

212039
Oldlands Farm
Bognor

Drainage Strategy

September 2021

Document Control:

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PL05	30/08/21	GW	ED	ED
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1.0 Introduction

This report has been prepared by EirEng Consulting Engineers to support the planning submission for the erection of a warehouse (Use Class B8) with ancillary office, associated vehicle parking, van storage, plant, ancillary structures, lighting, landscaping and infrastructure works including earthworks to facilitate flood compensation area at Oldlands Farm, Newlands Road, Bognor PO22 6NN. The layout of the proposed development is detailed in the series of planning drawings by ASA Architects, submitted with the application.

The purpose of this report is to present details of the surface water and foul drainage as a result of the proposed development. The report also incorporates details of the proposed Sustainable Drainage Systems (SuDS) to be utilised on the Site.

2.0 Site Layout and Proposed Development

2.1 Site Location

The site is located north of Bognor just off the A29/A259 at postcode PO22 6NN. The site is presently undeveloped agricultural land and covers an area of approx. 18.87ha total, comprising 7ha development area (for warehouse and van storage), and 11.87ha flood compensation area and fill extraction area. Existing access to the site is directly off the roundabout at the junction of the A29 Shripney Road and the A259 Felpham Relief Road. The national grid coordinates for the site are NGR: 494570, 101850 (TQ 494570, 101850). The existing site plan is included in Appendix A.

The site is directly bounded by the following:

- North and West –The A259 Charles Purley Way;
- East –A railway;
- South –Rolls Royce building and car park.

2.2 Proposed Development

The proposed development comprises the 'erection of a warehouse (Use Class B8) with ancillary office, associated vehicle parking, van storage, plant, ancillary structures, lighting, landscaping and infrastructure works including earthworks to facilitate a flood compensation area'. The proposed site layout is presented in Appendix B.

2.3 Site Topography and Geology

The topography of the site is predominantly flat where elevations typically vary between 1m and 2.9m AOD based on the 2021 topographical survey. There is a mound of spoil typically around 4.3m high and a low-lying area at around 0.2m AOD. There are ditches on the site and along the southern boundary.

Based on the Preliminary Geo-Environmental Risk Assessment by Delta Simons, the majority of the site is underlain by superficial deposits of Raised Marine Deposits consisting of clay, silt, sand and gravel and River Terrace Deposits containing sand, silt, and clay. Due to being low lying and the nature of the soils below the site, it is unlikely that infiltration to ground would be considered viable. A site investigation is planned for this site during April and May 2021.

3.0 Flood Risk

A separate Flood Risk Assessment (Report No: 20-1543.06) has been prepared by Delta Simons dated April 2021. This details the flood risk and how this can be managed and mitigated to allow the site to be developed.

The FRA report concludes that:

- The main potential source of flooding to the site is fluvial and combined fluvial and tidal flooding, the baseline flood risk from all other sources of flooding are considered Low.
- EA modelled flood data indicates that the site is within the extents of the 5% AEP flood event for both the fluvial and combined fluvial and tidal scenarios. Fluvial risk at the site is attributed to Oldlands Farm Ditch in the south west and combined flood risk is derived from tidal and fluvial interactions between the on-site land drains and Lidsey Rife to the east of the site. The baseline fluvial / tidal flood risk at the Site is assessed to be Moderate to High.
- The identified flood risk will be mitigated by raising site levels to 4.15 m AOD, approximately 2.55 m above the maximum flood level expected during the 1% AEP + 35% CC flood event and 2.44 m above the 1% AEP +45% CC event. To ensure and raising does not increase flood risk elsewhere, it is proposed to provide like-for-like and level-for-level floodplain compensation within a parcel of land to the north west of the site for the 1% AEP + 35% CC event. A high-level assessment of the proposed FCS area indicates that this is feasible for this scheme, the design of the FCS area should be considered further during the detailed design stage.

- Overall, the proposed mitigation measures will reduce the fluvial / tidal risk at the Site and the impact of the development elsewhere to Low.
- The impact of the development on surface water risk will be managed with a surface water management scheme, which is designed to restrict flows to the greenfield rate and attenuate storms up to the 1 in 100 year + 40% CC event. Overall, the impact of the development on surface water risk and all other sources of risk is considered Low.

4.0 Surface Water Drainage

4.1 Existing Surface Water

From Southern Water's sewer records, there are no surface water sewers crossing or adjacent to the site. However, there are existing drainage ditches across and to the south of the site.

A topographical survey dated 2021 is provided in Appendix C.

4.2 Proposed Sustainable Drainage

The surface water drainage system is designed with siphonic drainage from the proposed warehouse building, rainwater pipes from the car park structure and channels from hard external surfaces leading to a piped system with manholes. The proposed surface water drainage will utilise SuDS techniques in the form of an attenuation basin/pond and tanks subject to water table levels. If the water table is found to be shallow (following ongoing site investigations), an alternative system using shallow attenuation tanks or open textured subbase below external permeable paving potentially can be used. The alternative system used will need to be designed to accommodate similar volumes of storage to the basin and tanks.

Surface water from external hard surfaces subject to vehicle storage and HGV movements will be directed to oil interceptors prior to attenuation. The surface water will then be piped to a hydrobrake or similar device limiting the flow to greenfield runoff before discharging to the surrounding ditches. The proposed drainage layout is shown at Appendix E.

The attenuation will be designed with a capacity up to a 1 in 100-year (plus 40% climate change (CC)) event, based on the restricted greenfield runoff discharge rate to be agreed with West Sussex Council. A calculation of this rate is attached at Appendix F. The calculations show the site draining to three main outfalls to adjacent ditches plus an existing outfall near the site access road, with each separate system having its own attenuation storage tanks or detention basin and restricted discharge. The

calculations also allow for tidal blocking, as the Flood Risk Assessment describes the site as being tidally affected. This has been taken to relate to a period of 6 hours for the purposes of calculation. Any flooding occurring during a 100 year plus 40% CC event will remain on site but a storm event greater than this would potentially cause the attenuation to overtop and would then shed overland following the topography towards the bounding watercourses, similar to existing conditions. Calculations for the drainage design are shown in Appendix F.

Finished floor levels will be set above external levels, which will mitigate the residual risk of flooding.

Maintenance of the SuDS features would be in line with the SuDS Manual (CIRIA C753, 2015) and as described in Appendix G. The maintenance of the drainage system including any SuDS features would be undertaken by the end user.

4.3 Potential SuDS Options on Site

The following represents our considered views on suitable SuDS options appropriate to this site. 'CIRIA C753 The SuDS Manual' was consulted to examine the use of SuDS on this site. Our conclusions are based on the assessment of the site and the evaluation of the relevant design requirements and regulatory consultation.

4.3.1 Rainwater/Greywater Harvesting

This normally involves collecting rainwater from roofs or lightly used wastewater and diverting it into a tank where it can be reused, after filtration, for flushing toilets, gardening, etc but not for washing or drinking. It requires a tank in the ground where the rainwater is collected and the water is filtered before being pumped back into the building for reuse, eg for flushing toilets or used for irrigation.

Due to the use of siphonic drainage and the large expanse of roof, it is not appropriate for this site.

Not Recommended.

4.3.2 Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover, over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows.

However they can add weight and cost to the building. There are also no flat areas of roof where this would work effectively. They are not proposed to be used for this development.

Not Recommended.

4.3.3 Soakaways

Soakaways are square or circular excavations either filled with rubble or lined with brickwork, precast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. They can be grouped and linked together to drain large areas including highways. The supporting structure and backfill can be substituted by modular geocellular units. Soakaways provide stormwater attenuation, storm water treatment and groundwater recharge.

Soakaways are not feasible as the ground conditions are likely to be unsuitable.

Not Recommended.

4.3.4 Swales

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. They should promote low flow velocities to allow much of the suspended particulate load in the storm water runoff to settle out, thus providing effective pollutant removal. Roadside swales can replace conventional gullies and drainage pipes. Swales are easy to incorporate into the landscape design where space available and they can reduce the run-off rates and volumes.

Swales are unlikely to work on this site due to likely lack of infiltration provided.

Not Recommended.

4.3.5 Permeable Pavements

Permeable pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored and can then be infiltrated into the ground, be reused or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment if required.

Although there is a potential to lose long term effectiveness due to siltation, the use of permeable paving may be necessary should there be a high water table, rendering standard deeper underground tanks unusable.

Recommended (if becomes necessary due to high water table).

4.3.6 Geo-cellular/Modular Systems

Modular plastic geo-cellular systems with a high void ratio that can be used to create a below ground storage structure. Modular tanks can be used for run off attenuation but requires silt trap protection and a suitable means of access for cleaning and inspection. On this site, standard tanks may not be suitable due to high water table and smaller, shallower versions may need to be used under external hard surfaces.

Recommended.

4.3.7 Ponds

Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Runoff from each rain event is detained and treated in the pond. The retention time promotes removal through sedimentation and the opportunity for biological uptake mechanisms to reduce nutrient concentrations.

An attenuation pond is being provided to the north of the site.

Recommended.

4.3.8 Detention Basin

Detention basins are surface structures, typically vegetated depressions that provide flow control through temporary storage and attenuation with controlled release of stored runoff. They should be designed as landscape features that act as visual enhancement and habitat creation. When dry, they can be used for social space and habitat creation.

There is scope to provide a detention basin or pond to the north of the site but a permanent pond is currently proposed.

Recommended (pond or basin).

4.3.9 Infiltration Basin

Infiltration basins are vegetated depressions in the ground designed to store surface water runoff on the surface. They should be dry most of the time except in periods of heavy rain. Infiltration basins should be designed as landscape features that act as visual enhancement and habitat creation. When dry, they can be used for social space and habitat creation.

As for swales, an infiltration basin is unlikely to work on this site due to likely lack of infiltration provided.

Not Recommended.

4.3.10 Filter Drain

Filter drains are gravel filled trenches that collect, store and move water. They also treat pollution. The trench is filled with free draining gravel and often has a perforated pipe in the bottom to collect the water. They are widely used to drain roads and are often seen along the end of main roads. There is frequently a geotextile just below the surface that is used to trap silt and stop it clogging the gravel deeper in the trench. A small filter strip before the trench is also a good way of stopping silt clogging the trench. A filter strip is an area of vegetated land designed to accept runoff, located between an impermeable area and a receiving water course or drainage system.

As for swales, filter drains are unlikely to work on this site due to likely lack of infiltration provided but may be used if enclosed and part of a permeable paving solution.

Not Recommended (unless used as part of a permeable paving solution).

4.3.11 Rain Garden/Stormwater Planter

Rain gardens and stormwater planters are shallow, localised, landscaped areas which typically rely on engineered soils, enhanced vegetation and underdrains. These features are designed to manage and treat runoff from frequent storm events, providing attenuation and treatment of runoff.

Not appropriate in an industrial or commercial environment where available land is limited.

Not Recommended.

5.0 Foul Drainage

5.1 Existing Foul Drainage

From the Southern Water sewer records, there are no existing foul sewers situated within or immediately adjacent to the site. However, the topographical survey shows a foul manhole within the access road which can be used as a connecting point for the foul drainage from the site.

5.2 Proposed Foul Drainage

The proposed foul drainage from the building and separate amenity block will drain via 150mm diameter gravity sewers prior to discharge to a package sewage pumping station to lift flows to a rising main to be connected to an existing manhole in the access road, subject to agreement (currently unadopted). The proposed site foul drainage layout is provided in Appendix D. Calculations for foul flows are contained in Appendix F.

6.0 Maintenance and Management

Maintenance of the sewers, manholes, gullies, inlets/outlets and channel drains should be inspected at 6 monthly intervals and cleaned out at 12 monthly intervals. A full CCTV survey should also be carried out at 10 yearly intervals, including any underground tanks. For the permeable paving system, this would be in line with manufacturer's information and maintenance requirements, in accordance with CIRIA C753 SuDS Manual requirements.

Maintenance on the site would be managed by the end user. It is recommended that a specialist maintenance contractor should be appointed to undertake maintenance of all drainage on the site for the duration of its occupancy.

Further details of the maintenance and management associated with this development are presented in Appendix G.

7.0 Summary and Conclusions

The proposed development would be operated with minimal risk from flooding with the proposed mitigation measures and would not increase flood risk elsewhere.

Proposed surface water flows will be discharged to the adjacent watercourses via hydrobrakes or similar subject to agreement with West Sussex Council. The proposed surface water discharge rate and volume will be in accordance with greenfield run-off. Foul discharge to Southern Water's system will be subject to their requirements and available capacity.

The on-site treatment and pollution prevention measures with the provision of oil separators, permeable paving (if used) and catchpit inspection chambers/manholes, will provide adequate stages of treatment prior to discharge to the receiving watercourse.

Appendix A – Existing Site Plan



Existing Site Plan
1:1000

Notes for planning purposes only: This plan is submitted for planning purposes only and does not constitute a guarantee of accuracy or a statement of fact. It is the responsibility of the applicant to ensure that the information provided is accurate and up-to-date. The Council cannot be held responsible for any errors or omissions.	LOCATION PLAN:	NOTES:  Visual Scale 1:1000	PROJECT TITLE Bognor Regis Existing Site Plan <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>PLANNING</th> <th>DE</th> <th>BY</th> <th>FOR</th> </tr> </thead> <tbody> <tr> <td>AS</td> <td>1:1000</td> <td>30/04/2023</td> <td>S2</td> <td>PA</td> <td></td> </tr> </tbody> </table> 21028-ASA-V0-XX-DR-A-PL02-(S2-P1)	NO.	DATE	PLANNING	DE	BY	FOR	AS	1:1000	30/04/2023	S2	PA		LYSANDER ashtonsmith 20123
NO.	DATE	PLANNING	DE	BY	FOR											
AS	1:1000	30/04/2023	S2	PA												

Appendix B – Proposed Site Layout

Appendix C – Topographical Survey



3D THERMAGELLIC SURVEY

DATE: 10/10/10

TIME: 10:00

TEMP: 10.0

HUMIDITY: 100

WIND: 10

CLOUDS: 10

WIND DIRECTION: 10

WIND SPEED: 10

WIND GUST: 10

WIND VELOCITY: 10

WIND DIRECTION: 10

WIND SPEED: 10

WIND GUST: 10

WIND VELOCITY: 10

RECORD

TIME	TEMP	HUMIDITY	WIND	CLOUDS	WIND DIRECTION	WIND SPEED	WIND GUST	WIND VELOCITY
10:00	10.0	100	10	10	10	10	10	10
10:05	10.0	100	10	10	10	10	10	10
10:10	10.0	100	10	10	10	10	10	10
10:15	10.0	100	10	10	10	10	10	10
10:20	10.0	100	10	10	10	10	10	10
10:25	10.0	100	10	10	10	10	10	10
10:30	10.0	100	10	10	10	10	10	10
10:35	10.0	100	10	10	10	10	10	10
10:40	10.0	100	10	10	10	10	10	10
10:45	10.0	100	10	10	10	10	10	10
10:50	10.0	100	10	10	10	10	10	10
10:55	10.0	100	10	10	10	10	10	10
11:00	10.0	100	10	10	10	10	10	10
11:05	10.0	100	10	10	10	10	10	10
11:10	10.0	100	10	10	10	10	10	10
11:15	10.0	100	10	10	10	10	10	10
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11:25	10.0	100	10	10	10	10	10	10
11:30	10.0	100	10	10	10	10	10	10
11:35	10.0	100	10	10	10	10	10	10
11:40	10.0	100	10	10	10	10	10	10
11:45	10.0	100	10	10	10	10	10	10
11:50	10.0	100	10	10	10	10	10	10
11:55	10.0	100	10	10	10	10	10	10
12:00	10.0	100	10	10	10	10	10	10

DO NOT SCALE

[illegible]

SECRET

LAST

[illegible][illegible]

Entity	100%	100%	Two Asset Inheritance Election
Entity	100%	100%	Entity Trust
Entity	100%	100%	Entity

Franken 2000
2000000

1. 姓名: 王明 2. 性别: 男 3. 年龄: 25 4. 职业: 教师 5. 住址: 北京市朝阳区	6. 联系电话: 13800138000 7. 电子邮箱: wangming@example.com 8. 身份证号: 110101199001010001
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Auditor: Gr80

Olderide Perry
Barbara Smith

3D Topographic Survey	
RECORD	

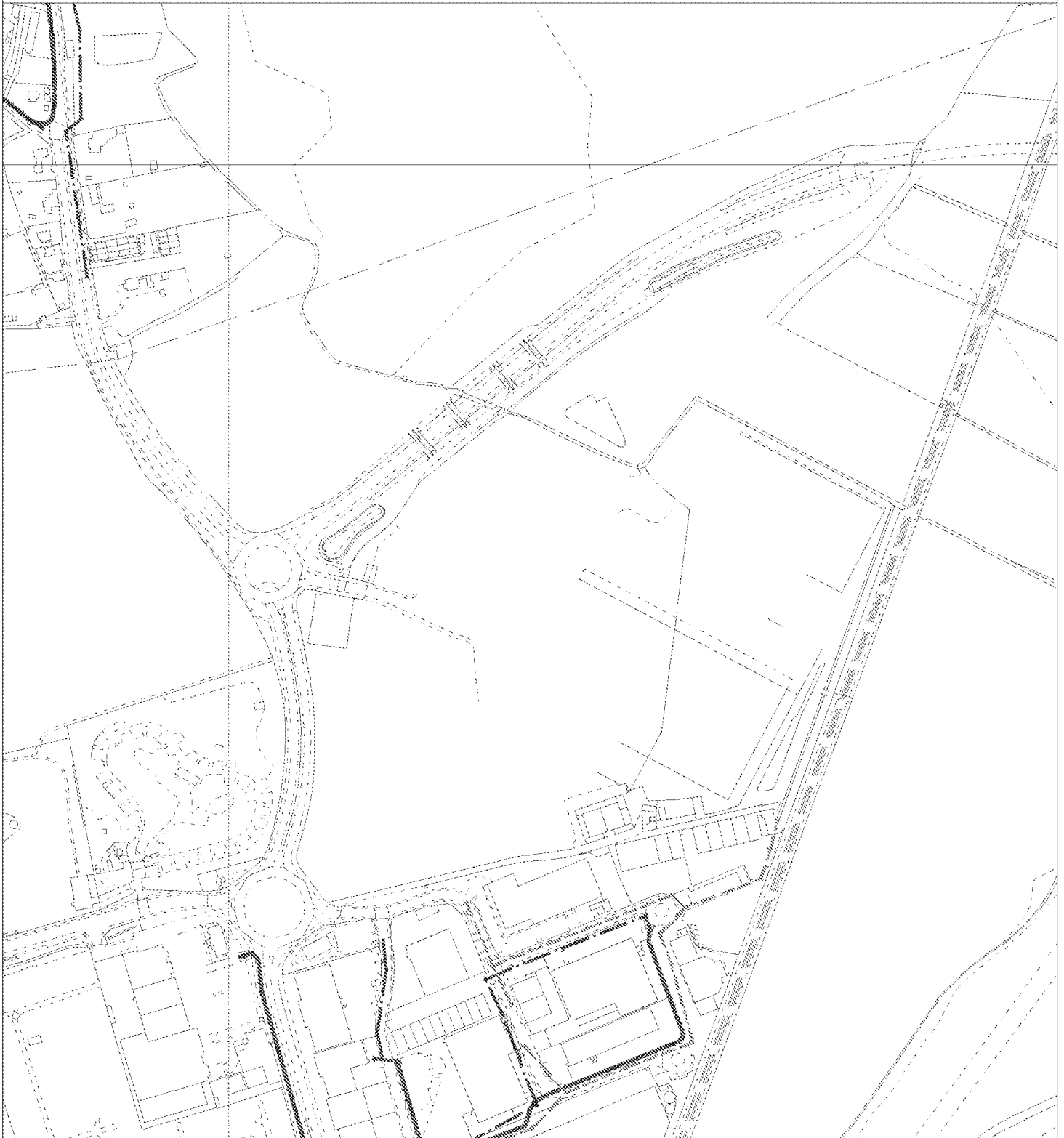
By: <u> </u>	Reviewed By: <u> </u>	Checked By: <u> </u>	Approved By: <u> </u>
NY	7Y	60	MC
Date of Issue: <u>06/07/2021</u>		Scale: <u>6-7M</u>	
06/07/2021		1/100	

LP3204	LAP	XX	GE
Age	4	2002	602

Reference: 17, 2004

Appendix D – Southern Water Records

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: SU9401NW

Scale: 1:4560

Screen Print

WARNING: BAC pipes are constructed at Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

ARUN DISTRICT COUNCIL BE42/19/DOC



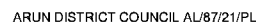
Printed By: chandne

Date: 16-4-2019

Southern Water MapGuide Browser

Requested By:

Appendix E – Proposed Drainage Layout



Appendix F – Surface Water, Qbar and Foul Calculations

Eireng Consulting Engineers

File: 212039_Storm Calculations.pfd
Network: Outfall 1
Jakub Matveev
30/08/2021

Page 1
Oldlands Farm
Bognor

Design Settings

Rainfall Methodology	FSR	M5-60 (mm)	17.000	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200
Return Period (years)	2	Ratio-R	0.400	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	CV	0.750	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓
FSR Region	England and Wales	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S001	0.018	5.00	0.0	3.050	1200	494440.067	101888.181	1.145
S002	0.068	5.00	0.0	2.850	1200	494523.291	101923.862	1.390
S003	0.060	5.00	0.0	2.680	1200	494578.745	101950.730	1.465
S003a	0.012	5.00	0.0	2.300	1200	494610.600	101967.384	1.650
S003b	0.000	5.00	0.0	2.300	1200	494631.087	101980.340	1.715
ACO Qmax 350	0.283	5.00	0.0	2.310		494484.336	101824.687	0.660
S004	0.000	5.00	0.0	2.600	1800	494492.270	101834.187	0.980
S006	0.000	5.00	0.0	3.300	1200	494524.110	101828.231	1.870
S007	0.610	5.00	0.0	2.820	1500	494635.987	101836.966	1.395
S008	0.049	5.00	0.0	2.800	1800	494561.386	101873.600	1.685
S009	0.126	5.00	0.0	3.000	1800	494586.560	101926.881	2.035
S010a	0.002	5.00	0.0	2.850	1200	494609.550	101879.065	1.010
S010	0.041	5.00	0.0	2.750	1200	494654.087	101862.698	1.240
S011a	0.002	5.00	0.0	2.750	1200	494631.736	101940.138	1.135
S011b	0.227	5.00	0.0	2.600	1200	494677.323	101923.385	1.320
S011	0.042	5.00	0.0	2.500	1500	494686.268	101946.748	1.365
S012	0.292	5.00	0.0	2.300	1800	494614.309	101976.540	1.545
S013	0.000	5.00	0.0	2.300	1800	494616.952	101979.797	1.560
S014	0.000	5.00	0.0	2.300	1800	494631.851	101973.278	1.740
Attenuation Pond	0.000	5.00	0.0	1.750		494681.877	101970.299	1.300
S015	0.000	5.00	0.0	1.600	1800	494689.276	101952.553	1.160
S016	0.000	5.00	0.0	1.500	1200	494696.203	101949.757	1.100
Outfall 1	0.000	5.00	0.0	1.500		494698.114	101948.986	1.140

Links

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	S001	S002	80.220	0.000	1.905	1.460	0.445	0.000	300	0.00	0.00
1.001	S002	S003	81.720	0.000	1.460	1.215	0.245	0.000	300	0.00	0.00
1.002	S003	S003a	48.800	0.000	1.215	0.650	0.565	0.000	300	0.00	0.00
1.003	S003a	S003b	28.800	0.000	0.650	0.585	0.065	0.000	300	0.00	0.00
1.004	S003b	S014	7.200	0.000	0.585	0.560	0.025	0.000	300	0.00	0.00
Qmax link	ACO Qmax 350	S004	22.377	0.000	1.650	1.620	0.030	0.000	375	0.00	0.00

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.098	77.6	2.4	0.000	0.000	0.018	0.0	36	0.501
1.001	0.997	69.7	11.6	0.000	0.180	0.086	0.0	82	0.736
1.002	1.697	119.9	19.1	0.000	1.350	0.146	0.0	81	1.252
1.003	0.661	60.5	20.1	1.350	1.415	0.158	0.0	119	0.772
1.004	0.668	65.6	20.0	1.415	1.440	0.158	0.0	113	0.817
Qmax link	0.668	97.8	38.4	0.000	0.000	0.283	0.0	163	0.834

Links

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)
2.000	S004	S005	32.893	0.500	1.620	1.430	0.190	1:20.5	375	5.81	50.0
2.001	S006	S008	78.733	0.500	1.430	1.265	0.165	1:18.9	375	6.85	50.0
4.000	S007	S008	85.133	0.500	1.425	1.190	0.235	1:12.7	450	8.19	50.0
2.002	S008	S009	55.028	0.500	1.115	0.965	0.150	1:20.0	525	7.02	45.0
2.003	S009	S012	85.888	0.500	0.965	0.830	0.135	1:21.8	525	6.40	45.0
5.000	S010a	S010	47.489	0.500	1.840	1.680	0.160	1:25.5	225	6.05	50.0
5.001	S010	S011b	65.283	0.500	1.510	1.280	0.230	1:20.0	375	7.05	50.0
6.000	S011a	S011b	48.168	0.500	1.615	1.430	0.185	1:21.8	225	8.65	50.0
5.002	S011b	S011	25.037	0.500	1.280	1.210	0.070	1:17.4	375	10.0	45.0
5.003	S011	S012	77.882	0.500	1.135	0.905	0.230	1:25.0	450	8.08	45.0
2.004	S012	S013	4.298	0.500	0.755	0.740	0.015	1:29.5	600	8.71	45.0
2.005	S013	S014	15.293	0.500	0.740	0.560	0.180	1:37.8	600	8.83	45.0
1.005a	S014	Attenuation Pond	50.135	0.500	0.560	0.450	0.110	1:28.8	600	8.52	40.0
1.005b	Attenuation Pond	S015	15.127	0.500	0.450	0.440	0.010	1:92.7	250	10.68	40.0
1.006	S015	S016	7.470	0.500	0.440	0.400	0.040	1:38.0	450	10.18	40.0
1.007	S016	Outfall 1	2.001	0.500	0.400	0.360	0.040	1:1.0	375	10.17	40.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.384	152.9	38.4	0.500	1.495	0.283	0.0	128	1.160
2.001	0.884	105.4	38.4	1.495	0.500	0.283	0.0	156	0.882
4.000	1.075	171.0	82.7	0.500	1.190	0.610	0.0	220	1.066
2.002	1.124	243.3	126.4	0.500	1.510	0.942	0.0	268	1.134
2.003	1.085	234.8	135.5	1.510	0.500	1.068	0.0	286	1.121
5.000	0.233	30.0	0.3	0.500	0.500	0.002	0.0	15	0.233
5.001	1.073	118.5	5.8	0.500	0.500	0.043	0.0	56	0.563
6.000	0.002	31.9	0.3	0.500	0.500	0.002	0.0	15	0.238
5.002	0.057	105.2	36.5	0.500	0.500	0.272	0.0	152	0.868
5.003	1.099	174.8	39.2	0.500	0.500	0.314	0.0	144	0.891
2.004	1.451	410.3	208.2	0.500	0.500	1.674	0.0	303	1.456
2.005	2.562	724.5	206.9	0.500	1.130	1.674	0.0	218	2.224
1.005a	1.134	320.6	217.0	1.130	0.750	1.832	0.0	363	1.214
1.005b	0.698	277.8	211.0	0.500	0.500	1.832	0.0	491	0.689
1.006	1.484	236.0	210.0	0.750	0.500	1.832	0.0	333	1.667
1.007	2.529	279.3	210.0	0.750	0.750	1.832	0.0	244	2.765

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	50.135	1:28.8	300	Covered	3.050	1.905	0.500	2.850	1.460	0.500
1.001	61.827	1:19.5	300	Covered	2.850	1.460	1.000	2.680	1.215	1.100
1.002	49.162	1:30.0	300	Covered	2.680	1.215	1.100	2.300	0.650	1.350
1.003	21.565	1:21.0	300	Covered	2.300	0.650	1.350	2.300	0.585	1.415

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S001	1200	Manhole	Accessable	S002	1200	Manhole	Accessable
1.001	S002	1200	Manhole	Accessable	S003	1200	Manhole	Accessable
1.002	S003	1200	Manhole	Accessable	S003a	1200	Manhole	Accessable
1.003	S003a	1200	Manhole	Accessable	S003b	1200	Manhole	Accessable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.004	2.573	236.1	300	Circular	2.300	0.585	1.415	2.300	0.560	1.440
Qmax link	12.573	433.6	375	Circular	2.310	1.650	0.000	2.600	1.620	0.000
2.000	30.000	170.5	375	Circular	2.600	1.620	0.000	3.300	1.430	1.495
2.001	50.718	338.9	375	Circular	3.300	1.430	1.495	2.800	1.265	1.500
4.000	88.111	338.7	450	Circular	2.820	1.425	0.000	2.800	1.190	1.100
2.002	88.930	830.0	525	Circular	2.800	1.115	0.000	3.000	0.965	1.510
2.003	58.888	821.6	525	Circular	3.000	0.965	1.510	2.300	0.830	0.000
5.000	47.000	185.6	225	Circular	2.850	1.840	0.000	2.750	1.680	0.000
5.001	60.000	185.5	375	Circular	2.750	1.510	0.000	2.600	1.280	0.000
6.000	68.508	282.3	225	Circular	2.750	1.615	0.000	2.600	1.430	0.000
5.002	25.000	837.4	375	Circular	2.600	1.280	0.000	2.500	1.210	0.000
5.003	77.801	836.8	450	Circular	2.500	1.135	0.000	2.300	0.905	0.000
2.004	4.188	275.6	600	Circular	2.300	0.755	0.000	2.300	0.740	0.000
2.005	30.453	80.3	600	Circular	2.300	0.740	0.000	2.300	0.560	0.000
1.005a	50.115	458.6	600	Circular	2.300	0.560	1.100	1.750	0.450	0.000
1.005b	19.227	582.7	750	Circular	1.750	0.450	0.000	1.600	0.440	0.000
1.006	7.470	588.8	450	Circular	1.600	0.440	0.000	1.500	0.400	0.000
1.007	2.051	511.5	375	Circular	1.500	0.400	0.000	1.500	0.360	0.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.004	S003b	1200	Manhole	Adapttable	S014	1800	Manhole	Adapttable
Qmax link	ACO Qmax 350		Junction		S004	1800	Manhole	Adapttable
2.000	S004	1800	Manhole	Adapttable	S006	1200	Manhole	Adapttable
2.001	S006	1200	Manhole	Adapttable	S008	1800	Manhole	Adapttable
4.000	S007	1500	Manhole	Adapttable	S008	1800	Manhole	Adapttable
2.002	S008	1800	Manhole	Adapttable	S009	1800	Manhole	Adapttable
2.003	S009	1800	Manhole	Adapttable	S012	1800	Manhole	Adapttable
5.000	S010a	1200	Manhole	Adapttable	S010	1200	Manhole	Adapttable
5.001	S010	1200	Manhole	Adapttable	S011b	1200	Manhole	Adapttable
6.000	S011a	1200	Manhole	Adapttable	S011b	1200	Manhole	Adapttable
5.002	S011b	1200	Manhole	Adapttable	S011	1500	Manhole	Adapttable
5.003	S011	1500	Manhole	Adapttable	S012	1800	Manhole	Adapttable
2.004	S012	1800	Manhole	Adapttable	S013	1800	Manhole	Adapttable
2.005	S013	1800	Manhole	Adapttable	S014	1800	Manhole	Adapttable
1.005a	S014	1800	Manhole	Adapttable	Attenuation Pond		Junction	
1.005b	Attenuation Pond		Junction		S015	1800	Manhole	Adapttable
1.006	S015	1800	Manhole	Adapttable	S016	1200	Manhole	Adapttable
1.007	S016	1200	Manhole	Adapttable	Outfall 1		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S001	494440.067	101888.181	3.050	1.145	1200				
S002	494523.291	101923.862	2.850	1.390	1200		0	1.000	1.905 300
							1	1.000	1.460 300
							0	1.001	1.460 300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S003	494578.745	101950.790	2.680	1.465	1200		1 1.001	1.215	300
S003a	494610.600	101987.384	2.300	1.650	1200		0 1.002 1 1.002	1.215 0.650	300 300
S003b	494631.087	101980.340	2.300	1.715	1200		0 1.003 1 1.003	0.650 0.585	300 300
ACO Qmax 350	494484.336	101824.687	2.310	0.660			0 1.004	0.585	300
S004	494492.270	101834.187	2.600	0.980	1800		0 Qmax link 1 Qmax link	1.650 1.620	375 375
S006	494524.110	101828.231	3.300	1.870	1200		0 2.000 1 2.000	1.620 1.430	375 375
S007	494635.987	101836.966	2.820	1.395	1500		0 2.001	1.430	375
S008	494561.386	101873.600	2.800	1.685	1800		0 4.000 1 4.000 2 2.001	1.425 1.190 1.265	450 450 375
S009	494586.560	101926.881	3.000	2.035	1800		0 2.002 1 2.002	1.115 0.965	525 525
S010a	494609.550	101879.065	2.850	1.010	1200		0 2.003	0.965	525
S010	494654.087	101862.698	2.750	1.240	1200		0 5.000 1 5.000	1.840 1.680	225 225
S011a	494631.736	101940.138	2.750	1.135	1200		0 5.001	1.510	375
S011b	494677.323	101923.385	2.600	1.320	1200		0 6.000 1 6.000 2 5.001	1.615 1.430 1.280	225 225 375
							0 5.002	1.280	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S011	494686.268	101946.748	2.500	1.365	1500		1	5.002	1.210 375
S012	494614.309	101976.540	2.300	1.545	1800		0 1 2	5.003 5.003 2.003	1.135 450 0.905 450 0.890 525
S013	494616.952	101979.797	2.300	1.560	1800		0	2.004	0.755 600
S014	494631.851	101973.278	2.300	1.740	1800		1 2	1.004 2.005	0.560 300 0.560 600
Attenuation Pond	494681.877	101970.299	1.750	1.300			0	1.005a	0.560 600
S015	494689.276	101952.553	1.600	1.160	1800		1	1.005b	0.440 750
S016	494696.203	101949.757	1.500	1.100	1200		0	1.006	0.440 450
Outfall 1	494698.114	101948.986	1.500	1.140			1	1.007	0.360 375

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	26.4
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m³/ha)	20.0	100 year (l/s)	33.5
MS-60 (mm)	17.000	Analysis Speed	Normal	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Ratio-R	0.400	Skip Steady State	x	1 year (l/s)	11.5	100 year 360 minute (m³)	885

Storm Durations

	15	30	60	120	180	240	360	480	600	720	960	1440
Return Period (years)	1											
Climate Change (CC %)	0											
Additional Area (A %)	0											
Additional Flow (Q %)	0											
Return Period (years)	30											
Climate Change (CC %)	0											
Additional Area (A %)	0											
Additional Flow (Q %)	0											
Return Period (years)	100											
Climate Change (CC %)	40											
Additional Area (A %)	0											
Additional Flow (Q %)	0											

Pre-development Discharge Rate

Site Makeup	Greenfield	SAAR (mm)	720	Region	7	Growth Factor 100 year	2.48	Q 1 year (l/s)	11.5
Greenfield Method	IH124	Soil Index	3	Growth Factor 1 year	0.85	Betterment (%)	0	Q 30 year (l/s)	26.4
Positively Drained Area (ha)	4.550	SPR	0.37	Growth Factor 30 year	1.95	QBar	13.5	Q 100 year (l/s)	33.5

ARUN DISTRICT COUNCIL AL/87/21/PL

Eireng Consulting Engineers			File: 212039_Storm Calculations.pfd Network: Outfall 1 Jakub Matveev 30/08/2021				Page 7 Oldlands Farm Bognor	
Results for 1 year Critical Storm Duration. Lowest mass balance: 99.53%								
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S001	11	1.937	0.032	2.1	0.0462	0.0000	OK
15 minute winter	S002	12	1.532	0.072	9.8	0.1521	0.0000	OK
15 minute winter	S003	12	1.286	0.071	15.3	0.1377	0.0000	OK
15 minute winter	S003a	13	0.852	0.202	16.0	0.2574	0.0000	OK
15 minute winter	S003b	13	0.847	0.262	14.5	0.2966	0.0000	OK
15 minute winter	ACO Qmax 350	10	1.792	0.142	33.7	1.2169	0.0000	OK
15 minute winter	S004	11	1.741	0.121	32.7	0.3086	0.0000	OK
15 minute winter	S006	12	1.573	0.143	32.9	0.1621	0.0000	OK
15 minute winter	S007	11	1.626	0.201	72.7	2.1094	0.0000	OK
15 minute winter	S008	12	1.361	0.246	102.3	0.7692	0.0000	OK
15 minute winter	S009	13	1.224	0.259	115.2	0.9789	0.0000	OK
30 minute winter	S010a	20	1.853	0.013	0.2	0.0151	0.0000	OK
15 minute winter	S010	11	1.560	0.050	5.0	0.0902	0.0000	OK
30 minute winter	S011a	20	1.627	0.012	0.2	0.0145	0.0000	OK
15 minute winter	S011b	11	1.421	0.141	31.5	0.6455	0.0000	OK
15 minute winter	S011	12	1.270	0.135	34.6	0.3216	0.0000	OK
15 minute winter	S012	13	1.035	0.280	167.4	1.7716	0.0000	OK
15 minute winter	S013	13	0.976	0.236	165.6	0.5994	0.0000	OK
15 minute winter	S014	13	0.846	0.286	181.2	0.7267	0.0000	OK
720 minute winter	Attenuation Pond	675	0.706	0.256	19.5	314.4956	0.0000	OK
720 minute winter	S015	675	0.706	0.266	6.3	0.6774	0.0000	OK
720 minute winter	S016	675	0.706	0.306	6.4	0.3461	0.0000	OK
15 minute summer	Outfall 1	247	1.500	1.140	1.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S001	1.000	S002	1.9	0.230	0.024	0.7690	
15 minute winter	S002	1.001	S003	8.8	0.688	0.126	0.7893	
15 minute winter	S003	1.002	S003a	14.8	0.797	0.124	1.5093	
15 minute winter	S003a	1.003	S003b	14.5	0.340	0.241	1.2532	
15 minute winter	S003b	1.004	S014	15.9	0.258	0.243	0.4777	
15 minute winter	ACO Qmax 350	Qmax link	S004	32.7	0.954	0.334	0.4247	
15 minute winter	S004	2.000	S006	32.9	1.008	0.215	1.1101	
15 minute winter	S006	2.001	S008	31.5	0.880	0.299	2.1020	
15 minute winter	S007	4.000	S008	67.2	1.067	0.393	5.2771	
15 minute winter	S008	2.002	S009	103.5	1.024	0.426	6.0237	
15 minute winter	S009	2.003	S012	111.3	1.156	0.474	5.4776	
30 minute winter	S010a	5.000	S010	0.2	0.218	0.006	0.0363	
15 minute winter	S010	5.001	S011b	4.7	0.212	0.040	1.5174	
30 minute winter	S011a	6.000	S011b	0.2	0.227	0.005	0.0362	
15 minute winter	S011b	5.002	S011	29.9	0.860	0.284	0.8711	
15 minute winter	S011	5.003	S012	33.4	0.864	0.191	3.0145	
15 minute winter	S012	2.004	S013	165.6	1.432	0.404	0.4855	
15 minute winter	S013	2.005	S014	166.5	1.419	0.230	1.9091	
15 minute winter	S014	1.005a	Attenuation Pond	182.5	3.071	0.569	3.4572	
720 minute winter	Attenuation Pond	1.005b	S015	6.3	0.093	0.023	2.6208	
720 minute winter	S015	1.006	S016	6.4	0.100	0.027	0.7935	
720 minute winter	S016	1.007	Outfall 1	6.4	1.007	0.023	0.2118	108.3

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Eireng Consulting Engineers		File: 212039_Storm Calculations.pfd Network: Outfall 1 Jakub Matveev 30/08/2021				Page 8 Oldlands Farm Bognor		
Results for 30 year Critical Storm Duration. Lowest mass balance: 99.53%								
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S001	11	1.955	0.050	5.2	0.0727	0.0000	OK
15 minute winter	S002	11	1.580	0.120	24.3	0.2531	0.0000	OK
15 minute winter	S003	11	1.331	0.116	39.2	0.2259	0.0000	OK
15 minute winter	S003a	12	1.075	0.425	41.9	0.5420	0.0000	OK
15 minute winter	S003b	12	1.037	0.452	40.4	0.5111	0.0000	OK
15 minute winter	ACO Qmax 350	10	1.890	0.240	82.4	2.0609	0.0000	OK
15 minute winter	S004	10	1.825	0.205	80.5	0.5226	0.0000	OK
15 minute winter	S006	12	1.683	0.253	80.6	0.2867	0.0000	OK
15 minute winter	S007	11	1.803	0.378	177.5	3.9706	0.0000	OK
15 minute winter	S008	12	1.618	0.503	261.5	1.5738	0.0000	OK
15 minute winter	S009	12	1.475	0.510	270.4	1.9297	0.0000	OK
15 minute winter	S010a	12	1.860	0.020	0.6	0.0236	0.0000	OK
15 minute winter	S010	11	1.589	0.079	12.2	0.1409	0.0000	OK
15 minute winter	S011a	12	1.635	0.020	0.6	0.0228	0.0000	OK
15 minute winter	S011b	11	1.519	0.239	77.9	1.0903	0.0000	OK
15 minute winter	S011	11	1.350	0.215	85.8	0.5124	0.0000	OK
15 minute winter	S012	12	1.284	0.529	416.2	3.3482	0.0000	OK
15 minute winter	S013	12	1.173	0.433	414.8	1.1012	0.0000	OK
15 minute winter	S014	12	1.019	0.459	455.2	1.1675	0.0000	OK
600 minute winter	Attenuation Pond	615	0.978	0.528	48.7	679.8805	0.0000	OK
600 minute winter	S015	615	0.977	0.537	6.9	1.3660	0.0000	OK
600 minute winter	S016	615	0.977	0.577	7.3	0.6528	0.0000	OK
15 minute summer	Outfall 1	247	1.500	1.140	10.3	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S001	1.000	S002	4.8	0.295	0.062	1.5428	
15 minute winter	S002	1.001	S003	22.8	0.895	0.327	1.5832	
15 minute winter	S003	1.002	S003a	38.6	0.849	0.322	2.3188	
15 minute winter	S003a	1.003	S003b	40.4	0.573	0.668	1.5256	
15 minute winter	S003b	1.004	S014	40.4	0.573	0.615	0.5002	
15 minute winter	ACO Qmax 350	Qmax link	S004	80.5	1.180	0.823	0.8436	
15 minute winter	S004	2.000	S006	80.6	1.165	0.527	2.2666	
15 minute winter	S006	2.001	S008	78.7	0.961	0.747	5.4903	
15 minute winter	S007	4.000	S008	169.4	1.234	0.991	12.0417	
15 minute winter	S008	2.002	S009	237.2	1.161	0.975	12.5891	
15 minute winter	S009	2.003	S012	264.4	1.310	1.126	11.7442	
15 minute winter	S010a	5.000	S010	0.4	0.298	0.015	0.0714	
15 minute winter	S010	5.001	S011b	11.8	0.267	0.099	2.9468	
15 minute winter	S011a	6.000	S011b	0.5	0.266	0.016	0.3921	
15 minute winter	S011b	5.002	S011	74.3	1.113	0.706	1.6685	
15 minute winter	S011	5.003	S012	84.0	0.905	0.480	8.4417	
15 minute winter	S012	2.004	S013	414.8	1.713	1.011	1.0082	
15 minute winter	S013	2.005	S014	414.9	1.848	0.573	3.6497	
15 minute winter	S014	1.005a	Attenuation Pond	454.9	3.823	1.419	6.3740	
600 minute winter	Attenuation Pond	1.005b	S015	6.9	0.106	0.025	6.4283	
600 minute winter	S015	1.006	S016	7.3	0.065	0.031	1.1836	
600 minute winter	S016	1.007	Outfall 1	6.6	0.997	0.024	0.2273	81.9
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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S001	11	1.973	0.068	9.5	0.0986	0.0000	OK
15 minute winter	S002	11	1.629	0.169	44.4	0.3573	0.0000	OK
15 minute winter	S003	12	1.594	0.379	73.4	0.7387	0.0000	OK
15 minute winter	S003a	12	1.428	0.778	62.8	0.9934	0.0000	OK
960 minute winter	S003b	945	1.340	0.755	7.9	0.8535	0.0000	OK
15 minute summer	ACO Qmax 350	11	2.310	0.660	141.5	8.5609	0.0000	OK
15 minute winter	S004	11	2.600	0.980	140.2	2.4941	5.3293	OK
15 minute winter	S006	11	2.528	1.098	120.0	1.2414	0.0000	OK
15 minute winter	S007	11	2.820	1.395	320.7	14.6656	7.2713	OK
15 minute winter	S008	11	2.419	1.304	327.6	4.0755	0.0000	OK
15 minute winter	S009	11	2.110	1.145	383.1	4.3312	0.0000	OK
15 minute winter	S010a	13	1.908	0.068	2.8	0.0795	0.0000	OK
15 minute winter	S010	12	1.903	0.393	50.6	0.7038	0.0000	OK
15 minute winter	S011a	12	1.917	0.302	14.3	0.3517	0.0000	OK
15 minute winter	S011b	12	1.867	0.587	136.3	2.6827	0.0000	OK
15 minute winter	S011	12	1.789	0.654	127.2	1.5575	0.0000	OK
15 minute winter	S012	11	1.681	0.926	613.1	5.8550	0.0000	OK
15 minute winter	S013	11	1.530	0.790	606.4	2.0105	0.0000	OK
960 minute winter	S014	930	1.341	0.781	71.3	1.9864	0.0000	OK
960 minute winter	Attenuation Pond	945	1.340	0.890	60.7	1218.4830	0.0000	OK
960 minute winter	S015	930	1.339	0.899	6.6	2.2871	0.0000	OK
960 minute winter	S016	945	1.342	0.942	7.4	1.0558	0.0000	OK
15 minute summer	Outfall 1	247	1.500	1.140	10.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S001	1.000	S002	9.0	0.346	0.116	2.4006	
15 minute winter	S002	1.001	S003	43.7	0.968	0.627	3.3722	
15 minute winter	S003	1.002	S003a	56.9	0.929	0.475	3.4197	
15 minute winter	S003a	1.003	S003b	62.9	0.893	1.040	1.5256	
960 minute winter	S003b	1.004	S014	7.2	0.114	0.110	0.5002	
15 minute summer	ACO Qmax 350	Qmax link	S004	125.3	1.300	1.281	1.3651	
15 minute winter	S004	2.000	S006	120.0	1.238	0.785	3.5727	
15 minute winter	S006	2.001	S008	106.0	0.970	1.006	6.4764	
15 minute winter	S007	4.000	S008	243.1	1.534	1.422	13.1684	
15 minute winter	S008	2.002	S009	323.8	1.499	1.331	12.7306	
15 minute winter	S009	2.003	S012	379.0	1.755	1.614	12.2892	
15 minute winter	S010a	5.000	S010	3.1	0.405	0.105	1.1187	
15 minute winter	S010	5.001	S011b	36.4	0.432	0.307	7.1674	
15 minute winter	S011a	6.000	S011b	-13.3	-0.409	-0.417	1.9316	
15 minute winter	S011b	5.002	S011	108.7	1.226	1.033	2.7593	
15 minute winter	S011	5.003	S012	127.8	0.921	0.731	12.3399	
15 minute winter	S012	2.004	S013	606.4	2.153	1.478	1.1814	
15 minute winter	S013	2.005	S014	605.0	2.148	0.835	4.5809	
960 minute winter	S014	1.005a	Attenuation Pond	60.7	1.029	0.189	14.1163	
960 minute winter	Attenuation Pond	1.005b	S015	6.6	0.124	0.024	8.4622	
960 minute winter	S015	1.006	S016	7.4	0.075	0.031	1.1836	
960 minute winter	S016	1.007	Outfall 1	6.5	0.992	0.023	0.2273	223.9

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Design Settings

Rainfall Methodology	FSR	M5-60 (mm)	17.000	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200
Return Period (years)	2	Ratio-R	0.400	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	CV	0.750	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓
FSR Region	England and Wales	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S101	0.470	8.00	0.0	3.100	1800	494594.573	101715.724	1.075
S102	0.412	6.00	0.0	3.200	1800	494623.885	101771.716	1.535
S103	0.243	5.00	0.0	2.880	1800	494619.696	101807.962	1.320
S104	0.000	5.00	0.0	3.100	1800	494545.927	101846.789	1.780
S105	0.000	5.00	0.0	2.850	1800	494551.247	101856.892	1.640
Attenuation Tank Outfall 2	0.000	5.00	0.0	2.850		494597.143	101832.864	1.745
S106	0.020	5.00	0.0	1.800	1800	494643.040	101808.837	0.800
Outfall 2	0.000	5.00	0.0	1.800		494646.802	101806.867	1.200

Links

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)
10.000	S101	S102	63.300	0.800	2.025	1.815	0.210	101.6	375	8.00	25.0
10.001	S102	S103	80.000	0.800	1.665	1.560	0.105	347.6	525	8.00	25.0
10.002	S103	S104	80.000	0.800	1.560	1.320	0.240	367.8	525	10.00	21.2
10.003	S104	S105	13.400	0.650	1.320	1.210	0.110	268.8	525	10.00	21.2
10.004a	S105	Attenuation Tank Outfall 2	50.800	0.800	1.210	1.105	0.105	268.8	525	11.00	28.2
10.004b	Attenuation Tank Outfall 2	S106	61.000	0.800	1.105	1.000	0.105	268.8	525	12.00	27.7
10.005	S106	Outfall 2	3.000	0.800	1.000	0.600	0.400	20.0	225	12.00	27.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
10.000	1.039	114.7	57.5	0.740	1.000	0.470	0.0	188	1.040
10.001	1.196	258.8	104.7	1.000	0.790	0.882	0.0	232	1.135
10.002	1.196	258.9	125.5	0.790	1.255	1.125	0.0	258	1.187
10.003	2.198	475.8	124.9	1.255	0.810	1.125	0.0	183	1.866
10.004a	1.001	216.8	119.6	0.810	1.220	1.125	0.0	279	1.025
10.004b	1.001	216.8	114.9	1.220	0.770	1.125	0.0	272	1.016
10.005	0.770	160.6	116.8	0.770	0.600	1.145	0.0	143	4.393

Pipeline Schedule

Link	Length (m)	Slope (1%)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
10.000	375.000	368.8	375	Overhead	3.100	2.025	0.975	3.200	1.815	1.285
10.001	305.000	367.5	525	Overhead	3.200	1.665	1.535	2.880	1.560	1.020
10.002	305.000	367.5	525	Overhead	2.880	1.560	1.320	3.100	1.320	1.255
10.003	13.418	333.0	525	Overhead	3.100	1.320	1.255	2.850	1.210	1.115
10.004a	11.891	480.4	525	Overhead	2.850	1.210	1.115	2.850	1.105	1.220
10.004b	11.891	480.4	525	Overhead	2.850	1.105	1.220	1.800	1.000	0.875
10.005	6.287	10.8	225	Overhead	1.800	1.000	0.875	1.800	0.600	0.975

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
10.000	S101	1800	Manhole	Adaptation	S102	1800	Manhole	Adaptation
10.001	S102	1800	Manhole	Adaptation	S103	1800	Manhole	Adaptation
10.002	S103	1800	Manhole	Adaptation	S104	1800	Manhole	Adaptation
10.003	S104	1800	Manhole	Adaptation	S105	1800	Manhole	Adaptation
10.004a	S105	1800	Manhole	Adaptation	Attenuation Tank Outfall 2		Junction	
10.004b	Attenuation Tank Outfall 2		Junction		S106	1800	Manhole	Adaptation
10.005	S106	1800	Manhole	Adaptation	Outfall 2		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S101	494594.573	101715.724	3.100	1.075	1800				
S102	494623.885	101771.716	3.200	1.535	1800		0 10.000	2.025	375
S103	494619.696	101807.962	2.880	1.320	1800		1 10.000	1.815	375
S104	494545.927	101846.789	3.100	1.780	1800		0 10.001	1.665	525
S105	494551.247	101856.892	2.850	1.640	1800		1 10.001	1.560	525
Attenuation Tank Outfall 2	494597.143	101832.864	2.850	1.745			0 10.002	1.560	525
S106	494643.040	101808.837	1.800	0.800	1800		1 10.002	1.320	525
							0 10.003	1.320	525
							1 10.003	1.210	525
							0 10.004a	1.210	525
							1 10.004a	1.105	525
							0 10.004b	1.105	525
							1 10.004b	1.000	525
							0 10.005	1.000	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Outfall 2	494646.802	101806.867	1.800	1.200		1	10.005	0.600	225

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	25.4
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m ³ /ha)	20.0	100 year (l/s)	33.5
MS-60 (mm)	17.000	Analysis Speed	Normal	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Ratio-R	0.400	Skip Steady State	x	1 year (l/s)	11.5	100 year 360 minute (m ³)	885

Storm Durations

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	0	0	0	100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SAAR (mm)	720	Region	7	Growth Factor 100 year	2.48	Q 1 year (l/s)	11.5
Greenfield Method	IH124	Soil Index	3	Growth Factor 1 year	0.85	Betterment (%)	0	Q 30 year (l/s)	26.4
Positively Drained Area (ha)	4.550	SPR	0.37	Growth Factor 30 year	1.95	QBar	13.5	Q 100 year (l/s)	33.5

Pre-development Discharge Volume

Site Makeup	Greenfield	Positively Drained Area (ha)	4.550	SPR	0.37	Return Period (years)	100	Storm Duration (mins)	360	PR	0.357
Greenfield Method	FSR/FEH	Soil Index	3	CWI	108.148	Climate Change (%)	0	Betterment (%)	0	Runoff Volume (m ³)	885

Node Outfall 2 Surcharged Outfall

Overrides Design Area	x	Overrides Design Additional Inflow	x	Depression Storage Area (m ²)	0	Depression Storage Depth (mm)	0	Evapo-transpiration (mm/day)	0
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Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.000	60	0.336	120	0.650	180	0.919	240	1.126	300	1.256	360	1.300	420	1.256	480	1.126	540	0.919

Node S106 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.610	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	6.1	Product Number	CTL-SHE-0122-6100-0610-6100		
Invert Level (m)	1.000	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.150		

Node Attenuation Tank Outfall 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	1.105	Time to half empty (mins)	
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Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	2744.0	0.0	0.400	2744.0	0.0	0.401	0.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.56%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S101	13	2.186	0.161	43.7	1.8212	0.0000	OK
15 minute winter	S102	12	1.883	0.218	84.2	1.7270	0.0000	OK
15 minute winter	S103	12	1.799	0.239	103.2	1.4894	0.0000	OK
15 minute winter	S104	12	1.528	0.208	108.0	0.5283	0.0000	OK
15 minute winter	S105	13	1.449	0.239	106.3	0.6075	0.0000	OK
600 minute winter	Attenuation Tank Outfall 2	615	1.181	0.076	13.9	196.9371	0.0000	OK
600 minute winter	S106	615	1.180	0.180	6.0	0.5494	0.0000	OK
60 minute summer	Outfall 2	275	1.800	1.200	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S101	10.000	S102	42.8	0.993	0.373	2.7238	
15 minute winter	S102	10.001	S103	83.8	0.928	0.324	3.2937	
15 minute winter	S103	10.002	S104	108.0	1.234	0.417	7.2964	
15 minute winter	S104	10.003	S105	106.3	1.217	0.223	0.9979	
15 minute winter	S105	10.004a	Attenuation Tank Outfall 2	107.1	2.766	0.494	2.4916	
600 minute winter	Attenuation Tank Outfall 2	10.004b	S106	6.0	0.178	0.028	2.1934	
600 minute winter	S106	10.005	Outfall 2	6.0	1.886	0.037	0.1568	70.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.56%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S101	12	2.321	0.296	106.8	3.3407	0.0000	OK
15 minute winter	S102	12	2.091	0.426	211.2	3.3674	0.0000	OK
15 minute winter	S103	12	2.007	0.447	270.7	2.7828	0.0000	OK
15 minute winter	S104	12	1.691	0.371	264.1	0.9448	0.0000	OK
15 minute winter	S105	12	1.583	0.373	261.8	0.9497	0.0000	OK
600 minute winter	Attenuation Tank Outfall 2	600	1.273	0.168	30.9	437.7208	0.0000	OK
600 minute winter	S106	600	1.273	0.273	6.1	0.8307	0.0000	OK
60 minute summer	Outfall 2	275	1.800	1.200	6.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S101	10.000	S102	105.3	1.260	0.918	5.6911	
15 minute winter	S102	10.001	S103	205.3	1.084	0.793	6.9946	
15 minute winter	S103	10.002	S104	264.1	1.463	1.020	14.9695	
15 minute winter	S104	10.003	S105	261.8	1.599	0.550	1.8692	
15 minute winter	S105	10.004a	Attenuation Tank Outfall 2	262.0	3.530	1.208	4.3323	
600 minute winter	Attenuation Tank Outfall 2	10.004b	S106	6.1	0.086	0.028	4.4747	
600 minute winter	S106	10.005	Outfall 2	6.2	1.907	0.039	0.1689	84.1

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.56%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S101	11	3.100	1.075	192.8	12.1357	11.3747	OK
15 minute winter	S102	12	2.841	1.176	327.6	9.3053	0.0000	OK
15 minute winter	S103	12	2.647	1.087	427.5	6.7688	0.0000	OK
15 minute winter	S104	12	1.971	0.651	411.5	1.6563	0.0000	OK
15 minute winter	S105	12	1.799	0.589	409.4	1.4982	0.0000	OK
600 minute winter	Attenuation Tank Outfall 2	600	1.407	0.302	56.2	787.7775	0.0000	OK
600 minute winter	S106	600	1.407	0.407	6.0	1.2400	0.0000	OK
60 minute summer	Outfall 2	275	1.800	1.200	7.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S101	10.000	S102	181.8	1.648	1.584	6.9708	
15 minute winter	S102	10.001	S103	307.4	1.423	1.188	7.8824	
15 minute winter	S103	10.002	S104	411.5	1.905	1.589	18.0091	
15 minute winter	S104	10.003	S105	409.4	1.895	0.860	2.4667	
15 minute winter	S105	10.004a	Attenuation Tank Outfall 2	409.5	3.700	1.889	5.8313	
600 minute winter	Attenuation Tank Outfall 2	10.004b	S106	6.0	0.042	0.028	7.9878	
600 minute winter	S106	10.005	Outfall 2	6.2	1.886	0.039	0.1689	91.2

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Design Settings

Rainfall Methodology	FSR	M5-60 (mm)	17.000	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200
Return Period (years)	2	Ratio-R	0.400	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	CV	0.750	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓
FSR Region	England and Wales	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S201	0.050	5.00	0.0	3.100	1200	494351.863	101757.441	1.080
S202	0.044	5.00	0.0	2.880	1200	494322.864	101782.758	1.145
S203	0.000	5.00	0.0	2.900	1200	494351.938	101820.575	1.325
S204	0.078	5.00	0.0	2.700	1500	494401.499	101873.837	0.865
S205	0.000	5.00	0.0	2.950	1500	494355.402	101817.912	1.555
S206	0.000	5.00	0.0	2.780	1500	494343.620	101802.713	1.540
Attenuation Tank Outfall 3	0.000	5.00	0.0	2.550		494365.962	101785.551	1.380
S207	0.080	5.00	0.0	3.220	1200	494565.328	101722.095	0.790
S208	0.045	5.00	0.0	3.220	1200	494492.997	101759.755	1.200
S209	0.157	5.00	0.0	2.600	1500	494413.492	101801.151	1.140
S210	0.270	5.00	0.0	2.830	1200	494413.195	101852.511	1.055
S211	0.162	5.00	0.0	2.830	1500	494376.789	101804.960	1.370
S212	0.094	5.00	0.0	2.600	1800	494401.697	101785.810	1.320
S213	0.000	5.00	0.0	2.600	1800	494388.304	101768.390	1.500
Outfall 3	0.000	5.00	0.0	2.000		494393.268	101764.573	0.916

Links

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)
20.000	S201	S202	38.408	0.000	2.020	1.810	0.209	1:88.8	225	8.87	86.6
20.001	S202	S203	47.791	0.000	1.735	1.575	0.160	1:88.3	300	8.56	86.6
20.002	S203	S205	4.360	0.000	1.575	1.545	0.030	1:88.8	300	8.80	86.6
21.000	S204	S205	72.674	0.000	1.835	1.545	0.290	1:88.8	300	6.32	86.6
20.003	S205	S206	15.251	0.000	1.395	1.240	0.155	1:88.1	450	6.78	86.6
20.004a	S206	Attenuation Tank Outfall 3	22.573	0.000	1.240	1.170	0.070	1:88.5	450	7.26	86.6
50.004b	Attenuation Tank Outfall 3	S213	28.372	0.000	1.170	1.100	0.070	1:88.5	450	7.71	86.6
22.000	S207	S208	81.548	0.000	2.430	2.020	0.410	1:88.3	225	8.47	86.6
22.001	S208	S209	85.689	0.000	2.020	1.610	0.410	1:88.6	225	8.17	86.6
22.002	S209	S212	12.551	0.000	1.460	1.355	0.105	1:88.2	375	6.45	86.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	I Area (ha)	I Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
20.000	0.000	38.3	6.8	0.000	0.000	0.050	0.0	64	0.728
20.001	0.000	64.0	12.7	0.000	0.000	0.094	0.0	91	0.710
20.002	1.300	91.9	12.7	0.000	0.000	0.094	0.0	75	0.924
21.000	0.000	70.0	10.6	0.000	0.000	0.078	0.0	78	0.717
20.003	1.824	290.0	23.3	0.000	0.000	0.172	0.0	86	1.113
20.004a	1.007	160.2	23.3	0.000	0.000	0.172	0.0	116	0.727
50.004b	1.007	160.2	22.8	0.000	0.000	0.172	0.0	114	0.720
22.000	0.000	36.7	10.8	0.000	0.000	0.080	0.0	84	0.807
22.001	0.000	35.0	16.1	0.000	0.000	0.125	0.0	107	0.861
22.002	1.331	147.0	35.7	0.000	0.000	0.282	0.0	126	1.106

Links

Name	US Node	DS Node	Length (m)	Is (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1%)	Dia (mm)	T of C (mins)	Rain (mm/hr)
23.000	S210	S211	51.418	0.0001	1.775	1.535	0.240	2.000	300	0.01	56.6
23.001	S211	S212	51.418	0.0001	1.460	1.355	0.105	2.000	375	0.01	56.6
22.003	S212	S213	25.875	0.0001	1.280	1.100	0.180	2.000	450	0.01	56.6
20.005	S213	Outfall 3	8.252	0.0001	1.570	1.084	0.486	2.000	450	0.01	56.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
23.000	0.581	70.0	36.6	0.750	0.875	0.270	0.0	154	1.001
23.001	1.042	115.1	58.5	0.750	0.875	0.432	0.0	189	1.046
22.003	1.839	292.4	101.2	0.600	0.750	0.808	0.0	182	1.678
20.005	1.021	162.4	122.0	0.750	0.875	0.980	0.0	292	1.117

Pipeline Schedule

Link	Length (m)	Slope (1%)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
20.000	30.418	2.000	225	Circular	3.100	2.020	0.875	2.880	1.810	0.875
20.001	47.201	2.000	300	Circular	2.880	1.735	0.875	2.900	1.575	1.000
20.002	4.869	2.000	300	Circular	2.900	1.575	0.875	2.950	1.545	1.000
21.000	72.674	2.000	300	Circular	2.700	1.835	0.750	2.950	1.545	1.000
20.003	12.281	2.000	450	Circular	2.950	1.395	1.100	2.780	1.240	0.875
20.004a	20.173	2.000	450	Circular	2.780	1.240	1.070	2.550	1.170	0.875
50.004b	20.173	2.000	450	Circular	2.550	1.170	0.875	2.600	1.100	0.875
22.000	84.548	2.000	225	Circular	3.220	2.430	0.875	3.220	2.020	0.875
22.001	48.836	2.000	225	Circular	3.220	2.020	0.750	2.600	1.610	0.750
22.002	18.361	2.000	375	Circular	2.600	1.460	0.750	2.600	1.355	0.875
23.000	20.087	2.000	300	Circular	2.830	1.775	0.750	2.830	1.535	0.875
23.001	51.418	2.000	375	Circular	2.830	1.460	0.875	2.600	1.355	0.875
22.003	21.875	2.000	450	Circular	2.600	1.280	0.875	2.600	1.100	0.875
20.005	8.252	2.000	450	Circular	2.600	1.570	0.875	2.000	1.084	0.875

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
20.000	S201	1200	Manhole	Attenuation Tank	S202	1200	Manhole	Attenuation Tank
20.001	S202	1200	Manhole	Attenuation Tank	S203	1200	Manhole	Attenuation Tank
20.002	S203	1200	Manhole	Attenuation Tank	S205	1500	Manhole	Attenuation Tank
21.000	S204	1500	Manhole	Attenuation Tank	S205	1500	Manhole	Attenuation Tank
20.003	S205	1500	Manhole	Attenuation Tank	S206	1500	Manhole	Attenuation Tank
20.004a	S206	1500	Manhole	Attenuation Tank	Attenuation Tank Outfall 3	Junction		
50.004b	Attenuation Tank Outfall 3	Junction			S213	1800	Manhole	Attenuation Tank
22.000	S207	1200	Manhole	Attenuation Tank	S208	1200	Manhole	Attenuation Tank
22.001	S208	1200	Manhole	Attenuation Tank	S209	1500	Manhole	Attenuation Tank
22.002	S209	1500	Manhole	Attenuation Tank	S212	1800	Manhole	Attenuation Tank
23.000	S210	1200	Manhole	Attenuation Tank	S211	1500	Manhole	Attenuation Tank
23.001	S211	1500	Manhole	Attenuation Tank	S212	1800	Manhole	Attenuation Tank
22.003	S212	1800	Manhole	Attenuation Tank	S213	1800	Manhole	Attenuation Tank
20.005	S213	1800	Manhole	Attenuation Tank	Outfall 3	Junction		

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S201	494351.863	101757.441	3.100	1.080	1200		0	20.000	2.020 225
S202	494322.864	101782.758	2.880	1.145	1200		1	20.000	1.810 225
S203	494351.938	101820.575	2.900	1.325	1200		0 1	20.001 20.001	1.735 300 1.575 300
S204	494401.499	101873.837	2.700	0.865	1500		0	20.002	1.575 300
S205	494355.402	101817.912	2.950	1.555	1500		0 1 2	21.000 21.000 20.002	1.835 300 1.545 300 1.545 300
S206	494343.620	101802.713	2.780	1.540	1500		0 1	20.003 20.003	1.395 450 1.240 450
Attenuation Tank Outfall 3	494365.962	101785.551	2.550	1.380			0	20.004a	1.240 450
							1	20.004a	1.170 450
S207	494565.328	101722.095	3.220	0.790	1200		0	50.004b	1.170 450
S208	494492.997	101759.755	3.220	1.200	1200		0	22.000	2.430 225
S209	494413.492	101801.151	2.600	1.140	1500		1	22.000	2.020 225
S210	494413.195	101852.511	2.830	1.055	1200		0	22.001	1.610 225
S211	494376.789	101804.960	2.830	1.370	1500		0	22.002	1.460 375
S212	494401.697	101785.810	2.600	1.320	1800		0 1 2	23.000 23.000 22.002	1.775 300 1.535 300 1.460 375
							0	23.001	1.355 375
							0	22.003	1.280 450

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S213	494388.304	101768.390	2.600	1.500	1800		1 50.004b 2 22.003	1.100	450
Outfall 3	494393.268	101764.573	2.000	0.916			0 20.005 1 20.005		

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	26.4
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m³/ha)	20.0	100 year (l/s)	33.5
MS-60 (mm)	17.000	Analysis Speed	Normal	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Ratio-R	0.400	Skip Steady State	x	1 year (l/s)	11.5	100 year 360 minute (m³)	885

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	0	0	0	100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SAAR (mm)	720	Region	7	Growth Factor 100 year	2.48	Q 1 year (l/s)	11.5
Greenfield Method	IH124	Soil Index	3	Growth Factor 1 year	0.85	Betterment (%)	0	Q 30 year (l/s)	26.4
Positively Drained Area (ha)	4.550	SPR	0.37	Growth Factor 30 year	1.95	QBar	13.5	Q 100 year (l/s)	33.5

Pre-development Discharge Volume

Site Makeup	Greenfield	Positively Drained Area (ha)	4.550	SPR	0.37	Return Period (years)	100	Storm Duration (mins)	360	PR	0.357
Greenfield Method	FSR/FEH	Soil Index	3	CWI	108.148	Climate Change (%)	0	Betterment (%)	0	Runoff Volume (m³)	885

Node Outfall 3 Surcharged Outfall

Overrides Design Area	x	Overrides Design Additional Inflow	x	Depression Storage Area (m²)	0	Depression Storage Depth (mm)	0	Evapo-transpiration (mm/day)	0
Applies to All storms									

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.000	60	0.336	120	0.650	180	0.919	240	1.126	300	1.256	360	1.300	420	1.256	480	1.126	540	0.919

Node S213 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.500	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	5.0	Product Number	CTL-SHE-0112-5000-0500-5000		
Invert Level (m)	1.100	Objective (HE)	Minimise upstream storage	Min Outlet Diameter (m)	0.150		

Node Attenuation Tank Outfall 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	1.170	Time to half empty (mins)	
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Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	2646.0	0.0	0.400	2646.0	0.0	0.401	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S201	11	2.079	0.059	6.0	0.1220	0.0000	OK
15 minute winter	S202	11	1.819	0.084	10.7	0.1604	0.0000	OK
15 minute winter	S203	12	1.650	0.075	10.7	0.0847	0.0000	OK
15 minute winter	S204	11	1.905	0.070	9.3	0.2491	0.0000	OK
15 minute winter	S205	12	1.474	0.079	18.6	0.1398	0.0000	OK
15 minute winter	S206	12	1.344	0.104	18.8	0.1838	0.0000	OK
720 minute winter	Attenuation Tank Outfall 3	705	1.241	0.071	10.5	177.5428	0.0000	OK
15 minute winter	S207	11	2.506	0.076	9.5	0.2405	0.0000	OK
15 minute winter	S208	12	2.111	0.091	14.3	0.1712	0.0000	OK
15 minute winter	S209	11	1.576	0.116	28.3	0.5249	0.0000	OK
15 minute winter	S210	11	1.916	0.141	32.2	0.8822	0.0000	OK
15 minute winter	S211	11	1.636	0.176	48.7	0.7291	0.0000	OK
15 minute winter	S212	11	1.457	0.177	86.7	0.7029	0.0000	OK
15 minute winter	S213	11	1.414	0.314	86.1	0.8001	0.0000	OK
15 minute summer	Outfall 3	180	2.000	0.916	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S201	20.000	S202	5.7	0.694	0.150	0.3175	
15 minute winter	S202	20.001	S203	10.7	0.716	0.167	0.7136	
15 minute winter	S203	20.002	S205	10.5	0.818	0.114	0.0559	
15 minute winter	S204	21.000	S205	8.2	0.677	0.117	0.8811	
15 minute winter	S205	20.003	S206	18.8	0.814	0.065	0.4459	
15 minute winter	S206	20.004a	Attenuation Tank Outfall 3	18.8	1.659	0.117	0.3984	
720 minute winter	Attenuation Tank Outfall 3	50.004b	S213	-8.7	-0.372	-0.054	0.8186	
15 minute winter	S207	22.000	S208	9.2	0.746	0.252	1.0645	
15 minute winter	S208	22.001	S209	11.9	0.804	0.339	1.3321	
15 minute winter	S209	22.002	S212	27.9	1.005	0.190	0.5374	
15 minute winter	S210	23.000	S211	30.5	0.969	0.436	1.8860	
15 minute winter	S211	23.001	S212	48.4	1.015	0.420	1.4985	
15 minute winter	S212	22.003	S213	86.1	0.973	0.294	1.9356	
15 minute winter	S213	Hydro-Brake*	Outfall 3	5.0				4.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S201	11	2.116	0.096	14.6	0.1977	0.0000	OK
15 minute winter	S202	11	1.873	0.138	26.6	0.2620	0.0000	OK
15 minute winter	S203	11	1.699	0.124	26.6	0.1407	0.0000	OK
15 minute winter	S204	11	1.950	0.115	22.7	0.4089	0.0000	OK
15 minute winter	S205	11	1.528	0.133	47.5	0.2342	0.0000	OK
15 minute winter	S206	11	1.395	0.155	47.3	0.2739	0.0000	OK
720 minute winter	Attenuation Tank Outfall 3	690	1.324	0.154	23.1	387.8871	0.0000	OK
15 minute winter	S207	10	2.556	0.126	23.3	0.9969	0.0000	OK
15 minute winter	S208	12	2.188	0.168	35.6	0.3163	0.0000	OK
15 minute winter	S209	11	1.696	0.236	71.7	1.0677	0.0000	OK
15 minute winter	S210	11	2.059	0.284	78.6	1.7746	0.0000	OK
15 minute winter	S211	11	1.803	0.343	120.1	1.4172	0.0000	OK
15 minute winter	S212	11	1.673	0.393	212.5	1.5612	0.0000	OK
15 minute winter	S213	11	1.564	0.464	209.1	1.1816	0.0000	OK
15 minute summer	Outfall 3	180	2.000	0.916	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S201	20.000	S202	14.1	0.888	0.369	0.6120	
15 minute winter	S202	20.001	S203	26.6	0.899	0.416	1.4117	
15 minute winter	S203	20.002	S205	26.4	1.042	0.287	0.1106	
15 minute winter	S204	21.000	S205	21.2	0.877	0.303	1.7499	
15 minute winter	S205	20.003	S206	47.3	1.086	0.163	0.8391	
15 minute winter	S206	20.004a	Attenuation Tank Outfall 3	47.5	2.184	0.297	0.7264	
720 minute winter	Attenuation Tank Outfall 3	50.004b	S213	-19.1	-0.487	-0.119	1.7868	
15 minute winter	S207	22.000	S208	22.5	0.902	0.612	2.1766	
15 minute winter	S208	22.001	S209	30.5	1.032	0.873	2.6509	
15 minute winter	S209	22.002	S212	69.4	1.111	0.472	1.6721	
15 minute winter	S210	23.000	S211	74.3	1.130	1.061	4.0551	
15 minute winter	S211	23.001	S212	117.6	1.189	1.021	3.2275	
15 minute winter	S212	22.003	S213	209.1	1.351	0.715	3.3552	
15 minute winter	S213	Hydro-Brake*	Outfall 3	5.0				4.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S201	10	2.158	0.138	26.3	0.2843	0.0000	OK
15 minute winter	S202	11	1.936	0.201	48.2	0.3812	0.0000	OK
15 minute winter	S203	11	1.752	0.177	48.0	0.1997	0.0000	OK
15 minute winter	S204	11	1.998	0.163	41.0	0.5824	0.0000	OK
15 minute winter	S205	11	1.583	0.188	86.8	0.3325	0.0000	OK
720 minute winter	S206	705	1.447	0.207	7.3	0.3661	0.0000	OK
720 minute winter	Attenuation Tank Outfall 3	705	1.447	0.277	41.7	696.5974	0.0000	OK
15 minute winter	S207	12	3.220	0.790	42.1	2.4932	0.4521	OK
15 minute winter	S208	12	3.008	0.988	57.9	1.8581	0.0000	OK
15 minute winter	S209	11	2.292	0.832	118.2	3.7630	0.0000	OK
15 minute winter	S210	10	2.830	1.055	141.9	6.5927	7.5966	OK
15 minute winter	S211	11	2.458	0.998	177.5	4.1237	0.0000	OK
15 minute winter	S212	11	2.197	0.917	322.0	3.6407	0.0000	OK
15 minute winter	S213	11	1.873	0.773	319.9	1.9671	0.0000	OK
15 minute summer	Outfall 3	180	2.000	0.916	5.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S201	20.000	S202	25.5	1.023	0.667	0.9606	
15 minute winter	S202	20.001	S203	48.0	1.030	0.751	2.2224	
15 minute winter	S203	20.002	S205	47.9	1.214	0.521	0.1722	
15 minute winter	S204	21.000	S205	38.9	1.038	0.556	2.7156	
15 minute winter	S205	20.003	S206	86.6	1.305	0.299	1.2765	
720 minute winter	S206	20.004a	Attenuation Tank Outfall 3	7.2	0.595	0.045	2.4461	
720 minute winter	Attenuation Tank Outfall 3	50.004b	S213	-34.5	-0.569	-0.215	3.2909	
15 minute winter	S207	22.000	S208	35.6	0.970	0.970	3.2433	
15 minute winter	S208	22.001	S209	47.5	1.216	1.359	3.5649	
15 minute winter	S209	22.002	S212	116.1	1.157	0.790	2.1344	
15 minute winter	S210	23.000	S211	95.0	1.350	1.357	4.2172	
15 minute winter	S211	23.001	S212	165.8	1.503	1.440	3.4654	
15 minute winter	S212	22.003	S213	319.9	2.019	1.094	3.4815	
15 minute winter	S213	Hydro-Brake*	Outfall 3	5.9				5.9

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Design Settings

Rainfall Methodology	FSR	M5-60 (mm)	17.000	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200
Return Period (years)	2	Ratio-R	0.400	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	CV	0.750	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓
FSR Region	England and Wales	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S301	0.098	5.00	0.0	2.900	2400	494418.204	101767.890	1.200
S302	0.000	5.00	0.0	2.600	2400	494387.797	101716.143	1.635
Outfall 4 (MH)	0.000	5.00	0.0	2.430	2400	494379.226	101715.353	2.730
Outfall 4 (Ditch)	0.000	5.00	0.0	2.000		494378.385	101724.086	1.660

Links

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)
30.000	S301	S302	80.015	0.800	1.700	0.965	0.735	81.7	450	5.48	80.0
30.001	S302	Outfall 4 (MH)	8.807	0.800	0.965	0.875	0.090	89.8	300	5.53	80.0
30.002	Outfall 4 (MH)	Outfall 4 (Ditch)	0.778	0.800	0.400	0.340	0.060	185.2	150	5.71	80.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
30.000	2.251	358.0	13.3	0.735	0.608	0.098	0.0	58	1.095
30.001	1.608	113.6	13.3	1.335	1.255	0.098	0.0	69	1.087
30.002	0.800	14.6	13.3	1.880	1.510	0.098	0.0	112	0.937

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
30.000	80.015	81.7	450	Circular	2.900	1.700	0.735	2.600	0.965	1.635
30.001	8.807	89.8	300	Circular	2.600	0.965	1.335	2.430	0.875	1.255
30.002	0.778	185.2	150	Circular	2.430	0.400	1.880	2.000	0.340	1.510

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
30.000	S301	2400	Manhole	Manhole	S302	2400	Manhole	Manhole
30.001	S302	2400	Manhole	Manhole	Outfall 4 (MH)	2400	Manhole	Manhole
30.002	Outfall 4 (MH)	2400	Manhole	Manhole	Outfall 4 (Ditch)		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S301	494418.204	101767.890	2.900	1.200	2400		0	30.000	1.700 450

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S302	494387.797	101716.143	2.600	1.635	2400		1	30.000	0.965	450
Outfall 4 (MH)	494379.226	101715.353	2.430	2.730	2400		0	30.001	0.965	300
							1	30.001	0.875	300
Outfall 4 (Ditch)	494378.385	101724.086	2.000	1.660			0	30.002	0.400	150
							1	30.002	0.340	150

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	25.4
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m³/ha)	20.0	100 year (l/s)	33.5
MS-60 (mm)	17.000	Analysis Speed	Normal	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Ratio-R	0.400	Skip Steady State	x	1 year (l/s)	11.5	100 year 360 minute (m³)	885

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	0	0	0	100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	SAAR (mm)	720	Region	7	Growth Factor 100 year	2.48	Q 1 year (l/s)	11.5
Greenfield Method	IH124	Soil Index	3	Growth Factor 1 year	0.85	Betterment (%)	0	Q 30 year (l/s)	26.4
Positively Drained Area (ha)	4.550	SPR	0.37	Growth Factor 30 year	1.95	QBar	13.5	Q 100 year (l/s)	33.5

Pre-development Discharge Volume

Site Makeup	Greenfield	Positively Drained Area (ha)	4.550	SPR	0.37	Return Period (years)	100	Storm Duration (mins)	360	PR	0.357
Greenfield Method	FSR/FEH	Soil Index	3	CWI	108.148	Climate Change (%)	0	Betterment (%)	0	Runoff Volume (m³)	885

Node Outfall 4 (Ditch) Surcharged Outfall

Overrides Design Area	x	Overrides Design Additional Inflow	x	Depression Storage Area (m²)	0	Depression Storage Depth (mm)	0	Evapo-transpiration (mm/day)	0
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Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)						
0	0.000	60	0.336	120	0.650	180	0.919	240	1.126	300	1.256	360	1.300	420	1.256	480	1.126	540	0.919	600	0.650	660	0.336	720	0.000

Node Outfall 4 (MH) Online Hydro-Brake® Control

Flap Valve	✓	Design Depth (m)	1.900	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	2.8	Product Number	CTL-SHE-0069-2800-1900-2800		
Invert Level (m)	0.400	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.100		

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Node S302 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.700	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	2.0	Product Number	CTL-SHE-0072-2000-0700-2000		
Invert Level (m)	0.965	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.100		

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S301	11	1.754	0.054	11.7	0.3329	0.0000	OK
480 minute winter	S302	408	1.658	0.693	1.4	3.1331	0.0000	OK
360 minute winter	Outfall 4 (MH)	376	1.634	1.234	1.2	5.5827	0.0000	OK
120 minute summer	Outfall 4 (Ditch)	360	1.640	1.300	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S301	30.000	S302	11.3	0.774	0.031	2.9681	
480 minute winter	S302	Hydro-Brake*	Outfall 4 (MH)	1.2				
360 minute winter	Outfall 4 (MH)	Hydro-Brake*	Outfall 4 (Ditch)	1.5				9.7

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Results for 30 year Critical Storm Duration. Lowest mass balance: 97.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S301	56	1.888	0.188	14.6	1.1594	0.0000	OK
60 minute winter	S302	55	1.891	0.926	14.6	4.1897	0.0000	OK
600 minute winter	Outfall 4 (MH)	375	1.745	1.345	1.8	6.0831	0.0000	OK
120 minute summer	Outfall 4 (Ditch)	960	1.640	1.300	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S301	30.000	S302	14.6	0.705	0.041	6.6406	
60 minute winter	S302	Hydro-Brake*	Outfall 4 (MH)	2.3				
600 minute winter	Outfall 4 (MH)	Hydro-Brake*	Outfall 4 (Ditch)	1.9				38.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S301	74	2.615	0.915	16.6	5.6355	0.0000	OK
120 minute winter	S302	74	2.600	1.635	15.8	7.3967	7.0327	OK
720 minute winter	Outfall 4 (MH)	555	1.877	1.477	2.1	6.6827	0.0000	OK
120 minute summer	Outfall 4 (Ditch)	960	1.640	1.300	2.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	S301	30.000	S302	15.8	0.641	0.044	9.5096	
120 minute winter	S302	Hydro-Brake*	Outfall 4 (MH)	3.0				
720 minute winter	Outfall 4 (MH)	Hydro-Brake*	Outfall 4 (Ditch)	2.3				70.1

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	720	720
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	20.93	20.93
1 in 1 year (l/s):	17.79	17.79
1 in 30 years (l/s):	48.14	48.14
1 in 100 year (l/s):	66.77	66.77
1 in 200 years (l/s):	78.28	78.28

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Foul Sewerage Design Calculations

The following calculations are in accordance with British Water's 'Code of Practice Flows and Loads – 4'

From above, Flow Rate= 50 litres/employee/day (no canteen)

Peak Design Flow Rate = 6 x Flow Rate + 10% infiltration

Max number of Employees per 8hr shift = 150 (assumed)
Number of shifts/day = 3 (assumed)

Flow Rate = $((150 \times 3) \times 50) / (3600 \times 24) = 0.260 \text{ l/s}$

Design Flow Rate = $(6 \times 0.260) \times 1.1 = 1.72 \text{ l/s}$

Appendix G – Drainage Maintenance

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Drainage Maintenance

It is anticipated that the maintenance schedule will generally comprise the following activities in accordance with the CIRIA publication C753 (The SuDS Manual). The items detailed below, which require inspection is not exhaustive and may be added to and amended.

Activity Indicative frequency

Typical tasks

Routine/regular maintenance (including inspections and monitoring)/every 3 months

- Inspect upstream and downstream catchpits for silt and vortex control manhole for debris. Clean out if necessary using vacuum tanker
- Litter/debris removal
- Inspection and clearance of grilles and screens
- Inspection of flow controls

Occasional maintenance/Annually

- Silt removal within manholes/catchpits/gullies
- Clean out any silt/debris/oils from channels
- Pipe drainage CCTV/check every 10 years: check manholes for evidence of silt/blockage
- Attenuation tank – CCTV/check every 10 years for silt build-up and remove via vacuum tanker
- Silt and debris removal at outfalls

Remedial maintenance/As required

- Silt removal
- Tasks to repair problems due to damage or vandalism:
- Inlet/outlet repair
- Remedial works required from CCTV survey
- Erosion repairs
- Control structure repairs
- System rehabilitation following a pollution event