M11 Junction 7A

Ringway Jacobs / Essex County Council

Drainage System Summary Report

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M11 Junction 7A

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Document history and status

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1. Introduction

1.1 Drainage System Summary Report

This Drainage System Summary Report describes both the existing and proposed drainage systems within the M11 Junction 7A scheme, including the proposed drainage strategy for managing the quantity and quality of surface water runoff.

1.2 Scheme Overview

The primary objectives of the M11 Junction 7A scheme are as follows:

- To improve accessibility to and from Harlow;
- To reduce congestion primarily for the A414 corridor;
- To ensure the proposed infrastructure is of the appropriate scale for the future traffic demands of the stated growth;
- To facilitate future housing developments around Harlow and employment growth to the east of Harlow.

The proposed scheme is located in the west of Essex County, east of Harlow between the existing Junctions 7 and 8 of the M11. The proposed location of Junction 7A is centred at approximate National Grid Reference 549800, 212300.

The scheme extends westwards through rural land before joining the existing Sheering Road (B183) to the north of the Campions. The B183 continues westwards towards Harlow, becoming Gilden Way (North) prior to Churchgate Roundabout and Gilden Way (South) after the roundabout. The western limit of the scheme is the London Road Roundabout prior to the A414.

The proposed scheme comprises the following main elements:

- New grade separated junction consisting of an overbridge and roundabouts above the existing M11 motorway;
- New slip roads mostly on embankment to the north of the new junction;
- New slip roads mostly in cutting to the south of the new junction;
- Roundabouts connecting the motorway to the existing Sheering Road (B183) in the west. The new link comprises carriageways on separate embankments;
- Revised culverted sections of a rerouted unnamed ordinary watercourse discharging to Pincey Brook; and
- Approximately 2km of works along the Gilden Way (B183) from the general area of Mayfield Farm to its junction with London Road Roundabout in the west.

Works on Gilden Way comprise widening of the existing carriageway to create an additional lane, and road surface improvement works. There are no proposed works or modifications to the Gilden Way Bridge over the Harlowbury Brook.

In terms of the drainage design, the scheme can be considered as three distinct highway catchments, and are referred to as follows:

- Gilden Way (Highway Drainage Catchment A)
- Proposed Link Roads (Highway Drainage Catchment B)
- Proposed Junction 7A (Highway Drainage Catchment C)

Gilden Way (Highway Drainage Catchment A) can be further considered as two sub-catchments, referred to as Gilden Way (South) or Catchment A (South) and Gilden Way (North) or Catchment A (North).

See Appendix A for high level drainage schematic plans, prepared to support the planning application for the scheme, which illustrate the above highway drainage catchments.

2. Drainage Design

2.1 Drainage Objectives

An appropriate drainage strategy will mitigate the risk of surface water flooding as a result of the proposed increase in impermeable surfaces following development of the scheme.

The main objectives of the drainage strategy include:

- Remove water from the carriageway;
- Mitigate the impact of increased impermeable area on receiving watercourses;
- Mitigate any increase in surface water flood risk;
- Control road runoff prior to discharge; and
- Mitigate the impact of the scheme on the water quality of receiving watercourses.

2.2 Design Criteria and Modelling

The proposed drainage systems have been designed in accordance with the Highways England Design Manual for Roads and Bridges (DMRB), the CIRIA SuDS Manual 2015 and guidance from Essex County Council (ECC) as Lead Local Flood Authority (LLFA) (hereafter referred to as ECC), using the Micro Drainage Version 2016.1 drainage design software. At this stage in the design process, a range of assumptions regarding the existing drainage systems have been necessitated by limitations in the coverage of the available archive and survey data.

2.2.1 Design Rainfall

There are currently two separate design rainfall approaches which are readily used for drainage design in the industry; the Flood Studies Report (FSR) (NERC, 1975) and the Flood Estimation Handbook (FEH) (CEH, 1999). In this instance the FEH approach was found to be slightly more conservative and has therefore been adopted.

2.2.2 Allowance for Climate Change

At this stage in the design process, an allowance for climate change of 30% enhanced rainfall intensity has been made for the design of the proposed drainage systems. No climate change allowances have been applied during reviews of the existing drainage systems and consultation with ECC is ongoing regarding any refinements to the allowances for climate change that would be appropriate to this scheme.

2.2.3 Return Period

Table 2.1 summarises the design return periods adopted at this stage. An initial design return period of 1 in 30 years has been adopted for no flooding from the drainage system, including for highway drainage catchment C (the proposed Junction 7A), based on guidance in the CIRIA SuDS Manual 2015. This approach will be reviewed following consultation with Highways England, and any revised approach agreed with ECC and the Environment Agency (EA).

Table 2.1 : Design Return Periods

Event	Return Period	Guidance
Piped network		
No surcharging of pipe	1 in 1 year (Highway Drainage Catchments B and C) 1 in 2 years (Highway Drainage Catchment A)	DMRB HD 33/16 ECC Development Construction Manual January 2012
No surcharging above formation of combined filter drains	1 in 5 years	DMRB HD 33/16
No flooding	1 in 30 years	CIRIA SuDS Manual 2015
Attenuation structures		
Ponds / Tank		
No flooding	1 in 100 years	CIRIA SuDS Manual 2015
Oversized Pipes		
No flooding	1 in 30 years	CIRIA SuDS Manual 2015
Management of exceedance flows	1 in 100 years	CIRIA SuDS Manual 2015

2.3 Discharge Hierarchy

It is best practice to apply the currently preferred discharge hierarchy when considering the discharge of surface water, which requires adopting infiltration based SuDS to the maximum extent possible before attenuating flows and discharging to surface waters. In general, attenuation based SuDS are proposed throughout the scheme to manage both the quantity and quality of runoff and provide amenity and biodiversity benefits. Based on geotechnical investigation works carried out to date, there are currently thought to be significant ground condition constraints to using infiltration based SuDS across the scheme, although this will be reviewed on a location by location basis during subsequent phases of the design.

3. Gilden Way (Highway Drainage Catchment A)

3.1 Existing Gilden Way Drainage System

The Gilden Way section of the scheme extends from the existing London Road Roundabout in northeast Harlow, in a north easterly direction past the Harlowbury Brook to the approximate location of Mayfield Farm, where the new section of Gilden Way deviates from the existing Gilden Way / Sheering Road and joins the new Sheering Road Roundabout. From a review of the limited surface water drainage asset information available, it is understood that the existing Gilden Way highway drainage catchment is currently served by kerbs and gullies and two independent carrier pipe drainage systems discharging to the Harlowbury Brook, one system to the southwest of Harlowbury Brook and another system to the northeast. It is understood that the outfalls on the west and east side of the Harlowbury Brook are approximately 375mm and 600mm in diameter respectively.

3.2 Proposed Drainage System

3.2.1 Proposed Strategy

The existing systems are understood to currently discharge directly to Harlowbury Brook with no attenuation. It is proposed to attenuate flows in a combination of ponds, a storage tank and oversized pipes along the lengths of the systems before discharging to the Harlowbury Brook at the existing discharge locations, to achieve a discharge rate as agreed with ECC.

In general, the proposed highway works on Gilden Way are constrained to be within the existing highway corridor, and therefore the space readily available for drainage purposes is extremely limited. However, the space constraints have been eased in certain locations by the advice that use of Harlow District Council owned land may, with their agreement, be considered for this part of the project.

The preferred attenuation SuDS features are ponds where space permits. However, there are few large enough open areas adjacent to Gilden Way, particularly in close proximity to the outfalls at Harlowbury Brook. Therefore, it is proposed to attenuate flows in ponds and a storage tank located part way along each system, with the remaining storage being provided by oversized pipes either under the new verge, footpath or road.

Specifically, for the Gilden Way (South) system, it is proposed to locate a pond in a pocket of relatively clear land to the south of Gilden Way approximately 250m from the Harlowbury Brook. The pond will be sympathetically located and detailed to limit the impact of the existing trees in the area, although it is likely that some trees will need to be removed. For the Gilden Way (North) system, it is proposed to locate a pond in the playing fields to the southeast of the existing Churchgate Roundabout, adjacent to the existing sports pitches. Similarly, the pond will be sympathetically located and detailed to limit the impact on the existing sports pitches, although it is likely that a large proportion of the existing mature trees in the area will need to be removed. In addition, it is proposed to locate a storage tank in the area of land to the southwest of the existing Churchgate Roundabout, which is to be positioned in the clearing between trees to limit the need for tree removal. The position of this tank should be reviewed at the next design stage, with the merits of locating the tank in the centre of the Churchgate Roundabout explored further.

In general, it is proposed to drain Gilden Way with kerbs and gullies, with combined kerb drainage utilised where advantageous due to specific site constraints.

At present, the practicality of directly reusing or refurbishing significant proportions of the existing drainage infrastructure is considered unlikely. This is due to the positional relationship between the existing and proposed highway alignment combined with the increase in capacity requirements when accounting for road widening, allowance for climate change and the need for oversized pipes. Therefore, it is generally proposed to abandon the existing drainage and construct drainage specifically positioned and sized to suit the new road layout. However, directly reusing or refurbishing existing drainage infrastructure may be necessary in some locations, particularly in areas of high density existing utilities. This will be explored further at future stages of design.

It is understood that Essex Highways will maintain maintenance responsibilities for all drainage infrastructure within the Gilden Way highway drainage catchment.

3.2.2 Attenuation & Discharge Limit

Being located part way along each system, the ponds and the invert levels of their outlets will be located well outside of the Harlowbury Brook 1% AEP (plus climate change) floodplain and therefore no pond related compensatory storage will be required.

The ECC preference is to restrict the discharge from each of the two proposed Gilden Way systems to the Harlowbury Brook to 50% of the existing 1 in 1 year 'brownfield' (from existing contributing areas) discharge rates. Based on this approach, the required diameters of the oversized pipe system are a significant contributing factor to what is considered to be, in certain locations along Gilden Way, an extremely challenging scheme to construct due to the required coordination with existing utilities and environmental mitigations. Consultation with ECC is ongoing regarding a suitable approach to a refinement of the limiting discharge rate requirements for the Gilden Way highway drainage catchment.

3.2.3 Pollution Control

The Highways Agency Water Risk Assessment Tool (HAWRAT)[1] was used to assess the potential ecological impacts of routine surface water runoff and to determine the need for specific pollution mitigation measures. The following pollution mitigations measures are proposed for the Gilden Way systems:

- In addition to providing water quantity benefits, the inherent nature of the ponds will provide treatment of surface water runoff prior to discharge to the receiving watercourse. Ponds are to have a 500mm permanent pool depth which will act as the main treatment zone, and are to be planted which provides additional water quality benefits. Ponds are also to be lined to prevent contamination of groundwater and aquifers;
- A silt trap is required upstream of the storage tank to the southwest of Churchgate Roundabout;
- An oil interceptor and silt trap is required before discharging to the Harlowbury Brook, for both the Gilden Way systems (requirement for oil interceptors based on a worst case assumption regarding low flows in the Harlowbury Brook);
- Highway gullies are to be trapped gullies;

During recent consultation, ECC advised that for water quality mitigations, they would generally follow the CIRIA SuDS Manual 2015 advice as opposed to the HAWRAT approach. At the next stages of the design, a comparison between the water quality requirements indicated from HAWRAT and the CIRIA SuDS Manual 2015 will be undertaken, with a view to incorporating any appropriate refinements advised by the CIRIA SuDS Manual 2015.

[1] Highways Agency was replaced by Highways England in April 2015. This Water Risk Assessment Tool is yet to be renamed.

4. Proposed Link Roads (Highway Drainage Catchment B)

4.1 Proposed Drainage System

4.1.1 Proposed Strategy

The proposed link roads are to be constructed on 'greenfield' land. The highway catchment includes the Westbound Diverge Link, Eastbound Merge Link, Pincey Brook Roundabout, Sheering Road Roundabout, Sheering Road Dumbbell Link and the new section of Gilden Way to the approximate location of Mayfield Farm. The proposed link roads highway drainage catchment is to be drained by kerbs and gullies, or alternatively a combined kerbs and drainage system at the roundabouts, with the carrier pipe system converging at the Sheering Road Roundabout. Filter drains are to be adopted where the proposed highway is in cutting. It is proposed to attenuate flows in a pond to the north of Sheering Road Roundabout before discharging to the Pincey Brook at an existing outfall location approximately 40m east of the Ealing Bridge (the Sheering Road Bridge), to achieve a discharge rate in line with best practice and as agreed with ECC.

In general, within the vicinity of the proposed link roads, the land falls from south to north towards the Pincey Brook. New ditches and cut-off drains are to be provided along the link roads where required. Specifically, it is proposed to provide a ditch and cut-off drain where the link is on embankment and in cutting respectively south of the Westbound Diverge Link, Sheering Road Roundabout and Gilden Way. It is proposed that the ditch and a short length of the cut-off drain will drain to the realigned unnamed watercourse, which is discussed in section 4.2. It is proposed that the remaining length of the cut-off drain will fall towards a low point south of the Sheering Road Roundabout, before being piped around the proposed Sheering Road Roundabout drainage system and discharging to the existing drainage ditch to the east of the existing wooded areas adjacent to Sheering Road. It is also proposed to provide a new cut-off drain to the west of Sheering Road Roundabout and including a length along the northwest side of Gilden Way, which will be piped to the existing drainage ditch in the same way. From readily available LiDAR information, this would appear to be where the land being intercepted by the proposed link roads currently drains, and therefore the proposal is to mimic the current drainage path. In addition, it is proposed to provide new ditches at the toe of the embankments in the area enclosed by the proposed link roads, which will drain to the realigned unnamed watercourse.

It is understood that Essex Highways will have maintenance responsibilities for all drainage infrastructure within the proposed link roads highway drainage catchment.

4.1.2 Attenuation & Discharge Limit

Both the pond and the invert level of its outlet will be placed outside of the Pincey Brook 1% AEP (plus climate change) floodplain, based on hydraulic modelling of the Pincey Brook undertaken by Jacobs, and therefore no compensatory storage will be required. This has been agreed in principle with ECC and the EA.

In line with best practice and as agreed in principle with ECC, discharge to the Pincey Brook from the proposed link roads highways drainage catchment will be restricted to the 1 in 1 year 'greenfield' runoff rate for the catchment or 1 l/s, whichever value is the larger.

4.1.3 Pollution Control

The Highways Agency Water Risk Assessment Tool (HAWRAT) was used to assess the potential ecological impacts of routine surface water runoff and to determine the need for specific pollution mitigation measures. The following pollution mitigations measures are proposed for the proposed link roads system:

- In addition to providing water quantity benefits, the inherent nature of the pond will provide treatment of surface water runoff prior to discharge to the receiving watercourse. The pond is to have a 500mm permanent pool depth which will act as the main treatment zone, and is to be planted which provides

additional water quality benefits. The pond is also to be lined to prevent contamination of groundwater and aquifers;

- Highway gullies are to be trapped gullies;

During recent consultation, ECC advised that for water quality mitigations, they would generally follow the CIRIA SuDS Manual 2015 advice as opposed to the HAWRAT approach. At the next stages of the design, a comparison between the water quality requirements indicated from HAWRAT and the CIRIA SuDS Manual 2015 will be undertaken, with a view to incorporating any appropriate refinements advised by the CIRIA SuDS Manual 2015.

4.2 Unnamed Watercourse

The link road construction also requires the realignment of a small unnamed watercourse, which currently flows in a northerly direction from the wooded areas known as The Mores as an open channel, before discharging into the Pincey Brook via two parallel approximately 140m long, 300mm diameter pipes.

Two lengths of new 2m x 2m box culvert of approximate lengths 54m and 21m, excluding skew inlet and outlet structures, will accommodate the realigned watercourse as it passes through the new Westbound Diverge Link and Eastbound Merge Link highway embankments respectively. The size of the new box culverts have been determined by bat, otter and badger access considerations, rather than solely drainage related requirements. Bottom of embankment toe ditches will be used to convey run-off to the realigned watercourse as described elsewhere is the report.

There is an open channel section between the lengths of the two box culverts which is encompassed by the new link road construction. It is likely that the ground will need to be locally re-profiled in this area to achieve a minimum channel depth of 1m.

Downstream of the highway embankment works, the realigned watercourse reverts to an open channel and is appropriately positioned to avoid existing trees and to avoid works occurring in close proximity to the route of the existing gas main. The downstream length of open channel provides significant opportunity for ecological improvement when compared to the existing small diameter piped outlets to the Pincey Brook.

4.3 Sheering Road

There is an existing high point on Gilden Way/Sheering Road at the approximate location of Mayfield Farm. As discussed in Section 3, the existing Gilden Way drainage to the southwest of Mayfield Farm outfalls to the Harlowbury Brook and is considered as part of Highway Drainage Catchment A. To the north of Mayfield Farm, the new section of Gilden Way deviates from the existing road and joins the new Sheering Road Roundabout. The existing Sheering Road to the northeast of Mayfield farm is understood to drain via a combination of carrier pipes and ditches, and outfall to the Pincey Brook at the existing outfall location approximately 40m east of the existing Sheering Road Bridge (Ealing Bridge).

In the proposed scheme, the southern section of the existing Sheering Road becomes solely an access road for residential properties north of Gilden Way, with a new junction and link from the new section of Gilden Way. A new length of Sheering Road from the new Sheering Road Roundabout ties into the existing Sheering Road before the Ealing Bridge.

It is currently proposed that Sheering Road will continue to drain via the existing drainage system, with minor adaptation where necessary (e.g. piping existing ditches under the new access junction), and that the existing and proposed contributing areas served by the drainage system will be balanced. However, consultation is ongoing with ECC to determine practical measures that can optimise the level of discharge betterment.

5. Proposed Junction 7A (Highway Drainage Catchment C)

5.1 Existing M11 Drainage System

In the vicinity of the proposed Junction 7A, the existing M11 drains from south to north from a high point approximately 1.8km south of the Pincey Brook and discharging to the Pincey Brook immediately west of the M11. Each carriageway is served by a surface water channel and carrier pipe system in the verge. It is currently understood that the carrier pipe system serving the southbound carriageway outfalls into a ditch where the M11 transitions from in cutting to on embankment approximately 270m south of the Pincey Brook. The ditch is then understood to join the carrier pipe system serving the northbound carriageway at the toe of the M11 embankment via a pipe on the south side of and integral with the box culvert underpass approximately 100m south of the Pincey Brook. The northbound carriageway embankment is understood to be drained by a filter drain which joins the M11 drainage system at this location. The system then discharges to the Pincey Brook via an outfall, understood to be approximately 375mm in diameter.

To the north of the box culvert underpass, the existing M11 southbound carriageway is understood to currently discharge to the Pincey Brook via two separate outfalls and independent of the highway drainage catchment south of the box culvert underpass. The length between to box culvert underpass and the Pincey Brook is understood to drain via surface water channel and outlets into the toe of embankment ditch before discharging to Pincey Brook from the south. The length north of the Pincey Brook is understood to drain in the same way, before discharging to Pincey Brook from the north.

Archive material shows a piped system in the central reserve (the high point in cross section through the M11), which is assumed to provide sub surface drainage.

Based on the limited information available, for this particular location there is a risk that the existing M11 drainage system is in a relatively poor condition.

5.2 Proposed Drainage System

5.2.1 Proposed Strategy

The proposed Junction 7A dumbbell roundabouts and link are to be drained by kerbs and gullies, or alternatively a combined kerbs and drainage system. The northbound diverge and southbound merge are to be predominantly drained by surface water channels which will tie into the existing surface water channel on the M11 mainline, with short lengths of kerbs and gullies utilised from the roundabouts. Due to the relatively steep nature of the northbound merge and southbound diverge, which would require the use of complex weir outlets if surface water channels were adopted, these slips will be drained by kerbs and gullies, with short lengths of filter drain where the slip roads are in cutting. The edge of carriageway drainage will transition back into surface water channel to tie into the existing at a location that longitudinal gradients dictate that the complex weir outlets are not required. This includes the length of the southbound diverge which extends over the box culvert underpass and to approximately 200m north of the Pincey Brook.

It is proposed to connect the new carrier drains from the proposed Junction 7A and slip roads to the existing M11 carrier drains, and upgrade / upsize the existing pipes impacted by the scheme to take the additional runoff and meet latest design criteria in terms of climate change. A new carrier pipe system serving the southbound diverge and adjacent southbound carriageway to the north of the box culvert underpass will join the proposed Junction 7A system in the vicinity of the box culvert underpass, and will benefit from the water quantity and quality advantages provided by the proposed pond. To the north of the extended southbound diverge, the existing M11 southbound drainage system is to continue to drain as is currently assumed, via surface water channel and outlets into the toe of embankment ditch.

The existing systems currently discharge directly to Pincey Brook with no attenuation. It is proposed to attenuate flows in a pond positioned immediately to the south of the Pincey Brook and to the west of the M11 before discharging to the Pincey Brook at the existing discharge location, to achieve a discharge rate as agreed with ECC.

The proposed works encompasses the existing ditch and filter drain east and west of the existing M11 respectively where the M11 in on embankment. New ditches will be provided both east and west of the M11 from the Junction 7A dumbbell roundabouts to the box culvert underpass where the proposed M11 slips roads are predominantly on embankment. In addition, a new cut-off drain will be provided to the east of the M11 from the southern extent of the scheme to where the proposed ditch begins where the M11 slip road is in cutting. It is proposed that the new ditches will be connected by pipes to the existing ditches north of the box culvert underpass, which are understood to outfall directly to Pincey Brook. At a future design stage, the existing and required capacities of the existing ditches north of the box culvert underpass are to be reviewed and, if required, ditch capacities increased accordingly.

It is assumed that Highways England will have maintenance responsibilities for all drainage infrastructure within the proposed Junction 7A catchment, although this is subject to a wider approval of the drainage proposals by Highways England.

5.2.2 Attenuation & Discharge Limit

As with the proposed link road system, both the pond and the invert level of its outlet will be placed outside of the Pincey Brook 1% AEP (plus climate change) floodplain and therefore no compensatory storage will be required. This has been agreed in principle with ECC and the EA.

As agreed in principle with ECC, it is proposed to restrict the discharge to the Pincey Brook to a rate that is no greater than 50% of the existing 1 in 1 year ‘brownfield’ (from existing contributing areas) discharge rate, in addition to the 1 in 1 year ‘greenfield’ runoff rate for the proposed additional highway catchment area.

5.2.3 Pollution Control

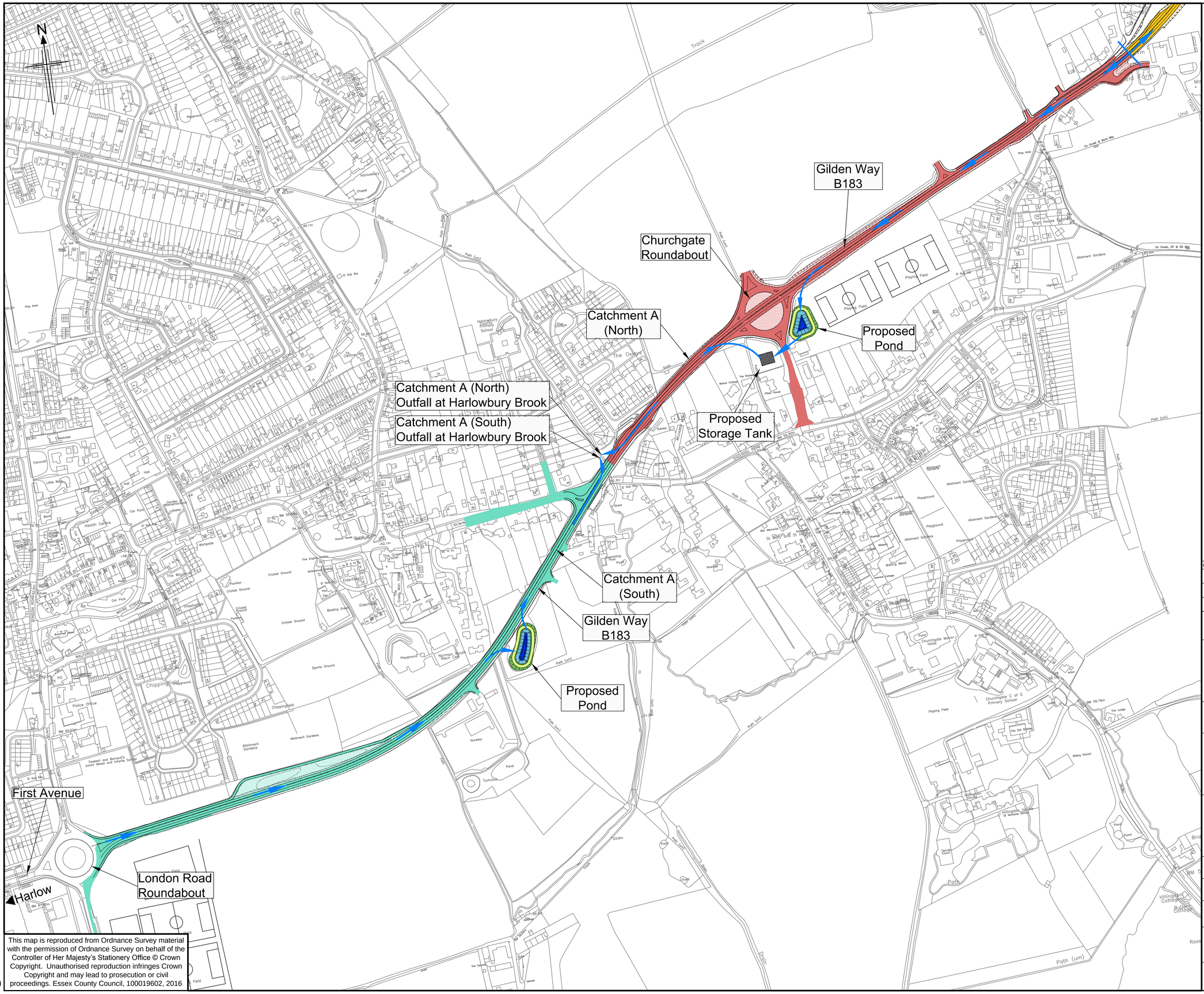
The Highways Agency Water Risk Assessment Tool (HAWRAT) was used to assess the potential ecological impacts of routine surface water runoff and to determine the need for specific pollution mitigation measures. The following pollution mitigations measures are proposed for the proposed Junction 7A system:

- In addition to providing water quantity benefits, the inherent nature of the pond will provide treatment of surface water runoff prior to discharge to the receiving watercourse. The pond is to have a 500mm permanent pool depth which will act as the main treatment zone, and is to be planted which provides additional water quality benefits. The pond is also to be lined to prevent contamination of groundwater and aquifers;

- Highway gullies are to be trapped gullies;

During recent consultation, ECC advised that for water quality mitigations, they would generally follow the CIRIA SuDS Manual 2015 advice as opposed to the HAWRAT approach. At the next stages of the design, a comparison between the water quality requirements indicated from HAWRAT and the CIRIA SuDS Manual 2015 will be undertaken, with a view to incorporating any appropriate refinements advised by the CIRIA SuDS Manual 2015.

Appendix A. High Level Drainage Schematic Plans



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Key:

- Catchment A (South) Impermeable Area
- Catchment A (South) Permeable Area
- Catchment A (North) Impermeable Area
- Catchment A (South) Permeable Area
- Flow Direction

Notes:

1. Drawing is to be printed in colour.

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
-	-	-	-	-	-	-
-	-	-	-	-	-	-
P0	18/11/16	ORIGINAL	SR	MB	JP	PM

DRAWING STATUS

APPENDIX A

RINGWAY JACOBS integrated expertise

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SCHEME TITLE

M11 JUNCTION 7A

DRAWING TITLE

DRAINAGE
CATCHMENT A

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
	SR	MB	JP	PM
DATE	DATE 18/11/16	DATE 18/11/16	DATE 18/11/16	DATE 18/11/16

DRAWING UNITS U.N.O.
DIMENSIONS AND LEVELS IN METRES

SCALE AT A1 (841X594mm)
1:2500

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B3553F05-0500-DR-0009

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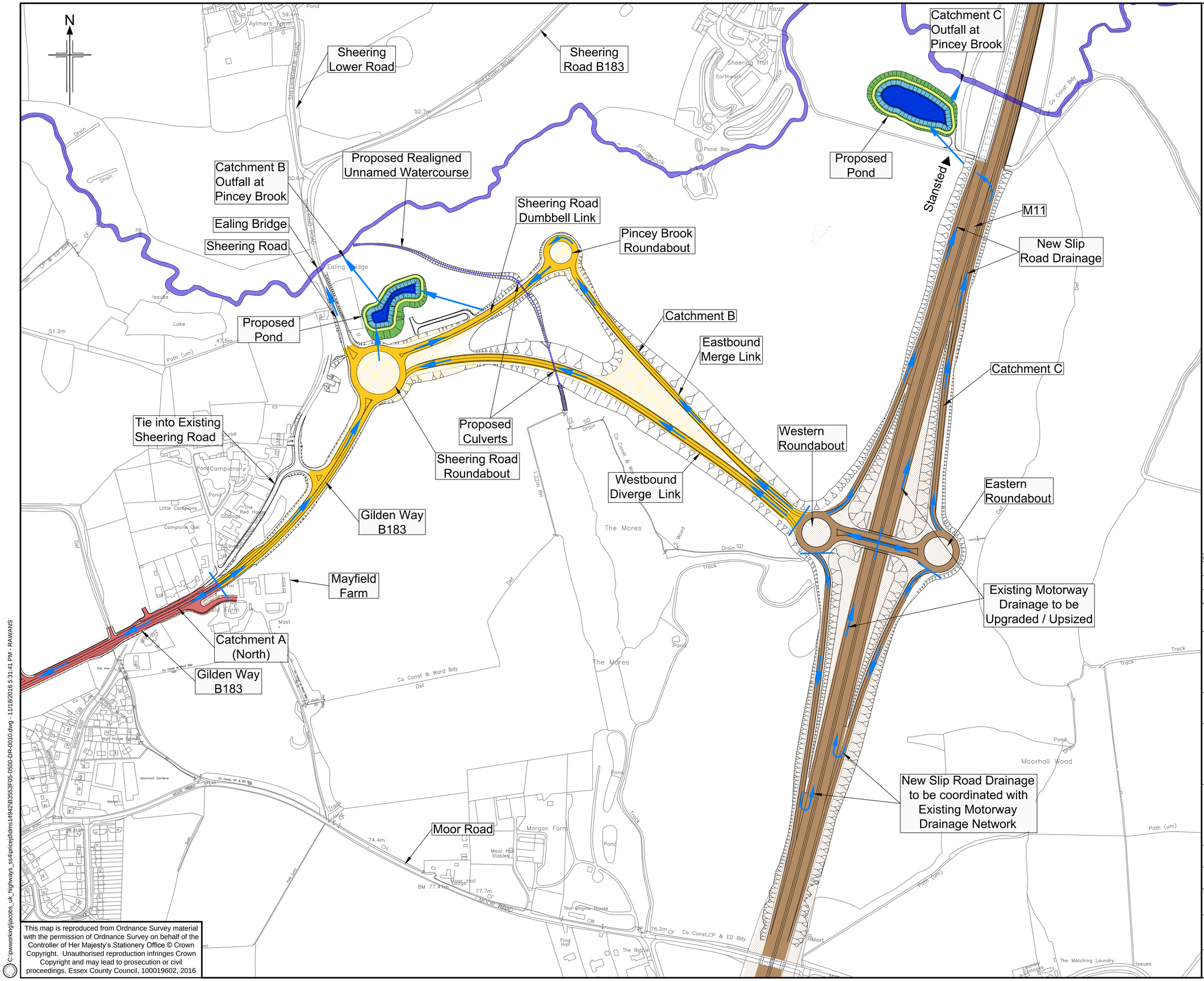

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Key:

- Catchment B Impermeable Area
- Catchment B Permeable Area
- Catchment C Impermeable Area
- Catchment C Permeable Area
- Flow Direction
- 1 In 100 Year + 70% Climate Change Flood Extent (Jacobs Hydraulic Modelling - Existing Scenario)
- Watercourse

Notes:

1. Drawing is to be printed in colour.

0 50 100 150 200 250 m

SCALE 1 : 2500

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
-	-	-	-	-	-	-
-	-	-	-	-	-	-
P0	18/11/16	ORIGINAL	SR	MB	JP	PM

DRAWING STATUS

APPENDIX A

RINGWAY JACOBS integrated expertise

Essex County Council

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SCHEME TITLE

M11 JUNCTION 7A

DRAWING TITLE

DRAINAGE
CATCHMENTS B & C

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
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DATE	DATE 18/11/16	DATE 18/11/16	DATE 18/11/16	DATE 18/11/16

DRAWING UNITS U.N.O.
DIMENSIONS AND LEVELS IN METRES

SCALE AT A1 (841X594mm)
1:2500

DRAWING No.
B3553F05-0500-DR-0010

REV.
P0

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M11 J7a

Essex County Council

Drainage Systems Summary Report

Addendum

B3553F05-0500-RP-0002 | P0

28 February 2017

M11 J7a

Project No:	B3553F05
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Document history and status

Revision	Date	Description	By	Review	Approved
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1. ADDENDUM 1: Gilden Way (Highway Drainage Catchment A) - Design Refinement 3

Appendix A. Drainage Schematics – B5335F05-0500-SK-0002 Rev P0

1. ADDENDUM 1: Gilden Way (Highway Drainage Catchment A) - Design Refinement

The need to fully co-ordinate the proposed highway drainage system, and required environmental mitigation works, with current (and future) utility provision, all within a range of spatial constraints along Gilden Way, presents significant challenges to achieving a safe and cost effective construction of the scheme.

Ongoing pre-Application discussions with ECC (as LLFA) identified a requirement to determine the greatest level of discharge rate betterment that could be practically achieved across a range of return periods, up to and including the 1 in 100 year event, with consideration for the site constraints. Interface co-ordination work with Utility Providers also resulted in the definition of maximum practical pipe diameters at critical locations, and a wider limitation on oversized pipes in the downstream parts of the system, to no greater than 600mm diameter. The congestion of utilities imposed further conditions to utilise existing pipe runs through the Mulberry Green junction area and re-use of the existing outfall locations, subject to full assessment of their current condition and residual life. Condition of the existing drainage assets in the works area retained for re-use will be established in the detailed design phase and any remediation carried out accordingly.

Based on the refined design criteria, supplementary design work has been carried out and indicative results are presented in Table Ad.1 below. The discharge betterment percentages indicated, as derived on a best practical basis, are comparisons between existing and proposed discharge rates for corresponding storm return periods. The existing discharge rate estimates make no allowance for the impact of climate change, whereas the proposed discharge rates have been derived whilst including an allowance of 30% enhanced rainfall intensity.

Table Ad.1: Gilden Way Combined South and North Discharge Rates and Betterment

Discharge Rates (l/s) and Betterment (%)	Return Period (years)						
	1:1	1:2	1:5	1:10	1:20	1:30	1:100
Existing Rate, without CC allowance (l/s)	259	299	340	353	368	387	418
Proposed Rate, incl. CC allowance (l/s)	94	107	124	146	165	162	169
Betterment (%)	64%	64%	64%	59%	55%	58%	60%

As indicated in Table Ad.1, the proposed discharge rates provide at least 50% betterment for each reviewed return period. Features specifically introduced to enable this betterment outcome are illustrated in the attached drainage schematics (B3553F05-0500-SK-0002).

The exceedance volume in a 1 in 100 year (+30% climate change) rainfall event for the proposed Gilden Way (South) and (North) systems combined has been estimated at approximately 300m^3, which represents a significant reduction (of between 40% and 50%) when compared to the existing 1 in 100 year scenario (with no allowance for climate change). The sensitivity of this reduction in exceedance volume is to be reviewed, in line with the LLFA's preference for up to 40% climate change allowance, at detailed design.

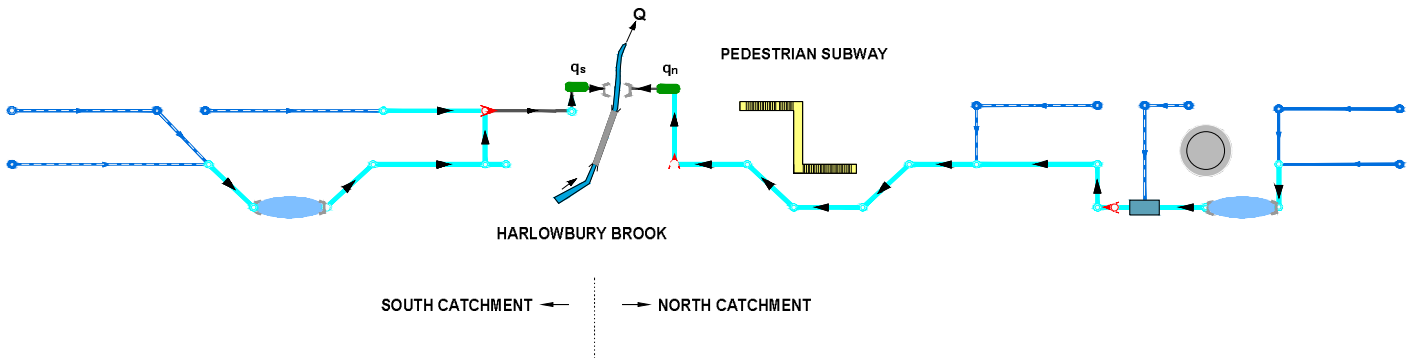
In order to further reduce flood risk, it is proposed that the exceedance volumes anticipated by the design will, as far as practical, be managed within the highway corridor. Whilst the techniques to be deployed will be fully defined during the more detailed stages of the design development, in principle, the containment layouts and configurations adopted will be fully integrated and/or co-ordinated with the environmental mitigation measures and the utility provisions required by the scheme. Adaptations to the kerb and back of footpath details, including landscaped areas and noise barriers will form part of the strategy to be explored for the management of exceedance volumes within the highways corridor.

Appendix A. Drainage Schematics

B3553F05-0500-SK-0002 Rev P0

1. THERE IS OVERALL REDUCTION IN FLOW INTO THE WATERCOURSE FROM THE PROPOSED DRAINAGE.
THIS EQUATES TO OVER 50% DISCHARGE BETTERMENT.

2. CHAMBER LOCATIONS AND LENGTH OF PIPE RUNS ARE INDICATIVE.
INTERMEDIATE CHAMBERS HAVE BEEN OMITTED FOR CLARITY.



q_n = North Catchment Discharge
q_s = South Catchment Discharge
$Q = q_n + q_s$ = Combined Discharge
Q = Achieves 50% betterment (reduction in existing flows)

Notes:

1. All dimensions in meters unless stated otherwise.

KEY:

- Existing Carrier Drain
- Carrier Drain
- Online Storage Pipe
- Manhole
- Flow Control
- Underground Storage Tank
- Pollution Control (Inceptor)
- Attenuation Pond
- Churchgate Roundabout
- Headwall

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PRELIMINARY DESIGN

RINGWAY JACOBS Integrated expertise

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SCHEME TITLE

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PM

DRAWING TITLE

GILDEN WAY
DRAINAGE SCHEMATICS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
AK	HK	MAO	AK	PM
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