A12 Chelmsford to A120 widening scheme TR010060

6.1 ENVIRONMENTAL STATEMENT CHAPTER 3 ASSESSMENT OF ALTERNATIVES

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A12 Chelmsford to A120 widening scheme

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ENVIRONMENTAL STATEMENT
CHAPTER 3 ASSESSMENT OF ALTERNATIVES

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3 Assessment of alternatives

3.1 Introduction

3.1.1 Regulation 14 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (EIA Regulations) requires an environmental statement to include at least '*a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*'.

3.1.2 In accordance with Regulation 14 and Schedule 4 of the EIA Regulations, this chapter outlines the alternative design options that were considered during the development of the proposed scheme. The options appraisal process is summarised below within the context of National Highways' Project Control Framework (PCF):

- PCF Stage 0 – strategy, shaping and prioritisation. At this stage, initial analysis is conducted to assess the viability of transport scheme solutions to the problem, including road network and non-road network solutions.
- PCF Stage 1 – options identification. At this stage, traffic modelling and economic and environmental assessment are undertaken on a number of options. This informs decisions on which options to present during non-statutory public consultation.
- PCF Stage 2 – options selection. At this stage, the public are consulted on the recommended options from PCF Stage 1. Refinements are then made to the option designs, traffic modelling and economic and environmental assessments following feedback from the consultation. At the end of the stage a Preferred Route Announcement (PRA) is made to announce the decision on which option to progress.
- PCF Stage 3 – preliminary design. This stage involves developing the preferred option to the required level for undertaking an Environmental Impact Assessment (EIA) and applying for a Development Consent Order (DCO). Alternative ways of constructing the proposed scheme have been explored throughout PCF Stage 3 (see Section 3.3 of this chapter).

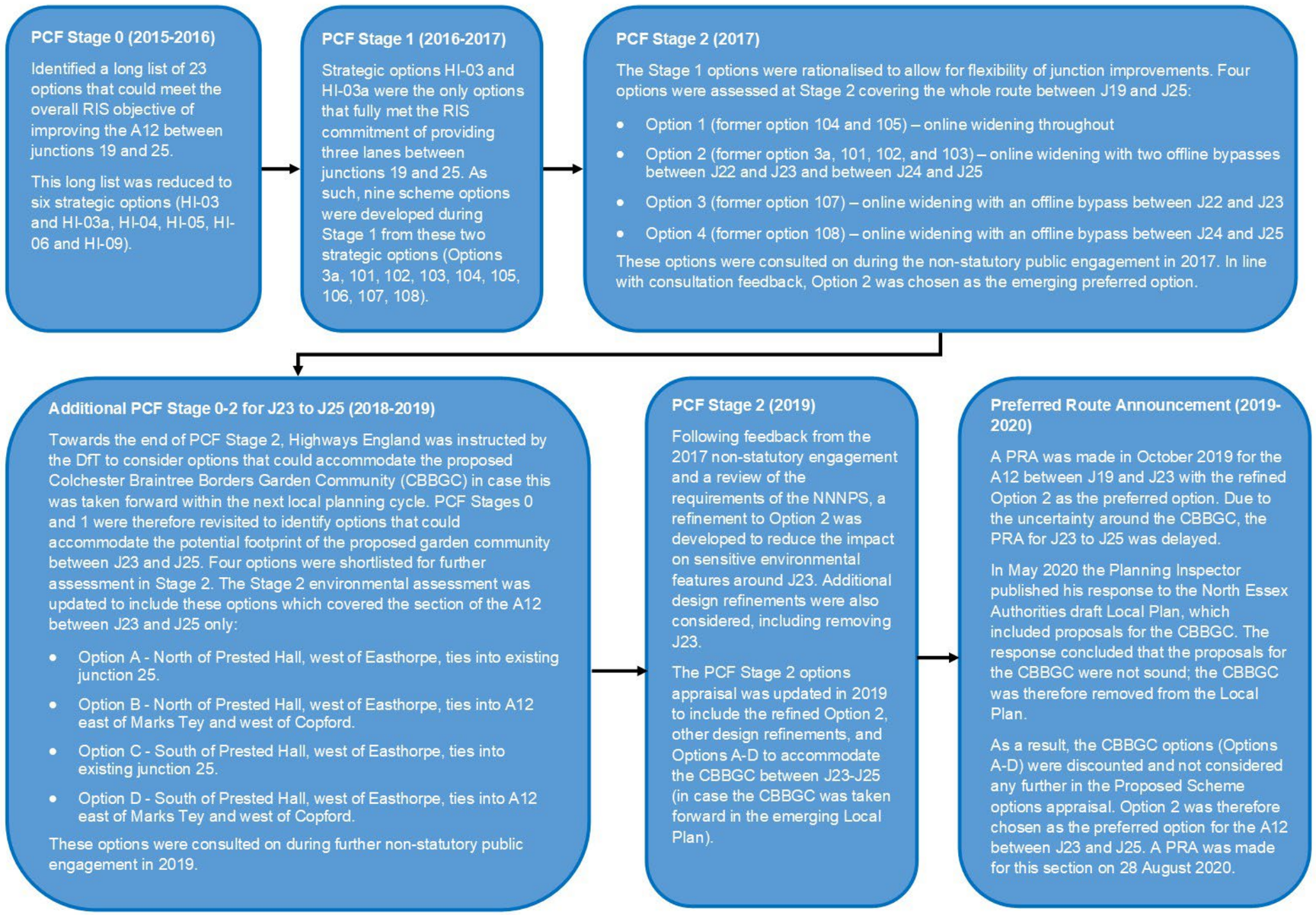
3.1.3 In 2017, a non-statutory consultation was held in relation to proposals to widen the A12 from junction 19 at Chelmsford to junction 25 at Marks Tey where the A120 joins the A12. Four options were presented for the A12 between junctions 19 and 25 (Options 1-4). Further information on the consultation is provided in Chapter 4: Consultation, of the Environmental Statement [TR010060/APP/6.1]. Following the consultation, the option designs were refined in preparation for a PRA.

3.1.4 However, the North Essex Authorities were pursuing a joint Local Plan which proposed several garden communities, including the Colchester Braintree Borders Garden Community (CBBGC). If the CBBGC were to go ahead, it would likely impact on Options 1-4 that were presented in the 2017 consultation, specifically on the section between junction 23 and junction 25. Additional options therefore had to be developed to consider the section of the A12 between these junctions that could accommodate the potential footprint of the proposed garden community (Options A-D). These options were consulted on through a second non-statutory consultation event in October 2019.

3.1.5 Given the uncertainty that the CBBGC introduced to the proposed scheme option development, two PRAs were made for the proposed scheme (one covering junctions 19 to 23 announced in October 2019, and another covering junctions 23 to 25 announced in August 2020).

3.1.6 An overview of the design history is provided in Plate 3.1. Section 3.2 of this chapter provides more detail on the scheme options considered at each design stage, the preferred option, and the environmental considerations in coming to this decision.

Plate 3.1 Design history overview



3.2 Proposed scheme history

PCF Stage 0 options appraisal (strategy, shaping and prioritisation)

3.2.1 The Options Assessment Report (Highways England, 2016) set out a long list of 23 options that could meet the overall objective of improving the A12 between junctions 19 (Boreham interchange) and 25 (Marks Tey interchange). It included 15 highways improvement options, five public transport options and three collision reduction and incident management measures. The long list of options (including non-road options such as improvements to public transport) was reduced to six strategic options using the Department for Transport's (DfT's) Early Assessment and Sifting Tool. The six options included two options that fully met the Road Investment Strategy 1 (RIS1) (DfT, 2015) commitment of improving the A12 corridor to three lanes between junctions 19 and 25 (options HI-03 and HI-03a) and four lower cost options that looked at improvements to the most congested sections of the corridor (HI-04, HI-05, HI-06 and HI-09). Table 3.1 summarises the PCF Stage 0 strategic options.

Table 3.1 PCF Stage 0 strategic options

Option	Comments	Summary
HI-03: Offline improvements between J22 and J23, and between J24 to J25. Online widening and junction improvements including removal of J20b.	Strong strategic case as it provides upgrades to the whole section between J19 and J25. It is a higher cost option but offers good value for money.	Taken forward to PCF Stage 1
		
HI-03a: Offline improvements between J22 and J23, and between J24 to J25. Online widening and junction improvements with reduced specification.	Strong strategic case providing upgrades to the whole section of the A12 between J19 and J25. This is a slightly lower cost option than HI-03.	Taken forward to PCF Stage 1
		
HI-04: Offline improvements between J22 and J23, and between J24 to J25. Online widening and junction improvements.	Good strategic and lower cost scheme. However, by not including J23-J24, it may be difficult to justify upgrading this section at a later date. Did not meet the RIS objectives.	Dismissed
		

Option	Comments	Summary
HI-05: Offline improvements between J22 and J23. Online widening and junction improvements. 	Good lower cost option which would provide a viable solution to the scheme objectives. Initially taken forward, but later dismissed as did not meet the RIS objectives.	Dismissed
HI-06: Offline improvements between J22 and J23. Online widening and junction improvements. 	Option would offer a good strategic and lower cost scheme. However, by not including J21-J22 and J23-J25, it may be difficult to justify upgrading these sections at a later date. Did not meet the RIS objectives.	Dismissed
HI-09: Online widening between J20a and J21 and junction improvements. 	Lower cost option but provides a low strategic benefit compared to other options. Initially taken forward, but later dismissed as did not meet the RIS objectives.	Dismissed

Blue links indicate three-lane carriageway capacity through existing, new or upgraded roads. Blue circles indicate junction upgrades. A black circle indicates junction removal.

PCF Stage 1 options appraisal (options identification)

3.2.2 PCF Stage 1 involved developing further options that would meet the overarching RIS commitment and the scheme-specific objectives. As HI-03 and HI-03a were the only options that met the RIS commitment, these were taken forward into PCF Stage 1 for further assessment. Nine scheme options were developed from these two strategic options. These included four options which had two offline bypasses but different junction arrangements (Options 3a, 101, 102 and 103), two which were wholly online with different junctions (104 and 105), one option with a significant length of new bypass to the north of the existing A12 (106) and two options with a single bypass (107 and 108). These options were appraised during PCF Stage 1.

3.2.3 Option 106 was discounted at PCF Stage 1 as it involved two major structures crossing the Great Eastern Main Line (GEML) railway, which would have significant costs and significant landscape and visual environmental impacts.

3.2.4 It was also concluded during PCF Stage 1 that most junctions were likely to require some level of improvement, although there was some flexibility around improvements and potential closing of one or more junctions at Hatfield Peverel (junctions 20a, 20b and 21). Therefore, four alternative alignments (ignoring junction variations) were taken forward to the non-statutory consultation in PCF Stage 2:

- Option 1 (former option 104 and 105 alignment) – online widening throughout and provision of a local access road to provide alternative access to existing single tier junctions
- Option 2 (former 3a, 101, 102 and 103 alignment) – online widening with two offline bypasses between junctions 22 and 23 and between junctions 24 and 25
- Option 3 (former 107 alignment) – online widening with an offline bypass between junctions 22 and 23
- Option 4 (former 108 alignment) – online widening with an offline bypass between junctions 24 and 25

3.2.5 The PCF Stage 1 options are summarised in Table 3.2. The options taken forward to PCF Stage 2 are shown in the options consultation brochure, which is included in Annex A of the Consultation Report [TR010060/APP/5.2].

Table 3.2 PCF Stage 1 scheme options

Option number	Description	Taken forward to PCF Stage 2
3a	Three lanes provided throughout with offline sections to the south of the A12 between J22-J23 and J24-J25 to remove local direct accesses to the A12.	Option 2
101	Three lanes provided throughout with offline sections to the south of the A12 between J22-J23 and J24-J25 to remove local direct accesses to the A12. Remove J20a and J20b and replace with a combined J20 to the south of Hatfield Peverel.	
102	Same as 101 except without a new J20 and assumes complete removal of J23.	
103	Three lanes provided throughout with offline sections between J22-J23 and J24-J25 to remove local direct accesses to the A12. Remove J22 and J24 but upgrade J21 and J23 to provide access to Witham and Kelvedon respectively.	

Option number	Description	Taken forward to PCF Stage 2
104	Three lanes provided throughout completely online with removal of single tier junctions by providing local access roads. Remove J20a and J20b and replace with a combined J20 to the south of Hatfield Peverel.	Option 1
105	Three lanes provided throughout completely online with removal of single tier junctions by providing local access roads. Remove J20a and J20b and replace with an improved J21 with access roads to Hatfield Peverel.	
106	Same as 101 but offline to the north of the A12 (and GEML) between J22-J25.	Dismissed
107	Three lanes provided throughout with offline sections to the south of the A12 between J22-J23.	Option 3
108	Three lanes provided throughout with offline sections to the south of the A12 between J24-J25.	Option 4

PCF Stage 2 options appraisal (option selection)

3.2.6 Options 1 to 4 were taken forward to public consultation in January 2017 at the start of PCF Stage 2. In addition, further work was undertaken to develop technical, economic and environmental assessments for the proposed scheme. An interim environmental appraisal was undertaken in 2017 to assess the PCF Stage 2 Options 1 to 4.

3.2.7 Option 2 was assessed as the least favourable for the environment overall, due to the likely significant effects on cultural heritage, mineral deposits, landscape, ecology and flood risk.

3.2.8 The offline sections of Option 2 would extend over an area of known minerals deposits, some of which have a licence to extract, and other areas that do not currently have permission for extraction. There was a risk that the offline sections of road could sterilise minerals, or that time would be required in the programme to allow extraction before construction of the road. Sterilisation of mineral deposits is a topic highlighted within the National Networks National Policy Statement (NNNPS) (DfT, 2014). In addition, offline sections would affect larger areas of grade 2 and 3a land under the Agricultural Land Classification (ALC), which are classed as the best and most versatile (BMV) land.

3.2.9 The section of Option 2 at Rivenhall End would also involve offline development in the Blackwater Valley, and could significantly affect the sensitive landscape character, as well as archaeological and ecological assets within this area. This option would also lie close to the Rivenhall Long Mortuary Enclosure scheduled monument and would likely have a significant effect on the setting of this site and the surrounding historic landscape.

3.2.10 However, while Option 2 was assessed to have the least favourable impact on the environment[1], it was seen to be the most resilient and would generate the greatest capacity across the strategic road network and local road network. Option 2 would be safer for road workers during both construction (due to the length of offline sections that could be constructed away from live traffic) and operation (as there would be an alternative route along certain sections of the A12 on which to divert traffic during road maintenance). Option 2 had the best overall provision for walkers, cyclists and horse riders (WCH), as existing severance issues on the A12 would be rectified, and reduced flow on the de-trunked sections of the A12 would improve the ambience of existing shared facilities alongside the de-trunked sections of A12. It would also have benefits in relation to air quality and noise effects for receptors along the existing A12, notably through the community of Rivenhall End. It was seen to be the most resilient of the four options, as it assumes that the existing dual carriageway would remain. Option 2 was also the most popular option from the non-statutory public consultation, with 49% of respondents supporting the option (see Chapter 4: Consultation [TR010060/APP/6.1]).

3.2.11 For these reasons, the Scheme Assessment Report[2] produced in 2017 concluded that Option 2 was the recommended preferred route (Highways England, 2017).

3.2.12 Option 1 was the environmentally preferred option. This is because the option would be constructed online within the existing A12 corridor rather than creating a new infrastructure feature within the landscape. This would have less ecological, landscape and setting effects than Options 2, 3 and 4. However, Option 1 would potentially have worse air quality and noise impacts as there would be no opportunity to move strategic traffic onto new bypasses. While there were some environmental benefits to widening the existing A12, by reducing impacts on previously undisturbed land, there were concerns about the impact on local businesses and residents in Rivenhall End, as this option would not provide a bypass. Local access roads would be required to remove private accesses onto the A12 (as opposed to the offline options which would allow use of de-trunked sections of the A12), which would not have the safety benefits of building new sections of road away from the existing A12. In addition, there were concerns that this option would not handle traffic and congestion as well as Option 2, nor be as safe to construct. This option was only supported by 28% of respondents, as opposed to the 49% that supported Option 2.

3.2.13 While Option 3 would have provided the bypass at Rivenhall End, there were concerns it would not address the problems with private access onto the A12 between junctions 24 and 25. In addition, there were concerns that this option

[1] Option 2 was assessed to have the least favourable impact on the environment in 2017. However, the design of Option 2 was refined later in the options selection process to avoid or reduce these environmental impacts, therefore reducing the environmental impact of this route option. Further details are provided in Section 3.2 – Design refinements (PCF Stage 2), of this chapter.

[2] The Scheme Assessment Report documents the findings of the options appraisal (including the results of the design, traffic, economic, and environmental assessments) and recommends the preferred option.

would not handle traffic and congestion as well as Option 2, nor be as safe to construct. This option was only supported by 11% of respondents, as opposed to the 49% that supported Option 2.

3.2.14 While Option 4 would have addressed the problems with private access between junctions 24 and 25, it would not have provided the bypass at Rivenhall End. In addition, there were concerns that this option would not handle traffic and congestion as well as Option 2, nor be as safe to construct. This option was only supported by 4% of respondents, as opposed to the 49% that supported Option 2.

PCF Stage 2 options appraisal – Hatfield Peverel junctions

3.2.15 The PCF Stage 1 traffic modelling and design work indicated that there was potential to rationalise the three junctions at Hatfield Peverel (junctions 20a, 20b and 21), which could improve traffic flows and safety performance on the A12. The non-statutory consultation material therefore posed the question to stakeholders regarding rationalisation of the junctions. There was general support within the engagement responses saying that there was no need for two junctions at Hatfield Peverel and that there were existing safety concerns with the slip roads at junction 20b (Hatfield Peverel North).

3.2.16 This led to further work to assess how to reduce the number of junctions, and two sub-options were developed which could be applied to any of the four PCF Stage 2 options (Options 1 to 4). In both cases, junctions 20a (Hatfield Peverel South) and 20b would be closed and replaced by a new junction:

- Option HI-09a – providing a new all movement junction 21 to the east of Hatfield Peverel
- Option HI-09b – providing a new all movement junction 20 to the west of Hatfield Peverel

3.2.17 The two sub-options were reviewed against the scheme objectives. This concluded that Option HI-09a worked better than Option HI-09b. This was due to the existing constraints to the south of junction 20a, which would constrain the design of an improved junction at this location. The constraints include the River Ter floodplain and listed buildings. It would also be difficult to fit a new junction in this location without significant changes to the B1137, which would add to the costs of this option. Option HI-09b would also still require improvements at junction 21 to provide a connection back to Hatfield Peverel, once junction 20b was closed.

3.2.18 In comparison, Option HI-09a was in an area of relatively few constraints. There is also an existing local access road between Hatfield Peverel and junction 21 on the south side.

3.2.19 Given the larger environmental impact and difficulty to construct Option HI-09b, Option HI-09a (closing junctions 20a and 20b, and building a new all movements junction 21 to the east of Hatfield Peverel) was chosen and incorporated into Options 1 to 4.

Additional options appraisal (PCF Stage 0-2) – CBBGC options

3.2.20 Towards the end of PCF Stage 2, National Highways was instructed by the DfT to consider options that could accommodate the proposed CBBGC in case this was taken forward within the next local planning cycle. Further options were therefore developed that could accommodate the potential footprint of the proposed garden community.

3.2.21 All of the CBBGC options appraisal work assumed that Option 2 was emerging as the preferred option from the previous PCF Stage 2 work described in the above section. Option 2 designs were therefore assumed up to junction 23 (Kelvedon South interchange) and the new options looked at alternatives to incorporate the proposed CBBGC between junction 23 and junction 25.

3.2.22 Four CBBGC options were shortlisted for more detailed assessment, as follows:

- Option A – alignment goes north of Prested Hall, west of Easthorpe, and ties into the existing junction 25
- Option B – alignment goes north of Prested Hall, west of Easthorpe, and ties into the A12 east of Marks Tey and west of Copford
- Option C – alignment goes south of Prested Hall, west of Easthorpe, and ties into the existing junction 25
- Option D – alignment goes south of Prested Hall, west of Easthorpe, and ties into the A12 east of Marks Tey and west of Copford

3.2.23 Options A-D were presented at a non-statutory consultation in October 2019 to gain views from stakeholders and the local community on the options proposed to accommodate the CBBGC (if taken forward in the draft Local Plan). There was strong opposition to these options due to the wider opposition towards the CBBGC (see Chapter 4: Consultation [TR010060/APP/6.1]).

3.2.24 In May 2020, the Planning Inspectorate published their response to the North Essex Authorities' draft Local Plan, which included proposals for the CBBGC. The response concluded that the proposals for the CBBGC were not sound. As a result, the North Essex Authorities decided to remove the CBBGC from the Local Plan.

3.2.25 As the CBBGC was no longer a committed development, and given the strong opposition from the local community towards the proposed CBBGC route options and the greater environmental impacts due to the longer offline alignments, Options A to D were discounted and not considered any further in the proposed scheme options appraisal. The preferred option between junctions 23 and 25 therefore reverted back to Option 2.

Design refinements (PCF Stage 2)

3.2.26 The 2017 Scheme Assessment Report (Highways England, 2017) recommended Option 2 as the preferred route. However, through value engineering and subsequent option refinement, elements of the option design were adjusted, and had to be re-assessed. As well as scope changes through value engineering, designs were refined to take on board stakeholder

comments (see Chapter 4: Consultation [TR010060/APP/6.1]) and to better align the proposed scheme with policy within the NNNPS (DfT, 2014), as required for development consent.

NNNPS review

3.2.27 Although Option 2 was chosen as the emerging preferred option in 2017, it was assessed as the least favourable in terms of the environmental impact. The key impacts identified were as follows:

- Flood risk: for the Exception Test to be passed it must be demonstrated that the proposed scheme provides wider sustainability benefits to the community that outweigh flood risk; and a Flood Risk Assessment must demonstrate that the proposed scheme would be safe for its lifetime, without increasing flood risk elsewhere and, where possible, would reduce flood risk overall. Option 2, prior to design refinements, would have involved offline development in the River Blackwater floodplain.

- Historic environment: where the proposed development would lead to substantial harm to or total loss of significance of a designated heritage asset, the Secretary of State should refuse consent unless it can be demonstrated that the substantial harm or loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm. Historic England raised concerns over Option 2, prior to design refinements, as the new offline bypass would have likely resulted in substantial harm to the Rivenhall Long Mortuary Enclosure scheduled monument, as well as associated archaeological remains that contribute to the wider historic setting of the monument.

- Minerals sterilisation: where a proposed development has an impact on a mineral safeguarding area (MSA), the Secretary of State should ensure that the applicant has put forward appropriate mitigation measures to safeguard mineral resources. Option 2 had the largest footprint in the MSA.

- BMV agricultural land: applicants should take into account the economic and other benefits of BMV agricultural land (defined as land in grades 1, 2 and 3a of the ALC). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality land in preference to that of a higher quality. Option 2 had the largest footprint in areas of BMV land.

3.2.28 A refined Option 2 alignment was created to address impacts on the Rivenhall Long Mortuary Enclosure scheduled monument and the River Blackwater floodplain. For the refined Option 2, the length of the bypass between junctions 22 and 23 was reduced, re-joining the existing A12 at a point just east of Rivenhall End, thereby taking the alignment away from the scheduled monument and reducing potential development in the floodplain. The refined option would also result in reduced loss of BMV land and sterilisation of minerals compared to the original Option 2. The refined Option 2 therefore reduces overall impacts in compliance with the NNNPS (DfT, 2014).

Value engineering

3.2.29 In addition to the refined Option 2 described above, a number of additional design refinements were introduced as part of a value engineering exercise:

- Descoping (i.e. no longer undertaking works as part of the proposed scheme) verge and central reserve works between junction 19 and junction 20a. The carriageway is already three lanes in this section, so descoping works here would still be consistent with the RIS commitment for three-lane provision. Although highway improvement works have been descoped for this section of the A12, the southbound carriageway would be resurfaced with a road surface with better noise reducing properties than a conventional low noise road surface. This would be provided to mitigate noise impacts from the A12 (see Section 3.3 of this chapter for further details).

- Removal of existing junction 23 (the previous proposals had included a new junction 23). This would improve safety, reduce fill material requirements, and reduce environmental impacts (including on the River Blackwater and associated floodplain). Traffic modelling indicated that the removal of junction 23 from the proposed scheme would result in minimal adverse impact to traffic due to the relatively few vehicles that utilise the junction.

- Given the removal of junction 23, a local access road would be required to facilitate access in and around Kelvedon. The existing A12 from junction 22, through Rivenhall End, would be retained as a dual carriageway local access road, with provision of a new mini-roundabout to the east of Rivenhall End. A new single carriageway local access road would be provided from the mini-roundabout connecting to the B1024 into Kelvedon. Access over the A12 to the Essex County Fire and Rescue Service Headquarters would be via Cranes Bridge and a single carriageway access road.

- Retaining the River Ter Bridge width (i.e. creating three lanes by changing verges, working widths and lane markings instead of physically widening the bridge).

- Assuming the use of borrow pits for fill material instead of importing material. A number of potential borrow pit locations were investigated in PCF Stages 2 and 3 (see Section 3.3 of this chapter).

3.2.30 The outcome of the PCF Stage 2 options appraisal, including the design refinements described above, is shown in Table 3.3. Although the refined Option 2 superseded the original Option 2 from 2017, the original alignment is included in Table 3.3 to demonstrate the difference in impacts as a result of the design refinements.

3.2.31 An addendum to the 2017 Scheme Assessment Report was produced to document the outcome of the PCF Stage 2 design refinements that had taken place since 2017 (Highways England, 2020a).

Table 3.3 Potential environmental effects from PCF Stage 2 options

Option	Overall environmental score	Conclusions of the environmental appraisal (based on an assessment of the PCF Stage 2 designs)
Do nothing	Not assessed	This is assessed as the baseline to compare other options to. Air quality and WCH access would likely get worse due to increased congestion and traffic.
Option 1 (online widening)	Potential significant adverse effect – mitigation may be possible	An online option would have less impact to ecology and landscape in general, as there would be minimal land-take and severance. It would also avoid impacts to the Colemans Farm quarry site near Rivenhall End. There would be impacts to people and the landscape of urban areas as the road is widened, and from the loss of existing vegetation screening. There would be no improvement to noise important areas due to the traffic remaining online at these locations. Although Option 1 is likely to have the least overall impact, there are still potential significant effects, particularly to the landscape and setting of historic buildings along the A12. It is likely these effects could be mitigated.
Original Option 2 (two bypasses)	Significant adverse effect – unlikely to be able to mitigate	This option has the potential for significant environmental effects, particularly in relation to the offline sections which would sever areas of BMV agricultural land and have a detrimental effect on landscape and ecology. The offline section between J22-J23 would be within the Blackwater Valley, and could cause significant effects to the landscape character. The footprint would also affect an archaeologically rich area and would likely cause substantial harm to the setting of the Rivenhall Long Mortuary Enclosure scheduled monument, as well as associated archaeological remains that contribute to the wider historic setting of the monument. Large areas of floodplain, an operational quarry and an MSA would also be affected. The operational quarry at Colemans Farm near Rivenhall End has a planning condition for restoration to be one of Essex's flagship biodiversity sites. If the footprint of the road were to impinge on the planned restoration area, then equivalent biodiversity areas would need to be provided elsewhere. The offline section between J24-J25 would result in significant impacts on the setting of a number of listed buildings, notably major impacts to the grade II listed building, Doggetts Hammer Farm, located within 20m of this option. Mitigation would include reducing the extent of works into these sensitive features. However, it is likely that some effects could not be mitigated, with significant residual effects remaining (particularly on archaeological remains).

Option	Overall environmental score	Conclusions of the environmental appraisal (based on an assessment of the PCF Stage 2 designs)
Refined Option 2 (two bypasses; J22-J23 bypass ties back into A12 east of Rivenhall End)	Potential significant adverse effect – mitigation may be possible	As with Option 2, this option has the potential for significant environmental effects, particularly in relation to the offline sections which would sever areas of BMV agricultural land and have a detrimental effect on landscape and ecology. However, the proposed bypass between J22 and J23 would tie back into the existing A12 east of Rivenhall End and would therefore address the impact on the Rivenhall Long Mortuary Enclosure scheduled monument and reduce the impact on the setting of the Palaeolithic landscape compared to the original Option 2. This alignment would also reduce the area of development in the River Blackwater floodplain. Although there would still be adverse effects on these sensitive features, it is likely that mitigation could be implemented to reduce the effect. Areas of floodplain, the operational quarry, an MSA, and the listed buildings between J24-J25 would all still be affected.
Option 3 (Rivenhall bypass)	Significant adverse effect – unlikely to be able to mitigate	This option has the potential for significant environmental effects. The main difference compared to Option 2 is that it only includes the Rivenhall bypass between J22 and J23, and not the second bypass between J24 and J25. The offline section would sever areas of BMV agricultural land and would have a detrimental effect on landscape and ecology. The offline section would be within the Blackwater Valley, and could cause significant effects to the landscape character. The footprint would also affect an archaeologically rich area and would likely cause substantial harm to the setting of the Rivenhall Long Mortuary Enclosure scheduled monument, as well as associated archaeological remains that contribute to the wider historic setting of the monument. Large areas of floodplain, the operational quarry at Colemans Farm, and an MSA would also be affected. Mitigation would include reducing the extent of works into these sensitive features. However, it is likely that some effects could not be mitigated, with significant residual effects remaining (particularly on archaeological remains).
Option 4 (Marks Tey bypass)	Potential significant adverse effect – mitigation may be possible	This option has the potential for significant environmental effects. The main difference compared to Option 2 is that it only includes the Marks Tey bypass between J24 and J25, and not the second bypass between J22 and J23. This offline section would sever areas of BMV agricultural land and would have a detrimental effect on landscape and ecology. There would also be significant impacts on the setting of a number of listed buildings, notably major impacts to the grade II listed building, Doggetts Hammer Farm, located within 20m of this option. There would be no bypass between J22 and J23;

Option	Overall environmental score	Conclusions of the environmental appraisal (based on an assessment of the PCF Stage 2 designs)
		the option would therefore avoid impacts on the Rivenhall Long Mortuary Enclosure scheduled monument. This alignment would also reduce the area of development in the River Blackwater floodplain. There is still potential for significant effects on other receptors from the proposed Marks Tey bypass, but it is likely these could be mitigated.
Option A to D (options to accommodate the CBBGC between J23-J25)	N/A	Options discounted as a decision was made to remove the CBBGC from the North Essex Authorities' draft Local Plan, on the basis that the Planning Inspector found the proposals to be not sound.

Preferred Route Announcement

3.2.32 Option 2 was chosen in 2017 as the emerging preferred option, as discussed in Section 3.2 – 'PCF Stage 2 Options appraisal (option selection)', of this chapter. Although this option was assessed to have the least favourable impact on the environment compared to the other options considered, it was the most popular option from the non-statutory public consultation, would deliver the greatest capacity, and would have design advantages over the other options. In addition, the Option 2 design was refined to avoid or reduce its environmental impacts. Given the reduced environmental impact of the refined Option 2 compared to the original Option 2 alignment, a PRA was made in October 2019 for the A12 between junctions 19 and 23 with the refined Option 2 as the preferred option (incorporating the design refinements described in the previous section of this chapter).

3.2.33 Following the decision to remove the CBBGC from the North Essex Authorities' draft Local Plan[3], and the subsequent dismissal of the CBBCG options (Options A-D) in Spring 2020, Option 2 was chosen as the preferred option for the A12 between junctions 23 and 25. A PRA was made for this section on 28 August 2020.

3.3 Development of preferred option

3.3.1 Following the PRA, the environmental assessment and scheme development considered design refinements and alternative ways of delivering the proposed scheme. This included consideration of:

- the location and type of technology to be included (e.g. traffic signals and gantries)

[3] The letter from the Planning Inspector with the recommendation to remove the CBBGC from the Local Plan, along with the letter from the North Essex Authorities confirming that CBBGC would be removed, is included in Appendix 3.1 of the Environmental Statement [TR010060/APP/6.3].

- the construction methodology and programme (including the phasing of construction works and number and location of compounds and haul roads)
- optimising the cut-fill balance to reduce material requirements and waste, including consideration of the location and size of borrow pits
- the location and extent of carriageway widening
- the alignment of new offline carriageway
- the location and design of proposed WCH routes
- the type, location and extent of environmental mitigation

3.3.2 Alternative ways of delivering the proposed scheme have been considered to avoid or reduce environmental impacts through improvements to the scheme design. This embedded mitigation is summarised in Table 3.4.

3.3.3 Table 3.4 refers to the statutory and supplementary consultations that were undertaken for the proposed scheme. Further information on these consultations is provided in Chapter 4: Consultation, of the Environmental Statement [TR010060/APP/6.1], and Annex N of the Consultation Report [TR010060/APP/5.2].

Table 3.4 PCF Stage 3 design development

Design element	Design change and reasoning
Junction 19 (shown on sheet 2 of the General Arrangement Plans [TR010060/APP/2.9])	The developer of the Beaulieu Park development, located adjacent to the existing J19, is upgrading J19 in advance of the proposed scheme works to tie into the development, which is currently under construction. It is assumed that the developer upgrades to J19 will be complete before works start on the proposed scheme. The proposed scheme includes additional modifications to increase junction capacity, including a widened overbridge from two to three lanes and additional lanes on roundabouts, approaches and exits. The current design proposals now make greater use of existing infrastructure (reducing the footprint of the proposed scheme), and would reduce the impact on the setting of Boreham House registered park and garden. Additional changes to J19 include amending the alignment of the B1137 Main Road approach to J19 and removing hardstrips to avoid impacting the grade II listed building 'Generals'; adding Payne's Lane Bridge to tie in to the Beaulieu Park development (including amending the ramp design following comments from Essex County Council); and planting individual trees along Main Road to offset any tree losses and future proof the proposed scheme as many of the existing trees are in poor condition.
B1137 Main Road (shown on sheets 2 to 5 of the General Arrangement Plans [TR010060/APP/2.9])	During the statutory consultation, concerns were raised from stakeholders that traffic would increase along the B1137 Main Road through Boreham, as traffic would use this road to travel to J19 rather than joining the A12 at the new J21. This could result in noise level increases through Boreham. In response to these concerns, new speed limits on Main Road are proposed and were presented as part

Design element	Design change and reasoning
	of the supplementary consultation (existing 50mph sections would reduce to 40mph, and 40mph sections would reduce to 30mph). The new speed limits would encourage traffic to use J21, reducing traffic flows along Main Road compared to a scenario with the proposed scheme in place but no additional speed restrictions. There would also be traffic flow reductions on The Street (west of Station Road) and Church Road. Speed restriction would, however, slightly increase traffic flows on Maldon Road and Wellington Bridge.
Hatfield Peverel noise mitigation (shown on sheets 5 and 6 of the General Arrangement Plans [TR010060/APP/2.9])	The design presented at the statutory consultation included a 3m high noise barrier between J20a and J21, on the south side of the A12. Since the statutory consultation, further work was undertaken to develop solutions to reduce noise levels through Hatfield Peverel. It is proposed to use a surface with better noise reducing properties than a conventional low noise road surface, to reduce noise for a greater number of properties through Hatfield Peverel, and this was presented as part of the supplementary consultation. In addition, the use of surfacing as the solution would reduce the noise on both sides of the A12 and not just the southern side where the noise barrier was proposed. Noise reductions for the barrier option and surfacing option are shown below: • 1-3dB(A) reductions with a barrier: 142 receptors • 1-3dB(A) reductions with the surface solution: 373 receptors • >3dB(A) reductions with a barrier: 73 receptors • >3dB(A) reductions with the surface solution: 76 receptors These results show that noise levels would be lower at more receptors, when using the road surfacing with better noise reducing properties, compared to a noise barrier. Not having to provide a noise barrier would reduce disruption during construction, as the retaining wall that needs to be constructed would be a lower height. Noise and vibration associated with construction would be reduced as would the need for night-time working. As such, the noise barrier was removed from the design and a surface with better noise reducing properties was added to the design through Hatfield Peverel (mainline chainage 15375 to 17175 – see the General Arrangement Plans for chainages).
Maldon Road junction with The Street (shown on sheet 5 and 6 of the General Arrangement Plans [TR010060/APP/2.9])	The new J21 arrangement could potentially result in congestion at the B1137 The Street and B1019 Maldon Road junction in Hatfield Peverel. While this is expected to happen with or without the proposed scheme going ahead, the new J21 location would change how the traffic moves around the junction and surrounding roads. By closing J20a and J20b and providing a new all movement J21, traffic on The Street would be reduced. However, more traffic would turn right at the B1137 The Street and B1019 Maldon Road junction coming from Maldon Road to join the new J21. An alternative design was considered which involved removing the mini-roundabout, signalising the junction, and widening the approaches to the junction to two lanes. Although this design would have mitigated the traffic increases predicted as a result of the

Design element	Design change and reasoning
	proposed scheme, it would not resolve the current situation. This design would have also resulted in the loss of trees that are included in tree preservation orders, demolition of properties, loss of private/residential land, impacts to the setting of listed buildings, and impacts on the local community from a large junction being built in the village centre. The adverse effects of this design would have outweighed the benefits and was not supported by Essex County Council, and was therefore discounted. Extensive engagement has taken place with stakeholders including Essex County Council regarding a Maldon Link Road as a means to address existing operational issues with Maldon Road and The Street junction. Over the course of the development of the proposed scheme this work has included detailed traffic assessments of the Maldon Road and The Street junction, possible interventions at that junction, as well as a detailed assessment of bypass options. The project has concluded that there is no case to include a bypass as part of the proposed scheme. Further information on the detailed work that has taken place can be found in Appendix 3.2 of the Environmental Statement [TR010060/APP/6.3].
Junction 21 (shown on sheet 6 of the General Arrangement Plans [TR010060/APP/2.9])	J21 has moved further west (closer to Hatfield Peverel) compared to the PCF Stage 2 design. This new location is considered the optimum location for attracting more traffic to use the junction, while avoiding the need to demolish existing properties in Hatfield Peverel. The design presented at the statutory consultation had a link road to the south of the A12 connecting The Street to J21, with Wellington Bridge providing WCH access only. Due to the proposed closure of J20a and J20b, more traffic would turn right onto the Street if heading north from Maldon (via Maldon Road) to travel to the new J21. This would result in significant adverse effects for nine dwellings along The Street to the east of Maldon Road caused by an increase in noise of more than 3dB(A). Stakeholders raised concerns during the statutory consultation about the high noise levels these properties would experience. Following this feedback, an alternative option was presented at the supplementary consultation which involved removing the southern link road and using Wellington Bridge as a northern link road to the new J21. This would result in a significant decrease in noise of around 4dB(A) for the majority of the dwellings along The Street to the east of Maldon Road, removing the significant effects associated with the southern link road. However, there would be a minor (not significant) increase in noise of 2dB(A) at the dwellings within The Vineyards, north of Wellington Bridge, compared to a negligible increase in noise at the dwellings within The Vineyards with the southern link road in place. Given that the northern link road removed the significant adverse noise effects along The Street, and introduced no new adverse significant effects, this was chosen as the preferred option and incorporated into the proposed scheme design.

Design element	Design change and reasoning
Market Lane noise barrier (shown on sheet 8 of the General Arrangement Plans [TR010060/APP/2.9])	During the statutory consultation, it was assumed that it would be possible to keep the existing noise barrier at Market Lane in place while constructing the retaining wall required for the proposed scheme. However, for the reasons discussed below, this may not be possible. A key principle of the Outline Construction Traffic Management Plan [TR010060/APP/7.7] is to ensure that two lanes of traffic are maintained in each direction on the proposed scheme during weekday daytimes. The reason for this is to ensure that the proposed scheme remains as free flowing as possible during construction. If it is not, it would increase journey times for users, which in turn could lead to temporary increases in traffic on local roads during the construction phase. In order to build the retaining wall next to the northbound carriageway, a level platform is required that can accommodate cranes, piling rigs, deliveries and ensure workers' safety. At this location, the space may not be available to do this safely while maintaining the two lanes of traffic. As such, it is expected that the retaining wall would need to be constructed, working from the area of land between Market Lane and the proposed scheme. To do this safely, the existing noise barrier would need to be temporarily removed for the duration of the works. This was presented as part of the supplementary consultation. The temporary removal of the noise barrier during the construction phase would result in short-term significant noise impacts from traffic on the A12 until the barrier is reinstated. However, there would also be a reduced speed limit on the A12 during the works as part of traffic management measures, which would reduce noise levels. The removal of the noise barrier, in combination with reduced speed limits which are necessary during the construction phase, would result in a temporary moderate noise level increase of approximately 4dB(A) at ground floor level for those dwellings on Market Lane that are closest to the A12. This increase would be a significant adverse effect. Once the noise barrier is reinstated, noise level increases would no longer be significant. With the temporary removal of the noise barrier during construction, there would be additional loss of existing vegetation to the north of the barrier. This would result in a significant adverse visual impact on residents in Market Lane and potentially also residents in other properties in the area if views are orientated towards the A12, during the construction phase. There would be direct open views of construction activity and traffic. The noise barrier would be reinstated following construction of the retaining wall, and trees replanted. During winter year 1 of operation, views would be intercepted by the replacement noise fence, and by summer year 15, replacement planting alongside Market Lane would have established.

Design element	Design change and reasoning
Junction 22 (shown on sheet 10 of the General Arrangement Plans [TR010060/APP/2.9])	The alignment of the mainline around J22 has been revised to reduce the impact on Colemans Farm Quarry. The alignment remains offline and now comes further north than the PCF Stage 2 design, therefore limiting impacts to phases 2, 3, 4 and 5 of the quarry's extraction programme. In addition, J22 has moved further north-east to reduce the impact on the quarry's processing area. Options have also been explored for reducing earthworks and fill material requirements at J22. This has involved modifying the vertical alignment of the mainline and east-facing slip roads to allow the proposed A12 to go below J22 and Braxted Road. As well as reducing material requirements for J22, reducing the vertical alignment also reduces landscape and visual effects due to the reduced profile of the junction.
Junction 24 (shown on sheets 14 and 15 of the General Arrangement Plans [TR010060/APP/2.9])	Early design options located the proposed J24 offline to the south of the existing J24. The new J24 has now been relocated to Inworth Road. The new location provides better connectivity between Tiptree and the strategic road network, and reduces traffic making strategic journeys on the wider local road network when compared against the PCF Stage 2 design. The current proposals for J24 would reduce the visual impact on Prested Hall (grade II listed building) and improve the earthworks cut-fill balance.
Inworth Road (shown on sheets 14 and 20 of the General Arrangement Plans [TR010060/APP/2.9])	The new J24 would result in an increase in traffic along Inworth Road. The Order Limits have been extended along Inworth Road to allow for the widening of certain pinch points by between 0.25m and 1.5m. This includes widening straight sections of the road to provide a minimum of 6.1m carriageway width and widening bends to accommodate two large vehicles passing in opposite directions. Suitable drainage and flood risk mitigation would also be included. These design changes mean that the additional traffic would not lead to increased delays on the road, and also addresses existing safety and flooding concerns raised by stakeholders. These proposals were presented as part of the supplementary consultation. The pinch-point widening and associated drainage works would result in the following likely significant effects: • There would be no new adverse significant effects on air quality, biodiversity, geology and soils, material assets and waste, noise levels[4], the water environment, or climate from widening pinch-points along Inworth Road.

[4] Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1] has concluded that four properties along Inworth Road and four properties along Kelvedon Road north of Tiptree would experience a significant adverse noise effect. There would be seven with a significant beneficial effect along Inworth Road and 12 along Grange Road. These effects are due to an increase in traffic on Inworth Road due to the new location of junction 24 (adverse), and resurfacing the existing concrete surface of the A12 with low noise road surfacing (beneficial), and not a result of the pinch point widening along Inworth Road.

Design element	Design change and reasoning
	• There could be short-term, localised landscape and visual effects due to loss of vegetation, which could also result in temporary effects on the setting of listed buildings; however, this would be mitigated by re-planting, removing the significant effects in the long-term (see Chapter 7: Cultural heritage and Chapter 8: Landscape and visual, of the Environmental Statement [TR010060/APP/6.1]). • There could be an adverse significant effect on agricultural land, as land-take for flood risk mitigation would make some smaller fields untenable (see Chapter 13: Population and human health, of the Environmental Statement [TR010060/APP/6.1]). • Additional drainage and flood storage areas have been incorporated into the design, which would mitigate an increase in flood risk and aim to reduce the existing flood risk (see Chapter 14: Road drainage and the water environment, of the Environmental Statement [TR010060/APP/6.1]). An alternative option was suggested by some residents of the Inworth community, which would involve constructing a bypass link road connecting the southern dumbbell roundabout of the new J24 with the B1023 Inworth Road, at a point south of Inworth village. This option would offer some benefits, including reducing traffic through the village of Inworth; improving the operational safety of the road, as traffic would move onto the new bypass which would be designed to modern standards; and providing more opportunity to improve WCH provision. However, the bypass option would have adverse environmental effects, including the loss of potential veteran trees; impacts to the setting of listed buildings and adverse visual impacts on residents in Inworth from constructing new infrastructure to the rear of properties on the west side of Inworth Road; and introducing a new noise source to the west of Inworth which would increase the noise to the rear of some sensitive receptors. In addition, while the bypass option would provide some benefits to residential properties on the eastern side of Inworth Road, it would not provide benefits across the length of Inworth Road. The bypass would have a higher cost of construction and would require more land. There were also concerns raised about the bypass from the Inworth community itself, with some residents worried that the bypass would introduce air and noise impacts into rural land, impact biodiversity, result in the unnecessary loss of agricultural land, and impact public rights of way. Considering all these factors, the bypass option was discounted, and the pinch-point widening chosen as the preferred option and incorporated into the proposed scheme design. Further information on the detailed work that has taken place can be found in Appendix 3.3 of the Environmental Statement [TR010060/APP/6.3].

Design element	Design change and reasoning
Kelvedon Road	There is predicted to be a significant adverse noise effect at 71 dwellings and three other sensitive receptors along the route from Inworth Road to the B1022 (via Kelvedon Road, through Messing and then Harborough Road). This is due to a moderate (3-5dB(A)) increase in noise at 16 dwellings and a major (5+dB(A)) increase at 55 dwellings. This increase in noise would be caused by an increase in traffic volume along this route due to the new junction 24 arrangement. The 18-hour daily traffic volumes are predicted to change from around 380 without the proposed scheme to 1,210 with the proposed scheme. Over the 18-hour period considered for a daytime noise assessment, this level of traffic would equate to around two vehicles every five minutes without the proposed scheme and six vehicles every five minutes with the proposed scheme. The daytime absolute noise level at those dwellings closest (e.g. within 10m) to Kelvedon Road/The Street is between 58 and 62dB(A), which is below the significant observable adverse effect level (SOAEL). Further from these roads the noise levels are lower. The acoustic character and context of the noise is not expected to change with the proposed scheme, as the noise would still be from road traffic on the same façade of a sensitive receptor as before. Mitigation is not possible along this road for the following reasons: • A low noise surface is only considered to be effective by DMRB LA 111 when average speeds are above 75km/h. The predicted speed along this part of Kelvedon Road is predicted to be 34km/h and so a low noise surface would not be effective. • To be effective, a noise barrier needs to be unbroken. In a situation such as Kelvedon Road, where access is required from the road to sensitive receptors, it is not possible to have a barrier that is unbroken. Noise barriers within the middle of a village and surrounding dwellings are also likely to have adverse visual effects. Other solutions were investigated to remove the significant noise effects, including prohibiting traffic from accessing Kelvedon Road from Inworth Road, and an Inworth Road bypass (as discussed in the row above for Inworth Road). However, noise modelling indicated that these options would result in significant effects elsewhere, namely Oak Road to the north of Tiptree, including receptors that would be above the SOAEL. Given that effects within Messing would be below the SOAEL, no design changes were implemented.

Design element	Design change and reasoning
Prested Hall access (shown on sheet 15 of the General Arrangement Plans [TR010060/APP/2.9])	The long, tree-lined driveway to Prested Hall would be severed by the proposed scheme. The following options have been considered for maintaining access to Prested Hall: • Create a new drive in the location of the existing one – this option is not feasible as the proposed A12 mainline would be higher at the point it severs the drive, and as such, there would not be enough space to ramp up an overbridge at the gradient required for WCH. There would also be a loss of distinctive trees along the driveway. • New offline access from the existing A12 where a new five-arm roundabout would be constructed in the location of the existing J24. An overbridge would be constructed over the new A12 mainline to the west of the existing Prested Hall driveway. The new access road would then tie into the southernmost section of the driveway. Most of the trees along the drive on the southern side of the new A12 would be lost where it ties back in. • Merging the Prested Hall access with the Threshelfords access road further to the west. The new Prested Hall access road would be provided from the existing J24 using part of the existing A12 northbound carriageway. It would then join with the Threshelfords access road before crossing the A12 via a new Threshelfords overbridge. The third option – merging the Prested Hall access with the Threshelfords access road – has been chosen following comments from local stakeholders. The proposed access arrangements are shown on Figure 2.1: Environmental Masterplan [TR010060/APP/6.2]. This option would result in the least amount of new infrastructure being constructed in the area (i.e. one new structure over the proposed A12 mainline as opposed to two), and would have the least impact on the existing Prested Hall driveway as trees on the remnant sections of the driveway would be retained.
Junction 24 to 25 alignment (shown on sheets 15 to 18 of the General Arrangement Plans [TR010060/APP/2.9])	The horizontal alignment of the A12 mainline between J24 and J25 has been improved to reduce the area of land between the new and existing A12. The new alignment also avoids a registered veteran tree to the south of Easthorpe Road. Required works to a farm access track in this area have also been redesigned to position the track away from the veteran tree (outside of the root protection area). Where the new A12 approaches J25, the proposed scheme has been moved slightly eastwards before turning back towards the existing A12 in order to avoid a number of properties, including a listed building (Doggetts Hammer Farm). The proposed scheme would provide a WCH route from the new Wishing Well Farm overbridge along the south side of the new A12 and a new bridge for walkers (Potts Green Bridge) linking to Doggetts Lane.

Design element	Design change and reasoning
Easthorpe Road (shown on sheet 16 of the General Arrangement Plans [TR010060/APP/2.9])	The design at the statutory consultation showed proposals for improved access to Easthorpe Road from the existing A12 once it is de-trunked. The design presented at statutory consultation allowed drivers to use the new roundabout to access Easthorpe Road from both sides of the existing A12 and cross over the A12 bypass via a new bridge. Stakeholders raised concerns that this would increase traffic along Easthorpe Road. An alternative design was considered and presented at the supplementary consultation that involved banning general traffic from using the new bridge to travel to and from Easthorpe Road. An accommodation bridge across the proposed scheme would still be provided at this location to provide access for agricultural machinery and emergency vehicles as well as walkers. By stopping general vehicle access from Easthorpe Road onto the future de-trunked A12, traffic modelling indicates that vehicles that would use that access would use School Road and London Road to make their journeys instead, with a small number using other routes. This would result in negligible changes in air quality and noise levels along those roads, and a significant benefit in noise levels of more than 3dB(A) at receptors along Easthorpe Road. Given the significant benefits of closing Easthorpe Road to traffic to and from the de-trunked A12, and that there would be no significant adverse effects on School Road and London Road, this was chosen as the preferred option and incorporated into the proposed scheme design.
Junction 25 (shown on sheets 18 and 19 of the General Arrangement Plans [TR010060/APP/2.9])	The current design proposals seek to maximise the use of existing infrastructure at J25 to facilitate improvements for walkers and cyclists. Modifications to the junction design have been made to mitigate for the fact that northbound traffic from Kelvedon may choose to continue along the de-trunked A12, rather than join at J24. This includes the following design changes: western roundabout converted to compact signalised junction (crossroads), which would allow for safer, easier trips for walkers and cyclists; eastbound to westbound U-turn provision on dumbbell link; and kerb realignment to provide additional capacity at the eastern roundabout. Links would be provided for walkers and cyclists from the Kelvedon/Feering direction across the junction using controlled crossings, along with a new bridge for walkers and cyclists (Marks Tey Replacement Bridge) across the A12 to provide links towards Copford (see Plate 2.6 in Chapter 2: The proposed scheme [TR010060/APP/6.1]).

Design element	Design change and reasoning
Retaining walls	The proposed earthworks have been reviewed. In certain locations, retaining walls have been proposed, instead of earthworks slopes, to reduce land-take, minimise encroachment into third party land, and limit adverse impacts on environmental features. Examples include the following (the chainages referred to below are shown on the General Arrangement Plans [TR010060/APP/2.9): • J19 southbound off-slip to avoid encroaching on business premises between the slip road and B1137 Main Road (mainline chainage 10950 to 11050) • Northbound and southbound carriageway of the A12 at Olivers Bridge to avoid encroaching on properties along Maldon Road (mainline chainage 20300 to 20600 (southbound) / 20650 (northbound)) • Southbound carriageway of the A12, south of junction 22, to minimise permanent land-take within the River Blackwater floodplain (mainline chainage 21750 to 21850) • Northbound carriageway of the A12 at Park Bridge to avoid encroaching on a property north of the A12 (mainline chainage 31750 to 31875) • Southbound carriageway at junction 25 to avoid encroaching on properties along London Road (mainline chainage 38100 to 38350)
Main river flood risk mitigation	Areas originally included within the Order Limits for flood risk mitigation were re-assessed through more detailed flood risk modelling following design refinements. As a result, it was concluded that the proposed scheme is unlikely to increase flood risk at the following main rivers, and therefore that mitigation is no longer required: • Boreham Brook • River Ter • River Brain • River Blackwater • Domsey Brook (west and east crossings) • Roman River The Order Limits have accordingly been reduced in these areas. A 22m-long raised flood mitigation bund would be placed along the right bank of the Rivenhall Brook immediately downstream of the new Rivenhall Brook culvert, to ensure the watercourse realignment would not result in any increased flooding to the western floodplain of the watercourse. Further information on flood risk is provided in Chapter 14: Road drainage and the water environment [TR010060/APP/6.1], and Appendix 14.5: Flood Risk Assessment, of the Environmental Statement [TR010060/APP/6.3].

Design element	Design change and reasoning
Ordinary watercourse flood risk mitigation	The Preliminary Flood Risk Assessment at statutory consultation identified a potential flooding issue at an existing culverted crossing of the A12 for an ordinary watercourse located approximately 750m east of the River Blackwater crossing at J23. This watercourse has been denoted as 'Watercourse 21' within the list of unnamed watercourses across the proposed scheme area. The preliminary assessment included allocation of an area upstream of the A12 crossing for provision of a flood storage reservoir as a potential option to address the flood risk. An alternative design was considered, and presented as part of the supplementary consultation, that provides a reduced flood storage area in conjunction with a diversion to take flood flows in this watercourse directly to the River Blackwater via a drainage ditch and buried pipe along the southern boundary of the A12. This option would reduce land-take associated with the flood storage area while mitigating the flood risk, and was therefore chosen as the preferred option and incorporated into the proposed scheme design. Flood mitigation was also included for three other ordinary watercourses, in the form of flood storage compensation (Watercourses 21a, 23 and 26). Further information on flood risk mitigation is provided in Chapter 14: Road drainage and the water environment, of the Environmental Statement [TR010060/APP/6.1]. Watercourses are shown on Figure 14.1 [TR010060/APP/6.2].
Road surfacing	Conventional low noise surfacing has generally been proposed for offline sections of the proposed scheme, and where the A12 would be widened. Road surfacing with better noise reducing properties than a conventional low noise road surface has been incorporated into the design at the following locations to reduce noise level increases from the proposed scheme (the chainages referred to below are shown on the General Arrangement Plans [TR010060/APP/2.9]): • Between junction 19 and junction 20a, on the southbound carriageway of the A12 only (mainline chainage 11525 to 15375) • Through Hatfield Peverel (mainline chainage 15375 to 17175) • Witham bypass and the new Rivenhall End bypass between junction 22 and junction 23, starting east of the new junction 21 and finishing at junction 23 (mainline chainage 17950 to 26175) • The new A12 bypass between junction 24 and junction 25, starting west of Easthorpe Green and finishing at junction 25 (mainline chainage 35725 to 38200) Further information on road surface proposals is provided in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1].

Design element	Design change and reasoning
Utility diversions	Chapter 2: The proposed scheme [TR010060/APP/6.1], describes the options being considered for utility diversions. This has included offline diversions (i.e. utility corridors away from the proposed A12 mainline) to avoid sensitive environmental features. In some instances, the Order Limits have been extended, to allow for offline utility diversions. In the case of the high-pressure gas main, operated by Cadent Limited, five diversion corridors were considered. A preferred corridor has been chosen for the diversion, and is described in Chapter 2: The proposed scheme [TR010060/APP/6.1]. The final route and design (within the preferred corridor) is not known for the gas main diversion, however, the corridor has been defined with a sufficient width (i.e. the limits of deviation) to reduce impacts on properties, businesses and environmentally sensitive areas where practicable. A description of the discounted diversion corridors is provided in Section 3.3 – Gas main diversion, of this chapter.
Ecology mitigation areas	During the statutory consultation process, a number of proposed ecological mitigation areas were challenged by stakeholders, requiring a review of the location and scale of the proposed land-take. Stakeholders were consulted to discuss options. Each location was then reviewed in-line with the stakeholder comments, and consideration given to the size and location of each area, as well as the type of mitigation habitat proposed within each area. The following details the locations of the ecological mitigation areas that have changed following stakeholder feedback. <u>South of junction 19:</u> A single, large mitigation area was proposed linking important ditch networks. Because of concerns raised by the landowner, and potential impacts on access to adjacent fields, alternative solutions were discussed during a meeting with the landowner, resulting in a reduction in size of the mitigation area, and the subsequent creation of a smaller, secondary area, located further south along another part of the ditch network. Tree planting has also been moved from south of the mitigation area to the northern side to provide additional screening for Boreham House, at the request of Chelmsford City Council. This layout has been included within the proposed scheme design, and is shown on sheet 1 of the General Arrangement Plans [TR010060/APP/2.9]. <u>East of junction 19:</u> A single mitigation area was proposed between the A12 and the B1137 Main Road, adjacent to an area already proposed to be taken for an attenuation pond. The landowner asked if the overall land-take could be reduced to allow the retention of a more suitable land parcel. The footprint of the attenuation pond was therefore reconfigured, allowing enough space to relocate the mitigation area into its immediate surroundings, and thereby reducing the overall land required in this area. This layout has been included within the proposed scheme design, and is shown on sheet 2 of the General Arrangement Plans [TR010060/APP/2.9].

	West of Hatfield Peverel (south of A12 corridor): A single mitigation area is proposed between a proposed attenuation pond and the River Ter. A non-landowner stakeholder requested a change to this location. The location was therefore reviewed and the mitigation area was moved into an adjacent field. However, the full extent of the stakeholder's land use was not disclosed, and they advised this new location was inappropriate due to an existing use. An alternative was suggested by the stakeholder, but upon investigation was not deemed suitable. As no suitable alternatives were found, the mitigation was returned to the original area. This is shown on sheet 5 of the General Arrangement Plans [TR010060/APP/2.9]. Junction 21 (south of A12 corridor): A single, large mitigation area was proposed to the south-west of the proposed new J21, adjacent to proposed attenuation ponds. Concern was raised by the landowner regarding possible future use of the land. This land could also be used for a potential future link road connecting Maldon Road to J21. The mitigation area was therefore relocated to the south-east of J21. This layout has been included within the proposed scheme design, and is shown on sheet 6 of the General Arrangement Plans [TR010060/APP/2.9]. Junction 21 (north of A12 corridor): A single, large mitigation area was proposed to the north-east of the proposed new J21, sited between an attenuation pond and borrow pit E. The landowner wanted to retain as much land as possible in this location, and through discussion, this area was significantly reduced in size, with the lost habitat footprint relocated elsewhere within the same land ownership. As a result, two new areas were formed in land parcels located to the west of J21. The first site makes partial use of a field located between the existing A12 and railway line, immediately east of Terling Hall Road, and the second area would be located north of Bury Lane, in a triangular patch of land adjacent to the railway line. This layout has been included within the proposed scheme design, and is shown on sheet 6 of the General Arrangement Plans [TR010060/APP/2.9]. South of Witham: Two mitigation areas are proposed either side of Howbridge Hall Road. The landowner asked if land-take could be reduced as much as possible on the western side of the road to leave them with a more usable field. Alternative land-take layouts were proposed around this location, with several iterations discussed with the landowner. The current proposal has removed the plot completely from the field on the western side of Howbridge Hall Road, and has increased the area to the east as much as possible by re-aligning the access track within this land parcel (around the proposed attenuation pond). Not all the ecological mitigation could be accommodated within this space however, so through discussions with the landowner, an alternative part of their field – located slightly further south – which was of a suitable size would be used to make up the shortfall. This layout has been included within the proposed scheme design, and is shown on

Design element	Design change and reasoning
	sheets 7 and 8 of the General Arrangement Plans [TR010060/APP/2.9]. Junction 22: Three individual mitigation areas were proposed south of J22. The northernmost area was reconfigured following a request from the landowner to move the area as far away from their property as possible, partially due to concerns regarding the potential implications of sensitive ecology close to their operational quarry. The revised layout was subsequently rejected by the landowner who wished for this whole parcel of land to be left clear of any proposals. An alternative layout has therefore been designed, whereby the mitigation area has been relocated to the north-east, into a land parcel contained between the old and new A12 corridors. It creates two plots either side of a proposed attenuation pond, with the new A12 alignment separating the areas from the quarry. This proposal is shown on sheet 10 of the General Arrangement Plans [TR010060/APP/2.9]. South-east of Rivenhall End: A single mitigation area was proposed adjacent to the land south of the proposed A12 and east of Braxted Road. A request was made to remove the southern portion of this mitigation area. The mitigation area was therefore split into two smaller areas, with the removed footprint from the original area relocated into an area on the northern side of the Rivenhall Brook. A further request was received to free as much of the original land parcel as possible, so the remaining area to the south has been pushed eastwards and reconfigured to sit around the proposed attenuation pond. This layout has been included within the proposed scheme design, and is shown on sheet 11 of the General Arrangement Plans [TR010060/APP/2.9]. South of the existing junction 23: A single, large mitigation area was proposed running parallel to the new Essex County Fire and Rescue Service Headquarters access road on the southern side of the A12. A landowner request was made to relocate this plot to allow for better use of their property. The mitigation area was therefore pushed to the south-east side of the land parcel, and is now located running along the edge of the River Blackwater willow plantation, wrapping up the north-east side around a proposed attenuation pond. This is shown on sheet 12 of the General Arrangement Plans [TR010060/APP/2.9]. Prested Hall: A single mitigation area was proposed adjacent to Prested Hall. A request was made to look at the extent of land-take across the wider Prested Hall setting. As the mitigation area would be permanent land-take, it was decided to move this to the field parcel closer to the A12 corridor, freeing up the majority of the field parcel closest to Prested Hall. This layout has been included within the proposed scheme design, and is shown on sheet 15 of the General Arrangement Plans [TR010060/APP/2.9].

Design element	Design change and reasoning
	South-west of Doggetts Lane and east of Doggetts Farm: A single, large mitigation area was proposed south-west of Doggetts Lane, on the northern side of the proposed A12. The landowner requested a review of this land-take as they wished to retain as much viable farmland as possible in this location. An initial amendment transferred half of the mitigation area to land on the southern side of the proposed A12, but a second review removed the whole of the mitigation area from its original location across to the new location (adjacent to Wishing Well Farm). A second single, large mitigation area was proposed in a field parcel adjacent to the proposed A12, on the southern side, east of Doggetts Farm. The landowner also requested that this mitigation area be relocated to the area around Wishing Well Farm. This request has largely been accommodated, creating one, significantly larger mitigation area around the Wishing Well Farm premises, leaving only a small mitigation area remaining to the northernmost end of the original plot (on the southern side of the new A12). Access track provision has been retained around each new area. This layout has been included within the proposed scheme design, and is shown on sheet 18 of the General Arrangement Plans [TR010060/APP/2.9]. Roman River (Marks Tey): A single mitigation area is proposed by the Roman River for the inclusion of wildlife boxes (e.g. bat and bird boxes). The landowner requested that ownership of this land parcel reverts to them after completion of works. This would be possible with agreement from the landowner in place. This layout has therefore been retained and included within the proposed scheme design, and is shown on sheet 19 of the General Arrangement Plans [TR010060/APP/2.9].
Veteran trees	There are veteran, ancient and notable trees (as defined by the Woodland Trust) within the study area. Within the Order Limits, there are three veteran elms, one located south-west of Witham along the B1389, one south of Easthorpe Road and another along the A12 south of Marks Tey close to the connection of the Easthorpe Road access bridge to the de-trunked A12. When designing the connections to the B1389 and de-trunked A12, care was taken to avoid impacts on the root protection areas of these trees in order for them to be retained. As described above, the horizontal alignment of the A12 mainline between J24 and J25 has been improved to avoid the veteran elm to the south of Easthorpe Road. Arboricultural surveys presented within Appendix 8.4 of the Environmental Statement [TR010060/APP/6.3] have identified potential veteran and potential ancient trees within the Order Limits that have not been defined by the Woodland Trust. The proposed scheme has been refined where practicable to avoid impacts on and retain these trees, however, the loss of five potential veteran trees is unavoidable. These include:

Design element	Design change and reasoning
	• An oak tree south of the A12 and south-west of Witham to accommodate earthworks where the A12 is widened online. Moving the mainline to avoid loss of this tree is constrained by the geometry of the existing J21 and existing and proposed development to the north of the A12. This tree (T236) is shown on sheet 7 of the Retained and Removed Vegetation Plans [TR010060/APP/2.14]. • An oak tree east of Witham to accommodate a haul road adjacent to the A12 southbound carriageway. Opportunities to move the haul road are limited due to the floodplain of the Rover Blackwater. This tree (T316) is shown on sheet 9 of the Retained and Removed Vegetation Plans [TR010060/APP/2.14]. • A willow tree at J22 (Colemans interchange) is lost beneath the footprint of the junction. Opportunities to move the junction are constrained by its scale and geometry and the need to minimise effects on Coleman's Farm Quarry. This tree (T367) is shown on sheet 10 of the Retained and Removed Vegetation Plans [TR010060/APP/2.14]. • A willow tree north-east of Rivenhall End and north of the proposed offline bypass between J22 and J23 to accommodate the new road. Moving the mainline closer to the existing A12 to avoid this tree would have potential impacts on other environmental constraints including 3no. potential veteran trees in the verge by Essex County Fire and Rescue Service Headquarters and the grade II* listed building at Hole Farm. This tree (T452) is shown on sheet 12 of the Retained and Removed Vegetation Plans [TR010060/APP/2.14]. • An oak tree south of J24 (Kelvedon North interchange) to accommodate the new junction and the earthworks around the southern roundabout. This tree is at risk of removal, but opportunities to retain it may be presented at detailed design. This tree (T542) is shown on sheet 14 of the Retained and Removed Vegetation Plans [TR010060/APP/2.14].

3.3.4 As a result of ecology and arboricultural surveys, the proposed scheme design has been refined throughout where practicable to avoid impacts on habitats, protected and notable species, important hedgerows, trees subject to tree preservation orders (TPO) and within conservation areas, and trees designated as or identified as meeting ancient, veteran and Grade A criteria. Further details are provided in Chapter 8: Landscape and visual, and Chapter 9: Biodiversity, of the Environmental Statement [TR010060/APP/6.1]).

3.3.5 Vegetation loss and retention is based on the information presented on the Retained and Removed Vegetation Plans [TR010060/APP/2.14]. To assume a worst case, all trees at risk of removal have been assumed lost, however, it may be feasible to retain some of the trees identified as trees at risk, including some of the TPO, potential veteran trees and trees within the Chelmer and Blackwater Navigation Conservation. This would be determined at the detailed design stage.

Borrow pit strategy

3.3.6 Section 2.6 of Chapter 2: The proposed scheme [TR010060/APP/6.1], describes the borrow pit locations that have been included in the Order Limits. The location of borrow pits has considered the anticipated type and quantity of material yields, location, access to the A12 and proposed works, proximity to residential areas, groundwater levels, archaeology, and other environmental factors. Borrow pit locations which have been discounted include the following:

- Borrow pit A (south-west of junction 20a) – discounted due to the distance of the borrow pit from the A12. There would be a requirement to use Mowden Hall Lane for access, which went against the preference for off-road haulage. Main Road also separates this borrow pit from the A12, meaning construction traffic would need to travel via Hatfield Peverel or Boreham to access the A12. This would have an impact on the quality of life of residents of Boreham and Hatfield Peverel. Ground investigations suggested that the yield of suitable material was not as high as the preferred borrow pits, and groundwater may make extraction challenging.

- Borrow pits B, C and L (north of Hatfield Peverel and GEML) – discounted due to the borrow pits' distance from the A12. The GEML segregates these borrow pits from the A12, meaning construction traffic would need to travel via Hatfield Peverel, or a temporary bridge over the railway line would be required to access the A12. Sending construction traffic through Hatfield Peverel would have an impact on the quality of life of residents.

- Borrow pit D (east of Hatfield Peverel, between the A12 and GEML) – discounted due to being adjacent borrow pit E, which had a more favourable location regarding the intended fill area.

- Borrow pit G (east of junction 21 on the south side of the A12) – discounted as the distance of the borrow pit from the proposed scheme was unsuitable when compared to the preferred borrow pit locations. Ground investigations also suggested that groundwater control during excavation would likely be intensive and would result in drawdown impacts extending off-site which would need to be mitigated.

- Borrow pit H (south of the A12 between junctions 21 and 22) – discounted due to changes in the proposed scheme alignment design and earthworks material quantities rendering the location of the borrow pit unsuitable for the general fill area it would serve.

- Borrow pit K (east of the existing A12 between the east end of Feering and the Prested Hall Estate) – discounted due to changes in the proposed scheme alignment design and earthworks material quantities rendering the location of the borrow pit unsuitable for the general fill area it would serve. There would also be potential groundwater issues and potential impacts on protected species.

3.3.7 Further information on the borrow pit optioneering is provided in the Borrow Pits Report, which is included in Volume 7 of the DCO application [TR010060/APP/7.8].

3.3.8 In addition to discounting the above borrow pits, environmental constraints have also been considered for the borrow pits included within the Order Limits. Mitigation measures for avoiding sensitive features are included in the Register of Environmental Actions and Commitments, which is within the first iteration of the Environmental Management Plan [TR010060/APP/6.5], and include:

- exclusion zones around features such as badger setts, hedgerows, trees and suspected asbestos containing material
- room around certain sections of the borrow pit perimeters to install seeded bunds to provide noise and visual mitigation to nearby properties
- suitable public right of way diversions

Compound siting

3.3.9 Section 2.6 of Chapter 2: The proposed scheme [TR010060/APP/6.1], describes the construction compounds that have been included in the Order Limits. The siting of compounds has considered location, access to the A12 and proposed works, access to existing utility supplies, proximity to residential areas, and other environmental factors. Compound locations which have been discounted include the following:

- North of the existing junction 21 (east of Woodend Farm) – discounted due to being located adjacent to a new housing estate, which would be affected by noise and light pollution impacting on the properties closest to the compound, especially if the compound were to operate through the night. A lack of utilities at this location also contributed to this site being discounted.
- South of the existing junction 22 – although this site was located close to available utilities and had good access/egress onto the A12 via junction 22, it was discounted as the area was required for a potential drainage pond and for environmental mitigation.
- North of the existing junction 23 – site has limited connectivity and access to the proposed works due to being situated next to Kelvedon and the junction only having two accesses onto the A12. This would mean a greater amount of construction traffic using local roads. A lack of utilities at this location also contributed to this site being discounted.

Gas main diversion

3.3.10 Five potential corridors were considered for the gas main diversion, and were presented at the supplementary consultation (shown on Plate 3.2 below). Table 3.5 describes these corridors, as well as the reasons why they were selected or discounted. All corridors in Table 3.5 divert from the existing gas main at approximately NGR (national grid reference) TL 821 130, west of Maldon Road (B1018), and re-join the existing gas main at approximately NGR TL 830 144, south-west of Little Braxted.

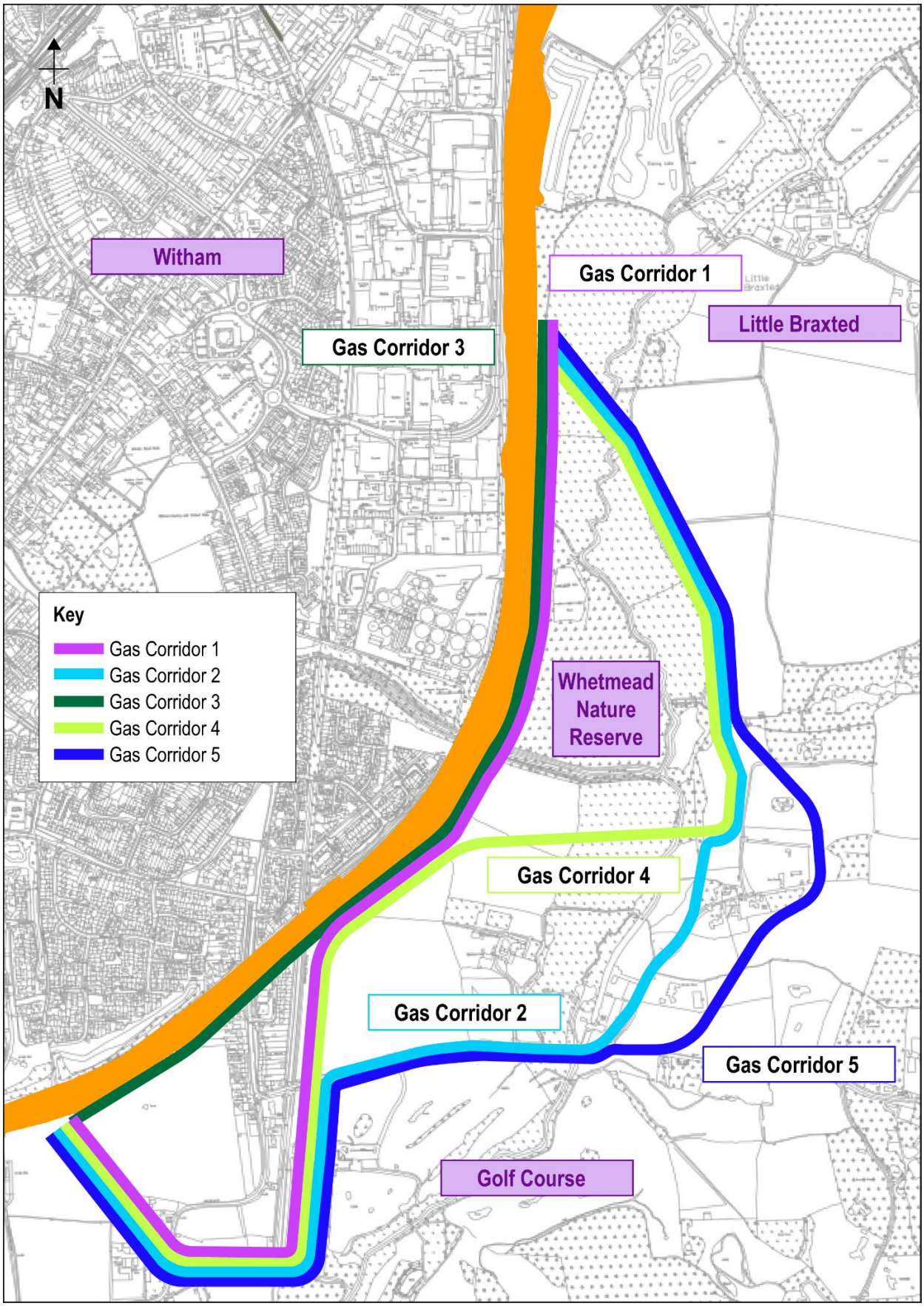
3.3.11 Corridor 4 was selected as the preferred corridor, and is included in the scheme description within Chapter 2: The proposed scheme [TR010060/APP/6.1]. There have been minor changes to the route of corridor 4 and its associated

limits of deviation since the supplementary consultation, which are reflected by the Order Limits shown on the General Arrangement Plans in Volume 2 of the DCO application [TR010060/APP/2.9].

Table 3.5 Gas main diversion options

Diversion corridor	Reason for discounting or selecting the option
Corridor 1 – Diverts south-east, away from the A12 and around Maldon Road and then travels back north-east to follow the existing A12.	This corridor would involve diverting the gas main through the historic landfill at Whetmead LNR. There would be issues around safety during construction and long term serviceability of the asset associated with placing a new asset in the potentially contaminated ground, which were not acceptable to Cadent. This option was therefore discounted.
Corridor 2 – Diverts south-east, away from the A12 and around Maldon Road and then travels further east along Blue Mills Hill where it crosses the River Blackwater. It then travels north-east along Ishams Chase to divert around Whetmead Local Nature Reserve (LNR), avoiding the potential contaminated land, before continuing north towards the A12.	This option would potentially result in the loss of trees and hedgerows that line Blue Mills Hill and Ishams Chase, impacting the landscape character of these areas and potentially impacting on the setting of listed buildings. There would also be disruption to residents during construction. There was strong opposition to this option from residents of Blue Mills Hill and Ishams Chase, as well as Maldon District Council. This option was therefore discounted.
Corridor 3 – Follows as closely as possible to the existing A12 mainline.	This corridor would involve diverting the gas main through the historic landfill at Whetmead LNR. There would be issues around safety during construction and long term serviceability of the asset associated with placing a new asset in the potentially contaminated ground, which were not acceptable to Cadent. This option was therefore discounted.
Corridor 4 – Diverts south-east, away from the A12 and around Maldon Road and then returns north-east to run alongside the existing A12 mainline before diverting east away from the A12 again, crossing the River Blackwater to go around Whetmead LNR, avoiding the potential contaminated land, before continuing north towards the A12.	This corridor was selected by Cadent as the preferred option. Although this option would result in loss of woodland where it crosses the River Blackwater, the route of the corridor has been altered since the supplementary consultation to avoid woodland on the east bank of the River Blackwater, therefore reducing tree loss. This option also avoids the landfill at Whetmead, and properties along Blue Mills Hill and Ishams Chase.
Corridor 5 - Diverts south-east, away from the A12 and around Maldon Road and then travels further east than Corridor 2 to divert around the residential properties along Ishams Chase and Whetmead LNR, avoiding the potential contaminated land, before continuing north towards the A12.	As with corridor 2, this option would potentially result in the loss of trees and hedgerows that line Blue Mills Hill and Ishams Chase, impacting the landscape character of these areas and potentially impacting on the setting of listed buildings. There would also be disruption to residents during construction. There was strong opposition to this option from residents of Blue Mills Hill and Ishams Chase, as well as Maldon District Council. This option was therefore discounted.

Plate 3.2 Gas main corridors as presented at the supplementary consultation



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