

## **Appendix 11 Road Drainage and the Water Environment**

Gaugers Burn Outfall

HIGHWAYS AGENCY		Highways Agency Water Risk Assessment Tool version 1.0 November 2009			
Annual Average Concentration		Soluble - Acute Impact		Sediment - Chronic Impact	
	Copper	Zinc	Copper	Zinc	Sediment deposition for this site is judged as:
Step 2	0.00	0.00	Pass	Pass	Accumulating? No 0.19 Low flow Vel m/s
Step 3	-	-	Pass	Pass	Extensive? No - Deposition Index
OS grid reference of assessment point (m)	Easting	369021	Northing	770328	
OS grid reference of outfall structure (m)	Easting		Northing		
Outfall number			List of outfalls in cumulative assessment		
Receiving watercourse	Luther Water				
EA receiving water Detailed River Network ID			Assessor and affiliation	CP AMEY	
Date of assessment	26/07/2019		Version of assessment		
Notes					
<b>Step 1 Runoff Quality</b>	AADT	>10,000 and <50,000	Climatic region	Colder Dry	Rainfall site
					Edinburgh (SAAR 676.2mm)
<b>Step 2 River Impacts</b>	Annual 95%ile river flow (m³/s)	0.43	(Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only)		
	Impermeable road area drained (ha)	0.85627	Permeable area draining to outfall (ha) 2.35964		
	Base Flow Index (BFI)	0.58	Is the discharge in or within 1 km upstream of a protected site for conservation? No		
<b>For dissolved zinc only</b>	Water hardness	Low = <50mg CaCO3/l			
<b>For sediment impact only</b>	Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No				
	Tier 1 Estimated river width (m)	8	Manning's n	0.07	Side slope (m/m)
	Tier 2 Bed width (m)	3			Long slope (m/m) 0.0001
<b>Step 3 Mitigation</b>	Brief description		Estimated effectiveness		
			Treatment for solubles (%)	Attenuation for solubles - restricted discharge rate (1/s)	Settlement of sediments (%)
Existing measures			0	Unlimited	0
Proposed measures			0	Unlimited	0
<b>Predict Impact</b> <b>Show Detailed Results</b> <b>Exit Tool</b>					

Unnamed Watercourse adjacent to Mains of Newton

Annual Average Concentration		Soluble - Acute Impact		Zinc		Sediment - Chronic Impact		
	Copper	Zinc	Copper	Zinc		Sediment deposition for this site is judged as:		
Step 2	0.01	0.02	Pass	Pass	Pass	Accumulating?	No	0.19
Step 3	-	-				Extensive?	No	-
			ug/l	ug/l				Low flow Vel m/s
								Deposition Index

Location Details			
Road number	A90		HA Area / DBFO number
Assessment type	Non-cumulative assessment (single outfall)		
OS grid reference of assessment point (m)	Easting	369827	Northing
OS grid reference of outfall structure (m)	Easting		Northing
Outfall number	List of outfalls in cumulative assessment		
Receiving watercourse	Luther Water		
EA receiving water Detailed River Network ID			Assessor and affiliation
Date of assessment	26/07/2019		CP AMEY
Version of assessment			
Notes			

Step 1 Runoff Quality			
AADT	>10,000 and <50,000	Climatic region	Colder Dry
Rainfall site	Edinburgh (SAAR 676.2mm)		

Step 2 River Impacts			
Annual 95%ile river flow (m³/s)	0.43	(Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only)	
Impermeable road area drained (ha)	5.05206	Permeable area draining to outfall (ha)	5.86292
Base Flow Index (BFI)	0.58	Is the discharge in or within 1 km upstream of a protected site for conservation?	
		No	
For dissolved zinc only			
Water hardness	Low = <50mg CaCO3/l		
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			
<input checked="" type="checkbox"/> Tier 1	Estimated river width (m)	6	
<input type="checkbox"/> Tier 2	Bed width (m)	3	
	Manning's n	0.07	
	Side slope (m/m)	0.5	
	Long slope (m/m)	0.0001	


  

Step 3 Mitigation		Estimated effectiveness			
Brief description	Treatment for solubles (%)	Attenuation for solubles - restricted discharge rate (1/s)		Settlement of sediments (%)	
		0	Unlimited	0	0
Existing measures	0	Unlimited	0	0	
Proposed measures	0	Unlimited	0	0	

<b>Predict Impact</b>
<b>Show Detailed Results</b>
<b>Exit Tool</b>

Attenuation Basin A – Surface water



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**Assessment of Priority Outfalls**

**Method D – assessment of risk from accidental spillage**

	Additional columns for use if other roads drain to the same outfall						Totals	Return Period
	A (main road)	B	C	D	E	F		
D1   Water body type	Surface watercourse	Surface watercourse	Surface watercourse	Surface watercourse	Surface watercourse	Surface watercourse		
D2   Length of road draining to outfall (m)	1,222	899	1,068	135	135	354		
D3   Road Type (A=road or Motorway)	A	A	A	A	A	A		
D4   If A road, is site urban or rural?	Rural	Rural	Rural	Rural	Rural	Rural		
D5   Junction type	No junction	Slip road	Slip road	Roundabout	Roundabout	No junction		
D6   Location	< 1hour	< 1hour	< 1hour	< 1hour	< 1hour	< 1hour		
D7   Traffic flow (AADT two way)	31,128	4,480	4,142	3,882	3,798	8048		
D8   % HGV	7.1	2.8	2.4	1.5	1.64	1.95		
D8   Spillage factor (not % HGV/year)	0.29	0.83	0.83	3.09	3.09	0.29		
D9   Risk of accidental spillage	0.00029	0.00003	0.00003	0.00001	0.00001	0.00001		
D10   Probability factor	0.60	0.60	0.60	0.60	0.60	0.60		
D11   Risk of pollution incident	0.00017	0.00002	0.00002	0.00001	0.00001	0.00000		
D12   Is risk greater than 0.01?	No	No	No	No	No	No		
D13   Return period without pollution reduction measures	0.00017	0.00002	0.00002	0.00001	0.00001	0.00000	0.0002	4428
D14   Existing measures factor	1	1	1	1	1	1		
D15   Return period with existing pollution reduction	0.00017	0.00002	0.00002	0.00001	0.00001	0.00000	0.0002	4428
D16   Proposed measures factor	1	1	1	1	1	1		
D17   Residual with proposed Pollution reduction measures	0.00017	0.00002	0.00002	0.00001	0.00001	0.00000	0.0002	4428

Justification for choice of existing measures factors:

Justification for choice of proposed measures factors:

**Table D1**

Serious Accidental Spillages (Billion HGV / km / year)		Motorways	Rural Trunk	Urban Trunk
Location	No junction	0.36	0.29	0.31
	Slip road	0.43	0.83	0.36
	Roundabout	3.09	3.09	5.35
	Cross road	-	0.88	1.46
	Side road	-	0.33	1.81
	Total	0.37	0.45	0.85

**Table 7.1**

System	Optimum Risk Reduction Factor
Filter Drain	0.6
Grassed Ditch / Swale	0.6
Pond	0.5
Wetland	0.4
Soakaway / Infiltration basin	0.6
Sediment Trap	0.6
Unlined Ditch	0.7
Penstock / Valve	0.4
Notched Weir	0.6
Oil Separator	0.5

Attenuation Basin A – Groundwater



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Assessment of Priority Outfalls

Method D - assessment of risk from accidental spillage

Additional columns for use if other roads drain to the same outfall

	A (main road)	B	C	D	E	F		
D1	Water body type	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater		
D2	Length of road draining to outfall (m)	1,222	899	1,068	135	135		
D3	Road Type (A=road or Motorway)	A	A	A	A	A		
D4	If A road, is site urban or rural?	Rural	Rural	Rural	Rural	Rural		
D5	Junction type	No junction	Slip road	Slip road	Roundabout	Roundabout		
D6	Location	< 1hour	< 1hour	< 1hour	< 1hour	< 1hour		
D7	Traffic flow (AADT two way)	31,128	4,480	4,142	3,882	3,738		
D8	% HGV	7.1	2.8	2.4	1.5	1.64		
D8	Spillage factor (no/lt <sup>2</sup> HGV/km/year)	0.29	0.83	0.83	3.09	3.09		
D9	Risk of accidental spillage	0.00029	0.00003	0.00003	0.00001	0.00001		
D10	Probability factor	0.30	0.30	0.30	0.30	0.30		
D11	Risk of pollution incident	0.00003	0.00001	0.00001	0.00000	0.00000		
D12	Is risk greater than 0.01?	No	No	No	No	No	Totals	Return Period
D13	Return period without pollution reduction measures	0.00009	0.00001	0.00001	0.00000	0.00000	0.0001	8855
D14	Existing measures factor	1	1	1	1	1		
D15	Return period with existing pollution reduction	0.00009	0.00001	0.00001	0.00000	0.00000	0.0001	8855
D16	Proposed measures factor	1	1	1	1	1		
D17	Residual with proposed Pollution reduction measures	0.00009	0.00001	0.00001	0.00000	0.00000	0.0001	8855

Justification for choice of existing measures factors:

Justification for choice of proposed measures factors:


Table D1

Serious Accidental Spillages (Billion HGV km/year)		Motorways	Rural Trunk	Urban Trunk
Location	No junction	0.36	0.29	0.31
	Slip road	0.43	0.83	0.36
	Roundabout	3.09	3.09	5.35
	Cross road	-	0.88	1.46
	Side road	-	0.93	1.81
	Total	0.37	0.45	0.85

Table 7.1

System	Optimum Risk Reduction Factor
Filter Drain	0.6
Grassed Ditch / Swale	0.6
Pond	0.5
Wetland	0.4
Soak away / Infiltration basin	0.6
Sediment Trap	0.6
Unlined Ditch	0.7
Penstock / valve	0.4
Notched Weir	0.6
Oil Separator	0.5

Attenuation Basin C- Surface Water



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**Assessment of Priority Outfalls**

**Method D - assessment of risk from accidental spillage**

	Additional columns for use if other roads drain to the same outfall						Totals	Return Period
	A (main road)	B	C	D	E	F		
D1 Water body type	Surface watercourse							
D2 Length of road draining to outfall (m)	506							
D3 Road Type (A=road or Motorway)	A							
D4 If A road, is site urban or rural?	Rural							
D5 Junction type	Side road							
D6 Location	< 1 hour							
D7 Traffic flow (AADT two way)	3,275							
D8 % HGV	2.35							
D8 Spillage factor (no/10 <sup>8</sup> HGV/km/year)	0.93							
D9 Risk of accidental spillage	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000		
D10 Probability factor	0.60							
D11 Risk of pollution incident	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000		
D12 Is risk greater than 0.01?	No							
D13 Return period without pollution reduction measures	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	137807
D14 Existing measures factor	1							
D15 Return period with existing pollution reduction	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	137807
D16 Proposed measures factor	1							
D17 Residual with proposed Pollution reduction measures	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	137807

Justification for choice of existing measures factors:

Justification for choice of proposed measures factors:

**Table D1**

Serious Accidental Spillages (Billion HGV / km / year)		Motorways	Rural Trunk	Urban Trunk
Location	No junction	0.36	0.29	0.31
	Slip road	0.43	0.83	0.36
	Roundabout	3.09	3.09	5.35
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<b>Total</b>		<b>0.37</b>	<b>0.45</b>	<b>0.85</b>

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Filter Drain	0.6
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Soakaway / Infiltration basin	0.6
Sediment Trap	0.6
Unlined Ditch	0.7
Penstock / valve	0.4
Notched Weir	0.6
Oil Separator	0.5

Attenuation Basin C – Groundwater

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**Assessment of Priority Outfalls**

**Method D - assessment of risk from accidental spillage**

	A (main road)	Additional columns for use if other roads drain to the same outfall					Totals	Return Period
		B	C	D	E	F		
D1 Water body type	Groundwater							
D2 Length of road draining to outfall (m)	506							
D3 Road Type (A-road or Motorway)	A							
D4 If A road, is site urban or rural?	Rural							
D5 Junction type	No junction							
D6 Location	< 1 hour							
D7 Traffic flow (AADT two way)	3,275							
D8 % HGV	2.15							
D8 Spillage factor (no/10 <sup>6</sup> HGVkm/year)	0.93							
D9 Risk of accidental spillage	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000		
D10 Probability factor	0.30							
D11 Risk of pollution incident	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000		
D12 Is risk greater than 0.01?	No							
D13 Return period without pollution reduction measures	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	275615
D14 Existing measures factor	1							
D15 Return period with existing pollution reduction	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	275615
D16 Proposed measures factor	1							
D17 Residual with proposed Pollution reduction measures	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	275615

Justification for choice of existing measures factors:

Justification for choice of proposed measures factors:

**Table D1**

Serious Accidental Spillages		Motorways	Rural Trunk	Urban Trunk
(Billion HGV km/year)				
Location	No junction	0.36	0.25	0.31
	Slip road	0.43	0.33	0.36
	Roundabout	3.09	3.09	5.35
	Cross road	-	0.88	1.46
	Side road	-	0.93	1.81
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Notched Weir	0.6
Oil Separator	0.5

