Mallard Pass
Solar Farm

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Environmental Statement Volume 1 Chapter 16: Interactions of Effects and Summary of Cumulative Effects

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16.0 Interaction of Effects and Summary of Cumulative Effects

16.1 Introduction

16.1.1. This chapter of the Environmental Statement (ES) reports the results of the interaction of effects assessment associated with the construction, operation and maintenance, and decommissioning of the Proposed Development. Interaction of effects result from the different types of effects generated by the Proposed Development having a combined effect on the same receptors.

16.1.2. This chapter also presents a summary of the cumulative effects (combined effects of the Proposed Development and other developments) that have been assessed within each technical chapter (***Chapters 6 to 15*** of the ES [**EN010127/APP/6.1)**] and the cumulative effects assessment methodology

16.2 Legislative and Policy Context

16.2.1. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') (Ref 16-1) make explicit reference to the requirement for an assessment of the effect interactions between types of effect, and states at Schedule 4 Part 4, that the EIA should contain:

"*A description of the aspects of the environment likely to be significantly affected by the Development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors*"

16.2.2. The Overarching National Policy Statement for Energy (EN-1) states in paragraph 4.2.5 that:

"when considering cumulative effects, the ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence)".

16.2.3. In relation to cumulative effects, Schedule 4 Part 5 of the EIA Regulations requires an ES to include:

"A description of the likely significant effects of the development on the environment resulting from, inter alia:

…(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources…

The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. […]".

16.2.4. The EIA Regulations, at regulation 5(2), makes explicit reference to the requirement for an assessment of the effect interactions between types of effect and states:

"The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC2 and Directive 2009/147/EC3;

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape;

(e) the interaction between the factors referred to in sub-paragraphs (a) to (d).”

16.2.5. The legislation does not provide further detail of what is required in respect of cumulative assessment.

16.3 Guidance

16.3.1. As set out in Section 2.5 of ***Chapter 2: Overview of the EIA Process*** of the ES, the Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (December 2015) (Ref 16-3) has formed the basis of assessing cumulative effects between the Proposed Development and other developments. The advice note does not however provide any guidance on assessing effect interactions resulting from different types of effects generated by the Proposed Development having a combined effect on the same receptors.

16.3.2. Guidance prepared by Hyder Consulting for the European Commission (Ref 16-8) defines effect interactions, differentiating them from cumulative effects between the Proposed Development and other developments, and provides some high-level guidance on how the results of the assessment should be presented. The assessment methodology presented below is based on this high-level guidance with professional judgement applied to inform the details of the methodology.

16.4 Interaction of Effects Assessment Methodology

16.4.1. Interaction effects occur when receptors are subject to residual effects under more than one environmental topic. As such, the residual effects presented in ***Chapters 6-15*** (regardless of whether they are classed as significant or not significant) have been reviewed to identify receptors subject to one or more types of effect to ensure that the interrelationship between each of the aspects of the environment likely to be affected by the Proposed Development has been properly evaluated and considered.

16.4.2. Interaction effects have been considered during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. In light of the comprehensive range of embedded design measures (set out within the Design and Access Statement [**EN010127/APP/7.3**] and ***Appendix 17.1: Mitigation Schedule*** [**EN010127/APP/6.2**]), effect interactions have only been considered where residual adverse or beneficial effects of at least slight or minor in at least one receptor group have been identified.

16.4.3. Likely effect interactions have been identified and qualitatively assessed using the findings of all technical assessments reported within this ES, together with professional judgement.

16.4.4. The approach to assessing effect interactions has followed a four-stage process, as outlined in the following paragraphs.

Stage 1: Topic-specific Assessments

16.4.5. The first stage of the assessment is presented in each of the individual environmental topic chapters and comprises the individual assessments of residual effects on receptors across the construction, operation and decommissioning phases of the Proposed Development. The embedded design mitigation, and additional mitigation were proposed in other technical chapters (i.e. ***Chapter 10: Noise and Vibration*** of this ES), is

assumed to be implemented before consideration of the effects in this chapter. Therefore, residual effects identified in ***Chapters 6 to 15*** of this ES have been considered in this chapter.

Stage 2: Identification of Receptors

16.4.6. Stage 2 involves a review of the assessments undertaken in the topic-specific chapters to identify 'receptor groups' requiring assessment within the effect interactions assessment. The term 'receptor group' is used to highlight that the approach taken for the effect interactions assessment does not assess every individual receptor assessed at the EIA stage, but rather potentially sensitive groups of receptors identified through the EIA process. Only receptors that are expected to incur more than one potential effect have been included in the assessment (e.g. noise and dust).

16.4.7. Receptors predicted to be affected by only a single effect (e.g. only noise) are excluded because there is considered to be no potential for effect interactions to take place. It should be noted that uncertainty in the assessment of effects, for most of the technical chapters in this ES, is dealt with by making conservative, or worst-case, assumptions.

16.4.8. The receptor groups identified within this ES can be broadly categorised as follows:

a. Landscape and visual resources: landscape character; visual receptors (residents; users of public rights of way; other visual receptors);
b. Ecology and biodiversity: ecological nationally designated sites;
c. Historic environment: settings of nationally designated heritage assets;

d. Access and highways: road users, residents; pedestrians/cyclists; sensitive local uses (e.g. schools, hospitals, local facilities);

e. Noise and vibration: residents, users of public rights of way; users of other land uses (e.g. places of work);

f. Air quality: residents; ecological designated sites;

g. Water resources and Ground conditions: land at risk of flooding land quality/soils;

h. Agriculture: agricultural land; farm businesses; and

i. Socio-economics: employment levels and tourism.

Stage 3: Assessment of potential effect interactions on receptor groups

16.4.9. Consideration is given to the potential for multiple effect interactions to arise for each of the identified receptor groups across the construction, operation and decommissioning of the Proposed Development.

16.4.10. This involves the assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor or receptor group. As an example, all effects on a given receptor such as local residents – construction dust and noise, increased traffic and visual change etc. may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

16.5 Interaction of Effects Assessment (Stage 2)

16.5.1. The following receptor groups that have the potential to be subject to effect interactions have been identified:

a. Landscape character

b. Visual receptors

c. Ecologically designated sites

d. Road users, pedestrians and cyclists, users of public rights of way, railway operations, train drivers, aviation operations

e. Residents and users of other land uses (e.g. places of work, heritage based visitor attractions)

f. Land at risk of flooding

g. Land quality/soils

h. Employment and tourism

16.5.2. Table 16-1 and Table 16-2 provide a qualitative assessment of the effect interactions on these receptor groups. Construction and decommissioning have been presented together because the types of effect interactions would be broadly the same with decommissioning effects likely to be less significant.

16.5.3. No significant adverse effect interactions have been identified.

Table 16-1 Assessment of Effect Interactions During Construction and Decommissioning

Receptor Group	Description of potential effect interactions	Residual significance of effect determined through EIA		Effect interactions	
Landscape and Visual; Noise and Vibration					
		Landscape and Visual	***Noise and Vibration***		
Public Rights of Way (PRoW) users	The combined effect of noise disturbance and the visual effect from construction works (construction plant, fencing, bare ground etc.) has the potential for increased adverse effects on PRoW users.	Moderate – Major adverse	Negligible – Minor adverse	This interaction of effects is not considered to result in any significant effects beyond the Moderate – Major adverse landscape effects given that noise disturbance will be short term as works are completed and move away from the PRoW.	
Ecology and Biodiversity; Air Quality; Water Resources and Ground Conditions					
		Ecology and Biodiversity	***Air Quality***	***Water Resources and Ground Conditions***	
Ecological designated sites	The combined effect of localised cabling and highways works and air quality effects has the potential for increased adverse	Non-significant	Negligible adverse	Negligible adverse	It is considered that the effect interactions have been adequately mitigated through embedded mitigation, the proposed green

Receptor Group	Description of potential effect interactions	Residual significance of effect determined through EIA		Effect interactions	
	effects on ecological designated sites. The Ryhall Pastures and Little Warren Verges SSSI is also hydrologically connected to the Order limits with the potential for further interactions of effects on this site.				infrastructure design and control documents such as the oCEMP, oDEMP and oWMP such that the resulting combined effects would be negligible and not significant.
Land Use and Soils; Water Resources and Ground Conditions					
		Land Use and Soils	***Water Resources and Ground Conditions***		
Soil quality	There is potential for an interaction of effects between adverse effects on soil quality/structure due to soil handling and trafficking of construction vehicles and contamination effects.	Negligible adverse	Slight adverse	The good practice mitigation measures secured through the oSMP (e.g. soil handling and storage) and the oCEMP (e.g. use of drip trays) are considered sufficient to avoid any significant adverse effect interactions on soil quality/structure.	
Land Use and Soils; Socio-economics					

Receptor Group	Description of potential effect interactions	Residual significance of effect determined through EIA		Effect interactions
		Land Use and Soils	***Socio-economics***	
Employment	Construction of the Proposed Development will have beneficial effects on employment in the local area, however, it will also have adverse effects on the agricultural businesses with the potential for an effect interaction on employment.	Negligible/minor beneficial effects	Slight adverse	The beneficial employment effects associated with construction are considered to significantly outweigh the slight adverse effects on agricultural businesses. As such, this effect interaction is not considered to result in a significant adverse effect and is likely to remain minor beneficial.

Table 16-2 Assessment of Effect Interactions During Operation

Receptor Group	Description of potential effect interactions	Residual significance of effect determined through EIA		Effect interactions
Landscape; Noise and Vibration				
		Landscape and Visual	***Noise and Vibration***	
PRoW users	The combined effect of noise disturbance from the plant (inverters, transformers etc.) and the visual effect of the Proposed	Moderate – Major adverse	Negligible – Minor adverse	This interaction of effects is not considered to result in any significant effects beyond the Moderate –

Receptor Group	Description of potential effect interactions	Residual significance of effect determined through EIA		Effect interactions
	Development has the potential for increased adverse effects on PRoW users.			Major adverse landscape effects given that noise disturbance minimised as secured by noise limits and provision for additional mitigation (plant selection, noise barriers etc.) in the oOEMP.

16.6 Summary of Cumulative Effects

Introduction

16.6.1. Section 2.5 of ***Chapter 2: Overview of EIA Process***, of this ES, presents the cumulative assessment methodology based on the Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (December 2015) including the short list of cumulative developments that were carried forward for assessment. The long list of cumulative developments initially identified is provided in ***Appendix 2.4*** which sets out the distance from the Proposed Development, temporal overlap, zone of influence, scale and nature of the other developments.

16.6.2. This subsection presents a summary of the cumulative effects assessed in ***Chapters 6 to 15*** of this ES.

Summary of Cumulative Effects

16.6.3. Table 16-3 presents a summary of the cumulative effects assessed in ***Chapter 6 to 15*** of this ES.

16.6.4. No significant adverse cumulative effects have been identified.

16.6.5. When considered in combination with other renewable generation projects over the construction, operation and maintenance, and decommissioning of the Proposed Development, there would be a major beneficial cumulative effect on climate change through the contribution to the UK's legally binding emission reduction targets.

16.6.6. During construction there would be moderate beneficial effects on employment as a result of the combined effect of the Proposed Development with other developments which have an overlapping construction phase.

Table 16-3 Summary of Cumulative Effects

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
Landscape and Visual					
5 63 64 65	1 3 3 3	2021/0379/MAF MCS Policy 4 STM1-H1 STM2-H2	The approved warehouse (2021/0379/MAF) is located within the existing industrial estate to the south of Essendine. The Proposed Development would potentially be viewed in-combination with the new warehouse from the A6121 Stamford Road approaching Essendine. The warehouse is centrally located within the existing industrial area to the south of Essendine and would appear of similar mass, scale and form as the surrounding industrial complex. The approved warehouse would have a minimal adverse effect on the landscape character and receptor groups that would be	The embedded mitigation which includes sensitive siting of the PV Arrays and substantial new native planting to provide visual screening have minimised effects on the visual receptor group that would be affected by the Proposed Development and the warehouse (2021/0379/MAF) as far as possible. No additional	Negligible adverse change the residual effects on landscape character and visual receptors.

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			affected by both the warehouse and the Proposed Development. All the other developments (MCS Policy 4, STM1-H1 and STM2-H2) assessed are located at a greater distance from the Proposed Development and are separated by intervening landform, woodland or settlements therefore are unlikely to incur any significant cumulative landscape and visual effects.	mitigation could be implemented to further ameliorate adverse effects.	
Ecology and Biodiversity					
Entire long-list	N/A	N/A	The Proposed Development has been shown to have few adverse effects on any feature of any significance, with the exception of the three Local Wildlife Sites (LWS) (Essendine hedgerow south side MacMillan Way LWS; Essendine Verge SE of the Freewards (N Side) LWS and Essendine Verge (NE	The adverse effects of the Proposed Development on the LWS will be compensated through habitat replacement (hedgerow	None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			Side) LWS). No cumulative developments included in the Long List have the potential for adverse effects on these LWSs.	planning and grassland re-seeding). No additional mitigation is required.	
Cultural Heritage					
Entire short-list	N/A	N/A	The Proposed Development is not anticipated to have any adverse effects on designated heritage assets or historic landscape features (via changes to their setting). The cumulative developments on the shortlist also do not have any potential for adverse effects on the setting of designated heritage assets. No cumulative developments within the short-list involve activities with the potential to have adverse effects on below ground archaeology that	No additional mitigation is required.	None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			the Proposed Development has the potential to affect. Furthermore, the Proposed Development is only anticipated to have minor adverse effects which are not significant.		
Access and Highways					
Entire short-list	N/A	N/A	There are no cumulative developments on the short-list with the potential for cumulative effects with the Proposed Development due to the limited overlap in construction programme and construction vehicle routing. Furthermore, the traffic associated with other cumulative developments have been accounted for within the Trip End Model Presentation Programme (TEMPro) growth factors that have formed the basis of the transport assessment. As such the assessment is inherently cumulative	No additional mitigation is required.	None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			and no significant adverse effects have been identified.		
Noise and Vibration					
Road traffic noise: Entire short-list	N/A	N/A	The effects of construction and operational activities associated with the Proposed Development (excluding construction traffic) are relatively localised and limited to a zone of approximately 500m to 1km from the Solar PV Site. The nearest developments on the short list with potential for cumulative effects are located at a distance of more than 1.5km from the Order limits. As such, there is no potential for cumulative effects. In relation road traffic noise, the assessment is based on traffic data that takes into account growth factors and is therefore inherently	No additional mitigation is required.	None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			cumulative and no significant effects were identified.		
Water and Ground Conditions					
18 19 20	N/A	N/A	During construction there is a possibility of sediment and pollutants migrating offsite from the propsoed cumulative developments, the Environment Agency (EA) and other relevant consultees have stipulated several construction control measures and permit requirements as part of the planning approval and application process for developments IDs 18 and 19, which should therefore limit the potential for cumulative effects through the use of construction good practice. Cumulative development ID 20 is a proposed solar and BESS site and is likely to be subject to an	No additional mitigation is required.	Negligible adverse Not significant

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			Environmental Permit from the EA, the terms of which can be relied on to reduce risk of pollution to a nominal level. Measures presented within the oWMP will limit the potential for sediment and pollutants to be transferred from the Proposed Development, meaning there is limited potential for the Proposed Development to contribute to a cumulative effect on water quality. During operation it is anticipated that there will be a minor reduction in flow rates for the Proposed Development due to the implementation of SuDS and through managed grassland. Therefore, cumulative effects during the operational phase on all receptors is therefore of Negligible significance.		

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
Land Use and Soils					
N/A	N/A	N/A	The effect on agricultural land associated with the Proposed Development is reversible in nature, unlike built development. Therefore, other potential developments on the short-list do not influence the decisions of individual landowners, and the use of other land, whether it is of BMV quality or not, would be due to other schemes, and is not considered cumulatively.	No additional mitigation is required.	None
Climate Change					
Entire short-list	N/A	N/A	The cumulative effect of the Proposed Development with other developments that will displace greenhouse gas emissions is considered to be a fundamental change in the climate effects of UK energy supply, which is a major	No additional mitigation is required.	Major beneficial (significant)

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			beneficial effect that is significant and will contribute to the UK's legally binding emission reduction targets.		
Socio-economics					
Employment: Entire short list Tourism and Recreation: 64 65	3 3	Employment: Entire short list Tourism and Recreation: Stamford North (STM1-H1) Stamford East (STM2-H2)	The combined effect of the construction employment, and linked supply chain benefits and contribution to Gross Value Added (GVA), generated by all the developments on the short-list is likely to be of considerable benefit to the study area economy, resulting in a temporary moderate beneficial effect, which is considered significant. During operation cumulative developments on the short-list will not generate considerable operational employment due to their nature as either infrastructure or as residential projects. Therefore, the	No additional mitigation is required.	Construction Employment: Moderate beneficial (significant) Operational Employment: None Tourism and Recreation: None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			overall combined cumulative effect on employment is likely to remain as negligible, which is not considered to be significant. With regard to decommissioning, it is unlikely that the construction or decommissioning of any of the developments on the short-list would overlap with the decommissioning phase of the Proposed Development. Therefore, the employment effects are likely to remain minor beneficial, which is not significant. There is no intervisibility between Stamford North (STM1-H1) and Stamford East (STM2-H2) and the Proposed Development. As such, there would be no cumulative effects on tourism and recreation.		

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
Air Quality					
Construction dust: None Road traffic emissions: entire short-list	N/A	Construction dust: None Road traffic emissions: entire short-list	There are no developments on the short-list that are in close enough proximity to the Proposed Development to have construction dust effects on receptors that would be subject to the negligible adverse dust effects generated by the Proposed Development. In relation road traffic noise, the assessment is based on traffic data that takes into account growth factors and is therefore inherently cumulative and no significant effects were identified.	No additional mitigation is required.	None
Arboriculture					
Entire short-list	N/A	None	The nearest developments on the short list are located at a distance of more than 1.5km from the Order	No additional mitigation is required.	None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
			limits. Effects on trees are very localised and relate to encroachment of root protection zones and direct damage. As such, at a distance of over 1.5km there is no potential for cumulative effects with other developments.		
Glint and Glare					
Entire short-list	N/A	None	There are no developments on the short-list with the potential to generate adverse effects on the same receptors considered in the glint and glare assessment.	No additional mitigation is required.	None
Major Accidents and Disasters					
Road traffic accidents: entire short list Fire, flooding, COMAH sites, major accident	N/A	N/A	The Access and Highways assessment is based on traffic data that takes into account growth factors and is therefore inherently a cumulative assessment and no significant effects relating to the	The outline Construction Traffic management Plan (oCTMP) is sufficient to	None

ID	Tier	Application Reference	Assessment of Cumulative Effects	Additional Mitigation	Residual Cumulative Effect
pipelines, electromagnetic fields or plant disease: none			increase of traffic accidents were identified. There are no developments on the short-list with the potential to increase the risk of major accidents and disasters associated with fire, flooding, COMAH sites, major accident pipelines, electromagnetic fields or plant disease.	mitigate the risk of road traffic accidents. No additional mitigation is required.	

16.7 References

16-1 Her Majesty's Stationary Office (HMSO) (2017) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

16-2 Department of Energy and Climate Change (2011) Overarching National Policy Statement (NPS) for Energy EN-1

16-3 Planning Inspectorate (2019) Advice Note Seventeen Cumulative Effects Assessment relevant to nationally significant infrastructure projects

16-4 Rutland County Council (2010) Minerals Core Strategy and Development Control Policies

16-5 South Kesteven District Council (2020) South Kesteven Local Plan 2011-2036

16-6 Design Manual for Roads and Bridges (DMRB), Volume 11, Section 2, Part 5 (HA 205/08) 'Assessment and Management of Environmental Effects'

16-7 European Commissions 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions'

16-8 Nuclear Safety and Civil Protection', Hyder Consulting UK Limited, 1999