

E1.18

ES Chapter 18 - Effect Interactions

Authored by Avison Young

November 2025

THE CROWN
 ESTATE

East Hemel

18. Effect Interactions

18.1 Introduction

18.1.1 This Chapter presents an assessment of the likely significant effect interactions of the Development; that is, the likely combination of significant environmental effects generated by the Development in isolation upon a particular receptor or group of receptors. Effect interactions were considered for the Works and the completed and operational Development.

18.1.2 This Chapter, prepared by Avison Young, was informed by all assessments undertaken as part of the Environmental Impact Assessment (EIA) and subsequently reported in the Environmental Statement (ES). As such, this Chapter draws from information contained in **ES Volume 2, Chapters 7 to 17** inclusive.

18.1.3 It should be noted that effect interactions are commonly referred to as a type of 'cumulative effect'. However, as outlined in **ES Volume 2, Chapter 2: EIA Methodology**, the likely cumulative effects of the Development with other Cumulative Schemes per environmental topic area scoped into the ES (different to 'effect interactions') are considered separately within **ES Volume 2, Chapter 7 to 17** inclusive.

18.2 Assessment Methodology and Significance Criteria

Assessment Methodology

18.2.1 There are no established methodologies for assessing, qualifying or quantifying the interaction of effects from a particular project upon a receptor or group of receptors. However, the following method was employed, based upon professional judgement, experience and a review of other similar assessments undertaken to inform recently published ESs for similar projects:

- A review of **ES Volume 2, Chapters 7 to 17** to establish:
 - The range of likely significant residual effects arising from the Works and the completed and operational Development in isolation.
 - The receptor or group of receptors affected by the identified likely significant residual effects of the Works and the completed and operational Development in isolation.
- Tabulation of the above, thereby allowing for the identification of receptors, or groups of receptors, that would experience multiple likely significant residual environmental effects.

18.2.2 Only likely significant residual effects were considered in this assessment. This is owing to the following:

- Insignificant effects would have no potential to interact with any other likely residual effects.
- It is not considered that multiple insignificant effects could lead to significant effect interactions.

- The reasonable assumption that all Primary and Tertiary Mitigation and additional (Secondary) Mitigation referred to in **ES Volume 2, Chapters 7 to 17** inclusive would be implemented.

Significance Criteria

18.2.3 The significance of each individual likely significant environmental effect was defined according to the methodologies outlined in **ES Volume 2, Chapters 7 to 17** inclusive. However, once again, there are no accepted methodologies which allow for the establishment of the relative significance of effect interactions. This is partially due to the fact that the assessment of effect interactions do not compare 'like effects' with 'like effects'.

18.2.4 In view of the above, this assessment can only identify the range of likely significant residual environmental effects (and their significance as defined in **ES Volume 2, Chapters 7 to 17** inclusive) upon a particular receptor or group of receptors. In order to undertake a worst-case scenario assessment, it was assumed that the combination of two or more significant residual effects from two or more environmental topics (i.e. **ES Volume 2, Chapters 7 to 17** inclusive) upon a particular receptor or group of receptors would constitute a **significant** effect interaction.

18.3 Likely Residual Effect Interactions of the Development and their Significance

The Works

18.3.1 **Table 18.1** summarises all likely significant residual effects associated with the Works, as identified in **ES Volume 2, Chapters 7 to 17** inclusive. **Table 18.1** also identifies the receptor or groups of receptors affected by the significant residual effects.

Table 18.1: Likely Significant Residual Effects of the Works

Type of Significant Residual Effect	Likely Significance of Residual Effect	Receptor / Group of Receptors
Landscape and Visual (LV)		
	Major Adverse	Users of Landscape Character Area (LCA) 094 – Buncefield Plateau (extended)
LV1 – Effect on landscape character	Moderate Adverse	Users of: <ul style="list-style-type: none"> • LCA H3 – Industrial Fringe • LCA 010 – St Stephen’s Plateau • LCA Industrial Urban Fringe: Hemel Hempstead Industrial Estate
LV2 – Effect on visual amenity	Moderate Adverse	Users and / or occupiers at the following locations: <ul style="list-style-type: none"> • Viewpoint 2: View from highway near Old Jeromes (residential)

Type of Significant Residual Effect	Likely Significance of Residual Effect	Receptor / Group of Receptors
		<ul style="list-style-type: none"> • Viewpoints 3 and 4: View from Punchbowl Lane • Viewpoints 6 and 26: View from highway on Redbourn Road / Hemel Hempstead Road <ul style="list-style-type: none"> • Viewpoint 9: View from PRoW near Flamsteadbury Farm • Viewpoint 11: View from PRoW near Baker's Farm • Viewpoint 13: View from PRoW near Brikklin Wood • Viewpoints 14 and 17: View from highway on A4147 Hemel Hempstead Road <ul style="list-style-type: none"> • Viewpoint 16: View from residential dwellings on Leverstock Green • Viewpoint 27N and 27S: Views from the Nickey Line (permissive path)
		<p>Users and / or occupiers at the following locations:</p> <p>Viewpoint 5: View from residential dwellings on Cherry Tree Lane and Punchbowl Lane (West)</p> <p>Major Adverse Viewpoint 18NE and 18SE: Views from residential dwellings on Westwick Row facing north-east and south-east</p> <p>Viewpoint 25 and 28: View from PRoWs FP009 and FP011 north of the Site</p> <p>Viewpoint 29: View from highway A414 Breakspear Way</p>
Ecology and Nature Conservation (ENC)		
<i>No significant residual effects identified</i>		
Heritage and Archaeology (HA)		
<i>No significant residual effects identified</i>		
Transport and Access (TA)		
<i>No significant residual effects identified</i>		
Air Quality (AQ)		
<i>No significant residual effects identified</i>		
Noise and Vibration (NV)		
<i>No significant residual effects identified</i>		
Agricultural Land Use (ALU)		
Irreversible loss of 116 hectares (ha) of best and most versatile (BMV) agricultural land within the	Major Adverse	BMV agricultural land

Type of Significant Residual Effect	Likely Significance of Residual Effect	Receptor / Group of Receptors
Site as a result of change in land use		
Irreversible loss of soil resource and function within the Site as a result of soil compaction and erosion	Minor Adverse	Soil resource and function
Water Resources and Flood Risk (WR)		
<i>No significant residual effects identified</i>		
Climate Change (CC)		
Embodied carbon emissions associated with the construction (upfront carbon A1-A5) of the Development, including buildings and infrastructure works	Moderate Adverse	Global climate
Socio-economics (SE)		
<i>No significant residual effects identified</i>		
Health (H)		
<i>No significant residual effects identified</i>		

18.3.2 **Table 18.2** reorganises the results of **Table 18.1** so that the full range of likely residual environmental effects arising from the Works upon specific receptors or groups of receptors can be easily identified. As noted earlier in this Chapter, the combination of two or more significant residual effects from two or more environmental topics upon a particular receptor or group of receptors was judged as a significant effect interaction.

Table 18.2: Likely Significant Effect Interactions of the Works

Receptor / Group of Receptors Affected	Likely Significant Residual Effects of the Works	Would Significant Effect Interactions be Experienced?
Users of the Site and immediate surrounds	WR1	No
The local population and users / residents at the following locations:	LV1, LV2	Yes. However, LV1 and LV2 would not result in multiple effects on the same receptor locations.

Receptor / Group of Receptors Affected	Likely Significant Residual Effects of the Works	Would Significant Effect Interactions be Experienced?
<ul style="list-style-type: none"> • Users of LCA 094 – Buncefield Plateau (extended) • LCA H3 – Industrial Fringe • LCA 010 – St Stephen’s Plateau • LCA Industrial Urban Fringe: Hemel Hempstead Industrial Estate • Viewpoint 2: View from highway near Old Jeromes (residential) • Viewpoints 3 and 4: View from Punchbowl Lane • Viewpoints 6 and 26: View from highway on Redbourn Road / Hemel Hempstead Road • Viewpoint 9: View from PRoW near Flamsteadbury Farm • Viewpoint 11: View from PRoW near Baker’s Farm • Viewpoint 13: View from PRoW near Brikklin Wood • Viewpoints 14 and 17: View from highway on A4147 Hemel Hempstead Road • Viewpoint 16: View from residential dwellings on Leverstock Green • Viewpoint 27N and 27S: Views from the Nickey Line (permissive path) <p>Viewpoint 5: View from residential dwellings on Cherry Tree Lane and Punchbowl Lane (West)</p> <p>Viewpoint 18NE and 18SE: Views from residential dwellings on Westwick Row facing north-east and south-east</p> <p>Viewpoint 25 and 28: View from PRoWs FP009 and FP011 north of the Site</p> <ul style="list-style-type: none"> • Viewpoint 29: View from highway A414 Breakspear Way 		

18.3.3 **Table 18.2** demonstrates that no significant residual effect interactions attributable to the Works would be anticipated.

The Completed and Operational Development

18.3.4 **Table 18.3** summarises all likely significant residual effects associated with the completed and operational Development, as identified in **ES Volume 2, Chapters 7 to 17** inclusive. **Table 18.3** also identifies the receptor or groups of receptors affected by the significant residual effect.

Table 18.3: Likely Significant Residual Effects of the Completed and Operational Development

Type of Significant Residual Effect	Likely Significance of Residual Effect	Receptor / Group of Receptors
Landscape and Visual (LV)		
LV3 – Effect on landscape character	Major Adverse in Year 1, reducing to Moderate Adverse by Year 15	Users of LCA 094 – Buncefield Plateau (extended)
	Major Adverse in Year 1, reducing to Moderate Adverse by Year 15	Users and / or occupiers at the following locations: <ul style="list-style-type: none"> Viewpoint 5: View from residential dwellings on Cherry Tree Lane and Punchbowl Lane (West) Viewpoint 18NE and 18SE: Views from residential dwellings on Westwick Row facing north-east and south-east
LV4 – Effect on visual amenity	Moderate Adverse in Year 1 and 15	Users and / or occupiers at the following locations: <ul style="list-style-type: none"> Viewpoint 2: View from highway near Old Jeromes (residential) Viewpoint 13: View from PRoW near Brikklin Wood Viewpoints 25 and 28: View from PRoWs FP009 and FP011 north of the Site
	Moderate Adverse in Year 1	Users and / or occupiers at the following locations: <ul style="list-style-type: none"> Viewpoint 9: View from PRoW near Flamsteadbury Farm Viewpoints 14 and 17: View from highway on Hemel Hempstead Road A4147 (east and west)

Type of Significant Residual Effect	Likely Significance of Residual Effect	Receptor / Group of Receptors
		<ul style="list-style-type: none"> Viewpoint 16: View from residential dwellings on Leverstock Green
Ecology and Nature Conservation (ENC)		
<i>No significant residual effects identified</i>		
Heritage and Archaeology (HA)		
HA1 – Effect on the setting of the Grade II-listed Wood End Cottages	Moderate Adverse	Wood End Cottages
Transport and Access (TA)		
<i>No significant residual effects identified</i>		
Air Quality (AQ)		
<i>No significant residual effects identified</i>		
Noise and Vibration (NV)		
<i>No significant residual effects identified</i>		
Agricultural Land Use (ALU)		
<i>No significant residual effects identified</i>		
Water Resources and Flood Risk (WR)		
WR1 – Maintenance of existing overland flow routes as to not increase floor risk	Minor Beneficial	Local residents within and immediately surrounding the Site
Climate Change (CC)		
CC1 – Effect of the operational carbon emissions of the Development (B6), including impacts from buildings	Major Adverse	Global climate
CC2 – Effect of the embodied carbon emissions associated with the operation and end-of-life emissions of the Development (B1-B5, C1-C4 lifecycle embodied), including impacts from buildings and infrastructure works	Major Adverse	Global climate
CC3 – Effect of flooding from extreme rainfall events (surface water flooding), heatwaves and overheating, warmer summers and increased solar radiation	Major to Moderate Adverse	Natural environment within the Site

Type of Significant Residual Effect	Likely Significance of Residual Effect	Receptor / Group of Receptors
Socio-economics (SE)		
SE1 – Effect on the economy	Major Beneficial effect at the local and district levels	Local and district economies
SE2 – Effect on housing	Major Beneficial at the local and district levels	Local and district populations
SE3 – Effect on primary healthcare	Moderate Beneficial at the local level	Local population
SE4 – Effect on primary education	Moderate Beneficial at the local level	Local population
SE5 – Effect on open space	Moderate Beneficial at the local level	Local population
SE6 – Effect on community	Moderate Beneficial at the local level	Local population
SE7 – Effect on leisure	Major Beneficial at the local level and Moderate Beneficial at the district levels	Local and district populations
Health (H)		
<i>No significant residual effects identified</i>		

18.3.5 **Table 18.4** reorganises the results of **Table 18.3** so that the full range of likely residual environmental effects arising from the completed and operational Development upon specific receptors or groups of receptors can be easily identified. As noted earlier in this Chapter, the combination of two or more significant residual effects from two or more environmental topics upon a particular receptor or group of receptors was judged as a **significant** effect interaction.

Table 18.4: Likely Significant Effect Interactions of the Completed and Operational Development

Receptor / Group of Receptors Affected	Likely Significant Residual Effects of the Completed and Operational Development	Would Significant Effect Interactions be Experienced?
Users of the Site and immediate surrounds	WR1	No
The local population and users / residents at the following locations: <ul style="list-style-type: none"> Users of Landscape Character Area (LCA) 094 – Buncefield Plateau (extended) Viewpoint 5: View from residential dwellings on Cherry Tree Lane and Punchbowl Lane (West) 	LV3, LV4, SE2, SE3, SE4, SE5, SE6, SE7	Yes. However, SE2-SE7 represent beneficial effects for the local population, while LV3 and LV4 would not result in multiple effects on the same receptor locations.

Receptor / Group of Receptors Affected	Likely Significant Residual Effects of the Completed and Operational Development	Would Significant Effect Interactions be Experienced?
<ul style="list-style-type: none"> Viewpoint 18NE and 18SE: Views from residential dwellings on Westwick Row facing north-east and south-east Viewpoint 2: View from highway near Old Jeromes (residential) Viewpoint 13: View from PRow near Brikklin Wood Viewpoints 25 and 28: View from PRow's FP009 and FP011 north of the Site Viewpoint 9: View from PRow near Flamsteadbury Farm Viewpoints 14 and 17: View from highway on Hemel Hempstead Road A4147 (east and west) Viewpoint 16: View from residential dwellings on Leverstock Green 		
District population	SE2, SE7	No
Local economy	SE1	No
District economy	SE1	No
Wood End Cottages	HA1	No
Global climate	CC1, CC2	No
Natural environment within the Site	CC3	No

18.3.6 **Table 18.4** demonstrates that significant effect interactions would be attributable to the completed and operational Development. A significant effect interaction would occur to the local population and users / residents as result of significant adverse effects to LCA 094 – Buncefield Plateau (extended) and eleven nearby representative viewpoints and significant beneficial effects in regard to housing, primary healthcare and education, open space, community and leisure. No further mitigation is considered appropriate for this effect interaction beyond that which is already proposed.

18.4 Conclusions

- 18.4.1 This Chapter has presented an assessment of the likely significant effect interactions of the Development; that is, the likely combination of significant environmental effects generated by the Development in isolation upon a particular receptor or group of receptors. Effect interactions were considered for the Works and the completed and operational Development.
- 18.4.2 During the Works, no significant residual effect interactions attributable to the Works are anticipated. Therefore, it is considered that no additional mitigation over and above that already stated previously is considered necessary.
- 18.4.3 Once the Development is completed and operational, there would be significant effects interaction on the local population and users / residents in respect of landscape character and visual amenity (adverse in nature) and housing, primary healthcare and education, open space, community and leisure (beneficial in nature).