# Appendix 11.2

Water Quality Assessment



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# 1 Introduction

- 1.1.1 Potential impacts on surface and ground water may result from the Proposed Scheme both during construction and later during operation. Impacts may occur, for example, from pollution from site runoff (construction) or accidental spillage (operation). Further details of potential impacts are provided in **Chapter 11**. Pollutants associated with road surface runoff, such as heavy metals (copper and zinc), suspended solids, and hydrocarbons, can enter watercourses damaging sensitive species, and/ or enter groundwater contaminating potable water supplies.
- 1.1.2 The Proposed Scheme is located within areas designated for their protected species or habitats (i.e. Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Sites of Special Scientific Interest (SSSIs)); therefore, treatment of road runoff must satisfy the requirements of statutory bodies such as Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH). Further detail on protected species and habitats is provided in **Chapter 12**.
- 1.1.3 Design development has been environmentally led. Details of the initial assessments undertaken in a pre-mitigation scenario are provided in this appendix. These findings informed the design development by identifying potential impacts of a preliminary design on the water environment (as well as adverse impacts to the Proposed Scheme by the water environment), from which appropriate mitigation requirements were established and 'embedded' into the design that is assessed in **Chapter 11**.

# 2 Approach and Methods

- 2.1.1 Water quality has been assessed in line with Design Manual for Roads and Bridges (DMRB) HD45/09 guidance. Methods outlined in DMRB are used to determine potential pollution impacts from:
  - Routine Runoff to Surface Waters (Method 'A')
  - Detailed Assessment of Pollution Impacts from Routine Runoff to Surface Waters (Method 'B')
  - Assessment of Pollution Impacts from Routine Runoff on Groundwater (Method 'C')
  - Assessment of Pollution Impacts from Spillages (Method 'D')
- 2.1.2 The assessment focuses on outfalls from the A9 mainline and local or side roads which have been identified in Scottish Planning Policy (SPP) as sources of pollution to rivers and streams requiring appropriate treatment in the form of Sustainable Drainage Systems (SuDS).
- 2.1.3 Outfalls from accommodation tracks and NMUs (surfaced or unsurfaced) will not be assessed individually but will normally require a basic single level of treatment. Guidance on the appropriate treatment for tracks and NMUs has been followed as per *'Side Road and Accommodation Track SUDS' Technical Note,* AMJV (2015) (see **Annex 2**: Technical Note).
- 2.1.4 SEPA has been consulted on the design approach for SuDS and been discussed on a scheme-wide basis at Environmental Steering Group meetings. The current enhanced SuDS design (within Project 9 area) is as follows:
  - First stage of treatment will mainly comprise stone-filled filter drains at the roadside (overedge drainage) – swales or grassed filter strips may be provided as an alternative at some locations.
  - Second stage of treatment will normally comprise a detention basin (including sediment forebay and often micro-pool), or retention pond



- Enhanced stage biological treatment can be provided through halophyte vegetation in the retention basin or micro-pools, which then require regular maintenance including removal of cuttings.
- 2.1.5 Filter drains with catch-pits and detention basins with a sediment fore-bay maximises sediment containment. Outlet controls on detention basins detain first flush events and discharge at predevelopment rates or attenuated to 'greenfield' discharge, thus first flush does not discharge directly to the watercourse but is held back enabling dilution of the flow helping to minimise risks of 'shock load' due to salt and/ or other road surface contaminants. Flows in receiving watercourses will also be elevated due to the same precipitation or thaw events, further increasing dilution.
- 2.1.6 Vegetated basins also enable surface adsorption of potential contaminants, which may then either degrade in sunlight (e.g. oil residues) or be more gradually removed by later drainage flows and/ or periodic vegetation clearance. Vegetated swale outfalls are also considered to enhance the overall treatment provided via an additional vegetated area before discharge to the receiving watercourse.
- 2.1.7 Extended basins including micro-pools (bio-retention zones) will also improve dilution potential and shut-off valves are included on SuDS outlets to facilitate accidental spillage containment which will typically represent the most significant advantage in terms of overall pollution risk reduction when compared to existing conditions
- 2.1.8 Where insufficient space or other engineering constraints inhibits the use of conventional SuDS, proprietary systems such as a hydrodynamic vortex separator (in combination with tank sewers and/ or modular treatment systems) may be used to provide appropriate alternative treatment and attenuation.

# 2.1.9 A summary of proposed treatment for Project 9 drainage networks is outlined in **Table 1** and **Table 2**.

SuDS	1 <sup>st</sup> Level	2 <sup>nd</sup> Level	Inclusion	Outfall	Outfall	Outfall Co-ordinates		
ID	SuDS	SuDS	pool	Form	water	Easting	Northing	
417	Filter Drain	Basin	Yes	Grass-lined channel	River Spey (MW9.1)	269009	796782	
427	Filter Drain	Pond	No	Grass-lined channel	Unnamed watercourse (W9.49a)	270400	796968	
434	Filter Drain	Basin	Yes	Pipe to Pre- earthworks drainage ditch	River Spey (MW9.1)	270683	797609	
458	Filter Drain	Basin	Yes	Grass-lined channel	Allt Eoghainn (MW9.4)	272877	798391	
461	Filter Drain	Basin	Yes	Grass-lined channel	Unnamed watercourse (W9.11)	273108	798450	
474	Filter Drain	Basin	Yes	Pipe to pre- earthworks drainage ditch	Milton Burn/ Inverton Burn (MW 9.6)	274467	798916	
487	Filter Drain	Basin	Yes	Pipe to pre- earthworks drainage ditch	River Spey (MW9.1)	275646	799395	

Table 1: Summary of proposed SuDS features for drainage networks



SuDS	1 <sup>st</sup> Level	2 <sup>nd</sup> Level	Inclusion	Outfall	Outfall	Outfall Co	-ordinates
ID	SuDS	SuDS	pool	Form	water	Easting	Northing
490	Filter Drain	Basin	Yes	Grass-lined channel	River Spey (MW9.1)	275980	799758
493	Filter Drain	Basin	Yes	Grass-lined channel	River Spey (MW9.1)	275980	799758
502	Filter Drain	Swale	No	Grass-lined channel	River Spey (MW9.1)	276605	800509
507	Filter Drain	Basin	No	Grass-lined channel	Unnamed Drain (MW9.10)	276705	801059
509	Filter Drain	Pond	No	Grass-lined channel	Unnamed Drain (MW9.10)	276770	801087
513	Filter Drain	Pond	No	Grass-lined channel	Unnamed watercourse (W9.26)	277081	801545
530	Filter Drain	Pond	No	Grass-lined channel	Unnamed watercourse (W9.27)	278505	801918
534	Filter Drain	Basin	Yes	Grass-lined channel	Raitts Burn (MW 9.14)	278954	802096
537	Filter Drain	Basin	Yes	Grass-lined channel	Unnamed Drain (W9.33)	279290	802326
561	Filter Drain	Tank Sewer & Vortex separator <sup>1</sup>	No	Swale	Unnamed watercourse (MW9.17)	281209	803669
563	Filter Drain	Tank Sewer & Vortex separator	No	Swale	Unnamed watercourse (MW9.17)	281202	803687

Note: the SuDS 'management train' included in the Proposed Scheme design is one of several equivalent options derived from the SuDS Manual (CIRIA, 2015).

2.1.10 **Table 2** highlights the variety of depths associated with micro-pool within each basin (ponds provide permanent water retention and hence do not include a micro-pool). Basins and ponds can have various layouts, varying types of halophyte vegetation (a plant adapted to growing in saline conditions) and inflow/ outflow control devices specific to their location.

SuDS ID	Dry Sediment Forebay	Main Treat	ment Bay	Micro-pool			
		Dry Basin	Permanent Pool (pond)	0.3m	0.6m	1.0m	
417	~	$\checkmark$		~	~		
427	~		~		~	~	
434	~	$\checkmark$		~			
458	~	√		~	~		

Table 2:SuDS Design Summary

<sup>&</sup>lt;sup>1</sup> Due to spatial constraints, Networks 561 and 563 have one stage of treatment through filter drains and retained within a tank sewer before discharging via a swale.



		Main Treat	ment Bay	Micro-pool						
SuDS ID	Forebay	Dry Basin	Permanent Pool (pond)	0.3m	0.6m	1.0m				
461	~	$\checkmark$		~						
474	~	~		~	√					
487	~	$\checkmark$		~						
490	~	$\checkmark$		~	$\checkmark$					
493	~	$\checkmark$		~	✓	$\checkmark$				
502	SWALE AND GRASS-LINED CHANNEL									
507	~	$\checkmark$								
509	~		~		~					
513	~		✓		$\checkmark$	~				
530	~		~		~	~				
534	~	$\checkmark$		~	$\checkmark$					
537	~	$\checkmark$		~	~	~				
561		ATTENUTATION TANK	, VORTEX SEPARATO	R AND SWALE	OUTFALL					
563		ATTENUTATION TANK	, VORTEX SEPARATO	R AND SWALE	OUTFALL					

#### HAWRAT

2.1.11 Potential impacts from routine runoff and accidental spillage risk to watercourses have been assessed using the Highways Agency (now Highways England) Water Risk Assessment Tool (HAWRAT) in line with DMRB HD45/09 which is applicable to trunk roads in Scotland. HAWRAT is a spreadsheet tool designed to evaluate risks related to the intermittent nature of routine road runoff. It assesses the acute pollution impacts on aquatic ecology associated with soluble pollutants, and the chronic impacts associated with sediment bound pollutants. This is undertaken using the parameters outlined below.

#### Runoff Pollutant Models

2.1.12 The HAWRAT assessment uses statistically based models for predicting the runoff quality for each pollutant. The models use traffic density, climate region and event rainfall characteristics to predict runoff quality in terms of Event Mean Concentrations (EMCs) and Event Mean Sediment Concentrations (EMSCs). Using long-term rainfall data, the models generate distributions of runoff quality.



#### Impact Model

2.1.13 The tool also uses models to predict the impact of runoff on receiving rivers. For soluble pollutants (that cause acute impacts), the assessment involves a simple mass balance approach accounting for river flows. For sediment related pollutants, the model considers both the likelihood and extent of sediment accumulation.

#### Threshold Analysis

2.1.14 The tool holds a number of ecologically based thresholds with which it compares the predicted impacts to evaluate the toxicity risks.

#### Assessment Thresholds

- Soluble (Acute) Look-up tables show Runoff Specific Thresholds (RSTs) for dissolved copper and zinc and the allowable number of exceedances of these thresholds
- Sediments (Chronic) Look-up tables show Threshold Effect levels (TELs) and Probable Effect Levels (PELs)

#### Method A - Simple Assessment of Pollution Impacts from Routine Runoff to Surface Waters

- 2.1.15 Method 'A' uses HAWRAT to assess the short-term and long-term risks to the receiving watercourses based on the impacts from soluble pollutants and sediment-bound pollutants. The assessment is first carried out for individual outfalls, thereafter, when more than one outfall discharges into the same stretch of watercourse, the combined effects are also assessed.
- 2.1.16 HAWRAT tests for a suite of pollutants identified through the Highways Agency (Highways England) and Environment Agency research programme as the key contaminants in road runoff, either because of their abundance and/ or they are the most harmful in terms of species sensitivity in the water environment. These pollutants are:
  - Soluble pollutants associated with acute pollution impacts, expressed as EMCs (µg/l) for dissolved copper (Cu) and zinc (Zn)
  - Sediment related pollutants associated with chronic pollution impacts, expressed as EMSCs (mg/kg) for total copper, zinc, cadmium, and (in μg/kg) for pyrene, fluoranthene, anthracene, phenanthrene and total PAH (Polycyclic Aromatic Hydrocarbons)
- 2.1.17 HAWRAT allows the user to assess the potential effects of short-term risks on water quality related to the intermittent nature of road runoff, as well as the effectiveness of any recommended mitigation measures. It does so by predicting road runoff pollutant loading at each step of the assessment and comparing it against runoff specific thresholds, for example Environmental Quality Standards (EQSs), based on annual average concentrations.
- 2.1.18 For the assessment of potential impacts from routine runoff to surface waters, HAWRAT uses three steps as follows: Quality of Runoff; In-River Impacts; and Mitigation. A 'pass' result at one step negates the requirement of a subsequent step.

#### Step 1 - Quality of Runoff

2.1.19 This is an initial first step to assess the quality of the direct road runoff against toxicity thresholds prior to treatment and discharge to the water body. Toxicity thresholds based on Environmental Quality Standards (EQS) for the protection of freshwater aquatic life have been derived from



SEPA's Supporting Guidance (WAT-SG-53) (2014). The relevant EQSs for the protection of freshwater aquatic life are given as 1.0µg/l for copper and 10.9µg/l for zinc.

- 2.1.20 HAWRAT displays a 'pass' or 'fail' and the corresponding concentrations. If the toxicity levels yield a 'pass' then no further assessment is required. The parameters used in Step 1 are:
  - The design traffic flow of the road (two-way Annual Average Daily Traffic) (AADT)
  - The climatic region of the site
  - The nearest rainfall site within that climatic region

Step 2 - In River Impacts

- 2.1.21 If Step 1 yields a 'fail', the assessment continues to Step 2. Step 2 takes account of the acute impacts of soluble pollutants and the chronic impacts of sediment pollutants after dilution and dispersion in the watercourse prior to mitigation.
- 2.1.22 For sediment-bound pollutants, Step 2 provides two tiers of assessment; the first is a desk-based assessment; the second is a more detailed assessment allowing the entry of estimated or measured dimensions of a watercourse. Passing the first tier avoids a second-tier assessment. The parameters used in Step 2 are:
  - The annual 95%ile river flow (m<sup>3</sup>/s)
  - Base Flow Index (BFI)
  - The impermeable road area which drains to the outfall (ha)
  - Any permeable (non-road surface) area which also drains to the outfall (ha)
  - The hardness of the receiving water (mg CaCO<sub>3</sub>/l)
  - Whether the discharge is likely to impact on a protected site for conservation
  - Whether there is a downstream structure, lake or pond that reduces the river velocity near the point of discharge
  - For Tier 1 assessments, an estimate of the river width
  - For Tier 2 assessment details of channel dimensions, side slope, long slope and an estimation of Manning's *n*

#### Step 3 - Mitigation

2.1.23 If the outfall point fails Step 2 after discharge to the water body, the assessment continues to Step 3. This requires the input of any existing and proposed mitigation measures in order to assess whether the mitigation will be sufficient to reasonably treat the runoff.

A brief description of the existing and proposed measures, and their associated estimated removal capability (expressed as a percentage), is input to the tool. Estimated removal capacity is required for treatment of soluble pollutants and settlement of sediments.

- 2.1.24 Information on estimates of pollutant removal capability for various Sustainable Drainage Systems (SuDS) management systems is derived from DMRB HD33/16 (Table 8.1).
- 2.1.25 If a combined approach is proposed, the mitigation techniques are combined to determine the total removal capacity. The procedure to calculate the removal capacity is carried out in line with SuDS Manual (C753). The efficiency value of the first level of treatment is calculated as 100% effective; thereafter, secondary and tertiary (where applicable) levels are assumed to perform at



50% effectiveness due to already reduced inflow concentrations. If the outfall point fails Step 3, HAWRAT can provide an indication of the scale of additional mitigation required.

#### Cumulative Assessment

2.1.26 In line with DMRB HD45/09, cumulative assessments have also been undertaken for multiple discharges to single tributaries of larger watercourses where drainage outfalls are located within 1km along a river reach. In the context of this assessment, a reach is defined as a length of watercourse between two confluences. HD45/09 states *"the reason for this is that the available dilution and stream velocity will naturally change at confluences and influence the assessment".* The three-stage process described above is also followed for the cumulative assessment. Long-term concentrations are also calculated using the HD45/09 procedure.

Method B - Detailed Assessment of Pollution Impacts from Routine Runoff to Surface Waters

- 2.1.27 If the in-river annual average concentrations of soluble pollutants exceed the EQS values (i.e. a failure at Step 2), and appropriate mitigation is not being provided in the form of SuDS, the bioavailability of the soluble pollutants can be reassessed using a Biotic Ligand Model (BLM). The three steps outlined in the Simple Assessment are also followed for the Detailed Assessment.
- 2.1.28 The BLM refines the EQS on a site-specific basis and then compares the copper and zinc concentrations predicted by HAWRAT to the BLM derived 'Probable Non-Effect Concentration' (PNEC). If the annual average concentrations exceed the EQS, it is highly likely that the Runoff Specific Thresholds (RSTs) are also being exceeded.
- 2.1.29 As mitigation (Step 3) is employed to treat the pollutants in order for them to meet the RSTs, this results in a reduction in annual average concentrations, which in turn may result in compliance with the EQS.

Method C - Assessment of Pollution Impacts from Routine Runoff on Groundwater

- 2.1.30 Method C assesses the pollution impacts from routine runoff on groundwater. This involves assessing the overall risk to groundwater quality posed by the disposal of road runoff to the ground, either by direct discharge or through infiltrations.
- 2.1.31 The assessment is based on an examination of the 'Source-Pathway-Receptor protocol' (S-P-R). The principle applied in this assessment is that all components of the S-P-R linkage have to be present to create a pollutant linkage. The receptor in the assessment is groundwater. The presence of the pollutant in itself does not pose a threat to groundwater if there is no identifiable pathway. Further details of groundwater are provided in **Chapter 10**.
- 2.1.32 Each component is identified and given a weighting factor. This is to recognise that each may have a greater or lesser influence on the magnitude of the risk to groundwater. Each component is given a risk score (low, medium or high) and multiplied by the weighing factor. The overall cumulative assessment of risk score is obtained and classed using suggested ratings from HD45/09:
  - Overall risk score <150 = Low Risk of Impact
  - Overall risk score 150 250 = Medium Risk of Impact
  - Overall risk score >250 = High Risk Impact



#### Method D - Assessment of Pollution Impacts from Spillages

- 2.1.33 Method D assesses the impact of accidental spillages on the road network and is carried out using HAWRAT. It estimates the risk of a collision (involving spillage) occurring and the risk, that if a spillage has occurred, of the pollutant reaching and impacting onto the receiving waterbodies.
- 2.1.34 It is initially assessed without any mitigation and the risk is expressed as the probability of an incident in any one year. If the results show that mitigation is required, the risk is reduced using a pollution risk reduction factor for each mitigation measure. The following information is required for assessing the risk:
  - Road and junction type and urban/ rural setting
  - The length of road draining to an outfall in each category
  - The Annualised Average Daily Traffic (AADT) two-way flow for each vehicle category
  - The percentage of AADT flow that comprises Heavy Good Vehicles (HGVs)
  - The probability of a serious pollution incident occurring as a result of a serious spillage (expressed as a factor based on the response time to the site)

#### Spillage factor

- 2.1.35 The normal acceptable risk of a serious pollution risk occurring is anywhere the annual probability is predicted to be less than 1%. In areas where road discharges are within close proximity to a natural wetland, designated wetland, SSSI, SAC, SPA, Ramsar sites or where important drinking water supplies and abstraction, the acceptable spillage risk threshold is much lower at 0.5% annual probability (i.e. 1 in 200 years).
- 2.1.36 The probability of a serious accidental spillage is calculated as follows:

$$P_{SPL}$$
 = RL x SS x (AADT x 10<sup>-9</sup>) x (%HGV ÷ 100)

Where:

P<sub>SPL</sub> = annual probability of a spillage with the potential to cause a serious pollution incident

- RL = road length, within each drainage catchment draining to each watercourse
- SS = Serious spillage rate, based on the type of junction and the road setting

$$P_{INC} = P_{SPL} x P_{POL}$$

Where:

 $P_{INC}$  = the probability of a spillage with an associated risk of a serious pollution incident occurring

 $P_{POL}$  = the probability, given a spillage, that a serious pollution incident will take place. This takes into account a risk reduction factor, dependent upon emergency response times and the type of watercourse

2.1.37 The risk is initially assessed without any mitigation and subsequently and re-assessed on the basis of embedded mitigation being incorporated into the Proposed Scheme design. The initial risk without mitigation was found to be P, and the risk of the final design with embedded mitigation (P<sub>EMB</sub>) was calculated as:

$$P_{EMB} = P \times R_F$$



Where:

 $R_F$  is the reduction factor based on assumptions about the type of SuDS system incorporated as embedded mitigation within the final design. Based on DMRB guidance a prescribed reduction factor of 0.8 was used, as this is considered a conservative estimate of a 20% reduction in pollutants which may be achieved by a short length of filter drain.

2.1.38 The acceptable risk of a serious pollution incident will be where the annual probability (P<sub>SPL</sub>) is predicted to be less than 0.5%. This suggested threshold level is referenced within DMRB as being applicable for proposed schemes where road runoff discharges in close proximity (<1km) to designated SSSIs SPAs and SACs.

### 3 Results of Potential Impacts

- 3.1.1 The assessment results presented below assume pre-mitigation conditions to determine worstcase scenarios and inform mitigation requirements to the Proposed Scheme.
- 3.1.2 Within each of the assessment subheadings, details of the assessments are first presented; thereafter, the potential magnitude and significance of impacts are given for each drainage network based on the methodology and criteria described in **Chapter 11**.

#### Pre-mitigation Routine Runoff to Surface Waters (Method A)

- 3.1.3 The assessment for routine runoff to surface waters has been undertaken using the three step HAWRAT process. As detailed in **section 2** if the toxicity levels yield a 'pass' at any stage of the process, no further assessment is required. In Scotland, however, it is a statutory requirement to provide two levels of SuDS to control and treat surface water runoff. Therefore, filter drains and SuDS basins have been incorporated into the Proposed Scheme drainage design as 'embedded mitigation' for each drainage network, including those which predicted a 'pass' at Step 2. In cases where a 'fail' has been predicted at Step 2, Step 3 has been applied.
- 3.1.4 Step 3 is repeated with 'enhanced' treatment until all failures are eliminated. HAWRAT spreadsheet outputs are provided in **Annex 1**: Calculations of this Appendix. Results of the assessment are summarised in **Table 3**.



Table 3:Method A Results Table

	Receiving Water	Drained Road Area		Average Annual Concentration Soluble Soluble – Acute Impact		Sediment – Chronic Impact			Required mitigation to				
Network	Course Q₅₅ (m³/s)	(incl. verges) (ha)	Step	HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	produce 'Pass' result				
				Copper Zinc concentration concentration (µg/l) (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index						
417	River Spey (MW9.1)	0.75	2/1	Pass	Pass	Pass (Alort Protocted	Yes	No	Passes without mitigation –				
417	2.021	8.75	2/1	-/-	-,-	-/-	2/1	2/1	2/1	0.00 0.01 Area) 0.08	0.08	6	design
	Unnamed watercourse (W9.49a)	2.77	2	Pass	Pass	Pass	Yes	No	Passes with two levels of treatment i.e. filter drain and pond				
427	0.0013	2.77	3	0.58	1.40	Area)	0.10	12					
424	River Spey (MW9.1)	6.26	2/4	Pass	Pass	Pass	No	No	Passes without mitigation – two levels still included in design				
434	2.55	6.26	2/1	0.00	0.01	Alert Protected Area)	0.19	-					
450	Allt Eoghainn (MW9.4)	5.20	2/1	Pass	Pass		Yes	No	Passes without mitigation – two levels still included in design				
458	0.013	5.36	2/1	0.18	0.57	Pass	0.06	98					
461	Unnamed watercourse (W9.11)	0.206	2/1	Pass	Pass	Pass	Yes	No	Passes without mitigation – two levels still included in design				



	Receiving Water	Drained Road Area	Step	Average Annual Concentration Soluble Soluble – Acute Impact		Sediment – Chronic Impact			Required mitigation to												
Network	Course Q <sub>95</sub> (m³/s)	(incl. verges) (ha)		HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	produce 'Pass' result												
				Copper concentration (µg/l)	Zinc concentration (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index													
	0.0036			0.27	0.83		0.01	18													
474	Milton/ Inverton Burn (MW9.6)	7.64	2/1	Pass	Pass	Pass (Alert Protected	Yes	No	Passes without mitigation – two levels still included in design												
474	0.137	7.04	_, _	0.05	0.14	Area & D/S Structure)	0.09	25													
	River Spey (MW9.1)	11	11	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	2/4	Pass	Pass	Pass (Alort Protocted	No	No	Passes without mitigation –
407	3.1	1.1	2/1	0.00 0.00 Area)	0.13	-	design														
400	River Spey (MW9.1)	0.95	2/1	Pass	Pass	Pass (Alert Protected	No	No	Passes without mitigation –												
490	3.1	0.85	2/1	0.00	0.00	Area & D/S Structure)	0.35	-	two levels still included in design												
102	River Spey (MW9.1)		2/1	Pass	Pass	Pass (Alert Protected	No	No	Passes without mitigation –												
493	3.1	3.1	2/1	Area & D/S 0.00 0.00 Structure)	0.33	-	two levels still included in design														
502	River Spey (MW9.1)	1.91	2/1	Pass	Pass	Pass (Alert Protected Area)	Yes	No	Passes without mitigation – two levels still included in design												



	Receiving Water	Drained Road Area		Average Annual Concentration Soluble Soluble – Acute Impact		Sediment – Chronic Impact			Required mitigation to
Network	Course Q <sub>95</sub> (m³/s)	(incl. verges) (ha)	Step	HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	produce 'Pass' result
				Copper concentration (µg/l)	Zinc concentration (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index	
	3.24			0.00	0.00		0.08	1	
507	Unnamed watercourse (W9.21)	0 5 4 5	2	Pass	Pass	Pass (Alert Protected	Yes	No	Passes with two levels of
507	0.001	0.343	5	0.45 0.77 Area)	0.08	50	SuDS basin		
	Unnamed watercourse (W9.21)	1.73 3	2	Pass	Pass	Pass (Alert Protected Area)	Yes	No	Passes with two levels of
209	0.001		5	0.58	1.39		0.09	23	pond
513	Unnamed watercourse (W9.26)	2 75	3	Pass	Fail	Pass (Alert Protected Area)	No	No	Passes with two levels of treatment (i.e. filter drain and pond) for sediment-bound pollutants and soluble Cu; however, enhanced
513	0.001			0.73	1.74		0.13	-	treatment required for soluble Zn. Passes with swale incorporated as second stage of treatment
	Unnamed watercourse (W9.27)	0.22	2	Pass	Pass	Pass	Yes	No	Passes without mitigation –
220	0.001	0.22	3	0.14	0.43	Area)	0.00	37	design



	Receiving Water	Drained Road Area		Average Annual Con Soluble – Ac	Average Annual Concentration Soluble Soluble – Acute Impact		Sediment – Chronic Impact				
Network	Course Q <sub>95</sub> (m³/s)	(incl. verges) (ha)	Step	HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	produce 'Pass' result		
				Copper concentration (µg/l)	Zinc concentration (µg/I)	Pass/Fail	Low flow velocity (m/s)	Deposition Index			
E24	Raitts Burn (MW9.14)	1 65	.65 2/1 Pass Pass Pass (Alert Protected Area & D/S Structure)	Pass (Alert Protected	Yes	No	Passes without mitigation –				
534	0.034	1.05		0.03	0.09	Area & D/S 0.09 Structure)	0.02	36	design		
527	Unnamed watercourse (W9.33)	5.88 3	5.88 3	3	Fail	Fail	Pass (Alert Protected	Yes	No	Passes with two levels of treatment (i.e. filter drain and pond) for sediment-bound pollutants; however, enhanced treatment required	
	0.001			1.12	2.73	Area)	0.10	44	for soluble Cu & Zn Passes with swale incorporated as second stage of treatment		
561	Unnamed watercourse (MW9.17)					Pass	Pass	Pass (Alert Protected	No	No	Passes with two levels of
501	0.006	5.5	3	0.36	0.56	Area & D/S Structure)	0.30	-	vortex separator		
	Unnamed watercourse (MW9.17)	4.05	4.05 2/1 Pass Pass 0.59	Pass (Alert Protected	No	No	Passes with two levels of				
202	0.006			0.38	0.59	Area & D/S Structure)	0.30	-	vortex separator		



 Table 4:
 Method A cumulative assessments results (Soluble Pollutants – 1km)

				-								
Cumulative	Approx.	Receiving	Combined		Average Annual Co Soluble – A	ncentration Soluble- cute Impact	Se	Proposed Mitigation				
Network (within 1km)	distance between outfalls (m)	Watercourse Q <sub>95</sub> (m <sup>3</sup> /s)	Drained Road Area (incl. verges) (ha.)	Step	HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	levels requested by SEPA)		
					Copper concentration (µg/I) Zinc concentration (µg/I)	Pass/Fail	Low flow velocity (m/s)	Deposition Index				
490 + 493	0m (same	River Spey (MW9.1)	3.9	2	Pass	Pass	N/A	N/A	N/A	Passes without mitigation – two		
	outfall)	3.0			0.00	0.00		N/A	N/A	design		
507 + 509 73r	73m	Unnamed watercourse (W9.21)	2.3	2.3	2.3 3	3	Pass	Pass	N/A	N/A	N/A	Passes with two levels of treatment
		0.001			0.65	1.55		N/A	N/A	pond		
		Unnamed watercourse (MW9.17)			Fail	Pass		N/A	N/A	Passes with two levels of treatment (i.e. filter drain and tank & vortex		
561 + 563	2m (adjacent outfalls)	0.006	7.3	3	0.60	0.93	N/A	N/A	N/A	(i.e. filter drain and tank & vortex separator) for sediment-bound pollutants and soluble Zn; however, enhanced treatment required for soluble Cu. Passes with swale incorporated as second stage of		



Table 5:	Method A cumulative assessments re	sults (Sediment-bound Pollutants	– outfalls within 100m)
1 01010 01			

Cumulative	Distance	e Receiving n Watercourse Q₃s m) (m³/s)	Combined Drained Road Area (incl. verges) (ha.)	Step	Average Annual Co Soluble – A	ncentration Soluble- cute Impact	Se	Proposed Mitigation					
Network bei (within 100m) outf	between outfalls (m)				HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT	Sediment Accumulating? Yes/No	Extensive? Yes/No	(incl. minimum two levels requested by SEPA)			
					Copper concentration (µg/l)	Zinc concentration (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index				
490 + 493	0m (same	River Spey (MW9.1)	3.9	3.9	3.9	3.9	2	Pass	Pass	Pass (Alert Protected	No	No	Passes without mitigation – two
outfall)	outfall)	3.0			0.00	0.00	Area & D/S Structure)	0.32	-	design			
507 + 509 73m		Unnamed watercourse (W9.21)	2.3	_	Pass	Pass	Pass (Alert	Yes	No	Passes with two levels of treatment i.e. filter drain and pond			
	73m	0.001	(0.545 + 1.76)	3	0.65	1.55	Protected Area)	0.09	23				
561 + 563 (a	2m	Unnamed watercourse (MW9.17)	7.1	2	Pass	Pass	Pass (Alert Protected Area & D/S Structure)	No	No	Passes with treatment i.e. filter drain, tank and vortex separator			
	outfalls)	0.005	(3.3 + 3.8)	3	0.32	0.99		0.30	-				



3.1.5 The results in **Table 3**, **Table 4** and **Table 5** highlight that, where necessary, incorporation of appropriate levels of mitigation reduces risk from routine runoff on receiving watercourses. The resulting magnitude of impact from routine runoff on each receiving watercourse is, therefore, predicted to be **Negligible**.

#### Detailed Assessment from Routine Runoff to Surface Waters (Method B)

3.1.6 This is no requirement for a detailed assessment as the Proposed Scheme incorporates SuDS (typically two treatment levels) on all networks and outfalls. SuDS provision will be in line with national and local planning policy and SEPA 'best-practice' guidance for trunk road drainage.

Assessment of Pollution Impacts from Routine Runoff on Groundwater (Method C)

3.1.7 Assessments of potential impacts to groundwater were undertaken for both embedded mitigation techniques that are incorporated into the design (i.e. filter drains and SuDS basins). Details of ground conditions were obtained using information outlined in **Chapter 10**, along with British Geological Survey (BGS) data and ground investigation (GI) data. The site locations are those proposed for the SuDS basins for each drainage network.

Network	Overall Risk of Impact Score for Filter Drains	Overall Risk of Impact Score for SuDS Basin
417	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
427	200 (Medium Risk of Impact)	230 (Medium Risk of Impact)
434	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
458	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
461	160 (Medium Risk of Impact)	190 (Medium Risk of Impact)
474	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
487	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
490	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
493	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
502	160 (Medium Risk of Impact)	190 (Medium Risk of Impact)
507	200 (Medium Risk of Impact)	230 (Medium Risk of Impact)
509	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
513	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
530	185 (Medium Risk of Impact)	215 (Medium Risk of Impact)

Table 6:Method C Results Table



Network	Overall Risk of Impact Score for Filter Drains	Overall Risk of Impact Score for SuDS Basin
534	200 (Medium Risk of Impact)	230 (Medium Risk of Impact)
537	180 (Medium Risk of Impact)	210 (Medium Risk of Impact)
561	200 (Medium Risk of Impact)	N/A
563	200 (Medium Risk of Impact)	N/A

3.1.8 The summary of results in **Table 6** supported by detailed results in **Annex 1**: Calculations, show that the risk for potential impacts to groundwater is **Medium** due to the presence of higher permeable soil and drift geology conditions within the Proposed Scheme extents; thus SuDS should be lined or part-lined to restrict infiltration.

Assessment of Pollution Impacts from Spillages (Method D)

3.1.9 Assessments of potential pollution impacts from spillages impacts to groundwater were undertaken using a conservative approach; the calculations are based on the longest road drainage catchment area of the Proposed Scheme (Network 434) and details for the proposed junctions at Newtonmore and Kingussie. The results have been presented (in years) for a system without mitigation and for the final design incorporating SuDS as 'embedded' mitigation. The Annual Spillage Probability (ASP) has been presented as a percentage output on the basis of the final design. Results from the HAWRAT excel spreadsheet are provided in **Annex 1:** Calculations to this Appendix.

Return period scenario Road section assessment	Return period without pollution reduction measures (years)	Return Period with Embedded Pollution reduction measures (years)	ASP based on Final Design Incorporating Embedded Mitigation (%)		
Longest outfall (surface water spillage)	2233	2791	0.04		
Longest outfall (groundwater spillage)	3349	4186	0.02		
Newtonmore Junction (surface water spillage)	2665	3331	0.03		
Newtonmore Junction (groundwater spillage)	3859	4823	0.02		
Kingussie Junction (surface water spillage)	10727	13409	0.007		
Kingussie Junction (groundwater spillage)	16091	20114	0.005		

Table 7: Method D Results Table

3.1.10 **Table 7** indicates that calculated ASP for the Proposed Scheme is considerably less than the accepted 0.5% value for serious pollution incident for protected areas. The magnitude of risk



from accidental spillages on surface water and groundwater is predicted to be negligible, but given that the sensitivity of the receiving watercourses, spillage containment has been provided as 'embedded' mitigation (shut-off valves) within the Proposed Scheme design.

### 4 Potential Impact Assessment

- 4.1.1 This section provides an overview of the potential impacts on water quality that may arise as a result of the Proposed Scheme. The potential impact assessment has been carried out on the assumption that the final design incorporates embedded mitigation as described in **Section 3**.
- 4.1.2 **Table 8** presents a summary of the potential water quality impacts for a range of water features which were identified for surface water and groundwater receptors. Note that each water feature has been assigned a sensitivity classification on the basis of the baseline information presented in **Appendix 11.1**. In accordance with the approach outlined in **section 11.2** of **Chapter 11**, the assessment applies the sensitivity classification along with the predicted magnitude of change to produce an overall significance of impact for each water feature.

Drainage Network	Water Feature Location	Receptor Water Quality Sensitivity	HAWRAT Water Quality Results Based on Final Drainage Design Inc. Embedded Mitigation	Magnitude	Significance of Impact
		Recepto	or: Surface Water Quality		
417	River Spey (MW9.1) ch. 41,800	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
427	Unnamed watercourse (W9.49a) ch. 42,940	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
434	River Spey (MW9.1) ch. 43,450	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
458	Allt Eoghainn (MW9.4) ch. 45,800	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
461	Unnamed watercourse (W9.11) ch. 43,050	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
474	Milton/ Inverton Burn (MW9.6) ch. 47,400	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
487	River Spey (MW9.1) ch. 48,550	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
490	River Spey (MW9.1) ch. 49,250	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
493	River Spey (MW9.1) ch. 49,250	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
502	River Spey (MW9.1) ch. 50,450	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
507	Unnamed watercourse (MW9.10) ch. 50,750	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
509	Unnamed watercourse (MW9.10) ch. 50,750	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
513	Unnamed watercourse (W9.26) ch. 51,460	Low	Failure of soluble Zn from routine runoff risk identified by HAWRAT (Method A). ASP <0.5% (Method D)	Minor Adverse	Neutral

Table 8: Potential Water Quality Impacts



Drainage Network	Water Feature Location	Receptor Water Quality Sensitivity	HAWRAT Water Quality Results Based on Final Drainage Design Inc. Embedded Mitigation	Magnitude	Significance of Impact
530	Unnamed watercourse (W9.27)	Low	No routine runoff risk identified by HAWRAT (Method A)	Negligible	Neutral
534	Cn. 52,850 Raitts Burn (MW9.14) ch. 53,450	Medium	ASP <0.5% (Method D) No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
537	Unnamed watercourse (W9.33) ch. 53,800	Low	Failure of soluble Cu and Zn from routine runoff risk identified by HAWRAT (Method A). EQS value for Cu is exceeded ASP <0.5% (Method D)	Minor Adverse	Neutral
561	Unnamed watercourse (MW9.17) ch. 56,160	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
563	Unnamed watercourse (MW9.17) ch. 56,160	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
		Recept	or: Groundwater Quality		
417	River Spey (MW9.1) ch. 41,800	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
427	Unnamed watercourse (W9.49a) ch. 42,940	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
434	River Spey (MW9.1) ch. 43,450	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
458	Allt Eoghainn (MW9.4) ch. 45,800	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
461	Unnamed watercourse (W9.11) ch. 43,050	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
474	Milton/ Inverton Burn (MW9.6) ch. 47,400	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
487	River Spey (MW9.1) ch. 48,550	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
490	River Spey (MW9.1) ch. 49,250	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
493	River Spey (MW9.1) ch. 49,250	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
502	River Spey (MW9.1) ch. 50,450	Very High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
507	Unnamed watercourse (W9.21) ch. 50,750	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
509	Unnamed watercourse (W9.21) ch. 50,750	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
513	Unnamed watercourse (W9.26) ch. 51,460	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
530	Unnamed watercourse (W9.27) ch. 52,850	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
534	Raitts Burn (MW9.14) ch. 53,450	Medium	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
537	Unnamed watercourse (W9.33) ch. 53.800	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral



Drainage Network	Water Feature Location	Receptor Water Quality Sensitivity	HAWRAT Water Quality Results Based on Final Drainage Design Inc. Embedded Mitigation	Magnitude	Significance of Impact
561	Unnamed watercourse (MW9.17) ch. 56,160	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
563	Unnamed watercourse (MW9.17) ch. 56,160	Low	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral

# 5 Conclusion and Recommendations

5.1.1 This appendix has presented further information on the water quality assessments undertaken during the EIA to support the findings reported in **Chapter 11**.

#### Surface Water

- 5.1.2 Adverse impacts (failures) of water quality assessments can be appropriately mitigated typically using two-level SuDS management for treatment for road surface water runoff. Two point source discharges were found to produce a 'Fail' result for acute pollution impacts after inclusion of two levels of treatment in the Proposed Scheme design (i.e. filter drains and pond).
- 5.1.3 Network 513 failed for soluble copper but did not exceed EQS values. Network 537 failed for copper and zinc and exceeded the EQS values for copper. However, using the assessment methodology **in section 11.2** of **Chapter 11**, the Low sensitivity value of these watercourses, coupled with the Minor Adverse magnitude of impact, results in an overall **Neutral** significance of impact.
- 5.1.4 In these instances a 'Fail' of the HAWRAT routine runoff assessments does not necessarily require a redesign or adoption of further mitigation; however, supplementary assessments were carried out using alternate treatment measures (i.e. filter drain and grass-lined channel/ swale) and were found to produce 'Pass' results (see **Annex 1**: Calculations) . It is therefore recommended that alternate SuDS measures are incorporated at these locations to optimise treatment efficiency.
- 5.1.5 As outlined in **Table 8**, it is considered that there is no likely significant water quality impacts associated with the Proposed Scheme if appropriate mitigation measures are included, as set out in **section 11.5** of **Chapter 11**. This information has been further presented in an evaluation of residual effects for each of the receptors within **Chapter 11**.

#### Groundwater

- 5.1.6 Medium risk values have been determined for all drainage networks throughout the Project 9 Proposed Scheme extent. This is translated into a pre-mitigation magnitude of impact vale of Moderate Adverse.
- 5.1.7 Slight to Very Large Adverse significance of impact can be mitigated to a **Neutral** value by lining SuDS to prevent infiltration. It is noted that infiltration is a favoured SuDS solution by SEPA; however, at present there is insufficient information regarding local conditions to design bespoke solutions which might otherwise allow infiltration.
- 5.1.8 As permanent water is required at several SuDS outlets (for water quality treatment and/ or ecological enhancement), the soil below the pool area should be sufficiently impermeable to maintain the pool. As Project 9 is located in an area of highly permeable strata, a liner should be required to prevent pools drying out.



#### Cumulative Impacts

- 5.1.9 Cumulative impact assessments have found a 'Fail' result for acute pollution (copper) at one location post-mitigation (Networks 561/ 563). Both networks comprise filter drains, tank sewer and vortex separator, and discharge to the watercourse via a swale. However, as the swale is not equal to, or greater than, the roadway length draining to it (and therefore not considered to be a fully effective stage of treatment), a precautionary approach has been taken and their treatment efficiency have not been included in the overall assessment.
- 5.1.10 Further assessment has been carried out that does incorporate the treatment efficiency for swales/ grassed channels (provided in HD33/16) to demonstrate that optimising swale length, and therefore treatment, would suitably treat runoff to produce a 'Pass' result. A recommendation is made to further investigate options to maximise length of swale at detailed design stage.
- 5.1.11 Using the assessment methodology in **section 11.2** of **Chapter 11**, the Low sensitivity value of the receiving watercourse from both Networks 561 and 563, coupled with the Minor Adverse magnitude of impact, results in a **Neutral** significance of impact. Overall, an improvement in water quality is predicted compared with the baseline conditions due to the first-time application of SuDS.

#### Residual Impacts

5.1.12 As the existing drainage system throughout the Proposed Scheme extent considerably predates the employment of SuDS techniques, and any treatment currently provided is incidental and does not meet the requirements of current standards, there is no facility to control and treat routine road surface runoff effectively or contain accidental spillages of oil or other contaminants. Consequently, an overall improvement in water quality is predicted compared with the baseline conditions due to the first-time application of SuDS resulting in a residual **Slight Beneficial** impact.



# Annex 1: Calculations

Figure 1: Method A Calculations for SuDS 417

HIGHWAYS	Highways A	gency Water Ris	sk Assessme	ent Toc	version 1.0 November	2009				
AGENCY		Soluble - Acute Impact					Sedime	ent - Chror	nic Impact	t i i i i i i i i i i i i i i i i i i i
	Copper           Step 2         0.00           Step 3         -	r Zinc 0.01 ug/l - ug/l	Pass		Pass Ale	rt. Protected A	rea. Sedin Exten	nent depos nulating? Isive?	ition for th Yes No	Nis site is judged as: 0.08 Low flow Vel 6 Deposition In
Location Details										
Road number					HA Area / DBFO numb	er				
Assessment type	Non-cumulative as	Non-cumulative assessment (single outfall)								
OS grid reference of assessm	nent point (m)	Easting	269009			Northing		796782		
OS grid reference of outfall st	Easting			_	Northing					
Outfall number	417			List of outfalls in	t					
Receiving watercourse	River Spey			cumulative assessme	ent					
EA receiving water Detailed I	Ass			Assessor and affiliatio	n		CFJV_IM			
Date of assessment	13/07/2018			Version of assessmen	essment					
Notes		-								
<u>Step 1 Runoff Quality</u> <u>Step 2 River Impacts</u>	AADT >10,000 and Annual 95%ile river Impermeable road a	flowr (m <sup>3</sup> /s) area drained (ha)	2.021 6.0	Colder (Enter Perme	vet	Rainfall site iver flow box tfall (ha)	Ardtalnaig to assess St 2.75	(SAAR 1343. tep <b>1 runofi</b>	9mm) f <b>quality o</b>	nity)
Far day sheet are and	Base Flow Index (B	FI) 0	.411	ls the c	lischarge in or within 1	km upstream	of a protecte	d site for c	onservatio	Yes -
For dissolved zinc only	TTALET HAILINESS	Low = <50mg CaCO3/I								
For sediment impact only	• Is there a downstrea • Tier 1 = Estimate	am structure, lake, p ed river width (m)	ond or canal that	t reduce	s the velocity within 10	Orn of the poi	nt of discharç	je?	N	0 <b>v</b> D
	© Tier 2 Bed widt	h (m)	3	Mannin	g'sn 0.07 □	Side slop	e (m/m)	0.5	Long s	lope (m/m) 0.000
Step 3 Mitigation				Γ	Estin	ated effective	eness			Due die 6 June e 6
Brief description				Treatment for Attenuation for Settle					Fredict Impact	
					dis	charge rate ( I	/s )	. /	St	ow Detailed Pee
Existing measures				[	) 🕞 Unli	mited _	0			low becalled Kes



HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY	Soluble - Acute Impact				Sediment - Chronic Impact				
Annu	al Average Co	oncentration Zinc	Copper	Zinc	Sediment			lenosition for this site is judged as:	
Step	2 0.97	2.99 ug/l	Pass	Test. Try more	Alert. I	Protected Area. Accu	Accumulating? Yes 0.10 Low flow		
Step	<b>3</b> 0.58	1.79 ug/l		mitigation		Exter	nsive?	No 12 Deposition Index	
Location Details									
Road number				HA Area / DBFO	number				
Assessment type		Non-cumulative ass	essment (single outfa	ll)				•	
OS grid reference of assessment point	(m)	Easting	270395			Northing	796967		
OS grid reference of outfall structure (m	)	Easting				Northing			
Outfall number		427		List of outfal	IS IN				
Receiving watercourse		Unnamed watercours	se (W9.49a)	cumulative asse	cooment				
EA receiving water Detailed River Network			Assessor and aff	iliation		CFJV_IM			
Date of assessment	16/01/2018	Version of asses	sment		1.0				
Notes									
Step 1 Runoff Quality AADT	>10,000 and	I <50,000 - Clin	matic region Co	der Wet 🗸	Rai	Ardtalnaig	(SAAR 1343.9	9mm) 🔽	
Step 2 River Impacts Annual	95%ile river	flow (m³/s)	0.0013 (Ent	er zero in Annual 95%	%ile river	r flow box to assess S	itep 1 runoff	quality only)	
Imperme	eable road a	rea drained (ha)	2.0 Per	neable area draining	to outfal	(ha) 0.77			
Base Fl	owindex (Bi	FI) 0.7	773 <b>ks th</b>	e discharge in or within 1 km upstream of a protected site for conservation?					
For dissolved zinc only Water h	ardness	Low = <50mg CaCO3/L							
· · · · · · · · · · · · · · · · · · ·		2011 String Cablesin							
For sediment impact only is there	a downstrea	m structure, lake, po	ond or canal that redu	ices the velocity with	in 100m	of the point of dischar	ge?	No 🗸 D	
© Tier 1	Estimate	d river width (m)	2						
© Tier 2	Bed widt	h (m)	2 Man	ning's n 0.05		Side slope (m/m)	0.5	Long slope (m/m) 0.0125	
Step 3 Mitigation					Estimate	ed effectiveness		Dradiet Impeet	
Brief description			Treatment for	Atte	enuation for Set	tlement of	Predict impact		
			solubles (%)	discha	es - restricted sedi	ments (%)			
Existing measures					Unlimite			Show Detailed Results	
Proposed measures Eilter drain and w	at datantian as	nd (100%) (Cu)			Unlimit				
Filler drain and w	er derennioù bo	nu (100%) (Cu)		40	Unimite			Exit Tool	

Figure 2: Method A Calculations for SuDS 427 (copper)



HIGHWAYS	Highways Aq	<b>jency Water Ris</b>	k Assessment Too	version 1.0 Nove	mber 200	HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009								
AGENCY	Annual Average Co Copper Step 2 0.97 Step 3 0.45	Solubl ncentration 2.99 ug/l 1.40 ug/l	e - Acute Impact Copper	Zinc Se Pass Alert. Protected Area.		Protected Area. Exten	Sediment - Chronic Impact Sediment deposition for this site is judged a Accumulating? Yes 0.10 Low flow 1 Extensive? No 12 Depositio							
Location Details														
Road number				HA Area / DBFO	number									
Assessment type		Non-cumulative ass	essment (single outfall)				-	-						
OS grid reference of assessment	t point (m)	Easting	270395			Northing	796967							
OS grid reference of outfall struct	ture (m)	Easting		_		Northing								
Outfall number 427				List of outfall	s in									
Receiving watercourse Unnamed water			se (W9.49a)	cumulative asse	SSITIETIL									
EA receiving water Detailed Rive	er Network ID			Assessor and affi	liation		CFJV_IM							
Date of assessment		16/01/2018		Version of assess	sment 1.0									
Notes														
Step 1 Runoff Quality       AADT       >10,000 and <50,000						mm)  quality only)  reservation? Yes  No  No								
G	Tier 2 Bed width	(m)	2 Mannin	<b>g's n</b> 0.05		Side slope (m/m)	0.5	Long slope (m/m) 0.0125						
Step 3 Mitigation Brief description				Estimated effectiveness           Treatment for solubles (%)         Attenuation for solubles - restricted discharge rate (l/s)         Settlement of sediments (%)										
Existing measures			0	D	Unlimite	ed 🖵 🔽 0	D							
Proposed measures Filter drain	in and wet detention por	nd (100%) (Zn)	5	3.25	Unlimite	ed <b>v</b> D 72		Exit Tool						

Figure 3: Method A Calculations for SuDS 427 (zinc)



HIGHWAYS Highways	Agency Water Risk Assessment To	Oli version 1.0 November 200	19	
Annual Average C Coppe Step 2 0.00 Step 3 -	r Zinc 0.01 ug/l Pass ug/l	Zinc Alert.	Sedime Sedim Protected Area. Exten	ent - Chronic Impact ment deposition for this site is judged as: mulating? No 0.19 Low flow Vel m/s no - Deposition Index
Location Details				1
Road number		HA Area / DBFO number		
Assessment type	Non-cumulative assessment (single outfall			•
OS grid reference of assessment point (m)	Easting 270683		Northing	797609
OS grid reference of outfall structure (m)	Easting		Northing	
Outfall number	434	List of outfalls in		
Receiving watercourse	River Spey (MW9.1)	cumulative assessment		
EA receiving water Detailed River Network ID		Assessor and affiliation		CFJV_IM
Date of assessment	13/07/2018	Version of assessment		
Notes				1
Step 1 Runoff Quality       AADT       >10,000 ar         Step 2 River Impacts       Annual 95%ile river         Impermeable road       Base Flow Index (B         For dissolved zinc only       Water hardness	Image: display state     Climatic region     Cold       Climatic re	er Wet Rai	r flow box to assess Si I (ha) 1.6 upstream of a protecte	(SAAR 1343.9mm)
For sediment impact only is there a downstre	am structure, lake, pond or canal that reduc	es the velocity within 100m	of the point of discharg	
© Tier 1 Estimate C Tier 2 Bed wid	ed river width (m) 17.2 th (m) 3 Manni	ng's n 0.07 D	Side slope (m/m)	0.5 Long slope (m/m) 0.0001
Step 3 Mitigation	Brief description	Estimate Treatment for Atte solubles (%) solubl discha	ed effectiveness enuation for Settl es - restricted sedin arge rate ( Vs )	Predict Impact Predict Impact Show Detailed Posults
Existing measures Proposed measures		0 Unlimit 0 Unlimit	ed v D 0	

Figure 4: Method A Calculations for SuDS 434



AGENCY       Soluble - Acute Impact       Sediment - Chronic Impact         Annual Average Concentration       Copper       Zinc         Step 2       0.18       0.57         Step 3       -       ug/l         Location Details       HA Area / DBFO number	<b>ged as:</b> w flow Vel m/s
Location Details       Road number       HA Area / DBFO number	
Road number HA Area / DBFO number	
Assessment type Non-cumulative assessment (single outfall)	•
OS grid reference of assessment point (m) Easting 272877 Northing 798391	
OS grid reference of outfall structure (m) Easting Northing	
Outfall number 458 List of outfalls in	
Receiving watercourse Allt Eoghainn (MW9.4)	
EA receiving water Detailed River Network ID Assessor and affiliation CFJV_IM	
Date of assessment     16/01/2018     Version of assessment     1.0	
Notes	
Step 1 Runoff Quality       AADT       >10,000 and <50,000	•
Step 2 River Impacts       Annual 95% ile river flow (m³/s)       0.0131       (Enter zero in Annual 95% ile river flow box to assess Step 1 runoff quality only)         Impermeable road area drained (ha)       2.53       Permeable area draining to outfall (ha)       2.83         Base Flow Index (BFI)       0.75       Is the discharge in or within 1 km upstream of a protected site for conservation?	No 🔻 D
For dissolved zinc only       Water hardness       Low = <50mg CaCO3/l	
© Tier 1 Estimated river width (m) 1.5	
C Tier 2         Bed width (m)         2         Manning's n         0.05         Side slope (m/m)         0.5         Long slope (m/m)	0.0125
Step 3 Mitigation         Estimated effectiveness         Predict           Brief description         Treatment for solubles (%)         Attenuation for solubles - restricted discharge rate ( l/s )         Settlement of sediments (%)	mpact
Existing measures 0 Unlimited - 0 0 D	ea Results
Proposed measures Filter drain and wet detention pond (100%) (Zn) 0 0 0 D 0 Exit	「ool

Figure 5: Method A Calculations for SuDS 458



HIGHWAYS	Highways A	gency Water	<b>Risk Assessn</b>	nent To	OI version 1.0 November 20	09					
AGENCY		So	Copper	pact	Zinc		Sedime	nt - Chron	ic Impact	:	
	Coppe	r Zinc	copper				Sedim	ent deposi	ition for th	nis site is	judged as:
	Step 2 0.04	0.12 ug/l	Pass		Pass	Pass	Accum	ulating?	Yes	0.01	Low flow Vel m/s
	Step 3 -	- ug/l					Exten	sive?	No	18	Deposition Index
Location Details											
Road number					HA Area / DBFO numbe	r					
Assessment type		Non-cumulative	e assessment (sin	gle outfal	)						•
OS grid reference of assessn	nent point (m)	Easting	273108			Northing		798450			
OS grid reference of outfall st	ructure (m)	Easting				Northing					
Outfall number		461			List of outfalls in						
Receiving watercourse		Unnamed water	course (W9.11)		cumulative assessmen						
EA receiving water Detailed F	River Network ID				Assessor and affiliation			CFJV_IM			
Date of assessment		13/07/2018			Version of assessment						
Notes		-									
Step 1 Runoff Quality	AADT >10,000 and	d <50,000 ▼	<b>Climatic region</b>	Cold	er Wet 🔹 🛛 🦷	infal site	Ardtalnaig (	SAAR 1343.9	9mm)		-
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.0036	(Ente	r zero in Annual 95%ile riv	er flow box to	) assess St	ep 1 runoff	quality o	nity)	
Step 2 River Impacts	Annual 95%ile river Impermeable road a	flow (m³/s) area drained (ha)	0.0036	(Ente Perm	r zero in Annual 95%ile riv eable area draining to outfa	er flow box to ∎ (ha)	0 assess St	ep 1 runoff	quality o	nly)	
Step 2 River Impacts	Annual 95%ile river Impermeable road a Base Flow Index (B	flow (m³/s) area drained (ha) SFI)	0.0036	(Enter Perm Is the	r zero in Annual 95%ile riv eable area draining to outfa discharge in or within 1 kr	er flow box to III (ha)	0 assess St 0.072 f a protecte	ep 1 runoff d site for co	quality or	nly) m?	No 🗸 D
Step 2 River Impacts	Annual 95%ile river Impermeable road a Base Flow Index (B Water hardness	flow (m³/s) area drained (ha) SFI) Low = <50mg CaC	0.0036 0.134 0.75 03/1	(Ente Perm Is the	r zero in Annual 95%ile riv eable area draining to outfa discharge in or within 1 kr	er flow box to ul (ha) u n upstrearn of	o assess Str 0.072 f a protecte	ep 1 runoff d site for co	quality or	nly) m?	No v
Step 2 River Impacts For dissolved zinc only For sediment impact only	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness	flow (m <sup>3</sup> /s) area drained (ha) iFD Low = <50mg CaC am structure, lak	0.0036 0.134 0.75 03/1 • •	(Ente Perm Is the	r zero in Annual 95%ile riv eable area draining to outfa discharge in or within 1 kr	er flowr box to ull (ha) [] n upstrearn of n of the point	o assess St 0.072 f a protecte of dischard	ep 1 runoff d site for co e?	quality or	niy) vn?	
Step 2 River Impacts For dissolved zinc only For sediment impact only	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Is there a downstrea © Tier 1 Estimate	flow (m <sup>3</sup> /s) area drained (ha) FF) Low = <50mg CaC am structure, lak ed river width (m)	0.0036 0.134 0.75 03/1 • •	(Enter Perm Is the	r zero in Annual 95%ile riv eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r	er flow box to II (ha) In upstrearn of In of the point	o assess Str 0.072 f a protecte of discharg	ep 1 runoff d site for co e?	quality or onservation	nty) m? • _	
Step 2 River Impacts For dissolved zinc only For sediment impact only	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness [ Is there a downstrea © Tier 1 Estimate © Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) FT) Low = <50mg CaC arn structure, lak ed river width (m) th (m)	0.0036 0.134 0.75 03/1 • • • e, pond or canal th 1.7 3	(Ente Perm Is the hat reduc Mann	r zero in Annual 95% ile riv eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r	er flow box to II (ha) n upstrearn of n of the point Side slope	o assess St 0.072 f a protecte of discharg (m/m)	ep 1 runoff d site for co e?	quality of onservatio N Long s	nly) m? • _	No ▼ □
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Is there a downstrea © Tier 1 Estimate © Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) AFD Low = <50mg CaC arn structure, lak ed river width (m) Ih (m)	0.0036 0.134 0.75 03/1 • D e, pond or canal t 1.7 3	(Enter Perm Is the hat reduc Mann	r zero in Annual 95% ile riv eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r ing's n 0.07	er flow box to II (ha) [ In upstrearn of In of the point Side slope red effectiven	o assess St 0.072 f a protecte of discharg (m/m)	ep 1 runoff d site for co ne?	quality or onservatio	nly) n? ○ lope (m/n	No v D
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Sthere a downstrea Tier 1 Estimate Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) FD Low = <50mg CaC arn structure, lak ed river width (m) th (m) Brief descripti	0.0036 0.134 0.75 03/1 • • • e, pond or canal t 1.7 3	(Enter Perm Is the hat reduc Mann	r zero in Annual 95% ile riv eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r ing's n 0.07 0 Estima Treatment for At	er flow box to II (ha) [ n upstream of n of the point Side slope ied effectivenous tenuation for	o assess St 0.072 f a protecte of discharg (m/m) ess Setti	ep 1 runoff d site for co e? 0.5	quality or onservatio	nly) n? over (m/m Predia	No ▼ □
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Sthere a downstrea Tier 1 Estimate Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) FD Low = <50mg CaC arn structure, lak ed river width (m) th (m) Brief descripti	0.0036 0.134 0.75 03/1 • • • e, pond or canal t 1.7 3	(Enter Perm Is the hat reduc Mann	r zero in Annual 95% ile riv eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r ing's n 0.07 0 Estima Treatment for At solubles (%) solut	er flow box to II (ha) [1] In upstream of In of the point Side slope ted effectivend tenuation for les - restricter	o assess St 0.072 f a protecte of discharg (m/m) ess Setti d sedin	ep 1 runoff d site for co e? 0.5	quality or onservatio	nly) n? lope (m/n Predia	No ▼ □
Step 2 River Impacts         For dissolved zinc only         For sediment impact only         Step 3 Mitigation	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Sthere a downstrea Tier 1 Estimate Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) FF) Low = <50mg CaC am structure, lak ed river width (m) th (m) Brief descripti	0.0036 0.134 0.75 03/1 e, pond or canal t 1.7 3 001	(Enter Perm Is the hat reduc	r zero in Annual 95% ile rive eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r ing's n 0.07 0 Estima Treatment for solubles (%) old solution	er flow box to il (ha) in upstream of n upstream of n of the point Side slope ted effectiven tenuation for les - restricter arge rate (1)	o assess St 0.072 f a protecte of discharg (m/m) ess Settl d sedin )	ep 1 runoff d site for co e? 0.5 ement of nents (%)	quality or onservation Long s	nly) n? lope (m/m Predia now Det	No v D 0.0001 ct Impact ailed Results
Step 2 River Impacts         For dissolved zinc only         For sediment impact only         Step 3 Mitigation         Existing measures	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness [ Is there a downstrea © Tier 1 Estimate © Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) FD Low = <50mg CaC am structure, lak ad river width (m) th (m) Brief descripti	0.0036 0.134 0.75 03/1 • • e, pond or canal t 1.7 3	(Enter Perm Is the hat reduc	r zero in Annual 95% ile rive eable area draining to outfa discharge in or within 1 kr ces the velocity within 100r ing's n 0.07 Estima Treatment for solubles (%) Solut 0 Unlim	er flow box to II (ha) In upstream of n of the point Side slope ied effectiven tenuation for les - restricter arge rate ( //s ted I (/s) I (ha)	o assess St 0.072 f a protecte of discharg (m/m) ess Setti d Setti sedin )	ep 1 runoff d site for co ee? 0.5 ement of hents (%)	quality or onservation Long s	nly) n? lope (m/m Predia now Det	No v D 0.0001 ct Impact ailed Results

Figure 6: Method A Calculations for SuDS 461



HIGHWAYS	Highways A	gency Water R	isk Assessment	TOOI ve	rsion 1.0 Nove	mber 2009	)				
AGENCI	Annual Average Co Copper Step 2 0.04 Step 3 -	Solu oncentration r Zinc 0.13 ug/l _ ug/l	Ible - Acute Impact Copper Pass		Zinc Pass	Alert. F & D/:	Protected Area S Structure.	Sediment Sedimer Accumu Extensit	t - Chror nt depos lating? ve?	nic Impact sition for this site is Yes 0.09 No 25	b <b>judged as:</b> Low flow Vel m/s Deposition Index
Location Details											
Road number		A9		HA	Area / DBFO	number					
Assessment type		Non-cumulative a	assessment (single ou	utfall)							
OS grid reference of assessm	ent point (m)	Easting	274467				Northing	7	98916		
OS grid reference of outfall stru	ucture (m)	Easting					Northing				
Outfall number		474			List of outfal	S IN					
Receiving watercourse		Inverton burn (MW	9.6)		indianve asse	SSITICIL					
EA receiving water Detailed R	iver Network ID			As	sessor and aff	liation		(	CFJV_IM	1	
Date of assessment		13/07/2018		Ve	rsion of asses	sment					
Notes											
Step 2 River Impacts	Annual 95%ile river Impermeable road a Base Flow Index (B	flow (m³/s) urea drained (ha) Fl)	0.137 (E 5.8 P 0.544 s	Enter zero 'ermeable : the discl	) in Annual 95 area draining harge in or with	%ile river to outfall iin 1 km i	flow box to as (ha) 1.84 upstream of a	ssess Step	o 1 runofi site for c	f quality only) conservation?	Yes
For dissolved zinc only	Water hardness	Low = <50mg CaCO3	3/I ▼ D								
For sediment impact only	Is there a downstrea ⊙ Tier 1 Estimate	um structure, lake, d river width (m)	pond or canal that re	educes th	e velocity with	in 100m (	of the point of	discharge	?	Yes -	
	© Tier 2 Bed widt	h (m)	2.0 M	<b>lanning</b> 's	n 0.05		Side slope (m	v <b>im)</b> 0.8	5	Long slope (m/	<b>m)</b> 0.025
Step 3 Mitigation		Brief description		Tr	eatment for	Estimate	d effectiveness nuation for	Settler	ment of	Predi	ct Impact
Existing measures				0		dischar	rge rate ( I/s )	0	and ( 70)	Show De	tailed Results
Proposed measures						L					1

Figure 7: Method A Calculations for SuDS 474



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	ICI version 1.0 Nove	mber 201	19				
AGENCY	Annual Average Co Copper Step 2 0.00	Solubi	e - Acute Impact Copper Pass	Zinc Pass	Alert.	Sedi Protected Area. Ac	ment - Chror diment depos cumulating?	nic Impact	site is ju 0.13	<b>dged as:</b> ow flow Vel m/s
Location Details	Step 5 -	- ugn				Ex	ensive	NO	u	eposition index
Road number				HA Area / DBFO	number					
Assessment type		Non-cumulative ass	essment (single outfal	l)						•
OS grid reference of assessm	nent point (m)	Easting	275399			Northing	799366			
OS grid reference of outfall st	ructure (m)	Easting				Northing				
Outfall number		487		List of outfall	s in					
Receiving watercourse		River Spey (MW9.1)	)	cumulative asse	essment					
EA receiving water Detailed	River Network ID			Assessor and affi	liation		CFJV IN	1		
Date of assessment		17/01/2018		Version of assess	sment		1.0			
Notes		l								
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 🔽 Cli	matic region Cold	ler Wet 💽	Rai	infall site Ardtaln	aig (SAAR 1343	.9mm)		•
Step 2 River Impacts	Annual 95% ile river Impermeable road a Baso Elevendor (B	flow (m³/s) rea drained (ha)	3.1         (Entername           0.751         Permit           111         Is the	r zero in Annual 959 eable area draining discharge in er witt	Kile rive to outfal	r flow box to assess (ha) 0.353	Step 1 runof	f quality only	)	Vos –
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I				rupsiteant of a prote		UISCIVAUUII	r 	163
For sediment impact only	Is there a downstrea	rn structure, lake, po	ond or canal that redu	ces the velocity with	in 100m	of the point of discr	arge?	No	•	D
	<ul> <li>Tier 1 Estimate</li> </ul>	d river width (m)	24.6							
	C Tier 2 Bed widt	h (m)	3 Mann	ing's n 0.07	D	Side slope (m/m)	0.5	Long slo	pe (m/m)	0.0001
Step 3 Mitigation					Estimate	ed effectiveness			<b>D</b>	•
		Brief description		Treatment for	Att	enuation for S	ettlement of		Predict	Impact
				solubles (%)	discha	es - restricted se arge rate ( l/s )	diments ( %)	Sho	w Deta	iled Results
Existing measures				0	Unlimit	ed 🔽 🖸 0	D			
Proposed measures				0	Unlimit	ed 🗸 🖸 0	D		Exit	ΤοοΙ

Figure 8: Method A Calculations for SuDS 487



HIGHWAYS	Highways A	gency Water R	isk Assessme	ent Too	Viversion 1.0 Nove	mber 201	19					
AGENCY	Annual Average Co	Solu	ible - Acute Impa Copper	ct	Zinc			Sedime	nt - Chron	ic Impact		
	Step 2 0.00 Step 3 -	0.00 ug/l - ug/l	Pass		Pass	Alert.	Protected Area.	Accum Exten	ulating? sive?	No No	0.35	Low flow Vel m/s Deposition Index
Location Details												
Road number		A9			HA Area / DBFO	number						
Assessment type		Non-cumulative a	assessment (single	e outfall)								-
OS grid reference of assessme	ent point (m)	Easting	275980				Northing		799758			
OS grid reference of outfall stru	cture (m)	Easting					Northing					
Outfall number		490			List of outfall	s in						
Receiving watercourse		River Spey (MW9	.1)		cumulative asse	ssment						
EA receiving water Detailed Riv	ver Network ID				Assessor and affi	liation			CFJV_IM			
Date of assessment		13/07/2018			Version of assess	sment						
Notes		·										
Step 1 Runoff Quality	AADT >10,000 and	d <50,000 ▼	Climatic region	Colde	r Wet 👻	Rai	infall site	Ardtalnaig (	SAAR 1343.	9mm)		•
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	3.1	(Enter	zero in Annual 959	%ile rive	r flowr box to a	issess St	ep 1 runoff	quality o	nly)	
	Impermeable road a	rea drained (ha)	0.82	Perme	able area draining	to outfal	(ha) 0.0	31				
	Base Flow Index (B	FI)	0.411	ls the	discharge in or with	in 1 km	upstream of a	protecte	d site for o	onservatio	n?	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3	3/I 🔽 🖸									
For sediment impact only	is there a downstrea	ım structure, lake.	pond or canal that	it reduce	es the velocity withi	in 100m	of the point of	discharo	e?	N	• •	D
	• Tier 1 Estimate	d river width (m)	13.5				•					
	© Tier 2 Bed widt	h (m)	3	Mannir	ng's n 0.07	D	Side slope (r	n/m)	0.5	Long s	lope (m/n	I) 0.0001
Step 3 Mitigation					[	Estimate	ed effectivenes	s			Dere all'	
		Brief description			Treatment for	Atte	enuation for	Settl	ement of		Predic	et impact
					solubles (%)	solubl discha	es - restricted arge rate ( l/s )	sedin	nents (%)	Sh	ow Det	ailed Results
Existing measures					0	Unlimit	ed 🗸 🕞	0	D			
Proposed measures					0	Unlimit	ed 🔽 🖸	0	D		Exi	it Tool

Figure 9: Method A Calculations for SuDS 490



HIGHWAYS	Highways A	Agency Water R	isk Assessment T	OOI version 1.0 No	wember 20	09					
AGENCY	Annual Average C	Solution er Zinc	Ible - Acute Impact Copper	Zinc			Sedime Sedim	nt - Chron ent deposi	ic Impact	is site is	judged as:
	Step 2 0.00 Step 3 -	0.00 ug/l - ug/l	Pass	Pass	Alert.	Protected Area.	Extens	iulating? sive?	No No	-	Low flow Vel m/s Deposition Index
Location Details		<b>_</b>					•				
Road number		A9		HA Area / DBF	O number						
Assessment type		Non-cumulative a	assessment (single outfa	all)							•
OS grid reference of assessm	ent point (m)	Easting	275980			Northing		799758			
OS grid reference of outfall str	ucture (m)	Easting				Northing					
Outfall number		493		List of out	falls in						
Receiving watercourse		River Spey (MW9	.1)	cumulative as	ssessment						
EA receiving water Detailed F	River Network ID			Assessor and	affiliation			CFJV IM			
Date of assessment		13/07/2018		Version of ass	essment			_			
Notes		-									
<u>Step 2 River Impacts</u>	Annual 95%ile river Impermeable road a Base Flow Index (B	flow (m³/s) area drained (ha) 3FN	3.1 (Ent 3.0 Pen 0.411 Is th	er zero in Annual ( neable area draini e discharce in or y		r flow box to a II (ha) 0.1	ssess Sto	ep 1 runoff d site for c	quality or	niy) m?	Yes •
For dissolved zinc only	Water hardness	Low = <50mg CaCO	3/1								
For sediment impact only	is there a downstrea	am structure, lake,	pond or canal that red	uces the velocity w	nthin 100m	of the point of	discharg	e?	N	0 -	D
	Tier 1 Estimate	ed river width (m)	14.1								
	© Tier 2 Bed wid	th (m)	3 Mar	ning's n 0.07	D	Side slope (n	n/m) (	0.5	Long s	lope (m/m	l) 0.0001
Step 3 Mitigation		Brief description	1	Treatment for	Estimat	ed effectivenes enuation for	s Settle	ement of		Predic	t Impact
Existing measures				solubles (%)	solubl discha	es - restricted arge rate ( l/s )	sedim	nents (%)	Sh	low Det	ailed Results
								D			
Proposed measures				0	Unlimit	ed 🗸 D	0	D		Exi	t Tool

Figure 10: Method A Calculations for SuDS 493



AGENCY	Annual Average (	Solut	ble - Acute Impact Copper	Zinc		Sedim	ent - Chroi	nic Impact	:	
	Сорр	er Zinc				Sedi	ment depos	sition for th	nis site is jud	ged as:
	Step 2 0.00	0.00 ug/l	Pass	Pass	Alert. Protecte	Area. Accu	mulating?	Yes	0.08 Lo	w flow Vel m/s
La antine Datala	Step 5 -	- ug/i				Exte	nsive?	NO		position index
Road number				HA Area / DBEO	number					
		Non cumulativo os	second (single outfr		number					
OS arid reference of assessme	ent point (m)	Fasting		ui)	Northir	a	200724			
OS grid reference of assessme	icture (m)	Easting	270090		Northir	9	000724			
		Lasung		List of outfalls	sin	y				
		502	0	- cumulative asse	ssment					
Receiving watercourse		River Spey (MVV9.	1)							
EA receiving water Detailed Ri	iver Network ID			Assessor and affil	liation		CFJV_IN	Λ		
Date of assessment		18/01/2018		Version of assess	sment		1.0			
Notes										
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 a Annual 95%ile rive	nd <50,000 <b>v</b> C	Simatic region Co	Ider Wet 💽	Rainfall sit	Ardtalnai	(SAAR 1343 Step 1 runof	.9mm) F quality or	nly)	
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I	r flow (m <sup>3</sup> /s) area drained (ha) 3FI)	Simatic region         Co           3.24         (Ent           0.69         Pen           0.411         Is th	Ider Wet er zero in Annual 95% neable area draining t e discharge in or with	Rainfall site Gile river flow b to outfall (ha) in 1 km upstrea	Ardtalnais x to assess \$ 0.301 m of a protect	(SAAR 1343 Step 1 runof ed site for c	.9mm) F quality or conservatio	nly) m?	Yes
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I Water hardness	r flow (m <sup>3</sup> /s) area drained (ha) 3FI) ( Low = <50mg CaCO3/	Simatic region     Co       3.24     (Ent       0.69     Pen       0.411     Is th       1     D	der Wet	Rainfall site Gile river flow b to outfall (ha) in 1 km upstrea	Ardtalnai x to assess \$ 0.301 m of a protect	i (SAAR 1343 Step 1 runof ed site for d	.9mm) f quality or conservatio	nly) n?	Yes
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact only	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre	and <50,000         C           r flow (m <sup>3</sup> /s)         area drained (ha)           3FF)         (           Low = <50mg CaCO3/         (           am structure, lake, p         (	3.24     (Ent       0.69     Pen       0.411     Is th       1     I       pond or canal that reduced	Ider Wet	Rainfall site Gile river flow b to outfall (ha) in 1 km upstrea in 100m of the p	Ardtalnai Ardtalnai 0.301 m of a protect	i (SAAR 1343 Step 1 runof ed site for c	.9mm) f quality or conservatio	nty) nr? • • • •	Yes
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact only	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre © Tier 1 Estimat	nd <50,000  r flow (m <sup>3</sup> /s) area drained (ha) 3FI)  Low = <50mg CaCO3/1 arm structure, lake, p ed river width (m)	Simatic region     Co       3.24     (Ent       0.69     Pen       0.411     Is th       1     Image: Construction of the second of	Ider Wet er zero in Annual 95% neable area draining t e discharge in or with uces the velocity within	Rainfall site Gile river flow b to outfall (ha) in 1 km upstrea n 100m of the p	Ardtalnai x to assess \$ 0.301 m of a protect oint of discha	i (SAAR 1343 itep 1 runof ed site for c ge?	.9mm) f quality or conservatio	nły) nr? • • •	Yes
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact only	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre © Tier 1 Estimat © Tier 2 Bed wice	nd <50,000  r flow (m <sup>3</sup> /s) area drained (ha) 3FI)  Low = <50mg CaCO3/ arm structure, lake, p ed river width (m) th (m)	3.24     (Ent       0.69     Pen       0.411     Is th       1     Is th       34.6     Man	Ider Wet er zero in Annual 95% neable area draining t e discharge in or withing uces the velocity withing ning's n 0.07	Rainfall site Gile river flow be to outfall (ha) in 1 km upstrea n 100m of the p	Ardtalnai Ardtalnai 0.301 m of a protect oint of discha	ed site for o ge?	.9mm) f quality or conservatio N Long si	nly) vn? ∘ □ kope (m/m)	Yes •
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	AADT >10,000 a Annual 95% ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre © Tier 1 Estimat © Tier 2 Bed wid	nd <50,000  C r flow (m <sup>3</sup> /s) area drained (ha) BFI) C Low = <50mg CaCO3/ arm structure, lake, p ed river width (m) th (m)	Simatic region  Co    3.24  (Ent    0.69  Per    0.411  Is th    1  Image: Constraint of the second of	Ider Wet  r zero in Annual 95% neable area draining t e discharge in or with tces the velocity withit ning's n 0.07	Rainfall site Gile river flow by to outfall (ha) in 1 km upstread in 100m of the p Side s Estimated effect	Ardtalnai Ardtalnai x to assess \$ 0.301 m of a protect oirrt of discha ope (m/m) iveness	(SAAR 1343 Step 1 runof ed site for o ge?	.9mm) F quality or conservatio N Long si	niy) n? ○ ▼ □ kope (m/m)	Yes -
Step 1       Runoff Quality         Step 2       River Impacts         For dissolved zinc only       For sediment impact only         For sediment impact only       Step 3	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre © Tier 1 Estimat © Tier 2 Bed wid	nd <50,000  r flow (m <sup>3</sup> /s) area drained (ha) BFI) C Low = <50mg CaCO3/ arm structure, lake, p ed river width (m) th (m) Brief description	Simatic region  Co    3.24  (Ent    0.69  Pen    0.411  Is th    1  Image: Constraint of the second of	Ider Wet  r zero in Annual 95% neable area draining t e discharge in or withi ning's n  Treatment for	Rainfall site Gile river flow by to outfall (ha) in 1 km upstread in 100m of the p Side s Estimated effect Attenuation	Ardtalnair Ardtalnair x to assess \$ 0.301 m of a protect oper (m/m) veness for Se	(SAAR 1343 Step 1 runof ed site for o ge? 0.5	.9mm)  F quality or  conservatio  Long sl	niy) m? ovvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvvv	Yes -
Step 1       Runoff Quality         Step 2       River Impacts         For dissolved zinc only       For sediment impact only         For sediment impact only       Step 3         Mitigation       Image: Control of the sediment impact only	AADT >10,000 a Annual 95% ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre © Tier 1 Estimat © Tier 2 Bed wid	nd <50,000  r flow (m <sup>3</sup> /s) area drained (ha) 3FI) C Low = <50mg CaCO3// arm structure, lake, p ed river width (m) th (m) Brief description	Simatic region     Co       3.24     (Ent       0.69     Per       0.411     Is th       1     Image: Color canal that red       34.6     Man	Ider Wet  r zero in Annual 95% neable area draining t e discharge in or withi ning's n 0.07  Treatment for solubles (%)	Rainfall site file river flow by to outfall (ha) in 1 km upstread in 100m of the p Side s Estimated effect Attenuation solubles - rest discharge rate	Ardtalnair Ardtalnair x to assess \$ 0.301 m of a protect ope (m/m) veness for Se icted sed (Vs)	(SAAR 1343 Step 1 runof ed site for o ge? 0.5	.9mm)  F quality or  conservatio  Long s  Sh	nly) «n? « • • • • « « » » » » » » » » » » » » » » » » »	Yes -
Step 1 Runoff Quality         Step 2 River Impacts         For dissolved zinc only         For sediment impact only         Step 3 Mitigation         Existing measures	AADT >10,000 a Annual 95%ile rive Impermeable road Base Flow Index (I Water hardness Is there a downstre © Tier 1 Estimat © Tier 2 Bed wid	nd <50,000  r flow (m <sup>3</sup> /s) area drained (ha) 3FI) C Low = <50mg CaCO3/l arm structure, lake, p ed river width (m) th (m) Brief description	3.24       (Ent         0.69       Per         0.411       Is th         1       Image: Comparison of the second sec	Ider Wet     Image: Constraint of the second s	Rainfall site file river flow by to outfall (ha) in 1 km upstread in 100m of the p Side s Estimated effect Attenuation solubles - rest discharge rate Unlimited	Ardtalnair Ardtalnair x to assess \$ 0.301 m of a protect ope (m/m) veness for Se icted (Vs) 0 0 0 0 0 0 0	(SAAR 1343 Step 1 runof ed site for o ge? 0.5	.9mm)  F quality or  conservatio  Long si  Sh	nly) «r? « • • • • «voide the second	Yes -

Figure 11: Method A Calculations for SuDS 502


HIGHWAYS	<b>Highways A</b>	gency Water Risl	k Assessment To	Ol version 1.0 Nover	nber 200	)					
AGENCY	Annual Average Co Copper Step 2 0.45 Step 3 -	Soluble ncentration Zinc 1.41 ug/l - ug/l	e - Acute Impact Copper Pass	Zinc iver Fails Toxicity est. Try mitigation	Alert. P	Protected Area.	Sedime Sedim Accum Exten	nt - Chron ent deposi ulating? sive?	iic Impact ition for th Yes No	<b>is site is</b> j 0.08 50	<b>udged as:</b> Low flow Vel m/s Deposition Index
Location Details		I									
Road number				HA Area / DBFO r	number						
Assessment type		Non-cumulative ass	essment (single outfall)								
OS grid reference of assessment p	ooint (m)	Easting	276698			Northing		801034			
OS grid reference of outfall structure	e (m)	Easting				Northing					
Outfall number		507		LIST OF OUTTAILS	s in ssment						
Receiving watercourse		Unnamed watercours	se (W9.21)	Currandaryo 4550	Someric						
EA receiving water Detailed River	Network ID			Assessor and affil	iation			CFJV_IM			
Date of assessment		17/01/2018		Version of assess	ment			1.0			
Notes				·							
Step 1 Runoff Quality AAI	DT >10,000 and nual 95%ile river f	<50,000 Clir	0.001 (Enter	zero in Annual 95%	Rair Gile river	flow box to a	Ardtalnaig ( ISSESS St	saar 1343.9 Saar 1343.9	9mm) <b>quality on</b>	ły)	<u> </u>
Bas	se Flow Index (BF	-1)         0.7	5 <b>Is the</b>	discharge in or withi	in 1 km (	upstream of a	ı protecte	d site for o	onservatio	n?	Yes 🗸
For sediment impact only is th	here a downstreau ier 1 Estimated	m structure, lake, po	nd or canal that reduc	es the velocity within	n 100m -	of the point o	f discharg	e?	No	•	D
© Ti	ier 2 Bed width	ı (m)	1.0 Manni	ng's n 0.05		Side slope (i	n/m) 🔤	).5	Long sl	ope (m/m	0.0041
Step 3 Mitigation		Brief description		E Treatment for solubles (%)	Estimate Atte soluble dischar	d effectivenes nuation for s - restricted ge rate ( 1/s )	s Settl sedin	ement of ients ( %)		Predic	t Impact
Existing measures				0	Unlimite	d 🗣 🖸	0	D	31	ow Det	aneu results
Proposed measures				0	Unlimite	d 🗕 🗖	0	D		Exi	t Tool

Figure 12: Method A Calculations for SuDS 507 (copper)



HIGHWAYS	S Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 20	19					
AGENCY	Annual Average Co	Solubl	e - Acute Impact	Zinc			Sedime	nt - Chron	nic Impact		
	Copper	Zinc					Sedim	ent depos	ition for thi	s site is j	udged as:
	Step 2 0.45	1.41 ug/l	Pass	Pass	Alert.	Protected Area.	Accum	ulating?	Yes	0.08	Low flow Vel m/s
	Step 3 0.25	0.77 ug/l					Exten	sive?	No	15	Deposition Index
Location Details		1									
Road number				HA Area / DBFO	number						
Assessment type		Non-cumulative ass	sessment (single outfal	I)							•
OS grid reference of assess	ment point (m)	Easting	276698			Northing		801034			
OS grid reference of outfall s	tructure (m)	Easting				Northing					
Outfall number		507		List of outfal	ls in						
Receiving watercourse		Unnamed watercour	se (W9.21)	cumulative asse	ssment						
EA receiving water Detailed	River Network ID			Assessor and aff	iliation			CFJV_IM			
Date of assessment		17/01/2018		Version of asses	sment			1.0			
Notes		·									
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 ▼ Cli	matic region Cold	ler Wet 💌	Ra	infall site	Ardtalnaig (	SAAR 1343.	9mm)		•
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.001 (Ente	r zero in Annual 95ª	%ile rive	r flow box to a	ussess St	ep 1 runoff	quality on	y)	
	impermeable road a	rea drained (ha)	0.545 <b>Perm</b>	eable area draining	to outfa	(ha) 0.0	00				
	Base Flow Index (B	FI) 0.	75 <b>Is the</b>	discharge in or with	nin 1 km	upstream of a	protecte	d site for c	onservatior	12	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	▼ D								
For sediment impact only	Is there a downstrea	im structure, lake, po	ond or canal that redu	ces the velocity with	in 100rr	of the point of	f discharg	je?	No	•	D
	⊖ Tier 1 Estimate	d river width (m)	1.0								
	• Tier 2 Bed widt	h ( <b>m</b> )	1.0 <b>Mann</b>	ing's n 0.05		Side slope (r	n/m)	0.5	Long sk	pe (m/m	0.0041
Step 3 Mitigation			[		Estimat	ed effectivenes	S			Brodie	timnaat
		Brief description		Treatment for	Att	enuation for	Settl	ement of		Fredic	сттраст
				solubles (%)	solubl	es - restricted	sedin	nents (%)			
Existing measures				0	Unlimit	ed _	0		She	ow Deta	alled Results
Dropogod monguros	designed OutDO has 1. (7.)				11-1-2		70				
Filte	r drain and SuDS basin (Zn)	)		45	Uniimit	ea 🗸 D	10			Exi	t Tool

Figure 13: Method A Calculations for SuDS 507 (zinc)



HIGHWA	YS Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 200	19		
AGENCY		Solubl	e - Acute Impact			Se	diment - Chror	nic Impact
	Annual Average Co	Tinc	Copper	Zinc			Sediment depos	ition for this site is judged as:
	Step 2 0.96	2.98 ug/l	Pass	Test. Try more	Alert.	Protected Area.	Accumulating?	Yes 0.09 Low flow Vel m/s
	Step 3 0.58	1.79 ug/l		mitigation			Extensive?	No 23 Deposition Index
Location Details								
Road number		A9		HA Area / DBFO	number			
Assessment type		Non-cumulative ass	sessment (single outfal	I)				•
OS grid reference of asse	essment point (m)	Easting	276770			Northing	801087	
OS grid reference of outfa	all structure (m)	Easting	1			Northing		
Outfall number		509		List of outfal	ls in			
Receiving watercourse		Unnamed watercours	se (MW9.10)	- cumulative asse	essment			
EA receiving water Detail	ed River Network ID			Assessor and aff	iliation		CFJV_IN	1
Date of assessment		13/07/2018		Version of asses	sment			
Notes								
Step 1 Runoff Qual	AADT >10,000 and	d <50,000 🗸 Cli	matic region Cold	ler Wet 👻	Rai	infall site Ardta	alnaig (SAAR 1343	9mm) 🔽
	•							
Step 2 River impact	<b><u>us</u></b> Annual 95%ile river	flow (m³/s)	0.001 (Ente	r zero in Annual 959	%ile rive	r flow box to asse	ss Step 1 runof	f quality only)
	Impermeable road a	rea drained (ha)	1.5 Perm	eable area draining	to outfal	(ha) 0.23		
	Base Flow Index (B	FI) 0.	75 Is the	discharge in or with	iin 1 km	upstream of a pro	tected site for a	conservation?
For dissolved zinc only	y Water hardness	Low = <50mg CaCO3/I	▼ D					
For sediment impact o	nly is there a downstrea	um structure, lake, po	ond or canal that reduc	ces the velocity with	in 100m	of the point of dis	charge?	No 🗸 D
-	- Tier 1 Estimate	d river width (m)	1.0	-		-	-	
	• Tier 2 Bed widt	h (m)	1.0 <b>Mann</b>	ing's n 0.05		Side slope (m/m)	0.5	Long slope (m/m) 0.006
Step 3 Mitigation					Estimate	ed effectiveness		Predict Impact
		Brief description		Treatment for	Atte	enuation for	Settlement of	
				Solubles ( %)	discha	arge rate ( l/s )	seuments (%)	Show Detailed Results
Existing measures				0	Unlimit	ed 🛛 🔽 🛛	D	
Proposed measures F	Filter draina & wet detention por	nd (100%) (Cu)		40	Unlimit	ed 🗸 🖸 72	2	Exit Tool

Figure 14: Method A Calculations for SuDS 509 (copper)



HIGHWA	YS Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 200	9					
AGENCY		Solubl	e - Acute Impact				Sedime	nt - Chron	ic Impact		
	Annual Average Co	oncentration Zinc	Copper	Zinc			Sedim	ent denos	ition for this	site is iu	doed as:
	Step 2 0.96	2.98 ug/l	Pass	Pass	Alert. F	Protected Area	Accun	ulating?	Yes	0.09 Lo	ow flow Vel m/s
	Step 3 0.45	1.39 ug/l					Exten	sive?	No	23 D	eposition Index
Location Details											
Road number		A9		HA Area / DBFO	number						
Assessment type		Non-cumulative ass	essment (single outfal	)							•
OS grid reference of ass	essment point (m)	Easting	276770			Northing		801087			
OS grid reference of out	fall structure (m)	Easting				Northing					
Outfall number		509		List of outfall	s in						
Receiving watercourse		Unnamed watercours	se (MW9.10)	cumulative asse	ssmeni						
EA receiving water Deta	iled River Network ID			Assessor and affi	liation			CFJV_IM			
Date of assessment		13/07/2018		Version of assess	sment						
Notes											
Step 1 Runoff Qua	AADT >10,000 and	i <50,000 ▼ Clin	matic region Cold	er Wet 🝷	Raii	nfall site	Ardtalnaig	(SAAR 1343.)	9mm)		-
Step 2 River Impac	ts Annual 95%ile river	flow (m³/s)	0.001 (Ente	r zero in Annual 95%	‰ile river	flow box to	assess St	ep 1 runoff	quality only	ı)	
	Impermeable road a	rea drained (ha)	1.5 Perm	eable area draining	to outfall	(ha) 0.	23				
	Base Flow Index (B	FI) 0.1	75 <b>Is the</b>	discharge in or with	in 1 km	upstream of a	a protecte	d site for o	onservation	?	Yes -
For dissolved zinc on	<b>ly</b> Water hardness	Low = <50mg CaCO3/I	▼ D								
For sediment impact of	only is there a downstrea	rn structure, lake, po	ond or canal that redu	es the velocity with	in 100m	of the point a	f dischard	je?	No	•	
	∴	d river width (m)	1.0			•					
	© Tier 2 Bed widt	h (m)	1.0 Mann	ing's n 0.05		Side slope (	m/m)	0.5	Long slo	pe (m/m)	0.006
			r								
Step 3 Mitigation					Estimate	d effectivenes	SS			Predict	Impact
		Brief description		I reatment for solubles (%)	Atte	nuation for	Settl	ement of			
				55105165 (70)	discha	rge rate ( I/s )	Jocum	10110 (70)	Sho	w Detai	led Results
Existing measures				0 D	Unlimite	d 🖣 🗖	0	D			
Proposed measures	Filter draina & wet detention por	nd (100%) <mark>(</mark> Zn)		53.25	Unlimite	d 🗕 🟳	72			Exit	Tool

Figure 15: Method A Calculations for SuDS 509 (zinc)



HIGHWA	YS Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 200	9					
AGENCT	Annual Average Co Copper Step 2 1.22 Step 3 0.73	Soluble incentration Zinc 3.72 ug/l 2.23 ug/l	e - Acute Impact Copper	Zinc River Fails Toxicity Test. Try more mitigation	Alert. F	Protected Area.	Sedimer Sedim Accum Extens	nt - Chron ent deposi ulating? sive?	ic Impact ition for th No No	t nis site is j 0.13 -	<b>udged as:</b> Low flow Vel m/s Deposition Index
Location Details											
Road number		A9		HA Area / DBFO	number						
Assessment type		Non-cumulative ass	essment (single outfal	I)							-
OS grid reference of ass	essment point (m)	Easting	277081			Northing		801545			
OS grid reference of outf	fall structure (m)	Easting				Northing					
Outfall number		513		List of outfall	s in						
Receiving watercourse		Unnamed watercours	se (W9.26)	cumulative asse	essment						
EA receiving water Deta	iled River Network ID			Assessor and affi	liation			CFJV_IM			
Date of assessment		13/07/2018		Version of assess	sment						
Notes											
Step 1 Runoff Qua	AADT >10,000 and	<50,000 Clin		r zoro in Annual 059	Rain Kilo rivor	nfall site 4	Ardtalnaig (	SAAR 1343.	9mm)	nki)	<u> </u>
	Impermeable road a Base Flow Index (Bl	rea drained (ha)	2.45         Perm           402         Is the	eable area draining discharge in or with	to outfall in 1 km	(ha) 0.4 upstream of a	protected	site for c	onservatio	m?	Yes 🗸
For dissolved zinc on	<b>ly</b> Water hardness	Low = <50mg CaCO3/I	▼ D								
For sediment impact of	only is there a downstrea	rn structure, lake, po	ond or canal that redu	es the velocity with	in 100m	of the point of	discharg	e?	N	lo 🖵	D
	© Tier 1 Estimate	d river width (m)	1.5								
	• Tier 2 Bed widt	n (m)	1.5 <b>Mann</b>	ing's n 0.05		Side slope (rr	vim) 🤇	).5	Long s	lope (m/m	0.0275
Step 3 Mitigation					Estimate	d effectiveness	3				
		Brief description		Treatment for solubles (%)	Atte	enuation for es - restricted	Settle sedim	ement of ients ( %)		Predic	t Impact
Existing measures				0	Unlimite		0	D	Sh	now Deta	ailed Results
Proposed measures	Filter drain and wet detention po	nd (100%) (Cu)		40	Unlimite	d - D	72			Exit	t Tool

Figure 16: Method A Calculations for SuDS 513 (copper)



HIGHWA	YS Highways A	gency Water Ris	sk Assessment	TOOI version 1.0	November 20	09					
AGENCY	Annual Average Co	Solut oncentration	ole - Acute Impact Copper	Zinc River Fails Toxici			Sedime Sedim	nt - Chron ent deposi	ic Impact ition for thi	s site is j	udged as:
	Step 2         1.22           Step 3         0.57	3.72 ug/l 1.74 ug/l	Pass	Test. Try more mitigation	Alert. & E	Protected Area D/S Structure.	Accum Exten	ulating? sive?	No No	0.13	Low flow Vel m/s Deposition Index
Location Details											
Road number		A9		HA Area / D	BFO number						
Assessment type		Non-cumulative as	ssessment (single ou	tfall)							-
OS grid reference of asse	essment point (m)	Easting	277081			Northing		801545			
OS grid reference of outfa	III structure (m)	Easting				Northing					
Outfall number		513		List of o	outfalls in						
Receiving watercourse		Unnamed watercou	irse (W9.26)	cumulative	assessment						
EA receiving water Detail	ed River Network ID			Assessor ar	d affiliation			CFJV_IM			
Date of assessment		13/07/2018		Version of a	ssessment						
Notes		-									
Step 1 Runoff Qual	AADT >10,000 and	d <50,000 🔹 C	limatic region	Colder Wet	- Ra	infall site	Ardtalnaig (	SAAR 1343.9	9mm)		•
Step 2 River Impac	Annual 95%ile river	flow (m³/s)	0.001 <b>(E</b>	nter zero in Annua	l 95%ile rive	r flow box to	assess St	ep 1 runoff	quality only	y)	
	Impermeable road a	<b>rea drained (ha)</b>	2.45 Pe	ermeable area drai	ning to outfa	∎ (ha) 🛛 🛛	.47				
	Base Flow Index (Bl	FI) (	).402 <b>Is</b>	the discharge in o	r within 1 km	upstream of	a protecte	d site for c	onservation	?	Yes 🗸
For dissolved zinc only	v Water hardness	Low = <50mg CaCO3/	▼ D								
For sediment impact o	nly is there a downstrea	im structure, lake, c	ond or canal that re	duces the velocity	within 100m	n of the point (	of dischard	e?	Ye	s 🗸	
· ·	• • Tier 1 Estimate	d river width (m)	1.5	-		•					
	© Tier 2 Bed widt	h (m)	1.5 Ma	anning's n 0.05		Side slope (	(m/m)	).5	Long slo	pe (m/m	0.0275
Step 3 Mitigation					Estimat	ed effectivene	SS			Predic	t Imnact
		Brief description		Treatment f	or Att	enuation for	Settl	ement of		Teulo	impact
				solubles ( %	o) solubl discha	les - restricted arge rate ( l/s )	) sedin	ients ( %)	Sho	ow Deta	ailed Results
Existing measures				0	D Unlimit	ed 🗕 🗖	0	D			
Proposed measures F	ilter drain and wet detention po	ond (100%) (Zn)		53.25	Unlimit	ed 🖵 🖸	72			Exi	t Tool

Figure 17: Method A Calculations for SuDS 513 (zinc)



HIGHW/	AYS Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 200	9					
AGENCT	Annual Average Co Copper Step 2 1.22 Step 3 0.61	Solub oncentration r Zinc 3.72 ug/l 1.86 ug/l	le - Acute Impact Copper Pass	Zinc River Fails Toxicity Test. Try more mitigation	Alert. & D	S Protected Area /S Structure.	Sedimen Sedime Accum Extens	nt - Chron ent depos ulating? ive?	iic Impact ition for th No No	<b>is site is j</b> 0.13	<b>udged as:</b> Low flow Vel m/s Deposition Index
Location Details											
Road number		A9		HA Area / DBFO	number						
Assessment type		Non-cumulative as	sessment (single outfal	)							-
OS grid reference of as	sessment point (m)	Easting	277081			Northing	8	801545			
OS grid reference of out	tfall structure (m)	Easting				Northing					
Outfall number		513		List of outfalls	S IN comont						
Receiving watercourse		Unnamed watercour	se (W9.26)	Cumulative asse	Someni						
EA receiving water Deta	ailed River Network ID			Assessor and affi	liation			CFJV_IM			
Date of assessment		13/07/2018		Version of assess	sment						
Notes				I							
Step 1 Runoff Qua	ality     AADT     >10,000 and       Cts     Annual 95% ile river       Impermeable road a       Base Flow Index (B	d <50,000  Cli flow (m <sup>3</sup> /s) area drained (ha) Fl) 0.	Imatic region         Cold           0.001         (Enter           2.45         Perm           402         Is the	er Wet r zero in Annual 959 eable area draining discharge in or with	Rai Gile rive to outfal in 1 km	r flow box to ass I (ha) 0.47 upstream of a p	italnaig (S sess Ste	p 1 runoff	9mm) quality or onservatio	nly) n?	Yes
For dissolved zinc or	nly Water hardness	Low = <50mg CaCO3/I									
For sediment impact	only Is there a downstrea C Tier 1 Estimate © Tier 2 Bed width	am structure, lake, po cl river width (m) h (m)	ond or canal that reduced 1.5 Mann	ing's n 0.05	n 100m	of the point of d Side slope (m/r	ischarge n) 🛛 0	.5	Y Long si	es 🔽	0.0275
Step 3 Mitigation		Brief description		Treatment for solubles (%)	Estimate Atte soluble	ed effectiveness enuation for es - restricted urge rate ( //s )	Settle	ment of ents (%)		Predic	t Impact
Existing measures				0	Unlimite		0	D	Sh	ow Deta	alled Results
Proposed measures	Filter drain and swale/grassed c	hannel (Cu)		50	Unlimite	ed 🗸 D	100			Exi	t Tool

Figure 18: Method A Calculations for SuDS 513 (copper) Filter Drain & Swale



HIGHWAY	rs Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nover	mber 2009				
AGENCY	Annual Average Co Copper Step 2 1.22 Step 3 0.37	Solubl	e - Acute Impact Copper Pass	Zinc Pass	Alert. Protected Area & D/S Structure. Sediment de Accumulatin Extensive?			ic Impact	s site is judged as:
Location Details	3tep 3 0.57	1.12 ug/i					sive:		Deposition index
Road number		A9		HA Area / DBFO	number				
Assessment type		Non-cumulative ass	sessment (single outfall	)					•
OS grid reference of asses	ssment point (m)	Easting	277081	-	Northing		801545		
OS grid reference of outfal	ll structure (m)	Easting			Northing				
Outfall number		513		List of outfalls	s in				
Receiving watercourse		Unnamed watercour	se (W9.26)	cumulative asses	ssment				
EA receiving water Detaile	ed River Network ID			Assessor and affil	liation		CFJV_IM		
Date of assessment		13/07/2018		Version of assess	ment				
Notes				1					
Step 1 Runoff Qualit	AADT >10,000 and Annual 95% ile river to Impermeable road a Base Flow Index (Bl Water hardness	<50,000 Clin flow (m <sup>3</sup> /s) rea drained (ha) Fl) 0.	Imatic region         Cold           0.001         (Enter           2.45         Perm           402         Is the	er Wet r zero in Annual 95% eable area draining t discharge in or with	Rainfall site 6ile river flow box to outfall (ha) in 1 km upstream	Ardtalnaig to assess St 0.47 of a protecte	ep 1 runoff	omm) quality only onservation	) ? Yes <b>v</b>
For sediment impact on	It is there a downstrea	m structure, lake, po d river width (m)	and or canal that reduc	es the velocity within	n 100m of the poir	t of discharg	je?	Yes	3
	• Tier 2 Bed widt	n (m)	1.5 Manni	ng's n 0.05	Side slop	e (m/m)	0.5	Long slo	pe (m/m) 0.0275
Step 3 Mitigation		Brief description		E Treatment for solubles (%)	Estimated effective Attenuation for solubles - restrict discharge rate ( )	ness Settl ed sedin	ement of nents ( %)		Predict Impact
Existing measures			I	0	Unlimited 🖵 🔽		D	sho	w Detailed Results
Proposed measures Fi	ilter drain and swale/grassed cl	hannel (Zn)		70	Unlimited 🗸	D 100			Exit Tool

Figure 19: Method A Calculations for SuDS 513 (zinc) Filter Drain & Swale



AGENCY												
	Annual Average Con Copper Step 2 0.14 Step 3	Solu ncentration Zinc 0.43 ug/l	ble - Acute Impac Copper Pass	et	Zinc Pass	Alert. P	otected Area.	Sedimer Sedime Accum	nt - Chron ent deposi ulating? ive?	ition for th	<b>is site is j</b> 0.00 37	<b>udged as:</b> Low flow Vel m/s Deposition Index
ocation Details		ugn										
oad number		A9		ŀ	HA Area / DBFO nu	umber						
ssessment type		Non-cumulative a	ssessment (single	outfall)								
S grid reference of assessment	t point (m)	Easting	278954				lorthing		802096			
S grid reference of outfall struct	ure (m)	Easting					lorthing					
utfall number		530			List of outfalls	in						
eceiving watercourse		Unnamed waterco	urse (W9.27)		cumulative assess	sment						
A receiving water Detailed Rive	er Network ID				Assessor and affilia	ation			CFJV IM			
ate of assessment		13/07/2018		N	Version of assessm	nent						
otes	l	10/01/2010										
tep 1 Runoff Quality A	ADT >10,000 and nnual 95%ile river f	<50,000 • C	<b>Limatic region</b>	Colder W	Vet 💽	Rain ile river	all site /	Ardtalnaig (S	saar 1343. p <b>1 runoff</b>	9mm) quality or	ıly)	
Step 1 Runoff Quality A Step 2 River Impacts A Im Ba	ADT >10,000 and nnual 95%ile river f xpermeable road ar ase Flow Index (BF	<50,000  C low (m <sup>3</sup> /s) ea drained (ha) T)	0.001         0.16           0.353         1	Colder W (Enter ze Permeab Is the dis	Vet voin Annual 95%i volume area draining to scharge in or within	Rain ile river o outfall n 1 km u	iall site // low box to a (ha) 0.0 pstream of a	Ardtalnaig (S Issess Ste 6 protected	GAAR 1343. p <b>1 runoff</b> I site for c	<sup>9mm)</sup> quality or onservatio	nly) n?	Yes
tep 1 Runoff Quality A tep 2 River Impacts Au Im Bi For dissolved zinc only W	ADT >10,000 and nnual 95%ile river f apermeable road ar ase Flow Index (BF later hardness	<50,000 C low (m <sup>3</sup> /s) ea drained (ha) 1) Low = <50mg CaCO3/	2imatic region       0.001       0.16       0.353       //	Colder W (Enter ze Permeab Is the dis	Vet	Rain ile river o outfall o 1 km u	ial site //	Ardtalnaig (S ssess Ste 6 protected	p 1 runoff	9mm) <b>quality or</b> onservatio	n) n?	Yes
Step 1       Runoff Quality       A         Step 2       River Impacts       A         Irr       B         For dissolved zinc only       W         For sediment impact only       Is         ©       P	ADT >10,000 and nnual 95% ile river f apermeable road an ase Flow Index (BF later hardness there a downstrear Tier 1 Estimated	<pre>&lt;50,000  Cow (rm³/s) rea drained (ha) T) Low = &lt;50mg CaCO3/ n structure, lake,   I river width (rn)</pre>	2imatic region         0.001         0.16         0.353         1         •	Colder W (Enter ze Permeab Is the dis	Vet	Rain ile river o outfall o 1 km u 100m c	all site //	Ardtalnaig (\$ issess Stel f protected discharge	sAAR 1343. p 1 runoff I site for co ≥?	9mm) quality or onservatio	ıły) m? ○ [	Yes V
Step 1 Runoff Quality       A         Step 2 River Impacts       A         Irr       B         For dissolved zinc only       W         For sediment impact only       Is         ©       ©	ADT >10,000 and nnual 95%ile river f apermeable road ar ase Flow Index (BF later hardness there a downstrear Tier 1 Estimated Tier 2 Bed width	<pre>&lt;50,000 C low (rn³/s) ea drained (ha) i) Low = &lt;50mg CaCO3/ n structure, lake, p l river width (rn) (m)</pre>	2imatic region         0.001         0.16         0.353         1         0         0         0.16         0.353         1         0         0         0.16         0.353         1         0         0         0         0         0         0         1.5         1.5	Colder W (Enter ze Permeab Is the dis t reduces Manning)	Vet vet voin Annual 95% voie area draining to scharge in or within the velocity within 's n 0.05	Rain ile river o outfall 1 1 km u 100m c	iall site (ha) (ha) (ha) (ha) (ha) (ha) (ha) (ha)	Ardtalnaig (\$ issess Stel f protected discharge n/m) 0	SAAR 1343.         p 1 runoff         I site for co         >?         .5	9mm) quality or onservatio N Long si	n? • _ [	Yes ▼           □           0.0275
Step 1       Runoff Quality       A         Step 2       River Impacts       A         Irr       B         For dissolved zinc only       W         For sediment impact only       Is         ©       C         Step 3       Mitigation	ADT >10,000 and nnual 95%ile river f apermeable road at ase Flow Index (BF later hardness there a downstrear Tier 1 Estimated Tier 2 Bed width	<pre>&lt;50,000  Cov (rm³/s) rea drained (ha) Ti) Low = &lt;50mg CaCO3/ n structure, lake,   I river width (rm) (rm)</pre>	2imatic region         0.001         0.16         0.353         1         •	Colder W (Enter ze Permeab Is the dis reduces Manning)	Vet vet voin Annual 95% voice area draining to scharge in or within the velocity within 's n 0.05 Es	Rain le river o outfall 1 km u 100m c	all site ( low box to a (ha) 0.0 pstream of a f the point of Side slope (n effectiveness	Ardtalnaig (\$ issess Stelle f protected discharge nvfm) 0 s	p 1 runoff	9mm) quality or onservatio N Long si	n? • • • •	Yes ▼       □       0.0275
Step 1 Runoff Quality       A         Step 2 River Impacts       A         Irr       B         For dissolved zinc only       W         For sediment impact only       Is         ©       C         Step 3 Mitigation       Impacts	ADT >10,000 and nnual 95%ile river f apermeable road at ase Flow Index (BF later hardness there a downstrear Tier 1 Estimated Tier 2 Bed width	<pre>&lt;50,000 C low (rn³/s) rea drained (ha) a) Low = &lt;50mg CaCO3/ n structure, lake, p l river width (m) (m) Brief description</pre>	2imatic region         0.001         0.16         0.353         1         •	Colder W (Enter ze Permeab Is the dis reduces Manning)	Vet vet vois Annual 95% i oke area draining to scharge in or within the velocity within 's n 0.05 Es Treatment for solubles (%)	Rain ile river i o outfall i 1 km u 100m c stimated Atter solubles dischard	iall site (in the second secon	Ardtalnaig (\$ issess Stelle f protected f discharge s Settle sedim	p 1 runoff I site for co	9mm) quality or onservatio N Long si Sh	n? • v (m/m Predic	Yes  Yes  No.0275 Impact
Step 1 Runoff Quality       A         Step 2 River Impacts       A         Irr       B         For dissolved zinc only       W         For sediment impact only       Is         ©       C         Step 3 Mitigation       Existing measures	ADT >10,000 and nnual 95% ile river f apermeable road ar ase Flow Index (BF /ater hardness [ there a downstrear Tier 1 Estimated Tier 2 Bed width	<pre>&lt;50,000 C low (rn³/s) rea drained (ha) 7) Low = &lt;50mg CaCO3/ n structure, lake,   I river width (rn) (m) Brief description</pre>	2imatic region         0.001         0.16         0.353         1         •	Colder W (Enter ze Permeab Is the dis reduces Manning*	Vet vet voin Annual 95% i oke area draining to scharge in or within the velocity within 's n 0.05 Es Treatment for solubles (%)	Rain ile river i o outfall i 1 km u 100m c stimatec Atter solubles discharg Unlimitec	iall site (ha) 0.0 (ha) 0.0 pstream of a f the point of Side slope (n effectivenes: uation for - restricted ge rate ( <i>V</i> s)	Ardtalnaig (\$ issess Steller f protected f discharge s s S Settle sedim 0 0	p 1 runoff p 1 runoff site for c s? .5	9mm) quality or onservatio N Long si Sh	ily) n? ovr (m/m Predic ovr Deta	Ves  Ves  Ves  Ves  Ves  Ves  Ves  Ves

Figure 20: Method A Calculations for SuDS 530



HIGHWATS Highway	s Agency Water Ris	sk Assessment Too	version 1.0 November 20	9			
Annual Average Co Step 2 0 Step 3	Solution           e Concentration           oper         Zinc           03         0.09           ug/l	ble - Acute Impact Copper Pass	Zinc Pass Alert.	Protected Area /S Structure. Structure.	ent - Chron nent deposi nulating? isive?	ic Impact ition for this site is Yes 0.02 No 36	<b>judged as:</b> Low flow Vel m/s Deposition Index
Location Details							
Road number	A9		HA Area / DBFO number				
Assessment type	Non-cumulative as	sessment (single outfall)					•
OS grid reference of assessment point (m)	Easting	278954		Northing	802096		
OS grid reference of outfall structure (m)	Easting			Northing			
Outfall number	534		List of outfalls in				
Receiving watercourse	Raitts Burn (MW9.1	4)					
EA receiving water Detailed River Network ID			Assessor and affiliation		CFJV_IM		
Date of assessment	13/07/2018		Version of assessment				
Notes							
Step 2 River Impacts Annual 95%ile ri Impermeable ro Base Flow Index	ver flow (m³/s) d area drained (ha) (BFI) 0	0.034 (Enter 1.06 Perme	zero in Annual 95%ile rive able area draining to outfa discharge in or within 1 km	r flow box to assess S I (ha) 0.3 upstream of a protecte	tep 1 runoff ed site for co	quality only) onservation?	Yes
For dissolved zinc only Water hardness	Low = <50mg CaCO3/I	▼ D					
For sediment impact only       Is there a downs         © Tier 1       Estin         © Tier 2       Bed at	ream structure, lake, p ated river width (m) ridth (m)	5.5     1.5       1.5     Mannin	es the velocity within 100m	of the point of dischard	<b>ge?</b> 0.5	Yes 🗸	n) 0.0275
For sediment impact only is there a downs © Tier 1 Estim © Tier 2 Bed Step 3 Mitigation	ream structure, lake, p ated river width (m) ridth (m) Brief description	ond or canal that reduce	es the velocity within 100m g's n 0.05 Estimate Treatment for solubles (%) solubl discha	side slope (m/m) [ side slope (m/m) [ ed effectiveness enuation for Sett sed irrog rate ( l/s )	0.5	Ves	n) 0.0275
For sediment impact only is there a downs © Tier 1 Estin © Tier 2 Bed and Step 3 Mittigation Existing measures	ream structure, lake, p ated river width (m) ridth (m) Brief description	Source     5.5       1.5     1.5	es the velocity within 100m og's n 0.05 Estimate Treatment for solubles (%) oublidische 0 Unlimit	Side slope (m/m) Side slope (m/m) ed effectiveness enuation for Sett ses - restricted sedir urge rate ( 1/s ) ed ed 0	ge?	Yes  Long skope (m/r Predi Show Det	n) 0.0275 ct Impact

Figure 21: Method A Calculations for SuDS 534



HIGHWAYS	Highways A	gency Water Ris	k Assessment Too	version 1.0 Nove	mber 200	9		
AGENCY	Annual Average Co Copper Step 2 1.86 Step 3 1.12	Zinc         Ri           5.83         ug/l           3.50         ug/l	e - Acute Impact Copper ver Fails Toxicity Test. Try more mitigation	Zinc ver Fails Toxicity Test. Try more mitigation	Alert. I	Sediment - Chronic Sediment deposit Accumulating? Extensive?		Impact on for this site is judged as: Yes 0.10 Low flow Vel m/s No 44 Deposition Index
Location Details								
Road number		A9		HA Area / DBFO	number			
Assessment type		Non-cumulative ass	essment (single outfall)			1		•
OS grid reference of assessme	nt point (m)	Easting	279290			Northing	802326	
OS grid reference of outfall struc	cture (m)	Easting		_		Northing		
Outfall number		537		List of outfall	s in			
Receiving watercourse		Unnamed watercour	se (W9.33)	cumulative asse	ssment			
EA receiving water Detailed Riv	ver Network ID			Assessor and affi	iliation		CFJV_IM	
Date of assessment		13/07/2018		Version of assess	sment			
Notes							_	
Step 1 Runoff Quality       /         Step 2 River Impacts       /         I       I         For dissolved zinc only       /         For sediment impact only       /	AADT >10,000 and Annual 95%ile river for Impermeable road a Base Flow Index (BI Water hardness s there a downstrea Tier 1 Estimated	<pre>&lt;50,000 Clin flow (m³/s) rea drained (ha) -7) 0. Low = &lt;50mg CaCO3/l m structure, lake, pc d river width (m)</pre>	matic region   Colde     0.001   (Enter     4.47   Perme     75   Is the original state of the state of	r Wet	Rai %ile river to outfal in 1 km in 100m	Infall site     Ardtalnaig       r flow box to assess S       I (ha)       1.41       upstream of a protected       of the point of discharged	(SAAR 1343.9m	uality only) servation? Yes
	Tier 2 Bed widt	ı (m)	1.0 Mannir	g's n 0.05		Side slope (m/m)	0.5	Long slope (m/m) 0.008
Step 3 Mitigation		Brief description		Treatment for solubles (%)	Estimate Atte soluble	ed effectiveness enuation for Sett es - restricted sedir roe rate ( //s )	lement of nents ( %)	Predict Impact
Existing measures				0	Unlimite	ed 🗸 🖸 0	D	Show Detailed Results
Proposed measures Filter dra	ain and wet detention po	nd (100%) (Cu)		40	Unlimite	ed 72		Facility Taxad

Figure 22: Method A Calculations for SuDS 537 (copper)



Highways	gency Water Risk As	sessment Tool	version 1.0 November 200	9		
AGENCY Annual Average ( Step 2 1.86 Step 3 0.87	Soluble - Ad           oncentration         Cd           r         Zinc	ppper Pass	Zinc er Fails Toxicity fest. Try more mitigation	Sedime Protected Area. Exten	nt - Chronic Impact lent deposition for thi nulating? <mark>Yes</mark> sive? No	s site is judged as: 0.10 Low flow Vel m/s 44 Deposition Index
Location Details						
Road number	A9		HA Area / DBFO number			
Assessment type	Non-cumulative assessm	ent (single outfall)				-
OS grid reference of assessment point (m)	Easting 279	290		Northing	802326	
OS grid reference of outfall structure (m)	Easting		7	Northing		
Outfall number	537		List of outfalls in			
Receiving watercourse	Unnamed watercourse (W	(9.33)	cumulative assessment			
EA receiving water Detailed River Network ID			Assessor and affiliation		CFJV_IM	
Date of assessment	13/07/2018		Version of assessment			
Notes						
Step 1 Runoff Quality       AADT       >10,000 all         Step 2 River Impacts       Annual 95% ile rive         Impermeable road       Base Flow Index (Ill         For dissolved zinc only       Water hardness	d <50,000         Climatic           flow (m³/s)         0.0           area drained (ha)         4.4           SFI)         0.75           Low = <50mg CaCO3/I	region  Colder    01  (Enter z    7  Permea    I  Is the d	Vet zero in Annual 95% ile river able area draining to outfal ischarge in or within 1 km	Infall site     Ardtalnaig (       r flow box to assess State       I (ha)       1.41       upstream of a protecte	(SAAR 1343.9mm) ep 1 runoff quality on d site for conservation	Y) ? Yes -
For sediment impact only is there a downstre	am structure, lake, pond o	r canal that reduce	s the velocity within 100m	of the point of discharg	e? No	▼ D
For sediment impact only is there a downstre C Tier 1 Estimat	am structure, lake, pond o ed river width (m) 1.3	r canal that reduce	s the velocity within 100m	of the point of discharg	e? No	T
For sediment impact only       Is there a downstree         C Tier 1       Estimate         Tier 2       Bed wide	am structure, lake, pond or ed river width (m) 1.3 th (m) 1.0	r canal that reduce Manning	s the velocity within 100m g's n 0.05	of the point of discharg Side slope (m/m)	0.5 Long sk	<b>ype (m/m)</b> 0.008
For sediment impact only is there a downstree C Tier 1 Estimat C Tier 2 Bed wid Step 3 Mittigation	arn structure, lake, pond or sd river width (m) 1.3 th (m) 1.0 Brief description	r canal that reduce	s the velocity within 100m g/s n 0.05 Estimate Treatment for Atte solubles (%) discha	of the point of discharg         Side slope (rm/m)         ed effectiveness         enuation for es - restricted         rge rate ( l/s )	ement of nents (%)	pe (m/m) 0.008 Predict Impact
For sediment impact only is there a downstre C Tier 1 Estimat Tier 2 Bed wid Step 3 Mitigation Existing measures	am structure, lake, pond or ed river width (m) 1.3 th (m) 1.0 Brief description	r canal that reduce: Manning 0	s the velocity within 100m g's n 0.05 Estimate Treatment for solubles (%) Unlimite	of the point of discharg         Side slope (m/m)         ed effectiveness         enuation for es - restricted rge rate ( 1/s )         ed         ed	ement of hents (%)	predict Impact

Figure 23: Method A Calculations for SuDS 537 (zinc)



		успсу наші ка	sk assessment i	OOI version 1.0 Nove	mber 200	)			
AGENCI	Annual Average Co Copper Step 2 1.86 Step 3 0.56	Solub oncentration Zinc 5.83 ug/l 1.75 ug/l	l <b>e - Acute Impact</b> Copper Pass	Zinc Pass	Alert. F	rotected Area. Ex	iment - Chron ediment depos ccumulating? ktensive?	nic Impact sition for this Yes No	s site is judged as: 0.10 Low flow Vel m/s 0 Deposition Index
Location Details		1							
Road number		A9		HA Area / DBFO	number				
Assessment type		Non-cumulative as	sessment (single outfa	all)					•
OS grid reference of assessment p	point (m)	Easting	279290			Northing	802326		
OS grid reference of outfall structur	re (m)	Easting				Northing			
Jutfall number		537		List of outfall	ls in				
Receiving watercourse		Unnamed watercou	rse (W9.33)		soment				
A receiving water Detailed River	Network ID			Assessor and affi	iliation		CFJV_IN	1	
Date of assessment		13/07/2018		Version of assess	sment				
Votes		·		L					
Step 1 Runoff Quality AA Step 2 River Impacts An Imp	DT >10,000 and nual 95%ile river to permeable road a	I <50,000 Cl flow (m³/s)	imatic region Co	ter zero in Annual 95%	Raii %ile river	fall site Ardtale	naig (SAAR 1343 s Step 1 runol	.9mm) <b>f quality onl</b>	- 1)
		ica ulaineu (na)	4.47 Pel	meable area oraining	to outai	(18)			
Ba:	se Flow Index (Bl	FI) 0	.75 Is th	meacile area ciraining ne discharge in or with	to outrail nin 1 km	upstream of a prot	ected site for (	conservation	? Yes -
Ba: For dissolved zinc only Wa For sediment impact only Is th C T C T	se Flow Index (Bl iter hardness [ here a downstrea ïer 1 Estimated ïer 2 Bed width	Low = <50mg CaCO3/I m structure, lake, p d river width (m) h (m)		meable area oraining te discharge in or with uces the velocity with ming's n 0.05	in 1 km in 1 km	upstream of a prote of the point of disc Side slope (m/m)	harge?	Conservation	? Yes • • • • • • •
Ba: For dissolved zinc only Wa For sediment impact only Is ti ○ T Step 3 Mitigation	se Flow Index (Bl Iter hardness [ here a downstrea Ter 1 Estimate Ter 2 Bed widt	FI) 0 Low = <50mg CaCO3/I rn structure, lake, p d river width (m) h (m) Brief description	<pre></pre>	Image in or with         Intersection of the selection of the select	in 1 km in 1 km in 100m Estimate Atte soluble dischar	(iiii)     1.41       upstream of a prote       of the point of disc       Side slope (m/m)       d effectiveness       nuation for       s - restricted       sg rate (1/s)	harge?	Long slo	Predict Impact
Ba: For dissolved zinc only Wa For sediment impact only Is ti C T C T T Step 3 Mitigation Existing measures	se Flow Index (Bi Iter hardness [ here a downstrea Tier 1 Estimated Tier 2 Bed width	FI) 0 Low = <50mg CaCO3/l m structure, lake, p d river width (m) h (m) Brief description	<pre></pre>	Image of the selection of	in 100m	of the point of disc Side slope (m/m) d effectiveness nuation for s - restricted rige rate (1/s) d  Q	Lacted site for of harge?	Long sko	Predict Impact

Figure 24: Method A Calculations for SuDS 537 Swale



HIGHWAYS	Highways A	gency Water Ris	sk Assessment To	XXI version 1.0 Nove	mber 200	9					
AGENCI	Annual Average Co Copper Step 2 0.36 Step 3 -	Solub           oncentration           r         Zinc           1.10         ug/l           -         ug/l	le - Acute Impact Copper Pass	Zinc River Fails Toxicity Fest. Try mitigation	Alert. & D	Protected Area /S Structure.	Sedime Sedim Accum Exten	nt - Chron ent deposi nulating? sive?	ic Impact tion for thi No No	<b>is site is</b> 0.30 -	<b>udged as:</b> Low flow Vel m/s Deposition Index
Location Details											
Road number				HA Area / DBFO	number						
Assessment type		Non-cumulative as	sessment (single outfa	ll)							-
OS grid reference of assessm	ient point (m)	Easting	281210			Northing		803668			
OS grid reference of outfall str	ucture (m)	Easting				Northing					
Outfall number		561		List of outfalls	s in						
Receiving watercourse		Unnamed watercour	rse (MW9.17)	cumulative asse	ssment						
EA receiving water Detailed R	River Network ID			Assessor and affi	liation	1		CFJV_IM			
Date of assessment		17/01/2018		Version of assess	ment			1.0			
Notes		-									
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only	AADT >10,000 and Annual 95%ile river Impermeable road a Base Flow Index (B Water hardness	d <50,000         Ci           flow (m³/s)         area drained (ha)           FI)         0.           Low = <50mg CaCO3/l         0.	Imatic region     Color       0.006     (Entername       2.577     Perm       .62     Is the	er zero in Annual 959 reable area draining e discharge in or with	Rai Gile rive to outfal in 1 km	nfall site Au r flow box to as I (ha) 0.71 upstream of a p	sess St	ep 1 runoff	quality on	ly) 1?	Yes
For sediment impact only	Is there a downstrea <sup>C</sup> Tier 1 Estimate <sup>©</sup> Tier 2 Bed widt	am structure, lake, p ed river width (m) h (m)	2.0     Man	<b>ces the velocity withi</b>	n 100m	of the point of o Side slope (m/	discharg (m)	<b>e?</b>	Ye Long sk	s <b>⊥</b> ppe (m/m	0.064
Step 3 Mitigation		Brief description		E Treatment for solubles ( %)	Estimate Atte soluble discha	ed effectiveness enuation for es - restricted inge rate ( //s )	Settl sedin	ement of nents ( %)		Predic	t Impact
Existing measures				0	Unlimite		0		- Sno	ow Det	med kesults
Proposed measures				0 D	Unlimite	ed - D	0	D		Exi	t Tool

Figure 25: Method A Calculations for SuDS 561 (copper)



HIGHWA	YS Highways A	gency Water Ris	sk Assessment To	ICI version 1.0 Nove	ember 20	09					
AGENCI	Annual Average Co Copper Step 2 0.36 Step 3 0.18	Solub oncentration Zinc 1.10 ug/l 0.56 ug/l	ole - Acute Impact Copper Pass	Zinc Pass	Alert. & [	Protected Area )/S Structure.	Sedime Sedim Accun Exten	nt - Chror ent depos ulating? sive?	iic Impact ition for th No No	is site is j 0.30	<b>Jdged as:</b> Low flow Vel m/s Deposition Index
Location Details					number						
Road number				HA Area / DBFO	number						
Assessment type		Non-cumulative as	sessment (single outfal	1)		N. 0.1					
OS grid reference of asse	essment point (m)	Easting	281210			Northing		803668			
OS grid reference of outfa	all structure (m)	Easting				Northing					
Outfall number		561		List of outfal	IS IN SSMONT						
Receiving watercourse		Unnamed watercou	urse (MW9.17)	cumulative asse	coorneric						
EA receiving water Detai	led River Network ID			Assessor and aff	iliation			CFJV_IM			
Date of assessment		23/01/2018		Version of asses	sment			1.0			
Notes											
Step 1 Runoff Qual	AADT >10,000 and	d <50,000 ▼ C	imatic region Cold	ler Wet 🗸	Ra	infall site	Ardtalnaig	SAAR 1343.	9mm)		•
<u>Step 2 River Impac</u>	<b>(15)</b> Annual 95%ile river Impermeable road a Base Flow Index (B	flow (m³/s) area drained (ha) FI) 0	0.006 (Ente 2.577 Perm .62 Is the	r zero in Annual 95' eable area draining discharge in or with	%ile rive to outfa hin 1 km	r flow box to II (ha) 0. I upstream of a	assess St 715 a protecte	ep 1 runoff d site for c	quality or onservatio	nly) m?	Yes
For dissolved zinc only	y Water hardness	Low = <50mg CaCO3/I	T								
For sediment impact o	naly is there a downstrea Tier 1 Estimate	um structure, lake, p d river width (m)	ond or canal that redu	ces the velocity with	in 100m	n of the point c	of discharg	e?	Y	es 📕	
	• Tier 2 Bed widt	h (m)	2.0 <b>Man</b> r	ing's n 0.05		Side slope (	m/m)	0.5	Long s	ope (m/m	0.064
Step 3 Mitigation				Taraharanté	Estimat	ed effectivene	ss			Predic	t Impact
		Brief description		solubles (%)	Att solubl discha	enuation for les - restricted arge rate ( l/s )	sedin	ement of nents (%)	Sh	ow Deta	iled Results
Existing measures				0	Unlimit	ed 🗸 D	0	D			
Proposed measures	Filter drain and Vortex separato	r (Zn)		49.125	Unlimit	ed 🗕 🗖	68			Exi	Tool

Figure 26: Method A Calculations for SuDS 561 (zinc)



HIGHWAYS	Highways Ag	gency Water R	isk Assessm	ent Too	version 1.0 Nove	mber 200	9					
AGENCY		Solu	ible - Acute Imp	act				Sedimer	nt - Chror	nic Impact	:	
	Annual Average Co	oncentration	Copper		Zinc			Sedim	ent denos	ition for th	vie eito ie	iudaed as:
	Step 2 0.38	1.16 ug/l	Pass	Ri	ver Fails Toxicity	Alert.	Protected Area	Accum	ulating?	No	0.30	Low flow Vel m/s
	Step 3 -	- ug/l		Te	st. Try mitigation	& D	/S Structure.	Extens	sive?	No	-	Deposition Index
Location Details												
Road number		A9			HA Area / DBFO	number						
Assessment type		Non-cumulative a	issessment (sing	le outfall)								•
OS grid reference of assessment	t point (m)	Easting	281202				Northing		803687			-
OS grid reference of outfall struct	ure (m)	Easting					Northing					
Outfall number		563	·		List of outfall	sin		ĺ				
Receiving watercourse		Unnamed waterco	ourse (MW9.17)		cumulative asse	essment						
EA receiving water Detailed Rive	er Network ID				Assessor and affi	liation			CFJV_IM			
Date of assessment		13/07/2018			Version of assess	sment						
Notes								]				
Step 1 Runoff Quality A	ADT >10,000 and	<50,000 ▼	Climatic region	Colde	Wet 👻	Rai	nfall site 🛛 /	Ardtalnaig (S	SAAR 1343.	9mm)		•
Step 2 River Impacts A	nnual 95%ile river f	flow (m³/s)	0.006	(Enter	zero in Annual 959	%ile rive	r flowr box to a	ssess Ste	ep 1 runofi	quality o	nly)	
in the second se	permeable road a	rea drained (ha)	2.77	Perme	able area draining	to outfai	l (ha) 1.2	В				
B	ase Flow Index (Bl	FI)	0.62	ls the o	lischarge in or with	iin 1 km	upstream of a	protected	l site for c	onservatio	m?	Yes 🗸
For dissolved zinc only W	later hardness	Low = <50mg CaCO3	8Л <del>–</del> D									
									-			
For sediment impact only is	there a downstrea	m structure, lake,	pond or canal th	at reduce	s the velocity with	in 100m	of the point of	discharg	e?	Y	es 🔻	
0	Tier 1 Estimated	d river width (m)	2.0									
•	Tier 2 Bed width	n (m)	2.0	Mannir	g's n 0.05		Side slope (rr	vim) 🛛 🛛	).5	Long s	lope (m/n	n) 0.064
Step 3 Mitigation						Estimate	ed effectiveness	6			Dradi	-4 I
		Brief description			Treatment for	Atte	enuation for	Settle	ement of		Fredi	стираст
					solubles (%)	soluble	es - restricted	sedim	ents (%)			1
Existing measures										Sh	low Det	ailed Results
					, D		su 🔹 🗋	Ľ	D			
Proposed measures					)	Unlimite	ed 🔽 🖸	0	D		Ex	it Tool

Figure 27: Method A Calculations for SuDS 563 (Copper)



	IIIyiiwaysA	gency Water Ris	K Assessment	<b>FOOI</b> version 1.0 Nove	ember 2009					
AGENCY	Appuel Average C	Solub	le - Acute Impact	Zino			Sediment - Chr	onic Impact		
			Copper	Zinc			Sediment dep	osition for th	is site is	udged as:
	Step 2 0.38	1.16 ug/l	Pass	Pass	Alert. Pro & D/S	otected Area Structure.	Accumulating	No	0.30	Low flow Vel m/s
	Step 3 0.19	0.59 ug/l					Extensive?	No	-	Deposition Index
Location Details										
Road number		A9		HA Area / DBFO	number					
Assessment type		Non-cumulative as	sessment (single out	fall)						•
OS grid reference of assessme	ent point (m)	Easting	281202		N	orthing	803687			
OS grid reference of outfall stru	cture (m)	Easting	<u> </u>		N	orthing				
Outfall number		563		List of outfal	lls in					
Receiving watercourse		Unnamed watercour	se (MW9.17)	cumulative asse	essment					
EA receiving water Detailed Ri	ver Network ID			Assessor and aff	filiation		CFJV_	IM		
Date of assessment		13/07/2018		Version of asses	sment					
Notes										
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 🔹 Ci	imatic region C	older Wet 👻	Rainfa	ll site 🛛 A	rdtalnaig (SAAR 13	13.9mm)		-
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.006 <b>(E</b> n	iter zero in Annual 95'	%ile river fk	ow box to as	isess Step 1 run	off quality or	ıly)	
	Impermeable road a	rea drained (ha)	2.77 <b>Pe</b>	rmeable area draining	to outfall (h	<b>1.28</b>				
	Base Flow Index (B	<b>FI)</b> 0.	.62 <b>Is t</b>	he discharge in or wit	hin 1 km up	stream of a	protected site fo	conservatio	n?	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	• D							
For sediment impact only	is there a downstree	um structure, lake, p	ond or canal that rec	tuces the velocity with	in 100m of	the point of (	discharge?	Y	es 🗸	
	O Tier 1 Estimate	d river width (m)	20			•	-			
	○Tier 1 Estimate ©Tier 2 Bed widt	d river width (m) h (m)	2.0	nning's n 0.05	s s	ide slope (m	- fm) 0.5	Lona s	lope (m/m	0.064
	○ Tier 1 Estimate ⓒ Tier 2 Bed widt	d river width (m) h (m) 	2.0 2.0 Ma	nning's n 0.05	]S	ideslope (m	<b>fm)</b> 0.5	Long s	lope (m/m	0.064
Step 3 Mitigation	C Tier 1 Estimate ◎ Tier 2 Bed widt	d river width (m) h (m)	2.0 2.0 Ma	nning's n 0.05	Estimated e	ide slope (m	<b>/m)</b> 0.5	Long s	ope (m/m	) 0.064
Step 3 Mitigation	○ Tier 1 Estimate ◎ Tier 2 Bed widt	d river width (m) h (m) Brief description	2.0 Ma	Treatment for	Estimated e	ide slope (m effectiveness iation for	fm) 0.5		ope (m/m Predic	) 0.064
Step 3 Mitigation	○ Tier 1 Estimate ◎ Tier 2 Bed widt	d river width (m) h (m) Brief description	2.0 2.0 <b>Ma</b>	Treatment for solubles (%)	Estimated e	ide slope (m effectiveness ation for restricted	fm) 0.5 Settlement o sediments ( %	Long s	lope (m/m Predic	) 0.064
Step 3 Mitigation	○ Tier 1 Estimate ⓒ Tier 2 Bed widt	d river width (m) h (m) Brief description	2.0 Ma	Treatment for solubles (%)	Estimated e	ide slope (m effectiveness lation for - restricted e rate ( l/s )	fm) 0.5 Settlement o sediments ( %	) Long sl	ope (m/m Predic	) 0.064 t Impact ailed Results
Step 3 Mitigation Existing measures	○ Tier 1 Estimate ⓒ Tier 2 Bed widt	d river width (m) h (m) Brief description	2.0 Ma	Treatment for solubles (%)	Estimated e Attenu solubles discharge Unlimited	ide slope (m effectiveness lation for - restricted e rate ( I/s )	fm) 0.5 Settlement o sediments ( %	Long s	ope (m/m Predic	) 0.064

Figure 28: Method A Calculations for SuDS 563 (Zinc)



AGENCY	- inginiayore	gency materia	Sk resourcement re	ANI VEISION 1.0 NOVE	mber 201	9		
Adenor		Solut	ble - Acute Impact	Zinc		Sedim	ent - Chronic Im	pact
	Copper	Zinc	Copper	Zinc		Sedi	ment deposition f	or this site is judged as:
	Step 2 0.00	0.00 ug/l	Pass	Pass		Accu	Imulating?	Low flow Vel m/s
	Step 3 -	- ug/l				Exte	nsive?	Deposition Index
ocation Details								
load number		A9		HA Area / DBFO	number			
Assessment type		Cumulative asses	sment excluding sedim	ents (outfalls between	n 100m a	and 1km apart)		
)S grid reference of assessn	ient point (m)	Easting	275980			Northing	799758	
S grid reference of outfall st	ucture (m)	Easting				Northing		
Outfall number		490		List of outfall	sin	493		
Receiving watercourse		River Spey (MW9.	1)	cumulative asse	essment			
A receiving water Detailed F	River Network ID			Assessor and affi	liation		CFJV IM	
Date of assessment		18/07/2018		Version of assess	sment			
lotes								
<u>tep 2 River Impacts</u>	Annual 95%ile river t Impermeable road a	flow (m³/s) rea drained (ha) 	3.0 (Ente 3.82 Perm	ar zero in Annual 959 neable area draining	&ile rive to outfal	r flow box to assess \$	Step 1 runoff quali	ity only)
	Base Flow Index (BI	FD [0	).411 <b>is the</b>	edischarge in or with	in 1 km	upstream of a protect	ed site for conser	vation?
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	- D					
For sediment impact only	Is there a downstrea	m structure, lake, p	ond or canal that redu	ces the velocity within	in 100m	of the point of discha	rge?	Yes 👻
For sediment impact only	Is there a downstrea Tier 1 Estimated	rn structure, lake, p 3 river width (m)	cond or canal that redu	ices the velocity withi	in 100m	of the point of discha	rge?	Yes 💌
For sediment impact only	Is there a downstrea Tier 1 Estimated Tier 2 Bed width	rm structure, lake, p d river width (m) 1 (m) 	cond or canal that redu 14.1 3 Man	ices the velocity withi	in 100m	of the point of discha Side slope (m/m)	nge?	Yes ng skope (m/m) 0.0001
For sediment impact only	Is there a downstrea Tier 1 Estimated Tier 2 Bed widt	ım structure, lake, r d river width (m) `1 (m)	14.1       3   Man	ning's n 0.07	in 100m	of the point of discha Side slope (m/m)	nge?	Yes ng slope (m/m) 0.0001 Predict Impoct
For sediment impact only	Is there a downstrea © Tier 1 Estimated © Tier 2 Bed widt	m structure, lake, p d river width (m) h (m) Brief description	14.1     Man	ning's n 0.07	in 100m	of the point of discha Side slope (m/m) ed effectiveness enuation for Se	0.5 Lo	Yes ng skope (m/m) 0.0001 Predict Impact
For sediment impact only	Is there a downstrea Tier 1 Estimate Tier 2 Bed widt	im structure, lake, p d river width (m) h (m) Brief description	cond or canal that redu	ning's n 0.07 Treatment for solubles (%)	in 100m	of the point of discha Side slope (m/m) ed effectiveness enuation for Se es - restricted sed rare rate ( //s )	0.5 Lo	Yes ng slope (m/m) 0.0001 Predict Impact
For sediment impact only Step 3 Mitigation Existing measures	Is there a downstrea Tier 1 Estimate Tier 2 Bed widt	im structure, lake, p d river width (m) h (m) Brief description	cond or canal that reduced by the second of the second sec	ning's n 0.07	Estimate	of the point of discha Side slope (m/m) ed effectiveness enuation for Se es - restricted sed rge rate ( l/s ) ed for the point of the sed restricted sed	0.5 Lo	Yes ng skope (m/m) 0.0001 Predict Impact Show Detailed Resul
For sediment impact only Step 3 Mitigation Existing measures	Is there a downstrea Tier 1 Estimate Tier 2 Bed widt	in structure, lake, p d river width (m) h (m) Brief description	oond or canal that reduined in the second of	ning's n 0.07	Estimate soluble discha	of the point of discharge         Side slope (m/m)         ed effectiveness         enuation for         es - restricted         rge rate ( //s )         ed	ttlement of iments (%)	Yes  Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes

Figure 29: Method A HAWRAT output for SuDS 490 & 493 cumulative assessment excluding sediments (outfalls between 100m and 1km apart)



AGENCY	Highways A	gency Water	<b>Risk Assessment</b>	TOOI version 1.0 No	vember 20	19				
AGENCI		Sc	oluble - Acute Impact				Sedimer	nt - Chronic	: Impact	
	Annual Average Co	Zinc	Copper				Sedim	ant denositi	on for this si	te is judged as:
	Step 2 1.09	3.31 ug/l	Pass	Test. Try more			Accum	ulating?		Low flow Vel m/s
	Step 3 0.65	1.99 ug/l		mitigation			Extens	ive?		Deposition Index
Location Details										
Road number		A9		HA Area / DBF	0 number					
Assessment type		Cumulative as	sessment excluding sec	liments (outfalls betwe	en 100m	and 1km apart)				
OS grid reference of assessn	nent point (m)	Easting	276761			Northing		801088		
OS grid reference of outfall st	ructure (m)	Easting				Northing				
Jutfall number		507		List of outf	alls in			509		
Receiving watercourse		Unnamed wate	rcourse (MW9.10)	cumulative as	sessment					
EA receiving water Detailed F	River Network ID			Assessor and a	filiation			CFJV IM		
Date of assessment		13/07/2018		Version of asse	ssment					
Votes		-								
Step 1 Runoff Quality	AADT >10,000 and	d <50,000 ▼	Climatic region	Colder Wet	Ra	infall site	Ardtalnaig (	SAAR 1343.9n	nm)	,
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.001 <b>(E</b>	inter zero in Annual 9	5%ile rive	r flow box to a	issess Ste	ap1runoffc	quality only)	
	impermeable road a	rea drained (ha)	2.033 P	ermeable area drainin	g to outfa	(ha) 0.2	29			
	Baco Elow Indov /B	 CN		the discharge in er w	- ithin 1 km	unctroom of a	protoctor	l cito for cor	Constance	Vac -
	Dase FION INCEA (D	ry	0.411	uie uischauge in or w		rupsieani ora	protected		DELAGOOL	Tes
For dissolved zinc only	Water hardness	Low = <50mg CaC	O3/I ▼ □							
For sediment impact only	is there a downstrea	um structure, lak	e, pond or canal that re	duces the velocity wi	thin 100m	of the point of	discharg	e?	No	▼ D
	Tier 1 Estimate	d river width (m)	1.3	-		-				
	© Tier 2 Bed widt		1.0 M	anning's n 0.05		Side slope (r	n/m) 🔽	.5	Long slope	(m/m) 0.008
Step 3 Mitigation					Estimat	ed effectivenes	S		Pr	edict Impact
		Brief description	on	Treatment for	Att	enuation for	Settle	ement of		
		Difer description		colubles ( 9/ )	colubl	oc roctricted	- coores	Opto ( V/ )		
		Difer description		solubles (%)	solubl discha	es - restricted arge rate ( I/s )	seaim	ents (%)	Chau	Detailed Desult
Existing measures		Direi debenpa		solubles (%)	solubl discha	es - restricted arge rate ( l/s ) ed		ents (%)	Show	Detailed Result
Existing measures	design and used determines are	2101 d0501pt		solubles ( %)	solubl discha Unlimit	es - restricted arge rate ( l/s ) ed	0 100	ents (%)	Show	Detailed Result

Figure 30: Method A HAWRAT output for SuDS 507 & 509 cumulative assessment excluding sediments (outfalls between 100m and 1km apart)



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 20	19				
	Annual Average Co Copper Step 2 1.09 Step 3 0.51	Zinc           3.31         ug/l           1.55         ug/l	e - Acute Impact Copper	Zinc Pass			Sedime Sedim Accum Extens	nt - Chroni ent deposit ulating? sive?	c Impact tion for this	s site is judged as: Low flow Vel m/s Deposition Index
Location Details										
Road number		A9		HA Area / DBFO	number					
Assessment type		Cumulative assess	ment excluding sedime	nts (outfalls betweer	100m	and 1km apart)				-
OS grid reference of assessme	ent point (m)	Easting	276761			Northing		801088		
OS grid reference of outfall strue	cture (m)	Easting				Northing				
Outfall number		507		List of outfall	s in comont			509		
Receiving watercourse		Unnamed watercour	rse (MW9.10)	cumulative asse	SSILICII					
EA receiving water Detailed Riv	ver Network ID			Assessor and affi	liation			CFJV_IM		
Date of assessment		13/07/2018		Version of assess	sment					
Notes										
Step 2 River Impacts	Annual 95% ile river i Impermeable road a Base Flow Index (BI Water hardness	low (m <sup>3</sup> /s) rea drained (ha) -T) 0. Low = <50mg CaCO3/1 m structure lake po	0.001     (Enter       2.033     Permit       411     Is the       Image: Constraint of the second sec	zero in Annual 95% eable area draining discharge in or with	Kile rive to outfa in 1 km	r flow box to as (ha) 0.22 upstream of a p	sess Sto 9 protecter	ep 1 runoff d site for co		) ? Yes <b>v</b>
i of acument impact only	Tier 1 Estimate	1 river width (m)		could record mu			usanug		110	
	Tier 2 Bed widt	ı (m)	1.0 Manni	ng's n 0.05		Side slope (m	/m)	0.5	Long slo	<b>pe (m/m)</b> 0.008
Step 3 Mitigation		Brief description		Treatment for solubles (%)	Estimate Atte solubl discha	ed effectiveness enuation for es - restricted arge rate ( //s )	Settle sedim	ement of nents ( %)	<u>Sha</u>	Predict Impact
Existing measures Proposed measures Filter dr	ain and wet detention po	nd (100%) (Zn)		0 D 53.25	Unlimit Unlimit	ed v D ed v D	0 100	D		Exit Tool

Figure 31: Method A HAWRAT output for SuDS 507 & 509 cumulative assessment excluding sediments (outfalls between 100m and 1km apart)



HIGHWAYS	Highways A	gency Water Ri	sk Assessm	ient Too	Diversion 1.0 Nove	mber 20	19					
	Annual Average Co Copper Step 2 0.63 Step 3 0.32	Solut oncentration Zinc 1.95 0.99 ug/l	ble - Acute Imp Copper Pass	act	Zinc Pass			Sedime Sedim Accum Exten	nt - Chroni ent deposit ulating? sive?	c Impact tion for thi	s site is jud Lo De	l <b>ged as:</b> w flow Vel m/s ¤position Index
Location Details												
Road number		A9			HA Area / DBFO	number						
Assessment type		Cumulative asses	sment excluding	) sedimer	nts (outfalls betweer	n 100m (	and 1km apa	rt)				
OS grid reference of assessm	nent point (m)	Easting	281210				Northing		803668			
OS grid reference of outfall str	ructure (m)	Easting					Northing					
Outfall number		561			List of outfall	S IN	563					
Receiving watercourse		Unnamed watercou	urse (MW9.17)		cumulative asse	ssment						
EA receiving water Detailed F	River Network ID				Assessor and affi	liation			CFJV_IM			
Date of assessment		18/07/2018			Version of assess	sment						
Notes		1							1			
		u <50,000 <b>→</b> C	limatic region	Colde	r Wet 👻	Ra	infall site	Ardtalnaig (	SAAR 1343.9	mm)		•
Step 2 River Impacts	Annual 95%ile river Impermeable road a Base Flow Index (B	flow (m <sup>3</sup> /s) rea drained (ha) Fl)	0.006         5.35           0.62	Colde (Enter Perme	rr Wet zero in Annual 959 eable area draining discharge in or with	Rai &ile rive to outfa in 1 km	r flow box to II (ha)	Ardtalnaig ( assess Sta 2.0	ep 1 runoff d site for co	<sup>mm)</sup> quality on nservatior	ю. У)	Yes •
Step 2 River Impacts For dissolved zinc only	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness	flow (m³/s) area drained (ha) F1) Low = <50mg CaCO3/	Imatic region           0.006           5.35           0.62           1           •	Colde (Enter Perme	rr Wet zero in Annual 959 sable area draining discharge in or with	Rai Kile rive to outfa in 1 km	r flow box to II (ha)	Ardtalnaig ( assess Sti 2.0	sAAR 1343.9 ep 1 runoff d site for co	<sup>mm)</sup> quality on nservation	(? X)	Yes
Step 2 River Impacts For dissolved zinc only For sediment impact only	Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Is there a downstrea © Tier 1 Estimate © Tier 2 Bed widt	flow (m <sup>3</sup> /s) area drained (ha) FI) Low = <50mg CaCO3/ arm structure, kake, p d river width (m) h (m)	imatic region 0.006 5.36 0.62 1 ▼ □ cond or canal the 2.0 2.0	Colde (Enter Perme Is the lat reduce Mannin	rr Wet zero in Annual 959 eable area draining discharge in or with es the velocity withing ng's n 0.05	Rai Kile rive to outfa iin 1 km in 100m	infall site r flow box to (ha)	Ardtalnaig ( a assess Str 2.0 a protecte of discharg (m/m)	ep 1 runoff d site for co e?	mm) quality on riservation Ye Long sk	y) ? s → ppe (m/m)	Yes -
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitligation	Annual 95%ile river Impermeable road a Base Flow Index (B) Water hardness Is there a downstrea © Tier 1 Estimate © Tier 2 Bed widt	a < 50,000	imatic region 0.006 5.36 0.62 1 ↓ □ pond or canal th 2.0 2.0	Colde (Enter Perme Is the at reduce Mannin	rr Wet  zero in Annual 959 eable area draining discharge in or with es the velocity withi ng's n 0.05  Treatment for solubles (%)	Rai Kile rive to outfal in 1 km in 100m Estimate Solubl Solubl discha	r flow box to r flow box to upstream of of the point Side slope enuation for es - restricted arge rate ( <i>V</i> s	Ardtalnaig ( a assess Str 2.0 of discharg (m/m) ess Setti d sedin	ep 1 runoff d site for co e? 0.5 ement of hents (%)	mm) quality on riservation Ve Long sk	y) s v ppe (m/m) Predict	Yes -
Step 2 River Impacts         For dissolved zinc only         For sediment impact only         Step 3 Mitigation         Existing measures	Annual 95%ile river Impermeable road a Base Flow Index (B Water hardness Is there a downstrea Tier 1 Estimate Tier 2 Bed widt	a < so,out	imatic region 0.006 5.35 0.62 1 ▼ □ cond or canal th 2.0 2.0	Colde (Enter Perme Is the at reduce Mannin	rr Wet  zero in Annual 959 sable area draining discharge in or with es the velocity withi ng's n 0.05  Treatment for solubles (%) 0	Rai Kile rive to outfal in 1 km in 100m Estimate Atti solubi discha	r flow box to II (ha)	Ardtalnaig ( assess Str 2.0 of discharg (m/m) (m/m) ess Setti sedin )	ep 1 runoff d site for co e? 0.5 ement of hents (%)	mm) quality on rservation Ye Long sk	y) Predict I pow Detail	Yes V 0.064

Figure 32: Method A HAWRAT output for SuDS 561 & 563 cumulative assessment excluding sediments (outfalls between 100m and 1km apart)



	r ingirway or	чуспсу тацсі г	usr Assessme		Ji version 1.0 Nove	mber zu	9					
AGENCY	Annual Austrana C	Sol	uble - Acute Impac	ct	Zine			Sedime	nt - Chron	ic Impac	t	
		r Zinc	Copper		Zinc			Sedim	ent depos	ition for t	his site is	judged as:
	Step 2 0.00	0.00 ug/l	Pass		Pass	Alert. & D	Protected Area //S Structure.	Accum	ulating?	No	0.32	Low flow Vel m/s
	Step 3 -	- ug/l						Exten	sive?	No	-	Deposition Index
Location Details												
Road number		A9			HA Area / DBFO	number						
Assessment type		Cumulative asse	essment including se	edimer	ts (outfalls within 10	0m)						
US grid reference of assess	sment point (m)	Easting	275980				Northing		799758			
US grid reference of outfall s	structure (m)	Easting					Northing					
Outfall number		490			LIST OF OUTTAIL	s in ssment	493					
Receiving watercourse		River Spey (MW	9.1)									
EA receiving water Detailed	River Network ID				Assessor and affi	liation			CFJV_IM			
Date of assessment		18/07/2018			Version of assess	sment						
Notes												
Sten 1 Runoff Quality												
accept in trained in equilation of the second secon		4 <50 000	OF	Calde	va West	Dei	infall aita 🗌 📝	vedtelmeier (	CAAD 4242	D		
	AADT >10,000 an	d <50,000 <b>▼</b>	Climatic region	Colde	er Wet  ▼	Rai	infall site 🛛 /	Ardtalnaig (	SAAR 1343.	9mm)		
Step 2 River Impacts	AADT >10,000 an Annual 95%ile river	id <50,000 ▼ flow (m³/s)	Climatic region 3.0	Colde	zero in Annual 959	Rai Kile rive	r flow box to a	Ardtalnaig ( ssess St	saar 1343. <b>Ep 1 runoff</b>	9mm) quality o	oniy)	
Step 2 River Impacts	ADT >10,000 an Annual 95%ile river	r flow (m <sup>3</sup> /s) area drained (ha)	3.0         3.82	Colde (Enter Perme	er Wet zero in Annual 959 eable area draining	Rai Kile rive to outfal	r flow box to a	Ardtalnaig ( ssess St	saar 1343. ep 1 runoff	9mm) quality c	only)	
Step 2 River Impacts	Annual 95%ile river Impermeable road Base Flow Index (E	flow (m <sup>3</sup> /s) area drained (ha)	3.0         3.82           0.411	Colde (Enter Perme Is the	er Wet zero in Annual 959 eable area draining discharge in or with	Rai Kile rive to outfal in 1 km	r flow box to a (ha) 0.12 upstream of a	Ardtalnaig ( ssess Sta 27 protecte	saar 1343. ep 1 runoff d site for c	omm) quality o	only) on?	Yes
Step 2 River Impacts	AADT >10,000 an Annual 95%ile river Impermeable road a Base Flow Index (E Water hardness	d <50,000 flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC	3.0       3.82       0.411       03/	Colde (Enter Perme Is the	er Wet zero in Annual 959 eable area draining discharge in or with	Rai Gile rive to outfal	r flow box to a II (ha) 0.12 I upstream of a	Ardtalnaig ( ssess St 27 protecte	SAAR 1343. ep 1 runoff d site for c	9mm) quality o onservatio	only) on?	Yes
Step 2 River Impacts For dissolved zinc only For sediment impact only	Annual 95%ile river Impermeable road a Base Flow Index (E Water hardness y is there a downstree	flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC arm structure, lake	3.0           3.82           0.411           33/1           0           pond or canal that	Colde (Enter Perme Is the	er Wet	Rai Kile rive to outfal in 1 km	r flow box to a r flow box to a (ha) 0.1: upstream of a	Ardtalnaig ( ssess Sto 27 protecte discharg	saar 1343. ep 1 runoff d site for c	9mm) quality o onservatio	on? Yes v	Yes
Step 2 River Impacts For dissolved zinc only For sediment impact only	AADT >10,000 an Annual 95% ile river Impermeable road a Base Flow Index (E Water hardness Water hardness Is there a downstrea © Tier 1 Estimate	Id <50,000 flow (m³/s) area drained (ha) SFI) Low = <50mg CaCC arm structure, lake ad river width (m)	Climatic region 3.0 3.82 0.411 3.7 0.411 3.7 0.411 3.8 0.411 1.4 1.	Colde (Enter Perme Is the	er Wet zero in Annual 959 eable area draining discharge in or with es the velocity with	Rai Kile rive to outfal in 1 km	r flow box to a r flow box to a II (ha) 0.13 upstream of a	Ardtalnaig ( ssess Sti 27 protecte discharg	ep 1 runoff d site for c	9mm) quality c onservati	oniy) on? Yes _	Yes
Step 2 River Impacts For dissolved zinc only For sediment impact only	AADT >10,000 an Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Water hardness State a downstrea Tier 1 Estimate Tier 2 Bed wid	Id <50,000 flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC arm structure, lake ad river width (m) th (m)	Climatic region 3.0 3.82 0.411 3.7 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	Colde (Enter Perme Is the t reduc	er Wet zero in Annual 959 sable area draining discharge in or with es the velocity withing ng's n 0.07	Rai Kile rive to outfal in 1 km in 100m	r flow box to a r flow box to a l (ha) 0.13 upstream of a of the point of Side slope (rr	Ardtalnaig ( ssess Sk 27 protecter discharg	ep 1 runoff d site for c e?	guality o onservati	oniy) on? Yes _ slope (m/m	Yes -
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	AADT >10,000 an Annual 95% ile river Impermeable road i Base Flow Index (E Water hardness Water hardness Sthere a downstree © Tier 1 Estimate © Tier 2 Bed wid	Id <50,000 flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC am structure, lake ad river width (m) th (m)	Climatic region 3.0 3.82 0.411 3.7 0.411 3.8 0.411 3.8 0.411 14.1 3 3 14.1 3 3 3 14.1 3 3 14.1 3 3 14.1 3 3 3 3 3 3 3 3 3	Colde (Enter Perme Is the t reduc	er Wet zero in Annual 959 eable area draining discharge in or with es the velocity with ng's n 0.07	Rai Kile rive to outfal in 1 km in 100m	r flow box to a r flow box to a l (ha) 0.12 upstream of a of the point of Side slope (rr	Ardtalnaig ( ssess Str 27 protecte discharg	ep 1 runoff d site for c e?	guality o onservati Long :	on? Yes ▼ slope (m/m	Yes 0.0001
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	AADT >10,000 an Annual 95% ile river Impermeable road i Base Flow Index (E Water hardness Water hardness Is there a downstrea Tier 1 Estimate Tier 2 Bed wid	I d <50,000 (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC arm structure, lake ad river width (m) th (m) Brief description	Climatic region 3.0 3.82 0.411 3.7 0.411 3.7 0.411 3.82 0.411 1.4.1 3.7 0.411 1.4.1 3.7 0.411 1.4.1	Colde (Enter Perme Is the t reduc	er Wet	Rai Kile rive to outfal in 1 km in 100m Estimate	r flow box to a r flow box to a (ha) (0.1) upstream of a for the point of Side slope (rr ed effectiveness enuation for	Ardtalnaig ( ssess Str 27 protecte discharg	ep 1 runoff d site for c e?	guality o onservati	on? Yes v skope (m/m Predic	Yes - ) 0.0001
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mittigation	AADT >10,000 an Annual 95% ile river Impermeable road a Base Flow Index (E Water hardness Water hardness Sy Is there a downstrea © Tier 1 Estimate Tier 2 Bed wid	I d <50,000 flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC arm structure, lake ad river width (m) th (m) Brief description	Climatic region 3.0 3.82 0.411 3.7 0.411 3.7 0.411 3.82 0.411 0.411 3.82 0.411 1.4.1 3.8 0.411 1.4.1 1.4.1 3.8 0.411 1.4.1	Colde (Enter Perme Is the t reduc	er Wet  zero in Annual 959 eable area draining discharge in or with es the velocity withi ng's n 0.07  Treatment for solubles (%)	Rai Kile rive to outfal in 1 km in 100m Estimate	r flow box to a r flow box to a (ha) (1.1) upstream of a for the point of Side slope (rr ed effectiveness enuation for es - restricted for es - re	Ardtalnaig ( ssess Str 27 protecte discharg v/m)	ep 1 runoff d site for c e? 0.5 ement of eents (%)	guality o onservati	on? Yes v slope (m/m Predic	Yes -
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation	AADT >10,000 an Annual 95% ile river Impermeable road a Base Flow Index (B Water hardness Water hardness Water hardness Is there a downstrea Tier 1 Estimate	I d <50,000 (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC arm structure, lake ad river width (m) th (m) Brief description	Climatic region 3.0 3.82 0.411 3.7 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	Colde (Enter Perme Is the t reduc	er Wet  zero in Annual 959 cable area draining discharge in or with es the velocity withi ng's n 0.07  Treatment for solubles (%)	Rai Kile rive to outfal in 1 km in 100m Estimate Atte soluble	r flow box to a r flow box to a l (ha) 0.13 upstream of a of the point of Side slope (rr ed effectiveness enuation for es - restricted arge rate (1/s)	Ardtalnaig ( ssess Str 27 protecte discharg v/m)	ep 1 runoff d site for c e? 0.5	equality of conservation on servation of the servation of	on? Yes v slope (m/m Predic how Det	Yes ) 0.0001 ct Impact ailed Result
Step 2 River Impacts For dissolved zinc only For sediment impact only Step 3 Mitigation Existing measures	AADT >10,000 an Annual 95% ile river Impermeable road a Base Flow Index (E Water hardness Water hardness Is there a downstrea Tier 1 Estimate Tier 2 Bed wid	I d <50,000 (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaCC arn structure, lake ad river width (m) th (m) Brief description	Climatic region 3.0 3.82 0.411 □ 3.7 ▼ □ , pond or canal that 14.1 3 14.1 3 14.1	Colde (Enter Perme Is the t reduc	er Wet  Zero in Annual 959 eable area draining discharge in or with es the velocity withi ng's n  Treatment for solubles (%)	Rai Kile rive to outfal in 1 km in 100m Estimate Attr solubl discha Unlimit	r flow box to a r flow box to a (ha) 0.1: upstream of a of the point of Side slope (rr ed effectiveness enuation for es - restricted arge rate (1/s ) ed ed •	Ardtalnaig ( ssess Str 27 protecter discharg v/m) [1] s Settil sedim 0	ep 1 runoff d site for c e? 0.5	guality c onservation	on? Yes ↓ Slope (m/m Predic how Det	Yes ) 0.0001 ct Impact ailed Result

Figure 33: Method A HAWRAT output for SuDS 490 & 493 cumulative assessment including sediments (outfalls within 100m) (copper)



	- nignways <i>i</i> a	gency water k	isk Assessment 7	TOOI version 1.0 Nove	mber 200	19					
AGENCY		Solu	ble - Acute Impact	Zine			Sedimen	t - Chron	ic Impact		
			Copper	ZINC Divor Eails Toxicity			Sedime	ent depos	ition for th	is site is i	udged as:
	Step 2 1.09	3.31 ug/l	Pass	Test. Try more	Alert.	Protected Area.	Accum	ulating?	Yes	0.09	_ow flow Vel m/s
	Step 3 0.65	1.99 ug/l		mitigation			Extens	ive?	No	23	Deposition Index
Location Details	_										
Road number		A9		HA Area / DBFO	number						
Assessment type		Cumulative asser	ssment including sedir	ments (outfalls within 10	00m)						
OS grid reference of assess	ment point (m)	Easting	276761			Northing	8	301088			
OS grid reference of outfall s	tructure (m)	Easting				Northing					
Outfall number		507	<b>.</b>	List of outfal	ls in	509					
Receiving watercourse		Unnamed waterco	urse (MW9.10)	cumulative asse	essment						
EA receiving water Detailed	River Network ID	1		Assessor and aff	iliation			CFJV IM			
Date of assessment		18/07/2018		Version of asses	sment			_			
Notes		-									
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 ▼ (	Ximatic region C	Colder Wet	Rai	infall site 🛛 A	Ardtalnaig (S	AAR 1343.	9mm)		
Step 2 River impacts		110W (11195)	0.001 (En	nter zero in Annual 959	%ile rrve	r flow box to as	ssess Ste	p 1 runoit	quality or	ily)	
	impermeable road a	irea drained (ha)	2.033 Pe	rmeable area draining	to outfal	<b>I (ha)</b> 0.22	29				
	Base Flow Index (B	FI)	0.411 Is t	the discharge in or with	nin 1 km	upstream of a	protected	site for c	onservatio	n?	Yes 🗸
For dissolved zinc only	•••••••••										
,	Water hardness	Low = <50mg CaCO3									
For sediment impact only	Water hardness Is there a downstrea	Low = <50mg CaCO3	pond or canal that rec	duces the velocity with	in 100m	of the point of	discharge	:?	N	0 🔽	D
For sediment impact only	Water hardness           Is there a downstrea           Tier 1           Estimate	Low = <50mg CaCO3 um structure, lake, d river width (m)	pond or canal that rev	duces the velocity with	in 100m	of the point of	discharge	?	N	0 🔽	D
For sediment impact only	Water hardness         Is there a downstrea         C Tier 1       Estimate         © Tier 2       Bed widt	Low = <50mg CaCO3 win structure, lake, d river width (m) h (m)	pond or canal that rev 1.0 1.0 Ma	duces the velocity with	in 100m	of the point of Side slope (m	discharge v/m) 0	5	N Long sl	ope (m/m	0.006
For sediment impact only Step 3 Mitigation	Water hardness         Is there a downstrea         Tier 1       Estimate         Tier 2       Bed widt	Low = <50mg CaCO3 um structure, lake, d river width (m) h (m)	pond or canal that red 1.0 1.0 Ma	duces the velocity with unning's n 0.05	in 100m	of the point of Side slope (m	discharge v/m) 0	5	N Long si	ope (m/m	0.006
For sediment impact only Step 3 Mitigation	Water hardness       Is there a downstrea       C Tier 1       Estimate       Tier 2       Bed widt	Low = <50mg CaCO3 um structure, lake, d river width (m) h (m) Brief description	pond or canal that rev 1.0 1.0 Ma	duces the velocity with	in 100m	of the point of Side slope (m ed effectiveness enuation for	discharge /m) 0 Settle	5 ment of		ope (m/m	0.006
For sediment impact only Step 3 Mitigation	Water hardness       Is there a downstrea       Tier 1       Estimate       Tier 2       Bed widt	Low = <50mg CaCO3 um structure, lake, d river width (m) h (m) Brief description	pond or canal that rev 1.0 1.0 Ma	duces the velocity with mning's n 0.05 Treatment for solubles (%)	in 100m	of the point of Side slope (m ed effectiveness enuation for es - restricted	discharge v/m) 0 Settle sedime	5 ment of ents (%)		ope (m/m	0.006
For sediment impact only Step 3 Mitigation	Water hardness         Is there a downstrea         C Tier 1       Estimate         Tier 2       Bed widt	Low = <50mg CaCO3 urn structure, lake, d river width (m) h (m) Brief description	pond or canal that rev 1.0 1.0 Ma	duces the velocity with	Estimate Soluble discha	of the point of Side slope (m ed effectiveness enuation for es - restricted urge rate (1/s )	discharge v/m) 0 Settle sedime	5 ment of ents (%)	Long s	ope (m/m Predic ow Deta	0.006 t Impact iled Result
For sediment impact only Step 3 Mitigation Existing measures	Water hardness Is there a downstrea Tier 1 Estimate Tier 2 Bed widt	Low = <50mg CaCO3 um structure, lake, d river width (m) h (m) Brief description	pond or canal that res	duces the velocity with	in 100m	side slope (m Side slope (m ed effectiveness enuation for es - restricted irge rate ( l/s ) ed	discharge /m) 0 s Settle sedimo	5 ment of ents (%)	Long s	ope (m/m Predic	0.006 t Impact iled Results

Figure 34: Method A HAWRAT output for SuDS 507 & 509 cumulative assessment including sediments (outfalls within 100m) (copper)



AGENCY			hable Assisted and the				O a allina	4. Oh.	1		
	Annual Average C	oncentration	Copper	Zinc			Sedimen	t - Chron	lic Impact	1	
	Сорре	r Zinc					Sedime	ent deposi	ition for th	nis site is j	udged as:
	Step 2 1.09	3.31 ug/l	Pass	Pass	Alert.	Protected Area.	Accumu	ulating?	Yes	0.09	Low flow Vel m/s
	Step 3 0.51	1.55 ug/l					Extens	ive?	No	23	Deposition Index
Location Details											
Road number		A9		HA Area / DBF	) number						
Assessment type		Cumulative ass	sessment including sedin	nents (outfalls within 1	00m)						
OS grid reference of asses	sment point (m)	Easting	276761			Northing	8	301088			
OS grid reference of outfall	structure (m)	Easting				Northing					
Outfall number		507		List of outfa	ulls in	509	ĺ				
Receiving watercourse		Unnamed water	course (MW9.10)	cumulative ass	essment						
EA receiving water Detailed	d River Network ID			Assessor and a	filiation	1		CFJV_IM			
Date of assessment		18/07/2018		Version of asse	ssment						
Notes		-									
Step 1 Runoff Quality	<b>X AADT</b> >10,000 ar	d <50,000 ▼	Climatic region C	older Wet	Ra	infall site 🛛 /	Ardtalnaig (S	AAR 1343.	9mm)		
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 ar Annual 95% ile river Impermeable road Base Flow Index (E	d <50,000 <b>v</b> flow (m <sup>3</sup> /s) area drained (ha) SFI)	Climatic region C 0.001 (En 2.033 Per 0.411 is ti	older Wet ter zero in Annual 95 meable area draining he discharge in or wi	] Ra 5%ile rive 9 to outfa thin 1 km	r flow box to a I (ha) 0.2 upstrearn of a	Ardtalnaig (S ssess Ste 29 protected	AAR 1343. <b>p 1 runoff</b> site for co	9mm) quality or	nty) m?	Yes •
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only	AADT >10,000 ar Annual 95%ile river Impermeable road Base Flow Index (E Water hardness	d <50,000 flow (m <sup>3</sup> /s) area drained (ha) SFI) Low = <50mg CaC	Climatic region C 0.001 (En 2.033 Per 0.411 Is the 03/1 V	older Wet ter zero in Annual 93 meable area draining he discharge in or wi	<b>Ra</b> i%ile rive g to outfa thin 1 km	infall site // r flow box to a ll (ha) 0.2 upstrearn of a	Ardtalnaig (S ssess Ste 29 protected	p 1 runoff site for c	9mm) <b>quality o</b>	nity) m?	Yes
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact onl	AADT >10,000 ar     Annual 95%ile river     Impermeable road:     Base Flow Index (E     Water hardness     Is there a downstre	d <50,000 v flow (m <sup>3</sup> /s) area drained (ha) SFI) Low = <50mg CaC arn structure, lake	Climatic region         C           0.001         (En           2.033         Per           0.411         Is the set of the set	older Wet ter zero in Annual 95 meable area draining he discharge in or wi	Ra %ile rive g to outfa thin 1 km	infall site // r flow box to a ll (ha) 0.2 upstream of a	Ardtalnaig (S ssess Ste 29 protected discharge	p 1 runoff site for co	9mm) quality or onservatio	nty) xn?	Yes
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact onl	AADT >10,000 ar Annual 95% ile river Impermeable road Base Flow Index (E Water hardness In Is there a downstre Tier 1 Estimate	d <50,000 flow (m <sup>3</sup> /s) area drained (ha) 3FD Low = <50mg CaC arm structure, lake ed river width (m)	Climatic region C 0.001 (En 2.033 Per 0.411 Is the second seco	older Wet ter zero in Annual 95 meable area draining he discharge in or wi luces the velocity wit	Ra 5%ile rive 9 to outfa 1 km hin 100m	infall site / r flow box to a l (ha) 0.2 upstream of a	Ardtalnaig (S ssess Ste 29 protected discharge	p 1 runoff site for co	9mm) • quality or onservatio	nty) xrr?	Yes -
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact onl	AADT >10,000 ar Annual 95% ile river Impermeable road Base Flow Index (E Water hardness Water hardness Is there a downstre C Tier 1 Estimate Tier 2 Bed wid	d <50,000 flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaC am structure, laka sci river width (m) th (m)	Climatic region       C         0.001       (En         2.033       Per         0.411       Is the set         03//       •         •	ter zero in Annual 95 meable area draining ne discharge in or wi luces the velocity wit	Ra 3%ile rive 9 to outfa 1hin 1 km	infall site / r flow box to a l (ha) 0.2 upstream of a of the point of Side slope (m	Ardtalnaig (S ssess Ste 29 protected discharge v/m) 0	AAR 1343: <b>p 1 runoff</b> <b>site for co</b> ? 5	9mm) • quality of onservatio N Long s	nly) xn? 10 v (m/m)	Yes -
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact onl Step 3 Mitigation	AADT >10,000 ar Annual 95% ile river Impermeable road Base Flow Index (E Water hardness Water hardness In Is there a downstre C Tier 1 Estimate Tier 2 Bed wid	d <50,000 v flow (m <sup>3</sup> /s) area drained (ha) SFI) Low = <50mg CaC arn structure, lake ad river width (m) th (m)	Climatic region C 0.001 (En 2.033 Per 0.411 Is the 0.3/  C e, pond or canal that reconnected 1.0 Man	older Wet ter zero in Annual 95 meable area draining he discharge in or wi luces the velocity wit nning's n 0.05	Ra %ile rive g to outfa thin 1 km hin 100m	infall site / r flow box to a l (ha) 0.2 upstream of a of the point of Side slope (rr	Ardtalnaig (S ssess Ste 29 protected discharge v/m) 0.	p 1 runoff site for co ? 5	9mm) • quality or onservation N Long s	nly) m? io v (m/m)	Yes -
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact onl Step 3 Mitigation	AADT >10,000 ar Annual 95% ile river Impermeable road Base Flow Index (E Water hardness Water hardness Iv Is there a downstre C Tier 1 Estimate Tier 2 Bed wid	d <50,000 v flow (m <sup>3</sup> /s) area drained (ha) BFI) Low = <50mg CaC am structure, lake ad river width (m) th (m) Brief description	Climatic region       C         0.001       (En         2.033       Per         0.411       Is the standard s	ter zero in Annual 95 meable area draining ne discharge in or wi luces the velocity wit nning's n 0.05	Ra %ile rive g to outfa thin 1 km hin 100m Estimate Solubl discha	r flow box to a r flow box to a l (ha) 0.2 upstream of a of the point of Side slope (rr ed effectiveness enuation for es - restricted urge rate ( <i>l/s</i> )	Ardtalnaig (S ssess Ste 29 protected discharge v/m) 0 5 S Settle sedime	AAR 1343 : p 1 runoff site for co ?? 5 ment of ents (%)	9mm) i quality or onservation N Long s Sh	nly) m? kope (m/m) Predic	Yes V 0.006
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only For sediment impact onl Step 3 Mitigation Existing measures	X       AADT       >10,000 ar         Annual 95%ile river       Impermeable road         Base Flow Index (E       Water hardness         Water hardness       Impermeable road         Y       Is there a downstre         Tier 1       Estimate         Tier 2       Bed wid	d <50,000 v flow (m <sup>3</sup> /s) area drained (ha) SFI) Low = <50mg CaC arn structure, lake ed river width (m) th (m) Brief descriptio	Climatic region       C         0.001       (En         2.033       Per         0.411       Is the set         03//       Image: Constraint of the set         03//       Image: Constraint of the set         1.0       Mage: Constraint of the set         1.0       Mage: Constraint of the set         Dom       Image: Constraint of the set	ter zero in Annual 95 meable area draining he discharge in or with luces the velocity with ming's n 0.05 Treatment for solubles (%) 0	Ra 3%ile rive 3 to outfa thin 1 km hin 100m Estimati Solubi discha Unlimit	infall site //	Ardtalnaig (S ssess Ste 29 protected discharge v/m) 0. 5 Settle sedime 0	AAR 1343. p 1 runoff site for co ?? 5 ment of ents (%)	9mm) i quality or onservation N Long s Sh	nly) m? kope (m/m) Predic	Yes V 0.006

Figure 35: Method A HAWRAT output for SuDS 507 & 509 cumulative assessment including sediments (outfalls within 100m) (zinc)



Annual Averag	Soluble - Acute Impact				Sediment - Chronic Impact			
Cop           Step 2         0.           Step 3         0.	per         Zinc           63         1.95         ug/l           32         0.97         ug/l	Pass	Pass	ert. Protected Area & D/S Structure.	Sediment de Accumulating Extensive?	position for t J? No No	is site is judged as:           0.30         Low flow Vel m/s           -         Deposition Index	
ocation Details	4.0							
coad number	A9		HA Area / DBFO numi	Jei				
Second reference of accessment point (m)	Cumulative asses	sment including sedime	nts (outralis within 100m)	Northing	00000	0		
S grid reference of assessment point (m)	Easting	281210		Northing	80366	ŏ		
S grid reference of outial structure (m)	Easung		List of outfollo in	Northing				
	561	(11)(2,(7))	- cumulative assessm	ent 563				
eceiving watercourse	Unnamed watercou	urse (MW9.17)						
A receiving water Detailed River Network ID			Assessor and affiliation	n	CFJV	_IM		
Date of assessment	18/07/2018		Version of assessmer	t				
Step 1 Runoff Quality         AADT         >10,000           Image: step 2 River Impacts         Annual 95% ile rit	and <50,000  C rer flow (m <sup>3</sup> /s)	Colo 0.006 (Ente	r zero in Annual 95%ile i	Rainfall site /	Ardtalnaig (SAAR 1	343.9mm) noff quality o	only)	
Step 1 Runoff Quality     AADT     >10,000       Step 2 River Impacts     Annual 95%ile ri       Impermeable roa     Base Flow Index	and <50,000 <b>C</b> rer flow (rrr <sup>3</sup> /s) d area drained (ha) (BFI)	Color       0.006     (Enter       5.35     Perm       0.62     Is the	r zero in Annual 95%ile i reable area draining to ou discharge in or within 1	Rainfall site     A       iver flow box to a:     iver flow box to a:       iffall (ha)     2.0       km upstream of a	Ardtalnaig (SAAR 1 ssess Step 1 ru	343.9mm) noff quality c or conservati	ynly) on? Yes ↓	
Step 1 Runoff Quality       AADT       >10,000         Step 2 River Impacts       Annual 95%ile riv         Impermeable roa       Base Flow Index         For dissolved zinc only       Water hardness	and <50,000 C er flow (rr³/s) d area drained (ha) (BFI) ( Low = <50mg CaCO3/	Colo         Colo           0.006         (Enter           5.35         Perm           0.62         Is the           1         <	r zero in Annual 95% ile i eable area draining to ou discharge in or within 1	Rainfall site 4	Ardtalnaig (SAAR 1	343.9mm) noff quality c or conservati	on? Yes -	
Step 1 Runoff Quality       AADT       >10,000         Step 2 River Impacts       Annual 95% ile river impermeable roated and the state of the	and <50,000 er flow (m <sup>3</sup> /s) d area drained (ha) (BFI) Low = <50mg CaCO3// ream structure, lake, p ated river width (m)	Color Co	r zero in Annual 95% ile r eable area draining to ou discharge in or within 1 ces the velocity within 10	Rainfall site     /       iver flow box to a:     //       tfall (ha)     2.0       km upstream of a       Om of the point of	Ardtalnaig (SAAR 1	noff quality c	on? Yes •	
Step 1 Runoff Quality       AADT       >10,000         Step 2 River Impacts       Annual 95%ile riv         Impermeable roa       Base Flow Index         For dissolved zinc only       Water hardness         For sediment impact only       Is there a downs         © Tier 1       Estim         © Tier 2       Bed v	and <50,000 C er flow (m <sup>3</sup> /s) d area drained (ha) (BFI) ( Low = <50mg CaCO3// ream structure, lake, p ated river width (m) idth (m)	Colo       0.006     (Enter       5.35     Perm       0.62     Is the       1     Image: Color canal that reduce       2.0     Mann	r zero in Annual 95%ile i r zero in Annual 95%ile i reable area draining to ou e discharge in or within 1 ces the velocity within 10 ing's n 0.05	Rainfall site (7) iver flow box to a: tifall (ha) (2.0) km upstream of a Orn of the point of Side slope (rr	vrdtalnaig (SAAR 1 ssess Step 1 ru protected site f discharge?	343.9mm) noff quality of or conservati	nnhy) on? Yes - Yes - skope (m/m) 0.064	
itep 1 Runoff Quality       AADT       >10,000         itep 2 River Impacts       Annual 95%ile river         Impermeable roat       Base Flow Index         For dissolved zinc only       Water hardness         For sediment impact only       Is there a downs         © Tier 1       Estime         © Tier 2       Bed verter	and <50,000 C er flow (m <sup>3</sup> /s) d area drained (ha) (BFI) ( Low = <50mg CaCO3// ream structure, lake, p ated river width (m) idth (m) Brief description	Cold Cold	r zero in Annual 95% ile i r zero in Annual 95% ile i reable area draining to ou e discharge in or within 1 ces the velocity within 10 ing's n 0.05 Estin Treatment for solutiles (%) sol	Rainfall site     4       iver flow box to a:     1       iffall (ha)     2.0       km upstream of a       Orn of the point of       Side slope (rr       nated effectiveness       Attenuation for       Unless: restricted	vrdtalnaig (SAAR 1 ssess Step 1 ru protected site f discharge? v/m) 0.5 Settlement sediments (	343.9mm) noff quality o or conservati	nhy) on? Yes - Yes - skope (m/m) 0.064 Predict Impact	
Step 1 Runoff Quality       AADT       >10,000         Step 2 River Impacts       Annual 95%ile river Impermeable roated and the statement impermeable roated and the statement impact only       Matter hardness         For dissolved zinc only       Water hardness       © Tier 1       Estimation         *tep 3 Mittigation	and <50,000 C er flow (m <sup>3</sup> /s) d area drained (ha) (BFI) ( Low = <50mg CaCO3// ream structure, lake, p ated river width (m) idth (m) Brief description	Color     Color       0.006     (Enter       5.35     Perm       0.62     Is the       1     Is       2.0     Mann	ier Wet     _       r zero in Annual 95%ile i       n zero in Annual 95%ile i       e discharge in or within 1       ces the velocity within 10       ing's n     0.05       Treatment for solubles (%)     sol dis       0     Uni	Rainfall site     /       iver flow box to at     ////////////////////////////////////	vrdtalnaig (SAAR 1 ssess Step 1 ru protected site f discharge? v/m) 0.5 s Settlement sediments ( 0	343.9mm) noff quality c or conservati  Long :  of %) S	on? Yes - Yes - Skope (m/m) 0.064 Predict Impact	

Figure 36: Method A HAWRAT output for SuDS 561 & 563 cumulative assessment including sediments (outfalls within 100m) (copper)



HIGHWAYS Highwar	orgency materials rescontant				
AGENCY Annual Avera C Step 2 Step 3	pper Zinc 1.95 ug/l Pass 1.95 ug/l Pass	Zinc Pass	Alert. Protected Area & D/S Structure.	Sediment - Chron Sediment depos Accumulating? Extensive?	nic Impact sition for this site is judged as: No 0.30 Low flow Vel m/s No - Deposition Index
Location Details					
Road number	A9	HA Area / DBFO r	number		
Assessment type	Cumulative assessment including sedim	ents (outfalls within 10	0m)		
DS grid reference of assessment point (m)	Easting 281210		Northing	803668	
OS grid reference of outfall structure (m)	Easting		Northing		
Jutfall number	561	List of outfalls	s in 563		
Receiving watercourse	Unnamed watercourse (MW9.17)	cumulative asse	ssment		
A receiving water Detailed River Network ID		Assessor and affil	iation	CFJV_IN	1
Date of assessment	18/07/2018	Version of assess	ment		
Votes					
Step 1 Runoff Quality         ADT         >10.0           Step 2 River Impacts         Annual 95%ile	0 and <50,000  Climatic region Co iver flow (m <sup>3</sup> /s) 0.006 (Ent	Ider Wet	Rainfall site A	rdtalnaig (SAAR 1343 seess Step 1 runof	.9mm)
Step 1 Runoff Quality AADT ≥10,0 Step 2 River Impacts Annual 95%ile Impermeable ro Base Flow Inde	0 and <50,000         Climatic region         Comparing the	Ider Wet er zero in Annual 95% neable area draining ( e discharge in or with	Rainfall site     A       Gile river flow box to as     to as       to outfall (ha)     2.0       in 1 km upstream of a p	rdtalnaig (SAAR 1343 sess Step 1 runol	.9mm)
Step 1 Runoff Quality       AADT       >10.0         Step 2 River Impacts       Annual 95%ile         Impermeable re       Base Flow Inde         For dissolved zinc only       Water hardness	0 and <50,000	Ider Wet er zero in Annual 95% neable area draining t e discharge in or with	Rainfall site     A       6ile river flow box to as     to as       to outfall (ha)     2.0       in 1 km upstream of a p	rdtalnaig (SAAR 1343	.9mm)
Step 1 Runoff Quality       AADT       >10,0         Step 2 River Impacts       Annual 95%ile         Impermeable run       Base Flow Inde         For dissolved zinc only       Water hardness         For sediment impact only       Is there a down	0 and <50,000	Ider Wet er zero in Annual 95% neable area draining f e discharge in or withing uces the velocity withing	Rainfall site     A       Sile river flow box to as     to as       to outfall (ha)     2.0       in 1 km upstream of a p       n 100m of the point of a	rdtalnaig (SAAR 1343 ssess Step 1 runol protected site for o discharge?	.9mm)  f quality only)  conservation?  Yes
Step 1 Runoff Quality       AADT ≥10,0         Step 2 River Impacts       Annual 95%ile         Impermeable re       Base Flow Inde         For dissolved zinc only       Water hardness         For sediment impact only       Is there a down         C Tier 1       Esti	0 and <50,000	Ider Wet er zero in Annual 95% neable area draining ( e discharge in or withing uces the velocity withing)	Rainfall site     A       Gile river flow box to as     to outfall (ha)     2.0       in 1 km upstream of a p     100m of the point of a	rdtalnaig (SAAR 1343 ssess Step 1 runol protected site for o discharge?	.9mm)  F quality only)  conservation?  Yes  Yes
Step 1 Runoff Quality       AADT       >10.0         Step 2 River Impacts       Annual 95%ile         Impermeable m       Base Flow Inde         For dissolved zinc only       Water hardness         For sediment impact only       Is there a down         © Tier 1       Esti         © Tier 2       Bed	0 and <50,000	Ider Wet er zero in Annual 95% neable area draining t e discharge in or within uces the velocity within ning's n 0.05	Rainfall site       A         Sile river flow box to as       5         to outfall (ha)       2.0         in 1 km upstream of a p         n 100m of the point of c         Side slope (m/	rdtalnaig (SAAR 1343 ssess Step 1 runof protected site for o discharge?	.9mm) F quality only) conservation? Yes Long slope (m/m) 0.064
Step 1 Runoff Quality       AADT ≥10,0         Step 2 River Impacts       Annual 95%ile         Impermeable re       Base Flow Inde         For dissolved zinc only       Water hardness         For sediment impact only       Is there a down         © Tier 1       Esti         © Tier 2       Bed         Step 3 Mittigation	0 and <50,000	Ider Wet	Rainfall site       A         Sile river flow box to as       5         to outfall (ha)       2.0         in 1 km upstream of a p         n 100m of the point of a         Side slope (m)         Estimated effectiveness	rdtalnaig (SAAR 1343 ssess Step 1 runof protected site for o discharge? fm) 0.5	.9mm) F quality only) conservation? Yes Ves Long slope (m/m) 0.064 Predict Impact
Step 1 Runoff Quality       AADT       >10,0         Step 2 River Impacts       Annual 95%ile         Impermeable re       Base Flow Inde         For dissolved zinc only       Water hardness         For sediment impact only       Is there a down         © Tier 1       Esti         ® Tier 2       Bed	0 and <50,000	Ider Wet  er zero in Annual 95% neable area draining t e discharge in or withi uces the velocity within ning's n 0.05  Treatment for solubles (%)	Rainfall site       A         Sile river flow box to as       5         Sile river flow box to as       2.0         In 100m of the point of a       2.0         In 100m of the point of a       3         Side slope (m/       5         Estimated effectiveness       4         Attenuation for solubles - restricted discharge rate (1/s)       5	rdtalnaig (SAAR 1343 ssess Step 1 runol protected site for o discharge? fm) 0.5 Settlement of sediments (%)	.9mm)  F quality only)  conservation?  Yes Yes Ves Ves Ves Ves Ves Ves Ves Ves Ves V
Step 1 Runoff Quality       AADT       >10,0         Step 2 River Impacts       Annual 95%ile         Impermeable re       Base Flow Inde         For dissolved zinc only       Water hardness         For sediment impact only       Is there a down         © Tier 1       Esti         ® Tier 2       Bed         Step 3 Mitigation	0 and <50,000	Ider Wet  er zero in Annual 95% neable area draining t e discharge in or withi uces the velocity within ning's n 0.05  Treatment for solubles (%) 0	Rainfall site       A         Sile river flow box to as       5         Sile river flow box to as       2.0         In 100m of the point of a       2.0         In 100m of the point of a       1         Side slope (m/       Side slope (m/         Estimated effectiveness       Attenuation for solubles - restricted discharge rate (Vs)         Unlimited       Image: Comparison of a point a point of a point of a point of a point a point of a	rdtalnaig (SAAR 1343 ssess Step 1 runol protected site for o discharge? fm) 0.5 Settlement of sediments (%) 0 D	.9mm)  F quality only)  conservation?  Yes Yes Ves Output Dog slope (m/m) 0.064  Predict Impact Show Detailed Results

Figure 37: Method A HAWRAT output for SuDS 561 & 563 cumulative assessment including sediments (outfalls within 100m) (zinc)



SuDS Network	417				
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	13,160 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall		35 – 39mm	Medium –	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road Area 7.6 ha	High – 3	45
4	Unsaturated zone (depth	20	TP9-009 (located c.150m south east of SuDS 417 earthworks)	Medium – 2	40
			BH depth = 3.7m, assumed ground water level >5m and < 15m		
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	River Terrace Deposits; Gravel, sand, silt and clay:	High – 3	22.5
	g		Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected		
7	Lithology	7.5	to surface waters River Terrace Deposits;	High – 3	22.5
			Gravel, sand, silt and clay; Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters		
Overall Score for Fi	Iter Drains				180 Medium Risk of Impact (150 - 250)
Overall Score for S	JDS Basin (with	high road area)			210 Medium Risk of Impact (150 - 250)
SuDS Network	427				
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	13,024 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 2.7 ha	High – 3	45
4	Unsaturated zone (depth to water)	20	TP9-013 (located at northern edge of SuDS 417 earthworks) Depth to water = 2.5m	High – 3	60
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly	Low – 1	20

intergranular flow)

to surface waters

Glaciofluvial Deposits;

Gravel, sand and silt;

Glaciofluvial Deposits;

Gravel, sand and silt;

Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected

## Table 9:Method C Calculations



Effective

grain size

Lithology

7.5

7.5

6

7

High – 3

High – 3

22.5

22.5

			Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.		
Overall Score for F	l ilter Drains		to surface waters	<u> </u>	200 Medium Risk of Impact (150 - 250)
Overall Score for S	uDS Basin (with	high road area)			230 Medium Risk of Impact (150 - 250)
SuDS Network	434				
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	12,900 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 6.4ha	High – 3	45
4	Unsaturated zone (depth to water)	20	TP9-017 (located c. 115m south of SuDS 434 earthworks) Depth to water = Dry BH depth = 4.2m, assumed ground water level >5m and < 15m	Medium – 2	40
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	Glaciofluvial Deposits; Gravel, sand and silt; Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters	High – 3	22.5
7	Lithology	7.5	Glaciofluvial Deposits; Gravel, sand and silt; Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters	High – 3	22.5
Overall Score for F	ilter Drains				180 Medium Risk of Impact (150 - 250)
Overall Score for S	uDS Basin (with	high road area)			210 Medium Risk of Impact (150 - 250)
SuDS Network	x 458				
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	12,905 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity	]	35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 5.3ha	High – 3	45
4	Unsaturated zone (depth to water)	20	BH9-006 (located c. 195m east of SuDS 458 earthworks) Depth to water = 8.00m BH depth = 23.6m	Medium – 2	40
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly	Low – 1	20



-			intergranular flow)		
6	Effective	7.5	Glaciofluvial Deposits;	High – 3	22.5
	grain size		Gravel, sand and slit; Mederate to high groundwater potential		
			Groundwater would also generally be		
			expected to be hydraulically connected		
			to surface waters		
7	Lithology	7.5	Glaciofluvial Deposits;	High – 3	22.5
			Gravel, sand and silt;	U U	
			Moderate to high groundwater potential.		
			Groundwater would also generally be		
			expected to be hydraulically connected		
Overall Sears for F	Tiltor Droing		to surface waters		190
Overall Score for F	-iiter Drains				Nedium Risk of
					Impact (150 -
					250)
Overall Score for S	SuDS Basin (with	high road area	)		210
					Medium Risk of
					Impact (150 -
					250)
SuDS Network	k 461				
Component	Property	Weighting	Site Data	Risk Score	Component
1	Traffic	15	12 905 (AADT)	$l_{OW} = 1$	15
	Density	10	12,000 (AADT)	LOW	10
2	Rainfall	15	1304.0	High – 3	45
	volume			5	
	Rainfall		35 – 39mm	Medium –	
	intensity			2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry				
			SuDS Basin associated with High Road	High – 3	45
			Area 1.6ha		
4	Unsaturated	20	BH9-006 (located c. 30m west of SuDS	Low – 1	20
	zone (depth		401  earlinworks)		
	to water)		BH depth = $23.6m$		
5	Flow type	20	Unconsolidated or non-fractured	Low – 1	20
	51		consolidated deposits (i.e. dominantly		
			intergranular flow)		
6	Effective	7.5	Glaciofluvial Deposits;	High – 3	22.5
	grain size		Gravel, sand and silt;		
			Noderate to high groundwater potential.		
			Groundwater would also generally be		
			to surface waters		
7	Litholoav	7.5	Glaciofluvial Deposits;	High – 3	22.5
		-	Gravel, sand and silt;	5 -	
			Moderate to high groundwater potential.		
			Groundwater would also generally be		
			expected to be hydraulically connected		
Overall Seere for F	Tiltor Draine	I	to surface waters	1	160
Overall Score for F					Medium Risk of
					Impact (150 -
					250)
Overall Score for S	SuDS Basin (with	high road area	)		190
					Medium Risk of
					Impact (150 -
					250)
Subs Network	K 4/4		Site Dete	Diale Creation	Company
Component	Property	Factor		RISK Score	Component
	Traffic	15			15
	Density	15			15
2	Rainfall	15	1304.0	High – 3	45
	volume	-		5 -	
	Rainfall	]	35 – 39mm	Medium –	
	intensity			2	
3	Soakaway	15	Filter Drains	Low – 1	15



	geometry				
	g,		SuDS Basin associated with High Road Area 8.0ha	High – 3	45
4	Unsaturated	20	TP9-027 (located c. 80m west of SuDS	High – 3	60
	to water)		Depth to water = $2.40m$		
	Eleve terre e	20	BH depth = 2.40m	1 au 1	
5	Flow type	20	consolidated deposits (i.e. dominantly	LOW - 1	20
			intergranular flow)		
6	effective grain size	7.5	Glaciofluvial Deposits; Gravel, sand and silt:	High – 3	22.5
	3		Moderate to high groundwater potential.		
			Groundwater would also generally be expected to be hydraulically connected		
			to surface waters		
7	Lithology	7.5	Glaciofluvial Deposits;	High – 3	22.5
			Moderate to high groundwater potential.		
			Groundwater would also generally be		
			to surface waters		
Overall Score for F	ilter Drains				180 Madium Diak of
					Impact (150 -
0 110 ( 0					250)
Overall Score for S	UDS Basin (With	nign road area)			Medium Risk of
					Impact (150 -
SuDS Network	487				250)
Component	Property	Weighting	Site Data	Risk Score	Component
Number	Troffie	Factor		Law 1	Score
1	Density	15	12,909 (AADT)	LOW - 1	15
2	Rainfall	15	1304.0	High – 3	45
	Rainfall	-	35 – 39mm	Medium –	-
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SUDS Basin associated with High Road	High - 3	45
			Area 1.1ha	riigit 5	
4	Unsaturated	20	TP9-030 (located c. 95m south-west of	Medium –	40
	zone (depth		SuDS 487 earthworks)	2	
	to water)		BH depth = $2.30$ m, assumed ground		
5		20	water level >5m and < 15m	Low 1	20
5	Flow type	20	consolidated deposits (i.e. dominantly	LOW - I	20
	Effective.	75	intergranular flow)	List 0	00.5
6	arain size	7.5	Glaciofluvial Deposits; Gravel, sand and silt:	Hign – 3	22.5
	0		Moderate to high groundwater potential.		
			expected to be hydraulically connected		
			to surface waters		
(	Lithology	1.5	Giaciotluvial Deposits; Gravel, sand and silt:	High – 3	22.5
			Moderate to high groundwater potential.		
			Groundwater would also generally be		
			to surface waters		
Overall Score for F	ilter Drains				180 Medium Risk of
					Impact (150 -
	UDC Decire (with	high rocal and -			250)
Overall Score for S	UDS Basin (with	nigh road area)			Medium Risk of
					Impact (150 -
					250)



SuDS Notwork	400				
Component	Property	Weighting	Site Data	Risk Score	Component
Number		Factor			Score
1	Traffic	15	12,910 (AADT)	Low – 1	15
2	Rainfall	15	1304.0	High – 3	45
	volume	-	25 20mm	Maaliuwa	-
	intensity		35 – 39mm	iviedium – 2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road	High - 3	45
			Area 1.4ha	r ligit o	
4	Unsaturated	20	TP9-059 (located c. 105m south-west of	Medium –	40
	to water)		Depth to water = Dry	2	
			BH depth = 3.80m, assumed ground		
-			water level >5m and < 15m		
5	Flow type	20	Unconsolidated or non-tractured consolidated deposits (i.e. dominantly	Low – 1	20
			intergranular flow)		
6	Effective	7.5	Glaciofluvial Deposits;	High – 3	22.5
	grain size		Gravel, sand and silt;		
			Groundwater would also generally be		
			expected to be hydraulically connected		
			to surface waters		
7	Lithology	7.5	Glaciofluvial Deposits;	High – 3	22.5
			Gravel, sand and silt; Moderate to high groundwater potential		
			Groundwater would also generally be		
			expected to be hydraulically connected		
			to surface waters		
	uDS Pasis (with	high road area			Medium Risk of Impact (150 - 250)
		nigin toad area	)		Medium Risk of Impact (150 - 250)
SuDS Network	493				
Component	Property	Weighting	Site Data	Risk Score	Component
Number	Troffie	Factor		Lour 1	Score
I	Density	15	12,910 (AADT)	LOW - I	15
2	Rainfall	15	1304.0	High – 3	45
	volume	-	05 00.00	NA - diama	-
	Rainfall		35 – 39mm	Medium – 2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		CuDC Designessesisted with Lligh Dead	Llinh D	45
			Area 2.6ha	Hign – 3	45
A	Unsaturated	20	TP9-059 (located c 440m south-west of	Medium –	40
7	zone (depth	20	SuDS 493 earthworks)	2	40
	to water)		Depth to water = Dry		
			BH depth = 3.80m, assumed ground		
		20	water level >5m and < 15m	1 - 1	20
5		20	consolidated deposits (i.e. dominantly	LOW - I	20
5	Flow type				1
5	гюм туре		intergranular flow)		
5	Effective	7.5	intergranular flow) Alluvium	High – 3	22.5
5	Effective grain size	7.5	intergranular flow) Alluvium Clayey, silty or gravelly fine to coarse	High – 3	22.5
5 6	Effective grain size	7.5	intergranular flow) Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel	High – 3	22.5
6	Effective grain size	7.5	intergranular flow) Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential.	High – 3	22.5



			expected to be hydraulically connected		
			to surface waters.		
7	Lithology	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse	High – 3	22.5
			gravel.		
			Moderate to high groundwater potential.		
			expected to be hydraulically connected		
			to surface waters.		
Overall Score for F	ilter Drains				180 Medium Risk of Impact (150 - 250)
Overall Score for S	SuDS Basin (with	high road area	)		210 Medium Risk of Impact (150 - 250)
SuDS Network	<b>&lt; 502</b>				
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	12,914 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 1.0ha	High – 3	45
4	Unsaturated zone (depth	20	BH9-034 (located at southern edge of SuDS 502 earthworks)	Low – 1	20
	to water)		Depth to water = Dry BH depth = 54.0m		
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	Glaciofluvial Deposits Clayey, silty and sandy fine to coarse gravel. Moderate to high or high productivity with intergranular flow and good quality and quantity status. Groundwater in glaciofluvial deposits would also be expected to be hydraulically connected to surface waters.	High – 3	22.5
7	Lithology	7.5	Glaciofluvial Deposits Clayey, silty and sandy fine to coarse gravel. Moderate to high or high productivity with intergranular flow and good quality and quantity status. Groundwater in glaciofluvial deposits would also be expected to be hydraulically connected to surface waters.	High – 3	22.5
Overall Score for F	ilter Drains				160
					Medium Risk of Impact (150 - 250)
Overall Score for S	SuDS Basin (with	high road area			190 Medium Risk of Impact (150 - 250)
SuDS Network	< 507 <u> </u>				
Component	Property	Weighting	Site Data	Risk Score	Component
Number	Traffic	15	14,076 (AADT)	Low – 1	15
2	Rainfall	15	1304.0	High – 3	45
	Rainfall	-	35 – 39mm	Medium –	1



	intoncity			2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road Area 0.54ha	High – 3	45
4	Unsaturated zone (depth to water)	20	BH9-013 (located c. 30m north-west of SuDS 507 earthworks) Depth to water = 1.0m BH depth = 14.0m	High – 3	60
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
7	Lithology	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
Overall Score for F	ilter Drains				200 Medium Risk of Impact (150 - 250)
Overall Score for S	uDS Basin (with	high road area)			230 Medium Risk of Impact (150 - 250)
CuDC Mature	500				2007
SuDS Network	<b>509</b> Property	Weighting	Site Data	Risk Score	
SuDS Network Component Number	x <b>509</b> Property	Weighting Factor	Site Data	Risk Score	Component Score
SuDS Network Component Number	Traffic Density	Weighting Factor 15	Site Data 15,149 (AADT)	Risk Score Low – 1	Component Score 15
SuDS Network Component Number 1 2	Traffic Density Rainfall Volume Rainfall	Weighting Factor 15 15	Site Data 15,149 (AADT) 1304.0 35 - 39mm	Risk Score Low – 1 High – 3	Component Score 15 45
SuDS Network Component Number	<b>509</b> Property Traffic Density Rainfall volume Rainfall intensity	Weighting Factor 15 15	Site Data           15,149 (AADT)           1304.0           35 – 39mm	Risk Score Low – 1 High – 3 Medium – 2	Component Score 15 45
SuDS Network Component Number 1 2 3	509       Property       Traffic       Density       Rainfall       volume       Rainfall       intensity       Soakaway       geometry	Weighting Factor 15 15 15	Site Data 15,149 (AADT) 1304.0 35 – 39mm Filter Drains SuDS Basin associated with High Road	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3	Component Score 15 45 15 45
SuDS Network Component Number 1 2 3	509       Property       Traffic       Density       Rainfall       volume       Rainfall       intensity       Soakaway       geometry	Weighting Factor 15 15 15 15	Site Data 15,149 (AADT) 1304.0 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 1.76ha	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3	Component Score 15 45 15 45
SuDS Network Component Number 1 2 3 4	Solution       Solution       Property       Traffic       Density       Rainfall       volume       Rainfall       intensity       Soakaway       geometry       Unsaturated       zone (depth       to water)	Weighting Factor 15 15 15 15 20	Site Data         15,149 (AADT)         1304.0         35 – 39mm         Filter Drains         SuDS Basin associated with High Road         Area 1.76ha         TP9-034 (located c. 40m north-west of         SuDS 509 earthworks)         Depth to water = Dry         BH depth = 4.30m, assumed ground         water level >5m and < 15m	Risk Score Low – 1 High – 3 Medium – Low – 1 High – 3 Medium – 2	Component Score         Score           15         45           45         45           45         40
SuDS Network Component Number 1 2 3 4 5	Solution       Solution         Property       Traffic         Density       Rainfall         volume       Rainfall         intensity       Soakaway         geometry       Unsaturated         zone (depth       to water)         Flow type       Solution	Weighting Factor 15 15 15 15 20 20	Site Data         15,149 (AADT)         1304.0         35 – 39mm         Filter Drains         SuDS Basin associated with High Road         Area 1.76ha         TP9-034 (located c. 40m north-west of         SuDS 509 earthworks)         Depth to water = Dry         BH depth = 4.30m, assumed ground         water level >5m and < 15m	Risk ScoreLow - 1High - 3Medium - 2Low - 1High - 3Medium - 2Low - 1	Component           Score           15           45           15           45           20
SuDS Network Component Number 1 2 3 4 5 6	Solution         Property         Traffic         Density         Rainfall         volume         Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size	Weighting Factor           15           15           15           20           20           7.5	Site Data         15,149 (AADT)         1304.0         35 – 39mm         Filter Drains         SuDS Basin associated with High Road         Area 1.76ha         TP9-034 (located c. 40m north-west of         SuDS 509 earthworks)         Depth to water = Dry         BH depth = 4.30m, assumed ground         water level >5m and < 15m	Risk ScoreLow - 1High - 3Medium - 2Low - 1High - 3Medium - 2Low - 1High - 3	Component Score         Score           15         45           45         45           40         20           22.5         22.5



			glaciofluvial deposits would also be expected to be hydraulically connected		
Overall Score for F	liter Draine	L	to surface waters.		180
					Medium Risk of Impact (150 - 250)
Overall Score for S	SuDS Basin (with	high road area	)		210 Medium Risk of Impact (150 -
SuDS Notwork	v 513				250)
Component	Property	Weighting	Site Data	Risk Score	Component
Number	roporty	Factor			Score
1	Traffic Density	15	15,148 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 2.75ha	High – 3	45
4	Unsaturated zone (depth	20	TP9-036 (located c. 100m west of SuDS 513 earthworks)	Medium – 2	40
	to water)		BH depth = 2.20m, assumed ground		
5	Flow type	20	Unconsolidated or non-fractured	Low – 1	20
			consolidated deposits (i.e. dominantly intergranular flow)		
6	Effective	7.5	Glaciofluvial Ice Contact	High – 3	22.5
	grain size		gravel.		
			Moderate to high or high productivity		
			with intergranular flow and good quality		
			glaciofluvial deposits would also be		
			expected to be hydraulically connected		
7	Lithology	7.5	Glaciofluvial Ice Contact	Hiah — 3	22.5
			Clayey, silty and sandy fine to coarse	5	
			gravel. Moderate to high or high productivity		
			with intergranular flow and good quality		
			and quantity status. Groundwater in		
			expected to be hydraulically connected		
			to surface waters.		
Overall Score for F	filter Drains				180 Medium Risk of Impact (150 -
Overall Sears for S	NUDE Desin (with	high road area	A		250)
Overall Score for S	Sudo dasin (with	nigh toau alea	)		Medium Risk of
					Impact (150 - 250)
SuDS Network	k 530				
Number	Property	Factor	Site Data	RISK Score	Score
1	Traffic Density	15	15,150 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 2.6ha	High – 3	45
4	Unsaturated	20	TP9-042A (located at northern edge of	High – 3	60



	zone (depth to water)		SuDS 530 earthworks) Depth to water = 2.3m		
			BH depth = 2.3m		
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective	7.5	Peat	Medium –	15
C C	grain size		I ow value in terms of resource and	2	
	grain eile		productivity, but likely variable	-	
			permeability (depending on	ding on	
			decomposition) and variable water		
			contents from rainfall run-off and		
			groundwater with a variety of important		
			functional roles		
7	Lithology	75	Poot	Modium	15
1	Littiology	7.5	Feat		15
			Low value in terms of resource and	2	
			productivity, but likely variable		
			permeability (depending on		
			decomposition) and variable water		
			contents from rainfall, run-off and		
			groundwater with a variety of important		
			functional roles.		
Overall Score for	Filter Drains				185
					Medium Risk of
					Impact (150 -
					250)
Overall Score for	SuDS Basin (with	high road area			215
		0			Medium Risk of
					Impact (150 -
					250)
SuDS Networ	k 534				/
Component	Property	Weighting	Site Data	Pick Score	Component
Number	riopeny	Factor	Sile Dala	NISK SCOLE	Score
	Troffie			Low 1	15
1	Tramic	15	15,150 (AADT)	LOW = 1	15
_	Density	. –			
2	Rainfall	15	1304.0	High – 3	45
	volume				
	volume		35 _ 30mm	NA a allower	
	Rainfall		55 – 591111	iviedium –	
	Rainfall intensity		35 – 391111	2	
3	Rainfall intensity Soakaway	15	Filter Drains	Low – 1	15
3	Rainfall intensity Soakaway geometry	15	Filter Drains	Low – 1	15
3	Rainfall intensity Soakaway geometry	15	Filter Drains	Low – 1	15
3	Rainfall intensity Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road	Low – 1 High – 3	15 45
3	Rainfall intensity Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road Area 1.7ha	Low – 1 High – 3	15 45
3	Rainfall intensity Soakaway geometry Unsaturated	15 20	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 costtworks)	Medium – 2 Low – 1 High – 3 High – 3	15 45 60
3	Rainfall intensity Soakaway geometry Unsaturated zone (depth	15 20	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks)	Low – 1 High – 3 High – 3	15 45 60
3	Rainfall intensity Soakaway geometry Unsaturated zone (depth to water)	15 20	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m	High – 3 High – 3	15 45 60
3	Rainfall intensity Soakaway geometry Unsaturated zone (depth to water)	15 20	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m	Low – 1 High – 3 High – 3	15 45 60
3 4 5	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type	15 20 20	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured	Medium – 2 Low – 1 High – 3 High – 3	15 45 60 20
3 4 5	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type	15 20 20	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured consolidated deposits (i.e. dominantly	Medium – 2 Low – 1 High – 3 High – 3 Low – 1	15 45 60 20
3 4 5	Rainfall       intensity       Soakaway       geometry       Unsaturated       zone (depth       to water)       Flow type	15 20 20	50 = 55mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly         intergranular flow)	Mealum – 2 Low – 1 High – 3 High – 3 Low – 1	15         45         60         20
3 4 5 6	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective	15 20 20 7.5	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow) Alluvial Fan Deposits	Medium – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size	15 20 20 7.5	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow) Alluvial Fan Deposits Sandy gravelly silt and silty fine to	Medium – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size	15 20 20 7.5	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow) Alluvial Fan Deposits Sandy gravelly silt and silty fine to coarse gravel.	Medium – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size	15 20 20 7.5	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow) Alluvial Fan Deposits Sandy gravelly silt and silty fine to coarse gravel. Moderate to bich groundwater potential	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size	15 20 20 7.5	Filter Drains SuDS Basin associated with High Road Area 1.7ha TP9-044 (located c.53m north of SuDS 530 earthworks) Depth to water = 2m BH depth = 2m Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow) Alluvial Fan Deposits Sandy gravelly silt and silty fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall intensity         Soakaway geometry         Unsaturated zone (depth to water)         Flow type         Effective grain size	15 20 20 7.5	Filter Drains         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly         intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to         coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be         expected to be bydraulically connected	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size	15 20 20 7.5	Filter Drains         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6	Rainfall intensity         Soakaway geometry         Unsaturated zone (depth to water)         Flow type         Effective grain size	15 20 20 7.5	Filter Drains         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3 Low – 1 High – 3 Low – 1 High – 3	15 45 60 20 22.5
3 4 5 6 7	Rainfall intensity         Soakaway geometry         Unsaturated zone (depth to water)         Flow type         Effective grain size         Lithology	15 20 20 7.5 7.5	Filter Drains         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits	Medium – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5 22.5
3 4 5 6 7	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology	15 20 20 7.5 7.5	Filter Drains         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.	Medum – 2 Low – 1 High – 3 High – 3 High – 3 High – 3	15 45 60 20 22.5 22.5
3 4 5 6 7	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology	15 20 20 7.5 7.5	Filter Drains         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.	Medum – 2 Low – 1 High – 3 High – 3 High – 3 High – 3	15 45 60 20 22.5 22.5
3 4 5 6 7	Rainfall intensity         Soakaway geometry         Unsaturated zone (depth to water)         Flow type         Effective grain size         Lithology	15 20 20 7.5 7.5	50 = 55mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Moderate to high groundwater potential.	Medum – 2 Low – 1 High – 3 High – 3 High – 3 High – 3	15         45         60         20         22.5         22.5
3 4 5 6 7	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology	15 20 20 7.5 7.5	50 = 55mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be         expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3 High – 3	15         45         60         20         22.5         22.5
3 4 5 6 7	Rainfall intensity         Soakaway geometry         Unsaturated zone (depth to water)         Flow type         Effective grain size         Lithology	15 20 20 7.5 7.5	50 = 55mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3 High – 3	15         45         60         20         22.5         22.5
3 4 5 6 7	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology	15 20 20 7.5 7.5	SUP Service         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be         expected to be hydraulically connected to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 High – 3 High – 3	15 45 60 20 22.5 22.5
3 4 5 6 7 Overall Score for	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology         Filter Drains	15         20         20         7.5	50 = 35mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3 High – 3	15 45 60 20 22.5 22.5 22.5
3 4 5 6 7 Overall Score for	Rainfall         Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology         Filter Drains	15         20         20         7.5	50 = 55mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3 High – 3	15 45 60 20 22.5 22.5 22.5
3 4 5 6 7 Overall Score for	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology         Filter Drains	15         20         20         7.5	50 = 35mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly         intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to         coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be         expected to be hydraulically connected         to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to         coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be         expected to be hydraulically connected         to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5 22.5 22.5 22.5
3 4 5 6 7 Overall Score for	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology         Filter Drains	15         20         20         7.5	50 = 35mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3	15 45 60 20 22.5 22.5 22.5 22.5 200 Medium Risk of Impact (150 - 250)
3 4 5 6 7 Overall Score for	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology         Filter Drains	15 20 20 7.5 7.5	50 = 35mm         Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3 High – 3	15 45 60 20 22.5 22.5 22.5 22.5 22.5
3 4 5 6 7 Overall Score for	Rainfall         intensity         Soakaway         geometry         Unsaturated         zone (depth         to water)         Flow type         Effective         grain size         Lithology         Filter Drains         SuDS Basin (with	15 20 20 7.5 7.5	Filter Drains         SuDS Basin associated with High Road         Area 1.7ha         TP9-044 (located c.53m north of SuDS         530 earthworks)         Depth to water = 2m         BH depth = 2m         Unconsolidated or non-fractured         consolidated deposits (i.e. dominantly intergranular flow)         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.         Alluvial Fan Deposits         Sandy gravelly silt and silty fine to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to coarse gravel.         Moderate to high groundwater potential.         Groundwater would also generally be expected to be hydraulically connected to surface waters.	Medum – 2 Low – 1 High – 3 High – 3 Low – 1 High – 3 High – 3	15 45 60 20 22.5 22.5 22.5 22.5 22.5 200 Medium Risk of Impact (150 - 250) 230



					Medium Risk of Impact (150 - 250)
SuDS Network	<b>&lt; 537</b>				, ,
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	15,150 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
			SuDS Basin associated with High Road Area 6.2ha	High – 3	45
4	Unsaturated zone (depth to water)	20	TP9-045 (located c.25m north of SuDS 537 earthworks) Depth to water = Dry BH depth = 1.2m, assumed ground water level >5m and < 15m	Medium – 2	40
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
7	Lithology	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
Overall Score for F	ïlter Drains				180 Medium Risk of Impact (150 - 250)
Overall Score for S	SuDS Basin (with	high road area	)		210 Medium Risk of Impact (150 - 250)
Subs Network	<b>( 561</b>	Maighting	Site Date	Diale Caara	Component
Number	Property	Factor		Kisk Score	Score
1	Traffic Densitv	15	15,150 (AADT)	Low – 1	15
2	Rainfall volume	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains	Low – 1	15
	-		SuDS Basin/ feature associated with High Road Area 3.3ha	High – 3	45
4	Unsaturated zone (depth to water)	20	No information so conservative value has been adopted	High – 3	60
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel.	High – 3	22.5


			Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.		
7	Lithology	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
Overall Score for F		200 Medium Risk of Impact (150 - 250)			
Overall Score for S	SuDS Basin (with	high road area	)		230 Medium Risk of Impact (150 - 250)
Component	Rroperty	Weighting	Site Data	Risk Score	Component
Number	Topony	Factor			Score
1	Traffic Density	15	15,150 (AADT)	Low – 1	15
2	Rainfall	15	1304.0	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin/ feature associated with High Road Area 3.8ha	High – 3	45
4	Unsaturated zone (depth to water)	20	No information so conservative value has been adopted	High – 3	60
5	Flow type	20	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Low – 1	20
6	Effective grain size	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
7	Lithology	7.5	Alluvium Clayey, silty or gravelly fine to coarse sand and silty sandy fine to coarse gravel. Moderate to high groundwater potential. Groundwater would also generally be expected to be hydraulically connected to surface waters.	High – 3	22.5
Overall Score for F	filter Drains				200 Medium Risk of
					Impact (150 - 250)
Overall Score for S	SuDS Basin (with	high road area	)		230 Medium Risk of Impact (150 - 250)



Figure 38:

Method D results for mainline impact on surface water

HIGHWAYS         View Spillage Assessment Parameters         Reset         Go To Runoff Risk Assessment Interface											
Ass	Assessment of Priority Outfalls										
										-	
Meth	od D	<ul> <li>assessment of risk from acc</li> </ul>	idental spillage	k	Additional colum	ins for use if other roads	drain to the same o	utfall			
				A (main road)	В	С	D	E	F		
D1	Wate	r body type		Surface watercourse						_	
D2	Leng	th of road draining to outfall (m)		2,300						-	
D3	Koad	Type (A-road or Motorway)		A							
D4	ILA IO	ion type		No junction						-	
D5	Loca	tion								-	
D7	Traffi	c flow (AADT two way)		12.910							
D8	% H0	GV		19							
D8	Spilla	age factor <i>(no/10<sup>9</sup>HGVkm/year)</i>		0.29							
D9	Risk	of accidental spillage		0.00060	0.00000	0.00000	0.00000	0.00000	0.00000		
D10	Proba	ability factor		0.75							
D11	Risk	of pollution incident		0.00045	0.00000	0.00000	0.00000	0.00000	0.00000		Return Period
D12	ls ris	k greater than 0.01?		No						Totals	(years)
D13	Retu	n period without pollution reduc	tion measures	0.00045	0.00000	0.00000	0.00000	0.00000	0.00000	0.0004	2233
D14	Exist	ing measures factor	reduction measure	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.0004	2222
D15	Prop	sed measures factor	reduction measure	0.8	0.00000	0.00000	0.00000	0.00000	0.00000	0.0004	2233
D17	Resid	dual with proposed Pollution red	uction measures	0.00036	0.00000	0.00000	0.00000	0.00000	0.00000	0.0004	2791
		······································									
	Location	Table D1 Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road Total	g measures facto Motorways 0.36 0.43 3.09 - - 0.37	rs: Rural Trunk 0.29 0.83 3.09 0.88 0.93 0.45	Urban Trunk 0.31 0.36 5.35 1.46 1.81 0.85	Justification for choice	Table 7.1 Filter Drain Grassed Ditch / Pond Wetland Soakaway / Infii Sediment Trap Unlined Ditch Penstock / valv	tem R Swale tration basin	Optimum Risk leduction Factor 0.6 0.5 0.4 0.6 0.6 0.7 0.4		
	Oil Separator 0.5										
The w	orksł	neet should be read in conjuncti	on with DMRB 11.3	3.10.							



Figure 39:

Method D results for mainline impact on groundwater

Â	AGENCY View Spillage Assessment Parameters				Reset	Go To Rur	off Risk Assessm	ent Interface		
Asses	Assessment of Priority Outfalls									
Method	D - assessment of risk from acc	idental spillage		Additional colum	ns for use if other roads	drain to the same o	outfall		_	
D4 by			A (main road)	В	С	D	E	F		
D1 W	ater body type		Groundwater						_	
D2 Le	ngth of road draining to outfall (m)		2,300						_	
D3 KC	A road is site urban or rural?		Rurol						-	
D4 II /	nction type		No junction			1			_	
D6 10	cation								_	
D7 Tr	affic flow (AADT two way)		12,910						-	
D8 %	HGV		19						_	
D8 Sr	pillage factor (no/10 <sup>9</sup> HGVkm/vear)		0.29		· · · · · ·					
D9 Ri	sk of accidental spillage		0.00060	0.00000	0.00000	0.00000	0.00000	0.00000		
D10 Pr	obability factor		0.50							
D11 Ri	sk of pollution incident		0.00030	0.00000	0.00000	0.00000	0.00000	0.00000		Return Period
D12 ls	risk greater than 0.01?		No						Totals	(years)
D13 Re	eturn period without pollution reduction	tion measures	0.00030	0.00000	0.00000	0.00000	0.00000	0.00000	0.0003	3349
D14 Ex	sisting measures factor		1							
D15 Re	eturn period with existing pollution	reduction measu	res 0.00030	0.00000	0.00000	0.00000	0.00000	0.00000	0.0003	3349
D16 Pr	oposed measures factor		0.8							
D17 Re	esidual with proposed Pollution red	uction measures	0.00024	0.00000	0.00000	0.00000	0.00000	0.00000	0.0002	4186
	Table D4									
		1				Sys	tem	Optimum Risk		
	Serious Accidental Spillages						R	eddenon Factor		
-	(Billion HG v km/ year)	Motorways	Rural Trunk	Urban Trunk		Filter Drain		0.6		
	No junction	0.36	0.29	0.31		Grassed Ditch	Swale	0.6		
	C Slip road	0.43	0.83	0.36		Pond		0.5		
	Cross road	3.09	0.88	1.46		Wetland		0.4		
	Side road	_	0.93	1.40		Soakaway / Infi	Itration basin	0.6		
	Total	0.37	0.45	0.85		Sediment Trap		0.6		
	Unlined Ditch 0.7 Penstock / valve 0.4 Notched Weir 0.6 Oil Separator 0.5									
The worl	he worksheet should be read in conjunction with DMRB 11.3.10.									



Figure 40:

Method D results for Newtonmore junction impact on surface water

Â	HIGHWAYS         View Spillage Assessment Parameters         Reset         Go To Runoff Risk Assessment Interface										
Asses	Assessment of Priority Outfalls										
Method	D - assessment of risk from acci	idental spillage	[r	Additional columns	s for use if other roads	dra	in to the same ou	tfall			
			A (main road)	В	С		D	E	F	_	
D1 W	01 Water body type Surface watercou			Surface watercours	e					_	
D2 Le	ngth of road draining to outfall (m)		1,700	640						4	
D3 R0	ad Type (A-road or Motorway)		A	A						-	
D4 IFA	A road, is site urban or rural?		No iunction	Rural Slip rood						-	
	cation		> 1 hour	> 1 hour						-	
D7 Tra	affic flow (AADT two way)		12 900	1 033	•	-			-		
D8 %	HGV		20	18							
D8 Sp	illage factor (no/10 <sup>9</sup> HGVkm/vear)		0.29	0.83			•				
D9 Ris	sk of accidental spillage		0.00046	0.00004	0.00000	0.0	0000	0.00000	0.00000		
D10 Pr	obability factor		0.75	0.75							
D11 Ris	sk of pollution incident		0.00035	0.00003	0.00000	0.0	0000	0.00000	0.00000		Return Period
D12 Is	risk greater than 0.01?		No	No						Totals	(years)
D13 Re	turn period without pollution reduct	ion measures	0.00035	0.00003	0.00000	0.0	0000	0.00000	0.00000	0.0004	2665
D14 Ex	isting measures factor		1	1							
D15 Re	turn period with existing pollution r	eduction measures	0.00035	0.00003	0.00000	0.0	0000	0.00000	0.00000	0.0004	2665
D16 Pr	oposed measures factor	untion management	0.8	0.8	0.00000	0.0	0000	0.00000	0.00000	0.0000	2224
							· ·				
						ſ	Table 7.1				
	Table D1 Serious Accidental Spillages						Syste	em R	Optimum Risk Reduction Factor		
	(Billion HGV km/year)	Motorways	Rural Trunk	Urban Trunk			Filter Drain		0.6		
	No junction	0.36	0.29	0.31			Grassed Ditch / S	Swale	0.6		
	Slip road	0.43	0.83	0.36			Pond		0.5		
	Cross road	3.09	3.09	5.35			Wetland		0.4		
	Side road		0.00	1.40			Soakaway/Infilt	ation basin	0.6		
	Total	0.37	0.45	0.85			Sediment Trap		0.6		
							Penstock / valve Notched Weir Oil Separator		0.4 0.6 0.5		
The work	sheet should be read in conjunction	on with DMRB 11.3	10.								



Figure 41: Method D results for Newtonmore junction impact on groundwater

HIGHWAYS         View Spillage Assessment Parameters				Reset	Go To Run	off Risk Assessm	ent Interface				
Ass	essm	nent of Priority Outfalls									
					[ <u></u>					_	
Meth	iod D -	assessment of risk from acc	idental spillage	A (	Additional columns	s for use if other roads	drain to the same of	utfall		-	
	1147.1			A (main road)	В	С	D	E	F	_	
D1	vvater	r body type		Groundwater	Groundwater					-	
D2	Dood	Type (A-read or Motorway)		1,700	Δ					-	
D3	If A ro	ad is site urban or rural?		Rural	Rural					-	
D5	Juncti	ion type		No junction	Slip road					-	
D6	Locat	ion		> 1 hour	> 1 hour					-	
D7	Traffic	flow (AADT two way)		12,900	1,033						
D8	% HG	SV		20	18						
D8	Spilla	ge factor (no/10 <sup>9</sup> HGVkm/year)		0.29	0.83						
D9	Risk (	of accidental spillage		0.00046	0.00004	0.00000	0.00000	0.00000	0.00000		
D10	Proba	bility factor		0.50	0.50						
D11	Risk (	of pollution incident		0.00023	0.00002	0.00000	0.00000	0.00000	0.00000		Return Period
D12	IS risk	c greater than 0.01?		NO	NO	0.00000	0.00000	0.00000	0.00000	lotals	(years)
D13	Retur	n period without pollution reduc	tion measures	0.00023	0.00002	0.00000	0.00000	0.00000	0.00000	0.0003	3998
D14	Rotur	ng measures lactor	reduction measure	0.00023	0.00002	0.0000	0.0000	0 00000	0.0000	0.0003	3998
D16	Propo	sed measures factor	reduction measure	0.00023 0.8	0.00002	0.00000	0.00000	0.00000	0.00000	0.0003	3330
D17	Resid	ual with proposed Pollution red	uction measures	0.00019	0.00001	0.00000	0.00000	0.00000	0.00000	0.0002	4997
							Table 7.1		]	_	
	G	Table D1					Svet	em	Optimum Risk		
		Serious Accidental Spillages (Billion HGV km/year)	Motorways	Rural Trunk	Urban Trunk		Filter Desin	Re	eduction Factor		
		No junction	0.36	0.29	0.31		Grassed Ditch /	Swale	0.0		
	5	Slip road	0.43	0.83	0.36		Pond	Swale	0.5		
	l iĝ	Roundabout	3.09	3.09	5.35		Wetland		0.4		
	ö	Cross road	-	0.88	1.46		Soakaway/Infil	ration basin	0.6		
		Side road	-	0.93	1.81		Sediment Trap		0.6		
		10(3)	0.37	0.45	0.05		Unlined Ditch Penstock / valve Notched Weir <u>Oil Separator</u>		0.7 0.4 0.6 0.5		
The \	he worksheet should be read in conjunction with DMRB 11.3.10.										



Figure 42: Method D results for Kingussie junction impact on surface water

HIGHWAYS AGENCY View S	pillage Assessmen	t Parameters	Reset	Go To Run	off Risk Assess	ment Interface		
Assessment of Priority Outfalls								
Method D., assessment of sick from assidental anillage			for use if other reads	drain to the same of	utfall			
method D - assessment of risk from accidental spinage	(main road)	Additional columns	for use if other roads			F		
D1 Water body type	Surface watercourse	Surface watercourse	<u> </u>	U	L		-	
D2 Length of road draining to outfall (m)	442	138	,					
D3 Road Type (A-road or Motorway)	A .	A					-	
D4 If A road, is site urban or rural?	Rural	Rural						
D5 Junction type	No junction	Slip road						
D6 Location	> 1 hour	> 1 hour						
D7 Traffic flow (AADT two way)	14,076	1,529						
D8 % HGV	18	9						
D8 Spillage factor (no/10 <sup>9</sup> HGVkm/year)	0.29	0.83						
D9 Risk of accidental spillage	0.00012	0.00001	0.00000	0.00000	0.00000	0.00000		
D10 Probability factor	0.75	0.75						
D11 Risk of pollution incident	0.00009	0.00000	0.00000	0.00000	0.00000	0.00000		Return Period
D12 Is risk greater than 0.01?	No	No					Totals	(years)
D13 Return period without pollution reduction measures	0.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.0001	10727
D14 Existing measures factor	1	1		0.00000				44747
D15 Return period with existing pollution reduction measures	0.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.0001	10/2/
D16 Proposed measures factor	0.00007	0.00000	0.00000	0.00000	0.00000	0.0000	0.0001	12400
				Table 7.1				
Table D1				Syst	em	Optimum Risk Reduction Factor		
(Billion HGV km/ year)	Dural Trunk	Urban Trunk						
No impetion				Filter Drain		0.6		
Slip road 0.43	0.29	0.31		Grassed Ditch /	Swale	0.6		
Boundabout 3.09	3.09	5 35		Pond		0.5		
Cross road -	0.88	1.46		Vvetiand Seekoway (Infil	ration basin	0.4		
Side road -	0.93	1.81		Soakaway/ Innii	ration basin	0.0		
Total 0.37	0.45	0.85		Linlined Ditch		0.0		
				Penstock / valve Notched Weir Oil Separator		0.4 0.6 0.5		
The worksheet should be read in conjunction with DMRB 11.3	.10.							



Figure 43:

Method D results for Kingussie junction impact on groundwater

HIGHWAYS AGENCY	View Spillage Assess	Reset	Go To Runoff F	Go To Runoff Risk Assessment Interface			
Assessment of Priority Outfalls							
Method D., assessment of risk from assidented	millaga	Additional column	a for upp if other reads	drain to the come outfall	1	]	
method D - assessment of risk from accidental	spinage	Additional column					
D1 Water body type	Croundwater	u) D Groundwater	C	U	I		
D2 Length of road draining to outfall (m)	442	138					
D3 Road Type (A-road or Motorway)	A	A					
D4 If A road, is site urban or rural?	Rural	Rural					
D5 Junction type	No junction	Slip road					
D6 Location	> 1 hour	> 1 hour					
D7 Traffic flow (AADT two way)	14,076	1,529					
D8 % HGV	18	9					
D8 Spillage factor (no/10 <sup>3</sup> HGVkm/year)	0.29	0.83					
D9 Risk of accidental spillage	0.00012	0.00001	0.00000	0.00000 0.0	0000 0.00000		
D10 Probability factor	0.50	0.50	0.00000	0.00000	0000		Deturn Deried
D11 Risk of pollution incident	0.00000	0.00000	0.00000	0.00000 0.0	0.0000	Totals	Keturn Period
D12 Is lisk greater than 0.01?	euree 0.0006	0.0000	0.0000	0.00000 0.0	0000 0.0000	0.0001	16091
D14 Existing measures factor	1	1	0.00000	0.00000	0.0000	0.0001	10051
D15 Return period with existing pollution reduction	measures 0.00006	0.00000	0.00000	0.00000 0.0	0000 0.00000	0.0001	16091
D16 Proposed measures factor	0.8	0.8					
D17 Residual with proposed Pollution reduction m	easures 0.00005	0.00000	0.00000	0.00000 0.0	0.0000 0.00000	0.0000	20114
				Table 7.1		1	
Table D1				Sustan	Optimum Risk		
Serious Accidental Spillages				System	Reduction Factor		
(Billion HGV km/year) Motory	ays Rural Trunk	Urban Trunk		Filter Drain	0.6		
No junction 0.36	0.29	0.31		Grassed Ditch / Swa	ale 0.6		
Slip road 0.43	0.83	0.36		Pond	0.5		
Roundabout 3.09	3.09	5.35		Wetland	0.4		
- Cross road	0.88	1.46		Soakaway/Infiltration	on basin 0.6		
Total 0.37	0.95	0.85		Sediment Trap	0.6		
				Onlined Ditch Penstock / valve Notched Weir Oil Separator	0.7 0.4 0.6 0.5		
re worksheet should be read in conjunction with DMRB 11.3.10.							



Annex 2: Technical Note



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Project:	A9 Dualling	Originated	PG
Subject:	Side Road and Accommodation Track SUDS	Checked	DP
Date:	August 2015	Reviewed	RMcE
Document Reference	A9P0N-AMJ-HDG-Z_ZZZZ_XX-TN-DE-0001	Authorised	SB
Suitability	For Review & Comment	Version	P3.0

### 1. SUDS on Side Roads, Accommodation and NMU Tracks

Section 4.1 of Chapter 3 'Water and Flooding' of the A9 Dualling Programme Environmental Design Guide [1] states that 'All runoff from newly dualled A9 carriageway will be collected and treated via, as a minimum, two levels of sustainable drainage systems (SUDS), prior to discharge.

Dualling of the A9 involves interaction with existing side roads, requiring diversions and realignments as well as creation of accommodation tracks and non-motorised user (NMU) tracks. This Technical Note outlines the proposed approach to SUDS on these side roads and tracks.

#### 1.1 Current Guidance on SUDS use with Roads

There is limited guidance on how to approach the SUDS assessment and design for the type of roads and tracks that are beyond the A9 mainline or junctions. Below are extracts from a number of relevant guidance documents referencing SUDS use with roads:

- 'SUDS for Roads' [2] section 2.1 acknowledges the different categories of roads below Trunk Roads, including a number of categories of distributor and access roads. The guidance on the number of SUDS levels for roads in section 2.4.1 states 'It is generally accepted that roads typically require two levels of treatment, although for smaller developments residential roads may require only one level'
- Guidance in SEPA 'Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems (SUDS or SUDS systems) [3]. Section 7.7 states that 'Levels of treatment required will depend on the volume of traffic using the road; 'One level is appropriate for lightly trafficked and minor roads, two levels of treatment are normally required for all other roads, except motorways which normally require three levels.'
- Highland Council guidance, sections 6.25 to 6.29 'Drainage of the Road' of Flood Risk & Drainage Impact Assessment: Supplementary Guidance [4], refers to individual elements of SUDS for use on roads, but references SUDS for Roads for further guidance (section 6.29).

Perth and Kinross Council guidance, 'Flood Risk and Flood Risk Assessments' [5] does not make any specific reference to SUDS use with roads.

## 1.2 Side Road and Track Classifications

SUDS for Roads (Figures 2.1 and 2.2) classify roads in three broad categories; trunk, distributor and access roads.

'A9 Dualling: Preliminary Engineering Support Services' [6] (PES) report classifies side roads into three tiers for the purposes of the junction strategy: Tier 1; A and B roads, Tier 2; C and unclassified roads and Tier 3; Private and Agricultural access roads. Section 4.10.1 of the PES report identifies that B roads with Annual Average Daily Traffic (AADT) or less than 500 should be considered separately to those with a greater AADT.

Taking both of the above classifications into consideration, it is proposed to group the side roads and tracks in the following classifications. This is so that the most appropriate method of SUDS assessment, selection and guidance can be applied to each group.

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- Tier 0: Trunk Road (side road to A9) under the jurisdiction of Transport Scotland.
- Tier 1.1: A and B roads (local roads) with an AADT of over 500.
- Tier 1.2: A and B roads (local roads) with an AADT of under 500.
- Tier 2: C and unclassified roads.
- Tier 3: Private and Agricultural Access Roads (Accommodation Tracks).
- Tier 4: NMU tracks.

#### 1.3 Guidance Relevant to each Side Road and Track Classification

- Tier 0 side roads are those under the jurisdiction of Transport Scotland, therefore design standards and advice in the Design Manual for Roads and Bridges (DMRB) [7] applies, as it does for the mainline A9.
- Tier 1 and 2 are local authority roads, therefore guidance on SUDS assessment in the DMRB may not be appropriate. HD45/09 Road Drainage and the Water Environment [8] is the applicable section of guidance in the DMRB. The methods in here, such as Method A (HAWRAT) (HD45/09 Annex 1) for assessing the runoff from roads on receiving watercourses, are aimed at roads with a traffic flow (AADT) of over 10,000 per day. On parts of the A9 mainline the AADT is below this, and on the side roads likely to be lower again, often lower than 10% (1000 AADT) of this. Therefore, more appropriate guidance on SUDS assessment and selection is in SUDS for Roads.

Guidance in SUDS for Roads is applicable to all types of roads from trunk roads to minor access links (section 1.1.1).

Section 2.6 of SUDS for Roads sets out a procedure to select the appropriate SUDS features for a road, taking into consideration aspects such as topography, space available and environmental factors. It is proposed to use this procedure to assist in selecting the SUDS for Tier 1 and 2 side roads.

Tier 1 roads have been sub-divided into two categories, based on the PES Report AADT of 500 as the limit of a lightly trafficked road. The use of 500 AADT as a basis for lightly trafficked roads originates from DMRB TD41/94 [9] as a road with such low traffic flows as to allow an uncontrolled direct access off the trunk road. SEPA guidance 'WAT-RM-08' will be considered in the case of lightly trafficked roads with an AADT of under 500.

Tier 1.1 A and B roads with an AADT of over 500 Tier 1.2: A and B roads with an AADT of under 500

• Tier 3 accommodation tracks and access roads vary depending on the use and requirements and the majority will be private. These have been sub-divided into five categories on the basis of applying the most appropriate SUDS guidance to each one.

Tier 3.1: Agricultural / forestry with an AADT of under 100 Tier 3.2 Agricultural with an AADT of under 50 Tier 3.3 Residential with an AADT of under 100 Tier 3.4 Residential with an AADT of under 10 Tier 3.5 Road feature maintenance track with and AADT of under 10

Table 1.1 below shows potential variants within the Tiers. As most tracks will be designed to meet the requirements of the landowner, the tracks can vary between resembling minor roads (Tier 3.1 impermeably surfaced) to less formal accesses (Tier 3.4 permeably paved). Use of permeably paved accesses will be subject to suitability of ground conditions and intended usage.

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In addition to guidance in SUDS for Roads and WAT-RM-08, other drainage design guidance specifically for tracks may also be considered. SNH guidance 'Constructed Tracks in the Scottish Uplands' [10] contains guidance on the design and construction of tracks in a rural upland setting, including drainage (section 4.9), which may also be appropriate for some track types.

	Turnical		Turrical		Purpose		
Tier	Width*	Surface	Vehicle	AADT	(dwelling, business, agricultural)		
3.1	6m	Impermeable surfacing	HGV 6 (or more)-axle articulated	<100	Agricultural /forestry		
5.1	om	Permeable paving	HGV 6 (or more)-axle articulated	<100	Agricultural/forestry		
			Car /LGV				
3.2	4m with passing places	Impermeable surfacing	HGV 6 (or more)-axle articulated	<50	Agricultural		
			Car /LGV		Agricultural		
		Permeable paving	HGV 6 (or more)-axle articulated	<50			
			Car /LGV				
	4m with	Impermeable surfacing	HGV (3 axle rigid) – service vehicle	<100	Residential (multiple properties)		
3.3	passing		Car /LGV				
		Permeable paving	HGV (3 axle rigid) – service vehicle	<100	Residential (multiple properties)		
34	3m with	Impermeable surfacing	Car / LGV	<10	Residential (single property)		
3.4	places	Permeable paving	Car / LGV	<10	Residential (single property)		
3.5	3m with passing places	Permeable paving	LGV	<10	SUDS maintenance track		

\* Actual dimensions will be subject to change following consultation with local authority or the affected landowners Table 1.1 Private and Agricultural Access Roads

• Tier 4 NMU tracks will also vary depending on the use and requirements. They are likely to be a mix of private and local authority tracks. They have been subdivided into two categories in order to apply the most appropriate SUDS guidance to each one:

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Tier 4.1: Impermeably surfaced NMU tracks Tier 4.2: Permeably paved NMU tracks

1.3 Water Quality, SUDS, Guidance and Legislation

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The drainage of the side roads, accommodation track and NMU track provision will consider the requirements of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 [11] (CAR).

Within the CAR Practical Guide [12], pollution control from surface water discharge is covered by both 'Point Source' (section 3.1) and 'Diffuse Pollution' (section 3.2), for the protection of the water environment.

Point source pollution includes 'surface water from urban areas' and diffuse pollution includes 'discharge of surface water run-off.' Further guidance on SEPA's website [13] identifies run-off from roads as diffuse pollution and should have SUDS applied, in accordance with SUDS for Roads. Roads are identified within the diffuse pollution in urban area, although applicable to rural and urban situations where roads are proposed.

SEPA guidance 'Diffuse Pollution General Biding Rules: Forestry' [14] references rural diffuse pollution, surface runoff:

- Water should be discharged in a way that minimises the risk of polluting the water environment.
- No discharge from drainage should result in the destabilisation of the banks or bed of the receiving water.

SNH 'Constructed Tracks in the Scottish Uplands' (section 4.9 – Drainage) references the CAR practical guide and acknowledges the potential impact of surface water runoff from these tracks on the receiving watercourses.

Point source and diffuse pollution, urban and rural are covered by General Binding Rules (GBR) 10 and 21, which cover surface water drainage, except where a simple licence is required.

- GBR10 addresses discharges relating to construction sites, buildings, roads, yards and other built up areas and requires provision of SUDS.
- GBR21 addresses the discharge of water run-off via a surface water drainage system to the water environment (rural land activities) and requires that run-off must be discharged in a manner that minimises the risk of pollution to any river, burn, ditch or wetland and must not result in the destabilisation of the banks or bed of the receiving river, burn, ditch or wetland. GBR 21 does not specify the requirement for SUDS.

Section c) of GBR10 states 'All reasonable steps must be taken to ensure that the discharge will not result in pollution of the water environment.' Therefore the provision of SUDS for each side road or track will contribute to achieving this.

Section 2, below, identifies the steps to be taken for each Tier of side road or track in order to best meet the requirements of GBR10 and 21.

### 2. Proposed Assessment Procedures

### 2.1 Side Roads (Tier 0)

• Tier 0 roads; where other Transport Scotland trunk roads join the A9 mainline, these shall be assessed in accordance with DMRB guidance and two levels of SUDS as a minimum will generally be proposed.

### 2.2 Side Roads (Tiers 1.1, 1.2 and 2)

All side roads will be reviewed on a case-by-case basis in line with an assessment and selection process based on that outlined in section 2.6 of SUDS for Roads. This includes consideration of location, traffic usage and position relative to any designated environmental sites. To ensure a proportional and risk-based solution, the SUDS approach for each category of side road is as follows:

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- Tier 1.1 roads; these will be reviewed in accordance with an assessment based on section 2.6 of SUDS for Roads. It is proposed that two levels of SUDS shall be used, however each road will be reviewed on a case-by-case basis to ensure this is appropriate. Where physical or other site constraints exist that prevent the application of two levels, one level of SUDS may be proposed. If one level of SUDS is proposed, the type of SUDS will be considered to maximise pollutant capture and treatment, and the relevant stakeholders will be consulted.
- Tier 1.2 roads; these will be assessed in the same manner as Tier 1.1 roads. However, consideration will be given to the advice in WAT-RM-08 for roads that are lightly trafficked. Therefore, it is proposed to have one level of SUDS unless they are located in, or discharge to, an aquatic part of a Natura2000 site Special Protection Area (SPA) or Special Areas of Conservation (SAC) designated under the Birds Directive (79/409/EEC) [15] or the Habitats Directive (92/43/EEC) [16] respectively, whereby use of two levels will generally be proposed.

Where one level of SUDS is used, the most appropriate type of SUDS should be considered with the aims of maximising pollutant capture and treatment with due regard to ease of maintenance.

• Tier 2 roads; these will be assessed using the same approach as for Tier 1.2 roads.

## 3. Accommodation Tracks (Tier 3)

Each accommodation track in Tiers (Tier 3.1 to 3.5) has an AADT of under 100. Therefore it is appropriate to consider the advice given in WAT-RM-08. The traffic figures are low enough for one level of SUDS generally to be sufficient to give adequate and proportionate protection to the receiving watercourse. The type of SUDS will be considered to maximise pollutant capture and treatment.

However, Table 1.1 indicates that the type of vehicle use may vary significantly, and Tier 3.1 and 3.2 may carry types of industrial vehicle which have a higher risk of generating pollution.

Each track will be assessed on a case-by-case basis, using a process based on that outlined in section 2.6 of SUDS for Roads. It will generally be proposed that one level of SUDS is sufficient; however, where higher risk vehicles are identified as using the tracks, two levels of SUDS may be proposed. Likewise, where the tracks are located in or upstream of a Natura 2000 site (SAC or SPA), an additional level of SUDS may be required to give sufficient protection to the receiving watercourse.

Advice in SNH guidance 'Constructed Tracks in the Scottish Uplands' will be considered where applicable. Where permeable paving is used, particularly for Tiers 3.4 and 3.5, and where site conditions allow, the permeable paving may be considered as one level of SUDS.

### 4. NMU Tracks (Tier 4)

NMU tracks will generally not be used by vehicles, and so no vehicle based pollutants will be generated and washed into the run-off. Therefore, specific SUDS features to protect the quality of the receiving watercourses will not generally be provided. Where the tracks are paved, the runoff rates will be assessed and one level of SUDS may be proposed, principally as a conveyance and flood mitigation feature. Where the NMU tracks are constructed with permeable paving, this may be considered as one SUDS level in certain circumstances, depending on paving type, track use and local ground conditions. Otherwise they shall be treated in the same manner as paved NMU tracks.

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# 5. References

- 1. Chapter 3 'Water and Flooding' of the A9 Dualling Programme Environmental Design Guide (CH2M Hill, 2015).
- 2. SUDS for Roads (WSP, 2009).
- Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems (SUDS or SUDS systems) (SEPA, 2014).
- 4. Flood Risk & Drainage Impact Assessment: Supplementary Guidance (The Highland Council, 2013)
- 5. 'Flood Risk and Flood Risk Assessments (Developers Guidance Note on Flooding and Drainage) (Perth and Kinross Council, 2014)
- 6. A9 Dualling: Preliminary Engineering Support Services' DMRB Stage 1 Assessment (Jacobs, 2014)
- 7. Design Manual for Roads and Bridges (DMRB) (Highways England) www.standardforhighways.co.uk
- 8. HD45/09 'Road Drainage and the Water Environment' Volume 11, Section 3, Part 10 (DMRB, 2009)
- 9. TD41/95 'Vehicular Access to All Purpose Trunk Roads' Volume 6, Section 1, Part 7 (DMRB 1995)
- 10. Constructed Tracks in the Scottish Uplands (SNH, 2013)
- 11. The Water Environment (Controlled Activities) (Scotland) Regulations 2011
- 12. The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). A Practical Guide Version 7.2 (SEPA, 2015)

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- 13. http://www.sepa.org.uk/regulations/water/diffuse-pollution/diffuse-pollution-in-the-urban-environment/
- 14. Reducing the Risk of Water Pollution: Diffuse Pollution General Biding Rules: Forestry (SEPA, 2006)
- 15. Birds Directive (79/409/EEC) as amended. European Parliament (1979)
- 16. Habitats Directive (92/43/EEC) as amended. European Parliament (1992)