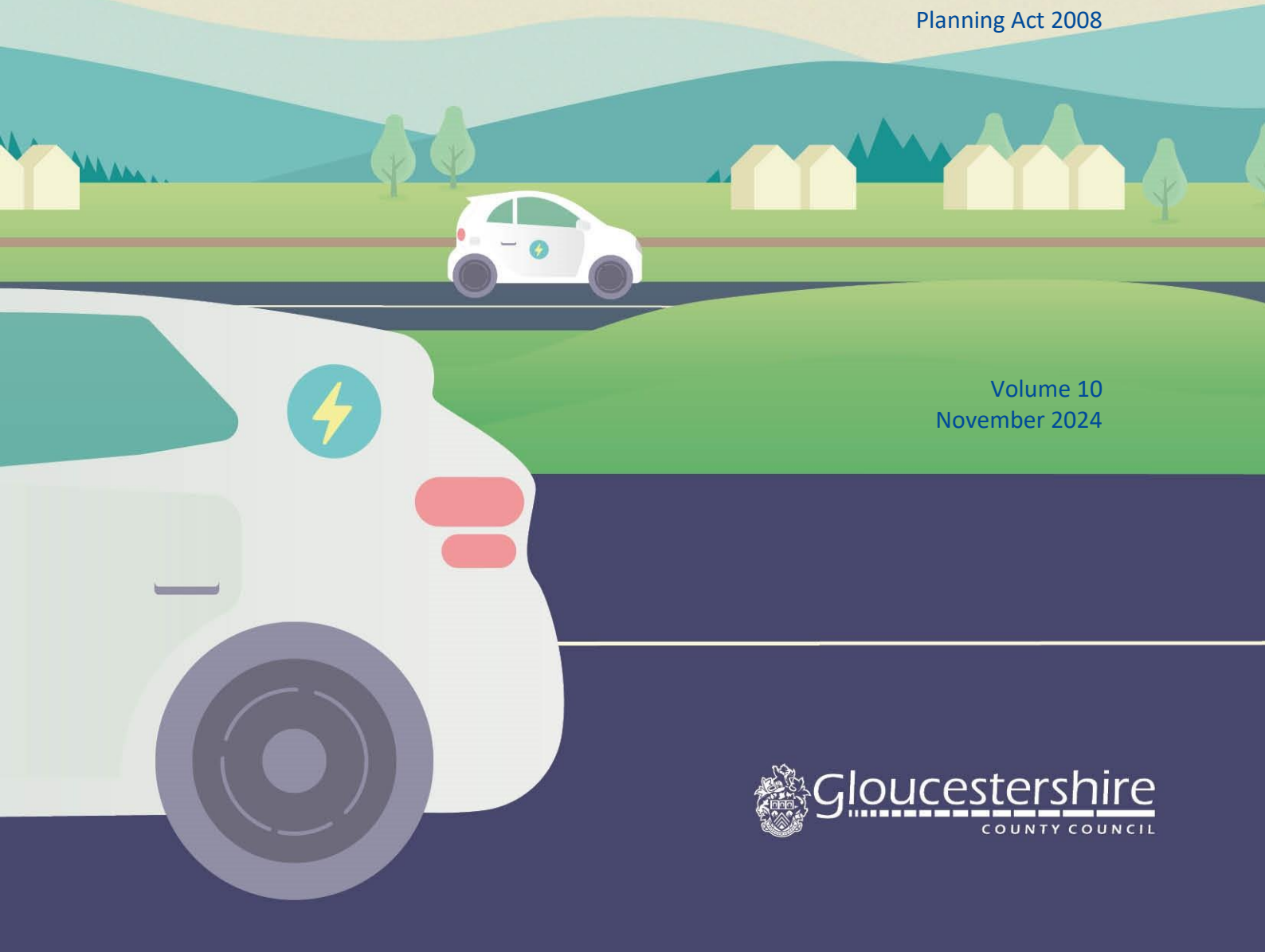
M5 Junction 10 Improvements Scheme

HEWRAT Assessment for DCO Change Requirements

TR010063 – APP 10.42

Nationally Significant Infrastructure Projects: Changes to an application after it has been accepted for examination

Planning Act 2008



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Nationally Significant Infrastructure Projects: Changes to an application after it has been accepted for examination

M5 Junction 10 Improvements Scheme

Development Consent Order 202[x]

HEWRAT Assessment for DCO Change Requirements

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HEWRAT Assessment for DCO Change Requirements

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1 Introduction

1.1.1 Arcadis Consulting (UK) Ltd was appointed by Galliford Try (GT) to support the proposed changes to the M5 Junction 10 Scheme design (referred to as 'Scheme') that is currently at the examination stage of the Development Consent Order (DCO). The client seeks to submit a series of design changes to the current DCO application for efficiency and buildability of the proposed Scheme. The proposed DCO changes are outlined in Table 1-1.

Table 1-1 Proposed DCO design changes

	DCO Change Item
1	West Cheltenham Link Road (WCLR) replacement of swales to filter drains
2	WCLR replacement of box culverts with bridges
3	WCLR River Chelt bridge structural form
4	WCLR vertical realignment
5	Relocation of existing National Road Telecommunication Services (NRTS) Transmission Station
6	Flood storage area reconfiguration
7	Infill of existing northbound on-slip loop

1.1.2 The purpose of this document is to summarise the effects that the proposed surface water drainage design changes may have upon the surface water quality receptors outlined in the Environment Statement (ES) - Chapter 8: Road Drainage and the Water Environment, RDWE (Doc Ref: TR010063 – App 6.6, Dated: December 2023). The surface water quality receptors include the River Chelt and the Leigh Brook.

1.1.3 The changes to the surface water drainage arrangements as a result of the DCO design changes are outlined in Table 3-3. The proposed drainage measures have been designed to ensure that there are sufficient surface water quality treatment measures in place prior to discharge of surface water into the receiving watercourses.

1.1.4 This technical note concludes that the Highways England Water Risk Assessment Tool (HEWRAT) assessment passes both the individual outfall assessment and the cumulative assessment. Therefore, the assessment results remain in line with the conclusions detailed in the DCO ES – Chapter 8.

1.2 Design Fix 4 Technical Note

1.2.1 The current DCO submission presents the Design Fix (DF) 3 design. The Arcadis project team has led the next stage of the design development, referred to as DF4. The DF4 design has been developed upon the DF3 design with minor design changes made to the drainage arrangements to accommodate for the wider Scheme design variations.

1.2.2 The Water Environment Technical Note[1] (Doc Ref: GCCM5J10-ARC-EWE-ZZ-TN-LE-00006) outlines the DF4 design changes in comparison to the DF3 design. It presents the HEWRAT Assessment undertaken to assess the Scheme impact on the water environment topic - surface water quality.

1.2.3 A summary of the Technical Notes and their purposes is shown in Table 1-2.

Table 1-2 Summary of Technical Notes

Title	Reference Number	Summary
Water Environment M5 Junction 10 Improvement Scheme	GCCM5J10-ARC-EWE-ZZ-TN-LE-00006	The intention of this document is to provide GT a summary of the changes the DF4 updates have upon the water environment. Specifically on hydrogeology/groundwater, surface water quality and Water Framework Directive (WFD). In addition, it outlines the recommendations and next steps that need to be adopted/ considered at DF5. This technical note is currently being updated to reflect agreed change of all 'basins' into 'ponds' for the surface water quality (HEWRAT) assessment. This document is not intended to be used to inform DCO updates.
West Cheltenham Link Road – Swales to Filter Drains Design Change	GCCM5J10-ARC-EWE-ZZ-TN-LE-00005	This document was produced to assess any effects on surface water quality as a result of the change from swales to filter drains along the West Cheltenham Link Road. This document was produced to support DCO design change. This document has now been superseded by document ref. GCCM5J10-ARC-EWE-ZZ-TN-LE-00013, which captures HEWRAT assessment changes in relation to all relevant DCO changes.
HEWRAT Assessment for DCO Change Requirements	GCCM5J10-ARC-EWE-ZZ-TN-LE-00013	This document summarises the assessment of effects on surface water quality as a result of the proposed DCO design changes, with particular focus on design changes 1 and 6. Document produced to support DCO design change.

[1] It should be noted that the Water Environment Technical Note assumed all drainage basins to be dry based on DF3 design information made available at the time of undertaking the assessment. This has been amended in this technical note following confirmation received from Atkins in July 2024 that basins were assessed to have a 'wet' permanent body at DF3. See paragraph 3.1.4 for further information.

2 DCO Submission

2.1.1 DCO application was re-submitted on 19th December 2023. The DCO application was supported by the following suite of documents in relation to the surface water quality assessment:

- ES chapter - Chapter 8: RDWE (Doc Ref: TR010063 – App 6.6, Dated: December 2023)
- ES chapter – Appendix 8.2A WFD Surface Water Impact Assessment (Doc Ref: TR010063 – App 6.15, Dated December 2023)
- ES chapter – Appendix 8.3 Surface Water Quality Assessment (Doc Ref: TR010063 – App 6.15, Dated December 2023)

2.1.2 The assessment on surface water quality was undertaken in accordance with Design Manual for Roads and Bridges (DMRB) LA113 using the HEWRAT tool. The ES - Chapter 8 summarises that with the proposed mitigation measures (outlined in Table 3-2) the HEWRAT assessment passes, and no further mitigation is required.

2.1.3 The results for the routine runoff have been summarised in Table 8.14 of the ES – Chapter 8. An extract of which has been included below:

Table 8-14 - Routine runoff assessment results with Scheme scenario

Drainage Catchment	Acute impacts from soluble copper – pass or fail	Acute impacts from soluble zinc – pass or fail	Compliance with EQS for copper (based on PNEC)	Compliance with EQS for zinc (based on PNEC)	Chronic impacts from sediment related pollutants – pass or fail	Magnitude of impact	Significance
J1	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse
Link Road	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse
A4019 main line at Elms Park	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse
Combined basin	Pass	Pass	Compliant	Compliant	Pass	Minor beneficial	Slight beneficial
S1	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse
S1 south	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse
M5 south of the River Chelt	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse
S2	Pass	Pass	Compliant	Compliant	Pass	Minor beneficial	Slight beneficial
B-road	Pass	Pass	Compliant	Compliant	Pass	Negligible	Slight adverse

3 DF3 to DF4 Drainage Amendments

3.1.1 This section outlines the differences in the surface water drainage catchment areas (see Table 3-1) and proposed mitigation measures (see Table 3-2) between DF3 and DF4.

3.1.2 It is noted that while the DF3 Scheme drainage design consisted of eight drainage catchments, there are seven drainage catchments in the DF4 Scheme drainage design, as outlined in Table 3-1. The DF4 catchment areas are shown in Appendix A.

Table 3-1 DF3 vs DF4 Drainage Catchment Areas

Design Fix 3*			Design Fix 4			Difference between DF3 – DF4	
Drainage Catchment	Imp[2] Area (ha)	Perm[2] Area (ha)	Drainage Catchment	Imp Area (ha)	Perm Area (ha)	Imp Area (ha)	Perm Area (ha)
J1	1.020	0.186	**J1**	1.049	0.321	-0.029	-0.135
Link Road	1.028	0.240	**L2**	1.181	0.939	-0.153	-0.699
A4019 Main Line at Elms Park	3.336	0.389	**L1**	4.206	1.124	-0.87	-0.735
Combined Basin	6.465	1.316	**J2**	7.444	2.206	-0.979	-0.89
S1	3.604	0.382	**S1**	3.141	0.257	0.463	0.125
S1 South	0.621	0.072				0.621	0.072
S2	8.274	3.235	**S2**	4.852	4.697	3.422	-1.462
B Road	0.624	0.101	**J3**	0.704	0.206	-0.08	-0.105

**The DF3 impermeable and permeable areas have been taken from Table 8.13 of DCO ES – Chapter 8: RDWE Chapter (TR010063 – App 6.6)*

3.1.3 Table 3-1 shows that there are both increases and decreases in both the impermeable and permeable areas between the DF3 and DF4 drainage catchments. To ensure that the surface water is sufficiently treated prior to discharge into the receiving watercourses via the proposed outfalls – the mitigation measures at DF4 have been designed to sufficiently treat runoff from proposed impermeable and permeable areas, see Table 3-2.

[2] Imp = Impermeable, Perm = Permeable

Table 3-2 DF3 vs DF4 mitigation measures

Drainage Catchment	Existing Mitigation Measures*	Design Fix 3 Mitigation Measures*	Design Fix 4	
			Drainage Catchment	Mitigation Measures (Including Existing)
J1	Vegetated ditch	Basin	**J1**	Vegetated ditch
Link Road	N/A	Swale, basin, vegetated ditch	**L2**	Swale, pond, vegetated ditch
A4019 Main Line at Elms Park	Vegetated ditch	Basin	**L1**	Pond, vegetated ditch
Combined Basin	Vegetated ditch	Swale, basin, wetland	**J2**	Swale, pond, vegetated ditch, wetland
S1	Vegetated ditch	Basin	**S1**	Vegetated ditch, pond
S1 South	Vegetated ditch	N/A		
S2	Vegetated ditch	Swale, basin	**S2**	Vegetated ditch, pond, swale
B Road	N/A		**J3**	Swale, vegetated ditch

**Mitigation measures as captured in Table 4-3 of DCO ES App 8.3 (Ref: TR010063 – App 6.15. dated December 2023).*

3.1.4 A Technical Query (TQ) was raised by the project team to understand whether the basins proposed at DF3 were assessed as 'dry' or 'wet' basins/ponds. Atkins confirmed by email (dated 22nd July 2024) that the basins were assessed as permanently wet features in the HEWRAT Assessment. As such the DF4 drainage design has also assumed that the basins will have a permanently wet area. For the avoidance of doubt, the basins will be referred to as ponds moving forward. The pond design details will be developed at the next stage.

3.1.5 As such, Table 3-2 shows that most of the proposed mitigation measures at DF3 and DF4 remain the same. The exceptions to this are for catchment S2, where the order of the mitigation measures has changed, J1, which no longer has a pond and J3, which has swales and vegetated ditches in the design.

3.1.6 As detailed in Paragraph 3.1.3, although there are differences in the permeable and impermeable areas at the two design stages, the water quality assessment undertaken in line with the requirements of DMRB LA113 (tested with the HEWRAT) still shows that all catchments pass. Therefore, it is considered appropriate to use the assessment conclusions in this technical note, that has been based on the DF4 design, to demonstrate that the proposed DCO design changes still align with the DCO ES conclusions for surface water quality, as detailed in Section 2.

3.1.7 This section outlines the changes made to the DF4 surface water drainage arrangements, outlined in Section 3, as a result of the proposed DCO design changes.

3.1.8 Table 3-3 outlines the proposed changes made to the DF4 surface water drainage arrangements as a result of the proposed DCO design changes. The design changes do not result in any changes to the DF4 catchment areas presented in Table 3-1, it does however result in changes to the proposed DF4 mitigation measures for two catchment areas (catchment J2 and L2).

Table 3-3 Proposed Surface Water Drainage Changes

	DCO Change Item	Does this result in a change to the DF4 surface water drainage arrangements?
1	West Cheltenham Link Road (WCLR) replacement of swales to filter drain	Yes, this impacts catchment J2 and L2. The swales proposed in DF3 and DF4 have now been replaced with filter drains. Therefore, the DF4 mitigation measures following adoption of this DCO change are the following: • Catchment J2: Filter drain, pond, vegetated ditch, wetland • Catchment L2: Filter drain, pond, vegetated ditch
2	WCLR replacement of box culverts with bridges	No changes to the DF4 drainage arrangements or features
3	WCLR River Chelt bridge structural form	No changes to the DF4 drainage arrangements or features
4	WCLR vertical realignment	No changes to the DF4 drainage arrangements or features
5	Relocation of existing NRTS Transmission Station	No changes to the DF4 drainage arrangements or features
6	Flood storage area reconfiguration	No changes to DF4 drainage arrangements, however surface water runoff from catchment J2 will now outfall into a smaller wetland area in comparison to the large flood storage area. The details of which will be developed at the next design stage.
7	Infill of existing northbound on-slip loop	No changes to the DF4 drainage arrangements or features

3.1.9 Table 3-4 provides a summary of the amended drainage arrangements, as a result of the DCO design changes. The values and measures in this table have been used to undertake the HEWRAT assessment, the results of which are presented in Section 4.

Table 3-4 New DF4 surface water drainage arrangements (DF4 + DCO design changes)

Drainage Catchment	Impermeable Area (ha)	Permeable Area (ha)	Mitigation Measures (Including Current)	Calculated Treatment Efficiency*
J1	1.049	0.321	Vegetated ditch	Copper & Zinc: 15% Sediments: 25%
L2	1.181	0.939	Filter drain, pond, vegetated ditch	Copper: 27.5% Zinc: 67.5% Sediments: 100%
L1	4.206	1.124	Pond, vegetated ditch	Copper: 47.5% Zinc: 37.5% Sediments: 72.5%
J2	7.444	2.206	Filter drain, pond, vegetated ditch, wetland	Copper: 62.5% Zinc: 92.5% Sediments: 100%
S1	3.141	0.257	Vegetated ditch, pond	Copper: 35% Zinc: 30% Sediments: 55%
S2	4.852	4.697	Vegetated ditch, pond, swale	Copper: 60% Zinc: 55% Sediments: 95%
J3	0.704	0.206	Swale, vegetated ditch	Copper & Zinc: 57.5% Sediments: 92.5%

3.1.10 Given the nature of the changes summarised in Table 3-3, it was not necessary to re-run the spillage risk assessment. The change from swales to filter drains for catchments along the WCLR does not result in a change to the spillage risk assessment as they have the same optimum spillage risk reduction factor, as per CG 501 DMRB[3]. Another input parameter to the spillage risk assessment is the length of carriageway draining to each outfall. As there have been no changes to outfall locations there are no changes to this parameter.

3.1.11 Treatment efficiencies used in the HEWRAT for the DF4 mitigation measures were calculated using CG 501 and the methodology from the Sustainable Drainage Systems (SuDS) Manual[4]. This also applies to the cumulative assessments: the treatment efficiencies for the relevant catchments (Table 3-4) were totalled and applied to the cumulative catchment. For J1 and J2, a sensitivity test was undertaken whereby the treatment efficiencies were reduced to reflect the proportion of the

[3] CG 501 Design of highway drainage systems, DMRB
[4] The SuDS Manual C753, CIRIA

cumulative catchment area that J1 and J2 comprise (J1 is 12% and J2 is 88%, see Table 3-1). This did not change the results presented in Table 4-2.

4 Surface Water Quality Assessment

4.1 Overview

4.1.1 In line with the current ES document and in accordance with DMRB LA113, the HEWRAT has been used to assess the impact of the Scheme (DF4 plus DCO changes) on surface water quality. The assessment considers the single outfall assessment (Table 4-1) and cumulative outfall assessment (Table 4-2).

4.1.2 Table 4-2 lists the catchments that have been included in the cumulative assessment. The outfalls for the drainage catchments not listed in Table 4-2 do not qualify for cumulative assessment (i.e. more than 1km apart).

4.1.3 The outfalls for drainage catchments S1 and 'M5 south of River Chelt' are between 100m and 1km apart so the cumulative assessment excludes sediments. This is the same as in the ES Chapter – Appendix 8.3 Surface Water Quality Assessment. The 'M5 south of River Chelt' is outside of the Scheme drainage works but it forms part of the cumulative assessment for outfalls into the River Chelt.

4.1.4 In the ES Chapter – Appendix 8.3 Surface Water Quality Assessment for the cumulative assessment for assessment point J1 sediments have been included. However, it is noted that the distance between J1 and J2 is greater than 100m and therefore sediments should be excluded from the assessment. If sediments were to be included in the cumulative assessment for J1 and J2 shown in Table 4-1, the result is a fail.

4.2 EQS Compliance

4.2.1 Predicted concentrations of copper and zinc in the receiving watercourses are assessed against the Environmental Quality Standard (EQS) for these metals[5]. A pass is achieved if the modelled concentration of the metals is lower than the EQS, when combining the ambient background concentration (ABC) in the receiving watercourse with the concentration within the highway discharge. The HEWRAT shows a fail for copper compliance with the EQS for all drainage catchments.

4.2.2 For the drainage catchments that outfall to the River Chelt (S1, L1, J3 and L2), EQS failures for dissolved copper are inevitable because the ABC of dissolved copper exceeds the EQS. Therefore, regardless of the treatment applied to the road drainage runoff, a failure would still result. For the Leigh Brook (drainage catchments J1, J2 and S2), the ABC of dissolved copper is very close to the EQS.

4.2.3 As reported in the ES Chapter – Appendix 8.3 Surface Water Quality Assessment, when the routine runoff assessment is undertaken for the current scenario, without the Scheme, copper EQS failures still occur for both receiving watercourses. This suggests that the proposed discharges associated with the Scheme are not the cause of the failures.

[5] Environment Agency Environmental Quality Standards https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit

4.2.4 In this scenario the LA113 guidance recommends that a detailed assessment is undertaken using the Metals Bioavailability Assessment Tool (M-BAT). This tool (WFD-UKTAG[6]) gives an estimate of the concentration of dissolved metal that is a Predicted No Effect Concentration (PNEC) specific to the site of interest. The site specific PNEC can be considered a site specific EQS (expressed as dissolved concentration). Further detail on the PNEC values is included in the Water Environment Technical Note. When the dissolved copper concentrations generated in the HEWRAT are compared to the relevant PNEC values, this shows all drainage catchments are compliant including in the cumulative outfall assessment. These results are shown in Table 4-1 and Table 4-2.

4.2.5 For zinc, compliance is achieved when comparing the dissolved zinc concentrations to the EQS.

4.3 Results

Table 4-1 Individual Outfall Assessment

Catchment	Acute impact from soluble – pass or fail		Compliance with EQS / PNEC – pass or fail		Chronic impact from sediment - pass or fail
	Copper	Zinc	Copper (based on PNEC)	Zinc (based on EQS)	
J1	Pass	Pass	Pass	Pass	Pass
L2	Pass	Pass	Pass	Pass	Pass
L1	Pass	Pass	Pass	Pass	Pass
J2	Pass	Pass	Pass	Pass	Pass
S1	Pass	Pass	Pass	Pass	Pass
S2	Pass	Pass	Pass	Pass	Pass
J3	Pass	Pass	Pass	Pass	Pass

Table 4-2 Cumulative Outfall Assessments

Cumulative Assessments	Acute impact from soluble – pass or fail		Compliance with EQS / PNEC – pass or fail		Chronic impact from sediment - pass or fail
	Copper	Zinc	Copper (based on PNEC)	Zinc (based on EQS)	
J1 (J1 and J2)	Pass	Pass	Pass	Pass	N/A
S1 (S1 and M5 south of River Chelt)	Pass	Pass	Pass	Pass	N/A

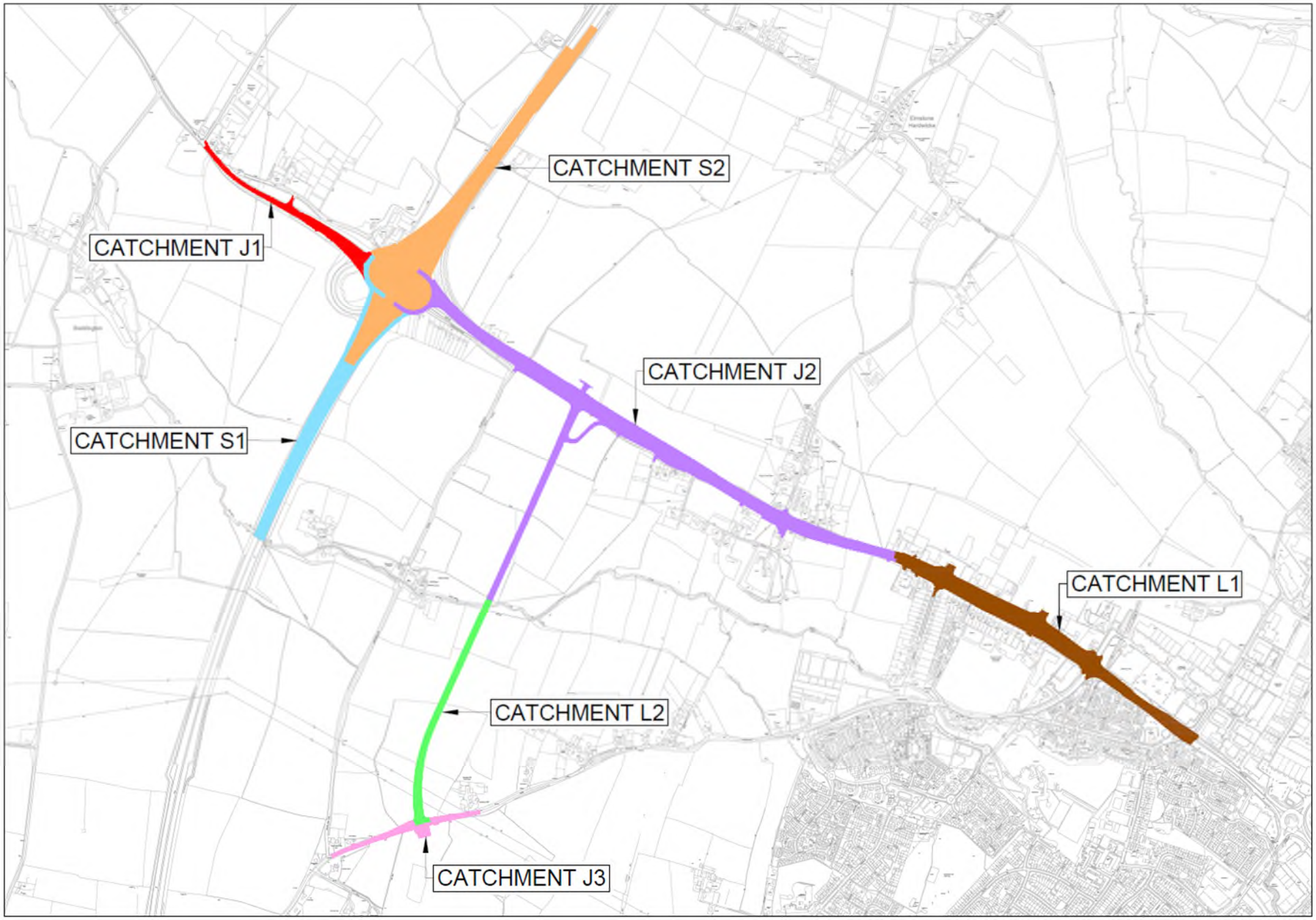
[6] https://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat

5 Summary

5.1.1 In the ES Chapter – Appendix 8.3 Surface Water Quality Assessment, the results from the assessments of water quality were used to determine the magnitude of impact and significance of effect for each drainage catchment and hence informed the ES.

5.1.2 The DF4 HEWRAT calculations summarised in this technical note confirm that there are no changes to the magnitude of impact and significance of effect assigned in the DCO documents for all catchment areas.

Appendix A Drainage Catchment Areas


CATCHMENT S2
CATCHMENT J1
CATCHMENT J2
CATCHMENT S1
CATCHMENT L1
CATCHMENT L2
CATCHMENT J3

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