APPENDIX D – Ground Investigation

Historic and Current Uses of Ardersier Port, Inverness

Ardersier Port is situated on the southern shore of the Moray Firth near Inverness. The site was originally developed in the 1970s to support the construction of offshore oil platforms, with the establishment of the McDermott fabrication yard. Following the downturn in oil platform construction, the site was decommissioned and subsequently fell into disuse. In recent years, Ardersier Port has been proposed for redevelopment to support renewable energy projects and the offshore decommissioning sector. The port is currently being redeveloped as a strategic hub for the energy transition, including offshore wind development, subsea infrastructure support, and large-scale industrial use.

The proposed Phase 2 Yard Space development, the focus of this assessment, includes areas of both former port infrastructure in the north and an area of Forestry Commission managed woodland to the south of the port.

Site Geology and Ground Conditions

In the northern former fabrication yard area, ground conditions have been previously established by historic phases of post decommissioning/demolition ground investigation works undertaken in 2007 (*Envirocentre Ltd.*) consisting of boreholes and trial pit excavations across the site. More recent ground investigations have also been undertaken in 2023-2024 (*Solmek Ltd.*) associated with the new Quay Wall construction at the northern edges of the port, which are located to the north and west of the proposed Phase 2 yard space, consisting of deep boreholes and in-situ CPT and soil infiltration testing in trial pit excavations.

A review this historic investigation information identifies that in much of the former fabrication yard area of the site Made Ground and Fill deposits are present at surface, generally described as reworked natural Sand deposits (Raised Marine Deposits) with some localised areas of deeper made ground which includes anthropogenic content. These deposits, which vary in thickness and composition, are a result of the historic industrial uses and subsequent decommissioning and demolition activities. Underlying the granular Fill and Made Ground layers at site surface, the natural superficial geology comprises Raised Marine Deposits, primarily *medium dense to dense slightly silty slightly gravelly fine to coarse Sands*.

Boreholes drilled to depths of >60.0mbgl within the port site have not encountered bedrock, confirming the solid geology is present at significant depth beneath the site.

Groundwater was encountered at approximate depths between 3.00 to 5.00mbgl. The groundwater within this depth range is subject to tidal influence, consistent with the site's coastal location adjacent to the Moray Firth. Previous data logging of the groundwater level has indicated hydraulic connection between the underlying natural Sands and the nearby coastal/estuarine waters, which will lead to fluctuations in groundwater levels in response to tidal cycles. Previous data logging of the groundwater level has indicated approximately 0.4m of groundwater level fluctuation.

To the south, the proposed Phase 2 yard space will extend into an area of largely previously undeveloped forestry land. There is not extensive previous ground investigation information available for this southern area of the site however historic BGS borehole information and the historic use of this area indicate the ground conditions are less disturbed, with a topsoil layer overlying natural Raised Marine Sands at shallow depth, reflecting the land’s long-term use as woodland. Access tracks and surface water drainage ditches are present throughout the woodland.

Soil Infiltration Testing

Previous phases of site investigation carried out by *Solmek Ltd.* and *MAT test Site Services Ltd* included in-situ soil infiltration testing in close proximity to the northern section of the proposed Phase 2 Yard Space. These tests were conducted within areas of made ground overlying natural Raised Marine Sand deposits, which are consistent with the ground conditions identified across the northern part of the proposed Phase 2 yard space development area. As such, the results of this testing are considered relevant to the current development plans.

The infiltration data obtained allows an assessment of the permeability characteristics of the superficial soils, supporting the assessment of surface water drainage strategies and the feasibility of sustainable drainage systems (SuDS) within the Phase 2 area. Three tests per test location were undertaken and all testing was completed in accordance with BRE Digest 365. Refer to the Infiltration Testing Results Summary for the testing results.

CALCULATION

FAIRHURST

Contract:	Ardersier Port Phase 2
Title:	Infiltration Testing Results Summary

Sheet No.	1 of 1 Rev
Contract No.	162855
Date:	13/06/2025
Designer:	HF
Checker:	AH

Author	Report/ Document	Test Reference	Average Infiltration Rate (m/s)
Solmek	S231026 - Factual Site Investigation Report Quay Wall Phase 3, Ardersier Port, Inverness	BHAWA02	1.77E-04
Solmek	S231026 - Factual Site Investigation Report Quay Wall Phase 3, Ardersier Port, Inverness	BHFWA03	2.10E-04
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit 2	3.72E-05
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit 4	8.57E-05
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit 5	2.41E-05
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit 6	3.55E-05
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit 7	1.57E-05
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit 8	5.13E-05
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit E1	1.02E-04
MATTest	Summary of Percolation Tests Haventus, Ardersier Port	Trial Pit E2	7.56E-05

APPENDIX E – Design Calculations

CALCULATION

FAIRHURST

Contract	Port of Ardersier Phase 2
Part of Structure	Existing WWPS Inflow Capacity Estimate

Sheet No.	1 of 1 Rev -
Contract No.	162855
Date	07/05/2025
Designer	AH
Checker	DE

Foul Discharge Calculations

Equivalent No. of Properties : H = 2000 Per Scottish Water meeting 07/05/2025

Demand per property: $Q_{f,base}$ = 400 litres/property/day (PDE form Guidance, 3.5 - Foul Discharge - Domestic)

Flow Calculations

Average Flow Demand : $Q_{f,avg} = (Q_{f,base} \times H) / 86400 =$ ***9.259 l/s***

Maximum Flow Demand : $Q_{f,max} = 2.5 \times Q_{f,avg} =$ ***23.148 l/s***

CALCULATION

FAIRHURST

Contract:	Port of Ardersier - Phase 2
Title:	Groundwater Risk Screening Matrix

Sheet No.	1 of 1 Rev -
Contract No.	162855
Date:	22/04/2025
Designer:	AH
Checker:	AKF

Element Number	Element Description	Risk Description	Risk Score (RS)	Weighting Factor (WF)	Risk Score (RS x WF)
1	Pollution Hazard Traffic Density	All standard urban land use types (excluding high hazard and trunk roads/motorways) All standard urban land use types (excluding high hazard and trunk roads/motorways)	1	15	15
2	Standard Average Annual Rainfall	<740mm	1	15	15
3	Type of SuDS	Continuous unlined linear collection and conveyance components (eg filter strips, swales)	1	15	15
4	Unsaturated Zone Depth	1-5m	3	20	60
5	Predominant Flow Type Through Toils	Intergranular flow (occurs in unconsolidated or non-fractured consolidated deposits and fine or medium sands)	1	20	20
6	Unsaturated Zone Material	<1% Clay	3	5	15
7	Unsaturated Zone Organic Carbon Content : soil organic matter (SOM) content	<1% SOM	3	5	15
8	Unsaturated Zone pH	>8	1	5	5
				Total Risk Score	160

Low or Medium - Use Simple Index Approach. Note: For discharges to protected groundwater bodies, implement an upstream treatment component that will provide groundwater protection in the event of an unexpected pollution event or poor system performance.

Note: Sub-soil information based on interim borehole logs and Phase 1 Ground Investigation report. Final risk screening to be undertaken upon completion of Phase 2 Ground Investigation.

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RES01		5.00	4.210		281550.554	857599.425	0.725
ICS01			4.210	500	281594.048	857573.764	1.062
RES02		5.00	4.505		281564.782	857623.541	1.025
ICS02	0.134	5.00	4.210	500	281608.276	857597.880	1.248
ICS03			4.393	500	281612.951	857605.803	1.493
MHS01	0.044	5.00	4.444	1200	281621.994	857600.468	1.614
Jct 01			4.113		281643.096	857588.018	1.405
Jct 02			4.031		281639.793	857582.420	1.356
Jct 03	0.027	5.00	4.025		281644.960	857579.371	1.380
MHS04	0.080	5.00	4.088	1200	281629.971	857553.965	0.924
MHS02			4.016	1200	281637.211	857566.237	1.447
MHS03			4.491	1200	281642.810	857562.934	1.965
SOAKAWAY			4.495		281649.192	857559.168	2.006

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RES01	ICS01	50.500	0.600	3.485	3.148	0.337	149.9	225	5.79	50.0
1.001	ICS01	ICS02	28.000	0.600	3.148	2.962	0.186	150.5	225	6.23	50.0
2.000	RES02	ICS02	50.500	0.600	3.480	2.962	0.518	97.5	225	5.64	50.0
1.002	ICS02	ICS03	9.200	0.600	2.962	2.900	0.062	148.4	225	6.37	50.0
1.003	ICS03	MHS01	10.500	0.600	2.900	2.830	0.070	150.0	225	6.54	50.0
1.004	MHS01	Jct 01	24.500	0.600	2.830	2.708	0.122	200.8	225	6.98	50.0
1.005	Jct 01	Jct 02	6.500	0.600	2.708	2.675	0.033	197.0	225	7.10	50.0
1.006	Jct 02	Jct 03	6.000	0.600	2.675	2.645	0.030	200.0	225	7.21	50.0
1.007	Jct 03	MHS02	15.250	0.600	2.645	2.569	0.076	200.7	300	7.44	50.0
3.000	MHS04	MHS02	14.248	0.600	3.164	2.569	0.595	23.9	225	5.09	50.0
1.008	MHS02	MHS03	6.500	0.600	2.569	2.526	0.043	151.2	300	7.52	50.0
1.009	MHS03	SOAKAWAY	7.411	0.600	2.526	2.489	0.037	200.3	300	7.63	50.0

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	42	0	0	200	42	0	0
30	42	0	0				

Node SOAKAWAY Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.18000	Invert Level (m)	2.489	Depth (m)	
Side Inf Coefficient (m/hr)	0.18000	Time to half empty (mins)	383	Inf Depth (m)	
Safety Factor	5.0	Pit Width (m)	30.000	Number Required	1
Porosity	0.30	Pit Length (m)	30.000		

Node Jct 01 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.004
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.708	Surround Shape	(Trench)
Safety Factor	1.0	Time to half empty (mins)	136	Diameter (mm)	2000

Node Jct 02 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.005
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.675	Surround Shape	(Trench)
Safety Factor	1.0	Time to half empty (mins)	177	Diameter (mm)	2000

Node Jct 03 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.006
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.645	Surround Shape	(Trench)
Safety Factor	1.0	Time to half empty (mins)	196	Diameter (mm)	2000

Node MHS02 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.007
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.569	Surround Shape	(Trench)
Safety Factor	1.0	Time to half empty (mins)	248	Diameter (mm)	2000

Node MHS02 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	3.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.569	Surround Shape	(Trench)
Safety Factor	1.0	Time to half empty (mins)	188	Diameter (mm)	2000

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year +42% CC 15 minute summer	106.618	30.169	2 year +42% CC 8640 minute winter	1.440	0.569
2 year +42% CC 15 minute winter	74.820	30.169	2 year +42% CC 10080 minute summer	2.032	0.518
2 year +42% CC 30 minute summer	72.168	20.421	2 year +42% CC 10080 minute winter	1.312	0.518
2 year +42% CC 30 minute winter	50.644	20.421	30 year +42% CC 15 minute summer	305.935	86.569
2 year +42% CC 60 minute summer	51.108	13.506	30 year +42% CC 15 minute winter	214.691	86.569
2 year +42% CC 60 minute winter	33.955	13.506	30 year +42% CC 30 minute summer	214.708	60.755
2 year +42% CC 120 minute summer	36.592	9.670	30 year +42% CC 30 minute winter	150.672	60.755
2 year +42% CC 120 minute winter	24.311	9.670	30 year +42% CC 60 minute summer	154.412	40.807
2 year +42% CC 180 minute summer	30.257	7.786	30 year +42% CC 60 minute winter	102.588	40.807
2 year +42% CC 180 minute winter	19.668	7.786	30 year +42% CC 120 minute summer	99.020	26.168
2 year +42% CC 240 minute summer	25.039	6.617	30 year +42% CC 120 minute winter	65.786	26.168
2 year +42% CC 240 minute winter	16.636	6.617	30 year +42% CC 180 minute summer	78.492	20.199
2 year +42% CC 360 minute summer	20.166	5.190	30 year +42% CC 180 minute winter	51.022	20.199
2 year +42% CC 360 minute winter	13.109	5.190	30 year +42% CC 240 minute summer	63.360	16.744
2 year +42% CC 480 minute summer	16.380	4.329	30 year +42% CC 240 minute winter	42.095	16.744
2 year +42% CC 480 minute winter	10.882	4.329	30 year +42% CC 360 minute summer	49.348	12.699
2 year +42% CC 600 minute summer	13.676	3.741	30 year +42% CC 360 minute winter	32.077	12.699
2 year +42% CC 600 minute winter	9.345	3.741	30 year +42% CC 480 minute summer	39.093	10.331
2 year +42% CC 720 minute summer	12.348	3.309	30 year +42% CC 480 minute winter	25.972	10.331
2 year +42% CC 720 minute winter	8.299	3.309	30 year +42% CC 600 minute summer	31.998	8.752
2 year +42% CC 960 minute summer	10.290	2.710	30 year +42% CC 600 minute winter	21.863	8.752
2 year +42% CC 960 minute winter	6.816	2.710	30 year +42% CC 720 minute summer	28.417	7.616
2 year +42% CC 1440 minute summer	7.571	2.029	30 year +42% CC 720 minute winter	19.098	7.616
2 year +42% CC 1440 minute winter	5.088	2.029	30 year +42% CC 960 minute summer	23.064	6.073
2 year +42% CC 2160 minute summer	5.441	1.504	30 year +42% CC 960 minute winter	15.278	6.073
2 year +42% CC 2160 minute winter	3.749	1.504	30 year +42% CC 1440 minute summer	16.361	4.385
2 year +42% CC 2880 minute summer	4.535	1.215	30 year +42% CC 1440 minute winter	10.996	4.385
2 year +42% CC 2880 minute winter	3.047	1.215	30 year +42% CC 2160 minute summer	11.407	3.152
2 year +42% CC 4320 minute summer	3.466	0.906	30 year +42% CC 2160 minute winter	7.860	3.152
2 year +42% CC 4320 minute winter	2.283	0.906	30 year +42% CC 2880 minute summer	9.332	2.501
2 year +42% CC 5760 minute summer	2.896	0.741	30 year +42% CC 2880 minute winter	6.272	2.501
2 year +42% CC 5760 minute winter	1.874	0.741	30 year +42% CC 4320 minute summer	6.983	1.826
2 year +42% CC 7200 minute summer	2.505	0.639	30 year +42% CC 4320 minute winter	4.598	1.826
2 year +42% CC 7200 minute winter	1.617	0.639	30 year +42% CC 5760 minute summer	5.765	1.476
2 year +42% CC 8640 minute summer	2.231	0.569	30 year +42% CC 5760 minute winter	3.731	1.476

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +42% CC 7200 minute summer	4.958	1.265
30 year +42% CC 7200 minute winter	3.200	1.265
30 year +42% CC 8640 minute summer	4.402	1.123
30 year +42% CC 8640 minute winter	2.841	1.123
30 year +42% CC 10080 minute summer	4.005	1.022
30 year +42% CC 10080 minute winter	2.585	1.022
200 year +42% CC 15 minute summer	472.106	133.590
200 year +42% CC 15 minute winter	331.302	133.590
200 year +42% CC 30 minute summer	337.163	95.405
200 year +42% CC 30 minute winter	236.606	95.405
200 year +42% CC 60 minute summer	246.430	65.124
200 year +42% CC 60 minute winter	163.722	65.124
200 year +42% CC 120 minute summer	156.812	41.441
200 year +42% CC 120 minute winter	104.182	41.441
200 year +42% CC 180 minute summer	123.209	31.706
200 year +42% CC 180 minute winter	80.089	31.706
200 year +42% CC 240 minute summer	98.565	26.048
200 year +42% CC 240 minute winter	65.485	26.048
200 year +42% CC 360 minute summer	75.501	19.429
200 year +42% CC 360 minute winter	49.077	19.429
200 year +42% CC 480 minute summer	59.042	15.603
200 year +42% CC 480 minute winter	39.226	15.603

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
200 year +42% CC 600 minute summer	47.847	13.087
200 year +42% CC 600 minute winter	32.692	13.087
200 year +42% CC 720 minute summer	42.158	11.299
200 year +42% CC 720 minute winter	28.333	11.299
200 year +42% CC 960 minute summer	33.819	8.905
200 year +42% CC 960 minute winter	22.402	8.905
200 year +42% CC 1440 minute summer	23.664	6.342
200 year +42% CC 1440 minute winter	15.904	6.342
200 year +42% CC 2160 minute summer	16.276	4.498
200 year +42% CC 2160 minute winter	11.214	4.498
200 year +42% CC 2880 minute summer	13.184	3.533
200 year +42% CC 2880 minute winter	8.860	3.533
200 year +42% CC 4320 minute summer	9.724	2.542
200 year +42% CC 4320 minute winter	6.404	2.542
200 year +42% CC 5760 minute summer	7.943	2.033
200 year +42% CC 5760 minute winter	5.141	2.033
200 year +42% CC 7200 minute summer	6.770	1.727
200 year +42% CC 7200 minute winter	4.369	1.727
200 year +42% CC 8640 minute summer	5.965	1.522
200 year +42% CC 8640 minute winter	3.850	1.522
200 year +42% CC 10080 minute summer	5.391	1.375
200 year +42% CC 10080 minute winter	3.480	1.375

Results for 2 year +42% CC Critical Storm Duration. Lowest mass balance: 98.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RES01	1	3.485	0.000	0.0	0.0000	0.0000	OK
15 minute summer	ICS01	1	3.148	0.000	0.0	0.0000	0.0000	OK
15 minute summer	RES02	1	3.480	0.000	0.0	0.0000	0.0000	OK
15 minute summer	ICS02	11	3.095	0.133	23.4	0.0260	0.0000	OK
15 minute summer	ICS03	11	3.035	0.135	22.6	0.0264	0.0000	OK
15 minute summer	MHS01	11	2.986	0.156	29.8	0.1759	0.0000	OK
15 minute summer	Jct 01	12	2.854	0.146	29.7	1.1330	0.0000	OK
15 minute summer	Jct 02	12	2.820	0.145	28.5	0.4558	0.0000	OK
15 minute summer	Jct 03	12	2.788	0.143	32.2	0.4188	0.0000	OK
15 minute summer	MHS04	10	3.219	0.055	14.0	0.0619	0.0000	OK
15 minute summer	MHS02	12	2.738	0.169	43.5	1.4447	0.0000	OK
15 minute summer	MHS03	12	2.682	0.156	42.9	0.1763	0.0000	OK
120 minute summer	SOAKAWAY	82	2.581	0.092	26.9	24.8683	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	RES01	1.000	ICS01	0.0	0.000	0.000	0.0000
15 minute summer	ICS01	1.001	ICS02	0.0	0.000	0.000	0.3411
15 minute summer	RES02	2.000	ICS02	0.0	0.000	0.000	0.6151
15 minute summer	ICS02	1.002	ICS03	22.6	0.922	0.531	0.2263
15 minute summer	ICS03	1.003	MHS01	22.6	0.836	0.534	0.2840
15 minute summer	MHS01	1.004	Jct 01	29.7	1.098	0.813	0.6811
15 minute summer	Jct 01	1.005	Jct 02	28.5	1.052	0.773	0.1761
15 minute summer	Jct 02	1.006	Jct 03	28.5	1.066	0.778	0.1609
15 minute summer	Jct 03	1.007	MHS02	32.1	0.866	0.411	0.5653
15 minute summer	MHS04	3.000	MHS02	13.9	1.046	0.131	0.2740
15 minute summer	MHS02	1.008	MHS03	42.9	1.099	0.475	0.2535
15 minute summer	MHS03	1.009	SOAKAWAY	42.7	2.421	0.546	0.1524
120 minute summer	SOAKAWAY	Infiltration		9.1			

Results for 30 year +42% CC Critical Storm Duration. Lowest mass balance: 98.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RES01	21	3.624	0.139	9.0	0.0000	0.0000	OK
30 minute summer	ICS01	20	3.608	0.460	20.6	0.0901	0.0000	SURCHARGED
30 minute summer	RES02	20	3.619	0.139	9.9	0.0000	0.0000	OK
30 minute summer	ICS02	20	3.603	0.641	64.5	0.1256	0.0000	SURCHARGED
30 minute summer	ICS03	20	3.508	0.608	42.8	0.1191	0.0000	SURCHARGED
30 minute summer	MHS01	19	3.408	0.578	61.1	0.6535	0.0000	SURCHARGED
30 minute summer	Jct 01	21	3.079	0.371	59.2	4.2716	0.0000	SURCHARGED
30 minute summer	Jct 02	20	3.001	0.326	57.3	1.1287	0.0000	SURCHARGED
30 minute summer	Jct 03	20	2.934	0.289	63.9	0.9155	0.0000	OK
15 minute summer	MHS04	10	3.259	0.095	40.2	0.1075	0.0000	OK
30 minute summer	MHS02	19	2.880	0.311	94.8	3.1957	0.0000	SURCHARGED
240 minute summer	MHS03	168	2.835	0.309	47.8	0.3493	0.0000	SURCHARGED
240 minute summer	SOAKAWAY	172	2.834	0.345	47.6	93.1856	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
30 minute summer	RES01	1.000	ICS01	-9.0	-0.290	-0.213	1.6536
30 minute summer	ICS01	1.001	ICS02	-20.6	-0.519	-0.487	1.1136
30 minute summer	RES02	2.000	ICS02	-9.9	-0.303	-0.188	1.6564
30 minute summer	ICS02	1.002	ICS03	42.8	1.076	1.005	0.3659
30 minute summer	ICS03	1.003	MHS01	43.5	1.094	1.028	0.4176
30 minute summer	MHS01	1.004	Jct 01	59.2	1.490	1.622	0.9744
30 minute summer	Jct 01	1.005	Jct 02	57.3	1.440	1.552	0.2585
30 minute summer	Jct 02	1.006	Jct 03	58.5	1.471	1.598	0.2386
30 minute summer	Jct 03	1.007	MHS02	65.3	1.011	0.835	1.0679
15 minute summer	MHS04	3.000	MHS02	40.1	1.260	0.376	0.3968
30 minute summer	MHS02	1.008	MHS03	93.1	1.368	1.032	0.4345
240 minute summer	MHS03	1.009	SOAKAWAY	47.6	1.393	0.608	0.5219
240 minute summer	SOAKAWAY	Infiltration		9.4			

Results for 200 year +42% CC Critical Storm Duration. Lowest mass balance: 98.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RES01	11	4.210	0.725	23.5	0.0000	0.0000	FLOOD RISK
60 minute summer	ICS01	33	4.210	1.062	23.8	0.2082	1.1197	FLOOD
30 minute summer	RES02	18	4.274	0.794	21.9	0.0000	0.0000	FLOOD RISK
30 minute summer	ICS02	18	4.210	1.248	101.3	0.2446	4.5577	FLOOD
30 minute summer	ICS03	19	4.080	1.180	54.1	0.2313	0.0000	SURCHARGED
30 minute summer	MHS01	19	3.938	1.108	84.7	1.2533	0.0000	SURCHARGED
60 minute summer	Jct 01	38	3.350	0.642	78.9	8.2489	0.0000	SURCHARGED
60 minute summer	Jct 02	38	3.228	0.553	69.6	2.0151	0.0000	SURCHARGED
60 minute summer	Jct 03	37	3.116	0.471	79.4	1.5687	0.0000	SURCHARGED
30 minute summer	MHS04	18	3.311	0.147	60.7	0.1668	0.0000	OK
180 minute winter	MHS02	172	3.100	0.531	58.6	6.7386	0.0000	SURCHARGED
180 minute winter	MHS03	172	3.099	0.573	55.8	0.6481	0.0000	SURCHARGED
180 minute winter	SOAKAWAY	172	3.098	0.609	55.5	164.4814	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	RES01	1.000	ICS01	-23.5	-0.643	-0.555	2.0084
60 minute summer	ICS01	1.001	ICS02	-23.8	-0.598	-0.562	1.1136
30 minute summer	RES02	2.000	ICS02	-21.9	-0.550	-0.416	2.0084
30 minute summer	ICS02	1.002	ICS03	54.1	1.360	1.270	0.3659
30 minute summer	ICS03	1.003	MHS01	54.4	1.368	1.285	0.4176
30 minute summer	MHS01	1.004	Jct 01	83.6	2.103	2.289	0.9744
60 minute summer	Jct 01	1.005	Jct 02	69.6	1.750	1.887	0.2585
60 minute summer	Jct 02	1.006	Jct 03	69.8	1.756	1.908	0.2386
60 minute summer	Jct 03	1.007	MHS02	79.4	1.128	1.016	1.0739
30 minute summer	MHS04	3.000	MHS02	60.5	1.643	0.567	0.4797
180 minute winter	MHS02	1.008	MHS03	55.8	1.058	0.619	0.4577
180 minute winter	MHS03	1.009	SOAKAWAY	55.5	1.713	0.709	0.5219
180 minute winter	SOAKAWAY	Infiltration		9.7			

CALCULATION

FAIRHURST

Contract	Port of Ardersier Phase 2
Calculations For	Population Equivalent for Non-Domestic Foul Drainage System

Sheet No.	1 of 1 Rev -
Contract No.	162855
Date	01/05/2025
Designer	AH
Checker	DE

1.0 - Number of people, N: **4000 people per day** (Haventus)

2.0 - Per SEPA's How to Apply for a Licence to Discharge Sewage Effluent, the population equivalent(PE) for non-domestic sites can be calculated by multiplying the number of people using the system BOD (g/day) and dividing by 60.

Activity/ Building
Open Industrial Site

BOD = **25 g/day** (Flows and Load 4 - Table of Loadings for Sewage Treatment Systems)

PE ≈ (No. of people x BOD)/ 60 ≈ **1666.7**

3.0 - Foul treatment system to be suitable for PE = **1667**

4.0 - CAR Licence/ Registration Requirements

Licence - Per SEPA's CAR a Practical Guide, a Simple licence is required for a PE of >15-100

5.0 - Maximum Daily Loading (Flows and Loads 4)

Flow (L) Per Person per day = **60**
Average flow = N x L = **240000 L/day** **(240.00 m³/day)**
Assume **24** hour working day = **86400 seconds per work day**
Flow per second = Average Flow/ Seconds per work day = **2.8 L/s**
Max BOD = N x BOD = **100000 g/day** **(100.00 kg/day)**

6.0 - Flow Estimation to Sewers for Scotland 4th Edition

Per Sewers for Scotland 4th Edition, domestic flow from industrial sites can be calculated by multiplying the area of the developable land (ha) by 0.6 litres per second.

Total site area = **219 ha**
Estimated Flow = Total site area x 0.6 = **131 L/s**

7.0 - Design Foul Flow

Proposed development site is to be open industrial with shift working. Estimated flow rate derived from Sewer for Scotland 4th edition method is equivalent to average flow rate approximately 7050 domestic properties. Flow rate estimation derived from SEPA's guidance document is equivalent to approximately 470 domestic properties. It is, therefore, considered that the flow rate estimation derived from SEPA's guidance document is more proportionate to the proposed development site's intended use and equivalent population.

Design average foul flow rate = **2.8 L/s**

Design peak foul flow rate (x2.5) = **6.9 L/s**

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	

Yard Infiltration Trench Size Calculation
Infiltration Trench 01

Sheet No.	1 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***178427 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***53528 m²***

Trench Properties

Width = ***2.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***961.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	961	293.2	21.7	271.5	0.52	1081.1 m³	
10	961	443.1	43.4	399.7	0.77	1081.1 m³	
15	961	548.5	65.0	483.4	0.93	1081.1 m³	
30	961	761.1	130.1	631.0	1.21	1081.1 m³	
60	961	1017.8	260.1	757.6	1.46	1081.1 m³	
120	961	1330.3	520.3	810.0	1.56	1081.1 m³	
240	961	1718.3	1040.6	677.7	1.30	1081.1 m³	
360	961	1997.6	1560.9	436.7	0.84	1081.1 m³	
600	961	2411.0	2601.5	0.0	0.00	1081.1 m³	
1440	961	3320.4	6243.5	0.0	0.00	1081.1 m³	
2880	961	4273.5	12487.0	0.0	0.00	1081.1 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 961 m x 2.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 3603.8m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	

Yard Infiltration Trench Size Calculation
Infiltration Trench 02

Sheet No.	2 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***78333 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***23500 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***538.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	538	128.7	12.1	116.6	0.40	363.2 m³	
10	538	194.5	24.3	170.2	0.58	363.2 m³	
15	538	240.8	36.4	204.4	0.70	363.2 m³	
30	538	334.1	72.8	261.3	0.90	363.2 m³	
60	538	446.8	145.7	301.2	1.03	363.2 m³	
120	538	584.0	291.3	292.7	1.00	363.2 m³	
240	538	754.4	582.7	171.7	0.59	363.2 m³	
360	538	877.0	874.0	3.0	0.01	363.2 m³	
600	538	1058.5	1456.7	0.0	0.00	363.2 m³	
1440	538	1457.7	3496.0	0.0	0.00	363.2 m³	
2880	538	1876.1	6991.9	0.0	0.00	363.2 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 538 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1210.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 03

Sheet No.	3 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***122279 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***36684 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***780.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	780	200.9	17.6	183.3	0.43	526.5 m³	
10	780	303.6	35.2	268.5	0.64	526.5 m³	
15	780	375.9	52.8	323.1	0.77	526.5 m³	
30	780	521.6	105.5	416.1	0.99	526.5 m³	
60	780	697.5	211.0	486.5	1.15	526.5 m³	
120	780	911.7	422.0	489.7	1.16	526.5 m³	
240	780	1177.6	844.0	333.6	0.79	526.5 m³	
360	780	1369.0	1266.0	102.9	0.24	526.5 m³	
600	780	1652.3	2110.1	0.0	0.00	526.5 m³	
1440	780	2275.5	5064.1	0.0	0.00	526.5 m³	
2880	780	2928.7	10128.2	0.0	0.00	526.5 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 780 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1755m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 04

Sheet No.	4 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***143106 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***42932 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***922.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	922	235.1	20.8	214.4	0.43	622.4 m³	
10	922	355.4	41.6	313.8	0.63	622.4 m³	
15	922	439.9	62.3	377.6	0.76	622.4 m³	
30	922	610.4	124.7	485.7	0.97	622.4 m³	
60	922	816.3	249.3	567.0	1.14	622.4 m³	
120	922	1067.0	498.7	568.3	1.14	622.4 m³	
240	922	1378.2	997.4	380.8	0.76	622.4 m³	
360	922	1602.1	1496.1	106.1	0.21	622.4 m³	
600	922	1933.7	2493.5	0.0	0.00	622.4 m³	
1440	922	2663.1	5984.3	0.0	0.00	622.4 m³	
2880	922	3427.5	11968.6	0.0	0.00	622.4 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 922 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 2074.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 05

Sheet No.	5 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***52007 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***15602 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***378.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	378	85.5	8.5	76.9	0.38	255.2 m³	
10	378	129.1	17.1	112.1	0.55	255.2 m³	
15	378	159.9	25.6	134.2	0.66	255.2 m³	
30	378	221.8	51.2	170.6	0.83	255.2 m³	
60	378	296.7	102.5	194.2	0.95	255.2 m³	
120	378	387.7	204.9	182.8	0.89	255.2 m³	
240	378	500.8	409.9	91.0	0.44	255.2 m³	
360	378	582.2	614.8	0.0	0.00	255.2 m³	
600	378	702.7	1024.7	0.0	0.00	255.2 m³	
1440	378	967.8	2459.2	0.0	0.00	255.2 m³	
2880	378	1245.6	4918.3	0.0	0.00	255.2 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 378 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 850.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 06

Sheet No.	6 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***72949 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***21885 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***626.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	626	119.9	14.1	105.7	0.31	422.6 m³	
10	626	181.1	28.2	152.9	0.45	422.6 m³	
15	626	224.2	42.4	181.9	0.54	422.6 m³	
30	626	311.2	84.7	226.4	0.67	422.6 m³	
60	626	416.1	169.4	246.7	0.73	422.6 m³	
120	626	543.9	338.9	205.0	0.61	422.6 m³	
240	626	702.5	677.7	24.8	0.07	422.6 m³	
360	626	816.7	1016.6	0.0	0.00	422.6 m³	
600	626	985.7	1694.3	0.0	0.00	422.6 m³	
1440	626	1357.5	4066.2	0.0	0.00	422.6 m³	
2880	626	1747.2	8132.4	0.0	0.00	422.6 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 626 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1408.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 07

Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***124389 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***37317 m²***

Trench Properties

Width = ***2.0 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***730.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	730	204.4	16.5	187.9	0.48	657.0 m³	
10	730	308.9	32.9	275.9	0.70	657.0 m³	
15	730	382.4	49.4	332.9	0.84	657.0 m³	
30	730	530.6	98.8	431.7	1.09	657.0 m³	
60	730	709.5	197.6	511.9	1.30	657.0 m³	
120	730	927.4	395.3	532.1	1.35	657.0 m³	
240	730	1197.9	790.6	407.4	1.03	657.0 m³	
360	730	1392.6	1185.8	206.7	0.52	657.0 m³	
600	730	1680.8	1976.4	0.0	0.00	657.0 m³	
1440	730	2314.8	4743.4	0.0	0.00	657.0 m³	
2880	730	2979.2	9486.7	0.0	0.00	657.0 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 730 m x 2 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 2190m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 08

Sheet No.	8 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***128822 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***38647 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***814.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	814	211.7	18.3	193.3	0.44	549.5 m³	
10	814	319.9	36.7	283.2	0.64	549.5 m³	
15	814	396.0	55.0	340.9	0.77	549.5 m³	
30	814	549.5	110.1	439.4	1.00	549.5 m³	
60	814	734.8	220.2	514.6	1.17	549.5 m³	
120	814	960.5	440.4	520.1	1.18	549.5 m³	
240	814	1240.6	880.7	359.9	0.82	549.5 m³	
360	814	1442.2	1321.1	121.1	0.28	549.5 m³	
600	814	1740.7	2201.9	0.0	0.00	549.5 m³	
1440	814	2397.3	5284.4	0.0	0.00	549.5 m³	
2880	814	3085.4	10568.9	0.0	0.00	549.5 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 814 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1831.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Size Calculation Infiltration Trench 09

Sheet No.	9 of 9 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***75985 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***22796 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***522.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	522	124.8	11.8	113.1	0.40	352.4 m³	
10	522	188.7	23.6	165.1	0.58	352.4 m³	
15	522	233.6	35.3	198.2	0.70	352.4 m³	
30	522	324.1	70.7	253.4	0.90	352.4 m³	
60	522	433.4	141.3	292.1	1.03	352.4 m³	
120	522	566.5	282.7	283.8	1.00	352.4 m³	
240	522	731.8	565.4	166.4	0.59	352.4 m³	
360	522	850.7	848.1	2.6	0.01	352.4 m³	
600	522	1026.7	1413.5	0.0	0.00	352.4 m³	
1440	522	1414.0	3392.3	0.0	0.00	352.4 m³	
2880	522	1819.9	6784.6	0.0	0.00	352.4 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 522 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1174.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 01 Road 1

Sheet No.	1 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***2580 m²***

Runoff Coefficient, C: ***1***

Contributing Area = ***2580 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***369.5 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	370	14.1	5.6	8.6	0.06	110.9 m³	
10	370	21.4	11.1	10.2	0.08	110.9 m³	
15	370	26.4	16.7	9.8	0.07	110.9 m³	
30	370	36.7	33.3	3.3	0.03	110.9 m³	
60	370	49.1	66.7	0.0	0.00	110.9 m³	
120	370	64.1	133.4	0.0	0.00	110.9 m³	
240	370	82.8	266.8	0.0	0.00	110.9 m³	
360	370	96.3	400.1	0.0	0.00	110.9 m³	
600	370	116.2	666.9	0.0	0.00	110.9 m³	
1440	370	160.0	1600.6	0.0	0.00	110.9 m³	
2880	370	206.0	3201.1	0.0	0.00	110.9 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 369.5 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 369.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 02 Road 1

Sheet No.	2 of 6	Rev A
Contract No.	162855	
Date	17/07/2025	
Designer	HF	
Checker	AH	

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***1687 m²***

Runoff Coefficient, C: ***1***

Contributing Area = ***1687 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***207.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	207	9.2	3.1	6.1	0.08	62.1 m³	
10	207	14.0	6.2	7.7	0.10	62.1 m³	
15	207	17.3	9.4	7.9	0.11	62.1 m³	
30	207	24.0	18.7	5.3	0.07	62.1 m³	
60	207	32.1	37.4	0.0	0.00	62.1 m³	
120	207	41.9	74.9	0.0	0.00	62.1 m³	
240	207	54.2	149.8	0.0	0.00	62.1 m³	
360	207	63.0	224.6	0.0	0.00	62.1 m³	
600	207	76.0	374.4	0.0	0.00	62.1 m³	
1440	207	104.6	898.6	0.0	0.00	62.1 m³	
2880	207	134.7	1797.1	0.0	0.00	62.1 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 207 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 207m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 03 Road 2

Sheet No.	3 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***5896 m²***

Runoff Coefficient, C: ***0.7***

Contributing Area = ***4127 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***806.5 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	807	22.6	12.1	10.5	0.04	242.0 m³	
10	807	34.2	24.2	9.9	0.03	242.0 m³	
15	807	42.3	36.3	6.0	0.02	242.0 m³	
30	807	58.7	72.7	0.0	0.00	242.0 m³	
60	807	78.5	145.4	0.0	0.00	242.0 m³	
120	807	102.6	290.7	0.0	0.00	242.0 m³	
240	807	132.5	581.4	0.0	0.00	242.0 m³	
360	807	154.0	872.1	0.0	0.00	242.0 m³	
600	807	185.9	1453.5	0.0	0.00	242.0 m³	
1440	807	256.0	3488.4	0.0	0.00	242.0 m³	
2880	807	329.5	6976.8	0.0	0.00	242.0 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 806.5 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 806.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 04 Road 2 / 3

Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***10624 m²***

Runoff Coefficient, C: ***0.7***

Contributing Area = ***7437 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***1397.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	1397	40.7	21.0	19.8	0.04	419.1 m³	
10	1397	61.6	41.9	19.6	0.04	419.1 m³	
15	1397	76.2	62.9	13.3	0.03	419.1 m³	
30	1397	105.7	125.8	0.0	0.00	419.1 m³	
60	1397	141.4	251.6	0.0	0.00	419.1 m³	
120	1397	184.8	503.3	0.0	0.00	419.1 m³	
240	1397	238.7	1006.6	0.0	0.00	419.1 m³	
360	1397	277.5	1509.8	0.0	0.00	419.1 m³	
600	1397	335.0	2516.4	0.0	0.00	419.1 m³	
1440	1397	461.3	6039.4	0.0	0.00	419.1 m³	
2880	1397	593.7	12078.7	0.0	0.00	419.1 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 1397 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1397m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 05 Road 05

Sheet No.	5 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 5 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	1.448	5.5 mm	55 mm/hr
10	5.7 mm	1.450	8.3 mm	50 mm/hr
15	7.0 mm	1.454	10.2 mm	41 mm/hr
30	9.7 mm	1.462	14.2 mm	28 mm/hr
60	13.0 mm	1.463	19.0 mm	19 mm/hr
120	17.1 mm	1.457	24.9 mm	12 mm/hr
240	22.2 mm	1.448	32.1 mm	8 mm/hr
360	25.8 mm	1.448	37.3 mm	6 mm/hr
600	31.1 mm	1.448	45.0 mm	5 mm/hr
1440	42.8 mm	1.448	62.0 mm	3 mm/hr
2880	55.1 mm	1.448	79.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***611 m²***

Runoff Coefficient, C: ***0.7***

Contributing Area = ***428 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***81.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	81	2.3	1.2	1.1	0.04	24.3 m³	
10	81	3.5	2.5	1.1	0.04	24.3 m³	
15	81	4.4	3.7	0.7	0.02	24.3 m³	
30	81	6.1	7.4	0.0	0.00	24.3 m³	
60	81	8.1	14.8	0.0	0.00	24.3 m³	
120	81	10.6	29.5	0.0	0.00	24.3 m³	
240	81	13.7	59.0	0.0	0.00	24.3 m³	
360	81	16.0	88.6	0.0	0.00	24.3 m³	
600	81	19.3	147.6	0.0	0.00	24.3 m³	
1440	81	26.5	354.2	0.0	0.00	24.3 m³	
2880	81	34.1	708.5	0.0	0.00	24.3 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 81 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 81m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 06 Road 3 Access

Sheet No.	6 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	AH

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 30 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.045	7.7 mm	39 mm/hr
10	5.7 mm	2.055	11.7 mm	70 mm/hr
15	7.0 mm	2.073	14.6 mm	58 mm/hr
30	9.7 mm	2.112	20.5 mm	41 mm/hr
60	13.0 mm	2.118	27.5 mm	28 mm/hr
120	17.1 mm	2.109	36.0 mm	18 mm/hr
240	22.2 mm	2.084	46.2 mm	12 mm/hr
360	25.8 mm	2.070	53.3 mm	9 mm/hr
600	31.1 mm	2.045	63.6 mm	6 mm/hr
1440	42.8 mm	1.991	85.3 mm	4 mm/hr
2880	55.1 mm	1.937	106.8 mm	2 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***755 m²***

Runoff Coefficient, C: ***1***

Contributing Area = ***755 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***84.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	84	5.8	1.3	4.6	0.15	25.2 m³	
10	84	8.9	2.6	6.3	0.21	25.2 m³	
15	84	11.0	3.8	7.2	0.24	25.2 m³	
30	84	15.5	7.7	7.9	0.26	25.2 m³	
60	84	20.8	15.3	5.5	0.18	25.2 m³	
120	84	27.2	30.6	0.0	0.00	25.2 m³	
240	84	34.9	61.2	0.0	0.00	25.2 m³	
360	84	40.3	91.8	0.0	0.00	25.2 m³	
600	84	48.0	153.0	0.0	0.00	25.2 m³	
1440	84	64.4	367.2	0.0	0.00	25.2 m³	
2880	84	80.6	734.4	0.0	0.00	25.2 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 84 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 84m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Port of Ardersier - Phase 2
Calculations For	SUDS Water Quality Simple Index Approach

Sheet No.	1 of 2 Rev A
Contract No.	162855
Date	02/06/2025
Designer	AH
Checker	DE

Land Use Pollution Hazard

Step 1 - Allocate Suitable pollution hazard indices for the proposed land use from SUDs Manual Table 26.2

Land Use	Hazard Level	TSS	Metals	Hydrocarbons
Non-Residential Car Park (<300 vehicle movements per day)	Low	0.5	0.4	0.4
Low Traffic Roads (<300 vehicles per day)	Low	0.5	0.4	0.4

Where land use varies across the site, the highest pollution hazard indices shall be taken forward to Step 2.

Treatment Systems

Step 2 - Select SUDS components with a total pollution mitigation index that is greater than or equal to the pollution hazard index from SUDS Manual Table 26.3 (Discharge to Surface Water), Table 26.4 (discharge to Groundwater), or indices provided by proprietary treatment system manufactures. Where the mitigation index of an individual component is insufficient, two or more components can be used in series. A factor of **0.5** is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations.

Treatment Train 1 - Internal Site Roads

Land Use:	Low Traffic Roads (<300 vehicles per day)		
SUDS Component	**TSS**	**Metals**	**Hydrocarbons**
Infiltration Trench	0.4	0.4	0.4
A Soil with good contamination attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Total Mitigation Index	**0.60**	**0.55**	**0.55**
Treatment Sufficient	✓	✓	✓

Discharge to:

Groundwater

Treatment Train 1 Maintenance

Maintenance inspections to be undertaken monthly and sediment to be cleared as needed per recommendations in CIRA SuDS Manual.

Spill kits to be on-hand to control spillage of fuels/oils. In the event of a spill, the affected section of filter material is to be replaced and contaminated material disposed of appropriately.

CALCULATION

FAIRHURST

Contract	Port of Ardersier - Phase 2
Calculations For	SUDS Water Quality Simple Index Approach

Sheet No.	2 of 2 Rev A
Contract No.	162855
Date	02/06/2025
Designer	AH
Checker	DE

Treatment Systems (Continued)

Treatment Train 2 - Building and Car Park

Land Use:	-Residential Car Park (<300 vehicle movements per		
SUDS Component	**TSS**	**Metals**	**Hydrocarbons**
Filter Drain	0.4	0.4	0.4
Soakway	0.4	0.4	0.4
Total Mitigation Index	**0.60**	**0.60**	**0.60**
Treatment Sufficient	✓	✓	✓

Discharge to:

Groundwater

Treatment Train 2 Maintenance

Maintenance inspections to be undertaken monthly and sediment to be cleared as needed per recommendations in CIRA SuDS Manual.

Spill kits to be on-hand to control spillage of fuels/oils. In the event of a spill, the affected section of filter material is to be replaced and contaminated material disposed of appropriately.

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 01

Sheet No.	1 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***178427 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***53528 m²***

Trench Properties

Width = ***2.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***961.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	961	534.6	21.7	512.9	0.99	1081.1 m³	
10	961	813.5	43.4	770.2	1.48	1081.1 m³	
15	961	1019.8	65.0	954.8	1.84	1081.1 m³	
30	961	1451.6	130.1	1321.5	2.54	1081.1 m³	*240.4*
60	961	1952.5	260.1	1692.4	3.25	1081.1 m³	*611.3*
120	961	2541.3	520.3	2021.0	3.88	1081.1 m³	*939.9*
240	961	3223.0	1040.6	2182.5	4.19	1081.1 m³	*1101.3*
360	961	3690.4	1560.9	2129.5	4.09	1081.1 m³	*1048.4*
600	961	4354.0	2601.5	1752.5	3.37	1081.1 m³	*671.4*
1440	961	5716.3	6243.5	0.0	0.00	1081.1 m³	
2880	961	7122.4	12487.0	0.0	0.00	1081.1 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 961 m x 2.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 3603.8m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 02

Sheet No.	2 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***78333 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***23500 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***538.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	538	234.7	12.1	222.6	0.76	363.2 m³	
10	538	357.2	24.3	332.9	1.14	363.2 m³	
15	538	447.7	36.4	411.3	1.41	363.2 m³	*48.1*
30	538	637.3	72.8	564.4	1.94	363.2 m³	*201.3*
60	538	857.2	145.7	711.5	2.44	363.2 m³	*348.4*
120	538	1115.7	291.3	824.4	2.83	363.2 m³	*461.2*
240	538	1415.0	582.7	832.3	2.86	363.2 m³	*469.2*
360	538	1620.2	874.0	746.2	2.56	363.2 m³	*383.0*
600	538	1911.5	1456.7	454.8	1.56	363.2 m³	*91.7*
1440	538	2509.6	3496.0	0.0	0.00	363.2 m³	
2880	538	3126.9	6991.9	0.0	0.00	363.2 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 538 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1210.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 03

Sheet No.	3 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***122279 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***36684 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***780.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	780	366.4	17.6	348.8	0.83	526.5 m³	
10	780	557.5	35.2	522.3	1.24	526.5 m³	
15	780	698.9	52.8	646.1	1.53	526.5 m³	*119.6*
30	780	994.8	105.5	889.3	2.11	526.5 m³	*362.8*
60	780	1338.1	211.0	1127.1	2.67	526.5 m³	*600.6*
120	780	1741.6	422.0	1319.6	3.13	526.5 m³	*793.1*
240	780	2208.8	844.0	1364.8	3.23	526.5 m³	*838.3*
360	780	2529.1	1266.0	1263.1	2.99	526.5 m³	*736.6*
600	780	2983.9	2110.1	873.8	2.07	526.5 m³	*347.3*
1440	780	3917.5	5064.1	0.0	0.00	526.5 m³	
2880	780	4881.1	10128.2	0.0	0.00	526.5 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 780 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1755m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 04

Sheet No.	4 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***143106 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***42932 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***922.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	922	428.8	20.8	408.0	0.82	622.4 m³	
10	922	652.5	41.6	610.9	1.23	622.4 m³	
15	922	817.9	62.3	755.6	1.52	622.4 m³	*133.2*
30	922	1164.2	124.7	1039.6	2.08	622.4 m³	*417.2*
60	922	1566.0	249.3	1316.7	2.64	622.4 m³	*694.3*
120	922	2038.2	498.7	1539.5	3.09	622.4 m³	*917.2*
240	922	2585.0	997.4	1587.6	3.18	622.4 m³	*965.3*
360	922	2959.9	1496.1	1463.8	2.94	622.4 m³	*841.4*
600	922	3492.1	2493.5	998.6	2.00	622.4 m³	*376.3*
1440	922	4584.7	5984.3	0.0	0.00	622.4 m³	
2880	922	5712.5	11968.6	0.0	0.00	622.4 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 922 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 2074.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 05

Sheet No.	5 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***52007 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***15602 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***378.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	378	155.8	8.5	147.3	0.72	255.2 m³	
10	378	237.1	17.1	220.0	1.07	255.2 m³	
15	378	297.2	25.6	271.6	1.33	255.2 m³	*16.5*
30	378	423.1	51.2	371.9	1.81	255.2 m³	*116.7*
60	378	569.1	102.5	466.7	2.28	255.2 m³	*211.5*
120	378	740.7	204.9	535.8	2.61	255.2 m³	*280.6*
240	378	939.4	409.9	529.6	2.58	255.2 m³	*274.4*
360	378	1075.7	614.8	460.9	2.25	255.2 m³	*205.7*
600	378	1269.1	1024.7	244.4	1.19	255.2 m³	
1440	378	1666.2	2459.2	0.0	0.00	255.2 m³	
2880	378	2076.0	4918.3	0.0	0.00	255.2 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 378 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 850.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 06

Sheet No.	6 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***72949 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***21885 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***626.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	626	218.6	14.1	204.5	0.60	422.6 m³	
10	626	332.6	28.2	304.4	0.90	422.6 m³	
15	626	416.9	42.4	374.6	1.11	422.6 m³	
30	626	593.5	84.7	508.8	1.50	422.6 m³	*86.2*
60	626	798.3	169.4	628.9	1.86	422.6 m³	*206.3*
120	626	1039.0	338.9	700.2	2.07	422.6 m³	*277.6*
240	626	1317.7	677.7	640.0	1.89	422.6 m³	*217.5*
360	626	1508.8	1016.6	492.2	1.45	422.6 m³	*69.7*
600	626	1780.1	1694.3	85.9	0.25	422.6 m³	
1440	626	2337.1	4066.2	0.0	0.00	422.6 m³	
2880	626	2912.0	8132.4	0.0	0.00	422.6 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 626 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1408.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 07

Sheet No.	7 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***124389 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***37317 m²***

Trench Properties

Width = ***2.0 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***730.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	730	372.7	16.5	356.2	0.90	657.0 m³	
10	730	567.1	32.9	534.2	1.35	657.0 m³	
15	730	710.9	49.4	661.5	1.67	657.0 m³	*4.5*
30	730	1012.0	98.8	913.1	2.31	657.0 m³	*256.1*
60	730	1361.2	197.6	1163.6	2.94	657.0 m³	*506.6*
120	730	1771.7	395.3	1376.4	3.48	657.0 m³	*719.4*
240	730	2246.9	790.6	1456.4	3.68	657.0 m³	*799.4*
360	730	2572.7	1185.8	1386.9	3.51	657.0 m³	*729.9*
600	730	3035.3	1976.4	1058.9	2.68	657.0 m³	*401.9*
1440	730	3985.1	4743.4	0.0	0.00	657.0 m³	
2880	730	4965.3	9486.7	0.0	0.00	657.0 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 730 m x 2 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 2190m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 08

Sheet No.	8 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***128822 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***38647 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***814.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	814	386.0	18.3	367.6	0.83	549.5 m³	
10	814	587.3	36.7	550.7	1.25	549.5 m³	*1.2*
15	814	736.3	55.0	681.2	1.55	549.5 m³	*131.8*
30	814	1048.0	110.1	937.9	2.13	549.5 m³	*388.5*
60	814	1409.7	220.2	1189.5	2.70	549.5 m³	*640.1*
120	814	1834.8	440.4	1394.4	3.17	549.5 m³	*845.0*
240	814	2327.0	880.7	1446.2	3.28	549.5 m³	*896.8*
360	814	2664.4	1321.1	1343.3	3.05	549.5 m³	*793.9*
600	814	3143.5	2201.9	941.7	2.14	549.5 m³	*392.2*
1440	814	4127.1	5284.4	0.0	0.00	549.5 m³	
2880	814	5142.3	10568.9	0.0	0.00	549.5 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 814 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1831.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Infiltration Trench Sensitivity Check Infiltration Trench 09

Sheet No.	9 of 9 Rev -
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 100 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.641	10.0 mm	30 mm/hr
10	5.7 mm	2.663	15.2 mm	91 mm/hr
15	7.0 mm	2.704	19.1 mm	76 mm/hr
30	9.7 mm	2.788	27.1 mm	54 mm/hr
60	13.0 mm	2.806	36.5 mm	36 mm/hr
120	17.1 mm	2.783	47.5 mm	24 mm/hr
240	22.2 mm	2.717	60.2 mm	15 mm/hr
360	25.8 mm	2.676	68.9 mm	11 mm/hr
600	31.1 mm	2.616	81.3 mm	8 mm/hr
1440	42.8 mm	2.494	106.8 mm	4 mm/hr
2880	55.1 mm	2.414	133.1 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***75985 m²***

Runoff Coefficient, C: ***0.3***

Contributing Area = ***22796 m²***

Trench Properties

Width = ***1.5 m***

Trench Depth = ***1.5 m***

(Optional) Fixed Length = ***522.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	522	227.7	11.8	215.9	0.76	352.4 m³	
10	522	346.4	23.6	322.9	1.14	352.4 m³	
15	522	434.3	35.3	399.0	1.41	352.4 m³	*46.6*
30	522	618.2	70.7	547.5	1.94	352.4 m³	*195.2*
60	522	831.5	141.3	690.2	2.44	352.4 m³	*337.8*
120	522	1082.2	282.7	799.6	2.83	352.4 m³	*447.2*
240	522	1372.6	565.4	807.2	2.86	352.4 m³	*454.8*
360	522	1571.6	848.1	723.5	2.56	352.4 m³	*371.2*
600	522	1854.2	1413.5	440.7	1.56	352.4 m³	*88.4*
1440	522	2434.4	3392.3	0.0	0.00	352.4 m³	
2880	522	3033.2	6784.6	0.0	0.00	352.4 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 522 m x 1.5 m x 1.5 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1174.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Sensitivity Check Infiltration Trench 01 Road 1

Sheet No.	1 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 200 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.812	10.6 mm	28 mm/hr
10	5.7 mm	2.838	16.2 mm	97 mm/hr
15	7.0 mm	2.887	20.3 mm	81 mm/hr
30	9.7 mm	2.988	29.1 mm	58 mm/hr
60	13.0 mm	3.009	39.1 mm	39 mm/hr
120	17.1 mm	2.982	50.9 mm	25 mm/hr
240	22.2 mm	2.903	64.3 mm	16 mm/hr
360	25.8 mm	2.855	73.5 mm	12 mm/hr
600	31.1 mm	2.783	86.5 mm	9 mm/hr
1440	42.8 mm	2.639	113.0 mm	5 mm/hr
2880	55.1 mm	2.543	140.2 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***2580 m²***

Runoff Coefficient, C: ***1***

Contributing Area = ***2580 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***369.5 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	370	27.4	5.6	21.9	0.16	110.9 m³	
10	370	41.8	11.1	30.7	0.23	110.9 m³	
15	370	52.5	16.7	35.8	0.27	110.9 m³	
30	370	75.0	33.3	41.6	0.31	110.9 m³	
60	370	100.9	66.7	34.2	0.26	110.9 m³	
120	370	131.2	133.4	0.0	0.00	110.9 m³	
240	370	166.0	266.8	0.0	0.00	110.9 m³	
360	370	189.8	400.1	0.0	0.00	110.9 m³	
600	370	223.3	666.9	0.0	0.00	110.9 m³	
1440	370	291.6	1600.6	0.0	0.00	110.9 m³	
2880	370	361.6	3201.1	0.0	0.00	110.9 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 369.5 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 369.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Sensitivity Check Infiltration Trench 02 Road 1

Sheet No.	2 of 6	Rev A
Contract No.	162855	
Date	17/07/2025	
Designer	LB	
Checker	HF	

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 200 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.812	10.6 mm	28 mm/hr
10	5.7 mm	2.838	16.2 mm	97 mm/hr
15	7.0 mm	2.887	20.3 mm	81 mm/hr
30	9.7 mm	2.988	29.1 mm	58 mm/hr
60	13.0 mm	3.009	39.1 mm	39 mm/hr
120	17.1 mm	2.982	50.9 mm	25 mm/hr
240	22.2 mm	2.903	64.3 mm	16 mm/hr
360	25.8 mm	2.855	73.5 mm	12 mm/hr
600	31.1 mm	2.783	86.5 mm	9 mm/hr
1440	42.8 mm	2.639	113.0 mm	5 mm/hr
2880	55.1 mm	2.543	140.2 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***1687 m²***

Runoff Coefficient, C: ***1***

Contributing Area = ***1687 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***207.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	207	17.9	3.1	14.8	0.20	62.1 m³	
10	207	27.3	6.2	21.1	0.28	62.1 m³	
15	207	34.3	9.4	25.0	0.33	62.1 m³	
30	207	49.0	18.7	30.3	0.40	62.1 m³	
60	207	66.0	37.4	28.6	0.38	62.1 m³	
120	207	85.8	74.9	10.9	0.15	62.1 m³	
240	207	108.5	149.8	0.0	0.00	62.1 m³	
360	207	124.1	224.6	0.0	0.00	62.1 m³	
600	207	146.0	374.4	0.0	0.00	62.1 m³	
1440	207	190.7	898.6	0.0	0.00	62.1 m³	
2880	207	236.4	1797.1	0.0	0.00	62.1 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 207 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 207m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Sensitivity Check Infiltration Trench 03 Road 2

Sheet No.	3 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 200 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.812	10.6 mm	28 mm/hr
10	5.7 mm	2.838	16.2 mm	97 mm/hr
15	7.0 mm	2.887	20.3 mm	81 mm/hr
30	9.7 mm	2.988	29.1 mm	58 mm/hr
60	13.0 mm	3.009	39.1 mm	39 mm/hr
120	17.1 mm	2.982	50.9 mm	25 mm/hr
240	22.2 mm	2.903	64.3 mm	16 mm/hr
360	25.8 mm	2.855	73.5 mm	12 mm/hr
600	31.1 mm	2.783	86.5 mm	9 mm/hr
1440	42.8 mm	2.639	113.0 mm	5 mm/hr
2880	55.1 mm	2.543	140.2 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***5896 m²***

Runoff Coefficient, C: ***0.7***

Contributing Area = ***4127 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***806.5 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	807	43.9	12.1	31.8	0.11	242.0 m³	
10	807	66.8	24.2	42.6	0.15	242.0 m³	
15	807	83.9	36.3	47.6	0.16	242.0 m³	
30	807	119.9	72.7	47.3	0.16	242.0 m³	
60	807	161.5	145.4	16.1	0.06	242.0 m³	
120	807	209.9	290.7	0.0	0.00	242.0 m³	
240	807	265.5	581.4	0.0	0.00	242.0 m³	
360	807	303.5	872.1	0.0	0.00	242.0 m³	
600	807	357.2	1453.5	0.0	0.00	242.0 m³	
1440	807	466.5	3488.4	0.0	0.00	242.0 m³	
2880	807	578.4	6976.8	0.0	0.00	242.0 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 806.5 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 806.5m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Sensitivity Check Infiltration Trench 04 Road 2/3

Sheet No.	4 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 200 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.812	10.6 mm	28 mm/hr
10	5.7 mm	2.838	16.2 mm	97 mm/hr
15	7.0 mm	2.887	20.3 mm	81 mm/hr
30	9.7 mm	2.988	29.1 mm	58 mm/hr
60	13.0 mm	3.009	39.1 mm	39 mm/hr
120	17.1 mm	2.982	50.9 mm	25 mm/hr
240	22.2 mm	2.903	64.3 mm	16 mm/hr
360	25.8 mm	2.855	73.5 mm	12 mm/hr
600	31.1 mm	2.783	86.5 mm	9 mm/hr
1440	42.8 mm	2.639	113.0 mm	5 mm/hr
2880	55.1 mm	2.543	140.2 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***10624 m²***

Runoff Coefficient, C: ***0.7***

Contributing Area = ***7437 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***1397.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	1397	79.1	21.0	58.1	0.12	419.1 m³	
10	1397	120.4	41.9	78.5	0.16	419.1 m³	
15	1397	151.3	62.9	88.4	0.18	419.1 m³	
30	1397	216.1	125.8	90.3	0.18	419.1 m³	
60	1397	290.9	251.6	39.3	0.08	419.1 m³	
120	1397	378.3	503.3	0.0	0.00	419.1 m³	
240	1397	478.5	1006.6	0.0	0.00	419.1 m³	
360	1397	547.0	1509.8	0.0	0.00	419.1 m³	
600	1397	643.6	2516.4	0.0	0.00	419.1 m³	
1440	1397	840.6	6039.4	0.0	0.00	419.1 m³	
2880	1397	1042.3	12078.7	0.0	0.00	419.1 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 1397 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 1397m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Sensitivity Check Infiltration Trench 05 Road 5

Sheet No.	5 of 6 Rev A
Contract No.	162855
Date	17/07/2025
Designer	LB
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 200 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.812	10.6 mm	28 mm/hr
10	5.7 mm	2.838	16.2 mm	97 mm/hr
15	7.0 mm	2.887	20.3 mm	81 mm/hr
30	9.7 mm	2.988	29.1 mm	58 mm/hr
60	13.0 mm	3.009	39.1 mm	39 mm/hr
120	17.1 mm	2.982	50.9 mm	25 mm/hr
240	22.2 mm	2.903	64.3 mm	16 mm/hr
360	25.8 mm	2.855	73.5 mm	12 mm/hr
600	31.1 mm	2.783	86.5 mm	9 mm/hr
1440	42.8 mm	2.639	113.0 mm	5 mm/hr
2880	55.1 mm	2.543	140.2 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***611 m²***

Runoff Coefficient, C: ***0.7***

Contributing Area = ***428 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***81.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	81	4.5	1.2	3.3	0.11	24.3 m³	
10	81	6.9	2.5	4.5	0.15	24.3 m³	
15	81	8.7	3.7	5.0	0.17	24.3 m³	
30	81	12.4	7.4	5.0	0.17	24.3 m³	
60	81	16.7	14.8	2.0	0.07	24.3 m³	
120	81	21.8	29.5	0.0	0.00	24.3 m³	
240	81	27.5	59.0	0.0	0.00	24.3 m³	
360	81	31.5	88.6	0.0	0.00	24.3 m³	
600	81	37.0	147.6	0.0	0.00	24.3 m³	
1440	81	48.3	354.2	0.0	0.00	24.3 m³	
2880	81	59.9	708.5	0.0	0.00	24.3 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 81 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 81m³**

(Note that the depth is measured below the inlet pipe invert)

CALCULATION

FAIRHURST

Contract	Ardersier Port Phase 2
Part of Structure	Yard Roadside Infiltration Trench Size Calculation Infiltration Trench 06 Road 3 Access

Sheet No.	6 of 6 Rev -
Contract No.	162855
Date	17/07/2025
Designer	HF
Checker	HF

Design Rainfall

Climate Change Allowance **42 %**

From Wallingford Procedure, Volume 3 - Maps

From Wallingford Procedure, Volume 3 - Maps - Rainfall Depths (M5 - 60minutes) **M5_60= 13 mm**

From BRE Digest 365, fig. 1 **rainfall ratio r = 0.250**

Design Storm Return Period **P= 200 yrs**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	3.8 mm	2.812	10.6 mm	28 mm/hr
10	5.7 mm	2.838	16.2 mm	97 mm/hr
15	7.0 mm	2.887	20.3 mm	81 mm/hr
30	9.7 mm	2.988	29.1 mm	58 mm/hr
60	13.0 mm	3.009	39.1 mm	39 mm/hr
120	17.1 mm	2.982	50.9 mm	25 mm/hr
240	22.2 mm	2.903	64.3 mm	16 mm/hr
360	25.8 mm	2.855	73.5 mm	12 mm/hr
600	31.1 mm	2.783	86.5 mm	9 mm/hr
1440	42.8 mm	2.639	113.0 mm	5 mm/hr
2880	55.1 mm	2.543	140.2 mm	3 mm/hr

Infiltration Rate

Measured Infiltration Rate = ***5.00E-05 m/s***

OR Outlet Flow Rate =

Impermeable Area = ***755 m²***

Runoff Coefficient, C: ***1***

Contributing Area = ***755 m²***

Trench Properties

Width = ***1.0 m***

Trench Depth = ***1.0 m***

(Optional) Fixed Length = ***84.0 m***

Gravel free volume = 30%

(Trench fill material)

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	84	8.0	1.3	6.8	0.22	25.2 m³	
10	84	12.2	2.6	9.7	0.32	25.2 m³	
15	84	15.4	3.8	11.5	0.38	25.2 m³	
30	84	21.9	7.7	14.3	0.47	25.2 m³	
60	84	29.5	15.3	14.2	0.47	25.2 m³	
120	84	38.4	30.6	7.8	0.26	25.2 m³	
240	84	48.6	61.2	0.0	0.00	25.2 m³	
360	84	55.5	91.8	0.0	0.00	25.2 m³	
600	84	65.3	153.0	0.0	0.00	25.2 m³	
1440	84	85.3	367.2	0.0	0.00	25.2 m³	
2880	84	105.8	734.4	0.0	0.00	25.2 m³	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

- **Provide gravel filled a trench that is a minimum of 84 m x 1 m x 1 m deep**
- **Minimum Gravel Free Volume = 30%**
- **Total Pit Volume = 84m³**

(Note that the depth is measured below the inlet pipe invert)

APPENDIX F – Scottish Water GIS

Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS.

Plotted By: alvin.hunte@fairhurst.co.uk

N

The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District office.

Date: 11/06/2025

162855 - Waste Sheet 1 of 3

0 20 40 80 Meters

SCALE: 1:4,810

Scottish Water
Trusted to serve Scotland
The Bridge
6 Buchanan Gate
Stepps
Glasgow
G33 6FB
Tel No: 08000 778 778

Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS.

Plotted By: alvin.hunte@fairhurst.co.uk

N

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Date: 11/06/2025

162855 - Waste Sheet 2 of 3

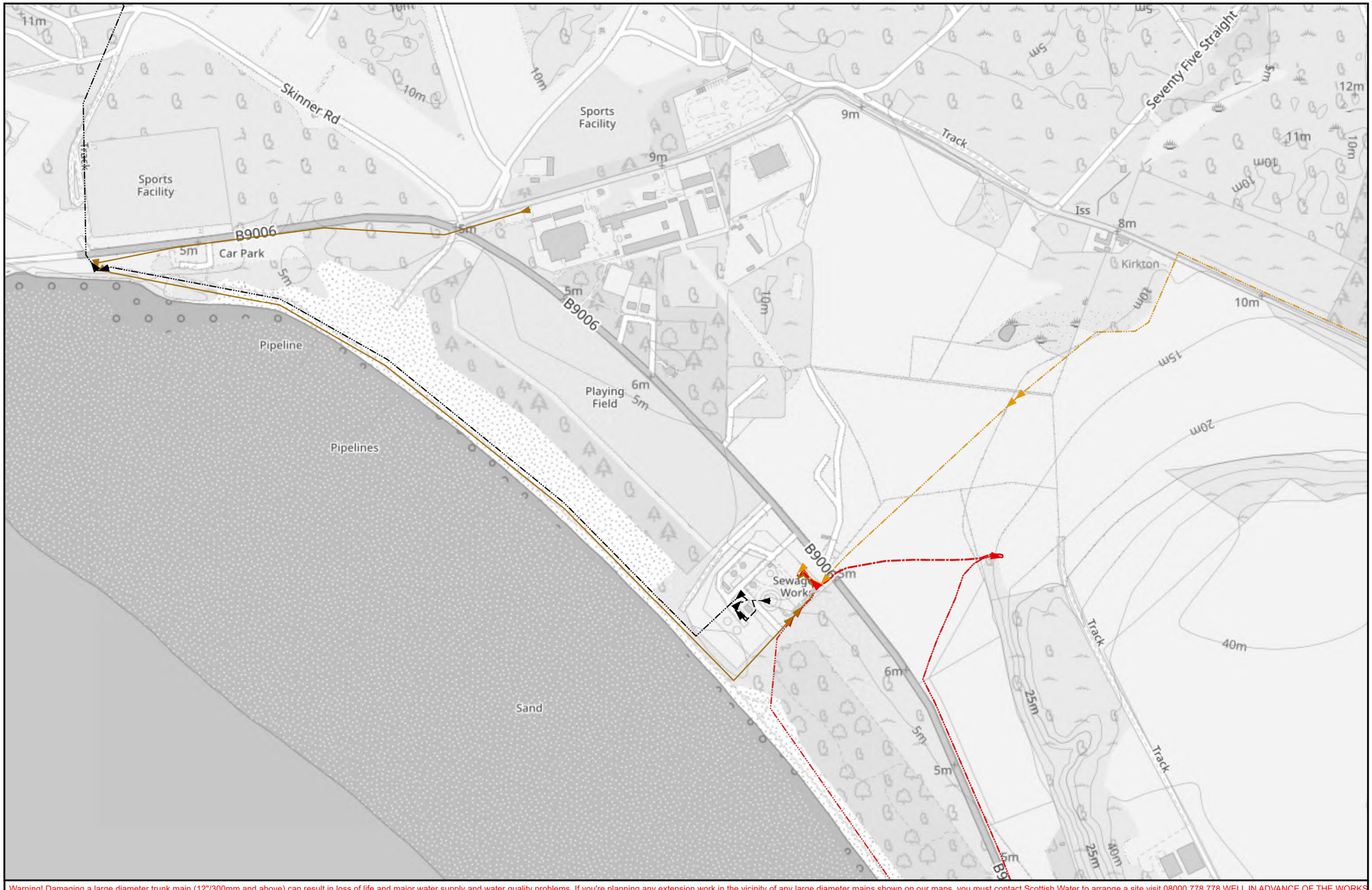
0 20 40 80 Meters

SCALE: 1:4,810

Scottish Water
Trusted to serve Scotland

The Bridge
6 Buchanan Gate
Stepps
Glasgow
G33 6FB

Tel No: 08000 778 778



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Plotted By: alvin.hunte@fairhurst.co.uk

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Date: 11/06/2025

162855 - Waste Sheet 3 of 3

0 20 40 80 Meters

SCALE: 1:4,810

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APPENDIX G – SuDS Maintenance Requirements

Replica of SuDS Manual Table 20.15 - Operation and maintenance requirements for Pervious Pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Annually, and after autumn leaf fall, as required, based onsite-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions and rutting considered detrimental to the structural performance or a hazard to users.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 hr after large storms infirst six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Adapted replica of SuDS Manual Table 16.1 - Operation and maintenance requirements for filter drains (Adapted for Infiltration Trenches)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from trench surface.	Monthly (or as required)
	Inspect trench surface for blockages, clogging, standing water and structural damage	Monthly
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the trench, using recommended methods (e.g., NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Annually, or as required
Remedial actions	Reconstruct trench and/or replace or clean void fill, if performance deteriorates or failure occurs	As required based on inspections
	Replacement of clogged geotextile (will require reconstruction of trench)	As required