis	km
Max. distance where Low MoE occurred	27.9
Av. Distance where Low MoE occurred	21.1
Max. distance where Medium MoE occurred	12.1
Av. distance where Medium MoE occurred	11.2

Combined Cumulative Effect p 100

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of cumulative change)	Significance of effect (Cumulative effects)
1 St Peters Chapel	30.9	High	Slight	Moderate/minor

Analysis (cumulative)	km
Max. distance where Low MoE occurred	30.90
Av. Distance where Low MoE occurred	30.90
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

Slight assessed as Low

Scheme name	London Array Offshore Phase 1		
Document	ES Landscape Seascape and Visual Assessment Appendix 5.1		
Data source	http://marinedataexchange.co.uk		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	630		
No. of turbines	175	up to 271	
Turbine blade tip height (m)	147	175	
Distance from nearest coast km	21		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
Deal	40	High	None	None
North Foreland	22	High	Low to Negligible	Negligible
Margate - Cliftonville/Palm Bay	21	High	Low	Slight Adverse
Margate - Walpole Bay	21	High	Low	Slight Adverse
Chislet / West Thanet	27	Low	Low to Negligible	Negligible
Reculver	27	High	Low to Negligible	Negligible
Herne Bay	31	High	Negligible	Negligible
Whitstable	34	Medium	Negligible	Negligible
Swale	44	High	None	None
Shoeburyness	40	Medium	Negligible	Negligible
Shoebury Ness	36	Medium	Negligible	Negligible
Burnham on Crouch	40	Medium	Negligible	Negligible
Blackwater Estuary	40	Medium	Negligible	Negligible
Clacton-on-Sea	24	Medium	Low to Negligible	Negligible
Holland-on-Sea	24	Medium	Low to Negligible	Negligible
Naze Tower	24	Medium	Low to Negligible	Negligible
Harwich Seafront	31	Medium	Negligible	Negligible
Felixstow Seafront	31	Medium	Negligible	Negligible

Analysis	km
Max. distance where Low MoE occurred	21.0
Av. Distance where Low MoE occurred	21.0
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

Combined Cumulative Effect no data found

ES ordered from marine data exchange but download failed

Scheme name	Moray East
Document	ES Chapter 8.4
Data source	morayoffshore.com
Status	Under construction

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	1116		
No. of turbines	186		
Turbine blade tip height (m)	204		
Distance from nearest coast km	22		

Effect

No other windfarms present (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of change)	Significance of effect (Significance of residual effects)
1 Duncansby Head	42.00	Medium-high	Low	Not significant
2 Keiss Pier	35.00	Medium-high	Low	Not significant
3 Sortat	40.00	Medium-low	Low-negligible	Not significant
4 Wick Bay	26.00	Medium-high	Medium	Significant
5 Sarclet	23.00	Medium	Medium	Significant
6 Hill O' Many Stanes	24.00	Medium-high	Medium	Significant
7 Lybster (end of Main Street)	27.00	Medium-high	Medium	Significant
8 Latheron (A9)	31.00	Medium-high	Medium	Significant
9 Dunbeath (nr Heritage Centre)	34.00	Medium-high	Medium	Significant
10 Berriedale (A9)	36.00	Medium-high	Medium-low	Not significant
11 Morven	49.00	Medium-high	Low	Not significant
12 Navidale	45.00	Medium-high	Medium-low	Not significant
13 Catchory	39.00	Medium	Low	Not significant
14 Minor Rd, S side Stemster Hill	34.00	Medium-low	Medium-low	Not significant
15 Whaligoe Steps	23.00	Medium-high	Medium	Significant
16 Lossiemouth Harbour	46.00	Medium	Low	Not significant
17 Buckie, Cliff Terrace	44.00	Medium-low	Low	Not significant
18 Portnockie - Bow Fiddle Rock	41.00	Medium-high	Low	Not significant
19 Cullen, Viaduct & cycle path	43.00	Medium-high	Low	Not significant
20 Bin Hill	46.00	Medium	Low	Not significant
21 Findlater Castle	43.00	Medium-high	Low	Not significant
22 Portsoy	45.00	Medium-high	Low	Not significant

Analysis	km
Max. distance where Low MoE occurred	49.00
Av. Distance where Low MoE occurred	43.00
Max. distance where Medium MoE occurred	34.00
Av. distance where Medium MoE occurred	27.00

Combined Cumulative Effect see Chapter 15.4

Combined cumulative effect with other windfarms, existing, consented or applied for - worst case (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of change)	Significance of effect (Significance of impact)
1 Duncansby Head	42.00	Medium-high	Low	Not significant
2 Keiss Pier	35.00	Medium-high	Medium-low	Not significant
3 Sortat	40.00	Medium-low	Low	Not significant
4 Wick Bay	26.00	Medium-high	Medium-low	Not significant
5 Sarclet	23.00	Medium	Low	Not significant
6 Hill O' Many Stanes	24.00	Medium-high	Medium-low	Not significant
7 Lybster (end of Main Street)	27.00	Medium-high	Medium-low	Not significant
8 Latheron (A9)	31.00	Medium-high	Medium	Significant
9 Dunbeath (nr Heritage Centre)	34.00	Medium-high	Low	Not significant
10 Berriedale (A9)	36.00	Medium-high	Medium	Significant
11 Morven	49.00	Medium-high	Medium-low	Not significant
12 Navidale	45.00	Medium-high	Medium-low	Not significant
13 Catchory	39.00	Medium	Low	Not significant
14 Minor Rd, S side Stemster Hill	34.00	Medium-low	Medium	Not significant
15 Whaligoe Steps	23.00	Medium-high	Low	Not significant
16 Lossiemouth Harbour	46.00	Medium	Low	Not significant
17 Buckie, Cliff Terrace	44.00	Medium-low	Low	Not significant
18 Portnockie - Bow Fiddle Rock	41.00	Medium-high	Low	Not significant
19 Cullen, Viaduct & cycle path	43.00	Medium-high	Low	Not significant
20 Bin Hill	46.00	Medium	Low	Not significant
21 Findlater Castle	43.00	Medium-high	Low	Not significant
22 Portsoy	45.00	Medium-high	Low	Not significant

Analysis (cumulative)	km
Max. distance where Low MoE occurred	46.00
Av. Distance where Low MoE occurred	39.00
Max. distance where Medium MoE occurred	36.00
Av. distance where Medium MoE occurred	34.00

Scheme name	Moray West
Document	Offshore EIA report see Chapter 14 summary p168/1025 & distances from p 17
Data source	4COffshore, Morayofshore.com
Status	Application submitted

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
749		751	
62-84		62-86	
Turbine blade tip height (m)		199-285	turbine type not decided
Distance from nearest coast km	22		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Impact Magnitude)	Significance of effect (Effect Significance)
1: Duncansby Head	53	Medium-high	Low	Not-significant
2: Keiss	43	Medium-high	Negligible	Not-significant
3: Wick	32	Medium-high	Medium-low	Significant
4: Sarclet	26	Medium-high	Medium	Significant
5: Whaligoe Steps	26	Medium-high	Medium	Significant
6: Minor Road (SE of Osclay)	28	Medium	Medium	Significant
7: Lybster	25	Medium-high	Medium	Significant
8: Latheron	25	Medium-high	Medium	Significant
9a: Dunbeath	25	Medium-high	Medium	Significant
9b: Dunbeath	24	Medium-high	Medium-high	Significant
10: Morven	35	Medium-high	Medium-low	Not-significant
11: Berriedale (A9)	23	Medium-high	Medium	Significant
12: Navidale	28	Medium-high	Medium	Significant
13a: Brora	37	Medium-high	Medium-low	Not-significant
13b: Dornoch	49	Medium-high	Low	Not-significant
14: Tarbat Ness Lighthouse	37	Medium-high	Medium-low	Not-significant
15: Burghead Visitor Centre	38	Medium-high	Medium-low	Not-significant
16: Lossiemouth Harbour	32	Medium-high	Medium-low	Not-significant
17: Buckie	40	Medium-high	Medium-low	Not-significant
18: Bin Hill	43	Medium	Low	Not-significant
19: Portnockie	39	Medium-high	Medium-low	Not-significant
20: Cullen	41	Medium-high	Medium-low	Not-significant
21: Findlater Castle	42	Medium-high	Medium-low	Not-significant
22: Sandend	44	Medium-high	Low	Not-significant
23: Portsoy	50	Medium-high	Medium-low	Not-significant

Analysis	km
Max. distance where Low MoE occurred	53.00
Av. Distance where Low MoE occurred	47.00
Max. distance where Medium MoE occurred	28.00
Av. distance where Medium MoE occurred	26.00

Combined Cumulative Effect

Combined cumulative effect with other consented windfarms (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Cumulative Magnitude of change)	Significance of effect (Significance of Cumulative Effect)
4: Sarclet	26	Medium-high	Medium	Significant
5: Whaligoe Steps	26	Medium-high	Medium	Significant
6: Minor Road (SE of Osclay)	28	Medium	Medium	Significant
7: Lybster	25	Medium-high	Medium	Significant
8: Latheron	25	Medium-high	Medium	Significant
9a: Dunbeath	25	Medium-high	Medium	Significant
9b: Dunbeath	24	Medium-high	Medium	Significant
10: Morven	35	Medium-high	Medium-low	Significant
11: Berriedale (A9)	23	Medium-high	Medium	Significant
12: Navidale	28	Medium-high	Medium	Significant
13a: Brora	37	Medium-high	Low	Not significant
13b: Dornoch	49	Medium-high	Low	Not significant
14: Tarbat Ness Lighthouse	37	Medium-high	Low	Not significant
15: Burghead Visitor Centre	38	Medium-high	Low	Not significant
16: Lossiemouth Harbour	32	Medium-high	Low	Not significant
17: Buckie	40	Medium-high	Medium-low	Significant
18: Bin Hill	43	Medium	Medium-low	Not significant
19: Portnockie	39	Medium-high	Medium-low	Significant
20: Cullen	41	Medium-high	Medium-low	Significant
21: Findlater Castle	42	Medium-high	Medium-low	Significant
22: Sandend	44	Medium-high	Low	Not significant
23: Portsoy	50	Medium-high	Medium-low	Not significant

Analysis (cumulative)	km
Max. distance where Low MoE occurred	49.00
Av. Distance where Low MoE occurred	39.50
Max. distance where Medium MoE occurred	28.00
Av. distance where Medium MoE occurred	26.00

Scheme name	Navitus Bay Wind Park		
Document	Environmental Statement Volume C Chapter 13 Seascape Landscape and Visual p224+		
Data source	http://infrastructure.planningportal.gov.uk/projects/south-east/navitus-bay-wind-park		
Status	Withdrawn		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW		970	
No. of turbines		121	
Turbine blade tip height (m)		200	
Distance from nearest coast km	10		

Effect

No other windfarms present or taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude)	Significance of effect (Significance of impact)
6 - Whiteways, Povington Hill	28.2	High	Low	Moderate
7 Swyre Head	23.1	High	Medium	Major-moderate
8 St Aldhelm's Head	19.0	High-medium	Medium	Major-moderate
9 Duriston Castle	14.4	High-medium	High-medium	Major-moderate
12 Old Harry Rocks	16.3	High	Medium	Major-moderate
16 Constitution Hill	25.6	High	Very low	Negligible
20 Hengisbury Head	20.4	High	Medium-low	Moderate
27 Hurst Castle	23.0	High-medium	High	Major
28 The Needles	17.7	High	High	Major
29 Tennyson's monument	19.5	High	Medium	Major-moderate
32 Limerstone Down	26.1	High	Medium-low	Moderate
33 Blackgang Car Park	27.8	High	Low-very low	Minor

Analysis	km
Max. distance where Low MoE occurred	28.2
Av. Distance where Low MoE occurred	28.2
Max. distance where Medium MoE occurred	23.1
Av. distance where Medium MoE occurred	19.5

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect	Significance of effect (Significance of impact)
6 - Whiteways, Povington Hill	28.2	High	Medium	Major-moderate
33 Blackgang Car Park	27.8	High	Medium	Major-moderate

Analysis (cumulative)	km
Max. distance where Low MoE occurred	n/a
Av. Distance where Low MoE occurred	n/a
Max. distance where Medium MoE occurred	28.20
Av. distance where Medium MoE occurred	28.00

Scheme name	Neart na Gaoithe		
Document	ES - Chapter 21 Seascape, Landscape and Visual Impacts		
Data source	http://www.neartnagaoithe.com/environmental-statement1.asp		
Status	Consented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	448		
No. of turbines	45-54	128 to 64	
Turbine blade tip height (m)	208	175 to 197	
Distance from nearest coast km	15		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect	Significance of effect (Significance of impact)
2 Beach Road, Kirkton, St Cyrus	49.00	High	Negligible	None
5 Dodd Hill	43.90	Medium	Negligible	None
6 Braehead of Lunan	39.00	High	Low	Moderate-minor
7 Arbroath	30.8	High	Medium-low	Moderate
8 Carnoustie	31.70	Medium	Medium-low	Moderate
9 Dunedee Law	44.90	Medium	Negligible	None
10 Tentsmuir	31.80	High	Medium-low	Moderate
11 Strathkinness	33.10	High	Low-negligible	Minor
12 St Andrews, East Scores	28.20	High	Low	Moderate
13 Fife Ness, Lochaber Rock	15.50	High	High	Major
14 Anstruther Easter	21.80	High	High	Major
15 Largo Law	36.80	Medium	Negligible	None
16 Isle of May	16.30	High	High	Major
17 North Berwick Law	33.00	High	Low	Moderate
18 Dunbar	28.00	High	Medium	Major-moderate
19 West Steel	34.90	Medium	Low	Minor
20 Coldingham Moor	32.80	Medium	Medium-low	Minor
21 St Abb's Head	33.00	High	Medium-low	Moderate

Analysis	km
Max. distance where Low MoE occurred	39.00
Av. Distance where Low MoE occurred	33.78
Max. distance where Medium MoE occurred	28.00
Av. distance where Medium MoE occurred	28.00

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of impact)	Significance of effect (Cumulative impact significance - additional impact of Neart na Gaoithe in addition to all other cumulative wind farms)
2 Beach Road, Kirkton, St Cyrus	49.00	High	no info	Minor
5 Dodd Hill	43.90	Medium	no info	Minor
6 Braehead of Lunan	39.00	High	no info	Moderate-minor
7 Arbroath	30.8	High	no info	Moderate-minor
8 Carnoustie	31.70	Medium	no info	Moderate-minor
9 Dunedee Law	44.90	Medium	no info	Minor
10 Tentsmuir	31.80	High	no info	Major-moderate
11 Strathkinness	33.10	High	no info	Moderate-minor
12 St Andrews, East Scores	28.20	High	no info	Major-moderate
13 Fife Ness, Lochaber Rock	15.50	High	no info	Major
14 Anstruther Easter	21.80	High	no info	Major-moderate
15 Largo Law	36.80	Medium	no info	Minor
16 Isle of May	16.30	High	no info	Major
17 North Berwick Law	33.00	High	no info	Moderate-minor
18 Dunbar	28.00	High	no info	Moderate
19 West Steel	34.90	Medium	no info	Minor
20 Coldingham Moor	32.80	Medium	no info	Moderate-minor
21 St Abb's Head	33.00	High	no info	Moderate-minor

Analysis (cumulative)	km
Max. distance where Low MoE occurred	n/a
Av. Distance where Low MoE occurred	n/a
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

Scheme name	North Hoyle		
Document	North Hoyle Offshore Wind Farm Environmental Statement Chapter 5.3		
Data source	https://infrastructure.planninginspectorate.gov.uk		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	60		
No. of turbines	30		
Turbine blade tip height (m)	107		
Distance from nearest coast km	7.5		

Effect

No other windfarms present appear to be taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity to change)	Magnitude of effect (Magnitude of change)	Significance of effect (Significance of effects)
1 Thos-on-Sea	20.4	Moderate	Low	Low to Moderate
2 Bryn Euryn	21.8	Moderate	Low	Low to Moderate
3 Mynydd Marian	18.7	Low to Moderate	Low	Low
4 Abergale / Pensam Station	14.2	Moderate	Low	Low to Moderate
5 Rhyl Aquarium	9.2	Low	Moderate	Low to Moderate
6 Graig Fawr	10.8	Moderate	Moderate	Moderate
7 Marian Ffrith	13.5	High	Moderate	Moderate to High
8 Prestatyn - Nova Centre	7.5	Low	High	Moderate
9 Point of Ayr	9.5	High	High	High
10 Bryn-llwyn - Viewpoint	9.6	Moderate	High	Moderate to High
11 Thurstaston Common	19.8	High	Low	Low to Moderate
12 Hilbre Point	14.8	Moderate to High	Low	Moderate

Analysis	km
Max. distance where Low MoE occurred	21.8
Av. Distance where Low MoE occurred	18.3
Max. distance where Medium MoE occurred	13.5
Av. distance where Medium MoE occurred	11.2

Combined Cumulative Effect see p52

(terminology in brackets if different in document)

Combined cumulative effect with other proposed windfarms, at Rhyl Flats and Burbo

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect	Significance of effect
1 Thos-on-Sea	20.4	Moderate	Low	
11 Thurstaston Common	19.8	High	Low	
3 Mynydd Marian	18.7	Low to Moderate	Low	
2 Bryn Euryn	21.8	Moderate	Low	
4 Abergale / Pensam Station	14.2	Moderate	Low	
12 Hilbre Point	14.8	Moderate to High	Low to moderate	
5 Rhyl Aquarium	9.2	Low	Moderate	
8 Prestatyn - Nova Centre	7.5	Low	Moderate	
6 Graig Fawr	10.8	Moderate	Moderate	
7 Marian Ffrith	13.5	High	Moderate to High	
10 Bryn-llwyn - Viewpoint	9.6	Moderate	Moderate to high	
9 Point of Ayr	9.5	High	High	

Analysis (cumulative)	km
Max. distance where Low MoE occurred	20.4
Av. Distance where Low MoE occurred	19.0
Max. distance where Medium MoE occurred	14.2
Av. distance where Medium MoE occurred	9.2

Moderate assessed as Medium

Scheme name	Rampion Offshore Wind Farm (Hastings Zone)		
Document	E5 Section 12 - Seascape, Landscape & Visual Impact Assessment Dec 2012 p71+		
Data source	http://infrastructure.planninginspectorate.gov.uk		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	400		note Option F modelled in ES
No. of turbines	116	100-175 (worst case)	
Turbine blade tip height (m)	140	165-210	
Distance from nearest coast km	13		

Effect

No other windfarms present

(terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (magnitude of predicted visual change)	Significance of effect (level of predicted visual effect)
1 Beachy Head cliff top	22.50	Very high	Medium	Major
2 Birling Gap cliff top	19.60	Very high	Medium	Major
3 Birling Gap beach	19.60	Very high	Medium	Major
4 Seven Sisters C Park cliff top	17.80	Very high	Medium	Major
5 Seven Sisters Cuckmere Haven	18.70	Very high	Very small	Moderate
6 Seaford Head cliff top	15.70	Very high	Medium	Major
7 Seaford sea front promenade	15.50	High	Medium	Major-moderate
8 Newhaven Coastguard cliff top	14.60	Medium	Medium	Moderate
9 Peacehaven cliff top	13.90	High	Large	Major
10 Beacon Hill, Rottingdean	14.10	High	Large	Major
11 Brighton parade	14.20	High	Large	Major
12 Brighton sea front promenade	14.10	High	Large	Major
13 Shoreham/A259 coastal road	14.20	High	Medium	Major-moderate
14 Worthing sea front promenade	13.40	High	Large	Major
15 Littlehampton sea front	17.80	High	Medium	Major-moderate
16 Bognor Regis sea front	23.90	High	Small	Moderate
17 Pagham beach	28.20	High	Small	Moderate
18 Selsey sea front promenade	29.50	High	Small	Moderate
19 Willingdon Hill	24.00	High	Medium	Major-moderate
20 Firle Beacon	21.60	Very high	Medium	Major
21 Saxon Down	24.10	High	Small	Moderate
22 Hollingbury Golf Course	18.10	Very high	Medium	Major
23 Ditchling Beacon ridge	23.60	High	Medium	Major-moderate
24 Devil's Dyke	19.60	Very high	Large	Major
25 Upper Beeding	19.80	Medium	Very small	Minor-negligible
26 Cissbury Ring	18.90	Very high	Medium	Major
27 Highdown Hill	16.80	High	Large	Major
28 Springhead Hill	25.40	High	Medium	Major-moderate
29 Bignor Hill	30.00	Very high	Medium	Major-moderate

Analysis	km
Max. distance where Low MoE occurred	29.50
Av. Distance where Low MoE occurred	26.43
Max. distance where Medium MoE occurred	30.00
Av. distance where Medium MoE occurred	19.93

note: we assess 'Small' to be equivalent to 'Low'

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (cumulative magnitude of visual change)	Significance of effect (level and significance of cumulative visual effect)
19 Willingdon Hill	24.00	High	Medium (no effect)	Major-moderate (no effect)
20 Firle Beacon	21.60	Very high	Medium (no effect)	Major (no effect)
21 Saxon Down	24.10	High	Small (no effect)	Moderate (no effect)

Analysis (cumulative)	km
Max. distance where Low MoE occurred	n/a or as above
Av. Distance where Low MoE occurred	n/a or as above
Max. distance where Medium MoE occurred	n/a or as above
Av. distance where Medium MoE occurred	n/a or as above

Scheme name	Sheringham shoal		
Document	ES May 2006		
Data source	http://sheringhamshoal.co.uk		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	317		
No. of turbines	88		3.6 MW
Turbine blade tip height (m)	135	117, 142 and 172	note they consider visual effect similar
Distance from nearest coast km	17		

Effect

No other windfarms taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
1 Cromer Pier	19.00	High	Medium	Moderate
2 Wells-Next-The Sea	25.00	High	Low	Minor
3 Beeston Hill	17.00	High	High	Major
4 Viewpoint in Oak Wood	19.00	High	Medium	Moderate
5 Cley Marshes Nature Reserve	18.00	High	High	Major
6 Overstrand, car park	21.00	High	Medium	Moderate
7 Inceborough Hill	18.50	High	Medium	Moderate
8 Sheringham, Peddars Way	17.00	High	High	Major
9 Sheringham Coast Watch - hut	17.00	Medium	High	Moderate
10 Weybourne, Peddars Way	17.00	High	Medium	Moderate
11 Holgate Hill	19.00	Medium	Medium	Moderate
12 A148, crossroads near Bale	27.50	Medium	n/a	Negligible
13 Blakeney, car park	19.50	High	Medium	Moderate
14 Morston - car park	21.00	High	Medium	Moderate
15 Stiffkey Salt Marshes	22.00	High	Low	Minor
16 A149 St Withburga Church	27.50	Medium	n/a	Negligible
17 Beeston Regis Heath	19.00	Medium	Medium	Minor
18 Dead Man's Hill	17.00	Medium	High	Moderate
19 Muckleburgh Hill	18.00	Medium	High	Moderate
20 Holt, church	23.00	High	n/a	Negligible
21 West Beckham	21.50	Low	n/a	Negligible
22 A148	25.00	Medium	n/a	Negligible
23 Holkham Park	28.00	High	n/a	Negligible
24 Beacon Hill Road	32.00	High	n/a	Negligible
25 Gibraltar Point Viewpoint	35.00	High	n/a	Negligible
26 Passenger Ferry	5.00	m	High	Moderate

Analysis	km
Max. distance where Low MoE occurred	25.00
Av. Distance where Low MoE occurred	23.50
Max. distance where Medium MoE occurred	21.00
Av. distance where Medium MoE occurred	19.22

Combined Cumulative Effect

Incl proposed schemes at Cromer and Docking Shoal/Race Bank (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
1 Cromer Pier	19.00	High	not defined	Moderate
2 Wells-Next-The Sea	25.00	High	not defined	Minor
18 Dead Man's Hill	17.00	Medium	not defined	Moderate

Analysis (cumulative)	km
Max. distance where Low MoE occurred	not defined
Av. Distance where Low MoE occurred	not defined
Max. distance where Medium MoE occurred	not defined
Av. distance where Medium MoE occurred	not defined

Scheme name	Thanet		
Document	Thanet Offshore Wind Farm ES Chapter 13.6		
Data source			
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	300		
No. of turbines	100	60-100	
Turbine blade tip height (m)	115	150	
Distance from nearest coast km	11		

Effect

Other windfarms present or planned are not taken into consideration (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
Reculver Country Park	27.7	Low to Medium	Low	Minor
West Brook POS / Coastal Path	17.5	Medium	Medium	Moderate
Margate Harbour Wall	15.4	Medium	Low	Minor
Kingsgate / North Foreland	12.3	High	Medium to High	Moderate
Broadstairs Promenade	14.2	Medium to High	Medium to High	Moderate
Wellington Crescent, Ramsgate	16.6	Medium	Medium to Low	Minor to Moderate
Richborough Castle	24.5	Medium to Low	Negligible	Negligible
Kings Avenue / Princes Drive	23.5	Medium	Low to Medium	Minor to Moderate
Deal Pier / Promenade	25.6	Medium	Low to Medium	Minor to Moderate
St Margaret's at Cliffe	33	High	Low to Negligible	Minor

Analysis	km
Max. distance where Low MoE occurred	27.7
Av. Distance where Low MoE occurred	21.5
Max. distance where Medium MoE occurred	17.5
Av. distance where Medium MoE occurred	17.5

Combined Cumulative Effect

Combined cumulative effect with other windfarms (Kentish Flats) (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of cumulative impact)	Significance of effect (Impact significance)
Reculver Country Park	27.7	Low to Medium	Medium	Minor to moderate
West Brook POS / Coastal Path	17.5	Medium	Medium	Moderate
Margate Harbour Wall	15.4	Medium	Minor	Minor to moderate
Kingsgate / North Foreland	12.3	High	Medium	Moderate

Analysis (cumulative)	km
Max. distance where Low MoE occurred	27.7
Av. Distance where Low MoE occurred	21.6
Max. distance where Medium MoE occurred	17.5
Av. distance where Medium MoE occurred	14.9

Scheme name	Walney Phase 1		
Document	Walney Offshore Windfarm ES Part 2		
Data source			
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	186		
No. of turbines	51	93	
Turbine blade tip height (m)	137	202	
Distance from nearest coast km	15		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
St Bees Head	42.6	High	Negligible	Negligible/Nil
Seascale Beach	31.3	High (Residents)	Very Small	Minor
Bootle Fell	27.6	Medium	Very Small	Minor/Negligible
Black Combe	23.4	High	Small	Moderate/Minor
Coastal Path, Haverigg	18.8	High	Medium	Moderate/Minor
A593 Broughton in Furness	36.4	Medium	Negligible	Nil
A595 Kirkby in Furness	25.1	Medium	Very Small	Minor/Negligible
Hoad Monument, Ulverston	30.5	High	Negligible	Negligible/Nil
High Haume Farm	23	High	Small	Moderate/Minor
Biggar Bank, Walney	14.4	High (Residents)	Medium	Moderate
South Walney Nature Reserve	16.2	High	Medium	Moderate
Birkrigg Fell	26.8	High	Very Small	Minor
Humphrey Head	36.4	High	Negligible	Negligible/Nil
Morecambe Stone Pier	37.7	High	Negligible	Negligible/Nil
Heysham Head	35.6	High	Negligible	Negligible/Nil
Rossall Point, Fleetwood	28.9	High	Very Small	Minor
Blackpool Tower	35.2	High	Negligible	Negligible/Nil

Analysis	km
Max. distance where Low MoE occurred	23.4
Av. Distance where Low MoE occurred	23.2
Max. distance where Medium MoE occurred	18.8
Av. distance where Medium MoE occurred	16.5

Combined Cumulative Effect

In Walney ES 1.0 notes that:

Walney and West of Duddon Sands are assessed as a single entity,

and assessed in context of several other proposed windfarms on the Eastern Irish Sea.

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of change)	Significance of effect (Significance of visual effect)
St Bees Head	42.6	High	Negligible	Negligible
Coastal Path, Haverigg	18.8	High	Large	Major
South Walney Nature Reserve	16.2	High	Large	Major
Biggar Bank, Walney	14.4	High (Residents)	Major	Major- moderate
Black Combe	23.4	High	Medium	Moderate
High Haume Farm	23	High	Medium	Moderate
Rossall Point, Fleetwood	28.9	High	Medium	Moderate
Blackpool Tower	35.2	High	Medium	Moderate
Bootle Fell	27.6	Medium	Small	Minor
A595 Kirkby in Furness	25.1	Medium	Small	Minor
Birkrigg Fell	26.8	High	Small	Moderate -minor
Seascale Beach	31.3	High (Residents)	Very small	Minor
A593 Broughton in Furness	36.4	Medium	Very small	Minor
Hoad Monument, Ulverston	30.5	High	Very small	Minor
Humphrey Head	36.4	High	Very small	Minor - negligible
Morecambe Stone Pier	37.7	High	Very small	Minor - negligible
Heysham Head	35.6	High	Very small	Minor - negligible

Analysis (cumulative)	km
Max. distance where Low MoE occurred	27.6
Av. Distance where Low MoE occurred	26.5
Max. distance where Medium MoE occurred	35.2
Av. distance where Medium MoE occurred	27.6

Small' assessed as Low

Scheme name	Walney Extension Offshore Windfarm		
Document	Environmental Statement Volume 1 Chapter 19 Seascape, landscape and visual impact assessment June 2013 p.69+		
Data source	http://infrastructure.planninginspectorate.gov.uk/projects/north-west/walney-extension-offshore-wind-farm		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	750		
No. of turbines	110	93-207	
Turbine blade tip height (m)	222	142-222	
Distance from nearest coast km	19		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (Magnitude of impact)	Significance of effect
1 St Bees head	39.56	High	Low-negligible	Minor
2 Thornhill	39.15	Low	Low-negligible	Negligible
3 Seascale beachfront	33.78	High-medium	Low-negligible	Minor
4 Seafront at Ravenglass	32.33	High	Low	Moderate
5 Black Combe, Bootle fell	27.79	High	Medium-low	Major-moderate to moderate
6 Coastal path Silecroft	24.29	High	Low	Moderate
7 Public footpath NW Milcom	28.18	High	Low-negligible	Minor
8 Askam in Furness	29.06	High	Negligible	Negligible
9 Biggar Bank Rd Walney Island	20.75	High	Low	Moderate
10 South End Haws Walney Island	22.69	High	Low	Moderate
11 Morecambe Stone Pier	44.06	High	None	None
12 Rossal Point Fleetwood	34.46	Medium	Negligible	Negligible
13 Blackpool promenade	38.98	High	Negligible-none	Negligible-none
14 Douglas Head Isle of Man	35.94	High	Negligible	Negligible
15 Loch promenade Douglas	36.66	High-medium	Negligible	Negligible
16 Snaefell Isel of Man	38.28	High	Negligible	Negligible
17 Maughold, Isle of Man	31.29	High	Low-negligible	Negligible

Analysis	km
Max. distance where Low MoE occurred	32.33
Av. Distance where Low MoE occurred	25.02
Max. distance where Medium MoE occurred	n/a
Av. distance where Medium MoE occurred	n/a

Combined Cumulative Effect

Combined cumulative effect with other windfarms, either existing or proposed (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor	Magnitude of effect (combined effect offshore)	Significance of effect
3 Seascale beachfront	33.78	High-medium	Low-negligible	Minor
5 Black Combe, Bootle fell	27.79	High	Medium	Major-moderate
9 Biggar Bank Rd Walney Island	20.75	High	Low	Moderate
12 Rossal Point Fleetwood	34.46	Medium	Negligible	Negligible
17 Maughold, Isle of Man	31.29	High	Medium	Major-moderate

Analysis (cumulative)	km
Max. distance where Low MoE occurred	21.00
Av. Distance where Low MoE occurred	21.00
Max. distance where Medium MoE occurred	31.29
Av. distance where Medium MoE occurred	29.54

Scheme name	West of Duddon Sands		
Document			
Data source			
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	389		
No. of turbines	108	139	
Turbine blade tip height (m)	150	150	
Distance from nearest coast km	14		

Effect

Additional effect to other existing windfarms as part of baseline (terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
Seascale Beach	41.1	High (Residents)	Negligible	Negligible / Nil
Bootle Fell	32.5	Medium	Very Small	Minor / Negligible
Black Combe	26.3	High	Small	Moderate / Minor
Coastal Path Haverigg	20.2	High	Small	Moderate / Minor
A593 Broughton in Furness	35.9	Medium	Negligible	Nil
A595 Kirkby in Furness	25.4	Moderate	Very Small	Minor / Negligible
Hoad Monument Ulverston	30.8	High	Very Small	Minor
High Haume Farm	23.5	High	Small	Moderate / Minor
BiggarBank, Walney	14.6	High (residents)	Medium	Moderate
South Walney Nature Reserve	7.5	High	Medium	Moderate
Birkrigg Fell	27.1	High	Very Small	Minor
Humphrey Head	35.7	High	Very Small / Negligible	Minor / Negligible
Morecombe Stone Pier	35.1	High	Negligible	Negligible / Nil
St Patrick's Chapel	32.6	High	Very Small	Minor
Rossall Point, Fleetwood	23	High	Small	Moderate / Minor
Blackpool Tower	27.9	High	Very Small	Minor
St Annes Pier	33.8	High	Negligible	Negligible / Nil

Analysis	km
Max. distance where Low MoE occurred	26.3
Av. Distance where Low MoE occurred	23.2
Max. distance where Medium MoE occurred	14.6
Av. distance where Medium MoE occurred	11.0

Combined Cumulative Effect

see Walney 1

Scheme name	Westermost Rough A		
Document	Seascape and Visual Assessment February 2009 p38		
Data source	http://www.marinedataexchange.co.uk		
Status	Implemented		

Windfarm details	as built or consented	as assessed in ES/SLVIA	Notes eg turbine types
Total turbine capacity MW	210		
No. of turbines	35	35 to 110	
Turbine blade tip height (m)	177	112 to 172	
Distance from nearest coast km	8		

Effect

No other windfarms present or taken into consideration

(terminology in brackets if different in document)

Viewpoint	Distance (km) from turbine	Sensitivity of receptor (Sensitivity)	Magnitude of effect (Magnitude of impact)	Significance of effect (Significance of impact)
1 Spurn Head Bird Observatory	17.50	Medium-high	Medium	Moderate
2 Seaside Road / Central Promenade, Withemsea	8.10	Medium	Medium-high	Moderate
3 Layby on Pilmar Lane, Roos	10.60	Medium-low	Medium-low	Moderate-minor
4 East Newton Road, Aldbrough	13.00	High	Medium	Moderate-major
5 North End Marine Drive / Eastgate, Hornsea	20.00	Medium-low	Low-medium	Minor-moderate
6 Viewing Point, North Harbour, Bridlington	35.00	Low-medium	Low-negligible	Minor-negligible
7 PROW, South Landing, Flamborough Head	34.50	Medium-high	Low-negligible	Minor
8 North Road, Halsham	12.50	Low	Low-medium	Minor-moderate
9 Stonebridge Car Park, Donna Nook	32.60	Low-medium	Low	Minor

Analysis	km
Max. distance where Low MoE occurred	32.60
Av. Distance where Low MoE occurred	32.60
Max. distance where Medium MoE occurred	17.50
Av. distance where Medium MoE occurred	15.25

Combined Cumulative Effect no data found

From ES: "Three potential sources for cumulative effect have been identified. These include the operational wind farms at Out Newton and Hull Waste Water Treatment Works, the consented wind farm at Lisset Airfield (onshore) and those registered 'in planning' which includes the Humber Gateway (Round 2 offshore) and the onshore wind farm at Burton Pidsea."

Appendix B: Glossary

<i>Term</i>	<i>Definition</i>
Apparent	object visible in the seascape/landscape.
Aspect	in Wales, an aspect is a component of the LANDMAP information recorded, organised and evaluated into a nationally consistent spatial data set. The landscape information is divided into five aspects- geological landscape, landscape habitats, visual and sensory, historic landscape and cultural landscape.
Aspect area	areas defined in each of the LANDMAP aspect assessments which are mutually exclusive
Assessment	term to describe all the various ways of looking at, analysing, evaluating and describing the seascape/landscape or assessing impacts on seascape/landscape and visual receptors.
Biodiversity	the variety of life including all the different habitats and species in the world.
Character	see seascape character or landscape character.
Characteristics	Elements, features and qualities which make a particular contribution to distinctive character.
Characterisation	the process of identifying areas of similar character, classifying and mapping them and describing their character. *
Classification	concerned with dividing the seascape into areas of distinct, recognisable and consistent common character and grouping areas of similar character together. It requires the identification of patterns in the seascape, created by the way the natural and human influences interact and are perceived and experienced to create character in the seascape.
<i>Conservation</i>	the protection and careful management of natural and built resources and the environment.
Consistent	relatively unchanging element or pattern across a given area of seascape/landscape.
Cultural heritage asset	see heritage asset
Cumulative impacts/effects	either additional changes caused by a proposed development in conjunction with similar developments or the combined effect of a set of developments, taken together
Description	capturing the overall essence of the character of the seascape, with reference to geology, landform, bathymetry, habitats, use of the coast and sea, cultural associations etc, drawing out the ways in which these factors interact together and are perceived and experienced and are associated with events and people. *
Elements	individual component parts of the seascape such as beaches, cliffs, submerged reefs, sea walls, groynes and rocky outcrops.
Features	particularly prominent or eye-catching elements such as lighthouses, rock stacks and coastal cliffs.

<i>Term</i>	<i>Definition</i>
Key characteristics	those combination of elements, features and qualities which optically important to the current character of the seascape and help give an area its distinct sense of place.
Distinctiveness	see sense of place
Diversity	(in terms of the function of an area) the variety of different functions of an area.
Dominant	main defining feature or pattern.
Effects	term used in environmental impact assessment (EIA) where effects are changes arising from the action, operation or implementation of a proposed development.
Heritage asset	a designated or non-designated building, monument, site, place, area or landscape positively identified as having a degree of historical significance meriting consideration in planning decisions. Designated heritage assets include world heritage sites, scheduled ancient monuments, protected wreck sites, battlefields, listed buildings and registered parks and gardens.
Impact	used as part of overall term, as in EIA or SVIA, to help describe the process of assessing potentially significant effects- see effects.
Inherent	dictionary definition- 'existing as an inseparable part'. In the context of sensitivity means the sensitivity of the seascape/landscape zone itself with all its component elements and features rather than its relationship with adjacent zones.
Integrity	unspoilt by large-scale, visually intrusive or other inharmonious development
Landcover	combinations of natural and man-made elements including vegetation that cover the land surface.
Landform	combinations of slope and elevation which combine to give shape and form to the land.
LANDMAP	<i>LANDMAP</i> is the national Geographical Information System (GIS) based information system for Wales, devised by the Countryside Council for Wales, for taking landscape into account in decision-making. It is a nationally consistent dataset divided into 5 aspects- geological landscapes, landscape habitats, visual and sensory, historical landscapes and cultural landscapes.
Landscape	an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors
Landscape and Visual Impact Assessment (LVIA)	Landscape and Visual Impact Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity. (GLVIA 2013)
Landscape Character	a distinct, recognisable and consistent pattern of elements, features and qualities in the landscape that makes one landscape different from another, rather than better or worse.

<i>Term</i>	<i>Definition</i>
Landscape Character Area (LCA)	these are single unique areas which are discrete geographical areas of a particular landscape type. Each has its own individual character and identity, even though it shares the same generic characteristics with other areas of the same type. These areas in Wales are primarily derived from LANDMAP aspects.
Landscape resource	The overall stock of the landscape and its component parts. (The landscape considered as a measurable finite resource like any other eg minerals, land, water).
Landscape value	the relative value or importance attached to landscapes and LANDMAP aspects. These express national or local consensus e.g. designations or recognition, quality, special qualities including perceptual aspects such as scenic beauty, tranquillity or wildness, cultural associations or conservation issues. Value is also attributed to each LANDMAP aspect using a variety of criteria. An indication of how an area is valued may also be gained from observation of how it is used- eg a popular path to a hilltop viewpoint.
Magnitude of effect	degree of change
Objective	method of assessment in which personal feelings and opinions do not influence characterisation or judgements.
Perception	perception combines the sensory (that which we receive through our senses) with the cognitive (knowledge and understanding gained from many sources and experiences).**
Prominent	Standing out, striking, sharp, unmistakable, easily seen feature or pattern in the landscape.
Protect	to keep from harm.
Qualities	aesthetic (objective visible patterns) or perceptual (subjective responses by the seascape/landscape assessor) attributes of the seascape/landscape such as those relating to scale or tranquillity respectively.
Quality	Based on judgements about the physical state of the seascape/landscape, and about its intactness, from visual, functional and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place.
Receptor, visual	people in a variety of different situations who can experience views within an area and who may be affected by change or development. Receptors can include users of public footpaths, open access land, roads, rail or cycleways or urban or rural residents.
Receptor, seascape/landscape	seascape/landscape character areas, designations, elements or features which may be affected by development
Remoteness	physical isolation, removal from the presence of people, infrastructure (roads and railways, ferry and shipping routes) and settlement
Resource	see seascape/landscape resource.

Term	Definition
Seascape	The definition of seascape has two definitions which are both relevant: An area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land with sea, by natural and/or human factors. (Derived from European Landscape Convention, 2000). Landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other. (UK Marine Policy Statement, 2011, 2.6.5.1)
Seascape character	Seascape character is a distinct and recognizable pattern of elements and features in the seascape that makes one seascape different from another, rather than better or worse.
Seascape character assessment (SCA)	SCA is the process of identifying and describing variation in the character of the seascape, and using this information to assist in managing change in the seascape. It seeks to identify and explain the unique combination of elements and features that make seascape distinctive. *
Seascape character areas	these are single unique areas which are discrete geographical areas of a particular seascape character. Each has its own individual character and identity. These areas may be made up of a number of seascape types.
Seascape character types (marine)	these are distinct types of seascape that are relatively homogenous in character. They are generic in nature in that they may occur in different locations but wherever they occur they share broadly similar combinations of bathymetry, seabed geology and wave climate characteristics.
Seascape quality	the physical state of the seascape. It includes the extent to which typical character is represented in individual areas, sometimes referred to as strength of character, the intactness of the seascape from visual, functional and ecological perspectives and the condition or state of repair of individual elements of the seascape.*
Seascape sensitivity	The extent to which a seascape can accept change of a particular type and scale without unacceptable adverse effects on its character.
Seascape and Visual Impact Assessment (SVIA)	is an established methodology which is used to assess the impact of the development or other use change on seascape, related landscape and visual amenity. It includes analysis of the effects during the construction, operation and decommissioning phases of the development, including any restoration or after uses.
Scenic quality	seascape/landscape with scenes of a picturesque quality with aesthetically pleasing elements in composition
Scheduled monument	monument/feature of historic interest and national importance with statutory protection, most with little prospect of economic use. Governed by the Ancient Monuments and Archaeological Areas Act 1979 as amended and updated by the Historic Environment (Wales) Act 2016.

Term	Definition
Sense Of Place	the character of a place that makes it locally identifiable or distinctive ie different from other places. Some features or elements can evoke a strong sense of place eg islands, forts, vernacular architecture
Sensory	that which is received through the senses ie sight, hearing, smell, touch.
Setting, of a landscape or heritage asset	The surroundings in which the asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or a negative contribution to an asset, may affect the ability to appreciate that significance or may be neutral.
Settlement	all dwellings/habitations, whether single or clustered in cities, towns and villages.
Significance	in environmental impact assessment- the importance of an effect. A significant effect needs to be taken into account in decision-making.
Subjective	method of assessment in which personal views and reaction are used in the characterisation process.
Topography	term used to describe the geological features of the Earth's surface eg mountains, hills, valleys, plains.
Unity	consistency of pattern over a wide area ie the repetition of similar elements, balance and proportion, scale and enclosure.
Value	see landscape value
Viewing distance	The distance between the eye and an image/visualisation of a development.
Visual Effects	the likely visual effects undergone by people that would result from a development proposal or change in land management.
Visual sensitivity	visual sensitivity is a measure of the degree to which change is likely to cause a visual impact within a particular seascape/landscape.
Wind energy development/ Wind farm	development consisting of one or more wind turbines and supporting infrastructure.
Wireline/wireframe	Digital virtual model of a development showing only the outline shape set on a virtual landscape/seascape surface, usually shown as a grid.
ZTV	ZTV or ZVI (Zone of Visual Influence) analysis is the process of determining the visibility of an object in the surrounding landscape. The process is objective in which areas of visibility or non-visibility are determined by computer software using a digital elevation dataset. The output from the analysis is used to create a map of visibility.

Abbreviations

AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
CLVIA	Cumulative Landscape and Visual Impact Assessment
CCW	Countryside Council for Wales
EIA	Environmental impact assessment
GLVIA	Guidelines for landscape and visual impact assessment
GIS	Geographic information system
HPMCZ	Highly protected marine conservation zone
HSC	Historic Seascape Characterisation
HW	High water
HWM	High water mark
ICZM	Integrated Coastal Zone Management
Km	Kilometres
LCA	Landscape character assessment <i>or</i> landscape character area
LDP	Local Development Plan
LVIA	Landscape and visual impact assessment
LW	Low water
LWM	Low water mark
m	Metres
MPA	Marine Planning Area
MPS	Marine Policy Statement
nm	Nautical miles
NSIP	Nationally significant infrastructure project
NRW	Natural Resources Wales
OESEA	Offshore Energy Strategic Environmental Assessment
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SM	Scheduled Monument
SCA	Seascape character assessment /seascape character area
SCT	Seascape character type
SLA	Special Landscape Area
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SLVIA	Seascape, landscape and visual impact assessment
SVIA	Seascape and visual impact assessment

Data Archive Appendix

Data outputs associated with this project are archived in [NRW to enter relevant corporate store and / or reference numbers] on server-based storage at Natural Resources Wales.

The data archive contains:

- [A] The final report in Microsoft Word and Adobe PDF formats.
- [B] A full set of maps produced in JPEG format.
- [C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers
- [F] A full set of images produced in [jpg/tiff] format.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <https://libcat.naturalresources.wales> (English Version) and <https://catllyfr.cyfoethnaturiol.cymru> (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no [NRW to insert this number]

DO NOT DELETE THE SECTION BREAK BELOW



Published by:
Natural Resources Wales
Address line one
Address line two
Address line three
Post Code

0000 000 000

© Natural Resources Wales [enter publication year]

All rights reserved. This document may be reproduced with prior permission of
Natural Resources Wales

Further copies of this report are available from:

Email: library@cyfoethnaturiolcymru.gov.uk