

14 Summary of mitigation and residual effects

14.1 Mitigation and residual effects

- 14.1.1 This final chapter provides a summary of the mitigation measures that are proposed, and an outline of the residual impacts that are predicted after taking these into account. This chapter does not provide a summary of the entire ES, a non-technical summary is available separately.
- 14.1.2 The summary of mitigation measures is provided to assist the planning authority formulate conditions and legal agreements to ensure that the measures considered in the ES are implemented, if it is decided that consent should be granted. The mitigation included in the scheme can be categorised into two types: 'inherent mitigation' and 'additional mitigation'.
- 14.1.3 Inherent mitigation is generally a core part of the scheme which is incorporated into the EIA parameter plans and planning application drawings. If consent is granted, it is likely to include a condition ensuring that the development takes place in accordance with these parameters and therefore secures the implementation of the inherent measures.
- 14.1.4 Additional mitigation tends to be more detailed and is not generally capable of being shown in the assessment parameter plans and other planning application drawings. It is this additional mitigation that is detailed below.

14.2 Soil Management Plan

- 14.2.1 A Soil Management Plan that accords with The Construction Code of Practice for the Sustainable Use of Soils on Construction Sites will outline good practice for soil handling, and will be submitted pursuant to a planning condition for approval. This will outline good practice for soil handling during the construction period, including minimising the handling and movement of heavier textured soils in order to avoid subsequent problems of compaction and smearing, and consideration will need to be given to means of improving the drainage of these soils for their proposed use as recreational and garden media. It will confirm the soil types; the most appropriate re-use for the different types of soils; and the proposed methods for handling, storing and replacing soils on-site.

14.3 Landscape and visual

- 14.3.1 In terms of inherent mitigation, the parameter plans and application drawings show that the scheme takes a landscape led approach to its layout, incorporating green corridors of public open space adjacent to all of its boundaries as well as through the centre of the Site adjacent to existing hedgerows. All components of the urban realm (school, housing, community and retail) would be set within an extensive network of green spaces, ensuring the new landscape is both permeable for wildlife and can also be readily traversed by pedestrians and cyclists within an attractive and tranquil environment.
- 14.3.2 In terms of 'additional mitigation', landscape proposals have been set out in the Green Infrastructure Parameter Plan (Figure 3.3), Composite Phase 1 Site Layout (Figure 3.6), Illustrative Masterplan (Figure 3.15) and Illustrative Green Infrastructure Strategy (Figure 3.16) and provided for the entire Site. These include:
- Retention of the network of mature trees and hedgerows and further supplementing and

reinforcing these networks with new planting.

- Compensation for the loss of a small area of native woodland at the Long Chaulden entrance with a larger area of new woodland on the Site's western boundary.
- Chalk Grassland: Informal open space would incorporate significant swathes of chalk grassland, creating a chalk downland feel, with occasional scattered shrubs/trees.
- Reptile Receptor Area: An area of open chalk grassland on the western side of Pouchen Park would be retained as a reptile receptor area. This would be managed so no more than 50% of the entire grassland would be cut in any one year and will be informally demarked with a timber knee rail, and presented as a 'nature conservation area' to justify its likely less well kept look.
- Dry Attenuation Basins (south): Dry basins in the southern part of the Site would be managed as chalk grassland, and sown with a calcareous wildflower/grass mix, with chalky subsoils exposed and arisings used to create chalk/'butterfly' banks. No additional topsoil or organics would be added. Any wetter areas would be allowed to develop into calcareous fen/wet flush habitats.
- Dry Attenuation Basins (north): In the northern part of the Site, where chalky substrates are not present a similar approach would be taken, but with a wildflower mix suited to the conditions.
- SUDS-Conveyance features: Swales would be treated as attenuation basins, with wet wildflower seed mixes sown. The ditches in chalky areas would be allowed to develop into fen/wet flush habitats where possible.
- Wet Attenuation Basins: The two attenuation basins at the Long Chaulden entrance would be designed to include a variety of vegetation and habitats, including submerged/emergent and marginal plant species at the edges and wet grassland/marsh within the freeboard areas. The detailed design of the pond could also include a 'shoal' of shallower land at the eastern end and areas of deeper water to prevent invasion by reeds and bulrushes for example.
- Retained hedges/treelines: These key wildlife corridors will include reinforcing with underplanting and the provision of long grass/wildflower margins where possible. These scalloped margins will create an 'ecotone' gradient, grading from the existing hedgerow through low shrubs, ruderals to long grassland (woodland edge/hedge seed mix). Hedgerows will be trimmed and laid as necessary to ensure the good long-term health of the features. Adjacent to the Chiltern Way, the hedgerow will be reduced to approximately 1.2m in height to enhance natural surveillance and strengthen the hedgerow structure.
- Woodland Mitigation Area: An area of new woodland will be provided adjacent to the Site's western boundary to compensate for the loss of a small area of existing woodland close to the Long Chaulden frontage. This will be larger than the area that will be lost.
- Opportunity for community orchard within the Pouchen Park.
- Opportunity for community food-growing garden adjacent to Community Hub.

Residual Landscape Effects

- 14.3.3 The proposals will have an indirect 'negligible adverse' effect on the Chilterns AONB, given that the only changes will be to an extremely limited view of the AONB when viewed in conjunction with the Site from restricted parts of the Sheethanger Common area.
- 14.3.4 Effects on the landscape character of both the Lower Bulbourne Valley and Little Heaths Uplands will be 'minor adverse'. Effects on the Chilterns National Landscape Character Area will be 'negligible adverse' reflecting the small proportion of the area that will be changing, the

relative weakness of the existing landscape character in this area and the net enhancements that will be occurring within the green space areas. Effects on the 'land use' of the Site are judged to remain 'moderate adverse' reflecting the loss of agricultural land. Effects on the Site's landform would be 'minor adverse' as the localised earthworks will be integrated with the wider landscape by established vegetation.

- 14.3.5 The footpaths crossing the Site will experience 'moderate beneficial' effects on their path surfacing as the setting of the paths will have changed. However, whilst from the current open views will change to views that include new housing frontages with new green corridors in the foreground, the changes need not necessarily be negative, and are therefore 'neutral'.
- 14.3.6 With regards to trees and vegetation, the additional mitigation planting and open space will compensate appropriately for the removal of the previous trees, having an overall 'neutral' effect.

Residual Visual Effects

- 14.3.7 The new planting will make a significant difference to the landscape effects of the development and after 15 years it will be sufficiently tall to provide good screening. The retention and supplementing of the east-west orientated hedgerows will help the integration of the new buildings with the wider landscape.
- 14.3.8 Moderate adverse effects will be limited to views from Little Hay Golf Complex and Westbrook Hay to the south of the Site, where the southern and central parts of the development will form a clear element within a wider panoramic view which already includes extensive areas of Hemel Hempstead as well as some elements of transport infrastructure. Closer to the Site, residents on the eastern side of Pouchen End and within Middle Hill may also experience 'moderate adverse' effects with views of new housing beyond their rear gardens.
- 14.3.9 Other residential receptors and road users surrounding the Site boundaries; including residents of Champion Road, Furze Road, Lindlings, Musk Hill, Broom Hill, Rowcroft and Long Chaulden; will generally experience 'neutral' changes to their views, with occasional 'minor adverse' effects where views of new housing are clearer. Residents immediately to the north-east of the Site, including Newlands Road, The Meadows, The Avenue, Poppy Close and Squirrel Chase will experience 'minor adverse' effects as views will be limited to glimpses through the existing screening of mature trees along Footpath 20 (Chiltern Way).

Receptor	Mitigation/ Enhancement measures	Residual Effect
CONSTRUCTION (ALL EFFECTS ARE ADVERSE, TEMPORARY AND LOCAL UNLESS OTHERWISE STATED)		
Landscape Receptors		
Chilterns AONB	None	Indirect negligible adverse
NCA 110 Chilterns	None	Minor adverse
Lower Bulbourne Valley	None	Minor adverse
Little Heaths Uplands	None	Minor adverse
Site landform	None	Moderate adverse
Site land-use	None	Moderate adverse
Footpath 20 (Chiltern Way)	None	Indirect Moderate adverse
Footpath 21	None	Indirect Major adverse
Footpath 91	None	Indirect Moderate adverse
Site trees: Category A	None	No change

Receptor	Mitigation/ Enhancement measures	Residual Effect
Site trees: Category B	None	Moderate adverse
Site trees: Category C & unclassified	None	Moderate adverse
Visual Receptors		
Users of Footpath 21 adjacent to northern boundary of site	None	Major adverse
Users of Footpath 91 connecting Pouchen End Lane with Chaulden	None	Moderate adverse
From the Chiltern Way adjacent to the site's eastern boundary.	None	Major adverse
Users of Pouchen End Lane to the north of the site	None	Moderate adverse
Users of Pouchen End Lane to west of site	None	Moderate adverse
Residents of eastern side of Pouchen End	None	Major - Moderate adverse
Users of Chaulden Lane	None	Moderate adverse
Users of Little Hay Golf Complex, including Hertfordshire Way	None	Moderate adverse
Train users on West Coast Mainline route to south of site	None	Moderate adverse
Walkers on short stretch of Grand Union Canal Walk to south-east of site	None	Moderate adverse
Users of the A4251 London Road to south of site	None	Minor adverse
Walkers at Westbrook Hay	None	Minor adverse
Walkers at Sheethanger Common	None	Moderate adverse
Residents of Felden and Box Lane areas	None	Moderate adverse
Users of the A41 close to Apsley	None	Negligible adverse
Residents of Campion Road, Furze Road, Lindlings, Musk Hill adjacent to site boundary	None	Moderate adverse
Users of Campion Road, Furze Road, Lindlings, Musk Hill adjacent to site boundary	None	Minor adverse
Residents of Broom Hill, Rowcroft, Middle Hill adjacent to site boundary	None	Moderate adverse
Users of Broom Hill, Rowcroft, Middle Hill adjacent to site boundary	None	Minor adverse
Residents of Long Chaulden adjacent to site boundary	None	Moderate adverse
Users of Long Chaulden	None	Minor adverse
Residents of Newlands Road, The Meadows, The Avenue, Poppy Close & Squirrel Chase adjacent to site boundary	None	Minor – Moderate adverse
Users of Newlands Road, The Meadows, The Avenue, Poppy Close & Squirrel Chase	None	Minor adverse
OPERATION (ALL EFFECTS ADVERSE, PERMANENT AND LOCAL UNLESS OTHERWISE STATED)		

Receptor	Mitigation/ Enhancement measures	Residual Effect
Landscape Receptors		
Chilterns AONB	The landscape and GI framework will have established however the net benefits will be minimal given the initial negligible magnitude of change.	Indirect negligible adverse on setting
NCA 110 Chilterns	The landscape and GI framework will have established, lessening the magnitude of change.	Negligible adverse
Lower Bulbourne Valley	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Little Heaths Uplands	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Site landform	The landscape and GI framework will have established, helping to screen changes in levels	Minor adverse
Site land-use	N/A	Moderate adverse
Footpath 20 (Chiltern Way)	The landscape and GI framework will have established, enhancing effects on the setting of the path.	Moderate beneficial effect on hedgerow management & path surfacing. Neutral effect on setting.
Footpath 21	The landscape and GI framework will have established, enhancing effects on the setting of the path.	Moderate beneficial effect on hedgerow management & path surfacing. Indirect neutral effect on setting.
Footpath 91	The landscape and GI framework will have established, enhancing effects on the setting of the path.	Moderate beneficial effect on path surfacing. Neutral effect on setting.
Site trees: Category A	The landscape and GI framework will have established, lessening the magnitude of change.	No change
Site trees and hedgerows: Category B	The landscape and GI framework will have established, lessening the magnitude of change.	Negligible beneficial
Site trees and hedgerows: Category C	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Visual Receptors		
Users of Footpath 21 adjacent to northern boundary of site	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Users of Footpath 91 connecting Pouchen End Lane with Chaulden	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
From Footpath 20 (Chiltern Way) adjacent to the site's eastern boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Users of Pouchen End Lane to the north of the site	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Users of Pouchen End Lane to west of site	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Residents of eastern side of Pouchen End	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral – Low adverse

Receptor	Mitigation/ Enhancement measures	Residual Effect
Users of Chaulden Lane	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Users of Little Hay Golf Complex, including Hertfordshire Way	The landscape and GI framework will have established, lessening the magnitude of change.	Moderate adverse
Train users on short stretch of West Coast Mainline route to south of site	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Walkers on short stretch of Grand Union Canal Walk to south-east of site	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Users of the A4251 London Road to south of site	The landscape and GI framework will have established, lessening the magnitude of change.	Negligible adverse
Walkers at Westbrook Hay	The landscape and GI framework will have established, lessening the magnitude of change.	Moderate adverse
Walkers at Sheethanger Common	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Residents of Felden and Box Lane areas	The landscape and GI framework will have established, lessening the magnitude of change.	Minor adverse
Users of the A41 close to Apsley	The landscape and GI framework will have established, lessening the magnitude of change.	Negligible adverse
Residents of Campion Road, Furze Road, Lindlings, Musk Hill adjacent to site boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Users of Campion Road, Furze Road, Lindlings, Musk Hill adjacent to site boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Residents of Broom Hill, Rowcroft, Middle Hill adjacent to site boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral - Minor adverse
Users of Broom Hill, Rowcroft, Middle Hill adjacent to site boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral - Minor adverse
Residents of Long Chaulden adjacent to site boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Users of Long Chaulden	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral
Residents of Newlands Road, The Meadows, The Avenue, Poppy Close & Squirrel Chase adjacent to site boundary	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral - Minor adverse (site entrance)
Users of Newlands Road, The Meadows, The Avenue, Poppy Close & Squirrel Chase	The landscape and GI framework will have established, lessening the magnitude of change.	Neutral - Minor adverse (site entrance)

14.4 Ecology and biodiversity

14.4.1 During the construction phase of the proposed development mitigation measures would relate to the adoption of best practice construction methods intended to avoid or minimise potential for fuel and chemical spills which could affect ecological receptors. These measures would be set

out in the Construction Environmental Management Plan (CEMP).

14.4.2 Enhancement measures are incorporated into the scheme design which include; additional woodland edge landscaping and management; and enhanced wildlife corridors through the Site. These measures would be set out in a Landscape and Ecology Management Plan (LEMP).

14.4.3 Within the development, the mitigation measures and residual effects on the habitats and species assessed are set out below. None of these are considered to be significant in terms of this assessment.

Receptor	Mitigation / enhancement	Residual effect
Chilterns Beechwoods SAC	None required	No significant adverse effects
Roughdwon Common SSSI	None required	No significant adverse effects
Shrubhill Common LNR / Shrubhill Common North LWS	At the construction phase, mitigation measures include the minimisation of litter, dust, noise and vibration through a Construction Environmental Management Plan (CEMP). At operational phase, implementation of sensitive lighting regime and provision of open space, play space and pedestrian/cycle leisure routes on Site.	No significant adverse effects
Neutral Semi- Improved Grassland	Enhance retained grassland in the south of the Site and surrounding the new attenuation basin in the east, to create swathes of species-rich chalk grassland with occasional scattered shrubs / trees implemented through a LEMP.	No significant adverse effects
Hedgerow Network	Strengthening/buffering of retained corridors with new planting implemented through LEMP to establish grassland margins, grading to native shrub and trees. Compliance with standard arboricultural practice.	No significant adverse effects
Woodland, Plantation and Mature Trees	Extensive new tree planting including of c0.5 ha of new woodland planting with appropriate management regime through LEMP. Compliance with standard arboricultural practice. Measures to protect tree ref 120.	No significant adverse effects
Bats	At the construction phase, restriction of night time working. Enhancement of navigational corridors and creation of foraging areas through LEMP including: <ul style="list-style-type: none"> 4.3ha of semi-improved grassland retained and enhanced in the south west of the Site together with tree planting to create a parkland habitat attractive to a variety of invertebrates. Planting adjacent to hedgerows to establish an ecotone of varying habitat structure and characteristics which will enhance the foraging potential of this habitat type. SuDS measures of wet basins, attenuation basins and swales will include ecological enhancements to improve bat foraging potential. A community orchard could be created in the south of the Site, attracting a variety of insects, such as moths, thereby providing foraging opportunities for bats. 	No significant adverse effects

Receptor	Mitigation / enhancement	Residual effect
	<ul style="list-style-type: none"> • Woodland planting to the north of existing hedgerow H13 to encourage a diverse range and rich assemblage of invertebrates thereby enhancing foraging potential for bats. • The provision / enhancement / creation of freshwater, grassland, woodland and linear features at the Site will ensure bats can continue to make use of the Site for foraging and commuting throughout the operational phase of the development. <p>Sensitive lighting scheme to be adopted at the operational stage to limit disturbance to foraging/commuting bats</p>	
Breeding Birds	<p>Any clearance of potential nesting habitat will be undertaken outside of the bird nesting season or immediately following confirmation by a suitably qualified ecologist that no active nests are present.</p> <p>LEMP to provide extensive planting of native trees throughout the Site including scattered trees, woodland and an orchard, thereby providing extensive foraging and nesting habitat for birds.</p> <p>LEMP to provide for scrub and extensive tree planting immediately adjacent to boundary hedgerows along the majority of the northern, western and southern Site boundaries, thereby screening these hedgerows from the development and the impacts of human disturbance and, in addition, providing adequate cover suitable for the more elusive bullfinch and yellowhammer.</p> <p>LEMP to discourage public access within the retained section of semi-natural woodland.</p>	No significant adverse effects (accepting that breeding bird assemblage will change from farmland species, but that overall diversity is retained)
Invertebrates	<p>Various habitat creation measures (pond, grassland)</p> <p>Sensitive lighting scheme to be adopted at the operational stage</p>	No significant adverse effects (some limited gains for invertebrate opportunities)
Badger	<p>Obtain a licence from Natural England where necessary to ensure construction works undertaken in close proximity to the setts at the Site is lawful.</p> <p>LEMP to include provision and management of areas of short mown grassland within public open space to increase earthworm foraging resource for badgers. Retention and management of 4.3ha of semi-improved grassland in the south-west of the Site.</p> <p>LEMP to provide deciduous woodland north of existing hedgerow H13 to provide high quality foraging habitat for badgers and a community orchard in the south of the Site.</p> <p>A sensitive lighting scheme to be provided within the vicinity of badger setts, including landscape features which are likely to function as 'badger corridors'.</p> <p>LEMP to provide protective shrubs i.e. prickly / thorny species planted around the retained Badgers setts to deter interference from dogs and local residents.</p>	No legal infringement.

Receptor	Mitigation / enhancement	Residual effect
Slow-worm	<p>During construction, a 60 day in-situ translocation exercise will be implemented to minimise the risk of killing and/or injury of slow-worm.</p> <p>Provision of enhanced foraging/sheltering habitat and dispersal corridors</p> <p>At the operational phase, appropriate management of the receptor area will be set out within the LEMP.</p>	No legal infringement.

14.5 Archaeology and Heritage

14.5.1 The archaeological potential of the Site was assessed using the findings of a desk-based assessment, geophysical survey and historic landscape survey and trial trenching. No archaeological heritage assets have been identified to date that would be considered as of more than local importance. The type of archaeology identified in the evaluation and the potential for remaining archaeology is highly unlikely to be of more than county importance at most.

14.5.2 The Site is known to contain a number of non-designated archaeological assets, which have been identified as likely to experience effects ranging from minor to moderate adverse as a result of the construction of the proposed development. Mitigation in the form of a programme of archaeological works comprising a strip, map and sample exercise for those areas identified in figure 8.3 is proposed, the scope of which has been agreed in principle with the Local Authority's archaeological advisor. This can be implemented by planning condition.

14.5.3 Owing to the separation distance, topography and the proposed additional landscaping there will be no direct effects on built heritage assets, and no additional mitigation is required.

14.5.4 The mitigation residual effects are tabulated below. None of the impacts are significant in terms of the assessment.

Receptor	Residual Effect
Construction	
Non designated buried archaeological features	Minor
Operation	
Built heritage assets: Pouchen End (Grade II) Winkwell Conservation Area	Neutral
Undesignated assets: Former stables and Barns east of Pouchen End Lane; Field End Farm; Grand Union Canal, The West Coast Mainline (Formerly London and Birmingham Railway)	Neutral / Negligible

14.6 Transport and Access

14.6.1 Inherent mitigation is not detailed here but in summary this includes:

- Safe points of vehicular access to the proposed development;
- The opportunity for many day to day journeys to be contained within the Site without impacting on the existing external highway network;
- Development layouts which maximise the potential for 'walkable' neighbourhoods where

walking, cycling and public transport are the first choice as a mode of transport; and,

- Car parking arranged on the Site to suit the housing type and secure cycle storage in dedicated stores, garages and/or within gardens.

14.6.2 In terms of additional mitigation, the Construction and Environment Management Plan would include traffic management to provide the appropriate mitigation of construction traffic. The CEMP would include the following measures:

- The use of appropriate and approved routes for HGV deliveries and for staff;
- The management of working hours and delivery times to minimise disturbance caused by traffic (e.g. avoiding deliveries during the peak hours);
- Covering loads coming to and leaving the development;
- Provision of wheel washing / vehicle cleaning facilities on Site; and
- Inspection of local highway network and cleaning as necessary.

14.6.3 In terms of the operational stage of the development, in addition to the site access junctions improvements to the following junctions have been designed to ensure that the junctions will continue to operate well within capacity once the development is completed, and to provide enhancements for pedestrians and cyclists:

- Junction 3 - Long Chaulden / Northridge Way Mini Roundabout;
- Junctions 4&5 - Long Chaulden / Boxted Road / Warners End Road / Northridge Way Mini Roundabouts;
- Junction 6 - Warners End Road / Leighton Buzzard Road Roundabout;
- Junction 7 - Northridge Way / Fishery Road Roundabout; and,
- Junction 8 - Fishery Road / A4251 Roundabout.

14.6.4 A Framework Travel Plan, including detailed measures for the first phase of 350 dwellings (Phase 1), will encourage the use of more sustainable modes of travel such as walking, cycling and the use of public transport.

14.6.5 In terms of residual effects, The Avenue would be subject to a large percentage increase in traffic which could indicate a substantial increase in severance however this is based upon very low existing traffic volumes currently using this route of 231 vehicles per hour (VPH) in the AM peak hour and 246 VPH in the PM peak hour compared to with development traffic flows of 514 vph in the AM peak hour and 503vph in the PM peak hour. This represents a low level of traffic well below the range that would be expected to cause unacceptable levels of severance, driver delay, and pedestrian delay together with impacts on pedestrian amenity, fear or Intimidation.

14.6.6 All potential effects during the construction stage are assessed to be negligible/minor. After taking into account the mitigation measures proposed, the residual effects upon completion and occupation of the proposed development are shown below. None of the effects are considered significant in the terms of the assessment.

Potential operational impact	Residual effect
Severance	Negligible
Driver Delay	Moderate Beneficial Impact

Potential operational impact	Residual effect
Pedestrian Delay	Negligible
Pedestrian Amenity	Negligible
Fear and Intimidation	Negligible
Accidents and Safety	Minor Beneficial
Hazardous Loads	Neutral

14.7 Noise and Vibration

14.7.1 Measures regularly and successfully applied to large scale construction projects in order to minimise noise and vibration effects on local communities would be implemented to control emissions relative to accepted criteria. Measures would include the following:

- Selecting inherently quiet plant;
- The use, where necessary and practicable, of enclosures and screens around noisy fixed plant;
- Limiting site work where possible to daytime hours; and,
- Adherence to relevant British Standards.

14.7.2 No adverse vibration impacts are expected during the construction works, nevertheless, appropriate vibration control measures consistent with the requirement to apply best practicable means under Control of Pollution Act 1974 would be implemented at all times.

14.7.3 In terms of the mitigation requirements for the proposed new dwellings, some noise control measures will be required as follows.

14.7.4 For those new dwellings facing Chaulden Lane and the railway, windows facing the road and railway will need to provide a minimum sound reduction (RTRA) of 24 dB at ground floor living rooms and 27 dB at first floor bedrooms. Appropriate window designs capable of providing a sound reduction of 24 dB would be normal thermal double glazing having a configuration of 4/12/4 or 4/16/4 for living rooms and an appropriate window design capable of providing a sound reduction of 27 dB would be 6/12/6.4 for bedrooms, where the information is presented in terms of the thickness of one pane of glass in mm, followed by the size of the air gap, followed by the thickness of the second pane of glass. Passive acoustic ventilators, such as acoustic trickle vents in the window frames or acoustic airbrick type vents within the walls, will need to be used for habitable rooms that have windows having an unscreened view towards the road or railway.

14.7.5 For new dwellings facing Pouchen End Lane, windows will need to provide a minimum sound reduction (RTRA) of no more than 11 dB RTRA. Normal thermal double glazing having a configuration of 4/12/4 or 4/16/4 typically provides a sound reduction of 25 dB RTRA which would be more than sufficient to enable all internal noise standards to be met. Internal noise standards of bedrooms on the fringes of development overlooking Pouchen End Lane would again be exceeded with windows open for ventilation, therefore, passive acoustic ventilators are again recommended in order to allow ventilation without noise intrusion.

14.7.6 The final Site layout should screen garden areas from the direct effects of road traffic and railway

noise through the placing of gardens used for amenity purposes behind dwellings. Any residual garden areas having a partial unscreened view to the road and railway should have at least a 1.8m high close-boarded timber fence or equivalent structure along the garden boundary to minimise the traffic noise impacts.

14.7.7 Matters relating to window design and ventilation can be controlled by way of a routine planning condition.

14.7.8 Residual impacts after mitigation would be as follows. None of the effects predicted are significant in terms of the assessment.

Potential Impact	Residual effect
Construction Noise	Minor adverse
Construction Vibration	Neutral
Operation :Ambient traffic and railway noise levels	Neutral
Operation :Rail vibrations	Neutral
Operation :Traffic generated by development	Minor impact for The Avenue, negligible impacts elsewhere

14.8 Air Quality

14.8.1 The Proposed Development falls within a medium to high risk category as defined by IAQM Guidance and therefore best practice mitigation measures will be included in the Site's dust management plan (Appendix 11.4), which would form part of the CEMP, for the relevant phase of construction. Indicative dust control measures are likely to include the following:

- The sheeting of vehicles transporting friable materials to or from the Site.
- Employment of water sprays and avoidance of dry-sweeping during extended periods of dry weather.
- Restriction of drop heights onto lorries etc.
- Avoidance of prolonged storage of debris on Site or exposure to wind.
- Use of wheel washes, limiting of vehicle speeds to 5mph, avoidance of unnecessary idling of engines and routing of Site traffic as far from residential properties as possible.
- Retention of as many trees and other vegetation as possible.
- Fitting all equipment (e.g. for cutting, grinding, crushing) with dust control measures such as water sprays wherever possible.
- Prevention of dust-contaminated run-off water from entering controlled waters.
- Storage of all fine, dry materials inside buildings or enclosures with adequate protection from wind, and preparation of storage mounds, sealed with tarpaulin, or seeding soils that are to be stored for a long period of time.
- Use of gas powered generators rather than diesel if possible (these are also quieter) and ensuring that all plant and vehicles are well maintained so that exhaust emissions do not breach statutory emission limits.
- The placing of machinery with exhaust emissions as far from sensitive property as practicable and switching off engines when not in use.

- Ensuring that a road sweeper is available to clean mud etc. from hardstanding roads and footpaths.
- Storage of materials away from sensitive receptors, where possible.
- Avoidance of fires on site.
- Application of the principles of the 'best practicable means' to all works.
- Compliance with relevant legislation and British Standard.
- Operation of a complaint and investigative response procedure.

14.8.2 Where appropriate, the application of dust control measures such as those described above and the use of approved access routes to and from the construction Site will significantly reduce the potential for adverse air quality impacts during the various stages of construction work. No mitigation measures are required for the operational phase of the Proposed Development..

14.8.3 A summary of the residual impacts is shown in the Table below, none of which are significant in terms of the assessment.

Potential impact	Residual effect
Construction dust	Minor temporary
Construction traffic	Negligible
Traffic generated by development	Negligible
Traffic generated by all developments	Negligible

14.9 Hydrology, Flood Risk and Foul Drainage

14.9.1 The following measures to control ground and water pollution effects from construction would form part of the CEMP:

- Protection of existing drainage systems at the start of construction works.
- Management of construction works so as to comply with the necessary standards and consent conditions to be identified by the EA, DBC and HCC.
- Consideration will be given to the appropriate storage of materials in wet weather and certain site activities may be postponed during heavy rainfall to prevent pollution entering watercourses.
- The environmental regulator will be consulted before any mains or tankered water, even if not contaminated, is discharged to the local watercourse.
- Any oil, fuel lubrication and other potential pollutants shall be handled on the Site in such a manner as to prevent pollution of any watercourse or aquifer. For any liquid other than uncontaminated water, this shall include storage in suitable, bunded tanks.
- No extraction, tipping or temporary storage of materials shall take place within an agreed distance of any watercourse unless part of the approved works. Under no circumstances shall tipped material enter any watercourse or culvert without prior consent.
- Provision of self-contained welfare facilities.
- Effective wheel / body washing facilities to be provided and used as necessary.
- A road sweeper to be available whenever the need for road cleaning arises.

- Vehicles carrying waste material off-site to be sheeted.
- 14.9.2 The surface water runoff during the construction phase will be managed through a temporary drainage network strategy, while the operational strategy is being constructed. This will mean that the surface runoff is controlled and discharged so as not to increase the overall runoff rate. The change of use from agricultural to developed area will have a beneficial effect with respect to agricultural pollution.
- 14.9.3 The proposed development is wholly located in an area that has the lowest possible risk of flooding. The effect of flooding downstream as a result of this development is negligible and no specific mitigation is necessary.
- 14.9.4 Surface water run-off from the development will be restricted as a result of the drainage strategy (see Figure 3.3 Green Infrastructure Parameter Plan, Figure 3.6 - Foul water network overview plan, Figure 3.7 Surface water network overview plan and Figures 3.19-3.24b confirming full details for the first phase of development). Discharge from all rainfall events up to and including the 1 in 100 year, will be restricted to the natural greenfield rate.
- 14.9.5 The use of Sustainable Drainage features will help remove urban pollutants from runoff before discharge to the ground or local watercourses. The features that would be used include attenuation ponds, infiltration basins, permeable paving, and swales.
- 14.9.6 Soakaway design follows the advice provided within the Geo-Environmental Site assessment and the Solution Feature Occurrence Assessment, and respects the groundwater source protection zone (total catchment) located to the south of the development. As a result no deep-bore soakaways will be located within the southern part of the Site; and, the maximum depth of deep-bore soakaways proposed for the northern part of the Site will be approximately 25.0m below existing ground maintaining more than 10m of unsaturated zone between the base of the deep bored soakaway and the groundwater level, which will mitigate any risk to the groundwater sources.
- 14.9.7 Provision to remove foul water from the development Site comprises an initial connection to the adjacent sewer for a maximum of 100 residential units; followed by the implementation of an on-site pumping station and a new dedicated off site rising main between the Development and the Berkhamsted Waste Water Treatment Works.
- 14.9.8 After taking into consideration the mitigation measures proposed, the residual effects on the receptors assessed are shown in the Table below. None of these are considered to be significant in terms of this assessment.

Potential impact	Residual effect
Construction	
Impact upon surface water runoff rate - on local watercourses	negligible
Impact upon surface water runoff quality - into local watercourses	negligible
Operation	

Potential impact	Residual effect
Surface water runoff rate into local watercourses/sewers	negligible
Surface water runoff quality into local watercourses	negligible
Surface water runoff quality into groundwater sources	Low- negative
Cessation of agricultural practices on site – impact on local watercourses	Low- positive
Additional foul drainage discharge to new or upgraded sewers	Low- positive

14.10 Socio-Economic

14.10.1 The assessment predicts beneficial effects during the construction phase. The potential for disruption during construction would be controlled and managed through implementation of the CEMP.

14.10.2 There will be an increase in the quantum of housing, including affordable housing provided within Hemel Hempstead. The proposed development will respond to the local housing need, delivering market and affordable housing (up to 40%), as well as a care home and gypsy and traveller accommodation. The provision of new housing to meet the needs of different households in the Study Area is considered to have a moderate beneficial impact at the Study Area level.

14.10.3 New residents would increase demand on local education and healthcare facilities such as GP surgeries and dental surgeries. The proposed development would provide a site suitable for a primary school and includes the flexibility to provide a medical facility of up to 100 sq.m. to cater for the population of the proposed development. No additional mitigation is considered necessary.

14.10.4 The provision of the open space and recreation facilities within the proposal would exceed the requirements set out in Local Plan Policy.

14.10.5 A summary of the residual effects predicted is provided in the Table below. The effect on the economy and employment is assessed to be significant, as is the effect on housing availability.

	Residual effects
Construction phase	
Economy and employment	Moderate beneficial (and therefore significant)
Completed Development	

Housing and population	Moderate beneficial (and therefore significant)
Economy and employment	Moderate beneficial (and therefore significant)
Education	Moderate beneficial (and therefore significant)
Healthcare	Minor beneficial
Open Space	Minor beneficial

Mitigation Implementation Summary

Mitigation Measure	Responsibility/Agent	Legal Instrument	Objective / Measure	Implementation Timescale
Construction and Environmental Management Plan				
Construction HGV routing and timing strategy	Developer/Contractor	Planning Condition	Implementation and Conformance	Upon commencement of development
Soil Management Plan	Contractor	EPA 1990	Avoidance of nuisance	Upon commencement of site work
Control of fumes and dust dispersion	Contractor	EPA 1990	Avoidance of nuisance	Upon commencement of site work
Control of noise emissions and vibration	Contractor	EPA 1990	Avoidance of nuisance	Upon commencement of site work
Managed discharge of water from construction	Contractor	EPA 1990	Avoid contamination	Upon commencement of site work
Controlled storage of materials/fuels/oils etc	Contractor	EPA 1990	Avoidance of pollution	Upon commencement of site work
Managed excavation and placement of soil/materials and soil management plan	Contractor	Planning condition	Maintain drainage flow paths; avoid flooding; minimise effects on the soil resource	Upon commencement of site work
Manage potential damage to retained habitats and disturbance of animal/bird species	Developer/contractor	Planning condition	Implementation and conformance	Upon commencement of site work

Mitigation Measure	Responsibility/Agent	Legal Instrument	Objective / Measure	Implementation Timescale
Biodiversity and landscape				
Green Infrastructure / LEMP	Developer	Planning condition	Establishment of mitigation and enhancements	As part of first phase and reserved matters for subsequent phases, and throughout construction
Archaeology and Heritage				
Archaeological evaluation of sub-component of Site	Developer	Planning condition	Presence/absence	As part of first phase and reserved matters for subsequent phases, and throughout construction
Transport and Access				
Travel plans	Developer	Planning condition	Implementation and monitoring modal shift	Upon first occupation of first phase and reserved matters for subsequent phases
Highway improvements	Developer	Planning obligation	Implementation	To be agreed

Mitigation Measure	Responsibility/Agent	Legal Instrument	Objective / Measure	Implementation Timescale
Noise				
Detailed design of scheme layout and building orientation to minimise internal noise levels	Developer	Planning condition	Desirable noise level achieved (BS:8233)	As part of first phase and reserved matters for subsequent phases, and throughout construction
Drainage and flood risk				
Sustainable drainage system	Developer	Planning condition	Collection and attenuation of surface water run-off; maintain water quality; no increase in flood risk	As part of first phase and reserved matters for subsequent phases, and throughout construction
Sustainable drainage system	Local authority or management company	Planning obligation	As above	Management and maintenance upon completion
Connection of foul drainage to network	Developer	Planning condition / Water Industry Act 1991	Suitable treatment	As part of first phase and reserved matters for subsequent phases, and throughout construction

Mitigation Measure	Responsibility/Agent	Legal Instrument	Objective / Measure	Implementation Timescale
Socio-economic				
Provision of land for a primary school	Developer	Planning obligation	Implementation	To be agreed
Provision of a local centre	Developer	Planning condition	Implementation	As part of reserved matters for subsequent phases