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# NORTH HYKEHAM RELIEF ROAD WATER QUALITY ASSESSMENT









## NORTH HYKEHAM RELIEF ROAD WATER QUALITY ASSESSMENT

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P04

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# **1. INTRODUCTION**

This report details the water quality risk assessment for the operational phase of the proposed North Hykeham Relief Road (NHRR). The report considers the risk of impacts to water quality which may arise from the scheme to determine whether these are acceptable or not and, where it is unacceptable, what mitigation is required to address the risk. The indicative drainage layout for the scheme is shown in Appendix 2.

The water quality assessment considers risks from routine runoff to both surface watercourses and groundwater. The risk of a spillage resulting in a pollution incident are also assessed. The assessment methods used are as described in National Highways' DMRB document 'Road Drainage and the Water Environment' (LA 113). The assessments utilise the Highways England Water Risk Assessment Tool (HEWRAT) as required by LA 113.

An overview of the methodologies is provided in the relevant sections below. Detailed information on methodology and calculations is available in DMRB LA 113 and, for treatment efficiencies, DMRB CG 501.

# 2. SITE INFORMATION

#### 2.1 Site Location

The NHRR consists of the construction of approximately 8km of Dual All-Purpose 2lane Carriageway between the A46-Newark Road Roundabout and the Lincoln Eastern Bypass-Sleaford Road Roundabout.

The new road will pass to the south of South Hykeham and through Station Road near Waddington, before passing north around the north side of RAF Waddington. A site location plan can be found in Figure 2-1 below.

#### Figure 2-1 Site Location Plan



#### 2.2 Site Description and Existing Drainage

The North Hykeham Relief Road (NHRR) crosses low-lying and largely flat farmland which is drained by man-made ditches or straightened drains. These drains are, in part, managed by an Internal Drainage Board (IDB). The ditches and drains discharge to either a watercourse named 'The Beck' (Figure 2-2) or the River Witham (Figure 2-3). The Witham flows south to north through the study area and will be crossed by the NHRR.

The Witham has levees on either bank to control flooding. The river level can often be higher than the surrounding land so many of the ditches and drains flow to an IDB pumping station which lifts the water into the Witham. The Beck is carried over the levees on embankment and flows into the Witham by gravity.

To the east of the Witham is an escarpment through which the proposed road will cut. The road rises to a proposed junction with the LEB. Grantham Road roundabout on the east is the highest point of the scheme at approximately 73 mAOD. The lowest point is at the River Witham at approximately 4.5 mAOD.



Figure 2-2 The Beck. Photo taken on 12/01/2023 at Beck lane.

Figure 2-3 River Witham. Photo taken on 12/01/2023 at Meadow Lane.



#### 2.3 Drainage Strategy and Discharge Points

The proposed drainage for the new road is divided into ten numbered catchments with the A46 Junction forming a first catchment. The catchments are split based on the alignment and the positions of the existing watercourses. The easternmost catchment (catchment 10) is proposed to discharge to an infiltration basin, while the other catchments discharge to surface watercourses. Proposed highway catchments and water quality assessment points are shown in appendix 2. Table 2-1 gives details of the catchment areas. Traffic flows for those catchments are also shown and are reported as Annual Average Daily Traffic (AADT).

Outfall Reference	Impermeable Catchment Area (ha)	Permeable Catchment Area (ha)	Catchment	
Highway catchment1	1.839	0.414	Discharges to tributary of the Beck	32923, 3.43% HGV
Highway Catchment 2	1.210	0.653	Discharges to tributary of the Beck	32923, 3.43% HGV
Highway Catchment 3	1.754	0.688	Discharges to tributary of the Beck	32923, 3.43% HGV
Highway Catchment 4	1.052	0.586	Discharges to the Witham via ditches	36798, 2.32% HGV
Highway Catchment 5	0.90	0.286	Discharges to the Witham via ditches	36798, 2.32% HGV
Highway Catchment 6	3.049	1.436	Discharges to the Witham via ditches	49121, 2.68% HGV
Highway Catchment 7	2.155	0.892	Discharges to the Witham via ditches	49121, 2.68% HGV
Highway Catchment 8	2.882	1.459	Discharges to the Witham via ditches	49121, 2.68% HGV
Highway Catchment 9	6.92	1.812	Discharges to the Witham via ditches	49121, 2.68% HGV
Highway Catchment 10	4.35	2.116	Discharges to infiltration basin	32120, 3.23% HGV

#### **Table 2-1 Drainage Catchments**

# 3. SURFACE WATER QUALITY ASSESSMENT

#### 3.1 Assessment Methodology for Routine Runoff

Highways England Water Risk Assessment Tool (HEWRAT) estimates the magnitude of potential short term and longer-term impacts to water quality associated with discharge of operational road drainage. Calculated concentrations of specific elements are compared against freshwater pollutant thresholds and Environmental Quality Standards (EQS) to assess compliance with the Water Framework Directive (WFD). HEWRAT considers the following:

- Short-term impacts in the form of runoff-specific thresholds (RST), which relate to the
  intermittent nature of road runoff (i.e. contaminants washed off the road surface in a
  rainfall event), over a typical exposure period of six hours (RST 6 hour) and for a worstcase scenario of 24 hours (RST 24 hour). Dissolved copper and dissolved zinc are used as
  indicators of the level of impact as they can result in acute toxic effects to aquatic life in
  certain concentrations.
- Chronic impacts (i.e. impacts which can persist for weeks or months) associated with sediment-bound pollutants on aquatic ecology. Two standards are used for metal and polycyclic aromatic hydrocarbon (PAH) concentrations within sediment; Threshold Effects Levels (TELs) (i.e. the concentration below which toxic effects are very rare) and Probable Effects Levels (PELs) (i.e. the concentration above which toxic effects are observed on most occasions).

• Longer-term in-river annual average concentrations for soluble pollutants (dissolved copper and dissolved zinc) which includes the contribution from road runoff. These concentrations are compared against published EQS for freshwaters to assess whether there is likely to be a long-term impact on ecology.

HEWRAT uses a three-step tiered approach to assess the impacts of both soluble and sedimentbound pollutants. A 'Pass' or 'Fail' result is recorded depending on whether the risk is within or exceeds the thresholds indicated above. Where a Fail result is recorded for one or more of the pollutant types, the next step is required based on increasing levels of inputs and assessment.

As well as assessing the risk of routine runoff from each drainage outfall in isolation, an incombination assessment is undertaken where more than one outfall discharges into the same reach of watercourse. This is the 'worst-case' scenario as the combined effects could be more significant. To aggregate the assessments, the total impermeable and permeable carriageway areas to be drained are added together, and the low flow of the watercourse is taken at the location furthest downstream (this is the assessment point of the combined outfall assessment). For drainage outfalls positioned between 100m and 1km apart, the cumulative assessment is for soluble pollutants only, whilst for outfalls positioned closer together (within 100m), the combined assessment includes soluble and sediment pollutants.

#### 3.2 Discharge Points for Road Runoff

The discharge points to surface watercourses and HEWRAT assessment locations are shown in Figure 3-1 and Figure 3-2:



Figure 3-1 Discharge point A





**Point A**: The catchment area from highway catchment area 1 and part of catchment area 2 discharge to an existing ditch. The existing ditch has a small catchment area (the ditch originates at the A46 roundabout) such that the ditch is often dry. The location for the HEWRAT assessment of potential impacts on freshwater ecology has therefore been taken as the point downstream where the existing ditch joins another ditch with a larger catchment. The downstream location where the two ditches meet is marked 'Point A' on Figure 3-1 above.

The combined catchments of highway catchment area 1, catchment area 2 and the catchment area 3 meet at this confluence of ditches. As the discharge locations are within 100m for highway catchment 1 and 2 therefore a cumulative assessment is required at point A.

**Point B:** Discharge from highway catchment areas 4, 5, 6 and7 combine via local farm ditches and IDB drains at Point B. The water in these watercourses is discharged into the river Witham via a pumping station. The ditches and drains have a small contributing catchment area of less than 50 hectares such that they are often dry. The location for the HEWRAT assessment of potential impacts on freshwater ecology has therefore been taken as the point where the ditch network discharges to the river Witham (which always has water in).

**Point C:** Discharge from highway catchment areas 8 and 9 combine via local farm ditches and IDB drains at Point C. The water in these watercourses is discharged into the river Witham. The ditches and drains have a small contributing catchment area of less than 50 hectares such that they are often dry. The location for the HEWRAT assessment of potential impacts on freshwater ecology has therefore been taken as the point where the ditch network discharges to the river Witham (which always has water in). Watercourse parameters

Table 3-1 presents watercourses parameters which are required for the water quality risk assessment using HEWRAT. The parameters have been determined from:

- topographical surveys of the watercourses;
- a detailed lidar survey; and

• LowFlows software<sup>1</sup>.

The Defra water hardness map(reproduced in appendix 3) shows the watercourse hardness (in terms of the concentration of calcium carbonate) to be between 200 and 300 mg  $CaCO_3/I$ . This is 'hard' in terms of the HEWRAT hardness bands.

Point	Grid Ref.	Watercourse	Catchment Area (km²)	Q <sub>95</sub> (m³/s)	BFI	Bed Width (m)	Long slope	Side Slope (h/v)	Mannings n
A	492407 364909	Ditch/ tributary leading to the Beck	3.38	0.002	0.26	1	0.0001	1:1.4	0.03
В	495450 364700	River Witham	562	0.31	0.5	18	0.007	1:7	0.03
С	495249 364413	River Witham	562	0.31	0.5	18	0.007	1:7	0.03

#### Table 3-1 Watercourse Parameters for use HEWRAT assessment

#### 3.3 Individual & Cumulative Assessments

In accordance with LA113 and depending on the proximity of outfalls, water quality assessments may need to be carried out for potential cumulative effects as well as for individual discharges. The assessments carried out are shown in Table 3-2.

Table 3-2	Individual	and	Cumulative	Assessments
	2		Gainaracite	710000000000000000000000000000000000000

Catchment Reference	ReferenceAssessmentIndividual / Cumulative		Assessment Point
Highway Catchment 1	Soluble and sediment	Individual outfall	Point A
Highway Catchment 2	Soluble and sediment	Individual outfall	Point A
Highway Catchment 3	Soluble and sediment	Individual outfall	Point A
Highway Catchment 2 Highway Catchment 3	Sediment	Cumulative discharges	Point A
Highway Catchment 1 Highway Catchment 2 Highway Catchment 3	Soluble	Cumulative discharges	Point A
Highway Catchment 4	Soluble and sediment	Individual outfall	Point B
Highway Catchment 5	Soluble and sediment	Individual outfall	Point B
Highway Catchment 6	Soluble and sediment	Individual outfall	Point B

<sup>&</sup>lt;sup>1</sup> Wallingford Hydrosolutions, Low Flows 2 software. Available at https://www.hydrosolutions.co.uk/software/lowflows2/ [Accessed 31-03-2023]

Highway Catchment 7	Soluble and sediment	Individual outfall	Point B
Highway Catchment 8	Soluble and sediment	Cumulative discharges	Point C
Highway Catchment 9	Soluble and sediment	Cumulative discharges	Point C
Highway Catchment 4 Highway Catchment 5 Highway Catchment 6 Highway Catchment 7 Highway Catchment 8 Highway Catchment 9	Sediment	Cumulative discharges	Point B & C
Highway Catchment 4 Highway Catchment 5 Highway Catchment 6 Highway Catchment 7 Highway Catchment 8 Highway Catchment 9	Soluble	Cumulative discharges	Point C
Highway Catchment 10	Groundwater Assessment	Infiltration Basin -	see section 5

## 3.4 HEWRAT Assessments Outputs

HEWRAT outputs are provided in Appendix 1 and summarised in Table 3-3. Table 3-3 HEWRAT Assessment Summary

		Soluble	Pollution			
	(Runoff	Impact Specific holds)	(Annu	Chronic Impact (Annual Ave. Concentration)		Comment
	Copper	Zinc	Copper	Zinc	Chronic Impact	
Highway Catchment 1, Point A						
Without mitigation	Pass	Pass	Pass	Pass	Fail	64% settlement of sediments required to pass
With mitigation	Pass	Pass	Pass	Pass	Pass	proposed sedimentation pond with a forebay and ditch to the outfall.
Highway Catchn	nent 2, Poir	nt A				
Step 2 (Tier 2)	Pass	Pass	Pass	Pass	Fail	38% settlement of sediments required to pass

		Soluble	Pollution			
	(Runoff	Acute ImpactChronic ImpactS(Runoff Specific Thresholds)(Annual Ave.S		(Annual Ave.		Comment
	Copper	Zinc	Copper	Zinc	Chronic Impact	
Step 3	Pass	Pass	Pass	Pass	Pass	Proposed swale, carrier ditches, and grit separator
Highway Catchn	nent 3, Poir	nt A		-		
Step 2 (Tier 2)	Pass	Pass	Pass	Pass	Fail	58% settlement of sediments required to pass
Step 3	Pass	Pass	Pass	Pass	Pass	Proposed swale, sedimentation pond, carrier ditches, and grit separator
Cumulative asse	essment (se	ediment): (	Catchment	1 Catchme	nt 2, Catchm	ent 3, Point A
Step 2 (Tier 2)	Pass	Pass	Pass	Pass	Fail	75% settlement of sediments required to pass
Step 3	Pass	Pass	Pass	Pass	Pass	Proposed swale, carrier ditches, and grit separator for Catchment 2 and 3
Cumulative ass	essment(so	oluble): Cat	chment 1 (	Catchment	2, Catchmen	t 3, Point A
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-
Highway Catchn	nent 4, Poir	nt B		1	1	
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-
Highway Catchn	nent 5, Poir	nt B				
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-
Highway Catchn	nent 6, Poir	nt B			1	
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-
Highway Catchn	nent 7, Poir	nt B		1		
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-
Highway Catchn	nent 8, Poir	nt B				

		Soluble	Pollution					
	(Runoff	Impact Specific holds)		Impact al Ave. tration)	Sediment	Comment		
	Copper	Zinc	Copper Zinc		Chronic Impact			
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-		
Highway Catchn	nent 9, Poir	nt B						
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-		
Cumulative asse	essment (se	ediment): H	lighway Ca	tchments 4	4, 5, 6, 7, 8 a	nd 9, Point B and C		
Step 2 (Tier 1)	Pass	Pass	Pass	Pass	Pass	-		
Step 2 (Tier 2)	Pass	Pass	Pass	Pass	Pass	_		

Table 3-3 shows failure of sediment-bound pollutants at discharge point A. However, once the proposed mitigation measures are included, the assessments pass. The mitigation measures included in the drainage design are swales, ponds, and vortex separators.

# 4. SPILLAGE ASSESSMENT

#### 4.1 Spillage Risk Assessment

Along a road there is always some risk of a vehicular collision that could result in the spillage of fuels, chemicals or other hazardous liquids, particularly if tankers and heavy goods vehicles (HGVs) are involved. A risk assessment of a serious spillage causing a pollution incident was undertaken using the methodology outlined in LA113.

The risk is calculated assuming that an accident involving spillage of pollutants onto the carriageway would occur at an assumed frequency (expressed as an annual probability), based on calculated traffic volumes and the type of road/junction. The annual probability of a serious accidental spillage also depends upon the emergency services response time, based on the location (i.e., urban, rural, or remote location).

Where spillage risk is calculated as less than 1% Annual Exceedance Probability (AEP) (less frequent than 1 in 100 years), the risk is regarded as acceptably low, and no mitigation is required. Where the risk is greater than 1% AEP, mitigation is required. Such mitigation would allow the drainage system to be shut off before the liquid reaches the discharge point.

Similar to the routine runoff assessment, a cumulative spillage risk assessment is undertaken where more than one outfall discharges into the same reach of watercourse (or groundwater body). To aggregate the assessments, the total length of road drained (split into each road/junction type) is combined for all outfalls and the highest AADT and %HGV values are taken for each road/junction type.

The spillage risk assessment results are detailed in Appendix 1 and summarised in Table 4-1.

Asset Reference	Length of Side Road (m)	Length of Roundabout (m)	Length of `A' Road (m)	Risk of Incident	Pass/ Fail
Point A (catchments 1,2 & 3)	315	485	1155	0.03%	Pass
Point B (catchments 4,5,6 & 7)	530	360	2336	0.03%	Pass
Point C (catchments 8 & 9)	824	196	3339	0.04%	Pass
Catchment 10	573	225	1145	0.02%	Pass

 Table 4-1 Spillage Risk Assessment Results

The spillage risk assessment considers the length and type of road. Different risk factors apply depending on the type of road, for example a roundabout has a higher risk factor than a straight road. The summarise table above shows the outcome of the assessment at the discharge points. All the assessments pass as the risk is below 1%, no mitigation measures are required.

# 5. GROUNDWATER ASSESSMENT

## 5.1 Catchment 10

#### 5.1.1 Ground Investigation

The ground investigation describes the geology in the area of the proposed infiltration basin. No borehole logs were available within the extent of the proposed basin footprint; however, logs were available adjacent to it and nearby(<100m) The three closest borehole logs were selected, each within the limestone bedrock. These logs comprise rotary core boreholes RC125, RC126, and RC215. The borehole depths extended to a maximum of 10metres below ground level (mbgl) and are situated in a similar area of elevation at approximately 67.0 mAOD to 67.5 mAOD according to OS LiDAR data.

The available logs are summarised in Table 5-1.

#### Table 5-1: Borehole log summary

Strata Description	Range of depth to base (m)
Grass over TOPSOIL	0.05
SAND. Clayey fine to coarse sand, some angular gravel (limestone)	0.4-1.2
Weak sandy LIMESTONE and GRAVEL. Sand is course to fine.	1.6-2.1
Moderately weak weathered LIMESTONE with horizontal discontinuities, limestone COBBLES	2.2-2.5
Medium strong LIMESTONE with sub horizontal discontinuities. Some clay and gravel infill.	5.9-7.4
Extremely weak MUDSTONE with horizontal and sub horizontal discontinuities	Unproven (>10)

From boreholes: RC125, RC126, RC215

The borehole logs confirm the presence of limestone that ranged between 1.2 to 7.4 mbgl. Fractures and fissures were not indicated in the limestone and discontinuities were mainly horizontal and subhorizontal. Groundwater was not encountered in any of the boreholes (which extended to depths of 10.0 mbgl). However, groundwater monitoring conducted for the Lincolnshire Eastern Bypass scheme, east of Catchment, identified groundwater strikes of 59.08 mAOD (5m bgl) at borehole BH652 and 60.67 mAOD (4m bgl) rising to 61.67 (3 mbgl) at borehole A48, less than 150m from the proposed infiltration basin.

No soil organic carbon data was available at the time of writing, but the GI Results have indicated loamy topsoil in the upper stratum. Additionally, no pH data was available. BGS soil data indicates lime-rich soils, which are typically alkaline, therefore a pH greater than 8 is assumed for the assessment below.

#### 5.1.2 Groundwater Risk Assessment

At the eastern end of the scheme, Catchment 10 will discharge to an infiltration basin. A simple assessment has been made of the risk to groundwater based on the methodology described in

Appendix C of LA 113. A level of risk is assigned to each parameter (1,2,3) which his multiplied by the weighting factor of the parameter, providing a risk score. The process is carried out for each parameter and the scores are summed to provide an overall risk score. The lowest possible score is 100 and the highest is 300. The score bands for determining risk are as follows:

- 1. <150 low risk
- 2. 150-250 medium risk
- 3. >250 high risk

The assessment is detailed in Table 5-2. Total scores above 150 necessitate further assessment per Section 3 of DMRB LA 113.

Parameter V	Weighting Factor	Score for Catchment 6 Infiltration basin	Reason for selected score	Weighting factor × score
Traffic Flow	10	1	<50,000 AADT band. Expected max AADT value approximately 32,120 AADT	10
Rainfall Depth (annual average)	10	1	<740mm band. Actual value 600mm from the SAAR (standard average annual rainfall) value for Lincoln in the catchment descriptors.	10
Drainage area ratio	10	1	<50 band. Infiltration area of basin approximately 0.5 ha (5000m <sup>2</sup> ). Catchment area 48,776m <sup>2</sup> . Actual	10
			drainage area ratio 1:9.35. The size of the basin is subject to confirmation following the GI, but any change to the basin size is unlikely to result in a change of the <50 ratio band.	
Infiltration method	15	2	Region method. Infiltration basin to be used.	30
Unsaturated zone	20	2	Depth to water table <15m to >5m approximated average. Based on the borehole data from the NHRR scheme, 500m west, no water was struck <10m However, borehole records from the adjacent Lincolnshire Eastern Bypass Scheme show groundwater at <5mbl.	40
Flow type	20	2	Sandy/gravelly clay overlaying limestone bedrock, however with no fractures or fissures observed. Assumed mixed fracture and intergranular flow.	40
Unsaturated zone clay content	5	1	>=15% clay minerals band selected. GI results indicate clay strata overlaying limestone with clay layers.	5
Organic carbon	5	2	Band selected is <15% to >1% soil organic matter. GI Results suggest loamy topsoil.	10
Unsaturated zone soil pH	5	1	BGS soil data indicates lime-rich soils <sup>2</sup> , therefore $pH >= 8$ is assumed.	5
			Total Score	160

Table 5-2 Groundwater Risk Assessment

<sup>&</sup>lt;sup>2</sup> UK Soil Observatory, online <u>https://mapapps2.bgs.ac.uk/ukso/home.html?layer=mySoil</u> [Accessed March 2023]

The score of 160 indicates a 'medium' risk which, in line with LA113, warrants further assessment of the parameter(s) contributing most to the risk in terms of the source-pathway-receptor linkage. In this case the greatest contributing factor to the risk is groundwater flow being through mixed fracture and intergranular flow through weak limestone which could provide a potential pathway for soluble contaminants in the road runoff to reach the groundwater and groundwater abstraction points. In addition, an estimated unsaturated zone between 5 mbgl and 15 mbgl, which is estimated based on conflicting groundwater levels observed in the area of the proposed infiltration basin and east of the proposed infiltration basin, reduces the likelihood of contaminants being adsorbed and attenuated due to a more limited time and distance passing through the unsaturated zone.

The infiltration basin is also located within the outer extent of an outer groundwater source protection zone (SPZ2). This zone is defined by the Environment Agency as having a 400-day travel time from a point below the water table. The travel time is derived from consideration of the minimum time required to provide delay, dilution and attenuation of slowly degrading pollutants. The associated SPZ1 is located 5.3km north-east of the proposed infiltration basin. Additionally, there are no active licenced groundwater abstractions or historical licenced groundwater abstractions used for drinking water identified within at least 1km according to the Insight report supplied by Groundsure.

Importantly, mitigation is embedded into the drainage design based on the results set out by water quality assessment document. Highway runoff is to be intercepted by grass surface water channels at the edge of the carriageway and conveyed by carrier drain to a lined sediment forebay equating to approximately 10% of the volume of the infiltration basin, which is based on minimum sizing provided in the SuDS Manual (CIRIA C753). Additionally, a pollution control valve (isolation penstock) is proposed for infiltration basins, at the outlet from the sediment forebay, upstream of the infiltration basin. As detailed in section 4, the risk of a spillage in catchment 10 is acceptably low. Nonetheless, the penstock will allow isolation of the drainage system in the event of a spillage should there be one.

The groundwater assessment total score of 160 represents the low end of medium risk, where low risk is less than 150. Therefore, considering the embedded mitigation in the design the risk to the groundwater environment is considered acceptably low.

# 6. CONCLUSION

Water quality risk assessments have been undertaken for the operational phase of the proposed North Hykeham Relief Road. The assessment includes surface water quality, spillage risk and groundwater risk.

Based on the alignment design and the locations of the natural watercourses, three assessment points were identified. Ten catchment areas have been determined and these catchments discharge to their associated assessment points.

The routine runoff assessments for impacts on water quality were undertaken using the HEWRAT assessment tool. The highway catchment 1, and catchment 2 and catchment 3 discharge to a tributary of the Beck watercourse. Without mitigation, the assessments fail due to excessive sediment. Cumulative mitigation measures of 75% is required to pass the assessment. This will be achieved by treatment measures including swales within the road verge, ditches and vortex chambers adjacent to the carriageway. Applying the treatment efficiencies given in DMRB CG501, these mitigation measures are sufficient to sufficiently reduce the amount of highway-derived sediment reaching the receiving watercourse.

Assessment point B is the discharge point to River Witham, which has contributing highway catchments from areas 4, 5, 6, 7, 8 and 9. The water quality assessment (using HEWRAT) and it passed individually and cumulatively.

A risk assessment of a serious spillage causing a pollution incident was undertaken using the methodology outlined in LA113. All assessment points passed, with the spillage risk calculated as less than 1%.

Catchment 10 is proposed to discharge to the ground via an infiltration basin. The location of the infiltration is based within a SPZ2. A risk assessment was undertaken using estimated values and scored 160 which indicated a medium risk. In accordance with LA113, further consideration of the risk was undertaken. The mitigation incorporated into the design includes grass-lined surface water channels, a sediment forebay for the infiltration basin and inclusion of a penstock to enable isolation of the drainage system in the event of a spillage. With this mitigation incorporated into the design the risk to groundwater quality is considered to be acceptably low.

# APPENDIX 1 HEWRAT ASSESSMENT EXTRACTS

highways Highways England V	Vater Risk Assessment Tool			Version 2.0.4 June 20	19			
	Soluble						Sediment - Ch	nronic Impact
EQS - Annual Average Conc		_		Acute Imp	act			
Copper	Zinc						Fail. 64 % settle	
0.23	1.00	ug/l		Copper	Zinc		Settlement needed = iment deposition for	64 %, proposed = 0 %
Step 2				Pass	Pass		umulating? Yes	0.03 Low flow Vel m/s
· · · · · · · · · · · · · · · · · · ·	-	lugil					ensive? Yes	271 Deposition Index
Step 3							<u>.</u>	<u> </u>
Road number	NHRR			HE Area / DBFO nu	mber		Anea 7	
Assessment type	Non-cumulative assessment (sin	ole outfall)						
OS grid reference of assessment point (m)	Easting 492407	igio outruit,			Northing	364909		
OS grid reference of outfall structure (m)	Easting				Northing	001000		
Outfall number	Highway Catchment 2			List of outfalls in cur				
Receiving watercourse	Tributary Leading to the Beck			assessment				
EA receiving water Detailed River Network ID	Though 2000 mg to the Book			Assessor and affilia	tion		AJ	
Date of assessment	20-05-2024			Version of assessm			2	
Notes	20 00 2021						-	
Step 1. Runoff Quality AADT F10,000 and <50.	000 V C	limatic regi	ion Colder I	Dry 🗸	Rainfall site	Lincolr	n (SAAR 600mm)	
		-						
Step 2 River Impacts Annual Q <sub>ss</sub> river flow (m <sup>3</sup> /s)	(	0.002	Fres	hwater EQS limits:				
(Enter zero in Annual Q <sub>95</sub> Impermeable road area drain river flow box to assess	ed (ha)	1.839		Bioavailable dissolv	ed copper (µg/l)		1 D	
Step 1 runoff quality Permeable area draining to o only)	utfall (ha)	0.414		Bioavailable dissolv	ed zinc (µg/l)		10.9 D	
Base Flow Index (BFI)	C	0.26	Is the d	lischarge in or within	1 km upstream of	a protected site	e for conservation?	No 🔻 D
For dissolved zinc only Water hardness	High = >200mg CaCO3/	•	F(	or dissolved coppe	ronly Ambient	background co	oncentration (µg/l)	0 D
For sediment impact only Is there a downstream structu	ire, lake, pond or canal that reduces t	the velocity	within 100	m of the point of disc	harge?		No 💌 D	
C Tier 1 Estimated rive	er width (m)							
					0.1	-1	0.74	
Tier 2 Bed width (m	)		Aanning's n	0.07 D	SIG	slope (m/m)	0.71 Long s	lope (m/m) 0.0001
Step 3 Mitigation				-	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
					stim ated effective n		Wie wordt of	
	Briefdescription				ttenuation for solub ricted discharge rat		tlement of iments (%)	
	briel description				,			
Existing measures			0	D No r	restriction 👻	D 0	D	
Propo sed measures			0	D No r	estriction -	D 0	D	
L								

۶	nighways england	Highways England	Water Risk Assessment To	ol		Version 2.0.4 June	2019			
			Soluble						Sedimen	t - Chronic Impact
		EQS - Annual Average Con				Acute In	npact			
		Copper	Zinc							Pass
	Step 2	0.23	1.00	ug/i	_	Copper	Zine		0	n for this site is judged as:
	Step 2					Pass	Pass		Accumulating?	
			-	ug/l					Extensive? N	
	Step 3			-3						
Ro	ad number		NHRR			HE Area / DBFO r	number		Area 7	
_	sessment type		Non-cumulative assessment	(single outfa	ID				Mica /	•
	orid reference o fas	sessment point (m.)	Easting 492407	(ongie odru			Northing	364909		
	arid reference o four		Easting				Northing	004000		
	tfall number		Highway Catchment 2 & 3			List of outfalls in o				
	ceiving watercourse		Tributary Leading to the Be	ck		assessment				
		ailed River Network ID	in a stary country to the De			Assessor and affi	iation		AJ	
	te o fassessment		20-05-2024			Version of assess			2	
No	tes								-	
<u>S</u>	tep 1 Runoff Qu	ality AADT >10,000 and <50	0,000	Climatic re	gion Colder	Dry 🔻	Rainfall site		Lincoln (SAAR 600mm)	•
	tep 2 River Impa	ote								
3		Annual Q <sub>95</sub> river flow (m <sup>3</sup> /s)		0.002	Fres	hwater EQS limits:				
	Enter zero in Annual ver flow box to asse		ned (ha)	1.839		Bioavailable disso	olved copper (µg/l)		1 D	
S	tep 1 runoff quality	Permeable area draining to	outfall (ha)	0.414		Bioavailable disso	olved zinc (µg/l)		10.9 D	
0	nly)	Base Flow Index (BFI)		0.26	Is the d	lischarge in or with	in 1 km upstream of	a protect	ed site for conservatio	n? No 🔽 D
F	or dissolved zinc o	only Water hardness	High = >200mg CaCO3/	-	F	or dissolved copp	eronly Ambient	t backgro	und concentration (µg	1) 0 0
F	or sediment impac	t only is there a downstream struct	ture, lake, pond or canal that reduc	ces the veloci	ty within 100	m of the point of di	scharge?		No 🔻 D	
		C Tier 1 Estimated m	ver width (m)	1						
		Tier 2 Bed width (n	n)	1	Manning's n	0.07 D	Side	e slope (r	n/m) 0.71 L	ong slope (m/m) 0.0001
S	tep 3 Mitigation									
<u> </u>							E stim ated effectiven			
						reatment for olubles (%) re	Attenuation for solut stricted discharge ra		Settlement of sediments (%)	
			Briefdescription				amole u u sonar ye ra		Southerna ( 70)	
Π	xisting measures				0	D N	lo restriction 👻	D	0 D	
	proposed measures	64% Treatment required (Pond+ o	ditch) is 82% mitigation		0	D N	lo restriction 👻	D	64	

; و	ngland	5	Highways Engl	and Water	Risk Asse	ssment Tool			Version 2.0.4 June 20	019				
					Sc	bluble						Sedime	nt - Chronic	: Impact
			EQS - Annual Average	e Concentra					Acute Imp	act				
		(	Copper		Zinc							Fail. 38 2	< settlement	needed.
	Step 2		0.17		0.71		ugři		Copper	Zinc		ediment depositic	n for this si	to is indeed as
	otep z								Pass	Pass			es 0.0	
			-				ugł				E	tensive? Y	es 16	1 Deposition Index
	Step 3						1				-	_		
Ro	ad numbe	er.		NHF	20				HE Area / DBFO nu	umber		Area 7		
	sessment					assessment (s	ingle outf	ali)				Alean		-
-		rence o fassessmer	nt p pint (m )	East		492407	angle out	carry		Northing	364909			
	-	rence o foutfall struc		East		102101				Northing	001000			
	fall numb			High	hway Catch	ment 2			List of outfalls in cu					
Re	ceiving w	atercourse				g to the Beck			assessment					
EA	receiving	water D etailed Riv	er Network ID			<u>,</u>			Assessor and affilia	tion		AJ		
Da	te o fasse	essment		09-0	07-2024				Version of assessm	ient		3		
No	tes													
<u>S</u> 1	ep 1 R	unoff Quality	AADT >10,000 a	and <50,000		•	Climatic I	region Colder	Dry 💌	Rainfall site	Line	coln (SAAR 600mm)		•
51	ep 2 R	iver Impacts	Annual Q <sub>95</sub> river flow (r	m³/s)		[	0.002	Fres	hwater EQS limits:					
		o in Annual Q <sub>95</sub> box to assess	Impermeable road area	a drained (ha	1)	[	1.21		Bioavailable dissolv	/ed copper (µg/l)		1 D		
s	tep 1 run	off quality	Permeable area drainir	ng to outfall (	(ha)	[	0.653		Bioavailable dissolv	/ed zinc (µg/l)		10.9 D		
ľ	nly)		Base Flow Index (BFI)			[	0.28	Is the	discharge in or within	1 km upstream of	f a protected s	site for conservation	on?	No 🖵 D
F	or disso	lved zinc only	Water hardness	High	= >200mg CaC	D3/I	-	F	or dissolved coppe	ronly Ambien	t background	concentration (µg	μ/Ι)	0 D
F	or sedim	ent impact only	Is there a downstream	structure, la	ke, pond or ca	anal that reduce:	s the velo	city within 100	m of the point of disc	charge?		No 💌 D		
			C Tier 1 Estima	ted river wid	th (m)	[	5							
			• Tier 2 Bed wi	dth (m)		[	1	Manning's r	0.03	Sid	le slope (m/m	) 0.71	Long slope (	m/m) 0.0001
S	ep 3 M	itigation							-	stimated effective			]	
									-	Attenuation for solu		Settlement of		
				Brid	efdescription					tricted discharge ra		ediments (%)		
					eracadiption					-				
	xisting m							0		restriction -	D 0	D		
l L	propo se d	measures						0	D No	restriction -	· D 0	D		

highways england	Highways England	Water Risk Assessment To	loc	Ver	sion 2.0.4 June	2019			
		Soluble						Sediment	- Chronic Impact
	EQS - Annual Average Co	ncentration			Acute In	npact			
	Copper	Zinc							Pass
Step 2	0.17	0.71	ugł	C	opper	Zine		Sediment deposition	for this site is judged as:
				F	ass	Pass		Accumulating? Yes	
Step 3	-	-	ugłi					Extensive? No	64 Deposition Index
Road number		NHRR		HE	Area / DBFO r	number		Area 7	
Assessment type		Non-cumulative assessmen	t (single outfall	)					•
OS grid reference of assessmer	nt point (m )	Easting 492407				Northing	364909		
OS grid reference of outfall struc	cture (m)	Easting				Northing			
Outfall number		Highway Catchment 2			t of outfalls in c	umulative	i – – – – – – – – – – – – – – – – – – –		
Receiving watercourse		Tributary leading to the Be	ck	ass	essment				
EA receiving water D etailed Riv	ver Network ID			As	sessor and affili	iation		AJ	
Date of assessment		09-07-2024		Ve	rsion of assess	ment		3	
Step 1 Runoff Quality	AADT >10,000 and <	50,000 👻	Climatic reg	ion Colder Dry	-	Rainfall site	L	incoln (SAAR 600mm)	
Step 2 River Impacts	Annual Q <sub>95</sub> river flow (m <sup>3</sup> /s)	\ \							
(Enter zero in Annual Que		)	0.002	Freshwa	ter EQS limits:				
	Impermeable road area dra		1.21			lved copper (µg/l)		1 D	
river flow box to assess		ained (ha)	1.21	Bio	available disso				
	Permeable area draining to	ained (ha)	1.21 0.853	Bio	available disso available disso	lved zinc (µg/l)		10.9 D	
river flow box to assess Step 1 runoff quality		ained (ha)	1.21	Bio	available disso available disso	lved zinc (µg/l)	a protected		17 <b>No r</b> D
river flow box to assess Step 1 runoff quality	Permeable area draining to	ained (ha)	1.21 0.853	Bic Bic Is the discl	available disso available disso	lved zinc (µg/l) in 1 km upstream of		10.9 D	
river flow box to assess Step 1 runoff quality only)	Permeable area draining to Base Flow Index (BFI) Water hardness	o outfall (ha)	121 0.853 026	Bic Bic Is the discl For d	available disso available disso narge in or withi issolved copp	lved zinc (µg/l) in 1 km upstream of er only Ambien		10.9 D	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struct	, o outfall (ha) High = >200mg CaCO3/	121 0.853 026	Bic Bic Is the discl For d	available disso available disso narge in or withi issolved copp	lved zinc (µg/l) in 1 km upstream of er only Ambien		d site for conservation	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struu © Tier 1 Estimated r	ined (ha) o outfall (ha) Hgh =>200mg CaCO34 cture, lake, pond or canal that redu river width (m)	121 0.853 028	Is the discl	available disso available disso harge in or within issolved copp f the point of dis	lived zinc (µg/l) in 1 km upstream of eer only Ambien scharge?	t backgrour	a site for conservation	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struct	ined (ha) o outfall (ha) Hgh =>200mg CaCO34 cture, lake, pond or canal that redu river width (m)	121 0.853 028	Bic Bic Is the discl For d	available disso available disso harge in or within issolved copp f the point of dis	lived zinc (µg/l) in 1 km upstream of eer only Ambien scharge?		a site for conservation	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struu © Tier 1 Estimated r	ined (ha) o outfall (ha) Hgh =>200mg CaCO34 cture, lake, pond or canal that redu river width (m)	121 0.853 028	Is the discl	available disso harge in or withi issolved copp of the point of dis	lved zinc (μg/l) in 1 km upstream of er only Ambien scharge? Sid	t backgrour	a site for conservation	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struu © Tier 1 Estimated r	ined (ha) o outfall (ha) Hgh =>200mg CaCO34 cture, lake, pond or canal that redu river width (m)	121 0.853 028	Bic Bic Is the discl For d within 100m o Manning's n 01	available disso harge in or within issolved copp of the point of dis	lived zinc (μg/l) in 1 km upstream of er only Ambien scharge? Sid E stim ated effectiver	t backgrour e slope (m/	d site for conservation d concentration (µg/l No m) 0.71 Lc	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struu © Tier 1 Estimated r	ined (ha) p outfall (ha) Hgh = >200mg CaCO34 cture, lake, pond or canal that redu river width (m) (m)	121 0.853 028	Bic Bic Is the discl For d within 100m o Manning's n 01	available disso available disso harge in or withi issolved copp f the point of dis	Ived zinc (µg/l) in 1 km upstream of er only Ambien scharge? Sid E stimated effectiver Attenuation for solut	t backgrour e slope (m/ ness oles -	d site for conservation ad concentration (µg/l No v D m) 0.71 Lc	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struu © Tier 1 Estimated r	ined (ha) o outfall (ha) Hgh =>200mg CaCO34 cture, lake, pond or canal that redu river width (m)	121 0.853 028	Bic Bic Is the discl For d within 100m o Manning's n 01 Treat	available disso available disso harge in or withi issolved copp f the point of dis	lived zinc (μg/l) in 1 km upstream of er only Ambien scharge? Sid E stim ated effectiver	t backgrour e slope (m/ ness oles -	d site for conservation d concentration (µg/l No m) 0.71 Lc	
river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Permeable area draining to Base Flow Index (BFI) Water hardness Is there a downstream struu © Tier 1 Estimated r	ined (ha) p outfall (ha) Hgh = >200mg CaCO34 cture, lake, pond or canal that redu river width (m) (m)	121 0.853 028	Bic Bic Is the discl For d within 100m o Manning's n 01 Treat	available disso available disso harge in or withi issolved copp of the point of dis ment for les (%) re	Ived zinc (µg/l) in 1 km upstream of er only Ambien scharge? Sid E stimated effectiver Attenuation for solut	t backgrour e slope (m/ ness bles - te (1/s)	d site for conservation ad concentration (ug/l No 0 0 m) 0.71 Lc Settlement of sediments (%)	

ی کر ا	nighways angland	5	Highways Engla	and Water Ri	isk Asse	ssment Tool			Version 2.0.4 June 2	019					
					So	luble						Sedimer	nt - Chron	ic Impact	
			EQS - Annual Average	Concentration			_		Acute Imp	act					
		C	opper		Zinc							Fail. 58 2			
	Step 2		0.22		0.96		ug/l		Copper	Zinc		Settlement nee diment depositio		<pre>%, proposed = 0 site is indeed as</pre>	
	Step 2								Pass	Pass		cumulating?		Low flow Ve	
			-				ug/l						es 2	234 Deposition I	
	Step 3										-				
Ro	ad numbe	ar.		NHRR					HE Area / DBFO nu	mber		Area 7			
	sessment					assessment (s	ingle outf	all)				Price 1			-
		rence o fassessmen	t point (m.)	Easting		492407	ingle out	any		Northing	364909				_
-		rence o foutfall struc		Easting		102101				Northing	001000				
	tfall numb				a y C atchr	ment 3			List of outfalls in cu						_
Re	ceiving w	atercourse			-	to the Beck			assessment						
		water Detailed Rive	er Network ID			<i>y</i> to the 2 con			Assessor and affilia	tion		AJ			
Da	te o fasse	essment		09-07-	2024				Version of assessm	ent		3			
	tes			00-07-	2024							0			
<u>S1</u>	tep 1 R	unoff Quality	AADT >10,000 a	nd <50,000		-	Climatic r	egion Colder	Dry 👻	Rainfall site	Lino	ain (SAAR 600mm)		•	
						_									
5	tep 2 Ri	iver Impacts	Annual Q <sub>es</sub> river flow (n	n3/n)			0.002	Eron	hwater EQS limits:						
			20 L			L		1103	nwater EQ3 limits.						
		o in Annual Q <sub>95</sub>	Impermeable road area	drained (ha)		[	1.754		Bioavailable dissolv	red copper (µg/l)		1 D			
		oox to assess off quality	Permeable area drainin	o to outfall (ha)	)	ſ	0.688		Bioavailable dissolv	ed zinc (ua/l)		10.9 D			
	nly)	,			·	L				4.2.7					
			Base Flow Index (BFI)			l	0.26	Is the o	lischarge in or within	1 km upstream of	a protected si	te for conservatio	on?	No 👻	D
		hand along suchs	Water hardness	11-h - h	200mg CaCC		•								
1	or uisso	lved zinc only	water naroness	High - 2	200mg cacc	73/1	<u> </u>	F	or dissolved coppe	ronly Ambient	t background (	concentration (µg	/1)	0	D
F	or sedim	ent impact only	Is there a downstream :	structure, lake,	pond or ca	nal that reduce:	s the velo	ity within 100	m of the point of disc	harge?		No 🔻 D			
						r	-			-					
			⊖ Tier 1 Estimat	ted river width (	m)	L	5								
			Tier 2 Bed wide	dth (m)		[	1	Manning's r	0.03	Sid	e slope (m/m)	0.71 L	.ong slope	(m/m) 0.0001	
L															
St	tep 3 M	itigation											1		
		-								stim ated effectiver					
										Attenuation for solut tricted discharge ra		ettlement of diments (%)			
				Briefd	lescription					and a social go ra					
	Existing m	easures						0	D No	restriction 👻	D 0	D			
	Proposed	measures						0	D No	restriction 👻	D 0	D			
1															

	ngland		Highways Engla	and Water Ris	k Asse	ssment Tool			Version 2.0.4 June 2	019			
					So	luble						Sediment -	Chronic Impact
			EQS - Annual Average	Concentration			_		Acute Imp	pact			
			opper		Zinc							P	ass
	Step 2		0.22		0.96		ug/l		Copper	Zinc			or this site is judged as:
	Step 3		-		-		ugil		Pass	Pass		cumulating? Yes ensive? <mark>No</mark>	0.05 Low flow Vel m/s 93 Deposition Index
	ad numbe		•	NHRR					HE Area / DBFO nu	umbor		Area 7	
	sessment							-10		annoer		Alea /	
		rence o fassessmen	to pipt (m)	Easting	nurative	assessment (si 492407	ngie ouu	an)		Northing	364909		
		rence o foutfall struct		Easting		492407				Northing	364909		
	tfall numb		uie (iii)		C at a b				List of outfalls in cu			1	
		atercourse		Highway					assessment	mulative			
		u water Detailed Rive	v Nature dr. ID	Tributary	reading	g to the Beck			Assessor and affilia			AJ	
-	te o fasse		I NELWOIK ID	09-07-20	00.4				Version of assess			AJ 3	
No		essment		09-07-20	024				version of assessm	ient		3	
		unoff Quality		nd <50.000			Climatic			Rainfall site	Lincol	in (SAAR 600mm)	
			Annual Q <sub>ss</sub> river flow (m			_	0.002	Fres	hwater EQS limits:				
ri	ver flow b	o in Annual Q <sub>as</sub> lox to assess	Impermeable road area				1.754		Bioavailable dissol			1	
	tep 1 run nly)	off quality	Permeable area drainin	ig to outfall (ha)			0.688		Bioavailable dissol	ved zinc (µg/l)		10.9 D	
	iny)		Base Flow Index (BFI)				0.28	Is the	discharge in or withir	n 1 km upstream of	a protected sit	e for conservation?	No 🔻 D
F	or disso	lved zinc only	Water hardness	High = >20	00mg CaCC	D3/I	•	F	or dissolved coppe	er only Ambien	t background c	oncentration (µg/l)	0 D
F	or sedim	ent impact only	Is there a downstream s Tier 1 Estimat Tier 2 Bed wid	ed river width (m		nal that reduces	the velo 5 1	city within 100     Manning's r		-	e slope (m/m)	No ▼ □	g slope (m/m) 0.0001
5	ep 3 M	itigation								stimated effective	00.00		
									reatment for	Attenuation for solu tricted discharge ra	bles - Se	tlement of liments (%)	
				Briefdes	scription					a a a a a a a go ra			
	xisting m	easures						0	D No	restriction -	D 0	D	
	roposed	measures	58 % Treatment Rewuired (	Pond+Ditch) is 60 %	mitigation			0	D No	restriction -	D 60		
	_												

highways england	Highways Engla	nd Water Risk Asse	ssment Tool			Version 2.0.4 June 2	2019			
		Sc	luble						Sediment	- Chronic Impact
	EQS - Annual Average					Acute Im	pact			
	Copper	Zinc								ettlement needed.
Step 2	0.33	1.40	u	ıgil		Copper	Zinc	Sec		ed = 75 %, proposed = 0 % for this site is judged as:
						Pass	Pass		cumulating? Yes	
Step 3	-	-	u	ıgil				Ext	ensive? Yes	395 Deposition Index
Road number						HE Area / DBFO n				
Assessment type		NHRR	and the standing of	a all as			umber		Area 7	
OS orid reference o fassessme	at a sist (m)	Easting	essment including s	seaim	ents (outrails	within 100m)	Northing	364909		-
OS grid reference o foutfall struc		Easting	492407				Northing	364909		
Outfall number	auro (m)			_		List of outfalls in cu				
Receiving watercourse		Highway Catch				assessment	Inulative	<u> </u>		
EA receiving water D etailed Riv	ar Natuork ID	Tributary leadin	g to the Beck			Assessor and affilia	100		AJ	
Date of assessment		00.07.0004				Version of assess			AJ	
Notes		09-07-2024				Version of assessi	nent		3	
Step 1 Runoff Quality	AADT >10,000 an	nd <50,000	- Clim	natic re	egion Colder I	Dry 💌	Rainfall site	Lincol	in (SAAR 600mm)	
Step 2 River Impacts	Annual Q <sub>ss</sub> river flow (m	<sup>3</sup> /s)	0.00	2	Fres	hwater EQS limits:				
(Enter zero in Annual Q <sub>95</sub> river flow box, to assess	Impermeable road area	drained (ha)	2.96	4		Bioavailable dissol	ved copper (µg/l)		1 D	
Step 1 runoff quality	Permeable area draining	g to outfall (ha)	1.34	1		Bioavailable dissol	ved zinc (µg/l)		10.9 D	
only)	Base Flow Index (BFI)		0.26		Is the d	lischarge in or withir	n 1 km upstream of	a protected sit	e for conservation	? No - D
For dissolved zinc only	Water hardness	High = >200mg CaC(	D3/I	•	F	or dissolved coppe	er only Ambien	t background c	oncentration (µg/l)	0 D
For sediment impact only	Is there a downstream s	tructure, lake, pond or ca	nal that reduces the	veloc	ity within 100	m of the point of dis	charge?		No 🔻 D	
	C Tier 1 Estimate	ed river width (m)	5							
	• Tier 2 Bed wid	th (m)	1		Manning's n	0.03	Sid	e slope (m/m)	0.71 Lo	ng slope (m/m) 0.0001
Step 3 Mitigation						6	E stim ated effectiver	ne ss		
							Attenuation for solul		tlement of	
		Briefdescription			s		stricted discharge ra		liments (%)	
Existing measures					0	D No	restriction -	D 0	D	
Proposed measures					0	D No	restriction -	D 0	D	
L				_						

# Highway Catchment 2 and 3 Cumulative Sediment Assessment

highways england		and Water Risk Asse	ssment Tool		Version 2.0.4 June 2	:019			
		Sc	oluble					Sedime	ent - Chronic Impact
	EQS - Annual Average Copper	Concentration Zinc			Acute Im	pact		Fail. 75	% settlement needed.
Step 2	0.33	1.40	ugil		Copper	Zinc		Sediment deposit	eeded = 75 %, proposed = 0 % ion for this site is judged as: Yes 0.05 Low flow Vel m/s
Step 3	-	-	ug/l						Yes 395 Deposition Index
Road number		NHRR			HE Area / DBFO n	umbor		Area 7	
Assessment type			essment including sedir	ments (outfalls	1	uniber		Alea /	-
OS grid reference o fassessmer	nt point (m.)	Easting	492407	nonia (ourun	, and an roomy	Northing	364909		
OS grid reference o foutfall struc		Easting				Northing			
Outfall number		Highway C atch	ment 2 & 3		List of outfalls in cu	umulative			
Receiving watercourse		Tributary leadin	ig to the Beck		assessment				
EA receiving water Detailed Riv	er Network ID		-		Assessor and affilia	ation		AJ	
Date of assessment		09-07-2024			Version of assessm	nent		3	
Step 1 Runoff Quality									
	AADT >10,000 a	nd <50,000	Climatic	region Colder	Dry 🔹	Rainfall site	Li	ncoln (SAAR 600mm)	
Step 2 River Impacts	AADT >10,000 a		Climatic		Dry	Rainfall site	Li	ncoln (SAAR 600mm)	
Step 2 River Impacts		n³/s)			-		Li	ncoln (SAAR 600mm)	
(Enter zero in Annual Q <sub>95</sub> river flow box to assess Step 1 runoff quality	Annual Q <sub>ss</sub> river flow (n	n³/s) I drained (ha)	0.002		water EQS limits:	ved copper (µg/l)	Li		
(Enter zero in Annual Q <sub>95</sub> river flow box to assess	Annual Q <sub>ss</sub> river flow (n Impermeable road area	n³/s) I drained (ha)	0.002	] Fres	hwater EQS limits: Bioavailable dissol	ved copper (µg/l) ved zinc (µg/l)		1	
(Enter zero in Annual Q <sub>95</sub> river flow box to assess Step 1 runoff quality	Annual Q <sub>ss</sub> river flow (n Impermeable road area Permeable area drainin	n³/s) I drained (ha)	0.002 2.964 1.341 0.28	Fres           Image: Second s	hwater EQS limits: Bioavailable dissol Bioavailable dissol	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of	a protected	1	tion? No. 0
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only)	Annual Q <sub>sts</sub> river flow (n Impermeable road area Permeable area drainir Base Flow Index (BFI) Water hardness	n <sup>3</sup> /S) drained (ha) ig to outfall (ha)	0.002 2.884 1.341 0.28 034	] Fres	shwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien	a protected	1 0.9 0 site for conservat	5 5 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Annual Q <sub>str</sub> river flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream	n²/s) I drained (ha) Ing to outfall (ha) High = >200mg CaCd	0.002 2.884 1.341 0.28 034	] Fres	shwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien	a protected	1 0.9 0 on site for conservat	5 5 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Annual Q <sub>str</sub> river flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream	n²/s) i drained (ha) ig to outfall (ha) High = >200mg CaCl structure, lake, pond or ca ted river width (m)	0.002 2.884 1.341 0.28 034	] Fres	hwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within for dissolved coppe m of the point of dis	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien charge?	a protected	1 0.9 0 site for conserval d concentration (µ	5 5 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Annual Q <sub>str</sub> flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream C Tier 1 Estimal	n²/s) i drained (ha) ig to outfall (ha) High = >200mg CaCl structure, lake, pond or ca ted river width (m)	0.002 2.884 1.341 0.28 034	Fres	hwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within for dissolved coppe m of the point of dis	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien charge?	a protected	1 0.9 0 site for conserval d concentration (µ	sion? No - D
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Annual Q <sub>str</sub> flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream C Tier 1 Estimal	n²/s) i drained (ha) ig to outfall (ha) High = >200mg CaCl structure, lake, pond or ca ted river width (m)	0.002 2.884 1.341 0.28 034	Fres Fres Manning's I Manning's I	hwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within for dissolved copper Im of the point of dis	ved copper (µg/l) ved zinc (µg/l) 1 km upstream of er only Ambien charge? Sid	a protected t background ie slope (m/r	1 0.9 0 site for conservat d concentration (µ No • 0 n) 0.71	sion? No - D
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Annual Q <sub>str</sub> flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream C Tier 1 Estimal	n²/s) i drained (ha) ig to outfall (ha) High = >200mg CaCl structure, lake, pond or ca ted river width (m)	0.002 2.884 1.341 0.28 034	Fres	hwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within for dissolved copper lim of the point of dis 003	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien charge? Sid	a protected t background e slope (m/r	1 0.9 0 site for conserval d concentration (µ	sion? No - D
(Enter zero in Annual Q <sub>es</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only Step 3 Mitigation	Annual Q <sub>str</sub> flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream C Tier 1 Estimal	n <sup>5</sup> /5) i drained (ha) ig to outfall (ha) Hgh =>200mg CaCf Hgh	0.002 2.884 1.341 0.28 034	Free Free Manning's I Manning's I	hwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within for dissolved copper lim of the point of dis 0.003	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien charge? Sid Stim ated effectiver Attenuation for solut attricted discharge ra	a protected t background t back	1 09 0 site for conservat d concentration (µ No • 0 n) 0.71 Settlement of sediments (%)	sion? No - D
(Enter zero in Annual Q <sub>65</sub> river flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Annual Q <sub>str</sub> flow (n Impermeable road area Permeable area drainin Base Flow Index (BFI) Water hardness Is there a downstream C Tier 1 Estimal	n <sup>5</sup> /5) i drained (ha) ig to outfall (ha) Hgh =>200mg CaCf Hgh	0.002 2.884 1.341 0.28 034	Fres	hwater EQS limits: Bioavailable dissol Bioavailable dissol discharge in or within for dissolved coppe im of the point of dis 003	ved copper (µg/l) ved zinc (µg/l) n 1 km upstream of er only Ambien charge? Sid	e slope (m/r hess bles - te (l/s) s	1 10.9 site for conservat d concentration (µ No • 0 m) 0.71 Settlement of	sion? No - D

highways england	Highways England	l Water Risk Assess			Version 2.0.4 June 2019			
	F00 1	Solub	ble				Sediment	- Chronic Impact
C	EQS - Annual Average Co Copper	Zinc			Acute Impact			
Step 2	0.49	2.07	ug/l		Copper Zinc			or this site is judged as:
Step 3	-	-	ug/l		Pass Pass		Accumulating? Extensive?	Low flow Vel m/s Deposition Index
Step 5								
ad number		NHRR			HE Area / DBFO number		Area 7	
ssessment type Sigrid reference of assessmen	te sist (s)			ments (outfall	s between 100m and 1km apart)	00.4000		
s and reference of assessmen S and reference of outfall struct		Easting 49 Easting	92407		Northing Northing	364909		
utfall number		Highway C atchme	nt 1, 2 &3		List of outfalls in cumulative			
ceiving watercourse		Tributary Leading	to the Beck		assessment			
A neceiving waterD etailed Rive ate ofassessment	er Network ID	20-05-2024			Assessor and affiliation Version of assessment		AJ	
te s							,	
tep 1 Runoff Quality	AADT >10,000 and <	:50,000	<ul> <li>Climatic r</li> </ul>	region Colder	Dry   Rainfall site	L	incoln (SAAR 600mm)	•
itep 2 River Impacts	Annual Q <sub>95</sub> river flow (m <sup>3</sup> /s)	)	0.002	Fres	hwater EQS limits:			
(Enter zero in Annual Q <sub>95</sub>	Impermeable road area dra	ained (ha)	5.35		Bioavailable dissolved copper (µg/l)		1 D	
river flow box to assess Step 1 runoff quality	Permeable area draining to		1.78		Bioavailable dissolved zinc (µg/l)		10.9 D	
only)	Base Flow Index (BFI)	o ounum (mu)	0.26		discharge in or within 1 km upstream of			No - D
	Dase Flow Index (BFI)		0.20		discharge in or within 1 km upstream of	a protected	sile for conservations	No - D
For dissolved zinc only	Water hardness	High = >200mg CaCO3/	-	F	or dissolved copper only Ambien	t backgrour	id concentration (µg/l)	0 D
For sediment impact only	Is there a downstream stru	cture, lake, pond or canal	that reduces the velo	city within 100	m of the point of discharge?		No 🔻 D	
		river width (m)	1	1				
			4	) Manaing'a g	0.07	le slope (m/	m) 0.71 lor	na slope (m/m) 0.0001
	Tier 2 Bed width (	(m)	1	Manning's r	0.07 D Sid	le slope (m/		ng slope (m/m) 0.0001
Step 3 Mitigation					Professional a Heatland			
				-	E stimated effective reatment for Attenuation for solu		Settlement of	
		Briefdescription			solubles (%) restricted discharge ra	ate (I/s)	sediments (%)	
Existing measures				0	D No restriction -	D 0	D	
Proposed measures				0	D No restriction -	D 6	4	
bishuran								
highways england		nd Water Risk Asses Sol	sment Tool		Version 2.0.4 June 2019		Sedim	ent - Chronic Impact
highways england	Highways Englan EQS - Annual Average C	Sol Concentration			Version 2.0.4 June 2019 Acute Impact		Sedin	
highways england	Highways Englan	Sol						Pass
highways england	Highways Englan EQS - Annual Average C Copper	Sol Concentration Zinc	uble		Acute Impact Copper Zinc		Sediment deposi	Pass
highways england Step 2	Highways Englan EQS - Annual Average C Copper	Sol Concentration Zinc	uble		Acute Impact			Pass tion for this site is judged a Yes 0.02 Low flow \
highways england	Highways Englan EQS - Annual Average C Copper	Sol Concentration Zinc	uble ug/l		Acute Impact Copper Zinc		Sediment deposi Accumulating?	Pass tion for this site is judged a Yes 0.02 Low flow \
Highways           step 2           Step 3	Highways Englan EQS - Annual Average C Copper	Sol Concentration Zinc 0.01	uble ug/l		Acute Impact Copper Zinc Pass Pass		Sediment deposi Accumulating? Extensive?	Pass tion for this site is judged a Yes 0.02 Low flow \
Step 2       Step 3	Highways Englan EQS - Annual Average C Copper	Sol Concentration Zinc 0.01 -	uble ug/ ug/		Acute Impact Copper Zinc		Sediment deposi Accumulating?	Pass tion for this site is judged a Yes 0.02 Low flow \
highways england Step 2 Step 3 Step 3 Step 4 Step 5 Step 5	Highways Englan	Sol Concentration Zine 0.01 - - NRR Non-cumulative a	uble ug/l ug/l		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number	36.47(	Sediment deposi Accumulating? Extensive? Area 7	Pass tion for this site is judged a Yes 0.02 Low flow \
highways           Step 2           Step 3	Highways Englan	Sol Concentration Zine 0.01 - - NHRR Non-cumulative a	uble ug/ ug/		Acute Impact Copper Zinc Pass Pass	36470	Sediment deposi Accumulating? Extensive? Area 7	Pass tion for this site is judged a Yes 0.02 Low flow \
highways england Step 2 Step 3 Step 3 Step 3 Step 4 Step 4 Step 4 Step 4 Step 5 Step 5 Step 5 Step 5 Step 5 Step 6 Step 6	Highways Englan	Sol Concentration Zinc 0.01 - NHRR Non-cumulative a Easting	uble ug/ ug/ ussessment (single o 495450		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Northing Northing List of outfalls in cumulative	36470	Sediment deposi Accumulating? Extensive? Area 7	Pass tion for this site is judged a Yes 0.02 Low flow \
highways england Step 2 Step 3 Dad number ssessment hype S and reference of assessmen S and reference of outfail struc utfail number coeMna watercourse	Highways Englan	Sol Concentration Zinc 0.01 - NHRR NHRR NHRR Easting Easting	uble ug/ ug/ ug/ ussessment (single o 495450 nent 4		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number No fiting List of outfalls in cumulative assessment	3647(	Sediment deposition of the second sec	Pass tion for this site is judged a Yes 0.02 Low flow W
highways england Step 2 Step 2 Step 3 oad number seesament toe S qnd reference of a seesame S qnd reference of a seesame S qnd reference of a seesame S qnd reference of a seesame A receiving water Detailed Riv	Highways Englan	Sol Concentration Zinc 0.01 NHRR Non-cumulative a Easting Easting Highway C atchm Riparian Waterc	uble ug/ ug/ ug/ ussessment (single o 495450 nent 4		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number HE Area / DBFO number Nothing Nothing List of outfalls in cumulative assessment Asse ssor and affiliation	36470	Sediment deposi Accumulating? Extensive? Area 7	Pass tion for this site is judged a Yes 0.02 Low flow W
highways england Step 2 Step 2 Step 3 Dod number seesment type S qrid reference of assessme S qrid reference of assessme tital number e de king watercourse A re oxing water D etailed Riv ate of assessment	Highways Englan	Sol Concentration Zinc 0.01 NHRR Non-cumulative as Easting Easting Highway C atchm	uble ug/ ug/ ug/ ussessment (single o 495450 nent 4		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number No fiting List of outfalls in cumulative assessment	36470	Sediment deposition of the second sec	Pass tion for this site is judged a Yes 0.02 Low flow W
highways england Step 2 Step 2 Step 3 Dod number seesment type S qrid reference of assessme S qrid reference of assessme tital number e de king watercourse A re oxing water D etailed Riv ate of assessment	Highways Englan	Sol Concentration Zinc 0.01 NHRR Non-cumulative a Easting Easting Highway C atchm Riparian Waterc	uble ug/ ug/ ug/ ussessment (single o 495450 nent 4		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number HE Area / DBFO number Nothing Nothing List of outfalls in cumulative assessment Asse ssor and affiliation	36470	Sediment deposition of the second sec	Pass tion for this site is judged a Yes 0.02 Low flow W
highways england Step 2 Step 3 Dead number seesment type S qrid reference of assessme S qrid reference of assessme tital number e de king watercourse A re oxhing water D etailed Riv ate of assessment	Highways Englan	Sol Concentration Zinc 0.01 NHRR Non-cumulative a Easting Easting Highway C atchm Riparian Waterc	uble ug/ ug/ ug/ ussessment (single o 495450 nent 4		Acute Impact Copper Zinc Pass Pass HE Area / DBFO number HE Area / DBFO number Nothing Nothing List of outfalls in cumulative assessment Asse ssor and affiliation	38470	Sediment deposition of the second sec	Pass tion for this site is judged a Yes 0.02 Low flow W
highways england Step 2 Step 2 Step 3 Doad number seesment toe S grid reference of assessme S grid reference of outfall struc utfall number ecelving wateroourse A receiving water D etailed Riv ate of assessment old S	Highways Englan	Sol Concentration Zinc 0.01 NHRR Non-cumulative a Easting Easting HighwayC atchn Riparian Waterc 08-05-2023	uble ug/ ug/ ug/ ug/ 495450 ent 4 ourse	utfall)	Nothing           HE Area / DBFO number           Nothing           Nothing           List of outfalls in cumulative assessment           Assessment           Assessment           Version of assessment	36470	Sediment deposition of the second sec	Pass tion for this site is judged a Yes 0.02 Low flow \
highways england Step 2 Step 2 Step 3 Ded number S and reference of assessmet S and reference of outfall structure and reference of outfall structure and reference of assessmet of assessment of assessment of assessment of assessment of assessment of assessment of assessment of assessment	Highways Englan	Sol Concentration Zinc 0.01 NHRR Non-cumulative a Easting Easting HighwayC atchn Riparian Waterc 08-05-2023	uble ug/ ug/ ug/ ug/ 495450 ent 4 ourse		Nothing           HE Area / DBFO number           Nothing           Nothing           List of outfalls in cumulative assessment           Assessment           Assessment           Version of assessment		Sediment deposition of the second sec	Pass tion for this site is judged Ves 0.02 Low Row No 5 Depositio
highways england Step 2 Step 2 Step 3 Ded number S and reference of assessmet S and reference of outfall structure and reference of outfall structure and reference of assessmet of assessment of assessment of assessment of assessment of assessment of assessment of assessment of assessment	Highways Englan	Sol Concentration Zine 0.01 NHRR Non-cumulative a Easting Highway Catchm Riparian Waterc 08-05-2023	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	i utfail)	Nothing           HE Area / DBFO number           Nothing           Nothing           List of outfalls in cumulative assessment           Assessment           Assessment           Version of assessment		Sediment deposi Accumulating? Extensive? Area 7 00 AJ 2	Pass tion for this site is judged Ves 0.02 Low Row No 5 Depositio
highways england Step 2 Step 2 Step 3 Step 3 Step 3 Step 4 Step 4 Step 4 Step 5 Step 5 Step 5 Step 5 Step 5 Step 5 Step 1 Runoff Quality Step 1 Runoff Quality Step 2 River Impacts (Enter zero in Annual Que	Highways Englan       EQS - Annual Average C       Copper       0.00       -       Int point (m )       cture (m)       wer Network ID	Sol Concentration Zine 0.01 - - NHRR Non-cumulative a Eastina Highway C atchm Riparian Waterc 08-05-2023 08-05-2023	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	i utfail)	Acute Impact Copper Zine Pass Pass HE Area / DBFO number HE Area / DBFO number HE for a see sament Asse sament Asse sament affiliation Version of assessment Ider Dry Rainfall site	e	Sediment deposi Accumulating? Extensive? Area 7 10 Al 2 Lincoln (SAAR 600mm	Pass tion for this site is judged 4 Ves 0.02 No 5 Depositio
highways england Step 2 Step 2 Step 3 Dead number sessment bpe S and reference of assessment S and reference of assessment S and reference of assessment ace of assessment of a sessment of a sessment	Highways Englan       EQS - Annual Average C       Copper       0.00       -       Int point (m)       cture (m)       ver Network ID   AADT       >10.000 and   Annual Q <sub>55</sub> river flow (m <sup>2</sup> )	Sol Concentration Zine 0.01 - - NHRR Non-cumulative a Eastina Highway C atchm Riparian Waterc 08-05-2023 08-05-2023	uble ug/ ug/ ug/ ug/ ug/ ug/ 495450 nent 4 ourse Climat	i utfail)	Acute Impact Copper Zine Pass Pass HE Area / DBFO number HE Area / DBFO number HE Area / DBFO number Us of outfalls in ourrulative assessment Assessor and affiliation Version of assessment Ker Dry Rainfall sit	e	Sediment deposi Accumulating? Extensive? Area 7 10 AJ 2 Lincoln (SAAR 600mm	Pass tion for this site is judged Ves 0.02 Low Row Depositio
highways england Step 2 Step 2 Step 3 Search and the search and th	Highways Englan         EQS - Annual Average C         Copper         0.00         -         Int point (m )         cture (m)         ver Network ID         AADT         P10.000 and         Annual Q <sub>ist</sub> river flow (m <sup>2</sup> )         Impermeable road area d         Permeable area draining	Sol Concentration Zine 0.01 - - NHRR Non-cumulative a Eastina Highway C atchm Riparian Waterc 08-05-2023 08-05-2023	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact Copper Zine Pass Pass HE Area / DBFO number Korthing Northing List of outfalls in cumulative asse sament Assessor and a filiation Version of assessment Ker Dry Rainfall sit restwater EQS limits: Bioavailable dissolved copper (ug Bioavailable dissolved zinc (ug/l)	е //)	Sediment deposi Accumulating? Extensive? Area 7 10 AJ 2 Lincoln (SAAR 600mm	Pass tion for this site is judged Ves Depositio Depositio
highways england Step 2 Step 2 Step 3 Step 3 Step 3 Step 3 Step 4 Step 4 Step 4 Step 4 Step 5 Step 5 Step 5 Step 1 Runoff Quality Step 2 River Impacts (Enter zero in Annual Que river flow box 10 assess Step 1 runoff quality only)	Highways Englan         EQS - Annual Average C         Cooper         0.00       0         -       0	Sol Concentration Zinc 0.01 - - NHRR Non-cumulative a Easting Easting Easting Highway C atchn Riparian Waterc 08-05-2023 08-05-2023 (40,000 	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ issessment (single o 495450 	ic region Co	Acute Impact Copper Zine Pass Pass HE Area / DBFO number Korthing Northing List of outfalls in cumulative asse sament Assessor and a filiation Version of assessment Ker Dry Rainfall sit Frestwater EQS limits: Bioavailable dissolved copper (ug	е //)	Sediment deposi Accumulating? Extensive? Area 7 10 AJ 2 Lincoln (SAAR 600mm	Pass tion for this site is judged a Ves 0.02 Low flow Depositio
highways england Step 2 Step 2 Step 3 Dad number Sadar Step 4 S and reference of assessment S and reference of outfail struct butfail number leekining water Detailed Riv ate of assessment obtes Step 1 Runoff Quality Step 2 River Impacts (Enter zero in Annual Q <sub>15</sub> river flow box to assess Step 1 und quality	Highways Englan         EQS - Annual Average C         Copper         0.00         -         Int point (m )         cture (m)         ver Network ID         AADT         P10.000 and         Annual Q <sub>ist</sub> river flow (m <sup>2</sup> )         Impermeable road area d         Permeable area draining	Sol Concentration Zine 0.01 - - NHRR Non-cumulative a Eastina Highway C atchm Riparian Waterc 08-05-2023 08-05-2023	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ issessment (single o 495450 	ic region Co	Acute Impact           Copper         Zinc           Pass         Pass           Northing         Northing           List of outfalls in cumulative assessment         Northing           Assessment         Version of assessment           Version of assessment         Since Pass           Bioavailable dissolved copper (µg0)         Bioavailable dissolved zinc (µg0)           Bioavailable dissolved zinc (µg0)         Northing 1 km upstream	e m of a prote	Sediment deposi Accumulating? Extensive? Area 7 10 AJ 2 Lincoln (SAAR 600mm	Pass tion for this site is judged two for this site is judged Low flow Two S Deposition
highways england Step 2 Step 2 Step 3 Step 3 Step 3 Step 3 Step 4 Step 4 Step 4 Step 4 Step 4 Step 5 Step 4 Step 5 Step 4 Step 4 Step 4 Step 4 Step 5 Step 4 Step 5 Step 1 Step 5 Step 5 Step 1 Step 5 Step 1 Step 5 Step 5 Step 1 Step 5 Step 5 Step 1 Step 5 Step 5 Step 5 Step 1 Step 5 Step 5	Highways Englan  EQS - Annual Average C Cooper  0.00  -	Sol           200centration         Zinc         0.01           0.01         0.01         -           NHRR         Non-cumulative a         -         -           Easting         Easting         -         -           Easting         -         -         -           Riparian Waterc         -         -         -           08-05-2023         -         -         -           rc40,000         -         -         -           /s)         -         -         -         -           /spin = >200mg CacCol         -         -         -         -	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact           Copper         Zinc           Pass         Pass           Northing         Northing           List of outfalls in cumulative assessment         Northing           Assessment         Version of assessment           Version of assessment         Since Pass           Bioavailable dissolved copper (µg0)         Bioavailable dissolved zinc (µg0)           Bioavailable dissolved zinc (µg0)         Northing 1 km upstream	e m of a prote	Sediment deposi Accumulating? Extensive? Area 7 100 AJ 2 Linoin (SAAR 600mm 1 109 cected site for conservation round concentration (	Pass  tion for this site is judged a Ves 0.02 Low flow Depositio
highways england Step 2 Step 2 Step 3 Dod number Sadar Seessment boe Sadar febrence of assessment Sadar febrence of outfall struct butfall number le ceiking water: Detailed Riv ale of assessment obts S Step 1 Runoff Quality Step 2 River Impacts (Enter zero in Annual Que river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Qas river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str	Sol           Zinc         0.01           Zinc         0.01           NHRR         Non-cumulative at Easting           Easting         Easting           Highway C atchm           Riparian Waterc           08-05-2023           vision           irained (ha)           to outfall (ha)           High = >200mg CaCCI           ructure, lake, pond or can	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact         Copper       Zinc         Pass       Pass         Pass       Pass         HE Area / DBFO number       Northing         Ist of outfails in cumulative assessment       Northing         List of outfails in cumulative assessment       Northing         Assessor and affiliation       Version of assessment         Ider Dry       Rainfall site         restwater EQS limits:       Bloavailable dissolved copper (ug)         Bloavailable dissolved zinc (ug/l)       he discharge in or within 1 km upstream         For dissolved copper only       Am	e m of a prote	Sediment deposi Accumulating? Extensive? Area 7 100 AJ 2 Linoin (SAAR 600mm 1 109 cected site for conservation round concentration (	Pass tion for this site is judged No S Deposition tion tion? No T D D D D D D D D D D D D D D D D D D
highways england Step 2 Step 2 Step 3 Sep 3 Sep 3 Sep 3 Sep 4 Sep	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Q <sub>se</sub> river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str         ° Tier 1       Estimated	Sol           200centration         Zinc         0.01           200centration         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           NHRR         Non-cumulative at Easting         Easting           Easting         Easting         0.01           Highway C atchm         Riparian Waterc         0.00-0.023           08-05-2023         0.00         0.00           /s)         rained (ha)         to outfall (ha)           to outfall (ha)         Uture, lake, pond or can driver width (m)	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact         Copper       Zinc         Pass       Pass         Pass       Pass         HE Area / DBFO number       Northing         List of outfills in cumulative assessment       Northing         List of outfills in cumulative assessment       Northing         Assessor and affiliation       Version of assessment         Version of assessment       See Sort assessment         Ider Dry       Rainfall site         Bioavailable dissolved copper (ug)       Bioavailable dissolved zinc (ug/l)         he discharge in or within 1 km upstreat       For dissolved copper only       Am         100m of the point of discharge?       Description       Copper only       Copper only	e m of a prote	Sediment deposi Accumulating? Extensive?	Pass tion for this site is judged a Ves Low flow Depositio
highways england Step 2 Step 2 Step 3 Dod number Sadar Seessment boe Sadar febrence of assessment Sadar febrence of outfall struct butfall number le ceiking water: Detailed Riv ale of assessment obts S Step 1 Runoff Quality Step 2 River Impacts (Enter zero in Annual Que river flow box to assess Step 1 runoff quality only) For dissolved zinc only	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Qas river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str	Sol           200centration         Zinc         0.01           200centration         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           NHRR         Non-cumulative at Easting         Easting           Easting         Easting         0.01           Highway C atchm         Riparian Waterc         0.00-0.023           08-05-2023         0.00         0.00           /s)         rained (ha)         to outfall (ha)           to outfall (ha)         Uture, lake, pond or can driver width (m)	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact         Copper       Zinc         Pass       Pass         Pass       Pass         HE Area / DBFO number       Northing         List of outfills in cumulative assessment       Northing         List of outfills in cumulative assessment       Northing         Assessor and affiliation       Version of assessment         Version of assessment       See Sort assessment         Ider Dry       Rainfall site         Bioavailable dissolved copper (ug)       Bioavailable dissolved zinc (ug/l)         he discharge in or within 1 km upstreat       For dissolved copper only       Am         100m of the point of discharge?       Description       Copper only       Copper only	e m of a prote	Sediment deposit Accumulating? Extensive?	Pass tion for this site is judged a Ves Low flow Depositio
highways england Step 2 Step 2 Step 3 Sep 3 Sep 3 Sep 3 Sep 3 Sep 4 Sep 4 Sec 1 Sec	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Q <sub>se</sub> river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str         ° Tier 1       Estimated	Sol           200centration         Zinc         0.01           200centration         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           NHRR         Non-cumulative at Easting         Easting           Easting         Easting         0.01           Highway C atchm         Riparian Waterc         0.00-0.023           08-05-2023         0.00         0.00           /s)         rained (ha)         to outfall (ha)           to outfall (ha)         Uture, lake, pond or can driver width (m)	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact         Copper       Zinc         Pass       Pass         Northing       Northing         Northing       Northing         List of outfalls in cumulative assessment       Assessment         Assessment       Version of assessment         Version of assessment       Bioavailable dissolved copper (µg)         Bioavailable dissolved zinc (µg/l)       he discharge in or within 1 km upstreat         For dissolved copper only       Am         100m of the point of discharge?       Ys n 002	e m of a prote bient backg	Sediment deposi Accumulating? Extensive?	Pass tion for this site is judged No S Deposition
highways england Step 2 Step 2 Step 3 Sep 3 Sep 3 Sep 3 Sep 3 Sep 4 Sep 4 Sec 1 Sec	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Q <sub>se</sub> river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str         ° Tier 1       Estimated	Sol           200centration         Zinc         0.01           200centration         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           NHRR         Non-cumulative at Easting         Easting           Easting         Easting         0.01           Highway C atchm         Riparian Waterc         0.00-0.023           08-05-2023         0.00         0.00           /s)         rained (ha)         to outfall (ha)           to outfall (ha)         Uture, lake, pond or can driver width (m)	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Northing           Itit of outfalls in cumulative assessment         Northing           List of outfalls in cumulative assessment         Rainfall site           Assessor and affiliation         Version of assessment           Ider Dry         Rainfall site           isoavailable dissolved copper (µg)         Bioavailable dissolved copper (µg/)           he discharge in or within 1 km upstrear         For dissolved copper only         Am           100m of the point of discharge?         Is n 003         E stim ated effect	e //l) m of a prote bient backg	Sediment deposi Accumulating? Extensive? Area 7 10 AJ 2 Linodn (SAAR 800mm 1 10.9 Concentration ( No (Marconcentration ( No (Marconcentration ( No (Marconcentration (	Pass tion for this site is judged No S Deposition
highways england Step 2 Step 2 Step 3 Sep 3 Sep 3 Sep 3 Sep 3 Sep 4 Sep 4 Second Second Second S and reference of assessment S and reference of outfall structure in number eceiving water D etailed Riv ate of assessment old S Step 1 Runoff Quality Step 2 River Impacts (Enter zero in Annual Que (Enter zero in Annual Que tiver flow box to assess Step 1 runoff quality only) For dissolved zinc only For sediment impact only	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Q <sub>se</sub> river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str         ° Tier 1       Estimated	Sol           200centration         Zinc         0.01           200centration         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           0.01         0.01         0.01           NHRR         Non-cumulative at Easting         Easting           Easting         Easting         0.01           Highway C atchm         Riparian Waterc         0.00-0.023           08-05-2023         0.00         0.00           /s)         rained (ha)         to outfall (ha)           to outfall (ha)         Uture, lake, pond or can driver width (m)	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact         Copper       Zinc         Pass       Pass         Northing       Northing         Northing       Northing         List of outfalls in cumulative assessment       Assessment         Assessment       Version of assessment         Version of assessment       Bioavailable dissolved copper (µg)         Bioavailable dissolved zinc (µg/l)       he discharge in or within 1 km upstreat         For dissolved copper only       Am         100m of the point of discharge?       Ys n 002	e m of a prote bient backg Side slope	Sediment deposi Accumulating? Extensive?	Pass tion for this site is judged No S Deposition
Step 2           Step 3           Issessment hole           Ssessment hole           S3 and reference of assessment           Sold reference of saversment           Issessment           Step 1 Runoff Quality           For dissolved zinc only           For sediment impact only           Step 3 Mitigation	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Q <sub>se</sub> river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str         ° Tier 1       Estimated	Sol           200centration           Zinc           0.01           0.01           NHRR           Non-cumulative a           Easting           Easting           Easting           Barlan           Riparian Waterc           08-05-2023           08-05-2023           /s)           Irained (ha)           to outfall (ha)           Water, lake, pond or can driver width (m)           h (m)	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region O	Acute Impact           Copper         Zinc           Pass         Pass           Pass         Pass           HE Area / DBFO number         Northing           Ist of outfails in cumulative assessment         Northing           List of outfails in cumulative assessment         Northing           Assessor and affiliation         Version of assessment           Ker Dry         Rainfall site           Bloavailable dissolved copper (ug)         Bioavailable dissolved zinc (ug/l)           he discharge in or within 1 km upstreat         For dissolved copper only         Am           100m of the point of discharge?         ('s n 0:03)         E stimated effect           Treatment for solubles (%)         Attenuation for restricted discharge	e m of a prote bient backg Side slope titveness solubles - perate (Jis	Sediment deposi Accumulating? Extensive? Area 7 00 AJ 2 Lincoln (SAAR 600mm 1 109 control (SAAR 600mm 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Pass           tion for this site is judged a           Ves         0.02           Low flow         Deposition
highways england Step 2 Step 2 Step 3 Sep 3 Sep 3 Sep 3 Sep 3 Sep 4 Sep 4 Sec 1 Sec	Highways Englan         EQS - Annual Average C         Cooper         0.00         -         0.00         -         Impoint (m)         cture (m)         -         AADT         >10.000 and         AADT         AADT         >10.000 and         Annual Q <sub>sc</sub> river flow (m <sup>1</sup> )         Impermeable road area d         Permeable area draining         Base Flow Index (BFI)         Water hardness         Is there a downstream str         ° Tier 1       Estimated	Sol           200centration           Zinc           0.01           0.01           NHRR           Non-cumulative a           Easting           Easting           Easting           Barlan           Riparian Waterc           08-05-2023           08-05-2023           value           value <td>uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/</td> <td>ic region Co</td> <td>Acute Impact           Copper         Zinc           Pass         Pass           Pass         Pass           It E Area / DBFO number         Northing           It is of outfalls in cumulative assessment         Northing           List of outfalls in cumulative assessment         Seesson and affiliation           Version of assessment         Version of assessment           Ider Dry         Rainfall site           Bioavailable dissolved copper (ug)         Bioavailable dissolved zinc (ug/l)           he discharge in or within 1 km upstreat         For dissolved copper only         Am           100m of the point of discharge?         Issumated effect         Treatment for         Attenuation for</td> <td>e m of a prote bient backg Side slope</td> <td>Sediment deposi Accumulating? Extensive?</td> <td>Pass tion for this site is judged No S Deposition</td>	uble ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/ ug/	ic region Co	Acute Impact           Copper         Zinc           Pass         Pass           Pass         Pass           It E Area / DBFO number         Northing           It is of outfalls in cumulative assessment         Northing           List of outfalls in cumulative assessment         Seesson and affiliation           Version of assessment         Version of assessment           Ider Dry         Rainfall site           Bioavailable dissolved copper (ug)         Bioavailable dissolved zinc (ug/l)           he discharge in or within 1 km upstreat         For dissolved copper only         Am           100m of the point of discharge?         Issumated effect         Treatment for         Attenuation for	e m of a prote bient backg Side slope	Sediment deposi Accumulating? Extensive?	Pass tion for this site is judged No S Deposition

# Highway Catchment 1, 2 and 3 Cumulative Soluble Assessment

highways england	Highwaya Engli	and Water Risk Asse	noment Tool		Version 2.0.4 Ju	- 2040					
england	nighways Engl				Version 2.0.4 Ju	ne 2019					
			oluble					Sediment - Cl	hronic Impact		
	EQS - Annual Average				Acute	Impact		Pas			
	Copper 0.00	Zinc 0.00	ugil		Copper	Zinc		Pas	55		
Step 2	0.00	0.00	agn		Copper	21110	Se	diment deposition for	this site is judged as:		
					Pass	Pass		cumulating? Yes	0.02 Low flow Vel m/s		
	-	-	ugłi				Ezt	ensive? No	4 Deposition Index		
Step 3											
Road number		NHRR			HE Area / DBF	O number		Area 7			
Assessment type			assessment (single outfa						•		
OS grid reference of a	assessment point (m )	Easting	495450	,		Northing	364700				
OS grid reference of c	utfall structure (m)	Easting				Northing	i				
Outfall number		Highway Catch	iment 5		List of outfalls in	cumulative	1				
Receiving watercours	e	Riparian Wate	rcourse	ê	assessment						
EA receiving water D	etailed River Network ID				Assessor and a	ffiliation		AJ			
Date of assessment		08-05-2023			Version of asse	ssment		2			
Notes											
Step 1 Runoff Q	uality AADT >10,000 a	and <50,000	<ul> <li>Climatic r</li> </ul>	egion Colder D	bry 🗸	Rainfall site	Lines	in (SAAR 600mm)	•		
	AAD 1 210,000 a			ogion couler b	~j •	reannan site	Linde		<u> </u>		
Step 2 River Imp	Annual Q <sub>95</sub> river flow (r	m <sup>3</sup> /s)	0.31	Freeh	water EQS limit	e.					
	Annual Gas Intel now (i	11-73)	0.51	riesii	water Los IIII	a.					
(Enter zero in Annu		a drained (ha)	0.9		Bioavailable dis	solved copper (µg/l)		1 D			
river flow box to as Step 1 runoff quality		ng to outfall (ha)	0.286		Bioavailable dis	solved zinc (µg/l)		10.9 D			
only)		. <b>.</b>									
	Base Flow Index (BFI)		0.28	Is the di	scharge in or w	ithin 1 km upstream of	a protected sit	te for conservation?	No 🖵 D		
For dissolved zind	only Water hardness	High = >200mg CaC	:03/ 👻	Eo	r dissolved co	nner only Ambient	t background a	:oncentration (µg/l)	0		
	, only water hardhood			10		pper only Anibien	i background c	concentration (µg/i)			
For sediment impa	act only is there a downstream	structure, lake, pond or c	anal that reduces the veloc	city within 100m	n of the point of	discharge?		No 🔻 D			
	Tier 1 Estima	ted river width (m)	18								
	• Her 1 Estima	ted river width (m)	10								
	C Tier 2 Bed wi	dth (m)	1	Manning's n	0.03	Sid	e slope (m/m)	0.71 Long s	slope (m/m) 0.0001		
L											
Step 3 Mitigatio	<u>n</u>					E stim ated effectiver	19 55				
				To	eatment for	Attenuation for solut		tlement of			
		Briefdescription	Briefdescription			solubles (%) restricted discharge rate (1/s)			sediments (%)		
			·								
Existing measures				0	D	No restriction	D O	D			
Proposed measure	S			0	D	No restriction	D 0				
lighway	Catchment 6										
highways england			and Table								
england	Highways Eligi	and Water Risk Asse			Version 2.0.4 Ju	ne 2019					
		S	oluble					Sediment - C	hronic Impact		
	EQS - Annual Average				Acute	Impact					
	Copper 0.00	Zinc 0.01			0			Pas	55		
Step 2	0.00	0.01	ugłi		Copper	Zinc	Se	diment deposition for	this site is judged as:		
					Pass	Pass		cumulating? Yes	0.02 Low flow Vel m/s		
	-	-	ug/i				Ezt	tensive? No	15 Deposition Index		
Step 3									-		
Road number		NHRR			HE Area / DBF	O number		Area 7			
Assessment type			assessment (single outfa						-		
OS grid reference of a	ssessment point (m )	Easting	495450			Northing	364700				
OS grid reference of c	utfall structure (m)	Easting				Northing					
Outfall number		Highway Catch	iment 6		List of outfalls in	cumulative					
Receiving watercours	e	Riparian Wate		8	assessment						
EA receiving water D	etailed River Network ID				Assessor and a	ffiliation		AJ			
Date of assessment		08-05-2023			Version of asse	ssment		2			
Notes											

Step 1 Runoff Quality	AADT >10,000 and <50,000	Climatic region Colder Dry  Rainfall site Linodn (SAAR 600mm)
Step 2 River Impacts	Annual $Q_{\text{ss}}$ river flow (m <sup>3</sup> /s)	031 Freshwater EQS limits:
(Enter zero in Annual Q <sub>95</sub>	Impermeable road area drained (ha)	3.049 Bioavailable dissolved copper (µg/l)
river flow box to assess Step 1 runoff quality	Permeable area draining to outfall (ha)	1.438 Bioavailable dissolved zinc (µg/l) 10.9
only)	Base Flow Index (BFI)	028         Is the discharge in or within 1 km upstream of a protected site for conservation?         No         D
For dissolved zinc only	Water hardness High = >200mg CaCO3/	For dissolved copper only Ambient background concentration (µg/l)
For sediment impact only	Is there a downstream structure, lake, pond or canal that redu	ces the velocity within 100m of the point of discharge?
	• Tier 1 Estimated river width (m)	18
	C Tier 2 Bed width (m)	1         Manning's n         0.03         Side slope (m/m)         0.71         Long slope (m/m)         0.0001
Step 3 Mitigation		E stim ated effective ne ss
		Treatment for Attenuation for solubles - Settlement of
	Briefdescription	solubles (%) restricted discharge rate (I/s) sediments (%)
Existing measures	İ	0 D No restriction V D D
Proposed measures		0 D No restriction V D D

lighway Cat		nd Water Risk Assessm	ent Tool	Version 2.0.4 June	2019			
england	rightays Engla	Soluble		Version 2.0,4 Julie	2013	<u> </u>	Sediment	- Chronic Impact
	EQS - Annual Average (	Concentration		Acute In	npact			
	Copper 0.00	Zinc 0.01	ugil	Copper	Zinc			Pass
Step 2	0.00	0.01	ugn					for this site is judged as:
				Pass	Pass		Accumulating? Yes Extensive? No	
Step 3	-	-	ug/l			-	Extensive? No	10 Deposition Inc
oad number		NHRR	· · · · · · · · · · · · · · · · · · ·	HE Area / DBFO r	number		Area 7	
ssessment type			ssment (single outfall)				Priva /	
S qrid reference of assessmer		Easting 495			Northing	364700		
S grid reference of outfall struc	cture (m)	Easting			Northing			
utfall number		Highway C atchment		List of outfalls in o assessment	cumulative			
eceiving watercourse A receiving waterD etailed Riv	er Network ID	Riparian Watercour	se	Assessor and affi	iation		AJ	
ate o fassessment		08-05-2023		Version of assess			2	
otes								
tep 1 Runoff Quality	AADT >10,000 and	d <50,000	<ul> <li>Climatic regio</li> </ul>	n Colder Dry 💌	Rainfall site	[	Lincoln (SAAR 600mm)	•
on 2 Divor Impacte	<u> </u>							
tep 2 River Impacts	Annual Q <sub>95</sub> river flow (m <sup>3</sup>	3/s)	0.31	Freshwater EQS limits:				
Enter zero in Annual Q <sub>95</sub>	Impermeable road area	drained (ha)	2.155	Bioavailable disso	lved copper (ua/l)		1 D	
iver flow box to assess Step 1 runoff quality	Permeable area draining		0.892	Bioavailable disso			10.9 D	
step 1 runoff quality		, to outurn (11d)		_			· · · ·	
	Base Flow Index (BFI)		0.26	Is the discharge in or with	in 1 km upstream o	of a protect	ed site for conservation	? No -
or dissolved zinc only	Water hardness	High = >200mg CaCO3/	-	For dissolved copp	eroply Ambia	at backers	und concentration (un/l)	
or choose a fine only		Tight 200ing 040000		i or uissorveu copp	Amble	m backgro	und concentration (µg/l)	
For sediment impact only	Is there a downstream st	tructure, lake, pond or canal th	hat reduces the velocity v	within 100m of the point of di	scharge?		No 🔻 D	
	• Tier 1 Estimate	ed river width (m)	18					
	⊖ Tier 2 Bed widt	tn (m)	1 Ma	anning's n 0.03	51	de slope (r	n/m) 0.71 Lo	ng slope (m/m) 0.0001
tep 3 Mitigation								
tep 5 miligation					E stim ated effective			
				Treatment for solubles (%) re	Attenuation for sol stricted discharge r	ubles - ate (1/s)	Settlement of sediments (%)	
		Briefdescription			oniois a alconargo i	410 (110)	Codimonia ( 70)	
Existing measures					lo restriction	• D	0 D	
Proposed measures				0 D N	lo restriction	• D	0 D	
	_							
ighway cate								
Ignway cato		nd Water Risk Assessm	ent Tool	Version 2.0.4 June	2019			
Ignway cato	Highways Engla	Soluble					Sediment	- Chronic Impact
highways england	Highways Englar EQS - Annual Average	Soluble Concentration		Version 2.0.4 June Acute In				
highways england	Highways Engla	Soluble						Pass
highways england	Highways Englar EQS - Annual Average Copper	Soluble Concentration Zinc	e	Acute In Copper	npact Zinc		Sediment deposition	Pass for this site is judged as:
highways england	Highways Englar EQS - Annual Average Copper	Soluble Concentration Zinc	e ug/l	Acute In	npact		Sediment deposition Accumulating? Yes	Pass for this site is judged as: 5 0.02 Lowflow Vela
highways england	Highways Englar EQS - Annual Average Copper	Soluble Concentration Zinc	e	Acute In Copper	npact Zinc		Sediment deposition Accumulating? Yes	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2	Highways Englar EQS - Annual Average Copper	Soluble Concentration Zinc	e ug/l	Acute In Copper	npact Zinc		Sediment deposition Accumulating? Yes	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2 Step 3	Highways Englar EQS - Annual Average Copper	Soluble Concentration Zinc 0.01	e ug/l	Acute In Copper Pass	npaot Zinc Pass		Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2 Step 2 ad number	Highways Englar EQS - Annual Average Copper	Solubit Concentration Zine 0.01 -	e ug/l	Acute In Copper	npaot Zinc Pass		Sediment deposition Accumulating? Yes	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2 Step 3 ad number sessment two e	Highways Englat EQS - Annual Average ( Copper 0.00	Solubit Concentration Zine 0.01 -	e ugi ugi ssment (single outfall)	Acute In Copper Pass	npaot Zinc Pass number Northing	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2 Step 2 Step 3 ad number sessment two e o and reference of a ssessment or af reference of outfail struct	Highways Englar	Solubit Concentration Zinc 0.01 - NHRR Non-cumulative asse E asting 495 E asting 495	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r	npact Zinc Pass number Northina Northina	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2 Step 2 Step 3 ad number sessment type i and reference of a seessment i ard reference of outfail struct thai humber	Highways Englar	Solubir Concentration Zinc 0.01 NHRR Non-cumulative asse E asting 495 E asting 495 E asting 495	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r	npact Zinc Pass number Northina Northina	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Lowflow Vela
Step 2 Step 2 Step 3 ad number sessment tope and reference of assessmen and reference of outfall struct fall number coling watercourse	Highways Englar	Solubit Concentration Zinc 0.01 - NHRR Non-cumulative asse E asting 495 E asting 495	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment	npact Zine Pass number Northing Northing Northing Northing	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Low flow Vel
step 2 Step 2 Step 3 d number ad number ad number grid reference of assessment grid reference of outfall struct that immeber ceiving water Detailed Riv	Highways Englar	Solubit Concentration Zinc 6.01 - - Resting HighwayCatchment Riparian Watercour	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment Assessor and affil	npaet Zinc Pass number Northing Northing zumulative lation	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Low flow Vel
Step 2 Step 2 Step 3 ad number sessment type and reference of assessment and reference of outfall struct fall number receiving watercourse receiving water Detailed Riv te of assessment	Highways Englar	Solubir Concentration Zinc 0.01 NHRR Non-cumulative asse E asting 495 E asting 495 E asting 495 HighwayC atchment	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment	npaet Zinc Pass number Northing Northing zumulative lation	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Low flow Vel
Step 2 Step 2 Step 3 ad number sessment type and reference of assessment and reference of outfall struct fall number receiving watercourse receiving water Detailed Riv te of assessment	Highways Englar	Solubit Concentration Zinc 6.01 - - Resting HighwayCatchment Riparian Watercour	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment Assessor and affil	npaet Zinc Pass number Northing Northing zumulative lation	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Low flow Vel
Step 2 Step 3 Step 3 Step 3 ad number sessment type qidr reference of assessment qidr reference of outfall struct fall number ce king watercourse re ce king water De tailed Riv te of assessment	Highways Englar	Solubit Concentration Zinc 6.01 - - Resting HighwayCatchment Riparian Watercour	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment Assessor and affil	npaet Zinc Pass number Northing Northing zumulative lation	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 0.02 Low flow Vel
	Highways Englar	Solubit Concentration Zinc 6.01 - - Resting HighwayCatchment Riparian Watercour	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment Assessor and affil	npaet Zinc Pass number Northing Northing zumulative lation	364700	Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 5 0.02 Low flow Vel
A number sessment to e ad number sessment to e ad reference of a sessment and reference of outfail struct till number ceiving waterourse receiving waterourse receiving water D etailed Riv te of assessment te of assessment	Highways Englar	Solubir Concentration Zinc 0.01 - NHRR Non-cumulative asse Easting HighwayCatchment Riparian Watercour 08-05-2023	e ugi ugi ssmert (single outfall) 450 88	Acute In Copper Pass HE Area / DBFO r List of outfalls in o assessment Assessor and affil Version of assess	npaot Zino Pass number Northing Northing Northing alson ment		Sediment deposition Accumulating? Extensive? Area 7 Area 7 Aj 2	Pass for this site is judged as: 5 0.02 bowlibow Vel 0eposition in 0epos
step 2 Step 2 Step 3 ad number sessment type ad reference of a sessment and reference of outfail struct fail number ceiving wateroourse receiving wateroourse receiving wateroourse te of assessment te of assessment	Highways Englar	Solubir Concentration Zinc 0.01 - NHRR Non-cumulative asse Easting HighwayCatchment Riparian Watercour 08-05-2023	e ugri ugri ssment (single outfall) 450	Acute In Copper Pass HE Area / DBFO r List of outfalls in o assessment Assessor and affil Version of assess	npaet Zinc Pass number Northing Northing zumulative lation		Sediment deposition Accumulating? Yes Extensive? No	Pass for this site is judged as: 0.02 Low flow Vel
step 2 Step 2 Step 3 ad number sessment type and reference of assessment and reference of outfail struct tall number receiving water D etailed Riv te of assessment te s tep 1 Runoff Quality	Highways Englat       EQS - Annual Average       Copper       0.00       -       Intpoint (m )       cture (m)       ver Network ID	Solubie Concentration 2 inc 0.01 - NHRR Non-cumulative asse Easting 495 Easting 495 Easting 495 Easting 495 Easting 495 Easting 495 Cathering	ssment (single outfall) 450 t 8 se Climatic regio	Acute In Copper Pass HE Area / DBFO r Assessment Assessor and affi Version of assess	npaot Zino Pass number Northing Northing Northing alson ment		Sediment deposition Accumulating? Extensive? Area 7 Area 7 Aj 2	Pass for this site is judged as: 5 0.02 Covi flow Vel 0 Oeposition It 0 Oeposi
step 2 Step 2 Step 3 ad number sessment to e i grid reference of assessment i grid reference of of utili struct till number ceiving water O etailed Riv te of assessment te of assessment tes tep 1 Runoff Quality tep 2 River Impacts	AADT >10,000 am	Solubie Concentration Zine 0.01 - NHRR Non-cumulative asse Easting 495 Easting 495 Easting 495 Easting 495 Easting 495 Concentration Highway C atchment Riparian Watercour 08-05-2023 d <50.000	ssment (single outfall) 450 Climatic regio	Acute In Copper Pass   HE Area / DBFO r   List of outfalls in c assessment   Assessor and affil   Version of assess   Version of assess   n Colder Dry +   Freshwater EQS limits:	Appaet Zinc Pass Pass Northing Northing Northing Northing Northing Northing Rainfall site		Sediment deposition Accumulating? Extensive? Area 7 Area 7 AJ 2 Linodn (SAAR 600mm)	Pass for this site is judged as: 5 0.02 Covi flow Vel 0 Oeposition It 0 Oeposi
	Highways Englat       EQS - Annual Average       Copper       0.00       -       Intpoint (m )       cture (m)       ver Network ID	Solubie Concentration Zine 0.01 - NHRR Non-cumulative asse Easting 495 Easting 495 Easting 495 Easting 495 Easting 495 Concentration Highway C atchment Riparian Watercour 08-05-2023 d <50.000	ssmert (single outfall) 450 58 50 Climatic regio	Acute In Copper Pass HE Area / DBFO r Assessment Assessor and affi Version of assess	Appaet Zinc Pass Pass Northing Northing Northing Northing Northing Northing Rainfall site		Sediment deposition Accumulating? Extensive? Area 7 Area 7 Aj 2	Pass for this site is judged as: 5 0.02 bowlibow Vel 0eposition in 0epos
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Step 2 Step 2 Step 3 ad number sessment toe and reference of assessment arid reference of outfail struct ful number ce Ming waterourse re ceiving waterourse re ceiving watero te alled Rive te of assessment tes tep 1 Runoff Quality tep 2 River Impacts Enter zero in Annual Q <sub>es</sub> ver flow to assess tep 1 runoff quality ny)	Highways Englat       EQS - Annual Average ( Copper 0.00       -<	Solubit Concentration Zinc 0.01 - NHRR Non-cumulative asse Easting 455 Easting 455 Easting 455 Easting 455 Easting 455 08-05-2023 08-05-2023 d <50.000 d <50.000	ssmert (single outfall) 450 Climatic regio	Acute In Copper Pass HE Area / DBFO r HE Area / DBFO r List of outfalls in c assessment Assessor and affit Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso	Inpact	f a protect	Sediment deposition Accumulating? Extensive? Area 7 A.J. 2 Lincain (SAAR 000mm)	Pass for this site is judged as: 5 0.02 Low/low Vel 9 0.02 0.04 0.04 0.04 0.04 0.04 0.04 0.04
	Highways Englat       EQS - Annual Average I       Copper       0.00       -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50.000  d < 50.000  Hgh =>200mg CaC034		Acute In Copper Pass HE Area / DBFO r Assessment Assessor and affil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp For dissolved copp	Pass Pass Pass Pass Northing Northing Northing Northing Northing Rainfall site Pass Pass Pass Pass Pass Pass Pass Pas	f a protect	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 AJ 2 Lincoln (SAAR 600mm) 1 D 109 D ed site for conservation und concentration (ug/l)	Pass for this site is judged as: 5 0.02 Cov Flow Vel 4 Deposition In
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubie Concentration Zinc 6.01 - NHRR Non-cumulative asse Easting Highway Catchment Riparian Watercour 08-05-2023 d < 50.000 d < 50.000 d < 50.000 - High => 200mg CaCO34 High => 200mg CaCO34		Acute In Copper Pass HE Area / DBFO r Assessment Assessor and affil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp For dissolved copp	Pass Pass Pass Pass Northing Northing Northing Northing Northing Rainfall site Pass Pass Pass Pass Pass Pass Pass Pas	f a protect	Sediment deposition Accumulating? Extensive? Are a 7 Are a 7 AJ 2 Linodin (SAAR 600mm)	Pass for this site is judged as: 5 0.02 Cov Flow Vel 4 Deposition In
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50.000  d < 50.000  Hgh =>200mg CaC034		Acute In Copper Pass HE Area / DBFO r Assessment Assessor and affil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp For dissolved copp	Pass Pass Pass Pass Northing Northing Northing Northing Northing Rainfall site Pass Pass Pass Pass Pass Pass Pass Pas	f a protect	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 AJ 2 Lincoln (SAAR 600mm) 1 D 109 D ed site for conservation und concentration (ug/l)	Pass for this site is judged as: 5 0.02 Covifion Vel 0eposition In 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50 000  d < 50 000  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34	e ugi ugi sament (single outfall) 450 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Acute In Copper Pass HE Area / DBFO r Assessor and affil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp within 100m of the point of dis	Inpact  Impact  mpact Impa	of a protect	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 AJ 2 Linodin (SAAR 000mm) 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Pass for this site is judged as: 5 0.02 0.04 0.04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50 000  d < 50 000  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34	e ugi ugi sament (single outfall) 450 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Acute In Copper Pass HE Area / DBFO r Assessment Assessor and affil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp For dissolved copp	Inpact  Impact  mpact Impa	of a protect	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 AJ 2 Lincoln (SAAR 600mm) 1 09 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Pass for this site is judged as: 5 0.02 Cov Flow Vel 4 Deposition In
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50 000  d < 50 000  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34	e ugi ugi sament (single outfall) 450 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Acute In Copper Pass HE Area / DBFO r Assessor and affil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp within 100m of the point of dis	Inpaet Zinc Pass Pass Inumber Inumber Inumber Inumuber Inumulative Iaition	of a protect nt backgro de slope (r	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 AJ 2 Linodin (SAAR 000mm) 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Pass for this site is judged as: 5 0.02 0.04 0.04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50 000  d < 50 000  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34	e ugi ugi sament (single outfall) 450 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Acute In Copper Pass HE Area / DBFO r List of outfalls in c assessment Assessor and affil Assessor and affil Version of assess Nersion of assess Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp within 100m of the point of di anning's n 003	Appaet Zinc Pass Anumber Pass Anumber Anumber Anumber Anumulative aation	[ ] If a protect the backgro	Sediment deposition Accumulating? Yes Extensive? No Area 7 Area 7 A.J. 2 Lincain (SAAR 000mm) 10.9 0 10.9 0 0 m/m) 0.71 Lo	Pass  for this site is judged as:
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Cencentration Zinc 6.01  NHIRR Non-cumulative asse Eastina 45 Eastina 45 Eastina 08-05-2023 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<00.000 4<	e ugi ugi sament (single outfall) 450 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Acute In Copper Pass HE Area / DBFO r Assessor and affi Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp within 100m of the point of dis anning's n O3	Inpaet Zinc Pass Pass Inumber Inumber Inumber Inumber Inumulative Iaition	f a protect	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 AJ 2 Linodin (SAAR 000mm) 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Pass  for this site is judged as:
	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Concentration Zine 6.01  NHRR Non-cumulative asse Eastina Highway C atchment Riparian Watercour 08-05-2023  d < 50 000  d < 50 000  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34  Hgh =>200mg CaCO34	e ugi ugi sament (single outfall) 450 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Acute In Copper Pass HE Area / DBFO r Assessment Assessor and afil Version of assess n Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Is the discharge in or with For dissolved copp within 100m of the point of di anning's n Treatment for solubles (%) re	Inpact Zinc Pass Inumber Inumber Inumber Inumulative Iation Rainfall site Inter only Inter only Scharge? Estimated effective Attenuation for sol	f a protect f a protect th backgro de slope (r ubles - s) slope (s)	Sediment deposition Accumulating? Extensive? Area 7 Area 7 AJ AJ 2 Linodn (SAAR 600mm) 10.9 0 ed site for conservation und concentration (µg/l) No 0 10.9 0 concentration (µg/l) No 0 concentration (µg/l)	Pass for this site is judged as: 5 0.02 0.04 0.04 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
highways england Step 2	Highways Englat         EQS - Annual Average I         Copper         0.00         -	Solubil Cencentration Zinc 6.01  NHIRR Non-cumulative asse Eastina 45 Eastina Highway C atchment Riparian Watercour 08-05-2023  4 <0.000  4 <0.000  High =>200mg CaCO31 tructure, lake, pond or canal th driver width (m) th (m)	e ugi ugi ugi sament (single outfall) 450 8 8 8 9 0 0 1 1 459 0 28 1 1 459 0 28 1 1 1 1 1 1 1 1 1 1 1 1 1	Acute In Copper Pass HE Area / DBFO r Assessor and affil Version of assess In Colder Dry Freshwater EQS limits: Bioavailable disso Bioavailable disso Bioavailable disso Is the discharge in or with Freshwater EQS limits: Bioavailable disso Is the discharge in or with To dissolved copp within 100m of the point of di anning's n Im Treatment for Solubles (%) re Im Im Treatment for Im	Pass Pass Pass Pass Pass Pass Pass Northing Rainfall site Pass Pass Pass Pass Pass Pass Pass Pas	f a protect f a protect the source of the	Sediment deposition Accumulating? Yes Extensive? No Are a 7 Are a 7 Ar	Pass           for this site is judged as:           0.02         Low flow Veir           14         Deposition In

highways england	Highways England V	Vater Risk Assessment To	ol	Version 2.0.4 June 2019	
engiano	5 5 5	Soluble			Sediment - Chronic Impact
	EQS - Annual Average Conc	entration		Acute Impact	
	Copper	Zinc			Pass
Step 2	0.01	0.03	ug/l	Copper Zinc	Sediment deposition for this site is judged as:
				Pass Pass	Accumulating? Yes 0.02 Low flow Vel m/s
Step 3	·	-	ug/l		Extensive? No 34 Deposition Index
Road number		NHRR		HE Area / DBFO number	Area 7
Assessment type		Non-cumulative assessment	(single outfall)		-
OS grid reference of assessmen		Easting 495450			34700
OS grid reference of outfall struct	ture (m)	Easting		Northing	
Outfall number Receiving watercourse		Highway C atchment 8 Riparian Watercourse		List of outfalls in cumulative assessment	
EA receiving water D etailed Rive	er Network ID	Ripanan watercourse		Assessor and affiliation	LA
Date of assessment		08-05-2023		Version of assessment	2
Notes					
Step 1 Runoff Quality					
Step 1 Kunon Quanty	AADT >10,000 and <50	.000	Climatic region Cold	r Dry   Rainfall site	Lincoln (SAAR 600mm)
Step 2 River Impacts					
	Annual Q <sub>95</sub> river flow (m <sup>3</sup> /s)		0.31 Fre	shwater EQS limits:	
(Enter zero in Annual Q <sub>95</sub> river flow box to assess	Impermeable road area drain	ed (ha)	6.92	Bioavailable dissolved copper (µg/l)	1 D
Step 1 runoff quality	Permeable area draining to o	outfall (ha)	1.812	Bioavailable dissolved zinc (µg/l)	10.9 D
only)	Base Flow Index (BFI)		0.26 Is the	discharge in or within 1 km upstream of a	protected site for conservation?
For dissolved zinc only	Water hardness	High = >200mg CaCO3/	·	For dissolved copper only Ambient be	ackground concentration (µg/l)
For sediment impact only	Is there a downstream structu	ure, lake, pond or canal that redu	ces the velocity within 10	0m of the point of discharge?	No 💌 D
			18		
	C Tier 2 Bed width (m	)	1 Manning's	n 0.03 Side s	lope (m/m) 0.71 Long slope (m/m) 0.0001
Step 3 Mitigation					
<u>step s mitigation</u>				E stim ated effective nes	
		Briefdescription		Treatment for Attenuation for soluble solubles (%) restricted discharge rate	
		brier description			
Existing measures Proposed measures			0	D No restriction	
Proposed measures					
Highway Cate	chmont 4 5	6 7 8 and 9	Cumulat	ive Sediment Acc	ecoment
Highway Cato				ive Sediment Ass	essment
Highway Cato		Water Risk Assessment To		Version 2.0.4 June 2019	
Highway Cato	Highways England	Water Risk Assessment To Soluble		Version 2.0.4 June 2019	essment Sediment - Chronic Impact
highways england		Water Risk Assessment To Soluble			
highways england	Highways England EQS - Annual Average Con	Water Risk Assessment To Soluble centration		Version 2.0.4 June 2019	Sediment - Chronic Impact Pass
highways england	Highways England EQS - Annual Average Con Copper	Water Risk Assessment To Soluble centration Zinc		Version 2.0.4 June 2019 Acute Impact	Sediment - Chronic Impact
heghways	Highways England EQS - Annual Average Con Copper	Water Risk Assessment To Soluble centration Zinc		Version 2.0.4 June 2019 Acute Impact Copper Zinc	Sediment - Chronic Impact Pass Sediment deposition for this site is judged as:
highways england	Highways England EQS - Annual Average Con Copper	Water Risk Assessment To Soluble centration Zinc	ug/i	Version 2.0.4 June 2019 Acute Impact Copper Zinc	Sediment - Chronic Impact Pass Sediment deposition for this site is judged as: Accumulating? Yes 0.02 Low flow Vel m/s
shiphways england Step 2 Step 3	Highways England EQS - Annual Average Con Copper	Water Risk Assessment To Soluble centration Zine 0.08	ug/i	Version 2.0.4 June 2019 Acute Impact Copper Zine Pass Pass	Sediment - Chronic Impact Pass Sediment deposition for this site is judged as: Accumulating? Extensive? No 0.02 Deposition Index
Road number	Highways England EQS - Annual Average Con Copper	Water Risk Assessment To Soluble centration Zinc 0.09 -	log ug/l	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number	Sediment - Chronic Impact Pass Sediment deposition for this site is judged as: Accumulating? Yes 0.02 Low flow Vel m/s
shiphways england Step 2 Step 3	Highways England 1 EQS - Annual Average Con Copper 0 02	Water Risk Assessment To Soluble centration Zine 0.08	log ug/l	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m)	Sediment - Chronic Impact Pass Sediment deposition for this site is judged as: Accumulating? Extensive? No 0.02 Deposition Index
Road number Assessment type OS and reference of assessment OS and reference of assessment	Highways England 1 EQS - Annual Average Con Copper 0.02 nt point (m )	NHRR           Cumulative assessment incl           Easting         495450           Easting         495450	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zine Pass Pass HE Area / DBFO number Is within 100m) Northing 3 Northing 1	Sediment - Chronic Impact           Pass           Sediment deposition for this site is judged as: Accumulating?           Yes         0.02         Low How Vel m/s           No         82         Deposition Index           Area 7         *
Road number Assessment two OS and reference of assessmen OS and reference of assessmen OS and reference of outfail struc Outfail number	Highways England 1 EQS - Annual Average Con Copper 0.02 nt point (m )	NHRR Cumulative assessment incl Easting Highway catchments 4,5,6	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m) Northing 3	Sediment - Chronic Impact           Pass           Sediment deposition for this site is judged as: Accumulating?           Yes         0.02         Low How Vel m/s           No         82         Deposition Index           Area 7         *
Road number Assessment type OS and reference of assessment OS and reference of assessment	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR           Cumulative assessment incl           Easting         495450           Easting         495450	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m) Northing 3 Northing 1 List of outfalls in cumulative	Sediment - Chronic Impact           Pass           Sediment deposition for this site is judged as: Accumulating?           Yes         0.02         Low How Vel m/s           No         82         Deposition Index           Area 7         *
Road number Assessment type OS grid reference of assessmer OS grid reference of outfall struc Outfall number Receiving watercourse	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR Cumulative assessment incl Easting Highway catchments 4,5,6	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zine Pass Pass HE Area / DBFO number Is within 100m) Northina 3 Northina 3 List of outfalls in cumulative assessment acutation acuta	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02 No       Area 7       Area 7       84700
Road number Assessment type OS quid reference of assessment OS quid reference of outfail struc Outfail number Receiving water Detailed Riv	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR Cumulative assessment incl Easting Highway catchments 4,5,6 Riparian Watercourse	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m) Northing 3 Northing List of outfalls in cumulative assessment Assessor and affiliation	Sediment - Chronic Impact       Pas       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02     Low How Yelm/s       Extensive?     Yes     0.02       Area 7     •       64700     •
Bengland       Step 2       Step 3         Road number       Assessment type       OS and reference of assessment       Ostard reference of assessment       Outfall number       Receiving watercourse       EA receiving water balled Riv       Date of assessment	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR Cumulative assessment incl Easting Highway catchments 4,5,6 Riparian Watercourse	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m) Northing 3 Northing List of outfalls in cumulative assessment Assessor and affiliation	Sediment - Chronic Impact       Pas       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02     Low How Yelm/s       Extensive?     Yes     0.02       Area 7     •       64700     •
Bengland       Step 2       Step 3         Road number       Assessment type       OS and reference of assessment       Ostard reference of assessment       Outfall number       Receiving watercourse       EA receiving water balled Riv       Date of assessment	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR Cumulative assessment incl Easting Highway catchments 4,5,6 Riparian Watercourse	ugri ugri uding sediments (outra	Version 2.0.4 June 2019 Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m) Northing 3 Northing List of outfalls in cumulative assessment Assessor and affiliation	Sediment - Chronic Impact       Pas       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02     Low How Yelm/s       Extensive?     Yes     0.02       Area 7     •       64700     •
Road number         Assessment type         OS and reference of assessment         Step 2         Step 3	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR           Cumulative assessment Incl           0.09	ugil ugil uding sediments (outfa	Version 2.0.4 June 2019           Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Pass           Its of outfolio in cumulative assessment         Assessor and affilia 50n           Version of assessment         Version of assessment	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02       Low flow Vel m/s       B2       Deposition Index       Area 7       Area 7       Area 7       Area 7       Area 7
Bengland       Step 2       Step 3         Road number       Assessment type       OS and reference of assessment       Ostard reference of assessment       Outfall number       Receiving watercourse       EA receiving water balled Riv       Date of assessment	Highways England 1 EQS - Annual Average Con Copper 0.02	NHRR           Cumulative assessment Incl           Zinc           0.08	ugri ugri uding sediments (outra	Version 2.0.4 June 2019  Acute Impact Copper Zinc Pass Pass HE Area / DBFO number Is within 100m) Northina 3 Northina 3 Northina 4 List of outfalls in cumulative assessment Version of assessment	Sediment - Chronic Impact       Pas       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02     Low How Yelm/s       Extensive?     Yes     0.02       Area 7     •       64700     •
Road number         Assessment type         OS and reference of assessment         Step 2         Step 3	AADT	NHRR           Cumulative assessment Incl           0.09	Uding sediments (outfa	Version 2.0.4 June 2019           Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Northing           Iswithin 100m)         Northing           List of outfalls in cumulative assessment         Assessor and affiliation           Version of assessment         Pass	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02       Low flow Vel m/s       B2       Deposition Index       Area 7       Area 7       Area 7       Area 7       Area 7
heighnays     england     Step 2     Step 2     Step 3      Road number     Assessment tyce     DS and reference of assessment     Soft reference of utfail struc     Outfail number     Receiving waterourse     EA rocking waterourse     EA rocking waterourse     Step 1 Runoff Quality     Step 1 Runoff Quality      Step 2 River Impacts	AADT >10,000 and <50	NHRR Cumulative assessment Ind Easting 495450 Easting 495450 Easting 495450 Riparian Watercourse 08-05-2023	Uding sediments (outfa	Version 2.0.4 June 2019           Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Northing           Is within 100m)         Northing           List of outfalls in cumulative assessment         Northing           Assessor and affiliation         Version of assessment           Version of assessment         Northing           erOry         Rainfall site	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02 No       Are a 7       Are a 7       64700
Angle A	AADT	NHRR Cumulative assessment Ind Easting 495450 Easting 495450 Easting 495450 Riparian Watercourse 08-05-2023	Uding sediments (outfa	Version 2.0.4 June 2019           Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Northing           Iswithin 100m)         Northing           List of outfalls in cumulative assessment         Assessor and affiliation           Version of assessment         Pass	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02       Low flow Vel m/s       B2       Deposition Index       Area 7       Area 7       Area 7       Area 7       Area 7
Angleways     Angleways     Angleways     Angleways     Step 2     Step 2     Step 3     Step 3     Angleways     Assessment type     OS grid reference of assessment     OS grid reference of assessment     OS grid reference of assessment     Notes     Step 1 Runoff Quality     Step 2 River Impacts     (Enter zero in Annual Qee     river flow box to assess     Step 1 runoff Quality	AADT >10,000 and <50	Vater Risk Assessment To Soluble centration Zine 0.08 Cumulative assessment incl Eastina Highway catchments 4,5,6 Riparian Watercourse Highway catchments 4,5,6 Riparian Watercourse 08-05-2023	Uding sediments (outfa	Version 2.0.4 June 2019           Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Northing           Is within 100m)         Northing           List of outfalls in cumulative assessment         Northing           Assessor and affiliation         Version of assessment           Version of assessment         Northing           erOry         Rainfall site	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02 No       Are a 7       Are a 7       64700
Indiverse in the set of the	AADT 210,000 and 420 AADT 210,000 and 420 AADT 210,000 and 420 Annual Q <sub>int</sub> river flow (m <sup>3</sup> /s) Impermeable road area drain	Vater Risk Assessment To Soluble centration Zine 0.08 Cumulative assessment incl Eastina Highway catchments 4,5,6 Riparian Watercourse Highway catchments 4,5,6 Riparian Watercourse 08-05-2023	Uding sediments (outfa	Version 2.0.4 June 2019           Acute Impact           Copper         Zinc           Pass         Pass           HE Area / DBFO number         Base some some some some some some some so	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02 No       Are a 7       Are a 7       64700
Indiverse in the set of the	ADT >10,000 and <20	NHRR Cumulative assessment Ind Easting Highway catchments 4,5,6 Riparian Watercourse 08-05-2023	ugrl         ugrl           ugrl         ugrl           uding sediments (outfa           0.7, 8, 9           Climatic region           0.31           10.956           0.471           0.28           use	Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfalls in cumulative       Northina         Assessment       Assessment         Assessment       Version of assessment         ex Dry       Rainfall site         eshwater EQS limits:       Bioavailable dissolved copper (µg/l)         Bioavailable dissolved zinc (µg/l)       Bioavailable dissolved zinc (µg/l)         et scharge in or within 1 km upstream of a	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02       Low flow Vel m/s         Area 7       No       82       Deposition Index         Area 7       •       64700       •       •         Area 7       •       •       •       •         Area 7       •       •       •       •         64700       •       •       •       •         AJ       2       •       •       •         1       •       •       •       •         108       •       •       •       •         108       •       •       •       •
Angleways     Angleways     Angleways     Angleways     Step 2     Step 2     Step 3     Step 3     Angleways     Assessment type     OS grid reference of assessment     OS grid reference of assessment     OS grid reference of assessment     Notes     Step 1 Runoff Quality     Step 2 River Impacts     (Enter zero in Annual Qee     river flow box to assess     Step 1 runoff Quality	Highways England I         EQS - Annual Average Con         Copper         0.02         - <t< td=""><td>Vater Risk Assessment To Soluble centration Zine 0.08 Cumulative assessment incl Eastina Highway catchments 4,5,6 Riparian Watercourse Highway catchments 4,5,6 Riparian Watercourse 08-05-2023</td><td>Uding sediments (outfa</td><td>Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfalls in cumulative       Northina         Assessment       Assessment         Assessment       Version of assessment         ex Dry       Rainfall site         eshwater EQS limits:       Bioavailable dissolved copper (µg/l)         Bioavailable dissolved zinc (µg/l)       Bioavailable dissolved zinc (µg/l)         et scharge in or within 1 km upstream of a</td><td>Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02 No       Are a 7       Are a 7       64700</td></t<>	Vater Risk Assessment To Soluble centration Zine 0.08 Cumulative assessment incl Eastina Highway catchments 4,5,6 Riparian Watercourse Highway catchments 4,5,6 Riparian Watercourse 08-05-2023	Uding sediments (outfa	Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfalls in cumulative       Northina         Assessment       Assessment         Assessment       Version of assessment         ex Dry       Rainfall site         eshwater EQS limits:       Bioavailable dissolved copper (µg/l)         Bioavailable dissolved zinc (µg/l)       Bioavailable dissolved zinc (µg/l)         et scharge in or within 1 km upstream of a	Sediment - Chronic Impact       Pass       Sediment deposition for this site is judged as: Accumulating?       Yes     0.02 No       Are a 7       Are a 7       64700
Indiverse in the set of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	NHRR Cumulative assessment Ind Easting 495450 Easting 495450 Easti	ugil         ugil           ugil         ugil           ugil         ugil           Climatic region         Cat           0.31         Fr           0.28         Is th	Version 2.0.4 June 2019         Acute Impact         Copper       Zine         Pass       Pass         HE Area / DBFO number       Pass         Interview       Pass         HE Area / DBFO number       Pass         Is within 100my       Northina         List of outfails in cumulative assessment       Assessor and a filia 3ton         Version of assessment       Version of assessment         er Dry       Rainfall site         Bioavailable dissolved copper (µg/l)       Bioavailable dissolved zinc (µg/l)         e discharge in or within 1 km upstream of a       For dissolved copper only	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02       Low flow Vel m/s         Area 7       No       82       Deposition Index         Area 7       •       64700       •       •         Area 7       •       •       •       •         Area 7       •       •       •       •         64700       •       •       •       •         AJ       2       •       •       •         1       •       •       •       •         108       •       •       •       •         108       •       •       •       •
Indiverse in the initial of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	Water Risk Assessment To Soluble centration Zinc 0.08 Cumulative assessment incl Eastina 495450 Eastina 495450 Highway catchments 4,5,6 Riparian Watercourse 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 uncl (ha) cuttall (ha)	Climatic region Cold 031 Fr 028 Is th ccs the velocity within 1	Version 2.0.4 June 2019         Acute Impact         Copper       Zine         Pass       Pass         HE Area / DBFO number       Pass         Interview       Pass         HE Area / DBFO number       Pass         Is within 100my       Northina         List of outfails in cumulative assessment       Assessor and a filia 3ton         Version of assessment       Version of assessment         er Dry       Rainfall site         Bioavailable dissolved copper (µg/l)       Bioavailable dissolved zinc (µg/l)         e discharge in or within 1 km upstream of a       For dissolved copper only	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02       Low How Velm/s         Extensive?       No       82       Deposition Index         Are a 7       •       82       Deposition Index         Are a 7       •       82       Deposition Index         Are a 7       •       •       •         action (SAAR 600mm)       •       •       •         1       •       •       •       •         109       •       •       •       •         ackground concentration (ug/l)       •       •       •
Indiverse in the initial of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	Water Risk Assessment To Soluble centration Zinc 0.08 Cumulative assessment incl Eastina 495450 Riparian Watercourse 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023	Climatic region Cold 0.31 Fr 0.28 Is th 0.28 Is th 0.28 Is th	Version 2.0.4 June 2019         Acute Impact         Copper         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfails in cumulative assessment       Assessor and atfiliation         Version of assessment       Version of assessment         er Dry       Rainfall site         Bioavailable dissolved copper (µg/l)       Bioavailable dissolved zinc (µg/l)         Bioavailable dissolved zinc (µg/l)       Ambient b         D0m of the point of discharge?       The point of discharge?	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02       Low How Velm/s         Extensive?       No       82       Deposition Index         Area 7       •       •       •         64700       •       •       •         1       •       •       •         109       •       •       •         109       •       •       •         No       •       •       •
Indiverse in the initial of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	Water Risk Assessment To Soluble centration Zinc 0.08 Cumulative assessment incl Eastina 495450 Riparian Watercourse 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023	Climatic region Cold 031 Fr 028 Is th ccs the velocity within 1	Version 2.0.4 June 2019         Acute Impact         Copper         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfails in cumulative assessment       Assessor and atfiliation         Version of assessment       Version of assessment         er Dry       Rainfall site         Bioavailable dissolved copper (µg/l)       Bioavailable dissolved zinc (µg/l)         Bioavailable dissolved zinc (µg/l)       Ambient b         D0m of the point of discharge?       The point of discharge?	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02       Low How Velm/s         Extensive?       No       82       Deposition Index         Are a 7       •       82       Deposition Index         Are a 7       •       82       Deposition Index         Are a 7       •       •       •         action (SAAR 600mm)       •       •       •         1       •       •       •       •         109       •       •       •       •         ackground concentration (ug/l)       •       •       •
Indiverse in the set of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	Water Risk Assessment To Soluble centration Zinc 0.08 Cumulative assessment incl Eastina 495450 Riparian Watercourse 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023	Climatic region Cold 0.31 Fr 0.28 Is th 0.28 Is th 0.28 Is th	Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfalls in cumulative       Assessment         Assessment       Assessment         Assessment       Version of assessment         Version of assessment       Side states         Bioavailable dissolved copper (ug/l)       Bioavailable dissolved zinc (ug/l)         a discharge in or within 1 km upstream of a       For dissolved copper only         Ambient b       D00m of the point of discharge?	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02       Low How Velm/s         Area 7       No       B2       Deposition Index         Area 7       •       •       •         64700       •       •       •         AJ       2       •       •         1       •       •       •         108       •       •       •         108       •       •       •         slope (m/m)       •       •       •
Indiverse in the initial of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	Water Risk Assessment To Soluble centration Zinc 0.08 Cumulative assessment incl Eastina 495450 Riparian Watercourse 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023	Climatic region Cold 0.31 Fr 0.28 Is th 0.28 Is th 0.28 Is th		Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Yes       0.02 No       Low How Velm/s         Are a 7       No       92       Deposition Index         Are a 7       No       92       Deposition Index         Are a 7       No       92       Deposition Index         Are a 7       No       No       No       No         Are a 7       No       No       No       No       No         Are a 7       No       No
Indiverse in the set of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	NHRR         Cumulative assessment Include         0.08         -         NHRR         Cumulative assessment incl         Eastina         45450         Eastina         Highway catchments 4,5,6         Riparian Watercourse         08-05-2023         08-05-2023         08-05-2023         under the second sec	Climatic region Cold 0.31 Fr 0.28 Is th 0.28 Is th 0.28 Is th	Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfalls in cumulative       Assessment         Assessment       Assessment         Assessment       Version of assessment         Version of assessment       Side states         Bioavailable dissolved copper (ug/l)       Bioavailable dissolved zinc (ug/l)         a discharge in or within 1 km upstream of a       For dissolved copper only         Ambient b       D00m of the point of discharge?	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Accumulating?       Yes       0.02       Low How Velm's BarDo         Area 7       •         B4700       •         Linotin (SAAR 800mm)       •         1       •         108       •         sckground concentration (ug/l)       •         No       •         silope (m/m)       •         Settlement of       •
Step 2         Step 2         Step 3         Road number         Assessment two         OS and reference of assessment         OS and reference of assessment         OS and reference of assessment         Date of assessment         Date of assessment         Notes         Step 1 Runoff Quality         Step 2 River Impacts         (Enter zero in Annual Que river flow box to assess Step 1 nuoff quality only)         For dissolved zinc only         For sediment impact only         For sediment impact only	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	Water Risk Assessment To Soluble centration Zinc 0.08 Cumulative assessment incl Eastina 495450 Riparian Watercourse 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023 08-05-2023	Climatic region Cold 0.31 Fr 0.28 Is th 10.29 Is th 10.20 Is th 1	Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass          HE Area / DBFO number       Pass         Is within 100my       Northina         List of outfalls in cumulative       Assessor and affilia Bon         Version of assessment       Version of assessment         er Dry       Rainfall site         eshwater EQS limits:       Bioavailable dissolved copper (µg/l)         Bioavailable dissolved zinc (µg/l)       Bioavailable dissolved zinc (µg/l)         e discharge in or within 1 km upstream of a       For dissolved copper only         Ambient b       Side #         E stim ated effective net reation for soluble (%)       Attenuation for soluble reation for soluble (%)	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Accumulating?       Yes       0.02       Low How Velm/s         Extensive?       No       92       Deposition Index         Are a 7       •       6       92       Deposition Index         Are a 7       •       •       •       •         64700       •       •       •       •         1       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •         109       •       •       •       •       •       •         109       •       •       •       •       •       •
Indiverse in the set of the	Highways England I         EQS - Annual Average Con         Copper         0.02         -         0.02         -	NHRR         Cumulative assessment Include         0.08         -         NHRR         Cumulative assessment incl         Eastina         45450         Eastina         Highway catchments 4,5,6         Riparian Watercourse         08-05-2023         08-05-2023         08-05-2023         under the second sec	Climatic region Cold 0.31 Fr 0.28 Is th 0.28 Is th 0.28 Is th	Version 2.0.4 June 2019         Acute Impact         Copper       Zinc         Pass       Pass         HE Area / DBFO number       Pass         Is within 100m)       Northina         List of outfalls in cumulative assessment       Assessment         Assessment       Northina         Assessment       Version of assessment         Version of assessment       Version of assessment         Statistics       Bioavailable dissolved copper (ug/l)         Bioavailable dissolved zinc (ug/l)       Bioavailable dissolved zinc (ug/l)         e discharge in or within 1 km upstream of a       For dissolved copper only Ambient b         00m of the point of discharge?       Side =         E stim ated effectivener       Treatment for soluble (%)         E stim ated effectivener       Treatment for of Attraue tion for soluble	Sediment - Chronic Impact         Pass         Sediment deposition for this site is judged as: Accumulating?         Accumulating?       Yes       0.02       Low How Velm's BarDo         Area 7       •         B4700       •         Linotin (SAAR 800mm)       •         1       •         108       •         sckground concentration (ug/l)       •         No       •         silope (m/m)       •         Settlement of       •

#### Spillage Assessment

#### Spillage assessment Point A

	england	View Paramet	iers Rese	t Spillage Risk	Go To Inter	ace			
lss	essment of Priority Outfalls								
<b>Neth</b>	od D - assessment of risk from accidental spillage		Additional columns	for use if other roads	drain to the same o	utfall		1	
		A (main road)	В	С	D	E	F	1	
D1	Water body type	Surface watercourse	Surface watercourse	Surface watercourse	Surface watercourse			1	
D2	Length of road draining to outfall (m)	1,155	355	130	315			1	
D3	Road Type (A-road or Motorway)	A	A	A	A				
D4	If A road, is site urban or rural?	Rural	Rural	Rural	Rural			1	
D5	Junction type	No junction	Roundabout	Roundabout	Slip road			]	
D6	Location (response time for emergency services)	< 20 minutes	< 20 minutes	< 20 minutes	< 20 minutes				
D7	Traffic flow (AADT two way)	32,323	32,323	32,323	3,625				
	% HGV	3.43	3.43	3.43	1.12				
D8	Spillage factor (no/10 <sup>9</sup> HGVkm/year)	0.29	3.09	3.09	0.93				
	Risk of accidental spillage			0.00016	0.00000	0.00000	0.00000		
D10	Probability factor	0.45	0.45	0.45	0.45				
D11	Risk of pollution incident	0.00006	0.00020	0.00007	0.00000	0.00000	0.00000		Return Perio
D12	Is risk greater than 0.01?	No	No	No	No			Totals	(years)
D13	Return period without pollution reduction measures	0.00006	0.00020	0.00007	0.00000	0.00000	0.00000	0.0003	2977
D14	Existing measures factor	1	1	1	1				
D15	Return period with existing pollution reduction measures	0.00006	0.00020	0.00007	0.00000	0.00000	0.00000	0.0003	2977
D16	Proposed measures factor	1	1	1	1				
D17	Residual with proposed Pollution reduction measures	0.00006	0.00020	0.00007	0.00000	0.00000	0.00000	0.0003	2977

#### Spillage assessment Point B (catchment 4, 5, 6 and 7)

england	View Parameters	Reset Spillage Risk	Go To Interface	
england	View Parameters	Reset Spillage Risk	Go To Interface	

#### Assessment of Priority Outfalls

							-	
od D - assessment of risk from accidental spillage		Additional columns	for use if other roads	s drain to the same o	utfall		1	
	A (main road)	В	С	D	E	F	1	
Water body type	Surface watercourse	Surface watercourse	Surface watercourse				1	
Length of road draining to outfall (m)	2,336	360	530				1	
Road Type (A-road or Motorway)	A	A	A				]	
If A road, is site urban or rural?	Rural	Rural	Rural		<b>•</b>		1	
Junction type	No junction	Roundabout	Side road				1	
Location (response time for emergency services)	< 20 minutes	< 20 minutes	< 20 minutes				]	
Traffic flow (AADT two way)	36,798	36,798	3,625				1	
% HGV	2.32	2.32	1.12				1	
Spillage factor (no/10 <sup>9</sup> HGVkm/year)	0.29	3.09	0.93				1	
Risk of accidental spillage	0.00021	0.00035	0.00001	0.00000	0.00000	0.00000	1	
Probability factor	0.45	0.45	0.45					
Risk of pollution incident	0.00009	0.00016	0.00000	0.00000	0.00000	0.00000		Return Period
Is risk greater than 0.01?	No	No	No				Totals	(years)
Return period without pollution reduction measures	0.00009	0.00016	0.00000	0.00000	0.00000	0.00000	0.0003	3933
Existing measures factor	1	1	1					
Return period with existing pollution reduction measures	0.00009	0.00016	0.00000	0.00000	0.00000	0.00000	0.0003	3933
Proposed measures factor	1	1	1					
Residual with proposed Pollution reduction measures	0.00009	0.00016	0.00000	0.00000	0.00000	0.00000	0.0003	3933
	Road Type (A-road or Motorway)         If A road, is site urban or rural?         Junction type         Location (response time for emergency services)         Traffic flow (AADT two way)         % HGV         Spillage factor (no/10 <sup>3</sup> HGVkm/year)         Risk of accidental spillage         Probability factor         Risk of pollution incident         Is risk greater than 0.01?         Return period without pollution reduction measures         Existing measures factor         Proposed measures factor	A (main road)           Water body type         Surface watercourse           Length of road draining to outfall (m)         2,336           Road Type (A-road or Motorway)         A           If A road, is site urban or rural?         Rural           Junction type         No junction           Location (response time for emergency services)         < 20 minutes	A (main road)         B           Water body type         Suface watercourse         Suface watercourse           Length of road draining to outfall (m)         2,336         360           Road Type (A-road or Motorway)         A         A           If A road, is site urban or rural?         Rural         Rural           Junction type         No junction         Roundabout           Location (response time for emergency services)         < 20 minutes	A (main road)         B         C           Water body type         Surface watercourse         Surface watercourse         Surface watercourse         Surface watercourse           Length of road draining to outfall (m)         2,336         360         530           Road Type (A-road or Motorway)         A         A         A           If A road, is site urban or rural?         Rural         Rural         Rural           Junction type         Coation (response time for emergency services)         < 20 minutes	A (main road)         B         C         D           Water body type         Surface watercourse         Surface watercourse	A (main road)         B         C         D         E           Water body type         Surface watercourse         Surface waterc	A (main road)         B         C         D         E         F           Water body type         Surface watercourse         Surface watercourse	A (main road)         B         C         D         E         F           Water body type         Surface watercourse         Surface watercourse         Surface watercourse         Image: Surface wat

#### Spillage assessment Point C (Catchment 8 and 9)

Sight Spillage Risk Go To Interface
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#### Assessment of Priority Outfalls

Meth	od D - assessment of risk from accidental spillage		Additional columns	for use if other roads	s drain to the same o	utfall			
		A (main road)	В	С	D	E	F		
D1	Water body type	Surface watercourse	Surface watercourse	Surface watercourse					
D2	Length of road draining to outfall (m)	3,339	196	824					
D3	Road Type (A-road or Motorway)	A	A	A					
D4	If A road, is site urban or rural?	Urban	Rural	Rural					
D5	Junction type	No junction	Roundabout	Side road					
D6	Location (response time for emergency services)	< 20 minutes	< 20 minutes	< 20 minutes					
D7	Traffic flow (AADT two way)	49,121	49,121	6,727					
D8	% HGV	2.68	2.68	1.96					
D8	Spillage factor (no/10 <sup>9</sup> HGVkm/year)	0.29	3.09	0.93					
D9	Risk of accidental spillage	0.00047	0.00029	0.00004	0.00000	0.00000	0.00000		
D10	Probability factor	0.45	0.45	0.45					
D11	Risk of pollution incident	0.00021	0.00013	0.00002	0.00000	0.00000	0.00000		Return Period
D12	Is risk greater than 0.01?	No	No	No				Totals	(years)
D13	Return period without pollution reduction measures	0.00021	0.00013	0.00002	0.00000	0.00000	0.00000	0.0004	2802
D14	Existing measures factor	1	1	1					
D15	Return period with existing pollution reduction measures	0.00021	0.00013	0.00002	0.00000	0.00000	0.00000	0.0004	2802
D16	Proposed measures factor	1	1	1					
D17	Residual with proposed Pollution reduction measures	0.00021	0.00013	0.00002	0.00000	0.00000	0.00000	0.0004	2802

#### Spillage assessment Catchment 10

highways england	View Parame	ters Res	et Spillage Risk	Go To Inter	face						
Assessment of Priority Outfalls											
Method D - assessment of risk from accidental spillage		Additional columns	for use if other road	s drain to the same o	utfall		7				
	A (main road)	В	С	D	E	F	1				
D1 Water body type	Groundwater	Groundwater	Groundwater								
D2 Length of road draining to outfall (m)	1,145	225	573								
D3 Road Type (A-road or Motorway)	A	A	A								
D4 If A road, is site urban or rural?	Rural	Rural	Rural								
D5 Junction type	No junction	No junction	No junction								
D6 Location (response time for emergency services)	< 20 minutes	< 20 minutes	< 20 minutes								
D7 Traffic flow (AADT two way)	32,120	32,120	9,165								
D8 % HGV	3.23	3.23	4.26								
D8 Spillage factor (no/10° HGVkm/year)	0.29	3.09	0.93								
D9 Risk of accidental spillage	0.00013	0.00026	0.00008	0.00000	0.00000	0.00000	1				
D10 Probability factor	0.45	0.45	0.45								
D11 Risk of pollution incident	0.00006	0.00012	0.00003	0.00000	0.00000	0.00000		Return Perio			
D12 Is risk greater than 0.01?	No	No	No				Totals	(years)			
D13 Return period without pollution reduction measures	0.00006	0.00012	0.00003	0.00000	0.00000	0.00000	0.0002	4779			
D14 Existing measures factor	1	1	1								
D15 Return period with existing pollution reduction measures	0.00006	0.00012	0.00003	0.00000	0.00000	0.00000	0.0002	4779			
D16 Proposed measures factor	1	1	1								
D17 Residual with proposed Pollution reduction measures	0.00006	0.00012	0.00003	0.00000	0.00000	0.00000	0.0002	4779			

# Catchment 10 Groundwater Assessment

SOURCE	10 10 10 15	Traffic flow Rainfall depth (annual averages) Drainage area ratio	<=50,000 AADT <=740 mm rainfall <=50	1 1 1	10 10 10
SOURCE	10				
		Drainage area ratio	<=50	1	10
	15				
		Infiltration method	"Region", shallow infiltration systems (e.g. infiltration basin)	2	30
	20	Unsaturated zone	Depth to water table <15 m to >5 m	2	40
PATHWAY	20	Flow type (Incorporates flow type an effective grain size)	Mixed fracture and intergranular flow (e.g. consolidated deposits or unconsolidated deposits of medium – coarse sand)	2	40
PAINWAT	5	Unsaturated Zone Clay Content	>=15% clay minerals	1	5
	5	Organic Carbon	<15% to >1% SOM	2	10
	5	Unsaturated zone soil pH	pH >=8	1	5

TOTAL SCORE		160
RISK SCREENING LEVEL		Medium

NHRR-RAM-HDG-HYKE-RP-CD-05004 - P04 - North Hykeham Relief Road

# APPENDIX 2 DRAWINGS

NHRR-RAM-HDG-HYKE-RP-CD-05004



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# APPENDIX 3 WATER HARDNESS MAP



# Map showing the rate of hardness in mg/l as Calcium Carbonate in England and Wales

Figure 4 - Defra water hardness map