17. Assessment of Cumulative Effects

Introduction

17.1 This Chapter reports the assessment of cumulative effects arising from the Proposed Scheme, in line with Schedule 4, Paragraph 5(e) of the EIA Regulations[1], which states the need to consider the following:

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

17.2 To accord with the EIA Regulations, the following types of cumulative effects have been considered within the EIA:

- **Effect interactions**: the interactions and combination of environmental effects of the Proposed Scheme affecting the same receptor, either within the Site or in the local area; and

- **In-combination effects**: the interaction and combination of environmental effects of the Proposed Scheme with other existing or approved project (s) affecting the same receptor (hereinafter referred to as 'Approved Projects'.

Guidance

17.3 Planning Practice Guidance[2] refers to the need for cumulative effects to be assessed as part of an ES, but at present, there is no widely accepted current methodology or best practice for the assessment of cumulative effects. As such, the methodology has been based on previous experience and knowledge at Turley, the types of receptors being assessed, and the nature of the Proposed Scheme.

17.4 Whilst the scope of the cumulative effects assessment required under the EIA Regulations is limited to considering the cumulation of effects with other existing and/or approved projects, it has been agreed with NNC, as a prudent best-practice approach in this matter, that the scope of Approved Projects for the purposes of the cumulative effects assessment for this ES extends to an additional project (Approved Project 2 – see **Table 17.1** below) in the vicinity of the site which are not yet approved but in respect of which planning applications have been submitted and are anticipated to be determined in a similar timeframe to the determination of the Proposed Scheme. Further information on the scope of the Approved Projects assessed is provided below.

Summary of Consultation

17.5 Prior to the submission of the EIA Scoping Report (**Appendix 1.2**) direct consultation with North Northamptonshire Council (NNC) was undertaken to ascertain their view on the identification of Approved Projects for consideration with respect to cumulative effects. A Technical Note (**Appendix 17.1**) was prepared and shared with NNC, suggesting projects for inclusion within the assessment methodology for cumulative effects. Feedback from NNC at the time identified a number of other projects, all of which were considered within the EIA Scoping Report (**Appendix 1.2**) but discounted with a suitable evidence base to support their

exclusion. At the same time the EIA Scoping Report (**Appendix 1.2**) set out the approach and methodology to be adopted within the EIA for the assessment of cumulative effect.

17.6 As part of the EIA Scoping Opinion (**Appendix 1.3**), NNC identified the requirement to consider another project in scope of the cumulative effects assessment, namely Thrapston Market Relocation (Ref: 11/01240/FUL). In line with EIA Scoping Opinion, this additional project has been considered as set out in **Paragraph 17.14**.

Assessment Methodology

Effect Interactions

17.7 The approach to the assessment of effect interactions considers, qualitatively, the changes in baseline conditions at common sensitive receptors due to the Proposed Scheme.

17.8 Following the completion of the **Technical Chapters 6 – 16**, the residual effects for the construction and operation stages have been collated into a matrix (**Tables 17.2** and **17.4** respectively) so that effect interactions on common receptors can be identified. Where a residual effect within **Technical Chapters 6 – 16** was concluded to be negligible, then this was excluded from the matrix. This is on the basis that a negligible residual effect is unlikely to cause a noticeable change at a receptor or the receptor is not considered sensitive to a change.

17.9 Where residual effects were 'minor' or greater, the receptors were categorised into receptor categories, defined by the 'factors' categories outlined in Schedule 4, Paragraph 4 of the EIA Regulations. The threshold has been set at 'minor' as this is considered to address the potential for a number of effects which are not necessarily considered significant to a receptor in isolation but could be significant when they are considered together.

17.10 Where the level of effect identified within **Technical Chapters 6 – 16** ranged across receptors assessed, the worst case level of effect was included in **Tables 17.2** and **17.4**. If no or negligible residual effects for a receptor group were identified, these were not included in **Tables 17.2** and **17.4**.

17.11 Where effect interactions were identified, a qualitative appraisal was undertaken for the relevant receptor categories. The qualitative evaluation at the receptor level considered the following:

- The magnitude of change of combining individual effects;
- Sensitivity/value/importance of the receptor/receiving environment to change; or/and
- Duration and reversibility of effect.

17.12 Where possible a conclusion of the effect interactions has been provided, discussing the likelihood of effect interactions and whether it is significant or not.

In-combination Effects

17.13 The appraisal of potential in-combination effects has followed a two-step approach:

- Step 1 – Identification of Approved Projects for Consideration; and

- Step 2 – Assessment of In-Combination Effects.

17.14 As identified within **Paragraph 17.4 – 17.5**, Step 1 was completed as part of the EIA Scoping Report, with a list of Approved Projects identified using a series of criterion. The approach to the identification of and selection of Approved Projects was confirmed through the EIA Scoping Report (**Appendix 1.2**), consultation with NNC (**Paragraph 17.4 – 17.5**) and the EIA Scoping Opinion (**Appendix 1.3**). In summary, Stage 1 comprised:

- a review of planning applications submitted to NNC with the last 5 years[i]; and
- consideration of the planning applications alongside a series of criteria to establish if an identified planning application was relevant for the consideration of cumulative effects. The following criteria where utilised:
  - Within 1km of the Site (taken as the Site boundary);
  - Submitted applications(s) not yet determined but have the potential to be determined prior to the determination of the Proposed Scheme;
  - Applications with a resolution to grant;
  - Permitted application(s) either under construction or not yet implemented;
  - All refusals subject to appeal procedures not yet determined;
  - The project being of a relevant scale: the threshold for consideration has been the Schedule 2 criteria in the EIA Regulations, at which there is a potential for 'likely significant effects'. However, it was recognised that this needed to be applied with caution.

17.15 As set out within **Paragraph 17.4** the Thrapston Market Relocation project (Ref: 11/01240/FUL) was not identified within the original search undertaken for the EIA Scoping Report (**Appendix 1.2**), given that the application was from 2010/11 and was thus outside the search criteria. Nonetheless, for completeness, and at the request of NNC, this project has been considered as an Approved Project.

17.16 As such, the final list of identified Approved Projects considered for the purposes of the cumulative effects assessment are set out within **Table 17.1** and illustrated on **Figure 17.1**.

17.17 Although the list of Approved Projects have been identified below (**Table 17.1**), this does not mean that all Approved Projects in scope will exhibit in-combination effects with the Proposed Scheme as this is dependent on there being a common receptor, which has been considered as part of Step 2.

[i] Undertaken at the time of the EIA Scoping Report in December 2021.

Table 17.1: List of Approved Projects

Ref	Planning Application Reference	Project Name	Description	Status (at the time of consideration)
1	16/01690/REM Associated Applications *07/02457/OUT*	Land Off Huntingdon And Market Road	Reserved matters for 417 units together with associated roads, access parking and landscaping pursuant to application number 07/02457/OUT.	Under Construction
2	NE/22/00151/FUL	Land East of Halden's Parkway	Hybrid Planning Application: Full permission sought for the demolition of all existing buildings and structures and the re-alignment of an existing farm track; site infrastructure works, including groundworks, strategic landscaping and creation of development plateaus; and construction of a storage and distribution unit (Unit 01) (Use Class B8) with ancillary offices (Use Class E), including access, parking, servicing, landscaping and associated infrastructure. Outline permission sought for the construction of industrial distribution space (Use Class B8) with ancillary offices (Use Class E). All matters reserved except for site access	To be determined (*Application validated 10 February 2022*)
Identified Projects from the Scoping Opinion				
3	11/01240/FUL Associated Applications *13/01131/CND*	Thrapston Market Relocation	Erection of livestock market with ancillary agri-business units, office accommodation and associated car parking, landscaping, access and associated highway works (as specified in the submitted Transport Assessment).	Permitted (*August 2011*)

Step 2 – Assessment of In-Combination Effects.

17.18 The assessment of in-combination effects has differed somewhat between the various technical topics, due to the nature by which some technical topics complete their assessment work.

17.19 For Landscape and Visual; Built Heritage; Archaeology; Biodiversity; Lighting; Socio-Economics; Agricultural Land and Soil Resources; and Climate Change, the appraisal has been largely qualitative, informed by available technical documentation submitted in support of the planning applications for the Approved Projects[ii]. The review of documentation has been completed in order to confirm common receptors between the Proposed Scheme and Approved Projects and the extent of any in-combination effect. Where suitable technical information was not available, either professional judgement or limitations have been used to determine an in-combination effect.

17.20 The qualitative evaluation at the receptor level has considered the following:

- Potential combined magnitude of change[iii];
- Sensitivity/value/importance of the receptor/receiving environment to change; and/or
- Duration and reversibility of effects.

17.21 Through a combination of the qualitative evaluation and mitigation presented in the ES, conclusions have been drawn as to the likelihood for in-combination environmental effects and how these relate to the environmental effects identified for the Proposed Scheme in isolation (i.e. the effects reported across **Technical Chapters 6 – 16**).

17.22 With respect to Traffic and Access; Air Quality; and Noise and Vibration, the assessment of in-combination effects associated with traffic has been informed by quantitative modelling work.

17.23 With respect to Approved Project 1 (Land Off Huntingdon And Market Road), as the Approved Project is largely constructed and most of it is operational, traffic generated by the Approved Project is considered to be appropriately captured within either the baseline or with the future background traffic growth forecasts included with the traffic data for the purpose of assessment within **Chapter 6. Traffic and Access**, **Chapter 7. Air Quality** and **Chapter 8. Noise and Vibration**. As such, any cumulative effects arising from this Approved Project with the Proposed Scheme are considered to be the same as that reported for the Proposed Scheme in isolation (i.e. within **Chapter 6, 7** and **8**).

17.24 It is not clear if Approved Project 3 (Thrapston Market Relocation) has been implemented or not. Nonetheless, given the size and scale of the Approved Project, it is considered that future background traffic growth forecasts that has informed the assessment within **Chapter 6**, **Chapter 7** and **Chapter 8** would appropriately account for this Approved Project, both in

[ii] It should be noted that technical information submitted in support of the Approved Projects is assumed to be accurate and conclusions are based on sound technical knowledge. The adequacy of information has not been questioned or reviewed.

[iii] Given the numerous terms used across all planning applications documents to describe effects, in some instances professional judgement has needed to be used to relate these values to the levels of effects utilised within this ES (i.e. negligible, minor, moderate and major).

terms of construction and operational related traffic. As such, any cumulative effects arising from this Approved Project with the Proposed Scheme is considered to be the same as that reported for the Proposed Scheme in isolation (i.e. within **Chapter 6, 7** and **8**).

17.25 In terms of Approved Project 2 (Land East of Halden's Parkway) traffic data for the Approved Project, provided by the promoter of the Site, was considered within the traffic data for the purposes of assessment within **Chapter 6** and **Chapter 7**. Therefore, any cumulative traffic effects arising from this Approved Project with the Proposed Scheme is considered to be the same as that reported for the Proposed Scheme in isolation (i.e. within **Chapter 6** and **7**). With respect to noise and vibration, a separate evaluation of cumulative effects relating to operational traffic for the Approved Project has been appraised separate to the assessment of the Proposed Scheme in isolation (i.e. within **Chapter 8**). The assessment is presented in **Paragraphs 17.52 – 17.68**.

17.26 There may be effects at the project level (both for the Proposed Scheme and Approved Projects), which require due consideration and management, but these effects have not been reconsidered as part of the cumulative effects assessment.

Off-Site Utilities Upgrades

17.27 At the EIA Scoping stage (**Appendix 1.2**) it was identified that as part of the assessment of cumulative effects, off-site utilities upgrades works would be considered in-combination with the Proposed Scheme. Such works are not classified as 'planning applications' or Approved Projects, as the works will be undertaken by the relevant district network operator or appointed third party specialist utilities engineering company on their behalf.

17.28 As set out within **Chapter 4: Development Specification**, off-site utilities upgrade work are required in relation to new electricity and water connections for the Proposed Scheme, with all other utilities already located within the A605 and requiring minimal additional connection activities. The specifics of the off-site utilities works are subject to further engagement with the relevant District Network Operators (DNOs), nonetheless, at this time the works anticipated for the off-site upgrades for the new electricity and water connections are expected to include:

- Installation of two new 33kV circuits installed between Thrapston Primary Sub-station (PSS) and the Site, with an approximate routing along Kettering Road, Bridge Street[iv], High Street, Huntingdon Road and north no the A605;
- Provision of reinforcement works between Thrapston Primary Sub-station and Irthlingborough BSP. This will include installation of two new 33kV circuits across an approximate 15km route between the two points[v].; and
- Installation of approximately 790m of new 225mm High Density Polyethylene (HDPE) pipe from Lancaster Drive / A605 junction to the Site.

17.29 The specifics of the above works are still to be agreed with the respective district network operators (DNO's) and all required works for the upgrades will be undertaken by the

[iv] This may include an element of directional drilling to navigate the River Nene.
[v] A final route has not been determined and is subject to detailed investigation works to be undertaken by Western Power Distribution.

respective DNOs or appointed third party contractors. In the absence of this, the assessment has made a series of assumptions, informed by knowledge of similar types of projects. Nevertheless, the points of connections and likely connection route (in the case of the electricity connection) is understood and therefore, with the use of a series of assumptions (likely scale of works and associated activities) a qualitative assessment of potential in-combination effects has been considered. In addition, given that the works associated with the connections would occur before the Proposed Scheme is operational, in-combination effects are considered to be limited to the construction phase only.

Assessment of Effect Interaction

17.30 **Table 17.2** and **17.4** detail those receptor categories where residual effects were identified within **Technical Chapters 6 – 16** for the construction and operational stages of the Proposed Scheme, respectively.

17.31 All Technical Chapters have clearly identified sensitive receptors, and these have been grouped into common categories for further consideration.

Construction Stage Effect Interactions Assessment

Table 17.2: Matrix of effect Interactions (Construction Stage)

Effect	Population and Human Health	Land / Soil	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
Chapter 8: Noise and Vibration					
Noise from construction works	Minor Adverse (Not Significant) and Major Adverse (Significant) [a]				
Vibration from construction works	Minor Adverse (Not Significant) and Moderate Adverse (Significant) [b]				
Chapter 9: Landscape and Visual					
Changes to landscape character				Moderate to Moderate/Minor Adverse (Not Significant) and	

Effect	Population and Human Health	Land / Soil	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
				Moderate to Major/Moderate Adverse (Significant)	
Change to visual amenity and character	Minor Adverse up to Major/Moderate Adverse (combination of Significant and Not Significant) [d]				
Chapter 10: Built Heritage					
Change to the significance and setting of heritage assets			Minor to Moderate Adverse (Not Significant)		
Chapter 11: Archaeology					
Loss, damage or truncation of below ground archaeological remains			Minor to Moderate Adverse (Not Significant) [c]		
Chapter 12: Biodiversity					
Disturbance of qualifying species (of the Upper Nene Valley Gravel Pits SPA and					Minor Adverse (Not Significant)

Effect	Population and Human Health	Land / Soil	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
Ramsar site) during the Construction Stage					
Temporary loss of ecologically valuable/important habitats					Minor Beneficial to Minor Adverse (Not Significant)
Short-term loss of supporting habitat upon which bats, badgers, other terrestrial mammals such as hedgehog and brown hare, reptiles, breeding and wintering birds (non-farmland species) rely					Minor Adverse (Not Significant)
Loss of supporting habitats upon which breeding and wintering farmland birds rely					Minor Adverse (Not Significant)
Chapter 14: Socio-Economics					
Total job creation in North Northamptonshire	Minor Beneficial (Not Significant)				
Economic Output in North Nothamptonshire	Moderate Beneficial (Significant)				
Workforce Expenditure in North Northamptonshire	Minor Beneficial (Not Significant)				

Effect Chapter 15: Agricultural Land and Soil Resources	Population and Human Health	Land / Soil	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
Loss of Agricultural Land		Minor Adverse (Not Significant) and Major Adverse (Significant) [e]			
Loss of Land resource for agricultural businesses	Minor Adverse (Not Significant)				

a – Major adverse effects where only identified for Springfield Cottage and receptors located adjacent to the proposed A605 upgrade works. All other receptors where determined to be minor adverse.

b – Moderate adverse effects where only identified for Springfield Cottage and receptors located adjacent to the proposed A605 upgrade works. All other receptors where determined to be minor adverse.

*c - As identified within **Chapter 11: Archaeology** archaeological assets where considered in three defined 'groupings' including remains directly associated with Titchmarsh Roman Town; Outlying areas of Roman activity (settlement enclosure); and remains of other dates, mostly related to post medieval agriculture.*

*d – The assessment of viewpoints within **Chapter 9: Landscape and Visual** identified a range of effects. It should be noted that only a single viewpoint identified a significant effect, at Viewpoint 4. Further details are set out within **Chapter 9: Landscape and Visual**.*

e - the assessment within Chapter 15: Agricultural Land and Soil Resources considered all types of agricultural land classifications. As such, the Major Adverse (and Significant) effect was only identified with respect to Best and Most Versatile Agricultural Land.

17.32 The following Technical Chapters did not identify any residual effects greater than negligible during the construction stage, thus are not included within **Table 17.2** above:

- **Chapter 6: Transport and Access**;
- **Chapter 7: Air Quality**;
- **Chapter 13: Lighting; and**
- **Chapter 16**: **Climate Change.**

17.33 From the residual effects identified, effect interactions were identified for *Population and Human Health*, *Cultural Heritage* and *Biodiversity* receptor group. The appraisal of effect interactions during the construction stage is considered further below.

Population and Human Health (Construction Stage)

17.34 Effect interactions with respect to the Population and Human Health receptor group is not unexpected, given that broadness of this receptor group. The effects interacting upon the receptor group comprise:

- Adverse noise and vibration impacts arising from construction activities, impacting upon nearby residential properties;
- Temporary adverse impacts upon visual amenity and character (assessed across a series of representative viewpoints) as a result of construction activities within the Site;
- Beneficial impacts on socio-economics indicators (jobs, economics output and expenditure in economy) at the North Northamptonshire level; and
- Loss of agricultural land as a resource for a farming business.

17.35 The impacts upon the farming business are considered to be a discrete receptor to the others, as the existing tenant farmer is understood to be based 2-3 miles from the Site and therefore is not considered to experience an effect interaction with the construction noise and vibration effects (given distance of separation).

17.36 Given the geographical scale at which the socio-economics effects have been identified (i.e. North Northamptonshire), although residents in close proximity to the Site (who experience the noise and vibration impacts) will experience these beneficial socio-economic effects, it is considered that the receptors experience of this would not be in the same context of the other construction related effects. On this basis, it is not considered to result in an effect interaction with the other effects noted.

17.37 On the basis of the above, it is only considered that an effect interaction would occur at nearby residential properties in terms of construction noise and vibration and amenity/character of views. The potential effect interaction could occur concurrently, experienced at the specific residential property, or subsequently as a receptor travels between their residential property and another location (i.e. work).

17.38 The nature of the individual effects and the way in which they impact upon the receptor makes it hard to quantifiably combine the effects together to generate a single 'effect'. Furthermore, depending on the receptor, they may be more tolerable to one effect or the other. On this basis it is deemed that the effect interaction would be experienced the same as the 'worst' individual effect (i.e. one that gave rise to the greatest adverse effect).

17.39 The assessment of visual amenity/character within **Chapter 9: Landscape and Visual** does not specifically align with the receptors assessed within **Chapter 8: Noise and Vibration**, nor did it evaluate views from residential properties specifically. Therefore, to consider the potential in-combination effect and the greatest individual level of effect, the receptors considered within **Chapter 8** have been considered alongside the most relevant 'representative viewpoint' assessed within **Chapter 9** (**Table 17.3**). Where there is no corresponding representative viewpoint, it is considered that an effect interaction would not occur due to the absence of a common receptor. Within the table, the greater individual level of effect is identified (in bold) and thus is considered the worst-case effect interaction level of effect.

Table 17.3: Comparison of receptors considered within Chapter 8 and 9 and corresponding level of residual effect reported

Receptor [a]	Applicable representative viewpoint	Construction noise	Construction vibration	Visual amenity
Residential properties forming the north-eastern edge of Thrapston	Viewpoint 9	Minor Adverse	Negligible	**Moderate Adverse**
Residential properties to the west of the A605, down to the junction with the A14	No corresponding viewpoint	**Major Adverse**	Moderate Adverse	n/a
Springfield Farm	Viewpoint 9	**Major Adverse**	Minor Adverse	Moderate Adverse
Residential properties in the village of Titchmarsh and Polopit	Viewpoints 3, 5 and 6	Negligible	Negligible	**Moderate / Minor adverse (VP 6) and Moderate adverse (VP 3 and 5)**
Residential receptors close to the parts of the local road network that would be used by traffic associated with the construction and operational of the Proposed Scheme	Viewpoints 9	Negligible	n/a	**Moderate Adverse**

a – as described within Chapter 8

Cultural Heritage (Construction Stage)

17.40 An effect interaction has been identified for this receptor group due to the anticipated impacts to both archaeological assets and built heritage assets during the construction stage. This interaction occurs as both aspects contribute to 'cultural heritage' however the direct effect reported within **Chapters 10** and **11** are upon assets that are not related, in that the archaeological assets identified within **Chapter 11** do not contribute to the understanding,

appreciation or setting of the Built Heritage assets considered within **Chapter 10**). Therefore, any effect interaction would be the same as the effect reported for the individual assets identified within the respective Chapter.

Biodiversity (Construction Stage)

17.41 Within the effects identified at the construction stage for the Biodiversity receptor group an effect interaction is considered possible in relation to 'habitats' within the Site and their loss, influencing both the habitats themselves but also species that benefit from the habitat. The single effect on the qualifying species associated with the Upper Nene Valley Gravel Pits SPA and Upper Nene Valley Gravel Pits Ramsar site is discrete from the above and therefore is not considered to be subject to any effect interactions.

17.42 When collectively considering the multiple effects on the habitat within the Site, it is evident that the effects are across two temporal scales. Short-term effects are considered to arise through the principal loss of habitat, however, as considered within **Chapter 10: Biodiversity**, these losses are compensated for in the long-term through the provision of new and/or enhanced habitat incorporated into the Proposed Scheme, explaining the mix of minor adverse and beneficial effects identified. Nonetheless, in line with the methodology set out within **Chapter 10: Biodiversity**, which links the level of effect to the 'significance' (in ecological terms) to the geographical importance of the receptor, any effect interaction is only 'minor' as all habitat (and the species that are utilising them) are considered important at the 'local' (Site) scale. On this basis, the effect interaction is considered to be no worse than minor adverse in the short-term and no better than minor beneficial in the long-term.

Summary of Construction Stage Effect Interactions

17.43 Overall, at the construction stage effect interactions would occur with respect to Population and Human Health receptor group, which would range from Minor Adverse up to Major Adverse, and for the Biodiversity receptor group, where the effect interaction is Minor Adverse in the short-term and (no better than) minor beneficial in the long-term.

Operational Stage Effect Interactions Assessment

Table 17.4: Matrix of effect Interactions (Operation Stage)

Effect	Population and Human Health	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
Chapter 8: Noise and Vibration				
Noise from operations at the Site, including loading and unloading activities within service yards and processes within the buildings and vehicles on site roads	Minor Adverse (Not Significant)			
Noise from road traffic using the Proposed Scheme	Minor Adverse (Not Significant) and Moderate Adverse (Significant) [a]			
Chapter 9: Landscape and Visual				
Changes to Landscape Character			Moderate Neutral (Not Significant) and Major / Moderate to Moderate Adverse (Significant)	
Changes to visual amenity and character	Minor Neutral up to Moderate Neutral			

Effect	Population and Human Health	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
	(Not Significant) and Moderate / Minor up to Major/Moderate Adverse (combination of Significant and Not Significant) [b]			
Chapter 10: Built Heritage				
Change to the significance and setting of heritage assets		Minor to Moderate Adverse (Not Significant) [c]		
Chapter 12: Biodiversity				
Disturbance due to operational stage lighting				Minor Adverse (Not Significant)
Disturbance of qualifying species (of the Upper Nene Valley Gravel Pits SPA and Ramsar site) due to increased vehicular movements, human movements onsite and recreational usage during operational stage				Minor Adverse (Not Significant)
Chapter 14: Socio-Economics				
Total job creation in North Northamptonshire	Moderate Beneficial			

Effect	Population and Human Health	Cultural Heritage (including architectural and archaeological aspects)	Landscape	Biodiversity
	(Significant)			
Employment for residents of North Northamptonshire	Moderate Beneficial (Significant)			
Economic output in North Northamptonshire	Moderate Beneficial (Significant)			
Workforce Expenditure in North Northamptonshire	Minor Beneficial (Not Significant)			

a – Major adverse effects where only identified for receptors on Oundle Road at night-time. All other receptors were determined to be minor adverse.

*b –The assessment of viewpoints within **Chapter 9: Landscape and Visual** identified a range of effects. It should be noted that only a single viewpoint identified a significant effect, at Viewpoint 12. Further details are set out within **Chapter 9: Landscape and Visual**.*

*c – **Chapter 10** identified negligible effects for a number of heritage assets (Grade II listed Buildings in Titchmarsh, focused on the Church of St Mary the Virgin and Grade II listed buildings distributed along the High Street, to the south of Titchmarsh). However, in line with the methodology set out in **Paragraphs 17.7 – 17.12** the negligible effects have not been identified within **Table 17.4**.*

17.44 The following Technical Chapters did not identify any residual effects greater than negligible during the operation stage, thus are not included within **Table 17.4** above:

- **Chapter 6: Transport and Access**;
- **Chapter 7: Air Quality;**
- **Chapter 13: Lighting; and**
- **Chapter 16**: **Climate Change.**

From the residual effects identified, effect interactions were identified for *Population and Human Health* and *Biodiversity* receptor group. The appraisal of effect interactions during the operational stage is considered further below.

Population and Human Health (Operational Stage)

17.45 Effect interactions with respect to Population and Human Health receptor group is not unexpected, given the broadness of this receptor group. The effects interacting upon the receptor group comprise:

- Adverse noise effects generated by on-site operational activities and traffic associated with the operation of the Proposed Scheme;
- Permanent changes to visual amenity and character (assessed across a series of representative viewpoints) due to the addition of the Proposed Scheme within views; and
- Beneficial impacts on socio-economics indicators (jobs, economics output and expenditure in economy) at the North Northamptonshire level.

17.46 As with the assessment of construction stage in-combination effects, it is considered that the beneficial socio-economic effects during the operational stage would not be experienced in the same context of the other operational related effects and therefore unlikely to result in an effect interaction with the other effects noted.

17.47 Similarly, the nature of the remaining effects (noise and visual amenity) have been considered in the same way as completed at the construction stage evaluation where the effect interaction is considered to be the same as the worst level of effect reported for the individual effects as set out in **Table 17.5 below**.

Table 17.5: Comparison of receptors considered within Chapter 8 and 9 and corresponding level of residual effect reported

Receptor [a]	Applicable representative viewpoint	Operational activity noise	Operational traffic noise	Visual amenity
Residential properties forming the north-eastern edge of Thrapston	Viewpoint 9	No worse than Minor Adverse	No worse than Minor Adverse	**Moderate Adverse**
Residential properties to the west of the A605, down to the junction with the A14	No corresponding viewpoint	No worse than Minor Adverse	No worse than Minor Adverse	n/a
Springfield Farm	Viewpoint 9	No worse than Minor Adverse	**Moderate Adverse**	**Moderate Adverse**
Residential properties in the village of	Viewpoints 3, 5 and 6	No worse than Minor Adverse	No worse than Minor Adverse	**Moderate Adverse (VP3), Moderate to**

Receptor [a]	Applicable representative viewpoint	Operational activity noise	Operational traffic noise	Visual amenity
Titchmarsh and Polopit				**Moderate / Minor Adverse (VP5) and Minor Neutral (VP6)**

a – as described within Chapter 8

Biodiversity (Operational Stage)

17.48 The effects identified within **Table 17.4** impact upon different species, with lighting impacting upon bats whilst the other effect is focused on disturbance of qualifying species of the Upper Nene Valley Gravel Pits SPA and Ramsar site, which is not inclusive of bat species. Given that the receptors are not common across the effects there is considered to be no in-combination effect.

Summary of Operational Stage Effect Interactions

17.49 Overall, at the operational stage effect interactions would occur with respect to Population and Human Health receptor group, which would range from Moderate Neutral up to Moderate Adverse.

Assessment of In-combination Effects

17.50 As set out under the Assessment Methodology above, a shortlist of Approved Projects was identified for consideration and agreed with NNC. These have been considered alongside the Proposed Scheme with respect to in-combination effects. The Approved Projects in scope of the cumulative effects assessment are listed in **Table 17.1**.

17.51 As stated within **Paragraphs 17.16 – 17.23** the evaluation of cumulative in-combination effects has been undertaken qualitatively in the most part, with the assessment of some technical topics / effects being informed by quantitative modelling. Further detail and clarifications are set out within the assessments below.

17.52 The assessment of in-combination effects has been set out in line with **Technical Chapter 6 – 16**.

Transport and Access

17.53 As noted within **Paragraphs 17.22 - 17.24** the assessment of effects within **Chapter 6** is based on traffic data that is inclusive of the traffic associated with the identified Approved Projects. On this basis, the cumulative in-combination effect is considered the same as that reported within **Chapter 6**, which were concluded to be negligible and not significant.

Air Quality

17.54 As noted within **Paragraphs 17.22 - 17.24** the assessment of effects within **Chapter 7** is based on traffic data that is inclusive of the traffic associated with the identified Approved Projects. On this basis, the cumulative in-combination effect is considered the same as that reported within **Chapter 7**, which were concluded to be negligible and not significant.

Noise and Vibration

17.55 Approved Project 1 is a predominantly residential scheme and on this basis any in-combination effects with the Proposed Scheme are considered to be limited to traffic related noise effects. As set out in **Paragraph 17.22**, any traffic associated with Approved Project 1 (Land Off Huntingdon And Market Road) is considered to be appropriately captured within the either the baseline or with the future background traffic growth forecasts included with the traffic data. As such, any cumulative effects arising from this Approved Project with the Proposed Scheme is considered to be the same as that reported for the Proposed Scheme in isolation which was Minor Adverse (not significant) up to Moderate Adverse(significant) depending on receptor.

17.56 With respect to Approved Project 3 (Thrapston Market Relocation), although there would be potential in-combination effects with the Proposed Scheme (due to its proximity), relating to all effects identified within **Chapter 8**, given its modest size and scale relative to the Proposed Scheme is it considered that any in-combination effects would be derived in the most part from the Proposed Scheme. On this basis, it is considered that any in-combination effects would have a level of effect and significance the same as the Proposed Scheme in isolation. The assessment in **Chapter 8** identified construction effects of Negligible up to Major Adverse (depending on receptor) and Negligible, Minor Adverse and Moderate Adverse (significant) effects at the operational stage[vi].

[vi] Effects moderate and above were deemed to be Significant.

17.57 As Approved Project 2 (Land East of Halden's Parkway) is a noise generating scheme of a similar [scale] and type to the Proposed Scheme, a greater evaluation of in-combination effects has been undertaken. A review of the noise assessment for Approved Project 2 considers common receptors with those assessed within **Chapter 8: Noise and Vibration** (specifically Polopit[vii]) and common effects with respect to noise arising from construction activities, on-site operational activity noise and noise associated with operational traffic. Each aspect has been considered in turn below.

Construction Noise[viii]

17.58 The noise assessment for Approved Project 2 predicts that construction noise levels at the common receptor will be 52dB or less. The outputs of **Chapter 8** identify that construction noise levels at the common receptor will be 47dB or less and clearly below the 65dB criterion adopted for the assessment, which was determined to result in a negligible magnitude of change.

17.59 Considering the output of each assessment these and combining these construction noise levels (logarithmically summing the two values) will result in a noise level of 53dB, which is less than 65dB; therefore, in-combination a negligible magnitude of change will still occur. Even with the high sensitivity of receptor, this will result in a Negligible effect (no greater than the Proposed Scheme in isolation).

On-site Operational Noise[ix]

17.60 The noise assessment for Approved Project 2 predicts rating levels at the common receptor of 41dB $L_{Ar,1hr}$ during the daytime and 42dB $L_{Ar,15mins}$ at night, for the scenario with all units operational. The rating levels include an acoustic character correction of +3dB; therefore, the daytime and night-time specific sound levels are 38dB $L_{Ar,1hr}$ and 39dB $L_{Ar,15mins}$ respectively. The assessment concludes that the numerical assessment outcomes suggest significant adverse effects; however, once context is considered, which is a requirement of British Standard 4142: 2014+A1: 2019, overall an adverse effect is "*unlikely*".

17.61 The noise assessment for the Proposed Scheme predicted specific sound levels of 27dB $L_{Ar,1hr}$ during the day and evening, 25dB $L_{Ar,15mins}$ during the early night-time, and 27dB $L_{Ar,15mins}$ during the late night-time. An acoustic character correction of +3dB was applied, with the resulting rating levels calculated to be at least 3dB below the background sound level. Therefore, the assessment for the Proposed Scheme concluded that a negligible effect would occur.

17.62 As the specific sound levels due to the Proposed Scheme are more than 10dB below those predicted for Approved Project 2 (Land East of Halden's Parkway), the 'combined' specific sound levels for both schemes operating together will be the same as those predicted for Approved Project 2 (Land East of Halden's Parkway) on its own. This is due to the way the evaluation of noise from multiple sources is determined logarithmically, where a noise level from a source is lower than the noise level from another source by 10dB or more, the

[vii] Within **Chapter 8: Noise and Vibration**, the receptors at Polopit is Receptors 28.
[viii] Effect referred to as "*Noise from construction works and activities*" within Chapter 8
[ix] Effect referred to as "*Noise from operations at the Proposed Scheme, including loading and unloading activities within service yards and process within the buildings*" within Chapter 8.

combined noise level will be equal to the noisier source; the quieter source has no impact on the combined level.

17.63 Therefore, the in-combination effect is considered to be greater than that for the Proposed Scheme in isolation, however, the level and significance of the adverse effects would be due to the operation of Approved Project 2 (Land East of Halden's Parkway). As noted above, the noise assessment for Approved Project 2 (Land East of Halden's Parkway) concluded that the numerical assessment outcomes suggest significant adverse effects; however, once context is considered, which is a requirement of British Standard 4142: 2014+A1: 2019, overall an adverse effect is '*unlikely*'. On this basis the in-combination effects is therefore no greater than the outputs reported for Approved Project 2 (Land East of Halden's Parkway), which was classified as '*unlikely*'.

Off-site Road Traffic[x]

17.64 The noise assessment for Approved Project 2 also considers off-site road traffic noise. There are common receptors adjacent to the local road network that will be used by both schemes.

17.65 Traffic data for Approved Project 2 has been provided separately to the baseline flows and the flows for the Proposed Scheme. This has allowed the in-combination effect to be determined alongside the effect of the Proposed Scheme in isolation (reported within **Chapter 8**). The flows have been provided for the year of full opening for the Proposed Scheme, 2028.

17.66 During the daytime, the combined magnitude of change is predicted to increase from negligible (for the Proposed Scheme in isolation) to large on 'Huntingdon Road West of Site'[xi] (between Islington and Haldens Parkway) and increase from negligible (for the Proposed Scheme in isolation) to medium on Huntingdon Road East of the A605[xi]. Such increases occur as Approved Project 2 is utilising these roads for traffic, whilst the Proposed Scheme does not anticipate usage of these routes.

17.67 There are no sensitive receptors on Huntingdon Road West of Site (between Islington and Haldens Parkway), and Huntingdon Road East of the A605; therefore, the medium and large magnitudes of change will not result in any adverse effects at receptors.

17.68 During the night-time, the combined magnitude of change is predicted to increase to large on Huntingdon Road West of Site (between Islington and Haldens Parkway), and increase to medium on Huntingdon Road East of the A605, compared to a negligible magnitude of change when just considering the Proposed Scheme.

17.69 However, there are no sensitive receptors on Huntingdon Road West of Site (between Islington and Haldens Parkway), and Huntingdon Road East of the A605; therefore, the predicted magnitudes of change will not result in any adverse effects at receptors.

[x] Effect referred to as "*Noise from road traffic using the Proposed Scheme*" within **Chapter 8: Noise and Vibration**.

[xi] Naming based on the highways links assessed as part of **Chapter 6: Transport and Access** and therefore informed assessment within **Chapter 8: Noise and Vibration**.

Summary of Noise and Vibration In-combination Assessment

17.70 Overall, the conclusions of the assessment identified that in-combination effects occur with all Approved Projects, but no in-combination effects will result in an effect that is greater than what is identified for the Proposed Scheme in isolation.

Landscape and Visual

17.71 With respect to Approved Project 1, given that the project is largely constructed and with some parts operational, in-combination effects would largely be focused on in-combination operational effects. When considering the in-combination operational effect, the Proposed Scheme and Approved Project would result in individual changes to their respective 'site level' landscape character and changes to visual amenity and character, with some overlap with those views considered within **Chapter 9**. Nonetheless, the degree of separation between the Proposed Scheme and Approved Project 1 afforded by Halden's Parkway and the wider urban area of Thrapston ensures that both projects are unlikely to be viewed in-combination with the visual context derived from the relative project. Furthermore, the landscape character of the surrounding area for Approved Project is considered to be limited to that of its immediate environ associated with Thrapston. On this basis, it is considered that any in-combination effect would be no greater than that derived for the individual projects in isolation. Effects for the Proposed Scheme ranged from Moderate Adverse up to Major/Moderate Adverse at the construction stage; and Negligible up to Major/Moderate Adverse at the operational stage (depending on receptors)[xii].

17.72 In relation to Approved Project 2, it is clear that there is a greater similarity and parity in terms of the scale of both projects, and one which should be acknowledged in terms of their in-combination impact at both the construction and operational stages. The expansion of commercial development to the north east and east of Thrapston, while in keeping with the pattern of previous commercial development, will clearly result in the loss of a sizeable proportion of the arable landscape that defines the landscape to the north east and east of Thrapston, resulting in a a potentially significant effect in landscape and visual terms. However, given the location of each project and the topography of the Nene Valley it is the case that an appreciation of both Sites will only be evident within views from the landscape to the north east and east.

17.73 A review of the Landscape and Visual assessment submitted in support of Approved Project 2 identified a number of common viewpoints to the north-east and east, which were also considered for the Proposed Scheme (**Table 17.6**). As such, a review of the outputs of the assessment identified for Approved Project 2 alongside those reported for the Proposed Scheme has been undertaken (**Table 17.6**) to interpret the likelihood of a in-combination effect that is greater than the Proposed Scheme in isolation.

[xii] All effects were determined to be significant with the exception of the single negligible effect at the operational stage.

Table 17.6: Viewpoints assessment results for Approved Project 2 and the Proposed Scheme

Approved Project 2 Viewpoint Reference	Approved Project 2 Residual Effect [a]		Proposed Scheme Viewpoint Reference	Proposed scheme Residual Effect	
	Con.	Opp.		Con.	Opp.
5	Moderate Adverse	Moderate / Minor Adverse	4	**Major / Moderate Adverse**	**Moderate Adverse**
7	Minor / Moderate Adverse	Minor Adverse / Negligible	5	**Moderate Adverse**	**Moderate to Moderate / Minor Adverse**
6	**Moderate / Major Adverse**	**Up to Moderate Adverse**	6	Moderate / Minor Adverse	Minor Neutral
8	**Moderate / Major Adverse**	**Moderate / Minor Adverse**	7	Minor Adverse	Minor Neutral

*a – terms identified within **Table 17.6** are taken directly from the reporting submitted for Approved Project 2 and represent reported 'residual effects'.*

17.74 It will be seen from the above table that It is not the case that effects identified within **Table 17.6** combined to create a new effect, but it is evident that for some views the level of effect for Approved Project 2 is considered greater than that reported for the Proposed Scheme, and vice-versa (identified in bold). Therefore, overall, it is considered that during the construction stage the level of effect at viewpoints 6 and 7 (6 and 8 in terms of corresponding viewppoints for Approved Project 2) would be greater than that identified for the Proposed Scheme in isolation, derived from the evaluation for Approved Project 2. Applying the assumption that moderate/major adverse effects are significant, this would mean the in-combination effect would be significant, whilst the Proposed Scheme in isolation was not considered significant. At the operational stage, only viewpoints 6 would again see a greater in-combination level of effect and would likely be significant (applying the same assumption above).

17.75 Approved Project 3 is located adjacent to the Proposed Scheme, although is of such a smaller scale and massing than the Proposed Scheme that it is considered that any in-combination effects between the projects is considered to result principally from the Proposed Scheme. On this basis, it is considered that the in-combination effect (at construction or operational) would be no greater than that identified for the Proposed Scheme in isolation.

Summary of Landscape and Visual In-combination Assessment

17.76 Overall, in-combination with Approved Project 2, the Proposed Scheme would generate greater adverse effects than that derived from the Proposed Scheme in isolation. The cumulative effect is also considered to be significant, whilst the effect for the Proposed

Scheme in isolation was not. It is considered that these cumulative effects would be concentrated to the north and north-east.

Built Heritage

17.77 With respect to Approved Project 1, a review of the original outline planning application indicates that the application was not supported by a Heritage Assessment (or equivalent). Furthermore, the associated officer report and committee reports do not indicate any concerns regarding heritage impacts generated by the project. On this basis it is reasonably assumed that there are no perceived heritage impacts from Approved Project 1 on heritage assets and as such there are no common receptors with the Proposed Scheme. This is considered reasonable given the degree of separation of the Approved Project and the Proposed Scheme and that the assessment within **Chapter 10** is focused on receptors within Titchmarsh. As such, it is considered that there is no perceived in-combination effects.

17.78 Approved Project 2 is located in close proximity to the Proposed Scheme and the application for the project included a Heritage and Archaeology assessment within the supporting ES. The assessment within the ES was supported by a Heritage Appraisal and Setting Assessment. A review of the assessment within the chapter indicates common receptors with the Proposed Scheme, namely *Titchmarsh Castle Scheduled Monument* and *Titchmarsh Conservation Area and listed buildings*.

17.79 The assessment work for Approved Project 2 (specifically the Heritage Appraisal and Setting Assessment) concluded that the project would have '*no impact*' upon the setting of Titchmarsh Castle Scheduled Monument. Furthermore, it states that, with respect to Titchmarsh Conservation Area, that "*it was difficult to identify any key views from heritage assets towards the site….the distance of the development from the village, set within what is a modern agricultural landscape with significant modern infrastructure nearby, is one which preclude the proposed development causing impacts to the Conservation Area which could be considered to cause a negative effect on it or the listed buildings within it.*" On this basis the ES Chapter identified '*significance of effect is considered negligible*' for construction and operational phase.

17.80 Given the conclusions of the assessment work for the Approved Project 2 it is considered that the in-combination effect on the common receptors would be no greater than the level of effect and significance reported for the Proposed Scheme in isolation, which was determined to be moderate adverse for Titchmarsh Conservation Area during both construction and operational stages and minor to moderate adverse and minor adverse for Titchmarsh Castle Moated Site for the construction and operational stages respectively (as reported within **Chapter 10**).

17.81 With respect to Approved Project 3, through a review of NNC planning portal, it does not appear that a 'Heritage Assessment' (or equivalent) was prepared or submitted with the application. Furthermore, the associated officer report and committee reports do not indicate any concerns regarding heritage impacts generated by the project. On this basis it is reasonably assumed that there are no perceived heritage impacts from Approved Project 3 on heritage assets. Nonetheless, given its proximity to the built heritage receptors within Titchmarsh, which are assessed within **Chapter 10**, it is considered that potential common receptors exist. Nonetheless, any in-combination effect is perceived to arise from the Proposed Scheme more so than Approved Project 3, given the comparative scales. On this

basis, the in-combination effect is considered no greater than the level of effect and significance reported for the Proposed Scheme in isolation.

Summary of Built Heritage In-combination Assessment

17.82 In-combination effects only occur with Approved Project 2 and 3, however, the in-combination effects would be no greater than reported for the Proposed Scheme in isolation which was Minor Adverse up to Moderate Adverse during construction and Negligible up to Moderate Adverse during operation (no effects were considered significant).

Archaeology

17.83 In terms of in-combination effects, the archaeological remains affected as a result of the Proposed Scheme (reported within **Chapter 11**) are discrete features or remains of archaeological interest, where no potential in-combination effect has been identified; i.e. no archaeological asset has been identified which is sufficiently extensive that it would be affected by both the Proposed Scheme and any of the identified Approved Projects.

17.84 The consideration of archaeological 'themes'; i.e. the potential of in-combination effects on an identifiable archaeological resource would be too broad, and the evidence base too biased towards those sites which have been evaluated, to draw reliable conclusions. Therefore, it is considered that there would be no in-combination effects on those receptors identified, as a result of the Proposed Scheme and the Approved Projects.

Biodiversity

17.85 With respect to Approved Project 1, given that the project is largely constructed and with some parts operational, in-combination effects would largely be focused on in-combination operational effects. However, given the distance between the Site and the Approved Project the effects on common receptors are considered to be limited and as such any in-combination effects would be no greater than the Proposed Scheme in isolation.

17.86 A similar conclusion is reached with respect to Approved Project 3, purely due to the size and scale of Approved Project 3 in comparison to the Proposed Scheme. In such circumstances, that effects associated with the Proposed Scheme would likely be the principal component of any in-combination effect.

17.87 Approved Project 2 was supported by an Ecological Impact Assessment, contained within the supporting ES provided as part of the application. A review of the application report identified that:

- Construction related residual effects on on-site habitat (that is within the red line boundary of Approved Project 2) would be of "*negligible significance*" due to the implementation of specifics construction measures and the proposed new habitat creation within the site. With respect to hedgerows, it was reported that a residual effect of "*minor positive at below local level*" would occur. All effects were not considered to be significant.

- Construction impacts on Bats, farmland birds (breeding and wintering) and generalist birds (breeding) were considered. The effects related to habitat loss and disturbance arising from construction, whilst the impacts on Bats also considered lighting impacts and interruption to commuting corridors. Mitigation in the form of CEMP measures, phased delivery of the project, and the implementation of new habitat where all

identified. As such residual effects were reported to be ranging from "*minor positive at a local level or below*" up to "*minor adverse at a local level*". All effects were not considered to be significant.

- Operational impacts on the newly created and retained habitat on-site (that is within the red line boundary of Approved Project 2) were considered. The effects related to habitat degradation through increased recreational use and disturbance to species. The assessment concluded "*minor adverse at site level in short-term*" but "*minor positive at site level in the long-term*". These conclusions were informed by the consideration of an appropriate management plan for habitat and "*>10% gain for habitats, hedgerows and rivers, streams and ditches"*. All effects where not considered to be significant.

- Operational impacts on bat arising from change lighting regime were also considered. With the implementation of a "*sensitive lighting regime*" it was determined that the effect would be "*negligible*" and not significant.

17.88 The ecological assessment for Approved Project 2 did also include an evaluation of cumulative effects, including identifying the Proposed Scheme. This evaluation considered loss of farmland in relation to wintering birds (specifically skylark and golden plover).

17.89 Given the information provided in conjunction with Approved Project 2 it has been determined that the potential in-combination effect with the Proposed Scheme could occur for the effects set out below, which includes an evaluation of the in-combination effect.

Habitat loss – farmland birds

17.90 The land-take required to deliver both the Proposed Scheme and Approved Project 2 would result in the loss of extensive areas of arable habitat from the local area. Farmland bird species would therefore likely be particularly vulnerable to cumulative effects as a result of this combined loss of suitable habitat. Both the Proposed Scheme and Approved Project 2 are also large schemes which would have the potential to cause increased disturbance effects to breeding and wintering birds during both construction and operational phases.

17.91 The effect on breeding and wintering farmland birds is therefore considered to be a cumulative, resulting in an indirect, temporary, short to medium term adverse effect which constitutes a minor adverse effect. This in-combination affect is considered not greater than the effect considered for the Proposed Scheme in isolation.

17.92 Inclusion of appropriate areas of habitat creation within the Proposed Scheme will compensate for the loss of habitat for farmland birds and therefore in-combination effect are considered to be temporary.

Disturbance to bats

17.93 The Proposed Scheme and Approved Project 2 could result in disturbance to bats in the operation phase via the combined illumination to linear features (hedgerows) used by bats for commuting and foraging. This could result in the reduced foraging habitat for bats. The Proposed Scheme does, however, include extensive new landscaping both within the site and within off site land under the client's control. A northern landscape buffer and all off site habitat creation will either be unlit or illuminated to less than 0.5 lux. A short term,

temporary loss of foraging habitat could occur, however once new habitats begin to establish the overall value of habitats to bats should increase.

17.94 Unmitigated the potential in-combination cumulative effect on foraging/commuting bats is considered to be direct, permanent, long-term, adverse effect which constitutes a moderate adverse effect.

17.95 Nonetheless, the inclusion of appropriate mitigation measures within the Proposed Schemes in relation to operational lighting and with similar mitigation suggested by Approved Project 2 in isolation also, the in-combination effects is considered to mitigate the in-combination cumulative effect from occurring.

Loss of priority habitat

17.96 There is the potential for an in-combination effect of the local loss of priority habitats (hedgerow) during the construction phase, resulting in a direct, temporary, short to medium term adverse effect which constitutes a minor adverse effect. This in-combination cumulative effect is considered no greater than the effect considered for the Proposed Scheme in isolation.

17.97 New hedgerow creation and enhancement of existing hedgerow will deliver a 1043.67% net gain in hedgerow units as part of Proposed Scheme, whilst Approved Project 2 suggests a 22.76% gain in relation to hedgerow. As such these in-combination cumulative effects will be temporary until the point new habitat provisions are created.

Loss of habitat which support protected and priority species.

17.98 The mosaic of habitats within the Site has the potential to support a range of protected/notable species, including bats, badgers, other terrestrial mammals such as hedgehog and brown hare, reptiles. These habitats will be lost during the construction phase but re-created and enhanced in the operational phase. Similar habitats are present for Approved Project 2.

17.99 The construction phase of the Proposed Scheme and Approved Project 2 could overlap resulting in a direct, temporary, short to medium term adverse effect which constitutes a minor adverse effect. This in-combination cumulative effect is considered no greater than the effect considered for the Proposed Scheme in isolation.

17.100 New hedgerow creation and enhancement associated with the Proposed Scheme will result in approximately 30% net gain in the biodiversity value of the Proposed Scheme. Approved Project 2 reports that an overall net gain in biodiversity of 10.18%. As such these in-combination cumulative effects will be temporary until the point new habitat provisions are created.

Summary of Biodiversity In-combination Effects Assessment

17.101 Overall, in-combination effects are anticipated with all Approved Projects, but for Approved Projects 1 and 3 these would be limited, whilst those with Approved Project 2 would be more prevalent. Nonetheless, the evaluation determines that the cumulative effects for Approved Project 2 and the Proposed Scheme where Minor Adverse (not significant) for all the in-combination effects. This conclusion is no different than for the Proposed Scheme in isolation.

Lighting

17.102 With respect to Approved Project 1, the project is understood to be largely built out and in the most part operational. In terms of in-combination lighting effects, it is considered there is no common receptors with the Proposed Scheme given the distance between the project and the Proposed Scheme, as well as the generally developed nature of the intervening landscaping.

17.103 Approved Project 3 is located adjacent to the Proposed Scheme and (if built out) will include an element of new artificial lighting alongside that of the Proposed Scheme thus generating a potential in-combination effect. Furthermore, simultaneous construction would lead to in-combination effects associated with temporary construction lighting associated with both projects. Nonetheless, given the size and scale of Approved Project 3 in relation to the Proposed Scheme any in-combination effects (during construction or operational stages) are considered to be derived principally from the Proposed Scheme. On this basis, the in-combination effects with Approved Project 3 are not considered to be greater than the Proposed Scheme in isolation (negligible across all effects and stages).

17.104 The environmental statement prepared for Approved Project 2 included an assessment of lighting impacts and included common receptors with the Proposed Scheme, namely those associated with Islington and Titchmarsh. It should be noted that both the assessment for Approved Project 2 and the Proposed Scheme focused on light pollution, considering the components of light spill, glare and sky glow.

17.105 The evaluation of construction effects arising for Approved Project 2 on the common receptors concluded "*negligible significance of effect*" in part due to mitigation adopted as part of a CEMP, similar to the measures suggested for the Proposed Scheme. On the basis that both projects adopt such measures, it is considered for the construction stage that there is limited in-combination effects at the receptors and no worse than that reported for the Proposed Scheme in isolation (negligible across all effects and stages).

17.106 Similar to the above, the operational lighting assessment for Approved Project 2 concluded "*negligible significance of effect*" at the common receptors. Again, this conclusion was reached on the basis that the operational lighting complied with the "lighting strategy" prepared for Approved Project 2. This conclusion is similar in nature to that for the Proposed Scheme, where lighting principles set out within **Chapter 4: Development Specification**, committed to as part of the Proposed Scheme, are considered to limit all instances of light spill, glare and sky glow (collectively taken to contribute to 'light pollution') to a negligible level. Therefore, assuming both projects adopt the respective mitigation measures set out in the lighting assessments, it is considered that the in-combination effect is considered no greater than the Proposed Scheme in isolation (negligible across all effects and stages).

Summary of Lighting In-combination Assessment

17.107 In-combination effects occur with Approved Project 2 and 3, however, overall, the in-combination effect is considered to be the same as that reported for the Proposed Scheme, negligible and not significant.

Socio-Economics

17.108 In terms of Approved Project 1 construction of is already underway (and largely complete) and therefore the potential for in-combination effects during the construction stage with the Proposed Scheme from a Socio-Economics perspective is considered to be very limited. On

this basis it considered that any in-combination effect will not be greater than the level of effect and significance reported for the Proposed Scheme in isolation which identified minor beneficial (not significant) and moderate beneficial (significant) effects.

17.109 In operational terms, the residential-led nature of Approved Project 1 means that the operational stage will effect a different set of socio-economic receptors, which have not been covered by the assessment within **Chapter 14**. Nonetheless, the operational stage of Approved Project 1 has the potential to create employment and economic output should a doctor's surgery come forward, although it is anticipated that employment creation and economic output would be negligible. Once operational, Approved Project 1's resident population will create additional expenditure in North Northamptonshire, adding to the workforce expenditure of the Proposed Scheme but professional judgement is that the in-combination effect on expenditure will remain the same as assessed for the Proposed Scheme, which identified minor beneficial (not significant) and moderate beneficial (significant) effects.

17.110 Construction of Approved Project 3 would result in some level of construction employment, however, given its scale it is considered minimal when considered comparatively (and thus in-combination) with the Proposed Scheme. Furthermore, Approved Project 3 will generate some level of employment. A review of the Committee Report on NNC planning portal indicates that the Approved Project would support 46 full time staff and up to 10 part time staff. Although, when considered in-combination with the Proposed Scheme, this results in an increase in jobs, GVA and workforce expenditure (like the Proposed Scheme will) the scale of this is considered to be minimal in comparison to the Proposed Scheme. Overall, therefore, it is considered that any in-combination effect between the Proposed Scheme and Approved Project 3 would be no greater than that identified for the Proposed Scheme in isolation, which identified minor beneficial (not significant) and moderate beneficial (significant) effects across construction and operational stages.

17.111 With respect to Approved Project 2, there is potential for in-combination effects with the Proposed Scheme during construction and operational stages. The Approved Project will, similar to the Proposed Scheme, create jobs, which in turn will create GVA and workforce expenditure and provide employment for North Northamptonshire residents. Utilising the information provided within the Socio-Economics assessment provided as part of the ES for Approved Project 2, in-combination effects have been evaluated (**Table 17.7**).

Table 17.7: Evaluation of in-combination effects for Socio-economics

Effect	Development Phase	In-combination evaluation
Job creation	Construction	Approved Project 2 identifies 142 direct FTE jobs being generated per annum over the 2-year construction period, plus a further 241 indirect FTE jobs per annum. Combined with the Proposed Scheme, the magnitude remains small in the context of the 7,000 jobs in the construction sector in North Northamptonshire currently.
	Operation	Approved Project 2 identifies 2,727 FTE jobs on-site (gross) of which 1,841 are net direct jobs in the same

Effect	Development Phase	In-combination evaluation
		sectors as being created by the Proposed Scheme. The Proposed Scheme will create 1,567 net direct jobs. Combined, the Proposed Scheme and Approved Project will create 3,408 net direct jobs (plus a further 1,427 indirect and induced jobs). In the context of 42,000 jobs in North Northamptonshire currently in the transport and storage, and manufacturing sectors, the magnitude remains moderate (+8.1%).
Net Employment	Operation	Of the 2,727 FTE jobs created on-site (gross) by Approved Project 2, 2,194 of these jobs are stated as being local jobs for residents of North Northamptonshire. Of the 2,159 FTE jobs created on-site by the Proposed Scheme, 1,690 will provide employment for Northamptonshire residents. The additional employment effect to North Northamptonshire of the Proposed Scheme and Approved Project combined is 4,144 FTE jobs. In the context of resident employment of 44,700 jobs in North Northamptonshire in the transport and storage, and manufacturing sectors currently, the magnitude remains moderate (+9.3%).
Economics Output	Construction	Applying the same GVA assumptions as used for the Proposed Scheme, it is calculated that the Approved Project 2's direct and indirect construction jobs would create a GVA of £13.3m per annum. Combined with the Proposed Scheme, this is equivalent to £66.3m per annum. In the context of annual construction sector GVA of £507.7m per annum in North Northamptonshire, the magnitude of change remains medium.
	Operation	The 1,841 net direct jobs created by Approved Project 2 are stated as creating GVA of £75.2m per annum. The 1,567 net direct jobs created by the Proposed Scheme will create GVA of £66.5m per annum. Combined, the Proposed Scheme and Approved Project's net direct jobs will create GVA of £141.7m per annum. Further GVA will be created by the indirect jobs. In the context of total GVA of £7,007m per annum in North Northamptonshire, the magnitude of change remains small (+2.0%).
Workforce Expenditure	Construction	Applying the same workforce expenditure assumptions as used for the Proposed Scheme, it is calculated that the Approved Project's direct construction workforce would create convenience expenditure of £38,340 per annum. In the context of current workforce

Effect	Development Phase	In-combination evaluation
		expenditure of £48.3m per annum in North Northamptonshire, the magnitude of change remains small.
	Operation	Applying the same workforce expenditure assumptions as used for the Proposed Scheme, it is calculated that Approved Project 2's net direct and indirect operational workforce (2,651 FTE jobs) would create convenience expenditure of £715,770 per annum. The Proposed Scheme will create operational workforce expenditure of £592,500 per annum. Combined, the Proposed Scheme and Approved Project will create operational workforce expenditure of £1.3m per annum. In the context of current workforce expenditure of £48.3m per annum in North Northamptonshire, the magnitude of change remains small (+2.7%).

Values stated are based on the reporting provided within the Socio-Economics Chapter for the ES for Approved Project 2.

Summary of Socio-Economics In-combination Assessment

17.112 In-combination effects with all Approved Projects are identified, although Approved Project 2 results in in-combination effects across all those assessed for the Proposed Scheme. While the in-combination effects do give rise to greater levels of jobs, employment, economic output and expenditure, overall, it is considered for the reasons set out above that they do not result in a change to the level of effects reported for the Proposed Scheme on its own.

Agricultural Land and Soil Resources

17.113 In terms of in-combination effects, the agricultural land and soils within the Site is discrete in nature and therefore none of the Approved Projects results in an in-combination effect with the Proposed Scheme on the agricultural land and soils within the Site. As such the in-combination effect of loss of agricultural land and soils within the Site is considered to be no greater than that considered at the project level and reported in **Chapter 15**.

17.114 There is the potential for indirect in-combination effects associated with a number of the Approved Projects where agricultural land (specifically best and most versatile agricultural land) and soils will be lost and considering the loss of agricultural land and soils in the wider local and regional context.

17.115 Approved Project 1, which is largely constructed and operational is not considered to give rise to any indirect in-combination effects as the agricultural land and soil resource is considered to have been lost already as a result of construction activities. As such, it is considered that only Approved Projects 2 and 3 would contribute to indirect in-combination effects with the Proposed Scheme.

17.116 Approved Project 3 would give rise to the loss of approximately 3.08ha of further agricultural land that is classified as Grade 3[xiii].The available mapping does not specify the specific subgrade (i.e. Grade 3a or 3b), however, given the proximity to the Site it is considered that the Grade 3a agricultural land identified within the Site of the Proposed Scheme would likely extend into Approved Project 3. On this basis, combined loss would be approximately 30.58ha of best and most versatile agricultural land. Using the methodology adopted within **Chapter 15** this loss would equate to a medium magnitude of change (the same as for the Proposed Scheme in isolation) and therefore a major adverse significant effect. Nonetheless, this conclusion is the same as that identified for the Proposed Scheme in isolation.

17.117 A review of the application documents submitted for Approved Project 2 included an 'Agricultural Quality Report' which identified that the site included 17.2h of Grade 3a, 56.9ha of Grade 3b and 2.8ha of 'other'. Therefore, in-combination with the Proposed Scheme there would be a loss of approximately 44.7ha of best and most versatile land and the loss of 78.2ha of lower grade agricultural land (i.e. Grade 3b or lower). Using the methodology adopted within **Chapter 15** these losses would equate to a medium magnitude of change for both categories of agricultural land. On this basis the in-combination effect would be Major Adverse significant effect with respect to best and most versatile agricultural land and Minor adverse (not significant) effect with respect to lower grade agricultural land. These conclusions are no different to those effects reported for the Proposed Scheme in isolation.

Summary of Agricultural Land In-combination assessment

17.118 In-combination effects would occur with Approved Projects 2 and 3, however, although more agricultural land will be lost (both in terms of best and most versatile and lower grades) the level of effect for the in-combination effect does not exceed what was identified for the Proposed Scheme in isolation..

Climate Change

17.119 The climatic system, the receptor assessed in **Chapter 16**, is not geographically constrained and as such all projects result in some level of effect on the climate, even where negligible in isolation (such as the Proposed Scheme). As such in-combination effects are inevitable, both with the identified Approved Projects and others not identified within the preliminary search and identification of Approved Projects. Furthermore, such effects occur across the entire construction and operational phase and therefore not specific to timescales. On this basis, it is considered that the in-combination effect with respect to Climate Change is greater than identified at the project level, although this effect is not able to be quantified due to the absence of GHG emissions information available with respect to Approved Project 2.

Off-Site Utilities Upgrades

17.120 In determining the potential in-combination effects arising from the Proposed Scheme and off-site utilises upgrade works (limited to the new electricity and water connections), a similar process of evaluation has been undertaken as to that adopted for the assessment of in-combination effects. As such, it has been necessary to establish the presence of a common receptor(s) with the Proposed Scheme before further evaluation is undertaken.

[xiii] Based on agricultural land classification defined on Magic Map access via https://magic.defra.gov.uk/magicmap.aspx

17.121 In terms of the off-site utilities works required, as noted already within **Paragraphs 17.27 – 17.29**, specific details of the proposed upgrade works are subject to further engagement and investigation works by the relevant DNO's and at this stage, therefore, informed by initial enquiries and discussions with them.

17.122 It is assumed that all works being undertaken by the relevant DNOs or appointed third party specialist utilities engineering company would be done so in line with best practice measures and additional standard measures (i.e., adopted on similar types of works undertaken regularly by the DNOs) to avoid and reduce nuisance and disturbance to nearby receptors. As such, effects arising from the works in isolation would, although notable, not be consider significant effects, especially as these works normally occur under permitted development rights and without the need for environmental assessment works.

17.123 With respect to the proposed electricity connection works, the routing of new cabling between the Site and Thrapston Primary sub-station has been assumed to follow Kettering Road, Bridge Street, High Street, Huntingdon Road and north no the A605[xiv]. Such routing is considered to include an element of directional drilling between Kettering Road and Bridge Street/High Street, owing to the construction of the existing Bridge Street bridge. The direction drilling would likely extend below the River Nene, over which the existing bridge passes. On this basis, it is assumed that the electricity connection works would comprise the laying of cable within the highways boundary, which would be laid in section, traversing the assumed connection route. This would likely include the excavation/cutting for cable trench, cable laying followed by reinstatement of highways surface. Such works would require partial/full lane closures (with the potential for supporting signalised flow control) to install cabling. The proposed connection between Thrapston Primary Sub-Station and Irthlingborough BSP, although a notable distance in its entirety, it is not expected to impact a common receptor with the Proposed Scheme so as to give rise to an in-combination effects. On this basis, this element of the works has been discounted for further evaluation. This is not to say the works would not have some degree of effect, but as stated within **Paragraph 17.123** it is assumed that the works would occur in line with normal practice for such works.

17.124 The proposed electricity connection works would give rise to noise effects, which have the potential to be experienced in-combination with the Proposed Scheme with construction works proposed as part of the A605 highways works. Other receptors identified within **Chapter 8: Noise and Vibration** are considered unlikely to be exposed to the works required for the connection and therefore common receptors are limited to those adjacent to the A605. Conversely, noise sensitive receptors located along the remainder of the assumed connection routing were not considered to be susceptible to noise effects arising from the Proposed Scheme and on this basis no in-combination effect is expected.

17.125 **Chapter 8** identified the works associated with the A605 would result in a Major Adverse and significant effect at the construction stage, albeit these effects would be temporary in nature. It is envisaged that cable routing works would be undertaken concurrently with works for the Proposed Scheme on the A605 to minimise inconvenience and disruption. On this basis, and considering the nature of the proposed works, it is not considered that their concurrent execution would generate material additional noise not already accounted for as part of the assessment of the Proposed Scheme in isolation. On that basis, it is considered

[xiv] This is assumed to be the most 'sensible routing' following local highways. However, the final route would be determined by Western Power Distribution.

that no additional or greater in-combination effect over and above that reported for the Proposed Scheme in isolation is expected.

17.126 In addition to the noise effects, the laying of the new connection would have an effect on road users along the proposed cable route. The assessment of construction traffic effects arising from the Proposed Scheme was scoped out of the assessment within the ES as part of the EIA Scoping Report (**Appendix 1.2**). This conclusion was based on the assessment that construction traffic would be limited in comparison to existing baseline traffic flows, as well as the specific routing of the construction along the A605 and A14. It is considered that the proposed connection works would be generating an element of construction traffic, but additional movements attributed to the connection works are considered to be nominal and therefore unnoticeable against existing baseline traffic flows to give rise to notable effects. Nonetheless, the works to install the new cable would cause disruption and disturbance to road users and those receptors along the connection route. However, the Proposed Scheme, except for works at the A605, would not combine with these effects such to create an in-combination effect, rather the effects associated with the connection works would be experienced in isolation from those effects occurring as a result of the Proposed Scheme. For those works along the A605, again it is reasonably envisaged that such connection works would occur concurrently with the works required for the Proposed Scheme and on this basis it is considered that they would not give rise to a notable extension of any effects already noted for the Proposed Scheme in isolation, which for construction traffic effects purposes where all considered as not likely significant and thus excluded from assessment within the ES.

17.127 The proposed water utilities connection extends along the A605, where works again would likely be similar to those considered above for the proposed electricity connection, albeit for a short extent.

17.128 Overall, for the reasons set out above, and based on the reasonable assumptions adopted for this analysis, it is considered that the proposed off-site utility works would have some level of in-combination effect with the Proposed Scheme, but that this would not lead to an overall effect greater than that assessed as part of the Proposed Scheme in isolation.

Summary of Assessment of Cumulative Effects

17.129 An assessment of cumulative effects has been completed considering both effect interactions and in-combination cumulative effects. A summary of the outputs of the assessment for each type of cumulative effect is set out below.

Assessment of Effect Interactions

17.130 The assessment of effect interactions across the construction and operational stage considered effects under 'receptor groups', in line with the methodology set out in **Paragraphs 17.7 – 17.12**.

17.131 During construction potential effect interactions were identified for the *Population and Human Health*, *Cultural Heritage* and *Biodiversity* receptor groups. At the operational stage potential effect interactions where identified *Population and Human Health* and *Biodiversity* receptor groups for the A summary of the outputs of each evaluation is provide within **Table 17.8**.

Table 17.8: Summary of effect interactions evaluation

Receptor Group	Construction Stage	Operational Stage
Population and Human Health	Effect interactions were identified with respect to noise, vibration and changes to visual amenity arising from construction activities in proximity to receptors. It was concluded that the way in which these effects are experienced by the receptor (i.e. differently) the effect interaction was equivalent to the 'greatest' individual level of effect.	The evaluation identified effect interactions with respect to noise from operational activities, noise associated with operational traffic and changes to visual amenity. The same conclusion was reached as that for the construction stage, where the effect interaction was equivalent to the 'greatest' individual level of effect
Cultural Heritage	Effect interactions were discounted as the archaeological assets effected by the Proposed Scheme where not considered to contribute to the setting or understanding of the built heritage assets considered with the assessment, these receptors, and effects were discrete from one-another.	n/a
Biodiversity	Effect interactions were identified in relation to habitat, both in terms of direct loss of habitat and how the habitat supports specifics species. Overall, it was concluded the level of effect would be minor, which equates to the level of effect reported for each effect in isolation. This conclusion was derived given the 'local significance' of the habitats which in line with the methodology section within Chapter 10 equate to a minor level of effect.	Effect interactions where discounted as the effects and receptors were considered discrete from one another.

Assessment of In-combination Effects

17.132 The assessment of in-combination effects considered three Approved Projects on a technical topic by topic basis (i.e. **Technical Chapters 6 – 16**). A summary of the evaluation of in-combination effects is provided within **Table 17.8**, which identifies:

- No in-combination effect was identified (denoted by ×);

- In-combination effects identified but determined to be no greater level of effect or significance than that reported for the Proposed Scheme in isolation (denoted by =); and

- In-combination effect identified and determined to be a level of effect or significance greater than the Proposed Scheme in isolation (denoted by >).

- Where a greater in-combination effect is identified and is considered significant, this has been highlighted in **bold**.

Table 17.9: Summary of in-combination effects

Technical Topic	Approved Project 1	Approved Project 2	Approved Project 3
Transport and Access	=	=	=
Air Quality	=	=	=
Noise and Vibration	=	=	=
Landscape and Visual	=	**>**	=
Built Heritage	×	=	=
Archaeology	×	×	×
Biodiversity	=	=	=
Lighting	×	=	=
Socio-Economics	=	=	=
Agricultural Land and Soil Resources	×	=	=
Climate Change	> *	> *	> *

** the in-combination effect is considered greater but is not quantifiable for specific reasons.*

17.133 As is evident from **Table 17.9** in-combination effects greater than the Proposed Scheme in isolation were identified for *Landscape and Visual* and *Climate Change*. The in-combination effects for Noise and Vibration and Landscape and Visual where deemed to give rise to new significant effects not reported for the Proposed Scheme alone.

17.134 In-combination effects greater than the Proposed Scheme in isolation were identified with respect to Landscape and Visual when considering Approved Project 2 and the Proposed Scheme cumulatively, specifically for receptors to the east, determined through comparison of visual impacts presented for the Proposed Scheme and Approved Project 2. It was noted that for some viewpoint locations the level of effect for Approved Project 2 was greater than that reported for the Proposed Scheme, and vice-versa. In instances where the Proposed Scheme generated the highest effect, the in-combination effect was not taken to be greater than the Proposed Scheme in isolation. Overall, it was concluded that during the construction stage the level of effect at Viewpoints 6 and 7[xv] would be greater than that

[xv] View from Public Footpath NZ8#1 to the east of the Application Site; and View from the unnamed lane linking the A14 with Polopit on the outskirts of Titchmarsh respectively

identified for the Proposed Scheme in isolation, derived from the evaluation for Approved Project 2. This in-combination effect would be significant a change from the not significant effect for the Proposed Scheme on its own. At the operational stage, viewpoints 6 and 7 would again see a greater in-combination level of effect, however, only for viewpoint 6 would the in-combination effect be likely significant.

17.135 The identification of a greater in-combination effect with respect to Climate Change is expected, as emissions from multiple projects will always be greater than for a project in isolation. However, although greater it is not possible to confirm the order of magnitude of change in-combination effect due to the absence of GHG emissions information for Approved Project 2.

Assessment of Off-site Utilities Upgrades

17.136 The in-combination evaluation of off-site utilise upgrades, specifically for electricity and water connections, shared common receptors near to the A605, which would experience some level of in-combination effects in relation to noise and traffic (construction stage). However, through a qualitative assessment of potential in-combination effects of those proposed works, which it is assumed would likely occur concurrently with the relevant construction works for the Proposed Scheme, it is considered that additional in-combination effects of the utilities connections works in cumulation with the effects of the Proposed Scheme would likely be nominal in comparison to the effects from the Proposed Scheme at the construction stage in isolation. On this basis, it is not anticipated that there will be in-combination construction stage effects arising from the proposed off-site utilities upgrades that would be greater than that already identified for the Proposed Scheme on its own.

References

[1] The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended) SI 2017/517. Available at: http://www.legislation.gov.uk/uksi/2017/571/contents/made [Accessed: 29/09/2020].

[2] Ministry of Housing, Communities and Local Government (Online). Planning Practice Guidance Environmental Impact Assessment. Available at: https://www.gov.uk/guidance/environmental-impact-assessment#the-purpose-of-environmental-impact-assessment [Accessed: 07/04/2020].