



Chapter 14

Summary of Residual Effects

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Chapter 14

14 Summary of Residual Effects

14.1 Introduction

1. This Chapter provides a summary of the predicted potential effects of the Proposed Development, proposed mitigation measures and the anticipated residual effects of the Proposed Development after mitigation measures have been applied.

14.2 Residual Effects

2. Residual effects during construction and operation are summarised below in **Table 14.1** and **Table 14.2** respectively. **Table 14.3** below summarises residual cumulative effects, where the Proposed Development has been considered in combination with other local wind energy developments. Where text is in **bold** within the tables, this refers to an effect that is considered to be significant under The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (hereinafter referred to as 'the EIA Regulations').
3. The tables provide a quick reference to the significant residual environmental effects and relevant mitigation measures identified within the technical chapters (see Chapters 5 to 13) of this Environmental Impact Assessment (EIA) Report. With successful implementation of the proposed mitigation measures predicted residual effects have been assessed as not significant in the context of the EIA Regulations, with the exception of landscape and visual.
4. The mitigation measures and commitments to be applied prior to construction, during construction and during operation of the Proposed Development can be found in **Appendix 14.1 Schedule of Commitments**.
5. The Proposed Development is predicted to result in some significant residual landscape and visual effects during operation. The Proposed Development would be a small extension to an operational windfarm which is an existing characteristic of the large scale, broad gently undulating foothills area. It would not introduce turbines into a distinctly separate site or character area. While the large scale of the turbines cannot be screened entirely, they would generally appear grounded within the forested landscape and significant effects on landscape character and visual amenity would be relatively contained to the south and south east of the Site. Whilst the proposed turbines are larger than those of the operational Harestanes windfarm, this allows more energy to be generated per turbine, thus avoiding the potential environmental effects associated with a greater number of smaller turbines required to provide the equivalent output. This move towards larger turbines is recognised by the Scottish Government¹.

¹ Scottish Government, 2017. Onshore Wind: Policy Statement. Available at:
<https://www.gov.scot/publications/onshore-wind-policy-statement-9781788515283/pages/2/>

Description of Effect (Construction Phase)	Pre-Mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
Chapter 5: Landscape and Visual					
No significant effects on landscape character or visual amenity was assessed for the Construction stage.					
Chapter 6: Hydrology, Geology, Hydrogeology and Soils					
Pollution of surface waters	Moderate	Minor Adverse	Embedded good practice measures as detailed within an approved Construction Environmental Management Plan (CEMP) and overseen by an Environmental Clerk of Works.	Moderate	Minor Adverse
Pollution of groundwater	Minor	Minor Adverse		Minor	Minor Adverse
Pollution of groundwater private water supplies (PWS)	Minor	Negligible		Minor	Negligible
Pollution effect on soil	Minor	Minor Adverse		Minor	Minor Adverse
Erosion causing loss of soil	Minor	Minor Adverse		Minor	Minor Adverse
Sedimentation of surface water	Minor	Minor Adverse		Minor	Minor Adverse
Sedimentation of groundwater PWS	Minor	Negligible		Minor	Negligible
Surface water drainage patterns	Minor	Minor Adverse		Minor	Minor Adverse
Modification of groundwater levels and flows	Minor	Minor Adverse		Minor	Minor Adverse
Modification of groundwater levels and flows on PWS	Moderate	Minor Adverse		Moderate	Minor Adverse
Modification of groundwater levels and flows on groundwater and Groundwater Dependent Terrestrial Ecosystems (GWDTE)	Minor	Negligible		Minor	Negligible
Loss of soil	Minor	Minor Adverse	None	Minor	Minor Adverse
Compaction of soil	Minor	Minor Adverse	None	Minor	Minor Adverse
Peat stability failure on soil loss	Minor	Minor Adverse	Additional site investigation, including post-felling Slope management Specific drainage design	Minor	Negligible
Peat stability failure causing surface water sedimentation	Moderate	Moderate Adverse	Additional site investigation, including post-felling Slope management; specific drainage design	Moderate	Minor Adverse
Peat stability failure modifying surface water drainage patterns	Moderate	Moderate Adverse	Additional site investigation, including post-felling assessment Slope management; specific drainage design	Minor	Minor Adverse
Chapter 7: Ecology and Biodiversity					
IEF Ancient Woodland Inventory: Un-named woodland 2 Habitat loss and/or degradation – Direct Effects	Low	Regional Level Significant	An arboricultural survey will be carried out to ensure tree felling is minimised and appropriate tree root protection areas are protected. Compensatory Planting proposals as set out in Chapter 4: Development Description. In addition, this area of ancient woodland will be subject to positive management measures to improve or maintain its current value. The specifics of such management measures will be agreed post-consent.	Low	Site Level Not Significant
IEF Ancient Woodland Inventory: Un-named woodland 2 Habitat loss and/or degradation – Indirect Effects	Negligible	Site Level	Embedded good practice measures as detailed within an approved CEMP and overseen by an Environmental Clerk of Works.	Negligible	Site Level Not Significant
Terrestrial Habitat Important Ecological Features (IEF): Fen and flush: M9 Blanket bog: M19 Wet heath: M15 Dry heath: H12, H21 Habitat loss and/or degradation	Low	Site Level Not Significant		Low	Site Level Not Significant
IEF Fauna: Red squirrel	Low	Site Level Not Significant		Low	Site Level Not Significant
IEF Fauna: Pine marten	Negligible	Site Level		Negligible	Site Level

Description of Effect (Construction Phase)	Pre-Mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
Injury or mortality; disturbance or displacement; habitat loss or degradation		Not Significant			Not Significant
IEF Fauna: Bats Injury or mortality;	Negligible	Site Level Not Significant		Negligible	Site Level Not Significant
IEF Fauna: Bats Disturbance or displacement; habitat loss or degradation	Low	Site Level Not Significant		Low	Site Level Not Significant
Chapter 8: Ornithology					
Goshawk Habitat loss (nesting)	None	None	None	None	None
Goshawk Habitat loss (foraging)	Negligible	Negligible	None	Negligible	Negligible
Goshawk Disturbance/Displacement (nesting)	Small	Slight Adverse	Surveys prior and during construction to identify active nests and inform requirement for work exclusion zones.	Negligible	Negligible
Goshawk Disturbance/Displacement (foraging)	Negligible	Negligible	None	Negligible	Negligible
Chapter 9: Noise					
Blast induced vibration and air overpressure	Slight	Negligible	Adherence to best practice measures ensure through the CEMP	Slight	Negligible
Chapter 10: Archaeology and Cultural Heritage					
Direct impact on Whitefaulds Quarry (HA44)	Moderate	Slight Beneficial	None	Moderate	Slight Beneficial
Potential direct impact on Whitefaulds Shepherd's Cairn (HA45)	Major	Slight Adverse	Site demarcation and avoidance	Minor	Neutral
Potential direct impact on Donken's Cottage Enclosure (HA49)	Minor	Slight Adverse	Site demarcation and avoidance	Negligible	Neutral
Potential direct impact on Donken's Cottage (HA50)	Major	Moderate Adverse	Site demarcation and avoidance	Negligible	Neutral
Direct impact on Clachanbirnie Wall (HA53)	Minor	Slight Adverse	Historic Building Recording	Negligible	Neutral
Direct impact on Pumro Fell Cairn (HA56)	Major	Slight Adverse	Earthwork Survey	Minor	Neutral
Potential direct impact on Clachanbirnie Sheepfold (HA58)	Minor	Slight Adverse	Site demarcation and avoidance	Minor	Neutral
Chapter 11: Access, Traffic and Transport					
Road Capacity	Minor	Slight Adverse	None	Minor	Slight Adverse
Severance	Minor	Slight Adverse	None	Minor	Slight Adverse
Driver Delay	Minor	Slight Adverse/Neutral	Convoy management, driver information on construction traffic routes and times and consideration to be given to use of on-site borrow pits and on-site concrete batching to reduce HGV trips. This would form part of the Construction Traffic Management Plan (CTMP).	Minor	Slight/Neutral
Pedestrian Delay	Negligible	Slight Adverse /Neutral	None	Negligible	Slight Adverse /Neutral
Pedestrian Amenity	Negligible	Slight Adverse /Neutral	None	Negligible	Slight Adverse /Neutral
Fear and Intimidation	Negligible	Slight Adverse /Neutral	None	Negligible	Slight Adverse /Neutral
Accidents and Safety	Moderate	Moderate Adverse	In relation to general construction traffic it is proposed that signage directing site operatives on the surrounding road network, including advising on advisory speed limits and where applicable the potential for interaction with vulnerable road users will be installed on the local road network. Signage will also be installed advising members of the public of an increase in HGV's operating in the area, in particular on the road network in the immediate vicinity of the proposed site	Minor	Slight Adverse

Description of Effect (Construction Phase)	Pre-Mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
			access junction, where there will be an increase in HGV's entering and leaving the Proposed Development. With regards to abnormal indivisible loads associated with the delivery of wind turbine components, convoy management, driver information on proposed access routes and formal escort procedures will be implemented to manage the movement of loads. All of the above measures would form part of the CTMP.		
Chapter 12: Socio-economics, Recreation and Tourism					
Estimated construction job generation and gross value added (GVA) in Dumfries and Galloway (approximately £3.1 million GVA and 52 jobs).	N/A	Minor Beneficial	None	N/A	Minor Beneficial
Estimated construction job generation and GVA in Scotland. (approximately £9.2 million GVA and 155 jobs).	N/A	Negligible	None	N/A	Negligible
Effects on tourism and tourism-based businesses (e.g. tourist accommodation)	N/A	Negligible	None	N/A	Negligible
Direct and indirect effects of the Proposed Development on recreational access and amenity.	N/A	Minor Adverse	Access Management Plan	N/A	Minor Adverse
Chapter 13: Other Issues					
Forestry loss	N/A	N/A	Commitment for compensatory planting	N/A	N/A
Damage to Ancient Woodland	N/A	N/A	Arboricultural survey	N/A	N/A
Aviation and Radar (radar line of sight)	N/A	N/A	None	N/A	N/A
Carbon Balance	N/A	N/A	None	N/A	N/A
Telecommunications	N/A	N/A	None	N/A	N/A
Shadow Flicker	N/A	N/A	None	N/A	N/A
Eskdalemuir Seismic Array (Seismic budget)	N/A	N/A	None	N/A	N/A

Table 14.1: Summary of Residual Construction Effects

Description of Effect (Operational phase)	Pre-mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
Chapter 5: Landscape and Visual					
Landscape Character					
Foothills with Forest	High-medium (within 5km) Low to Negligible elsewhere within the LCT	Major-Moderate Adverse Significant (within 5km) Minor Adverse and not significant (beyond 5km within the LCT)	None	High-medium (within 5km) Low to Negligible elsewhere within the LCT	Major-Moderate Adverse Significant (within 5km) Minor Adverse and not significant (beyond 5km within the LCT)
Foothills – Beattock	Medium (within 4km) Low to Negligible elsewhere within the LCT	Moderate Adverse Significant (within 4km) Minor Adverse and Not significant (beyond 4km within the LCT)	None	Medium (within 4km) Low to Negligible elsewhere within the LCT	Moderate Adverse Significant (within 4km) Minor Adverse and Not significant (beyond 4km within the LCT)
Middle Dale - Annandale	Medium (within 5km) Low to Negligible elsewhere within the LCT	Moderate-Minor Adverse and not Significant (within 5km) Minor Adverse and Not significant (beyond 5km within the LCT)		Medium (within 5km) Low to Negligible elsewhere within the LCT	Moderate-Minor Adverse and not Significant (within 5km) Minor Adverse and Not significant (beyond 5km within the LCT)
Upland fringe – Ae Fringe	Medium (southern part of LCT) No effect within north and west area of LCT.	Moderate Adverse Significant (southern part of LCT) No effects within north and west section	None	Medium (southern part of LCT) No effect within north and west area of LCT.	Moderate Adverse Significant (southern part of LCT) No effects within north and west section.
Upland Fringe – Torthorwald Fringe	Low	Moderate-Minor Adverse Not Significant	None	Low	Moderate-Minor Adverse Not Significant
Southern Uplands – Lowthers	Negligible	Negligible Neutral and Not Significant	None	Negligible	Negligible Neutral and Not Significant
Landscape Designations					
Torthorwald Ridge Regional Scenic Area	Low	Moderate-Minor Adverse Not Significant	None	Low	Moderate-Minor Adverse Not Significant
Talla-Hart Fell Wild Land Area	Negligible	Negligible Neutral Not Significant	None	Negligible	Negligible Neutral Not Significant
Visual Receptor Groups					
Parkgate/Kirkland/Burranche	Low	Moderate-Minor Adverse Not Significant	None	Low	Moderate-Minor Adverse Not Significant
South of Site – Auchencairn, Riddingwood and Amisfield	Medium-Low to Low	Moderate-Minor Adverse Not Significant	None	Medium-Low	Moderate Adverse Significant
Annandale – Nethermill, Templand, Johnstonebridge, Torthorwald	Medium (within 8km) reducing to Low beyond.	Moderate Adverse Significant (within approximately 8km) reducing to Moderate-Minor Adverse and Not Significant beyond.	None	Medium (within 8km) reducing to Low beyond.	Major-Moderate Adverse Significant (within approximately 8km) reducing to Moderate-Minor Adverse and Not Significant beyond.
Residential Visual Amenity					
Courancehill	Low-negligible	Moderate-Minor Adverse Not Significant	None	Low-negligible	Moderate-Minor Adverse Not Significant
Mollin Farm, Holmwood	Negligible	Negligible Neutral Not Significant	None	Negligible	Negligible Neutral Not Significant

Description of Effect (Operational phase)	Pre-mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
Lighting Effects					
<i>Landscape Character</i>					
Foothills with Forest – Ae unit, and Foothills – Beattock unit	High-Medium	Major-Moderate Adverse Significant	None	High-Medium	Major-Moderate Adverse Significant
Middle Dale – Annandale	Medium	Moderate-Minor Adverse Not Significant	None	Medium	Moderate-Minor Adverse Not Significant
Upland Fringe – Ae Fringe unit	Medium	Moderate Adverse Significant	None	Medium	Moderate Adverse Significant
Upland Fringe –Torthorwald Ridge unit	Low	Moderate-Minor Adverse Not significant	None	Low	Moderate-Minor Adverse Not significant
Southern Uplands – Lowthers	Low	Moderate-Minor Adverse Not Significant	None	Low	Moderate-Minor Adverse Not Significant
<i>Visual Receptors</i>					
Local Residents within 5km	High-Medium	Major-Moderate Adverse Significant	None	High-Medium	Major-Moderate Adverse Significant
Local Residents in isolated properties in Annandale, within 5-10km	Medium	Moderate Adverse Significant	None	Medium	Moderate Adverse Significant
Local Residents in villages and towns in Annandale, within 5-10km	Medium	Moderate-Minor Adverse Not Significant	None	Medium	Moderate-Minor Adverse Not Significant
Road users in Annandale, within 5-10km	Medium	Moderate-Minor Adverse Not Significant	None	Medium	Moderate-Minor Adverse Not Significant
Key Routes					
A701	Medium-Low	Moderate-Minor Adverse and Not Significant	None	Medium-Low	Moderate-Minor Adverse and Not Significant
Roman and Reivers	Low	Moderate-Minor Adverse Not Significant	None	Low	Moderate-Minor Adverse Not Significant
Annandale Way	Medium-Low (Raehills to Lochmaben section) Low to Negligible elsewhere along the route.	Moderate Adverse Significant (Raehills to Lochmaben sections) Minor to Negligible elsewhere along the route.	None	Medium-Low (Raehills to Lochmaben section) Low to Negligible elsewhere along the route.	Moderate Adverse Significant (Raehills to Lochmaben sections) Minor to Negligible elsewhere along the route.
Core Paths within Forest of Ae	Low	Moderate-Minor Adverse Not Significant	None	Low	Moderate-Minor Adverse Not Significant
Regional Cycle Route no. 10	Medium	Moderate-Minor Adverse Not Significant	None	Medium	Moderate-Minor Adverse Not Significant
Visitor Attractions					
Forest of Ae	Negligible	Negligible Neutral Not Significant	None	Negligible	Negligible Neutral Not Significant
Chapter 6: Hydrology, Geology, Hydrogeology and Soils					
Modification of Groundwater Levels and Flows	Minor	Minor Adverse	None	Minor	Minor Adverse
Chapter 7: Ecology and Biodiversity					
Terrestrial Habitat IEFs: Fen and flush: M9 Blanket bog: M19 Wet heath: M15 Dry heath: H12, H21 Habitat degradation	N/A	Site Level Not Significant	Embedded good practice measures as detailed within an approved CEMP and overseen by an Environmental Clerk of Works including site Species Protection Plans.	N/A	Site Level Not Significant

Description of Effect (Operational phase)	Pre-mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
IEF Fauna: Red squirrel, pine martin Injury or mortality; disturbance or displacement	Negligible	Site Level Not Significant		Negligible	Site Level Not Significant
IEF Fauna: Bats Injury or mortality;	High	Regional Level Significant	Bat Curtailment Strategy	Negligible	Site Level Not Significant
IEF Fauna: Bats Disturbance or displacement	Negligible	Site Level Not Significant	Embedded good practice measures as detailed within an approved CEMP and overseen by an Environmental Clerk of Works including site Species Protection Plans.	Negligible	Site Level Not Significant
Chapter 8: Ornithology					
Goshawk Disturbance/Displacement (nesting)	Negligible	Negligible	Post-construction surveys to identify goshawk distribution, nest locations and breeding success.	Negligible	Negligible
Goshawk Disturbance/Displacement (foraging)	Small	Slight Adverse	None	Small	Slight Adverse
Goshawk Barrier Effect	Small	Slight Adverse	None	Small	Slight Adverse
Chapter 9: Noise					
Operational turbine noise	N/A	Not Significant	Adherence to appropriate noise levels limits	N/A	Not Significant
Chapter 10: Archaeology and Cultural Heritage					
47 Heritage Assets	Various	Neutral	None	Various	Neutral
68 Heritage Assets	Various	Slight Adverse	None	Various	Slight Adverse
Whitefaulds Quarry (HA44)	Moderate	Slight Beneficial	None	Moderate	Slight Beneficial
Chapter 11: Access, Traffic and Transport					
No effects on access, traffic and transport are anticipated during the operation of the Proposed Development.					
Chapter 12: Socio-economics, Recreation and Tourism					
Estimated operation and maintenance job generation and GVA in Dumfries and Galloway. (approximately £160,558 to £267,597GVA and three to five jobs jobs)	N/A	Negligible	None	N/A	Negligible
Estimated operation and maintenance job generation and GVA in Scotland. (approximately £208,285 to £309,068 GVA and four to six jobs)	N/A	Negligible	None	N/A	Negligible
Effects on tourism and tourism-based businesses (e.g. tourist accommodation)	N/A	Negligible	None	N/A	Negligible
Direct and indirect effects of the Proposed Development on existing recreational access and amenity.	N/A	Negligible	None	N/A	Negligible
Direct effects on recreation once recreational enhancement measures were realised	N/A	Minor beneficial	None	N/A	Minor beneficial
Chapter 13: Other Issues					
Forestry and Land Use	N/A	N/A	None	N/A	N/A
Aviation and Radar (radar line of sight)	N/A	Significant	Measures are proposed to mitigate Line of Sight effects on Primary Surveillance Radar operated by NERL, Glasgow Prestwick Airport and the Ministry of Defence	N/A	Not Significant

Description of Effect (Operational phase)	Pre-mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
Carbon Balance	N/A	N/A	None	N/A	N/A
Telecommunications	N/A	N/A	None	N/A	N/A
Shadow Flicker	N/A	N/A	None	N/A	N/A
Eskdalemuir Seismic Array (Seismic budget)	N/A	N/A	Applicant is a member of the Eskdalemuir Working Group, which is working with government and industry representatives to seek to resolve this issue	N/A	N/A

Table 14.2: Summary of Residual Operational Effects

Description of Cumulative Effect	Pre-mitigation Effect		Mitigation Measure	Residual Effect	
	Magnitude	Significance		Magnitude	Significance
Chapter 5: Landscape and Visual					
No significant cumulative effects on landscape and visual are anticipated.					
Chapter 6: Hydrology, Geology, Hydrogeology and Soils					
No significant cumulative effects on hydrology, geology, hydrogeology and soils are anticipated.					
Chapter 7: Ecology and Biodiversity					
There are no significant effects anticipated on important ecological features either alone, or in combination with other plans and projects as a result of the Proposed Development.					
Chapter 8: Ornithology					
Goshawk Habitat Loss (foraging)	Negligible	Negligible	None	Negligible	Negligible
Goshawk Disturbance/Displacement	Small	Slight Not Significant	None	Small	Slight Not Significant
Goshawk Collision Mortality	Negligible	Negligible	None	Negligible	Negligible
Goshawk Barrier Effect	Small/Minor	Slight Not Significant	None	Small/Minor	Slight Not Significant
Chapter 9: Noise					
No significant cumulative noise effects on are anticipated.					
Chapter 10: Archaeology and Cultural Heritage					
No significant cumulative effects on archaeology and cultural heritage are anticipated.					
Chapter 11: Access, Traffic and Transport					
No significant cumulative effects on access, traffic and transport are anticipated.					
Chapter 12: Socio-economics, Recreation and Tourism					
Generation of additional construction related spend, employment and GVA	N/A	Minor Beneficial Not Significant	None	N/A	Minor Beneficial Not Significant
Tourism during construction	N/A	Negligible	None	N/A	Negligible
Recreation during construction	N/A	Negligible	None	N/A	Negligible
Generation of additional operation and maintenance related spend, employment and GVA (and community benefit funds and shared ownership offers)	N/A	Minor Beneficial Not Significant	None	N/A	Minor Beneficial Not Significant
Tourism during construction	N/A	Negligible	None	N/A	Negligible
Recreation during operation	N/A	Negligible	None	N/A	Negligible
Chapter 13: Other Issues					
Cumulative Effect Interactions	N/A	N/A	None	N/A	N/A

Table 14.3: Summary of Residual Cumulative Effects

Harestanes South Windfarm Extension Project Team

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