

A47/A11 Thickthorn Junction

Scheme Number: TR010037

Volume 6

6.1 Environmental Statement

Chapter 2 – The Proposed Scheme

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
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**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

The A47/A11 Thickthorn Junction
Development Consent Order 202[x]

**CHAPTER 2
THE PROPOSED SCHEME**

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2. The proposed scheme

2.1. The need for the proposed scheme

- 2.1.1. The A47 corridor was identified as a key area in need of investment under the Department for Transport's Roads Investment Strategy 2 (RIS 2). The A47 currently experiences high levels of congestion especially at peak times and has a poor safety record.
- 2.1.1. Currently, the existing Thickthorn Junction experiences high levels of congestion during peak hours, predominantly between the A11 eastbound to A47 eastbound and A47 westbound to A11 westbound. This is in addition to congestion on the A11 in both directions during peak hours (08:00 – 09:00 and 17:00 – 18:00).
- 2.1.2. Traffic studies have shown that congestion is predicted to get worse due to the following:
- Proposed growth in residential development in the Cringleford and Hethersett areas, which can lead to more vehicles on the road
 - Increasing traffic is outgrowing the capacity of the road, causing tailbacks and delays
- 2.1.3. If nothing is done to improve capacity at the A47/A11 Thickthorn Junction, demand from road users is expected to exceed capacity in the vicinity of Cringleford and Hethersett due to committed developments at both locations. Increased congestion in future years is likely to reduce user satisfaction and constrain economic growth in Norwich, South Norfolk, Peterborough and Cambridge.
- 2.1.4. In developing the Proposed Scheme, the aim is to address these issues by improving the traffic flow, reducing journey times on the route, increasing the route safety and resilience, provide capacity for growth and provide mitigation against environmental impacts of the A47. The Proposed Scheme is also intended to support economic growth by supporting employment and residential development opportunities in Norwich, South Norfolk and Cambridge which form part of the Cambridge Norwich Tech Corridor along the A11 between Cambridge and Norwich.

2.2. Proposed scheme objectives

- 2.2.1. In line with the RIS 2, Highways England's Delivery Plan 2020 - 2025, and as detailed on the 2017 preferred route announcement, the Proposed Scheme aims to meet the following objectives:

Supporting economic growth

- The Proposed Scheme aims to reduce congestion related delay, improve journey time reliability and increase the overall capacity of the A47. This will help contribute to sustainable economic growth supporting regional housing and economic growth in Norwich and the surrounding areas.

A safer and reliable network

- The Proposed Scheme aims to make the network safer for motorists and for those living near the junction by improving operational safety issues at the Thickthorn Junction.

A more free-flowing network

- The Proposed Scheme aims to increase the resilience of the Thickthorn junction to cope with incidents such as collisions, breakdowns, maintenance and extreme weather. In addition, the Proposed Scheme aims to reduce vehicular delay and improve journey time reliability, making journey times more predictable and movement at the junction more free-flowing.

Improved environment

- The Proposed Scheme aims to protect the environment by minimising adverse impacts and where possible, deliver benefits.

An accessible and integrated network

- The Proposed Scheme considers local communities and their access to roads. The Proposed Scheme provides a safer route between communities for cyclists, walkers, horse riders and other vulnerable uses of the network.

Value for money

- To ensure that the Proposed Scheme is affordable and delivers good value for money

2.3. Proposed scheme location

2.3.1. The A47/A11 Thickthorn Junction is located approximately 6km to the southwest of Norwich. The location of the Proposed Scheme is shown on Figure 1.1, Scheme location **(TR010037/APP/6.2) (APP-053)**.

2.3.2. The land immediately to the northeast, southeast, and southwest quadrants of the existing A47 Thickthorn Junction is currently predominantly agricultural land, although some parcels of land to the northeast and southeast have planning permission for housing developments. The land in the northwest quadrant accommodates Thickthorn Park and Ride and Thickthorn Services comprising a hotel, a restaurant, an electricity substation and a petrol filling station.

- 2.3.3. There are several residential properties which are located to the northwest of the junction on the B1172 Norwich Road, and to the north-east along the Old Newmarket Road. The Cringleford residential area is located is less than 500m to the north and east of the existing junction.
- 2.3.4. Natural resources present in the area of the Proposed Scheme include biodiversity habitats, agricultural soils, mineral and groundwater (aquifers) resources. Further details are provided in the following ES Chapters **(TR010037/APP/6.1)**:
- 8 Biodiversity **(APP-045)**
 - 9 Geology & soils **(APP-046)**
 - 10 Material assets and waste **(APP-047)**
 - 13 Road drainage and water environment **(APP-050)**
- 2.3.5. There are four statutory designated sites of national and local importance within 2km of the Proposed Scheme and three additional statutory designated sites of international importance, further than 2km from the DCO boundary but hydrologically connected to the Proposed Scheme. There are also 15 non statutory designated County Wildlife Sites (CWS) within 2km of the Proposed Scheme. Further detail is provided in Tables 2-1 and 2-2 and within ES Chapter 8, Biodiversity **(TR010037/APP/6.1) (APP-045)**.

Table 2-1 Statutory designated sites

Statutory designated site	Approximate distance from DCO boundary at closest point (m) and direction
The Broads Special Area of Conservation (SAC), Broadland Special Protection Area (SPA), Broadland Ramsar	11.5km east of the Proposed Scheme but hydrologically linked (downstream)
Eaton Chalk Pit SSSI	1.5km to the east
Eaton Common Local Nature Reserve (LNR)	1.4km to the east
Earlham Park Woods LNR	1.9km to the north
Marston Marshes LNR	1.6km to the east

Table 2-2 Non-statutory designated sites

Non- statutory designated site	Approximate distance from DCO boundary at closest point (m) and direction
Meadow Farm Meadow CWS	Adjacent to the scheme
Intwood Carr CWS	400m to the east
Foxburrow Meadow CWS	1.4km to the south
Softley Drive Meadow CWS	1.4km to the north east
Riding School Meadow CWS	1.2km to the east
Eaton Island CWS	1.3km to the east
Eaton Street Meadow CWS	1.5km to the east
Bluebell Marsh CWS	1.2km to the north east
Eaton Common CWS	1.9km to the east
Eaton Chalk Pit CWS	2km to the east
UEA Marsh CWS, UEA Butterfly Meadow CWS, UEA Broad CWS	1.6km to the north
Braymeadow CWS	1.5km to the north west
Ketteringham Hall Lake CWS	1.4km to the south west

2.4. Proposed scheme description

- 2.4.1. The preferred route for the Proposed Scheme was announced in August 2017. Since then, the Proposed Scheme design has been developed through an iterative process in parallel with the environmental assessment. The development of the Proposed Scheme design has been informed by knowledge of environmental constraints, the environmental assessment of emerging design proposals and engagement with stakeholders (including responses received during statutory consultation).
- 2.4.2. The Proposed Scheme comprises one new 1.65km long free-flowing slip road that will connect the A11 with the A47. The new connector road will re-route traffic away from the existing Thickthorn Junction through new underpasses.
- 2.4.3. There will be changes to the roundabout at the existing A47/A11 Thickthorn Junction such as providing additional lanes for traffic, and improvements will be

made to traffic signals and pedestrian crossings within the vicinity. In addition, a new 0.95km link road between Cantley Lane South and the B1172 Norwich Road will be construction to allow continued access to the Thickthorn Junction. A new footbridge (Cantley Lane footbridge (Cringleford)) crossing the A47 between Cantley Lane South and Cantley Lane will accommodate walkers, cyclists and horse riders and replace the existing footbridge.

2.4.4. A summary of the key design elements of the Proposed Scheme is presented below. All elements are based on the October 2020 preliminary design and any minor changes in line with the limits of deviation will be outlined at the detailed design stage. Description text should be read in conjunction with:

- Figure 1.1 (Scheme overview) (TR010037/APP/6.2) (APP-053)
- Figure 2.1 (Environmental Constraints) (TR010037/APP/6.2) (APP-054)
- Figure 2.2 (The Proposed Scheme) (TR010037/APP/6.2) (APP-054)
- Environmental Masterplan (TR010037/APP/6.8) (APP-123)
- General Arrangement drawings (TR010037/APP/2.2) (APP-005)
- Works Plans (TR010037/APP/2.4) (APP-007)

A11-A47 connector road

2.4.5. One 1.65km connector road will be constructed between the A11 eastbound to A47 southbound directing traffic away from Thickthorn Junction. Once travellers have left the main A11 eastbound carriageway, the connector road will allow travellers to merge to the A47 southbound without the need to stop.

2.4.6. The A11 to A47 connector road will include provision of a maintenance layby and require the construction of two new underpasses under the strategic road network and two new overbridges to carry the new Cantley Lane South to B1172 Norwich Road link road and the new Cantley Lane footbridge (Cringleford).

Changes to the existing A47/A11 Thickthorn Junction

2.4.7. The southern half of the roundabout at Thickthorn Junction will be widened to provide four lanes and the road markings across the whole junction will be repainted to suit the revised layout.

2.4.8. The existing A47 westbound exit slip road towards Thickthorn Junction and the existing left turn into Cantley Lane South will be realigned and the left turn onto Cantley Lane South removed. There will be a segregated left turn lane from the A47 westbound slip road to the A11 westbound.

- 2.4.9. The existing slip road from Thickthorn Junction that merges onto the A47 eastbound, approaching Cringleford Rail Bridge will be retained in its current form with only road marking improvements to provide two lanes.
- 2.4.10. All the A11 and A47 entry arms onto the existing Thickthorn Junction will have traffic signal control with two pedestrian crossings to the north of the roundabout.
- 2.4.11. Improvements will be made to the traffic signals around the roundabout circulatory at the:
- A47 westbound exit slip road entry
 - roundabout exit to the A47 eastbound entry slip road
 - approach from the B1172 will be signalised
- 2.4.12. Old Newmarket Road is not traffic signal controlled and will remain as currently exists.
- 2.4.13. The current signal arrangement at Thickthorn Junction will be improved to suit the proposed works.

Cantley Lane link road

- 2.4.14. The Proposed Scheme severs the existing access between Cantley Lane South and Thickthorn Junction. A new 0.95km link road between Cantley Lane South and the B1172 Norwich Road to the north will be constructed.
- 2.4.15. The new Cantley Lane South link road curves west-northwest before first crossing the A11 main carriageway and then the A47 to A11 link road, via two new overbridges. The link road curves north before joining the B1172 to the west of Thickthorn Junction via a T-junction.
- 2.4.16. The existing access to Cantley Lane South (from the existing A47 westbound exit slip road) will be removed and all Cantley Lane South traffic to and from Thickthorn Junction will use the new link road to reach the B1172 Norwich Road, A11 and A47.

Station Lane to A11 eastbound merge improvement

- 2.4.17. Station Lane junction is an existing at grade priority junction which has a left turn only on to the A11 eastbound. Improvements will be made to the existing junction by adding a merge that tapers onto the A11 eastbound.

Speed limits

- 2.4.18. The speed limit along the B1172 Norwich Road is proposed to be reduced from national speed limit to 40mph.

- 2.4.19. The speed limit proposed on the Cantley Lane link road is proposed at 40mph with a speed limit of 50mph proposed on the A11-A47 connector road.

Road surfacing

- 2.4.20. The road surfacing of the proposed A11 to A47 link road and Cantley Lane link road shall be low noise tarmacadam, with the exception of the Cantley Lane link road overbridges which shall be surfaced with hot rolled asphalt.
- 2.4.21. Where works to the existing A11 and A47 concrete road surface are required, the surfacing will be replaced with concrete.
- 2.4.22. It is proposed to surface the walking, cycling and horse-riding bridge and the proposed footpath on the Cantley Lane link road with asphalt.
- 2.4.23. The specification of the full pavement make-up (i.e. the specific aggregate base) for all roads within the Proposed Scheme will be refined during the detailed design stage.

Cantley Stream realignment

- 2.4.24. The proposed construction of the Cantley Lane link road will require the existing Cantley Stream to be realigned by approximately 390m. The adjacent access track will also require to be diverted.

Fencing, barriers, road signage

- 2.4.25. Where new boundary fencing is required to delineate the highway boundary, this will be in the form of post and wire fencing that ties into existing fencing.
- 2.4.26. To facilitate a known bat flight path that crosses the A47 (between Cantley Lane and Cantley Lane South), a post and wire mesh fence is proposed to be constructed between the A47 southbound and A47 on bound slip road.
- 2.4.27. It is proposed to provide safety barriers on the A11 to A47 link road and around connections to structures. Steel vehicle restraint system (VRS) is proposed in highway verge, with more substantial systems proposed to protect structures.
- 2.4.28. Road signage covering warning and regulatory signage as well as informative and advanced direction signage will be provided.
- 2.4.29. Existing road signage on the slip roads toward the A47 Thickthorn Junction will be updated to reflect the change in junction design.

Structures

2.4.30. The Proposed Scheme includes a variety of new, modified, existing, demolished and replacement structures. These include underpasses, bridges and culverts that are detailed in the following sections. The new and existing structures are numbered (for example S01) as shown on the General Arrangement Plans **(TR010037/APP.2.2) (APP-005)**.

Cantley Lane South culvert (S46)

2.4.31. A new culvert will be required to carry the diverted Cantley Stream beneath the existing Cantley Lane South carriageway. The size of this culvert is approximately 1.10m high by 6m wide and will be constructed from concrete.

New underpasses (S02 and S04)

2.4.32. There are two new underpasses proposed on the A11 to A47 link road. The Ward's Wood underpass (S02) (9.5m width x 61m length, 5.7m high) at the west central part of the scheme will carry the new A11 to A47 link road beneath the existing A11 dual carriageway. The Cantley Lane underpass (S04) (11.5m width, 123m length, 5.7m high) will carry the A11 to A47 link road beneath the existing A47 southeast of Thickthorn Junction.

Cantley Wood overbridges (S41 and S42)

2.4.33. Two new overbridges will be constructed to the southwest of the Proposed Scheme. A single span reinforced concrete bridge is proposed to carry the new Cantley Lane South link road over the existing A11 (Cantley Wood overbridge (S41)). Immediately north of this bridge a second overbridge will carry the Cantley Lane South link road over the proposed A11 to A47 link road (Cantley Wood Link Road overbridge (S42)).

Existing Cantley Stream underpass (S01A)

2.4.34. An existing underpass carrying the A11 over Cantley Stream will need to be extended to accommodate a widened carriageway where the A11 to A47 link road diverges from the A11 eastbound carriageway. The A11 slip road underpass is proposed with a headroom of 2.85m over the private farm access track to match headroom at the adjacent S01A Cantley Stream Underpass.

Existing Cantley Lane footbridge (S09) and proposed Cantley Lane footbridge (Cringleford) for walkers, cyclists and horse riders (S45)

2.4.35. The existing Cantley Lane footbridge that crosses the A47 between Cantley Lane South and Cantley Lane will be demolished under the Proposed Scheme and replaced with a new footbridge approximately 50m southeast of the existing

footbridge location. The replacement Cantley Lane footbridge (Cringleford) will be suitable for walkers, cyclists and horse riders. Approach ramps will be constructed on earthwork embankments.

Improved residential access

- 2.4.36. A new turning head will be provided at the northern terminus of Cantley Lane South with improvements proposed to the private access of identified residential properties along Cantley Lane South.

Lighting

- 2.4.37. An environmental assessment has been undertaken on a lighting design described below and shown on the environmental masterplan **(TR010037/APP/6.8) (APP-123)** and is considered to be the worst case scenario of lighting columns required. Discussions with relevant stakeholders and further work will be completed in later stages of detailed design to reduce and eliminate road lighting where safe to do so.

Lighting design

- 2.4.38. The current lighting design is that lighting columns between 10m and 12m in height with LED luminaires would be located in verges and oriented perpendicular to the A11 to A47 link road carriageway. Surrounding the existing Thickthorn Junction, existing lighting will be replaced.
- 2.4.39. For the two new underpasses, it is proposed to provide wall mounted lighting.
- 2.4.40. All luminaires would be mounted with zero degree tilts to ensure upward light spill is minimised.
- 2.4.41. Electrical supply to the lighting columns would be connected to a feeder pillar with cables routed through ducting that is buried in verges and beneath the carriageway where applicable. All works for the lighting supply will take place within the proposed DCO boundary.
- 2.4.42. Engagement with Norfolk County Council has resulted in no new lighting being required on the Cantley Lane link road as a result of the Proposed Scheme.

Drainage

- 2.4.43. The drainage design for the Proposed Scheme has been developed with advice provided from the appropriate environmental specialists. The assessment of drainage in relation to the water environment is reported in Chapter 13, Road drainage and the water environment **(TR010037/APP/6.1) (APP-050)**. Figure 2.1 shows the existing water environment features for the Proposed Scheme and the

Drainage and surface water plans show the Proposed Scheme drainage design including the proposed outfall locations (**TR010037/APP/2.8**) (**APP-011**).

2.4.44. Several organisations have been consulted or were issued with requests for information (RFI) regarding the drainage of the Proposed Scheme:

- The Environment Agency
- Anglian Water (RFI only) due to no assumed impact or connection to the Anglian Water network
- Norfolk County Council
- Norfolk Rivers District Internal Drainage Board
- Broadland District Council
- South Norfolk District Council

Existing drainage

2.4.45. Where possible, existing drainage would be retained at the tie-ins with the existing A47. Existing systems may be relocated in some sections on the approaches to junctions at the eastern and western extents of the Proposed Scheme, to maintain the operation of the drainage on the existing section of the A47.

Proposed drainage

2.4.46. The drainage infrastructure will be designed in accordance with the DMRB and Norfolk County Council Design Guidance. Additional climate change allowance of 40% will be incorporated into the proposed design.

Drainage of structures

2.4.47. Structure, deck drainage and back of wall drainage systems would be provided and would outfall to a suitable drainage system.

2.4.48. Where overbridges or underpasses are proposed to cross under the A47 and A11, these may not provide sufficient space to maintain existing drainage in places. If the existing drainage cannot remain, surface water will be directed into the proposed new road drainage networks, ensuring attenuation treatment prior to discharge.

Road drainage

2.4.49. The new mainline carriageway would drain to filter drains and discharge to a sustainable urban drainage system (SuDS) system located at low points along the route or where necessary for constraints such as structures or river crossings. The drainage system would provide treatment of the surface water

run-off and maintain greenfield discharge rates to receiving watercourses or groundwater.

- 2.4.50. An attenuation tank will be located at a low point on the A11 to A47 link road beneath a maintenance layby (S18) and will be serviced by a pumping station. The new Cantley Lane connection will be drained by kerb and gully.
- 2.4.51. Two detention basins are proposed be designed to accommodate a 1 in 100 year storm event plus an uplift of 20% for climate change (an additional 20% added capacity over and above this volume has also been provided in accordance with DMRB CG 501).
- 2.4.52. These would also have a minimum of 300mm freeboard above the designed water level.
- 2.4.53. Additional spillage containment would be provided where required at discharge points.
- 2.4.54. Outline proposed drainage systems include:
- The improvements to the A11 and A47 and Cantley Lane link road would be drained by a combined carrier filter or carrier drains located in the verge or central reserve.
 - Combined drains would be provided at the toe of any cuttings along the mainline. The combined drains would drain the cuttings and collect surface run-off from the carriageway.
- 2.4.55. Toe drains, where required, draining embankments greater than 1.5m in height, would drain via ditches to soakaways or along existing surface water pathways. At tie-ins, existing drainage would be used where possible subject to surveys of the existing drainage system.
- 2.4.56. Natural overland flow and existing ditches / streams would be intercepted by new ditches and conveyed along natural drainage paths as far as possible. This would involve pipe crossings of the Proposed Scheme.

Landscaping and environmental design

- 2.4.57. Landscape features are described in more detail in Chapter 7, Landscape and visual effects (TR010037/APP/6.1) (APP-044) and illustrated on the Environmental Masterplan (TR010037/APP/6.8) (APP-123) submitted as a part of this DCO application.
- 2.4.58. Appropriate landscape planting would be provided within the DCO boundary to replace lost features, enhance visual amenity and provide visual screening to the

completed scheme. The nature and type of planting is outlined on the Environmental Masterplan.

2.5. Baseline scenario

Existing baseline scenario

- 2.5.1. The existing baseline scenario refers to the conditions that currently exist as surveyed in 2019 and 2020, in the area within which the Proposed Scheme would be implemented.
- 2.5.2. The A47 Corridor is ranked second nationally for fatalities on A roads and the accident severity ratio is above average. The existing road is a junction allowing access to the A11 and A47.
- 2.5.3. The existing A11 west slip road to the A47 Thickthorn Junction currently has an average speed of 2 kph during the morning peak. This is significantly lower than the daily average speed of 23 kph during the morning peak. This is an indicator of congestion and affects journey times and journey time reliability on the road meaning that the A47 Thickthorn Junction is already over capacity.
- 2.5.4. The existing conditions within the Proposed Scheme boundary and surrounding area relevant to each of the chapter topics, is reported in Chapters 5 to 14 (**TR010037/APP/6.1**) (**APP-042 – APP-050, REP3-006**) under 'Baseline Conditions'. A brief summary of the baseline is provided below, and the environmental constraints are illustrated in Figure 2.1 (**TR010037/APP/6.2**) (**APP-054**).
- 2.5.5. There are no AQMAs currently declared in South Norfolk Council. The closest AQMA is located over 3km to the north-east, within Norwich City Centre, and does not fall within the modelled study area.
- 2.5.6. The heritage assets located in the vicinity of the Proposed Scheme are a combination of ancient, post medieval and modern in origin. There is one scheduled monument 'Two tumuli in Big Wood' (referred to as 'Two Tumuli') comprising two burial barrows located outside the DCO boundary, immediately south of the A11 and east of Cantley Stream. There are no registered parks and gardens, conservation areas or historic battlefields within the cultural heritage study area (as defined in ES Chapter 6, Cultural heritage (**TR010037/APP/6.1**) (**APP-043**)).
- 2.5.7. There are a number of listed buildings within the cultural heritage study area including one within the DCO boundary, the grade II listed Milestone No.4, located to the north of the Proposed Scheme. The remaining listed buildings closest to the Proposed Scheme comprise Thickthorn Hall (grade II), approximately 190m north of the A11 and the associated Kitchen garden walls

and attached octagonal building (grade II), The Round House (grade II) approximately 280m east of the Proposed Scheme, North House/The Farmhouse (grade II), approximately 20m east of the Proposed Scheme and Cantley House (grade II) located approximately 200m south of the Proposed Scheme.

- 2.5.8. The Proposed Scheme extents of the DCO boundary (as defined in ES Chapter 7, Landscape and visual effects (**TR010037/APP/6.1**) (**APP-044**)) is in an otherwise rural location with the village of Cringleford (forming the south western fringes of Norwich) approximately 0.5km to the east (although there is current construction works to extend the urban footprint closer to the Site), the Norfolk and Norwich Hospitals site approximately 1km to the north and the village of Hethersett approximately 2km to the west. To the south lies a more extensive area of sparsely populated open countryside. Thickthorn Hall and its parkland lie between the Proposed Scheme and Hethersett to the west.
- 2.5.9. The underlying natural topography is gently rolling with slightly higher land immediately to the north and east of the existing A47/A11 Thickthorn Junction and lower ground associated with the course of Cantley Stream to the south.
- 2.5.10. The eastern extents of the Proposed Scheme coincide with the coverage of South Norfolk Council landscape character areas.
- 2.5.11. There are valuable habitats and species of nature conservation importance within the biodiversity study areas (as defined in ES Chapter 8, Biodiversity (**TR010037/APP/6.1**) (**APP-045**)). Approximately 1.5km east of the Proposed Scheme is Eaton Chalk Pit Site of Special Scientific Interest (SSSI), a series of abandoned chalk mines, the undisturbed tunnels of which are used by various species of bat which hibernate underground during the winter months.
- 2.5.12. There are 15 County Wildlife Sites (CWS) located within 2km of the DCO boundary, the closest being Meadow Farm Meadow, to the south-eastern extents of the DCO boundary. A wide range of habitats have been identified within the biodiversity study areas which include but are not limited to:
- semi-improved natural grassland
 - broadland semi-natural woodland
 - hedgerows
 - marshy grassland
 - dense and scattered scrub
- 2.5.13. There are protected species and species of principal importance, including badger, bats, breeding birds, wintering birds, barn owl, terrestrial and aquatic invertebrates, otter, water vole, reptiles and their habitats.

- 2.5.14. The land around the existing A47 is predominately agricultural, the majority of which is used for arable production. The agricultural land within the footprint of the Proposed Scheme contains:
- Grade 3a agricultural land (good quality)
 - Grade 3b agricultural land (moderate quality)
- 2.5.15. There are no sites that are designated for their geological importance within the geology and soils study area.
- 2.5.16. Sensitive receptors, such as residential properties, in proximity to the Proposed Scheme have been identified. Over 400 noise sensitive receptors have been identified within 300m to the north and south of the Proposed Scheme. Some of these receptors are located close to the existing A47 so are currently exposed to relatively high noise levels due to road traffic.
- 2.5.17. The existing A47 provides a connection for people, places, businesses and enables access to employment, healthcare, education and other community assets. Walking, cycling and horse-riding facilities are also located within the population and human health study area.
- 2.5.18. The main water features within the study area are the Cantley Stream, an ordinary watercourse which passes through the study area and is partially within the DCO boundary. It flows beneath both the A11 and A47 in an easterly direction where it joins Intwood Stream at the eastern edge of the study area. There are smaller drainage channels and isolated ponds within the road drainage and the water environment study area.
- 2.5.19. The majority of the Proposed Scheme is located within Flood Zone 1 (which is associated with low risk of flooding from rivers) with localised areas of Flood Zone 2 and Flood Zone 3 (which is associated with high risk of flooding from rivers). These locations are predominately along the Cantley Stream corridor.
- 2.5.20. The groundwater conditions include the following aquifers:
- The chalk bedrock is a Principal aquifer
 - The superficial Sheringham Cliffs Formation, Lowestoft Formation – Sand, Happisburgh and Lowestoft (Undifferentiated), Alluvium, and River Terrace Deposits are classified as Secondary A aquifers.

Future baseline scenarios

- 2.5.21. Existing baseline conditions will change and evolve without the implementation of the Proposed Scheme. These future conditions have been considered as part of

the EIA and are referred to as the future baseline. Changes to the existing baseline conditions may occur due to a combination of influences, for example climate, traffic flows and the delivery of new developments.

- 2.5.22. Norwich, Cambridge and Peterborough are amongst the fastest growing cities in the country. Without improvement, the current congestion and journey time reliability problems experienced on local roads and in particular the existing A47 corridor are likely to increase.
- 2.5.23. The future baseline scenarios considered in the ES are defined in Chapter 4, Environmental assessment methodology (**TR010037/APP/6.1**) (**APP-041**) and a list of developments included as part of the future baseline is provided in ES Appendix 15.1 (**TR010037/APP/6.3**) (**APP-117**).

2.6. Construction, operation and long-term management

- 2.6.1. The approach to construction described below is indicative but it is representative of the likely approach to be adopted. Further provisions in relation to construction of the Proposed Scheme are provided in the environmental management plan (EMP) (**TR010037/APP/7.4**) (**APP-128**).

Land required for the proposed scheme

- 2.6.2. In order for the Proposed Scheme to be constructed, the rights to compulsorily acquire the land required to deliver the Scheme are being sought by Highways England through the DCO application.
- 2.6.3. Landowner engagement has been a key part of the development of the Proposed Scheme. Land acquisition would initially be sought through negotiation. The compulsory acquisition process would be the last resort.
- 2.6.4. Temporary and permanent land requirements have been identified through a combination of the design development and environmental assessment, and through engagement with landowners that would be affected by the Proposed Scheme. These are illustrated in the Land Plans (**TR010037/APP/2.3**) (**APP-006**).
- 2.6.5. Land take required for the Proposed Scheme is:
- 50.70 ha total permanent land take required
 - 2.34 ha total temporary land take required
 - 13.34 ha total new rights land take required

Construction programme

- 2.6.6. The construction activities for the Proposed Scheme have been identified through close working with the appointed contractor. Inevitably, some aspects of detailed design cannot be known at this stage. Where this is the case the description of the Proposed Scheme used in preparing the ES ensures that the effects of any works will have no greater environmental effects than those identified and assessed as part of the EIA process.
- 2.6.7. The impacts of construction activities are considered for each environmental chapter of this ES. Assessment has been based on the information provided in this chapter and on standard best practice construction techniques.
- 2.6.8. Construction is anticipated to take approximately 23 months and would be carried out in phases, so not all sections of the road would be under construction for the full period.
- 2.6.9. The proposed phases of construction are set out in Tables 2-3 and 2-4 (Construction phasing). There are currently two proposals for the construction of the A11-A47 link road, the box push method and the top down method. The final choice of construction method will be determined during the detailed design stage.

Push box method

- 2.6.10. This method of construction relates to the installation of the two underpasses carrying the A11-A47 link road. The underpasses will be constructed off site. Excavation of surrounding material is required prior to the underpasses being pushed in to place during two periods of road closure.
- 2.6.11. Enabling and site preparation work would be largely carried out as Phase 0, with the main works carried out during Phases 1 to 6 before final compound removal in Phase 7.

Table 2-3: Construction phasing push box method

Phase	Activity	Estimated Programme	Working hours
0	Site preparation	One month	Predominantly daytime works.
1	Utility diversions Commence construction of new footbridge across A47. Minimal traffic management on A47 Commence excavation for box slide construction	Three months	Predominantly daytime works.

Phase	Activity	Estimated Programme	Working hours
	Commence construction to Cantley Lane link road, drainage basins and Cantley Stream culverts		
2	Cantley Lane link road / Cantley Lane junction improvements Cantley Lane / B1172 Norwich Road junction improvements A11-A47 link road underpass excavation. Installation of new all user bridge Removal of existing footbridge Install Cantley Stream culvert, Works to widen the roundabout at existing Thickthorn Junction Construct boxes ready to 'push' into place	Eight months	Predominantly daytime works. Overnight works required to install new all user bridge and remove existing footbridge, ties in for Cantley Lane link road / B1172 Norwich Road
3	Push box preparation, continued works to A11-A47 link road	Two months	Predominantly daytime works.
4	Undertake installation of preconstructed underpass boxes Reconstruct carriageways to reopen to traffic	Two months	Predominantly daytime works. Overnight works required to install preconstructed underpass boxes
5	Complete underpass construction on A11-A47 link road Works to dedicated left turn from A47 to A11	Nine months	Predominantly daytime works, overnight works required to complete A47 tie ins.
6	Complete A11-A47 link road A47 tie ins. Finishing works to A11 and A47, structures, road signage, road markings, vehicle restraint system (VRS)	One month	Predominantly daytime works, overnight works required remove traffic management
7	Compound removal	One month	Predominantly daytime works. Overnight works if required

Top down method

- 2.6.12. This method of construction requires the excavation of materials around the proposed location of the A11-A47 link road to allow the insitu construction of the underpasses.
- 2.6.13. Enabling and site preparation work would be largely carried out as Phase 0, with the main works carried out during Phases 1 to 7 before final compound removal in Phase 8.

Table 2-4: Construction phasing top down method

Phase	Activity	Estimated Programme	Working hours
0	Site preparation	One month	Predominantly daytime works.
1	Utility diversions Commence construction of new footbridge across A47. Minimal traffic management on A47	Three months	Predominantly daytime works.
2	Commence new offline Cantley Lane Link including A11 overbridge Works to inner lanes of the existing A47/A11Thickthorn roundabout and B1172 Norwich Road approach into roundabout Construct widening to A11 to allow underpass to commence Begin construction of A11 underpass & associated earthworks Continue construction of new A47 footbridge abutments and approaches	Three months	Predominantly daytime works. Overnight A11 closures to allow tie in to temporary carriageways
3	Continue Phase 2 works Install new footbridge bridge and finalise approaches Remove now redundant footbridge under weekend closure	One month	Predominantly daytime works. Weekend closure to remove existing footbridge
4	Continue offline Cantley Lane Link including A11 overbridge Continue works to inner lanes of existing A47/A11 Thickthorn roundabout Widen A47 East bound on slip / east bound A47 carriageway Commence construction of A47 underpass	Six months	Predominantly daytime works. Overnight works required to for A11 structures and deck pours.
5	Complete offline Cantley Lane link road including A11 overbridge Move TM on A11 traffic to use newly constructed half of S02 in temporary lanes Commence works to existing A47/A11 Thickthorn roundabout outer lanes between A11 southbound and A47 westbound (dedicated A47 Westbound lane onto A11 southbound)	Two months	Predominantly daytime works.
6	Complete A11northbound off slip & road into S02 Continue S02 second half construction Move TM on A47 to enable second half of S04 to commence	Six and a half months	Predominantly daytime works.

Phase	Activity	Estimated Programme	Working hours
7	Complete offline A11 to A47 off slip northbound Complete carriageways over S02 & S04 Finishing works	Four months	Predominantly daytime works. Overnight works required to complete tie ins to A11-A47 link road
8	Compound removal	One month	Predominantly daytime works.

2.7. Construction compounds and site accesses

- 2.7.1. The main construction compound is located to the north west of the Proposed Scheme, in fields south of the B1172 Norwich Road and west of the existing Thickthorn Park & Ride. Access will be from the B1172 Norwich Road. One satellite compound is proposed (one in a field to the east of the A11 and south of the existing Thickthorn Junction with access from Cantley Lane South). The main and satellite compounds would include temporary site offices, parking, and welfare facilities.
- 2.7.2. Table 2-3 indicates indicative timings of use and assumptions of each of the compound locations which are the same for both the push box and top down methods of construction. The proposed locations of the compounds is shown on the General Arrangement Plans (TR010037/APP/2.2) (APP-005).

Table 2-5: Proposed compound details for box push construction and top down construction

Compound	Approximate area	Indicative usage timings	Compound assumptions
Main compound (south of B1172 Norwich Road)	2ha	23 months (Phase 0 to phase 8)	Access would be from the B1172 Norwich Road.
Satellite 1 (north of the existing Cantley Lane South)	0.5ha	23 months (Phase 0 to phase 8)	Access would be from the A11 westbound.
Satellite Compound 2 (east of the Proposed Scheme)	0.5ha	23 months (Phase 0 to phase 8)	Access would be from the Cringleford Residential Area and primarily be for welfare and materials storage
Satellite Compound 3 (Station Lane)	0.19ha	23 months (Phase 0 to phase 8)	Access would be from Station Lane and primarily be for welfare and materials storage.

- 2.7.3. Access to the construction compounds is outlined in Table 2-3 above. Where access is to be derived from the existing A47, traffic management measures would be in place on the existing A47 and local roads.
- 2.7.4. All compounds would ensure existing trees and hedgerows surrounding the proposed compound site would be retained. Compound layouts, fencing and material storage would be located to avoid loss of, or damage to, roots of hedgerows and trees. Access to residential properties would be maintained throughout the construction period.
- 2.7.5. It is assumed that cabins would be no more than two storey and would be white, where practicable. Topsoil storage bunds would be a maximum height of 3m and positioned to provide visual screening for receptors, such as residential properties and PRow users. Outside of core working hours during periods of

darkness, lighting would be limited to low level and localised for security purposes. During core working hours during periods of darkness it is assumed the site would be fully floodlit.

Material storage and stockpiles

- 2.7.6. Topsoil (and potentially subsoil) will need to be removed from the proposed works areas and then temporarily stockpiled until needed for re-use.
- 2.7.7. Stockpiling would also be required for imported general fill and aggregates for use in the permanent works.
- 2.7.8. The topsoil stockpiles would generally be located at the perimeter of working areas, with a maximum height of 3m (in accordance with British Standard BS3882: 2015), so that they would also screen the works from nearby receptors.
- 2.7.9. Material storage areas are proposed to be located in the following areas:
- to the east of the proposed A11 to A47 link road, in a field between the A47 southbound and the Cringleford residential area, with access from the construction area of the A11 to A47 link road.
 - in a field to the east of the Station Lane and A11 eastbound junction, with access from Station Lane only.
- 2.7.10. Soils removed from areas identified as being of designated archaeological importance would be subject to specific procedures, defined in the EMP (TR010037/APP/7.4) (APP-128).

Excavated materials

- 2.7.11. Construction of the Proposed Scheme would require excavation in places to form cuttings for the highway and this material would then be used to form embankments. This is considered in greater detail in ES Chapter 10, Material assets and waste (TR010037/APP/6.1) (APP-047).
- 2.7.12. A combination of imported and site won earthworks materials would be used for the construction of the permanent works, including general fill, structural fills and aggregates. The use of site won materials would be determined by site ground conditions and engineering assessments to inform the suitability for re-use. Site processing would be implemented, as required, to ensure that site won materials can be re-used in the permanent works.
- 2.7.13. Materials which cannot be sourced from site would be imported from a variety of sources, including nearby third party developments, supply chain partners and other A47 Regional Delivery Partnership or Highways England schemes. These

imports would be on an 'as required' basis to meet the needs of the construction programmes and the scheme permanent works designs.

Construction traffic

- 2.7.14. The haul routes to be used during the construction of the Proposed Scheme are located for the majority of on-site vehicle movements, as well as the use of the wider existing road network.
- 2.7.15. Construction traffic arriving from off site would consist of vehicles delivering the products required for the construction of the Proposed Scheme, including concrete, bitumen, aggregates and pipes.
- 2.7.16. All materials would arrive onto site along the existing A47. It is predicted that there would be a 50/50 split between materials coming from the east and west along the existing A47.
- 2.7.17. Some deliveries would arrive as abnormal loads, such as large construction plant. In most cases these construction traffic movements, as well as site worker journeys, would be directly to and from the main compound area accessed from the B1172 Norwich Road and the indicated material storage areas as shown on the General Arrangement Plans **(TR010037/APP/2.2) (APP-005)**.
- 2.7.18. It is assumed that over the course of works 50 to 150 heavy goods vehicles would access the site each day.
- 2.7.19. For the purposes of the environmental impact assessment (EIA), it is assumed that 75% of all deliveries would go to the main construction compound accessed from the B1172 Norwich Road, 20% to the satellite compounds and 5% to the material storage areas.
- 2.7.20. The construction phase traffic management plan **(TR010037/APP/7.5) (APP-129)** defines the measures used to reduce the impacts from construction traffic, including measures to reduce worker vehicle movements and to reduce HGV movements, particularly at peak periods. This will be implemented by the contractor.

Existing A47 during construction

- 2.7.21. The majority of the improvements to be undertaken as part of the Proposed Scheme are offline (construction of Cantley Lane link road, the A11 to A47 link road, widening of the Cantley Lane and A11 underpasses) allowing traffic to continue to use the existing A47 as works progress. The exception to this is the construction of the underpasses beneath the existing A11 and A47 to facilitate the construction of the A11 to A47 link road.

- 2.7.22. Appropriate traffic management measures would be put in place to ensure that traffic flows on the existing A47 and other local roads are maintained, whilst allowing safe working at the interface between the existing road network and the Proposed Scheme.
- 2.7.23. The tie-ins to the existing A47 would require overnight road closures and contraflow traffic management measures.

Construction methods

- 2.7.24. The construction of the Proposed Scheme would use typical construction techniques associated with major infrastructure projects. Typical construction techniques would include reinforced concrete bored piling, cut to fill earthworks using large excavators, dozers, rollers and articulated dump trucks, reinforced concrete construction associated with new structures, road foundation and pavement construction using pavers and rollers, street furniture installation, drainage installation, service diversions using open cut and directional drilling techniques.

Indicative construction working hours

- 2.7.25. It is expected that the majority of construction works would normally take place between 07.00 – 19.00 Monday to Friday and 07.00 – 19.00 on Saturday. There may be exceptions to these hours for oversized deliveries, and junction tie-ins. There are likely to be extended working hours in the summer months to take advantage of the daylight or weather. Any works required outwith the hours stated above will be undertaken in discussion with the local planning authority.

Plant and equipment

- 2.7.26. Construction of the Proposed Scheme would require a large quantity of plant and equipment. The volume of earth to be moved would require large excavators, dump trucks, bulldozers, compactors, graders, bowsers and stabilising plant.
- 2.7.27. Plant numbers and usage will be determined by the chosen construction method although for the purposes of assessment, indicative plant lists have been used to consider construction impacts in ES Chapter 11, Noise and vibration **(TR010037/APP/6.1) (APP-048)**.

Walking, Cycling and Horse-Riding routes

- 2.7.28. Prior to the removal of the existing footbridge across the A47, the new Cantley Lane footbridge (Cringleford) for walkers cyclists and horse riders will be constructed. This prevents the requirement for temporary severance or diversion of the public right of way.

Utilities

- 2.7.29. Construction of the Proposed Scheme is likely to require the diversion, relocation or protection of existing utility assets.
- 2.7.30. The Proposed Scheme would require the diversion of BT Openreach, National Grid, Anglian Water, UKPN and other utility assets. Details of the individual utility diversion would be developed during detailed design. For the purpose of the preliminary design, utility works corridors are illustrated on the Works Plans **(TR010037/APP/2.4) (APP-007)** to provide spatial provision for diverting utilities affected by the Proposed Scheme.

Demolition

- 2.7.31. The Proposed Scheme requires the demolition of one shed, located in an area of field east of the existing Cantley Lane South. This area of land is required for the construction of the Cantley Lane South and Cantley Lane link road junction.
- 2.7.32. The existing Cantley Lane footbridge between Cantley Lane South and Cantley Lane, crossing the A47 to the southeast of the Thickthorn Junction will be removed and replaced with a new footbridge suitable for walkers, cyclists and horse riders. The new Cantley Lane Footbridge (Cringleford) will be constructed prior to the existing one being demolished.

Environmental management plan

- 2.7.33. An Environmental Management Plan (EMP) **(TR010037/APP/7.4) (APP-128)** has been prepared in to include construction, operational and maintenance mitigation measures which have been defined in part by the requirements which arise from the assessments presented in this ES.
- 2.7.34. In line with guidance set out in DMRB LA 120 (Environmental Management Plan), the EMP establishes a suitable mechanism to link assessment assumptions, planning conditions and obligations. The EMP is a live document that is revised as more information becomes available throughout the lifetime of the Proposed Scheme.

Operation and long-term management

- 2.7.35. Once the Proposed Scheme is opened, it would form part of the A47 and A11 trunk roads and part of the strategic road network. The A11 to A47 link road would be managed using established procedures that are in place for the existing A47 and A11 and by using the monitoring and control systems in accordance with the relevant design standards.

- 2.7.36. Maintenance is defined as actions needed to inspect, repair, adjust, alter, remove, replace or reconstruct all aspects that relate to the Proposed Scheme. Long-term maintenance and repairs would be undertaken as required to maintain the appropriate standards for the strategic road network.
- 2.7.37. Maintenance of the Cantley Lane link road and upgrades to Cantley Lane South and the B1172 Norwich Road would become the responsibility of the local highway authority.

Limits of Deviation

- 2.7.38. The design has been developed to a level of detail that is sufficient to provide confidence during the examination of an application for a DCO, with due consideration given to aspects of the design that have not yet been fixed in the light of Planning Inspectorate Advice Note 9 'Using the Rochdale Envelope'. This information is based on a preliminary Proposed Scheme design of October 2020. The assessments included within this ES are based on the design of the Proposed Scheme described within this chapter and presented on the General Arrangement Plans (**TR010037/APP/2.2**) (**APP-005**).
- 2.7.39. Where appropriate, limits of deviation have been incorporated within the Order Limits to allow modifications to be made to the Proposed Scheme during the detailed design and construction stages. Such flexibility is required, for example, to enable the construction contractor to alter their working procedures or make adjustments to the position of certain infrastructure in response to unforeseen conditions identified on site.
- 2.7.40. The limits of deviation have been determined based on the design, construction and buildability factors, and have been taken into consideration as part of the EIA.
- 2.7.41. The assessment considered the vertical extents as shown on the engineering drawings and sections (**TR010037/APP/2.7**) (**APP-010**) and horizontal extents and profile levels indicated on the Works Plans (**TR010037/APP/2.4**) (**APP-007**).
- 2.7.42. The vertical limit of deviation for the Proposed Scheme mainline is 1m up and 1m down and environmental commitments will be maintained.
- 2.7.43. The new carriageway would not deviate past the limit of deviation shown on the Works Plans (**TR010037/APP/2.4**) (**APP-007**). In no case would the Proposed Scheme extend beyond the defined Order limits.

2.8. Embedded environmental mitigation

2.8.1. The EIA team have worked closely with the design team to ensure a joined up approach throughout the assessment process. This method ensured that the majority of environmental mitigation measures were raised at an early stage as constraints and opportunities were identified and incorporated into the design. Embedded environmental mitigation measures have been discussed within the relevant section above which have included:

- Walking, cycling and horse riding (WCH) provision: enhancing connectivity providing an upgraded active travel route across the A47
- Ecological measures: reducing habitat fragmentation through mammal ledges and the provision of mammal habitat enhancement in suitable locations
- SuDS design: wetland habitat creation
- Landscaping: sensitive landscaping, including wildflower planting

2.8.2. In addition to the above, the biodiversity assessment has concluded that bat and bird boxes would be provided.

Decommissioning

2.8.3. It is considered highly unlikely that the Proposed Scheme would be demolished before the end of its design life of 60 years as the road would have become an integral part of the strategic road network.

2.8.4. In the event of the Proposed Scheme needing to be demolished, this would conform to the statutory process at that time, and a further EIA would be carried out if required. Demolition of the Proposed Scheme is not therefore considered further in this ES.