

# Appendix 11.4 Surface Water Environment Water Quality Calculations Transport Scotland August 2018





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# **Glossary and Abbreviations**

Terminology	Abbreviation	Description
Accidental spillage	-	Contaminated road runoff directly resulting from spillages due to vehicle accident, leading to an acute pollution incident and impact on the receiving surface or groundwater body
Ambient Background Concentration	ABC	Site-specific or soil type-specific ambient background concentrations of trace metals in soils - needed for risk assessment
Annual Average Daily (24 hour) Traffic	AADT24	Daily volume of vehicle traffic, based on annual traffic volumes to incorporate variations across the year
Base Flow Index	BFI	A measure of the ratio of long-term base-flow to total stream flow representing the slow continuous contribution of groundwater to river flow
Design Manual for Roads and Bridges	DMRB	A series of 15 volumes that provide standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways in the United Kingdom, and, with some amendments, the Republic of Ireland
Drainage network	-	Specific catchments, including permeable and impermeable surfaces, collecting precipitation to be transferred from The Proposed Scheme to a local receiving water body via either surface water or groundwater discharge
Environmental Quality Standards	EQS	Environmental Quality Standards (EQS) are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined by the Water Framework Directive. The assessment of EQS considers long-term risks over the period of one year by comparing discharge concentrations of pollutants against EQS level
Five percentile flow	Q95	The flow in cubic metres per second which was equalled or exceeded for 95% of the flow record
Highways Agency Water Risk Assessment Tool	HAWRAT	Standard approach specified in Design Manual for Roads and Bridges document HD 45/09. A Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road runoff. Assesses acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment bound pollutants (with dissolved copper and dissolved zinc used as indicators)
Mainline	-	Main carriageway of The Proposed Scheme; A9 dual carriageway between Dalraddy and Slochd
Outfall	-	Discharge location for drainage network
Routine runoff	-	Potentially contaminated road runoff from routine operation, including sediment and soluble metals
Side roads	-	New/upgraded side roads and accommodation tracks required to link with the mainline of The Proposed Scheme

Terminology	Abbreviation	Description						
Site of Special Scientific Interest	SSSI	A formal conservation designation for an area which is of particular interest because of its fauna, flora or geological or physiological features; in other words, these areas have extremely high conservation value						
Sodium chloride	NaCl	An ionic compound with the chemical formula NaCl, representing a 1:1 ratio of sodium and chloride ions.						
Surface water discharge	-	Drainage network that discharges via outfall to surface water body						
Sustainable Drainage Systems	SuDS	Techniques used to manage flow attenuation and water quality treatment of runoff to minimise adverse effect on receiving water body, examples include filter drains, swales, retention/detention ponds, surface flow wetlands and infiltration basins						
Water Framework Directive	WFD	The purpose of the Water Framework Directive is to establish a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater						

# 1. Introduction

### 1.1 Overview

- 1.1.1 This report is a technical appendix to the A9 Dualling Dalraddy to Slochd DMRB Stage 3 Environmental Statement, Chapter 11: Road Drainage and the Water Environment.
- 1.1.2 This document details the methods and results of the water quality assessments carried out for each mainline road drainage network, as summarised in Chapter 11.
- 1.1.3 The assessments have taken into consideration the embedded sustainable drainage systems (SuDS) incorporated within the Design Manual for Roads and Bridges (DMRB) Stage 3 drainage design.

### 1.2 Aims and Objectives

- 1.2.1 This document provides details of the assessment methods and results of the following water quality assessments carried out for each mainline road drainage network:
  - DMRB HD 45/09 Method A assessment of pollution impacts from routine runoff on surface waters;
  - DMRB HD 45/09 Method D assessment of pollution impacts from operational accidental spillage; and
  - Assessment of the short term, acute impacts of road salt, utilising a method developed for use on all projects within the A9 Dualling programme.

# 2. Assessment Methods

### 2.1 Method A Routine Runoff Assessment

- 2.1.1 DMRB HD 45/09 Method A is an assessment of pollution impacts from routine runoff on surface waters, comprising two separate elements:
  - HAWRAT Assessment: the Highways Agency Water Risk Assessment Tool (HAWRAT) is a Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road runoff. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment bound pollutants, respectively; and
  - EQS Assessment: Environmental Quality Standards (EQS) are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the Water Framework Directive (WFD). The long-term risks over the period of one year are assessed through comparison of the annual average concentration of pollutants discharged with the published EQS for those pollutants;
- 2.1.2 Both assessments require a variety of data about the Proposed Scheme and the receiving watercourses, including: the permeable and impermeable areas of each drainage network, traffic volumes associated with each drainage network, the Q<sub>95</sub> flow (flow exceeded 95% of the time) for each receiving watercourse at the point of the road discharge, watercourse Base Flow Index (BFI) (a measure of the proportion of flow in

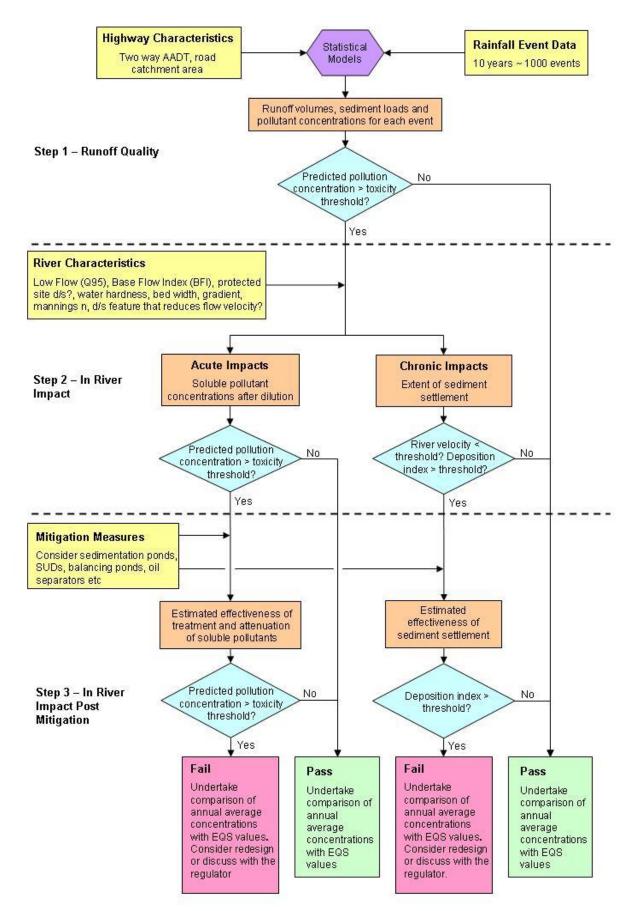
the watercourse derived from groundwater) and watercourse dimensions such as bed width, side slopes and gradient at the point of discharge.

2.1.3 It should be noted that Method C assessments are included within Chapter 10: Geology, Soils and Groundwater.

#### **HAWRAT Assessment**

- 2.1.4 HAWRAT is a tiered consequential system which involves up to three assessment stages:
  - Step 1 uses statistical models to determine pollutant concentrations in raw road runoff prior to any treatment or dilution in the receiving watercourse.
  - Step 2 assesses in-river pollutant concentrations after dilution and dispersion but without active mitigation.
  - Step 3 considers the in-river pollutant concentrations with active mitigation. For an individual outfall to pass the HAWRAT assessment, it must pass both soluble pollutant and sediment pollutant impacts.
- 2.1.5 Figure 2.1 displays the HAWRAT process and stages of assessment.
- 2.1.6 For soluble pollutants the HAWRAT calculates the in-river concentration of soluble copper and zinc for approximately 1000 stochastically generated rainfall events. For each rainfall event the calculated soluble copper and zinc concentrations are compared with in-built thresholds, and the number of exceedances across the 1000 rainfall events calculated. This is then compared with in-built exceedance thresholds. These vary depending on if sensitive sites such as any Site of Special Scientific Interest (SSSI) are located downstream of the proposed discharge location (i.e. for less sensitive locations it is considered acceptable for the 24hr copper and zinc concentration thresholds to be exceeded twice a year on average, however if a SSSI was located within 1km downstream of the discharge the number of exceedances considered acceptable in a year on average would be halved to once per year). The number of exceedances determines whether the proposed discharge passes or fails the soluble metals part of the HAWRAT assessment.
- 2.1.7 For the sediment-bound pollutants the ability of the receiving watercourse to disperse sediments is considered and, if sediment is expected to accumulate, the potential extent of sediment coverage is also considered. HAWRAT estimates the river velocity under low flow conditions and assumes that sediment arriving in the river when the velocity is less than 0.1 m/s accumulates. A basic estimation of velocity is calculated iteratively using the cross sectional area of the river channel and the flow volume at low flow conditions. The extent of deposition is evaluated by calculating the deposition index. To pass the sediment assessment within HAWRAT the discharge under assessment must pass both stages.
- 2.1.8 Where failures occur mitigation measures in the form of Sustainable Drainage Systems (SuDS) can be considered. The pollutant removal efficiency (expressed as a percentage reduction in pollutant concentrations) of the SuDS treatment train can be applied to the calculations and the assessments re-run.
- 2.1.9 The SuDS design and assessment process is iterative, and in most cases the drainage design is modified until each network passes all elements of the HAWRAT and EQS assessments.

#### Figure 2.1: HAWRAT Assessment Process



2.1.10 The treatment efficiency values applied in the assessment are based on those documented in DMRB HD 33/16 Design of Highway Drainage Systems, and summarised in Table 2.1.

Treatment System Type	Suspended Solids (% removal)	Soluble Copper (% removal)	Soluble Zinc (% removal)
Swales and Grassed Channels	80	50	50
Dry / Detention Basins	50	0	0
Wet / Retention Ponds	60	40	30
Surface Flow Wetlands	60	30	50
Vortex Grit Separators	40	0	15
Sediment Tanks	40	0	0
Oil Separators	0	0	0
Reservoir Pavements / Porous Asphalt	50	0	0
Vegetated Filter Strips	25	15	15
Combined Surface and Sub- surface Drains / Filter Drains	60	0	45
Ditches	25	15	15

#### Table 2.1: Indicative Treatment Efficiencies of Drainage systems

2.1.11 Generally, where a two or three stage treatment train is proposed the treatment efficiency of the secondary and tertiary stages is half of that quoted in Table 2.1. This takes into account the reduced performance of the secondary and tertiary stages due to the already reduced pollutant concentrations. However, if the primary stage does not provide any reduction of a particular pollutant, then for the next stage of the treatment train the full treatment efficiency quoted above is used for that particular pollutant. For example, in the case of a two stage treatment train consisting of filter drains followed by a wet/retention pond, the overall treatment efficiencies for sediment, copper and zinc would be as shown in Table 2.2. Please note: this is a conservative approach and assumes the treatment efficiency has a level of error, e.g. in reality it is unlikely that any pollutant will be removed to zero concentration.

Treatment Train	Suspended Solids (% removal)	Soluble Copper (% removal)	Soluble Zinc (% removal)
Primary Treatment - Filter Drains	60	0	45
Secondary Treatment - Wet / Retention Pond	30	40	15
Overall Treatment	72	40	53

#### Table 2.2: Example of Treatment Train Calculation

#### **EQS** Assessment

- 2.1.12 The HAWRAT also calculates the annual average concentration of soluble copper and zinc, and these can be compared with the published EQS thresholds to determine pass or failure of the EQS assessment.
- 2.1.13 The EQS thresholds for copper and zinc are:

- Copper an annual average of 1 µg/l bioavailable copper
- Zinc an annual average of 10.9 µg/l bioavailable zinc + Ambient Background Concentration (ABC) (µg/l) dissolved zinc
- 2.1.14 The HAWRAT calculates the total annual average concentration of dissolved copper and dissolved zinc, not the bioavailable fraction. Comparing these calculated values with the bioavailable EQS-+ results in a conservative assessment of the routine runoff impacts, which generally provides a degree of comfort in the Method A assessment. However, in exceptional circumstances this approach can be overly conservative leading to very onerous mitigation requirements.

## 2.2 Method D Accidental Spillage Assessment

- 2.2.1 The DMRB HD 45/09 Method D Accidental Spillage Assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:
  - The probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway; and
  - The probability that, if such a spillage did occur, the polluting substance would reach the receiving water body and cause a serious pollution incident.
- 2.2.2 The probability of a serious spillage occurring is dependent on a variety of factors; traffic volumes, percentage of heavy goods vehicles in the traffic volumes, whether the road is motorway, rural or urban trunk road, the road type categories within the road drainage catchment under assessment i.e. 'no junction', 'slip road', 'cross road' or 'roundabout' and the length of each road type within the catchment.
- 2.2.3 The probability of a serious spillage subsequently causing a serious pollution incident is dependent on the receiving surface water body and the response time of the emergency services, i.e. less than 20 minutes, less than one hour, or greater than one hour.
- 2.2.4 Typically an annual probability of 1% (i.e. a 1 in 100 chance of a serious pollution incident occurring in any one year) is considered by DMRB as an acceptable risk. However, where a road drainage outfall discharges within 1km of a sensitive receptor, (such as a nationally designated conservation site), a higher level of protection is required, such that the risk has no greater annual probability than 0.5% (i.e. a 1 in 200 chance of occurring in any one year).

### 2.3 Road Salt Assessment

- 2.3.1 The DMRB does not provide a method for assessing the potential impacts of salt (NaCl) on the surface water environment. In the absence of an existing method for assessing salt concentrations in runoff and at the point of dilution, a simple and conservative risk-based model has been developed for use on projects within the A9 Dualling Programme that generally follows the approach taken by the HAWRAT method.
- 2.3.2 Research has not identified an applicable methodology for the assessment of salt impacts from other reference sources, or specifically the concentration of chloride ions on the water environment. It is known that chloride and the presence of salt ions (as measured by conductivity) have a negative impact on freshwater pearl mussels and fish species in the water environment. There is literature available on the application of salt for safety purposes and for the management of salt application to reduce environmental impacts (UK Roads Liaison Group, 2013<sup>i</sup>).

- 2.3.3 The application of salt on road infrastructure is a winter activity (typically October to April) intended to prevent icing and avoid excessive build-up of snow and to promote the melting of snow. It is a widespread and existing practice that is unlikely to change significantly as a direct result of the A9 dualling programme, however the dualling of the A9 will create a larger surface area to which salt is applied and new drainage systems will alter the current pathways for salt to enter the water environment.
- 2.3.4 In the absence of an existing method for assessing salt concentrations in road runoff and at the point of dilution, a simple and conservative risk-based model has been developed that follows the principles of the approach taken by the HAWRAT routine runoff method. The method uses UK Roads Liaison Group (2013) guidance on the maximum application rate of road salt, combined with information of the ratio of road salt to brine in pre-wetted salt application; enabling an estimation of the mass (kg) of salt applied per square metre of road and subsequently per section of road draining to each discharge outlet. The method assumes that the road salt applied is essentially NaCl rather than any alternative chloride based salt compounds or other additives.
- 2.3.5 The mass of road salt (kg) is then adjusted to estimate the mass (kg) of specific NaCl applied, given a 23% concentration of salt within the brine and a 90% concentration of salt within the rock salt. A number of conservative assumptions have then been made; that the entire mass of NaCl is dissolved in the first 5mm of subsequent rainfall / snow melt and that the entirety of this solution will be discharged from the drainage outlet. This concentrated 'first flush' solution has been assumed to be discharged at the greenfield runoff rate, as per the design standard for the proposed road drainage networks. The result is an estimated concentration of NaCl in road runoff in kg/m<sup>3</sup>, which can be converted to milligrams per litre (mg/l).
- 2.3.6 The second stage of the assessment considers the dilution available within the receiving watercourse, due to the anticipated winter conditions at the time of application, this is calculated based on the estimated mean flow in each watercourse. No allowance for background watercourse salt concentrations is currently included in the assessment. The subsequent concentration of Cl<sup>-</sup> in the receiving watercourse is calculated from the outflow concentrations of NaCl (atomic weight of 58.44 g/mol) based on the ratio of relative atomic weights of Na (atomic weight of 22.98 g/mol) and Cl<sup>-</sup> (atomic weight of 35.45 g/mol) of 39:61.
- 2.3.7 There is no UK short-term EQS for CI<sup>-</sup> that can be used to assess the impact of the estimated outflow concentrations. For the purposes of this assessment, resultant CI<sup>-</sup> concentrations have been compared against the Canadian Council of Ministers of the Environment (2011)<sup>ii</sup> short-term exposure guideline value of 640 mg/l. The Canadian guidance is based on chloride toxicity tests which included a mussel species with similar biology / ecology to the freshwater pearl mussel native to the UK. Freshwater mussels are noted in the Canadian guidance document as being the most sensitive taxonomic group to chloride.
- 2.3.8 Generic input parameters used within the salt assessments are provided in Table 2.3 below.

Parameter	Value Used	Source
Max application of salt per m <sup>2</sup>	40 g/m <sup>2</sup>	UK Roads Liaison Group (2013)
Rainfall depth	5 mm	Value adopted relates to the first flush rainfall depths used in the 'The SuDS Manual' (CIRIA, 2015).

#### Table 2.3: Generic Salt Assessment Input Parameters

Parameter	Value Used	Source
Ratio of dry salt to brine	70:30	UK Roads Liaison Group (2013)
Runoff coefficient	1	As used in HAWRAT
Canadian Water Quality Guideline for short-term exposure to Chloride	640 mgCl <sup>-</sup> /l	Canadian Council of Ministers to the Environment (2011)

2.3.9 It should be noted that the results of the salt assessment have not been included within the overall impact assessment for the proposed scheme, due to there being no defined UK short-term EQS for Cl<sup>-</sup>, an absence of any methodology for assessing the impacts of salt within the DMRB guidance and lack of published data on SuDS treatment efficiency of Cl<sup>-</sup>.

#### Limitations

- With regards to the routine runoff assessment, use of HAWRAT presents several limitations:
  - A rainfall site must be selected from an embedded list of 21 sites across the UK, with only three located in Scotland. The closest and most geographically similar rainfall site is Ardtalnaig (near Aberfeldy). The annual average rainfall at Ardtalnaig is reported as being 1402 mm while the annual average rainfall within the study area is approximately 977 mm. There is therefore potential for overestimation of flows within the receiving watercourses and from the road drainage networks, but this is considered the best available alternative and a conservative approach in terms of impact.
  - HAWRAT uses two-way Annual Average Daily (24 hour) Traffic (AADT24) volumes in the estimation of pollutant build-up on the road, where AADT data is entered in broad bands of 10,000 to 50,000, 50,000 to 100,000, and >100,000. Again this is a conservative approach given that the volumes of traffic estimated for the Proposed Scheme (16,000-18,000 AADT) are at the lower end of the lowest traffic band and it is likely that there is overestimation of the pollutant concentrations in the road runoff.
  - The required treatment percentages returned by HAWRAT are very precise, which is a conservative approach, however the guidance on the treatment efficiency of SuDS provided in HD 33/16 can only be used as broad indicator of performance. With the above in mind a degree of pragmatism is required when designing and assessing the road drainage system; the treatment train should be sufficient to reasonably treat runoff.
  - A runoff coefficient of 1 is potentially very conservative even for paved road as this assumes that 100% of rainfall (above 5mm events) turns into runoff.

## 3. Results

### 3.1 Method A Routine Runoff Assessment

3.1.1 The Proposed Scheme involves a total of 26 surface water discharges associated with mainline drainage.

- 3.1.2 Four cumulative assessments have been carried out for outfalls: S4 and S5; S7 and S7A; N4 and N5; and N7, N8, N9, N10 and N11, as required for outfalls located within 1km of each other, on the same watercourse reach.
- 3.1.3 The results for each drainage network are summarised in Table 3.1. Highways Agency Water Risk Assessment Tool (HAWRAT) datasheets are provided in Annex A.1.

#### Table 3.1: Summary of Method A Routine Runoff Assessment Results

Mainline Drainage Network ID	Proposed SuDS Treatment	Treatment Efficiencies (% removal)			HAWR	AT Asses	ssment			EQS Ass	EQS Assessment			
	Train							m/s)	X	Annual Average Dissolved Copper		Annual Average Dissolved Zinc		
			Soluble Copper	Soluble Zinc	Sediment	Soluble Copper	Soluble Zinc	Sediment	-ow Flow Vel. (m/s)	Deposition Index	Value (μg/l)	Pass / Fail	Value (μg/l)	Pass / Fail
S1	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	Pass	0.086	4	0.01	Pass	0.02	Pass	
S2	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	Pass	0.017	-	0.07	Pass	0.17	Pass	
S3	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	Pass	0.004	-	0.13	Pass	0.32	Pass	
S4	Filter Drains & Wet/Retention Ponds	55	65	83	Pass	Pass	Pass	0.035	-	0.04	Pass	0.10	Pass	
S5	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	Pass	0.035	-	0.04	Pass	0.10	Pass	
S4/S5	Wet/Retention Ponds &	40	53	72	Pass	Pass	Pass	0.035	-	0.09	Pass	0.22	Pass	
S7	Filter Drains & Wet/Retention Ponds	55	65	83	Pass	Pass	-	0.002	54	0.44	Pass	1.05	Pass	

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Mainline Drainage Network ID	Proposed SuDS Treatment	Treatment Efficiencies (% removal)			HAWR	AT Asses	ssment			EQS Ass	EQS Assessment			
	Train							n/s)	Xi	Annual A Dissolve	verage d Copper	Annual Average Dissolved Zinc		
		Soluble Copper	Soluble Zinc	Sediment	Soluble Copper	Soluble Zinc	Sediment	-ow Flow Vel. (m/s)	Deposition Index	Value (μg/l)	Pass / Fail	Value (μg/l)	Pass / Fail	
S7A	Filter Drains & Dry/Detention Ponds	0	45	70	Pass	Pass	-	0.002	-	0.26	Pass	0.44	Pass	
S7/S7A	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	-	0.002	207	0.61	Pass	1.46	Pass	
S8	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	Pass	0.002	-	0.29	Pass	0.68	Pass	
S9	Filter Drains & Wet/Retention Ponds	40	53	72	Pass	Pass	Pass	0.003	-	0.10	Pass	0.25	Pass	
C1	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.001	-	0.24	Pass	0.58	Pass	
C3	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.003	-	0.18	Pass	0.44	Pass	
C5B	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.003	-	0.12	Pass	0.28	Pass	

Mainline Drainage Network ID	Proposed SuDS Treatment	Treatment Efficiencies (% removal)			HAWR	AT Asses	ssment			EQS Ass	EQS Assessment			
	Train							m/s)	X	Annual A Dissolve	Average d Copper	Annual Average Dissolved Zinc		
		Soluble Copper	Soluble Zinc	Sediment	Soluble Copper	Soluble Zinc	Sediment	Low Flow Vel. (m/s)	Deposition Index	Value (µg/l)	Pass / Fail	Value (μg/l)	Pass / Fail	
C11	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.004	-	0.24	Pass	0.58	Pass	
C12	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.007	-	0.14	Pass	0.33	Pass	
C13	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.002	21	0.22	Pass	0.53	Pass	
C14	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.002	-	0.56	Pass	1.35	Pass	
N1	Filter Drains & Wet/Retention Pond	0	45	70	Pass	Pass	Pass	0.889	1	0.00	Pass	0.00	Pass	
N2	Filter Drains & Wet/Retention Pond	0	45	70	Pass	Pass	Pass	0.045	-	0.06	Pass	0.10	Pass	
N4	Filter Drains & Wet/Retention Pond	0	45	70	Pass	Pass	Pass	0.017	-	0.06	Pass	0.11	Pass	

Mainline Drainage Network ID	Proposed SuDS Treatment	Treatment Efficiencies (% removal)			HAWR	AT Asses	ssment			EQS Ass	EQS Assessment			
	Train							m/s)	X	Annual A Dissolve	verage d Copper	Annual A Dissolved		
		Soluble Copper	Soluble Zinc	Sediment	Soluble Copper	Soluble Zinc	Sediment	-ow Flow Vel. (m/s)	Deposition Index	Value (μg/l)	Pass / Fail	Value (μg/l)	Pass / Fail	
N5	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.016	-	0.15	Pass	0.36	Pass	
N4/N5	Dry/Detention Ponds &	0	45	70	Pass	Pass	-	0.017	-	0.29	Pass	0.48	Pass	
N7	Filter Drains & Wet/Retention Pond	0	45	70	Pass	Pass	Pass	0.012	-	0.07	Pass	0.12	Pass	
N8	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.005	-	0.14	Pass	0.33	Pass	
N9	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.004	-	0.07	Pass	0.17	Pass	
N10	Filter Drains & Wet/Retention Pond	40	53	72	Pass	Pass	Pass	0.004	-	0.08	Pass	0.19	Pass	
N11	Swales/Grasse d Channels & Filter Drains	50	50	80	Pass	Pass	Pass	0.003	-	0.18	Pass	0.53	Pass	
N12	Filter Drains & Swales/Grasse d Channels	50	59	76	Pass	Pass	Pass	0.04	31	0.04	Pass	0.11	Pass	

Mainline Drainage Network ID	Proposed SuDS Treatment	Treatment Efficiencies (% removal)			HAWRAT Assessment				EQS Assessment				
	Train	5			<b>.</b>			(s/m)	Xe	Annual Average Dissolved Copper		Annual Average Dissolved Zinc	
		Soluble Copper	Soluble Zinc	Sediment	Soluble Copper Soluble Zinc Sediment Low Flow Vel. (m/s) Deposition Index	Deposition Inde	Value (µg/l)	Pass / Fail	Value (μg/l)	Pass / Fail			
N7/N8/N9/N10/N1 1	Dry/Detention Ponds &	0	45	70	Pass	Pass	-	0.012	-	0.31	Pass	0.52	Pass
N12	Filter Drains & Swales/Grasse d Channels	50	59	76	Pass	Pass	Pass	0.005	8	0.04	Pass	0.11	Pass

- 3.1.4 Each impact is assessed using the methods outlined in Section 11.2. The potential impacts are assessed with embedded design mitigation, but without additional environmental mitigation and therefore a precautionary approach has been adopted.
- 3.1.5 Silt and sediment laden site runoff generated during construction activities, such as soil stripping and earthworks can have a detrimental impact if allowed to enter watercourses untreated. Fine sediments can increase water turbidity and smother stream beds, affecting water quality and causing harm to fish, aquatic invertebrates and plants by interfering with feeding, respiration and spawning. The effects of sediment release can extend considerable distances downstream.

### 3.2 Method D Accidental Spillage Assessment

- 3.2.1 The DMRB Method D Accidental Spillage Assessment results are presented in full in Annex A, Section A.2, and are summarised in Table 3.2 below.
- 3.2.2 All mainline drainage networks pass accidental spillage assessments to the higher standard of at least a 1 in 200 year return period (where sensitive receptors are identified within 1 km downstream). The minimum return period for a single drainage network has been calculated as 1 in 1,720 years (S4). These calculations have been carried out assuming no mitigation is in place. If the SuDS proposed for the treatment of routine runoff are taken into account the accidental spillage risks will fall further.

Table 3.2: Summar	y Method D Accidenta	I Spillage Assessment Results
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Mainline Drainage Network ID	Return Period Probability 1 in 'X' (Years)	Pass / Fail
S1	13,238	Pass
S2	5,642	Pass
S3	12,707	Pass
S4	1,690	Pass
S5	4,583	Pass
S4/S5	1,234	Pass
S7	3,191	Pass
S7A	15,005	Pass
S7/S7A	2,631	Pass
S8	7,667	Pass
S9	16,155	Pass
C1	10,369	Pass
C3	12,505	Pass
C5B	17,570	Pass
C11	6,527	Pass
C12	3,875	Pass
C13	15,056	Pass
C14	4,293	Pass
N1	9,413	Pass

Mainline Drainage Network ID	Return Period Probability 1 in 'X' (Years)	Pass / Fail
N2	5,626	Pass
N4	2,147	Pass
N5	2,327	Pass
N4/N5	1,116	Pass
N7	11,207	Pass
N8	4,737	Pass
N9	24,267	Pass
N10	18,340	Pass
N11	7,975	Pass
N7/N8/N9/N10/N11	1,917	Pass
N12	21,789	Pass

## 3.3 Road Salt Assessment

3.3.1 Using the method and generic parameters set out in Section 2.3 the concentration of chloride ions in the theoretical raw road runoff has been estimated to be 3411 mg/l. The in-river concentrations at each of the mainline road drainage outfalls is presented in Table 3.3. The assessment fails if the in river CI concentrations is calculated as over 640 mg/l.

#### Table 3.3: Road Salt Assessment Results

Mainline Drainage Network ID	Imperm. Area (Ha)	Greenfield Runoff Rate (I/s)	Receiving watercourse	Mean Flow (I/s)	In-river Cl <sup>-</sup> Conc. (mg/l)	Pass / Fail
S1	0.926	1.9	Allt an Fhearna	471	13	Pass
S2	2.176	4.4	Allt Chriochaidh	67	208	Pass
S3	0.946	1.9	Ballinluig Burn	18	324	Pass
S4	3.715	7.4	Allt-na- Criche (Lynwilg)	137	175	Pass
S5	2.492	5.0	Allt-na- Criche (Lynwilg)	137	120	Pass
S7	4.668	9.3	Loch Puladdern	12	1493	Fail

Mainline Drainage Network ID	Imperm. Area (Ha)	Greenfield Runoff Rate (I/s)	Receiving watercourse	Mean Flow (I/s)	In-river Cl <sup>-</sup> Conc. (mg/l)	Pass / Fail
S7A	0.685	1.4	Loch Puladdern	12	350	Pass
S8	1.365	2.7	Easter Aviemore Burn	7	957	Fail
S9	0.647	1.3	AnCG bifurcation south	34	125	Pass
C1	0.548	1.1	AnCG bifurcation north	37	98	Pass
С3	1.255	2.5	Allt na Criche (Granish)	53	154	Pass
C5B	0.814	1.6	Avie Lochan Burn South	21	245	Pass
C11	2.326	4.7	Allt Cnapach	19	671	Fail
C12	1.978	4.0	Feith Mhor	37	329	Pass
C13	0.938	1.9	Feith Mhor Trib 2	8	648	Fail
C14	3.416	6.8	Feith Mhor Drain 7	11	1307	Fail
N1	1.479	3.0	River Dulnain	4770	2	Pass
N2	2.879	5.8	Allt nan Ceatharnach	343	56	Pass
N4	1.262	2.5	Bogbain Burn	131	64	Pass
N5	5.29	10.6	Bogbain Burn	122	272	Pass
N7	1.031	2.1	Allt Slochd Mhuic	74	92	Pass

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Mainline Drainage Network ID	Imperm. Area (Ha)	Greenfield Runoff Rate (I/s)	Receiving watercourse	Mean Flow (I/s)	In-river CI <sup>-</sup> Conc. (mg/l)	Pass / Fail
N8	1.7	3.4	Allt Slochd Mhuic	44	245	Pass
N9	0.595	1.2	Allt Slochd Mhuic	37	106	Pass
N10	0.707	1.4	Allt Slochd Mhuic	35	132	Pass
N11	1.576	3.2	Allt Slochd Mhuic	27	357	Pass
N12	0.545	1.1	Allt Cosach	22	161	Pass

- 3.3.2 As can be seen in Table 3.3, five of the outfalls discharging to the following waterbodies Loch Puladdern, Easter Aviemore Burn, Allt Cnapach, Feith Mhor Trib 2 and Feith Mhor Drain 7 fail the road salt assessment. This is unsurprising given that, for four of these watercourses, a large proportion of the watercourse flow is attributed to the road drainage discharge itself. In these instances, it is likely that there will be a short term impact on the watercourse due to road salt. For the theoretical calculations reported above, the road salt will discharge over a period of 7 hours. However, it should be noted that this is assuming a single gritter run/application of road salt. Any additional gritter runs during the winter weather event would prolong the period of salt discharge.
- 3.3.3 With regard to the watercourses where failures are anticipated, these are generally small heavily modified drains with little or no biodiversity interest, with the exception of Loch Puladdern which is within the Craigellachie National Nature Reserve and SSSI. Furthermore, each discharges into a larger watercourse a short distance downstream of the outfalls, where the salt content is diluted to levels below the acute impact threshold used in this assessment. Therefore, it is unlikely there will be any significant impact on the aquatic ecology of the study area.

<sup>&</sup>lt;sup>i</sup> Roads Liaison Group (2013). Well-maintained Highways: Code of Practice for Highway Maintenance Management.

<sup>&</sup>lt;sup>ii</sup> Canadian Council of Ministers of the Environment (2011). Canadian Water quality Guidelines for the Protection of Aquatic Life – Chloride.

# **Annex A. Calculation Datasheets**

## A.1 Method A Routine Runoff Assessment Datasheets

#### **Soluble Copper**

HIGHWAYS	ALGENCY HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
AGENCT		Solubl	e - Acute Impact				Sedime	nt - Chroni	c Impact		
	Annual Average Co		Copper	Zinc			Sedim	ent denosi	tion for this	site is judge	d ae:
	Step 2 0.01	0.03 ug/l	Pass	Pass	Alert. I	Protected Area.		ulating?	Yes		low Vel m/s
	Step 3 0.01	0.02 ug/l					Extens	sive?	No	4 Depo:	sition Index
Location Details		10000									
Road number		A9 D-S		HA Area / DBFO r	number						
Assessment type			sessment (single outfall)					•			
OS grid reference of assessm		Easting	285357					809186			
OS grid reference of outfall st	tructure (m)	Easting		1	Northing						
Outfall number		S1		List of outfalls cumulative asses							
Receiving watercourse		Allt an Fhearna									
EA receiving water Detailed F		Assessor and affil				AMJV					
Date of assessment 02/07/2018				Version of assess	ment			4			
Notes											
Step 1 Runoff Quality	AADT >10,000 and	<50,000 - Clin	matic region Colder	Wet -	Rai	nfall site	Ardtalnaig (S	SAAR 1343.9	mm)		
Step 2 River Impacts	Annual 95%ile river f	flow (m <sup>3</sup> /s)	0.086 (Enter 2	ero in Annual 95%i	ile river	flow box to as	sess Ster	o 1 runoff a	uality only)		
	Impermeable road ar	an drained (ha)		ble area draining to				, i ranon q	uanty enigy		
				ible area draining to	outiali	(na)	20			_	
	Base Flow Index (BF	i) 0.:	369 Is the d	ischarge in or withir	າ 1 km ເ	upstream of a p	protected	site for con	servation?		Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/									
For sediment impact only	Is there a downstrea	m structure, lake, por	nd or canal that reduces	the velocity within 1	00m of	the point of dis	scharge?		No	- D	
		d river width (m)	6				0			_	
	C Tier 2 Bed width		3 Mannin	d's n 0.07	D	Side slope (m	a/m) (	0.5	Long elo	pe (m/m)	0.0001
	O Hei Z Deu wiuti	1 (11)	- Wallin	ysn oor		Side slope (II	VIII) [		LUNY SIC	pe (mm)	0.0001
Step 3 Mitigation					Estir	nated effective	eness				
		Brief descrip	tion	Treatment for		enuation for	Settle	ement of		Predict Im	pact
				solubles (%)		es - restricted	sedim	ents (%)			1
Existing measures			0		Unlimite	d v D	0	D	Sho	w Detailed	Results
Proposed measures Fiter	Drains & Wet/Retention Por	nds	4	0	Unlimite	d <b>,</b> D	72			Exit To	
								1		2411 10	

HIGHWAYS	VAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY			e - Acute Impact			1	Sedimer	nt - Chroni	ic Impact	
	Annual Average Co		Copper	Zinc			Sadim	ent denosi	ition for this site is	iudaed as:
	Step 2 0.12	0.36 ug/l	Pass	Pass	Alert.	Protected Area.		ulating?	No 0.43	Low flow Vel m/s
	Step 3 0.07	0.22 ug/l					Extens		No -	Deposition Index
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type			sessment (single outfall	)						•
OS grid reference of assess		Easting	285720				809495			
OS grid reference of outfall	structure (m)	Easting		Northing						
Outfall number		S2		List of outfal cumulative asse						
Receiving watercourse		Allt Chriochaidh								
EA receiving water Detailed River Network ID				Assessor and aff				AMJV		
Date of assessment 02/07/2018				Version of asses	sment			4		
Notes										
Step 1 Runoff Quality	Step 1         Runoff Quality         AADT         >10.000 and <50.000         Climatic region         Colder Wet         Rainfall site         Ardtalwaig (SAAR 1343 9mm)         Image: Colder Wet         Image: Colder Wet									
Step 2 River Impacts	Annual 95%ile river f	flow (m <sup>3</sup> /c)	0.017 (Enter				01			
		,,		zero in Annual 95%				o i runoti q	uality only)	
	Impermeable road a	rea drained (ha)	2.176 Perme	able area draining t	to outfall	l (ha) 3.55				
	Base Flow Index (BF	-I) 0.4	451 Is the	discharge in or with	in 1 km i	upstream of a pr	rotected	site for con	nservation?	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D							
For sediment impact only	Is there a downstrea	m structure, lake, por	nd or canal that reduce	s the velocity within	100m of	f the point of dis	charge?		No 👻	D
	C Tier 1 Estimate	d river width (m)	6							
	Tier 2 Bed width		2.25 Manni	ng's n 0.04		Side slope (m/	(m) (	.98857	Long slope (m/n	n) 0.041402
	W TICI Z DOU WIDU			ng s n		Side slope (III/			Long slope (mm	0.041402
Step 3 Mitigation					Estir	mated effectiver	ness			
		Brief descrip	tion	Treatment for	Atte	enuation for	Settle	ement of	Predi	ct Impact
				solubles (%)		es - restricted	sedim	ents (%)		
Eviating measures	discharge rate ( Vs ) Show Detailed Results						ailed Results			
Existing measures				0		• •	0	D		
Proposed measures Fite	r Drains & Wet/Retention Por	nds		40	Unlimite	ed 🔽 🗖	72		Ex	it Tool

HIGHWAY	YS Highways A	gency Water Risl	k Assessment Too	version 1.	November 200	9					
AGENCY	Annual Average Co Copper Step 2 0.21 Step 3 0.13	oncentration	le - Acute Impact Copper Pass	Zinc Pass	Alert.	Protected A	Sedim	ent deposi ulating?			
Location Details Road number		A9 D-S		HA Area / DBFO number							
Assessment type			sessment (single outfa	·							-
OS grid reference of asse	,	Easting	286883			Northing		810073			
OS grid reference of outfa	all structure (m)	Easting			of outfalls in	Northing					
Outfall number											
Receiving watercourse											
EA receiving water Detaile	ed River Network ID		Assessor and affiliation								
Date of assessment	e of assessment 02/07/2018							4			
Notes											
Step 1 Runoff Quality	AADT >10,000 and	<50,000 ▼ Cli	matic region Cok	der Wet	<u>▼</u> Ra	infall site	Ardtalnaig (	SAAR 1343.9	∂mm)		•
Step 2 River Impacts	Impermeable road a	rea drained (ha)	0.946 Perm	eable area d	ual 95%ile river raining to outfall	(ha)	0.938			Va	S 🕶
	Base Flow Index (BF	-1)		e discharge in	or within 1 km	upstream	or a protected	site for cor	nservation?	10:	· • •
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	•								
For sediment impact on	-	d river width (m)	6 0.17 Man		within 100m of	f the point	_	1.26969	No Long slop		029467
	. THE Z DEU WIULI		Wan			Side slop			Long slop		023401
Step 3 Mitigation		Drief deserin	tion	Treatmen		mated effe		err ont of		Predict Impa	act
		Brief descrip	non	Treatmen	(%) soluble discha	enuation fo es - restric rge rate (	ted sedim /s)	ement of ents (%)	Sho	w Detailed R	lesults
Existing measures				0	D Unli mite	d - [	D 0	D			
Proposed measures Fi	iter Drains & Wet/Retention Por	nds		40	Unlimite	d -	D 72			Exit Tool	

HIGHWAYS	HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY			e - Acute Impact			:	Sedimer	nt - Chroni	ic Impact	
	Annual Average Co		Copper	Zinc			Sedim	ent deposi	tion for this site	s judged as:
	Step 2 0.10	0.30 ug/l	Pass	Pass		Protected Area & S Structure.		ulating?	No 0.49	
	Step 3 0.04	0.13 ug/l			07.	s suucture.	Extens	sive?	No -	Deposition Index
Location Details		40.0.0		HA Area / DBFO						
Road number		A9 D-S	economi (cingle eutrall)	HA Area / DBFO	number					
Assessment type OS grid reference of assess	mont point (m)		essment (single outfall) 288338	,						
	· · · · · · · · · · · · · · · · · · ·		288338	Northing			810636			
OS grid reference of outfall s Outfall number	structure (m)	Easting S4		List of outfalls in						
			cumulative asse							
Receiving watercourse		Allt-na-Criche(Lynwil	g)							
EA receiving water Detailed				Assessor and affiliation				AMJV		
Date of assessment	Date of assessment 02/07/2018 Notes				sment			4		
Notes										
Step 1 Runoff Quality	Step 1 Runoff Quality AADT >10.000 and <50.000  Climatic region Colder Wet Rainfall site Ardtahaig (SAAR 13439mm)									
Step 1 Kunon Quanty	AADT >10,000 and	<50,000 Clin	natic region Colder	r Wet 💌	Rai	infall site Ar	rotainaig (a	5AAK 1343.9	mm)	<u> </u>
Step 2 River Impacts	Annual 95%ile river f	flow (m <sup>3</sup> /s)	0.035 (Enter:	zero in Annual 95%	ilo rivor	flow box to ass	acc Stor	1 runoff a	uality only)	
		(	``````````````````````````````````````					/ runon q	duity only)	
	Impermeable road a	rea drained (na)	S.7 15 Permea	able area draining	to outfall	(na) 4.47	0			
	Base Flow Index (BF	0.4	11 Is the d	lischarge in or with	in 1 km u	upstream of a pr	otected	site for con	servation?	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	▼ D							
For sediment impact only	Is there a downstrea	m structure. lake. pon	d or canal that reduces	the velocity within	100m of	the point of disc	charge?		Yes	-
,		d river width (m)	6	,			3			-
	Tier 2 Bed width		2.68 Mannin	id's n 0.04		Side slope (m/	(m) [(	0.411708	Long slope (m	/m) 0.029392
	• Her Z Bed widtr	n (m)	2.00 Mannin	igsn 0.04		Side slope (m/	m) <u></u>	.411700	Long slope (m	(m) 0.029392
Step 3 Mitigation					Estir	nated effectiver	ness			
		Brief descript	ion	Treatment for	Atte	enuation for	Settle	ement of	Pre	dict Impact
				solubles (%)		es - restricted	sedim	ents (%)		
Existing measures					Unlimite	rge rate ( 1/s )	0	_	Show D	etailed Results
						•	-	D		
Proposed measures Fiter	r Drains, Wet/Retention Pond	Is & Swales/Grassed Chan	nels	55	Unlimite	d - D	83		E	xit Tool

HIGHWAY	Highways A	gency Water Risk	Assessment Too	version 1.0 Nove	ember 200	9					
AGENCY	Annual Average Co Copper Step 2 0.07 Step 3 -	oncentration	e - Acute Impact Copper Pass	Zinc Pass		Protected Area & S Structure.	Sedim	ulating?	tion for this	0.37 L	<b>dged as:</b> ow flow Vel m/s Deposition Index
Location Details	Step 5	A9 D-S		HA Area / DBEO				sive:			eposition index
Assessment type			essment (single outfa		number						
OS grid reference of assess	ment point (m)	Easting	288351	")		Northing		810631			•
OS grid reference of outfall		Easting	200331	Northing							
Outfall number	Structure (III)	S5		List of outfalls in						-	
Receiving watercourse		Allt-na-Criche(Lynwi	a)	cumulative assessment							
EA receiving water Detailed	River Network ID	37	Assessor and af	filiation			AMJV				
Date of assessment					sment			4			
Notes											
Step 1 Runoff Quality	AADT >10,000 and	I <50,000 ▼ Clir	natic region Cold	er Wet 👻	Rai	infall site	Ardtalnaig (	SAAR 1343.9	mm)		•
Step 2 River Impacts	Annual 95%ile river	flow (m <sup>3</sup> /s)	0.035 (Ente	r zero in Annual 95%	6ile river	flow box to as	sess Step	o 1 runoff q	uality only)		
	Impermeable road a	rea drained (ha)	2.492 Perm	eable area draining	to outfall	(ha) 1.4	89				
	Base Flow Index (BR	-I) 0.4	Is the	discharge in or with	nin 1 km i	upstream of a p	protected	site for con	servation?		Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D								
For sediment impact only	Is there a downstrea	im structure, lake, por	nd or canal that reduce	s the velocity within	100m of	f the point of di	scharge?		Yes	•	_
	C Tier 1 Estimate	d river width (m)	6								
	Tier 2 Bed widt	h (m)	6.11 Mann	ing's n 0.04		Side slope (n	1/m) [	0.9379935	Long slo	pe (m/m)	0.031568
Step 3 Mitigation			[		Estir	mated effective	eness			Dana di a t	Impact
		Brief descrip	tion	Treatment for		enuation for		ement of		Fredict	impact
				solubles (%)	discha	es - restricted rge rate ( l/s )		ents (%)	Sho	w Detai	led Results
Existing measures				0	Unlimite	- D	0	D			
Proposed measures				0	Unlimite	d 🗕 🗖	0	D		Exit	Tool

HIGHWAYS Highway	s Agency Water Risk Assessment T	ool version 1.0 November 2009	
Annual Averag	e concentration pper Zinc 26 0.80 ug/l ug/l Pass	Zinc Pass	
Location Details			
Road number	A9 D-S	HA Area / DBFO number	
Assessment type	Non-cumulative assessment (single ou		-
OS grid reference of assessment point (m)	Easting 289101	Northing	812069
OS grid reference of outfall structure (m)	Easting	Northing	
Outfall number	S7A	List of outfalls in cumulative assessment	
Receiving watercourse	Loch Pulladern	cumulative assessment	
EA receiving water Detailed River Network ID		Assessor and affiliation	AMJV
Date of assessment	03/07/2018	Version of assessment	4
Notes			
Step 1 Runoff Quality AADT >10,00	and <50,000  Climatic region	Colder Wet Rainfall site	Ardtalnaig (SAAR 1343.9mm)
Step 2 River Impacts Annual 95%ile ri Impermeable ro Base Flow Index	ad area drained (ha)	nter zero in Annual 95%ile river flow box rmeable area draining to outfall (ha) the discharge in or within 1 km upstream d	0.406
For dissolved zinc only Water hardness	Low= <50mg CaC 03/I		
Step 3 Mitigation		Estimated effe	ctiveness Predict Impact
	Brief description	Treatment for solubles (%) solubles - restric discharge rate (	r Settlement of ted sediments (%)
Existing measures		0 Unlimited	
Proposed measures Filter Drains & Dry/Detentio	Ponds	0 Unlimited V	70   Exit Tool

	vays Agency Water Risk	Assessment Tool	version 1.0 November 200	10					
AGENCY		e - Acute Impact Copper Pass	Zinc						
Location Details									
Road number	A9 D-S		HA Area / DBFO number						
Assessment type		essment (single outfall)				-			
OS grid reference of assessment point (m)		289080			812185				
OS grid reference of outfall structure (m)	Easting		_	Northing					
Outfall number	S7		List of outfalls in cumulative assessment						
Receiving watercourse	Loch Pulladern		cumulative assessment						
EA receiving water Detailed River Network	ID		Assessor and affiliation		AMJV				
Date of assessment	03/07/2018		Version of assessment		4				
Notes									
Step 1 Runoff Quality       AADT       >10,000 and <50,000       Climatic region       Coder Wet       Rainfall site       Ardtainaig (SAAR 1343.9mm)         Step 2 River Impacts       Annual 95%lie river flow (m <sup>3</sup> /s)       0.002       (Enter zero in Annual 95%lie river flow box to assess Step 1 runoff quality only)         Impermeable road area drained (ha)       3.945       Permeable area draining to outfall (ha)       2.531         Base Flow Index (BFI)       0.252       Is the discharge in or within 1 km upstream of a protected site for conservation?       Yes         For dissolved zinc only       Water hardness       Low= <50mg Cac O3d       D									
Step 3 Mitigation           Existing measures	Brief descrip		Treatment for solubles (%) Soluble discha	es - restricted sedim rge rate (Vs)	ement of ents (%)	Predict Impact			
Proposed measures Filter Drains, Wet/Rete	ntion Ponds & Swales/Grassed Char	inels	55 Unlimite	ed 🔽 🖻 83		Exit Tool			

HIGH WAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009								
AGENCI		Solub	ole - Acute Impact			Sedime	nt - Chronic	Impact
	Annual Average Co		Copper	Zinc		Sedin	nent denositi	on for this site is judged as:
	Step 2 0.48	1.46 ug/l	Pass	Pass	Alert.			No 0.26 Low flow Vel m/s
	Step 3 0.29	0.87 ug/l				Exten	sive?	No - Deposition Index
Location Details								
Road number		A9 D-S		HA Area / DBFO	number			
Assessment type			sessment (single outfal	Ŋ				-
OS grid reference of assessr		Easting	289403				814149	
OS grid reference of outfall s	tructure (m)	Easting		Northing				
Outfall number		S8		List of outfal				
Receiving watercourse		Easter Aviemore Burn cumulative assessment						
Assessor and affiliation AMJV								
Date of assessment		03/07/2018		Version of asses	sment		4	
Notes								
Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Colder Wet         Rainfall site         Ardtainaig (SAAR 1343.9mm)								
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.002 (Ente	r zero in Annual 95%	6ile river	flow box to assess Ste	p 1 runoff qua	ality only)
	Impermeable road a	rea drained (ha)	1.365 Perm	eable area draining	to outfall	l (ha) 1.015		
	Base Flow Index (BF	· · /		0		upstream of a protected	aita far aana	ervation?
	Dase Flow Index (Dr	") <u></u>	is the	discharge in or with	in 1 km	upstream of a protected	site for cons	
For dissolved zinc only	Water hardness	Low= <50mg C aC O 3/I	▼ D					
For sediment impact only	Is there a downstrea	m structure, lake, po	ond or canal that reduce	s the velocity within	100m of	f the point of discharge?		Yes 🔻
	C Tier 1 Estimate	d river width (m)	5					
	Tier 2 Bed widtl	h (m)	1.22 Mann	ing's n 0.035		Side slope (m/m)	1.164	Long slope (m/m) 0.04263
				•				
Step 3 Mitigation			[		Estir	mated effectiveness		Predict Impact
		Brief descrip	ption	Treatment for			ement of	- reuter mpact
				solubles (%)		es - restricted sedim rge rate (Vs)	ents (%)	Show Datailad Bowlts
Existing measures				0	Unlimite		D	Show Detailed Results
Proposed measures Filter	Drains & Wet/Retention Por	nds		40	Unlimite			
								Exit Tool

	ALENCY Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
Annual	Solub Average Concentration	ole - Acute Impact	Zinc	Sedime	nt - Chronic Impact						
	Copper Zinc	Pass	Pass		nent deposition for this site is judged as:						
Step 2 Step 3	0.17 0.53 ug/l 0.10 0.32 ug/l	Pass	Pass	Pass Accun Exten	nulating? No 0.22 Low flow Vel m/s sive? No - Deposition Index						
Location Details											
Road number	A9 D-S		HA Area / DBFO number	r							
Assessment type		sessment (single outfall)	jle outfall)								
OS grid reference of assessment point (		289746	Northing 814646								
OS grid reference of outfall structure (m)				Northing							
Outfall number	S9		List of outfalls in cumulative assessment								
Receiving watercourse	Southern bifurcation	n Allt na Criche <mark>(</mark> Granish									
EA receiving water Detailed River Netwo	rk ID		Assessor and affiliation		AMJV						
Date of assessment	03/07/2018		Version of assessment		4						
Notes											
Step 1 Runoff Quality AADT	Step 1 Runoff Quality AADT >10,000 and <50,000 Climatic region Colder Wet Rainfall site Ardtainaig (SAAR 1343.9mm)										
Step 2 River Impacts Annual 95	%ile river flow (m3/s)	0.003 (Enter	zero in Annual 95%ile rive	flow box to assess Ste	p 1 runoff quality only)						
Impermea	ble road area drained (ha)	0.647 Perme	able area draining to outfal	l (ha) 0.502							
Base Flow	r Index (BFI)	.321 Is the d	discharge in or within 1 km	upstream of a protected	site for conservation?						
For dissolved zinc only Water har	dness Low= <50mgCaCO3/	• D									
For sediment impact only Is there a	downstream structure, lake, po	ond or canal that reduces	the velocity within 100m o	f the point of discharge?	No 🔻 D						
⊂ Tier 1	Estimated river width (m)	5									
• Tier 2	Bed width (m)	1.67 Mannii	ng's n 0.048	Side slope (m/m)	0.31232 Long slope (m/m) 0.03826						
Step 3 Mitigation			Esti	mated effectiveness							
	Brief descri	ption			ement of Predict Impact						
				es - restricted sedim irge rate (Vs)	Show Detailed Results						
Existing measures		[	0 Unlimite	ed - D 0							
Proposed measures Filter Drains & Wet/R	Retention Ponds										

AGENCY HIGHWAYS	Highways A	gency Water Ris	k Assessment Tool	version 1.0 Nover	nber 200	9			
A	nnual Average Co Copper Step 2 0.41 Step 3 0.24	ncentration	e - Acute Impact Copper Pass	Zinc Pass	Alert.	D/S Structure. A	liment - Chron ediment depos ccumulating? xtensive?	nic Impact sition for this site is judged as: No 0.23 Low flow Vel m/s No - Deposition Index	
Location Details									
Road number		A9 D-S		HA Area / DBFO	number				
Assessment type			essment (single outfall)			Manufacture -			
OS grid reference of assessment p		Easting	289906			Northing	814997		
OS grid reference of outfall structur	re (m)	Easting				Northing			
Outfall number		C1		List of outfall cumulative asse					
Receiving watercourse		Northern bifurcation	Allt na Criche (Granish)	currulative asse	Someric				
EA receiving water Detailed River N	letwork ID			Assessor and affi	liation		AMJV		
Date of assessment		03/07/2018		Version of assess	ment		4		
Notes									
Step 2 River Impacts Annu									
For dissolved zinc only Wate	er hardness	Low= <50 mg CaCO3/I	▼ D						
For sediment impact only Is the C Tie	er 1 Estimated	d river width (m)	of or canal that reduces to 5		100m of	the point of discha Side slope (m/m)	rge?	Yes            Long slope (m/m)         0.05807	
Step 3 Mitigation		Brief descrip	tion	Treatment for solubles (%)	Atte		s Settlement of ediments (%)	Predict Impact Show Detailed Results	
Existing measures			0		Unlimite		D	Show betaned Results	
Proposed measures Filter Drains &	& Wet/Retention Por	ds	4		Unlimite			Exit Tool	

HIGHWAYS Highways	Agency Water Ris	k Assessment Tool	version 1.0 Nove	mber 2009					
Annual Averag Coj Step 2 0.	e Concentration per Zinc	le - Acute Impact Copper	Zinc Pass		Sedim	ulating?	c Impact ion for this site No 0.2 No -		
Location Details									
Road number	A9 D-S		HA Area / DBFO	number					
Assessment type		sessment (single outfall	)					-	
OS grid reference of assessment point (m)		Easting 290152				815669			
OS grid reference of outfall structure (m)	Easting				Vorthing				
Outfall number	C3 List of outfalls in cumulative assessment								
Receiving watercourse	Allt na Criche (Gran	iish)							
EA receiving water Detailed River Network ID			Assessor and aff	iliation		AMJV			
Date of assessment	essment 03/07/2018					4			
Notes	Notes								
Step 1 Runoff Quality AADT >10,000 and <50,000 • Climatic region Colder Wet • Rainfall site Ardtainaig (SAAR 1343.9mm)						·			
Step 2 River Impacts Annual 95%ile riv	er flow (m <sup>3</sup> /s)	0.003 (Enter	zero in Annual 95%	le river flo	ow box to assess Step	o 1 runoff qu	uality only)		
Impermeable roa	d area drained (ha)	1.255 Perme	able area draining t	o outfall (h	ha) 1.173				
Base Flow Index	(BFI)	.344 Is the	discharge in or with	in 1 km up	stream of a protected	site for con:	servation?	No 🗸 🗅	
For dissolved zinc only Water hardness	Low= <50mgCaCO3/I	▼ D							
For sediment impact only Is there a downs	ream structure, lake, po	nd or canal that reduces	s the velocity within	100m of th	ne point of discharge?		No	- D	
ाier 1 Estim	ated river width (m)	5							
• Tier 2 Bed v	idth (m)	0.89 Manni	ng's n 0.045	] s	Side slope (m/m)	2.08387	Long slope (r	n/m) 0.0124041	
Step 3 Mitigation				Estima	ated effectiveness		7		
	Brief descrip	otion	Treatment for	Atten	uation for Settle	ement of	Pre	dict Impact	
			solubles (%)	discharge	e rate (Vs)	ents (%)	Show D	etailed Results	
Existing measures			0	Unlimited	• 0	D			
Proposed measures Filter Drains & Wet/Retention	Ponds	ĺ	40	Unlimited	<b>•</b> D 72			Exit Tool	

AGENCY	HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
AGENCY			e - Acute Impact				Sedime	nt - Chronie	c Impact		
	Annual Average C		Copper	Zinc			Sedim	ent deposit	ion for this	cito is is	idead as:
	Step 2 0.20	0.59 ug/l	Pass	Pass	Alert.	D/S Structure.		ulating?	No		Low flow Vel m/s
	Step 3 0.12						Exten		No	-	Deposition Index
Location Details											
Road number		A9 D-S		HA Area / DBFO	number						
Assessment type			essment (single outfall)			1					-
OS grid reference of asse		Easting	290260		Northing 816360						
OS grid reference of outfa	II structure (m)	Easting				Northing				_	
Outfall number		C5B		List of outfalls in cumulative assessment							
Receiving watercourse		Avie Lochan Burn S	outh								
EA receiving water Detaile	d River Network ID			Assessor and aff	iliation			AMJV			
Date of assessment		05/07/2018		Version of assess	sment			4			
Notes								,			
Step 1 Runoff Quality	Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Colder Wet         Rainfall site         Ardtahaig (SAAR 1343 9mm)										
Step 2 River Impacts	Annual 95%ile river	flow (m <sup>3</sup> /s)	0.003 (Enter	zero in Annual 95%	ile river	flow box to as	ssess Step	o 1 runoff qu	ality only)		
	Impermeable road a	area drained (ha)	0.814 Perme	able area draining t	o outfall	(ha) 1.1	16				
	Base Flow Index (B										No 🗸 D
	Dase Flow Index (D	FI) 02	Is the c	discharge in or withi	IN 1 KM L	upstream or a	protected	site for cons	servation?		
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D								
For sediment impact on	y Is there a downstrea	am structure, lake, por	nd or canal that reduces	the velocity within	100m of	f the point of di	ischarge?		Yes	•	_
	C Tier 1 Estimate	ed river width (m)	5								
	Tier 2 Bed wid		2 Mannir	og's n 0.04		Side slope (r	n/m)	0.5162118	Long slo	pe (m/m)	0.063385
	Dou nu	ur (m)		igon		oldo olopo (i	,		Long bio		
Step 3 Mitigation			Γ		Estir	mated effectiv	eness			-	
		Brief descript	tion	Treatment for	Atte	enuation for	Settl	ement of		Predict	t Impact
				solubles (%)		es - restricted		ents (%)			
Existing measures				0	Unlimite	rge rate ( I/s )	0		Sho	w Deta	iled Results
-				D		•		D			
Proposed measures Fi	Iter Drains & Wet/Retention Po	onds		40	Unlimite	ed 🔽 🖸	72			Exif	Tool

HIGHWAYS	Highways A	gency Water Risk	Assessment Tool	version 1.0 Novemb	er 2009					
, , , , , , , , , , , , , , , , , , ,	Annual Average Co Copper Step 2 0.40 Step 3 0.24	ncentration	e - Acute Impact Copper Pass	Zinc Pass	Pass	Sedim	nulating?	ic Impact tion for this No No	0.19	<b>udged as:</b> Low flow Vel m/s Deposition Index
Location Details										
Road number		A9 D-S		HA Area / DBFO nu	mber					
Assessment type			essment (single outfall)							•
OS grid reference of assessment		Easting	291142		Northing		818469			
OS grid reference of outfall structu	ure (m)	Easting			Northing					
Outfall number		C11		List of outfalls in cumulative assessi						
Receiving watercourse		Allt Cnapach								
EA receiving water Detailed River				Assessor and affiliat			AMJV			
Date of assessment		03/07/2018		Version of assessme	ent		4			
Notes										
Step 1 Runoff Quality AAE	DT >10,000 and	<50,000 Clir	matic region Colder	Wet	Rainfall site	Ardtalnaig (S	SAAR 1343.9	nm)		•
Imp	nual 95%ile river f ermeable road ar se Flow Index (BF	ea drained (ha)	2.326 Permea	zero in Annual 95%ile able area draining to c ischarge in or within 1	outfall (ha)	535		,		No 🗸 D
For dissolved zinc only Wat	ter hardness	Low= <50mgCaCO3/I	• D							
ा		d river width (m)	d or canal that reduces           5           2.1         Mannin		Om of the point of di	_	0.42951	No Long slo	pe (m/m)	
Step 3 Mitigation		Brief descript	tion	Treatment for solubles (%) s	Estimated effective Attenuation for olubles - restricted	Settle	ement of ents (%)			t Impact
Existing measures			0		scharge rate (Vs)	0	D	Sho	w Deta	iled Results
Proposed measures Filter Drains	& Wet/Retention Pon	ds	4		nlimited -	72			Exit	t Tool

AIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
- Addition	Solubi	e - Acute Impact	71			Sedime	nt - Chroi	nic Impact	
Annual Average C		Copper	Zinc			Sedin	ent denos	ition for th	s site is judged as:
Step 2 0.23		Pass	Pass	Alert.	D/S Structure.		ulating?	No	0.30 Low flow Vel m/s
Step 3 0.14	0.42 ug/l					Exten	sive?	No	- Deposition Index
Location Details									
Road number	A9 D-S		HA Area / DBFO	number	-				
Assessment type		essment (single outfall)							•
OS grid reference of assessment point (m)	Easting	290827			Northing		820800		
OS grid reference of outfall structure (m)	Easting				Northing				
Outfall number	C12		List of outfal cumulative asse						
Receiving watercourse	Feith Mhor		cumulative asse	essment					
EA receiving water Detailed River Network ID			Assessor and aff	liation			AMJV		
Date of assessment	03/07/2018		Version of asses	sment			4		
Notes									
Step 1 Runoff Quality       AADT       >10,000 and <50,000       Climatic region       Colder Wet       Rainfall site       Ardtainaig (SAAR 1343.9mm)       •									
Step 2 River Impacts Annual 95%ile river	r flow (m <sup>3</sup> /s)	0.007 (Enter z	ero in Annual 95%	6ile river	flow box to a	ssess Ste	p 1 runoff (	quality only	)
Impermeable road	area drained (ha)	1.978 Permea	ble area draining t	to outfall	(ha) 2.	283			
			Ū.		.,				
Base Flow Index (E	SFI)	s the d	scharge in or with	IN 1 KM	upstream of a	protected	site for co	nservation	No 🗸 D
For dissolved zinc only Water hardness	Low= <50mg C aC 0 3/I	• D							
For sediment impact only Is there a downstre	am structure, lake, por	nd or canal that reduces	he velocity within	100m of	the point of d	ischarge?		Ye	s 🔻
○ Tier 1 Estimate	ed river width (m)	5							
Tier 2 Bed wide	ith (m)	0.18 Manning	g'sn 0.04		Side slope (r	m/m)	.22195	Long slo	ope (m/m) 0.005051
Step 3 Mitigation				Estir	mated effectiv	eness			
	Brief descrip	tion	Treatment for		enuation for		ement of		Predict Impact
	Bher deachp		solubles (%)	soluble	es - restricted	sedim	ents (%)		
					rge rate (Vs)			She	ow Detailed Results
Existing measures		0	D	Unlimite	ed 🗣 🕞	0	D		
Proposed measures Filter Drains & Wet/Retention P	onds	4	0	Unlimite	ed 🔽 🖸	72			Exit Tool

HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009											
AGENCY	Annual Average Co		e - Acute Impact Copper	Zinc			Sedime	nt - Chron	ic Impact		
	Copper	Zinc					Sedim	ent deposi	ition for th	is site is judge	ed as:
	Step 2 0.36	1.12 ug/l	Pass	Pass	Alert.	D/S Structure.		ulating?	Yes		flow Vel m/s
	Step 3 0.22	0.67 ug/l					Exten	sive?	No	21 Dept	osition Index
Location Details Road number		A9 D-S		HA Area / DBF	) number			1			
Assessment type			essment (single outfa		o namo er						
OS grid reference of ass	sessment point (m)	Easting	290661	,		Northing		820868			
OS arid reference of out		Easting				Northing					
Outfall number		C13		List of outfi	List of outfalls in			-			
Receiving watercourse		Feith Mhor Trib 2		cumulative assessment							
EA receiving water Deta	iled River Network ID	Assessor and affiliation AMJV									
Date of assessment	05/07/2018 Version of assessment 4										
Notes											
Step 1 Runoff Qual	Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Colder Wet         Rainfall site         Ardtainaig (SAAR 1343 9mm)										
Step 2 River Impact	ts Annual 95%ile river	flow (m³/s)	0.002 (Ente	er zero in Annual 95	%ile river	flow box to a	issess Ster	o 1 runoff c	uality only	')	
	Impermeable road a	rea drained (ha)	0.938 Perm	eable area draining	to outfall	(ha) 0	933				
	Base Flow Index (BF			e discharge in or wit			protected	site for cor	servation	2	No 🗸 🗇
For dissolved zinc only	y Water hardness	Low = <50mg CaCO3/	• D								
For sediment impact o	nly Is there a downstrea	m structure, lake, pon	d or canal that reduce	es the velocity within	n 100m of	the point of o	discharge?		Y	s v	
	○ Tier 1 Estimate	d river width (m)	5								
	Tier 2 Bed widt		1.5 Manr	ning's n 0.04		Side slope (	m/m)	0.5147679	Long sl	ope (m/m)	0.001295
					E						
Step 3 Mitigation		District		Traditional for		nated effectiv				Predict In	npact
		Brief descript	ION	Treatment for solubles (%)		enuation for es - restricted		ement of ents (%)			
					discha	rge rate ( Vs	)		Sh	ow Detaile	d Results
Existing measures				0 D	Unlimite	d - D	0	D			
Proposed measures	Filter Drains & Wet/Retention Pol										

AFIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
AGENCI			e - Acute Impact		Sedime	nt - Chronic Impa	act			
	Annual Average Co Copper		Copper	Zinc	Sedin	nent deposition for	r this site is judged as:			
	Step 2 0.94	2.87 ug/l	Pass	Pass		nulating? No	0.15 Low flow Vel m/s			
	Step 3 0.56	1.72 ug/l			Exten	sive? No	- Deposition Index			
Location Details										
Road number		A9 D-S		HA Area / DBFO numbe	r					
Assessment type			essment (single outfall)				-			
OS grid reference of assessmer		Easting	290591		Northing	821255				
OS grid reference of outfall struc		Easting			Northing					
Outfall number		C14		List of outfalls in cumulative assessmen						
Receiving watercourse		Feith Mhor Drain 7		culturative assessment						
EA receiving water Detailed Rive	er Network ID			Assessor and affiliation		AMJV				
Date of assessment		03/07/2018		Version of assessment		4				
Notes										
Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Coder Wet         Rainfall site         Ardtalnaig (SAAR 1343.9mm)         •										
Step 2 River Impacts A	nnual 95%ile river f	low (m <sup>3</sup> /s)	0.002 (Enter z	ero in Annual 95%ile rive	r flow box to assess Ste	p 1 runoff quality o	nlv)			
10	npermeable road ar	on drained (ba)		ble area draining to outfa						
	•			-	ii (iiu)					
B	ase Flow Index (BF	1) 0.5	34 Is the di	scharge in or within 1 km	upstream of a protected	site for conservati	ion?			
For dissolved zinc only W	/ater hardness	Low= <50 mg CaC 0 3/I	- D							
For sediment impact only Is	there a downstrear	m structure, lake, pon	d or canal that reduces t	he velocity within 100m c	f the point of discharge?	. [	No 🔻 D			
	Tier 1 Estimated	l river width (m)	5			L				
	Tier 2 Bed width	( )	0.85 Manning	n 0.07 D	Side slope (m/m)	4.088 Long	slope (m/m) 0.01851			
·	nei z Beu wiuli	r (iii)	wanning			Long				
Step 3 Mitigation				Est	imated effectiveness					
		Brief descript	ion			ement of	Predict Impact			
		2.10. acoupt		solubles (%) solub	es - restricted sedim	ients (%)				
Existing measures					arge rate (Vs)		Show Detailed Results			
				B	• •					
Proposed measures Filter Drai	ins & Wet/Retention Pon	ds	4	0 Unlimit	ed 🗸 🖸 72		Exit Tool			

AGENCY	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	9			
AGENCY	Annual Average Co Copper Step 2 0.00 Step 3 -	ncentration	e - Acute Impact Copper	Zinc Pass		Protected Area /S Structure.	nent - Chron diment depos cumulating? ensive?	sition for this site is ju	<b>idged as:</b> Low flow Vel m/s Deposition Index
Location Details									
Road number		A9 D-S		HA Area / DBFO	number				
Assessment type			essment (single outfall)						-
OS grid reference of assessment		Easting	289623			Northing	822513		
OS grid reference of outfall struc	ture (m)	Easting				Northing			
Outfall number		N1		List of outfal cumulative asse					
Receiving watercourse		River Dulnain							
EA receiving water Detailed Rive	r Network ID			Assessor and aff	iliation		AMJV		
Date of assessment		03/07/2018		Version of assess	sment		4		
Notes									
Step 1 Runoff Quality       AADT       >10,000 and <50,000									
Step 3 Mitigation           Existing measures           Proposed measures           Filter Drain	ns & D ry/Detention Pon	Brief descript		Treatment for solubles (%)	Atte soluble	es - restricted services services services services (Vs) s	ettlement of diments (%)	Show Detai	t Impact iled Results

	ys Agency Water Risl	k Assessment Tool	version 1.0 November	r 2009				
	Age Concentration Copper Zinc 0.06 0.17 ug/l - ug/l	pper Zinc 0.06 0.17 ug/l Pass Pass Ale			ent - Chronic Impact ment deposition for this site is j mulating? No 0.35 No -	<b>udged as:</b> Low flow Vel m/s Deposition Index		
Location Details								
Road number	A9 D-S		HA Area / DBFO num	nber				
Assessment type		sessment (single outfall)		Northing		-		
OS grid reference of assessment point (m)	Easting	289165		822798				
OS grid reference of outfall structure (m)	Easting		_	Northing				
Outfall number	N2		List of outfalls in cumulative assessm					
Receiving watercourse	Allt nan Ceatharnac							
EA receiving water Detailed River Network ID	etailed River Network ID Assessor and affiliation AMJV							
Date of assessment	03/07/2018 Version of assessment 4							
lotes								
Step 2 River Impacts Annual 95%ile	00 and <50,000 Cli river flow (m <sup>3</sup> /s) pad area drained (ha)			iver flow box to assess St	(SAAR 1343.9mm) ep 1 runoff quality only)	•		
Base Flow Ind		278 Is the d	ischarge in or within 1	km upstream of a protecte	d site for conservation?	Yes •		
⊂ Tier 1 Est	© Tier 1 Estimated river width (m) 18							
Step 3 Mitigation	Brief descrip	tion	Treatment for solubles (%) so dis		ments (%)	t Impact ailed Results		
Proposed measures Filter Drains & Dry/Detent	ins & DryDetention Ponds 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							

HIGHWAY	<b>S</b> Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	9				
AGENCY	Annual Average Co	ncentration	e - Acute Impact Copper	Zinc			nt - Chronic	Impact		
	Copper           Step 2         0.06           Step 3         -	0.20 ug/l - ug/l	Pass	Pass			nulating?	lo 0.32 Low flow Vel m/s		
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type			essment (single outfall)							
OS grid reference of asse		Easting	288290	Northing 824099						
OS grid reference of outfa	all structure (m)	Easting		_		Northing				
Outfall number		N4		List of outfal cumulative asse						
Receiving watercourse		Bogbain Burn		cumulative asse	essmeni					
EA receiving water Detaile	ed River Network ID			Assessor and aff	filiation		AMJV			
Date of assessment		03/07/2018		Version of asses	sment		4			
Notes	Notes									
Step 1 Runoff Quality	AADT >10,000 and	I<50,000 ▼ Cli	matic region Colde	r Wet 🔹	Rai	nfall site Ardtalnaig (	SAAR 1343.9mm	1)		
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.017 (Enter	zero in Annual 95%	6ile river	flow box to assess Ste	p 1 runoff qua	ality only)		
	Impermeable road a	rea drained (ha)	1.262 Perme	able area draining	to outfall	(ha) 1.791				
	Base Flow Index (BF	FI) 0.:	283 Is the	discharge in or with	in 1 km u	upstream of a protected	site for conse	ervation?		
For dissolved zinc only	Water hardness	Low= <50mg CaCO3/I	• D							
For sediment impact on	ly Is there a downstrea	m structure, lake, por	d or canal that reduces	the velocity within	100m of	the point of discharge?		No 🔻 D		
	Tier 1 Estimate	d river width (m)	18							
	Tier 2 Bed widt	h (m)	1.61 Manni	ng's n 0.045		Side slope (m/m)	2.049387	Long slope (m/m) 0.011224		
Step 3 Mitigation			Γ		Estir	mated effectiveness				
	Brief description				-		ement of	Predict Impact		
		Direi decemp		Treatment for solubles (%)	soluble dischar	rge rate ( Vs )	ients (%)	Show Detailed Results		
Existing measures			Ī	0	Unlimite	d - D 0	D			
Proposed measures Fi	Iter Drains & Dry/Detention Por	ds		0	Unlimite	d 🕶 🖸 70		Exit Tool		

HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
AGENCY	Annual Annual Co	Solub	le - Acute Impact	Zinc		Sedime	nt - Chron	ic Impact		
	Annual Average Co Copper		Copper	Zinc			nent deposi	tion for this site is judged as:		
	Step 2 0.25 Step 3 0.15	0.77 ug/l 0.46 ug/l	Pass	Pass	Alert.	D/S Structure. Accur Exten	No 0.30 Low flow Vel m/s No - Deposition Index			
Location Details	Step 5 0.15	0.46 ug/i				LXten	sive:	Deposition index		
Road number		A9 D-S		HA Area / DBFO	number	ſ				
Assessment type		Non-cumulative as	sessment (single outfa	0						
OS grid reference of assessm	nent point (m)	Easting	287839							
OS grid reference of outfall si	nce of outfall structure (m) Easting					Northing				
Outfall number		N5		List of outfal						
Receiving watercourse		Bogbain Burn		cumulative asse	essment					
EA receiving water Detailed F	River Network ID	Assessor and affiliation AMJV								
Date of assessment		03/07/2018 Version of assessment 4								
Notes	ites									
Step 1 Runoff Quality	AADT >10,000 and	<50,000 • CI	imatic region Colo	er Wet 💌	Rai	infall site Ardtalnaig	SAAR 1343.9r	mm) 🔽		
Step 2 River Impacts	Annual 95%ile river f	low (m <sup>3</sup> /s)	0.016 (Ente	r zero in Annual 95%	le river	flow box to assess Ste	o 1 runoff a	uality only)		
	Impermeable road a	rea drained (ha)		eable area draining t				,		
	·			0		r (na)				
	Base Flow Index (BF	-I) 0	.282 Is the	discharge in or with	in 1 km	upstream of a protected	site for con	nservation?		
For dissolved zinc only	Water hardness	Low= <50mg CaCO3/I	• D							
For sediment impact only	Is there a downstrea	m structure, lake, po	nd or canal that reduce	s the velocity within	100m of	f the point of discharge?		Yes 🔻		
	C Tier 1 Estimate	d river width (m)	18							
	Tier 2 Bed width	n (m)	2.2 Manr	ing's n 0.045		Side slope (m/m)	0.857272	Long slope (m/m) 0.014026		
Step 3 Mitigation					Estir	mated effectiveness				
		Brief descrip	ofion	Treatment for			ement of	Predict Impact		
		2.101 20001		solubles (%)	soluble	es - restricted sedin	ients (%)			
Eulatian management						rge rate (Vs)		Show Detailed Results		
Existing measures				0	Unlimite	• 0	D			
Proposed measures Filter	ains & WetRetention Ponds 40 Unlimited 72 Exit Tool									

HIGHWAYS Highways	Agency Water Risk	Assessment Tool	version 1.0 Novem	ber 2009					
Annual Average Copy	0.07 0.21 ug/l Pass Pass Pass Accumulating				ent deposit ulating?	c Impact ion for this site is No 0.24 No -	judged as: Low flow Vel m/s Deposition Index		
Location Details									
Road number	A9 D-S		HA Area / DBFO n	/ DBFO number					
Assessment type		essment (single outfall)							
OS grid reference of assessment point (m)	Easting	284364			.,	824103			
OS grid reference of outfall structure (m)	Easting		List of outfalls		Northing				
Outfall number	••••								
Receiving watercourse	Allt Slochd Mhuic		cumulative asses	SILICIA					
EA receiving water Detailed River Network ID	eiving water Detailed River Network ID					AMJV			
Date of assessment	of assessment 03/07/2018					4			
Notes									
Step 1 Runoff Quality AADT >10,000 and <50,000 Climatic region Coder Wet Rainfall site Ardtalraig (SAAR 1343.9mm)									
Step 2 River Impacts Annual 95% le rive Impermeable road Base Flow Index (	area drained (ha)	1.031 Perme	able area draining to	outfall (h	ow box to assess Step ha) 1.462 ostream of a protected		, ,,	No 🗸 D	
For dissolved zinc only Water hardness	Low= <50mgCaCO3/I	▼ D							
	ed river width (m)	d or canal that reduces	·			.864197	No 🔽	n) 0.001915	
Step 3 Mitigation	Brief descrip	tion	Treatment for		ated effectiveness uation for Settle	ement of	Predi	ct Impact	
Existing measures					e rate (Vs)	ents ( %)	Show De	tailed Results	
			D		•	D			
Proposed measures Filter Drains & Dry/Detention F	onds		0	Unlimited	▼ D 70		Ex	it Tool	

AGENCY	HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY	Annual Average Co		e - Acute Impact Copper	Zinc	Sedime	nt - Chronic Impact				
	Copper Step 2 0.24	Zinc	Pass	Pass		nent deposition for this site is judged as: nulating? No 0.26 Low flow Vel m/s				
	Step 3 0.14	0.71 ug/l 0.43 ug/l				isive? No - Deposition Index				
Location Details Road number		A9 D-S		HA Area / DBFO numbe						
			economia (cingle cutfell							
Assessment type OS grid reference of assessme	ent point (m)		essment (single outfall	)	Northing	•				
5		Easting	284212		Northing	824528				
OS grid reference of outfall str	ucture (m)	Easting			Northing					
Outfall number		N8		List of outfalls in cumulative assessment						
Receiving watercourse		Allt Slochd Mhuic		Cumulative assessment						
EA receiving water Detailed Riv	ver Network ID			Assessor and affiliation		AMJV				
Date of assessment		04/07/2018		Version of assessment		4				
Notes										
Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Colder Wet         Rainfall site         Ardtahaig (SAAR 1343.9mm)         •										
Step 2 River Impacts	Annual 95%ile river f	flow (m <sup>3</sup> /s)	0.005 (Enter	zero in Annual 95%ile rive	flow box to assess Ste	p 1 runoff quality only)				
	Impermeable road a	rea drained (ha)	1.7 Perme	able area draining to outfai	I (ha) 3.03					
	Base Flow Index (BF	-I) 0.2	215 Is the	discharge in or within 1 km	upstream of a protected	site for conservation?				
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D							
For sediment impact only	Is there a downstrea	m structure, lake, por	nd or canal that reduces	s the velocity within 100m o	f the point of discharge?	No V D				
	Tier 1 Estimated	d river width (m)	5							
6	Tier 2 Bed width	h (m)	1.59 Manni	ng's n 0.04	Side slope (m/m)	0.965714 Long slope (m/m) 0.019824				
Step 3 Mitigation			Γ	Est	mated effectiveness					
		Brief descript	tion			lement of Predict Impact				
					es - restricted sedin arge rate ( l/s )	nents (%)				
Existing measures				0 Unlimit		Show Detailed Results				
Proposed measures Filter Dr	rains & Wet/Retention Por	nds		40 Unlimit	ed 🗸 🖸 72	Exit Tool				

HIGHWAYS	Highways Ag	gency Water Risk	Assessment Tool	version 1.0 Novem	iber 2009	)				
	Annual Average Co	Soluble	e - Acute Impact Copper	Zinc		Sedime	nt - Chronie	c Impact		
	Copper		Copper	Zinc		Sedim	ent depositi	ion for this site is judged as:		
	Step 2 0.12 Step 3 0.07	0.36 ug/l 0.21 ug/l	Pass	Pass		Pass Accum Extens		No 0.23 Low flow Vel m/s No - Deposition Index		
Location Details	Step 5 0.07	0.21 ug/i				LAtens	ave:	Deposition index		
Road number		A9 D-S		HA Area / DBFO n	umber					
Assessment type		Non-cumulative asse	essment (single outfall)				-			
OS grid reference of assessment point (m) Easting 284069					Northing 824795					
OS grid reference of outfall struct	ture (m)	Easting		Northing						
Outfall number		N9 List of outfalls in								
Receiving watercourse		Allt Slochd Mhuic		cumulative asses	sment					
EA receiving water Detailed River	r Network ID			Assessor and affili	ation		AMJV			
Date of assessment		03/07/2018		Version of assessr	ment		4			
Notes										
Step 1 Runoff Quality AA	DT >10,000 and	<50,000 - Clin	natic region Colde	r Wet 🔹	Rain	nfall site Ardtalnaig (S	AAR 1343.9m	m) 🔹		
Step 2 River Impacts An	nual 95%ile river f	low (m <sup>3</sup> /s)	0.004 (Enter	zero in Annual 95%il	la rivar f	flow box to assess Ster	1 runoff qu	ality only)		
		. ,	· ·			· · · · · · · · · · · · · · · · · · ·	o i runon qu	anty only)		
Imj	permeable road ar	ea drained (ha)	Perme	able area draining to	outfall	(ha) 0.154				
Ва	se Flow Index (BF	I) 0.2	Is the o	lischarge in or within	1 km u	pstream of a protected	site for cons	ervation?		
For dissolved zinc only Wa	ater hardness	Low= <50mgCaCO3/I	• D							
For sediment impact only is t	there a downstrea	m structure, lake, pon	d or canal that reduces	the velocity within 10	00m of t	the point of discharge?		No 🔻 D		
ा <b>ा</b>	Fier 1 Estimated	river width (m)	18							
• 1	Fier 2 Bed width	n (m)	1.24 Mannir	ng's n 0.04		Side slope (m/m)	.8230769	Long slope (m/m) 0.013652		
Step 3 Mitigation			Γ		Estim	nated effectiveness				
		Brief descript	ion	Treatment for	Atter	nuation for Settle	ement of	Predict Impact		
						s - restricted sedim ge rate (Vs)	ents (%)			
Existing measures					Unlimited			Show Detailed Results		
		4-		D		72	D			
Proposed measures Filter Drain	s & WetRetention Ponds 40 Unimited v 🖸 72 Exit Tool									

AGENCY	HWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
	nual Average Co	Solub	le - Acute Impact	Zinc		Sedime	ent - Chror	nic Impact		
	Copper		Copper	ZIIIC		Sedir	nent depos	ition for this	site is iu	dged as:
SI	ep 2 0.14	0.41 ug/l	Pass	Pass	Alert.		mulating?	No		ow flow Vel m/s
SI	tep 3 0.08	0.25 ug/l				Exter	sive?	No	- [	eposition Index
Location Details										
Road number		A9 D-S		HA Area / DBFO	number	•				
Assessment type			sessment (single outfall)							-
OS grid reference of assessment po		Easting	283999			Northing	825014			
OS grid reference of outfall structure	e (m)	Easting				Northing				
Outfall number		N10		List of outfall cumulative asse						
Receiving watercourse		Allt Slochd Mhuic								
EA receiving water Detailed River Ne	etwork ID			Assessor and aff	liation		AMJV			
Date of assessment		03/07/2018		Version of assess	sment		4			
Notes										
Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Colder Wet         Rainfall site         Ardtainaig (SAAR 1343.9mm)         •										
Step 2 River Impacts Annua	al 95%ile river	flow (m <sup>3</sup> /s)	0.004 (Enter z	zero in Annual 95%	ile river	flow box to assess Ste	ep 1 runoff (	uality only)		
Imper	meable road a	rea drained (ha)	0.707 Permea	able area draining t	o outfall	(ha) 0.305		,		
		. ,		•						
Base	Flow Index (BF	=I) 0	207 Is the d	ischarge in or withi	n 1 km u	upstream of a protected	site for co	nservation?		No 🗸 D
For dissolved zinc only Water	hardness	Low= <50mg C aC O 3/I	▼ D							
For sediment impact only is the	re a downstrea	im structure, lake, po	nd or canal that reduces	the velocity within '	100m of	the point of discharge?	<b>,</b>	Yes	-	
ं Tier	1 Estimate	d river width (m)	18							
• Tier		. ,	1.45 Mannin	g's n 0.04		Side slope (m/m)	10	Long slo	pe (m/m)	0.014401
Step 3 Mitigation					Ectir	mated effectiveness				
Step 5 Mitigation		Brief descrip	tion	Treatment for			lement of		Predict	Impact
		brief descrip		solubles (%)			nents (%)			
						rge rate (∦s)	( )	Sho	w Detai	led Results
Existing measures			0	D	Unlimite	d - 0	D			
Proposed measures Filter Drains &	etRetention Ponds 40 Unimited 72 Exit Tool							Tool		

HIGHWAYS Highways	Agency Water Ris	k Assessment Tool	version 1.0 Nover	nber 200	9			
Annual Average Cop Step 2 0. Step 3 0.	Concentration per Zinc 15 1.06 ug/l	Ple - Acute Impact Copper	Zinc Pass	Sediment deposi				te is judged as: .24 Low flow Vel m/s - Deposition Index
Location Details								
Road number	A9 D-S		HA Area / DBFO	number				
Assessment type		sessment (single outfall)						-
OS grid reference of assessment point (m)	Easting	283725	Northing 825397					
OS grid reference of outfall structure (m)	Easting		Northing					
Outfall number								
Receiving watercourse	Allt Slochd Mhuic		cumulative asse	ssmeni				
EA receiving water Detailed River Network ID			Assessor and aff	liation		AMJV		
Date of assessment	Date of assessment 03/07/2018 Version of assessment 4							
Notes								
Step 1 Runoff Quality       AADT       >10,000 and <50,000								
• Tier 2 Bed v	idth (m)	1.83 Mannii	ng's n 0.04		Side slope (m/m)	0.4937313	Long slope	(m/m) 0.038734
Step 3 Mitigation	Brief descrip		Treatment for solubles (%)	Atte	es - restricted sedin ge rate (Vs)	lement of nents (%)		redict Impact Detailed Results
			D		•	D		
Proposed measures swales/grassed Channels	osed measures Swales/Grassed Channels 50 🔲 Unimited 🖌 🖸 80 <b>Exit Tool</b>							

HIGHWAY	S Highways A	gency Water Risk	Assessment Too	version 1.0 Nove	mber 200	9					
AGENCI	Annual Average Co	Soluble	e - Acute Impact	Zinc			Sedime	nt - Chron	ic Impact		
	Copper		Copper	Zinc			Sedim	ent deposi	tion for this	site is jud	lged as:
	Step 2 0.09	0.27 ug/l	Pass	Pass		Pass	Accun	nulating?	Yes		ow flow Vel m/s
	Step 3 0.04	0.13 ug/l					Exten	sive?	No	8 D	eposition Index
Location Details											
Road number		A9 D-S		HA Area / DBFO	number						
Assessment type			essment (single outfal	,						-	
OS grid reference of asses		Easting	282723			Northing		826218			
OS grid reference of outfa		Easting		_		Northing					
Outfall number		N12		List of outfal cumulative asse							
Receiving watercourse		Allt Cosach		cumulative asse	essment						
EA receiving water Detaile	d River Network ID			Assessor and aff	filiation			AMJV			
Date of assessment		03/07/2018		Version of asses	sment			4			
Notes											
Step 1 Runoff Quality	AADT >10,000 and	<50,000 - Clir	natic region C old	er Wet 🔹	Rai	nfall site	Ardtalnaig (S	SAAR 1343.9	mm)		•
Step 2 River Impacts	Annual 95%ile river f	low (m³/s)	0.005 (Ente	r zero in Annual 95%	6ile river	flow box to	assess Ste	p 1 runoff q	uality only)		
	Impermeable road a	rea drained (ha)	0.545 Perm	eable area draining	to outfall	(ha)	0.397				
				Ŭ							
	Base Flow Index (BF	0.2	Is the	discharge in or with	in 1 km u	upstream of	a protected	site for cor	servation?		No 🔹 D
For dissolved zinc only	Water hardness	Low= <50 mg C aC O 3/I	• D								
For sediment impact only	y Is there a downstrea	m structure, lake, pon	d or canal that reduce	s the velocity within	100m of	the point of	discharge?		No	•	
	Tier 1 Estimated	d river width (m)	1								- I
	ਾ Tier 2 Bed width	n (m)	1.83 Mann	ing's n 0.04		Side slope	e (m/m)	.4937313	Long slo	pe (m/m)	0.038734
			1								
Step 3 Mitigation						nated effect				Predict	Impact
		Brief descript	ion	Treatment for solubles (%)		enuation for es - restricte		ement of ents (%)			
				55145165 ( 70)		ge rate ( Vs		0,40 ( 70)	Sho	w Detail	ed Results
Existing measures				0	Unlimite	d - C	0	D	1		
Proposed measures Filt	ter Drains & Swales/Grassed C										

AGENCY										
AGENCY	Annual Average Co Copper Step 2 0.15 Step 3 0.09	ncentration	le - Acute Impact Copper	Zinc Sediment - C Pass Alert. Protected Area & D/S Structure. Sediment of Accumulati Extensive?			nent deposi nulating?	nic Impact ition for this site is No 0.37 No -	judged as: Low flow Vel m/s Deposition Index	
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type		Cumulative assess	ment including sedimer	ts (outfalls within 10	00m)				-	
OS grid reference of assessi	ment point (m)	Easting	288351			Northing	810631			
OS grid reference of outfall s	tructure (m)	Easting			Northing					
Outfall number		S4/S5					ĺ	S5		
Receiving watercourse		Allt-na-Criche (Lynw	na-Criche (Lynwilg) cumulative assessment							
EA receiving water Detailed	River Network ID			Assessor and af	filiation		AMJV			
Date of assessment		03/07/2018		Version of asses	sment		4			
Notes S5 is downstream outfall location.										
Step 1 Runoff Quality Step 2 River Impacts	Step 1 Runoff Quality       AADT       >10,000 and <50,000									
For dissolved zinc only	Water hardness	Low= <50mgCaCO3/I	- D							
For sediment impact only	ct only       Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?       Yes       Yes         C Tier 1       Estimated river width (m)       1									
Step 3 Mitigation		Brief descrip	tion	Treatment for solubles (%)	Atte		lement of nents (%)		ct Impact	
Existing measures			[	0	Unlimite	ed 🗸 🕞 0	D			
Proposed measures Filter	Drains & Wet/Retention Por	nds	40 Unimited 72 Exit Tool						it Tool	

HIGHWAYS Highways	HWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
Annual Average (	er Zinc 3.11 ug/l Pass	Zinc River Fails Toxicity Test. Try more mitigation								
Location Details										
Road number	A9 D-S	HA Area / DBFO number								
Assessment type	Cumulative assessment including sedime				•					
OS grid reference of assessment point (m)	Easting 289102			812069						
OS grid reference of outfall structure (m)	Easting		Northing							
Outfall number	S7/S7A	List of outfalls in cumulative assessment -	S7		S7A					
Receiving watercourse	Loch Pulladern	cumulative assessment								
EA receiving water Detailed River Network ID		Assessor and affiliation		AMJV						
Date of assessment	03/07/2018	Version of assessment		4						
Notes										
Step 1 Runoff Quality AADT >10,000 a	Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Coder Wet         Rainfall site         Ardtainaig (SAAR 1343.9mm)									
Step 2 River Impacts         Annual 95% lie rive           Impermeable road         Base Flow Index (6           For dissolved zinc only         Water hardness	area drained (ha)	r zero in Annual 95%ile river f eable area draining to outfall ( discharge in or within 1 km u	(ha) 2.9		Yes					
Step 3 Mitigation         Estimated effectiveness         Predict Impact           Brief description         Treatment for solubles (%)         Settlement of solubles (%)         Settlement of solubles (%)         Settlement of solubles (%)										
Existing measures		0 Unlimited	- 0	D						
Proposed measures Filter Drains & Wet/Retention P	onds	40 Unlimited	• 0 72		Exit Tool					

HIGHWAYS Hig	hways Agency W	ater Risk As	sessment Too	l version 1.0 Nove	ember 200	19				
		c م/ا	Acute Impact Copper Pass	Zinc Pass						<b>dged as:</b> ow flow Vel m/s eposition Index
Location Details										
Road number	A9 D-S			HA Area / DBFO						
Assessment type Cumulative assessment including sediments (outfalls within 100m)							-			
OS grid reference of assessment point (m) Easting 288290						Northing	824099			
OS grid reference of outfall structure (m						Northing				
Outfall number	N4/N5			List of outfa		N4			N5	
Receiving watercourse	Bogbain B	urn								
EA receiving water Detailed River Netwo	ork ID			Assessor and af	filiation		AMJV			
Date of assessment	03/07/201	8		Version of asses	sment		4			
Notes										
Step 1 Runoff Quality       AADT       >10,000 and <50,000										
For sediment impact only       Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?       No       Image: Constructure in the point of discharge?         • Tier 1       Estimated river width (m)       1       Image: Constructure in the point of discharge?       No       Image: Constructure in the point of discharge? <td< td=""></td<>										
Step 3 Mitigation	Bri	ef description		Treatment for solubles (%)	Atte soluble dischar	rge rate (Vs)	ement of ients (%)			Impact led Results
Existing measures				0	Unlimite	• 0	D			
Proposed measures Filter Drains & Dry/	ilter Drains & Dry/Detention Ponds 0 0 0 70 D Exit Tool									

HIGHWAY	S Highways A	gency Water	Risk Assessment	Tool	version 1.0 Nov	ember 200	9					
AGENCY	Annual Average Concentration Copper Zinc Step 2 0.31 0.94 ug/l Pass			t	Zinc Pass		Sediment - Chronic Impact Sediment deposition for this site is judged as: Accumulating? No 0.10 Low flow Vel m/s					•
	Step 3 0.17	0.52 ug/l						Exten	sive?	No	- De	position Index
Location Details												
Road number	A9 D-S			HA Area / DBFO number								
Assessment type		sessment including se	diments	· · · · · · · · · · · · · · · · · · ·				•				
OS grid reference of assessment point (m)		Easting 284364			Northing				824103			
OS grid reference of outfall structure (m)		Easting				Northing						
Outfall number		N7/N8/N9/N10/N11			List of outfa cumulative ass		N7				N8	
Receiving watercourse		Allt Slochd Mhuic			cumulative ass	essment	N9		N10		N11	
EA receiving water Detailed				Assessor and affiliation				AMJV				
Date of assessment	03/07/2018			Version of assessment				4				
Notes												
Step 1 Runoff Quality	AADT >10,000 and	<50,000 🗸	Climatic region	Colder	Wet	Rai	infall site	Ardtalnaig (S	GAAR 1343.9	mm)		•
Step 2 River Impacts         Annual 95%ile river flow (m³/s)         0.012         (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only)           Impermeable road area drained (ha)         5.609         Permeable area draining to outfall (ha)         5.59           Base Flow Index (BFI)         0.249         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 CaC 03/1												
For sediment impact only       Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?       No v D         • Tier 1       Estimated river width (m)       1         • Tier 2       Bed width (m)       6.11       Manning's n       0.04       Side slope (m/m)       0.9379993       Long slope (m/m)       0.031568												
Step 3 Mitigation Estimated effectiveness												
	Brief de	Brief description			Treatment for Attenuation for Se				tlement of Predict Impact			
	-							iments (%)				
							rge rate ( Vs	-		Show	v Detaile	ed Results
Existing measures				C	D	Unlimite	d 🗾 🗖	0	D			
Proposed measures Filter Drains & Dry/Detention Ponds 45 0 10 10 Exit								Exit T	ool			

## **Soluble Zinc**

HIGHW	AYS Highways A	gancy Water Piel	Assessment To	Version 1.0 Nove		0					
AGENCY	Highways A	<b>.</b> ,	e - Acute Impact	V version 1.0 Nove	ember 200	19	Sedimer	nt - Chroni	ic Impact		
	Annual Average Co	oncentration	Copper	Zinc							
	Step 2 0.01	r Zinc 0.03 ug/l	Pass	Pass	Alert	Protected Area.		ent deposi ulating?	Yes	is site is jud	dged as: ow flow Vel m/s
	Step 3 0.00	0.02 ug/l		1 033	Alert	riotected Area.	Extens	•	No		eposition Index
Location Details											
Road number		A9 D-S		HA Area / DBFC	) number						
Assessment type			sessment (single outfa	ll)							-
OS grid reference of as		Easting	285357			Northing		809186			
OS grid reference of ou	tfall structure (m)	Easting				Northing					
Outfall number		S1		List of outfa cumulative ass							
Receiving watercourse		Allt an Fhearna									
EA receiving water Detailed River Network ID Assessor and affiliation AMJV											
Date of assessment 02/07/2018 Version of assessment 4											
Notes											
Stop 4. Bunoff Oue	Step 1 Runoff Quality ADDT >10.000 and <50.000  Climatic region Colder Wet Rainfall site Ardtahaig (SAAR 1343.9mm)										
Step 1 Runoff Qua	IITY AADT >10,000 and	d <50,000 _ Cli	matic region Col	der Wet 👻	Ra	infall site	Ardtainaig (S	SAAR 1343.9	mm)		•
Step 2 River Impac	Annual 95%ile river	flow (m <sup>3</sup> /s)	0.086 (Ente	er zero in Annual 95%	Viloriu or	flow how to as	acco Stor	1 supoff a	uality only		
	, unidal co fono filo	. ,	(Line					o i runoii q	uality only	)	
	Impermeable road a	rea drained (ha)	0.926 Perm	eable area draining	to outfall	(ha) 1.2	28				
	Base Flow Index (BF	FI) 0.	369 Is the	e discharge in or with	nin 1 km	upstream of a p	protected	site for con	servation'	?	Yes -
For dissolved zinc on	ly Water hardness	Low = <50mg CaCO3/I	▼ D								
For sediment impact	only Is there a downstrea	am structure, lake, po	nd or canal that reduc	es the velocity within	100m of	f the point of dis	scharge?		N	•	D
	<ul> <li>Tier 1 Estimate</li> </ul>	d river width (m)	6	-			-				
	C Tier 2 Bed widt	h (m)	3 Manr	ning's n 0.07	D	Side slope (m	n/m) 🔽	.5	Long sl	ope (m/m)	0.0001
				5			, L			,	
Step 3 Mitigation					Estir	mated effective	eness			Bradiet	Impact
		Brief descrip	tion	Treatment for		enuation for		ement of		Predict	impact
	solubles (%)		es - restricted rge rate ( I/s )	sedim	ents (%)						
Existing measures	Existing measures 0				Unlimite		0	D	Sh	ow Detai	led Results
Proposed measures	Filter Drains & Wet/Retention Po	53	Unlimite		72		_				
Froposed measures	r iter prains & wetrketention Po	iluə		55	Chilmite	• <b>d</b> • D	12			Exit	Tool

AGENCY	HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY		Solubl	e - Acute Impact				Sedime	nt - Chroni	ic Impact	
	Annual Average Co		Copper	Zinc			Sedim	ent denosit	tion for this site is judged as:	
	Step 2 0.12	0.36 ug/l	Pass	Pass	Alert.	Protected Area.		ulating?	No 0.43 Low flow Vel m/s	
	Step 3 0.05	0.17 ug/l					Exten	sive?	No - Deposition Index	
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type			essment (single outfall	)		All officers			•	
OS grid reference of assessm		Easting	285720			Northing		809495		
OS grid reference of outfall st	ructure (m)	Easting				Northing				
Outfall number		S2		List of outfall cumulative asse						
Receiving watercourse		Allt Chriochaidh		cumulative asse	SSITICIL					
EA receiving water Detailed R	liver Network ID			Assessor and aff	iliation			AMJV		
Date of assessment		02/07/2018		Version of assess	sment			4		
Notes										
Step 1 Runoff Quality	AADT >10,000 and	<50,000 • Clir	matic region Colde	r Wet 💌	Rai	infall site	Ardtalnaig (	SAAR 1343.9	mm) 💌	
Step 2 River Impacts	Annual 95%ile river f	low (m <sup>3</sup> /s)	0.017 (Enter	zero in Annual 95%	ilo rivor	flow box to a	ecocc Stor	1 rupoff g	uality only)	
		, ,	(Litter				55	) i iunon q	uaity only)	
	Impermeable road a	rea drained (ha)	2.176 Perme	able area draining t	o outfall	(ha) 3.	55			
	Base Flow Index (BF	1) 0.4	451 Is the	discharge in or withi	n 1 km u	upstream of a	protected	site for con	servation? Yes -	
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	▼ D							
For sediment impact only	Is there a downstrea	m structure, lake, por	nd or canal that reduces	the velocity within	100m of	f the point of d	lischarge?		No 👻 D	
	C Tier 1 Estimated	d river width (m)	6							
	Tier 2 Bed width		2.25 Manni	ng's n 0.04		Side slope (	m/m)	.98857	Long slope (m/m) 0.041402	
Step 3 Mitigation						mated effectiv			Predict Impact	
		Brief descript	tion	Treatment for solubles (%)		enuation for es - restricted		ement of ents (%)	· · · · ·	
				Solubios ( 70)		rge rate ( I/s )			Show Detailed Results	
Existing measures				0	Unlimite	d 🗸 🔽	0	D		
Proposed measures Fiter D	Drains & Wet/Retention Por	nds		53	Unlimite	d - D	72		Exit Tool	

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	YS Highways A	gency Water Risk	Assessment Too	version 1.0 Nove	mber 200	9			
AGENCY			e - Acute Impact			Sedin	ent - Chron	nic Impact	
	Annual Average Co		Copper	Zinc		Sed	ment deposi	ition for this site is ju	dged as:
	Step 2 0.21	0.67 ug/l	Pass	Pass	Alert.		imulating?		ow flow Vel m/s
	Step 3 0.10	0.32 ug/l				Exte	nsive?	No - [	Deposition Index
Location Details Road number		40.0.0		HA Area / DBFO	august as				
		A9 D-S			number				
Assessment type	ecoment soist (m)		essment (single outfa	1)		Nesthing	040070		•
OS grid reference of ass	,	Easting	286883			Northing	810073		
OS grid reference of out	fall structure (m)	Easting		List of outfa	lla in	Northing	_		
Outfall number		S3		cumulative asse					
Receiving watercourse		Ballinluig Burn							
EA receiving water Detai				Assessor and aff			AMJV		
Date of assessment		02/07/2018		Version of asses	sment		4		
Notes									
Step 1 Runoff Quali	<b>b</b>					and the second sec	(0.4.1D. 404.0.0	0	
Step 1 Runon Quan	AADT >10,000 and	<50,000  Clir	matic region Cold	er Wet 👻	Rai	infall site Ardtalnai	(SAAR 1343.9	9 mm)	•
Step 2 River Impact	Annual 95%ile river 1	flow (m <sup>3</sup> /s)	0.004 (Ente	r zero in Annual 95%	6ile river	flow box to assess S	ep 1 runoff c	quality only)	
	Impermeable road a	readined (he)	``````````````````````````````````````	eable area draining				quality only?	
				0		(na)			
	Base Flow Index (BF	-1) 0.6	558 Is the	discharge in or with	iin 1 km ι	upstream of a protecte	d site for cor	nservation?	Yes 👻
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D						
For sediment impact or	nly Is there a downstrea	m structure, lake, por	nd or canal that reduce	s the velocity within	100m of	f the point of discharge	?	No 👻	D
	C Tier 1 Estimate	d river width (m)	6						
	Tier 2 Bed width	h (m)	0.17 Mann	ing's n 0.035		Side slope (m/m)	1.26969	Long slope (m/m)	0.029467
Step 3 Mitigation					_	mated effectiveness		Predict	Impact
		Brief descript	tion	Treatment for solubles (%)			tlement of ments (%)		
						rge rate ( I/s )			iled Results
Existing measures				0	Unlimite	d - D 0	D		
Proposed measures	Filter Drains & Wet/Retention Por	nds		53	Unlimite	rd - D 72		Exit	Tool

HIGHWAYS	HWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY			le - Acute Impact				Sedimer	nt - Chroni	ic Impact	
	Annual Average Co		Copper	Zinc			Sedim	ent deposi	tion for this site is	iudged as:
	Step 2 0.10	0.30 ug/l	Pass	Pass		Protected Area & S Structure.		ulating?	No 0.49	Low flow Vel m/s
	Step 3 0.03	0.10 ug/l			01.	5 Suuclure.	Extens	sive?	No -	Deposition Index
Location Details Road number		A9 D-S		HA Area / DBFO	aurah ar					
Assessment type			ecoment (single sutfall		number					
OS grid reference of assessn	nont point (m)	Easting	sessment (single outfall 288338	)		Northing		810636		•
OS grid reference of outfall st		Easting	200330			Northing		010030		
Os grid reference of outrall si Outfall number	tructure (m)	S4		List of outfal	lc in	Northing				
			1-)	- cumulative asse						
Receiving watercourse		Allt-na-Criche(Lynwi	llg)							
EA receiving water Detailed R				Assessor and aff				AMJV		
Date of assessment		02/07/2018		Version of asses	sment			4		
Notes										
Step 1 Runoff Quality	AADT >10,000 and	<50,000 - Cli	matic region Colde	er Wet 👻	Rai	infall site	Ardtalnaig (S	SAAR 1343.9	imm)	•
Step 2 River Impacts	Annual 95%ile river f	low (m <sup>3</sup> /s)	0.035 (Enter	zero in Annual 95%	ile river	flow box to as	sess Step	1 runoff q	uality only)	
	Impermeable road ar	rea drained (ha)	3.715 Perme	able area draining t	o outfall	(ha) 4.4	78			
				0		(114)				
	Base Flow Index (BF	·I) 0.	411 Is the	discharge in or withi	in 1 km i	upstream of a p	rotected	site for con	servation?	Yes 👻
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	▼ D							
For sediment impact only	Is there a downstrea	m structure, lake, por	nd or canal that reduce:	s the velocity within	100m of	f the point of dis	charge?		Yes 🗸	
	C Tier 1 Estimated	d river width (m)	6							
	Tier 2 Bed width		2.68 Manni	ng's n 0.04		Side slope (m	/m) 🛛	.411708	Long slope (m/r	n) 0.029392
Step 3 Mitigation			Γ		Estir	nated effective	nocc			
atop o mitigation		Brief descrip	tion	Treatment for		enuation for		ement of	Predi	ct Impact
		Difer descrip		solubles (%)	soluble	es - restricted		ents (%)		
						rge rate ( I/s )			Show Det	ailed Results
Existing measures				0	Unlimite	d 🗕 🖸	0	D		
Proposed measures Fiter	Drains, Wet/Retention Pond	s & Swales/Grassed Cha	nnels	65	Unlimite	d - D	83		Ex	it Tool

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AGENCY	Highways A	gency Water I	Risk Assessmen	t Tool	version 1.0 Nover	nber 200	9					
AGENCY			luble - Acute Impac	t				Sedimer	nt - Chron	ic Impact		
	Annual Average Co Copper Step 2 0.07 Step 3 0.04		Copper Pass		Zinc Pass		Protected Area & S Structure.		ulating?	ition for th No No		<b>dged as:</b> .ow flow Vel m/s Deposition Index
Location Details Road number		A9 D-S			HA Area / DBFO	number						
Assessment type			assessment (single	outfall)	TA Alca / DBI O	number						
OS grid reference of assessm	nent point (m)	Easting	288351	outraily			Northing		810631			
OS grid reference of outfall st		Easting	200331				Northing		010031			
Outfall number		S5			List of outfall	sin	literating					
Receiving watercourse		Allt-na-Criche(L)	(nwila)		cumulative asse	ssment						
EA receiving water Detailed R	liver Network ID				Assessor and aff	iliation			AMJV			
Date of assessment		02/07/2018			Version of assess	sment			4			
Notes		1										
Step 1 Runoff Quality	AADT >10,000 and	<50,000 👻	Climatic region	Colder	Wet 👻	Rai	nfall site	rdtalnaig (S	SAAR 1343.9	(mm)		•
Step 2 River Impacts	Annual 95%ile river f Impermeable road at Base Flow Index (BF	rea drained (ha)	2.492	Permea	ero in Annual 95% ble area draining t scharge in or withi	o outfall	(ha) 1.48	9			-	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCC	D3/1 🔽 🖸									
	S there a downstrea C Tier 1 Estimated C Tier 2 Bed width	d river width (m)	6	educes t Manning		100m of	the point of dis Side slope (m.	_	0.9379935		ope (m/m)	0.031568
Step 3 Mitigation		Brief des	scription		Treatment for solubles (%)	Atte	mated effective enuation for es - restricted	Settle	ement of ents (%)		Predict	Impact
Existing measures				0	D	Unlimite	d - D	0	D	Sh	ow Deta	iled Results
Proposed measures Filter D	Drains & Wet/Retention Por	nds		4		Unlimite	d 🔽 🖸	72			Exit	Tool

AGENCY	Highways A	gency Water Ris	k Assessment Too	version 1.0 November 200	)9		
	Annual Average Co Copper Step 2 0.26 Step 3 0.14	ncentration	le - Acute Impact Copper	Zinc Pass			
Location Details							
Road number		A9 D-S		HA Area / DBFO number	ſ		
Assessment type			sessment (single outfall	)			-
OS grid reference of assessm		Easting	289101			812069	
OS grid reference of outfall st	ructure (m)	Easting			Northing		
Outfall number		S7A		List of outfalls in cumulative assessment			
Receiving watercourse		Loch Pulladern		cumulative assessment			
EA receiving water Detailed R	liver Network ID			Assessor and affiliation		AMJV	
Date of assessment		03/07/2018		Version of assessment		4	
Notes							
Step 2 River Impacts	AADT >10,000 and Annual 95%ile river f Impermeable road at Base Flow Index (BF Water hardness	low (m <sup>3</sup> /s) rea drained (ha)	0.002 (Enter 0.685 Perme	er Wet Ra zero in Annual 95%ile river eable area draining to outfal discharge in or within 1 km	flow box to assess Ste		
Step 3 Mitigation		Brief descrip	ition	Treatment for Atte		ement of ents (%)	Predict Impact
Existing measures					rge rate ( //s )		ow Detailed Results
Proposed measures Filter D	) rains & D ry/Detention P on	ds		45 Unlimite	ed - 0 70		Exit Tool

HIGHWAYS Highways	Agency Water Risl	k Assessment Tool	version 1.0 November 2	009						
Annual Average (	concentration er Zinc 2.99 ug/l	le - Acute Impact Copper Pass	Zinc Pass							
Location Details										
Road number	A9 D-S		HA Area / DBFO numb	er						
Assessment type	Non-cumulative ass	essment (single outfall)	)			•				
OS grid reference of assessment point (m)	Easting	289080		Northing	812185					
OS grid reference of outfall structure (m)	Easting			Northing	1					
Outfall number	S7		List of outfalls in		1					
Receiving watercourse	Loch Pulladern		cumulative assessme	nt						
EA receiving water Detailed River Network ID			Assessor and affiliation	l	AMJV	I				
Date of assessment 03/07/2018 Version of assessment 4										
Notes										
Step 1 Runoff Quality       AADT       >10,000 and <50,000										
Step 3 Mitigation	Brief descrip	ition	Treatment for A solubles (%) solul		ilement of nents (%)	Predict Impact				
Existing measures			0 Unlim		D	onow becalled Results				
Proposed measures Filter Drains, Wet/Retention Por	nds & Swales/Grassed Cha	nnels	65 Unlim			Exit Tool				

HIGHWAYS High	ways Agency Water Ris	k Assessment Tool	version 1.0 Nover	nber 200!	9			
	Solut Average Concentration	ble - Acute Impact Copper	Zinc			nt - Chroni	ic Impact tion for this site is judge	vd ae:
Step 2 Step 3	0.48 1.46 ug/l 0.22 0.68 ug/l	Pass	Pass	Alert.		nulating?	No 0.26 Low	flow Vel m/s osition Index
Location Details								
Road number	A9 D-S		HA Area / DBFO	number				
Assessment type		sessment (single outfall	)					-
OS grid reference of assessment point (m		289403			Northing	814149		
OS grid reference of outfall structure (m)	Easting				Northing			
Outfall number	S8		List of outfall					
Receiving watercourse	Easter Aviemore E	urn	cumulative asse	ssmeni				
EA receiving water Detailed River Networ	k ID		Assessor and affi	liation		AMJV		
Date of assessment	03/07/2018		Version of assess	sment		4		
Notes								
Step 1 Runoff Quality AADT	>10,000 and <50,000 - C	limatic region Colde	er Wet 💽	Raii	nfall site Ardtalnaig (	SAAR 1343.9n	nm)	<u> </u>
Step 2 River Impacts Annual 95%	%ile river flow (m3/s)	0.002 (Enter	zero in Annual 95%	ile river	flow box to assess Ste	o 1 runoff ai	uality only)	
Impermeat	ble road area drained (ha)		able area draining to				, ,,	
			•		.,			
Base Flow	Index (BFI)	0.403 Is the	discharge in or withi	n 1 km u	upstream of a protected	site for con	servation?	No 🗸 D
For dissolved zinc only Water hard	Low= <50mgCaCO3/	▼ D						
For sediment impact only Is there a d	lownstream structure, lake, p	ond or canal that reduces	s the velocity within 1	100m of	the point of discharge?		Yes 🔻	
ි Tier 1	Estimated river width (m)	5						
• Tier 2	Bed width (m)	1.22 Manni	ng's n 0.035		Side slope (m/m)	1.164	Long slope (m/m)	0.04263
Step 3 Mitigation		Γ		Estin	nated effectiveness			
	Brief descr	ption	Treatment for			ement of	Predict Im	pact
			solubles (%)		es - restricted sedimingerate (Vs)	ents (%)		1
Existing measures		[	0	Unlimited		D	Show Detailed	Results
Proposed measures Filter Drains & WetRe	etention Ponds		53	Unlimited			Exit To	ol

HIGHWAYS	Highways A	gency Water Risk	Assessment Tool	version 1.0 November 2	009		
AGENCI	Annual Average Co Copper Step 2 0.17 Step 3 0.08	ncentration	e - Acute Impact Copper Pass	Zinc Pass	Sedin	nt - Chronic Impac nent deposition for th nulating? No sive? No	
Location Details							
Road number		A9 D-S		HA Area / DBFO numb	er		
Assessment type			essment (single outfall)				-
OS grid reference of assessme	ent point (m)	Easting	289746		Northing	814646	
OS grid reference of outfall str	ucture (m)	Easting		_	Northing		
Outfall number		S9		List of outfalls in cumulative assessme	nt		
Receiving watercourse		Southern bifurcation	Allt na Criche (Granish)	cumulative assessme	III		
EA receiving water Detailed Ri	ver Network ID			Assessor and affiliation	1	AMJV	
Date of assessment		03/07/2018		Version of assessment		4	
Notes							
Step 2 River Impacts For dissolved zinc only For sediment impact only		low (m <sup>3</sup> /s) rea drained (ha) 1) 0.3 Low= <50mg C aC O 3/	0.647 Permez 21 Is the d	zero in Annual 95%ile riv able area draining to out ischarge in or within 1 ki	er flow box to assess Ste	site for conservation	? No v
	Tier 2 Bed width	n (m)	1.67 Mannin	g's n 0.048	Side slope (m/m)	0.31232 Long sl	ope (m/m) 0.03826
Step 3 Mitigation		Brief descript	ion	Treatment for solubles (%) solu discl	bles - restricted sedim harge rate (Vs)		Predict Impact ow Detailed Results
	ains & Wet/Retention Pon	ds		3 Unin	• •		E-14 E-1
			ľ				Exit Tool

AGENCY	Highways A	gency Water Ri	sk Assessment Tool	version 1.0 Nover	nber 200	9				
AGENCI	Annual Average Co		ble - Acute Impact	Zinc		Sedime	nt - Chroni	c Impact		
			Copper	ZIIIC		Sedin	nent deposit	ion for this	site is jud	ged as:
	Step 2 0.41	1.24 ug/l	Pass	Pass	Alert.					w flow Vel m/s
	Step 3 0.19	0.58 ug/l				Exten	sive?	No	- De	position Index
Location Details							1			
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type			ssessment (single outfall)							-
OS grid reference of assessin		Easting	289906			Northing	814997			
OS grid reference of outfall st	tructure (m)	Easting				Northing				
Outfall number		C1		List of outfall cumulative asse						
Receiving watercourse		Northern bifurcatio	n Allt na Criche (Granish)							
EA receiving water Detailed F	River Network ID			Assessor and aff			AMJV			
Date of assessment		03/07/2018		Version of assess	sment		4			
Notes										
Step 1 Runoff Quality	AADT >10,000 and	<50,000 <b>▼</b> (	Climatic region Colder	Wet •	Rai	nfall site Ardtalnaig (	SAAR 1343.9m	( <b>m</b> )		•
Step 2 River Impacts	Annual 95%ile river	flow (m <sup>3</sup> /s)	0.001 (Enter z	ero in Annual 95%	ile river	flow box to assess Ste	o 1 runoff au	uality only)		
	Impermeable road a	rea drained (ha)		ble area draining t				, ,,		
				-		(na)				
	Base Flow Index (BF	FI)	0.383 Is the d	ischarge in or withi	n 1 km i	upstream of a protected	site for cons	servation?		No 🔹 D
For dissolved zinc only	Water hardness	Low= <50mgCaCO3/								
For sediment impact only	Is there a downstrea	m structure, lake, p	ond or canal that reduces	the velocity within	100m of	the point of discharge?		Yes	-	,
	○ Tier 1 Estimate	d river width (m)	5							
	Tier 2 Bed widt	. ,	0.77 Mannin	a's n 0.045		Side slope (m/m)	6.7	Long clop	o (m/m)	0.05807
	e nei z Beu wiuti	n (m)	Marinin	ysn v.oro		Side slope (III/III)	0.7	Long slop	e (110111)	0.05007
Step 3 Mitigation					Estir	nated effectiveness				1
		Brief descr	iption	Treatment for			ement of	-	Predict I	mpact
		2		solubles (%)	soluble	es - restricted sedim	ients (%)			
Existing measures			0	D	dischar Unlimite	rge rate (Vs)	D	Shov	v Detaile	ed Results
Proposed measures Filter	Orains & Wet/Retention Por	nds	5		Unlimite					
									Exit T	001

	YS Highways A	gency Water Risk	Assessment Too	version 1.0 Nove	mber 200	9					
AGENCY	Annual Average Co Copper Step 2 0.31	ncentration	e - Acute Impact Copper Pass	Zinc Pass		Pass	Sedim	nt - Chron nent deposi nulating?		is site is j	udged as: Low flow Vel m/s
	Step 3 0.14	0.44 ug/l					Exten		No	-	Deposition Index
Location Details					•						
Road number		A9 D-S		HA Area / DBFO	number						
Assessment type		Non-cumulative ass	essment (single outfal	)							-
OS grid reference of ass		Easting	290152			Northing		815669			
OS grid reference of out	fall structure (m)	Easting				Northing					
Outfall number		C3		List of outfal cumulative asse							
Receiving watercourse		Allt na Criche (Grani	ish)	cumulative asse	essmeni						
EA receiving water Deta	iled River Network ID			Assessor and aff	filiation			AMJV			
Date of assessment		03/07/2018		Version of asses	sment			4			
Notes				1							
Step 1 Runoff Qual	AADT >10,000 and	I <50,000 Cli	matic region C old	er Wet 🔹	Rai	infall site	Ardtalnaig (	SAAR 1343.9	mm)		•
Step 2 River Impact	ts Annual 95%ile river t	flow (m³/s)	0.003 (Ente	r zero in Annual 95%	6ile river	flow box to a	ssess Ste	p 1 runoff q	uality only	)	
	Impermeable road a	rea drained (ha)	1.255 Perm	eable area draining	to outfall	(ha) 1.	173				
	Base Flow Index (BF	FI) 0.:	344 Is the	discharge in or with	in 1 km i	upstream of a	protected	site for cor	nservation?	?	No 🗸 D
For dissolved zinc only	y Water hardness	Low= <50mg CaC O3/I	▼ D								
For sediment impact o	nly is there a downstrea	m structure, lake, por	nd or canal that reduce	s the velocity within	100m of	the point of d	ischarge?		No	•	D
	<ul> <li>Tier 1 Estimate</li> </ul>	d river width (m)	5								
	Tier 2 Bed width	. ,	0.89 Mann	ing's n 0.045		Side slope (I	m/m)	2.08387	Long slo	ope (m/m	) 0.0124041
Step 3 Mitigation			[		Entir	mated effectiv	0.0000				
step s miligation		Drief deserie	tion	Treatment for	-	nated effectiv		ement of		Predic	t Impact
		Brief descrip	uon	solubles (%)		enuation for es - restricted		ement or ents (%)			
						rge rate ( Vs )			She	ow Deta	ailed Results
Existing measures				0	Unlimite	•d 🗣 🕞	0	D			
Proposed measures	Filter Drains & Wet/Retention Por	nds		53	Unlimite	d 🗕	72			Exi	t Tool

AGENCY	HWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCT			e - Acute Impact				Sedimer	nt - Chroni	ic Impact	
	Annual Average Co		Copper	Zinc			Sedim	ent denosi	tion for this site is judged as:	
	Step 2 0.20	0.59 ug/l	Pass	Pass	Alert.	D/S Structure.		ulating?	No 0.27 Low flow Vel m/s	
	Step 3 0.09	0.28 ug/l					Extens	sive?	No - Deposition Index	
Location Details										
Road number		A9 D-S		HA Area / DBFO r	number					
Assessment type			essment (single outfall)			Marchine -				
OS grid reference of assessn		Easting	290260			Northing		816360		
OS grid reference of outfall st	tructure (m)	Easting		1		Northing				
Outfall number		C5B		List of outfalls cumulative asses						
Receiving watercourse		Avie Lochan Burn S	outh							
EA receiving water Detailed R				Assessor and affil				AMJV		
Date of assessment		05/07/2018		Version of assess	ment			4		
Notes										
			r							
Step 1 Runoff Quality	AADT >10,000 and	<50,000  Clin	matic region Colder	Wet 💌	Rai	nfall site	Ardtalnaig (S	SAAR 1343.9	mm) 🔽	
Step 2 River Impacts	Annual 95%ile river f	flow (m <sup>3</sup> /s)	0.003 (Enter z	ero in Annual 95%i	ile river	flow box to a	ssess Ster	1 runoff a	uality only)	
	Impermeable road ar	rea drained (ba)		ble area draining to						
				-		(114)				
	Base Flow Index (BF	-I) 0.2	247 Is the d	ischarge in or within	ո 1 km ս	upstream of a	protected	site for con	nservation?	
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D							
For sediment impact only	Is there a downstrea	m structure, lake, pon	nd or canal that reduces	the velocity within 1	00m of	the point of d	ischarge?		Yes 🗸	
	C Tier 1 Estimated	d river width (m)	5							
	Tier 2 Bed width		2 Mannin	n's n 0.04		Side slope (r	m/m) 🚺	5162118	Long slope (m/m) 0.063385	
	Dod mai			gon		oldo olopo (i				
Step 3 Mitigation					Estin	nated effectiv	eness			
		Brief descript	tion	Treatment for		enuation for		ement of	Predict Impact	
				solubles (%)		s - restricted		ents (%)		
Existing measures			0		Unlimite		0		Show Detailed Results	
	Drains & Wet/Retention Por	ada	5		Unlimite		72	D	-	
Froposed medsures Fixer	prains & weeKelention Pon	ius		3	Unimited	•	12		Exit Tool	

HIGHWAYS	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	19				
AGENCI	Annual Average Co Copper Step 2 0.40 Step 3 0.19	ncentration	e - Acute Impact Copper Pass	Zinc Pass		Pass Acc	ent - Chror iment depos imulating? nsive?	ition for this s	0.19 Low flo	l as: ow Vel m/s ition Index
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type			essment (single outfall	)						-
OS grid reference of assess		Easting	291142			Northing	818469			
OS grid reference of outfall	structure (m)	Easting		_		Northing				
Outfall number		C11		List of outfal cumulative asse						
Receiving watercourse		Allt Cnapach		cumulative asse	ssmeni					
EA receiving water Detailed	River Network ID			Assessor and affiliation AMJV						
Date of assessment		03/07/2018		Version of assess	sment		4			
Notes										
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 and Annual 95%ile river t			zero in Annual 95%		flow box to assess S	(SAAR 1343.9			·
	Impermeable road a Base Flow Index (BF	rea drained (ha)	2.326 Perme	able area draining t	o outfall			,	N	• • •
For dissolved zinc only	Water hardness	Low= <50mg CaCO3/I	• D							
For sediment impact only		d river width (m)	d or canal that reduces		100m of	the point of discharge Side slope (m/m)	? 0.42951	No Long slope	• (m/m)	0.019693
Step 3 Mitigation		Brief descrip	tion	Treatment for solubles (%)	Atte		tlement of ments (%)		redict Imp	
Existing measures				0	Unlimite	ed 🗸 🕞 0	D			
Proposed measures Filter	r Drains & Wet/Retention Por	nds		53	Unlimite	rd - D 72			Exit Too	4

HIGHWAYS	Highways A	gency Water Risl	k Assessment Tool	version 1.0 Nove	mber 200	9			
AGENCI	Annual Average Co Copper Step 2 0.23 Step 3 0.11	ncentration	le - Acute Impact Copper	Zinc Pass	Sediment - Chroni Alert. D/S Structure. Sediment deposit Accumulating? Extensive?				site is judged as: 0.30 - Deposition Index
Location Details									
Road number		A9 D-S		HA Area / DBFO	number				
Assessment type			essment (single outfall)						-
OS grid reference of assess	ment point (m)	Easting	290827			Northing	820800		
OS grid reference of outfall s	structure (m)	Easting		_		Northing			
Outfall number		C12		List of outfal					
Receiving watercourse		Feith Mhor		cumulative asse	ssmeni				
EA receiving water Detailed	River Network ID			Assessor and aff	iliation		AMJV		
Date of assessment		03/07/2018		Version of assess	sment		4		
Notes									
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 and		matic region Colde	<u></u>			naig (SAAR 1343.		۲
Step 2 Kiver impacts	Annual 95%ile river Impermeable road a Base Flow Index (Bf	rea drained (ha)	1.978 Perme	zero in Annual 95% able area draining t discharge in or withi	o outfall	(ha) 2.283		,	No 🗸 🗅
For dissolved zinc only	Water hardness	Low= <50mgCaCO3/I	▼ D						
For sediment impact only		d river width (m)	nd or canal that reduces 5 0.18 Mannie		100m of	the point of dischar Side slope (m/m)	rge?	Yes Long slope	• (m/m) 0.005051
Step 3 Mitigation		Brief descrip	tion	Treatment for	-	nated effectiveness	; Settlement of	P	redict Impact
Existing measures		bher descrip		solubles (%)	soluble	ge rate (Vs)	ediments (%)	Show	Detailed Results
Proposed measures Filter	Drains & Wet/Retention Po	nds		53	Unlimited	d <b>-</b> D 72			Exit Tool

HIGHWAY	YS Highways A	gency Water Ris	k Assessment Too	DI version 1.0 Nove	mber 200	9					
AGENCY	Annual Average Co Copper Step 2 0.36 Step 3 0.17	oncentration	ele - Acute Impact Copper Pass	Zinc Pass	Alert. D/S Structure. Accum			ediment - Chronic Impact Sediment deposition for this Accumulating? Extensive? No			udged as: Low flow Vel m/s Deposition Index
Location Details Road number	•	A9 D-S		HA Area / DBFO	number						
Assessment type			sessment (single outfa	all)							-
OS grid reference of asse		Easting	290661			Northing		820868			
OS grid reference of outfa	all structure (m)	Easting				Northing					
Outfall number		C13		List of outfal							
Receiving watercourse		Feith Mhor Trib 2		cumulative asse	ssinen						
EA receiving water Detaile	ed River Network ID			Assessor and affiliation AMJV							
Date of assessment		05/07/2018		Version of assessment 4							
Notes								,			
Step 1 Runoff Qualit	Step 1 Runoff Quality       AADT       >10,000 and <50,000										
	Impermeable road a	, ,	·	neable area draining t			·	o i runon q	danty only	,	
	Base Flow Index (BF	FI) 0	.477 Is the	e discharge in or with	in 1 km	upstream of a p	protected	site for con	servation?	•	No 🗸 🗅
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/	• D								
For sediment impact on		d river width (m)	5	es the velocity within	100m of	f the point of di	_	0.5147679	Ye	s 💽	0.001295
	Dod wide			ingon					Long Si	200 (mm	
Step 3 Mitigation		Brief descrip	otion	Treatment for solubles (%)	Atte	mated effective enuation for es - restricted	Settle	ement of ents (%)	]_	Predic	ct Impact
Existing measures				0	discha Unlimite	rge rate ( I/s )	0	D	Sh	ow Det	ailed Results
Proposed measures F	iter Drains & Wet/Retention Por	nds		53	Unlimite	ed - D	72			Ex	it Tool

HIGHWAYS	Highways A	gency Water Ris	sk Assessment Tool	version 1.0 November	2009				
Adenci	Annual Average Co Copper Step 2 0.94 Step 3 0.44	ncentration	ble - Acute Impact Copper	Zinc Pass	Pass		ting? No	t is site is judged as: 0.15 Low flow Vel m/s - Deposition Index	
Location Details									
Road number		A9 D-S		HA Area / DBFO num	ber				
Assessment type			ssessment (single outfall)					•	
OS grid reference of assess		Easting	290591		Northing	821	255		
OS grid reference of outfall s	structure (m)	Easting		_	Northing				
Outfall number		C14		List of outfalls in cumulative assessm					
Receiving watercourse		Feith Mhor Drain 7		cumulative assessm	ent				
EA receiving water Detailed	River Network ID			Assessor and affiliation	on	AM	IJV		
Date of assessment		03/07/2018		Version of assessme	nt	4			
Notes									
Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Colder Wet         Rainfall site         Ardtainaig (SAAR 1343.9mm)         •									
Step 2 River Impacts	Annual 95%ile river f Impermeable road a Base Flow Index (BF	rea drained (ha)	3.416 Perme	zero in Annual 95%ile r able area draining to ou discharge in or within 1	tfall (ha) 3.95	54			
For dissolved zinc only	Water hardness	Low= <50mgCaCO3/I	▼ D						
For sediment impact only		d river width (m)	5 0.85 Mannin	·			Long s	• • D	
Step 3 Mitigation					stimated effective	ness			
		Brief descri	iption	Treatment for	Attenuation for	Settlemer	nt of	Predict Impact	
Existing measures				dis	ubles - restricted charge rate ( Vs )	sediments		ow Detailed Results	
Proposed measures Filter	Drains & Wet/Retention Por	nds			imited -	72		Exit Tool	

HIGHWAYS HI	HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
	al Average Co	Solub	le - Acute Impact Copper	Zinc		Sed	iment - Chroi	nic Impact		
	Copper	Zinc			Alert.	Drotoctod Area		sition for this site is judged as:		
Step Step		0.01 ug/l 0.00 ug/l	Pass	Pass	& D		cumulating? tensive?	Yes         0.06         Low flow Vel m/s           No         1         Deposition Index		
Location Details										
Road number		A9 D-S		HA Area / DBFO	number	r				
Assessment type		Non-cumulative as	sessment (single outfal	1)				-		
OS grid reference of assessment point	(m)	Easting	289623			Northing	822513			
OS grid reference of outfall structure (r	n)	Easting				Northing				
Outfall number		N1	11							
Receiving watercourse		River Dulnain		cumulative asse	essment					
EA receiving water Detailed River Netw	ork ID			Assessor and aff	filiation		AMJV			
Date of assessment		03/07/2018		Version of asses	sment		4			
Notes										
Step 1 Runoff Quality AADT	>10,000 and	<50,000 - CI	C old	er Wet 🔹	Ra	infall site Ardtain	aig (SAAR 1343.9	imm) 💌		
Step 2 River Impacts Annual 9	5%ile river f	low (m³/s)	0.889 (Ente	r zero in Annual 95%	6ile river	flow box to assess	Step 1 runoff	quality only)		
Imperme	able road ar	ea drained (ha)	1.479 Perm	eable area draining	to outfall	l (ha) 0.662	٦ <sup>`</sup>			
				Ŭ		. ,				
Base Fig	w Index (BF	1)	Is the	discharge in or with	in 1 km	upstream of a prote	cted site for co	nservation?		
For dissolved zinc only Water ha	ardness	Low= <50 mg CaCO3/I	▼ D							
For sediment impact only Is there a	a downstrea	m structure, lake, po	nd or canal that reduce	s the velocity within	100m of	f the point of dischar	ge?	Yes 🗸		
• Tier 1	Estimated	d river width (m)	18							
ି Tier 2	Bed width	. ,	0.85 Mann	ing's n 0.07	D	Side slope (m/m)	4.088	Long slope (m/m) 0.01851		
Step 3 Mitigation						mated effectiveness		Predict Impact		
		Brief descrip	otion	Treatment for solubles (%)			Settlement of ediments (%)			
				Solubles ( %)		rge rate (Vs)	cuments ( %)	Show Detailed Results		
Existing measures				0	Unlimite		D	Show Detailed Results		
Proposed measures Filter Drains & Dry	Detention Pon	ds		45	Unlimite			Exit Tool		

AGENCY	VAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCI	Annual Average Co		ble - Acute Impact	Zinc		Sedim	ent - Chron	ic Impact		
	Copper		Copper	ZIIIC		Sedi	ment deposi	ition for this site	e is judged as:	
	Step 2 0.06	0.17 ug/l	Pass	Pass	Alert. Pr	rotected Area. Accu	mulating?	No 0.3	35 Low flow Vel m/s	
	Step 3 0.03	0.10 ug/l				Exter	nsive?	No -	Deposition Index	
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type			ssessment (single out	tall)		N I a sel la la su	000700		•	
OS grid reference of asse		Easting	289165			Northing	822798			
OS grid reference of outfa	all structure (m)	Easting		Link of sudfa		Northing				
Outfall number		N2		List of outfa						
Receiving watercourse		Allt nan Ceatharna	ich							
EA receiving water Detail	ed River Network ID			Assessor and af			AMJV			
Date of assessment		03/07/2018		Version of asses	sment		4			
Notes										
Step 1 Runoff Qualit	AADT >10,000 and	<50,000 🗸 🤇	Climatic region C	older Wet 🔹	Raint	fall site Ardtalnaig	(SAAR 1343.9r	nm)	•	
Step 2 River Impacts	Annual 95%ile river f	flowr (m3/c)	0.045 (Fr							
	Annual 55%ile river i	10W (111-75)		nter zero in Annual 95%	611e river fi		ep 1 runoff q	uality only)		
	Impermeable road a	rea drained (ha)	2.879 Pe	rmeable area draining	to outfall (I	(ha) 4.426				
	Base Flow Index (BF	·I)	0.278 Is t	he discharge in or with	iin 1 km up	pstream of a protected	d site for con	servation?	Yes 🗸	
For dissolved zinc only	Water hardness	Low= <50mgCaCO3/	1 <b>-</b> D							
For sediment impact on	ly Is there a downstrea	m structure, lake, p	ond or canal that redu	ces the velocity within	100m of th	the point of discharge	?	No	• D	
	Tier 1 Estimated	d river width (m)	18	-						
			4.56 Ma	nning's n 0.045		Side slope (m/m)	1.09615		m/m) 0.015136	
	Tier 2 Bed width	1 (11)	4.00 IVIa			Side slope (III/III)	1.00010	Long slope (	0.015136	
Step 3 Mitigation					Estima	ated effectiveness				
		Brief descr	iption	Treatment for			lement of	- Pre	edict Impact	
		2		solubles (%)	solubles	s - restricted sedir	nents (%)			
				_		ge rate ( Vs )		Show I	Detailed Results	
Existing measures				0	Unlimited	- 0	D			
Proposed measures F	ilter Drains & Dry/Detention Pon	ds		45	Unlimited	<b>- - 70</b>			Exit Tool	

	vays Agency Water Risl	k Assessment Tool	version 1.0 November 20	09					
	Copper Zinc 0.06 0.20 ug/	le - Acute Impact Copper	Zinc	Sedin	ent - Chronic Impact nent deposition for th nulating? No				
Step 3	0.04 0.11 ug/l			Exten		- Deposition Index			
Location Details					1				
Road number	A9 D-S		HA Area / DBFO number	r					
Assessment type		essment (single outfall)	)			-			
OS grid reference of assessment point (m)		288290		Northing	824099				
OS grid reference of outfall structure (m)	Easting			Northing					
Outfall number	N4		List of outfalls in cumulative assessment						
Receiving watercourse	Bogbain Burn								
EA receiving water Detailed River Network			Assessor and affiliation AMJV						
Date of assessment	03/07/2018		Version of assessment 4						
Notes									
Step 1 Runoff Quality         AADT         >10,000 and <50,000         Climatic region         Coder Wet         Rainfall site         Ardtainaig (SAAR 1343.9mm)									
Step 2 River Impacts Annual 95%	ile river flow (m <sup>3</sup> /s)	``````````````````````````````````````	zero in Annual 95%ile river		p 1 runoff quality only	/)			
Impermeable	e road area drained (ha)	1.262 Perme	able area draining to outfal	ll (ha) 1.791					
Base Flow Ir	idex (BFI)	283 Is the	discharge in or within 1 km	upstream of a protected	site for conservation	? No • D			
For dissolved zinc only Water hardn	ess Low= <50mgCaCO3/I								
For sediment impact only Is there a do	wnstream structure, lake, por	nd or canal that reduces	the velocity within 100m o	f the point of discharge?	N	D - 0			
ाier 1 ह	stimated river width (m)	18							
• Tier 2 E	ed width (m)	1.61 Manni	ng's n 0.045	Side slope (m/m)	2.049387 Long sl	ope (m/m) 0.011224			
Step 3 Mitigation		Γ	Esti	imated effectiveness					
	Brief descrip	tion			ement of	Predict Impact			
				les - restricted sedim arge rate (Vs)	nents (%)	ow Detailed Results			
Existing measures			0 Unlimite	ed 🗸 🖸 0					
Proposed measures Filter Drains & Dry/Dete	ention P onds		45 Unlimite	ed - 70		Exit Tool			

HIGH WAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY	Annual Average Co	Sol ncentration	uble - Acute Impact Copper	Zinc		Sedime	nt - Chroni	c Impact	
	Copper           Step 2         0.25           Step 3         0.12		Pass	Pass	Alert.		nulating?	ion for this site is judged as: No 0.30 No - Deposition Index	
Location Details									
Road number		A9 D-S		HA Area / DBFO	number				
Assessment type		Non-cumulative	assessment (single outfa	II)				-	
OS grid reference of assessme	ent point (m)	Easting	287839			Northing	824195		
OS grid reference of outfall str	ucture (m)	Easting				Northing			
Outfall number		N5		List of outfal					
Receiving watercourse		Bogbain Burn		cumulative asse	essment				
EA receiving water Detailed Ri	ver Network ID	_		Assessor and aff	filiation		AMJV		
Date of assessment		03/07/2018		Version of asses	sment		4		
Notes									
Step 1 Runoff Quality	AADT >10,000 and	<50,000 🗸	Climatic region Cok	ler Wet 🔹	Rai	nfall site Ardtainaig (	SAAR 1343.9m	nm) 🔽	
Step 2 River Impacts	Annual 95%ile river t	flow (m³/s)	0.016 (Ente	r zero in Annual 95%	6ile river	flow box to assess Ste	p 1 runoff qu	uality only)	
	Impermeable road a	rea drained (ha)	5.29 Perm	eable area draining	to outfall	(ha) 3.445			
	Base Flow Index (BF	FI)	0.282 Is the	discharge in or with	iin 1 km i	upstream of a protected	site for cons	servation?	
For dissolved zinc only	Water hardness	Low= <50mgCaCO	3/I • D						
For sediment impact only	Is there a downstrea	m structure, lake,	pond or canal that reduce	s the velocity within	100m of	the point of discharge?		Yes 🔻	
	Tier 1 Estimate	d river width (m)	18						
	Tier 2 Bed widtl	n (m)	2.2 Manr	ning's n 0.045		Side slope (m/m)	0.857272	Long slope (m/m) 0.014026	
Step 3 Mitigation						mated effectiveness		Predict Impact	
		Brief desc	ription	Treatment for solubles (%)			ement of ents (%)		
				30100103 ( 70)		rge rate ( Vs )	cino ( 70)	Show Detailed Results	
Existing measures				0	Unlimite	d - D 0	D		
Proposed measures Filter D	rains & Wet/Retention Por	nds		53	Unlimite	d <b>,</b> D 72		Exit Tool	

HIGHWAYS	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	19					
AGENCI	Annual Average Co	ncentration	e - Acute Impact Copper	Zinc				nt - Chron Ient deposi	ic Impact tion for this	site is i	udged as:
	Step 2         0.07           Step 3         0.04	0.21 ug/l 0.12 ug/l	Pass	Pass		Pass		nulating?	No No	0.24	Low flow Vel m/s Deposition Index
Location Details	3169 3 0.04	0.12 ug/i					LAten	sive:			Deposition index
Road number		A9 D-S		HA Area / DBFO	number						
Assessment type		Non-cumulative ass	essment (single outfall	)							-
OS grid reference of assessme	ent point (m)	Easting	284364			Northing		824103			
OS grid reference of outfall stru	ucture (m)	Easting				Northing					
Outfall number		N7		List of outfal							
Receiving watercourse		Allt Slochd Mhuic		cumulative assessment							
EA receiving water Detailed Riv	ver Network ID			Assessor and affiliation				AMJV			
Date of assessment		03/07/2018		Version of assessment 4							
Notes											
Step 1 Runoff Quality	AADT >10,000 and	<50,000 • Clin	natic region Colde	er Wet 🔹	Rai	infall site	Ardtalnaig (S	SAAR 1343.9	nm)		•
Step 2 River Impacts	Annual 95%ile river f	low (m³/s)	0.012 (Enter	zero in Annual 95%	6ile river	flow box to a	assess Ste	p 1 runoff q	uality only)		
	Impermeable road a	rea drained (ha)	1.031 Perme	able area draining	to outfall	l (ha) 1	.462				
	Base Flow Index (BF	i) 0.	Is the	discharge in or with	in 1 km i	upstream of a	a protected	site for cor	servation?		No 🗸 D
For dissolved zinc only	Water hardness	Low= <50mg C aC O 3/I	▼ D								
For sediment impact only	Is there a downstrea	m structure, lake, por	d or canal that reduces	s the velocity within	100m of	f the point of a	discharge?		No	-	D
0	Tier 1 Estimate	d river width (m)	18								
	Tier 2 Bed width	n (m)	0.14 Manni	ng's n 0.04		Side slope (	(m/m)	.864197	Long slo	pe (m/m)	0.001915
Step 3 Mitigation			Γ		Fetir	mated effectiv	veness				
		Brief descript	ion	Treatment for		enuation for		ement of		Predic	t Impact
		Brief descrip		solubles (%)	soluble	es - restricted	l sedim	ents (%)			
						rge rate (Vs			Sho	w Deta	iled Results
Existing measures				0	Unlimite	ed 🕒 🖻	0	D			
Proposed measures Filter Dr	ains & Dry/Detention Pon	ds		45	Unlimite	ed 🔽 🖻	70			Exit	t Tool

AGENCY	Highways Agency Water Risk Assessm	ent Tool	version 1.0 Novembe	r 2009		
AGENCY	Soluble - Acute Im Annual Average Concentration Copper	pact	Zinc	Sedime	ent - Chronic Impact	
	Annual Average Concentration Copper		Zinc	Sedir	ment deposition for this	site is judged as:
	Step 2 0.24 0.71 ug/l Pass		Pass		mulating? No	0.26 Low flow Vel m/s
	Step 3 0.11 0.33 ug/l			Exter	nsive? No	- Deposition Index
Location Details						
Road number	A9 D-S		HA Area / DBFO num	nber		
Assessment type	Non-cumulative assessment (sir	igle outfall)		Marshin a	004500	•
OS grid reference of asse				Northing	824528	
OS grid reference of outfa			List of outfalls in	Northing		
Outfall number	N8		cumulative assessm			
Receiving watercourse	Allt Slochd Mhuic					
EA receiving water Detail			Assessor and affiliati		AMJV	
Date of assessment	04/07/2018		Version of assessme	nt	4	
Notes						
Sten 4 Dun off Ourslife						
Step 1 Runoff Qualit	AADT >10,000 and <50,000  Climatic region	Colder	•Wet •	Rainfall site Ardtalnaig	(SAAR 1343.9mm)	•
Step 2 River Impacts	Annual 95%ile river flow (m <sup>3</sup> /s) 0.005	(Enter z	zero in Annual 95%ile r	iver flow box to assess Ste	ep 1 runoff quality only)	
	Impermeable road area drained (ha)	Permea	able area draining to ou	utfall (ha) 3.03		
	Base Flow Index (BFI)	Is the di	ischarge in or within 1	km upstream of a protected	site for conservation?	No 🗸 🗅
For dissolved zinc only	Water hardness Low = <50mg CaCO3/					
For sediment impact on	y Is there a downstream structure, lake, pond or canal th	nat reduces f	the velocity within 100	m of the point of discharge?	P No	• D
	C Tier 1 Estimated river width (m) 5	1				
	© Tier 2 Bed width (m) 1.59	Manning	g's n 0.04	Side slope (m/m)	0.965714 Long slo	pe (m/m) 0.019824
Step 3 Mitigation				Estimated effectiveness		Dendiet Immed
	Brief description		Treatment for		lement of	Predict Impact
				lubles - restricted sedir scharge rate ( I/s )	ments (%)	
Existing measures		0		bottod0		w Detailed Results
	ter Drains & Wet/Retention Ponds			• •		
Proposed measures F	ter Drains & weaketention Ponds	5.	55 Un	Imited - D 12		Exit Tool

	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	19				
AGENCY	Annual Average Co	ncentration Zinc	e - Acute Impact Copper	Zinc		Sedir		on for this site is judged as:		
	Step 2         0.12           Step 3         0.06	0.36 ug/l 0.17 ug/l	Pass	Pass		Pass Accur Exter		lo 0.23 Low flow Vel m/s lo - Deposition Index		
Location Details										
Road number		A9 D-S		HA Area / DBFO	number					
Assessment type		Non-cumulative ass	essment (single outfall) 284069					-		
OS grid reference of assess	ment point (m)	Easting	Northing			824795				
OS grid reference of outfall s	structure (m)	Easting				Northing				
Outfall number		N9	List of outfal							
Receiving watercourse		Allt Slochd Mhuic		cumulative asse	essment					
EA receiving water Detailed	River Network ID			Assessor and aff	iliation		AMJV			
Date of assessment		03/07/2018		Version of assess	sment		4			
Notes										
Step 1 Runoff Quality AADT >10,000 and <50,000 • Climatic region Colder Wet • Rainfall site Ardtainaig (SAAR 1343.9mm) •										
Step 2 River Impacts	Annual 95%ile river f	'low (m³/s)	0.004 (Enter	zero in Annual 95%	lle river	flow box to assess Ste	p 1 runoff qua	ality only)		
	Impermeable road a	rea drained (ha)	0.595 Perme	able area draining t	o outfall	(ha) 0.154				
	Base Flow Index (BF					upstream of a protected	site for conse	ervation?		
For dissolved zinc only	Water hardness	Low= <50 mg C aC O 3/I	• D							
For sediment impact only	Is there a downstrea	m structure, lake, pon	d or canal that reduces	the velocity within	100m of	the point of discharge?		No 🔻 D		
	C Tier 1 Estimated	d river width (m)	18							
	Tier 2 Bed width	n (m)	1.24 Manni	ng's n 0.04		Side slope (m/m)	1.8230769	Long slope (m/m) 0.013652		
Step 3 Mitigation			Γ		Estir	mated effectiveness				
		Brief descript	ion	Treatment for	Atte	enuation for Sett	ement of	Predict Impact		
				solubles (%)			ients (%)			
Existing measures					Unlimite	rge rate (Vs)		Show Detailed Results		
							D			
Proposed measures Filter	Drains & Wet/Retention Por	ids		53	Unlimite	rd 🔻 🖸 72		Exit Tool		

HIGHWAYS Highways	WAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
	Solub	le - Acute Impact			Sedir	nent - Chroi	nic Impact			
Annual Average C		Copper	Zinc		Sei	liment depos	ition for thi	s site is iu	dued as:	
Step 2 0.14	0.41 ug/l	Pass	Pass	Alert.		umulating?	No		.ow flow Vel m/s	
Step 3 0.06	0.19 ug/l				Ext	ensive?	No	- 0	eposition Index	
Location Details										
Road number	A9 D-S		HA Area / DBFO	number						
Assessment type		essment (single outfall)							-	
OS grid reference of assessment point (m)	Easting	283999			Northing	825014				
OS grid reference of outfall structure (m)	Easting		-		Northing					
Outfall number	N10		List of outfall cumulative asse							
Receiving watercourse	Allt Slochd Mhuic		cumulative asse	SSILICIA						
EA receiving water Detailed River Network ID			Assessor and aff	liation		AMJV				
Date of assessment	03/07/2018		Version of assess	sment		4				
Notes						_				
Step 1 Runoff Quality AADT >10,000 ar	d < 50,000 🔹 Cli	matic region Colder	Wet 🔹	Rai	infall site Ardtalna	g (SAAR 1343.9	9mm)		•	
Step 2 River Impacts Annual 95%ile river	flow (m <sup>3</sup> /s)	0.004 (Enter z	ero in Annual 95%	ile river	flow box to assess \$	tep 1 runoff	quality only	)		
Impermeable road	area drained (ha)	0.707 Permea	ble area draining t	o outfall	(ha) 0.305	1				
· · ·	· · /		· ·		. ,					
Base Flow Index (E	FI)	207 Is the d	ischarge in or withi	n 1 km i	upstream of a protect	ed site for co	nservation?		No 🗸 D	
For dissolved zinc only Water hardness	Low= <50 mg C aC O 3/I	▼ D								
For sediment impact only Is there a downstre	am structure, lake, por	nd or canal that reduces	the velocity within	100m of	the point of discharg	e?	Yes			
○ Tier 1 Estimate	ed river width (m)	18							_	
Tier 2 Bed wide		1.45 Mannin	g'sn 0.04		Side slope (m/m)	10	Long slo	pe (m/m)	0.014401	
Step 3 Mitigation				Estir	mated effectiveness					
	Brief descrip	tion	Treatment for			ttiement of		Predict	Impact	
	Ener descrip		solubles (%)	soluble	es - restricted see	liments (%)				
					rge rate (Vs)		Sho	w Detai	led Results	
Existing measures		0	D	Unlimite	ed 🕘 🗖	D				
Proposed measures Filter Drains & Wet/Retention P	onds	5	3	Unlimite	d - 0 72			Exit	Tool	

	ways Agency Wat	er Risk Assessment To	ol version 1.0 Nove	ember 200	9			
	Copper         Zinc           0.35         1.06         ug/l           0.18         0.53         ug/l	Soluble - Acute Impact Copper	Zinc Pass	Alert.	Sedin	nulating?	ion for this site is j No 0.24	u <b>dged as:</b> Low flow Vel m/s Deposition Index
Location Details								
Road number	A9 D-S		HA Area / DBFC	number				
Assessment type		tive assessment (single out	fall)					-
OS grid reference of assessment point (n		283725			Northing	825397		
OS grid reference of outfall structure (m)					Northing			
Outfall number	N11		List of outfa					
Receiving watercourse	Allt Slochd N	1huic						
EA receiving water Detailed River Networ			Assessor and af			AMJV		
Date of assessment	03/07/2018		Version of asses	sment		4		
Notes								
Step 1 Runoff Quality AADT	>10,000 and <50,000 -	Climatic region C	older Wet 🔹	Rai	nfall site Ardtalnaig (	SAAR 1343.9m	im)	•
Impermeat	%ile river flow (m³/s) ble road area drained (f Index (BFI)	1.576 Per	meable area draining	to outfall	flow box to assess Ste (ha) 0.639 upstream of a protected			No • D
For dissolved zinc only Water hard	iness Low= <50mg C	aC O 3/I 🗸 🖸						
For sediment impact only Is there a c C Tier 1 * Tier 2	downstream structure, I Estimated river width ( Bed width (m)		ces the velocity within nning's n	100m of		0.4937313	Yes 🔻	0.038734
Step 3 Mitigation				Estir	nated effectiveness		Brodia	t Impact
	Brief	description	Treatment for solubles (%)	soluble dischar	rge rate (Vs)	ement of ents (%)		iled Results
Existing measures			0	Unlimite		D		
Proposed measures Swales/Grassed Cha	innels		50	Unlimite	d 🔽 🖻 80		Exit	Tool

HIGHWAYS	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	)9		
AGENCY	Annual Average Co	Soluble ncentration	e - Acute Impact Copper	Zinc		Sedime	nt - Chronic	: Impact
	Copper Step 2 0.09		Pass	Pass				on for this site is judged as: Yes 0.04 Low flow Vel m/s
	Step 2 0.05 Step 3 0.04	0.11 ug/l				Exten		No 8 Deposition Index
Location Details								
Road number		A9 D-S		HA Area / DBFO	number	ſ		
Assessment type			essment (single outfall	)				-
OS grid reference of assessm		Easting	282723			Northing	826218	
OS grid reference of outfall st	ructure (m)	Easting				Northing		
Outfall number		N12		List of outfal				
Receiving watercourse		Allt Cosach		cumulative asse	essmeni			
EA receiving water Detailed R	liver Network ID			Assessor and aff	iliation		AMJV	
Date of assessment		03/07/2018		Version of asses	sment		4	
Notes								
Step 1 Runoff Quality	AADT >10,000 and	<50,000 • Clir	natic region Cold	er Wet 🔹	Rai	infall site Ardtalnaig (	SAAR 1343.9m	m) 💽
Step 2 River Impacts	Annual 95%ile river f	flow (m³/s)	0.005 (Enter	zero in Annual 95%	6ile river	flow box to assess Ste	p 1 runoff qu	ality only)
	Impermeable road a	rea drained (ha)	0.545 Perme	able area draining	to outfall	l (ha) 0.397		
				Ū.				
	Base Flow Index (BF	-1)	Is the	discharge in or with	in 1 km i	upstream of a protected	site for cons	ervation?
For dissolved zinc only	Water hardness	Low= <50mg C aC O 3/I	T					
For sediment impact only	Is there a downstrea	m structure, lake, pon	d or canal that reduces	s the velocity within	100m of	f the point of discharge?		No 🔻 D
	Tier 1 Estimated	d river width (m)	1					
	C Tier 2 Bed width	. ,	1.83 Manni	ng's n 0.04		Side slope (m/m)	.4937313	Long slope (m/m) 0.038734
Step 3 Mitigation			Г		Ectir	mated effectiveness		
		Brief descript	ion	Treatment for			ement of	Predict Impact
		brief descript		solubles (%)	soluble	es - restricted sedim	ents (%)	
						rge rate ( l/s )		Show Detailed Results
Existing measures				0	Unlimite	ed - D 0	D	
Proposed measures Filter D	) rains & Swales/Grassed C	hannels	,	59	Unlimite	ed - 76		Exit Tool

HIGHWAYS AGENCY	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	nber 200	9				
AGENCY	Annual Average Co	Soluble	e - Acute Impact	Zinc		Sedir	nent - Chroi	nic Impact		
	Copper		Copper	Zinc		See	liment depos	ition for this	site is iud	aed as:
	Step 2 0.15	0.47 ug/l	Pass	Pass		Drotected Area	umulating?	No		w flow Vel m/s
	Step 3 0.07	0.22 ug/l				Ext	ensive?	No	- De	position Index
Location Details				-						
Road number		A9 D-S		HA Area / DBFO						
Assessment type			nent including sediments	(outfalls within 10	0m)					-
OS grid reference of assessment		Easting	288351			Northing	810631			
OS grid reference of outfall struc		Easting				Northing				
Outfall number		S4/S5		List of outfall cumulative asse		S4			S5	
Receiving watercourse		Allt-na-Criche (Lynwi	ilg)	cumulative asse	SSILICIL					
EA receiving water Detailed Rive	r Network ID			Assessor and aff	liation		AMJV			
Date of assessment		03/07/2018		Version of assess	sment		4			
Notes		S5 is downstream o	utfall location.							
Step 1 Runoff Quality Ar	ADT >10,000 and	<50,000 • Clir	matic region Colder	Wet •	Rai	nfall site Ardtalna	g (SAAR 1343.9	)mm)		•
Step 2 River Impacts Ar	nual 95%ile river f	low (m³/s)	0.035 (Enter z	ero in Annual 95%	ile river	flow box to assess \$	tep 1 runoff	quality only)		
Im	permeable road ar	rea drained (ha)	6.207 Permea	ble area draining t	o outfall	(ha) 5.967	1			
		. ,		ů.		· ·				
Ba	ase Flow Index (BF	I) 0.4	Is the di	ischarge in or withi	n 1 km ı	upstream of a protect	ed site for co	nservation?		Yes -
For dissolved zinc only W	ater hardness	Low= <50mgCaCO3/I	• D							
For sediment impact only Is	there a downstrear	m structure, lake, pon	d or canal that reduces t	the velocity within	100m of	the point of discharg	e?	Yes	-	
	Tier 1 Estimated	d river width (m)	1							
	Tier 2 Bed width	. ,	6.11 Mannin	d'sn 0.04		Side slope (m/m)	0.9379993	Long slop	(m/m)	0.031568
	THE 2 DEU WIULI	I (III)	Manning	ysn olo		Side slope (m/m)	0.33733333	LUNY SIO	e (n/m)	0.031566
Step 3 Mitigation					Estir	mated effectiveness				
		Brief descript	tion	Treatment for			ttlement of		Predict I	mpact
		2.101 desempt		solubles (%)	soluble	es - restricted see	liments (%)			
						gerate (Vs)		Sho	w Detail	ed Results
Existing measures			0	D	Unlimite	d 🖣 🗖 0	D			
Proposed measures Filter Drain	ns & Wet/Retention Pon	ds	5	3	Unlimite	d <b>-</b> 0 72			Exit T	Tool

AGENCY	Highways A	gency Water Risk	Assessment Tool	version 1.0 Nove	mber 200	9					
AGENCT	Annual Average Co	Solubl ncentration	e - Acute Impact Copper	Zinc			Sedime	nt - Chron	ic Impact		
	Copper           Step 2         1.02           Step 3         0.48		Pass	Pass		Try Tier 2 for Velocity		nulating?	ition for this Yes Yes	site is judged as: 0.02 Low flow Vel m/ 207 Deposition Inde	
Location Details											
Road number		A9 D-S		HA Area / DBFO							_
Assessment type			ment including sediments	6 (outfalls within 10	00m)						-
OS grid reference of assessm		Easting	289102			Northing		812069			
OS grid reference of outfall st	ructure (m)	Easting				Northing					
Outfall number		S7/S7A		List of outfal cumulative asse		S7				S7A	
Receiving watercourse		Loch Pulladern									
EA receiving water Detailed R	iver Network ID			Assessor and aff	iliation			AMJV			
Date of assessment		03/07/2018		Version of asses	sment			4			
Notes											
Step 1 Runoff Quality	AADT >10,000 and	<50,000 • Cli	matic region Colder	Wet 🗣	Rai	nfall site	Ardtalnaig (S	SAAR 1343.9	mm)		·
Step 2 River Impacts	Annual 95%ile river 1 Impermeable road a Base Flow Index (BF	rea drained (ha)	4.196 Permea	zero in Annual 95% able area draining t ischarge in or withi	o outfall	(ha)	2.9		,	Yes •	
For dissolved zinc only	Water hardness	Low= <50mgCaCO3/I	• D								
		d river width (m)	nd or canal that reduces           1           6.11         Mannin	-	100m of	the point of Side slope		0.9379993	No Long slop	e (m/m) 0.031568	
Step 3 Mitigation					Estir	nated effect	liveness				
		Brief descrip	tion	Treatment for	Atte	nuation for	Settle	ement of	┥║	Predict Impact	
Existing measures				solubles (%)		ge rate (Vs	•)	ents (%)	Show	v Detailed Result	ts
Proposed measures Filter D	rains & Wet/Retention Por	nds	5	3	Unlimite		70			Exit Tool	

HIGHWAYS Highways	Agency Water Risk Asses	sment Tool	version 1.0 Nove	mber 200	19		
Annual Average ( Step 2 0.25 Step 3 0.16	er Zinc 0.87 ug/l Pass	er	Zinc Pass		Pass Ac	nent - Chror diment depos cumulating? ensive?	hic Impact ition for this site is judged as: No 0.14 No - Deposition Index
Location Details							
Road number	A9 D-S		HA Area / DBFO				
Assessment type	Cumulative assessment inclu		s (outfalls within 10	00m)			-
OS grid reference of assessment point (m)	Easting 288290				Northing	824099	
OS grid reference of outfall structure (m)	Easting		_		Northing		
Outfall number	N4/N5		List of outfal		N4		N5
Receiving watercourse	Bogbain Burn		cumulative asse	essmeni			
EA receiving water Detailed River Network ID			Assessor and aff	filiation		AMJV	
Date of assessment	03/07/2018		Version of asses	sment		4	
Notes			-				
Step 1 Runoff Quality AADT >10,000 a	nd <50,000   Climatic reg	ion Colde	r Wet 🔹	Rai	infall site Ardtalna	ig (SAAR 1343.9	(mm)
Step 2 River Impacts Annual 95% ile rive Impermeable road Base Flow Index (f	area drained (ha)	Perme	able area draining	to outfall	flow box to assess (ha) 5.236 upstream of a protect		
For dissolved zinc only Water hardness	Low= <50mg C aC O 3/1	D					
, , , , , , , , , , , , , , , , , , , ,	am structure, lake, pond or can ed river width (m) 1 (m) 6.11	al that reduces		100m of	the point of discharg	e?	No T D Long slope (m/m) 0.031568
Step 3 Mitigation	Brief description		Treatment for		mated effectiveness enuation for S	ettlement of	Predict Impact
			solubles (%)	dischar	rge rate ( l/s )	diments (%)	Show Detailed Results
Existing measures			0	Unlimite	ed 🚽 🖸 0	D	
Proposed measures Filter Drains & Dry/Detention P	onds		45	Unlimite	rd - 70		Exit Tool

HIGHWAYS Highway	s Agency Water Ris	k Assessment Tool	version 1.0 Novem	nber 2009	9		
	Solub e Concentration	le - Acute Impact	Zinc		Sedime	nt - Chronic Imp	act
	pper Zinc	Copper	ZIIIC		Sedim	ent deposition for	r this site is judged as:
	31 0.94 ug/l	Pass	Pass			nulating? No	0.10 Low flow Vel m/s
	.17 0.52 ug/l				Extens	sive? No	- Deposition Index
Location Details Road number	A9 D-S		HA Area / DBFO r	umbor			
Assessment type		ment including sediments					
OS grid reference of assessment point (m)	Easting	284364		лп) 	Northing	824103	
OS grid reference of outfall structure (m)	Easting	204304			Northing	024103	
Outfail number	N7/N8/N9/N10/N11		List of outfalls	: in	N7		N8
Receiving watercourse	Allt Slochd Mhuic		cumulative asses		N9	N10	N11
	Allt Slochd Minuic		Assessor and affili	-	119		NT1
EA receiving water Detailed River Network ID						AMJV	
Date of assessment	03/07/2018		Version of assess	ment		4	
Notes							
Step 1 Runoff Quality AADT >10,00	) and <50,000 Cl	imatic region Colder	Wet	Raii	nfall site Ardtalnaig (5	SAAR 1343.9mm)	•
Step 2 River Impacts Annual 95%ile	un flow (m3/a)	0.012 (Enter 7					
Alliual 95%ile	ver now (ne/s)	(Enter 2	ero in Annual 95%i	le river	flow box to assess Step	p 1 runoff quality o	only)
Impermeable ro	id area drained (ha)	5.609 Permea	ble area draining to	outfall	(ha) 5.59		
Base Flow Inde	(BFI) 0	.249 Is the d	ischarge in or withir	1 km u	upstream of a protected	site for conservati	on? No •
For dissolved zinc only Water hardness	Low= <50mg CaC O3/I	▼ D					
For sediment impact only Is there a down	tream structure, lake, po	nd or canal that reduces	the velocity within 1	00m of	the point of discharge?	[	No 🔻 D
● Tier 1 Estil	ated river width (m)	1				L	
ି Tier 2 Bed	vidth (m)	6.11 Mannin	g's n 0.04		Side slope (m/m)	1.9379993 Long	slope (m/m) 0.031568
Step 3 Mitigation				Estin	nated effectiveness		
	Brief descrip	otion	Treatment for			ement of	Predict Impact
	5.00 00000		solubles (%)	soluble	es - restricted sedim	ents (%)	
					ge rate (Vs)		Show Detailed Results
Existing measures		Ō	D	Unlimited	d 🗣 🖸 0	D	
Proposed measures Filter Drains & Dry/Detention	Ponds	4	5	Unlimited	d		Exit Tool

## A.2 Method D Accidental Spillage Assessment Datasheet

9 Acciden	tal Spillage Calcu	lations												<u>.</u>				
ormula																		
	ADT x 365 x 10		1					-										
utfall etwork	Road Length (km)	Road Type	Junction Type	Spillage Accident Rates	AADT24- 2way	%HGV	Patri	Pper	p <sup>mc</sup>	Outfall Risk	Overall Prob.	Designated Area <1km	Annual Probability 1 in	RANK	Annual Probability 1 in x	-		Cumulatives
*	*			(SS) 🔭	-			• •	×.	*			x		*		*	
1	0.02457	Rural	No Junction	0.29	10955.92		4.30251E-06	0.75	3.22688E-06	0.00000322688198071		No	309897	48	10369		Overall Prob.	Annual Probability 1 in x
1	0.18197		Slip Road	0.83	10955.81		9.11994E-05	0.75	6.83996E-05	0.00006839958307874		No	14620	33				
1	0.13656		No Junction	0.29	13623.27		3.3083E-05	0.75	2.48123E-05	0.00002481225749913	0.000024812	No	40303	47				
11	1.16545		No Junction	0.29	10965.56		0.000204264	0.75	0.000153198	0.00015319815492287	0.000153198	No	6527	14	6527			
12	0.37308	the second se	No Junction	0.29	10966.11		6.53917E-05	0.75	4.90437E-05	0.00004904374651207		No	20390	40	3875			
2	0.2049		Side Road	0.93	10966.24		0.000115173	0.75	8.63801E-05	0.00008638010516168	0.000086380	No	11577	26				
2	0.22156		No Junction	0.29	10966.81		3.88364E-05	0.75	2.91273E-05	0.00002912733487549		No	34332	46	-		-	
2	0.22176		Side Road	0.93	10967.62		0.000124666	0.75	9.34996E-05	0.00009349957385318	0.000093500	No	10695	24				
3	0.50522			0.29	10966.83		8.85583E-05	0.75	6.64188E-05	0.00006641875321632	-	No	15056	35	15056		-	
4	1.77114	-	No Junction	0.29	10971.94		0.000310602	0.75	0.000232951	0.00023295143412708		No	4293	8	4293			
5	0.59162		Slip Road	0.83	8500.86		0.000202641	0.75	0.000151981	0.00015198109603739	0.000151981	No	6580	15	475			
5	0.28044			3.09	9815.53		0.000388074	1.75	0.00067913			No	1472	1	-			
5	0.10002		Roundabout	3.09	7819.98		7.32187E-05	2.75	0.000201351	0.00020135138563616		No	4966	10	-			
5	0.10008		Roundabout	3.09	9815.53		0.000138491	3.75	0.000519342	0.00051934227501133		No	1926	2				
5	0.18649	Rural	Side Road	0.93	7819.86		4.10874E-05	4.75	0.000195165	0.00019516504760660	0.000195165	No	5124	11				
5	0.14897	Rural	Side Road	0.93	9814.81		6.20393E-05	5.75	0.000356726	0.00035672568879581	0.000356726	No	2803	5				
	0.36205	Rural	No Junction	0.29	10955.92	15.1	6.33994E-05	0.75	4.75496E-05	0.00004754955722894	0.000047550	No	21031	41	21031			
	0.60887	Rural	No Junction	0.29	10956.24	15,1	0.000106624	0.75	7.99678E-05	0.00007996780699906	0.000079968	No	12505	28	12505			
В	0.433331	Rural	No Junction	0.29	10956.95	15.1	7.58887E-05	0.75	5.69165E-05	0.00005691654272897	0.000056917	No	17570	38	17570		0.000895539	1116.65
	0.62822	Rural	No Junction	0.29	10959.77	15.1	0.000110048	0.75	8.25358E-05	0.00008253578224327	0.000082536	No	12116	27	12116			
l î	0.53669	Rural	No Junction	0.29	10961.21	15.1	9.40264E-05	0.75	7.05198E-05	0.00007051980042601	0.000070520	No	14180	32	14180			
A	0.84707	Rural	No Junction	0.29	10962.05	15	0.000147432	0.75	0.000110574	0.00011057436764516	0.000110574	No	9044	20	9044			
	0.80757	Rural	No Junction	0.29	10973.83	15.1	0.000141647	0.75	0.000106235	0.00010623496479524	0.000106235	Yes	9413	21	9413			
0	0.34902	Rural	No Junction	0.29	17261.63	11.4	7.26989E-05	0.75	5.45242E-05	0.00005452417394300	0.000054524	No	18340	39	18340			
1	0.80257	Rural	No Junction	0.29	17262.85	11.4	0.000167183	0.75	0.000125387	0.00012538696655969	0.000125387	No	7975	19	7975			
12	0.29373	Rural	No Junction	0.29	17264.49	11.4	6.11924E-05	0.75	4.58943E-05	0.00004589433020395	0.000045894	No	21789	43	21789			
2	1.35522	Rural	No Junction	0.29	10978.13	15.05	0.000237009	0.75	0.000177757	0.00017775703483573	0.000177757	Yes	5626	12	5626			
	0.93835	Rural	Slip Road	0.83	17249.15	11.4	0.000558996	0.75	0.000419247	0.00041924667674603	0.000419247	No	2385	4	2147			
	0.04461	Rural	Slip Road	0.83	17249.15	11.4	2.65752E-05	1.75	4.65065E-05	0.00004650651311610	0.000046507	No	21502	42				
	2.75156	Rural	No Junction	0.29	17259	11.4	0.000573047	0.75	0.000429785	0.00042978533566746	0.000429785	No	2327	3	2327			
	0.57125	Rural	No Junction	0.29	17259.4	11.4	0.000118973	0.75	8.92296E-05	0.00008922958726314	0.000089230	No	11207	25	11207			
10 I I	0.23572		No Junction	0.29	17259.76	11.4	4.90938E-05	0.75	3.68204E-05	0.00003682037115852	0.000036820	No	27159	45	4737			
	0.4712		No Junction	0.29	17260.24		9.81404E-05	0.75	7.36053E-05	0.00007360530032579		No	13586	31			0.000521467	1917.67
	0.20101		Side Road	0.93	17259.76	11.4	0.000134256	0.75	0.000100692	0.00010069185547602	0.000100692	No	9931	23	1			0.015.000.000
	0.2638	Rural	No Junction	0.29	17260.59	11.4	5.49447E-05	0.75	4.12086E-05	0.00004120855679524	0.000041209	No	24267	44	24267			
	0.40233	Rural	No Junction	0.29	15160.96	15.6	0.000100722	0.75	7.55415E-05	0.00007554154158080	0.000075542	Yes	13238	30	13238			
0	1.01018		Side Road	0.93	3314.26		7.6144E-05	0.75	5.7108E-05	0.00005710803543781	0.000057108	No	17511	37	17511			
	0.94393			0.29	15160.91		0.000236309	0.75	0.000177232	0.00017723185489870		Yes	5642	13	5642		1	
	0.4192		No Junction	0.29	15158.25		0.000104927	0.75	7.8695E-05	0.00007869498619788	-	Yes	12707	29	12707			
	0.01681		Side Road	0.93	1199.85		5.75108E-07	0.75	4.31331E-07	0.00000043133135704	0.000000431	Yes	2318403	49	1690			
	0.71139		No Junction	0.29	13628.47		0.000172407	0.75	0.000129305	0.00012930528206973		Yes	7734	17				
	0.68624		No Junction	0.29	15159.14		0.000171777	0.75	0.000128833	0.00012883305842861	0.000128833	Yes	7762	18			0.000809819	1234.84
	0.61979		Slip Road	0.83	15159.76		0.000444051	0.75	0.000333038	0.00033303793824858	0.000333038	Yes	3003	6				
	1.20053		No Junction	0.29	13628.33		0.000290948	0.75	0.000218211	0.00021821121412362		Yes	4583	9	4583			
	0.5555			0.29	13627.97		0.000134622	0.75	0.000100966	0.00010096634607063	0.000100966	No	9904	22	9904		-	
	1.72426	-	No Junction	0.29	13626.95		0.000417832	0.75	0.000313374	0.00031337390055144	-	Yes	3191	7	3191			1000000
A	0.36667		No Junction	0.29	13627.85		8.88593E-05	0.75	6.66445E-05	0.00006664447187283		Yes	15005	34	15005		0.000380018	2631.45
3	0.71773		No Junction	0.29	13625.42		0.000173905	0.75	0.000130428	0.00013042847159182	0.000130428	No	7667	16	7667		-	
,	-	Rural	No Junction	0.29	13623.51		8.25346E-05	0.75	6.19009E-05	0.00006190091389349		No	16155	36	16155			