

North Essex Rapid Transit System (RTS)

Stage 1a/2

Environmental Risk Assessment

August 2019

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1 Introduction

1.1 The Scheme

Tendring Colchester Border Garden Community (TCBGC) has an ambitious plan to build 7500 new homes. To enable this ambition to be realised, it is necessary to provide a link road between A120 and A133 as well as a Rapid Transit System (RTS) for public transport. The RTS has the potential to unlock 2500 new homes and is an essential part of the TCBGC growth strategy. It is considered that the provision of a high-quality RTS, with dedicated sections and priority measures at key junctions, will provide for more reliable and improved journey times.

This report considers the RTS proposals only; the A120 to A133 link road is considered in a separate report. The RTS will link the University of Essex, through the Knowledge Gateway employment zone, to Colchester town centre and other key destinations, including rail stations and hospitals. The RTS will also serve two potential “Park and Choose” sites, with one proposed in the north (along the A120) and one proposed in the south (along the A133).

The proposed RTS route, with all the various route options being considered, is displayed in Figure B355363A-RTS-HGN-SW-SK-001 “Stage 1 Options” in Appendix A. For design purposes, the proposed RTS route has been split into three main sections (A to C); brief descriptions are provided below. The proposed RTS, as a whole, will be referred to as the ‘proposed Scheme’ hereafter in this report.

Section A

Section A covers the existing Park and Ride bus route between Colchester’s Park and Ride Terminal (north of the A12) and North Hill. There are no route options associated with Section A; however, there are a number of infrastructure format options being considered along the Northern Approach road section (near Colchester Hospital) using highway boundary land reserved during its original construction. The remainder of Section A already has bus priority infrastructure in place which can be utilised for the RTS.

Key proposed improvements within Section A include:

- improvements to Northern Approach Road and the adjacent green space to provide dedicated RTS facilities;
- upgrades to Northern Approach / Bruff Close junction to allow for dedicated movement of a RTS through / across the junction;
- upgrades to RTS facilities along Bruff Close (an existing dedicated bus facility);
- the use of North Station Road with the possible inclusion of a one-way system for all traffic and a contraflow RTS lane southbound towards the town centre; and
- the use of the southbound bus gate and the northbound bus lane at Middleborough, leading into Section B.

Section B

Section B covers Colchester’s town centre, extending eastwards towards the University of Essex. Options in the town centre are limited due to access requirements and existing one-way systems. A peak hour RTS gate is being considered at the western end of the High Street to reduce congestion for RTS using this route.

Five route options are being considered for this section; they all share common features such as: existing historic town centre with little or no opportunity to provide additional carriageway; limited on-street and disabled parking; and some existing bus infrastructure. All five options connect with Section A via North Hill and utilise existing bus routes through Colchester’s town centre, covering

North Hill, Head Street, High Street (from Head Street to Queen Street), Queen Street, St Botolph's Street, Osborne Street, and St John's Street; these routes will hereafter be referred to as the 'town centre routes' in this report. At the other end of Section B, all five options are still in the early stages of design development around Greenstead Roundabout/Colne Causeway, before connecting to Section C.

The proposed route for each of the Section B options are as follows:

- Option 1 – extending along the A134, from St Botolph's Roundabout to the Hythe area, then following Hythe Station Road bus lane onto Greenstead Road to Greenstead Roundabout;
- Option 2 – extending from High Street, along East Hill and Greenstead Road, to Greenstead Roundabout;
- Option 3 – utilises land running adjacent to the railway line from Colchester Town train station (at St Botolph's Roundabout) to Hythe train station, then following Hythe Station Road bus lane onto Greenstead Road to Greenstead Roundabout;
- Option 4 – extending along Military Road and Old Heath Road from St Botolph's Roundabout, before utilising Recreation Road, an existing dead-end. A new road would need to be constructed to link Recreation Road to the western end of Colne Causeway. From here, the route would then head along Hythe Quay (A134) to Hythe train station, before following Hythe Station Road bus lane onto Greenstead Road to Greenstead Roundabout; and
- Option 5 – extending from High Street, along East Hill, before heading along Ipswich Road and St Andrew's Avenue to Greenstead Roundabout.

Section C

Section C covers the area between Greenstead Roundabout and the A133. There are three route options being considered within this section, as follows:

- Option 1 – utilises existing roads within the Essex University's ground, from the A133 at Boundary Road, through Capon Road/Boundary Road roundabout (connecting to Section B options 1 to 4) and continuing along Boundary Road around the university campus. At the western end of Boundary Road, modification to the existing entrance to the Knowledge Gateway site (a University of Essex Business Park for research and technology) would be required;
- Option 2 – from Greenstead Roundabout (connecting to Section B option 5), this option proposes to install RTS lanes alongside the A133 towards the proposed A120 to A133 link road; and
- Option 3 – from the end of Elmstead Road (connecting to Section B options 1 to 4), this option would require the construction of a new road to connect the route to the A133 and beyond. Modification to the existing entrance to the Knowledge Gateway site would be required.

1.2 Purpose of Report

To inform options development of the proposed Scheme, this report presents the findings of a desk-based environmental risk assessment of all the proposed route options within a 250m buffer of the proposed Scheme, hereafter referred to as the 'study area'. The assessment provides a high-level overview of potential constraints only and is not considered to be a comprehensive assessment. Potential impacts have been considered for some environmental aspects where relevant information is available; however, detailed assessment on the likely significance/magnitude has not been undertaken at this stage. Recommendations will be refined as further details of the proposed Scheme become available.

The following environmental topics will be covered in the assessment:

1. People and Communities – this section gives consideration to the potential impacts of the proposed Scheme to 'All travellers', including non-motorised users such as pedestrians, cyclists,

and horse-riders. Consideration should also be given to the Equality Act 2010 to ensure changes allow access for all. Changes to access and land use may have an effect on land value and viability;

2. Air Quality – this section gives consideration to potential changes to air quality due to traffic flow alterations resulting from the proposed Scheme, including road widening and/or new road construction. Road improvement schemes could improve the local air quality but could also change traffic patterns causing poor air quality in other areas. Particular attention is given to already sensitive areas that have been declared an Air Quality Management Area (AQMA) by the local planning authority;
3. Noise and Vibration – this section gives consideration to potential changes in traffic noise and vibration levels due to alterations in traffic flow movements and speed as a result of the proposed Scheme, including road widening and/or new road construction. Consideration is also given to the potential for increased levels of noise and vibration during construction works (e.g. due to piling, drilling, and movement of large machinery). Particular attention is given to existing ‘hot spot’ areas for noise, i.e. Noise Important Areas (NIAs), which are managed by the highway authority;
4. Landscape and Visual – this section gives consideration to the potential changes to landscape setting and views as a result of the proposed Scheme. The most likely impact of the proposed Scheme on the landscape is the removal of vegetation potentially opening up views to the road to sensitive receptors;
5. Arboriculture – this section gives consideration to the potential impact on trees. In particular, statutory legislation within the Town and Country Planning Act (1990) refers to the protection and provisions made for those trees under a Tree Preservation Order (TPO) and those within a Conservation Area;
6. Cultural Heritage – this section gives consideration to the potential impact on both above and below ground cultural assets. As a non-renewable resource, some elements are protected by law; if designated, archaeological remains are protected under the Ancient Monuments and Archaeological Areas Act 1979, and listed buildings and areas of the built environment are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990. Unauthorised damage or alteration of nationally protected cultural heritage assets may result in fines and/or prosecution. The presence of known and unknown non-designated archaeological remains may also require mitigation, affecting project programme and budget. Archaeological deposits could lie relatively close to the surface and could be disturbed during groundworks or geotechnical investigations;
7. Ecology and Nature Conservation – this section gives consideration to the potential impact to habitats and species, which are protected in the UK under a variety of legislation including the Wildlife and Countryside Act 1981, Conservation of Habitats and Species Regulations 2010 (as amended) and Natural Environment and Rural Communities Act 2006. Harm or disturbance to protected habitats or species can result in fines and prosecution;
8. Geology and Soils – this section gives consideration to the potential impact on soils and geology, including the potential to encounter potentially contaminated materials underground. The geology is described in terms of superficial deposits and bedrock designations; superficial deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks, referred to as bedrock. Geological designations identify the potential of the geological strata to provide water that can be abstracted. Land contamination can cause potential harm to the environment, to construction workers involved in the scheme's development, and to members of the public in nearby areas during the construction and operation phases. Earth moving and excavation also has the potential to adversely impact soil structure affecting land value and agricultural viability; and

9. Road Drainage and Water Environment – this section gives consideration to flood risk (surface, groundwater and fluvial), hydromorphology (including the Water Framework Directive (WFD)), and surface and groundwater quality and quantity. National Planning Policy requires new developments to demonstrate that flood risk would not increase as a result of the development. If there is an increase to flood risk (as determined by undertaking flood risk assessment), then appropriate mitigation would be required. The WFD requires no deterioration in the overall status of WFD water bodies, including changes to hydromorphological, physico-chemical and biological quality elements. The Environment Agency is the statutory authority in relation to the WFD, groundwater, pollution and flood risk in connection to main rivers. The lead local flood/planning authority is responsible for flood risk from surface water and ordinary watercourses.

Section 2 provides a summary of the key characteristics concerning each route option, with further details under each environmental topic provided in Appendix C. An Environmental Constraints Plan (Drawing No. B355363A-RTS-EGN-SW-DR-001 to -003) showing the key environmental constraints is provided in Appendix B.

1.3 Methodology




The environmental risk assessment has been informed by the following desk-based sources of information:

- C-Maps: Colchester Borough Council Interactive Maps (website);
- Allotments: Colchester Borough Council (website);
- Country Parks and Local Nature Reserves: Colchester Borough Council (website);
- Environment Agency Catchment Data Explorer (website);
- Environment Agency Maps for Nitrate Vulnerable Zones (website);
- Environment Agency Flood Warning Information (website);
- Essex Highways Web Map (website);
- Extriium England Noise Map Viewer (website);
- British Geological Survey, Geology of Britain Viewer (website);
- Natural England Agricultural Land Classification Maps (website);
- Sustrans (website);
- Old-Maps (website);
- Google Maps (website); and
- MAGIC (website).

Environmental issues are considered in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 (Highways Agency, 2008) and interim advice notes (IANs) (new guidance issued

by Highways England that is yet to be incorporated into the DMRB). Environmental constraints have been identified using a risk-based approach that considers the level of project risk in terms of gaining planning consent, public perception, and the level of proposed mitigation required. The level of risk is colour coded for each environmental topic, highlighting where there is high/medium/low risk to the successful deliverability of the proposed Scheme. Both construction and operational effects are considered. The risk categories are defined in Table 1.1. As per Section 1.2, the risk level identified for each environmental topic is subject to change as the proposed Scheme is developed and further details of how the proposed Scheme interacts with the environmental constraints are understood.

Table 1.1 – Environmental Constraints Risk Categorisation

Colour Code and Risk Level	Definition of Constraint
 High	<p>Proposed route option would impact on a critical environmental asset; avoidance is imperative.</p> <p>Further assessment work would be required to determine the level/significance of impact.</p> <p>Mitigation may be costly and/or difficult/timely to achieve.</p>
 Medium	<p>Proposed route option is likely to impact on a key environmental asset; avoidance is recommended where practicable.</p> <p>Further assessment work would be required to determine the level/significance of impact.</p> <p>Mitigation likely to be achievable at an acceptable cost to the project.</p>
 Low	<p>Proposed route option would have minimal impact on environmental constraints.</p> <p>Minimal work required to confirm the exclusion of further assessment.</p> <p>Mitigation would be achievable at an acceptable cost to the project.</p>

2 Key Characteristics and Constraints

2.1 Section A

Section A is a key route connecting the north of Colchester (and the A12) to Colchester town centre, located predominantly in a busy residential setting, with the northern part being more rural compared to the urban southern part, which is close to the town centre. The northern and middle parts of Section A are lined with mature trees and shrubs, but the main concentration of trees protected with TPO status is near Colchester train station at the mid/southern part of Section A. Trees along Colne Bank Avenue (including The Albert roundabout) form part of the 'Avenue of Remembrance' and also have 'Memorial Tree' status; although it should be noted that current proposals do not affect these trees. More information about the 'Avenue of Remembrance' can be found within the assessment for Section B.

The River Colne flows directly through the southern part of Section A at North Station Road (under North Bridge), and it is near here that there are some small areas at medium/high risk of fluvial flooding as well as high risk of surface water flooding. The southern part of Section A, between Colchester train station and Colchester town centre, is also where there are noise 'hotspot' (NIAs) and a concentration of nine Grade II listed buildings located close to existing highway.

There is potential for air quality and noise effects to residential receptors in close proximity to A134 Northern Approach, where widening of the existing highway is proposed; further assessment is required to determine the likelihood of any significant adverse effects. Assessment to determine the likelihood of an increase to flood risk as a result of the increase in impermeable area (as a result of the widening) will also be required.

Table 5.1 – Summary of Environmental Risk for Section A

Environmental Topic	Risk Level
	Section A
Community	Low
Air Quality	Medium
Noise and Vibration	Medium
Landscape	Low
Arboriculture	Medium
Cultural Heritage	Medium
Ecology and Nature	Medium
Geology and Soils	Low
Water and Drainage	Medium

2.2 Section B

Section B comprises of Colchester's commercial and historical town centre in the west, some commercial/industrial areas in the east, and many residential properties in between. There are five options within Section B, all of which go through the town centre. The following are considered to be the key environmental constraints of the town centre:

- Existing sensitivity to air quality; the 'Area 1 – Central Corridors' AQMA covers North Hill, Head Street, High Street, Queen Street, St Botolph's Street, Osborne Street, and St John's Street;
- The 'Colchester Area 1' Conservation Area covers all town centre routes, where all trees are afforded TPO-level protection. All proposals would need to be sympathetic to the surroundings, taking into account any conservation area requirements;
- Existing sensitivity to high traffic noise levels at various NIAs in close proximity to the town centre routes; and
- Potential disruption to a national cycle route; National Cycle Network 1 runs along High Street, Queen Street, St Botolph's Street, Osborne Street, and St John's Street.

At the other end of Section B, where engineering solutions around Greenstead Roundabout are in early stage development, the key environmental constraints are considered to be as follows:

- Unknown (but likely minimal) third-party land take, as options at this location are still being developed;
- Potential adverse impact to existing urban landscape character where the roads have wide grass verges, mature trees and shrubs forming a green corridor which screen adjacent housing from the St. Andrew's Avenue, the majority of trees here are TPO-protected;
- Changing the existing highway layout here could have adverse effects on the noise environment and nearby NIAs; and
- Potential adverse impact to Salary Brook LNR, located approximately 130m east of Elmstead Road and 220m southeast of Greenstead Roundabout.

There are marked differences between the five route options, with Options 3 and 4 likely to have a greater environmental impact due to the construction of new highways. If widening of St Andrew's Avenue is required under the Option 5 proposals, this could have significant adverse effect on the landscape character and visual amenity of local receptors. The key environmental constraints that should be considered for each option are summarised as follows:

Section B – Option 1

- 'Area 1 – Central Corridors' AQMA along a portion of Magdalen Street;
- National Cycle Network 51 that crosses Hythe Station Road at road-level;
- Conservation Area on Hythe Hill; all trees within the Conservation Area are afforded TPO-level protection; and
- Moderate risk of land contamination due to previous industrial land uses in the area near Hythe.

Section B – Option 2

- ‘Area 1 – Central Corridors’ and ‘Area 2 – East Street and the adjoining lower end of Ipswich Road’ AQMAs along parts of East Street and Ipswich Road;
- National Cycle Network 51 that crosses East Street at road-level; and
- Conservation Area coverage along majority of route; all trees within the Conservation Area are afforded TPO-level protection.

Section B – Option 3

- Purchase of land, assumed to be owned by Network Rail, would be required and could be costly;
- Removal and replacement of existing mature vegetation alongside the railway track to facilitate the proposed Scheme; could be costly due to the level of replanting (and maintenance) likely to be required;
- Removal of ecological habitat along railway corridor likely to be species rich with protected species, mitigation measures will be required.
- Introduction of a new road alongside the railway corridor could have adverse effects on the noise environment, particularly if the dense vegetation alongside the railway corridor (which currently act as a natural noise barrier) is removed to facilitate the construction of the road;
- Potential adverse effects on the Grade II listed Station House (St Botolph’s Station) and the St Botolph’s Augustinian Priory Scheduled Monument, both located by Colchester Town train station;
- ‘Area 1 – Central Corridors’ AQMA along Brook Street that crosses the railway track; and
- National Cycle Network 51 that crosses under the railway track, and then again at road-level at Hythe Station Road.

Section B – Option 4

- New road to connect Recreation Road to Colne Causeway would require land take from either an existing allotment garden or deciduous woodland priority habitat, as well as industrial third-party land;
- Potential for archaeological remains and/or land contamination at the new road location;
- The new road could significantly alter the existing environment for air quality, noise, and landscape for local residents and users of the adjacent PRow;
- National Cycle Network 51 that crosses Hythe Station Road at road-level;
- Conservation Area coverage of part of the route; all trees within the Conservation Area are afforded TPO-level protection; and
- Moderate risk of land contamination due to previous industrial land use.

Section B – Option 5

- TPO-protection of the majority of trees on either side of St Andrew’s Avenue; these trees also form part of the ‘Avenue of Remembrance’ and are considered to be of high importance to the local community. Removing these trees would have adverse effects on the community and would affect the landscape character and visual amenity of adjacent sensitive receptors;

- It is recommended that a screening opinion is submitted to Colchester Borough Council to determine whether an Environmental Impact Assessment (EIA) and planning application for the proposed Scheme would be required;
- If the proposed Scheme does not have significant environmental effects and is delivered through permitted development rights, then a separate application for planning permission from Colchester Borough Council would be required for the removal of TPOs. Should planning permission be required for the proposed Scheme, then the grant of a full planning application for the proposed Scheme would remove the requirement for a separate consent for works to protected trees (which should be specified within conditions attached to the permission);
- 'Area 2 – East Street and the adjoining lower end of Ipswich Road' AQMA covers parts of Ipswich Road; and
- Two NIAs located on St Andrew's Avenue, with two other NIAs located in close proximity along Ipswich Road and A133 Clingoe Hill.

Table 5.2 – Summary of Environmental Risk for Section B

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Community	Medium	Medium	Medium	High	High
Air Quality	Medium	Medium	Medium	Medium	Medium
Noise and Vibration	Medium	Medium	Medium	High	High
Landscape	Medium	Medium	High	High	High
Arboriculture	Medium	Medium	Medium	Medium	High
Cultural Heritage	Medium	Medium	High	High	Medium
Ecology and Nature	Medium	Medium	High	Medium	Medium
Geology and Soils	Medium	Low	Low	Medium	Low
Water and Drainage	Medium	Medium	Medium	Medium	Medium

2.3 Section C

Section C comprises of land predominantly owned and used by the University of Essex. Outside of campus, farmland dominates amongst hedgerows and small pockets of mature woodland. Salary Brook LNR provides a range of wildlife areas that the surrounding community can enjoy. The main residential areas outside of the university campus are located to the south and east of Greenstead Roundabout. The key environmental constraints that should be considered for each option can be summarised as follows:

Section C – Option 1

- This option would utilise existing roads within university grounds and is unlikely to have any significant adverse effects on the existing environment.

Section C – Option 2

- The potential widening of the A133 to facilitate additional RTS lanes would have an adverse effect on the existing mature roadside trees along the A133, potentially also affecting Clingoe Hill Wood, which has TPO status; and
- Two NIAs are located along the A133, one near Greenstead Roundabout, marking this area particularly sensitive to traffic noise.

Section C – Option 3

- Minimal land take for the new road would be required from the university's Knowledge Gateway business park; and
- The existing Salary Brook Farmhouse would have their views changed and potentially adversely affected by the proposed new road. The Farmhouse is also Grade II listed, and the new road could have a potential adverse effect on the historic building's setting.

Table 5.3 – Summary of Environmental Risk for Section C

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Community	Low	Low	Low
Air Quality	Low	Low	Low
Noise and Vibration	Low	Medium	Low
Landscape	Low	Medium	Medium
Arboriculture	Low	Medium	Medium
Cultural Heritage	Low	Low	Medium
Ecology and Nature	Medium	Medium	Medium
Geology and Soils	Low	Low	Low
Water and Drainage	Low	Low	Low

3 Next Steps and Recommendations

3.1 Further Environmental Studies

In order to determine the likely effects of the proposed Scheme, the following assessments and activities are recommended, commencing at Stage 2 when further design details will be available (NB: *necessary only if deemed required by an earlier study):

Environmental Topic	Stage 2	Stage 3a
Community	Land ownership assessment, and early engagement with relevant stakeholders and members of the community	Continued engagement, consultation, and stakeholder management
Air Quality	Scoping air quality assessment	*Simple- or detailed- level modelling and assessment, if recommended by scoping assessment
Noise and Vibration	Scoping noise and vibration assessment	*detailed modelling and assessment, if recommended by scoping assessment
		Baseline noise surveys
		Consultation with Colchester Borough Council to identify any restrictions during construction
Landscape	Consultation with Colchester Borough Council's landscape officer	Input into landscape design, planting and specification, including replacement/compensation planting
Arboriculture	Obtain up-to-date TPO data from Tendring District Council. Early consultation with Colchester Borough Council regarding TPOs/Memorial Trees along St. Andrew's Avenue.	Arboricultural impact assessment, including a survey of all trees potentially affect by the proposed Scheme
		AMS and TPP, including tree protection measures
Cultural Heritage	Scoping heritage assessment, including consultation with Essex County Council's archaeology specialists	*Heritage Statement, including site walkover by historic building specialist, if recommended by scoping assessment
		*Written Scheme of Investigation may be required for proposed ground disturbance works, accompanied by a watching brief during construction

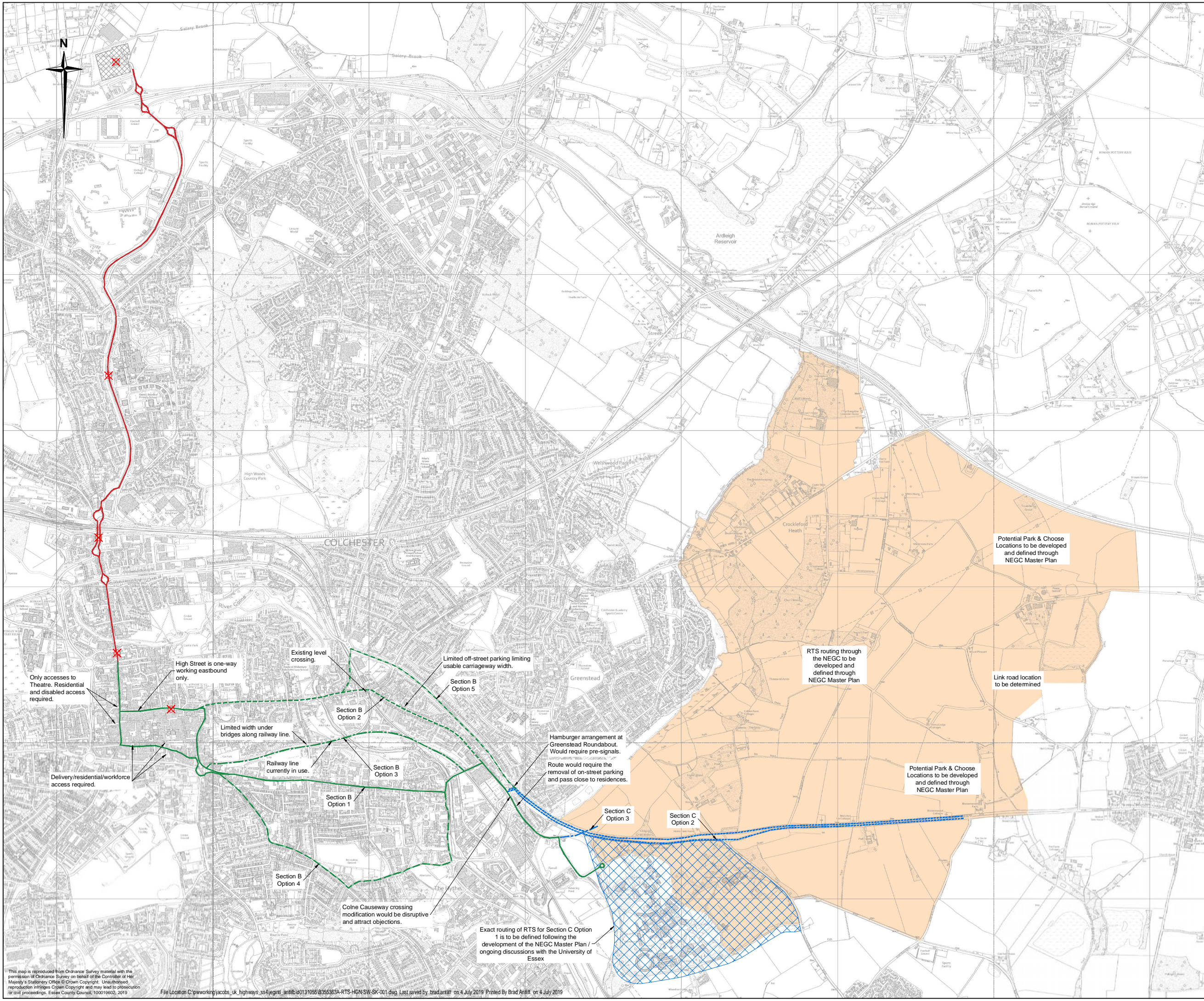
Environmental Topic	Stage 2	Stage 3a
Ecology and Nature	Preliminary ecological appraisal, with site walkover. Advise on how design can enhance priority habitat areas	*Protected Species Surveys, if recommended by preliminary ecological appraisal
Geology and Soils	Geo-environmental Phase 1 desk-based assessment and geotechnical assessment	Ground investigation works
Water and Drainage		Road drainage and water environment assessment including surface water flood risk assessment, if required.

3.2 Planning Requirements

A planning review is currently being undertaken for the proposed Scheme and will be outlined within separate technical advice notes for each section (A-C). The review will look at the likelihood of the proposed Scheme requiring planning permission, which will include an appraisal of relevant planning legislation, land ownership, and the proposed Scheme’s land take requirements.

The need for an EIA for highways schemes is governed by the Town and Country Planning (EIA) Regulations 2017 (SI17/571). An EIA is required where significant effects on the environment is likely to arise as a result of the proposed Scheme and where the proposed Scheme exceeds the one-hectare threshold, as per Schedule 2 of the Regulations. To determine this, further assessment is required, as outlined in Section 3.1. An EIA screening opinion would be required from the local planning authority due to the proposed Scheme exceeding the footprint of one hectare.

Appendix A: Proposed Scheme Options Plan




- Notes**
- Do not scale.
 - Indicative layouts based on Ordnance Survey data only. Topographical surveys to be undertaken at a later design stage.
 - Routes and options shown are an overview only, with no certainty as to feasibility of implementation. Therefore, this plan is not for public distribution.
 - RTS stop locations for Section B & C to be determined.

- Key**
- Section A
 - Section B - Option 1
 - - - Section B - Option 2
 - · - · - Section B - Option 3
 - - - - - Section B - Option 4
 - · - · - Section B - Option 5
 - - - - - Section C - Option 1
 - · - · - Section C - Option 2
 - - - - - Section C - Option 3
 - · - · - Section C - Option 4
 - ✕ Provisional RTS stop location for Section A and High Street Only
 - Existing Colchester Park & Ride location

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
B	07/19	Revisions to routes and additional information	BA	PN	PN	PK
A	06/19	Revisions to routes and additional information	BA	PN	PN	PK

FOR INFORMATION



Essex Highways, Seax House, Victoria Road South, Chelmsford, CM1 1QH. Tel: 0345 6037631 © Essex County Council

NORTH ESSEX RAPID TRANSIT SYSTEM

STAGE 1 OPTIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BA	BA	PN	PN	PK
DATE	DATE	DATE	DATE	DATE
JUN 19	JUN 19	JUN 19	JUN 19	JUN 19

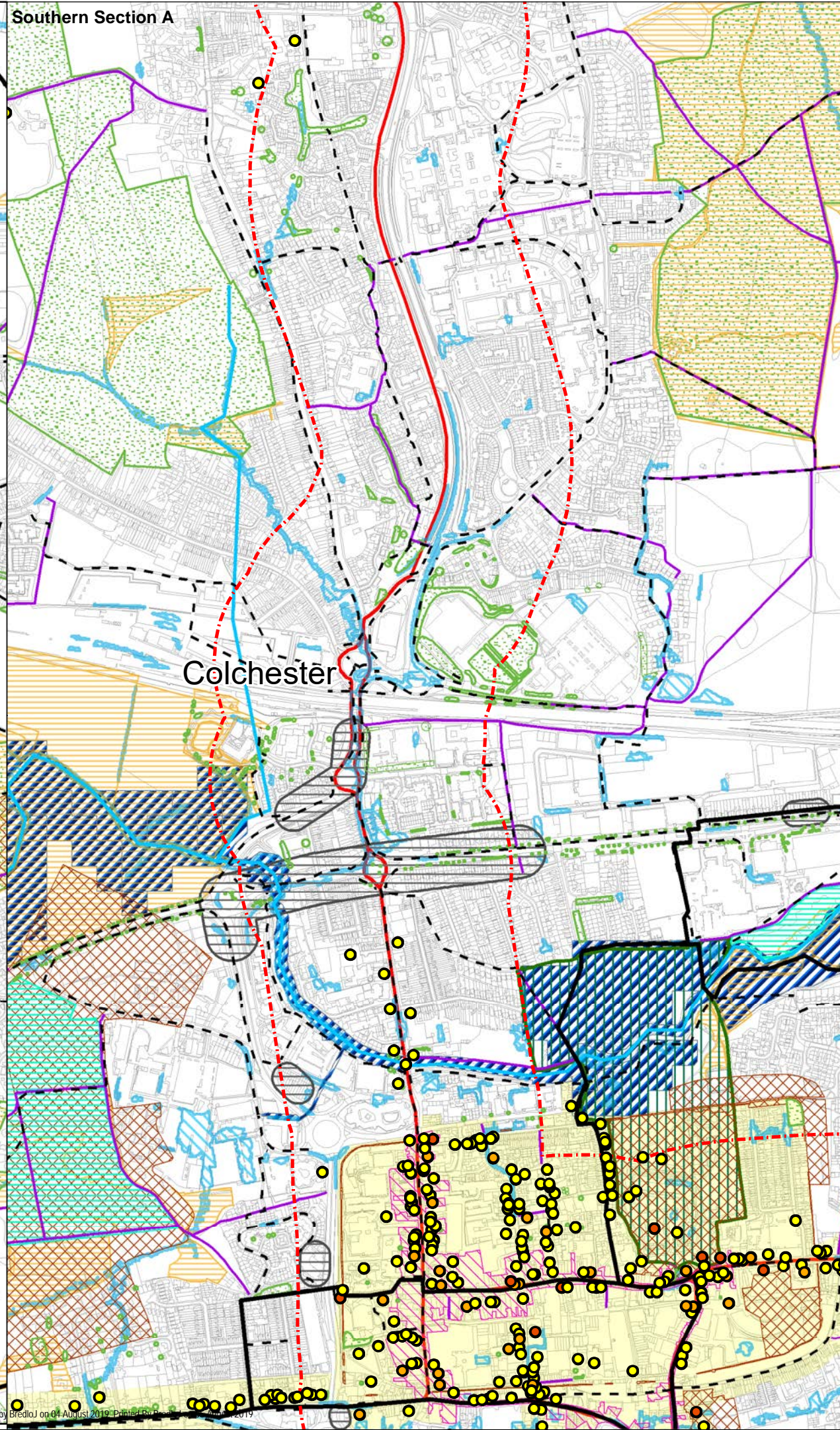
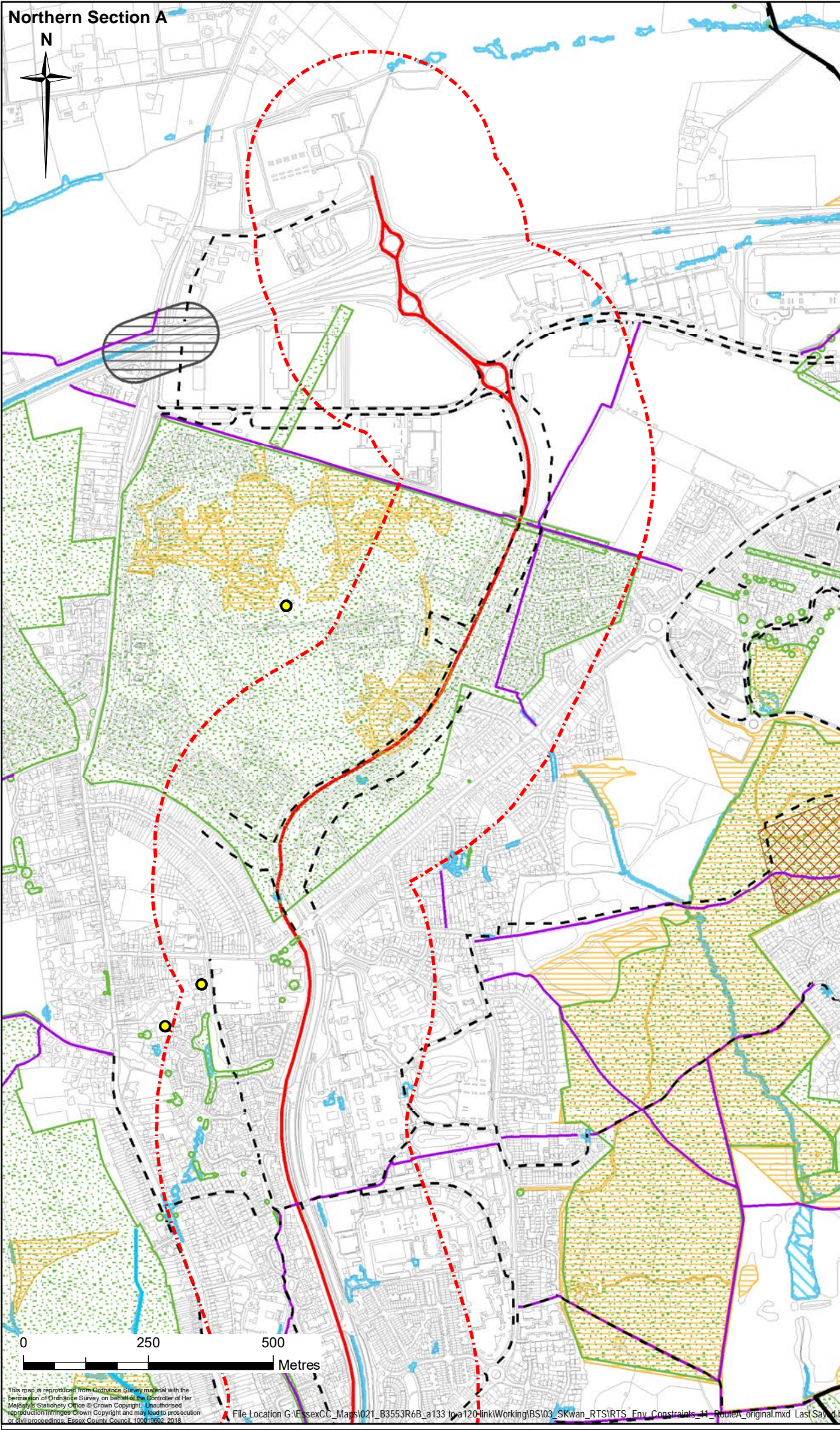
DRAWING UNITS U.N.O. DIMENSIONS IN MILLIMETRES LEVELS IN METRES SCALE AT A1 (841X594mm) NTS

DRAWING No. **B355363A-RTS-HGN-SW-SK-001** REV. **B**




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Appendix B: Environmental Constraints Plan



Notes

1. Do not scale

Key

- Proposed Scheme Route Options
- Study Area (250m)
- Scheduled Monument
- Listed Building - Grade I
- Listed Building - Grade II*
- Listed Building - Grade II
- Conservation Areas
- Registered Parks and Gardens
- Sites of Special Scientific Interest (SSSI)
- Local Nature Reserves (LNR)
- Tree Preservation Orders (TPOs)
- Priority Habitat Areas
- National Cycle Network
- Essex Cycle Network
- Public Right of Way
- Noise Important Area (NIA)
- Air Quality Management Area (AQMA)
- Watercourse
- High Fluvial Flood Risk
- High Surface Water Flood Risk

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
08/19		For Stage 1a/2 Environmental Risk Assessment Report	BS	SK	UW	PK

DRAWING STATUS: FOR INFORMATION



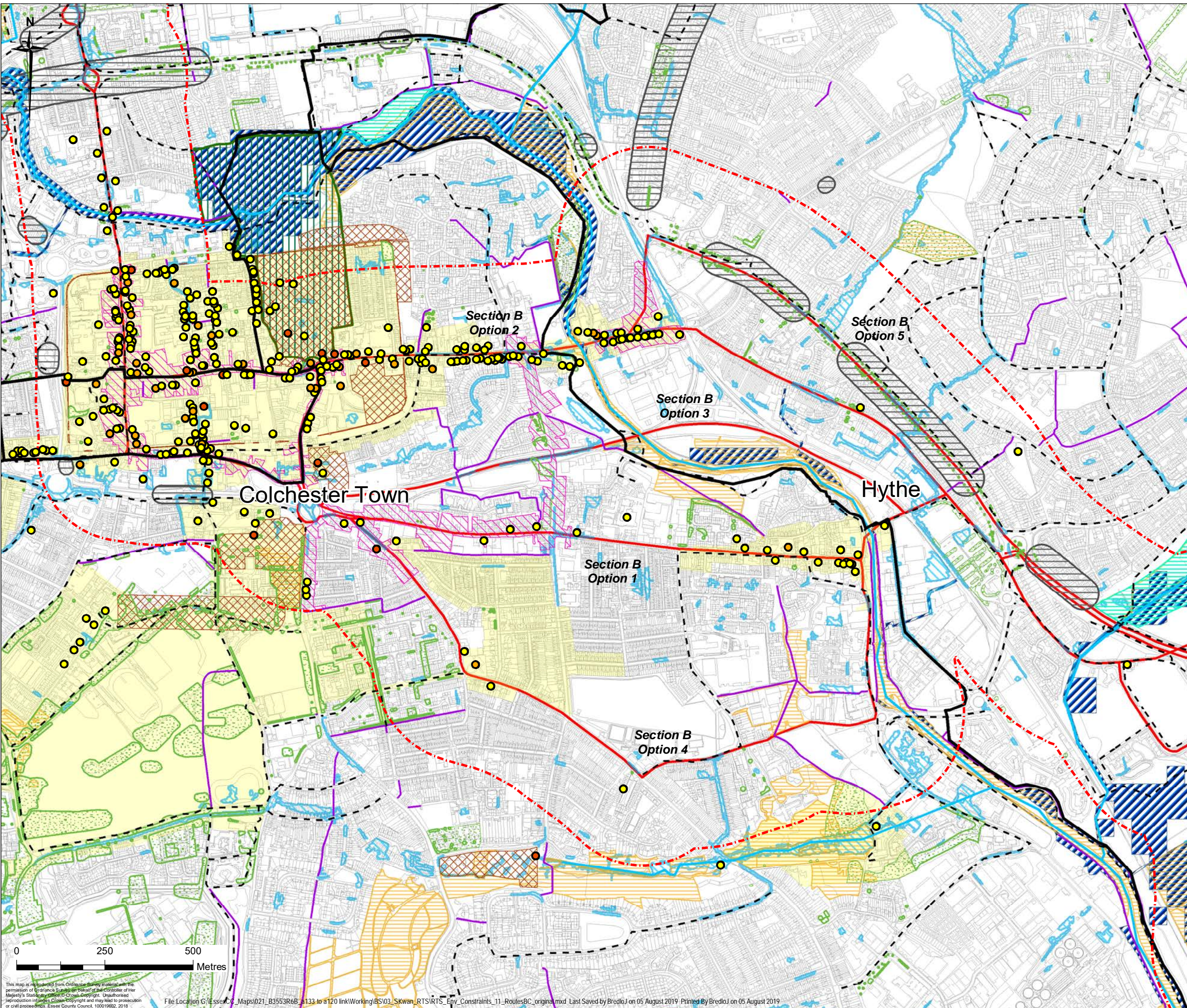
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SCHEME TITLE: North Essex Rapid Transit System (RTS)

DRAWING TITLE: ENVIRONMENTAL CONSTRAINTS Section A

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	BS	SK	UW	PK
DATE	DATE	DATE	DATE	DATE
AUG19	AUG19	AUG19	AUG19	AUG19
DRAWING UNITS U.N.O. DIMENSIONS IN MILLIMETRES LEVELS IN METRES			SCALE AT A3 (420x297 mm) 1:10,000	
DRAWING No. B355363A-RTS-EGN-SW-DR-001				REV. -

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Notes

1. Do not scale

Key

- Proposed Scheme Route Options
- Study Area (250m)
- Scheduled Monument
- Listed Building - Grade I
- Listed Building - Grade II*
- Listed Building - Grade II
- Conservation Areas
- Registered Parks and Gardens
- Sites of Special Scientific Interest (SSSI)
- Local Nature Reserves (LNR)
- Tree Preservation Orders (TPOs)
- Priority Habitat Areas
- National Cycle Network
- Essex Cycle Network
- Public Right of Way
- Noise Important Area (NIA)
- Air Quality Management Area (AQMA)
- ~~~~~ Watercourse
- High Fluvial Flood Risk
- High Surface Water Flood Risk

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
08/19		For Stage 1a/2 Environmental Risk Assessment Report	BS	SK	UW	PK

DRAWING STATUS: FOR INFORMATION



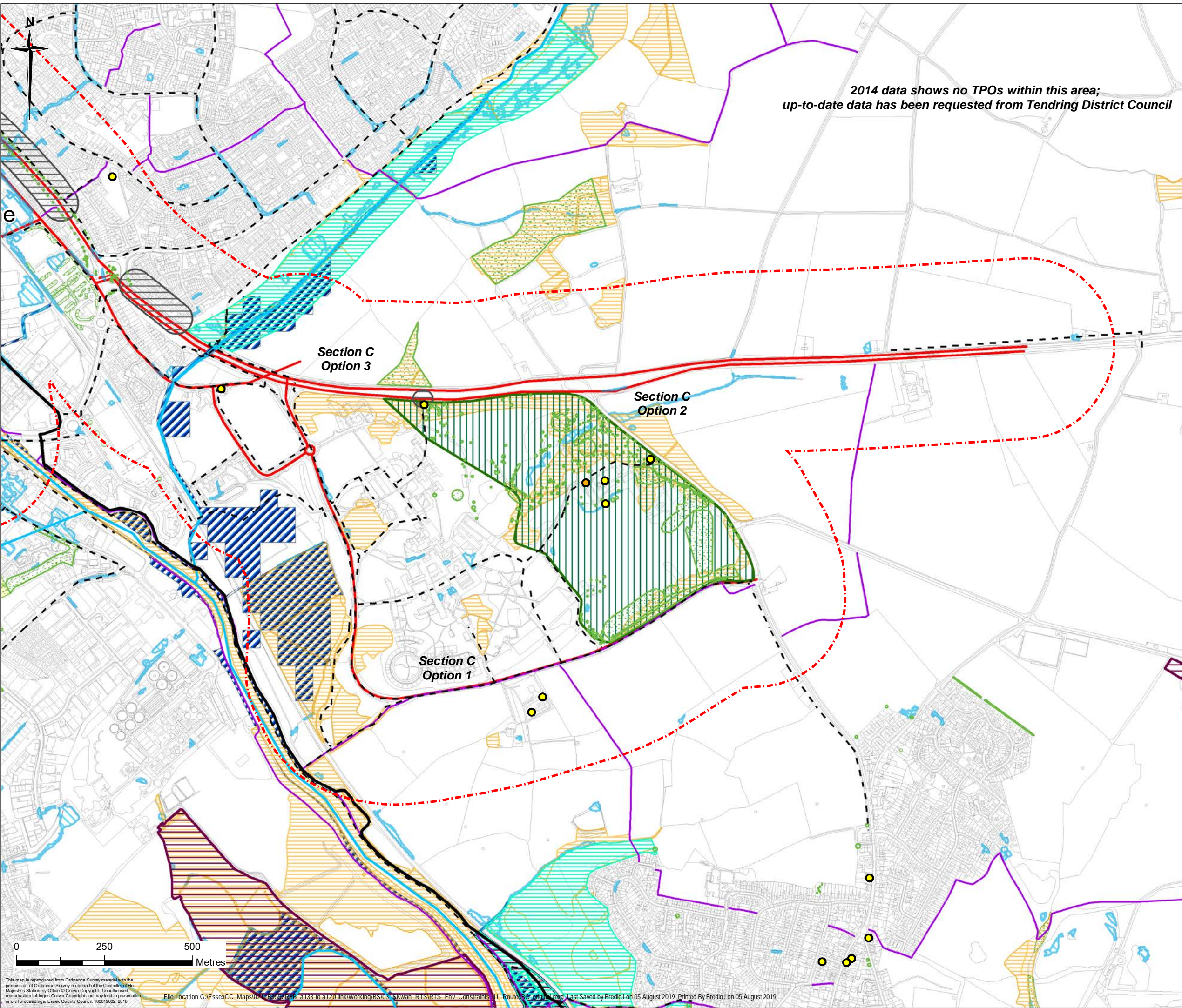
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SCHEME TITLE: **North Essex Rapid Transit System (RTS)**

DRAWING TITLE: **ENVIRONMENTAL CONSTRAINTS Section B**

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	OR	SK	UW	PK
DATE	DATE	DATE	DATE	DATE
AUG19	AUG19	AUG19	AUG19	AUG19
DRAWING UNITS U.N.O. DIMENSIONS IN MILLIMETRES LEVELS IN METRES			SCALE AT A3 (420x297 mm) 1:10,000	
DRAWING No. B355363A-RTS-EGN-SW-DR-002				REV. -

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Notes

1. Do not scale

Key

- Proposed Scheme Route Options
- Study Area (250m)
- Scheduled Monument
- Listed Building - Grade I
- Listed Building - Grade II*
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- Air Quality Management Area (AQMA)
- Watercourse
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- High Surface Water Flood Risk

Rev.	Date	Description of revision	Drawn	Checked	Reviewed	Approved
	08/19	For Stage 1&2 Environmental Risk Assessment Report	BS	SK	UW	PK

DRAWING STATUS: FOR INFORMATION



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SCHEME TITLE: **North Essex Rapid Transit System (RTS)**

DRAWING TITLE: **ENVIRONMENTAL CONSTRAINTS Section C**

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
BS	OR	SK	UW	PK
DATE	DATE	DATE	DATE	DATE
AUG19	AUG19	AUG19	AUG19	AUG19
DRAWING UNITS U.N.O. DIMENSIONS IN MILLIMETRES LEVELS IN METRES			SCALE AT A3 (420x297 mm) 1:10,000	
DRAWING No. B355363A-RTS-EGN-SW-DR-003				REV. -



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Appendix C: Environmental Risk Assessment

Section A

A.1 People and Communities

Characteristics and Constraints

The route covered by Section A provides important access to the residential areas of Mile End and Braiswick, linking these areas to the A12 (to the north) and Colchester town centre (to the south). The route is served by many local bus services, and also forms part of the existing Park and Ride route for Colchester’s Park and Ride Terminal. In addition, Colchester train station is located adjacent to the proposed Scheme, just off the A134 by North Station Roundabout. There is an extensive network of Public Rights of Way (PRoW) and cycle routes (mainly of county-level importance) within the study area.

Many businesses are also located adjacent to the proposed Scheme; within the study area are David Lloyd, HSBC, Volkswagen, Toyota, Kwik Fit, Wickes, Asda, and numerous other shops and restaurants. Places of community interest include Colchester United Football Club, Colchester Rugby Football Club, Colchester and District Archery Club, medical centres (such as Colchester Hospital, and Oaks Hospital), schools (such as Myland Primary School, North Primary School and Nursery, and Camulos Academy), and care homes (such as Tall Trees Care Home and Alderwood Care Home).

Recommended Actions

Due to the high number of both motorised and non-motorised users within the study area, there will need to be early engagement with residents, businesses, community facilities, and public transport providers to minimise any impacts of the proposed Scheme. Constraints on working methods during construction (for e.g. widening and realignment works) may also be required to minimise impacts.

Environmental Topic	Risk Level
	Section A
Community	Low

A.2 Air Quality

Characteristics and Constraints

The study area contains many sensitive receptors including residential properties, schools, hospitals, and care homes. Where there is proposed widening of the existing highway at Northern Approach Road, there is potential for some adverse effects to nearby residential receptors, but any changes are not anticipated to be significant.

Colchester’s ‘Area 1 – Central Corridors’ AQMA is located just south of Section A and will be considered in the assessment for Section B (see Section B.2). There are no sensitive ecological receptors within the study area.

Recommended Actions

Due to the proximity of the AQMA and sensitive receptors, the proposed Scheme is considered to be located in an area of high sensitivity for air quality. A scoping air quality assessment (in accordance with DMRB guidance HA207/07) is required to determine the likelihood of any adverse significant effects and identify the type of further assessment needed, if required. Construction effects on air quality are likely to be temporary in nature and not significant, although best management practices would need to be employed to minimise dust effects.

Environmental Topic	Risk Level
	Section A
Air Quality	Medium

A.3 Noise and Vibration

Characteristics and Constraints

In an existing noise environment dominated by traffic flows, the study area contains many residential receptors sensitive to noise and vibration. There are two NIAs located directly along the Section A route; both are located in the southern part of Section A: NIAs ID 6094 is located along A134 at Essex Hall Roundabout, and NIA ID 12061 is located along Colne Bank Avenue and Cowdray Avenue. NIA ID 4763 is also located along the A134 but is approximately 150m west of the proposed Scheme at Sheepen Place. Essex County Council is the managing highway authority for all three NIAs.

Alongside some areas of the A134 Northern Approach, the vegetation is over 10m wide; this acts as a natural buffer against traffic noise to nearby residential receptors. Where there is proposed widening to the existing highway along the A134 Northern Approach, there is potential for adverse effects to nearby residential receptors as traffic flows would be moved closer, and there is potential for further adverse effects should the natural vegetation noise buffer be removed to facilitate the carriageway widening; further assessment is required to confirm this.

The areas on either side of the railway track on the approach to Colchester train station are also subject to high levels of noise and vibration from passing trains, but there are few residential receptors located here.

Recommended Actions

The proposed Scheme has the potential to have some adverse noise and vibration effects on nearby sensitive receptors along A134 Northern Approach; further assessment would be required to confirm this. Due to the proximity of the proposed Scheme to sensitive receptors, it is also recommended that baseline noise and vibration surveys are undertaken for defending any potential claims for compensation under the Land Compensation Act 1973.

The Environmental Health Officer at Colchester Borough Council should be consulted to identify whether there are restrictions on working methods or operating hours during construction. The Council may require a construction noise assessment and/or a Section 61 application. Regardless of the Council requirements, best management practices should be included within the Works Information for the contractor.

Environmental Topic	Risk Level
	Section A
Noise and Vibration	Medium

A.4 Landscape and Visual

Characteristics and Constraints

The proposed Scheme is located within the Northern Thames Basin National Character Area (NCA), which extends from Hertfordshire in the west to the Essex coast in the east; any potential impacts on landscape are considered to be local and would not impact on the NCA. Section A is located predominantly within a busy residential setting; the relatively rural northern part progressively becoming more urban as the route heads closer to historical Colchester Town Centre to the south.

The northern and middle parts of Section A (north of the railway line) are currently well screened from sensitive residential receptors by hedgerows and trees, set apart from the carriageway on highway verge. Removal of this screening vegetation to facilitate the construction of the proposed Scheme, in particular, the proposed widening of the A134 Northern Approach, would open up views of the existing carriageway. Mitigation planting would be required to replace this screening but would be ineffective for several years until matured.

Other proposed minor modifications to Section A are not anticipated to significantly alter the landscape/townscape.

Recommended Actions

Section A of the proposed Scheme is not considered to be located in an area of high landscape sensitivity. Any tree and hedgerow losses would require replacing to reduce visual impacts and impact on landscape character. Input into a landscape design, planting and specification would be required.

Environmental Topic	Risk Level
	Section A
Landscape	Low

A.5 Arboriculture

Characteristics and Constraints

There are a number of TPOs and TPO groups within the study area, with some located directly adjacent to the proposed Scheme route. There is a large cluster of TPOs concentrated around the road network near Colchester train station along the A134, A133, Bruff Close, Petrolea Close, Clarendon Way, and Colne Bank Avenue, and another section along Via Urban Romanae with group TPO status. The local planning authority must be notified prior to any works being undertaken on these trees with TPO status protection. No TPOs are located along the section of A134 Northern Approach where widening of the existing carriageway is proposed.

Trees within Colne Bank Avenue roundabout and along the south-western aspect of the roundabout form part of the 'Avenue of Remembrance' and have 'Memorial Tree' status (see also Sections B.1 and B.5).

The Conservation Area 'Colchester Area 1' is located just to the south of Section A and will be considered in the assessment for Section B (see Section B.5).

Recommended Actions

The proposed Scheme's likely impact on arboriculture is not known at this stage. Designers should be made aware of the location of the Conservation Area and the numerous TPOs within the study area to minimise their impact by design. It is recommended that all trees with the potential to be affected by the proposed Scheme are surveyed (using the survey methodology detailed within BS5837:2012) and assessed against the proposals.

The survey is likely to involve both highway and third-party trees. An Arboricultural Impact Assessment (AIA) is recommended to:

- categorise and quantify all those trees expected to be removed;
- identify any notable trees worthy of retention;
- collect data on those trees assessed as retainable in order to inform protection measures; and
- identify and record all relevant adjacent trees which could be impacted by the proposals, for protection purposes.

Early engagement with Colchester Council's Tree Officer is also recommended to discuss the potential impact on TPOs/Memorial Trees.

At a later design stage, both an Arboricultural Method Statement (AMS) and Tree Protection Plan (TPP) are recommended, detailing the tree protection measures needed to safely retain any highway or third-party trees remaining, following clearance works prior to construction. A package of site supervision and site auditing may also be required to ensure the effectiveness and compliance of the protection measures detailed within the AMS and TPP. Input into a landscape design, planting and specification, regarding replacement/compensation planting, may be required.

Environmental Topic	Risk Level
	Section A
Arboriculture	Medium

A.6 Cultural Heritage

Characteristics and Constraints

Colchester is a town rich in cultural heritage, and this is apparent in Section B of the proposed Scheme which covers Colchester town centre (see Section B.6). In the southern part of Section A (close to Section B), there are nine Grade II listed buildings on either side of North Station Road. Any works along North Station Road would need to take the setting of these listed buildings into account, particularly as some are situated directly adjacent to the carriageway. There are further listed buildings and a Conservation Area within the study area south of Section A, but these will be

assessed in Section B.6 for Section B. Located further north of Section A, there is one Grade II listed building located 200m west of the proposed Scheme; due to distance, this listed building is unlikely to be affected.

Colchester is known to contain extensive archaeological deposits from the town’s prehistoric, Roman, Saxon, Norman, and medieval occupation. Although Section A is completely within highway and/or previously developed land, consultation with Essex County Council’s archaeological advisors is advised due to the high archaeological sensitivity of the proposed Scheme location.

Recommended Actions

Due to the close proximity of the proposed Scheme to designated cultural heritage assets, it is recommended that a scoping heritage assessment is produced in the first instance, to determine whether a Heritage Statement (and walkover survey by a historic buildings’ specialist) would be required. Consultation with Essex County Council’s archaeological advisors is advised due to the high archaeological sensitivity of the proposed Scheme location. It is likely that a watching brief would be required during any geotechnical investigations or groundworks.

Environmental Topic	Risk Level
	Section A
Cultural Heritage	Medium

A.7 Ecology and Nature Conservation

Characteristics and Constraints

There are no designated wildlife sites of international, national or local importance within the study area of Section A.

There are areas of priority habitat located in the northern part of the Section A study area, adjacent to Via Urban Romanae, and in the southern part, just west of Colne Bank Roundabout. Priority habitats are identified as being the most threatened or rapidly declining biological resources of the UK; therefore, the proposed Scheme should not harm these habitats, but seek instead to support their recovery. Should there be any loss to priority habitat, the proposed Scheme would need to provide compensation planting (to be agreed with Essex County Council).

Although in an urban setting, the northern and middle parts of Section A are well lined with trees and shrubs that have the potential to support protected and/or notable species, such as (breeding) birds and bats. In the southern part of Section A, the River Colne flows under North Station Road (at North Bridge); the River Colne and its banks have the potential to support a number of protected and/or notable species.

Recommended Actions

An ecological appraisal (with site walkover) is recommended to determine the presence of and likely impact to protected habitats and species; further subsequent surveys may be required.

The design team should consider supporting through design the enhancement of priority habitat areas located in the northern and southern parts of Section A; a qualified ecologist should be consulted to advise on this.

Environmental Topic	Risk Level
	Section A
Ecology and Nature	Medium

A.8 Geology and Soils

Characteristics and Constraints

Section A is underlain by superficial deposits classified as Secondary Aquifers A and B, which means it can store and yield supplies of groundwater. The northern part of Section A is underlain by superficial deposits of till, unsorted and unstratified, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier; the till here is a mixture of clay, sand, gravel, and boulders varying widely in size and shape. The southern part of Section A is underlain by lacustrine deposits, composed of coarse-grained bedload and suspended fine-grained material, brought by streams before being laid down in lakes.

The underlying bedrock for the proposed Scheme is London Clay Formation, which is classified as Unproductive Strata, indicating low permeability and negligible significance for water supply or river base flow.

The soil quality for Section A is split into three parts; the northern part (roughly north of Mill Road) is classed as '2 – Very Good', the middle part is classed as '3 – Good to Moderate', and the land in the southern part (roughly south of Colchester train station) is classed as 'predominantly in urban use'. Lands with soils classed as Grade 2 can yield high levels of many types of crop and should be safeguarded for agricultural use.

Based on readily available information, no significant potential sources of contamination have been identified within the Section A study area, with made ground likely to be present due to the existing highway; however, it is recommended that a geo-environmental assessment is undertaken to confirm this.

Recommended Actions

The overall potential risk from contaminated land is assessed as low due to the limited potential for contamination to have occurred on or immediately close to Section A of the proposed Scheme; a geo-environmental assessment is recommended to confirm this. The assessment would include chemical analysis of soil samples that would provide adequate information on potential contamination and associated risks, principally to human health and controlled waters. The information would also aid with materials management during construction of the proposed Scheme.

To inform design development, a geotechnical assessment is also recommended to establish whether there are any risks in ground stability.

Environmental Topic	Risk Level
	Section A
Geology and Soils	Low

A.9 Road Drainage and Water Environment

Characteristics and Constraints

Section A lies largely within the Colne d/s Doe's Corner WFD water body (GB105037041330), which is assessed as achieving Moderate Potential. A small northern part of Section A lies within the Salary Brook WFD water body (GB105037041320), which is also assessed as achieving Moderate potential.

The River Colne (a Main River) flows directly through the southern part of Section A at North Station Road (under North Bridge), and it is near here that there are some small areas at medium/high risk of fluvial flooding; although the proposed Scheme is not anticipated to interact with the River Colne.

Some southern parts of Section A are located within areas of high risk of surface water flooding. This includes extents along the A134 from Wallace Road (near Oaks Hospital), through North Station Roundabout and Essex Hall Roundabout, to The Albert roundabout. The proposed widening of the A134 Northern Approach has the potential to increase the impermeable area and associated flood risk.

Section A is located within the Sandlings and Chelmsford groundwater Nitrate Vulnerable Zone (NVZ) and the Colne surface water NVZ; NVZs are areas designated for being at risk from agricultural nitrate pollution. Section A overlies Secondary Aquifers A and B, which means it can store and yield supplies of groundwater as a resource for drinking water supply and to support surface water flows and wetland ecosystems.

Recommended Actions

It is not anticipated that the proposed Scheme would significantly alter the existing water and drainage environment at Section A but because the proposals are likely to result in an increase in impermeable area along the middle part of Section A, and there is existing high risk of surface water flooding at some southern parts of Section A, a road drainage and water environment assessment is recommended to ensure that there is no increase in flood risk as a result of, or to, the proposed Scheme.

Although impacts on water quality, hydromorphology (including WFD) and groundwater are likely to be minor, it is recommended that these are outlined in the road drainage and water environment assessment to scope out any significant effects.

As Section A is located within groundwater and surface water NVZs, the design of the proposed Scheme would need to minimise any potential to alter the nitrate levels in the catchments as this could lead to changes to surface waters and groundwaters. The assessment of water quality in support of the WFD would also need to review any changes to the NVZs as a result of the proposed Scheme. Appropriate pollution prevention measures would be required during construction to minimise any potential impacts on water quality.

Environmental Topic	Risk Level
	Section A
Water and Drainage	Medium

Section B

B.1 People and Communities

Characteristics and Constraints

The town centre routes, shared by all the Section B options (see Section 1.1), are located in the heart of Colchester's town centre. The town centre has a large concentration of commercial premises (restaurants, shops, hotels, and a cinema), business premises and some residential. Within the town centre area is also the Castle Museum (set within Colchester Castle Park's manicured gardens), the Natural History Museum, Hollytrees Museum, Colchester Arts Centre, Firstsite art gallery and cultural centre, and Headgate Theatre. Other community assets in the town centre include Colchester Town Hall and Colchester Library.

The roads that make up the town centre routes are relatively narrow and are predominantly one-way (only St John's Street is two-way). Pedestrian footways are wide despite the narrowness of the roads. The town centre routes are used heavily by buses as their main route around Colchester town centre and also form part of the county-level cycle network. Additionally, some of these roads form part of National Cycle Network 1. Colchester Town train station is located to the northeast of St Botolph's Circus roundabout, next to Colchester Magistrates' Court, and would be served by Options 1, 3 and 4.

National Cycle Network 51 roughly follows the path of the River Colne, and crosses Option 2 at road-level at East Street from Riverside Walk to East Bay. National Cycle Network 51 also crosses Option 3 via an underpass under the railway, before intersecting Hythe Station Road at road-level (Options 1, 3 and 4). Various other (county-level) cycle routes and PRowS also interact with all route options, including a PRow connecting St Andrew's Avenue (Option 5) directly to Hythe train station.

Travelling east from the town centre, the route options become progressively more residential and less commercial until the area around Hythe train station, where there is a large commercial/retail area that includes a supermarket and car rental and sales businesses. Options 4 and 5 are generally more residential than Options 1, 2 and 3; Option 1 comprises a mix of residential and small shops/retailers; Option 2 extends from the town centre's highly commercial High Street to East Street, where there is a commercial/industrial centre close by to the south; and Option 3 runs alongside an existing railway track lined with mature vegetation on either side. St Andrew's Avenue (Option 5) is spacious carriageway through a residential area, with wide grass verges and mature trees on either side. These trees form part of the 'Avenue of Remembrance' within Colchester, consisting of 'Memorial Trees' that are dedicated in memory of the World Wars, and to local people, charities, and other historical events. These trees are considered to be key trees of cultural and historic importance to the local authority and are considered very important to the local community.

Option 4 would serve the large Old Heath Recreation Ground, located to the north of, and adjacent to, Old Heath Road and Recreation Road; however, Option 4 would also require a new road to be constructed on land that is currently used for allotment gardens on one side (Grants Meadow Allotments is located at the end of Recreation Road) and deciduous woodland priority habitat on the other side. Due to current laws and planning policy guidance (PPG17) regarding allotments, it may be difficult to obtain this land for development. Third-party land to the west of Hythe Quay and

Haven Road, currently being used for industrial purposes, would also need to be obtained for this new road and could be costly. East Bay Allotment, located to the south of East Street and west of the River Colne, is unlikely to be impacted by Options 2 and 3. Capon Road is a third-party road owned by the University of Essex. Utilising this road would require an agreement with the University; this affects all route options with the exception of Option 5. Option 3 would require the purchase of land, assumed to be owned by Network Rail.

Medical centres within the Section B study area include the Wimpole Road GP's Surgery (Wimpole Road, Option 4) and Castle Gardens Medical Centre (East Hill, Option 2). There are a number of schools in the study area including Kendall Primary School (Recreation Road, Option 4), Saint James Primary School (Guildford Road, Option 2), and Colchester Language Academy (George Williams Way, Options 1 and 3).

Recommended Actions

Section B Option 3 would require the purchase of land from Network Rail for the entire length of the option, and Option 4 would require the purchase of third-party (industrial) land and land owned by Colchester Borough Council (currently designated for allotments and deciduous woodland priority habitat). There is potential for the trees along the 'Avenue of Remembrance' to be adversely affected in order to facilitate the RTS along St Andrew's Avenue for Option 5. All options may also require minimal land take around Greenstead Roundabout; this will be confirmed as options develop.

Due to the very high number of both motorised and non-motorised users within the Section B study area, there will need to be early engagement with the community and relevant stakeholders including Colchester Cycle Groups, to minimise any impacts of the proposed Scheme, in particular in the busy Colchester town centre and users of National Cycle Networks 1 and 51.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Community	Medium	Medium	Medium	High	High

B.2 Air Quality

Characteristics and Constraints

The Section B study area contains many sensitive receptors including numerous residential properties, and a number of medical centres, hospitals, and schools. Two AQMAs are located within the study area; 'Area 1 – Central Corridors' AQMA, and 'Area 2 – East Street and the adjoining lower end of Ipswich Road' AQMA. The Area 1 AQMA covers a large area including the town centre routes (North Hill, Head Street, High Street, Queen Street, St Botolph's Street, Osborne Street, and St John's Street), thus affecting all Section B options. Additionally, the Area 1 AQMA extends a further 650m along Magdalen Street from St Botolph's Circus roundabout (affecting Option 1), before heading north along Brook Street to East Street (affecting Options 2 and 3); the Area 1 AQMA also extends 300m along Military Road from St Botolph's Circus roundabout (affecting Option 4). Area 2 AQMA is located along East Street (between the River Colne and the railway track) and Ipswich Road (from East Street to the railway track); Area 2 AQMA therefore affects Options 2 and 5.

Both AQMAs have been designated in relation to breaches of the Nitrogen Dioxide (NO₂) annual mean objective. The Colchester Borough Council Air Quality Action Plan 2016-2021 contains actions to address the AQMAs including:

- review the phasing of traffic signals on entries to Colchester town centre (with a view to facilitate improved traffic flow, reducing congestion and providing priority for sustainable transport modes);
- provide attractive sustainable transport solutions to help cater for demand for longer distance travel to the town centre;
- improvements to real-time transport information displays; and
- provision of appropriate highway signage within and around the town centre area (to provide route signage and priority for sustainable transport modes).

The proposed Scheme should work in support of the above actions from the Air Quality Action Plan. Further assessment would be required to determine whether the proposals would have any adverse impacts on air quality, particularly along roads covered by the AQMAs. Section B Option 3 would involve converting railway land for highway use; this option would likely have some adverse impact on residential receptors along Brook Street (covered by the Area 1 AQMA); further assessment is required to determine the likely level of impact. The impact of Option 4's new road, to connect Recreation Road with Colne Causeway, would also need to be determined through further air quality assessment.

There are no designated wildlife sites sensitive to changes in air quality within the proposed Scheme study area.

Recommended Actions

With a large proportion of Section B roads covered by AQMAs, the proposed Scheme is considered to be located in an area of high sensitivity for air quality. Option 3 is considered to result in some adverse effects on air quality, but further assessments on all five options (in accordance with DMRB guidance HA207/07) is required to confirm any likely effects and to determine what additional assessment is required, if any.

The proposed Scheme should work in conjunction with the measures identified in the Colchester Borough Council Air Quality Action Plan 2016-2021 to help improve air quality.

Construction effects on air quality are likely to be temporary in nature and not significant, although best management practices would need to be employed to minimise dust effects.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Air Quality	Medium	Medium	Medium	Medium	Medium

B.3 Noise and Vibration

Characteristics and Constraints

There are many sensitive receptors to noise and vibration within Section B, where the existing noise environment is dominated by high traffic flows. For all Section B options, there are numerous residential properties located directly adjacent to the carriageway with no screening, or limited / no space for mitigation measures against any potential increase in noise levels. In particular, connecting Recreation Road to Colne Causeway with a new road (Option 4) is likely to increase the volume and frequency of RTS vehicles along Recreation Road, potentially increasing the noise and vibration levels experienced by residents along this road.

There are two NIAs located directly on the proposed Scheme area for Section B Option 5; NIAs ID 4767 and 6096 are both located along St Andrew's Avenue. Other NIAs within the Section B study area include NIA ID 12062 (Ipswich Road, 40m north of Option 5), NIA ID 4768 (A133 Clingoe Hill, 5m south of Option 5 and 40m east of Greenstead Roundabout (all options)), NIA ID 12068 (A134 Southway, 50m south of town centre routes (all options)), NIA ID 12066 (A134 Balcerne Hill, 150m west of town centre routes (all options)), NIA ID 12067 (A134 Balcerne Hill, 170m west of town centre routes (all options)), and NIA ID 4763 (A134 Westway, 180m northwest of town centre routes (all options), also mentioned in Section A.3 for Section A). As the highway authority, Essex County Council manages all the NIAs within Essex.

Existing noise and vibration levels from the railway line to and from Colchester Town and Hythe train stations would be minor, as the trains that run along these railway lines are infrequent (Colchester train station in Section A being Colchester's main hub station). The introduction of a new RTS corridor alongside the railway corridor (Option 3) is likely to result in an increase in noise and vibration levels to nearby residential properties, particularly if the natural vegetative 'noise barrier' running alongside the railway corridor is removed to facilitate the construction of Option 3; an assessment to determine the levels of change would be required.

Recommended Actions

The impact of the proposed Scheme on the existing noise and vibration environment of Section B is not known at this stage, and further assessment would be required to confirm this, especially at existing noise 'hotspot' locations (NIAs), affecting Option 5 particularly more than the other options, and where there is a significant change to the existing road network, like the proposed new roads at Options 3 and 4. Due to the proximity of the proposed Scheme to sensitive receptors, it is also recommended that baseline noise and vibration surveys are undertaken for defending any potential claims for compensation under the Land Compensation Act 1973.

The Environmental Health Officer at Colchester Borough Council should be consulted to identify whether there are restrictions on working methods or operating hours during construction. The Council may require a construction noise assessment and/or a Section 61 application. Regardless of the Council requirements, best management practices should be included within the Works Information for the contractor.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Noise and Vibration	Medium	Medium	High	High	High

B.4 Landscape and Visual

Characteristics and Constraints

The proposed Scheme is located within the Northern Thames Basin National Character Area (NCA), which extends from Hertfordshire in the west to the Essex coast in the east; any potential impacts on landscape are considered to be local and would not impact on the NCA. Section B is located within a busy town centre setting in the west, then predominantly residential from west to the east, before a mix of residential and commercial/industrial in the east, around Hythe train station. The setting of Colchester's town centre, as well as parts of route Options 1, 2 and 4, are also protected with Conservation Area status. It is not expected that the proposed Scheme would have significant impacts on the townscape of the town centre, with the proposals here consisting mainly of additional RTS stops, signage and road markings. Proposals would need to be sympathetic to the surroundings and take into account any requirements within the local conservation area plan; consultation with Colchester Borough Council's conservation officer is recommended at an early design stage.

Like in the town centre, routes along Options 1 and 2 consist of existing roads with properties built right up to the carriageway, offering little protection from views of the roads, and are located partly within conservation areas. However, it is not expected that the proposed Scheme would significantly alter the urban landscape/townscape on these routes. Option 4 would have similar impacts to Options 1 and 2 except at the proposed new road to connect Recreation Road and Colne Causeway; this could have significant adverse effects to users of the Grants Meadow Allotments (located at the end of Recreation Road) and the PRoW that borders the west of the allotments before joining Parsons Lane; mitigation planting would be required to screen the new road from the rest of the allotment and surrounding residential properties, but there is little space for this unless more land is taken from either the allotments to the south, or deciduous woodland priority habitat (see Section B.7) to the north. In addition, it would take several years for the vegetation to mature and provide the level of screening required. Residents along Recreation Road are also likely to experience more frequent views of the RTS vehicles and other road vehicles from their homes.

The potential widening of St Andrew's Avenue to facilitate additional RTS lanes would have an adverse effect on the landscape setting and to receptors along St Andrew's Avenue that currently enjoy views of a spacious carriageway lined with wide grass verges and mature trees (see Section B.1 regarding the 'Avenue of Remembrance' and Section B.5 on Memorial Trees). The development of Option 3 would also have an impact on the landscape due to the likely removal of vegetation to accommodate the conversion of railway land to a new road. Any vegetation removed would need to be reinstated wherever possible.

The engineering options around Greenstead Roundabout are still being developed, so the potential impact to this area (and all Section B options) cannot yet be determined. Greenstead Roundabout is

a busy roundabout, consisting of five mini roundabouts connecting five adjoining roads; the landscape setting here is residential, but the carriageway is bordered by wide grass verges and clusters of mature trees and shrubs. Any removal of vegetation here (majority of trees also have TPO status; see Section B.5) would need to be reinstated wherever possible (and maintained) to reduce potential impacts of the proposed Scheme.

Recommended Actions

Section B is considered to be located in an area with medium landscape sensitivity due to the large number of sensitive receptors and areas protected by Conservation Area status. Proposals would need to be sympathetic to the surroundings and take into account any requirements within the local conservation area plan; consultation with Colchester Borough Council's landscape officer is recommended at an early design stage.

Options 3, 4 and 5 are anticipated to have adverse effects on the landscape; further assessment would be required to determine the level of impact. The proposed works at other Section B options are not anticipated to have any permanent significant adverse effects on the townscape/landscape if the appropriate mitigation measures are implemented. Input into landscape design, planting and specification by a landscape architect would be required for all options.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Landscape	Medium	Medium	High	High	High

B.5 Arboriculture

Characteristics and Constraints

There are six Conservation Areas located within the Section B study area; four of these interact directly with Section B, as follows:

- Colchester Area 1 – covering all the town centre routes (affecting all options), before extending east along East Hill and East Street to the railway track (affecting Option 2);
- Garrison – a small section is located adjacent to St Botolph's Circus roundabout (affecting all options);
- New Town – located adjacent to Military Road by Winnock Road, and then at New Town Road (affecting Option 4); and
- Hythe – located along Hythe Hill from Port Lane to Hythe Station Road (affecting Option 1).

Conservation Areas exist to protect the appearance and character of the built and natural environment; as such, trees within a Conservation Area that have a trunk diameter of more than 75mm when measured at 1.5m from ground level have TPO-level protection (i.e. consent for works to the tree or within the root protection area must be obtained from the local planning authority prior to any works on the trees being carried out).

There are numerous trees with TPO status across the Section B study area, including the majority of trees located at the Greenstead Roundabout area, where design is still in the early stages. In

addition, the majority of trees on either side of St Andrew's Avenue (Option 5) have TPO status as well as being of local and historic importance; see Section B.1. The removal of these trees would have adverse effects on the community and would affect the landscape character and visual amenity of adjacent sensitive receptors.

Recommended Actions

The proposed Scheme's impact on arboriculture is not known at this stage, but designers should be made aware of the locations of the Conservation Areas and the numerous TPOs/Memorial Trees within the study area to minimise their impact by designing out the risk; in particular, this impacts on Option 5 and the potential engineering solutions that are currently being explored around Greenstead Roundabout, affecting all Section B route options. The potential removal of trees along St Andrew's Avenue (Option 5) is considered to have significant adverse effects on arboriculture, and a screening opinion is recommended to be submitted to Colchester Borough Council to determine whether an EIA and planning application for the proposed Scheme would be required. Planning conditions could be imposed on trees that the council would not want removed, which would restrict development around these trees, thereby restricting the design. Early engagement with Colchester Council's Tree Officer is recommended to discuss the potential impact on TPOs/Memorial Trees.

It is recommended that all trees with the potential to be affected by the proposed Scheme are surveyed (using the survey methodology detailed within BS5837:2012) and assessed against the proposals. The survey is likely to involve both highway and third-party trees.

An AIA is recommended to:

- categorise and quantify all those trees expected to be removed;
- identify any notable trees worthy of retention;
- collect data on those trees assessed as retainable in order to inform protection measures; and
- identify and record all relevant adjacent trees which could be impacted by the proposals, for protection purposes.

At a later design stage, both an AMS and TPP are recommended, detailing the tree protection measures needed to safely retain any highway or third-party trees remaining, following clearance works prior to construction. A package of site supervision and site auditing may also be required to ensure the effectiveness and compliance of the protection measures detailed within the AMS and TPP. Input into a landscape design, planting and specification, regarding replacement/compensation planting, may be required.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Arboriculture	Medium	Medium	Medium	Medium	High

B.6 Cultural Heritage

Characteristics and Constraints

Section B is located in an area of Colchester that is rich in heritage and culture, with six Conservation Areas, four of which directly interacts with Section B routes (see Section B.5). Within the 'Colchester Area 1' Conservation Area is Colchester's 'Historic Core', a walled Roman and medieval town, there are nine Scheduled Monuments and numerous listed buildings. The remainder of 'Colchester Area 1' Conservation Area along East Hill and East Street also contains a high concentration of listed buildings (affecting Option 2). There are numerous listed buildings along A134 Magdalan Street (Option 1), especially within the Hythe Conservation Area, and also a few along Military Road (Option 4) including four within the New Town Conservation Area.

Based on current scheme proposals, the heritage assets that may be affected are the Grade II listed Station House (St Botolph's Station) located at Colchester Town train station, and the St Botolph's Augustinian Priory Scheduled Monument located behind Colchester Town train station; both would be affected by the proposals for Option 3. The other Section B routes are not anticipated to have an adverse effect on other designated heritage assets, and there are no designated built heritage assets near Greenstead Roundabout.

There is high potential for archaeological remains within the Section B study area, although the potential to encounter any would be reduced if works are undertaken within land that has been previously developed, such as highway or railway land. As such, there is potential for archaeological remains on Option 4 where third-party land is required for the construction of the new road by the allotment gardens. Option 3's proposal to convert railway land into highway and proposals around Greenstead Roundabout (affecting all options) have low potential to encounter archaeological remains as these proposals would take place on previously developed railway and highway land.

Recommended Actions

Due to the close proximity of the proposed Scheme to designated cultural heritage assets, it is recommended that a scoping heritage assessment is produced in the first instance, to determine whether a Heritage Statement (and walkover survey by a historic buildings' specialist) would be required. Of concern is Option 3, which may result in significant adverse effects on the Scheduled Monument and Grade II listed building by Colchester Town train station.

Consultation with Essex County Council's archaeological officers is advised due to the high archaeological sensitivity of the proposed Scheme location. There is potential for archaeological remains to be encountered at Option 4, within the third-party land next to the allotment gardens, with all other proposals at Section B having low archaeological potential.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Cultural Heritage	Medium	Medium	High	High	Medium

B.7 Ecology and Nature Conservation

Characteristics and Constraints

There is one designated wildlife site within the Section B study area; Salary Brook LNR, located approximately 130m east of Elmstead Road and 220m southeast of Greenstead Roundabout, is designated for its wildlife and comprises of a wealth of habitats including pasture, grassland, marsh, fishing ponds and Salary Brook itself. The majority of Salary Brook is also designated as a Site of Importance for Nature Conservation (SINC). There are no other designated wildlife sites of international, national or local importance within the study area of Section B.

There are several areas of priority habitat located in close proximity to some of the Section B route options, such as:

- Woodpasture and parkland BAP priority habitat at Colchester Castle Park, north of High Street (all options);
- Mudflats priority habitat at River Colne where it flows by East Street (Option 2), the railway track (Option 3), Hythe Station Road (Options 1-4), and Hythe Quay (Option 4);
- Deciduous Woodland priority habitat adjacent to the railway track (Option 3); and
- Deciduous Woodland priority habitat located north and adjacent to the proposed new road by the allotment gardens (Option 4).

Priority habitats are identified as being the most threatened or rapidly declining biological resources of the UK; therefore, the proposed Scheme should not harm these habitats, but seek instead to support their recovery. Should there be any loss to priority habitat, the proposed Scheme would need to provide compensation planting (to be agreed with Essex County Council).

An ecological appraisal, with site walkover, is recommended to determine the likely habitats and species that would be affected by the proposed Scheme. Although in an urban setting, there are features within Section B that have the potential to support protected and/or notable species, such as the tree- and shrub-lined River Colne, Porters Brook, Salary Brook, the railway tracks, and St Andrew's Avenue. As the corridor along the railway track (Option 3) is undisturbed habitat, it is likely to be species-rich and provide habitat to several protected species.

Recommended Actions

An ecological appraisal (with site walkover) is recommended to determine the presence of and likely impact to protected habitats and species; further subsequent surveys may be required.

The design team should consider supporting through design the priority habitat areas located within Section B; a qualified ecologist should be consulted to advise on this.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Ecology and Nature	Medium	Medium	High	Medium	Medium

B.8 Geology and Soils

Characteristics and Constraints

Section B is predominantly underlain by superficial deposits classified as Secondary Aquifers A, which has very good water storage properties. The western part of Section B is underlain by superficial deposits of sand and gravel of glacial origin; the eastern part of Section B is underlain by lacustrine deposits, composed of coarse-grained bedload and suspended fine-grained material, brought by streams before being laid down in lakes.

The underlying bedrock for the proposed Scheme is London Clay Formation, which is classified as Unproductive Strata, indicating low permeability and negligible significance for water supply or river base flow.

There is no soil quality rating for Section B, which is located on land classed as 'land predominantly in urban use'.

Based on readily available information, there is evidence of historical land use with potential source for contamination, including previous gas works, iron works, oil mill, tar distillery, and timber dock, all to the south west of Hythe train station (potentially affecting Options 1 and 4). As this area is now predominantly residential, it is likely that any contamination would have been removed, but it is recommended that a geo-environmental assessment is undertaken to confirm this. Some areas remain relatively undeveloped, such as the area around Option 4's proposed new road.

Recommended Actions

The overall potential risk from contaminated land is assessed as low for Options 2, 3 and 5, and medium for Options 1 and 4; the latter is due to the previous industrial and railway operations land use to the southwest and around Hythe train station. A geo-environmental assessment is recommended; this would include chemical analysis of soil samples that would provide adequate information on potential contamination and associated risks, principally to human health and controlled waters. The information would also aid with materials management during construction of the proposed Scheme.

To inform design development, a geotechnical assessment is also recommended to establish whether there are any risks in ground stability.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Geology and Soils	Medium	Low	Low	Medium	Low

B.9 Road Drainage and Water Environment

Characteristics and Constraints

Section B lies within the Colne transitional WFD water body catchment (GB520503713800), which is assessed as achieving Moderate Potential. The River Colne flows in an easterly direction to the north of Colchester town centre, before turning southeast towards the direction of the University of

Essex. The River Colne crosses Option 2 under East Street, Option 3 under a railway bridge, and Options 1 and 4 under Hythe Station Road. Because the River Colne flows at a lower elevation to the surrounding land, there are few roads at risk of fluvial flooding within the Section B study area.

There are many areas with high risk of surface water flooding, including along the High Street (by Castle Park), St Botolph's Circus roundabout (and nearby parts of St Botolph's Street, Osborne Street, and Military Road), most of East Street, Option 3's railway track (by Brook Street), Barrack Street (by Brook Street), the eastern end of Hythe Station Road, and parts of Greenstead Road and St Andrew's Avenue.

Section B is located within the Sandlings and Chelmsford groundwater NVZ, designated for being at risk from agricultural nitrate pollution. Section B is underlain by superficial deposits classified as Secondary Aquifers A, which has very good water storage properties.

Recommended Actions

It is not anticipated that the existing water and drainage environment at Section B would be altered significantly; however, with high risk of surface water flooding across parts of Section B, a road drainage and water environment assessment is recommended to ensure that there is no increase in flood risk as a result of, or to, the proposed Scheme. Although impacts on water quality, hydromorphology (including WFD) and groundwater are likely to be minor, it is recommended that these are outlined in the road drainage and water environment assessment to scope out any significant effects.

As Section B is located within a groundwater NVZ, the design of the proposed Scheme would need to minimise any potential to alter the nitrate levels in the catchments as this could lead to changes to groundwaters. The assessment of water quality in support of the WFD would also need to review any changes to the NVZ as a result of the proposed Scheme. Appropriate pollution prevention measures would be required during construction to minimise any potential impacts on water quality.

Environmental Topic	Risk Level				
	Section B Option 1	Section B Option 2	Section B Option 3	Section B Option 4	Section B Option 5
Water and Drainage	Medium	Medium	Medium	Medium	Medium

Section C

C.1 People and Communities

Characteristics and Constraints

The Section C study area comprises of land predominantly owned and used by the University of Essex. The university's Colchester campus includes buildings for classes/lectures, student residential buildings, a library, sports grounds and gym, car parks, and small campus shops that cater mainly for students. Also on campus are Knowledge Gateway (a Business Park for research and technology), Wivenhoe Park Day Nursery, and Wivenhoe House Hotel set within wooded parkland (Wivenhoe Park). Outside of campus, farmland dominates amongst hedgerows and small pockets of mature woodland. Salary Brook LNR provides a range of wildlife areas that the surrounding community can enjoy. The main residential areas in the Section C study area, outside of the university campus, are located to the south and east of Greenstead Roundabout.

The university campus is served frequently by buses to and from Colchester town centre, and there is an extensive county-level cycle network across the university campus. The section of Boundary Road that runs east from the southwest corner of the campus to B1028 Colchester Road is also a designated PRow.

Minimal land take from the university's Knowledge Gateway business park is anticipated for Option 3 to construct the new road, and some land take may be required for Option 2 to accommodate for potential widening of the existing A133 carriageway; no land take is anticipated to be required for Option 1.

Recommended Actions

Early engagement with the local community is recommended to minimise any impacts, in particular, with the university, the residential areas near Greenstead Roundabout, and users of the extensive cycle network.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Community	Low	Low	Low

C.2 Air Quality

Characteristics and Constraints

Unlike Sections A and B, there are no AQMAs within the Section C study area. Sensitive receptors include the University of Essex Colchester campus (which includes residential units) and residential properties near Greenstead Roundabout. There are a few residential properties amongst the agricultural fields located to the east of Section C.

Recommended Actions

There are sensitive receptors located close to the proposed Section C route options, including residential properties and residential halls within the university campus. A scoping air quality assessment (in accordance with DMRB guidance HA207/07) is recommended to determine whether there is likely to be a significant effect and identify the type of further assessment needed, if required.

Construction effects on air quality are likely to be temporary in nature and not significant, although best management practices would need to be employed to minimise dust effects.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Air Quality	Low	Low	Low

C.3 Noise and Vibration

Characteristics and Constraints

Located in a relatively rural setting, the existing noise environment for Section C is dominated by traffic flows along the A133. There are two NIAs located within Section C, both along Option 2; NIA ID 4768 is located along the A133 adjacent to Greenstead Roundabout, and NIA ID 4769 is located over West Lodge, adjacent (south) to the A133 and Nesfield Road. Essex County Council is the managing highway authority for both NIAs. Sensitive receptors include the University of Essex Colchester campus (which includes residential units) and residential properties near Greenstead Roundabout.

Recommended Actions

Overall, the proposed Scheme is not expected to significantly alter the existing noise and vibration environment of Section C, but further assessment would be required to confirm this, especially at existing noise 'hotspot' locations (NIAs) along Option 2.

Due to the proximity of the proposed Scheme to sensitive receptors, it is also recommended that baseline noise and vibration surveys are undertaken for defending any potential claims for compensation under the Land Compensation Act 1973.

The Environmental Health Officer at Colchester Borough Council should be consulted to identify whether there are restrictions on working methods or operating hours during construction. The Council may require a construction noise assessment and/or a Section 61 application. Regardless of the Council requirements, best management practices should be included within the Works Information for the contractor.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Noise and Vibration	Low	Medium	Low

C.4 Landscape and Visual

Characteristics and Constraints

The proposed Scheme is located within the Northern Thames Basin National Character Area (NCA), which extends from Hertfordshire in the west to the Essex coast in the east; any potential impacts on landscape are considered to be local and would not impact on the NCA. Section C is located largely within a rural setting that includes tree and shrub-lined agricultural fields, parkland, marshy floodplain, and Salary Brook LNR. The potential widening of A133 for Option 2 could have minor adverse effects on the local landscape.

The main residential receptors are located near Greenstead Roundabout and within the university campus, but the Section C proposals are unlikely to have a significant impact on these receptors. There may be minor impacts to views from Salary Brook Farmhouse at Option 3.

Option 1 would utilise existing roads within university grounds and is unlikely to have any adverse impacts on the existing landscape.

Recommended Actions

Section C of the proposed Scheme is not considered to be located in an area with high landscape sensitivity, but there could be local adverse effects to the landscape should widening along the A133 for Option 2 be required. With all options, any tree and hedgerow losses would require replacing to reduce impact to landscape views and character. Input into a landscape design, planting and specification would be required.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Landscape	Low	Medium	Medium

C.5 Arboriculture

Characteristics and Constraints

There are a number of TPOs and TPO groups within the study area; these are concentrated within the extents of Wivenhoe Park and Clingoe Hill Wood. Land take along the A133 to facilitate additional RTS lanes for Option 2 could potentially impact upon Clingoe Hill Wood TPO and other mature roadside trees along the A133. There will also be impacts to existing trees in relation to the construction of the new road at Option 3. Mitigation planting would be required to replace any trees removed to facilitate the proposed Scheme. Minimal impacts on arboriculture are anticipated for Option 1, as existing campus roads will be utilised.

Recommended Actions

The proposed Scheme's likely impact on arboriculture is not known at this stage, as options around Section C are still being developed. Designers should be made aware of the TPO locations within the study area to minimise their impact by design. It is recommended that all trees with the potential to be affected by the proposed Scheme is surveyed (using the survey methodology detailed within

BS5837:2012) and assessed against the proposals. The survey is likely to involve both highway and third-party trees.

An AIA is recommended to:

- categorise and quantify all those trees expected to be removed;
- identify any notable trees worthy of retention;
- collect data on those trees assessed as retainable in order to inform protection measures; and
- identify and record all relevant adjacent trees which could be impacted by the proposals, for protection purposes.

Early engagement with Colchester Council’s Tree Officer is also recommended to discuss the potential impact on TPOs/Memorial Trees.

At a later design stage, both an AMS and TPP are recommended, detailing the tree protection measures needed to safely retain any highway or third-party trees remaining, following clearance works prior to construction. A package of site supervision and site auditing may also be required to ensure the effectiveness and compliance of the protection measures detailed within the AMS and TPP. Input into a landscape design, planting and specification, regarding replacement/compensation planting, may be required.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Arboriculture	Low	Medium	Medium

C.6 Cultural Heritage

Characteristics and Constraints

There is one Registered Parks and Gardens within the Section C study area, and one Grade II* and seven Grade II listed buildings. The Grade II* listed building is Wivenhoe House Hotel, an 18th-century manor hotel, is set within the Wivenhoe Park Grade II listed Registered Park and Garden. Wivenhoe Park is bordered to the north by the A133 (Option 2) and bordered to the south by Boundary Road (Option 1), but the proposals for Options 1 and 2 are not anticipated to have a significant impact on the setting of Wivenhoe Park.

Two of the listed buildings are located in very close proximity to the Section C route proposals; Grade II listed Salary Brook Farmhouse on Capon Road (Option 3), and West Lodge on A133 Clingoe Hill (Option 2). Option 3’s new road would bring more traffic to the farmhouse and is likely to have a minor adverse effect to the setting of the Grade II listed building. West Lodge is already subject to heavy traffic flows along the A133 and Option 2’s proposals for additional RTS lanes along the A133 is unlikely to have a significant effect on West Lodge. The other listed buildings are not anticipated to be affected by the scheme proposals.

There is limited potential for archaeological remains to be affected where land take is required for Option 3's new road and Option 2's widening along the A133, as the majority of land required is adjacent to existing carriageway. No land take will be required for Option 1.

Recommended Actions

Due to the close proximity of the proposed Scheme to designated cultural heritage assets, it is recommended that a scoping heritage assessment is produced in the first instance, to determine whether a Heritage Statement (and walkover survey by a historic buildings' specialist) would be required. Of (minor) concern is Salary Brook Farmhouse if Option 3 is pursued.

Consultation with Essex County Council's archaeological advisors is advised due to the high archaeological sensitivity of the proposed Scheme location. It is likely that a watching brief would be required during any geotechnical investigations or groundworks.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Cultural Heritage	Low	Low	Medium

C.7 Ecology and Nature Conservation

Characteristics and Constraints

There is one designated wildlife site within the Section C study area; Salary Brook LNR, located adjacent (north) of the A133 and 220m southeast of Greenstead Roundabout, is designated for its wildlife and comprises a wealth of habitats including pasture, grassland, marsh, fishing ponds and Salary Brook itself. The majority of Salary Brook is also designated as a SINC. Option 2 has potential to impact on the Salary Brook LNR due to its location being adjacent to the A133.

There are no other designated wildlife sites of international, national or local importance within the study area of Section C, but there are several areas of priority habitat located across the study area, including:

- Woodpasture and parkland BAP priority habitat at Wivenhoe Park within the university campus (potentially affected by Options 1 and 2);
- Deciduous Woodland priority habitat adjacent to the A133 (Clingoe Hill Wood) and bordering Wivenhoe Park (potentially affected by Options 1 and 2); and
- Coastal and floodplain grazing marsh alongside Salary Brook and in the flood storage area west of Boundary Road (potentially affected by Options 1 and 2).

Priority habitats are identified as being the most threatened or rapidly declining biological resources of the UK; therefore, the proposed Scheme should not harm these habitats, but seek instead to support their recovery. Should there be any loss to priority habitat, the proposed Scheme would need to provide compensation planting (to be agreed with Essex County Council).

An ecological appraisal, with site walkover, is recommended to determine the likely habitats and species that would be affected by the proposed Scheme. Options 2 and 3 have the potential to impact on mature trees, shrub, and woodland bordering the A133; Option 1 has the potential to

impact on mature trees and shrub along Boundary Road. Notwithstanding Salary Brook LNR, Salary Brook itself, which cuts under the A133 and Elmstead Road, also has the potential to support a number of protected and/or notable species.

Recommended Actions

An ecological appraisal (with site walkover) is recommended to determine the presence of and likely impact to protected habitats and species; further subsequent surveys may be required. The design team should consider supporting through design the priority habitat areas located within Section C; a qualified ecologist should be consulted to advise on this.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Ecology and Nature	Medium	Medium	Medium

C.8 Geology and Soils

Characteristics and Constraints

Section C is predominantly underlain by superficial deposits classified as Secondary Aquifers A, which has very good water storage properties. These superficial deposits consist of till, unsorted and unstratified, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier; the till here is a mixture of clay, sand, gravel, and boulders varying widely in size and shape. The residential areas near Greenstead Roundabout and Salary Brook LNR are underlain by lacustrine deposits, composed of coarse-grained bedload and suspended fine-grained material, brought by streams before being laid down in lakes.

The underlying bedrock for the proposed Scheme is London Clay Formation, which is classified as Unproductive Strata, indicating low permeability and negligible significance for water supply or river base flow.

The soil quality for Section C is predominantly classed as '3 – Good to Moderate', which is land capable of consistently producing moderate to high yields of a narrow range or arable crops.

Based on readily available information, no significant potential sources of contamination have been identified within the study area.

Recommended Actions

The overall potential risk from contaminated land is assessed as low due to the limited potential for contamination to have occurred on or immediately close to Section C of the proposed Scheme. To inform design development, a geotechnical assessment is recommended to establish whether there are any risks in ground stability.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Geology and Soils	Low	Low	Low

C.9 Road Drainage and Water Environment

Characteristics and Constraints

Section C largely lies within the Colne transitional WFD water body catchment (GB520503713800), with a small north-western part within the Salary Brook WFD water body (GB105037041320); both WFD water bodies are assessed as achieving Moderate potential.

Salary Brook flows in a south-westerly direction under the A133 Clingoe Hill carriageway before joining the River Colne outside of the Section C study area (to the west). To the east of where the two watercourses join is a flood storage area; areas within Salary Brook LNR, alongside Salary Brook, are also designated as high fluvial flood risk zones, including where Salary Brook crosses under St Andrew's Avenue.

The potential widening of the A133 to facilitate the RTS (Option 2) has the potential to increase impermeable area and associated flood risk, although there are few existing roads within Section C subject to high risk of surface water flooding. Option 3 is considered to require minimal land take and is not anticipated to significantly increase the impermeable area or flood risk. No land take will be required for Option 1.

Section C is underlain by superficial deposits classified as Secondary Aquifers A (very good water storage properties) and is located within the Sandlings and Chelmsford groundwater NVZ, designated for being at risk from agricultural nitrate pollution. The area from Greenstead Roundabout to Knowledge Gateway (affecting Option 3 and the western half of Option 2) is also within the Salary Brook surface water NVZ.

Recommended Actions

Options 1 and 3 are not anticipated to significantly alter the existing water and drainage environment of Section C; however, a road drainage and water environment assessment including a surface water flood risk assessment is recommended for Option 2 to ensure that there is no increase in surface water flood risk. Although impacts on water quality, hydromorphology (including WFD) and groundwater are likely to be minor, it is recommended that these are outlined in the road drainage and water environment assessment to scope out any significant effects.

As Section C is located within groundwater and surface water NVZs, the design of the proposed Scheme would need to minimise any potential to alter the nitrate levels in the catchments as this could lead to changes to surface waters and groundwaters. The assessment of water quality in support of the WFD would also need to review any changes to the NVZs as a result of the proposed Scheme. Appropriate pollution prevention measures would be required during construction to minimise any potential impacts on water quality.

Environmental Topic	Risk Level		
	Section C Option 1	Section C Option 2	Section C Option 3
Water and Drainage	Low	Low	Low

Appendix D: Acronyms

Arboricultural Impact Assessment	AIA
Arboricultural Method Statement	AMS
Air Quality Management Area	AQMA
Environmental Impact Assessment	EIA
Design Manual for Roads and Bridges	DMRB
Interim Advice Note	IAN
Local Nature Reserve	LNR
National Character Area	NCA
Nitrate Vulnerability Zone	NVZ
Noise Important Area	NIA
Public Right of Way	PRoW
Rapid Transit Scheme	RTS
Site of Importance for Nature Conservation	SINC
Tending Colchester Border Garden Community	TCBGC
Tree Preservation Order	TPO
Tree Protection Plan	TPP
Water Framework Directive	WFD