Figure 9.9: 20m and 50m Distance Bands around Roads within 500m of Site

9.6.21 The area is considered of medium sensitivity to dust soiling and of low sensitivity to human health effects from trackout.

Risk and Significance

9.6.22 Risk categories, without mitigation, are set out in Table 9.10, and have been used to determine the appropriate level of mitigation to be applied during the construction phase.

Table 9.10: Summary of Risk of Impacts (Development) Without Mitigation

Source	Dust Soiling	Human Health
Earthworks	Medium Risk	Low Risk
Construction	Medium Risk	Low Risk
Trackout	Medium Risk	Low Risk

9.6.23 Without mitigation, the construction phase of the Development would result in a medium risk of temporary, medium-term, direct adverse effects. The IAQM guidance is clear, however, that with appropriate mitigation in place, the residual effect will be 'not significant'.

Mitigation, Monitoring and Residual Effects

9.6.24 Measures to mitigate dust emissions will be required during the construction phase of the development in order to minimise effects upon nearby sensitive receptors. These are described in Section 9.5 of this chapter. Provided mitigation measures are implemented and maintained, the residual effects will remain as assessed and will be 'not significant'.

9.7 Completed Development

Assessment of Human Health Effects

Eastern Development

Nitrogen Dioxide

9.7.1 Predicted annual mean concentrations of NO_2 in 2025 at existing receptors are set out in Table 9.11 for both the 'Without Development' and 'With Eastern Development' scenario. The impact at each receptor is also described using the impact descriptors in Table 9.3.

Table 9.11: Predicted Impacts of the Eastern Development on NO_2 Concentrations in 2025 (µg/m^3)

Receptor	Without Development	With Eastern Development	% Change [iv]	Impact Descriptor
1	13.8	13.9	0	Negligible
2	15.9	16.3	1	Negligible
3	16.0	16.4	1	Negligible
4	16.6	16.8	1	Negligible
5	17.6	18.0	1	Negligible
6	15.9	16.0	0	Negligible
7	17.9	18.5	2	Negligible
8	10.1	10.2	0	Negligible
9	11.4	11.6	1	Negligible
10	11.2	11.4	1	Negligible
11	17.3	17.9	2	Negligible
12	13.5	13.8	1	Negligible
13	13.7	14.0	1	Negligible
14	13.7	14.0	1	Negligible
15	14.4	14.5	0	Negligible
16	14.4	14.5	0	Negligible
17	14.2	14.3	0	Negligible
Objective	40		-	-

9.7.2 As shown in Table 9.11, annual mean NO_2 concentrations are well below the objective at all modelled receptors. The Eastern Development will cause an increase in concentrations of between 0% and 2% of the objective (when rounded), with the impact being described as negligible at all receptors.

Particulate Matter

9.7.3 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ in 2025 at existing receptors are set out in Table 9.12 and Table 9.13 respectively, for both the 'Without Development' and 'With Eastern Development' scenario. The impact at each receptor is also described using the impact descriptors in Table 9.3.

[iv] % changes are relative to the objective and rounded to the nearest whole number.

Table 9.12: Predicted Impacts of the Eastern Development on PM_{10} Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	With Eastern Development	% Change [iv]	Impact Descriptor
1	16.0	16.0	0	Negligible
2	16.1	16.1	0	Negligible
3	16.1	16.1	0	Negligible
4	15.6	15.6	0	Negligible
5	15.7	15.8	0	Negligible
6	16.3	16.3	0	Negligible
7	14.8	14.8	0	Negligible
8	14.1	14.1	0	Negligible
9	14.3	14.3	0	Negligible
10	14.2	14.3	0	Negligible
11	14.9	15.0	0	Negligible
12	14.7	14.8	0	Negligible
13	14.8	14.8	0	Negligible
14	14.7	14.8	0	Negligible
15	14.8	14.8	0	Negligible
16	15.1	15.1	0	Negligible
17	15.1	15.1	0	Negligible
Criterion [v]	32		-	-

Table 9.13: Predicted Impacts of the Completed Eastern Development on $PM_{2.5}$ Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	With Eastern Development	% Change [iv]	Impact Descriptor
1	9.5	9.5	0	Negligible
2	9.5	9.6	0	Negligible
3	9.5	9.6	0	Negligible
4	9.6	9.6	0	Negligible
5	9.7	9.7	0	Negligible
6	9.6	9.6	0	Negligible
7	9.0	9.0	0	Negligible
8	8.7	8.7	0	Negligible
9	8.8	8.8	0	Negligible
10	8.8	8.8	0	Negligible
11	9.2	9.2	0	Negligible
12	9.8	9.8	0	Negligible
13	9.8	9.8	0	Negligible
14	9.8	9.8	0	Negligible
15	9.8	9.8	0	Negligible

[v] While the annual mean PM_{10} objective is 40 $\mu g/m^3$, 32 $\mu g/m^3$ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible. A value of 32 $\mu g/m^3$ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance.

Receptor	Without Development	With Eastern Development	% Change [iv]	Impact Descriptor
16	9.4	9.4	0	Negligible
17	9.4	9.4	0	Negligible
Objective	25		-	-

9.7.4 As shown in Tables 9.12 and 9.13 annual mean concentrations of PM_{10} and $PM_{2.5}$ are well below the objectives at all receptors. The Eastern Development will cause an increase in concentration of 0% of the objective (when rounded) at all receptors, with all the impacts being described as negligible.

9.7.5 Concentrations of PM_{10} are all well below 32 µg/m^3, and there is thus unlikely to be a risk of exceedance of the 24-hour mean PM_{10} objective at any receptor.

Significance of Operational Effects

9.7.6 Concentrations of all pollutants are all well below the relevant air quality objectives at all receptors. The Eastern Development will result permanent, long-term, direct adverse effects on air quality, but these are all described as 'negligible' and thus not significant.

Western Development

Nitrogen Dioxide

9.7.7 Predicted annual mean concentrations of NO_2 in 2025 at existing receptors are set out in Table 9.14 for both the 'Without Development' and 'With Western Development' scenario. The impact at each receptor is also described using the impact descriptors in Table 9.3.

Table 9.14: Predicted Impacts of the Completed Western Development on NO_2 Concentrations in 2025 (µg/m^3)

Receptor	Without Development	With Western Development	% Change [iv]	Impact Descriptor
1	13.8	16.2	6	Minor Adverse
2	15.9	17.9	5	Negligible
3	16.0	17.5	4	Negligible
4	16.6	16.9	1	Negligible
5	17.6	18.1	1	Negligible
6	15.9	16.6	2	Negligible
7	17.9	19.0	3	Negligible
8	10.1	10.3	1	Negligible
9	11.4	11.8	1	Negligible
10	11.2	11.5	1	Negligible
11	17.3	18.4	3	Negligible
12	13.5	14.0	1	Negligible
13	13.7	14.2	1	Negligible
14	13.7	14.2	1	Negligible
15	14.4	14.6	1	Negligible
16	14.4	14.6	1	Negligible
17	14.2	14.4	1	Negligible

Receptor	Without Development	With Western Development	% Change [iv]	Impact Descriptor
Objective	40		-	-

9.7.8 As shown in Table 9.14, annual mean NO_2 concentrations are well below the objective at all receptors. The Western Development will cause an increase in concentrations of between 1% and 6% of the objective (when rounded). The impact is described as negligible at all receptors, except for at Receptor 1 where the impact is described as minor adverse. This receptor is located close to the Western Site entrance, and is considered to be the receptor most sensitive to changes in traffic emissions associated with the Western Development.

Particulate Matter

9.7.9 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ in 2025 at existing receptors are set out in Table 9.15 and Table 9.16 respectively, for both the 'Without Development' and 'With Western Development' scenario. The impact at each receptor is also described using the impact descriptors in Table 9.3.

Table 9.15: Predicted Impacts of the Completed Western Development on PM_{10} Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	With Western Development	% Change [iv]	Impact Descriptor
1	16.0	16.2	1	Negligible
2	16.1	16.2	0	Negligible
3	16.1	16.2	0	Negligible
4	15.6	15.7	0	Negligible
5	15.7	15.8	0	Negligible
6	16.3	16.3	0	Negligible
7	14.8	14.9	0	Negligible
8	14.1	14.1	0	Negligible
9	14.3	14.3	0	Negligible
10	14.2	14.3	0	Negligible
11	14.9	15.1	0	Negligible
12	14.7	14.8	0	Negligible
13	14.8	14.8	0	Negligible
14	14.7	14.8	0	Negligible
15	14.8	14.8	0	Negligible
16	15.1	15.1	0	Negligible
17	15.1	15.1	0	Negligible
Criterion [v]	32		-	-

Table 9.16: Predicted Impacts of the Completed Western Development on $PM_{2.5}$ Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	With Western Development	% Change [iv]	Impact Descriptor
1	9.5	9.6	1	Negligible
2	9.5	9.6	0	Negligible

Receptor	Without Development	With Western Development	% Change [iv]	Impact Descriptor
3	9.5	9.6	0	Negligible
4	9.6	9.6	0	Negligible
5	9.7	9.7	0	Negligible
6	9.6	9.7	0	Negligible
7	9.0	9.1	0	Negligible
8	8.7	8.7	0	Negligible
9	8.8	8.8	0	Negligible
10	8.8	8.8	0	Negligible
11	9.2	9.2	0	Negligible
12	9.8	9.8	0	Negligible
13	9.8	9.8	0	Negligible
14	9.8	9.8	0	Negligible
15	9.8	9.8	0	Negligible
16	9.4	9.4	0	Negligible
17	9.4	9.4	0	Negligible
Objective	25		-	-

9.7.10 As shown in Tables 9.15 and 9.16 annual mean concentrations of PM_{10} and $PM_{2.5}$ are well below the objectives at all receptors. The Western Development will cause an increase in concentration of 0% of the objective (when rounded) at all receptors, except at Receptor 1 where the increase will be 1% for both PM_{10} and $PM_{2.5}$. All the impacts are described as negligible.

9.7.11 Concentrations of PM_{10} are all well below 32 µg/m^3, and there is thus unlikely to be a risk of exceedance of the 24-hour mean PM_{10} objective at any receptor.

Significance of Operational Effects

9.7.12 For annual mean NO_2 the Western Development will result permanent, long-term, direct minor adverse effects on air quality at one receptor, representing a single residential property, with permanent, long-term, direct negligible adverse effects at the remaining receptors. For PM_{10} and $PM_{2.5}$ negligible adverse effected are predicted at all receptors. Concentrations of all pollutants are well below the relevant air quality objectives at all receptors. Given the concentrations are below the air quality objective for all pollutants and only one minor adverse impact is predicted for annual mean NO_2, with the remaining 16 receptors having a negligible impact the operational effects of the Western Development are thus determined to be not significant.

Development

Nitrogen Dioxide

9.7.13 Predicted annual mean concentrations of NO_2 in 2025 at existing receptors are set out in Table 9.17 for both the 'Without Development' and 'Completed Development' scenario. The impact at each receptor is also described using the impact descriptors in Table 9.3.

Table 9.17: Predicted Impacts of the Completed Development on NO_2 Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	Completed Development	% Change [iv]	Impact Descriptor
1	13.8	16.3	6	Minor Adverse
2	15.9	18.2	6	Minor Adverse
3	16.0	17.9	5	Negligible
4	16.6	17.2	2	Negligible
5	17.6	18.4	2	Negligible
6	15.9	16.8	2	Negligible
7	17.9	19.7	5	Negligible
8	10.1	10.5	1	Negligible
9	11.4	12.0	2	Negligible
10	11.2	11.8	2	Negligible
11	17.3	19.0	4	Negligible
12	13.5	14.3	2	Negligible
13	13.7	14.5	2	Negligible
14	13.7	14.4	2	Negligible
15	14.4	14.7	1	Negligible
16	14.4	14.7	1	Negligible
17	14.2	14.6	1	Negligible
Objective	40		-	-

9.7.14 As shown in Table 9.17, annual mean NO_2 concentrations are well below the objective at all receptors. The Development will cause an increase in concentrations of between 1% and 6% of the objective (when rounded). The impact is described as minor adverse at two receptors (Receptor 1 and Receptor 2), each representing a single residential property; Receptor 1 is located close to the Western Site entrance (as discussed in Paragraph 9.7.8); Receptor 2 is located in proximity to Baynards Green roundabout and A43, where the combined impact of both the Eastern and Western Site lead to a large increase in traffic. The impacts are described as negligible at the remaining receptors.

Particulate Matter

9.7.15 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ in 2025 at existing receptors are set out in Table 9.18 and Table 9.19 respectively, for both the 'Without Development' and 'Completed Development' scenario. The impact at each receptor is also described using the impact descriptors in Table 9.3.

Table 9.18: Predicted Impacts of the Completed Development on PM_{10} Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	Completed Development	% Change [iv]	Impact Descriptor
1	16.0	16.2	1	Negligible
2	16.1	16.3	1	Negligible
3	16.1	16.2	0	Negligible
4	15.6	15.7	0	Negligible
5	15.7	15.8	0	Negligible

Receptor	Without Development	Completed Development	% Change [iv]	Impact Descriptor
6	16.3	16.3	0	Negligible
7	14.8	15.0	1	Negligible
8	14.1	14.1	0	Negligible
9	14.3	14.3	0	Negligible
10	14.2	14.3	0	Negligible
11	14.9	15.1	1	Negligible
12	14.7	14.8	0	Negligible
13	14.8	14.8	0	Negligible
14	14.7	14.8	0	Negligible
15	14.8	14.9	0	Negligible
16	15.1	15.1	0	Negligible
17	15.1	15.1	0	Negligible
Criterion [v]	32		-	-

Table 9.19: Predicted Impacts of the Completed Development on $PM_{2.5}$ Concentrations in 2025 ($\mu g/m^3$)

Receptor	Without Development	Completed Development	% Change [iv]	Impact Descriptor
1	9.5	9.6	1	Negligible
2	9.5	9.6	0	Negligible
3	9.5	9.6	0	Negligible
4	9.6	9.6	0	Negligible
5	9.7	9.7	0	Negligible
6	9.6	9.7	0	Negligible
7	9.0	9.1	0	Negligible
8	8.7	8.7	0	Negligible
9	8.8	8.8	0	Negligible
10	8.8	8.8	0	Negligible
11	9.2	9.3	0	Negligible
12	9.8	9.8	0	Negligible
13	9.8	9.8	0	Negligible
14	9.8	9.8	0	Negligible
15	9.8	9.8	0	Negligible
16	9.4	9.4	0	Negligible
17	9.4	9.4	0	Negligible
Objective	25		-	-

9.7.16 As shown in Tables 9.18 and 9.19 annual mean concentrations of PM_{10} and $PM_{2.5}$ are well below the objectives at all receptors. The Development will cause an increase in concentration of between 0% and 1% of the objective (when rounded) at all receptors for both PM_{10} and $PM_{2.5}$. All the impacts are described as negligible.

9.7.17 Concentrations of PM_{10} are all well below 32 $\mu g/m^3$, and there is thus unlikely to be a risk of exceedance of the 24-hour mean PM_{10} objective at any receptor.

Significance of Operational Effects

9.7.18 For annual mean NO_2 the Development will result permanent, long-term, direct minor adverse effects on air quality at two receptors, with permanent, long-term, direct negligible adverse effects on air quality at the remaining receptors. For PM_{10} and $PM_{2.5}$ negligible adverse effects are predicted at all receptors. Concentrations of all pollutants are well below the relevant air quality objectives at all receptors. Given the concentrations are below the air quality objective for all pollutants and only two minor adverse impacts are predicted for annual mean NO_2, (which represent individual residential properties) whilst the remaining 15 receptors having a negligible impact, the operational effects of the Development are thus determined to be not significant.

Assessment of Effects on Designated Ecological Sites

9.7.19 To calculate the contribution of NO_x emissions from the M40 and the B430 on the Ardley Cutting and Quarry Site SSSI traffic data for the baseline and cumulative developments and separately for the Development have been run in Defra's EFT for the year 2025. For context the Development's NO_x emissions have been compared against the baseline and cumulative development scenario. The results are presented in Table 9.20.

Table 9.20: Contribution of the Development to Total Road NO_x Emissions in 2025

Scenario (2025)	AADT	%HDV	NO_x emissions (g/km/s)	% Change
M40 South of J10				
Baseline + Cumulative Development	135,323	14.2	0.43256	-
Eastern Development	637	51.2	0.00171	0.4
Western Development	1,146	51.1	0.00308	0.7
Development	1,783	51.1	0.00479	1.1
B430				
Baseline + Cumulative Development	15,764	4.8	0.03404	-
Eastern Development	126	0.0	0.00026	0.8
Western Development	226	0.0	0.00047	1.4
Development	352	0.0	0.00074	2.2

9.7.20 The results in Table 9.20 demonstrate that the Eastern Development will lead to an increase in NO_x emissions of 0.4% along the M40 and 0.8% along the B430; the Western Development will lead to an increase in NO_x emissions of 0.7% along the M40 and 1.4% along the B430; and the completed Development will lead to an increase in NO_x emissions of 1.1% along the M40 and 2.2% along the B430.

9.7.21 Both the M40 and the B430 roads pass through the SSSI boundary via a road bridge which is elevated over both the SSSI and the Chiltern Main Line railway. The M40 and B430 cross a very small area of the SSSI in relation to its size (approximately 50m in both cases), most of which is the railway. Given concentrations of NO_x decrease exponentially with distance from the carriageway, it is likely that any effect of the Development on the SSSI will be limited to a proportionally very small area within the designation boundary located very close to the roadside.

9.7.22 Air quality impacts to designated sites are typically considered up to 200m from roads[22]. Calcareous grassland habitat is present within the SSSI which is known to be sensitive to air pollution. The total area of Calcareous grassland habitat within 200m of the B430 and the M40 roads on Natural England's MAGIC[23] website has been measured at approximately 3.8ha. This area forms approximately 9.47% of the total SSSI area (40.1224ha[24]). The critical load of Nutrient Nitrogen deposition for this habitat type, below which a significant effect is considered unlikely for the purposes of impact assessment, is 15 kgN/ha/yr according to the Air Pollution Information System[25]. The critical loads for NOx emissions are 30µg NOx/m^3 annual mean or 75µg NOx/m^3 24-hour mean. Natural England guidance[26] states that a project that will result in an increase of no more than 1% of these critical loads or levels (either alone or in combination with other projects) can be regarded as insignificant.

9.7.23 Based on current information as presented in Table 9.20, the predicted increase in traffic on the M40 and B430 from the Western Development and Development scenarios, when considered cumulatively with other schemes (a maximum AADT increase of 135,323), may cause a significant adverse cumulative effect on Ardley Cutting and Quarry SSSI, although the Development forms only a small proportion of this increase.

9.7.24 Taking account of the small contribution of traffic emissions on the SSSI from the Development, that the roads intersect on a very small area of the SSSI (most of which is at the height on the bridge over the railway), and a further assessment would be undertaken during the Reserved Matters Application (RMA) stage to inform any mitigation strategies that are required, it is considered the effects on the Ardley Cutting and Quarry SSSI is not significant.

Mitigation, Monitoring and Residual Effects

9.7.25 The assessment has demonstrated that the overall air quality effect of the Development on human health receptors will be 'not significant'; the Development will not lead to any exceedances of the air quality objectives, nor lead to any impacts that would be described as significant. Therefore, further mitigation measures are not proposed in this regard.

9.7.26 There is potential for a significant effect on the SSSI and further assessment of the effect of the Development on the designated SSSI should be secured during the RMA stage. Given the planning application is in outline, specific details on how the Development will operate are unknown at this stage. Consequently, it is considered with the granting of planning permission, an appropriately worded condition will be provided by CDC which requests that an air quality assessment on the Ardley Cutting and Quarry SSSI is undertaken with the submission of a RMA with mitigation measures brought forward if required. This would be informed by further transport modelling. Therefore, for the purposes of this assessment, on a precautionary basis, it is assumed that a residual adverse significant effect may occur on the SSSI as a result of the Development.

9.7.27 Measures to reduce pollutant emissions from road traffic are also being delivered in the longer term by the introduction of increasingly stringent emissions standards, largely via UK legislation. Given these measures, no significant effects are predicted on ecological receptors.

9.8 Cumulative Effects

9.8.1 Three cumulative schemes have been identified and form part of the future baseline. As such, the impacts of the Development from both the construction phase and the completed development on the cumulative schemes are inherently considered within the assessment.

Construction

9.8.2 The IAQM Guidance is clear that, with appropriate mitigation measures in place, any residual construction dust effects from an individual site will be 'not significant'. The guidance also suggests that cumulative construction dust impacts are only likely where sites are within 500m of each other. Work would also have to be taking place in areas of both sites that are close to a receptor in order for cumulative effects to occur.

9.8.3 None of the identified cumulative schemes are within 500m of the Development. Provided that the identified mitigation measures for the construction phase are implemented, the cumulative effect of construction activities will be 'not significant'.

Completed Development

9.8.4 The traffic data used in the operational 'Without Development' and 'Completed Development' scenarios incorporate traffic flows associated with all cumulative schemes which would affect flows on the roads included in this assessment. As such, the predictions of future pollutant concentrations presented in this chapter take account of cumulative effects. Operational impacts, which inherently include the cumulative schemes, have been shown to be 'not significant'.

Table 9.21: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
Construction									
Dust soiling and human health impacts from emissions of PM_{10}	Existing residential properties (high)	Local	Temporary	Eastern Development	Low risk	Eastern Development	Adherence to CEMP / DMP / mitigation measures	Eastern Development	Negligible (not significant)
				Western Development	Medium risk	Western Development		Western Development	Negligible (not significant)
				Development	Medium risk	Development		Development	Negligible (not significant)
Emissions from construction vehicles	Existing residential properties (high)	Local, district	Temporary	Development	Negligible	Development	N/A	Development	Negligible (not significant)
Emissions from on-site plant	Existing residential properties (high)	Local	Temporary	Development	Negligible	Development		Development	Negligible (not significant)
Completed Development									
Human health impacts from emissions from additional operational road traffic	Existing residential properties (high)	Local, district	Permanent	Eastern Development	Negligible	Eastern Development	N/A	Eastern Development	Negligible (not significant)
				Western Development	Negligible to minor adverse	Western Development		Western Development	Negligible to minor adverse (not significant)
				Development	Negligible to minor adverse	Development		Development	Negligible to minor adverse (not significant)
Impacts on designated ecological sites from emissions from additional operational road traffic	Ardley Cutting and Quarry SSSI (high)	Local	Permanent	Eastern Development; Western Development; Development	Not Significant	Eastern Development; Western Development; Development	Planning condition to undertake assessment and provide mitigation if required during RMA applications	Eastern Development; Western Development; Development	Not significant

References

[1] The Air Quality (England) Regulations 2000 Statutory Instrument 928, (2000). Available at: http://www.legislation.gov.uk/uksi/2000/928/contents/made.

[2] The Air Quality (England) (Amendment) Regulations 2002 Statutory Instrument 3043, (2002). Available at: http://www.legislation.gov.uk/uksi/2002/3043/contents/made.

[3] The Air Quality Standards Regulation 2010 Statutory Instrument 1001, (2010). Available at: http://www.legislation.gov.uk/uksi/2010/1001/contents/made.

[4] Defra, (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

[5] Defra, (2019). Clean Air Strategy 2019. Available at: https://www.gov.uk/government/publications/clean-air-strategy-2019.

[6] Ministry of Housing, Communities and Local Government, (2021). National Planning Policy Framework.

[7] Cherwell District Council, (2015). The Cherwell Local Plan 2011-2031 Part 1.

[8] Cherwell District Council, (1996). Cherwell Local Plan November 1996.

[9] Cherwell District Council, (2018). Developer Contributions Supplementary Planning Document (SPD) February 2018.

[10] Ministry of Housing, Communities and Local Government, (2019). Planning Practice Guidance. Available at: https://www.gov.uk/government/collections/planning-practice-guidance.

[11] Institute of Air Quality Management, (2016). Guidance on the Assessment of Dust from Demolition and Construction v1.1.

[12] Moorcroft and Barrowcliffe et al, (2017). Land-Use Planning & Development Control: Planning for Air Quality v1.2.

[13] Defra, (2021). Local Air Quality Management Technical Guidance (TG16) April 2021 Version. Available at: https://laqm.defra.gov.uk/technical-guidance.

[14] Institute of Air Quality Management, (2020). A guide to the assessment of air quality impacts on designated nature conservation sites v1.1.

[15] Defra, (2021). UK Pollutants Release and Transfer Register. Available at: https://prtr.defra.gov.uk/facility-search.

[16] Defra, (2021). Local Air Quality Management (LAQM) Support Website. Available at: https://laqm.defra.gov.uk/

[17] AQC, (2020). Calibrating Defra's 2018-based Background NOx and NO2 Maps against 2019 Measurements. Available at: https://www.aqconsultants.co.uk/resources.

[18] Defra, (2020). 2020 NO2 projections data (2018 reference year).

[19] Defra, (2021). UK Ambient Air Quality Interactive Map. Available at: https://uk-air.defra.gov.uk/interactive-map.

[20] Cherwell District Council, (2020). 2020 Air Quality Annual Status Report (ASR).

[21] Institute of Air Quality Management, (2018). Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites v1.1.

[22] Natural England (2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. NE Internal Guidance, V1.4 Final, June 2018.

[23] MAGIC: https://magic.defra.gov.uk/MagicMap.aspx

[24] Natural England, Designated Sites View: Ardley Cutting and Quarry SSSI. https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1000903&SiteName=&countyCode=34&responsiblePerson=&SeaArea=&IFCAArea=

[25] APIS (2016) Indicative values within nutrient nitrogen critical load ranges for use in air pollution impact assessments. http://www.apis.ac.uk/indicative-critical-load-values

[26] Natural England (2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. NE Internal Guidance, V1.4 Final, June 2018.

10 Noise and Vibration

10.1 Introduction

10.1.1 This chapter of the ES was prepared by Noise Consultants Limited ('NCL') and presents an assessment of the likely significant effects of the Development on land at Junction 10, M40, Baynards Green. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and/or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

10.1.2 The chapter considers the effects of:

- Construction activities and traffic movements (construction noise and vibration);
- Noise associated with the operation of the Development (operational sound); and
- Development related road traffic movements (operational road traffic noise).

10.1.3 The chapter is supported by the following technical appendices:

- Appendix 10.1 - Technical Glossary;
- Appendix 10.2 - Legislation, Planning Policy and Guidance – Further Information;
- Appendix 10.3 - Construction Noise and Vibration;
- Appendix 10.4 - Operational Sound;
- Appendix 10.5 - Operational Road Traffic Noise; and
- Appendix 10.6 - Road Traffic Noise Contours.

10.1.4 The chapter should be read in conjunction with the following chapter:

- Chapter 12: Biodiversity. for consideration of likely noise effects on species and habitats.

Competence

10.1.5 The principal author of this work is George Gibbs BEng(hons) MSc CEng CEnv MIOA MIEnvSc. He is an Associate Director with more than 14 years' experience in acoustics, noise and vibration prediction, measurement, and assessment. George is a Chartered Engineer, a Chartered Environmentalist, and a Corporate Member of the Institute of Acoustics and of the Institution of Environmental Sciences.

10.1.6 George has key experience in noise modelling, assessment and EIA. He has been responsible for leading work part of multi-disciplinary projects and as stand-alone specialist assessments. His project experience includes: renewable energy, including wind power; nuclear new build; rail and road infrastructure; residential and multi-use development; airport expansion; mineral extraction; waste and recycling; and military activities.

10.2 Legislation, Planning Policy and Guidance

10.2.1 This section sets out a summary of the legislation, planning policy and guidance relevant to the noise assessment. Further information is included in Appendix 10.2.

Legislation Context

10.2.2 The following legislation is relevant to the Development:

- Planning Act (2008)[1];
- Land Compensation Act (LCA) (1973)[2];
- Noise Insulation Regulations 1975[3] and Noise Insulation (Amendment) Regulations 1988[4]. Regulations under the LCA 1973;
- Control of Pollution Act (1974)[5];
- Environmental Protection Act (EPA) (1990)[6];
- The Environmental Noise (England) Regulations (2006)[7]; and
- Noise and Statutory Nuisance Act (1993)[8].

National

10.2.3 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (2021)[9]; and
- Noise Policy Statement for England (NPSE) (2010)[10].

Local

10.2.4 The following local planning policy is relevant to the Development:

- The Cherwell Local Plan 2011 - 2031 (incorporating re-adopted policy Bicester 13) (adopted July 2015); and
- Mid-Cherwell Neighbourhood Plan 2018-2031 (May 2019).

Guidance

10.2.5 The following guidance is relevant to the Development:

- The Guidelines for Environmental Noise Impact Assessment (2014)[11];
- WHO Community Noise Guidelines (1999)[12]. These guidelines are partly superseded by the WHO Environmental Noise Guidelines for the European Region (2018)[13];
- WHO Night Noise Guidelines (2009)[14];
- BS 5228-1:2009+A1: 2014 Code of practice for noise and vibration control on construction and open sites: Part 1 – Noise (BS 5228-1) (2014)[15];
- BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Open Construction Sites – Part 2: Vibration (BS 5228-2) (2014)[16];
- BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings: 1-Vibration sources other than blasting 2-Blast-induced vibration (2008)[17];

- BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground-borne vibration (1993)[18];
- BS 4142: 2014+A1:2019 Methods for rating and assessing industrial and commercial sound (2019)[19];
- BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings (2014)[20];
- BS 7445-1:2003. Description and measurement of environmental noise. Guide to quantities and procedures (2003)[21];
- Planning Practice Guidance Noise – PPG(N) (2014)[22];
- Calculation of Road Traffic Noise (CRTN) (1988)[23];
- Design Manual for Roads and Bridges: Sustainability & Environment Appraisal LA 111 Noise and vibration (LA 111) (2019)[24];
- Transport Research Laboratory (TRL) Report 53 'Ground vibration caused by civil engineering works' (1986)[25]; and
- Transport Research Laboratory (TRL) Report 429 (TRL 429 'Ground-borne vibration caused by mechanised construction works', 2000 Assessment Methodology[26].

10.3 Assessment Methodology

Consultation

10.3.1 Table 10.1 summarises key comments raised by consultees of relevance to this assessment and how the assessment has responded to them.

Table 10.1: Consultation Response Summary

Consultee and Comment	Response
Fritwell Parish Council (29 July 2021) – EIA Scoping Opinion	
What are the noise predictions at the site (in increased decibels) and range of noise attenuation to what localities? What will be the operational hours (is it 24/7)? Have residents in Ardley, Baynards Green, Fewcott, Fritwell and the new homes at Heyford Park been considered?	An assessment of the change on road traffic noise levels has been undertaken across the Site at the surrounding receptors for both the day and the night-time periods. The Development is proposed for 24-hour operation and the assessment has considered the potential for adverse effects across these periods. The assessment has considered the likely noise related effects at receptors within the spatial scope, namely those at Baynards Green. The road traffic noise assessment has shown that receptors within other communities will experience a change in BNL of less than 1 dB(A) and have therefore not been considered in the assessment.
CDC (29 July 2021) – EIA Scoping Opinion	
If required, reference should be made to BS4142:2014 (Methods for rating and	Sound from proposed industrial and commercial sources have been assessed in

Consultee and Comment	Response
assessing industrial and commercial sound) should noise sources be found that require this type of assessment.	accordance with BS4142:2014+A1:2019.
CDC – Environmental Health and Planning	
I have been asked to have a look at the methodology for the baseline survey at the above site. I can confirm that I happy with the approach that you have suggested.	Proposed monitoring methodology to be adopted in the assessment.

Study Area and Scope

10.3.2 The spatial extent of the study area has been considered with respect to the Eastern Development, Western Development, and Development.

10.3.3 The spatial extent of the study area for the construction noise and vibration assessment is consistent with those adopted in recent major infrastructure projects, including High Speed Two (HS2) Phases 1 and the 2a and Heathrow Expansion Project (HEP).

10.3.4 Details of the assessment year scenarios are summarised below:

- 2019 – Baseline (representative of pre-pandemic flows, as advocated in Chapter 8: Transport and Access);
- 2025 – Future Baseline (without Development); and
- 2025 – Completed Development.

Construction Noise and Vibration

10.3.5 To assess the effects of construction noise and vibration, the spatial extents of the study area from the Site boundary are:

- 300m: noise from construction activities, such as material movements, earthworks, ground improvement and piling, crushing and breaking;
- 100m: ground-borne vibration effects from high energy construction activities, including piling works; and
- 1dB change: noise effects from construction vehicle movements on routes to and from the construction site (Eastern Development, Western Development, or Development) likely to result in a change of 1 decibel (dB) $L_{Aeq,T}$ or greater.

Operational Sound

10.3.6 To assess the effects of operational sound, the extents of the assessment include consideration of receptors where operational sound levels are likely to equal or exceed existing background sound levels, and therefore indicating the likelihood of an adverse impact. The receptor locations to be assessed were informed by the results of the baseline noise monitoring.

Operational Road Traffic Noise

10.3.7 For operational road traffic on new, altered or existing roads, the study area was defined based on the combined extent of:

- The area within 50m of road links with the potential to experience a short-term Basic Noise Level (BNL) change of more than 1 dB(A) as a result of the Development;
- Identified receptors with the potential to experience a short-term Basic Noise Level (BNL) change of more than 1 dB(A) as a result of the Development; and
- Where the noise level at identified receptors is forecast to exceed the relevant Lowest Adverse Effect Level (LOAEL).

Matters scoped out

10.3.8 Potential effects scoped out of this assessment include the potential effects of ground-borne vibration effects from construction and operational road traffic as these vehicle trips are not expected to form a significant source of vibration.

Establishing Baseline Conditions

10.3.9 Baseline data was collected over the study areas (set out in Section 10.3) and was obtained in three rounds of data gathering exercises:

- Round 1: A desk-based review of key data sources across the study area;
- Round 2: Noise modelling to inform baseline predictions; and
- Round 3: Noise surveys, where necessary.

Round 1: Desk-based review of key data sources

10.3.10 Round 1 baseline data collection has considered publicly available measurement and prediction data, including noise mapping published as required by the Environmental Noise (England) Regulations 2006, for major roads and major railways.

Round 2: Noise Modelling to Inform Predictions

10.3.11 Road traffic noise levels have been calculated within the study area for the 2019 Baseline scenario using the using LimA® computational sound modelling software (version 2020).

Round 3: Noise Surveys

10.3.12 A baseline noise survey was undertaken in July 2021 to inform an understanding of the baseline noise levels at locations representative of the closest residential and non-residential receptors.

10.3.13 The format of the survey was unattended continuous monitoring, supplemented by short-term measurements. Monitoring locations and durations presented in Figure 10.1 and are summarised in Table 10.2.

Figure 10.1: Monitoring Locations

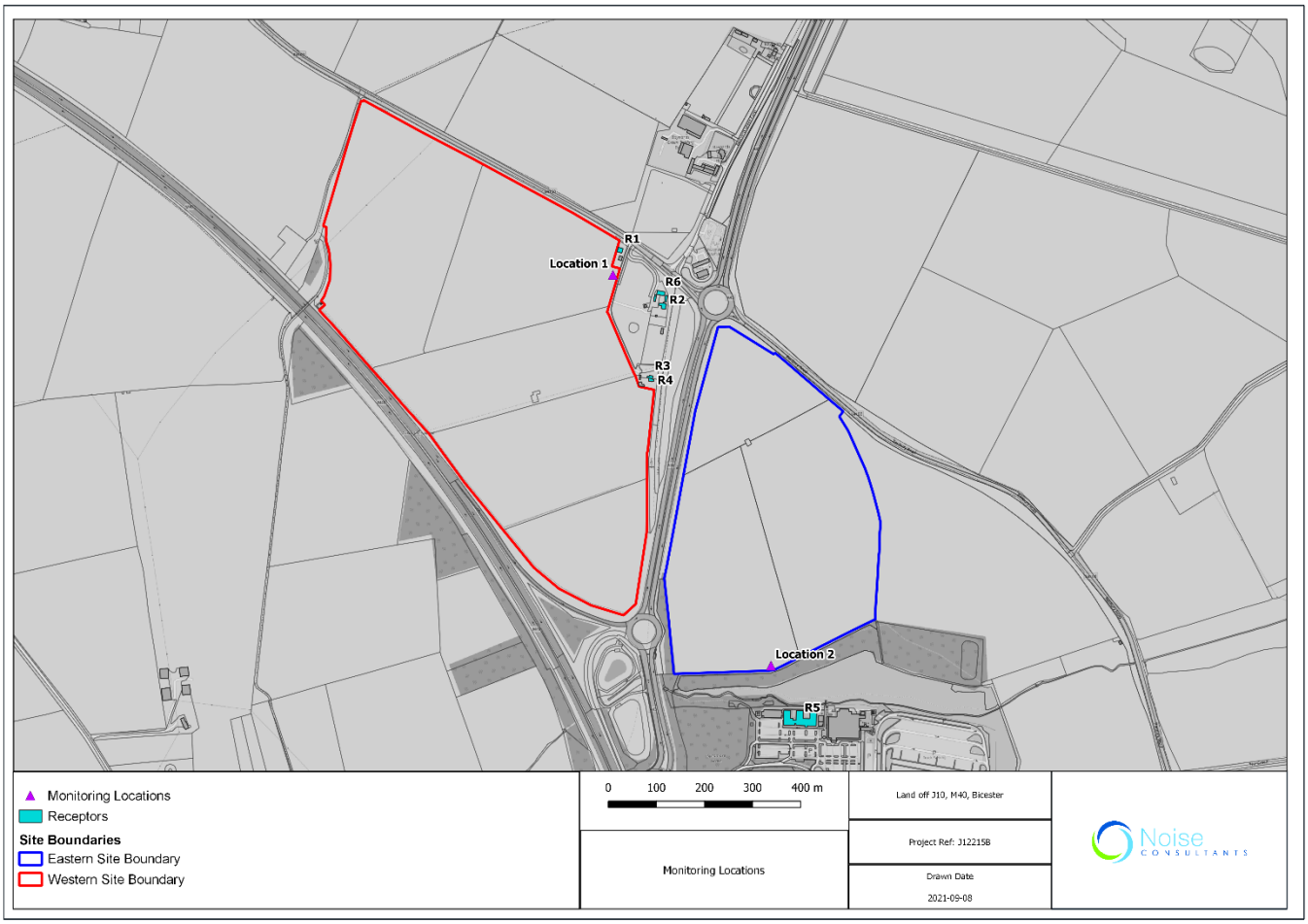


Table 10.2: Monitoring Locations

Monitoring Location	Location	Measurement Period (dd/mm/yyyy hh:mm)	Description
1	Western Development	06/07/2021 13:30hrs - 07/07/2021 13:00hrs	A measurement location at the northern section of the Western Development to quantify ambient noise levels representative of R1 – Medkre, R2 - Baynard House, R3 – 1 The Cottages, R4 – 2 The Cottages, and R6 – Baynard Barn.
2	Eastern Development	06/07/2021 14:15hrs - 07/07/2021 13:30hrs	A measurement location at the southern boundary of the Eastern Development to quantify ambient noise levels representative of R5 - Travelodge Hotel.

Identifying Likely Significant Effects

10.3.14 The identification of likely significant effects requires consideration of the following:

- Significant adverse impacts on health and quality of life, as identified through Government noise policy as set out by the NPSE;
- Environmental likely significant effects (adverse and beneficial);
- In-combination noise effects (intra-project effects[i]); and
- Cumulative noise effects (inter-project effects).

Significant adverse impacts on health and quality of life

10.3.15 The NPSE (2010) requires noise and vibration assessments to identify effects from a development that would result in significant adverse impacts on health and quality of life. The NPSE (2010) Noise Policy vision is to:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".

10.3.16 This long-term vision is supported by three Noise Policy Aims that can be delivered through effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development. These aims are to:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

10.3.17 The NPSE (2010) effect levels that relate to the likelihood of significant adverse effects on health and quality of life are as follows:

- NOEL - 'No Observed Effect Level': The level below which no effect can be detected;
- LOAEL - 'Lowest Observed Adverse Effect Level': The level above which adverse effects on health and quality of life can be detected; and
- SOAEL - 'Significant Observed Adverse Effect Level': The level above which significant adverse effects on health and quality of life occur.

10.3.18 PPG(N) provides further detail about how the effects of noise can be described in terms of perception and outcomes, adding a fourth term:

- UAEL – 'Unacceptable Adverse Effect Level': The level above which adverse effects are unacceptable.

10.3.19 A noise exposure hierarchy is presented in PPG(N), linking the response of the receptor to the increasing effect levels and associated actions, as summarised in Table 10.3.

Table 10.3: PPG(N) Noise Exposure Hierarchy

Increasing Effect Level	Response	Observed Effect	Action
Below NOEL	Not present	No effect	No specific measures
Above NOEL	Present and not intrusive	No Observed Effect	No specific measures

i See Chapter 3: EIA Methodology for further explanation of project effect definitions

Increasing Effect Level	Response	Observed Effect	Action
Above LOAEL	Present and intrusive	Observed Adverse Effect	Mitigate and reduce to a minimum
Above SOAEL	Present and disruptive	Significant Observed Adverse Effect	Avoid
Above UAEL	Present and very disruptive	Unacceptable Adverse Effect	Prevent

10.3.20 The NPSE states that a 'single objective' noise (or vibration) based measure applicable to all sources and receptors that defines the onset of LOAEL and SOAEL is not possible. However, the thresholds for the onset of each of the effect levels can be defined based upon relevant policy, available Standards and technical guidance.

10.3.21 Where it is not possible to define the onset of LOAEL and SOAEL from policy, standards or guidance, the effect levels have been defined with reference to those used as part of nationally significant high-profile infrastructure projects in England.

10.3.22 Likely significant effects on health and quality of life is considered to have occurred should noise exposure from the Development result in a noise-sensitive receptor newly exceeding the SOAEL, taking into account any mitigation or compensation measures that are part of the Development.

Environmental likely significant effects (adverse and beneficial)

10.3.23 Likely significant effects in the context of the EIA Regulations are identified separately to government noise policy defined significant effects on health and quality of life, but do require that a development should include measures, where it is sustainable to do so, in order to "mitigate and minimise" adverse effects.

10.3.24 For the purposes of the assessment, noise exposure at assessed noise sensitive receptors that are below the LOAEL threshold are not considered to constitute a significant effect. Where the noise exposure at a residential receptor newly exceeds the SOAEL threshold, a likely significant adverse effect in terms of the EIA Regulations is deemed to occur, in addition to a significant observed adverse effect on health and quality of life in terms of government noise policy.

10.3.25 Determining whether a significant adverse effect occurs where noise exposure lies between the LOAEL and SOAEL thresholds requires consideration of additional quantitative and qualitative factors, namely:

- Noise level – the level of exposure between the LOAEL and SOAEL values;
- Change in noise level – the magnitude of noise level change; and
- Receptor type (community population) – the size of population exposed.

10.3.26 Additional factors to be considered include:

- type and magnitude of effect;
- the existing ambient acoustic environment;
- additional metrics (such as, L_{Amax}).;

- how effective the measures employed to mitigate effect are likely to be, based on professional judgement, including best practicable means (BPM);
- the duration of the effect; and
- the scale of population exposed.

Cumulative Effects

10.3.27 Potential significant cumulative noise effects can arise from inter-project effects (cumulative noise effects with other developments). There are no cumulative schemes in proximity that would create cumulative vibration impacts so this is not considered further.

10.3.28 The assessment of inter-project effects requires an understanding of noise effects associated with other developments with the study area. The primary source is likely to be road traffic noise. Road traffic flows associated with other committed developments are included within the 2025 assessment years, and so are inherently considered as part of the road traffic noise assessment.

10.3.29 The study area for the construction assessment, as set out in paragraph 10.3.5, is limited to a maximum extent of 300m from the Site or where there is a 1dB change due to construction traffic movements. There are no cumulative schemes identified within a 300m radius of the Site so the construction phase cumulative assessment is limited to the potential for a cumulative 1dB change due to construction traffic movements.

10.3.30 The study area for the operational noise assessment includes consideration of receptors where operational sound levels are likely to equal or exceed existing background sound levels, and therefore indicating the likelihood of an adverse impact. The receptor locations to be assessed were informed by the results of the baseline noise monitoring, and given the relatively high ambient noise levels at these locations, and location of any cumulative schemes, cumulative operational noise impacts is not considered further.

10.3.31 associated with existing road traffic noise, appreciable cumulative operational noise effects are unlikely.

10.3.32 The road traffic flows do not include those associated with the proposed Oxfordshire Strategic Rail Freight Interchange (SFRI) given it is only a scoping stage, and associated traffic flow information is not yet publicly available. Cumulative noise effects, including of those associated with this Development, have therefore been considered qualitatively.

Determining Effect Significance

10.3.33 This section sets out the methodology for determining the significance of effect.

Receptor Groups

10.3.34 Where necessary, in addition to the likely effects of noise on individual residential receptors, consideration has been given to likely noise exposure within a community area, in particular where it was demonstrated that the noise exposure from the Development exceeds the LOAEL but is less than the SOAEL. In these instances, an environmental likely significant effect (adverse and beneficial) may occur with consideration of:

- The population within the community area; and

- The sensitivity of the receptors within the community area, for instance the presence of buildings having specific noise and vibration sensitive resources, which are referred to as ‘non-residential’ receptors.

10.3.35 For community areas a similar assessment outcome may be demonstrated when there is a large effect at a small population, and a smaller effect at a large population. The evaluation of significance on a community basis is a combination of advice derived from Standards and policy, in addition to considerations of context and receptor sensitivity.

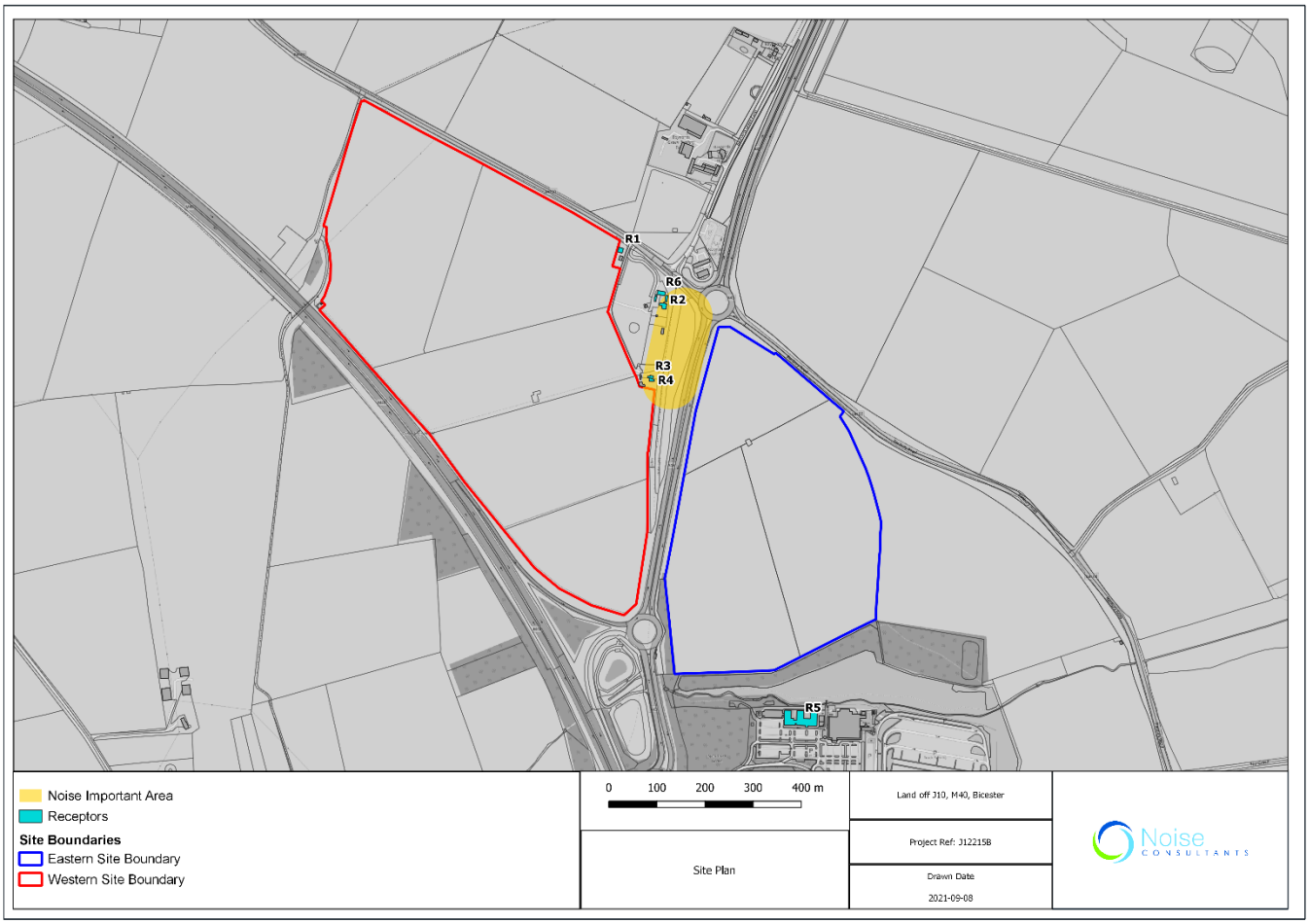
10.3.36 Where identified within the assessment spatial extents, non-residential receptors are also considered as they are likely to contain areas and activities that are potentially noise sensitive.

10.3.37 Noise Important Areas (NIAs) for roads and railways are areas identified by strategic noise maps as locations where the highest 1% of noise levels at residential locations can be found. There are approximately 10,000 NIAs in England, and their identification helps National Highways the planning and design of road traffic noise mitigation measures.

10.3.38 An NIA to the west of the A43, and incorporating part of the Development site, has been identified in the 2017 Defra strategic noise mapping. A consideration of the receptors existing sensitivity to noise is inherent in the assessment criteria, by way of consideration of the magnitude of change in noise level associated with the development, in addition to the absolute noise levels.

10.3.39 It is also not known whether National Highways have already developed road traffic noise mitigation measures with respect of the receptors in the NIA. On this basis, the receptors located within the NIA will be considered in the same context, and same assessment methodology, as those outside of the NIA.

Figure 10.2: Noise Important Area



10.3.40 In summary, the assessment considers the likely noise and vibration effects upon the receptors as detailed in Table 10.4. For residential receptors, consideration of noise related health effects included annoyance and sleep disturbance, with additional consideration of hypertension in the operational sound assessment.

10.3.41 For non-residential noise receptors, health outcomes considered were annoyance and disruption of use.

Table 10.4: Receptors Requiring Assessment for Noise and Vibration

Receptor group	Receptors included within group
Residential receptors	People, primarily where they live ('residential receptors') in terms of individual dwellings and on a wider community basis, including any shared community open areas (e.g. parks) as well as private open space (e.g. gardens)[ii]. Committed residential development identified following engagement with relevant local planning authorities, including Hayford Park, which is outside of the assessment scope.
Non-	Non-residential community facilities, namely educational, healthcare and places of

[ii] 'Shared community open areas' are those that the national planning practice guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (for example park to local green space) that is nearby.

Receptor group	Receptors included within group
residential receptors and quiet areas	worship, hotels, collectively described as 'non-residential receptors. Designated 'quiet areas'[iii]. Committed noise sensitive non-residential development identified following engagement with relevant local planning authorities.

Receptors within study area

10.3.42 Residential and non-residential receptors within the study area have been identified using aerial photography, and GIS datasets, and are shown in Figure 10.3 and

[iii] 'Quiet areas' comprise areas designated under Local Plans or Neighbourhood Development Plans as Local Green Spaces and areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations 2006.

10.3.43 Figure 10.4.

Assessing Significance

10.3.44 The section sets out the methodology for the identification of likely significant effects on residential receptors, and the assessment methodology and screening criteria adopted for non-residential receptors.

Residential Receptors

10.3.45 The PPG(N) noise exposure hierarchy was used to demonstrate the relationship between government noise policy observed effect, response and action, and EIA Regulations assessment considerations and effect, as summarised in Table 10.5 below.

Table 10.5: Government Noise Policy and EIA Regulations LOAEL and SOAEL Effect Interaction

Observed Effect	Response	Action	Assessment Consideration(s)	Effect
No effect	Not Present	No specific measures	None	Adverse effect unlikely
No observed effect	Present and not intrusive	No specific measures		
Lowest Observed Adverse Effect Level (LOAEL)				
Observed adverse effect	Present / Intrusive	Mitigate and reduce to a minimum	Noise Exposure Noise Change Population Additional Considerations	Possible EIA likely significant effect (adverse or beneficial)
Significant Observed Adverse Effect Level (SOAEL)				
Significant Adverse Effect	Present/ disruptive	Avoid	Noise Exposure Noise Change Additional Considerations	Significant adverse impact (health and quality of life) EIA likely significant effect (adverse or beneficial) where noise exposure currently exceeds SOAEL
Unacceptable Adverse Effect	Present/ very disruptive	Prevent		

Construction Noise and Vibration

Construction Noise (fixed and mobile plant)

10.3.46 The LOAEL and SOAEL thresholds of potential effect were determined with regard to the 'ABC Method' Category A and Category C values, respectively, as set out in Annex E of BS 5228-1 (2014) and presented in Appendix 10.3.

10.3.47 The UAEL thresholds are based upon the BS 5228-1 (2014) requirements for temporary rehousing, associated with construction activities of 10 of more days of working in any 15 consecutive days, or for 40 or more days in any six consecutive months, and set at 10 dB above the SOAEL.

Construction Vibration

10.3.48 The assessment criteria for construction vibration have been determined with regards to BS 5228-2 (2014) and BS 7385:1993 and are presented in terms of Peak Particle Velocity (PPV mms-1), as summarised in Appendix 10.3.

10.3.49 A significant effect from construction vibration is deemed to occur where there is a magnitude of impact exceedance of 1.00 mms-1 PPV during the daytime, or 0.30 mms-1 PPV during the night-time periods.

Construction Noise – Road Traffic

10.3.50 The assessment criteria used in the construction traffic assessment is consistent with the operational road traffic noise assessment, and is summarised in Appendix 10.3.

Operational Sound

10.3.51 BS 4142:2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142, 2019) is the principal assessment methodology used to carry out the assessment of sound of an industrial and/or commercial nature.

10.3.52 The assessment is performed by comparing the rating level of the sound source(s), $L_{Ar,Tr}$, against the background sound level, $L_{A90,T}$. The background sound level should be measured during a period in absence of the influence of sound from the industrial source. With regards to the assessment of impacts, BS 4142 (2019) states that:

"a) Typically, the greater the difference, the greater the magnitude of the impact

b) A difference of around + 10 dB or more is likely to be an indication of significant adverse impact, depending on the context

c) A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

10.3.53 The BS 4142 (2019) guidance is an initial framework for the determination of likely effects, informed by additional considerations including: the magnitude of the effect; absolute level of noise; the existing ambient acoustic environment, and the sensitivity of the receptors.

10.3.54 The likely greatest operational sound sources from the Development include:

- Building services sound from the Development warehouses;
- Road traffic using roads within the Development; and
- Road traffic movements in car park areas.

Operational Road Traffic Noise

10.3.55 The LOAEL and SOAEL threshold of potential effect criterion for road traffic noise have been taken from LA 111 Noise and vibration (2019) guidance. For the daytime, the

SOAEL noise exposure was deemed to be a façade level of 68 dB $L_{A10,\ 18hr}$ (equivalent of free-field level of 63 dB $L_{Aeq,16hr}$)[iv] and for the night-time period it was 55 dB $L_{night,\ outside}$.

10.3.56 The daytime and night-time LOAEL values were set at 55 dB $L_{A10,\ 18hr}$ (façade), and 40 dB $L_{night,\ outside,}$ respectively.

10.3.57 UAEL levels are not set in UK policy for road traffic noise, therefore reference was made to ProPG (2017), and BS 8233 (2014). With respect to L_{Aeq} target levels within dwellings, ProPG (2017), states:

"Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally"

10.3.58 Taking the internal target noise levels advocated in BS 8233 (2014) and applying the ProPG (2017) 10dB correction gives a daytime and night-time internal target noise criterion of 45 dB $L_{Aeq,16hr}$ and 40 dB $L_{Aeq,8hr}$, respectively. To convert the noise criterion to external free-field UAEL values a correction of 26 dB has been applied. A 26 dB indoor to outdoor noise level difference is based upon an assumed masonry construction dwelling, with standard thermal double-glazed windows (closed) with open trickle vent. This assumption is considered precautionary. Application of the 26 dB correction gives a daytime and night-time outdoor, free-field noise criterion of 71 dB $L_{Aeq,16hr}$ and 66 dB $L_{Aeq,8hr}$, respectively.

Significance Criteria – Summary

10.3.59 Values for the LOAEL, SOAEL and UAEL effect criteria, as referenced in the PPG(N) noise exposure hierarchy are summarised in Table 10.6, and are representative of outdoor, free-field values, unless otherwise stated.

Table 10.6: Thresholds of Potential Effect Criteria (outdoor, free-field noise levels unless otherwise stated)

Noise Source	Period	LOAEL	SOAEL	UAEL
Construction Noise	Daytime	65 dB $L_{Aeq,\ 12hr}$	75 dB $L_{Aeq,\ 12hr}$	85 dB $L_{Aeq,\ 12hr}$
	Evening	55 dB $L_{Aeq,4hr}$	65 dB $L_{Aeq,4hr}$	75 dB $L_{Aeq,4hr}$
	Night	45 dB $L_{Aeq,8hr}$	55 dB $L_{Aeq,8hr}$	65 dB $L_{Aeq,8hr}$
Operational Sound	All	Effect criteria set in relation to BS 4142 (2019) requirements		
Construction and Operational Road Traffic Noise	Daytime	55 dB $L_{A10,18hr}$ (façade)	68 dB $L_{A10,18hr}$ (façade)	71 dB $L_{Aeq,16hr}$
	Night	40 dB $L_{night,\ outside}$	55 dB $L_{night,\ outside}$	66 dB $L_{Aeq,8hr}$

Significance Evaluation Criteria for Adverse Impacts on Health and Quality of Life

10.3.60 The evaluation of significance in relation to health and quality of life requires an understanding as to whether the calculated 'end state' noise exposure, inclusive of any

[iv] BS 8233:2014 states that an $L_{A10,\ 18hr}$ can be converted to an $L_{Aeq,\ 16hr}$ with the following relationship: $L_{Aeq,\ 16hr} \approx L_{A10,\ 18hr} - 2$ dB(A)
Additionally, a +3 dB correction is applied to a free-field level to obtain a façade level.

reductions due to proposed mitigation, newly exceeds the potential effect criteria in Table 10.6.

10.3.61 Where the 'end state' i.e. with Development noise exposure newly exceeds the SOAEL value at a receptor, a significant effect in relation to health and quality of life has the potential to occur at an individual receptor. An unacceptable effect in relation to health and quality of life has the potential to occur where the noise emissions newly exceed UAEL.

10.3.62 Where the Development related noise exposure is demonstrated to be lower than the LOAEL values in Table 10.6, a significant effect in terms of the EIA Regulations is deemed not to occur.

10.3.63 Where the Development related noise exposure falls between LOAEL and SOAEL, this has the potential to constitute a significant effect, subject to the following considerations, namely:

- The level of noise exposure;
- The change in the noise exposure as a result of the Development; and
- The population experiencing such change and exposure to noise as a result of the Development.

10.3.64 The evaluation of potential significant effect on health and quality of life in relation to receptors newly exposed to development related noise exposures is considered on a case-by-case basis. However, in general, where a noise exposure is between the LOAEL and the SOAEL, and at least a medium change in exposure is calculated to occur, this is most likely to result in a significant effect.

Noise Exposure Classifications

10.3.65 Table 10.7 provides noise level exposure categories between the LOAEL and UAEL thresholds for application with the evaluation framework. Greater weight in terms of significance evaluation has been given to higher noise levels, even when occurring between the same thresholds, i.e. LOAEL and SOAEL.

Table 10.7: Noise Level Categories

Noise Level	Construction Noise			Construction and Operational Road Traffic Noise	
Very Low	<65dB $L_{Aeq, 12hr}$	<55dB $L_{Aeq, 4hr}$	<45dB $L_{Aeq, 8hr}$	<55dB $L_{A10,18hr (f)}$	<40dB $L_{night, outside}$
LOAEL					
Low	66-68dB $L_{Aeq, 12hr}$	56-58dB $L_{Aeq, 4hr}$	46-48dB $L_{Aeq, 8hr}$	56-59dB $L_{A10,18hr (f)}$	41-45dB $L_{night, outside}$
Medium	69-71dB $L_{Aeq, 12hr}$	59-61dB $L_{Aeq, 4hr}$	49-51dB $L_{Aeq, 8hr}$	60-63dB $L_{A10,18hr (f)}$	46-49dB $L_{night, outside}$
High	72-74dB $L_{Aeq, 12hr}$	62-64dB $L_{Aeq, 4hr}$	52-54dB $L_{Aeq, 8hr}$	64-67dB $L_{A10,18hr (f)}$	50-54dB $L_{night, outside}$
SOAEL					
Very High	>75dB $L_{Aeq, 12hr}$	>65dB $L_{Aeq, 4hr}$	>55dB $L_{Aeq, 8hr}$	>68dB $L_{A10,18hr (f)}$	>55dB $L_{night, outside}$
UAEL					

Unacceptable	>85dB $L_{Aeq, 12hr}$	>75dB $L_{Aeq, 4hr}$	>65dB $L_{Aeq, 8hr}$	>71dB $L_{Aeq,16hr}$	>66dB $L_{Aeq, 8hr}$

Magnitude of Change in Noise Exposure

10.3.66 A beneficial change is deemed to occur where it can be demonstrated that the Development would result in a reduction in noise exposure.

10.3.67 An adverse change is deemed to occur where the Development gives rise to an increase in noise exposure. The significance of the increase in noise exposure is dependent upon the magnitude of the change. For road traffic noise, the magnitude of change criteria presented in LA 111 for the 'short term' scenario was used to determine the: negligible; low; medium; and high categories. The Very High category correlates to the 'Major' long term magnitude, as summarised in Table 10.8.

Table 10.8: Change in Noise Level Categories

Change Category	Road traffic Noise
Negligible	<1 dB
Low	1 – 2.9 dB
Medium	3 – 4.9 dB
High	5 – 10 dB
Very High	>10 dB

Residential Populations

10.3.68 When the noise exposure is shown to exceed the LOAEL value, a likely significant effect in terms of the EIA Regulations may occur where:

- a larger population experiences a relatively smaller change in noise exposure; or
- a smaller population experiences a larger change in noise exposure.

10.3.69 A greater weight is given where there is a small noise exposure change over a larger population, which results in the noise exposure approaching the SOAEL value. Such considerations are given within the PPG(N) which states that:

"where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur."

Non-Residential Noise Sensitive Receptors

10.3.70 For the purposes of this assessment, non-residential receptors are defined as those which are not used as a permanent residence, however they do have a use sensitive to noise and vibration.

10.3.71 The assessment to determine whether or not such receptors would experience significant effects is based upon the quantitative and quantitative considerations outlined in the assessing significance section.

10.3.72 The assessment criterion used for the assessment of noise impacts at non-residential receptors identified within the spatial extents of the assessment are summarised in Table 10.9.

Table 10.9: Non-Residential Receptor External Noise Impact Criterion

Non-residential receptor group	Daytime 0700-2300hrs Impact Criterion dB $L_{Aeq,16h}$	Night-time 2300-0700hrs Impact Criterion dB $L_{Aeq,8h}$	Reference
Place of Worship	50*	Not Applicable	BS 8233:2014
Hotels	50*	45*	BS 8233:2014
Educational	50*	Not Applicable	BB93:2015
Healthcare	55*	50*	HTM08-01:2013

*and a change of >3 dB

10.3.73 Where noise exposure is shown to meet the associated noise criteria presented in Table 10.9, then no further assessment is required. Where the impact criterion is predicted to be exceeded, then consideration is given to the additional likely significant effects evaluation criterion, including change in noise level.

Evidence Assumptions and Limitations

10.3.74 Specific assumptions in relation to each of the assessments are set out within the respective appendices:

- Appendix 10.3 - Construction Noise and Vibration;
- Appendix 10.4 - Operational Sound; and
- Appendix 10.5 - Operational Road Traffic Noise.

10.3.75 The construction programme is not suitably developed to provide detailed phasing and equipment data. Assumptions required for the construction noise and vibration assessment are therefore based on those adopted for other, similar, developments. Noise emission data is taken from BS 5228-1 (2014). Haulage routes within the construction site boundaries are not yet defined. The construction noise assessment is based on fixed plant operating at the closest position of the Development to the assessed receptors. This is considered to present a worst-case assessment as during periods when the works are at distances further from the receptors, the associated noise levels will be lower.

10.3.76 The operational sound assessment has included consideration of: building services sound from the Development warehouses; road traffic using roads within the Development site; and road traffic movements in car park areas. At this stage, the Development design is not suitably developed to undertake a detailed quantitative assessment of likely building services noise emissions. The assessment is therefore based on reasonable assumptions, based on experience of other, similar, developments.

10.3.77 Road traffic assumptions within the Development and movements associated with the internal car parks are based on traffic flows derived by the transport consultants and included in Chapter 8: Transport and Access.

10.3.78 The operational road traffic noise assessment is based upon 18-hour Annual Average Weekday Traffic (AAWT) and AAWT 1-hour night-time flows, for the Eastern, Western and Development Sites, including percentage heavy good vehicles (HGV) composition road traffic flow information, and consideration of cumulative sites. This information, including road traffic flows associated with cumulative schemes incorporated within these figures, is included within Chapter 8: Transport and Access.

10.4 Baseline Conditions

Baseline Noise Conditions

10.4.1 Baseline noise conditions have been determined through a combination of a desktop study, noise modelling and noise surveys.

10.4.2 The noise survey was undertaken by NCL between the 6th and 7th July 2021, and was designed to capture noise levels across the Site during the daytime (07:00-23:00), evening (19:00-23:00) and night-time (23:00-07:00) periods, and the noise levels captured are representative of the assessed receptors.

10.4.3 A meteorological monitoring station was deployed concurrently with the noise monitoring to identify periods of adverse weather. Due to periods of light rain occurring during the survey, data captured during the following periods were excluded from the calculations:

- 06/07/2021 15:15hrs - 15:30hrs;
- 07/07/2021 00:15hrs - 00:30hrs; and
- 07/07/2021 01:00hrs - 02:15hrs.

10.4.4 The dominant contributors to the existing baseline acoustic environment at the measurement locations (as determined during equipment deployment and collection) were noted to include:

- Road traffic noise sources - including the M40 to the south west and the A43 between the Eastern site and Western site.

10.4.5 A summary of the baseline noise conditions derived for the Eastern and Western Developments is presented in the following sections. Further information on the baseline noise conditions is presented in Appendix 10.4 – Operational Sound.

Eastern Development

10.4.6 As shown in Defra's 2017 Round 3 Strategic Noise Mapping, sections of the Eastern Development have existing road traffic noise contributions from the A43 and M40 >70 dB $L_{Aeq,16hr}$ and >65 dB $L_{Aeq,8hr}$, due to high levels of road traffic noise contributions during the daytime and night-time periods.

10.4.7 At R5, based on Defra's 2017 Round 3 Strategic Noise Mapping, existing road traffic noise contributions are >60 dB $L_{Aeq,16hr}$ and >55 dB $L_{Aeq,8hr}$. This exceeds the LOAEL threshold for the day and the SOAEL threshold for the night-time period.

10.4.8 A summary of the measured levels used to inform the noise baseline on the Eastern Development is presented in Table 10.10. The noise levels are rounded to the nearest whole decibel.

Table 10.10: Summary of Measured Baseline Noise Levels - Eastern Site

Monitoring Location	Location	Period	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Mean)	dB $L_{A90,15min}$ (Mode)	dB L_{Amax} (Max)
Location 2	Eastern Site - Adjacent to the Travelodge Hotel	Daytime (07:00 - 23:00)	57	54	55	77
		Night (23:00 - 07:00)	52	49	47	69

10.4.9 Observations of the acoustic environment at the survey location are summarised in Table 10.11.

Table 10.11: Survey Observations - Eastern Site

Monitoring Location	Observations
Location 2	Road traffic noise from the M40 to the west and the A43 to the west of the monitoring location was noted to be the dominant contributor to the ambient noise climate whilst an NCL consultant was on-site. This included day and night periods.

Western Site

10.4.10 As shown in Defra's 2017 Round 3 Strategic Noise Mapping, sections of the Western Development have existing road traffic noise contributions from the A43 and M40 >70 dB $L_{Aeq,16hr}$ and >65 dB $L_{Aeq,8hr}$, due to high levels of road traffic noise contributions during the daytime and night-time periods.

10.4.11 At R1, R2 and R6, based on Defra's 2017 Round 3 Strategic Noise Mapping, existing road traffic noise contributions are >60 dB $L_{Aeq,16hr}$ and >55 dB $L_{Aeq,8hr}$. At R3 and R4, based on Defra's Round 3 Strategic Noise Mapping, road traffic noise contributions are >65 dB $L_{Aeq,16hr}$ and >60 dB $L_{Aeq,8hr}$.

10.4.12 A summary of the measured levels used to inform the noise baseline are presented in Table 10.12. The noise levels are rounded to the nearest whole decibel. Monitoring Location 1 was located on the side of the property away from the dominant existing noise sources, and therefore are representative of the sound environment at the quietest façade.

Table 10.12: Summary of Measured Baseline Noise Levels - Western Site

Monitoring Location	Location	Period	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Mean)	dB $L_{A90,15min}$ (Mode)	dB L_{Amax} (Max)
Location 1	Western Site - Adjacent to Medkre and Baynard House	Daytime (07:00 - 23:00)	59	57	58	78
		Night (23:00 - 07:00)	55	50	47	76

10.4.13 Observations of the acoustic environment at the survey location are summarised in Table 10.13.

Table 10.13: Survey Observations - Western Site

Monitoring Location	Observations
Location 1	Road traffic noise from the M40 to the south west, B4100 to the north and the A43 to the east of the monitoring location was noted to be the dominant contributor to the ambient noise climate whilst an NCL consultant was on-site. This included day and night periods.

Baseline Vibration Conditions

Eastern Development

10.4.14 No significant contributors to the ground-borne vibration baseline environment have been identified within the Eastern Development study area.

Western Development

10.4.15 No significant contributors to the ground-borne vibration baseline environment have been identified within the Western Development study area.

Future Baseline Conditions

10.4.16 In the absence of the Development, existing sound levels in the Eastern Development and Western Development are likely to experience a gradual increase over time, primarily due to growth in road traffic. On low speed roads, changes in car technology may potentially offset some of the expected sound level increases due to traffic growth.

10.4.17 Sound generated from tyre-road interaction dominates on higher speed roads therefore expected growth in road traffic is likely to increase ambient sound levels regardless of changes in technology.

Summary of Receptors and Sensitivity

10.4.18 A review of the Study Area using aerial photography and GIS datasets identified a non-residential receptor, a hotel, in addition to residential receptors. In addition, a Noise Important Area (NIA), as identified by Defra and in the vicinity of the Development, as shown in Figure 10.2.

10.4.19 Potential noise receptors identified and considered in the assessment include:

- Residential receptors;
- Residential receptors (in a Noise Important Area); and
- Non-residential receptors (Hotel).

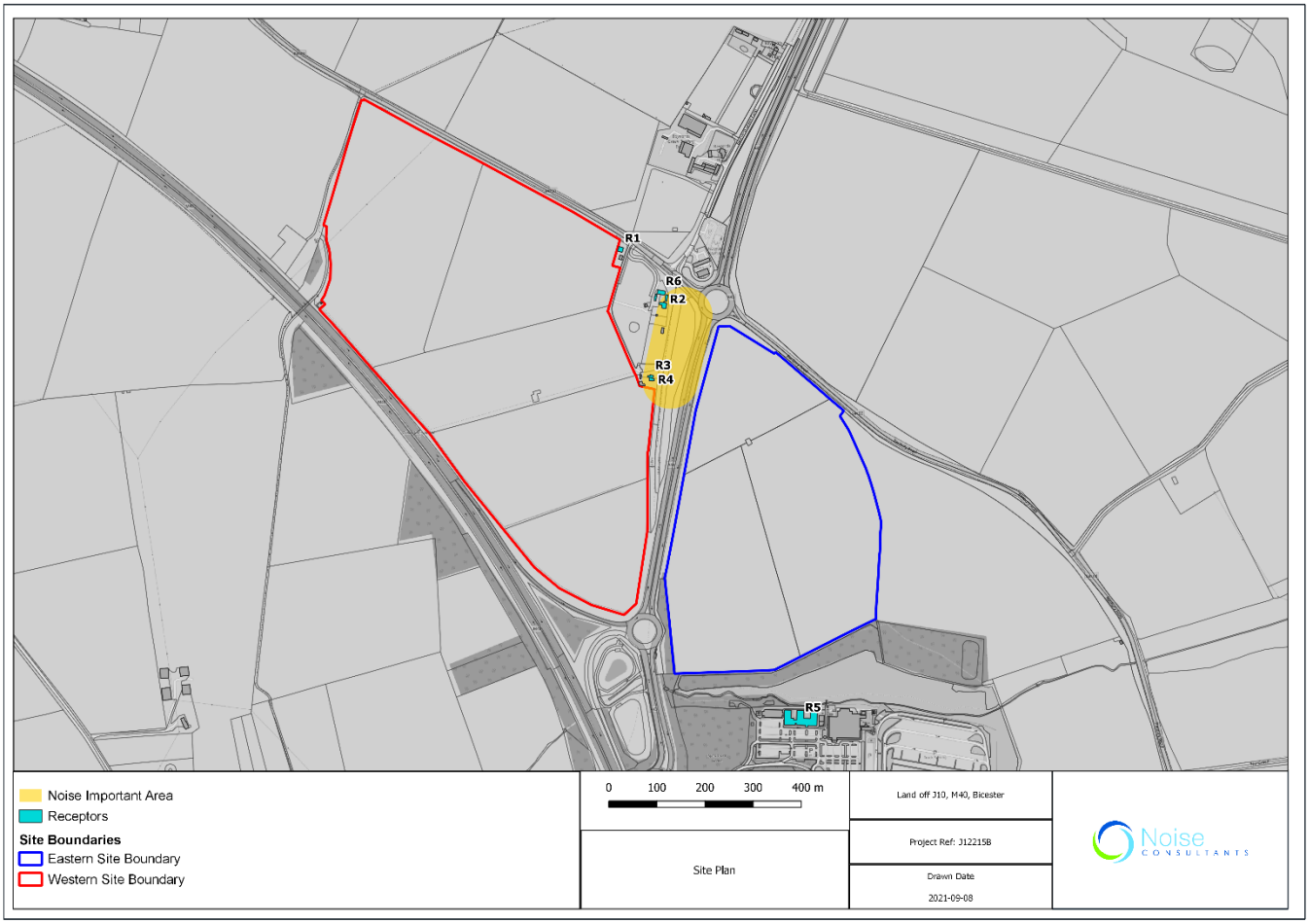
10.4.20 No ‘quiet areas’ as designated through implementation of the Environmental Noise (England) Regulations 2006 have been identified within the assessment extents.

10.4.21 Representative residential and non-residential receptors for construction noise and vibration, operational sound and operational road traffic noise are shown in Figure 10.3 and summarised in Table 10.14.

Table 10.14: Sensitive Receptors

Receptor ID	Receptor Type	Easting	Northing	Construction Noise and Vibration	Operational Sound	Operational Road Traffic Noise
R1 – Medkre	Residential	454710	229233	✓	✓	✓
R2 – Baynard House	Residential	454800	229118	✓	✓	✓
R3 – 1 The Cottages	Residential	454773	228969	✓	✓	✓
R4 – 2 The Cottages	Residential	454774	228963	✓	✓	✓
R5 – The Travelodge Hotel	Non-Residential	455084	228257	✓	✓	✓
R6 – Baynard Barn	Residential	454800	229118	✓	✓	✓

Figure 10.3: Sensitive Receptors (within extent of acoustic model)



10.4.22 In addition to the residential receptors identified in Table 10.4, receptors located in the vicinity of road links meeting the scoping criterion are also considered in the road traffic noise assessment. These additional receptors are located in the vicinity of road links 3, 4 and 5, as shown in Figure 8.1 of Chapter 8: Transport and Access, namely residential properties at The Lodge, Swifts House Farm, Braeburn Avenue/ B4100, and Charlotte Avenue/ B4100. These receptors are shown in

10.4.23 Figure 10.4, and are outside the extents of the noise model, but are shown to likely experience a BNL change of more than 1 dB(A) as a result of the Development.

Figure 10.4: Sensitive Receptors (wider assessment extents)

10.4.24 The evaluation of significance takes account of receptor sensitivity to noise. No residential receptors within the study area have been identified as having a relatively high sensitivity to noise, therefore the assessment has assumed a 'generic' sensitivity to noise in accordance with the approach used to underpin noise policy and the setting of the LOAEL and SOAEL values.

10.4.25 The effect of noise or vibration on non-residential noise-sensitive receptors is dependent on the receptor's specific sensitivity to noise. This is accounted for through the adoption of relevant assessment criteria as presented in Table 10.9.

10.5 Scheme Design and Management

10.5.1 IEMA Guidance uses the terms 'primary' (inherent design), 'secondary' (foreseeable) and 'tertiary' (inexorable) mitigation. The purpose of this section is to clearly identify what measures are primary and tertiary mitigation and therefore can be relied upon in the assessment.

Construction Noise and Vibration

10.5.2 The Applicant has committed to implementing Construction Environmental Management Plans (CEMPs) during enabling, demolition and construction activities for the Development. The CEMPs will define the key construction activity principles that will be adhered to and developed during construction activities, including recommendations that

represent good practice specific to the noise assessment, based on the assumed construction plant list and working methodologies. They will also include details on roles and responsibilities, working hours, control measures and activities to be undertaken to minimise environmental effects as well as monitoring and record-keeping requirements. It will also outline the methodology to be adopted should a complaint be received regarding excessive noise and/or vibration levels.

10.5.3 Framework CEMPs are included in Appendix 6.1 and 6.2; these will act as the basis for detailed CEMPs and agreed with CDC once contractors are appointed.

Completed Development

Operational Sound

10.5.4 At this stage the design of the Development is not suitably detailed to allow full consideration of the operational sound levels at receptors. Likely operational sound levels have therefore been determined based on assumptions adopted at other, similar developments and derived traffic flow information.

10.5.5 To control operational sound emissions from building services, cladding with a sound reduction performance commensurate of Kingspan KS1000 has been assumed.

Operational Road Traffic Noise

10.5.6 There is no road traffic noise-specific mitigation inherent in the design.

10.6 Construction

Assessment of Effects

10.6.1 A detailed assessment of construction noise and vibration is included within Appendix 10.3. This section sets out a summary of the assessment outcomes, and where necessary, associated mitigation recommendations.

Construction noise (fixed and mobile plant)

10.6.2 Construction noise levels have been calculated using spreadsheet-based noise models, adopting calculation methodologies advocated in BS 5228-2 (2014). Likely construction vibration levels have been informed by empirical formula presented within BS 5228-1:2009+A1:2014.

Enabling Works

10.6.3 Construction noise associated with the Enabling Works is considered as a phase as part of the Western Development and Development. As such, the conclusions reached below can be considered as representative of the worst-case effects associated with the Enabling Works in isolation.

Eastern Development

10.6.4 As shown in Table 10.16 in Appendix 10.3, when works are undertaken at the worst-case positions there are no predicted exceedances of SOAEL during any of the considered construction phases.

10.6.5 Accounting for the noise reductions associated with the good practice site measures to be detailed within the CEMP, a significance outcome of 'Not Significant' is determined at all receptors.

Western Development

10.6.6 As shown in Table 10.17 in Appendix 10.3, when works are undertaken at the worst-case positions there are no predicted exceedances of SOAEL during any of the considered construction phases.

10.6.7 Accounting for the noise reductions associated with the good practice site measures to be detailed within the CEMP, a significance outcome of 'Not Significant' is determined at all receptors.

Development

10.6.8 The assessment of construction noise from the Development is based on the worst-case noise level for the Eastern and Western Developments.

10.6.9 As shown in Table 10.18 in Appendix 10.3, when works are undertaken at the worst-case positions which is assumed to be the locations of the proposed building structures, there are no predicted exceedances of SOAEL during any of the considered construction phases.

10.6.10 In addition, all activities apart from 'External Areas and Reinstatement' have noise levels less than 72 dB $L_{Aeq,\ T}$, and therefore concurrent activities are less than 75 dB $L_{Aeq,\ T}$ (SOAEL). Based on the assumed construction plant lists, there is however the potential for concurrent 'External Areas and Reinstatement' activities at the Eastern and Western Developments to result in an exceedance of SOAEL at R3 and R4. The CEMPs will make provision for the Principal Contractors to be in liaison during the construction phases. Coordination of the construction programmes will seek to avoid activities with the greatest noise emissions associated with these phases occurring concurrently, and avoid noise levels exceeding the SOAEL.

10.6.11 Overall and taking into consideration the noise reductions associated with the good practice site measures to be detailed within the CEMP, a significance outcome of 'Not Significant' is determined at all receptors.

Construction Vibration (and Cosmetic Damage)

10.6.12 The spatial extents of the construction vibration assessment are set at 100m, as at greater distances the levels of vibration from construction activities are unlikely to exceed the assessment thresholds, and therefore not deemed a significant effect in terms of the EIA Regulations.

Eastern Development

10.6.13 As shown in Table 10.13 in Appendix 10.3 the closest receptor to the construction works at the Eastern Development is at a distance of 135m from the closest development position, and therefore outside the extents of the construction vibration assessment.

10.6.14 Construction related vibration immissions from the Eastern Development are likely to be below 1.00 mms^{-1} PPV during the daytime, and therefore a significant effect in terms of the EIA Regulations is not deemed to occur at residential receptors.

Western Development

10.6.15 As shown in Table 10.14 in Appendix 10.3 the closest receptor to the construction works at the Western Development is at a distance of 130m from the closest development position, and therefore outside the extents of the construction vibration assessment.

10.6.16 Construction related vibration immissions from the Western Development are likely to be below 1.00 mms^{-1} PPV during the daytime, and therefore a significant effect in terms of the EIA Regulations is not deemed to occur at residential receptors.

Development

10.6.17 As shown in Table 10.15 in Appendix 10.3 the closest receptor to the construction works is at a distance of 130m from the closest development position, and therefore outside the extents of the construction vibration assessment.

10.6.18 Construction related vibration immissions from the Development, including concurrent Eastern Development and Western Development activities, are likely to be below 1.00 mms^{-1} PPV during the daytime, and therefore a significant effect in terms of the EIA Regulations is not deemed to occur at residential receptors.

Construction Noise (Road Traffic)

10.6.19 The routing of construction traffic will be the subject of construction vehicle management considerations by the nominated construction contractor(s). However, it is anticipated that most construction vehicles will approach the Site via the A43 as opposed to the B4100. The routes taken by construction traffic will be agreed with the planning and highway authorities by way of a Construction Traffic Management Plan (CTMP) which would be secured by a planning condition.

10.6.20 Construction road traffic assumptions are derived by the transport consultants and included in Chapter 8: Transport and Access.

10.6.21 With reference to the construction road traffic noise change criteria, traffic flows would need to increase by at least 25% in order to result in a noise level change of approximately +/- 1 dB. Existing flows on the surrounding road network are relatively high, and therefore relatively high construction activity flows would be required in order to result in a noise level change greater than ‘negligible’.

Enabling Works

10.6.22 As shown in Table 10.19 in Appendix 10.3, the associated change in construction traffic flows is <1%, therefore a negligible change in noise level is predicted, and a significance outcome of ‘Not Significant’.

Eastern Development

10.6.23 As shown in Table 10.20 in Appendix 10.3, the associated change in construction traffic flows is <1%, therefore a negligible change in noise level is predicted, and a significance outcome of ‘Not Significant’.

Western Development

10.6.24 As shown in Table 10.21 in Appendix 10.3, the associated change in construction traffic flows is <1%, therefore a negligible change in noise level is predicted, and a significance outcome of ‘Not Significant’.

Development

10.6.25 As shown in Table 10.22 in Appendix 10.3, the associated change in construction traffic flows is <1%, therefore a negligible change in noise level is predicted, and a significance outcome of 'Not Significant'.

Mitigation, Monitoring and Residual Effects

10.6.26 No specific noise or vibration mitigation associated with the construction assessment is proposed beyond best practicable means to keep noise to a minimum which are in line with good practice site measures detailed within the CEMP. In addition to the CEMP, the Applicant has committed to ensuring that the contractor(s) implement CTMPs throughout construction of the Development which would include standard control measures for minimising, managing and monitoring construction effects. These will be provided at the Reserved Matters stage and secured via planning condition.

10.6.27 No significant residual effects for construction noise (fixed and mobile plant), vibration or road traffic have been identified for the Enabling Works, Eastern Development, Western Development or Development and no further mitigation is considered necessary.

10.7 Completed Development

Assessment of Effects

Operational Sound

10.7.1 A detailed assessment of operational sound is included within Appendix 10.4. This section sets out a summary of the assessment outcomes, and where necessary, associated mitigation recommendations.

10.7.2 The operational sound assessment is supported by a noise model developed using the using LimA® computational sound modelling software (version 2020), using source sound emission data based upon a list of indicative plant items and assumptions on the likely % on-time during the relevant daytime and night-time assessment periods. The noise model has been used to determine the likely sound emissions at each receptor, and accounts for 24hr operational working.

10.7.3 Sound power levels for each source have been adopted based on those provided by a typical example in the absence of specific plant being finalised at this stage. Calculated sound levels have been used to determine the specific sound level at each receptor for use in the BS 4142 (2019) assessment.

10.7.4 The likely greatest operational sound sources from the Development include:

- Building services sound from the buildings within the Development;
- Road traffic using roads within the Development (including HGVs), and in parking bays and service areas; and
- Road traffic movements in car park areas.

10.7.5 The BS 4142 (2019) guidance is an initial framework for the determination of likely effects, informed by additional considerations including: the magnitude of the effect; absolute level of noise; the existing ambient acoustic environment, and the sensitivity of the receptors.

Eastern Development

10.7.6 The outcome of the BS 4142 (2019) assessment demonstrates that operational sound from the Eastern Development is likely to have a ‘low impact’ at all assessed residential receptors and is likely to meet the non-residential receptor noise criterion. A significance outcome of ‘Not Significant’ is therefore determined at all receptors.

Western Development

10.7.7 As for the Eastern Development, the BS 4142 (2019) assessment demonstrates that operational sound from the Western Development is likely to have a ‘low impact’ at all assessed residential receptors and is likely to meet the non-residential receptor noise criterion. A significance outcome of ‘Not Significant’ is therefore determined at all receptors.

Development

10.7.8 The BS 4142 (2019) assessment demonstrates that operational sound from the Development is likely to have a ‘low impact’ at all assessed residential receptors and is likely to meet the non-residential receptor noise criterion. This assessment is conservative, as it assumes the cumulative noise emissions from the Eastern and

Western Developments at receptors. A significance outcome of 'Not Significant' is therefore determined at all receptors.

Operational Road Traffic Noise

10.7.9 A detailed assessment of road traffic noise is included within Appendix 10.5 – Operational Road Traffic Noise. This section sets out a summary of the assessment outcomes, and where necessary, associated mitigation recommendations.

10.7.10 The operational road traffic noise assessment has considered the following assessment years:

- 2019 - Baseline;
- 2025 - Future Baseline (without Development); and
- 2025 - Completed Development

10.7.11 The magnitude of change in noise exposure is considered for the following scenarios:

- 2025 Future Baseline (without Development) vs 2025 Completed Development

10.7.12 The magnitude of change in noise exposure is considered initially in terms of road links with the potential to experience a short-term BNL change of more than 1 dB(A) as a result of the Development.

10.7.13 Where there is a road link change in BNL of more than 1 dB(A) as a result of the Development, the magnitude of change and associated noise exposures have been determined at receptors in the vicinity of the Eastern Development, Western Development and Development respectively, to identify where road traffic noise levels are forecast to exceed the relevant LOAEL.

Eastern Development

10.7.14 A summary of the significance evaluation for those receptors in the vicinity of the Eastern Development and also in the vicinity of road traffic links with a change in daytime BNL of more than 1 dB(A) is presented in Tables 10.15 and 10.16.

Table 10.15: Eastern Development - Daytime: 2025 Future Baseline vs 2025 With Development (Noise Change Category)

Receptor ID	2025 With Development Noise Level $L_{A10,18h\ (f)}$	LOAEL/SOAEL/UAEL Category	Noise Exposure Category 'End State'	Noise Change Category	Significance Evaluation
R1	69.4	Above SOAEL	Very High	Negligible	Not Significant
R2	69.5	Above SOAEL	Very High	Negligible	Not Significant
R3	67.7	Above LOAEL	High	Negligible	Not Significant
R4	70.5	Above SOAEL	Very High	Negligible	Not Significant
R5	70.7	Above SOAEL	Very High	Negligible	Not Significant
R6	69.8	Above SOAEL	Very High	Negligible	Not Significant

Table 10.16: Eastern Development - Night-time: 2025 Future Baseline vs 2025 With Development (Noise Change Category)

Receptor ID	2025 With Development Noise Level $L_{Aeq,8h}$	LOAEL/SOAEL/UAEL Category	Noise Exposure Category 'End State'	Noise Change Category	Significance Evaluation
R1	58.2	Above SOAEL	Very High	Negligible	Not Significant
R2	59.2	Above SOAEL	Very High	Negligible	Not Significant
R3	57.6	Above SOAEL	Very High	Negligible	Not Significant
R4	60.3	Above SOAEL	Very High	Negligible	Not Significant
R5	60.5	Above SOAEL	Very High	Negligible	Not Significant
R6	59.5	Above SOAEL	Very High	Negligible	Not Significant

10.7.15 These results illustrate that no significant effects are expected for receptors in the vicinity of the Eastern Development.

10.7.16 Outside the spatial extents of the noise model, a consideration of change in night-time BNL has been used to identify areas with receptors with potentially adverse noise effects. As shown in Appendix 10.5, the B4100 to the east of the Eastern Development (Link 3, as shown in Figure 8.1, Chapter 8: Transport and Access) is likely to experience a BNL change +2.7 dB(A), however there are no sensitive receptors in the vicinity of this link. At all other links, the change in BNL is less than 1 dB(A).

Western Development

10.7.17 A summary of the significance evaluation for those receptors in the vicinity of the Western Development and also in the vicinity of road traffic links with a change in daytime BNL of more than 1 dB(A) is presented in Tables 10.17 and 10.18.

Table 10.17: Western Development - Daytime: 2025 Future Baseline vs 2025 With Development (Noise Change Category)

Receptor ID	2025 With Development Noise Level $L_{A10,18h\ (f)}$	LOAEL/SOAEL/UAEL Category	Noise Exposure Category 'End State'	Noise Change Category	Significance Evaluation
R1	72.3	Above SOAEL	Very High	Medium	Significant
R2	70.6	Above SOAEL	Very High	Low	Significant
R3	67.8	Above LOAEL	High	Negligible	Not Significant
R4	70.2	Above SOAEL	Very High	Negligible	Not Significant
R5	70.6	Above SOAEL	Very High	Negligible	Not Significant
R6	71.3	Above SOAEL	Very High	Low	Significant

Table 10.18: Western Development - Night-time: 2025 Future Baseline vs 2025 With Development (Noise Change Category)

Receptor ID	2025 With Development Noise Level $L_{Aeq,8h}$	LOAEL/SOAEL/UAEL Category	Noise Exposure Category 'End State'	Noise Change Category	Significance Evaluation
R1	59.9	Above SOAEL	Very High	Low	Significant
R2	59.9	Above SOAEL	Very High	Low	Significant
R3	57.6	Above SOAEL	Very High	Negligible	Not Significant
R4	60.0	Above SOAEL	Very High	Negligible	Not Significant
R5	60.3	Above SOAEL	Very High	Negligible	Not Significant
R6	60.5	Above SOAEL	Very High	Low	Significant

10.7.18 As shown, a significance outcome of 'Significant' is determined at receptors R1, R2 and R6, located in the vicinity of the Western Development. In addition, as shown in Table 10.18, receptors in the vicinity of the B4100 between the Western Development and Bicester, namely the residential properties at The Lodge, Swifts House Farm, Braeburn Avenue/ B4100, and Charlotte Avenue/ B4100 (Link 4 and 5, as shown in Figure 8.1, Chapter 8: Transport and Access), are likely to experience changes in BNL in the region of +1.5 dB(A), and therefore a significant effect.

Development

10.7.19 A summary of the significance evaluation for those receptors in the vicinity of the Development and also in the vicinity of road traffic links with a change in daytime BNL of more than 1 dB(A) is presented in Tables 10.19 and 10.20.

Table 10.19: Development - Daytime: 2025 Future Baseline vs 2025 With Development (Noise Change Category)

Receptor ID	2025 With Development Noise Level $L_{A10,18h\ (f)}$	LOAEL/SOAEL/UAEL Category	Noise Exposure Category	Noise Change Category	Significance Evaluation
R1	72.3	Above SOAEL	Very High	Medium	Significant
R2	70.8	Above SOAEL	Very High	Low	Significant
R3	68.1	Above SOAEL	Very High	Negligible	Not Significant
R4	70.4	Above SOAEL	Very High	Negligible	Not Significant
R5	70.6	Above SOAEL	Very High	Negligible	Not Significant
R6	71.5	Above SOAEL	Very High	Low	Significant

Table 10.20: Development - Night-time: 2025 Future Baseline vs 2025 With Development (Noise Change Category)

Receptor ID	2025 With Development Noise Level $L_{Aeq,8h}$	LOAEL/SOAEL/UAEL Category	Noise Exposure Category	Noise Change Category	Significance Evaluation
R1	59.9	Above SOAEL	Very High	Low	Significant
R2	60.2	Above SOAEL	Very High	Low	Significant
R3	58.1	Above SOAEL	Very High	Negligible	Not Significant
R4	60.3	Above SOAEL	Very High	Negligible	Not Significant
R5	60.4	Above SOAEL	Very High	Negligible	Not Significant
R6	60.8	Above SOAEL	Very High	Low	Significant

10.7.20 As shown, a significance outcome of 'Significant' is determined at receptors R1, R2 and R6, located in the vicinity of the Development. In addition, as shown in Appendix 10.5, receptors in the vicinity of the B4100 between the Western Development and Bicester, namely the residential properties at The Lodge, Swifts House Farm, Braeburn Avenue/ B4100, and Charlotte Avenue/ B4100 (Link 4 and 5, as shown in Figure 8.1, Chapter 8: Transport and Access), are likely to experience changes in BNL in the region of +2.1 dB(A), and therefore a significant effect.

Mitigation, Monitoring and Residual Effects

Operational Sound

10.7.21 Operational sound from building services has been calculated based on breakout noise from the proposed units and no significant effects have been identified. As details of the construction and makeup of the proposed units is unavailable at this stage, it is assumed that the cladding to be used will have similar sound reduction properties as used on similar projects, as detailed in Appendix 10.4. It is expected that the Applicant would be required to provide, and consider in the context of the assessment, the final design details when they become available. Additional noise related design considerations may include:

- The acoustic performance of the building cladding;
- The location of any building services; and
- The building orientation.

Operational Road Traffic Noise

10.7.22 Road traffic flow management and mitigation inherent in the development design includes measures set out in the Framework Travel Plan, as set out in Appendix 8.2. Notwithstanding, significant noise effects have been identified at a number of locations resultant from operational road traffic for the Western Development and therefore also the Development as a whole.

10.7.23 There are a number of mitigation strategies that can be implemented to reduce these noise levels at the receptors in the vicinity of the Development (i.e. R1, R2 and R6), with the most appropriate suite of measures subject to agreement with CDC. Noise mitigation options which would be considered, and delivered pre-occupation of the Development, include:

- A noise barrier - of sufficient density, to be located between the B4100 and the Western Development either on highways land (to be secured through a Section 278 (S.278) Agreement) or within the ownership boundary of the private dwellings. The specific design of any noise barrier will be the subject of further analysis, however for the purpose of significance evaluation a barrier with 2 metre height, located along the position illustrated in Appendix 10.5: Figure 10.3 has been modelled;

- Low noise road surfacing – depending on the speeds of the road in question, and the existing road construction, the use of low noise road surfacing can achieve reductions in the region of 3 dB(A); or

- Financial contribution to the landowner of R1, R2 and R6, to contribute to upgrades in building insultation.

10.7.24 The mitigation strategy adopted would be subject to agreement with CDC.

Western Development

10.7.25 For the purpose of significance evaluation, the noise model has been updated to include a 2m noise barrier. The outcome of this potential mitigation measure is set out in Tables 10.21 and 10.22.

Table 10.21: Western Development - Daytime: 2025 Future Baseline vs 2025 With Development with 2m Noise Barrier (Noise Change Category)

Receptor ID	Noise Exposure Category 'End State'	Noise Change Category	Significance Evaluation
R1	Very High	Negligible	Not Significant
R2	Very High	Negligible	Not Significant
R3	High	Negligible	Not Significant
R4	Very High	Negligible	Not Significant
R5	Very High	Negligible	Not Significant
R6	Very High	Negligible	Not Significant

Table 10.22: Western Development - Night-time: 2025 Future Baseline vs 2025 With Development with 2m Noise Barrier (Noise Change Category)

Receptor ID	Noise Exposure Category 'End State'	Noise Change Category	Significance Evaluation
R1	Very High	Negligible	Not Significant
R2	Very High	Negligible	Not Significant
R3	Very High	Negligible	Not Significant
R4	Very High	Negligible	Not Significant
R5	Very High	Negligible	Not Significant
R6	Very High	Negligible	Not Significant

10.7.26 As shown, the provision of a 2m noise barrier would be sufficient to reduce potential noise effects at all receptors in the vicinity of the Western Development to a 'Not Significant' level.

Development

10.7.27 Tables 10.23 and 10.24 illustrate the significance of noise effects of the Development with a 2m noise barrier in place.

Table 10.23: Development - Daytime: 2025 Future Baseline vs 2025 With Development with 2m Noise Barrier (Noise Change Category)

Receptor ID	Noise Exposure Category	Noise Change Category	Significance Evaluation
R1	Very High	Negligible	Not Significant
R2	Very High	Negligible	Not Significant
R3	High	Negligible	Not Significant
R4	Very High	Negligible	Not Significant
R5	Very High	Negligible	Not Significant
R6	Very High	Negligible	Not Significant

Table 10.24: Development - Night-time: 2025 Future Baseline vs 2025 With Development with 2m Noise Barrier (Noise Change Category)

Receptor ID	Noise Exposure Category	Noise Change Category	Significance Evaluation
R1	Very High	Negligible	Not Significant
R2	Very High	Negligible	Not Significant
R3	Very High	Negligible	Not Significant
R4	Very High	Negligible	Not Significant
R5	Very High	Negligible	Not Significant
R6	Very High	Negligible	Not Significant

10.7.28 As shown, the provision of a 2m noise barrier would be sufficient to reduce potential noise effects at all receptors in the vicinity of the Development to a 'Not Significant' level.

10.7.29 Further noise reductions, in the order of 3 dB, could be achieved with the provision of low noise road surfacing.

10.7.30 Should neither of these strategies be taken forward and depending on the age and nature of the properties, compensation could be provided to the occupiers of the identified properties to improve insulation should there be scope to do so.

10.7.31 The specific mitigation measures to be adopted will be determined as part of the development of the final design. Given that these mitigation options, alone or in combination, are considered to provide sufficient mitigation that would reduce noise to acceptable levels, no significant effects are expected on these receptors following implementation of this mitigation.

10.7.32 For those receptors located outside the spatial extents of the noise model where a potential significant effect is determined for the night-time period with respect to the Western Development and Development, namely the residential properties at The Lodge, Swifts House Farm, Braeburn Avenue/ B4100, and Charlotte Avenue/ B4100 (Link 4 and 5, as shown in Figure 8.1, Chapter 8: Transport and Access), the Travel Plan would set out measures to mitigate these impacts. The specific mitigation measures to be adopted in relation to these receptors will be determined as part of the development of the final design.

10.7.33 Where Western Development and Development associated traffic can be concentrated during periods of the night-time when baseline traffic flows are greatest, such as the shoulder periods at the beginning and end of the night-time (2300-0000hrs and 0600-0700hrs), this would reduce the overall change in noise levels experienced by receptors on the B4100, and the associated significance in EIA terms. However on a precautionary basis in the absence of any further study, the effects at these receptors are considered 'Significant'.

10.8 Cumulative Effects

Construction

10.8.1 Construction traffic from the Development is expected to lead to a <1dB change in sound at all locations, i.e. negligible effect. The Development associated construction traffic is approximately 40 two-way HGV on a daily basis, which is significantly lower flows than the baseline two-way HGV flows on the A43 (N) and A43 (S), 4896 and 5439, respectively.

10.8.2 When considered in the cumulative scenario traffic flows are not expected to exceed this threshold and a negligible cumulative effect is predicted.

Completed Development

Operational Road Traffic Noise

10.8.3 The traffic data used in the 2025 Future Baseline and Future Development scenarios incorporates traffic flows associated with cumulative developments where road traffic flow information is available, and with the potential to affect flows on the roads included in this assessment.

10.8.4 Consequently, the operational impacts reported inherently include those associated with the approved cumulative schemes.

10.8.5 The road traffic flows do not include those associated with the proposed Oxfordshire Strategic Rail Freight Interchange (SRFI) given it is only a scoping stage, and associated traffic flow information is not yet publicly available. Based on the publicly available information, it is not possible to quantitively evaluate the likely cumulative noise impacts associated with the SRFI road traffic.

10.8.6 However, the introduction of additional road traffic on the road network in the vicinity of the Development associated with the SFRI, in particular along the B4100, east and west of the A43, does have the potential to increase road traffic noise levels at receptors located in the vicinity of the Eastern Development.

Mitigation, Monitoring and Residual Effects

10.8.7 Road traffic flow management and mitigation measures, as set out in the Framework Travel Plan, should be updated to include consideration of developing information in respect of the SRFI, but noting that the SRFI application will also need to demonstrate how it mitigate its effects.

Table 10.25: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Development Site	Temporal Scale	Significance	Mitigation and Monitoring	Residual Effect
Enabling Works and Construction							
Construction noise	Residential and Non-residential Receptors	Local – Study Area	Enabling Works	Temporary	Not Significant	Adherence to the CEMP and CTMP	Not Significant
			Eastern Development		Potentially Significant		Not Significant
			Western Development				Not Significant
			Development				Not Significant
Construction vibration	Residential and Non-residential Receptors	Local – Study Area	Enabling Works	Temporary	Not Significant		Not Significant
			Eastern Development		Not Significant		Not Significant
			Western Development		Not Significant		Not Significant
			Development		Not Significant		Not Significant
Completed Development							
Operational sound	Residential Receptors	Local – Study Area	Eastern Development	Permanent	Not Significant	Additional mitigation developed as part of the final design, including consideration of: - the acoustic performance of the building cladding; - the location of any building services; and - the building orientation.	Not Significant
			Western Development	Permanent	Not Significant		Not Significant
			Development	Permanent	Not Significant		Not Significant
Operational Road Traffic Noise	Residential and Non-residential Receptors	Local – Study Area	Eastern Development	Permanent	Not Significant	Travel Plan measures	Not Significant
			Western Development	Permanent	Significant	Travel Plan measures, and further study of potential mitigation given by a noise barrier, low noise surfacing provision, and/or noise insulation measures.	Significant
			Development	Permanent	Significant		Significant
Cumulative Effects							
Operational Road Traffic Noise	Residential and Non-residential Receptors	Local – Study Area	Development	Permanent	Not Significant	Travel Plan measures	Not Significant

References

[1] Department for Communities and Local Government. (2009). Planning Act 2008.

[2] Land Compensation Act 1973. (1973)

[3] The Noise Insulation Regulations 1975. (1975)

[4] The Noise Insulation (Amendment) Regulations 1988. (1988)

[5] Control of Pollution Act 1974. (1974)

[6] Environmental Protection Act 1990. (1990)

[7] The Environmental Noise (England) Regulation 2006. (2006)

[8] Noise and Statutory Nuisance Act 1993. (1993)

[9] Department for Communities and Local Government, (2021). National Planning Policy Framework.

[10] Department for Environment, Food and Rural Affairs (Defra). (March 2010). Noise Policy Statement for England.

[11] Institute of Environmental Management and Assessment. (2014). The Guidelines for Environmental Noise Impact Assessment

[12] World Health Organisation. (1999). WHO Community Noise Guidelines.

[13] World Health Organisation. (2018). WHO Environmental Noise Guidelines for the European Region.

[14] World Health Organisation. (2009). WHO Night Noise Guidelines.

[15] British Standards Institution. (2014). BS 5228-1:2009+A1: 2014 Code of practice for noise and vibration control on construction and open sites: Part 1 – Noise.

[16] British Standards Institution. (2014). BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Open Construction Sites – Part 2: Vibration

[17] British Standards Institution. (2018). BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings: 1-Vibration sources other than blasting 2-Blast-induced vibration

[18] British Standards Institution. (1993). BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground-borne vibration

[19] British Standards Institution. (2019). BS 4142: 2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

[20] British Standards Institution. (2014). BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings.

[21] British Standards Institution. (2003). BS 7445-1:2003. Description and measurement of environmental noise. Guide to quantities and procedures

[22] Planning Practice Guidance Noise – PPG(N). (2014).

[23] Department for Transport. (1988). Calculation of Road Traffic Noise.

[24] Highways England. (2019). Design Manual for Roads and Bridges: Sustainability & Environment Appraisal LA 111 Noise and vibration.

[25] Transport Research Laboratory (TRL) Report 53 'Ground vibration caused by civil engineering works', 1986

[26] Transport Research Laboratory (TRL) Report 429 (TRL 429 'Ground-borne vibration caused by mechanised construction works', 2000

11 Cultural Heritage

11.1 Introduction

11.1.1 This chapter of the ES was prepared by RPS Consulting Services Ltd. and presents an assessment of the likely significant effects of the Development on archaeology and built heritage. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any likely significant adverse effects identified and/or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

11.1.2 The purpose of this chapter is to assess the potential effects of the Development on the archaeological and built heritage assets within and in proximity to the Site. This chapter of the ES sets out the policy context, assessment methodology and baseline conditions of the Site, examines potential effects of the Development, and presents mitigation measures to prevent, reduce or offset (where possible) any likely significant adverse impacts. The likely residual impacts once these mitigation measures have been implemented are presented, and their significance assessed. An assessment of potential cumulative effects arising from nearby committed development schemes is also provided.

11.1.3 The Site is comprised of two parcels of land to the east and west of the A43, which are known respectively as the Eastern Site and Western Site. Given the available information for each Site, the baseline conditions and receptors are considered to be closely aligned. This has been demonstrated by baseline reporting which is summarised later in this chapter when the baseline conditions are specified. As such, the two Sites are not differentiated as part of this chapter in archaeological and built heritage terms and are referred to as one Site. Equally, the impacts and potential effects are also expected to be the same for the Eastern Development, Western Development and Enabling Works, so the Development is assessed and reported as a whole, with differentiation highlighted where required. A worst case scenario is assumed for the purposes of assessing potential impacts on relevant receptors.

11.1.4 The chapter is supported by the following appendices:

- Appendix 11.1: Cultural Heritage Desk Based Assessment;
- Appendix 11.2: Geophysical Survey - Western Site;
- Appendix 11.3: Geophysical Survey - Eastern Site; and
- Appendix 11.4: Relevant Planning Policy and Guidance.

Competence

11.1.5 The RPS Heritage and Archaeology team has extensive experience in the provision of cultural heritage assessment for EIA. The authors of the archaeological portions of this chapter have relevant experience of 7 years and 15+ years respectively within Oxfordshire and further rural archaeological sites across southern England. The authors are registered (Member/Associate level) with the Chartered Institute for Archaeologist (CIfA), a peer review system designed to ensure the competency of archaeological practitioners, whilst RPS is a CIfA Registered Archaeological Organisation. The author of the built heritage portions of this Chapter is a Senior Director from the Built Heritage Team with over 7 years' experience and a registered member of the IHBC.

11.2 Legislation, Planning Policy and Guidance

Legislation Context

11.2.1 The following legislation is relevant to the Development:

- Ancient Monuments and Archaeological Areas Act 1979, updated 2014[1]; and
- Planning (Listed Buildings and Conservation Areas) Act 1990[2].

Planning Policy Context

National

11.2.2 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (2021)[3]; and

Local

11.2.3 The following local planning policy is relevant to the Development:

- Cherwell Local Plan 2011-2031, Part 1[4];
- Saved polices from Cherwell Local Plan (1996)[5]; and
- Mid-Cherwell Neighbourhood Plan 2018-30[6].

Guidance

11.2.4 The following guidance is relevant to the Development:

- Planning Practice Guidance (2014, updated June 2021)[7].
- Historic England Good Practice Advice (GPA) document 1, 2015[8];
- Historic England Good Practice Advice (GPA) document 2, 2015[9];
- Historic England Good Practice Advice (GPA) document 3, 2017[10];
- Historic England Good Practice Advice (GPA) document 4, 2020[11];
- English Heritage Conservation Principles, Policy and Guidance, 2008[12];
- Design Manual for Roads and Highways, 2019[13]; and
- Department for Culture, Media and Sport, (2013). Scheduled Monuments and Nationally Important Non-Scheduled Monuments[14].

11.3 Assessment Methodology

Consultation

11.3.1 Table 11.1 summarises key comments raised by consultees of relevance to this assessment and how it has responded to them.

Table 11.1: Consultation Response Summary

Consultee and Comment	Response
Oxfordshire County Council (OCC) Archaeologist (02/07/2021)	
Separate Written Scheme of Investigation documents were prepared for the Archaeological Desk Based Assessment, and for two Geophysical Survey phases informed by the DBA. These were submitted to OCC for comment and approval prior to works starting.	Provided an agreed basis on which to proceed with initial desk based reporting and geophysical survey at the Site.
Cherwell District Council (CDC) Scoping Opinion (29/07/2021)	
CDC confirmed that archaeology should be scoped into the proposed EIA process, and that the setting of nearby built heritage assets should also be included.	Effects on built heritage were proposed to be scoped out of the ES in the EIA Scoping Report. However, in response to the EIA Scoping Opinion, built heritage effects are scoped into this ES Chapter.

11.3.2 The OCC Archaeologist was contacted in the first instance on 13th May 2021 in their role as advisors to CDC. The scope of the desk based work and geophysical survey was agreed with the OCC Archaeologist via production and approval of relevant Written Schemes of Investigation (WSIs).

11.3.3 The subsequent EIA Scoping Opinion received from CDC confirmed that archaeology should be scoped into an EIA process, as well as the setting of nearby built heritage assets.

Study Area and Scope

11.3.4 A study area of 1km from the Site boundary was utilised throughout baseline reporting and this chapter to identify any archaeological and built heritage assets that might be present within the Site or nearby area that would need consideration within this assessment. This area was chosen on the basis of standard industry practice and was agreed with the OCC Archaeologist in July 2021.

Establishing Baseline Conditions

11.3.5 To inform this assessment, an archaeological desk-based assessment (DBA) was prepared initially in June 2021 (see Appendix 11.1). A geophysical survey was also undertaken across each Site (i.e. the Eastern Site and Western Site) between May and August 2021 (see Appendices 11.2 and 11.3). The geophysical survey highlights below ground anomalies and provides information on the possible presence/absence of archaeological remains. A Built Heritage Assessment and associated site-visit was undertaken in August 2021.

11.3.6 The archaeological DBA included a review of relevant nationally designated archaeological assets, below ground archaeological findspots, records and previous archaeological work within the study area as agreed with the OCC Archaeologist. This study area allowed the importance of known and likely archaeological assets features to be placed in their local, regional and national contexts.

11.3.7 Archaeological and built heritage assets are recorded in national and/or local historic environment databases, in this instance the National Monuments Record and the Oxfordshire Historic Environment Record (HER). These data sources have been used in the preparation of this chapter and to inform the approach to mitigation for the Site. In accordance with national and local planning policy, this assessment considers both designated and undesignated heritage assets within the study area, including:

- World Heritage Sites;
- Scheduled Monuments;
- Registered Battlefields;
- Archaeological Remains;
- Designated and Non-designated built heritage assets; and
- Conservation Areas.

11.3.8 The main sources consulted during the compilation of the baseline information are listed below:

- British Geological Survey;
- British Library;
- Oxfordshire County Archaeologist;
- Oxfordshire HER;
- National Heritage List for England;
- The National Archives; and
- Oxfordshire County Record Office.

11.3.9 Future baseline conditions were also assessed in the same manner.

Identifying Likely Significant Effects

11.3.10 No standard EIA methodologies exist for heritage and archaeological assessment. However, assessment methodology has been guided by various published guidance documents including: English Heritage's Conservation Principles, Policy and Guidance, the Historic Environment Good Practice Advice Planning Advice Note 3 and the Design Manual for Roads and Bridges Guidance. Although the latter was designed as best-practice for road schemes in particular, it is accepted as best-practice for the assessment of cultural heritage in relation to archaeology, listed buildings and historic landscapes.

11.3.11 The assessment is of a qualitative nature, and the evaluation of significance is ultimately a matter of professional judgement.

11.3.12 The three-stage approach presented below is adopted in order to reach an understanding of the level of any effect that the Development may have on a heritage asset. It is necessary to understand the significance of the asset and the proposed impacts on the asset to assess the overall effect on identified assets.

11.3.13 Using a matrix that measures both asset importance (significance in the context of NPPF terminology) and impact magnitude defines an assessment of the level of the potential effect

of the Development on identified assets. This approach, including the matrices themselves, is set out in Tables 11.2 – 11.4.

Construction

11.3.14 This ES chapter considers the nature, scale and significance of the effects to identified and potential archaeological and built heritage assets that would arise during the construction phase, with the effects defined on the basis of any changes compared to the baseline (i.e. the conditions which would exist if the proposals did not go ahead).

11.3.15 The scale of the Development indicates that any buried archaeological remains which may be present within the Site would be unlikely to survive the construction process within the footprint of proposed development works.

11.3.16 With regard to heritage assets outside the Site boundary, anticipated construction effects would most likely be indirect, short term and temporary. Potential effects on the setting of heritage assets include construction noise, dust or vibration, in addition to visual effects. Visual effects may relate to the presence of construction equipment (including any cranes) and hoardings in the short term and these views would change as the construction phase progressed.

11.3.17 Accordingly, this assessment considers the following potential effects:

- Direct effects on buried archaeological remains;
- Indirect effects on the settings of nearby archaeological assets;
- Direct effects on standing built heritage assets; and
- Indirect effects on the settings of standing built heritage assets.

Completed Development

11.3.18 The assessment identifies effects arising from the operational stage to built heritage assets. This includes permanent changes within the setting of the heritage assets, which may include changes of use, character and visual effects.

11.3.19 It is only during the construction phase that any direct effects on archaeological assets will occur; no direct impacts are anticipated once the Development is complete and occupied. Where relevant, indirect effects on the settings of relevant nearby archaeological assets once the Development is complete and occupied have been considered.

Cumulative Effects

11.3.20 There may be some cumulative impacts on below ground archaeological and built heritage receptors in general terms as a result of the interaction of the Development with other schemes. It is acknowledged that any archaeological remains within the Site form part of a wider landscape of multi-period archaeological sites and monuments. However, given the generally isolated, small scale and localised nature of archaeological remains, and the lack of proximity of cumulative schemes to the Site and identified built heritage assets, significant cumulative effects are unlikely, and this is scoped out of further assessment in this Chapter.

Determining Effect Significance

11.3.21 The methodologies for determining receptor sensitivity, magnitude of impact descriptors and significance criteria are outlined below.

Sensitivity of Receptor

11.3.22 The NPPF refers to the consideration of the 'significance' of heritage assets. However, in the context of EIA, the term 'significance' relates to the established scale of effect as a result of the combination of the importance/sensitivity of the asset and the magnitude of potential impact on that asset. Therefore, to avoid confusion, when referring to the NPPF the term 'importance' or 'sensitivity' (rather than significance) will be used.

11.3.23 Receptors are either known as designated or non-designated heritage assets or a perceived potential for archaeological heritage assets.

11.3.24 There are no national government guidelines for evaluating the significance of different types of heritage asset. For archaeological remains, the Department for Culture, Media and Sport (DCMS) has adopted a series of criteria for use in the determination of national importance when scheduling monuments. The criteria include period, rarity, documentation, group value, survival / condition, fragility / vulnerability, diversity and potential and can be used as a basis for the assessment of the importance of archaeological sites and remains. However, the document also states that these principles *'should not be considered definitive, but as indicators that contribute to a broader judgment based on individual circumstances.'*

11.3.25 Listed buildings are designated by the Secretary of State (based on recommendations from Historic England) for their special architectural or historic interest. Conservation Areas are designated locally for special architectural or historic interest. Locally listed buildings are also designated locally, based upon local criteria which identify built heritage assets which do not meet the requirements for statutory designation, but which retain a local degree of interest. The NPPF and the PPG introduce criteria for the assessment of the significance or importance of heritage assets, and these have been factored into this assessment.

11.3.26 The importance of a heritage asset can be defined as of International, National, Regional/County, Local or No Importance. Based on the DCMS criteria noted above, the criteria to establish the importance of heritage assets are described in Table 11.2.

Table 11.2: Receptor Sensitivity Descriptors

Value (Sensitivity)	Descriptor
International (Very High)	World Heritage Sites Assets of demonstrable international importance Assets that can contribute significantly to acknowledged international research objectives
National (High)	Scheduled Monuments Undesignated assets of schedulable quality Assets that can contribute significantly to acknowledged national research objectives Grade I and II* listed buildings

Value (Sensitivity)	Descriptor
	Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. Conservation Areas containing buildings of exceptional importance
Regional (Medium)	Designated or undesignated assets (including historic landscape) that contribute to regional research objectives Conservation Areas - containing buildings that contribute significantly to their historic character Grade II listed buildings
Local (Low)	Non-designated assets (including historic landscape) of local significance Assets compromised by poor preservation and/or poor survival of contextual associations Assets of limited importance, but with potential to contribute to local research objectives Locally Listed Buildings Historic (unlisted) buildings of modest quality in their fabric or historical association
None (Negligible)	Assets of limited importance/where importance has been compromised by intrusive alterations such that much of their importance has been lost

Magnitude of Impact

11.3.27 The magnitude of impact is assessed without regard to the importance of the asset. In terms of the judgment of the magnitude of impact this is based on the principle (established in the NPPF paragraphs 189-208) that preservation of the asset and its setting is preferred, and that total physical loss of the asset is the least preferred. Determining the magnitude of impact is based on an understanding of how, and to what extent, the Development would impact on the buried archaeological assets and the setting of any nearby heritage assets. The magnitude of impact is rated as High, Medium, Low, Negligible and No Change.

11.3.28 The survival of archaeological remains is often uncertain without archaeological evaluation and in these circumstances the magnitude of impact can only be estimated or stated as unknown. The magnitude of change resulting from the impact may vary depending on the nature of past development or management effects (e.g. extent of truncation and made ground and the various forms of impact).

11.3.29 Impacts can be direct and indirect:

- **Direct impacts**: are defined as an impact caused by an action, which generally occurs at the same time and place as that action. They are generally associated with the construction, operation or maintenance of a facility or activity and are usually obvious or quantifiable; and
- **Indirect impacts**: are defined as changes resulting from primary impacts. These changes include impacts to the setting of assets; effects can be short or long-term depending on their persistence or duration.

11.3.30 The criteria for assessing the magnitude of impact are set out in Tables 11.3 and 11.4:

Table 11.3: Magnitude of Impact Descriptors for Archaeology

Impact Magnitude	Direct Impacts	Indirect Impacts
High	Change to most or all key archaeological materials, such that the resource is totally altered	Radical transformation of the setting of an archaeological monument, feature or asset.
Medium	Changes to many key archaeological materials, such that the resource is clearly modified.	Considerable changes to setting that affect the character or importance of the asset.
Low	Changes to key archaeological materials, such that the asset is slightly altered.	Minor change to the setting of an archaeological monument, feature or asset.
Negligible	Negligible perceptible impact from changes in use, amenity or access. Negligible perceptible change in the ability to understand and appreciate the resource and its historical context and setting.	Negligible perceptible change in the setting of an archaeological monument, feature or asset.
No Change	No change to the archaeological monument, feature or asset.	No change to the setting of the archaeological monument, feature or asset.

Table 11.4: Criteria for Assessing the Magnitude of Impacts to Built Heritage Assets

Magnitude	Direct Impacts	Indirect Impacts
High	Complete loss of a heritage asset or change to key elements of the asset such that its value is totally altered.	Comprehensive changes to setting in a way that fundamentally compromises its ability to be understood or appreciated. The scale of change would be such that it could result in a designated asset being undesignated or having its level of designation lowered.
Medium	Changes to key materials/ fabric such that the heritage asset is considerably modified.	Considerable changes to the setting of an asset that affects our appreciation of it and its importance.
Low	Changes to materials/ fabric such that the heritage asset is slightly different.	Change to the setting of a heritage asset resulting in a small change in our ability to understand and appreciate the asset and its historical context, character and setting.
Negligible	Negligible change or no material change to material/fabric of a heritage asset that makes little contribution to its importance.	Very slight change to the setting of a heritage asset that hardly affects its importance.
No Change	Changes to material/fabric of a heritage asset that make no contribution to its importance.	Change to the setting of a heritage asset that has no impact on its importance.

Assessing Significance

11.3.31 The assessment of effects is a combination of the importance and sensitivity of the heritage asset (Table 11.2) and the magnitude of impact on that asset (Tables 11.3-4). Effects can be adverse or beneficial and temporary or permanent. It should be noted that effects to archaeology largely arise from the construction phase and that, in the case of archaeology, such effects are often permanent and non-reversible. Adverse effects are those that create or amplify existing or new impacts upon the importance/sensitivity of heritage assets or their setting and remove or limit the ability to understand and appreciate the importance of the heritage asset. Beneficial effects are those that mitigate existing impacts and help to restore or enhance the importance/sensitivity of heritage assets or their setting, therefore allowing for greater understanding and appreciation of it.

11.3.32 Table 11.5 presents a matrix that demonstrates how the scale of effect has been assessed.

Table 11.5: Effects Significance Matrix

		Magnitude of Impact				
		High	Medium	Low	Negligible	No Change
Receptor Sensitivity	Very High	Major	Major	Moderate / Major	Moderate / Minor	No Impact
	High	Major	Major/ Moderate	Moderate/ Minor	Minor/ Negligible	
	Medium	Major/ Moderate	Moderate	Minor	Negligible	
	Low	Minor/ Moderate	Minor	Negligible	Negligible	
	Negligible	Negligible	Negligible	Negligible	Negligible	

11.3.33 Table 11.6 provides a description of the various effect significance categories.

Table 11.6: Effects Significance Categories

Effect Significance Category	Description
Major	Effects at this level are material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Minor	Effects at this level are not likely to be considered material decision-making factors.
Negligible	Effects at this level are not material in the decision-making process
No Impact	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

11.3.34 Effects that are identified as Moderate or Major are considered to be 'significant' effects, whilst those that are identified as Negligible or Minor are considered to be 'not significant'.

11.3.35 Effects that are identified as Moderate/Major or Moderate/Minor require professional judgement to determine whether the significance of effect is either moderate or major, or moderate or minor.

Mitigation

11.3.36 Mitigation measures are included where relevant in order to mitigate or reduce potential adverse effects where possible. These will be outlined in this chapter once potential significant or non-significant adverse effects have been identified.

Residual Effects

11.3.37 Residual effects are those that are predicted to remain after implementation of mitigation measures. Such effects are outlined later in this chapter after mitigation measures have been identified.

Assumptions and Limitations

11.3.38 The assessment of the scale of effects is based on extensive professional experience gained on other major developments across the south of England.

11.3.39 The assessment assumes the accuracy of the available datasets reviewed in its compilation.

11.3.40 The current baseline conditions are informed by the Cultural Heritage Desk-Based Assessment (DBA) and Geophysical Survey.

11.3.41 The information presented in this ES chapter and the technical appendices (all undertaken in 2021) provide an indication of above and below ground archaeological assets present or likely to be present, rather than a definitive list of all assets likely to be present, as the full extent of below ground archaeological assets cannot be known prior to site-specific archaeological field investigation. The Geophysical Surveys undertaken to support the DBA presents a sub-surface map of potential anomalies which or may not be of an archaeological origin. Geophysical survey can only map anomalies and is not necessarily able to characterise them.

11.3.42 The principal limitation to the assessment of effects upon below ground heritage assets is the nature of the archaeological resource, which is buried and therefore not visible. This means it can be difficult to accurately predict the presence and likely importance of below ground heritage assets, and the likely impact (and resultant effects) of the Development upon such assets. The assessment is based on a worst-case assumption leading to total removal of all archaeological remains across the Site.

11.4 Baseline Conditions

Archaeology

11.4.1 The current baseline conditions are informed by the Cultural Heritage DBA and Geophysical Surveys, which are appended as Appendices 11.1-11.3. A summary of the assessments is presented below. The archaeological results are summarised (where relevant) by archaeological periods, as presented in Table 11.7:

Table 11.7: Archaeological Time Periods

Prehistoric	
Palaeolithic	900,000 – 12,000 BC
Mesolithic	12,000 – 4,000 BC
Neolithic	4,000 – 1,800 BC
Bronze Age	1,800 – 600 BC
Iron Age	600 BC – AD 43
Historic	
Roman	AD 43 – 410
Saxon/Early Medieval	AD 410 – 1066
Medieval	AD 1066 – 1485
Post Medieval	AD 1485 – 1799
Modern	AD 1800 – Present

11.4.2 There are no relevant nationally designated archaeological assets within the Site or in close proximity within the study area, as defined by the National Heritage List or Historic England register.

11.4.3 The solid geology of the Site is shown by the British Geological Survey (BGS Online 2021) as White Limestone Formation. A small band of head deposits is recorded in the southern part of the Western Site, whilst alluvial deposits are recorded along the southern boundary of the Eastern Site. Geotechnical site investigations have been undertaken historically at the Site as recorded by the BGS, which have identified a sequence of topsoil overlying superficial silt deposits, and in turn the limestone bedrock in the Western Site. The superficial deposits may represent hillwash colluvial deposits, comprising sediment material that has accumulated on lower slopes when washed down from higher ground.

11.4.4 A non-designated heritage asset comprising a 19th century milestone is recorded within the southern part of the Site adjacent to the A43 on the Oxfordshire HER, however the HER notes that this is thought to have been lost during construction of the M40 in the later 20th century. In general, the majority of HER records within the study area comprise evidence for cropmarks identified as possible archaeological anomalies. A focus of Medieval village activity is recorded at Baynards Green to the immediate north of the Site.

11.4.5 Historic mapping demonstrated that the Site has likely remained open agricultural land or pasture since at least the 18th century through to the present day. Minor development is shown, comprising localised areas of agricultural buildings and a small extraction pit in the northern part of the Eastern Site.

11.4.6 Two separate phases of Geophysical Survey have been undertaken. No clear archaeological anomalies were identified other than evidence for modern agricultural activity, although a number of anomalies of possible archaeological origin were identified with no particular focus suggested in the data.

11.4.7 The DBA concluded a moderate archaeological potential at the Site for the Later Prehistoric periods and for Saxon/Medieval rural and transient activity. A specific potential was identified in association with possible archaeological anomalies identified during geophysical survey. If present, it was considered most likely that any remains would be of a local or possibly a regional significance in NPPF terms.

11.4.8 Past ground disturbance at the Site is likely to have been widespread as a result of historic agricultural activity, as well as very localised areas of development and extraction.

11.4.9 Overall, it was concluded that the Site is likely to retain an archaeological potential and that the Development could impact upon remains of a local or possibly regional significance. However, no remains of high significance have been identified on the Site which may preclude development or be a material design consideration.

11.4.10 The potential for archaeological remains to be encountered within the Site, as well as likely past development impacts, is discussed in full in Appendix 11.1.

Built Heritage

11.4.11 The identification of heritage assets potentially affected by the development were based on the Cherwell District Council Scoping report, as well as the search of the National Heritage List for England (NHLE). The search concluded that the Site does not contain any designated heritage assets. It did identify three designated heritage assets, which fall within the study area. No non-designated heritage assets were identified within the study area.

11.4.12 The designated heritage assets identified, included:

- Barn at SP 5487 2940, Grade II listed (List entry number: 1046400);
- Manor Farmhouse, Grade II listed (List entry number: 1369564); and
- Fewcott Farmhouse, Grade II (List entry number: 1046880).

11.4.13 Following a site visit in August 2021, only the Barn at SP 5487 2940 was considered to have the potential to be affected by the Development for the reasons set out below.

11.4.14 Manor Farmhouse and Fewcott Farmhouse are located in the village of Fewcott, circa 800m from the site. These assets have no visual, historical or functional connection to the site and are, furthermore, separated from the site by agricultural field boundaries and the M40 motorway network.

11.4.15 These assets draw their significance from their historical connection and setting of Fewcott and Ardley. The study area does not contribute to their significance. For these reasons, the two assets were not further assessed as part of the built heritage assessment.

Barn at SP 5487 2940

11.4.16 The Barn is a Grade II listed building, considered to be constructed in the late 18th Century and represents one of the earliest surviving buildings in Baynard's Green. The building is set within its own grounds, surrounded by mature hedgerows and trees. The only available access is via a private road off the B4100/A43 roundabout, which also forms access for the nearby service station. Baynard's Trading Estate lies adjacent to the Barn.

11.4.17 Since its original construction, the Barn was part of Baynard's Green Farm, which has stood relatively isolated within the agricultural hinterland of Bicester. The farm lay near the historical road network, which still exists and now forms the A43 and B4100. The farm saw expansion during the 19th Century, but was partially demolished during the mid-20th Century.

11.4.18 Its immediate setting was changed during the 20th Century with the conversion of the Barn into office use and the development of ancillary buildings. Although altered, the enclosed

nature of the plot boundaries continues to facilitate the formation of a self-contained plot within the landscape, which has persisted since the late 18th Century. Traffic noise from the A43 is clearly audible from the barn's location; however, the wider landscape is not appreciable, as the plot is surrounded by mature vegetation and modern buildings.

11.4.19 In summary, the asset holds architectural interest as a late 18th Century stone barn, however to a lesser extent, due to significant alterations and conversions in the 20th Century. The Site, including the wider open fields, makes no contribution to the importance of the heritage asset.

Future Baseline

11.4.20 The baseline conditions for below ground archaeology at the Site are not likely to change unless the Site is subject to redevelopment.

11.4.21 The Site has remained in farming/agricultural use since historical records began. It is therefore likely that the natural development of the Site without the Development would continue to function in this way. Therefore, conditions for built heritage at the Site are not likely to change.

Summary of Receptors and Sensitivity

11.4.22 Table 11.8 below details the known archaeological assets, and potential archaeological resources identified within the Site from the Historic England National Heritage for England (NHLE) List, the Oxfordshire HER, from the DBA, and Geophysical Survey. Table 11.9 summarises relevant built heritage receptors.

Table 11.8: Summary of Receptor Sensitivity - Archaeology

Baseline Evidence	Receptor	Comment	Sensitivity (Value)
DBA	Low Potential for encountering Early Prehistoric flintwork, if present would comprise residual, isolated material from colluvial or head deposits	Potential for non-designated archaeological asset	Negligible to Low (Local)
DBA & Geophysical Survey	Moderate Potential for Later Prehistoric activity associated with previous finds in the nearby area and possible anomalies identified during Geophysical Survey	Potential for non-designated archaeological asset	Low (Local) to Medium (Regional)
DBA	Low Potential for Roman activity	Potential for non-designated archaeological asset	Low (Local)

Baseline Evidence	Receptor	Comment	Sensitivity (Value)
DBA	Moderate Potential for Saxon period agricultural activity and land division	Potential for non-designated archaeological asset	Low (Local)
DBA	Moderate Potential for Medieval period agricultural activity, land division, and transient activity associated with the nearby village green	Potential for non-designated archaeological asset	Low (Local)
DBA & Geophysical Survey	Low Potential for currently unknown Post Medieval and Modern remains	Potential for non-designated archaeological asset	Negligible to Low (Local)
DBA & Geophysical Survey	Mapped Post Medieval and Modern land boundaries and agricultural activity	Non-designated archaeological assets	Negligible
DBA & Geophysical Survey	Possible archaeological anomalies of currently unknown character identified during Geophysical Survey	Potential for non-designated archaeological asset	Low (Local) to Medium (Regional)

Table 11.9: Summary of Receptor Sensitivity - Built Heritage

Baseline Evidence	Receptor	Comment	Sensitivity (Value)
NHLE & BHS	Barn at SP 5487 2940, Grade II listed (List entry number: 1046400)	Designated asset	Medium (Regional)

11.4.23 No archaeological or built heritage receptors are being introduced as part of the Development.

11.5 Scheme Design and Management

11.5.1 Potential significant archaeological impacts will be offset through appropriate mitigation measures including those set out below as agreed with CDC and the OCC Archaeologist. These mitigation measures would be secured through planning conditions for both planning applications.

11.5.2 Construction works will be carried out in accordance with standard good site practice and adherence to a CEMP, with mitigation measures set out in the Framework CEMP (see Appendix 6.1). Should archaeological remains be identified, control mechanisms will be in place to preserve the archaeological resource by record prior to any significant impacts occurring.

11.5.3 The Development locates built form away from the northern Site boundary; as such the Build Zones are located away from the only built heritage asset in proximity to the Site (Barn at SP 5487 2940) to minimise potential indirect impacts on its setting.

11.6 Construction

Assessment of Effects

Archaeology

11.6.1 Activities during the Enabling Works and construction phase could include the cutting/piling of new foundations, the construction of roads, and the installation of services and sub-surface water drainage. These activities could damage and destroy the archaeological resource at the Site.

11.6.2 Based on those assumed construction phase activities, the likely impacts are summarised in Table 11.10. All potential impacts are considered direct.

Table 11.10: Assessment of Likely Construction Impacts

Construction Activity	Assessed Magnitude of Impact
Site set-up works, including contractors compound set-up and associated temporary services, levelling work and other preparatory groundworks	Low
Demolition of extant structures, including grubbing out of existing foundations	High
Site strip in advance of construction	High
Construction, including foundation excavation or pile installation, service installation, road construction	High
Landscaping, including ground reduction or levelling and creation of attenuation tanks and ponds	Low to Medium
Compression of buried remains from vehicle movement, construction of spoil tips, bunds or raised landscape areas	Low

11.6.3 It has been concluded for the purpose of this assessment that where any below ground heritage assets are present within the Site and remain intact, these will most likely be of a generally low to medium sensitivity.

11.6.4 It is considered likely that the effects to below ground heritage assets as a result of construction activities would be adverse in nature, given that such works remove either fully or partially any below ground remains which may be present within the Development footprint. These effects will be limited to the Site and will be permanent and irreversible.

11.6.5 Any effects as a result of construction activities on relevant known designated archaeological assets and non-designated below ground archaeological remains outside of the Site will be negligible (not significant).

11.6.6 An evaluation of the predicted archaeological impacts during construction and the subsequent nature, scale and significance of effects is provided in Table 11.11.

Table 11.11: Evaluation of Predicted Archaeological Impacts During Construction Phase

Receptor	Sensitivity	Magnitude of Impact	Scale of Effect
Low Potential for encountering Early Prehistoric flintwork, if present would comprise residual, isolated material from colluvial or head deposits	Negligible to Low	Up to High Direct	Negligible to Minor/ Moderate
Moderate Potential for Later Prehistoric activity associated with previous finds in the nearby area and possible anomalies identified during Geophysical Survey	Low to Medium	Up to High	Minor to Moderate
Low Potential for Roman activity	Low	Up to High	Minor/ Moderate
Moderate Potential for Saxon period agricultural activity and land division	Low	Up to High	Minor/ Moderate
Moderate Potential for Medieval period agricultural activity, land division, and transient activity associated with the nearby village green	Low	Up to High	Minor/ Moderate
Low Potential for currently unknown Post Medieval and Modern remains	Negligible to Low	Up to High	Negligible to Minor/ Moderate
Mapped Post Medieval and Modern land boundaries and agricultural activity	Negligible	Up to High	Negligible
Possible archaeological anomalies of currently unknown character identified during Geophysical Survey	Low to Medium	Up to High	Minor to Moderate

11.6.7 The range of sensitivity of known or potential archaeological assets is generally anticipated to vary from Negligible to Medium. At worst, the magnitude of impact is considered to be High upon any archaeological remains within the footprint of the Development as these are likely to be directly impacted and unlikely to survive the construction phase. It is considered that any indirect impacts upon relevant archaeological assets outside of the Site will be Negligible.

11.6.8 Professional judgement has subsequently been applied and the construction of the Development is assessed as likely having a generally permanent Minor/Moderate adverse to Negligible effect on archaeological remains. These effects would not generally be considered significant, however should any receptors of regional importance be present at the Site, the effect upon these receptors would potentially be Moderate adverse which would comprise a significant effect in EIA terms. This would not constitute substantial harm in NPPF terms and can be appropriately mitigated by preservation in record, as discussed below.

Built Heritage

11.6.9 The nature of the construction stage is such that it will introduce temporary changes within parts of the Barn's setting that does not contribute to its importance. These changes would not alter the ability to appreciate or experience the importance of the asset, will be temporary in nature and will have no impact on the built heritage asset.

Table 11.12: Evaluation of Predicted Built Heritage Impacts During Construction Phase

Receptor	Sensitivity	Magnitude of Impact	Scale of Effect
Barn at SP 5487 2940, Grade II listed (List entry number: 1046400)	Medium	Low	Negligible

Mitigation, Monitoring and Residual Effects

Archaeology

11.6.10 The Archaeological Desk Based Assessment and the Geophysical Survey provide a comprehensive package of evaluation surveys to support a planning application. Based upon the results of the DBA and Geophysical Survey, further archaeological work is anticipated.

11.6.11 Given that the results of the DBA and Geophysical Survey suggest that archaeological remains of high significance that could preclude development are unlikely to be present at the Site, it is considered that any further archaeological works can be reasonably secured by an appropriately worded planning condition.

11.6.12 The location, timing and extent of any archaeological mitigation will be discussed and agreed with CDC and their archaeological advisor at OCC. Any requirement for mitigation by trial trenching and excavation will take place in advance of construction activities. Any requirement for a programme of archaeological monitoring during relevant groundworks would be undertaken during the Enabling Works and/or construction phase of the Development.

11.6.13 Appropriate archaeological fieldwork followed by dissemination of the acquired data would be considered a beneficial effect. However, the adverse effects on archaeology as reported in Table 11.11 would not be reduced by mitigation, ranging from Negligible to Minor/Moderate adverse.

Built Heritage

11.6.14 No specific mitigation measures are considered necessary at construction stage as no impacts are predicted. This outcome rests on the prerequisite of a best practice approach in using construction methods.

11.7 Completed Development

Assessment of Effects

Archaeology

11.7.1 The Development, once completed and occupied, will not have any effect on archaeological remains within the Site as it has been assumed that the construction phase of the Development will have disturbed any remains which may be present as a result of excavation, earthworks and other below ground construction activities, as well as archaeological mitigation. Consequently, no additional direct effects will occur to relevant archaeological assets during the operational phase.

11.7.2 Similar to the construction phase, it is considered that any indirect impacts on relevant archaeological assets outside of the Site once the Development is completed and operational will be negligible.

Built Heritage

11.7.3 The completed and operational Development will present a change in character within the Site and is likely to lead to a higher amount of traffic along the B4100 and A43 intersection (see Chapter 8: Transport and Access). However, the Site does not contribute to the ability to appreciate the importance of the Barn due to its self-contained nature and traffic noise from the A43 being already audible at the Barn's location.

11.7.4 The Development will not diminish the ability to appreciate the importance of the Barn and will not obstruct or interfere with any important views of the assets. A summary of these impacts is summarised in Table 11.13.

Table 11.13: Evaluation of Predicted Built Heritage Impacts During Operations Phase

Receptor	Importance	Impact Description	Magnitude of Impact	Scale of Effect
Barn at SP 5487 2940, Grade II listed (List entry number: 1046400	Medium	Changes to setting	No impact	No Impact

Mitigation, Monitoring and Residual Effects

11.7.5 No archaeological or built heritage effects are anticipated at the operational stage and therefore no further mitigation measures are required. Residual effects remain as stated above.

11.8 Cumulative Effects

11.8.1 There may be some cumulative impacts on below ground archaeological receptors in general terms as a result of the interaction of the Development with other schemes. Indeed, it is acknowledged that any archaeological remains within the Site form part of a wider landscape of multi-period archaeological sites and monuments. However, given the generally isolated, small scale and localised nature of archaeological remains, no significant

cumulative effects are identified in relation to below ground archaeological remains arising from the construction and operational phases of the Development.

11.8.2 No cumulative effects to built heritage receptors are identified. The two closest schemes, Scheme 1 (Oxfordshire SRFI) and Scheme 2 (Heyford Park), lie in circa 2.5km distance of the Barn, south west of the villages of Fewcott and Ardley. The proximity of the schemes to the heritage asset would prevent any cumulative effects.

Table 11.14: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact	Mitigation and Monitoring	Residual Effect
Construction						
Enabling works and construction activities including excavations etc.	Archaeological remains of Early Prehistoric date (Low)	Local	Permanent	Up to High	Programme of archaeological works to be secured by planning condition and agreed with OCC Archaeologist.	Negligible to Minor/ Moderate Adverse
	Archaeological remains of Late Prehistoric date (Low to Medium)	Local to Regional				Minor to Moderate Adverse
	Archaeological remains of Roman date (Low)	Local				Minor/ Moderate Adverse
	Archaeological remains of Saxon date (Low)	Local				Minor/ Moderate Adverse
	Archaeological remains of Medieval date (Low)	Local				Minor/ Moderate Adverse
	Unknown archaeological remains of Post Medieval and Modern date (Negligible to Low)	Local				Negligible to Minor/ Moderate Adverse
	Known archaeological remains of Post Medieval and Modern date (Negligible)	Local				Negligible Adverse
	Unknown archaeological remains (Low to Medium)	Local to Regional				Minor to Moderate Adverse
Construction activities, including increased traffic and noise levels	Barn at SP 5487 2940 (Medium)	Local	Temporary	No impact	None required	None
Completed Development						
Dissemination of archaeological fieldwork results and publication	All archaeological receptors stated above	Negligible, Local, to Regional	Permanent	Up to High Indirect	None. Dissemination of fieldwork and results would be a requirement of archaeological works.	Minor to Moderate Beneficial
Change of setting to designated heritage asset	Barn at SP 5487 2940 (Medium)	Local	Permanent	No impact	None required	None
Cumulative Effects						
No cumulative effects are identified						

References

[1] Ancient Monuments and Archaeological Areas Act 1979, (updated 2014). United Kingdom Central Government.

[2] Listed Buildings and Conservation Areas Act 1990, (1990). United Kingdom Central Government.

[3] Ministry of Housing, Communities and Local Government, (2021). National Planning Policy Framework. July 2021

[4] Cherwell District Council, (2015). Local Plan 2011-31 Part 1.

[5] Cherwell District Council, (1996, saved in 2007). Local Plan 1996 Saved Policies.

[6] Cherwell District Council, (2019). Mid-Cherwell Area Neighbourhood Plan 2018-30.

[7] Ministry of Housing, Communities and Local Government, (2014, lasted updated June 2021). Planning Practice Guidance.

[8] Historic England, (2015). Good Practice Advice Note 1: The Historic Environment in Local Plans.

[9] Historic England, (2015). Good Practice Advice Note 2: Managing Significance in Decision-Taking in the Historic Environment.

[10] Historic England, (2017). Good Practice Advice Note 3: The Setting of Heritage Assets.

[11] Historic England, (2020). Good Practice Advice Note 4: Enabling Development and Heritage Assets.

[12] English Heritage, (2008). Conservation Principles, Policy and Guidance.

[13] Design Manual for Roads and Highways, (2019).

[14] Department for Culture, Media and Sport, (2013). Scheduled Monuments and Nationally Important Non-Scheduled Monuments.

12 Biodiversity

12.1 Introduction

12.1.1 This chapter of the ES was prepared by Tyler Grange Group Ltd. and presents an assessment of the likely significant effects of the Development on biodiversity. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and/or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

12.1.2 The chapter is supported by the following appendices:

- Appendix 12.1: Legislation and Planning Policy;
- Appendix 12.2: Protected Species Survey Methodology and Results;
- Appendix 12.3: Biodiversity Net Gain Assessment;
- Appendix 12.4: Habitat Features and Bat Survey Plan; and
- Appendix 12.5: Statutory Designated Sites within 2km of the Site Plan.

Competence

12.1.3 Amber Perrett BSc ACIEEM is the principal author of this chapter of the ES. She has over six years' experience in the environmental sector. Her experience includes logistics/commercial schemes, as well as contributing to the ecological and biodiversity input into the ES chapters for nationally significant infrastructure projects. Lisa Campbell BSc MA ACIEEM is the first reviewer of this chapter of the ES. She has over ten years' experience in the environmental sector. Her experience includes logistics/commercial schemes, as well as authoring ES chapters for a range of projects. Aaron Grainger BSc MSc MCIEEM is the second reviewer of this chapter of the ES. He has over ten years' experience in the environmental and EIA sector, including experience on logistics/commercial projects.

12.2 Legislation, Planning Policy and Guidance

Legislation Context

12.2.1 Specific habitats and species receive legal protection in the UK under the following pieces of legislation (with more detail contained in Appendix 12.1):

- The Wildlife and Countryside Act 1981 (as amended)[1];
- The Conservation of Habitats Species Regulation 2017 (the 'Habitats Regulations')[2];
- The Countryside and Rights of Way Act 2000[3];
- The Protection of Badgers Act 1992[4];
- The Hedgerows Regulations 1997[5];
- The Natural Environment and Rural Communities (NERC) Act 2006[6]; and
- The Wild Mammals (Protection) Act 1996[7].

12.2.2 Where relevant, the assessment takes account of this legislative protection.

Planning Policy Context

National

12.2.3 The following national planning policy is relevant to the Development:

- The National Planning Policy Framework 2021[8] ('NPPF').

Local

12.2.4 The following local planning policy is relevant to the Development:

- Cherwell Local Plan 2011 - 2031 Part 1 Partial Review, Adopted September 2020[9];
- Cherwell Local Plan 2011 - 2031 Part 1, Re-adopted December 2016[10];
- Oxfordshire Biodiversity Action Plan[11]; and
- Cherwell Corporate Biodiversity Action Plan 2016-18[12].

Guidance

12.2.5 The following guidance is relevant to the assessment:

- BS 42020:2013. Biodiversity – Code of practice for planning and development[13];
- BS 5837:2012. Trees in relation to design, demolition and construction, recommendations[14]; and
- CIEEM Guidelines for Ecological Impact Assessment in the United Kingdom, Ireland: Terrestrial, Freshwater, Coastal and Marine (the 'CIEEM Guidelines')[15].

12.2.6 Further guidance related to protected species is detailed in Section 12.3: Assessment Methodology of this chapter and Appendix 12.2.

12.3 Assessment Methodology

Consultation

12.3.1 Table 12.1 summarises key comments raised by consultees of relevance to this assessment and how the assessment has responded to them.

Table 12.1: Consultation Response Summary

Consultee and Comment	Response
Cherwell District Council (CDC) EIA Scoping Opinion, Planning and Development team, 29th July 2021	
"*The approach to this topic is agreed as this is relatively standard, i.e. CIEEM's Guidelines for Ecological Impact Assessment version 1.1 (updated September 2019).*" *"The report does not mention ecological enhancements beyond mitigation, and this should be included particularly if compensatory habitats or contributions are likely to be required in order to achieve the required net gains for biodiversity. A*	A biodiversity net gain metric (Defra 2.0) has been completed as described within this chapter and appended in Appendix 12.3. Enhancement measures are included within the metric as appropriate to ensure a net gain is achieved.

Consultee and Comment	Response
Biodiversity Impact Assessment tool should be included and discussed. *The cumulative impact assessment should include consideration of how the green infrastructure and any wildlife corridors will complement those of nearby developments*." "*Include and discuss A Biodiversity Impact Assessment tool within this chapter*". Telephone conversation with CDC on 20th July 2021.	The ecologist from CDC confirmed that it will be acceptable to offset any deficit in biodiversity units from the Development off-site provided the land is within CDC's jurisdiction.
Campaign for the Rural Environment (CPRE) (Oxfordshire), EIA Scoping Opinion, 23rd July 2021	
"*It is essential that biodiversity assessments and calculations of loss are given in full in the ES to comply with the industry-standard best practice principles for transparency and sharing of calculations as requested by the CIEEM as well as suitable mitigation of losses.*" "The *Baseline biodiversity data did not appear to include a survey of invertebrates which is required especially as the LP Policy ESD10, para 237, requests that surveys of the brown hairstreak butterfly are performed for all developments around the Bicester area.*"	A biodiversity net gain metric (Defra 2.0) has been completed as described within this chapter and appended in Appendix 12.3 Given that the majority of hedgerows within the Site will be retained (see Parameter Plans SK019 and SK025: Vegetation Retention and Removal), targeted brown hairstreak survey was not considered necessary. Replacement planting is proposed in close proximity to the locations of proposed hedgerow removal on the northern boundaries of the Site which is considered to sufficiently compensate for any loss in potential brown hairstreak habitat.
Fritwell Parish Council, EIA scoping opinion, July 2021	
"*Provide with further details of how and where in the locality the habitat loss will be compensated for by habitat creation and enhancement*."	An initial biodiversity net gain metric (DEFRA 2.0) has been completed as described within this chapter and appended in Appendix 12.3. Enhancement measures are included within the metric as appropriate to ensure a net gain is achieved.

Study Area and Scope

12.3.2 The study area is defined by the Zone of Influence (ZoI) of the Development. As will be described in this chapter, this was determined during the assessment process.

12.3.3 The ZoI is broadly confined to the Site and its immediate surroundings. In accordance with the CIEEM Guidelines, potential effects that could occur at greater distances were assessed with respect to international statutorily protected sites and national statutorily and non-statutorily protected sites up to 10km and 2km, respectively, from the Site. In addition, potential effects to protected and priority fauna species within 2km were considered and air quality impacts were

considered within 200m of the Site and affected road network in relation to designated sites where appropriate.

12.3.4 It was assumed that enabling works and Site clearance will commence in early 2022 and construction will last until 2025. For the purposes of the assessment, it is assumed the Development will have first occupation in 2024, with full occupation in 2025.

Establishing Baseline Conditions

12.3.5 To determine the important ecological features within the study area, a combination of desk-based research and surveys was undertaken.

Data Search

12.3.6 Protected and priority species records were obtained from Thames Valley Environmental Records Centre ('TVERC') for the area within a 2km radius of the Site. This set out to collate existing ecological baseline information available in the public domain and information held by relevant third parties to inform this chapter. Areas around the Site to which searches for information were undertaken varied depending on the ecological resource considered, in accordance with the study area set out in paragraphs 12.3.2-12.3.3.

12.3.7 The following information was received from TVERC:

- Records of legally protected and notable species; and
- Records of non-statutory sites designated for nature conservation value within 2km of the Site.

12.3.8 The online Multi-Agency Geographic Information for the Countryside ('MAGIC') database[16] was consulted (which utilises data provided by Natural England) for records of statutory designated sites and woodland listed on the Ancient Woodland Inventory within 2km of the Site. This search was extended to 10km for Natura 2000 sites (Special Areas of Conservation ('SAC') and Special Protection Areas ('SPA') and Ramsar sites).

Surveys

12.3.9 A summary of protected species surveys undertaken is provided below with further details and results presented in Appendix 12.2.

Phase 1 Habitat Survey

12.3.10 A Phase 1 habitat survey of the Site was carried out on 17th May 2021 by Tyler Grange Group Ltd. The survey covered the entire Site, including boundary features.

12.3.11 Habitats were described and mapped following the standard Phase 1 habitat survey methodology. Phase 1 habitat survey is a standard technique for classifying and mapping British habitats. The dominant plant species were recorded, and habitats identified according to their vegetation types. Where appropriate, consideration was given to whether each habitat would qualify as a Habitat of Principal Importance following habitat descriptions published by the Joint Nature Conservation Committee[17].

Badger (Meles meles)

12.3.12 A badger survey was completed on 16th June 2021 by Tyler Grange Group Ltd. The badger survey followed standard best practice methodologies[18,19,20].

12.3.13 The survey aimed to identify the presence or likely absence of badgers within and within 30m of the Site where freely accessible, by walking through the Site and identifying signs of badger activity.

12.3.14 Detailed survey methodology and results are provided in Appendix 12.2.

Barn owl (Tyto alba)

12.3.15 Two barn owl survey visits were completed, on 29th July 2021 and 12th August 2021 by Tyler Grange Group Ltd, in accordance with best practice guidance[21]. Surveys were led by a holder of a Natural England Class CL29 survey licence for barn owl. The survey focussed on the barn (building B1) on the Western Site as the only structure within the Site considered to have potential to support nesting barn owls. The survey involved an internal and external inspection of the barn to identify and record features which could offer potential for use by breeding barn owls, to record any evidence of current or historic use as nest or roost sites, and to assess the current status of barn owl at the Site.

12.3.16 Detailed survey methodology and results are provided in Appendix 12.2.

Bats - Ground level preliminary bat roost assessment surveys

12.3.17 A ground level preliminary bat roost assessment ('PBRA') of all buildings and trees present on-Site was completed on 17th May 2021 by Tyler Grange Group Ltd. The PBRA followed the Bat Conservations Trust's best practice guidelines (2016)[22].

12.3.18 The PBRA for the buildings followed standard methodology which comprised an external, ground-level inspection to assess the buildings potential to support roosting bats. Detailed survey methodology and results are provided in Appendix 12.2.

Bats – Activity: Transects

12.3.19 Surveys were completed in accordance with BCT guidance (2016) for low suitability habitat as far as possible, which recommends one dusk activity survey per season (spring: April/May, summer: July/August and autumn: September/October). It was not possible to complete the spring transect visit in 2021 given that ecological surveys began in late May 2021 and therefore two of the recommended three bat activity survey visits (summer and autumn) have been completed in 2021 to inform the baseline scenario.

12.3.20 Surveys were completed on 19th August 2021 and 13th September 2021 by Tyler Grange Group Ltd. A reasonable worst-case scenario has been set out with regard to survey results for spring in order to account for this, based on survey findings from the summer and autumn survey visits and professional judgement. This is considered to be sufficient for the purposes of this assessment in accordance with the precautionary principle set out within CIEEM guidance. The bat activity transect route is shown in Appendix 12.4.

12.3.21 Surveyors used a combination of visual observation and echolocation detection techniques to identify any bat activity on the Site. Detailed survey methodology and results are provided in Appendix 12.2.

Bats – Activity: Static Monitoring

12.3.22 As part of the manned activity survey data, automated static monitoring surveys of the Site were also conducted. Timings of static monitoring are as per best practice guidance, with static

detectors to be set out for five consecutive nights once each season (spring: April/May, summer: July/August and autumn: September/October). As it was not possible to complete the spring bat activity surveys, two of the three (summer and autumn) recommended[23] static detector deployments have been completed in 2021. Two static detectors (one on each transect route) were placed on the northern boundaries of the Site, between 12th and 17th August and between 01st-06th September 2021. Static bat detectors used were Anabat Express and Anabat Swift. The location of static detectors placed within the Site is shown in Appendix 12.4.

12.3.23 As with the transect surveys, a reasonable worst-case scenario has been set out with regard to spring survey results based on survey findings from the summer and autumn survey visits and professional judgement. Detailed survey methodology and results are provided in Appendix 12.2. This is considered to be sufficient for the purposes of this assessment in accordance with the precautionary principle set out within the CIEEM guidelines.

Bats - Emergence/re-entry Survey

12.3.24 One dusk emergence and one dawn re-entry surveys were completed respectively on a barn and a tree within the Western Site by Tyler Grange Group Ltd, in accordance with best practice guidelines. These surveys were completed on 29th July 2021 and 12th August 2021.

12.3.25 Surveyors were positioned to provide adequate visual coverage of all suitable features present on the building. Surveyor locations are shown in Appendix 12.4. Surveyors used a combination of visual observation and echolocation detection to identify any bats emerging from or re-entering the building. Detailed survey methodology and results are provided in Appendix 12.2.

Great Crested Newt (Triturus cristatus) (GCN) Survey – Habitat Suitability Index Assessment

12.3.26 A Habitat Suitability Index assessment (HSI) of waterbody WB1, which is located within the Eastern Site, as well as WB2, WB3 and WB4, which are all located within 250m of the Site, was completed in conjunction with the extended Phase 1 habitat survey. The HSI assessment was completed in accordance with best practice guidance, English Nature (2001)[24]. Detailed survey methodology and results are provided in Appendix 12.2.

GCN Survey - Environmental DNA Analysis

12.3.27 All waterbodies considered to have potential to support great crested newt following the HSI assessment were subject to environmental DNA (eDNA) analysis. This is an approach approved by Natural England for providing a rapid means of establishing the presence or likely absence of GCN in a waterbody.

12.3.28 Two large waterbodies located approximately 0.1km south of Site were scoped out of further assessment as the waterbodies are separated from the Site by the major roads of the M40 and A43 which are considered to form barriers to the dispersal of great crested newts to terrestrial habitats within the Site in accordance with relevant guidance[25].

12.3.29 eDNA sampling involved water samples being taken from waterbodies on 16th June 2021 by an experienced GCN surveyor from Tyler Grange Group Ltd. Sterile kits provided by Nature Metrics Ltd were used, following standard methodology to prevent contamination of the samples[26].

12.3.30 A full copy of the results of this analysis and detailed methodology is provided in Appendix 12.2.

Identifying Likely Significant Effects

Evaluation of Ecological Resources

12.3.31 The evaluation of ecological resources was made with reference to the CIEEM Guidelines. This process included:

- Identifying those ecological features likely to be affected; and
- Evaluating the features to identify those of importance, i.e. those which if their integrity or conservation status were affected, national or local policies (or in some cases legislation) would be triggered.

12.3.32 The level of importance of specific ecological receptors was assigned using a geographic frame of reference using the following terms: International; National; Regional; County; District; and/or Local. Categorisation of ecological receptors within each of these terms is largely dependent on the representation of each receptor within each geographic frame of reference.

Enabling Works and Construction

12.3.33 Likely significant effects on ecological receptors are considered at the construction phase through consideration of elements of the Development required for site clearance and construction work. This also includes consideration of the potential effects of the Enabling Works, as described in Chapter 5: Description of Development.

Completed Development

12.3.34 Likely significant effects on ecological receptors are considered at the completed Development phase through consideration of elements of the Development which are considered likely to occur at the operational stage. Principally, this relates to the operation of the commercial units.

Cumulative Effects

12.3.35 The methodology for the cumulative assessment follows that set out for the main assessment. The ZoI considers the impacts of relevant schemes within 10km that have the potential to have an additive or synergistic effect when considered in conjunction with the potential effects of the Development. Schemes assessed are listed within this chapter, in alignment with those identified in Chapter 3: EIA Methodology.

12.3.36 It is assumed that, as with the Development, all schemes considered will be required to mitigate potential effects upon important ecological receptors and deliver a net gain in biodiversity in-line with the Local Plan.

Determining Effect Significance

Sensitivity of Receptor

12.3.37 The CIEEM Guidelines do not require the sensitivity of the receptor to be assessed, the receptor is described in terms of its ecological value on a geographical scale which is determined through professional judgement and is based on factors such as quality and extent of a habitat, or the rarity of a habitat or species. To more accurately define the level of importance of an ecological feature, the geographical scale referenced in the CIEEM Guidelines was applied as set out in Table 12.2.

Table 12.2: Receptor Sensitivity Descriptors

Value (Sensitivity)	Descriptor (CIEEM Equivalent)
Very High	International
High	National
Medium	Regional, County
Low	District, Local
Negligible	Negligible

Magnitude of Impact

12.3.38 Impacts were described with reference to the following characteristics where relevant:

- Positive or negative;
- Extent;
- Magnitude;
- Duration;
- Timing;
- Frequency; and
- Reversibility.

12.3.39 Magnitude refers to extent, amount, intensity and volume. It is quantified where available data allows and is expressed in absolute or relative terms, e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

Assessing Significance

12.3.40 The significance of ecological effects uses terminology derived from CIEEM Guidelines. The approach is summarised below:

- **Designated Sites and Ecosystems:** Significant effects encompass impacts on structure and function of defined sites and ecosystems. For designated sites the focus is whether the Development and associated activities are likely to undermine the site's conservation objectives or negatively affect the conservation status of the species or habitats for which the site is designated. For ecosystems, the focus is whether the Development is likely to result in a change in its structure or function; and
- **Habitats and Species:** Consideration of conservation status is important for evaluating the significance of effects on individual habitats and species. Conservation status for habitats is determined by the sum of the influences acting on the habitat that may affect its extent, structure and function as well as its typical species composition within a given geographical area. For species, it is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

12.3.41 Potential and residual effects (adverse or beneficial) are defined in Table 12.3 and can be either temporary or permanent.

Table 12.3: Definitions of Significance Criteria for Ecology

Significance Criteria	Description of Criteria
Very Substantial (Major) Beneficial	A beneficial effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a regional level or above.
Substantial (Major) Beneficial	A beneficial effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a county level.
Moderate Beneficial	A beneficial effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a district level.
Minor Beneficial	A beneficial effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a site or local level.
Negligible	No significant effect on an important ecological feature.
Minor Adverse	An adverse effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a site or local level.
Moderate Adverse	An adverse effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a district level.
Substantial (Major) Adverse	An adverse effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a county level.
Very Substantial (Major) Adverse	An adverse effect on the conservation status of a defined site or ecosystem(s) and/or the habitats or species that is significant at a regional level or above.

Future baseline

12.3.42 The baseline habitats on the Site were in a managed condition at the time of the extended Phase 1 habitat survey. Given the arable nature of the Site, it is anticipated that, in the absence of the Development, similar management would continue in a future baseline scenario in 2025.

12.3.43 It is acknowledged that climate change may cause changes in species composition within the UK, including the Site over time. However, given that these changes are not known and are unlikely to be of relevance in 2025 considering the way the Site is managed for agricultural purposes, it is assumed that conditions will remain the same or similar to current conditions. Therefore, it is anticipated that the future baseline of the Site would remain the same or similar to the baseline recorded during the extended Phase 1 habitat survey and would contain similar habitats and species as described in the 'Baseline Conditions' of this chapter.

Assumptions and Limitations

12.3.44 Due to the timing of the planning application, it was not possible to complete all bat activity surveys within the optimal survey season, given that some surveys are required in spring in accordance with best practice guidelines. Therefore, the baseline and assessment in this ES chapter assumes a reasonable worst-case scenario based on survey data available to date, data search records and the suitability of the habitats present. This assumes that the boundary hedgerows of the Site are utilised by predominately common and widespread species, as identified during the summer and autumn surveys but, on a precautionary basis, assumes species would be found in slightly greater numbers during spring activity surveys. Consequently, the lack of these survey results is not considered to be a significant limitation to the conclusions of the ecology chapter and is considered appropriate for the purposes of this assessment in accordance with the precautionary principle set out within CIEEM Guidance.

12.3.45 It was initially anticipated that only tree T1 and building B1 required emergence/re-entry survey based on initial design plans. However, it is now understood that one moderate suitability tree (T19) on the northern boundary of the Western Site may be removed to facilitate a vehicular access point and, due to the proximity of the works, two moderate suitability trees (T4 and T5) may be subject to disturbance. Therefore, a reasonable worst-case assumption that these trees each contain a low conservation status bat roost is set out in relation to these trees, based on survey data to date (which found no roosts within tree T1 and building B1), data search records and professional judgement. This is therefore not considered a significant limitation and is considered appropriate for the purposes of this assessment in accordance with the precautionary principle set out within CIEEM Guidance.

12.3.46 It was not possible to complete breeding bird surveys in 2021 due to project timescales given breeding bird surveys must be completed between April and June in accordance with best practice guidance. A ‘reasonable worst-case’ assumption that the Site is utilised by a range of common and widespread species and low numbers of farmland birds is therefore set out in relation to breeding bird assemblages, based on habitats present within the Site and data search records. This is therefore not considered a significant limitation and is considered appropriate for the purposes of this assessment in accordance with the precautionary principle set out within CIEEM Guidance.

12.3.47 It was not possible to complete surveys for hazel dormouse *Muscardinus avellanarius* during 2021 given project timescales. Therefore, on a precautionary basis for the purposes of this assessment, a ‘reasonable worst-case’ assumption that the boundary hedgerows may be utilised by small numbers of hazel dormouse is made. This is therefore not considered a significant limitation and is considered appropriate for the purposes of this assessment in accordance with the precautionary principle set out within CIEEM Guidance.

12.4 Baseline Conditions

Eastern Site

Designated sites

Statutory sites

12.4.1 The data search confirmed that there are no SPAs, SACs or Ramsar sites within 10km of the Site.

12.4.2 One Site of Special Scientific Interest (SSSI) designated for biological interest, Ardley Cutting and Quarry SSSI, was identified within 2km of the Site, located approximately 1.3km south west of the Eastern Site Boundary. This SSSI is designated partially for geological reasons and partially for containing calcareous limestone grassland and woodland habitats which host a large population of great crested newt and a range of invertebrate species including small blue butterfly *Cupido minimus* and dark green fritillary *Argynnis aglaja* butterfly and four-spotted moth *Tyta luctuosa*. This SSSI is considered to be of national ecological importance. The location of statutory designated site within 2km of the Site are shown in Appendix 12.5.

Non-statutory sites

12.4.3 Five Local Wildlife Sites (LWSs) and one Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) Reserve were returned from the data search within 2km of the Site which are described in Table 12.4. LWSs are designated if the site meets the criteria for the selection of LWSs in Berkshire, Buckinghamshire and Oxfordshire[27]. These non-statutory sites are considered to be of county ecological importance.

Table 12.4: Summary of Non-statutory Designated Sites, Eastern Site

Site Name	Location from Site	Description
Ardley Quarry BBOWT Reserve	1.3km south west	Designated for scrub, woodland and rough grassland habitats containing a range of plant species such as cowslips *Primula veris*, common spotted-orchid *Dactylorhiza fuchsii* and bee orchid Ophrys apifera; butterflies including grizzled skipper *Pyrgus malvae* and green hairstreak *Callophrys rubi*, birds including chiffchaff *Phylloscopus collybita* and bullfinch *Pyrrhula pyrrhula* and reptiles.
Stoke Bushes LWS	1.16km north east	Designated for woodland habitat dominated by oak *Quercus* sp. and ash *Fraxinus excelsior* trees with a ground flora including dog's mercury *Mercurialis perennis*, bluebell *Hyacinthoides non-scripta*, wood anemone *Anemone nemorosa* and wood sedge *Carex depauperata*. Bird species of principal importance including marsh tit *Poecile palustris* and yellowhammer *Emberiza citrinella* have also been recorded.
Stoke Wood LWS	0.32km south	Designated for ancient woodland with records of 31 plant species including bluebell, primrose *Primula vulgaris* and wood spurge *Euphorbia amygdaloides*. Butterflies including silver-washed fritillaries *Argynnis paphia* and white admiral *Limenitis camilla* have been recorded.
Stoke Little Wood LWS	1.4km south east	Designated for ancient woodland habitat, dominated by oak, ash and field maple *Acer campestre* with a shrub layer including Midland hawthorn *Crataegus laevigata* and hazel *Corylus avellana* and a ground flora including dog's mercury, bluebell and common dog violet *Viola riviniana*. Red kite *Milvus* and badger have also been recorded.
Ardley Fields Quarry LWS	1.9km south	An area of restored quarry designated for grassland, pond and wet ditch habitats. The grassland is predominately species-poor with kidney vetch *Anthyllis vulneraria*, field scabious *Knautia arvensis* and burnet saxifrage *Pimpinella saxifrage* recorded in small areas. A number of bird species have been recorded including teal *Anas crecca*, gadwall *Mareca strepera* and little ringed plover *Charadrius dubius*.

Site Name	Location from Site	Description
Upper Heyford Airfield LWS	1.9km south west	Designated for grassland habitat including some areas of species-rich calcareous grassland. Plant species include cowslip, greater knapweed *Centaurea scabiosa* and lady's *bedstraw Galium verum*. A large population of great crested newt have been recorded within water storage tanks within he LWS. Birds recorded include skylark *Alauda arvensis*, curlew *Numenius arquata* and grey partridge *Perdix perdix*. Fourteen species of butterfly have been recorded at the site including Essex skipper *Thymelicus lineola*, large skipper *Ochlodes sylvanus* and small heath Coenonympha pamphilus.

Habitats

12.4.4 The Phase 1 habitat survey identified several habitat types within or directly adjacent to the Site. The locations and extent of these habitats are illustrated in Appendix 12.4.

Arable

12.4.5 The majority of the Eastern Site is formed of arable fields. Arable fields are of limited inherent ecological value and are considered to be of negligible ecological importance. The potential for this habitat type to support protected species (e.g. birds) is discussed separately below.

Grassland

12.4.6 Improved grassland formed the margins of the arable fields, dominated by perennial ryegrass *Lolium perenne* with Yorkshire fog *Holcus lanatus* and white clover *trifolium repens*. Improved grassland is of limited inherent ecological value and are considered to be of negligible ecological importance.

Hedgerows

12.4.7 Five hedgerows are present within the Eastern Site, forming the boundaries around the Eastern Site and partly demarcating the boundaries between arable fields:

- Hedgerows H10, H11, H12 and H13 are species-poor defunct hedgerows with multiple gaps. These hedgerows are dominated by common hawthorn *Crataegus monogyna* and blackthorn *Prunus spinosa* located on the eastern and southern boundaries of the Eastern Site and demarcating field boundaries in the centre of the Eastern Site; and
- Hedgerow 9 is an intact species-rich hedgerow with trees forming the western and northern boundaries of the Eastern Site. Tree species comprised pedunculate oak *Quercus robur*, ash, hazel and field maple. Shrub species included hawthorn, blackthorn, elder *Sambucus nigra*, holly *Ilex aquifolium* and dog rose *Rosa canina*.

12.4.8 Hedgerows are listed in Section 41 of the NERC Act 2006 as a priority habitat and based on the criteria listed in the UK BAP Priority Habitat Descriptions[28], the species-rich hedgerow H9 is likely to qualify as such. Although widespread in the wider landscape, the hedgerows present at the Site provide a network for mobile species and are irreplaceable in the short-term. The hedgerows are considered to be of local ecological importance.

Ponds

12.4.9 One waterbody is identified within the Eastern Site, waterbody WB1. WB1 is a small waterbody located within an arable field. The waterbody had limited aquatic and bankside vegetation at the time of the extended Phase 1 habitat survey. Ponds do offer some ecological value although this pond is unlikely to qualify as a priority habitat under the JNCC criteria for ponds and, as such, this habitat is considered to be of local ecological importance.

Scrub

12.4.10 One small area of dense scrub is present surrounding waterbody WB1. This habitat is primarily comprised of bramble *Rubus fruticosa* with common hawthorn and hazel. Given the small area and the prevalence of this habitat type in the wider landscape, this habitat is considered to be of negligible ecological importance.

Trees

12.4.11 Semi-mature ash trees are located along the north east boundary of the Eastern Site, within hedgerow H9. These trees are considered to contribute to providing habitat connectivity between the Site and the wider landscape although, given the prevalence of mature trees in the wider landscape and that the species present are common and widespread, these trees are considered to be of local ecological importance.

Ancient Woodland

12.4.12 There is no ancient woodland located within the Eastern Site. The closest ancient woodland to the Eastern Site is located approximately 330m south of the Eastern Site at 'Stoke Wood'.

Species

Amphibians

12.4.13 The data search from TVERC returned 24 records of GCN within 2km of the Site, with the closest record to the Eastern Site located approximately 1.4km east.

12.4.14 Suitable terrestrial habitat for GCN (such as scrub, woodland and tussocky grassland) are limited in extent within the Eastern Site. Arable habitat is considered to be sub-optimal for GCN and there is limited connectivity between arable habitat within the Eastern Site and areas of optimal habitat in the wider landscape.

12.4.15 The waterbody within the Eastern Site, waterbody WB1, was found to be of 'poor' suitability for GCN on HSI assessment. Therefore, GCN are assumed likely absent from waterbody WB1.

12.4.16 Four other waterbodies are identified within 250m of the Eastern Site, hereafter referred to as waterbodies WB2, WB3, WB4 and WB5. These waterbodies were subject to HSI assessment, and waterbodies WB2, WB3 and WB5 were found to be of 'poor' suitability for GCN on HSI assessment. Waterbody WB4 was found to be of 'average' suitability on HSI assessment and was therefore subject to presence/likely absence survey, see below. All waterbody locations are shown in Appendix 12.4.

12.4.17 An eDNA survey to establish the presence/likely absence of GCN was completed on waterbody WB4 and a negative result for GCN presence was returned following laboratory analysis. Therefore, GCN are assumed likely absent from this waterbody. Based on results of the HSI

assessment and eDNA survey, GCN are considered likely absent from the Site and are not considered further within this assessment.

Badger

12.4.18 The TVERC data returned three records of badger within 2km of the Site, with the closest record to the Eastern Site located approximately 0.7km south.

12.4.19 One outlier badger sett has been identified on the eastern boundary of the Eastern Site. A main sett has been identified adjacent to the eastern boundary of the Western Site although it is considered that the A43 road is likely to deter movement of badgers between this main sett and the outlier sett on the Eastern Site boundary.

12.4.20 The arable habitat that forms the majority of the Eastern Site is considered to be sub-optimal for foraging badgers and it is considered likely that the majority of badger activity is likely to occur along the boundaries and outside of the Eastern Site, within woodland and hedgerow habitats. Whilst badgers are protected under the Protection of Badgers Act 1992, they are a common and widespread species in the region and nationally. Badgers are therefore considered to be of negligible ecological importance.

Bats

12.4.21 The data search from TVERC returned 12 records for bats within 2km of the Site with the closest records to the Eastern Site located approximately 1.5km north. These records were comprised of roosting common pipistrelle *Pipistrellus pipistrellus* and activity of brown long-eared *Plecotus auritus*, Leisler's bat *Nyctalus leisleri*, Natterer's *Myotis nattereri*, noctule *Nyctalus noctula,* soprano pipistrelle *Pipistrellus pygmaeus* and whiskered Myotis mystacinus or Brandt's bat *Myotis brandti* (identification unconfirmed).

12.4.22 Three ash trees with low suitability for roosting bats have been identified on the northern boundary of the Eastern Site. In accordance with best practice guidelines, no further survey work is required for low suitability trees. If removal of these trees were to be required, they would be soft-felled under the supervision of an ecological clerk of works (ECoW).

12.4.23 The hedgerow habitats within and on the boundaries of the Site offer limited suitable commuting or foraging opportunities for bats while arable habitat is sub-optimal for foraging or commuting bats. Therefore, the habitat is considered to be of low suitability for bat activity.

12.4.24 The walked transect surveys identified at least five bat species utilising the Eastern Site: western barbastelle *Barbastella barbastellus*, *Myotis* species, noctule, common pipistrelle, soprano pipistrelle. The majority of this bat activity was concentrated on the boundaries of the Eastern Site, with the majority of activity recorded on the western and southern boundaries, as shown by the heat map presented in Appendix 12.4. Low levels of activity were detected on the northern boundary (hedgerow H9) and internal hedgerows (hedgerows H12 and H13) within the Eastern Site. No activity was observed on the eastern boundary of the Eastern Site (hedgerow H10). The majority of activity recorded was from common and soprano pipistrelle. Full results are presented in Appendix 12.2.

12.4.25 As shown in Table 12.5 below, the static monitoring surveys recorded seven bat species with the majority of bats comprising soprano pipistrelle and common pipistrelle. Western barbastelle bats was the rarest species recorded but in small numbers with the highest number of passes

per night[i] being 9.4 passes during the September survey. It is anticipated that no western barbastelle roosts are located within or adjacent to the Eastern Site as no passes were identified within an hour of sunrise or sunset. The number of passes per night for other more common species are also considered to be low relative to their population size (as shown in Table 12.6).

Table 12.5: Static monitoring results summary, Eastern Site

Passes	Species											Total passes
	Bb	*BLE*	*Myo*	*Myo/Plec*	*Nn*	*Ppi*	*Ppy*	*Ppn*	*PIP*	*Nyc*	*Unknown*	
August:	0	0	6	0	32	3	0	0	0	0	1	42
September:	47	4	51	2	10	290	321	1	0	0	0	726
Total passes per species:	47	4	57	2	42	293	321	1	0	0	1	768
Percentage of total passes:	6.12	0.52	7.42	0.26	5.47	38.15	41.80	0.13	0.00	0.00	0.13	
August passes per night:	0	0	1.2	0	6.4	0.6	0	0	0	0	0.2	
September passes per night:	9.4	0.8	10.2	0.4	2	58	64.2	0.2	0	0	0	

Key: Bb = western barbastelle, BLE = brown long-eared, Myo = Myotis species, Myo/Plec = Myotis or Plecotus species, not identifiable to species level, Unknown = not identifiable, Nn = noctule, Ppi = common pipistrelle, Ppy = soprano pipistrelle, Ppn = Nathusius' pipistrelle *Pipistrellus nathusii*, PIP = Pipistrellus species not identifiable to species level, Nyc = Nyctalus species not identifiable to species level, Unknown = not identifiable.

12.4.26 The estimated population size in England and the occurrence in the region for each species identified during the activity surveys is provided in Table 12.6 below.

Table 12.6: Population size of species recorded

Species	Estimated England population size[29]	Description of Occurrence nationally and locally[29]
Western barbastelle	Unknown	Relatively infrequent throughout the country and regionally
Brown long-eared bat	607,000	Common throughout the country and regionally
Noctule	565,000	Common throughout the country and regionally

[i] Averaged over the five nights of recording within each month

Species	Estimated England population size[29]	Description of Occurrence nationally and locally[29]
Common pipistrelle	1,870,000	Common throughout the country and regionally
Soprano pipistrelle	2,980,000	Common throughout the country and regionally
Nathusius' pipistrelle	Unknown	Relatively infrequent throughout the country and regionally

12.4.27 As it was not possible to complete a spring visit in 2021, a reasonable worst-case assumption has been made in relation to the assessment of ecological importance, based on the data search and survey data from the summer and autumn surveys. It is therefore assumed on a precautionary basis that slightly greater numbers of each species than those recorded in summer and autumn would be recorded in spring.

12.4.28 Relevant guidance by Wray *et al.*[30] on assessing the ecological importance of foraging and commuting bats recommends basing the overall assessment of importance on the rarest species. It is considered that the highest passes per night of barbastelle (9.4 passes per night) constitutes a small number of barbastelle according to this guidance. Given that no barbastelle roosts likely to be present nearby due to the timing records and considering the habitats present and results of the preliminary bat roost assessment, the bat assemblage utilising the Eastern Site is likely to be of district ecological importance. However, on a precautionary basis, in the absence of spring survey results, it is assumed that larger numbers of bats may be present than recorded during surveys to date and therefore the bat assemblage is assumed to be of up to County ecological importance.

Birds

12.4.29 The data search from TVERC returned records of several bird species within 2km of the Site. The closest records to the Eastern Site were of five species, located approximately on the western boundary of the Eastern Site although the grid reference is accurate to 1km and therefore presence within the Eastern Site cannot be confirmed. Species recorded at this location were: barn owl, kestrel *Falco tinnunculus*, lapwing *Vanellus vanellus*, lesser spotted woodpecker *Dendrocopos minor* and red kite.

12.4.30 The barn owl survey identified no signs of barn owl within building B1 and no other trees or buildings were identified that were considered suitable for nesting barn owl. Therefore, nesting barn owl are assumed likely absent from the Eastern Site and are not discussed further within this assessment.

12.4.31 Given the nature and extent of agricultural habitats present, namely arable land and hedgerows, the Site is considered likely to support a small breeding and wintering assemblage of farmland birds, such as lapwing, skylark *Alauda arvensis*, yellowhammer *Emberiza citrinella* and linnet *Linaria cannabina*. Given the habitats present and the intensive nature of agricultural practice apparent at the time of the extended Phase 1 habitat survey (with defunct hedgerows, narrow field margins and no visible plots with short vegetation for ground-nesting birds), it is considered unlikely that the Eastern Site supports a large population of farmland bird species.

12.4.32 Overall, it is assumed that the Eastern Site supports a small assemblage of farmland bird species. Given the sub-optimal habitats present on the Eastern Site and the prevalence of

agricultural habitats within the wider landscape, the Eastern Site is assumed on a precautionary basis to contain a bird assemblage of district ecological importance.

Hazel dormouse

12.4.33 The data search from TVERC returned no records of hazel dormouse within 2km of the Site.

12.4.34 The species-rich hedgerows on the boundaries of the Eastern Site may offer suitable habitat for hazel dormouse. However, connectivity between the Eastern Site and optimal habitat for dormouse (generally considered to be woodlands of ten hectares or greater in size[31]) is limited. The interior hedgerows contain large gaps limiting their connectivity to areas of woodland and making them sub-optimal for hazel dormouse. For the purposes of this assessment, on a precautionary basis, it is assumed that the boundary hedgerows may be utilised by small numbers of hazel dormouse of local ecological importance.

Reptiles

12.4.35 The data search from TVERC returned one records of reptiles: one grass snake *Natrix helvetica* located approximately 1.5km south west of the Eastern Site.

12.4.36 Habitats present within the Eastern Site that are suitable for reptiles are limited to the central hedgerows and grassland margins and the boundary hedgerows which may provide some limited sheltering, foraging or basking opportunities. The arable habitat forming the majority of the Eastern Site is considered to be sub-optimal for reptiles and therefore the Eastern Site is unlikely to support large populations of reptiles. It is therefore assumed that any small populations of reptiles present would be formed of common and widespread species and would be of local ecological importance.

Other species

12.4.37 The habitats within the Eastern Site are not considered suitable to support any protected or notable species other than those discussed within this chapter.

Western Site

Designated sites

Statutory sites

12.4.38 The data search confirmed that there are no SPAs, SACs or Ramsar sites within 10km of the Site.

12.4.39 One Sites of Special Scientific Interest (SSSI) designated for biological interest, Ardley Cutting and Quarry SSSI, was identified within 2km of the Site, located approximately 1.3km south west of the Western Site. This SSSI is designated partially for geological reasons and partially for its calcareous limestone grassland and woodland habitats which host a large population of great crested newt and a range of invertebrate species including small blue butterfly *Cupido minimus* and dark green fritillary *Argynnis aglaja* butterfly and four-spotted moth *Tyta luctuosa*. This SSSI is considered to be of national importance. The location of the statutory designated site within 2km of the Site is shown in Appendix 12.5.

Non-statutory sites

12.4.40 Five Local Wildlife Sites (LWSs) and one Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) Reserve were returned from the data search within 2km of the Site which are described in Table 12.7. LWSs are designated if the site meets the criteria for the selection of LWSs in Berkshire, Buckinghamshire and Oxfordshire. These non-statutory sites are considered to be of county ecological importance.

Table 12.7: Summary of Non-statutory Designated Sites, Western Site

Site Name	Location from Site	Description
Ardley Quarry BBOWT Reserve	1.5km south	Designated for scrub, woodland and rough grassland habitats containing a range of plant species such as cowslips, common spotted-orchid and bee orchid; butterflies including grizzled skipper and green hairstreak, birds including chiffchaff and bullfinch and reptiles.
Stoke Bushes LWS	1.5km north east	Designated for woodland habitat dominated by oak and ash trees with a ground flora including dog's mercury, bluebell, wood anemone and wood sedge. Bird species of principal importance including marsh tit and yellowhammer have also been recorded.
Stoke Wood LWS	0.63km south	Designated for ancient woodland with records of 31 plant species including bluebell, primrose and wood spurge. Butterflies including silver-washed fritillary and white admiral have been recorded.
Stoke Little Wood LWS	1.8km south east	Designated for ancient woodland habitat, dominated by oak, ash and field maple with a shrub layer including Midland hawthorn and hazel and a ground flora including dog's mercury, bluebell and common dog violet. Red kite and badger have also been recorded.
Ardley Fields Quarry LWS	1.8km south	An area of restored quarry designated for grassland, pond and wet ditch habitats. The grassland is predominately species-poor with kidney vetch, field scabious and burnet saxifrage recorded in small areas. A number of bird species have been recorded including teal, gadwall and little ringed plover.
Upper Heyford Airfield LWS	1.8km south west	Designated for grassland habitat including some areas of species-rich calcareous grassland. Plant species include cowslip, greater knapweed and lady's bedstraw. A large population of great crested newt have been recorded within water storage tanks within he LWS. Birds recorded include skylark, curlew and grey partridge. Fourteen species of butterfly have been recorded at the site including Essex skipper, large skipper and small heath.

Habitats

12.4.41 The extended Phase 1 habitat survey identified several habitat types within or directly adjacent to the Western Site. The locations of these habitats are illustrated on Appendix 12.4.

Arable

12.4.42 The majority of the Western Site is formed of arable fields. Arable fields are of limited inherent ecological value and are considered to be of negligible ecological importance. The potential for this habitat type to support protected species (e.g. birds) is discussed separately below.

Buildings

12.4.43 One barn building is present within the Western Site, hereafter referred to as building B1. Buildings are of limited inherent ecological value and are considered to be of negligible ecological importance. The potential for buildings to support protected species (e.g. bats) is discussed separately below.

Grassland

12.4.44 Improved grassland forms the margins of the arable fields, dominated by perennial ryegrass *Lolium perenne*. Improved grassland is of limited inherent ecological value and are considered to be of negligible ecological importance.

Hedgerows

12.4.45 Nine hedgerows are present within the Western Site, forming the boundaries around the Western Site and partly demarcating the boundaries between arable fields. A description on their structure and species composition is provided below:

- Hedgerows H3, H4, H5 and H6 are species-poor defunct hedgerows, demarcating field boundaries in the centre of the Western Site and dominated by common hawthorn;
- Hedgerows H1, H2, and H8 are intact species-rich hedgerows with trees forming the western, southern and northern boundaries of the Western Site and primarily comprised of field maple, blackthorn, hawthorn, hazel and sycamore *Acer pseudoplatanus* with honeysuckle *Lonicera periclymenum*; and
- Hedgerow H7 is an intact species-poor hedgerow with trees forming the majority of the north eastern boundary of the Western Site comprised primarily of common hawthorn, blackthorn, ash and holly.

12.4.46 Hedgerows are listed in Section 41 of the NERC Act 2006 as a priority habitat and based on the criteria listed in the UK BAP Priority Habitat Descriptions, the species-rich hedgerows are likely to qualify as such. Although widespread in the wider landscape, the hedgerows present at the Western Site provide a network for mobile species and are irreplaceable in the short-term. The hedgerows present are considered to be of local ecological importance.

12.4.47 A small length of coniferous hedge is also present on part of the north east boundary of the Western Site which is considered to be of negligible ecological importance.

Scrub

12.4.48 One small area of dense scrub is present in the south west corner of the Western Site. This habitat was primarily comprised of bramble *Rubus fruticosa*. Given the small area and the prevalence of this habitat type in the wider landscape, this habitat is considered to be of negligible ecological importance.

Tall ruderal

12.4.49 Two small areas of tall ruderal habitat are present in the Western Site (indicated by TN1 and TN5 in Appendix 12.4), located in the south-west corner and the centre. This habitat is dominated by nettle *Urtica dioica*. Given the small area and the prevalence of this habitat type in the wider landscape, this habitat is considered to be of negligible ecological importance.

Trees

12.4.50 Semi-mature and mature trees are present within the Western Site, primarily located along the northern and eastern boundaries, within the hedgerows. These trees are considered to contribute to providing habitat connectivity between the Site and the wider landscape although, given the prevalence of mature trees in the wider landscape and that the species present are common and widespread, these trees are considered to be of local ecological importance.

Ancient Woodland

12.4.51 There is no ancient woodland located within the Western Site. The closest ancient woodland to the Western Site is located approximately 590m south of the Western Site at 'Stoke Wood'. Species

Amphibians

12.4.52 The data search from TVERC returned 24 records of GCN within 2km of the Site, with the closest record to the Western Site located approximately 1.6km south.

12.4.53 Suitable terrestrial habitat for GCN (such as scrub, woodland and tussocky grassland) are limited in extent within the Site. Arable habitat is considered to be sub-optimal for GCN and there is limited connectivity between arable habitat within the Site and areas of optimal habitat in the wider landscape.

12.4.54 Waterbody WB1 present within the Eastern Site, located approximately 0.2km east of the Western Site, was found to be of 'poor' suitability for GCN on HSI assessment. Therefore, GCN are assumed likely absent from waterbody WB1.

12.4.55 Three other waterbodies are present within 250m of the Western Site, hereafter referred to as waterbodies WB2, WB3 and WB4. These waterbodies were subject to HSI assessment, and waterbodies WB2 and WB3 were found to be of 'poor' suitability for GCN on HSI assessment. Waterbody WB4 was found to be of 'average' suitability on HSI assessment and was therefore subject to presence/likely absence survey, see below. All waterbody locations are shown in Appendix 12.4.

12.4.56 An eDNA survey to establish the presence / likely absence of GCN was completed on Waterbody WB4 and a negative result for GCN presence was returned following laboratory analysis. Therefore, GCN are assumed likely absent from this waterbody. Based on results of the HSI assessment and eDNA survey, GCN are considered likely absent from the Site and are therefore not considered further within this assessment.

Badger

12.4.57 The TVERC data returned three records of badger within 2km of the Site, with the closest record to the Western Site located approximately 1km south.

12.4.58 A main badger sett has been identified in woodland located adjacent to the eastern boundary of the Western Site with approximately 11 sett entrance holes showing signs of active use and a badger carcass also identified in this location. One outlier badger sett has been identified on the eastern boundary of the Eastern Site, although it is considered that the A43 road is likely to deter movement of badgers between this main sett and the outlier sett.

12.4.59 One badger dung pit was also recorded on the southern boundary of the Western Site, indicating badgers are likely to utilise the southern boundary of the Western Site (TN2 in Appendix 12.4). The arable habitat that forms the majority of the Site is considered to be sub-optimal for foraging badgers and it is therefore considered likely that the majority of badger activity is likely to occur along the boundaries of the Site and outside of the Site, within woodland and hedgerow habitats. Whilst badgers are protected under the Protection of Badgers Act 1992, they are common and widespread in the region and nationally. The badger population here is therefore considered to be of negligible ecological importance.

Bats

12.4.60 The data search from TVERC returned 12 records for bats within 2km of the Site with the closest records to the Western Site located approximately 1.4km north. These records were comprised of roosting common pipistrelle *Pipistrellus pipistrellus* and activity of brown long-eared *Plecotus auritus*, Leisler's bat *Nyctalus leisleri*, Natterer's *Myotis nattereri*, noctule *Nyctalus noctula,* soprano pipistrelle *Pipistrellus pygmaeus* and whiskered Myotis mystacinus or Brandt's bat *Myotis brandti* (identification unconfirmed).

12.4.61 Several trees with low suitability and five trees with moderate suitability for roosting bats are present on the northern and eastern boundaries of the Western Site. In accordance with best practice guidelines, no further survey work is required for low suitability trees. Where removal of low suitability trees is required, they would be soft-felled under the supervision of an ecological clerk of works (ECoW). One moderate suitability tree (T19) may be removed on the northern boundary of the Western Site to facilitate a vehicular access point and, due to the proximity of the works, two moderate suitability trees T4 and T5 may be subject to disturbance. Therefore, a reasonable worst-case evaluation is set out below in relation to these trees, based on survey results undertaken to date and professional judgement.

12.4.62 For the purposes of this assessment, on a precautionary basis in the absence of survey data, it is assumed that trees T4, T5 and T19 each contain a low conservation status bat roost comprising low numbers of common or widespread species. It is anticipated that the roost would be of local ecological importance and this could be removed under a Bat Low Impact Class Licence (BLICL) for legal compliance.

12.4.63 No bats were observed re-entering Tree T1 or Building B1 during the emergence / re-entry surveys on 25th August 2021 or 13th September 2021. Roosting bats are therefore considered likely absent from Tree T1 and Building B1. [

12.4.64 The hedgerow habitats within and on the boundaries of the Site offer limited suitable commuting or foraging opportunities for bats while arable habitat is sub-optimal for foraging or commuting bats. Therefore, the habitat is considered to be of low suitability for bat activity.

12.4.65 The walked transect surveys identified at least four bat species utilising the Western Site: *Myotis* species, noctule, common pipistrelle, soprano pipistrelle. Bat activity was concentrated on the boundaries of the Western Site, with the majority of activity recorded on the eastern (hedgerow H7) and southern (hedgerow H2) boundaries, as shown by the heat map presented in Appendix 12.4. Low activity levels were identified on the northern boundary of the Western Site (hedgerow H8). No activity was observed on the north-western boundary hedgerow (hedgerow H1) or the internal hedgerows of the Western Site (hedgerows H3, H4, H5 and H6). The majority of activity recorded was from common and soprano pipistrelle. Full results are presented in Appendix 12.2.

12.4.66 As shown in Table 12.8 below, the static monitoring surveys recorded seven bat species with the majority of bats comprising soprano pipistrelle and common pipistrelle. Western barbastelle bats *Barbastella barbastellus* was the rarest species recorded but in small numbers with the highest number of passes per night[ii] being 5 passes during the September survey. It is anticipated that no western barbastelle roosts are located within or adjacent to the Site as no passes were identified within an hour of sunrise or sunset. The number of passes per night for other more common species are also considered to be low relative to their population size (as shown in table 12.9).

Table 12.8: Static Detector results, Western Site

	Species										
Species:	*Bb*	*BLE*	*Myo*	*Nn*	*Ppi*	*Ppy*	*Ppn*	*PIP*	*Nyc*	*Unknown*	Total passes
August:	3	2	7	12	19	2	0	0	0	0	45
September	25	3	180	28	1434	39	1	34	4	12	1760
Total passes per species:	28	5	187	40	1453	41	1	34	4	12	1805
Percentage of total passes:	1.55	0.28	10.36	2.22	80.50	2.27	0.06	1.88	0.22	0.66	
August passes per night:	0.6	0.4	1.4	2.4	3.8	0.4	0	0	0	0	
September passes per night:	5	0.6	36	5.6	286.8	7.8	0.2	6.8	0.8	2.4	

Key: Bb = western barbastelle, BLE = brown long-eared, Myo = Myotis species, Myo/Plec = Myotis or Plecotus species, not identifiable to species level, Unknown = not identifiable, Nn = noctule, Ppi = common pipistrelle, Ppy = soprano pipistrelle, Ppn = Nathusius' pipistrelle, PIP = Pipistrellus species not identifiable to species level, Nyc = Nyctalus species not identifiable to species level, Unknown = not identifiable.

12.4.67 The estimated population size in England and the occurrence in the region for each species identified during the activity surveys is provided in Table 12.9 below.

[ii] Averaged over the five nights of recording within each month

Table 12.9: Population size of species recorded

Species	Estimated England population size[32]	Description of occurrence locally and nationally[33]
Western barbastelle	Unknown	Relatively infrequent throughout the country and regionally
Brown long-eared bat	607,000	Common throughout the country and regionally
Noctule	565,000	Common throughout the country and regionally
Common pipistrelle	1,870,000	Common throughout the country and regionally
Soprano pipistrelle	2,980,000	Common throughout the country and regionally
Nathusius' pipistrelle	Unknown	Relatively infrequent throughout the country and regionally

12.4.68 As it was not possible to complete a spring visit in 2021, a reasonable worst-case assumption has been made in relation to the assessment of ecological importance, based on the data search and survey data from the summer and autumn surveys. It is therefore assumed on a precautionary basis that slightly greater numbers of each species than those recorded in summer and autumn would be recorded in spring.

12.4.69 Relevant guidance by Wray et al.[34] on assessing the ecological importance of foraging and commuting bats recommends basing the overall assessment of importance on the rarest species. It is considered that the highest passes per night of barbastelle (5 passes per night) constitutes a small number of western barbastelle according to this guidance. Given that no barbastelle roosts are likely to be present nearby based on the timing of barbastelle sound records and considering the habitats present and results of the preliminary bat roost assessment, the bat assemblage utilising the Eastern Site is likely to be of district ecological importance. However, on a precautionary basis, in the absence of spring survey results, it is assumed that larger numbers of bats may be present than recorded during surveys to date and therefore the bat assemblage is assumed to be of up to County ecological importance.

Birds

12.4.70 The data search from TVERC returned records of several bird species within 2km of the Site. The closest record to the Western Site was of lapwing, located 0.04km south west of the Western Site, although the grid reference is accurate to 1km and therefore presence within the Site cannot be confirmed.

12.4.71 Two barn owl surveys were completed on building B1 in the Western Site and identified no signs of nesting barn owl. Nesting barn owl are therefore considered likely absent from the Western Site and are not discussed further within this assessment.

12.4.72 Given the nature and extent of agricultural habitats present, namely arable land and hedgerows, the Western Site is considered likely to support a small breeding and wintering bird assemblage of farmland birds, such as lapwing, skylark, yellowhammer and linnet. Skylark were incidentally recorded during the extended Phase I habitat survey and records of other farmland bird species

such as yellowhammer and linnet were returned from the data search, indicating their likely presence within the Western Site. Given the habitats present and the intensive nature of agricultural practice apparent at the time of the extended Phase 1 habitat survey (with defunct hedgerows, narrow field margins and no visible plots with short-vegetation for ground-nesting birds), it is considered unlikely that the Western Site supports a significant bird assemblage.

12.4.73 Overall, it is assumed that the Western Site supports a small assemblage of breeding and wintering bird species including some farmland species such as lapwing, skylark, yellowhammer and linnet. Given the sub-optimal habitats present on site and the prevalence of agricultural habitats within the wider landscape, the Western Site is assumed on a precautionary basis to contain a bird assemblage of district ecological importance.

Hazel dormouse

12.4.74 The data search from TVERC returned no records of hazel dormouse within 2km of the Site.

12.4.75 The species-rich hedgerows on the boundaries of the Western Site may offer suitable habitat for hazel dormouse. However, connectivity between the Western Site and optimal habitat for dormouse (generally considered to be woodlands of ten hectares or greater in size[31]) is limited. The interior hedgerows contain large gaps limiting their connectivity to areas of woodland and making them sub-optimal for hazel dormouse. For the purposes of this assessment, on a precautionary basis, it is assumed that the boundary hedgerows may be utilised by small numbers of hazel dormouse of local ecological importance.

Reptiles

12.4.76 The data search from TVERC returned one records of reptiles: one grass snake located approximately 1.5km south west of the Western Site.

12.4.77 Habitats present within the Western Site that are suitable for reptiles are limited to the central hedgerows and grassland margins and the boundary hedgerows which may provide some limited sheltering, foraging or basking opportunities. The arable habitat forming the majority of the Site is considered to be sub-optimal for reptiles and therefore the Western Site is unlikely to support large populations of reptiles. It is therefore assumed that any small populations of reptiles present would be formed of common and widespread species and would be of local ecological importance.

Other species

12.4.78 The habitats within the Western Site are not considered suitable to support any protected or notable species other than those discussed within this chapter.

Summary of Receptors and Sensitivity

12.4.79 Table 12.10 provides a summary of the ecological receptors and their associated sensitivity.

Table 12.10: Summary of Receptor Sensitivity

Receptor	Sensitivity (Value)
Designated sites	
Ardley Cutting and Quarry SSSI	High
Ardley Quarry BBOWT Reserve	Low
Stoke Bushes LWS	Medium

Receptor	Sensitivity (Value)
Stoke Wood LWS	Medium
Stoke Little Wood LWS	Medium
Ardley Fields Quarry LWS	Medium
Upper Heyford Airfield LWS	Medium
Habitats	
Improved grassland	Negligible
Hedgerows	Low
Pond	Low
Scrub	Negligible
Trees	Low
Species	
Amphibians	Negligible
Badgers	Negligible
Bats	Medium
Birds	Low
Hazel dormouse	Low
Reptiles	Low

12.5 Scheme Design and Management

12.5.1 The design of the Development has been iterative and, in accordance with policy and best practice guidance (NPPF paragraph 180, bullet a, and BS 42020:2013), has followed the 'mitigation hierarchy'. As such, the Development has been designed to avoid and retain the majority of important ecological features including the majority of boundary hedgerows and trees to ensure they can be managed long-term to maximise their biodiversity potential. Where this is not possible, new habitats including amenity grassland, neutral grassland, trees, scrub and woodland are proposed in the Soft Landscaping Zones (see Parameter Plans 01 and 06) and along the Site boundary to compensate for habitat losses, to deliver overall biodiversity gain in conjunction with off-site provisions (see paragraphs 12.5.6-12.5.12).

12.5.2 Habitat creation and enhancement measures ensure the Development will be compliant with relevant policies under Bicester 10 and ESD10 of the CLP 2015 and will also achieve biodiversity net gain.

Enabling Works and Construction

12.5.3 Measures will be undertaken during the construction phase in order to minimise disruption and manage the effects of the Development such as implementation of a Construction Environmental Management Plan (CEMP) as standard mitigation, including a suite of best practice construction measures. The CEMP will include:

- All retained trees and hedgerows will be protected in accordance with BS 5837:2012[14];
- Badgers: Pre-construction badger survey, sensitive timing of works, careful storage of topsoil and materials, and a method statement to avoid any disturbance to setts (if required following the pre-construction survey);
- Breeding Birds: Removal of vegetation outside of the nesting bird season (March to August inclusive), or the supervision of vegetation removal by a suitably qualified ecologist should works take place within this period; and

- Hazel dormouse: Pre-construction survey, protection of existing hedgerows, and a method statement to avoid any disturbance to hazel dormouse (if required following the pre-construction survey).

12.5.4 Retention and protection of the existing boundary hedgerows will be inherent within the Development at the construction phase (see Parameter Plans SK019 and SK025: Vegetation Retention and Removal), except where areas of removal are required to facilitate access points in the north of the Site. Native tree and shrub planting throughout areas of retained habitat and off-site habitat creation will be provided as additional mitigation.

Completed Development

12.5.5 Retained and planted vegetation will continue to be retained and managed during the completed development phase. As additional mitigation, a detailed Landscape and Ecology Management Plan ('LEMP') will be prepared and submitted to CDC prior to operation of the Development. The LEMP will describe measures to maximise the biodiversity potential of retained and newly created habitats through appropriate management, as well as a programme of monitoring to provide a mechanism to modify the management prescriptions if required. It is anticipated the LEMP will be secured via a planning condition.

Biodiversity Net Gain

12.5.6 In accordance with consultation responses from CDC and the Local Plan, a Biodiversity Net Gain (BNG) assessment has been completed to ensure a net gain in biodiversity can be achieved (see Appendix 12.3).

12.5.7 The DEFRA Biodiversity Metric 2.0 was used to calculate the pre-development and predicted post-development biodiversity value of the Site based on the proposed landscaping plans for the Site and off-site habitat provision. It is acknowledged that a 3.0 version of the biodiversity metric was released in July 2021 after calculations had already begun using the 2.0 version of the metric. Therefore the 2.0 metric was used in accordance with Natural England advice which states that "users of the previous Biodiversity Metric 2.0 should continue to use that metric (unless requested to do otherwise by their client or consenting body) for the duration of the project it is being used for as they may find that the biodiversity unit values metric 2.0 generates will differ from those generated by Biodiversity Metric 3.0."[35]

12.5.8 The calculation utilised the baseline habitats identified during the 'extended' Phase I habitat survey compared against the created and enhanced habitats. This calculation is completed separately for non-linear and linear habitats and results are generated respectively. The UK Habitat Classification[36] was used to identify habitat types based on the results of the extended Phase I habitat Survey. A summary of the completed DEFRA 2.0 metric is provided in Appendix 12.3.

12.5.9 This metric operates by calculating the number of biodiversity units associated with a particular habitat type (both pre-and post-development) – the 'unit' value associated with each habitat type is calculated based on the following parameters:

- Size (in hectares)/Length (in km);
- Distinctiveness (i.e. how rare/valuable a given habitat is);
- Condition (i.e. how well the recorded habitat fits (or will fit) the standardised description of that habitat);

- Connectivity (i.e. how well-connected a given habitat is to similar habitats in the landscape);
- Strategic significance (i.e. if the existing or proposed habitat is within an area formally adopted in the local plan for green infrastructure or biodiversity improvements);
- When considering the creation of new habitats in the post-development site, other factors are also considered when calculating the 'unit' value of a given habitat and these are:
- Time to reach the target condition of each habitat; and
- Difficulty category for the creation of a given habitat.

12.5.10 An area of off-site habitat compensation will be created, comprising approximately 20ha of arable land at baseline and located in Piddington, south east of Bicester. This land parcel is under the Applicant's ownership, and it is anticipated that compensatory habitat provision will be secured through a section 106 agreement. Given project timescales, assumptions have been made on baseline habitats for the off-site area at Piddington for the purpose of completing the Defra 2.0 BNG metric. Full baseline data and detailed post-development habitat data will be gathered, and a final version of the metric will be completed at Reserved Matters stage.

12.5.11 As shown in Appendix 12.3, following implementation of both on-site and off-site habitat creation and enhancement, it is anticipated that the Development will be able to achieve a net gain of over 10% with initial calculations resulting in an +11.96% gain in habitat units and an +11.17% gain in hedgerow units. This assumes the creation of 20ha of neutral grassland and 1.5km of hedgerows at the Piddington site in addition to on-site creation of neutral grassland, street tree, mixed scrub, hedgerows and broadleaved woodland habitats where possible (as shown on Parameter Plans SK019 and SK025: Vegetation Retention and Removal). The completed Defra 2.0 metric is set out in Appendix 12.3.

12.5.12 A separate LEMP will be produced detailing the habitat management requirements for off-site created habitats and, as with the LEMP for the Site, it is anticipated the LEMP will be secured via a planning condition.

12.6 Enabling Works and Construction

Assessment of Effects

12.6.1 An assessment of effects on important ecological receptors (considered to be those of local or greater ecological importance) is discussed below.

Enabling Works

12.6.2 It is assumed that most site clearance works on the Western Site will be completed during the Enabling Works and therefore the assessment for the construction phase of the Western Development set out below also applies to the Enabling Works.

Eastern Development

Statutory and Non-statutory Designated sites

12.6.3 Given the distance between the designated sites identified within 2km (both Ardley Cutting and Quarry SSSI and the non-statutory designated sites) and the Eastern Site and lack of habitat connectivity between these designated sites and the Eastern Site, no direct effects are considered likely as a result of the Eastern Development. No indirect effect pathways have been

identified due to the distance between the Eastern Site and the designated sites, the lack of hydrological connectivity and the scale and nature of the Development.

12.6.4 Air quality impacts to designated sites are typically considered at up to 200m from the source[Error! Bookmark not defined.]. There are no designated sites within 200m of the Site, with the location of statutory designated sites within 2km of the Site and roads considered within the air quality assessment are shown in Appendix 12.5. The Design Manual for Roads and Bridges guidance of 1000 Annual Average Daily Traffic (AADT) is widely used to screen out the need for quantitative assessment[37] on traffic emissions related to a development. As discussed in Chapter 9: Air Quality, construction traffic is anticipated to be well below 1000 AADT (at up to 190 vehicles, of which 40 are HGVs) and therefore no adverse effects are anticipated on designated sites as a result of air quality changes from construction traffic (i.e. a negligible effect).

12.6.5 Construction of the Eastern Development will result in a negligible effect on the structure or function of designated sites.

Habitats

Hedgerows

12.6.6 Construction will require the removal of the defunct species-poor hedgerows within the centre of the Eastern Site, H12 and H13. Hedgerows forming the boundary of the Eastern Site will be retained except for removal of one section of hedgerow H9 (approximately 185m in length) to facilitate an access point on the northern boundary of the Eastern Site. The remaining boundary hedgerows will be retained during construction and protected through measures adhering to BS5837:2012 that will be detailed in the CEMP. Factors important to the conservation status of hedgerows include the maintenance of their extent and connectivity with woodland and other hedgerows in the surrounding landscape. In the absence of mitigation, the permanent but partial loss and fragmentation of hedgerows as a result of construction of the Eastern Development will result in a minor adverse effect which will be significant at the local level.

Ponds

12.6.7 Construction will require the removal of waterbody WB1 within the Eastern Site. In the absence of mitigation, the permanent removal of a pond as a result of construction of the Eastern Development will result in a permanent minor adverse effect that will be significant at the local level.

Trees

12.6.8 Construction will result in the loss of three ash trees T30, T31 and T32 within hedgerow H9 to facilitate an access point. Ash is a common and widespread species in the wider landscape. The remaining trees located on the boundaries of the Eastern Site will be retained during construction and protected through measures adhering to BS5837:2012 that will be detailed in the CEMP. However, in the absence of mitigation, the permanent removal of trees as a result of construction of the Eastern Development will result in a permanent minor adverse effect that will be significant at the local level.

Species

12.6.9 Species or species groups relevant to the assessment of potential construction phase effects of the Eastern Development are described below.

Badgers

12.6.10 The hedgerow (H10) where an outlier badger sett was identified on the eastern boundary of the Eastern Site is to be retained as part of the works. This boundary will predominately be buffered from the developed area by retained grassland including new tree planting. This buffer will minimise the risk of causing disturbance or harm to badgers occupying this sett. The sett will be further protected by measures detailed in the CEMP. Retaining boundary features will maintain habitat connectivity between the sett and the wider landscape, allowing free movement of badgers.

12.6.11 The CEMP will contain measures specific to the protection of badgers which will include the following:

- Pre-construction badger survey;
- Method statement to ensure disturbance and destruction of setts is avoided;
- Review of the need to apply for a mitigation licence if the above cannot be guaranteed;
- Construction works limited to daylight hours;
- Trenches or deep pits will be covered or a means of escape provided for badgers if left overnight; and
- Careful storage of topsoil / regular inspections.

12.6.12 In order to ensure legal compliance, a licence to interfere with a sett for development purposes from Natural England will be obtained for any works which have potential to disturb or harm badgers or their setts following a pre-construction survey. As part of the licence application, a method statement would be prepared detailing the approach and methods to be used in order to prevent disturbance or harm to badgers and their setts where possible including methods for partial sett closure and relocation where this is not possible. Works would be completed between 1st July and 30th November, in accordance with Natural England licensing guidelines, to avoid the most sensitive times of year for badgers. Where it is necessary to close sett entrances (to be determined following the pre-construction badger survey), alternative sett provision will be made within in suitable habitat within the Site as close to any closed sett entrances as possible.

12.6.13 New setts may be created during the period that elapses between planning permission being granted and construction works commencing. Therefore, additional pre-construction surveys will be undertaken to ensure that any new setts can be identified.

12.6.14 Badgers are a common and widespread species and the measures above are required predominately for legal compliance. Therefore, construction of the Eastern Development will result in a negligible effect on badgers.

Bats

12.6.15 The majority of trees which are considered to be suitable for roosting bats on the boundaries of the Eastern Site will be retained as part of construction works. Removal of three low suitability trees (T30 and T31) will be completed by soft-felling under the supervision of an Ecological Clerk of Works (ECoW) with these measures set out in the CEMP.

12.6.16 Lighting associated with construction has the potential to result in the potential disturbance to any bat assemblage associated with the Eastern Site. This could include bats being dissuaded from using retained / newly created foraging and commuting habitat.

12.6.17 Hedgerows where the highest levels of bat activity were identified during the bat activity transect surveys are to be retained. The partial removal of hedgerow H9 and removal of three trees on the northern boundary of the Eastern Site may result in loss or fragmentation of habitats which may be utilised by commuting or foraging bats.

12.6.18 Overall, in the absence of mitigation, it is considered that enabling works and construction of the Eastern Development could result in an adverse effect on the bat assemblage associated with the Eastern Site. However, given activity levels were comparatively low along hedgerow H9 (see Appendix 12.4), it is assumed only a small proportion of the total bat assemblage (assumed to be of up to county ecological importance on a precautionary basis) would be affected by the hedgerow removal. It is also considered likely that bats utilising hedgerow H9 could seek alternative commuting and foraging routes around the boundaries of the Site or in the local area. Therefore, in the absence of mitigation, it is assumed that a significant effect at up to district level may occur.

Birds

12.6.19 Hedgerows and trees on the boundaries of the Eastern Site which may be used by nesting birds will be retained. Internal hedgerows H12 and H13 will be removed as part of the Enabling Works to facilitate construction. Approximately 22 ha of arable habitat will be removed which is considered to provide foraging and nesting opportunities for farmland birds such as skylark.

12.6.20 Site clearance activities could result in the disturbance and destruction of nests and juvenile birds if carried out during the active breeding season which would trigger relevant legislation under the Wildlife and Countryside Act 1981 (as amended). The CEMP will include measures to mitigate this risk including limiting vegetation clearance to outside of the nesting season or necessitating the supervision of clearance activity if this is unavoidable.

12.6.21 As breeding bird surveys have not been completed, it is assumed that, in the absence of mitigation, the loss of arable, grassland and hedgerow habitats would result in a permanent moderate adverse effect on breeding and over-wintering farmland birds present at the Eastern Site which would be significant at district level. Therefore, in the absence of mitigation it is assumed that a significant effect at up to district level may occur

Hazel dormouse

12.6.22 Hedgerows which are considered to be suitable for hazel dormouse are those located on the boundaries of the Eastern Site with connectivity to the wider landscape. These boundary hedgerows will be retained as part of the works and will be buffered from development by retained grassland and tree planting. Removal of the central, defunct species-poor hedgerows (H12 and H13) is not considered likely to affect hazel dormouse due to their lack of connectivity to the boundary hedgerows and sub-optimal, species-poor composition.

12.6.23 One section of Hedgerow H9 (approximately 185m in length) is to be removed to facilitate an access point on the northern boundary of the Eastern Site. Best practice construction methods will form part of the CEMP, including a pre-construction survey by a suitably qualified ecologist prior to removal of this section. Best practice construction measures will be set out in the CEMP to avoid lighting disturbance to the retained hedgerows during construction.

12.6.24 In the unlikely event that hazel dormouse or evidence of their presence was identified during the pre-construction survey, a licence from Natural England would be obtained prior to hedgerow removal.

12.6.25 In the absence of mitigation, construction of the Eastern Development may result in a minor adverse effect on hazel dormouse, significant at the local level due to the loss and fragmentation of hedgerow habitat.

Reptiles

12.6.26 Construction of the Eastern Development will result in the loss of arable, improved grassland and defunct species-poor hedgerows which are sub-optimal for reptiles although reptiles may utilise these habitats in low numbers. It is therefore assumed that common and widespread reptile species may be present in low numbers.

12.6.27 Best practice measures will be set out in the CEMP which are considered to ensure compliance with legislation protecting reptiles including:

- Pre-construction walkover survey and a hand-search of any log / brash piles by an ecologist prior to removal;
- Soft-start of vegetation clearance machinery to allow any reptiles to move away from the area;
- Construction works limited to daylight hours;
- Trenches or deep pits will be covered or a means of escape provided for badgers if left overnight; and
- Careful storage of topsoil / regular inspections.

12.6.28 Given the sub-optimal habitats present, it is assumed that, in the absence of mitigation, the loss of these habitats would result in a negligible effect on the conservation status of reptile species potentially associated with the Eastern Development.

Western Development

Statutory and Non-statutory Designated sites

12.6.29 Given the distance between the designated sites identified within 2km (both Ardley Cutting and Quarry SSSI and the non-statutory designated sites) and the Western Site and lack of habitat connectivity between these designated sites and the Western Site, no direct effects are considered likely as a result of the Western Development. No indirect effect pathways have been identified due to the distance between the Western Site and the designated sites, the lack of hydrological connectivity and the scale and nature of the Development.

12.6.30 As discussed in the Chapter 9: Air Quality, construction traffic is anticipated to be well below 1000 AADT (at up to 190 vehicles, of which 40 are HGVs) and therefore no adverse effects are anticipated on designated sites as a result of air quality changes from construction traffic (i.e. a negligible effect).

12.6.31 The Enabling Works and construction of the Western Development will result in a negligible effect on the structure of function of designated sites.

Habitats

Hedgerows

12.6.32 Construction will require the removal of the defunct species-poor hedgerows within the centre of the Site, H3, H4, H5 and H6. Hedgerows forming the boundary of the Western Site will be

retained except for removal of one section of hedgerow H8 (approximately 330m in length) to facilitate an access point on the northern boundary of the Western Site. The remaining hedgerows will be retained during construction and protected through measures adhering to BS5837:2012 that will be detailed in the CEMP. Factors important to the conservation status of hedgerows include the maintenance of their extent and connectivity with woodland and other hedgerows in the surrounding landscape.

12.6.33 The permanent but partial loss and fragmentation of hedgerows as a result of the Enabling Works and construction of the Western Development will result in a minor adverse effect which will be significant at the local level.

Trees

12.6.34 Construction will result in the loss of approximately seventeen ash, pedunculate oak and field maple trees T7-T23 within hedgerow H8 to facilitate an access point. These are common and widespread species in the wider landscape. The remaining trees located on the boundaries of the Western Site will be retained during construction and protected through measures adhering to BS5837:2012 that will be detailed in the CEMP. However, in the absence of mitigation, the permanent removal of trees as a result of the Enabling Works and construction of the Western Development will result in a permanent minor adverse effect that will be significant at the local level.

Species

12.6.35 Species or species groups relevant to the assessment of potential construction phase effects of the Western Development are described below.

Badgers

12.6.36 The woodland edge where the main badger sett was identified during the badger survey, is to be retained as part of the works. This boundary will predominately be buffered from the developed area by retained grassland including new tree planting. This buffer will minimise the risk of causing disturbance or harm to badgers occupying this sett. The sett will be further protected by measures detailed in the CEMP. Retaining boundary features will maintain habitat connectivity between the sett and the wider landscape, allowing free movement of badgers.

12.6.37 The CEMP will contain measures specific to the protection of badgers as set out in paragraph 12.6.11 - 12.6.13 of this chapter. Given these measures, the Enabling Works and construction of the Western Development will result in a negligible effect on badgers.

Bats

12.6.38 The majority of trees which are considered to be suitable for roosting bats on the boundaries of the Western Site will be retained as part of the Western Development. Removal of low suitability trees on the northern boundary of the Site will be soft-felled and will be completed under the supervision of an Ecological Clerk of Works (ECoW) with these measures set out in the CEMP.

12.6.39 Removal of tree T1 and building B1 is anticipated to have a negligible effect on roosting bats given that roosting bats are considered likely absent from tree T1 and building B1. [

12.6.40 For the purposes of this assessment, it is assumed that low conservation status bat roosts are present in tree T19 which is to be removed and trees T45 and T5 which may be subject to

disturbance. Therefore, in the absence of mitigation, construction has the potential to remove bat roosts.

12.6.41 Lighting associated with construction has the potential to result in the potential disturbance to any bat assemblage associated with the Western Site. This could include bats being dissuaded from using retained/newly created foraging and commuting habitat.

12.6.42 Hedgerows where the highest levels of bat activity were identified during the bat activity transect surveys are to be retained. The partial removal of hedgerow H8 and approximately 17 trees on the northern boundary of the Site may result in loss or fragmentation of habitats which may be utilised by commuting or foraging bats.

12.6.43 Overall, in the absence of mitigation, it is considered that the Enabling Works and construction of the Western Development could result in an adverse effect on the bat assemblage associated with the Western Site. However, given activity levels were comparatively low along hedgerow H8 (see Appendix 12.4), it is assumed only a small proportion of the total bat assemblage (assumed to be of up to county ecological importance on a precautionary basis) would be affected by the hedgerow removal. It is also considered likely that bats utilising hedgerow H8 could seek alternative commuting and foraging routes around the boundaries of the Site or in the local area. Therefore, in the absence of mitigation, it is assumed that a significant effect at up to district level may occur.

Birds

12.6.44 Hedgerows and trees on the boundaries of the Western Site which may be used by nesting birds will be retained. Internal hedgerows H3-H6 will be removed to facilitate construction. Approximately 41ha of arable habitat will be removed which is considered to provide foraging and nesting opportunities for farmland birds such as skylark.

12.6.45 Site clearance activities could result in the disturbance and destruction of nests and juvenile birds if carried out during the active breeding season which would trigger relevant legislation under the Wildlife and Countryside Act 1981 (as amended). It is envisaged that the CEMP will include measures to mitigate this risk including limiting vegetation clearance to outside of the nesting season or necessitating the supervision of clearance activity if this is unavoidable.

12.6.46 It was not possible to complete breeding bird surveys in 2021 due to timing of the planning application and therefore, it is assumed that, in the absence of mitigation, the loss of arable, grassland and hedgerow habitats from the Enabling Works and construction of the Western Development would result in a permanent moderate adverse effect on breeding and over-wintering farmland birds present at the Western Site which would be significant at district level.

Hazel dormouse

12.6.47 Hedgerows which are considered to be suitable for hazel dormouse are those located on the boundaries of the Western Site with connectivity to the wider landscape. These boundary hedgerows will be retained as part of the works and will be buffered from development by retained grassland and tree planting. Removal of the central, defunct species-poor hedgerows is not considered likely to affect hazel dormouse due to their lack of connectivity to the boundary hedgerows and sub-optimal, species-poor composition.

12.6.48 One section of Hedgerow H8 (approximately 330m in length) is to be removed to facilitate an access point on the northern boundary of the Western Site. Best practice construction methods

will form part of the CEMP, including a pre-construction survey by a suitably qualified ecologist prior to removal of this section. Best practice construction measures will be set out in the CEMP to avoid lighting disturbance to the retained hedgerows during construction.

12.6.49 In the absence of mitigation, the Enabling Works and construction of the Western Development may result in a minor adverse effect on hazel dormouse, significant at the local level due to loss and fragmentation of hedgerow habitat.

Reptiles

12.6.50 Construction will result in the loss of arable, improved grassland and defunct species-poor hedgerows which are sub-optimal for reptiles although reptiles may utilise these habitats in low numbers. It is therefore assumed that common and widespread reptile species may be present in low numbers.

12.6.51 Given the sub-optimal habitats present, it is assumed that, in the absence of mitigation, the loss of these habitats from the Enabling Works and construction would result in a negligible effect on the conservation status of reptile species potentially associated with the Western Development.

Development

12.6.52 Site clearance has potential to cause adverse effects significant at the local level on ponds, hedgerows and hazel dormouse.

12.6.53 In the absence of spring survey data, it is assumed on a precautionary basis that partial removal of the northern boundary hedgerows and trees may cause an adverse effect significant at the county level for bats.

12.6.54 In the absence of data, it is assumed on a precautionary basis that vegetation clearance during the Enabling Works and construction phases may cause adverse significant effects at the district level for farmland birds.

12.6.55 No other effects are anticipated as a result of construction of the Development.

Mitigation, Monitoring and Residual Effects

12.6.56 The mitigation and compensation measures described below address the effects that have been identified as being significant during the construction impact assessment. Where the likely effects are considered to be negligible, no mitigation is required, and they are therefore not considered further in the assessment.

Eastern Development

Ponds

12.6.57 Swales are to be provided within the Eastern Development. However, it is likely that these will remain dry for most of the year. Therefore, a pond will be provided within the off-site compensation area at Piddington. This pond will be designed to provide greater ecological value than pond WB1 by incorporating a range of native species planting and containing water for the majority or all of the year.

12.6.58 Given the distance to the compensation area from the Site, it is considered that a residual adverse effect of the local level remains following the implementation of the above mitigation measures.

Trees

12.6.59 Native tree planting will take place throughout the Eastern Development. Planting will comprise a mixture of native species and is considered to provide a greater number of trees than those removed. Once established, it is considered that this replacement planting will more than compensate for the loss of trees as part of the Western Development. Therefore, it is anticipated that the residual effect on trees will be negligible.

Hedgerows

12.6.60 Replacement hedgerow planting will be completed close to the area of hedgerow loss on the northern boundaries of the Eastern Site. Once established, it is considered that this replacement hedgerow planting will compensate for the loss of hedgerow HoPI habitat and will help to maintain connectivity throughout the Eastern Development and to the wider landscape. Further hedgerow planting will be completed at the off-site compensation area at Piddington. Replacement hedgerow planting will be of a mixture of native shrub species such as hawthorn, blackthorn, hazel, elder and dog rose and is therefore considered likely that replacement hedgerows will be of greater ecological value than the defunct, species-poor hedgerows to be removed. Following implementation of these measures, it is anticipated that the residual effect on hedgerow habitat will be negligible.

Bats

12.6.61 To compensate for the partial loss of hedgerow H9, new hedgerow planting will be completed in the north of the Eastern Site. This will help to maintain linear habitat connectivity along the northern boundary of the Eastern Site and additional tree and hedgerow planting off-site will provide additional foraging and commuting opportunities for bats. Furthermore, the creation of neutral grassland, swales, planted trees, scrub and woodland habitat on-site will provide further foraging opportunities for bats.

12.6.62 Enabling works and construction are to take place during daylight hours with lighting of retained and newly created habitats to be minimised by measures set out within a CEMP. Therefore, no adverse effects are anticipated in relation to construction lighting.

12.6.63 Although replacement hedgerow planting will be completed, the newly planted hedgerows will take time to become fully established and therefore a temporary adverse effect is anticipated. However, given the low levels of bat activity recorded on hedgerow H8, partial removal of this hedgerow is anticipated to effect only small numbers of bats, which are likely to be able to take alternative routes through the landscape temporarily. Therefore, a residual temporary moderate adverse effect significant at up to the district level is anticipated until new hedgerow planting is established.

Birds

12.6.64 Grassland and hedgerow habitat provision off-site at Piddington is considered likely to provide alternative enhanced habitat for birds that may be utilise habitats within the Eastern Development such as skylark, yellowhammer and linnet. It is anticipated that scrapes can be created which will provide suitable habitat for lapwing while the grassland will provide suitable habitat for skylark to nest. Replacement hedgerow planting close to the areas of hedgerow loss

in the north of the Eastern Site will help to maintain habitat connectivity and minimise the loss of hedgerow habitats that birds may utilise for nesting.

12.6.65 Given the loss of large areas of arable and hedgerow habitats within the Eastern Site, and the distance to the off-site habitat compensation proposed, it is considered likely that birds associated with the Eastern Site may be displaced to other suitable habitat, such as that provided off-site as a result of the Development. Therefore, a residual permanent minor adverse effect, significant at a local level, is assumed to remain following the implementation of mitigation measures.

Hazel dormouse

12.6.66 Replacement hedgerow planting will be completed close to the area of hedgerow loss on the northern boundaries of the Eastern Site. Once established, it is considered that this replacement hedgerow planting will compensate for the loss of hedgerow habitat for any hazel dormouse present and will maintain habitat connectivity. It is considered that pre-construction survey by an ECoW will prevent the loss of individual hazel dormouse during hedgerow removal.

12.6.67 It is therefore considered that, following implementation of these measures, the Eastern Development will result in a negligible effect on hazel dormouse.

Western Development

Trees

12.6.68 Native tree planting will take place throughout the Western Site. Planting will comprise a mixture of native species and is considered to provide a greater number of trees than those removed. Once established, it is considered that this replacement planting will more than compensate for the loss of trees as part of the Western Development. Therefore, it is anticipated that the residual effect on trees will be negligible.

Hedgerows

12.6.69 Replacement hedgerow planting will be completed close to the area of hedgerow loss on the northern boundaries of the Western Site. Once established, it is considered that this replacement hedgerow planting will compensate for the loss of hedgerow HoPI habitat and will help to maintain connectivity throughout the Western Development and to the wider landscape. Further hedgerow planting will be completed at the off-site compensation area at Piddington. Replacement hedgerow planting will be of a mixture of native shrub species such as hawthorn, blackthorn, hazel, elder and dog rose and is therefore considered likely that replacement hedgerows will be of greater ecological value than the defunct, species-poor hedgerows to be removed. Following implementation of these measures, it is anticipated that the residual effect on hedgerow habitat will be negligible.

Bats

12.6.70 Removal of moderate tree T19 or disturbance to moderate suitability trees T4 and T5, will be completed in compliance with relevant legislation and through a BLICL if required. The BLICL ensures bats are appropriately removed from the roost and alternative roost provision in the form of bat boxes will be provided if necessary.

12.6.71 To compensate for the partial loss of hedgerow H8, new hedgerow planting will be completed in the north of the Western Site. This will help to maintain linear habitat connectivity along the

northern boundary of the Western Site and additional tree and hedgerow planting off-site will provide additional foraging and commuting opportunities for bats. Furthermore, the creation of neutral grassland, swales, planted trees, scrub and woodland habitat on-site will provide further foraging opportunities for bats.

12.6.72 Enabling Works and construction are to take place during daylight hours with lighting of retained and newly created habitats to be minimised by measures set out within a CEMP. Therefore, no adverse effects are anticipated in relation to construction lighting.

12.6.73 Although replacement hedgerow planting will be completed, the newly planted hedgerows will take time to become fully established and therefore a temporary adverse effect is anticipated. However, given the low levels of bat activity recorded on hedgerow H8, partial removal of this hedgerow is anticipated to effect only small numbers of bats which are likely to be able to take alternative routes through the landscape temporarily. Therefore, a residual temporary moderate adverse effect significant at the district level is anticipated until new hedgerow planting is established.

Birds

12.6.74 Grassland and hedgerow habitat provision off-site at Piddington is considered likely to provide alternative enhanced habitat for birds that may be utilise habitats within the Western Development such as skylark, yellowhammer and linnet. It is anticipated that scrapes can be created which will provide suitable habitat for lapwing while the grassland will provide suitable habitat for skylark to nest. Replacement hedgerow planting close to the areas of hedgerow loss in the north of the Western Development will help to maintain habitat connectivity and minimise loss of hedgerow habitats which birds may utilise for nesting.

12.6.75 The Development involves removal of large areas of arable habitat and hedgerow removal within the Western Site. It is considered likely that birds associated with the Western Site may be displaced to other suitable habitat, such as that provided off-site as a result of the Development. Alternative habitat will be provided within the district at Piddington. Therefore, a residual permanent minor adverse effect significant at the local level is assumed to remain following the implementation of mitigation measures.

Hazel dormouse

12.6.76 Replacement hedgerow planting will be completed close to the area of hedgerow loss on the northern boundaries of the Western Development. Once established, it is considered that this replacement hedgerow planting will compensate for the loss of hedgerow habitat for any hazel dormouse present and will maintain habitat connectivity. It is considered that pre-construction survey by an ECoW will prevent the loss of individual hazel dormouse during hedgerow removal.

12.6.77 It is therefore considered that, following implementation of these measures, the Development will result in a negligible effect on hazel dormouse.

Development

12.6.78 Following the implementation of mitigation measures, no significant effects are anticipated as a result of the Development except in relation to birds for which a residual minor adverse effect significant at the local level is anticipated.

12.6.79 The habitat creation and enhancement measures are considered to ensure the Development is compliant with relevant policies under Bicester 1 and ESD10 of the Local Plan as well as relevant

policies in the SPD. This includes the enhancement and creation of new habitats that will link up with adjacent habitats to form wildlife corridors.

12.6.80 A summary of residual effects is provided in Table 12.11.

12.7 Completed Development

Assessment of Effects

12.7.1 The potential effects are considered in the absence of mitigation measures which are provided separately below.

12.7.2 An assessment of effects at the completed development stage is provided below. Only ecological features that are assessed as potentially being subject to significant effects as a result of the completed development are described.

Eastern Development

Statutory and Non-statutory Designated sites

12.7.3 Due to the employment nature of the Eastern Development and the distances involved, the likelihood of increased recreational pressure adversely effecting statutory or non-statutory designated sites is negligible.

12.7.4 The potential for significant effects in relation to changes in air quality at Ardley Cutting and Quarry SSSI within 200m of the road network predicted to be used by operational traffic (namely the M40 and B430) has been considered. A high-level air quality assessment has been completed, as presented in the Chapter 9: Air Quality which predicts a worst-case scenario of air quality changes in the absence of detailed scheme information at the outline stage.

12.7.5 The worst case scenario presented in Chapter 9 predicts a potential increase of up to 637 AADT on the M40 and 126 AADT on the B430 from the Eastern Development. Given this is well below the 1000 AADT threshold typically used to screen out significant effects, it is considered that the Eastern Development will not result in a significant adverse effect on designated sites in relation to air quality (i.e. negligible effect).

12.7.6 No other pathways for direct or indirect effects have been identified due to the employment nature of the Eastern Development and the distance between the Eastern Site and designated sites.

Species

Badgers

12.7.7 As set out in the Lighting Assessment (ref: P0188), lighting associated with the completed Eastern Development has the potential to result in disturbance to badgers within or adjacent to the Eastern Site. This could include badgers being dissuaded from using retained/newly created habitat. In order to comply with relevant legislation to protect badgers, a licence from Natural England will be obtained if any works are required which may disturb badgers.

12.7.8 Badgers are common and widespread and therefore it is considered that this would result in a negligible effect on the conservation status of badgers associated with the Eastern Site.

12.7.9 No other pathways for direct or indirect effects have been identified, therefore no significant adverse effects on badger are expected.

Bats

12.7.10 As set out within the Lighting Assessment for the Development (reference: P0188 Lighting Assessment 001), lighting associated with the completed Eastern Development has the potential to result in disturbance to any bat assemblage associated with the Site. This could include bats being dissuaded from using retained / newly created foraging and commuting habitat. In the absence of mitigation, this could result in an adverse effect on the conservation status of the bat assemblage associated with the Eastern Site. In the absence of mitigation, this could have a significant adverse effect at up to the county level.

Birds

12.7.11 Lighting and noise disturbance associated with the completed Eastern Development has the potential to result in disturbance to nesting birds which may be associated with the retained habitats or boundary hedgerows. It is considered that these species will be predominately common and widespread and, given that the boundary hedgerows will be retained with a buffer of grassland and tree planting, no significant effects on breeding bird assemblages or the conservation status of bird species is anticipated for the completed Eastern Development (i.e. negligible).

Hazel dormouse

12.7.12 Lighting associated with the completed Eastern Development has the potential to result in disturbance to any hazel dormouse associated with the hedgerows forming the boundary of the Eastern Site. This could include hazel dormouse being dissuaded from using retained hedgerows. Although habitats are sub-optimal for hazel dormouse, on a precautionary basis it is considered that, in the absence of mitigation, operational lighting could result in a minor adverse effect on hazel dormouse if present within the Eastern Site which may be significant at the local level.

Western Development

Statutory and Non-statutory Designated sites

12.7.13 Due to the employment nature of the Western Development and the distances involved, the likelihood of increased recreational pressure adversely effecting statutory or non-statutory designated sites is negligible.

12.7.14 The potential for significant effects in relation to changes in air quality at Ardley Cutting and Quarry SSSI within 200m of the road network predicted to be used by operational traffic (namely the M40 and B430) has been considered. A high-level air quality assessment has been completed, as presented in Chapter 9: Air Quality which predicts a worst-case scenario of air quality changes in the absence of detailed scheme information at the outline stage.

12.7.15 The worst-case scenario presented in the Chapter 9 predicts a potential increase of up to 1,146 AADT on the M40 and 226 AADT on the B430 as a result of the Western Development which exceeds the 1000 AADT threshold typically used to screen out significant effects. It is therefore considered that a significant adverse effect on Ardley Cutting and Quarry SSSI is possible.

12.7.16 Habitats known to be present within the SSSI which are considered sensitive to air pollution are formed of calcareous grassland. The critical load of for Nutrient Nitrogen deposition, below which a significant effect is considered unlikely for this habitat type for the purposes of impact assessment is 15 kgN/ha/yr according to the Air Pollution Information System. The critical loads for Nitrogen Oxide (NOx) emissions are 30µg NOx/m3 annual mean or 75µg NOx/m3 24-hour mean. Natural England guidance states that a project that will result in an increase of no more than 1% of critical loads or levels (either alone or in combination) can be regarded as insignificant.

12.7.17 The total area of SSSI within 200m of the B430 and the M40 roads which is identified as lowland Calcareous grassland priority habitat on Natural England's MAGIC16 website is measured at approximately 3.8ha. This area forms approximately 9.47% of the total SSSI area (40.1224ha[38]).

12.7.18 Both the M40 and the B430 roads pass through the SSSI boundary via a road bridge which is elevated over both the SSSI and the Chiltern Main Line railway. It is anticipated that the critical loads for habitats within the SSSI are likely to already be exceeded as a result of existing high traffic volumes on the M40 and the Development would make a very small contribution to this. However, as described in Chapter 9, a worst-case scenario has been presented as much uncertainty remains at present on vehicular movements in relation to the Development. The M40 and B430 cross a very small area of the SSSI in relation to its size (approximately 50m in both cases), most of which is the railway. Given concentrations of NOx decrease exponentially with distance from the carriageway, it is likely that any effect of the Development on the SSSI will be limited to a proportionally very small area within the designation boundary located very close to the roadside.

12.7.19 For the purposes of this assessment, on a precautionary basis, it is assumed that the 1% threshold of the critical loads will be exceeded and therefore an adverse significant effect of the national level may occur. No other pathways for direct or indirect effects have been identified due to the employment nature of the Western Development and the distance between the Western Site and designated sites. Notwithstanding, given the uncertainty at this stage, the potential for likely significant effects will be assessed in further detail during the Reserved Matters Application (RMA) stage to inform any mitigation strategies that are required. Furthermore, consultation will be held with Natural England to ascertain the sensitivity of the SSSI to air pollutants and to aid in determining potential effects on the SSSI. Until such time, potential mitigation measures, if required, are not known.

Badgers

12.7.20 Lighting associated with the completed Western Development has the potential to result in disturbance to badgers within or adjacent to the Western Site. This could include badgers being dissuaded from using retained / newly created habitat. Badgers are common and widespread and therefore it is considered that this would result in a negligible effect on the conservation status of badgers associated with the Western Site. In order to comply with relevant legislation to protect badgers, a licence from Natural England will be obtained if any works are required which may disturb badgers.

12.7.21 No other pathways for direct or indirect effects have been identified, therefore no significant adverse effect (negligible effect) is expected on badger.

Bats

12.7.22 As set out within the Lighting submitted with the planning application, lighting associated with the completed Western Development has the potential to result in disturbance to any bat assemblage associated with the Site. This could include bats being dissuaded from using retained / newly created foraging and commuting habitat. In the absence of mitigation, this could result in a significant adverse effect on the county level.

Birds

12.7.23 Lighting and noise disturbance associated with the completed Western Development has the potential to result in disturbance to nesting birds which may be associated with the retained habitats or boundary hedgerows. It is considered that these species will be predominately common and widespread and, given that the boundary hedgerows will be retained with a buffer of grassland and tree planting, no significant effects on breeding bird assemblages or the conservation status of bird species is anticipated for the completed Western Development stage (i.e. negligible).

Hazel dormouse

12.7.24 Lighting associated with the completed Western Development has the potential to result in disturbance to any hazel dormouse associated with the hedgerows forming the boundary of the Western Site. This could include hazel dormouse being dissuaded from using retained hedgerows. Although habitats are sub-optimal for hazel dormouse, on a precautionary basis it is considered that, in the absence of mitigation, operational lighting would result in a minor adverse effect on hazel dormouse if present within the Western Site, which may be significant at the local level.

Development

12.7.25 In the absence of mitigation, a minor adverse effect, significant at the local level, could occur on bats and hazel dormouse caused by light spill from the completed Development on habitat features used by these species.

Mitigation, Monitoring and Residual Effects

Eastern and Western Developments

Designated Sites

12.7.26 As described in Chapter 9: Air Quality, a worst-case scenario has been presented for air quality changes given there is much uncertainty at present. The air quality assessment has assumed a worst-case assessment and does not take account of any mitigation measures that may be implemented during the Development's operation. Such operational measures that may have a benefit to the SSSI could include the use of a Travel Plan that avoids the use of the B430; staff shuttle buses from Bicester to reduce individual staff car journeys; adoption of a vehicle fleet that are EV capable and/or uses the latest and lowest Euro emission standards. Mitigation measures should be secured in consultation with Natural England (as the competent authority) and taking account of any existing habitat management measures. The potential for likely significant effects will therefore be assessed in further detail at the RMA stage; this will be informed by further traffic modelling. Therefore, for the purposes of this assessment, on a precautionary basis, it is assumed that a residual adverse significant effect of the national level may occur as a result of the Western Development.

Bats

12.7.27 To mitigate the potential adverse effects resulting from the illumination of retained and newly created habitat, a sensitive lighting scheme will be developed to ensure areas of value to bats, such as the retained hedgerows forming the boundaries of the Eastern and Western Sites and newly created habitats are not excessively lit. Following implementation of a sensitive lighting scheme, it is considered that the completed Eastern and Western Developments would result in negligible effect on bats.

Hazel dormouse

12.7.28 To mitigate the potential adverse effects resulting from the illumination of the retained and newly created habitats, a sensitive lighting scheme will be developed to ensure the hedgerows are not excessively lit. Following implementation of these measures, it is considered that the completed Eastern and Western Developments would result in negligible effect on hazel dormouse.

Development

12.7.29 Following the implementation of a sensitive lighting strategy, it is anticipated that the completed Development will result in negligible effect on all ecological receptors.

12.7.30 A summary of residual effects is provided in Table 12.11.

12.8 Cumulative Effects

12.8.1 The four cumulative schemes set out in Chapter 3: EIA Methodology have been considered as part of the assessment of potential cumulative effects. As with the Development, the cumulative schemes will be required to mitigate potential effects upon important ecological receptors and deliver a net gain in biodiversity in-line with the Local Plan. They are also required to adhere to the legislative framework and both national and local policy with regards to biodiversity. Information relating to anticipated impacts and enhancements have been added, where known.

Construction

Assessment

12.8.2 With the exception of the potential effects on farmland birds, the Development will not result in any significant residual adverse effects that could interact with those resulting from other developments in the Bicester area. It is, therefore, reasonable to assume that there are sufficient planning and legislative controls to ensure that, in combination with the Development, potential significant effects on a cumulative basis would be mitigated.

12.8.3 As set out in the Chapter 9: Air Quality, cumulative construction impacts related to air quality are only likely where sites are within 500m of each other. None of the identified cumulative schemes are within 500m of the Development. Furthermore, the AADT on the road network surrounding the Site is anticipated to be well below the 1000 AADT threshold and no adverse effects are anticipated at the construction phase, as previously discussed. Therefore, no cumulative impacts are anticipated at the construction phase in relation to air quality.

12.8.4 Based on the information available for the other cumulative schemes, potentially significant effects on farmland birds have been identified for the Heyford Park scheme (ref: 18/00825/HYBRID), which is located approximately 2.8km south west of the Development. The

Heyford Park ES acknowledges a permanent residual adverse significant effect at the Site level for breeding birds utilising grassland habitats, including skylark, during the construction phase in the absence of mitigation. Given a permanent residual minor adverse significant effect of the local level is also anticipated for the Development on breeding birds, it is therefore possible that a cumulative effect may occur, with displaced birds from the local area seeking suitable habitat elsewhere. As a result, a permanent minor adverse cumulative effect may occur of the local level.

12.8.5 Insufficient information is available in relation to the SFRI to make a detailed cumulative assessment, although an EIA scoping report and EIA Scoping Opinion (Ref: TR050008) indicates that potential significant effects on biodiversity from this development are possible. As residual effects have been identified as a result of the Development, there is therefore a possibility of cumulative effects with the SFRI scheme.

12.8.6 No residual effects were identified from the other cumulative schemes considered which may act cumulatively with the Development.

Mitigation, Monitoring and Residual Effects

12.8.7 Approximately 20ha of grassland will be provided off-site at Piddington which is expected to provide habitat of greater suitability for farmland birds than the existing baseline habitats at the Site. Scrapes will be provided for lapwing and the grassland and hedgerow habitat provision will be provide suitable foraging and nesting habitat for other farmland birds such as skylark, yellowhammer and linnet. However, given this habitat provision is approximately 12.8km from the Site, it is anticipated that a cumulative effect with Heyford Park may occur given the loss of suitable farmland bird habitat within the local area. Therefore, a permanent residual minor adverse cumulative significant effect of the local level is anticipated even with the implementation of the specified mitigation measures. It is anticipated that the provision of mitigation measures off-site will reduce the residual adverse cumulative significant effect on farmland birds from district to local level.

12.8.8 In terms of overall beneficial impacts, it appears to be too early to say with any confidence about whether all of the sites could deliver a beneficial cumulative impact, though this is a possibility. The created habitat at Piddington will provide enhanced areas for farmland birds such as lapwing, skylark, yellowhammer and linnet to forage, roost and breed. Therefore, it is feasible that a beneficial cumulative effect will occur in combination with mitigation for other schemes in the district.

Completed Development

Assessment

12.8.9 Potential significant effects from the completed Development in the absence of mitigation in relation to lighting would be on a very local level and are therefore not anticipated to act cumulatively with other schemes. Therefore, no significant cumulative effects are expected in relation to lighting.

12.8.10 Given the worst-case AADT set out in Chapter 9: Air Quality for the Development when considered with cumulative schemes is 135,323 for the M40 and 15,764 for the B430 which far exceeds the 1000 AADT screening threshold, it is not possible to exclude potential cumulative air quality effects at this stage. However, it is anticipated that the critical loads for habitats within the SSSI are likely to already be exceeded as a result of existing high traffic volumes on the M40 and the Proposed Development would make a very small contribution to this.

12.8.11 Given the uncertainty at this stage, the potential for likely significant effects will therefore be assessed in further detail with an addendum report submitted when full traffic data is available. Furthermore, consultation will be held with Natural England to ascertain the sensitivity of the SSSI to air pollutants and to aid in determining potential effects on the SSSI. For the purposes of this assessment, on a precautionary basis, it is assumed that the 1% critical load threshold will be exceeded for the Development in combination with other schemes and a cumulative adverse significant effect of the national level may occur.

Table 12.11: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
Enabling Works and Construction									
Partial loss of trees	Low	Local	Permanent	Eastern Development	Loss of approximately 3 trees	Eastern Development	Multiple new trees planted on-site and off-site. Implementation of LEMP.	Eastern Development	Negligible
				Western Development	Loss of approximately 17 trees	Western Development		Western Development	Negligible
				Development	Loss of approximately 20 trees	Development		Development	Negligible
Partial loss of hedgerows	Low	Local	Permanent	Eastern Development	185m of hedgerow	Eastern Development	c.0.7km new hedgerow on-site and c.1.5km of new hedgerow planting off-site. Implementation of LEMP.	Eastern Development	Negligible
				Western Development	330m of hedgerow	Western Development		Western Development	Negligible
				Development	515m of hedgerow	Development		Development	Negligible
Loss of Ponds	Low	Local	Permanent	Eastern Development	Loss of one pond (WB1)	Eastern Development	Provision of a pond within the off-site compensation area	Eastern Development	Minor adverse (local)
				Western Development	No pond removal, no impacts anticipated	Western Development	Not applicable	Western Development	Negligible
				Development	Loss of one pond (WB1)	Development	Provision of a pond within the off-site compensation area	Development	Minor adverse (local)
Disturbance to bats	High	County	Temporary	Eastern Development	Loss of potential foraging, commuting or roosting habitats	Eastern Development	Creation of new neutral grassland, swales, hedgerow and tree planting on-site and creation of neutral grassland and hedgerow planting off-site.	Eastern Development	Moderate adverse (up to district)
				Western Development		Western Development		Western Development	Moderate adverse (up to district)
				Development		Development		Development	Moderate adverse (up to district)
Disturbance to birds	Low	District	Permanent	Eastern Development	Loss of foraging and nesting habitat	Eastern Development	Creation of new neutral grassland, swales, hedgerow and tree planting on-site and creation of neutral grassland and hedgerow planting off-site.	Eastern Development	Minor adverse (local)
				Western Development		Western Development		Western Development	Minor adverse (local)
				Development		Development		Development	Minor adverse (local)

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
Disturbance to hazel dormouse	Low	Local	Permanent	Eastern Development	Loss and fragmentation of hedgerow habitat	Eastern Development	c.0.7km new hedgerow on-site and c.1.5km of new hedgerow planting off-site. Implementation of LEMP.	Eastern Development	Negligible
				Western Development		Western Development		Western Development	Negligible
				Development		Development		Development	Negligible
Completed Development									
Changes to the ecological features of Ardley Cutting and Quarry SSSI	High	National	Permanent	Eastern Development	No impacts anticipated	Eastern Development	Not applicable	Eastern Development	Negligible
				Western Development	Potential alterations to habitat composition associated with higher levels of nutrient nitrogen and NOx emissions	Western Development	No mitigation known at this stage. Planning condition to undertake detailed assessment and provide mitigation if required during RMA applications. Consultation to occur with Natural England to inform mitigation if required.	Western Development	Up to Major adverse (national)
				Development	Potential alterations to habitat composition associated with higher levels of nutrient nitrogen and NOx emissions	Development		Development	Up to Major adverse (national)
Disturbance to bats	High	County	Permanent	Eastern Development	Lighting disturbance to hedgerows and newly created habitats that may be used by bats	Eastern Development	Implementation of a sensitive lighting strategy	Eastern Development	Negligible
				Western Development		Western Development		Western Development	Negligible
				Development		Development		Development	Negligible
Disturbance to hazel dormouse	Low	Local	Permanent	Eastern Development	Lighting disturbance to hedgerows that may be used by hazel dormouse	Eastern Development		Eastern Development	Negligible
				Western Development		Western Development		Western Development	Negligible
				Development		Development		Development	Negligible
Cumulative Effects									
Disturbance to birds	Low	District	Permanent	Development	Cumulative loss of habitat utilised by farmland birds such as skylark	Development	Creation of new neutral grassland, swales, hedgerow and tree planting on-site and creation of neutral grassland and hedgerow planting off-site.	Development	Minor adverse (local)

References

[1] Wildlife and Countryside Act, 1981. https://www.legislation.gov.uk/ukpga/1981/69

[2] The Conservation of Habitats and Species Regulations, 2017. http://www.legislation.gov.uk/uksi/2010/490/contents/made

[3] Countryside and Rights of Way Act, 2000. https://www.legislation.gov.uk/ukpga/2000/37/contents

[4] Protection of Badgers Act, 1992. http://www.legislation.gov.uk/ukpga/1992/51/contents

[5] The Hedgerow Regulations, 1997. http://www.legislation.gov.uk/uksi/1997/1160/contents/made

[6] The Natural Environment and Rural Communities (NERC) Act 2006. https://www.legislation.gov.uk/ukpga/2006/16/contents

[7] Wild Mammals (Protection) Act 1996. https://www.legislation.gov.uk/ukpga/1996/3/contents

[8] Ministry of Housing, Community and Local Government, (2012). The National Planning Policy Framework, 2021. https://www.gov.uk/government/publications/national-planning-policy-framework--2

[9] Cherwell District Council, Adopted September 2020. Cherwell Local Plan 2011 - 2031 Part 1 Partial Review. Available at: https://www.cherwell.gov.uk/info/83/local-plans/215/adopted-cherwell-local-plan-2011-2031-part-1-partial-review---oxfords-unmet-housing-need [Accessed 26/08/2021]

[10] Cherwell District Council, Re-adopted December 2016. Cherwell Local Plan 2011 - 2031 Part 1. Available at: https://www.cherwell.gov.uk/info/83/local-plans/376/adopted-cherwell-local-plan-2011-2031-part-1 [Accessed 26/08/2021]

[11] Oxford City Council. Biodiversity Action Plan 2015 -2020, https://www.oxford.gov.uk/downloads/file/2109/biodiversity_action_plan_2015-20

[12] Cherwell Biodiversity Action Plan 2016-18 https://www.cherwell.gov.uk/downloads/file/320/cherwell-biodiversity-action-plan-2016-2018

[13] BSI, 2013. BS 42020:2013 Biodiversity - code of practice for planning and development

[14] BSI Standards Publication (2012). Trees in relation to design, demolition and construction – Recommendations.

[15] CIEEM (2018) Guidelines for Ecological Impact Assessment in the United Kingdom, Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1 2019. Chartered Institute of Ecology and Environmental Management.

[16]MAGIC: https://magic.defra.gov.uk/MagicMap.aspx

[17] JNCC: https://jncc.gov.uk/our-work/uk-bap-priority-habitats/#list-of-uk-bap-priority-habitats

[18] Harris S, Cresswell P and Jefferies D (1991) (Report) Surveying Badgers. The Mammal. Society, Bristol.

[19] Roper, T.J. (2010). Badger. Harper Collins

[20] Natural England (2014) Protected species and development: advice for local planning authorities. https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications

[22] BCT (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). February, 2016

[23] BCT (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). February, 2016

[24] English Nature (2001) Great Crested Newt Mitigation Guidelines. English Nature, Peterborough

[25] Tom Langton, Catherine Beckett and Jim Foster (2001) Great Crested Newt Conservation Handbook, Froglife, Suffolk.

[26] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A,Williams P and Dunn F (2014) *Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA*.Freshwater Habitats Trust, Oxford

[27] TVERC (2018) LOCAL WILDLIFE SITES SELECTION CRITERIA: Berkshire, Buckinghamshire and Oxfordshire, Version 7. https://www.tverc.org/cms/sites/tverc/files/LWS%20Selection%20Criteria_v7%20Aug18.pdf

[28] JNCC: https://jncc.gov.uk/our-work/uk-bap-priority-habitats/#list-of-uk-bap-priority-habitats

[29] National Bat Monitoring Programme Annual Report 2020: https://cdn.bats.org.uk/uploads/pdf/Our%20Work/NBMP/National-Bat-Monitoring-Programme-Annual-Report-2020.pdf?v=1621498216

[30] Wray S., Wells D., Long E., and Mitchell-Jones T. (2010) Valuing Bats in Ecological Impact Assessment, In practice No.70, CIEEM, Winchester.

[31] Bright, P., Morris, P., Mitchell-Jones, T. (2006) Dormouse Conservation Handbook. English Nature (now Natural England), Peterborough.

[32] National Bat Monitoring Programme Annual Report 2020: https://cdn.bats.org.uk/uploads/pdf/Our%20Work/NBMP/National-Bat-Monitoring-Programme-Annual-Report-2020.pdf?v=1621498216

[33] NBN atlas: https://species.nbnatlas.org/species/

[34] Wray S., Wells D., Long E., and Mitchell-Jones T. (2010) Valuing Bats in Ecological Impact Assessment, In practice No.70, CIEEM, Winchester.

[35] Natural England (2021) The Biodiversity Metric 3.0 (JP039) [Online] Available at: http://publications.naturalengland.org.uk/publication/6049804846366720 [Accessed 16/09/2021]

[36] The UK Habitat Classification Working Group (2018) The UK Habitat Classification, Habitat Definitions Version 1.0.

[37] Holman et al (2019). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0, Institute of Air Quality Management, London. http://www.iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf

[38] Natural England, Designated Sites View: Ardley Cutting and Quarry SSSI. https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1000903&SiteName=&countyCode=34&responsiblePerson=&SeaArea=&IFCAArea=

13 Landscape and Visual Impacts

13.1 Introduction

13.1.1 This chapter of the ES was prepared by Tyler Grange Ltd. and presents an assessment of the likely significant effects of the Development on landscape and visual receptors. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and / or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

13.1.2 The chapter is supported by the following appendices:

- Appendix 13.1: Figures:
  - Figure 13.1: Site Location;
  - Figure 13.2: Site Context;
  - Figure 13.3: Landscape Policy Plan;
  - Figure 13.4: Landscape Character;
  - Figure 13.5: Topography;
  - Figure 13.6: Zone of Theoretical Visibility;
  - Figure 13.7: Photoviewpoint Location Plan; and
  - Figure 13.8: Landscape Strategy Plan;
- Appendix 13.2: Photoviewpoint Sheets and Methodology;
- Appendix 13.3: LVIA Methodology;
- Appendix 13.4: Extracts from landscape character assessment;
- Appendix 13.5: Scoped out Photoviewpoints; and
- Appendix 13.6: Correspondence with Cherwell District Council.

Competence

13.1.3 This chapter has been prepared by a Senior Landscape Consultant in the landscape planning team at Tyler Grange, Rob Mayers, and reviewed by Wendy Lancaster CMLI FRSA, Landscape Director at Tyler Grange, Wendy has in excess of 15 years' experience and is a specialist in LVIA for large-scale strategic sites. Rob is a Landscape Architect with 9 years' experience and has been responsible for the assessment of projects over a wide variety of scales and sectors. Rob has extensive experience of preparing Landscape and Visual Impact Assessments (LVIAs) for ESs for large mixed-use developments, residential schemes, infrastructure projects and developments within historic landscapes.

13.2 Legislation, Planning Policy and Guidance

Legislation Context

13.2.1 There is no legislation relevant to Landscape and Visual matters.

Planning Policy Context

National

13.2.2 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (NPPF) (2021)[1], notably:
  - Chapter 2. Achieving sustainable development;
  - Chapter 12. Achieving well-designed places; and
  - Chapter 15. Conserving and enhancing the natural environment.

Local

13.2.3 The Adopted Cherwell Local Plan 2011-2031 (Part 1, re-adopted December 2016)[2] contains strategic planning policies for development and the use of land. The following local planning policy are relevant to the Development:

- Policy PSD1: Presumption in Favour of Sustainable Development;
- Policy SLE1: Employment Development;
- Policy ESD7: Sustainable Drainage Systems (SuDS);
- Policy ESD10: Protection and Enhancement of Biodiversity and the Natural Environment;
- Policy ESD13: Local Landscape Protection and Enhancement;
- Policy ESD15: The Character of the Built and Historic Environment; and
- Policy ESD17: Green Infrastructure.

13.2.4 A number of 'Saved' policies of the Adopted Cherwell Local Plan 1996[3] remain part of the statutory Development Plan, of relevance to the Development are the following policies:

- C7: Landscape conservation;
- C8: Sporadic development in the open countryside; and
- C28: Layout, design and external appearance of new development.

13.2.5 The Western Site is located within the Mid-Cherwell Neighbourhood Plan[4] area, of relevance to the Development are the following policies:

- Policy PD5: Building and site design; and
- Policy PD6: Control of light pollution.

13.2.6 The Non-Statutory Cherwell Local Plan 2011[5] contains the following policies relevant to the Development:

- R4: Rights of way and access to the countryside;
- EN 30: Sporadic development in the countryside;
- EN 31: Development outside urban areas;
- EN34 Landscape character;

- EN 35: Important landscape features;
- D1: Urban design objectives;
- D3: Local distinctiveness;
- D4: The quality of architecture;
- D10a: Tall buildings; and
- D12: Protection of views.

Guidance

13.2.7 The following guidance is relevant to the Development:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition, ('GLVIA3'), Landscape Institute and Institute of Environmental Management and Assessment (IEMA), 2013[6];
- Technical Guidance Note 02/21, Assessing landscape value outside national designations[7], Landscape Institute, 2021;
- Technical Guidance Note 06/19 Visual Representation of development proposals[8], Landscape Institute, 2019;
- An Approach to Landscape Character Assessment, Natural England, Second Version, October 2014[9];
- National Planning Practice Guidance (NPPG): Design[10];
- NPPG: Natural Environment[11];
- NPPG: Design Open Space, Sports and recreation Facilities, Public Rights of Way and Local Green Space[12]; and
- Cherwell Design Guide (2017)[13].

13.3 Assessment Methodology

13.3.1 The generic EIA methodology is detailed in Chapter 3: EIA Methodology of the ES. This section provides specific details of the landscape and visual methodology applied to the assessment of the Development and a summary of the general approach to provide appropriate context for the assessment that follows. The assessment methodology is based primarily upon the GLVIA 3 which is considered to be best practice guidance for undertaking landscape and visual assessments.

13.3.2 To assist the reader in understanding the purpose for undertaking landscape assessment work, the definition of 'landscape' as defined by the European Landscape Convention (ELC, 2000)[14] is set out below.

"Landscape" means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. This definition applies to all urban, peri-urban landscapes, towns, villages and rural areas. It applies to ordinary or degraded landscape as well as those that are outstanding or protected."

13.3.3 The methodology used to write this LVIA has been derived from GLVIA 3. This states that landscape and visual impact assessment relates to:

"…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"

13.3.4 In the context of this definition, the assessment process seeks to consider the effects in an objective and systematic manner whilst recognising the perceptual and therefore subjective response to the landscape. Whilst subjectivity can never be removed from the assessment process, by following a systematic and structured framework of assessment, a more robust assessment can be applied and justified, and transparent conclusions drawn.

13.3.5 Furthermore, the LVIA process deals with the separate but interlinked issues of:

- Landscape Character[i]: The effects of the Development upon discrete character areas and /or character types comprising features possessing a particular quality or merit; and
- Visual Context: The effects of the Development on views experienced by visual receptors, and upon the amenity value of the views.

13.3.6 The effects of both aspects must be addressed in the assessment.

13.3.7 The full method of assessment for landscape and visual effects that has been applied is included in Appendix 13.3 of the ES. In summary, the assessment process involves the following steps:

- Baseline appraisal of landscape, visual and planning policy baseline;
- Identification of potential receptors to change and their sensitivity;
- Assessment of potential effects on identified receptors;
- Assessment of cumulative effects on identified receptors;
- Assessment of residual effects on identified receptors; and
- Proposed mitigation measures.

Consultation

13.3.8 Table 13.1 summarises key comments raised by consultees of relevance to this assessment and how the assessment has responded to them.

Table 13.1: Consultation Response Summary

Consultee and Comment	Response
Cherwell District Council (29th July 2021) Scoping Opinion	
The LVIA should include representative viewpoints in respect of the various rural receptors and from the few residential properties near the site around Baynards Green.	Representative viewpoint 8 assessed in the LVIA include residential properties close to Baynards House and from PRoW, settlements and roads within the Study area.

[i] Landscape character is defined in the GLVIA3 as:
"A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse."

Consultee and Comment	Response
Cumulative effects, in addition to the NW Bicester Eco-town and Heyford Park, reference should also be made to the Great Wolf Leisure Resort at Chesterton and the proposed Strategic Rail Freight Interchange between Ardley and Upper Heyford.	The cumulative assessment includes the identified schemes and considers effects on landscape and visual receptors.
Cherwell District Council (12th August 2021) - Feedback on Photoviewpoint selection	
Proposed viewpoints are appropriate. A narrative should be provided for each of the 'scoped out' viewpoints.	A narrative relating to Photoviewpoints to be 'scoped out' has been included in Appendix 13.5.
CDC questioned whether residential receptors were to be included in the LVIA.	The position of Photoviewpoint 8 illustrates, potential views from residential properties from a publicly accessible location.

Study area and Scope

13.3.9 For the purposes of the LVIA, a Study area has been defined that extends to a distance of 2km from the Site boundary. The Study area has been informed by an understanding of landform and built form, and through the use of Zone of Theoretical Visibility (ZTV) mapping, which demonstrates the worst-case scenario in terms of visibility of the Site. Further details of the production of the ZTV are set out under the 'Establishing Baseline Conditions' section.

13.3.10 In order to focus on the significant effects, visual receptors identified through ZTV analysis and reviewed during site visits have been scoped out of the visual assessment where no views of the Development were identified. The viewpoints scoped out of the visual assessment, as agreed with CDC, are as follows (see Table 13.1 and Appendix 13.8 for further detail regarding this consultation).

- Photoviewpoint A, junction of PRoW within Tusmore Park;
- Photoviewpoint B, B4100 north west of Site;
- Photoviewpoint C, B4100 at Ploughley Hill;
- Photoviewpoint D, St Olave Church, Fritwell;
- Photoviewpoint E, PRoW 109/7/10, east of Ardley;
- Photoviewpoint F, B4100 south of Swifts House Farm; and
- Photoviewpoint G, bridleway 367/5/20, north of Stoke Little Wood.

13.3.11 The landscape and visual assessment comprises the assessment of the following construction and operation scenarios that encompass the Eastern Development, Western Development and the Development as a whole:

- Baseline – existing conditions at the time of time of the survey (i.e. 2021);
- Construction – over duration of indicative construction programme (i.e. approximately three years from 2022 – 2025;
- Future Baseline (without Development) – 2025;
- Completed Development (year 1) – 2025; and

- Completed Development (year 15) – 2040.

Establishing Baseline Conditions

13.3.12 The landscape and visual baseline conditions were established by undertaking a detailed desk study, fieldwork conducted on 23rd June 2021 to ground truth the findings of the desk study and capture photographs from the photoviewpoints assessed as part of the LVIA, and analysis of findings. These activities were undertaken in line with GLVIA 3 to create a detailed understanding of the existing landscape and visual context of both the Site and surrounding landscape within the Study area.

13.3.13 The landscape baseline was established through gathering data from published assessments on the landscape character and how this varies within the Study area, together with its geographic extent and how it is experienced and valued.

13.3.14 The visual baseline establishes the areas from where the new components of the Development can be seen, who can see them, the places where those who see them will be affected and the nature of views and visual amenity. This was informed through the use of aerial imagery from Google Earth and Bing mapping, Ordnance Survey (OS) mapping and the calculation of a ZTV of the Development.

13.3.15 The ZTV mapping exercise was conducted using QGIS software and based upon OS Terrain 5 data. The model does not take into account built form or vegetation, i.e., is a bare-earth model, and thus shows the worst-case scenario for the potential visibility of a building of up to 25m to account for the maximum proposed building height. The ZTV was used as a first sieve exercise to scope down the areas to assess for potential views towards the Site. From this exercise, a series of viewpoints were identified which were then shared for agreement with CDC (see Table 13.1 and Appendix 13.8).

13.3.16 Together, the established baseline scenario provides an understanding of the components of the landscape and visual receptors that may be affected by the Development, and includes the identification of key receptors and viewpoints which represent such receptors. The baseline is of sufficient detail to enable a well-informed assessment of the likely significant effects of the Development during the construction and operations phases.

13.3.17 The desk-based assessment has involved the following key activities:

- Familiarisation with the landscape and visual resources of the area within which the Development will be located;
- Review of legislation, policy and guidance including published landscape character assessments of the area and its wider context and publicly available datasets from Historic England, Natural England and OCC;
- Identification of landscape and visual receptors likely to be significantly affected by the Development;
- Preparation of ZTV maps;
- Identification of the location of viewpoints, informed by the ZTV, that were used to inform the assessment of effects of both landscape and visual receptors; and
- Identification of suitable study areas for the impact assessment stage of the LVIA.

13.3.18 This process defined a 2km Study area from Site boundary that has formed the basis of LVIA fieldwork.

13.3.19 Viewpoints identified during desk studies were ground truthed through fieldwork and their positions fixed prior to photography being undertaken. Landscape character areas were reviewed during fieldwork and the descriptions contained in the published landscape character assessment were augmented where necessary. Landscape and visual receptors were also assessed to ensure they are accurately represented through desk-based assessment.

Identifying Likely Significant Effects

13.3.20 The assessment criteria used for this LVIA includes consideration of value and susceptibility in determining receptor sensitivity; and consideration of the scale, extent and duration of the effect in determining magnitude. The value and susceptibility of a receptor are both considered in understanding and forming a judgment regarding its overall sensitivity. These criteria are outlined later in this section, with further detail on how these criteria are applied and combined to form judgements of sensitivity, magnitude and significance provided within Appendix 13.3.

13.3.21 Changes to the landscape character can arise as a result of:

- Changes to the fabric of the landscape including either through the loss of key elements or the introduction of new features which alter the distinct character of the landscape; and
- Changes which alter the way in which the landscape is perceived or appreciated.

13.3.22 Changes to views will occur where there is:

- Alteration of the view in terms of elements present and the overall composition;
- A change to the skyline; and / or
- There is a change to the distribution or dominance of features.

Enabling Works and Construction

13.3.23 Enabling Works and construction stage landscape and visual impacts are anticipated to arise from earthworks and site regrading, building works and construction activity (including the temporary impact of tower cranes). Enabling Works and construction phase effects are considered to be ‘short-term and temporary’ in duration due to the anticipated length of the proposed construction phase.

13.3.24 The assessment of the potential for likely significant construction stage effects has been carried out using professional judgement and experience of assessing similar developments, without reference to illustrative material such as AVRs.

Completed Development

13.3.25 The Development will lead to a direct and permeant change in landscape character on and in proximity of the Site, and an introduction of new built form in views. In order to inform the assessment of the effects of the completed Development on landscape character and on the visual receptors, fifteen visualisations were prepared in line with Landscape Institute TGN 06/19 Visual Representation of Development Proposals[15]. The AVRs are presented in Appendix 13.2.

13.3.26 The viewpoint locations are as agreed with CDC through the scoping process, allowing the LVIA to focus on the likely significant effects resulting from the Development. Due to the outline nature of the planning application, the visualisations are chalk massing (Type 3) Accurate Visual Representations (AVRs) and were prepared by overlaying photographs taken from representative viewpoints with a 3D massing model of the Development. The 3D model is based on the parameter plans and the methodology for producing the AVRs, as set out in Appendix 13.2. The selection of viewpoint locations takes account of the detailed and outline applications applicable to both Sites.

Cumulative Effects

13.3.27 The assessment of cumulative landscape and visual effects considers the potential effects of the Development interacting with other identified cumulative schemes.

13.3.28 GLVIA3 defines cumulative landscape and visual effects as those that:

"result from additional changes to the landscape or visual amenity caused by the Development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future."

13.3.29 It is important to note that GLVIA3 advocates that *'the emphasis on EIA is on likely significant effects rather than on comprehensively cataloguing of every conceivable effect that might occur'*. As such, the assessment should be reasonable and proportional, with a focus on likely significant effects.

13.3.30 As set out in Chapter 3: EIA Methodology and Appendix 3.5, four cumulative schemes have been considered for cumulative assessment within this EIA. Of these schemes, it is considered that the Development at Upper Heyford (cumulative scheme no. 1) would potentially be visible in views towards the Development from the north of the Site and therefore have potential to result in cumulative landscape or visual effects with the Development. Given the proximity to the Site and intervening topography, the other schemes, including the SFRI, are not considered to have any invisibility with the Development proposals and are scoped out of the cumulative assessment.

Determining Effect Significance

13.3.31 The process of forming a judgement as to the degree of significance of the effect is based upon the assessments of magnitude of impact and sensitivity of the receptor.

Sensitivity of Receptor

13.3.32 The desktop and on-site appraisals are used to identify potential receptors to change. Landscape receptors may be individual landscape elements, such as trees and hedgerows, or landscape character. Visual receptors are always people. Receptors that are identified but then deemed to not be affected by the Development are scoped out of the assessment in accordance with the GLVIA3.

13.3.33 The sensitivity of receptors is assessed by combining the considerations of:

- Susceptibility: the ability of a landscape or visual receptor to accommodate the Development *"without undue consequences for the maintenance of the baseline*

situation and / or the achievement of landscape planning policies and strategies." (GLVIA3, para. 5.40).

- Value: *"the relative value that is attached to different landscapes or views by society"* (GLVIA3, pages 114 and 157).

13.3.34 In order to assist in understanding the application of sensitivity to landscape and visual receptors, Appendix 13.3 sets out a number of assessment criteria which are summarised below. These allow for the separate consideration of both value and susceptibility factors in order to establish a balanced assessment.

Susceptibility

13.3.35 Susceptibility indicates the ability of a landscape or visual receptor to accommodate change *"without undue consequences for the maintenance of the baseline situation and / or the achievement of landscape planning policies and strategies."* (GLVIA, 3rd edition, para. 5.40)

Table 13.2: Receptor Susceptibility Descriptors

Susceptibility	Descriptor
High	Undue consequences are likely to arise from the Development.
Medium	Undue consequences may arise from the Development.
Low	Undue consequences are unlikely to arise from the Development.

13.3.36 Susceptibility of landscape character areas / types is influenced by their characteristics and is frequently considered (though often recorded as 'sensitivity' rather than susceptibility) within documented landscape character assessments and capacity studies.

13.3.37 Susceptibility of designated landscapes is influenced by the nature of the special qualities and purposes of designation and / or the valued elements, qualities or characteristics, indicating the degree to which these may be unduly affected by the development proposed.

13.3.38 Susceptibility of accessible or recreational landscapes is influenced by the nature of the landscape involved; the likely activities and expectations of people within that landscape and the degree to which those activities and expectations may be unduly affected by the development proposed.

13.3.39 Susceptibility of visual receptors is primarily a function of the expectations and occupation or activity of the receptors (GLVIA3, para 6.32).

Value

13.3.40 Landscape value is the relative value that is attached to different landscapes by society. As a general rule, those landscape resources which make a notable contribution to the character and cannot be replaced or substituted, or where the type of Development is inconsistent with the baseline situation will be of a high sensitivity. Those resources which are replaceable or contribute little to the overall character of the landscape, and where the type of proposals complement the baseline situation will be of low sensitivity.

13.3.41 Value can apply both to areas as a whole, or the individual elements, features and aesthetic or perceptual dimensions that contribute to the character of the landscape.

13.3.42 For visual receptors, susceptibility and value are closely linked – the most valued views are also likely to be those where viewer's expectations will be highest. Visual receptor value relates to the value of the view, e.g. a National Trail is nationally valued for access, not necessarily for the available views.

13.3.43 Receptor value is defined in Table 13.3.

Table 13.3: Receptor Value Descriptors

Value	Descriptor
High	Designated landscapes which are nationally or internationally designated for their landscape value.
Medium	Locally or regionally designated landscapes; also areas which documentary evidence and / or site observation indicates as being more valued than the surrounding area.
Low	Everyday landscape which is appreciated by the local community but has little or no wider recognition of its value.
Limited	Despoiled or degraded landscape with little or no evidence of being valued by the community.

13.3.44 As set out above, sensitivity is assessed through the application of professional judgement, based on a combination of the considerations of susceptibility and value and is not reliant on a formulaic interpretation of the tabulated criteria. Table 13.4 below provides an overview of how sensitivity is derived.

Table 13.4: Sensitivity of Landscape and Visual Receptors

Value	Susceptibility		
	High	Medium	Low
High	High	High – medium	Medium
Medium	High – medium	Medium	Medium - low
Low	Medium	Medium - low	Low
Limited	Low	Low – negligible	Negligible

13.3.45 The sensitivity of landscape receptors arising from the Development will be dependent on:

- Its characteristics of and contribution to a sense of place;
- The ability to recreate or replace the feature or characteristic; and
- Whether the Development is compatible with the baseline situation.

13.3.46 Those receptors that are classified as being high sensitivity to change may include nationally designated or iconic, unspoiled landscape with few, if any degrading elements, those of low sensitivity to change may include damaged or substantially modified landscapes capable of absorbing major change.

13.3.47 The sensitivity of people (visual receptors) who may experience a change to views and visual amenity arising from the Development, with reference to the representative viewpoints, in terms of their sensitivity to change will be dependent on:

- The location and context of the viewpoint;

- The expectations and occupation or activity of the receptors; and
- The importance of the view.

13.3.48 Those receptors that are classified as being of high sensitivity to change may include users of public rights of way or nearby residents, those of low sensitivity to change may include people in their place of work or travelling through the landscape in cars, trains or other modes of transport.

Magnitude of Impact

13.3.49 The magnitude of impact considers the size or scale of the Development, along with the geographical extent of the area influenced and its duration, as set out in the GLVIA3 (para. 3.26).

13.3.50 The scale of impact is assessed for all landscape and visual receptors and identifies the degree of change which would arise from the Development. The criteria for the assessment of the scale of impacts are set out in Table 13.5.

Table 13.5: Scale of Impact

Scale	Descriptor
High	Total or major alteration to key elements, features, qualities or characteristics, such that the baseline will be fundamentally changed following development.
Medium	Partial alteration to key elements, features, qualities or characteristics, such that the baseline will be noticeably changed following development.
Low	Minor alteration to key elements, features, qualities or characteristics, such that post development the baseline will be largely unchanged despite discernible differences.
Negligible	Very minor alteration to key elements, features, qualities or characteristics, such that the baseline will be fundamentally unchanged following development with barely perceptible differences.

13.3.51 Duration of impact is assessed for all landscape and visual receptors and identifies the time period over which the change to the receptor as a result of the Development would arise. The criteria for the assessment of duration of impact are set out in Table 13.6.

Table 13.6: Duration of Impact

Duration	Descriptor
Permanent	The change is expected to be permanent and there is no intention for it to be reversed. Or occurring for a period longer than 25 years.
Long term	The change is expected to be in place for 10–25 years and will be reversed, fully mitigated or no longer occurring beyond that timeframe.
Medium term	The change is expected to be in place for 2–10 years and will be reversed, fully mitigated or no longer occurring beyond that timeframe.
Short term	The change is expected to be in place for 0–2 years and will be reversed, fully mitigated or no longer occurring beyond that timeframe.

13.3.52 Extent of impacts is assessed for all receptors and indicates the geographic area over which the impacts will be felt, as set out in Table 13.7.

Table 13.7: Extent of Impact

Extent	Descriptor
Extensive	Extensive affecting the majority or all the receptor area (e.g. character area or field of view).
Intermediate	Affecting around half of receptor area.
Localised	Site and surroundings or part of the receptor area.
Limited	Affecting the site and immediate setting only.

13.3.53 The magnitude of impact is assessed through the application of professional judgement, based on a combination of the scale, duration and extent of effect (Tables 13.5 – 13.7), with descriptions set out in Table 13.8.

Table 13.8: Magnitude of Impact Descriptors

Magnitude of Impact	Descriptor
High	A large extent of a receptor will be lost or changed or there will be the additional of significant new features that alter their character or composition.
Medium	A medium extent of a receptor will be lost or changed or there will be the additional of significant new features that alter their character or composition.
Low	A small extent of a receptor will be lost or changed or there will be the additional of significant new features that alter their character or composition.
Negligible	A barely perceptible extent of a receptor will be lost or changed or there will be the additional of significant new features that alter their character or composition.

Assessing Significance

13.3.54 The significance of identified landscape and visual effects are assessed through the application of professional judgement and is not reliant on the formulaic interpretation of the tabulated criteria, combining the sensitivity of the landscape / visual receptor, the magnitude of the change and whether the change is likely to be temporary or permanent, long or short term. The assessment identifies which effects are considered to be significant as well as whether they are adverse or beneficial.

13.3.55 The matrix shown in Table 13.9 illustrates how the sensitivity of the landscape and visual receptors (Table 13.4) and the magnitude of impact (Table 13.9) can be combined to provide an assessment of the significance of effect.

Table 13.9: Landscape and Visual Significance Matrix

		Sensitivity			
		High	Medium	Low	Negligible
Magnitude	High	Major	Major – moderate	Moderate	Negligible
	Medium	Major - moderate	Moderate	Moderate - minor	Negligible
	Low	Moderate	Moderate - minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

13.3.56 Effects are defined as adverse, neutral or positive. Neutral effects are those which overall are neither adverse nor positive but may incorporate a combination of both.

13.3.57 Where intermediate ratings are given, e.g. "Moderate-Minor", this indicates an effect that is both less than Moderate and more than Minor, rather than one which varies across the range. In such cases, the higher rating will always be given first. This does not mean that the impact is closer to that higher rating but is done to facilitate the identification of the more significant effects within tables. Intermediate judgements may also be used for judgements of magnitude.

13.3.58 It is considered that major–moderate or major effects are considered to be significant and effects of moderate significance or less are *"of lesser concern"* (as defined by GLVIA3, para. 3.35) and not significant.

13.3.59 However, it is important to note that this is a quantitative approach, which the GLVIA3 strives to avoid, stating that:

"There should be more emphasis on narrative text describing the landscape and visual effects and the judgements made about their significance" and that "Tables and matrices should be used to support and summarise description text, not replace it.".

13.3.60 Therefore, professional judgement is applied where appropriate. It should also be noted that whilst an effect may be significant, that does not necessarily mean that such an impact would be unacceptable or should necessarily be regarded as an *"undue consequence"* (GLVIA3, para 5.40).

Assumptions and Limitations

13.3.61 The following assumptions have been made in this assessment:

- The assessment of effects arising from Build Zones on Parameters Plans 01 and 06 assumes structures / buildings could occupy the full extent of the outline envelope proposed.
- The proposed colour would be a neutral-grey for the buildings.
- Internal landscaped areas would consist of neutral and amenity grasslands in addition to swales.

- Planting growth is assessed on the basis of an average of 1m in 3 years for trees, although this will vary due to species and specific soil conditions, as well as maintenance and management;

13.3.62 The following limitations have been identified:

- The assessment and visualisations are based on the parameter plans for permanent structures limiting the degree of accuracy and detail.
- Planting is not included in the visualisations due to the indicative nature of the Landscape Strategy Plan limiting the degree of accuracy and detail.
- Site visits and photography were carried out during summer season with trees in leaf, as such the produced AVRs do not show worst-case scenario when visibility is greatest during the winter months.
- The ZTV model does not take into account the reducing scale of objects in the view over long distances or the reduction in contrast caused by atmospheric conditions. Given the local landform, surrounding land use and vegetation, the ZTV indicates a considerably greater area than in reality. The influence of vegetation will serve to limit inter-visibility of the Site.
- The estimated accuracy tolerance of the AVRs is +/- 100mm. Such a variance is unlikely to be perceptible in the views, and would not change the assessment of effects.

13.4 Baseline Conditions

Introduction

13.4.1 This section identifies the landscape and visual receptors and sets out the existing landscape and visual context of the Site and study area in terms of:

- The landscape features and character of the Site;
- The landscape character of the Study area;
- The nature and extent of the Site's visibility for visual receptors; and
- The sensitivity of the identified landscape and visual receptors to the change proposed.

13.4.2 The location of the Site and full extent of the Study area is shown on Figure 13.1. The local context of the Site is illustrated on Figure 13.2. Its topographical setting is illustrated on Figure 13.5.

13.4.3 The Site is made up of two components: the Eastern Site and Western Site, which are described below. Access to both the Western and Eastern Sites is currently from the B4100 on the northern Site boundary. The B4100 connects to the A43 at Baynards Green Roundabout adjacent to the north of the Site boundary.

Landscape Setting

Eastern Site

Settlement and Land use

13.4.4 The Eastern Site is located north of Cherwell Valley Services, with the settlements of Stoke Lyne and Ardley with Fewcott located 1.3km east, 1.3km west, 850m south and 700m southwest respectively. Land use is exclusively arable agriculture with the Eastern Site sub-divided into three fields bound by hedgerows.

Access and Rights of Way

13.4.5 Access to the Eastern Site is from the B4100, which forms part of the northern boundary, with the A43 adjacent to the west within a shallow cutting. Road junctions between the B4100, A43 and M40 are located to the north and south corners of the western boundary.

13.4.6 There are no Public Rights of Way (PRoW) crossing the Eastern Site; however, a bridleway (367/21/10) is situated adjacent to the southern boundary. Outwith the Eastern Site boundary, a number of PRoW are present, with a bridleway (367/24/10) situated along the southern boundary of Tusmore Park circa 500m to the north, and footpaths (367/3/10 and 367/3/20) circa 300m south east extending towards Stoke Lyne. To the west of the A43 a further network of PRoW extends along the alignment of the road (367/28/10 and 367/29/10) before traversing the Western Site (109/5/10) and connecting with the settlements of Ardley with Fewcott to the south.

Topography and Hydrology

13.4.7 The topography of the Eastern Site falls gently from the northwest corner near the junction of the B4100 and A43 to the south east, from a height of 116mAOD to 109mAOD. The wider setting of the Eastern Site is of an elevated but broad, even plateau situated between the Cherwell valley to the west and lower ground that surrounds Bicester. A small water body is present in the north of the Eastern Site located within a hedgerow, with a small watercourse running east to west from Cherwell Valley Services towards Stoke Lyne outwith the Eastern Site boundary.

Vegetation and Field Pattern

13.4.8 Fields are medium to large in scale and, although not rectilinear, are regular in appearance. Vegetation within the Eastern Site is predominantly arable agricultural set within a regular framework of hedgerows, some of which are gappy or overgrown in appearance. This pattern is repeated in the fields that surround the Eastern Site. Hedgerow trees are infrequent but evident within the north of the Eastern Site. Beyond the Eastern Site boundary are a number of small woodlands associated with the A43 road corridor and Cherwell Valley Services, with an area of ancient woodland at Stoke Wood circa 300m south of the Eastern Site. Tusmore Park also contains numerous areas of woodland.

Landscape Designations

13.4.9 There are no statutory or local landscape designations within the Eastern Site or Study area. The closest Conservation Area is situated in the settlement of Ardley with Fewcott, approximately 740m southwest of the Eastern Site boundary, while Tusmore Park contains a Scheduled Monument circa 1.8km to the north. A Grade II listed barn is situated

approximately 335m to the northwest of the Eastern Site boundary, with a number of listed features present in the surrounding villages of Fritwell, Ardley with Fewcott and Stoke Lyne.

Western Site

Settlement and Land use

13.4.10 The Western Site is located adjacent to three residential properties, while Bayard's Green, located to the north, comprises a collection of farm buildings and services for users of the A43. Within the Western Site a single building is present, utilised for agricultural storage. The settlement of Ardley with Fewcott is situated approximately 700m to the south of the Western Site boundary and Cherwell Valley Services is located approximately 300m to the south east. Land use is exclusively arable agriculture, with the Western Site sub-divided into six fields bound by hedgerows.

Access and Rights of Way

13.4.11 Access to the Western Site is from the B4100 which forms part of the northern boundary, with the A43 adjacent to the east within a shallow cutting. Road junctions between the B4100, A43 and M40 are located to the north and south corners of the eastern boundary. Traversing the Western Site is a PRoW (109/5/10) that extends along the A43 and links Baynard's Green with Ardley with Fewcott and Fritwell via a bridge crossing the M40. Along the Western Site's western boundary, a bridleway (109/2/40) provides links to Ardley with and Fewcott and Tusmore Park. A number of PRoW are present outwith the Western Site, with a bridleway (367/24/10) situated along the southern boundary of Tusmore Park circa 460m to the north, and a number of PRoW present to the east of Ardley with Fewcott.

Topography and Hydrology

13.4.12 The topography of the Western Site falls gently from the northwest corner towards the southeast from a height of 128mAOD to 111mAOD. The wider setting of the Western Site is of an elevated but broad even plateau situated between the Cherwell valley to the west and lower ground that surrounds Bicester. There are no water bodies within the Western Site however a number of balancing ponds associated with Junction 10 of the M40 are present to the south along with a small watercourse running east to west from Cherwell Valley Services towards Stoke Lyne.

Vegetation and Field Pattern

13.4.13 Fields are medium to large in scale and although not rectilinear are regular in appearance. Vegetation within the Western Site is predominantly arable agricultural set within a regular framework of hedgerows, some of which are gappy or overgrown in appearance. This pattern is repeated in the fields that surround the Western Site. Hedgerow trees are infrequent but evident within the north of the Western Site. Beyond the Site boundary are a number of small woodlands associated with the A43 and M40 road corridors and Cherwell Valley Services, with Stoke Wood ancient woodland located approximately 575m from the Western Site boundary. Tusmore Park also contains numerous areas of woodland and is situated circa 500m to the north east.

Landscape Designations

13.4.14 There are no statutory or local landscape designations within the Western Site or the Study area. The closest Conservation Area is situated in the settlement of Ardley with Fewcott

400m southwest of the Western Site boundary while Tusmore Park contains a Scheduled Monument, approximately 1.8km to the north. A Grade II listed barn is situated circa 205m to the northeast of the Site boundary, with a number of listed features present in the surrounding villages of Fritwell (approx. 1.1km west), Ardley with Fewcott (approx. 620m south west) and Stoke Lyne (approx. 1.8km east).

Landscape Character

13.4.15 GLVIA3 (paragraphs 5.13–5.15) indicates that character studies at the national or regional level are best used to 'set the scene' and understand the context. It also indicates that local authority assessments provide more detail and that these should be used to form the basis of the assessment of effects on landscape character – with (appropriately justified) adaptation, refinement and interpretation where required.

13.4.16 The document used as the main basis for assessment is described below:

- Oxfordshire Wildlife & Landscape Study (OWLS) (2004)[16].

13.4.17 Other assessments relevant to this assessment are described below:

- National Character Area profile: 107. Cotswolds[17](2015).
- Northamptonshire Current Landscape Character Assessment (2003)[18]

National Character Area (NCA) profiles

Cotswolds

13.4.18 Both the Eastern and Western Sites are located within the Cotswolds NCA which extends from Brackley in the northeast to Bath in the southwest.

13.4.19 The dominant pattern of the Cotswold landscape is described in the NCA as being a steep scarp crowned by a high, open wold. The distinctive character of the area is reflected 65% of this character area being designated as the Cotswolds Area of Outstanding Natural Beauty, although the Site is outwith this landscape designation.

13.4.20 Characteristics of relevance include:

- The limestone geology has formed the scarp and dip slope of the landscape, which in turn has influenced drainage, soils, vegetation, land use and settlement.
- Open and expansive scarp and high wold dipping gently to the southeast, dissected by river valleys.
- Arable farming dominates the high wold and dip slope while permanent pasture prevails on the steep slopes of the scarp and river valleys with pockets of internationally important limestone grassland.
- Ancient beech hangers line stretches of the upper slopes of the scarp, while oak/ash woodlands are characteristic of the river valleys. Regular blocks of coniferous and mixed plantations are scattered across the open high wold and dip slope.

Oxfordshire Wildlife & Landscape Study

13.4.21 Published by Oxfordshire County Council, the Oxfordshire Wildlife & Landscape Study (OWLS) (2004) describes the character and qualities of landscape character types (LCTs) and local character areas (LCAs) across the county. The study also identifies regional

character areas within the county, however notes that these are the parts of the National Character Areas which fall within Oxfordshire, no description is provided of these areas in the assessment.

13.4.22 As illustrated in Figure 13.4, the following LCTs and LCAs are present within the Study area (where LCTs and LCAs have been scoped out this has been noted together with rational for their exclusion):

- 6. Farmland Plateau LCT, covers the northern part of the Western Site;
- 7. Farmland Slopes & Valley Sides LCT, scoped out due to no intervisibility to the Site;
- 19. Wooded Estatelands LCT, covers the southern part of the Western Site and all of the Eastern Site;
- H. Fritwell (CW/57) LCA, covers the northern part of the Western Site;
- F. Lower and Upper Heyford (CW/56) LCA scoped out due to no intervisibility to the Site; and
- C. Middleton Stoney (CW/59) LCA, covers the southern part of the Western Site and all of the Eastern Site.

Oxfordshire Wildlife & Landscape Study

6. Farmland Plateau LCT

13.4.23 This landscape type covers the plateau across the elevated northern part of the county. To the east of the Cherwell Valley the plateau continues north east of Upper Heyford and Fritwell.

13.4.24 Its characteristics of relevance are:

- Level or gently rolling open ridges dissected by narrow valleys and broader vales.
- Large, regular arable fields enclosed by low thorn hedges and limestone walls.
- Rectilinear plantations and shelterbelts.
- Sparsely settled landscape with a few nucleated settlements.
- Long, straight roads running along the ridge summits.

Value, Susceptibility and Sensitivity

13.4.25 Overall, it is considered that the Farmland Plateau LCT is of medium / low landscape value as it is generally in good condition, containing regularly shaped arable fields and distinctive areas of woodland that contribute to a sense of place. Overall, the Farmland Plateau LCT is considered to have a high / medium susceptibility to the Development, combining the landscape value and susceptibility results in a medium sensitivity to proposals.

19. Wooded Estatelands LCT

13.4.26 The landscape type includes parklands at the eastern end of the Cotswolds, ranging from the area around Blenheim Park, Steeple Barton, Middleton Park and as far as Shelswell Park to the north of Bicester.

13.4.27 Its characteristics of relevance are:

- Rolling topography with localised steep slopes.
- Large blocks of ancient woodland and mixed plantations of variable sizes.
- Large parklands and mansion houses.
- A regularly-shaped field pattern dominated by arable fields.
- Small villages with strong vernacular character.

Value, Susceptibility and Sensitivity

13.4.28 Overall, it is considered that the Wooded Estatelands LCT is of medium / low landscape value as it is generally in good condition containing a number of parklands and distinctive areas of woodland that contribute to a sense of place. Overall, the Wooded Estatelands LCT is considered to have a high / medium susceptibility to the Development, combining the landscape value and susceptibility results in a medium sensitivity to proposals.

H. Fritwell (CW/57) LCA

13.4.29 This area is characterised by large, regularly-shaped arable fields and medium-sized mixed plantations. There are small fields of semi-improved grassland surrounding villages. There are also a few large blocks of ancient semi-natural woodland, including Stoke Wood and Stoke Little Wood, which add to the wooded character of the area. Hedges are generally low in height, except around Fritwell and Ardley where they are taller and more species-rich.

Value, Susceptibility and Sensitivity

13.4.30 Overall, it is considered that the Fritwell LCA is of medium / low landscape value as it is generally in good condition containing regularly shaped arable fields and distinctive areas of woodland that contribute to a sense of place. Overall, the Fritwell LCA is considered to have a high / medium susceptibility to the Development, combining the landscape value and susceptibility results in a medium sensitivity to proposals.

C. Middleton Stoney (CW/59) LCA

13.4.31 The area is dominated by large arable fields and localised improved grassland. Woodland is a strong landscape element, and large woodland blocks are associated with the parklands and estates. Parklands are a prominent feature throughout and they include Middleton, Bignell and Tusmore Parks in the north and Kirtlington and Bletchington Parks in the south.

Value, Susceptibility and Sensitivity

13.4.32 Overall, it is considered that the Middleton Stoney LCA is of medium / low landscape value as it is generally in good condition containing a number of parklands and distinctive areas of woodland that contribute to a sense of place. Overall, the Middleton Stoney LCA is considered to have a high / medium susceptibility to the Development, combining the landscape value and susceptibility results in a medium sensitivity to proposals.

Northamptonshire Current Landscape Character Assessment

13.4.33 Published by Northamptonshire County Council, the Current Landscape Character Assessment (2003) describes the character and qualities of landscape character types (LCTs) and landscape character areas (LCAs) across the county.

13.4.34 As illustrated in Figure 13.4, the following LCTs and LCAs are present within the Study area (where LCTs and LCAs have been scoped out this has been noted together with rational for their exclusion):

- 10. Limestone Plateau LCT, scoped out due to no intervisibility of the Site; and
- 10a Croughton Aynho and Farthinghoe Plateau LCA, scoped out due to no intervisibility of the Site.

Site Specific Character

Eastern Site

13.4.35 The Eastern Site is located within C. Middleton Stoney (CW/59) LCA. The Eastern Site is broadly representative of the LCA as it consists of large arable fields overlaying a gently rolling landform flanked by roadside hedges along its western and northern boundaries, while the internal hedgerow structure is formed of at times gappy internal field hedges. A limited number of hedgerow trees are also present in the north of the Eastern Site. Although influenced by noise, vehicular movement and the urban character of the A43 and B4100, the setting of the Eastern Site is rural in nature with the surrounding fieldscape of a similar scale and agricultural use. Although the Eastern Site does not contain any woodland, areas of woodland associated with Cherwell Valley Services and Stoke Wood are notable locally. There are no PRoW crossing the Eastern Site however, a bridleway (367/21/10) is located adjacent to the southern boundary. Views to and from the Eastern Site are generally filtered by intervening tree belts and small woodlands present within the wider landscape.

Landscape Value

13.4.36 The LI's Technical Guidance Note 02/21 identifies a range of factors that can assist in the identification of valued aspects of the landscape. Table 13.10 is derived from TGN 02/21 and provides a description as to the extent the valued factors are present within the Eastern Site. The assessment has drawn upon this guidance and the landscape character assessment detailed above.

Table 13.10: Eastern Site: Landscape Value

Aspect	Definition	Description
Landscape condition (quality)	A measure of the physical state of the landscape. It may include the extent to which the typical character is represented in individual areas, the intactness of the landscape and condition of individual elements.	The Eastern Site comprises a series of large-scale arable fields that are internally divided by hedgerows, the landscape features are generally in good condition and reflect the typical character of the area.

Aspect	Definition	Description
Perceptual (scenic quality)	The term used to describe landscapes that appeal primarily to the senses (primarily but not wholly the visual senses).	The Eastern Site is rural in nature despite the presence of nearby road infrastructure, the largely open aspect of the Eastern Site is in-keeping with its plateau location and limited tree cover further enhances the potential for views across the wider landscape. Overall, the Eastern Site does contain elements that contribute to the appreciation of the landscape.
Distinctiveness (rarity and representativeness)	Whether the landscape contains a particular character and / or features or elements which are considered particularly important examples.	Formed of several large scale arable fields bound by hedgerows, the Eastern Site is not particularly distinctive within the landscape as these features are encountered frequently within the local area. This scale and field pattern is however representative of the local character.
Natural Heritage	The presence of landscape features with clear evidence of ecological, geological, geomorphological or physiographic interest which contribute positively to the landscape.	The Eastern Site does not contain nor is adjacent to any of these identified landscape features.
Cultural Heritage	Whether the landscape contains clear evidence of archaeological, historical or cultural interest which contribute positively to the landscape.	The Eastern Site does not contain nor is adjacent to any of these identified landscape features.
Associations	Some landscapes are associated with particular people, such as artists or writers, or events in history that contribute to perceptions of natural beauty of the area.	There are no known cultural or historical associations with the Eastern Site.
Recreational Value	Evidence that the landscape is valued for recreational activity where experience of the landscape is important	There is currently no public access into the Eastern Site although there is a PRoW is situated along the southern boundary which the Eastern Site would contribute to the experience.

13.4.37 The Eastern Site is representative of the Middleton Stoney LCA as it is formed of a number of large-scale arable fields bound by hedgerows situated upon an elevated plateau. On

balance, having assessed the Eastern Site against the landscape value factors, landscape evidence base described above and by site specific analysis and field work, the landscape of the Eastern Site and its features are considered to be of localised importance and medium / low landscape value.

Susceptibility and Sensitivity

13.4.38 Overall, the Eastern Site is considered to have a high susceptibility to the Development, combining the landscape value and susceptibility results in a medium sensitivity to proposals.

Western Site

13.4.39 The Western Site is located within two LCAs: H. Fritwell (CW/57) and C. Middleton Stoney (CW/59); however it should be noted that changes in landscape character are rarely abrupt in nature but rather there is a transition between character areas as is the case with the Western Site. Approximately one quarter of the Western Site located closest to Junction 10 of the M40 is situated within the C. Middleton Stoney LCA while the remainder lies in the H. Fritwell LCA.

13.4.40 The Western Site is broadly representative of both LCAs as it consists of large arable fields overlaying a gently rolling landform. Hedgerows are at times incomplete but are otherwise generally in good condition and subdivide the Western Site into six fields. Although outwith the Western Site, areas of woodland are present, most notably Stoke Wood to the south of Cherwell Valley Services. There is a greater influence of the road network on the Western Site due largely to the presence of the M40 along its western side in addition to the A43 and B4100. Surrounding land use to the north and west however remains rural in character and is of a similar scale and agricultural use. A PRoW traverses the Western Site before turning northwards following its western boundary and linking with the wider PRoW to the west of the M40. Views to and from the Western Site are generally filtered by intervening tree belts and small woodlands present within the wider landscape.

Landscape Value

13.4.41 Table 13.11 is derived from TGN 02/21 and provides a description as to the extent the valued factors are present within the Site. The assessment has drawn upon this guidance and the landscape character assessment detailed above.

Table 13.11: Western Site: Landscape Value

Aspect	Definition	Description
Landscape condition (quality)	A measure of the physical state of the landscape. It may include the extent to which the typical character is represented in individual areas, the intactness of the landscape and condition of individual elements.	The Western Site comprises a series of large-scale arable fields that are internally divided by hedgerows, the landscape features are generally in good condition and reflect the typical character of the area. This scale and field pattern is however representative of the local character.

Aspect	Definition	Description
Perceptual (scenic quality)	The term used to describe landscapes that appeal primarily to the senses (primarily but not wholly the visual senses).	The Western Site is rural in nature despite the presence of nearby road infrastructure, the largely open aspect of the Western Site is in-keeping with its plateau location and limited tree cover further enhances the potential for views across the wider landscape. Overall, the Western Site does contain elements that contribute to the appreciation of the landscape.
Distinctiveness (rarity and representativeness)	Whether the landscape contains a particular character and / or features or elements which are considered particularly important examples.	Formed of several large scale arable fields bound by hedgerows the Western Site is not particularly distinctive within the landscape as these features are encountered frequently within the local area.
Natural Heritage	The presence of landscape features with clear evidence of ecological, geological, geomorphological or physiographic interest which contribute positively to the landscape.	The Western Site does not contain nor is adjacent to any of these identified landscape features.
Cultural Heritage	Whether the landscape contains clear evidence of archaeological, historical or cultural interest which contribute positively to the landscape.	The Western Site does not contain nor is adjacent to any of these identified landscape features.
Associations	Some landscapes are associated with particular people, such as artists or writers, or events in history that contribute to perceptions of natural beauty of the area	There are no known cultural or historical associations with the Western Site.
Recreational Value	Evidence that the landscape is valued for recreational activity where experience of the landscape is important.	There is currently a PRoW that traverses the Western Site before turning north and following the western boundary, there would be a limited contribution to the recreational value experienced from the PRoW due largely to the presence of the M40.

13.4.42 The Western Site is representative of the Fritwell and Middleton Stoney LCA as it is formed of a number of large scale arable fields bound by hedgerows situated upon an elevated plateau. On balance, having assessed the Western Site against the landscape value factors, landscape evidence base described above and by site specific analysis and field work, the landscape of the Western Site and its features are considered to be of localised importance and medium / low landscape value.

Susceptibility and Sensitivity

13.4.43 Overall, the Western Site is considered to have a high susceptibility to the Development, combining the landscape value and susceptibility results in a medium sensitivity to proposals.

Visual Baseline

Visual Context

Eastern Site

13.4.44 The Eastern Site is located on an elevated plateau situated between the Cherwell Valley to the northwest and the lower and flatter landscape situated to the north of Bicester. As such, there are few elevated positions from which to experience the Eastern Site. Areas of woodland associated with Cherwell Services merge with Stoke Wood and Stoke Little Wood to limit many views from the south and southeast. Similarly, the belts of woodland delineating Tusmore Park curtail many views towards the Eastern Site from the north and northeast. Views from the east will not experience the same level of foreshortening although small pockets and linear woodlands present between Stoke Lyne and the Eastern Site reduce the potential intervisibility in some views. Roadside treebelts associated with the B4100 and A43 and the linear woodlands situated to the west of the M40 provide visual screening from the west of the Eastern Site. Figure 13.2 illustrates the context of the Eastern Site.

13.4.45 The network of PRoW extending from the southern boundary of the Eastern Site to Stoke Lyne and Tusmore Park will experience a range of views, those to the north and east and being at a greater distance and containing a greater frequency of field boundary vegetation while those closer being more open in nature. Additionally, there will be limited views from the west from the PRoW traversing the Western Site, with tree cover associated with the A43 located in between the Eastern and Western Sites screening some views.

Western Site

13.4.46 As with the Eastern Site, the Western Site is located on an elevated plateau such that there are few elevated positions from which to experience the Site although, where the Western Site abuts the M40, little vegetation is present on the Western Site boundary. Linear woodlands to the west of the motorway will limit many views of the Western Site from locations such as Ardley with Fewcott and Fritwell. Areas of woodland associated with Cherwell Services merge with Stoke Wood and Stoke Little Wood to limit many views from the south and southeast. Similarly, the belts of woodland delineating Tusmore Park will curtail many views towards the Western Site from the north and northeast. Roadside treebelts associated with the B4100 and A43 will provide visual screening from the east and north of the Western Site. The network of PRoW extending across the Western Site will experience a range of views, however the majority contain hedgerow trees and pockets of

woodland that will serve to filter views towards the Western Site. Views from residential properties adjacent to the Western Site are filtered by tree cover located at the property boundary or within gardens.

Representative Viewpoints

13.4.47 Representative Photoviewpoints are included in Appendix 13.2, with the locations shown on Figure 13.7 in Appendix 13.1. The existing view and the value of each of the identified groups of visual receptors who may experience changes in their visual amenity as a result of the Development is summarised in Table 13.12.

Table 13.12: Visual Receptors and Viewpoints

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
1	Users of PRoW, residents of Stoke Lyne	Photoviewpoint 1 is situated on PRoW (367/26/20) south of Stoke Lyne Views are over hedgerow bound grazed fields with occasional hedgerow trees, small linear woodlands are also present some of which are associated with residential properties. Woodland screening Cherwell Valley Services forms part of the skyline to views.	Open, glimpsed	Eastern Site	1.4km	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
2	Users of the PRoW and local road network	Photoviewpoint 2 is located at the junction of bridleway (367/24/10) and minor road linking the B4100 and Tusmore Park Views are over large-scale arable fields bound by well maintained hedgerow with the occasional hedgerow tree also present. Woodland situated to the north of Cherwell Valley Services and to the west of the A43 is evident along the skyline.	Glimpsed	Eastern Site	1.1km	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
3	Users of the PRoW	Photoviewpoint 3 is located on a bridleway (367/24/10) on the southern boundary of Tusmore Park. Views are over large-scale arable fields bound by well maintained hedgerow with the occasional hedgerow tree also present. Woodland situated to the north of Cherwell Valley Services and to the west of the A43 is evident along the skyline. Although the A43 is not evident within views, buildings associated with the services at Baynard's Green are visible above the intervening hedgerows.	Glimpsed	Eastern Site	690m	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
4	Road users	Photoviewpoint 4 is situated at the junction of The Green and the B4100. Views are over large scale arable fields bound by well maintained but at times gappy hedgerows. Woodland located to the north of Cherwell Services is a prominent feature of views. Linear woodlands to the west of the A43 and those associated with Tusmore Park form a wooded horizon. Although the A43 is not evident within views, buildings associated with the services at Baynard's Green are visible above the intervening hedgerows.	Open	Eastern Site	770m	Low	Low	Low

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
5	Users of the PRoW	Photoviewpoint 5 is located on a PRoW (367/3/10) east of the Site. Views are over large scale arable fields bound by well maintained but at times gappy hedgerows. Woodland located to the north of Cherwell Services is a prominent feature of views. Linear woodlands to the west of the A43 and those associated with Tusmore Park form a wooded horizon. Although the A43 is not evident within views, buildings associated with the services at Baynard's Green are visible above the intervening hedgerows.	Open	Eastern Site	605m	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
6	Users of the PRoW	Photoviewpoint 6 is located to the south of the Eastern Site on PRoW (367/21/10). Views are over large-scale arable fields of the Eastern Site bound by well maintained hedgerow with the occasional hedgerow tree also present. Tree cover associated with the junction of the A43 and B4100 forms the skyline to views.	Glimpsed	Eastern Site	25m	High	High / medium	High
7	Users of the PRoW	Photoviewpoint 7 is located on a bridleway (109/2/40) that is aligned with the western boundary of the Western Site. Views are over large scale arable fields, the extents of the fields are defined by internal hedgerows and linear tree belts located along roads such as the B4100. Woodland to the north of Cherwell Valley Services forms a well vegetated skyline.	Open	Western Site	Within the Site boundary	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
8	Users of the PRoW	Photoviewpoint 8 is located on PRoW 109/5/10 that traverses the Western Site. Views are over large scale arable fields, the extents of the fields are defined by internal hedgerows and linear tree belts located along an agricultural track to the west of the Western Site. Communication masts, pylons and bridge spanning the M40 are also evident in views. Pylons are a feature of views.	Open	Western Site	Within the Site boundary	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
9	Users of the PRoW	Photoviewpoint 9 is located on PRoW 109/5/10 that traverses the Western Site. Views are over large scale arable fields, the extents of the fields are defined by internal hedgerows and post and wire fencing fronting the M40. The movement of traffic and road infrastructure such as signs are evident in views. Areas of woodland west of the M40 and north of Cherwell Valley Services form a wooded horizon to views.	Open	Western Site	Within the Site boundary	Medium	Medium	Medium

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
10	Users of the PRoW	Photoviewpoint 10 is situated north of the Western Site on bridleway 367/13/10. Views are over large scale arable fields that are bound by hedgerows and are at times are gappy in appearance. Linear tree belts flanking the B4100 provide a wooded horizon. A span of pylons and agricultural building are also evident within views.	Open	Western Site	346m	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
11	Road users	Photoviewpoint 11 is located on a bridge situated between Fritwell and the B4100 that crosses the M40. Views are over the M40 located within a shallow cutting, either side of the motorway are arable fields of large scale. Field boundaries vary, with fencing more common along the alignment of M40 while internal field boundaries are more frequently delineated by hedgerows and hedgerows with trees. The woodlands north of Cherwell Valley Services form a wooded horizon to views.	Open, glimpsed	Western Site	1km	Low	Low	Low

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
12	Users of the PRoW	Photoviewpoint 12 is situated to the east of Fritwell on PRoW 219/11/10. Views are over large scale arable fields, views over the wider landscape frequently include hedgerow trees located along the field boundaries. Pylons and communication masts are also evident within views. A distant wooded horizon formed by the planting north of Cherwell Services is a backdrop to views.	Open	Western Site	1.1km	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
13	Users of the PRoW	Photoviewpoint 13 is situated on a PRoW (109/3/20) north of Fewcott. Views are over a large scale arable field that extends from the settlement towards the unseen M40 motorway. Field boundaries are generally hedgerows and in good condition although some gaps are evident. Woodlands located to the west of the M40 and those close to Cherwell services form a strongly wooded horizon.	Open	Western Site	628m	High	High / medium	High

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
14	Road users	Photoviewpoint 14 is situated on Somerton Road as it crosses the London to Birmingham rail line. Views are over medium to large scale fields of predominantly arable use with field margins delineated by gappy and at times overgrown hedgerows. Woodlands flanking the M40 and those west of Fewcott form a backdrop to views from this location.	Open, glimpsed	Western Site	1.7km	Low	Low.	Low

Photo-viewpoint No.	Description of Receptor	Description of existing view towards Site	Existing visibility	Relevant to which Site	Approx. distance from Site boundary	Value of view	Susceptibility to Change	Sensitivity
15	Road users	Photoviewpoint 15 is located on a bridge situated between Ardley and Bucknell that crosses the M40. Views are over the M40 located within a shallow cutting, either side of the motorway are arable fields of large scale. Field boundaries vary, with fencing more common along the alignment of M40 while internal field boundaries are less common, and where present are more frequently delineated by hedgerows. Stoke Wood and those north of Cherwell Valley Services form a wooded horizon to views.	Open, glimpsed	Eastern Site	1.2km	Low	Low	Low

Future Baseline

13.4.48 In the absence of the Development or a management regime, the Site would remain in agricultural use. There would be no change in the value ascribed to the landscape or visual receptors.

13.4.49 Various factors may result in changing land use patterns within the study area. For example, agricultural practices may change in response to the effects of changing market conditions and opportunities for diversification. Or that the effects of a changing climate may influence the types of agricultural practices that are viable in this landscape. The future baseline may also be influenced by other development schemes or the long-term health of trees and other landscape features through the introduction of invasive species or pathogens.

13.4.50 Whilst the potential exists to alter the character of the local landscape, such changes are likely to be localised and therefore would not materially affect this assessment.

Summary of Receptors and Sensitivity

13.4.51 Table 13.13 below provides a summary of the identified landscape and visual receptors within the Study area: while Figure 13.4 illustrates their location.

Table 13.13: Summary of Receptor Sensitivity

Receptor	Value	Susceptibility	Sensitivity
Landscape			
Landscape features and character of the Eastern Site	Medium / low	High	Medium
Landscape features and character of the Western Site	Medium / low	High	Medium
C. Middleton Stoney (CW/59) LCA	Medium / low	High / medium	Medium
H. Fritwell (CW/57) LCA	Medium / low	High / medium	Medium
19. Wooded Estatelands LCT	Medium / low	High / medium	Medium
6. Farmland Plateau LCT	Medium / low	High / medium	Medium
Visual			
Residents of Stoke Lyne (Photoviewpoint 1)	High	High / medium	High
Users of the B4100 east of the Site (Photoviewpoint 4)	Low	Low	Low
Users of the PRoW to the south of the Site (Photoviewpoint 6)	High	High / medium	High
Users of the PRoW network to the east and north of the Site	High	High / medium	High

Receptor	Value	Susceptibility	Sensitivity
(Photoviewpoints 2, 3, 5 and 10)			
Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)	Low	Low	Low
Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)	High	High / medium	High
Users of the PRoW to the west and southwest of the Site (Photoviewpoints 12 and 13).	High	High / medium	High

13.4.52 Effects on the following visual receptors are scoped out in accordance with the methodology outlined in Section 13.3 of this chapter and rationale contained in Appendix 13.5:

- Users of the PRoW within Tusmore Park;
- Road users of the B4100 west of the A43;
- Receptors within the settlement of Fritwell;
- Receptors within the settlement of Ardley;
- Road users of the M40 and A43; and
- Road users of the B1400 south of the junction with The Green.

13.5 Scheme Design and Management

13.5.1 As detailed in Chapter 5: Description of Development, a number of primary and tertiary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the Development. These are summarised in this section as relevant to the landscape and visual impact assessment.

Construction

13.5.2 Measures will be undertaken during the construction phase in order to minimise disruption and manage the impacts of the Development and set out in a CEMP (See Appendices 6.1 and 6.2 for further details). Methods to reduce effects during construction include:

- Controlling the working hours of construction activities.
- Protecting existing woodland and hedgerows (retained as part of the Development) from damage during construction to maintain screening of lower level views of construction from the north, west and south. Further details of tree and hedgerow protection is included in the Arboriculture Impact Assessment that accompanies this application.
- Contractors will seek to avoid unnecessary tree and vegetation removal.

- Trees within or adjacent to the Site boundary which are to be retained, will be protected in line with the recommendations in BS 5837 and BS5839: Trees in Relation to Design, Demolition and Construction. Works relating to the protection of retained trees and trees subject to works will be overseen by a qualified arboricultural consultant.
- The supply, storage, handling, planting and maintenance of new planting will be undertaken in accordance with appropriate British Standards.
- The design of hoardings around construction activities shall include consideration of the character of the surrounding landscape. Fencing and hoarding shall be kept well maintained throughout construction.
- Creating temporary earth bunds and acoustic fencing / construction hoarding to provide visual containment of lower level construction activity and vehicle movements.
- Temporary stockpiles will be located in defined storage areas, away from sensitive visual receptors.
- Temporary lighting will be selected and sited so to minimise visual intrusion to residents, whilst maintaining the safe and efficient operation of the work site. At night and during periods of darkness, directional security lighting will be used where required.

Completed Development

13.5.3 The following design measures represent primary mitigation within the Development that respond to the particular sensitivities and constraints of the Site:

- The protection, enhancement and strengthening of existing trees and hedgerows which are to be retained (as illustrated in Parameter Plans 03 and 08);
    - The creation of approximately 17.5ha of new areas of green-blue infrastructure, including publicly accessible new open space, woodland and open woodland planting, meadow grassland, Sustainable Drainage Systems (SuDS) and wildlife habitat, particularly on the western and north-eastern areas of the Site;
    - The use of native species where appropriate in order to maximise the opportunities to contribute to local landscape character, reinstate green infrastructure and wildlife habitat opportunities;
    - Areas of bunding and woodland planting along the eastern and northern boundaries of the Site to reduce views from the wider landscape;
    - An external lighting strategy specified to minimise light spill and glare; and
    - Sensitive cladding principles, as set out in the Development Specification (see Appendix 5.2).

13.6 Construction

Assessment of Effects

13.6.1 The Development will necessitate the removal of all the internal hedgerows within both the Western and Eastern Sites though boundary hedgerows would remain with the exception of a small section fronting the B4100 to facilitate access to both Sites. The limited number of hedgerow trees within the Site would also be removed. The topography of the Site would require remodelling to create the development platform, access and external circulation and parking areas for the Development. General construction activities, such as the storage of

materials and the movement and activity of plant, will introduce further incongruent features. However, once the construction elements are removed, the temporary disturbance caused by construction activity would cease.

13.6.2 During the construction period, changes may be experienced in views towards the Site experienced by the visual receptors. This will principally be due to changes in land use and the introduction of temporary elements such as material stockpiles, site compounds, lighting, cranes and hoarding. In addition, there will be increased movement of plant and vehicles on local roads serving the Site.

13.6.3 Receptors using the PRoW that traverses the Western Site, where Photoviewpoints 7, 8 and 9 are located, are not assessed as these locations would be inaccessible during Enabling Works and construction works within an active construction site, and with the PRoW diverted permanently after completion of works.

13.6.4 The construction period for the Development is approximately three years. As such, the effects listed below are considered to be temporary.

Enabling Works (Western Site)

Landscape Receptors

13.6.5 Table 13.14 provides analysis of the predicted effects on landscape receptors during the Enabling Works situated within the Western Site, effects of the small scale enabling works for the Eastern Site are considered under general construction above.

Table 13.14: Landscape Effects and Evaluation of Significance – Enabling Works

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
6. Farmland Plateau LCT	Medium	Removal of part of hedgerow fronting B4100 and the regrading of existing topography to create roadway. General construction activities such as the storage of materials, the movement of plant and areas of spoil will introduce further incongruent features.	Negligible	Direct, temporary	Negligible neutral
19. Wooded Estateland LCT	Medium	Views of construction activity including cranes, plant movements and materials.		Indirect, temporary	Negligible neutral
H. Fritwell (CW/57) LCA	Medium	Removal of part of hedgerow fronting B4100 and the regrading of existing topography to create roadway.	Low	Direct, temporary	Minor adverse

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
		General construction activities such as the storage of materials, the movement of plant and areas of spoil will introduce further incongruent features.			
C. Middleton Stoney (CW/59) LCA	Medium	Views of construction activity including cranes, plant movements and materials.		Indirect, temporary	Minor adverse
Landscape features and character of the Enabling Works Site.	Medium	Removal of part of hedgerow fronting B4100 and the regrading of existing topography to create roadway. General construction activities such as the storage of materials, the movement of plant and areas of spoil will introduce further incongruent features.	Medium	Direct, temporary	Moderate / minor adverse

Visual Receptors

13.6.6 Table 13.15 provides analysis of the predicted effects on visual receptors during the Enabling Works.

Table 13.15: Visual Effects and Evaluation of Significance – Enabling Works

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Residents of Stoke Lyne (Photoviewpoint 1)	High	No change, there will be no views of construction activity for receptors due to intervening hedgerows	Negligible	Short term, temporary	Negligible neutral
Users of the B4100 east of the Site (Photoviewpoint 4)	Low				
Users of the PRoW to the south of the Site (Photoviewpoint 6)	High				
Users of the PRoW network to the east and north of the Site	High				

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
(Photoviewpoints 2, 3, 5 and 10)		and tree cover.			
Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)	Low				
Users of the PRoW to the west and southwest of the Site (Photoviewpoints 12 and 13).	High				

Eastern Development

Landscape Receptors

13.6.7 Table 13.16 provides analysis of the predicted effects on landscape receptors during the construction phase of the Eastern Development.

Table 13.16: Landscape Effects and Evaluation of Significance – Construction Phase, Eastern Development

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
6. Farmland Plateau LCT	Medium	Views of construction activity including cranes, plant movements and materials.	Medium / low	Indirect, temporary	Minor adverse
19. Wooded Estateland LCT	Medium	Removal of all the internal hedgerows and trees in addition to a small section of hedgerow fronting the B4100. The topography of the Eastern Site would require remodelling to create the development platforms necessary for the Eastern Development. General construction activities such as the storage of materials, the movement of plant and	Low	Direct, temporary	Minor adverse

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
		areas of spoil will introduce further incongruent features.			
H. Fritwell (CW/57) LCA	Medium	Views of construction activity including cranes, plant movements and materials.	Low	Indirect, temporary	Minor adverse
C. Middleton Stoney (CW/59) LCA	Medium	Removal of all the internal hedgerows and trees in addition to a small section of hedgerow fronting the B4100. The topography of the Eastern Site would require remodelling to create the development platforms necessary for the Eastern Development. General construction activities such as the storage of materials, the movement of plant and areas of spoil will introduce further incongruent features.	Medium	Direct, temporary	Minor adverse
Landscape features and character of the Eastern Site.	Medium		High / Medium		Moderate adverse

Visual Receptors

13.6.8 Table 13.17 provides analysis of the predicted effects on visual receptors during the construction phase of the Eastern Development.

Table 13.17: Visual Effects and Evaluation of Significance – Construction Phase, Eastern Development

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Residents of Stoke Lyne (Photo-viewpoint 1)	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above the	Medium / low	Short term, temporary	Minor adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
		hedgerows and tree cover in the intervening landscape.			
Users of the B4100 east of the Site (Photo-viewpoint 4)	Low	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above the hoarding surrounding the Site. Woodland situated to the north of Cherwell Valley Services would contain some views of the southern extent of the Eastern Development during construction.	Medium / low		Minor adverse
Users of the PRoW to the south of the Site (Photo-viewpoint 6)	High	Partial views of construction activity in close proximity to receptors. Views would be largely defined be the presence of the hoardings that would surround the Site during this phase of the development, with occasional views of large machinery, cranes and higher level construction activities where they would appear above the hoardings.	Medium		Moderate adverse
Users of the PRoW network to the east and north of the Site (Photo-viewpoints 2, 3, 5 and 10)	High	Partial views of construction activity limited to large machinery, cranes and higher level construction where they would appear above the hedgerows or hoardings in the intervening landscape.	Medium / low		Moderate adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Users of the local road network between Fritwell and Ardley with Fewcott (Photo-viewpoints 11, 14 and 15)	Low	There will be fleeting, glimpsed views from these locations. Construction operations within the Site will be partially visible, limited to cranes and higher level construction where they would appear above the hedgerows and tree cover in the intervening landscape.	Low		Negligible neutral
Users of the PRoW that traverses the Western Site (Photo-viewpoints 7, 8 and 9)	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above the hedgerows and tree cover in the intervening landscape.	Medium / low		Moderate adverse
Users of the PRoW to the west and southwest of the Site (Photo-viewpoints 12 and 13).	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above the hedgerows and tree cover in the intervening landscape.	Low		Minor adverse

Western Development

Landscape Receptors

13.6.9 Table 13.18 provides analysis of the predicted effects on landscape receptors during the construction phase of the Western Development.

Table 13.18: Landscape Effects and Evaluation of Significance – Construction Phase, Western Development

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
6. Farmland	Medium	Removal of all the internal hedgerows	Medium / low	Direct, temporary	Minor adverse

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Plateau LCT		and trees in addition to a small section of hedgerow fronting the B4100. The topography of the Western Site would require remodelling to create the development platforms necessary for the Western Development. General construction activities such as the storage of materials, the movement of plant and areas of spoil will introduce further incongruent features.			
19. Wooded Estateland LCT					
H. Fritwell (CW/57) LCA			Low		Minor adverse
C. Middleton Stoney (CW/59) LCA					
Landscape features and character of the Western Site.			High / medium		Moderate adverse

Visual Receptors

13.6.10 Table 13.17 provides analysis of the predicted effects on visual receptors during the construction phase on the Western Development.

Table 13.17: Visual Effects and Evaluation of Significance – Construction Phase, Western Development

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Residents of Stoke Lyne (Photo-viewpoint 1)	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above the hedgerows and tree cover in the intervening landscape.	Low	Short term, temporary	Minor adverse / Negligible
Users of the B4100 east of the	Low	Partial views of construction activity, limited to large machinery, cranes	Negligible		Negligible neutral

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Site (Photo-viewpoint 4)		and higher level operations where they would appear above intervening woodland.			
Users of the PRoW to the south of the Site (Photo-viewpoint 6)	High	There would be no views of the Western Site from this location.	Negligible		Negligible neutral
Users of the PRoW network to the east and north of the Site (Photo-viewpoints 2, 3, 5 and 10)	High	Partial views of construction activity limited to large machinery, cranes and higher level construction where they would appear above the hedgerows or hoardings in the intervening landscape.	Medium / low		Moderate adverse
Users of the local road network between Fritwell and Ardley with Fewcott (Photo-viewpoints 11, 14 and 15)	Low	There will be fleeting, glimpsed views from these locations. Construction operations within the Site will be partially visible, limited to cranes and higher level construction where they would appear above the hedgerows and tree cover in the intervening landscape.	Low		Negligible neutral
Users of the PRoW to the west and southwest of the Site (Photo-viewpoints 12 and 13).	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above the hedgerows and tree cover in the	Low		Moderate adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
		intervening landscape.			

Development (Eastern and Western)

Landscape Receptors

13.6.11 Table 13.19 provides analysis of the predicted effects on landscape receptors for the construction of the Development on both the Eastern and Western Sites.

Table 13.19: Landscape Effects and Evaluation of Significance – Development

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
6. Farmland Plateau LCT	Medium	Removal of all the internal hedgerows and trees in addition to a small section of hedgerow fronting the B4100. The topography of the Site would require remodelling to create the development platforms necessary for the Development. General construction activities such as the storage of materials, the movement of plant and areas of spoil will introduce further incongruent features.	Medium / low	Direct, temporary	
19. Wooded Estateland LCT					
H. Fritwell (CW/57) LCA			Medium		Minor adverse
C. Middleton Stoney (CW/59) LCA					
Landscape features and character of the Development Site.			High / medium		Moderate adverse

Visual Receptors

13.6.12 Table 13.20 provides analysis of the predicted effects on visual receptors for the construction of the Development.

Table 13.20: Visual Effects and Evaluation of Significance – Development

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
Residents of Stoke Lyne (Photo-viewpoint 1)	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations	Low	Direct, temporary	Minor adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
		where they would appear above the hedgerows and tree cover in the intervening landscape.			
Users of the B4100 east of the Site (Photo-viewpoint 4)	Low	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would appear above intervening woodland.	Negligible		Minor adverse
Users of the PRoW to the south of the Site (Photo-viewpoint 6)	High	There would be no views of the Western Site from this location.	Negligible		Moderate adverse
Users of the PRoW network to the east and north of the Site (Photo-viewpoints 2, 3, 5 and 10)	High	Partial views of construction activity limited to large machinery, cranes and higher level construction where they would appear above the hedgerows or hoardings in the intervening landscape.	Medium / low		Moderate adverse
Users of the local road network between Fritwell and Ardley with Fewcott (Photo-viewpoints 11, 14 and 15)	Low	There will be fleeting, glimpsed views from these locations. Construction operations within the Site will be partially visible, limited to cranes and higher level construction where they would appear above the hedgerows and tree cover in the intervening landscape.	Low		Negligible neutral
Users of the PRoW to the west and south west of the Site (Photo-	High	Partial views of construction activity, limited to large machinery, cranes and higher level operations where they would	Low		Moderate adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect
viewpoints 12 and 13)		appear above the hedgerows and tree cover in the intervening landscape.			

Mitigation, Monitoring and Residual Effects

13.6.13 No significant effects were identified during the construction phase for the Development due to the temporary nature of changes and the at worst medium to low magnitude of change. No further mitigation is deemed necessary to measures set out in Section 13.5: Scheme Design and Management of this chapter and, as such, the residual effects remain as set out under the 'Assessment' section above.

13.7 Completed Development

Assessment of Effects

13.7.1 This section presents the findings of the landscape and visual impact assessment for the operation of the Development and identifies any likely significant effects that are predicted to occur. Where relevant, a distinction is made between the period immediately after proposed planting (Year 1), and following establishment and initial maturation of proposed planting (Year 15) in order to capture the effects on visual screening / filtering.

Eastern Development

Landscape Receptors

13.7.2 Table 13.21 provides analysis of the predicted effects on landscape receptors for the completed and operational Eastern Development. The assessment considered the potential for significant effects due to the change to the fabric and features of landscape character types and areas resulting from the Eastern Development.

Table 13.21: Landscape Effects and Evaluation of Significance – Completed Eastern Development

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
6. Farmland Plateau LCT	Medium	Views of large scale commercial development in the context of a large scale arable landscape with adjoining areas of woodland.	Medium	Indirect, permanent	Moderate adverse	Minor adverse
H. Fritwell (CW/57) LCA			Medium		Moderate adverse	Minor adverse
19. Wooded Estateland LCT		The Eastern Development will result in the addition of a number of large commercial buildings with a maximum height of 24mAOD. These changes will be in the context of a large scale arable landscape with adjoining areas of woodland that is influenced by its proximity to the strategic road network. Areas of existing hedgerow and linear tree belts will largely be protected and enhanced with species in-keeping with the character of the Site and wider setting. Proposed native species screen planting to the boundaries of the Eastern Development will strengthen and enhance existing vegetation in-keeping with local character and landscape objectives.	Medium	Direct, permanent	Moderate adverse	Minor adverse
C. Middleton Stoney (CW/59) LCA			Medium		Minor adverse	Minor adverse
Landscape features and character of the Eastern Site			High / medium		Major / moderate adverse	Moderate adverse

Visual Receptors

13.7.3 Table 13.22 provides analysis of the predicted effects on visual receptors for the completed and operational Eastern Development. The assessment considered the potential for significant effects due to the change to the fabric and features encountered in views resulting from the Eastern Development.

Table 13.22: Visual Effects and Evaluation of Significance – Completed Eastern Development

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
Residents of Stoke Lyne (Photo-viewpoint 1)	High	The Eastern Development will introduce large commercial buildings to views from the north of Stoke Lyne in an otherwise rural landscape. The new buildings will be partially screened by hedgerows, hedgerow trees and linear woodlands in the intervening landscape. During the winter months the reduced leaf cover will increase slightly the available views of the Eastern Development.	Medium / low	Direct, permanent	Minor adverse	Minor adverse
Users of the B4100 east of the Site (Photo-viewpoint 4)	Low	The Eastern Development will introduce large commercial buildings to views in an otherwise rural landscape resulting in a notable change to views. Woodland located to the north of Cherwell Valley Services will constrain views of the southern extent of the Eastern Development although there will be little reduction in visibility elsewhere. Proposed screen planting will reduce views of lower elevations and assist in integrating the Eastern Development into	Medium		Minor adverse	Minor adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
		the wider landscape as the proposed planting reaches semi-maturity at year 15.				
Users of the PRoW to the south of the Site (Photo-viewpoint 6)	High	The Eastern Development will introduce large commercial buildings to views to an otherwise agricultural landscape resulting in a notable change to views in close proximity to receptors. Views will be experienced along the majority of the PRoW. In addition to the built form of the Eastern Development, the associated earthworks, sprinkler tanks and HGV parking bays would also be evident. Screen planting associated with the swales will reduce some views of the Eastern Development although upper elevations will remain visible even when reaching semi-maturity at year 15.	Medium		Major adverse	Major / moderate adverse
Users of the PRoW network to the east and north of the Site (Photo-viewpoints 2, 3, 5 and 10)	High	The Eastern Development will introduce a number of commercial buildings to views in an otherwise rural landscape resulting in a notable change. Although landscape features such as hedgerows and sporadic trees are evident within the intervening landscape they will have a minimal effect in reducing its visibility.	Medium		Moderate adverse	Moderate adverse
Users of the PRoW that traverses the Western Site	High		Medium		Moderate / minor adverse	Moderate / minor adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
(Photo-viewpoints 7, 8 and 9)						
Users of the local road network between Fritwell and Ardley with Fewcott (Photo-viewpoints 11, 14 and 15)	Low	The Eastern Development will introduce glimpsed views of large commercial buildings to an otherwise agricultural landscape. The change will result from a small proportion of the Eastern Development being visible between areas of woodland situated to the west of the M40 corridor.	Low		Negligible neutral	Negligible neutral
Users of the PRoW to the west and south west of the Site (Photo-viewpoints 12 and 13).	High	The Eastern Development will introduce a number of large commercial buildings to an otherwise agricultural landscape resulting in a minor change to the currently experienced outlook. The lower elevations of the Eastern Development would however be screened by existing hedgerows and tree cover enhanced by the proposed native tree and hedge screen planting.	Medium / low		Moderate / minor adverse	Moderate / minor adverse

Western Development

Landscape Receptors

13.7.4 Table 13.23 provides analysis of the predicted effects on landscape receptors for the completed and operational Western Development.

Table 13.23: Landscape Effects and Evaluation of Significance – Completed Western Development

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
6. Farmland Plateau LCT	Medium	The Western Development will result in the addition of a number of large commercial buildings with a maximum height of 24mAOD. These changes will be in the context of a large scale arable landscape with adjoining areas of woodland that is influenced by its proximity to the strategic road network. Areas of existing hedgerow and linear tree belts will largely be protected and enhanced with species in-keeping with the character of the Site its setting and local landscape objectives as it reaches semi-maturity at year 15.	Medium / low	Direct, permanent	Moderate adverse	Minor adverse
19. Wooded Estateland LCT			Low			
H. Fritwell (CW/57) LCA			Low		Moderate adverse	Minor adverse
C. Middleton Stoney (CW/59) LCA						
Landscape features and character of the Western Site			High / medium		Major / moderate adverse	Moderate adverse

Visual Receptors

13.7.5 Table 13.24 provides analysis of the predicted effects on visual receptors for the completed and operational Western Development.

Table 13.24: Visual Effects and Evaluation of Significance – Completed Western Development

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
Residents of Stoke Lyne (Photoviewpoint 1)	High	Introduction of large commercial buildings to views in an otherwise rural landscape. Proposals will be partially screened by	Low	Direct, permanent	Minor adverse / negligible	Minor adverse / negligible

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
		hedgerows, hedgerow trees and linear woodlands in the intervening landscape. During the winter months the reduced leaf cover will increase slightly the available views of the Western Development.				
Users of the B4100 east of the Site (Photoviewpoint 4)	Low	Partial views of large commercial buildings situated within a rural landscape where they would appear above intervening woodland.	Negligible		Negligible neutral	Negligible neutral
Users of the PRoW to the south of the Site (Photoviewpoint 6)	High	There would be no views of the Western Development from this location.	Negligible		Negligible neutral	Negligible neutral
Users of the PRoW network to the east and north of the Site (Photoviewpoints 2, 3, 5 and 10)	High	The Western Development will introduce a number of commercial buildings to views in an otherwise rural landscape resulting in a notable change. Although landscape features such as hedgerows and sporadic trees are evident within the intervening landscape they will have a minimal effect in reducing its visibility.	Medium / low		Moderate adverse	Moderate adverse
Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)	Low	The Western Development will introduce glimpsed views of large commercial buildings to an otherwise agricultural landscape. The change will result from a small proportion of the Western Development being visible between areas of woodland situated to the west of the M40 corridor.	Low		Negligible neutral	Negligible neutral

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)	High	The Western Development will introduce large commercial buildings to views in an otherwise rural landscape resulting in a notable change to views. The changes will be relatively close proximity to receptors. Proposed landscape features such as hedgerows and sporadic trees will be evident within the intervening landscape they will have a minimal effect in reducing its visibility however by year 15 they will begin to enclose views.	High		Major / moderate adverse	Moderate adverse
Users of the PRoW to the west and southwest of the Site (Photoviewpoints 12 and 13).	High	The Western Development will introduce a number of large commercial buildings to an otherwise agricultural landscape resulting in a minor change to the currently experienced outlook. The lower elevations of the Western Development would however be screened by existing hedgerows and tree cover enhanced by the proposed native tree and hedge screen planting.	High / medium		Moderate adverse	Moderate adverse

Development

Landscape Receptors

13.7.6 Table 13.25 provides analysis of the predicted effects on landscape receptors for the completed and operational Development.

Table 13.25: Landscape Effects and Evaluation of Significance – Completed Development

Landscape Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
6. Farmland Plateau LCT	Medium	The Development will result in the addition of a number of large commercial buildings with a maximum height of 24mAOD. These changes will be in the context of a large scale arable landscape with adjoining areas of woodland that is influenced by its proximity to the strategic road network. Areas of existing hedgerow and linear tree belts will largely be protected and enhanced with species in-keeping with the character of the Site its setting and local landscape objectives as the it reaches semi-maturity at year 15.	Medium	Direct, permanent	Moderate adverse	Minor adverse
19. Wooded Estateland LCT						
H. Fritwell (CW/57) LCA	Medium		Medium		Moderate adverse	Minor adverse
C. Middleton Stoney (CW/59) LCA						
Landscape features and character of the Site	Medium		High / medium		Major / moderate adverse	Moderate adverse

Visual Receptors

13.7.7 Table 13.26 provides analysis of the predicted effects on visual receptors for the completed and operational Development.

Table 13.26: Visual Effects and Evaluation of Significance – Completed Development

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
Residents of Stoke Lyne (Photoviewpoint 1)	High	Introduction of large commercial buildings to views in an otherwise rural landscape. Proposals will be partially screened by hedgerows, hedgerow trees and linear woodlands in the intervening landscape. During the winter months the reduced leaf cover will increase slightly the available views of the Development.	Medium / low	Direct, permanent	Minor adverse	Minor adverse
Users of the B4100 east of the Site (Photoviewpoint 4)	Low	The Development will introduce large commercial buildings to views in an otherwise rural landscape resulting in a notable change to views. Woodland located to the north of Cherwell Valley Services will contain views of the southern extent of the Development although elsewhere there will be little reduction in visibility of the Scheme.	Medium.		Minor adverse	Minor adverse
Users of the PRoW to the south of the Site (Photoviewpoint 6)	High	The Development will introduce large commercial buildings to views to an otherwise agricultural landscape resulting in a notable change to views in close proximity to receptors. In addition to the built form of the Development, the associated	Medium		Major adverse	Major / moderate adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
		earthworks, sprinkler tanks and HGV parking bays would also be evident.				
Users of the PRoW network to the east and north of the Site (Photoviewpoints 2, 3, 5 and 10)	High	The Development will introduce a number of commercial buildings to views in an otherwise rural landscape resulting in a notable change. Although landscape features such as hedgerows and sporadic trees are evident within the intervening landscape they will have a minimal effect in reducing its visibility.	Medium		Moderate adverse	Moderate adverse
Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)	Low	The Development will introduce glimpsed views of large commercial buildings to an otherwise agricultural landscape. The change will result from a small proportion of the Development being visible between areas of woodland situated to the west of the M40 corridor.	Low		Negligible neutral	Negligible neutral
Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)	High	The Development will introduce large commercial buildings to views in an otherwise rural landscape resulting in a notable change to views. The changes will be relatively close proximity to receptors.	High		Major / moderate adverse	Moderate adverse
Users of the PRoW to the west and south west of the	High	The Development will introduce a number of large commercial buildings to an otherwise agricultural landscape	Medium / low		Moderate adverse	Moderate adverse

Visual Receptor	Sensitivity	Description of Change	Magnitude of Impact	Nature of Change	Significance of Effect Year 1	Significance of Effect Year 15
Site (Photoviewpoints 12 and 13).		resulting in a minor change to the currently experienced outlook. The lower elevations of the Development would however be screened by existing hedgerows and tree cover enhanced by the proposed native tree and hedge screen planting.				

Mitigation, Monitoring and Residual Effects

Landscape Effects

13.7.8 Minor to moderate adverse (not significant) residual effects on landscape character are identified. These occur principally due to the Development being out of context with its existing setting. The proposed landscape and planting strategy will help integrate the Development into the landscape and contribute to achieving local landscape character objectives, although the loss of openness and landscape features will remain. The Development will provide high quality design and finishes to buildings within a considered and functional layout that will create a strong sense of place; further details and development of these principles will occur at the reserved matters stage. Notwithstanding, no further mitigation measures are considered necessary.

Visual Effects

13.7.9 Significant residual visual effects are only identified on users of the PRoW to the south of the Site (Photoviewpoint 6) due to the proximity of receptors to the Eastern Development. Elsewhere, residual effects range from moderate adverse to negligible (i.e. not significant). Views from settlements and PRoW will be generally unchanged from Year 1 after the introduction of mitigation measures with the exception of users of the PRoW that traverses the Western Site boundary (Photoviewpoints 7, 8 and 9), where areas of hedgerow and tree species will be reaching semi-maturity and enclosing views by Year 15. Proposed landscape and planting strategy will help integrate the Development into the landscape and reduce views of lower building elevations including vehicular movements. Where visible the proposed buildings will be experienced as contemporary, high quality buildings set amongst a structured landscape.

13.7.10 Further mitigation measures to reduce the significance of visual effects would be considered at the reserved matters stage, including considerations of façade materials, boundary treatments and detailed landscaping planting proposals.

13.8 Cumulative Effects

13.8.1 As set out in Section 13.5, a review of the intervisibility of the cumulative schemes identified for consideration in this EIA has scoped the cumulative landscape and visual assessment to an appraisal of the Development with the proposed residential-led development at Heyford Park (ref: 18/00825/HYBRID) in addition to the Oxfordshire Strategic Rail Freight Interchange (see Appendix 3.5 for further details).

13.8.2 On further review, it has been identified that there will be no intervisibility between the Eastern Development and the Heyford Park application. As such, cumulative effects are limited to those of the Western Development with the development at Heyford Park. Notwithstanding, the results are presented for the Development as a whole to ensure that consideration of the Eastern Development and Western Development are fully applied to cumulative assessment.

13.8.3 Similarly cumulative effects associated with the Strategic Rail Freight Interchange would be limited to the proposed alterations to Junction 10 of the M40 motorway. There would be no

intervisibility with the proposed logistics buildings and rail terminal situated to the south east of Heyford Park.

Construction

Landscape Character

13.8.4 If the construction phases of the Development and that at Heyford Park were to occur during the same time period, there is little potential for construction activities to be perceived as having an increased prevalence within the character area. Separated by circa 2.5km, where intervisibility is possible, views would be limited to taller elements such as cranes with the lower elevations and construction activities being screened by intervening hedgerows and tree cover. Furthermore, there would be little additional loss of defining characteristics or features such as hedgerows or trees or arable land use within the character area. On balance, the assessed effects on landscape character would not alter when considering the Development with Heyford Park.

13.8.5 If the construction phases of the Development and that of the SRFI at Junction 10 were to align there is a localised potential for construction activities to be perceived as having an increased prevalence within the character area due largely to the linear nature of the junction alterations. Where intervisibility is possible, views would be limited to taller elements such as cranes with the lower elevations of bridges and construction activities being screened by intervening hedgerows and tree cover. There would be a minor increase in the loss of defining characteristics or features such as hedgerows or trees or arable land use within the character area. On balance, the assessed effects on landscape character would not alter when considering the Development with the SRFI.

Visual Receptors

13.8.6 During construction, intervisibility of the Site and Heyford Park would be limited to users of the PRoW in areas to the north of the Western Development (close to Photoviewpoint 10). There is potential for views from the PRoW situated adjacent to the M40, however during construction this will be inaccessible as it is located within the Western Site boundary. Elsewhere, the frequency of hedgerows and linear tree belts, notably within the setting of the Western Site, would curtail many views including those from many road corridors and PRoWs. Where possible, views would be limited to the taller construction elements such as cranes and other features appearing above the treeline. However, this would not extend the area over which construction would be viewed rather the two schemes would coalesce within a vista. Overall, the assessed effects on visual receptors would not alter when considering the Development and Heyford Park cumulatively.

13.8.7 During construction, intervisibility of the Site and the SRFI related works at Junction 10 would be limited to users of the PRoW in areas to the west of the Development (close to Photoviewpoint 13). There is potential for views from the PRoW situated adjacent to the M40, however during construction this will be inaccessible as it is located within the Western Site boundary. Elsewhere, the frequency of hedgerows and linear tree belts, notably within the setting of the Site and sunken nature of the roadway would curtail many views. Where possible, views would be limited to the taller construction elements such as cranes and other features appearing above the treeline. However, this would not extend the area over which construction would be viewed rather the two schemes would coalesce within a vista. Overall, the assessed effects on visual receptors would not alter when considering the Development and the alterations to Junction 10 cumulatively.

Completed Development

Landscape Character

13.8.8 The Development will lead to a loss of landscape features and openness due to the introduction of new commercial buildings. However, in contrast to the loss of arable fields within the Site, the redevelopment of Heyford Park would occur within the context of a previously developed airfield. On balance, the assessed effects on landscape character would not alter when considering the Development cumulatively with the Development at Heyford Park.

13.8.9 When considering the SRFI works to Junction 10, although there will be a loss of landscape features the landscape character is already heavily influenced by road infrastructure and upon completion would remain localised to the existing road corridor. On balance, the assessed effects on landscape character would not alter when considering the Development cumulatively with the proposed alterations to Junction 10.

Visual Receptors

13.8.10 Intervisibility of the completed Development and Hayford Park would be limited to users of the PRoW in areas within the northern extent of the Western Site, close to Photoviewpoint 10. Additionally, there is potential for views from the PRoW situated adjacent to the M40. Elsewhere, the frequency of hedgerows and linear tree belts, notably within the setting of the Western Site, would curtail many views including those from many road corridors and PRoWs. Where possible, views would be limited to the taller elements such as such the proposed viewing tower appearing above the treeline. However, this would not extend the area over which built form would be viewed; rather the two schemes would coalesce within a vista. Overall, the assessed effects on visual receptors would not alter when considering the Development cumulatively with the Development at Hayford Park.

13.8.11 Upon completion of the Development and the SRFI related works Junction 10 views would be limited to users of the PRoW in areas to the west of the Development close to Photoviewpoints 9 and 13. Elsewhere, the frequency of hedgerows and linear tree belts, notably within the setting of the Site and sunken nature of the roadway would curtail many views. Where possible, views would be limited to the taller elements such as such the proposed bridge appearing above the treeline. However, this would not fundamentally alter views from these locations as both already include infrastructure associated with the strategic road network. Overall, the assessed effects on visual receptors would not alter when considering the Development cumulatively with the alterations to Junction 10.

Mitigation, Monitoring and Residual Effects

13.8.12 There are no further mitigation measures identified for the Development and, as such, the cumulative effects remain as described in Sections 13.6 and 13.7 for the construction and operational phases respectively.

Table 13.27: Summary of Landscape Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring	Residual Effect
Construction							
Loss of landscape features, alterations to topography and presence of construction activity and materials.	6. Farmland Plateau (Medium)	Localised	Short term	Eastern Development	Minor adverse	Adherence to the CEMP.	Minor adverse
				Western Development	Minor adverse		Minor adverse
				Enabling Works	Negligible		Negligible
				Development	Minor adverse		Minor adverse
	19. Wooded Estatelands (Medium)			Eastern Development	Minor adverse		Minor adverse
				Western Development	Minor adverse		Minor adverse
				Enabling Works	Negligible		Negligible
				Development	Minor adverse		Minor adverse
	H. Fritwell (CW/57) (Medium)			Eastern Development	Minor adverse		Minor adverse
				Western Development	Minor adverse		Minor adverse
				Enabling Works	Negligible		Negligible
				Development	Minor adverse		Minor adverse
	C. Middleton Stoney (CW/59) (Medium)			Eastern Development	Minor adverse		Minor adverse
				Western Development	Minor adverse		Minor adverse
				Enabling Works	Negligible		Negligible
				Development	Minor adverse		Minor adverse
	Eastern Site (Medium)			Moderate adverse			Moderate adverse
	Western Site (Medium)			Moderate adverse			Moderate adverse
	Site (Medium)			Moderate adverse			Moderate adverse
Completed Development							
Introduction of large commercial buildings into the landscape and loss of openness.	6. Farmland Plateau (Medium)	Localised	Permanent	Eastern Development	Moderate adverse (Year 1)	Creation of Green / blue infrastructure, the use of locally appropriate native species and use of bunding.	Minor adverse (Year 15)
				Western Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
	19. Wooded Estatelands (Medium)			Eastern Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Western Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
	H. Fritwell (CW/57) (Medium)			Eastern Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Western Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
	C. Middleton Stoney (CW/59) (Medium)			Eastern Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Western Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
				Development	Moderate adverse (Year 1)		Minor adverse (Year 15)
	Eastern Site (Medium)			Major / moderate adverse (Year 1)			Moderate adverse (Year 15)
	Western Site (Medium)			Major / moderate adverse (Year 1)			Moderate adverse (Year 15)
	Site (Medium)			Major / moderate adverse (Year 1)			Moderate adverse (Year 15)

Table 13.28: Summary of Visual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring	Residual Effect
Construction							
Views of construction activity,	Residents of Stoke Lyne (Photoviewpoint 1)	Localised	Short term	Eastern Development	Minor adverse	Adherence to the CEMP.	Minor adverse
				Western Development	Minor / negligible adverse		Minor / negligible adverse
				Enabling Works	Negligible		Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring	Residual Effect
machinery and materials.				Development	Moderate adverse		Moderate adverse
	Users of the B4100 east of the Site (Photoviewpoint 4)			Eastern Development	Minor adverse		Minor adverse
				Western Development	Neutral negligible		Neutral negligible
				Enabling Works	Negligible		Negligible
	Users of the PRoW to the south of the Site (Photoviewpoint 6)			Development	Minor adverse		Minor adverse
				Eastern Development	Moderate adverse		Moderate adverse
				Western Development	Negligible		Negligible
				Enabling Works	Negligible		Negligible
	Users of the PRoW network to the east and north of the Site (Photoviewpoints 2, 3, 5 and 10)			Development	Moderate adverse		Moderate adverse
				Eastern Development	Moderate adverse		Moderate adverse
				Western Development	Moderate adverse		Moderate adverse
				Enabling Works	Negligible		Negligible
	Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)			Development	Moderate adverse		Moderate adverse
				Eastern Development	Negligible		Negligible
				Western Development	Negligible		Negligible
				Enabling Works	Negligible		Negligible
	Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)			Development	Negligible		Negligible
				Eastern Development	Moderate adverse		Moderate adverse
				Western Development	Not assessed		Not assessed
				Enabling Works	Not assessed		Not assessed
	Users of the PRoW to the west and southwest of the Site (Photoviewpoints 12 and 13).			Development	Not assessed		Not assessed
				Eastern Development	Minor adverse		Minor adverse
				Western Development	Moderate adverse		Moderate adverse
				Enabling Works	Negligible		Negligible
				Development	Moderate adverse		Moderate adverse
Completed Development							
Views of large commercial buildings within an arable landscape and loss of openness.	Residents of Stoke Lyne (Photoviewpoint 1)	Localised	Permanent	Eastern Development	Minor adverse (Year 1)	Façade treatments, the use of locally appropriate native species in screen planting and use of bunding.	Minor adverse (Year 15)
				Western Development	Negligible (Year 1)		Minor adverse / negligible (Year 15)
				Development	Minor adverse (Year 1)		Minor adverse (Year 15)
	Users of the B4100 east of the Site (Photoviewpoint 4)			Eastern Development	Minor adverse (Year 1)		Minor adverse (Year 15)
				Western Development	Negligible (Year 1)		Negligible (Year 15)
				Development	Minor adverse (Year 1)		Minor adverse (Year 15)
	Users of the PRoW to the south of the Site (Photoviewpoint 6)			Eastern Development	Major adverse (Year 1)		Major / moderate adverse (Year 15)
				Western Development	Negligible (Year 1)		Negligible (Year 15)
				Development	Major adverse (Year 1)		Major / moderate adverse (Year 15)
	Users of the PRoW network to the east and north of the Site (Photoviewpoints 2, 3, 5 and 10)			Eastern Development	Moderate adverse (Year 1)		Moderate adverse (Year 15)
				Western Development	Moderate adverse (Year 1)		Moderate adverse (Year 15)
				Development	Moderate adverse (Year 1)		Moderate adverse (Year 15)
	Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)			Eastern Development	Negligible (Year 1)		Negligible (Year 15)
				Western Development	Negligible (Year 1)		Negligible (Year 15)
				Development	Negligible (Year 1)		Negligible (Year 15)
	Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)			Eastern Development	Moderate / minor adverse (Year 1)		Moderate / minor adverse (Year 15)
				Western Development	Major / moderate adverse (Year 1)		Moderate adverse (Year 15)
				Development	Major / moderate adverse (Year 1)		Moderate adverse (Year 15)
				Eastern Development	Moderate / minor adverse (Year 1)		Moderate / minor adverse (Year 15)

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring	Residual Effect
	Users of the PRoW to the west and south west of the Site (Photoviewpoints 12 and 13).			Western Development	Moderate adverse (Year 1)		Moderate adverse (Year 15)
				Development	Moderate adverse (Year 1)		Moderate adverse (Year 15)

References

[1] Department for Communities and Local Government, (2021). *National Planning Policy Framework.* Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf. Last accessed 05/07/2021.

[2] Cherwell District Council, (2016). *The Cherwell Local Plan 2011 – 2031 Part 1 (incorporating Policy Bicester 13 re-adopted on 19 December 2016)*. Available at https://www.cherwell.gov.uk/downloads/download/45/adopted-cherwell-local-plan-2011-2031-part-1-incorporating-policy-bicester-13-re-adopted-on-19-december-2016. Last accessed 05/07/2021.

[3] Cherwell District Council (1996). *Cherwell Local Plan.* Available at https://www.cherwell.gov.uk/info/83/local-plans/373/adopted-local-plan-1996-november-1996. Last accessed 05/07/2021.

[4] Mid-Cherwell Neighbourhood Plan Forum (2019). *Mid-Cherwell Neighbourhood Plan 2018 – 2031.* Available at https://www.cherwell.gov.uk/info/221/neighbourhood-plans/400/mid-cherwell-neighbourhood-plan/8. Last accessed 05/07/2021.

[5] Cherwell District Council (2004). *The Non-Statutory Cherwell Local Plan 2011*. https://www.cherwell.gov.uk/info/83/local-plans/159/non-statutory-cherwell-local-plan-2011-december-2004. Last accessed 05/07/2021.

[6] Landscape Institute and Institute of Environmental Management and Assessment (2013). *Guidelines for Landscape and Visual Impact Assessment 3rd Edition.*

[7] Landscape Institute (2021). *Technical Guidance Note 02/21, Assessing landscape value outside national designations*. Available at https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2021/05/tgn-02-21-assessing-landscape-value-outside-national-designations.pdf. Last accessed 05/07/2021.

[8] Landscape Institute (2019). Technical Guidance Note 06/19, Visual Representation of Development Proposals. Available at https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf. Last accessed 05/07/2021.

[9] Natural England (2014). *An Approach to Landscape Character Assessment. Second Edition*. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691184/landscape-character-assessment.pdf. Last accessed 05/07/2021.

[10] Ministry of Housing, Communities & Local Government (2019). *Planning practice guidance: Design: process and tools*. Available at https://www.gov.uk/guidance/design. Last accessed 05/07/2021.

[11] Ministry of Housing, Communities & Local Government (2019). *Planning practice guidance: Natural Environment.* Available at https://www.gov.uk/guidance/natural-environment. Last accessed 05/07/2021.

[12] Ministry of Housing, Communities & Local Government (2014). *Planning practice guidance: Open space, sports and recreation facilities, public rights of way and local green space.* Available at https://www.gov.uk/guidance/open-space-sports-and-recreation-facilities-public-rights-of-way-and-local-green-space. Last accessed 05/07/2021.

[13] Cherwell District Council (2017). Draft Cherwell Design Guide Supplementary Planning Document. Available at https://www.cherwell.gov.uk/downloads/download/1130/cherwell-design-guide-supplementary-planning-document-spd. Last accessed 05/07/2021.

[14] Council of Europe (2000). *Council of Europe Landscape Convention.* Available at https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=09000016807b6bc7. Last accessed 05/07/2021.

[15] Landscape Institute (2019). *Visual Representation of Development Proposals.* Technical Guidance Note 06/19. Available at https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf. Last accessed 11/08/2021.

[16] Oxfordshire County Council (2004). *Oxfordshire Wildlife & Landscape Study*. Available at http://owls.oxfordshire.gov.uk/wps/wcm/connect/occ/OWLS/Home/. Last accessed 09/07/2021.

[17] Natural England (2015) National Character Area profile: 107. Cotswolds. Available at http://publications.naturalengland.org.uk/publication/5900626?category=587130. Last accessed 09/07/2021.

[18] Northamptonshire County Council (2003) *Current Landscape Character Assessment*. Available at https://www.northampton.gov.uk/downloads/file/12149/08-northamptonshire-current-landscape-character-assessment#. Last accessed 26/07/2021.

14 Climate Change and Greenhouse Gases

14.1 Introduction

14.1.1 This chapter of the ES was prepared by Ecolyse Limited and presents an assessment of the likely significant effects of the Development on Climate Change. These are presented separately for the Enabling Works, the Eastern Development, the Western Development and considered together for the Enabling Works and Development as a whole.

14.1.2 Greenhouse Gases (GHGs) are gaseous compounds that have been identified as contributing to a warming effect in the earth's atmosphere. The primary GHG emissions of concern with respect to the Development is carbon dioxide (CO_2) which is emitted from combustion sources such as vehicular transport and heating and energy plant. Other GHGs also contribute to climate change and these are accounted for based on their Global Warming Potential (GWP). The combined GWP effect of all GHG emissions is presented as carbon dioxide equivalent (CO_{2e}).

14.1.3 The Climate Change assessment quantifies the GHG emissions resulting from the Enabling Works, Eastern, and Western Developments separately and combined, and in each case determines their significance in the context of local and national climate change policy and examines its resilience to future climate change.

14.1.4 Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and / or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

Competence

14.1.5 The assessment was led by Dr Graham Earl (PhD, IMechE), Director at Ecolyse Ltd. and supported by Laurence Caird (MEarthSci, CSci, MIES, MIAQM), Associate Director at Air Quality Consultants Ltd (AQC).

14.1.6 Dr Earl has over 25 years' experience in the fields of climate change, environment and asset management and assessment. Since the formation of Ecolyse six years ago, Dr Earl has developed approaches to assessing GHG emissions and climate change for EIA and has specialised in the assessment of climate change, and preparation of GHG inventories and climate resilience assessments for the purposes of EIAs for numerous light industrial, mixed used housing developments, as well as major infrastructure projects.

14.1.7 Mr Caird has over 15 years' experience in the fields of air quality and greenhouse gas emissions. He has helped shape a methodology for the assessment of greenhouse gas emissions within EIA to satisfy the requirements of the EIA Regulations and has produced carbon footprints and greenhouse gas assessments for numerous projects requiring EIAs including major residential, commercial and mixed-use developments and industrial facilities.

14.2 Legislation, Planning Policy and Guidance

Legislation Context

14.2.1 The following legislation is relevant to the Development:

- Climate Change Act (2008)[1];
- Climate Change Act 2008 (2050 Target Amendment) Order 2019[2]; and
- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended)[3].

Planning Policy Context

National

14.2.2 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (2021)[4].

Local

14.2.3 The following local planning policy is relevant to the Development:

- The Cherwell Local Plan 2011 – 2031[5], Policy Bicester 1: North West Bicester Eco-Town, and Ensuring Sustainable development (ESD) Policies 1 to 5.

Guidance

14.2.4 The following guidance is relevant to the Development:

- Institute of Environmental Management and Assessment (IEMA) guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance (2017)[6] (the 'IEMA Guidance');
- The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol[7];
- Publicly Available Standard (PAS) 2080: 2016 – Carbon Management in Infrastructure[8];
- Committee on Climate Change (CCC), Net Zero Technical Report, 2019[9];
- CCC, Sixth Carbon Budget, 2021[10];
- Royal Institution of Chartered Surveyors (RICS): Whole life carbon assessment for the built environment, 1st edition[11];
- British Standard EN15978:2011 - Sustainability of construction works[12];
- 2020 Climate Action Framework, Transforming Cherwell[13];
- Cherwell District Council (CDC) Climate Emergency Declaration 2019[14]; and
- CDC, Greenhouse Gas Report, Reporting Year 2019 to 2020[15].

14.3 Assessment Methodology

Consultation

An EIA Scoping Report was submitted to CDC in June 2021 (Appendix 3.2). A Scoping Opinion was received on the 29th July 2021 (Appendix 3.3). CDC agreed with the proposed approach of assessment with no other substantiative comments. No comments have been raised by other consultees of relevance to this assessment.

Study Area and Scope

14.3.1 The scope of the assessment is defined through its:

- Geographic scope;
- Temporal scope; and
- The activities contributing to GHG emissions.

14.3.2 Each is described further below.

Geographic Scope

14.3.3 GHGs contribute to climate change, which is a global environmental effect and as such the study area for the assessment is not limited by any specific geographical scope or defined by specific sensitive receptors.

14.3.4 The geographic scope is therefore determined by identifying emission sources associated with the Development over which the Applicant has some ability to control or influence, as detailed further below. These are considered separately for the Enabling Works, the Eastern and Western Developments.

Temporal Scope

14.3.5 The temporal scope is consistent with assessing the whole lifecycle GHG emissions from the Development. GHG emissions are assumed to be the same for the Eastern and Western Developments and the assessment considers the construction and operational phase of the Development as follows:

- **Construction Phase:** Direct and indirect GHG emissions resulting from the Development over the enabling and construction period, assumed to be 3 years between 2022 and 2025.
- **Operational Phase:** Direct and indirect GHG emissions resulting from the Development in the opening year of the completed Development, assumed to be 2025. The assessment specifically considers the GHG emissions in the opening year as it is likely that these represent the worst case annual GHG emissions for the Development over its lifetime. This is because the economy will be decarbonising over time consistent with meeting the UK's climate change target to be net zero by 2050 and this will act to reduce GHG emissions associated with the Development. Consideration is also given to likely pathways of GHG emissions from the Development out to 2050.

Activities Contributing to GHG Emissions

14.3.6 The following activities contribute to GHG emissions from the Enabling Works:

- Transportation of earthwork materials.

14.3.7 The following activities contribute to GHG emissions from the construction of the Development and apply equally to the Eastern and Western Developments:

- Transport of construction materials to the Site; and
- Emissions embodied in the materials used to construct the Site, from construction machinery and any waste.

14.3.8 The following activities contribute to GHG emissions from the operation of the completed Development and apply equally to the Eastern and Western Developments:

- Operational energy used by the Development;
- Operational transport activities related to the Development; and
- Repair, maintenance and refurbishment of the Development during its lifetime.

14.3.9 A small number of minor activities were scoped out of this assessment consistent with IEMA Guidance[6]. IEMA recommends that activities with emissions that in total equal less than 5% of the lifecycle emissions of the Development may be scoped out of the assessment. Activities scoped out are as follows:

- Enabling Works and construction of the Eastern and Western Developments:
  - Emissions from site activities such as energy consumption in site offices and welfare facilities, and fuel use of diesel-powered plant during the Enabling Works.
  - GHG emissions due to land use change – Likely to be minimal and be less than 1% of lifetime emissions. Any net increase in land use GHG emissions from each Development (Eastern and Western) will be minimised through the biodiversity and landscape planning for the respective Sites.
- Completed Development:
  - GHG emissions from the treatment and disposal of waste materials – these are a very small component of the GHG emissions of each Development and will be minimised through standard best practice including the implementation of operational waste management plans.
  - GHG emissions associated with water use (including water treatment and supply (pumping)) – these are expected to result in very small contributions to lifetime GHG emissions.

14.3.10 Emissions from decommissioning the Development at the end of its life were also scoped out of the assessment. End of life emissions include demolition of the buildings, transport of waste, processing of waste and disposal. The UK has committed to achieve net zero carbon emissions from 2050 onwards, therefore by the end of each building's life (over 60 years from completion) it can reasonably be expected that emissions from demolition, transport and waste processing will be net zero. Any residual emissions from waste disposal will be minimal as the waste is largely inert and recyclable and any such emissions will represent a very small proportion of each Development's GHG footprint. As such, it is not considered necessary to include end of life emissions estimates within the assessment.

Establishing Baseline Conditions

14.3.11 The Site is undeveloped land and there are currently no activities resulting in GHG emissions.

14.3.12 Therefore, the existing and future baseline GHG emissions for the purposes of this assessment were considered to be zero, which is a conservative worst-case assumption.

Identifying Likely Significant Effects

14.3.13 The assessment considered the whole life GHG emissions from the Eastern and Western Developments separately and in combination. This included GHG emissions during the construction and operational phases.

Enabling and Construction

14.3.14 The assessment of GHG emissions for the Eastern and Western Developments during the Enabling Works and construction followed the following approaches:

- The embodied GHG emissions from construction materials, construction equipment and construction waste materials were taken from the Lifecycle Assessment (LCA) completed in support of the BREEAM assessment. The LCA assessment complied with British Standard EN15978 Assessment of Environmental Performance of buildings[12] and considered all the upstream and downstream processes needed to construct the building; and
- GHG emissions from construction traffic during the Enabling Works and construction were calculated based on predicted construction traffic movements provided by David Tucker Associates (the project transport consultants), average travel distances based on RICS benchmarks[11] and latest government published[16] GHG emission factors for construction vehicles.

Completed Development

14.3.15 The assessment of operational effects of the completed Eastern and Western Developments adopted the following approaches:

- GHG emissions from operational transport were calculated using government published GHG emission factors for transport modes[16], transport modelling of delivery vehicles, and staff annual trips, as well as trip distance information provided by the David Tucker Associates;
- GHG emissions associated with the repair, maintenance and refurbishment of the building during its lifetime are based on the LCA completed in support of the BREEAM assessment;
- GHG emissions from operational energy consumption were based on energy modelling and industry benchmarks[17]; and
- GHG emissions in 2050 were also considered based on published strategies for decarbonisation of the grid and transport modes reflecting UK climate change policy and strategies.

14.3.16 The net increase in GHG emissions from the Enabling Works, construction and during operation in the opening year for the Eastern and Western Developments and both

combined (i.e. the Development) was calculated by comparison to the future baseline emissions, which in this case is assumed to be zero.

14.3.17 The assessment presents the GHG mitigation being proposed, which follows the principles of the GHG management hierarchy (avoid, reduce, off-set), to minimise, as far as reasonably practicable, the anticipated GHG emissions over each Development's lifecycle.

Cumulative Effects

14.3.18 IEMA Guidance makes clear that climate change is *"the largest interrelated cumulative environmental effect"* and therefore the assessment of GHG emissions which contribute to climate is intrinsically cumulative. The geographical location of emissions has no relevance to the assessment and therefore the GHG emissions from other developments considered through cumulative assessment are not distinguishable from any other development nationally. Therefore, the effects of the Enabling Works, Eastern and Western Developments in isolation and when considered together as the Development are independent of any local cumulative emissions.

14.3.19 The quantification of the GHG emissions associated with cumulative developments was therefore scoped out of this chapter. The cumulative GHG effects with other local developments are considered to be the same as those in each of the scenarios considered by this assessment, e.g. the completed Eastern and Western Developments in isolation and for the Development.

Determining Effect Significance

14.3.20 For GHG emissions there are no recognised significance criteria and thresholds.

14.3.21 The approach to classifying and defining likely significant effects therefore relies on IEMA Guidance and applying expert judgment on the significance of the lifecycle GHG emissions from the Development taking into account:

- Any net change in emissions;
- Their likely contribution to local and national GHG emissions;
- Their consistency with relevant policy; and
- An evaluation of the mitigation measures proposed to avoid, reduce and compensate GHG emissions.

14.3.22 IEMA Guidance identifies three underlying principles to inform the assessment of significance, as follows:

- The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect;
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive – e.g., population, fauna and soil; and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.

14.3.23 Based on these principles, IEMA conclude that:

- All projects create GHG emissions that contribute to climate change;
- Climate change has the potential to lead to significant environmental effects; and
- There is a GHG emission budget that defines a level of dangerous climate change whereby any GHG emission within that budget can be considered as significant.

14.3.24 For the majority of development projects, the individual contribution to total GHG emissions will be very small. However, the IEMA Guidance recognises that the contribution of GHG emissions to climate change is a cumulative global issue, and as such it is important for developments of all scales to acknowledge the significance of any increases in GHG emissions, and that the EIA should ensure the project addresses their occurrence by taking appropriate mitigating action.

14.3.25 In terms of mitigation, IEMA recommends that mitigation should in the first instance seek to avoid GHG emissions. Where GHG emissions cannot be avoided, the development should aim to reduce the residual significance of its emissions at all stages. Where additional GHG emissions remain but cannot be further reduced at source, approaches should be considered that compensate for the Development's remaining emissions, for example through offsetting.

Sensitivity of Receptor

14.3.26 The assessment of climate change does not include identification of sensitive receptors, as GHG emissions do not directly affect specific locations, but lead to indirect effects by contributing to climate change.

Assumptions and Limitations

14.3.27 It is necessary to make a number of assumptions when carrying out a greenhouse gas assessment, although assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- A number of emission sources were scoped out as detailed in para 14.3.9 and 14.3.10, although these are all minor and would not affect the conclusions of the assessment.
- In relation to Enabling Works, and construction and operational traffic movements of the Development, some assumptions were made on trip distance. Average trip distances were adopted to be conservative and ensure a realistic worst case.

14.4 Baseline Conditions

14.4.1 As described in Section 14.3 (paragraph 14.3.11), the baseline GHG emissions for the Eastern and Western Sites is taken to be zero.

Future Baseline

14.4.2 As identified in Section 14.3 (paragraph 14.3.11), were the Eastern or Western Developments to not come forward, the GHG emissions for each Development would remain at zero.

14.5 Scheme Design and Management

Enabling Works and Construction

14.5.1 Measures will be undertaken during the Enabling Works and the construction phase of the Development in order to minimise generation of GHG emissions. This includes adherence to CEMPs that will seek to minimise construction waste (and therefore embodied carbon), use of energy during construction and promote use of fuel-efficient construction vehicles, as set out in Table 14.5. Additionally, the CEMPs will include a Construction Transport Management Plan (CTMP) to minimise the number of construction trips. The CEMPs will apply equally to the Enabling Works, Eastern and Western Developments, with Framework CEMPs in Appendices 6.1 and 6.2 setting out the key principles that will be adhered to.

14.5.2 The Eastern and Western Developments will be assessed under BREEAM New Construction (NC) 2018, with a target to achieve a "Very Good" rating with aspirations / capabilities to achieve Excellent.

14.5.3 Reducing GHG emissions from the construction works will include a focus on procurement of sustainable materials that minimise embodied GHG emissions where feasible consistent with meeting BREEAM "Very Good" rating.

Completed Development

14.5.4 The Eastern and Western Developments have adopted best practice design and use of construction materials to minimise energy consumption of the Site and includes the following:

- Effective built form and orientation and proficient location of services such that the building design of the Development is optimised for energy efficiency;
- Use of passive design and energy efficiency features, including building fabrics with good practice levels of insulation and low air permeability, to improve on the Energy Efficiency Standards set out in the building regulations;
- Installation of Photovoltaic (PV) panels on roof areas;
- Installation of highly efficient Air-Source Heat Pumps (ASHPs) to regulate temperature; and
- Use of high efficiency LED lighting utilising low-energy control systems such as daylight dimming and occupancy sensing, where applicable.

14.5.5 These measures are primary (inherent design) and can therefore be relied on for the purposes of the assessment.

14.5.6 In addition, the Eastern and Western Developments make provision for electric vehicle (EV) charging spaces for both Heavy Goods Vehicles (HGVs) and cars, dedicated cycle parking and new bus stops on the site access roads to the Eastern and Western Developments. These are also considered as primary mitigation measures.

14.5.7 Finally, a comprehensive set of design measures have been adopted to ensure the buildings on the Eastern and Western Sites are resilient to future climate change. These are detailed in Table 14.6 and are also considered as primary mitigation measures.

14.6 Assessment of Effects

14.6.1 The climate change assessment considers the whole life GHG emissions resulting from the Enabling Works, the construction and the operation of the Eastern and Western Development and the Development (i.e. Enabling Works, Eastern and Western Developments combined).

14.6.2 In each case the effect of GHG emissions released during the enabling, construction and operational phase is not distinguishable; therefore there is no benefit in considering the likely significant effects separately for these phases. The assessment for the Enabling Works, Eastern Development and Western Development presents the quantification of the enabling, construction and operational phase GHG emissions together to enable an assessment on the significance of those emissions.

14.6.3 This section is structured as follows:

- Quantification of whole life GHG emissions;
- Consideration of the GHG emissions in context of local and national policy;
- Assessment of the likely significant effects;
- Consideration of mitigation, monitoring and residual effects; and
- Summary of assessment.

Quantification of Whole Life GHG Emissions from the Development

Construction – Embodied in materials, from construction machinery and waste materials

14.6.4 As described in Paragraph 14.3.14, the embodied GHGs in construction materials, from construction activity and waste materials is taken from the LCA for the construction of the Eastern and Western Developments. The use of any materials is minimal during the Enabling Works and therefore there are no embodied GHG emissions associated with this phase. The LCA calculates these GHG emissions as follows:

- Eastern Development = 26,983 tonnes CO_{2e};
- Western Development = 31,677 tonnes CO_{2e}; and
- Development = 58,660 tonnes CO_{2e}.

14.6.5 Based on a development lifetime of 60 years, this equates to the following annualised GHG emissions for each scenario, as follows:

- Eastern Development = 450 tonnes CO_{2e}/ annum;
- Western Development = 528 tonnes CO_{2e}/annum; and
- Development = 978 tonnes CO_{2e}/annum.

14.6.6 It is acknowledged that all of these emissions are released during the construction period, prior to operation of each Development scenario.

Enabling and Construction – Transport

14.6.7 In addition to embodied carbon in the materials used for construction, GHG emissions will be created by transportation during the Enabling Works and construction phase. The calculation of enabling and construction transport related GHG emissions for the Enabling

works, Eastern Development, The Western Development and the Development scenario is presented in Table 14.1 a, b, c and d respectively.

14.6.8 The assessment multiplies government published GHG emission factors[16] for delivery vehicles (modelled separately as HGVs over 3.5 tonnes and vans below 3.5 tonnes) by the number of construction trips modelled by the Transport Assessment (Appendix 8.1) and by trip distance. Trip distances are estimated to be 50km for locally sourced materials (e.g. concrete, aggregates etc) and 300km for nationally manufactured materials (e.g. plasterboard, roofing, façades etc.) based on guidance provide by RICS[11]. It is assumed that during the Enabling Works all trips are local. During the construction phase 50% of HGV delivery vehicles are local and 50% national, and 100% of van delivery vehicles are local.

Table 14.1 (a): Calculation of GHG from Enabling Works Traffic

Mode	2021 Emission Factor ($kgCO_{2e}$/km)	Distance Travelled (km)		Total CO_{2e} Emissions (tonnes)[a]
		Number enabling work return trips	Average round trip distance (km)	
HGV local trip	0.91495 full laden 0.66441 empty	7,300	50 km	288
HGV national trip		0	300 km	0
Van local delivery	0.24017	27,375	50 km	329
Total				617

Table 14.1 (b): Calculation of GHG from Construction Traffic: Eastern Development

Mode	2021 Emission Factor ($kgCO_{2e}$/km)	Distance Travelled (km)		Total CO_{2e} Emissions (tonnes)[a]
		Number construction deliveries / return trips	Average round trip distance (km)	
HGV local delivery	0.91495 full laden 0.66441 empty	10,950	50 km	432
HGV national delivery		10,950	300 km	2,594
Van local delivery	0.24017	82,125	50 km	986
Total				4,013

[a] Calculated by multiplying round trip distance by number of return trips by average of fully laden and empty emission factor as appropriate

Table 14.1 (c): Calculation of GHG from Construction Traffic: Western Development

Mode	2021 Emission Factor ($kgCO_{2e}$/km)	Distance Travelled (km)		Total CO_{2e} Emissions (tonnes) [a]
		Number construction deliveries / return trips	Average round trip distance (km)	
HGV local delivery	0.91495 full laden 0.66441 empty	14,600	50 km	576
HGV national delivery		14,600	300 km	3,459
Van local delivery	0.24017	109,500	50 km	1,315
Total				5,350

Table 14.1 (d): Calculation of GHG from Construction Traffic: Development

Mode	2021 Emission Factor ($kgCO_{2e}$/km)	Distance Travelled (km)		Total CO_{2e} Emissions (tonnes)[a]
		Number construction deliveries / return trips	Average round trip distance (km)	
HGV local delivery	0.91495 full laden 0.66441 empty	29,200	50 km	1,297
HGV national delivery		29,200	300 km	6,053
Van local delivery	0.24017	219,000	50 km	2,630
Total				9,980

14.6.9 The total GHG from construction traffic, is calculated as:

- Enabling Works = 617 tonnes CO_2e;
- Eastern Development = 4,013 tonnes CO_{2e};
- Western Development = 5,350 tonnes CO_{2e}; and
- Development = 9,980 tonnes CO_{2e}.

14.6.10 Based on a development lifetime of 60 years, this equates to the following annualised GHG emissions for each scenario, as follows:

- Enabling Works = 10 tonnes CO_{2e}/ annum;
- Eastern Development = 67 tonnes CO_{2e}/ annum;
- Western Development = 89 tonnes CO_{2e}/annum; and
- Development = 166 tonnes CO_{2e}/annum.

14.6.11 It is acknowledged that all of these emissions are released during the construction period, prior to operation of each Development scenario.

Operation – Repair, Maintenance and Refurbishment

14.6.12 The GHG emission from the repair, maintenance and refurbishment of each Development scenario over its lifetime have been estimated by the LCA as:

- Eastern Development = 795 tonnes CO_{2e};
- Western Development = 933 tonnes CO_{2e}; and
- Development = 1,728 tonnes CO_{2e}.

14.6.13 Based on a development lifetime of 60 years, this equates to the following annualised GHG emissions for each scenario, as follows:

- Eastern Development = 13 tonnes CO_{2e}/ annum;
- Western Development = 16 tonnes CO_{2e}/annum; and
- Development = 29 tonnes CO_{2e}/annum.

Operation – Transport

14.6.14 The transport related GHG emissions for each Development scenario in the opening year (2025) are presented in Table 14.2 a, b and c. The assessment multiplies GHG emission factors published by BEIS[16] for each mode of travel by the number of annual trips by mode (calculated using Trip Generation data provided through the Transport Assessment) by average trip distance by mode.

Table 14.2 (a): Assessment of Transport GHG Emissions from the Eastern Development (2025)

Type	Mode	Emission Factors (CO_2e per km or passenger km)	Annual distance travelled (million km per annum)	CO_2e Tonnes (per annum)[b]
Employees	Bus	0.11774	0.74	87
	Motorcycle	0.11355	0.3	34
	Car	0.17148	10.8	1,852
	Passenger in car	0.08574[c]	1.71	147
	Bicycle	0	0.47	0
	Pedestrian	0	0.02	0
Operational vehicles	HGV (average laden)	0.86407	30	25,922
Total				28,042

[b] CO_{2e} emissions are calculated by multiplying annual distance by CO_{2e} emission factors by mode.

[c] Assumes car shared by 2 people.

Table 14.2 (b): Assessment of Transport GHG Emissions from the Western Development (2025)

Type	Mode	Emission Factors (CO_{2e} per km or passenger km)	Annual distance travelled (million km per annum)	CO_{2e} Tonnes (per annum) [b]
Employees	Bus	0.11774	1.32	155
	Motorcycle	0.11355	0.54	61
	Car	0.17148	19.44	3,334
	Passenger in car	0.08574[c]	3.07	263
	Bicycle	0	0.85	0
	Pedestrian	0	0.04	0
Operational vehicles	HGV (average laden)	0.86407	54	46,660
Total				50,473

Table 14.2 (c): Assessment of Transport GHG Emissions from the Development (2025)

Type	Mode	Emission Factors (CO_{2e} per km or passenger km)	Annual distance travelled (million km per annum)	CO_{2e} Tonnes (per annum)[b]
Employees	Bus	0.11774	2.06	243
	Motorcycle	0.11355	0.84	95
	Car	0.17148	30.24	5,186
	Passenger in car	0.08574[c]	4.78	410
	Bicycle	0	1.32	0
	Pedestrian	0	0.06	0
Operational vehicles	HGV (average laden)	0.86407	84	72,582
Total				78,515

14.6.15 The GHG emissions from transport in the opening year for each Development scenario are therefore:

- Eastern Development = 28,042 tonnes CO_{2e}/ annum;
- Western Development = 50,473 tonnes CO_{2e}/annum; and
- Development = 78,515 tonnes CO_{2e}/annum.

14.6.16 These values are considered to be a worst-case reporting of emissions from this source since transport sources are decarbonising with time due to take up of electric vehicles and other alternatives that are being encouraged through government policies to meet the UK net zero target. Both the Eastern and Western Developments are incorporating provision of EV electric charging points to be supportive of wider government policies and ensure electric vehicles are catered for by the Development.

Operation – Energy Consumption

14.6.17 The CO_2 emissions from energy consumption of each Development scenario are calculated based on the building energy assessment modelling undertaken to inform the design.

14.6.18 This has calculated the energy consumption for the office space and core elements of the buildings on the Eastern and Western Developments. The energy consumption of the warehouse elements has been estimated based on industry benchmarks, e.g. CIBSE[18], since the warehouse element fit out is not defined and is to be subject to outline planning permission. Additionally, the amount of PV provision has been calculated to ensure all the office and core energy demand is met through onsite renewable energy. Energy consumption is converted to CO_2 based on SAP10 emission factors to ensure consistency with energy modelling. SAP10 emission factors are more conservative than BEIS[16] CO_2e emissions factors and therefore the assessment is worst case.

14.6.19 Table 14.3 a, b and c summarise the GHG emissions for the office and core and warehouse elements of each Development including any provision for PV to offset energy demand.

Table 14.3 (a): Assessment of CO_2 Emissions from Energy Consumption - Eastern Development

	Emissions before PV mitigation (Tonnes CO_2 per annum)	Offset through PV (Tonnes CO_2 per annum)	Net emissions (Tonnes CO_2 per annum)
Office and core	221	305	-84
Warehouse	1,723	0	1,723
Total	1,944	305	1639

Table 14.3 (b): Assessment of CO_2 Emissions from Energy Consumption - Western Development

	Emissions before PV mitigation (Tonnes CO_2 per annum)	Offset through PV (Tonnes CO_2 per annum)	Net emissions (Tonnes CO_2 per annum)
Office and core	362	488	-126
Warehouse	2,963	0	2,963

Total	3,325	488	2,837

Table 14.3 (c): Assessment of CO_2 Emissions from Energy Consumption - Development

	Emissions before PV mitigation (Tonnes CO_2 per annum)	Offset through PV (Tonnes CO_2 per annum)	Net emissions (tonnes CO_2 per annum)
Office and core	583	793	-210
Warehouse	4,686	0	4,686
Total	5,269	793	4,476

14.6.20 The total net GHG emissions from energy consumption are therefore:

- Eastern Development = 1,639 tonnes CO_2/ annum;
- Western Development = 2,837 tonnes CO_2/annum; and
- Development = 4,476 tonnes CO_2/annum.

Total GHG Emission Footprint

14.6.21 Table 14.4 a, b, c and d summarise the GHG emissions for each Development scenario in the opening year for each footprint element. The GHG emissions from the enabling and construction phase are annualised assuming a 60-year life. Annualising the enabling and construction GHG emissions allows them to be compared on a like-for-like basis to the operational GHG emissions which are reported on a per annum basis.

Table 14.4 (a): GHG Footprint for the Enabling Works for Opening Year

Development Phase	Footprint Element	Tonnes of CO_{2e}/annum		
		Baseline	Opening Year	Net Emissions
Enabling Works	Transport	0	10	10
Total		0	10	10

Table 14.4 (b): GHG Footprint for the Eastern Development for Opening Year

Development Phase	Footprint Element	Tonnes of CO_{2e}/annum		
		Baseline	Opening Year	Net Emissions
Construction	Embodied / waste / construction	0	450	450
	Transport	0	67	67
Operation	Repair, maintenance and refurbishment	0	13	13
	Transport	0	28,042	28,042
	Energy	0	1,639	1,639

Development Phase	Footprint Element	Tonnes of CO_{2e}/annum		
		Baseline	Opening Year	Net Emissions
Total		0	30,211	30,211

Table 14.4 (c): GHG Footprint for the Western Development for Opening Year

Development Phase	Footprint Element	Tonnes of CO_{2e}/annum		
		Baseline	Opening Year	Net Emissions
Construction	Embodied / waste / construction	0	528	528
	Transport	0	89	89
Operation	Repair, maintenance and refurbishment	0	16	16
	Transport	0	50,473	50,473
	Energy	0	2,838	2,838
Total		0	53,943	53,943

Table 14.4 (d): GHG Footprint for the Combined Development for Opening Year

Development Phase	Footprint Element	Tonnes of CO_{2e}/annum		
		Baseline	Opening Year	Net Emissions
Enabling Works	Transport	0	10	10
Construction	Embodied / waste / construction	0	978	978
	Transport	0	156	156
Operation	Repair, maintenance and refurbishment	0	29	29
	Transport	0	78,515	78,515
	Energy	0	4,476	4,476
Total		0	84,164	84,164

14.6.22 Reference to Table 14.4 a, b, c and d shows that the net change in GHG emissions in the opening year (taking into account both operational, enabling and constriction related GHG emissions) is calculated as:

- Enabling Works = 10 tonnes CO_{2e}/ annum;
- Eastern Development = 30,211 tonnes CO_{2e}/ annum;
- Western Development = 53,943 tonnes CO_{2e}/annum; and
- Development = 84,164 tonnes CO_{2e}/annum.

14.6.23 For each scenario the most significant source of GHG emissions is from transport which represent circa 93% of the net change in each scenario, although as discussed previously transport emissions are likely to decarbonise with time consistent with government policies to decarbonise this sector.

Consideration of the GHG emissions in the Context of Local and National Policy

Local

14.6.24 The relevant local polices are Policy Ensuring Sustainable Development (ESD) Policies 1 to 5, and Policy Bicester 1: North West Bicester Eco-Town[5]. Each is summarised further below, with an assessment of the Development's performance with the policy.

14.6.25 Policy ESD 1: Mitigating and Adapting to Climate Change states that:

"Measures will be taken to mitigate the impact of development within the District on climate change. At a strategic level, this will include:

- *Distributing growth to the most sustainable locations as defined in this Local Plan*
- *Delivering development that seeks to reduce the need to travel and which encourages sustainable travel options including walking, cycling and public transport to reduce dependence on private cars Designing developments to reduce carbon emissions and use resources more efficiently, including water (see Policy ESD 3 Sustainable Construction) Promoting the use of decentralised and renewable or low carbon energy where appropriate (see Policies ESD 4 Decentralised Energy Systems and ESD 5 Renewable Energy).*

The incorporation of suitable adaptation measures in new development to ensure that development is more resilient to climate change impacts will include consideration of the following:

- *Taking into account the known physical and environmental constraints when identifying locations for development*
- *Demonstration of design approaches that are resilient to climate change impacts including the use of passive solar design for heating and cooling*
- *Minimising the risk of flooding and making use of sustainable drainage methods, and*
- *Reducing the effects of development on the microclimate (through the provision of green infrastructure including open space and water, planting, and green roofs).*

Adaptation through design approaches will be considered in more locally specific detail in the Sustainable Buildings in Cherwell Supplementary Planning Document (SPD).

14.6.26 Policy ESD 2: Energy Hierarchy and Allowable Solutions, states that: CS1 (para 8) states that developments should:

In seeking to achieve carbon emissions reductions, we will promote an 'energy hierarchy' as follows:

- *Reducing energy use, in particular by the use of sustainable design and construction measures*
- *Supplying energy efficiently and giving priority to decentralised energy supply*
- *Making use of renewable energy*
- *Making use of allowable solutions.*

14.6.27 Policy ESD 3: Sustainable Construction, states that:

All new residential development will be expected to incorporate sustainable design and construction technology to achieve zero carbon development through a combination of fabric energy efficiency, carbon compliance and allowable solutions in line with Government policy. Cherwell District is in an area of water stress and as such the Council will seek a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day. All new non-residential development will be expected to meet at least BREEAM 'Very Good' with immediate effect, subject to review over the plan period to ensure the target remains relevant. The demonstration of the achievement of this standard should be set out in the Energy Statement. The strategic site allocations identified in this Local Plan are expected to provide contributions to carbon emissions reductions and to wider sustainability.

All development proposals will be encouraged to reflect high quality design and high environmental standards, demonstrating sustainable construction methods including but not limited to:

- *Minimising both energy demands and energy loss*
- *Maximising passive solar lighting and natural ventilation*
- *Maximising resource efficiency*
- *Incorporating the use of recycled and energy efficient materials*
- *Incorporating the use of locally sourced building materials*
- *Reducing waste and pollution and making adequate provision for the recycling of waste*
- *Making use of sustainable drainage methods*
- *Reducing the impact on the external environment and maximising opportunities for cooling and shading (by the provision of open space and water, planting, and green roofs, for example); and*
- *Making use of the embodied energy within buildings wherever possible and re-using materials where proposals involve demolition or redevelopment.*

Should the promoters of development consider that individual proposals would be unviable with the above requirements, 'open-book' financial analysis of proposed developments will

be expected so that an independent economic viability assessment can be undertaken. Where it is agreed that an economic viability assessment is required, the cost shall be met by the promoter.

14.6.28 Policy ESD 4: Decentralised Energy Systems sets out that:

The use of decentralised energy systems, providing either heating (District Heating (DH)) or heating and power (Combined Heat and Power (CHP)) will be encouraged in all new developments.

A feasibility assessment for DH/CHP, including consideration of biomass fuelled CHP, will be required for:

- *All residential developments for 100 dwellings or more*
- *All residential developments in off-gas areas for 50 dwellings or more*
- *All applications for non-domestic developments above1000m^2 floorspace.*

The feasibility assessment should be informed by the renewable energy map at Appendix5 'Maps' and the national mapping of heat demand densities undertaken by the Department for Energy and Climate Change (DECC) (see Appendix 3: Evidence Base).

Where feasibility assessments demonstrate that decentralised energy systems are deliverable and viable such systems will be required as part of the development unless an alternative solution would deliver the same or increased benefit.

14.6.29 Policy ESD 5: Renewable Energy, sets out that:

The Council supports renewable and low carbon energy provision wherever any adverse impacts can be addressed satisfactorily. The potential local environmental, economic and community benefits of renewable energy schemes will be a material consideration in determining planning applications.

Planning applications involving renewable energy development will be encouraged provided that there is no unacceptable adverse impact, including cumulative impact, on the following issues, which are considered to be of particular local significance in Cherwell:

- *Landscape and biodiversity including designations, protected habitats and species, and Conservation Target Areas*
- *Visual impacts on local landscapes*
- *The historic environment including designated and non-designated assets and their settings*
- *The Green Belt, particularly visual impacts on openness*
- *Aviation activities*
- *Highways and access issues, and*

- *Residential amenity.*

A feasibility assessment of the potential for significant on-site renewable energy provision (above any provision required to meet national building standards) will be required for:

- *All residential developments for 100 dwellings or more*
- *All residential developments in off-gas areas for 50 dwellings or more*
- *All applications for non-domestic developments above1000m^2 floorspace.*

Where feasibility assessments demonstrate that onsite renewable energy provision is deliverable and viable this will be required as part of the development unless an alternative solution would deliver the same or increased benefit. This may include consideration of 'allowable solutions' as Government Policy evolves.

14.6.30 The Development is compliant with:

- ESD 1 based on measures detailed in the Travel Plan and summarised in Section Mitigation Monitoring and Residual Effects, and in Table 14. to ensure resilience to climate change;
- ESD 2 based on inherent design measures to minimise energy consumption (see Section 14.5) and use of PV to ensure GHG emissions from energy use of office and core areas of buildings are zero;
- ESD 3 based on target of "Very Good" under BREEAM including measures to minimise embodied carbon of materials used, design measures to reduce energy demand and use of PV to ensure GHG emissions are zero from office and core areas of buildings; and
- ESD 4 and 5 through use of PV to meet all energy demand for office and core areas thus removing the need for any form of decentralised energy supply.

14.6.31 The Strategic Development: Bicester 1 - North West Bicester Eco-Town policy sets out a serious of requirements, of which the following are considered relevant to this development:

Zero-carbon development as defined in the Eco-Towns PPS and Eco Bicester One Shared Vision

14.6.32 The Development is compliant with this requirement based on:

- Measures described in the Travel Plan and summarised in Section Mitigation Monitoring and Residual Effects to increase the use of low carbon public transport, including installations of EV points to accelerate the take up of EV vehicles at the Development;
- Design measures to ensure the development is resilient to future climate change described further in Table 14.;
- Design measures to minimise energy consumption (see Section 14.5) and use of PV to ensure GHG emissions from energy use in office and core areas of buildings are zero; and

- Design measures to achieve target of “Very Good” under BREEAM including measures to minimise embodied carbon of materials used.

14.6.33 Government-published GHG emissions by local authority[19] show the CO_2 emissions for CDC in 2019 (the latest published year) were 545 kilo tonnes CO_2 excluding transport emissions. Excluding transport emission ensures a like for like comparison since transport emissions from the Development include a significant component of national journeys and therefore not comparable to the transport emissions included in CDC inventory which include only the component that sits within the CDC geographic boundary.

14.6.34 Comparing the GHG annualised emissions (excluding transport emissions) from each scenario shows that this would be:

- Enabling Works = 0.002% of CDC emissions;
- Eastern Development = 0.4% of CDC emissions;
- Western Development = 0.6% of CDC emissions; and
- Development = 1% of CDC emissions.

14.6.35 Even accounting for CDC's emissions falling by 2025, the GHG emissions from each Development scenario would on a like for like basis still remain a small component of local emissions.

14.6.36 As the majority of GHG emissions under each Development scenario are associated with transport and energy consumption, the annual emissions are expected to decarbonise year on year in line with local and national policies to decarbonise energy generation and road transport, as discussed further in paragraphs 14.6.40 to 14.6.42. The Development’s transport emissions will be minimised through a Travel Plan (see Appendix 8.2) including on-site design measures such as installation of EV charging points that apply equally to the Eastern and Western Developments.

National

14.6.37 The UK has recently legislated a 2050 net zero target following recommendations and analysis completed by the CCC[9]. To meet this target the CCC sets carbon budgets to define a pathway to net zero.

14.6.38 The opening year emissions for the Development coincide with the 4th carbon budget covering the period 2023 to 2027. The 4th carbon budget has been set as 1,950 million tonnes (MT) CO_{2e}, or an average annual budget of 390 MT CO_{2e}. Comparing the Development’s GHG emissions (including transport) to the national carbon budget shows that under each scenario this is:

- Enabling Works = 0.000003% of 4th carbon budget;
- Eastern Development = 0.008% of 4th carbon budget;
- Western Development = 0.014% of 4th carbon budget; and
- Development = 0.022% of 4th carbon budget.

14.6.39 The contribution is therefore a very small contributor under each Development scenario.

14.6.40 In terms of future emissions, the CCC[10] has established a "balanced net zero pathway" which considers feasible and cost-effective policy and technology interventions to ensure the UK can meet its new net zero target.

14.6.41 For power generation under this scenario, the CCC consider that 100% of power generation by 2050 will be low carbon and for ground transport it forecasts that all ground transportation (apart from small number of HGVs) will be electrically powered. The CCC therefore forecast that power and ground transportation sectors are largely decarbonised by 2050 with any residual emissions removed through technical and or natural means.

14.6.42 It is therefore reasonable to assume that national policy measures will ensure that energy and transport emissions relating to each Development scenario will be decarbonised consistent with the UK's net zero target. The recent government announcement bringing forward the ban on sale of new vehicles that are not electrically powered to 2030 is an example of policy that is being developed. The installation of on-site EV charging points will ensure that each Site can accommodate charging requirements of EV vehicles.

Assessment of Likely Significant Effects

14.6.43 The assessment of the significance of the GHG emission is informed through IEMA Guidance, as well as consideration of the net change in GHG in the context of CDC GHG emissions and consistency of the Development with CDC policies on carbon and climate change.

14.6.44 Comparing the GHG from each Development scenario to CDC GHG emissions shows that these will amount to at most 1% in the opening year. Each Development scenario also meets the requirements of CDC policies on climate change.

14.6.45 IEMA Guidance makes clear however that any increase in GHG emissions should be considered significant, therefore the assessment concludes that each Development scenario will result in a significant adverse effect. However, this will be true of almost any development and the emissions as a result of the Development in isolation are a small component in the context of CDC GHG emissions.

14.6.46 The principles of the IEMA Guidance are that where GHGs cannot be avoided, that mitigation should be provided to minimise GHGs. The mitigation is discussed in the following section.

Mitigation, Monitoring and Residual Effects

14.6.47 Mitigation measures adopted by equally by the Eastern and Western Developments are described for each element of the GHG footprint.

Construction

14.6.48 Mitigation measures adopted by the Eastern and Western Developments to minimise GHG emissions from the construction and enabling phase are inherent in the design and described in Section 14.5. No additional measures are proposed.

Operation

Transport

14.6.49 A Framework Travel Plan (FTP) accompanies the ES, provided in Appendix 8.2. This describes the short and long-term strategies which will be implemented to encourage sustainable travel and to reduce reliance on private car use. The FTP has set an initial target to reduce mode share for employee car use by 10% during the first five years of the development. The objectives of the plan are:

- To reduce the number of car trips per unit / dwelling per day;
- To increase membership and participation in a car share scheme;
- To increase employee membership to the local bicycle user group (BUG);
- To increase walking and cycle use;
- To increase the take up and renewal of public transport passes; and
- To increase awareness of benefits of sustainable travel.

14.6.50 To meet these objectives the FTP sets out a number of measures that will be facilitated by the appointment of a Travel Plan Co-ordinator (TPC) as follows;

Measures to Encourage Walking

- Footway connections to local facilities including A3/A5 outlets at Baynards Green Services;
- Secure changing and shower facilities will be provided within each unit;
- Demand for facilities will be monitored through the staff travel survey and new facilities provided as necessary;
- Information and advice concerning safe pedestrian routes to the site will be available to employees;
- The TPC will explore the potential for improvements to off-site facilities and liaise with the planning authority when necessary;
- The TPC will raise awareness of the health benefits of walking through promotional material; and
- Maps providing safe walking routes indicating distances and times to the most common destinations near to the work place (such as local bus stops).

Measures to Encourage Cycling

- A dedicated cycle route to Bicester;
- Sheltered and secure cycle parking will be located within each unit;
- Information and advice concerning safe cycle routes to the site will be available to employees;
- The TPC will try to negotiate discounts from cycle shops for staff to purchases a bicycle, the necessary safety equipment and waterproof clothing to enable them to commute to work by cycle;
- The TPC will investigate the initiation of a Bicycle User Group (BUG) to support staff that commute by cycle and to encourage others to do so;

- The TPC will establish contacts with the cycling officers of OCC to ensure input to the further development of any existing cycling strategy in the vicinity of the proposed development; and
- The TPC will ensure that the cycle stores and changing facilities that are in place are adequate and maintained.

Measures to Encourage the Use of Public Transport

- Details of relevant bus services will be prominently displayed for the information of employees;
- The TPC will liaise with the bus service operators to ensure that up-to-date timetable and route information is displayed;
- The TPC will contact local bus operators to find out whether discounted ticketing initiatives are available; and
- The TPC will seek to encourage the use of public transport.

Measures to Encourage Car Sharing

- The use of Oxfordshire's car sharing database (link: https://oxfordshire.liftshare.com/) will be promoted to employees;
- Car sharers may be given preferential treatment for parking;
- Employers will be encouraged to provide a guaranteed lift home service in emergencies for car sharers; and
- A guaranteed lift home service could be extended to cater for 'emergency' or 'short notice' situations for staff that cycle or walk to the development site.

Energy Consumption

14.6.51 Key mitigation measures adopted by the Eastern and Western Developments to minimise GHG emissions from energy consumption are inherent in the design and described in Section 14.5. No additional measures are proposed.

Mitigation Summary

14.6.52 Table 14.5 sets out an assessment of the Development's approach to mitigation against the mitigation principles described in IEMA Guidance (as discussed in paragraph 14.3.25), to avoid and reduce GHGs where practicable and compensate for any residual emissions.

Table 14.5: Proposed Approach to Mitigation in Accordance with IEMA Mitigation Principles

Development Phase	Avoid and Reduce GHGs
Enabling Works and Construction	Good and best practice approach adopted to minimise materials with high embodied carbon. Best practice measures to minimise GHGs from construction activities and adoption of best practice performance standards and guidelines for construction e.g. BREEAM "Very Good" rating Implementation of CEMPs which will include measures to minimise construction journeys.

Development Phase	Avoid and Reduce GHGs
Operation – Transport	Implementation of Travel Plan with best practice measures to promote use of sustainable transport modes. Installation of on-site EV charging for cars and HGVs Bus stop on site to promote use of public transport.
Operation – Energy	Energy efficiency design measures and on adoption of renewable technologies including PV and ASHPs resulting in zero energy emissions for office and core areas of buildings.

Residual Effects

14.6.53 The mitigation measures described above will be implemented to minimise the GHG emissions during construction and throughout the lifetime of each development scenario, however, a net increase in GHG emissions will remain, as summarised in Table 14.4 (a,b,c and d).

14.6.54 IEMA Guidance makes clear that any increase in GHG emissions should be considered significant. However, the residual emissions under each Development scenario are a small component in the context of the local GHG emissions (see paragraph 14.6.33). In addition, mitigation provided follows best practice, is in accordance with relevant local and national policy on climate change and the energy strategy under each Development scenario achieves a net reduction in operational energy emissions compared to Part L compliance.

14.6.55 It is therefore judged that in the case of each Development scenario that although the residual effects are described as significant, these have been minimised through an appropriate degree of mitigation consistent with best practice and IEMA Guidance.

Summary of GHG Assessment

14.6.56 The GHG assessment has examined four scenarios: Enabling Works, Eastern Development, Western Development, and the Development (i.e. the combined effects of the Enabling Works, Eastern and Western Developments).

14.6.57 Under each scenario the assessment finds that these will result in a net increase in GHG emissions, which are described as significant in accordance with IEMA best practice guidance on the assessment of GHGs for EIA. In each scenario mitigation is provided to avoid and reduce the GHG emissions, which follows the key principles of GHG mitigation in the IEMA Guidance and is consistent with the requirements of relevant policy.

14.7 Consideration of the potential effect of Climate Change on the Development

Context

14.7.1 Climate modelling completed by the meteorological office (UKCP)[20] is forecasting drier hotter summers, warmer wetter winters and more frequent extreme weather events due to climate change. Indeed, some level of climate change has already happened. For example, annual average UK temperature are over 1°C higher now than compared with 1961-1990, and sea levels around the UK have risen by 15-20 centimetres since 1900.

14.7.2 At the same time, there are upward trends in rainfall across the UK. Higher levels of winter rainfall have been experienced often in increasingly heavy rainfall events leading to more flooding and damage to buildings and infrastructure. These patterns are consistent with projections of more and heavier rainfall for the UK in a warmer global atmosphere. These changes increase health and safety risks to people and the built environment, increasing costs and disruption for repair and adaptation.

14.7.3 Therefore, there is a need for strategies to mitigate the impact of these events on building stock overall and in particular to ensure that new buildings are designed and constructed to minimise future risks while avoiding over specification and resource use in the meantime.

Climate Risk Assessment

14.7.4 To address future climate change risks a systematic risk assessment has been completed by the design team to identify the impact of expected extreme weather conditions arising from climate change on the Eastern and Western Developments over their projected life cycle. The assessment has covered the installation of building services and renewable systems, as well as structural and fabric resilience aspects and examined potential risks from:

- Flooding and increased precipitation;
- Extreme weather;
- Heat waves (inc. temperature increases);
- Drought (inc. reduced summer rainfall); and
- Subsidence or ground movement.

14.7.5 The risk assessment identified a number of design measures to be specified during the detailed design stage. These are common to both the Eastern and Western Developments and have been incorporated into each Development's design to manage risk from future climate, detailed in Table 14.6.

Table 14.6: Climate Change Resilience Measures (Eastern and Western Developments)

Identified Risk	Reduction / Mitigation Measure
Flooding and increased precipitation	▪ Findings of Flood Risk Assessment (FRA) to be addressed within the site drainage design. On-site attenuation to be designed sufficiently for the measured management of surface water generated on-site. ▪ Design includes soft landscaping, permeable paving and appropriate attenuation.
Extreme Weather	▪ Cladding to be specified as whole system suited to site exposure. ▪ No roof plant proposed, only PV panel array. ▪ Fixings to be compatible with roofing system.
Heat Waves	▪ Materials to be specified with light colours to help reflection. ▪ Cladding systems to be specified to thermal values assessed from thermal modelling assessment. ▪ AC system designed to deliver in a climate change scenario. ▪ Design includes external solar shading and specification will include solar control glass.

Identified Risk	Reduction / Mitigation Measure
Drought	▪ Plant drought-resistant plants.
Precipitation	▪ Findings of FRA to be incorporated in the drainage design. ▪ On site attenuation to be designed sufficiently for the measured management of surface water generated on site ▪ Falls to external levels to be designed to avoid pooling and water shed back towards level threshold areas ▪ Ensure material within landscaping design is suitably retained to avoid wash off into water courses ▪ Geographical area to be taken into consideration when guttering is designed, for the avoidance of redirecting water onto external areas that could present a flood risk.
Subsidence and Ground Movement	▪ Survey to be undertaken to determine the risks specific to the Site. ▪ Structure designed in accordance with Site Investigation. ▪ Design to include for movement within the foundations and structure.

14.7.6 The design of the Eastern and Western Developments has adopted the measures presented in Table 14.6 above and therefore the Development is considered to be resilient to future climate change.

Table 14.7: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
Enabling Works, Construction and Completed Development									
Whole life GHG emissions	Not applicable	Global	Permanent	Enabling Works	Significant adverse	Enabling Works	Adherence to the CEMP 'BREEAM Very Good, with aspirations/capabilities to achieve Excellent Travel Plan Energy efficient design Full offset of office and core areas building energy requirements (zero carbon) through PV cells	Enabling Works	Significant adverse
				Eastern Development		Eastern Development		Eastern Development	
				Western Development		Western Development		Western Development	
				Development		Development		Development	
Cumulative Effects									
Whole life GHG emissions	Not applicable	Global	Permanent	Major adverse		as above		Significant adverse	

References

[1] Her Majesty's Stationery Office, 2008. Climate Change Act 2008.

[2] Her Majesty's Stationery Office, 2019. The Climate Change Act 2008 (2050 Target Amendment) Order 2019

[3] The UK Government (2017). The Town and Country Planning (Environmental Impact Assessment) Regulations (2017), [online]. Available at: https://www.legislation.gov.uk/uksi/2017/571/pdfs/uksi_20170571_en.pdf (last accessed: 91/07/2021), as amended by The Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2018, October 2018, and The Town and Country Planning (Local Planning, Development Management Procedure, Listed Buildings etc.) (England) (Coronavirus) (Amendment) Regulations 2020, December 2020.

[4] Department for Communities and Local Government, (20121). National Planning Policy Framework.

[5] Cherwell District Council, 2016. The Cherwell Local Plan 2011 – 2031, Part 1. Adopted 20 July 2015 (incorporating Policy Bicester 13 re-adopted on 19 December 2016) - see file:///C:/Users/graham/Downloads/Final_adopted_Local_Plan_2011_2031_incorprating_re_adopted_policy_Bicester_13.pdf Accessed 11/8/2021

[6] IEMA (2017) Assessing Greenhouse Gas Emissions and Evaluating their Significance.

[7] The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, World Resource Institute, Revised Edition (2001)

[8] Publicly Available Standard (PAS) 2080 Carbon Management in Infrastructure.

[9] CCC (2019). Net Zero, Technical report.

[10] CCC (2021), Sixth Carbon Budget: https://www.theccc.org.uk/publication/sixth-carbon-budget/

[11] RICS (2017) Whole life carbon assessment for the built environment, 1st edition.

[12] EN15978 (2011) - Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method

[13] CDC. 2020 Climate Action Framework, Transforming Cherwell, Appendix 1. See https://www.cherwell.gov.uk/download/downloads/id/9828/climate-action-framework-2020.pdf Accessed 23/08/21

[14] See https://www.cherwell.gov.uk/info/7/environment/752/climate-emergency, Accessed /8/2021

[15] See https://www.cherwell.gov.uk/download/downloads/id/9871/greenhouse-gas-report-2019-2020.pdf Accessed 10/8/2021

[16] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

[17] CIBSE Guide F, Table 20.19(b) for Equipment

[18] CIBSE Guide F, Table 20.19(b) for Equipment

[19] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/996058/2005-19_UK_local_and_regional_CO2_emissions.ods. Accessed 8/7/2021

[20] See https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/about. Accessed 20/07/2021

15 Hydrology, Flood Risk and Drainage

15.1 Introduction

15.1.1 This chapter of the ES has been prepared by Bailey Johnson Hayes and presents an assessment of the likely significant effects of the Development on hydrology, flood risk and drainage. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and / or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

15.1.2 The chapter is supported by the following appendices:

- Appendix 15.1: Site Specific Flood Risk Assessment (FRA) and Drainage Assessment (August 2021) by Bailey Johnson Hayes; and
- Appendix 15.2: Report on Preliminary Phase II Ground Investigation at Land Adjacent to Junction 10 M40, Ardley (August 2021) by Applied Geology.

Competence

15.1.3 William Bailey C.Eng., F.I.Struct.E., M.I.C.E. is the principal author of this hydrology, flood risk and drainage chapter of the ES. He has over 40 years' experience of carrying out assessments and authoring technical chapters.

15.2 Legislation, Planning Policy and Guidance

Legislation Context

15.2.1 The following legislation is relevant to the Development:

- The Water Act (1989) as amended (2014)[1];
- The Water Industry Act (1991) as amended (1999)[2];
- The Water Resources Act (1991) as amended (2009)[3];
- The Land Drainage Act (1991) as amended (1994)[4];
- The Environment Act (1995)[5] and;
- The Flood and Water Management Act (2010)[6].

Planning Policy Context

National

15.2.2 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (2021)[7]; and

Regional

15.2.3 The following regional planning policy is relevant to the Development:

- Oxfordshire County Council Drainage Policy DP1-DP9 (2021)[8]; and
- Oxfordshire Plan 2050 Scoping Document (2018)[9].

Local

15.2.4 The following local planning policy is relevant to the Development:

- Cherwell Local Plan 2011-2031 Part 1, adopted July 2015 ('CLP 2015')[10];
- Saved policies of the Adopted Cherwell Local Plan (1996)[11];
- Cherwell Local Plan 2011 – 2031 Part 2, Issued Consultation, January 2016[12];
- Cherwell Level 1 and 2 Strategic Flood Risk Assessment (SFRA), 2017[13]; and
- Cherwell Council Surface Water Management Plan Phase 2[14].

Guidance

15.2.5 The following guidance is relevant to the Development:

- Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems, (2015)[15];
- CIRIA Guidance Notes; The SuDS Manual C753, (2015)[16];
- CIRIA C741 - Environmental Good Practice on Site, (2015)[17];
- CIRIA C532 - Control of Water Pollution from Construction Sites, (2001)[18];
- Pollution Prevention for Businesses Guidance, (2016)[19];
- Planning Practice Guidance, (2021)[20];
- Flood Risk Assessments; Climate Change Allowance, (2016)[21];
- Sewers for Adoption, Design and Construction Guide for Developers, 8th Edition, (2018)[22]; and
- Part H - Drainage and Waste Disposal – Building Regulations, (2015)[23].

15.3 Assessment Methodology

Consultation

15.3.1 Table 15.1 summarises key comments raised by consultees of relevance to this assessment and how the assessment has responded to them.

Table 15.1: Consultation Response Summary

Consultee and Comment	Response
CDC Scoping Opinion (29/07/2021)	
CDC has recognised that the Site lies entirely within Flood Zone 1, although the southern part of the Western Site is subject to medium risk of surface water flooding from the brook to the south. CDC acknowledge that the Development could lead to potentially significant increases in water demand and foul water discharge. Accordingly, it is recommended that this should be scoped into the ES.	An ES chapter is provided within the ES. This was informed by an FRA and Drainage Assessment (Appendix 15.1) that identified the risks of flooding and provided potential mitigation measures, to reduce the risk of surface water flooding to satisfactory levels. The ES chapter addresses the preliminary options for foul water discharge.

Consultee and Comment	Response
Thames Water scoping consultation response (29/07/2021)	
Thames Water advise the following matters should be considered: ▪ The Development's demand for sewage infrastructure; ▪ The Development's surface water drainage requirements; and ▪ The Development's demand for water supply and network infrastructure.	The FRA and Drainage Assessment have outlined the concept foul and surface water drainage requirements for the Development. This will enable more detailed consultation discussions at the planning stage.

Study Area and Scope

15.3.2 This chapter assesses the potential effects of the Development on the surrounding water environment, water resources infrastructure, water quality and the potential effects of the surrounding water environment on the Development. The scope of this assessment includes the Site and relevant local waterbodies and water resource features which could potentially be affected by the Development, including the underlying groundwater, groundwater abstractions and the catchment area for surface water, foul water drainage and potable water supply within approximately 1km of the Site boundary.

Establishing Baseline Conditions

15.3.3 This assessment establishes the baseline as 2020 / 2021. The existing baseline conditions at the two Sites and surrounding areas with regard to flooding, drainage, surface water quality, surface water resources and groundwater were determined with reference to the following information sources.

15.3.4 Topographical land survey data was obtained by MK Surveys in June 2021 from drone fly over and traditional land surveying techniques used to determine the landform of the existing Site (Appendix B of Appendix 15.1). This was used to assist in determining the existing surface water drainage arrangements.

15.3.5 Historical maps were reviewed to identify any previous water features known to be located in and around the Site and their direction of flow (Appendix B of Appendix 15.2). A desk top study of Ordnance Survey maps and historical mapping were examined to establish local water features, local topography, and the present water regimes. The Cultural Heritage Desk Based Assessment (Appendix 11.1) and geophysical survey data (Appendices 11.2 and 11.3) was also reviewed to establish the archaeological and geological history of the Site.

15.3.6 Sewer and water main records were obtained from Thames Water (Water) and Anglian Water (Wastewater) and the existing surface water networks were reviewed (Appendix E of Appendix 15.1). Consultation was also undertaken with CDC to ascertain information on historical flooding and existing surface water drainage regimes.

15.3.7 The FRA and Drainage Assessment was undertaken using the following methods of data collection; desk study, walk-over survey, MircoDrainage hydraulic modelling, and professional judgement to establish baseline flood risk.

15.3.8 A two-part review of the Geo-Environmental site investigations was also undertaken with specific focus on the geotechnical and hydrological data. Applied Geology were appointed by the Applicant to carry out a Phase I Preliminary Desk Study in 2015 which was supplemented by Phase II Intrusive Ground Investigation and laboratory sample testing in June-August 2021. The purpose of these reports is to provide adequate information for planning and development design (included in Appendix 15.2).

Identifying Likely Significant Effects

15.3.9 Below are descriptions and explanations of the methodologies used to identify and assess the likely significant effects during the Enabling Works, during construction of the Development and once the Development is completed and operational. This includes a description / explanation on the use of modelling, forecasting, professional judgement, and other methods where relevant.

Enabling Works & Construction

15.3.10 The methods used to assess the effects of the Enabling Works and construction phase of the Development include consideration of the potential effects on water quality of nearby waterbodies due to excavation, demolition, enabling and construction activities.

Completed Development

15.3.11 A FRA and Surface Water Drainage Strategy has been undertaken in order to assess potential significant effects of the completed Development on changes in flood risk, surface water runoff and drainage, and water quality. An assessment of the increased demand for potable and foul water provision is also provided. The methodology follows a three-step assessment approach:

a) hazard identification incorporating both probabilities of occurrence and the anticipated potential damages;

b) vulnerability (exposure and coping capacity) in the flood-prone areas; and

c) annualised flood risk (estimated on annual basis). The surface water strategy is guided by the latest SuDS design practices in order to achieve the objects of effective water management. Professional judgement is applied to select the best options & solutions.

15.3.12 The Enabling Works will be completed and superseded by the Western Development so this was designed in consideration of the Eastern and Western Developments; the completed Enabling Works are not discretely considered.

Cumulative Effects

15.3.13 The committed developments outlined in Chapter 3: EIA Methodology for consideration in the cumulative assessment are all considered to be of a proximity from the Site such that there is no hydraulic connectivity and cumulative effects would not occur. Additionally, each development would be required to implement a drainage strategy that would ensure that off-site flooding and water quality are not adversely affected by the proposed scheme. Potable and foul water infrastructure in the region would be managed through the respective statutory undertakers. As such, the assessment of cumulative effects is scoped out of this chapter.

Determining Effect Significance

15.3.14 The significance of an impact is determined by combining the predicted magnitude of the effect with the sensitivity of the receptor.

Sensitivity of Receptor

15.3.15 Table 15.2 sets out the assigned definitions of receptor sensitivity that are used in the assessment process for drainage, flood risk and hydrology.

Table 15.2: Receptor Sensitivity Descriptors

Value (Sensitivity)	Descriptor
High	High importance and rarity, national scale and limited potential for substitution. Receptor has very limited or no capacity to accommodate physical or chemical changes or influences.
Medium	Medium or high importance and rarity, regional scale, and limited potential for substitution. Receptor has a limited capacity to accommodate physical or chemical changes or influences.
Low	Low or medium importance and rarity, local scale. Receptor has a moderate capacity to accommodate physical or chemical changes or influences.
Negligible	Very low importance and rarity, local scale. Receptor is generally tolerant of and can accommodate physical or chemical changes or influences.

Magnitude of Impact

15.3.16 Magnitude considers factors such as severity, size or extent of an impact. To help define impact magnitude, the criteria presented in Table 15.3 were adopted for the purposes of this assessment.

Table 15.3: Magnitude of Impact Descriptors

Impact Magnitude	Descriptor
High	Permanent / irreplaceable change, which is certain to occur. Loss of resource and / or integrity of the resource; severe damage to key characteristics, features or elements (Adverse). Large scale improvement of resource or attribute quality; extensive restoration or enhancement (Beneficial).
Medium	Long-term though reversible change, which is likely to occur. Moderate loss of, or alteration to, one (maybe more) key characteristics, features or elements; measurable change in attributes, quality or vulnerability (Adverse). Minor improvement to, or addition of, one (maybe more) key characteristics, features or elements of the resource; minor improvement to attribute quality (Beneficial).
Low	Short- to medium-term though reversible change, which could possibly occur. Very minor loss of, or alteration to, one (maybe more) key characteristics, features or elements; noticeable change in attributes,

Impact Magnitude	Descriptor
	quality or vulnerability (Adverse). Very minor improvement to, or addition of, one (maybe more) key characteristic, feature or element; very minor improvement to attribute quality (Beneficial).
Negligible	Short-term, intermittent and reversible change, which is unlikely to occur. Temporary or intermittent very minor loss of, or alteration to, one (maybe more) characteristic, feature or element; possible change in attributes, quality or vulnerability (Adverse). Possible very minor improvement to, or addition of, one (maybe more) characteristic, feature or element; possible improvement to attribute quality (Beneficial).

Assessing Significance

15.3.17 The effect significance was determined by applying the EIA significance matrix set out in Chapter 3: EIA Methodology combining the sensitivity of a receptor with the magnitude of impact to form an overall judgement.

15.3.18 Professional judgement was applied to define the significance where a potential effect falls in the major / moderate and moderate / minor categories. These predictions carry a degree of subjectivity, as they are based on expert judgement regarding the effect-receptor interaction that occurs.

15.3.19 Effects classified as moderate or major in scale are considered 'significant'. Effects classified as minor or negligible in scale are considered 'not significant'.

15.3.20 All likely significant effects were identified using one of two descriptors, adverse and beneficial. Following their identification, significant effects were classified based on their nature as follows: temporary or permanent, direct or indirect, secondary, and cumulative.

Assumptions and Limitations

15.3.21 The derivation of the baseline scenario is reliant on the available sources. All comments, assessments, analysis, results, and conclusions in this chapter are based on the information currently available at the time of writing.

15.3.22 MicroDrainage calculations are based on assumptions of catchment areas set out in paragraph 5.14 of the FRA (Appendix 15.1).

15.4 Baseline Conditions

Ground Conditions

15.4.1 A review of available geological mapping, Phase I Preliminary Desk Study (2015) and Phase II Intrusive Ground Investigation and laboratory sample testing (2021) has been undertaken for each Site. The findings of this review are described below.

15.4.2 Generally, an initial layer of natural organic topsoil is present across the Site from ground level to depths of between 0.15m and 0.35m below ground level (bgl). This is in keeping

with expectations for typical crop farming fields. Small horizons of subsoil are present on the western and eastern margins of the Site.

15.4.3 The White Limestone Formation is present across the Site beneath the topsoil. The depth to the top of the stratum is fairly uniform across the Site influenced by the overlaying topsoil / subsoil. The base of this stratum was not encountered in any of the trial pits which were excavated down to a competent rock strength material at depths of between 0.80m and 2.90m bgl.

15.4.4 The weathered strata of the White Limestone Formation comprise of a highly variable mix of clayey, sandy, gravelly material with gravel of fine to course angular limestone and occasional to frequent cobbles. Variations across the Site are extensive with cohesive and granular material sometimes either interbedded or absent. Underlaying the initial weathered horizon, the materials became competent rock strength material at depths ranging from 0.70m and 2.49m bgl depending on the degree of weathering above.

15.4.5 A bedrock of solid limestone is expected below the Site, although this has not been encountered in the recent set of intrusive investigations. Further investigations would be required to establish the depth and competence of this material, although the foundations are unlikely to be piled in industrial use so this may not be required.

Groundwater and Soakaway Tests

15.4.6 During the intrusive ground investigation two soakaway tests were undertaken on the Eastern Site and three undertaken on the Western Site. Groundwater observations were also taken at all trial pit locations.

Eastern Site

15.4.7 Groundwater was observed as standing water in only one of the trial pits at a depth of 1.90m bgl on the centre of the southern Eastern Site boundary. Discrete groundwater seepages were recorded in some pits on the southern boundary at depths of 2.0m bgl. These observations suggest that the groundwater table is of significant depth (over 3m bgl) across the Eastern Site.

15.4.8 Calculated infiltration rates from the two tests on the eastern section of the Eastern Site range between 1 x 10^{-3} m/s and 2 x 10^{-5} m/s. These are considered quite substantial variations which reflects the high degree of variability in the weather horizons of White Limestone Formation strata. The groundwater occurrence and soakaway tests results suggest variable ground permeability / infiltration rates across the Eastern Site.

Western Site

15.4.9 Groundwater was observed as standing water in three of the trial pits at a depth of between 0.90m and 1.60m on the south east corner of the Western Site. Discrete groundwater seepages were recorded in some pits on the south eastern Western Site boundary at depths of between 0.90m and 2.0m bgl. These observations suggest that the groundwater table is of significant depth (over 3m bgl) across the majority of the Western Site, similar to the Eastern Site.

15.4.10 Calculated infiltration rates from the three tests on the western section of the Western Site ranged between 7 x 10-4 m/s and 7 x 10-6 m/s. These are considered quite substantial

variations which reflects the high degree of variability in the weather horizons of White Limestone Formation strata. The groundwater occurrence and soakaway tests results suggest variable ground permeability / infiltration rates across the Western Site.

Hydrology and Hydrogeology

15.4.11 Detailed assessment of hydrology and hydrogeology is provided in the FRA (Appendix 15.1). A summary of the main features for both Sites are provided below.

Eastern Site

15.4.12 The nearest surface watercourse is the Padbury Brook which is located approximately 35m south of the Eastern Site boundary and flows to the east. The Environment Agency Chemical Quality Grade by standards for the determinants biochemical oxygen demand (BOD), ammonia and dissolved oxygen for this watercourse is 'A' (Very Good).

15.4.13 According to the Applied Geology report (Appendix 15.2) there are no surface water abstractions within 2km of the Site. There are many licensed discharges within 500m of the Site, the nearest one being 30m south of the Eastern Site of emergency discharges from Cherwell Valley Services into the Padbury Brook. The majority of the other licensed discharges are for storm overflow.

15.4.14 The Environment Agency website indicates that the Eastern Site lies outside of any flood zone and is therefore located in Flood Zone 1 which has a less than 0.1% chance of flooding. The Eastern Site is subject to a very low risk of flooding from surface water and not subject to a risk of flooding from reservoirs.

15.4.15 According to the Environment Agency, the White Limestone Formation is classified as a Principal Aquifer. There are three groundwater abstractions within 500m of the centre of the Eastern Site, the nearest being 100m to the south-east for commercial use at the Cherwell Valley Services from the Eastern Site boundary. The Eastern Site is not located within a groundwater Source Protection Zone.

Western Site

15.4.16 The nearest surface watercourse is the Padbury Brook which is located approximately 150m south of the Western Site, with the nearest licensed discharge located circa 300m south east of the Western Site boundary. The Western Site is therefore located in Flood Zone 1 which has a less than 0.1% chance of flooding. The majority of the Western Site is subject to a very low risk of flooding from surface water, although a localised area of land within the southern corner is subject to a medium risk of flooding from surface water. The Western Site is not subject to a risk of flooding from reservoirs.

15.4.17 There are three groundwater abstractions within 500m of the centre of the Western Site, the nearest being 200m north west for household (potable) use and for general farming use. The Western Site is not located within a groundwater Source Protection Zone.

Surface Water Drainage and Surface Water Features

Eastern Site

15.4.18 Site contours from the topographical survey indicate that flow paths have naturally occurred on the Eastern Site, possibly during heavy rainfall in the form of overland flows. Flows are

generally directed in a southernly or easterly direction. On the eastern boundary, a field ditch of generally 0.5m to 1.0m deep conveys some surface water southwards to a natural low point in the south east corner of the Eastern Site. Water from this ditch eventually outfalls into the Padbury Brook to the south of the Eastern Site.

15.4.19 There are no significant water features on the Eastern Site. Surface water generally discharges through infiltration or via overland flows or to the field ditch outlet in the south east corner of the Eastern Site. No flooding is known to have taken place on the Eastern Site.

Western Site

15.4.20 Site contours from the topographical survey indicate that flow paths have naturally occurred on the Western Site, possibly during heavy rainfall in the form of overland flows. Flows are generally directed in a south easterly direction. On the southern boundary, a field ditch of generally 0.5m to 1.0m deep separates the Western Site from the M40 motorway. Water from this ditch eventually outfalls into the Padbury Brook, approximately 150m to the south east of the Western Site.

15.4.21 On the northern boundary, a field ditch of generally 0.5m to 1.0m deep separates the Western Site from the B4100, conveying water in an easterly direction. There is a natural low point in the Western Site on the south east corner which conveys discharge water off-site to the nearby Padbury Brook. Surface water generally discharges through infiltration or via overland flows in the south east corner of the Western Site. No flooding is known to have taken place on the Western Site.

Surface Water Quality

15.4.22 There are no known issues with water quality from the Eastern or Western Sites. Rainfall generally drains into the ground which is naturally filtered by the overlaying strata to feed into the groundwater table at circa 2m below ground levels. See Applied Geology report for further information. There is no known contamination on the Eastern or Western Sites.

Canals, Reservoirs and Waterbodies

15.4.23 The nearest canal is the Oxford Canal which runs adjacent to the River Cherwell approximately 5.0km west of the Site. The nearest large waterbody is a large pond located on Park Farm approximately 1.25km north east of the Site. The potential effect on canals, reservoirs and waterbodies is negligible given the location.

Rainfall

15.4.24 According to Met Office data, the annual average rainfall for the period 1981-2010 for the nearest Meteorological Office weather station to the application sites (Oxford, located approximately 15 miles to the south) is 659.7mm, with the wettest months being October to January. This compares with the higher averages of 1154mm for the UK, 854.8mm for England and 798.3mm for the Midlands Region. Oxfordshire has some of the lowest average annual rainfall in the UK.

Water Supply

15.4.25 The Baynard's Green & Ardley area is supplied with potable water by Thames Water which has provided local service asset plans. Existing water usage on both Sites is likely to be

minimal to none at present, and in the past would have related to general agricultural activities. The volume of water required for the previous agricultural land use on the Site is not known.

15.4.26 There is an existing water main which runs northwards adjacent to the A43 between the Eastern and Western Sites to service Baynards Green Petrol filling station and McDonald's restaurant.

Foul Water Drainage

15.4.27 There are no known existing public foul or effluent connections located on the Site. The nearest Anglian Water adopted foul water pumping station is located 60m south of the Eastern Site at the Moto Cherwell Service station. Foul water is pumped from the service station approximately 650m east, via a 100mm diameter pipe, directly to a wastewater treatment facility in Ardley. There is also a gravity foul system which serves the village of Ardley which is eventually pumped approximately 200m to the wastewater treatment facility.

Future Baseline

15.4.28 In the absence of the Development, the frequency and severity of flood events, due to climate change, could increase with the predicted increase in the frequency and intensity of rainfall events and river flow rates. In addition, surface water discharge from the Site and surrounding area into the local river system would increase as a result of peak rainfall intensity. This could result in an increase in run-off pollutants entering the system and increase erosion of the Padbury Brook channel through the turbulence created by the surface water outlets.

15.4.29 The alterations in other baseline conditions cannot be predicated (e.g. water quality) or are not considered likely to change (e.g. geological setting).

Summary of Receptors and Sensitivity

15.4.30 Table 15.5 defines the sensitivity of identified sensitive receptors.

Table 15.5: Summary of Receptor Sensitivity

Receptor	Sensitivity (Value)
Existing	
Padbury Brook watercourse	High
Local public water supply and sewerage networks	High
People and property on and adjacent to the Site	High
Ground water table (Eastern Site)	Medium
Ground water table (Western Site)	Medium
Surface water ditch (Eastern Site)	Medium
Surface water ditch, M40 (Western Site)	Medium
Surface water ditch, B4100 (Western Site)	Medium
Existing field boundary hedgerows	Low / Medium
Local biodiversity and trees	Low / Medium
Future	
Construction workers	High
Foul drainage infrastructure	High

Receptor	Sensitivity (Value)
Buildings, businesses, and workers	High
Sustainable Drainage System (SuDS) features	Medium
Access roads	Medium
Footpaths, including Public Rights of Way	Low

15.5 Scheme Design and Management

Enabling Works and Construction

15.5.1 Measures will be undertaken during the Enabling Works and construction phase to minimise disruption and manage the impacts of the Development.

15.5.2 During the Enabling Works and construction phase, CEMPs will be implemented to ensure best practice measures are in place that minimise localised flooding and avoid oils and other chemicals impacting the water quality of surface water receptors or local drainage regime. Measures to achieve this will include:

- Following the Environment Agency's Pollution Prevention Guidance (PPG) notes to ensure good practice in construction;
- Adherence to CIRIA Guidance in manuals C502 (Environmental Good Practice on Site) and C532 (Control of Water Pollution from Construction Sites);
- Production of a Pollution Incidence Response Plan in line with the Environment Agency's PPG 21 pollution Incident Response Planning;
- Implementation of a Flood Emergency Response Plan;
- Adherence to a Construction Traffic Management Plan (CTMP); and
- Implementation and use of a temporary surface water drainage system during construction to prevent materials soaking into the ground which reduce infiltration potential and silt traps to prevent blockage of surface water features.

15.5.3 These measures are set out in the Framework CEMPs in Appendices 6.1 and 6.2.

Completed Development

15.5.4 A surface water drainage strategy will be adopted to ensure all hardstanding and other areas that may be affected by contaminants will be attenuated and treated prior to discharge thus preventing contaminated surface water percolating into the soil. The drainage strategy seeks to maintain the existing hydrology in terms of the volume and rate of surface water run-off from both the Eastern and Western Developments so not to increase the risk of flooding on or off-site. The main components of the surface water drainage strategy are summarised below, with the concept drainage and external works schemes presented in the FRA (see Appendix 15.1):

- Swales;
- Infiltration Basins;
- Permeable Paving;
- Petrol Interceptors (Class 1 interceptors will be used for all drains before discharging to local watercourses);

- Catchpits, Gullies and Line Drains; and
- Flow control devices such as Hydro-brakes.

15.5.5 Given the variation in ground conditions and particularly permeability in the upper strata a 'Hybrid' approach has been taken for the surface water drainage system. The concept design uses large retention swales / infiltration basins in order to reduce any outflow to below the existing greenfield flow rates. Also, to assist with this regime all car park areas will be of permeable paving construction, infiltrating directly into the ground.

15.5.6 The surface water flows from the roofs / yards of the Western Development will be drained into large swales / infiltration basins to reduce outflow from this area to below greenfield flows of 35 l/s. These flows would lead to the lower basin system in the eastern section of the Western Development. The Development Zone located at the lower part of the Western Development, close to the A43, comprises a system of large swales / infiltration basins to capture surface water flows. Final runoff to local ditches will be limited to the greenfield flow for the Western Development, i.e. 70 l/s.

15.5.7 A system of large swales / infiltration basins will be implemented on the Eastern Development to reduce outflows to below greenfield runoff rates. The runoff in the heaviest storms will discharge to local ditches at no more than 30 l/s and then to the Padbury Brook.

15.5.8 Surface water generated from the new public accesses from the upgraded B4100 to the north of both the Eastern and Western Developments will be drained by road gullies. These will then direct runoff into ditches and swales at an acceptable rate in a separate system, in agreement with the local authority.

15.5.9 These measures to manage surface water run-off and restrict run-off rates is designed to ensure that:

- The Development does not flood from surface water up to and including the design storm event and surface water flooding up to the 1 in 30-year storm event can be safely contained on the Development; and
- Discharges will not exceed the greenfield run-off rates across a range of storm events up to and including the 1 in 100-year storm plus a 40% climate change allowance.

15.5.10 High efficiency water fixtures and fittings could be incorporated within buildings which achieve good quality user experience while minimising potable water demand, through features such as aeration, and hidden approaches to minimising water wastage such as sensors to shut off supply when facilities are not being used.

15.5.11 Commercial water consumption would be measured using smart meters. Through use of efficient practice fixtures and fittings, it is anticipated that the Development can reduce potable water demand.

15.6 Construction

Assessment of Effects

15.6.1 Phase-specific construction phase effects or mitigation are not expected for the Enabling Works, Eastern Development or Western Development. As such, a construction phase assessment is provided for the Development as a whole and is applicable to all three applications. All effects are considered to be temporary and short-term.

Human Health

15.6.2 The potential for flooding or contamination to affect the health of construction workers is low. Human receptors are classed as high sensitivity and assuming construction site practice and management measures outlined in the Section 15.5: Scheme Design and Management will be implemented, a negligible effect is predicted.

Increased Sediment Loading

15.6.3 Construction activities are likely to comprise the large-scale disturbance of soil, including topsoil and subsoil stripping, stockpiling of stripped material, heavy plant, and vehicular movements, dewatering and foundation, superstructure, and infrastructure constructions.

15.6.4 Such construction activities could result in increased surface water release and run-off as a result of the removal of surface vegetation and topsoil, and an increase in areas of hardstanding for the Site compound and temporary car parking. The scouring effects of water would pick up soil particles and transport them in suspension. This would lead to a low magnitude of impact. The Padbury Brook and on-Site ditches are classed as high and medium sensitivity respectively, so with the embedded mitigation measures in place the potential effects are considered to be minor adverse to negligible.

Accidental Leaks of Hazardous Materials

15.6.5 Leakage and spillage of oils etc. from construction plant and vehicles, although unlikely, could occur and cause local contamination of ground, groundwater, and surfaces of water. Other pollution sources that could be associated with the construction compound, stores and delivery include solvents, curing agents, paints, cement, and chemicals could result in release of substances and cause contamination of ground water. In addition, construction fuel tanks could leak or accidentally discharge, potentially causing significant environmental effects to local wildlife and habitats. The Padbury Brook is high sensitivity and on-site ditches, and groundwater are medium sensitivity, respectively. The magnitude of impact is considered negligible, therefore potential effects are considered to be negligible.

Construction Traffic

15.6.6 During peak construction periods, there will be construction workers, vehicles and deliveries arriving to the Site throughout the day. Large construction vehicles can draw excessive dirt and debris onto the highway which could block existing surface water features. Wheel washing protocols will be available to wash down vehicles when appropriate and reduce the risk of blockages and lead to a negligible effect.

Construction Infrastructure

15.6.7 Temporary water supplies and drainage facilities will be provided to support the construction employee population on the Site and connections to local sewers will be arranged for these temporary usages. The potential effects associated with supply of water and drainage facilities for the construction workforce is considered to be negligible.

Mitigation, Monitoring and Residual Effects

15.6.8 No additional mitigation is required over and above the measures included in Section 15.5. Monitoring will take place via regular inspections by the contractor throughout the

construction process. This will result in residual effects of negligible significance during construction of the Development, requiring no additional mitigation measures.

15.7 Completed Development

15.7.1 It is assumed for the purposes of this assessment that both parts of the Development (Eastern and Western) will be completed simultaneously and will be occupied at a similar time, leading to the most pressure on water and drainage resources. The effects of the completed Development, incorporating the mitigation measures discussed in section 15.5 are assessed below:

Assessment of Effects

Water Quality

15.7.2 Surface water drained from potentially contaminative sources within the Development such as service yards, delivery areas, car parks and internal roads will pass through SuDs filtration layers or petrol interceptors before outflowing into swales / infiltration basins. SuDS systems have natural filtration processes through features such as reedbeds, filtration membranes, subgrade stone etc. where silts can be removed before flow controls release water into local water courses or the ground at approved water quality. With these design measures in place, effects of the completed Development on water quality are expected to be negligible.

Surface Water Drainage and Flood Risk

15.7.3 The completed Development will result in a significant increase in impervious surfaces associated with buildings, service yards and delivery areas compared to the existing situation. This will increase the volume and rate of surface water run-off compared to that of the existing Site. However, through the use of permeable materials and SuDS as set out in Section 15.5 of the chapter, the potential impacts on local watercourses resources would be negligible.

15.7.4 The B4100 roundabout accesses and off-site footpath/cycleway works will be designed to reduce the risk of flooding to cater for modern rainfall and climate change events. This is expected to provide a minor beneficial impact on to the local surface water drainage infrastructure.

Groundwater Flooding

15.7.5 Although natural lateral flow via the groundwater table would be reduced by the introduction of impermeable and semi-permeable surface coverings, maximising the areas of SuDS infiltration basins around the Development reduces the minor changes to groundwater mobility. Contamination of groundwater from spills and leaks will be prevented by the installation of interceptors, bunding and good site management and maintenance. As such, the potential effects are considered to be negligible.

Foul Water Drainage

15.7.6 The FRA outlines a number of viable options which will be explored, detailed and extensive discussions and assessments undertaken to find the final solution. Three viable options for

discharge have been considered such as; pumping to a local treatment works, on-site treatment, and discharge to new or upgraded foul wastewater infrastructure. The preferred option is to pump foul waste to a nearby wastewater treatment plant, to be defined during the detailed design stage. Foul water drainage is to be agreed with Anglian Water as the wastewater undertaker at the reserved matters stage.

The receptors of pumping foul waste could be contaminating the ground, watercourses, or any other sensitive wildlife if the pipe burst, however this is highly unlikely when designed properly. The potential effects are considered to be of negligible significance.

Potable Water

15.7.7 The Development will increase the current water demand on the Site. On the assumption that Thames Water will implement improvements to meet the increased water demand of new development (the details of which will be agreed at reserved matters stage) and through the application of water use efficiency measures, no adverse impact is predicted on the local public water supply resulting in a negligible effect.

Mitigation, Monitoring and Residual Effects

15.7.8 No additional mitigation or monitoring is considered necessary. As such, the residual effects remain as stated for the completed Development.

Table 15.6: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
Construction									
Impacts on human health	Construction workers (High)	Local	Temporary	Enabling Works	Minor adverse	Enabling Works	Adherence to the CEMP	Enabling Works	Negligible
				Eastern Development	Minor adverse	Eastern Development		Eastern Development	Negligible
				Western Development	Minor adverse	Western Development		Western Development	Negligible
				Development	Minor adverse	Development		Development	Negligible
Increased sediment loading	Padbury Brook watercourse (High) Surface water ditches (Medium)	Regional & Local	Temporary	Enabling Works	Negligible	Enabling Works	Adherence to temporary drainage scheme	Enabling Works	Negligible
				Eastern Development	Moderate / Minor adverse	Eastern Development		Eastern Development	Minor adverse to Negligible
				Western Development	Moderate / Minor adverse	Western Development		Western Development	Minor adverse to Negligible
				Development	Moderate / Minor adverse	Development		Development	Minor adverse to Negligible
Accidental leaks of hazardous materials	Padbury Brook watercourse (High) Surface water ditches (Medium) Groundwater table (Medium)	Regional & Local	Temporary	Enabling Works	Negligible	Enabling Works	Adherence to the CEMP	Enabling Works	Negligible
				Eastern Development	Moderate adverse	Eastern Development		Eastern Development	Negligible
				Western Development	Moderate adverse	Western Development		Western Development	Negligible
				Development	Moderate adverse	Development		Development	Negligible
Dust and dirt from construction traffic	People and property on and adjacent to the Site (High) Surface water ditches (Medium)	Local	Temporary	Enabling Works	Negligible	Enabling Works	Adherence to CTMP	Enabling Works	Negligible
				Eastern Development	Minor adverse	Eastern Development		Eastern Development	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
				Western Development	Minor adverse	Western Development		Western Development	Negligible
				Development	Minor adverse	Development		Development	Negligible
Demand on water supply from construction infrastructure	People and property on and in the vicinity of the Site (High)	Regional & Local	Temporary	Enabling Works	Negligible	Enabling Works	Monitor infrastructure for defects	Enabling Works	Negligible
				Eastern Development	Negligible	Eastern Development		Eastern Development	Negligible
				Western Development	Negligible	Western Development		Western Development	Negligible
				Development	Negligible	Development		Development	Negligible
Completed Development									
Changes to water quality	Surface water ditches (Medium) Groundwater table (Medium)	Local	Permanent	Eastern Development	Minor adverse	Eastern Development	None required.	Eastern Development	Negligible
				Western Development	Minor adverse	Western Development		Western Development	Negligible
				Development	Minor adverse	Development		Development	Negligible
Changes to surface water drainage and flood risk – Development (exc. detailed site access and off-site pedestrian infrastructure)	Groundwater table (Medium) People and property on and adjacent to the Site (High)	Local	Permanent	Eastern Development	Moderate adverse	Eastern Development	None required.	Eastern Development	Negligible
				Western Development	Moderate adverse	Western Development		Western Development	Negligible
				Development	Development	Development		Development	Negligible
Changes to surface water drainage and flood risk – Site access and off-site pedestrian infrastructure	Surface water ditches (Medium) Groundwater table (Medium)	Local	Permanent	Eastern Development	Minor Beneficial	Eastern Development	None required.	Eastern Development	Minor Beneficial
				Western Development	Minor Beneficial	Western Development		Western Development	Minor Beneficial

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact		Mitigation and Monitoring		Residual Effect	
	People and property on and adjacent to the Site (High)			Development	Minor Beneficial	Development		Development	Minor Beneficial
Groundwater flood risk	Groundwater table (Medium)	Local	Permanent	Eastern Development	Moderate adverse	Eastern Development	None required.	Eastern Development	Negligible
				Western Development	Moderate adverse	Western Development		Western Development	Negligible
				Development	Moderate adverse	Development		Development	Negligible
Changes in demand on foul water drainage infrastructure	Surface water ditches (Medium) Groundwater table (Medium) People and property on and adjacent to the Site (High)	Local	Permanent	Eastern Development	Negligible	Eastern Development	None required.	Eastern Development	Negligible
				Western Development	Negligible	Western Development		Western Development	Negligible
				Development	Negligible	Development		Development	Negligible
Changes in demand on potable water drainage infrastructure	People and property on and adjacent to the Site (High)	Local	Permanent	Eastern Development	Negligible	Eastern Development	None required.	Eastern Development	Negligible
				Western Development	Negligible	Western Development		Western Development	Negligible
				Development	Negligible	Development		Development	Negligible

References

[1] Her Majesty's Stationary Office (HMSO), (1989) The Water Act 1989 (Amendment) (England and Wales) Regulations 2014.

[2] HMSO, (1991) The Water Industry Act 1991 (Amendment) (England and Wales) Regulations 1991.

[3] HMSO, (2017) The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009.

[4] HMSO, (1994) The Land Drainage Act 1994

[5] HMSO, (1995) The Environment Act 1995.

[6] HMSO, (2010) Flood and Water Management Act 2010.

[7] Ministry of Housing, Communities and Local Government (MHCLG). (2021). National Planning Policy Framework.

[8] Oxfordshire County Council, Drainage Policy. (https://www.oxfordshire.gov.uk/sites/default/files/file/roads-and-transport-major-projects/drainagepolicy.pdf)

[9] OCC (2018), Oxfordshire Joint Statutory Spatial Plan Scoping Document, October 2018

[10] Adopted Cherwell Local Plan 2011-2031 Part 1 (https://www.cherwell.gov.uk/downloads/download/45/adopted-cherwell-local-plan-2011-2031-part-1-incorporating-policy-bicester-13-re-adopted-on-19-december-2016)

[11] Cherwell District Council. (1996). Cherwell Local Plan, November 1996.

[12] CDC, (2016). Cherwell Local Plan 2011 – 2031 Part 2, Issued Consultation, January 2016

[13] AECOM, (2017). Cherwell Level 1 Strategic Flood Risk Assessment Update, May 2017

[14] CDC, (2021). Cherwell Council Surface Water Management Plan Phase 2.

[15] Department for Environment, Food and Rural Affairs (DEFRA), (2015). Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, (March 2015).

[16] Construction Industry Research and Information Association (CIRIA), (2015). The SuDS Manual C753, (November 2015).

[17] CIRA, (2015). Environmental good practice on site guide C741. 4th edition, (January 2015).

[18] CIRA, (2001). Control of Water Pollution from Construction Sites C532. (January 2001).

[19] Planning Guidance, (2016). Pollution prevention for businesses. https://www.gov.uk/guidance/pollution-prevention-for-businesses

[20] MHCLG. (Live Document). Planning Practice Guidance [online]. Available: http://planningguidance.communities.gov.uk/

[21] Planning Guidance, (2016). Flood risk assessments: climate change allowances. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

[22] Water UK (2012). Sewers for Adoption. A Design and Construction Guide for Developers (7th Edition), (August 2012).

[23] HMSO, (2010). The Building Regulations 2010, (October 2010).

16 Effect Interactions

16.1 Introduction

16.1.1 This chapter assesses the interaction of individual effects of the Development upon identified receptors / resources from multiple technical topics in the EIA (known as 'intra-project' effects). This chapter forms part of the cumulative assessment provided within this ES.

16.1.2 Details on the assessment approach for inter-project effects of the Development with other cumulative schemes are provided in Chapter 3: EIA Methodology. The inter-project cumulative assessments are provided in each technical chapter of this ES (Chapters 7–15).

16.2 Methodology

16.2.1 There is no consistent guidance or standardised approach to the assessment of effect interactions. However, it is recognised that the Development has the potential to give rise to a variety of impacts upon a number of different receptors, some of which have the potential to combine to become significant effects.

16.2.2 Table 16.1 summarises the receptor-based effect interactions assessment process used for both construction and operation of the Development.

Table 16.1: Effect Interactions Assessment Process

Step	Description
Step 1: Identify and categorise receptors	Identify all topic sensitive receptors and their geographical locations based on the study areas and study areas of the respective technical assessments. These will then be categorised by type.
Step 2: Identify impacts	Identify all topic impacts associated with sensitive receptor(s)/ receptor types.
Step 3: Screen receptors and associated impacts	Undertake a screening exercise upon the identified receptors and impacts. Screened items out from further assessment if they are: ▪ Receptors where no topic impacts overlap; ▪ Receptors with no temporal overlap with topic impacts; or ▪ Receptors where topic impacts are identified as 'negligible'.
Step 4: Assess effect interactions	Qualitative assessment based on professional judgement of the effect interactions.

16.2.3 The intra-project effects assessment uses professional judgement and takes a qualitative assessment approach. Assessing the significance of effects interaction requires subjective judgement about how well a receptor is able to accommodate the multiple changes that will occur as a result of the Development.

16.2.4 Assessments of socio-economics, transport and access, air quality, noise and vibration, cultural heritage, biodiversity, landscape and visual effects, climate change and greenhouse gases and water, flood risk and drainage have been carried out in this EIA.

16.2.5 The study area, or Zone of Influence (ZOI), for the in-combination effects assessment was defined by the study areas of these environmental topic assessments, which are discussed in the relevant topic chapters, and summarised in Chapter 3: EIA Methodology.

16.2.6 Steps 1 and 2 were undertaken within each technical assessment (Chapters 7-15) as part of the assessment of effects process. Steps 3 and 4 were undertaken by the EIA co-ordinators, Quod, for both the construction and completed development phases.

16.2.7 During the screening exercise, a spatial overlap was identified when the same receptor was identified in more than one technical chapter. These effects were then checked for a temporal overlap. If both a spatial and temporal overlap were identified, and the associated topic effects were above negligible, then the intra-project effects on that receptor / receptor group were taken forward for assessment (Step 4).

16.2.8 The assessment of transport, air quality, noise and vibration, and landscape and visual effects all concern ground level human receptors, namely the occupants of properties in proximity to the Site, the users of the road network, drivers, pedestrians and cyclists on the surrounding road network and users of the surrounding Public Rights of Way (PRoW). Human receptors are principally considered in relation to their health and wellbeing.

16.2.9 Human receptors have the potential to experience an interaction between transport, air quality, noise and vibration, and landscape and visual effects if there is a spatial and temporal overlap of effects acting on these receptors. There is also an indirect effect of socio-economics which is conducted at a greater spatial scale.

16.2.10 The potential cultural heritage effects only impact on buried archaeological assets and built heritage assets, imposing no effects on people. Therefore, cultural heritage effects are scoped out of further consideration in this chapter as there is no potential for effect interactions with other topics. Visual effects on setting of heritage assets has inherently been considered in the assessment provided in Chapter 11: Cultural Heritage.

16.2.11 Water resources and air quality are fundamentally linked to biodiversity receptors. However, these aspects are inherently considered in Chapter 12: Biodiversity as applicable, and are not assessed herein as an effect interaction.

16.3 Baseline

16.3.1 The baseline for the effect interactions assessment for this EIA is as described in each technical chapter affecting:

- Drivers, pedestrians and cyclists on the surrounding road network, PRoW and occupants of existing properties on the surrounding road network during the Enabling Works and construction phase; and

- Drivers, pedestrians and cyclists on the surrounding road network, PRoW and occupants of properties on the surrounding road network during the completed Development phase.

16.4 Assessment of Effects

Enabling Work and Construction effects

16.4.1 No residual effects with a minor significance or greater were identified in the transport and access, air quality and noise and vibration assessments. Only the landscape and visual assessment identifies residual effects up to moderate adverse significance on residents of nearby conurbations and users of the local road and public right of way (PRoW) network. As such, no effect interactions are predicted for the Enabling Works or construction phase of the Development.

Completed Development effects

16.4.2 No residual effects with a minor significance or greater were identified in the air quality assessment; as such, no effect interactions were identified and this topic was not considered further.

16.4.3 Effects of minor significance or greater were identified for drivers, pedestrians and cyclists on the surrounding road network and occupants of existing properties in proximity to the Site. Therefore, there is potential to experience an effect interaction between transport, noise and landscape and visual effects. Beneficial effects on the local and district economy were also identified within the Socio-economics assessment. Table 16.3 provides an assessment of these potential effect interactions.

Table 16.3: Potential Effect Interactions – Completed Development

Receptor	Chapter	Residual Effect (as reported in topic chapter)	Assessment of Effect Interaction
Drivers, pedestrians and cyclists on the surrounding road network; and occupants of properties in proximity to the Site.	Chapter 8: Transport and Access	Moderate adverse effects on driver delay; up to minor adverse effects on severance, pedestrian and cyclist delay & amenity, fear and intimidation, and accidents and safety.	**Up to minor adverse** – local road users, notably the B4100, A43/B4100 junction and M40 Junction 10, would experience a range of adverse effects on the local road network due to an increase in traffic. On the B4100 east of the Site, there would also be a localised minor adverse change in views. This receptor group may also experience indirect effects of GHG emissions associated with the traffic associated with the operation of the Development (cumulated with
	Chapter 13: Landscape and Visual Impacts	Minor adverse visual effects on users of the B4100 east of the Development from introduction of new built form (large commercial buildings) into the landscape and loss of openness.	

Receptor	Chapter	Residual Effect (as reported in topic chapter)	Assessment of Effect Interaction
	Chapter 14: Climate Change and Greenhouse Gases	GHG emissions from operations: Potential significant adverse (scale not defined)	national and global emissions), e.g. the disruption of extreme weather events (flooding and heatwaves), effecting the usability of roads and pavements. Overall, different local road users will experience a range of possible effect interactions depending on their mode and direction of travel.
Potential employees (Bicester and Cherwell District)	Chapter 7: Socio-economics	Moderate beneficial employment effects (Bicester and Cherwell District)	**Up to minor adverse** – potential future employees would experience a beneficial change through creation of a source of new employment. This receptor group would also experience a range of adverse effects on the local road network due to an increase in traffic and localised minor adverse impacts on views when commuting on the B4100 east of the Site. This receptor may also experience the indirect effects of GHG emissions associated with the traffic associated with the operation of the Development (cumulated with national and global emissions), e.g. the disruption of extreme weather events (flooding and heatwaves). Should these employees live within the identified noise sensitive receptors [illustrated in Figures 10.3 and 10.4 in Chapter 10: Noise and Vibration], they may also be subject to adverse road traffic noise associated with the operational Development.
	Chapter 8: Transport and Access	Moderate adverse effects on driver delay; up to minor adverse effects on severance, pedestrian and cyclist delay & amenity, fear and intimidation, and accidents and safety.	
	Chapter 10: Noise and Vibration	Significant road traffic noise effects on residential dwellings near the Site and on the B4100 north of Bicester.	
	Chapter 13: Landscape and Visual Impacts	Up to moderate adverse effects from introduction of new built form (large commercial buildings) into the landscape and loss of openness. Up to major / moderate adverse visual effects from the introduction of new built form.	
	Chapter 14: Climate Change and Greenhouse Gases	GHG emissions from operations: Potential significant adverse (scale not defined)	

17 Summary of Mitigation Measures, Monitoring and Likely Residual Effects

17.1 Introduction

17.1.1 Tables 17.1 and 17.2 provide a summary of the mitigation measures, monitoring requirements and likely residual effects resulting from the construction and occupation of the completed Development, as detailed in Chapters 7-15. Table 17.3 provides a summary of the cumulative effects.

17.1.2 Mitigation measures are designed into the Development (Eastern Development, Western Development and Enabling Works) to reduce potentially significant adverse effects where possible. A summary of key secondary and tertiary mitigation measures is provided below for both the construction phase and the completed Development.

Enabling Works and Construction

- Adherence to Construction Environmental Management Plans (CEMPs), including the erection of construction hoarding, site lighting control, emissions management plans;
- Adherence to a Construction Traffic Management Plan (CTMP);
- Timing of habitat/ hedgerow clearance (if required) avoiding seasonal constraints and/ or in the presence of a certified ecologist;
- Scheme of further archaeological evaluation and mitigation works, if required;
- Acquirement of bat mitigation and appropriate licences (if required); and
- Consideration of carbon offsetting during material selection for Site.

Completed Development

- Acoustic barrier around car park of Western Site and on B4100 between the B4100/A43 roundabout and the Western Site access;
- Financial contributions to highway and public access network infrastructure (via the S.278 agreements);
- Implementation of a Travel Plan;
- Implementation of proposed surface water drainage system;
- Adherence to mitigation measures stated in Sustainability and Energy Strategy;
- Landscaping and scheme management including implementation of a detailed Landscape and Ecology Management Plan, secured via planning condition;
- Biodiversity offsetting contributions through Applicant ownership of an off-Site compensation site, circa 20ha in Piddington, secured through a S.106 agreement; and
- BREEAM target rating of ‘Very Good’.

Table 17.1: Summary of Enabling Works and Construction Phase Effects

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Socio-Economics						
Enabling Works	Construction employment	Construction industry (Low)	Region	Temporary	None required	Negligible
Eastern Development						Negligible (Beneficial)
Western Development						
The Development						
Transport and Access						
Enabling Works	Severance	Pedestrians and cyclists (Low)	Local	Temporary	Adherence to CTMP	Negligible
Eastern Development						
Western Development						
The Development						
Enabling Works	Driver Delay	A43/B4100 junction and M40 Junction 10 (High) B4100 (Low)				Negligible
Eastern Development						
Western Development						
The Development						
Enabling Works	Pedestrian and Cyclist Delay Amenity	Pedestrians and cyclists (Low)				Negligible
Eastern Development						
Western Development						
The Development						
Enabling Works	Fear and Intimidation	Pedestrians and cyclists (Low)				Negligible
Eastern Development						
Western Development						
The Development						
Enabling Works	Accidents and Safety	A43/B4100 junction and M40 Junction 10 (High)				Negligible
Eastern Development						
Western Development						
The Development						

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
		B4100 (Low)				
Air Quality						
Eastern Development Western Development The Development	Dust soiling and human health impacts from emissions of PM_{10}	Existing residential properties (High)	Local	Temporary	Adherence to CEMP and Dust Management Plan	Negligible
	Emissions from construction vehicles	Existing residential properties (High)	Local, district		Adherence to CTMP	Negligible
	Emissions from on-Site plant	Existing residential properties (High)	Local		Adherence to CEMP	Negligible
Noise and Vibration						
Enabling Works Eastern Development Western Development The Development	Construction noise	Residential and Non-residential Receptors (High)	Local	Temporary	Adherence to CEMP	Not Significant
Enabling Works Eastern Development Western Development The Development	Construction vibration	Residential and Non-residential Receptors (High)				Not Significant
Cultural Heritage						
The Development	Enabling works and	Archaeological remains of Early	Local	Permanent	Programme of archaeological	Negligible to Minor/

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
	construction activities including excavations etc.	Prehistoric date (Low)			works to be secured by planning condition and agreed with OCC Archaeologist.	Moderate Adverse
		Archaeological remains of Late Prehistoric date (Low to Medium)	Local to Regional			Minor to Moderate Adverse
		Archaeological remains of Roman date (Low)	Local			Minor/ Moderate Adverse
		Archaeological remains of Saxon date (Low)	Local			Minor/ Moderate Adverse
		Archaeological remains of Medieval date (Low)	Local			Minor/ Moderate Adverse
		Unknown archaeological remains of Post Medieval and Modern date (Negligible to Low)	Local			Negligible to Minor/ Moderate Adverse
		Known archaeological remains of Post Medieval and Modern date (Negligible)	Local			Negligible Adverse

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
		Unknown archaeological remains (Low to Medium)	Local to Regional			Minor to Moderate Adverse
	Construction activities, including increased traffic and noise levels	Barn at SP 5487 2940 (Medium)	Local	Temporary	None required	None
Biodiversity						
Eastern Development Western Development The Development	Partial loss of trees	Low	Local	Permanent	Multiple new trees planted on-site and off-site. Implementation of LEMP.	Negligible
Eastern Development Western Development The Development	Partial loss of hedgerows	Low	Local		c.0.7km new hedgerow on-site and c.1.5km of new hedgerow planting off-site. Implementation of LEMP.	Negligible
Eastern Development	Loss of Ponds	Low	Local		Provision of a pond within the off-site compensation area	Minor adverse (local)
The Development						Minor adverse (local)

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Eastern Development	Disturbance to bats	High	County		Creation of new neutral grassland, swales, hedgerow and tree planting on-site and creation of neutral grassland and hedgerow planting off-site.	Moderate adverse (up to district)
Western Development						Moderate adverse (up to district)
The Development						Moderate adverse (up to district)
Eastern Development	Disturbance to birds	Low	District		Creation of new neutral grassland, swales, hedgerow and tree planting on-site and creation of neutral grassland and hedgerow planting off-site.	Minor adverse (local)
Western Development						
The Development						
Eastern Development	Disturbance to hazel dormouse	Low	Local		c.0.7km new hedgerow on-site and c.1.5km of new hedgerow planting off-site.	Negligible
Western Development						
The Development						

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
					Implementation of LEMP.	
Landscape and Visual						
Landscape						
Enabling Works	Loss of landscape features, alterations to topography and presence of construction activity and materials.	6. Farmland Plateau (Medium) 19. Wooded Estatelands (Medium) H. Fritwell (CW/57) (Medium) C. Middleton Stoney (CW/59) (Medium)	Localised	Short term	Adherence to the CEMP	Negligible
Eastern Development						Minor Adverse
Western Development						Minor Adverse
The Development						Minor Adverse
		Eastern Site (Medium)				Moderate Adverse
		Western Site (Medium)				Moderate Adverse
		Development (Medium)				Moderate Adverse
Visual						
Enabling Works	Views of construction activity, machinery and materials.	Residents of Stoke Lyne (Photoviewpoint 1)	Localised	Short term	Adherence to the CEMP	Negligible
Eastern Development						Minor Adverse
Western Development						Minor Adverse / negligible
The Development						Moderate Adverse

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Enabling Works		Users of the B4100 east of the Site (Photoviewpoint 4)				Negligible
Eastern Development						Minor Adverse
Western Development						Neutral negligible
The Development						Minor Adverse
Enabling Works		Users of the PRoW to the south of the Site (Photoviewpoint 6)				Negligible
Eastern Development						Moderate Adverse
Western Development						Negligible
The Development						Moderate Adverse
Enabling Works		Users of the PRoW network to the east and north of the Site (Photoviewpoints 2, 3, 5 and 10)				Negligible
Eastern Development						Moderate Adverse
Western Development						Moderate Adverse
The Development						Moderate Adverse
Enabling Works		Users of the local road network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)				Negligible
Eastern Development						Negligible
Western Development						Negligible
The Development						Negligible
Enabling Works		Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)				Not assessed
Eastern Development						Moderate Adverse
Western Development						Not assessed
The Development						Not assessed

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Enabling Works		Users of the PRoW to the west and southwest of the Site (Photoviewpoints 12 and 13).				Negligible
Eastern Development						Minor Adverse
Western Development						Moderate Adverse
The Development						Moderate Adverse
Climate Change and Greenhouse Gases						
Enabling Works	Whole life GHG emissions	N/A	Global	Permanent	Adherence to the CEMP 'BREEAM Very Good, with aspirations/capabilities to achieve Excellent Travel Plan Energy efficient design Full offset of office and core areas building energy requirements (zero carbon) through PV cells	Significant adverse
Eastern Development						
Western Development						
The Development						
Hydrology, Flood Risk and Drainage						
Enabling Works	Impacts on human health	Construction workers (High)	Local	Temporary	Adherence to CEMP	Negligible
Eastern Development						Negligible
Western Development						Negligible
The Development						Negligible

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Enabling Works	Increase sediment loading	Padbury Brook watercourse (High) Surface water ditches (Medium)	Local and Regional	Temporary	Adherence to temporary drainage scheme	Negligible
Eastern Development						Minor adverse to Negligible
Western Development						Minor adverse to Negligible
The Development						Minor adverse to Negligible
Enabling Works	Accidental leaks of hazardous materials	Padbury Brook watercourse (High) Surface water ditches (Medium)	Local and Regional	Temporary	Adherence to CEMP	Negligible
Eastern Development						Negligible
Western Development						Negligible
The Development						Negligible
Enabling Works	Dust and dirt from construction traffic	People and property on and adjacent to the Site (High) Surface water ditches (Medium)	Local	Temporary	Adherence to CTMP	Negligible
Eastern Development						Negligible
Western Development						Negligible
The Development						Negligible
Enabling Works	Demand on water supply from construction infrastructure	People and property on and in the vicinity of the Site (High)	Local and Regional	Temporary	Monitor infrastructure for defects	Negligible
Eastern Development						Negligible
Western Development						Negligible
The Development						Negligible

Table 17.2: Summary of Completed Development Effects

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Socio-Economics						
Eastern Development Western Development The Development	Provision of employment floorspace	Local & District economy (Low)	Local, District	Permanent	None required	Moderate Beneficial
Transport and Access						
Eastern Development	Severance	Pedestrians and cyclists (Low)	Local	Permanent	B4100 Footway/Cycleway	Negligible
Western Development The Development					B4100 Footway/Cycleway B4100 (West) Pedestrian Refuge and Footway/Cycleway	Minor Adverse
Eastern Development Western Development The Development	Driver Delay	A43/B4100 junction and M40 Junction 10 (High) B4100 (Low)	Local	Permanent	Interim Works Improvement Scheme; Bus Service Commitment; Footway/Cycleway; Travel Plan	Moderate Adverse
Eastern Development	Pedestrian and Cyclist Delay and Amenity	Pedestrians and cyclists (Low)	Local	Permanent	B4100 Footway/Cycleway	Minor Beneficial

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Western Development					B4100 Footway/Cycleway	Minor Adverse
The Development					B4100 (West) Pedestrian Refuge and Footway/Cycleway	Minor Adverse
Eastern Development					B4100 (Footway/Cycleway	Negligible
Western Development	Fear and Intimidation	Pedestrians and cyclists (Low)	Local	Permanent	B4100 Footway/Cycleway	Minor Adverse
The Development					B4100 (West) Pedestrian Refuge and Footway/Cycleway	
Eastern Development		A43/B4100 junction and M40 Junction 10 (High)			Interim Works Improvement Scheme; Bus Service Commitment; Footway/Cycleway; Travel Plan	Negligible
Western Development	Accidents and Safety		Local	Permanent		Minor Adverse
The Development		B4100 (Low)				
Air Quality						
Eastern Development	Human health impacts from emissions from	Existing residential properties (high)	Local, district	Permanent	N/A	Negligible (not significant)
Western Development						

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
The Development	additional operational road traffic					Negligible to minor adverse (not significant)
Western Development The Development	Impacts on designated ecological sites from emissions from additional operational road traffic	Ardley Cutting and Quarry SSSI (High)	Local	Permanent	No mitigation known at this stage – detailed air quality assessment and consultation with Natural England to inform mitigation if required. To be secured by planning condition for RMA stage.	Not significant
Noise and Vibration						
Eastern Development Western Development The Development	Operational sound	Residential receptors	Local	Permanent	Additional mitigation developed as part of the final design, including consideration of: - the acoustic performance of the building cladding;	Not significant

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
					- the location of any building services; and - the building orientation.	
Eastern Development	Operational Road Traffic Noise	Residential receptors	Local	Permanent	Travel Plan measures	Significant
Western Development					Travel Plan measures, and investigation into potential noise barrier and low noise surfacing provisions	
The Development						
Cultural Heritage						
The Development	Dissemination of archaeological fieldwork results and publication	All archaeological receptors stated above	Negligible, Local, to Regional	Permanent	None. Dissemination of fieldwork and results would be requirement of archaeological works.	Minor to Moderate Beneficial
	Change of setting to designated heritage asset	Barn at SP 5487 2940 (Medium)	Local	Permanent	None required	None
Biodiversity						
Eastern Development	Changes to the ecological features of	High	National	Permanent	N/A	Negligible

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Western Development The Development	Ardley Cutting and Quarry SSSI				No mitigation known at this stage – detailed air quality assessment and consultation with Natural England to inform mitigation if required. To be secured by planning condition for RMA stage.	Up to Major adverse
Eastern Development Western Development The Development	Disturbance to bats	High	County	Permanent	Implementation of a sensitive lighting strategy	Negligible
Eastern Development Western Development The Development	Disturbance to hazel dormouse	Low	Local	Permanent	Implementation of a sensitive lighting strategy	Negligible
Landscape and Visual						
Landscape						
Eastern Development	Introduction of large commercial buildings		Local	Permanent	Creation of Green / blue infrastructure,	Minor adverse (Year 15)

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Western Development	into the landscape and loss of openness.	6. Farmland Plateau (Medium)			the use of locally appropriate native species and use of bunding.	
The Development						Minor adverse (Year 15)
Eastern Development		19. Wooded Estatelands (Medium)				
Western Development						
The Development						Minor adverse (Year 15)
Eastern Development		H. Fritwell (CW/57) (Medium)				
Western Development						
The Development						Minor adverse (Year 15)
Eastern Development		C. Middleton Stoney (CW/59) (Medium)				
Western Development						
The Development						Minor adverse (Year 15)
Eastern Development		Eastern Site (Medium)				Moderate adverse (Year 15)
Western Development		Western Site (Medium)				
The Development		Site (Medium)				

Visual

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Eastern Development	Views of large commercial buildings within an arable landscape and loss of openness	Residents of Stoke Lyne (Photoviewpoint 1)	Local	Permanent	Façade treatments, the use of locally appropriate native species in screen planting and use of bunding	Minor adverse (Year 15)
Western Development						Minor adverse / negligible (Year 15)
The Development						Minor adverse (Year 15)
Eastern Development		Users of the B4100 east of the Site (Photoviewpoint 4)				
Western Development						Negligible (Year 15)
The Development						Minor adverse (Year 15)
Eastern Development		Users of the PRoW to the south of the Site (Photoviewpoint 6)				Major / moderate adverse (Year 15)
Western Development						Negligible (Year 15)
The Development						Major / moderate adverse (Year 15)
Eastern Development		Users of the PRoW network to the east and north of the Site (Photoviewpoints 2, 3, 5 and 10)				Moderate adverse (Year 15)
Western Development						
The Development						Moderate adverse (Year 15)
Eastern Development		Users of the local road				Negligible (Year 15)

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Western Development		network between Fritwell and Ardley with Fewcott (Photoviewpoints 11, 14 and 15)				
The Development						
Eastern Development		Users of the PRoW that traverses the Western Site (Photoviewpoints 7, 8 and 9)				Moderate / minor adverse (Year 15)
Western Development						Moderate adverse (Year 15)
The Development						Moderate adverse (Year 15)
Eastern Development		Users of the PRoW to the west and southwest of the Site (Photoviewpoints 12 and 13).				Moderate / minor adverse (Year 15)
Western Development						Moderate adverse (Year 15)
The Development						Moderate adverse (Year 15)
Climate Change and Greenhouse Gases						
See Table 17.1.						
Hydrology, Flood Risk and Drainage						
Eastern Development	Changes to water quality	Surface water ditches (Medium) Groundwater table (Medium)	Local	Permanent	None required.	Negligible
Western Development						Negligible
The Development						Negligible

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Eastern Development	Changes to surface water drainage and flood risk – Development (exc. detailed site access and off-site pedestrian infrastructure)	Groundwater table (Medium) People and property on and adjacent to the Site (High)	Local	Permanent	None required.	Negligible
Western Development						Negligible
The Development						Negligible
Eastern Development	Changes to surface water drainage and flood risk – Site access and off-site pedestrian infrastructure	Surface water ditches (Medium) Groundwater table (Medium) People and property on and adjacent to the Site (High)	Local	Permanent	None required.	Minor Beneficial
Western Development						Minor Beneficial
The Development						Minor Beneficial
Eastern Development	Groundwater flood risk	Groundwater table (Medium)	Local	Permanent	None required.	Negligible
Western Development						Negligible
The Development						Negligible
Eastern Development	Changes in demand on foul water drainage infrastructure	Surface water ditches (Medium) Groundwater table (Medium)	Local	Permanent	None required.	Negligible
Western Development						Negligible
The Development						Negligible

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
		People and property on and adjacent to the Site (High)				
Eastern Development	Changes in demand on potable water drainage infrastructure	People and property on and adjacent to the Site (High)	Local	Permanent	None required.	Negligible
Western Development						Negligible
The Development						Negligible

Table 17.3: Summary of Cumulative Effects – Construction

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Socio-Economics						
Enabling Works	Construction Employment	Construction industry (Low)	Region	Temporary	None required	Negligible (Beneficial)
Eastern Development						
Western Development						
The Development						
Transport and Access						
See Table 17.1.						
Air Quality						
No cumulative effects are identified.						
Noise and Vibration						

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
No cumulative effects are identified.						
Cultural Heritage						
No cumulative effects are identified						
Biodiversity						
The Development	Disturbance to birds	Low	District	Permanent	Creation of new neutral grassland, swales, hedgerow and tree planting on-site and creation of neutral grassland and hedgerow planting off-site.	Minor adverse (local)
Landscape and Visual						
No cumulative effects are identified.						
Climate Change and Greenhouse Gases						
See Table 17.1.						

Table 17.4: Summary of Cumulative Effects – Completed Development

Development	Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Mitigation and Monitoring	Likely Residual Effect
Socio-Economics						
Eastern Development Western Development The Development	Provision of employment floorspace	Local & District economy (low)	Local, District, Region	Permanent	None required	Major Beneficial at the Local and District level, Minor Beneficial at the Regional level
Transport and Access						
See Table 17.2.						
Air Quality						
See Table 17.2.						
Noise and Vibration						
See Table 17.2.						
Cultural Heritage						
No cumulative effects are identified.						
Biodiversity						
See Table 17.2.						
Landscape and Visual						
See Table 17.2.						
Climate Change and Greenhouse Gases						
See Table 17.1.						

17.2 Monitoring

17.2.1 Prior to the commencement of works, targeted ecological surveys of protected species will be carried to determine presence/ absence of species once the seasonal survey windows allow. Should any presence be identified, monitoring of any translocated populations will be required.

Construction

17.2.2 Outside standard good practice site monitoring requirements during construction works (which are included within the Framework CEMPs), no further environmental monitoring requirements are identified.

17.2.3 Site-specific CEMPs will be prepared once a Principal Contractor is appointed and will include monitoring prescriptions during the construction phase for dust, noise and vibration. Details of monitoring techniques, duration and extent will be agreed with CDC once the Principal Contractor is appointed, and the final construction method is confirmed.

17.2.4 A Construction Traffic Management Plan (CTMP) will be prepared and submitted to CDC and Oxfordshire County Council (OCC), prior to commencement of on-Site works. The CTMP will ensure that a strategy for planning of the construction access routes will be implemented.

Completed Development

17.2.5 The Travel Plan will provide a monitoring mechanism for the target vehicle trips on-Site during operation of the Development.