

Redbank Playing Fields

Radcliffe, Bury

Outline Drainage Strategy

Date 21.10.22

Notice

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Document History

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Summary

1. Lynas Engineers was commissioned by Steve Wells Associates to undertake an outline Drainage Strategy (DS) report in respect of the proposed development located off Unsworth Street, Radcliffe, Bury, M26 3RH.
2. The red-line boundary for the car park and pavilion development covers an area of 0.330ha.
3. The Outline DS demonstrates the following:
 - The outline flow rates, capacities and means of disposal of the surface water run-off from the existing site.
 - The potential solutions for the attenuation/disposal of surface water run-off from the proposed site.
 - The outline surface water drainage philosophy for the proposed development.
 - The outline foul water drainage philosophy for the proposed site.

Outline Drainage Strategy

Outline Surface Water Drainage Strategy

1. The overall impermeable area within the development area is 0.330ha.
2. Using the UK SuDS website's greenfield runoff tool, we have restricted the flow at a 1 in 100-year storm to QBar (1 in 2.3-year storm) = 2.54l/s. The greenfield runoff calculation is shown in see **Appendix A**.
3. **Appendices B, C, D** show the drainage strategy plans including Proposed Drainage, Drainage Exceedance Route, and MicroDrainage Calculations, respectively.
4. The design life of the development is 50 years, therefore this falls within the central allowance for climate change as per the NPPF climate change guidance for peak rainfall intensity.
5. The philosophy of the car park drainage includes the use of traditional gullies to capture rainfall and convey the flows into catchpits and pipework. Flows will pass through a petrol/oil interceptor before being restricted using a rising main, which will back the runoff into an online, underground cellular storage unit.
6. The philosophy for the pavilion drainage mirrors that of the car park drainage although the use of rainwater down pipes will be used to convey the flow into the network where it will then follow the same course as the car park drainage.
7. The proposed foul drainage will be gravity fed into UU 6603.
8. The existing private network to the north of the existing building (which can be seen within **Appendix B**) has been investigated as a point of connection, but as the invert levels are too high it would not be feasible to connect into as this would require pumping the foul network. As the existing network will still be utilised it is vital this system is retained.
9. The restricted flow from the car park will pass through the rising main, which will have an ultimate discharge rate from the proposed development of 2.54 l/s.
10. Given the BGS Geology of Britain information it is not anticipated that infiltration would be viable.
11. There are also no nearby watercourses that are feasible to connect into.
12. Therefore, the United Utilities networks have been identified as the most suitable connection points. A point of connection application shall be submitted to United Utilities to agree to a discharge of up to 2.54 l/s into existing UU chamber 6602; see **Appendix E** for existing UU layout.
13. The amount of storage required equates to 216.6m³ of cellular storage. This amount of attenuation negates any flooding for a critical 1 in 100-year storm +30% climate change event.
14. The Proposed Drainage Strategy drawing 22051-LE-ZZ-01-DR-D-0001 is included in **Appendix B**. The MicroDrainage design calcs for the proposed site can be found in **Appendix C**.

15. In the event of pump failure there is a threat of flooding, we have shown the exceedance flow if the flooding occurred shall overtop the proposed carpark. Please refer to **Appendix D** for the exceedance routes.

Sustainable Drainage Systems

1. SuDS Objectives:

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

2. SuDS Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individuals plot structure, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area.

3. The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- **Source Controls** – Control of runoff at source or as close to source as possible (e.g., soakaways, green roofs, pervious pavements).
- **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

4. SuDS Site Constraints

SuDS techniques are not suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- **Land Use Characteristics:** The size and type of the development plot allows a range of source control and site control SuDS devices to be considered both above and below ground.
- **Site Characteristics:** The cohesive nature of the underlying geology indicates that soakaways are unlikely to be a viable SuDS technique.
- **Catchment Characteristics:** The site is currently undeveloped and as such greenfield runoff rates will apply.
- **Environmental and Amenity Performance:** Safety to all future users is paramount when including SuDS within the overall development and so best practice guidance will be incorporated so that these devices blend into the surroundings without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

5. SuDS Methods

Figure 1 and Figure 2, on the next pages, provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability, and lifetime maintenance of the development.

Figure 1 - Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation, and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not Suitable:</u> - Although useable their benefit would be insignificant for this project. - Additional costs of installation would influence the feasibility of the development.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Not Suitable:</u> Although useable they are not necessary for this scheme.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have significant effect on viability of the development. - Running and maintenance costs would likely not be acceptable to the client.

Figure 1 Continued - Surface SuDS Methods

Method	Comment	Suitability for Development
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> - Infiltration viability unknown. - Percolation testing on-site required to confirm infiltration rate. - Superficial deposits are glacial till.
Permeable Surfacing	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or use of plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Not Suitable:</u> Permeable surfacing has not been incorporated into the design.
Swales, basins, filter strips / drains	- Provide areas for above ground surface runoff storage. - Swales and filter strips/drains also allow filtering of particulate matter, improving water quality.	<u>Not Suitable:</u> Over the edge combined carrier filter drains have not been incorporated into the design.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not Suitable:</u> Tree pits have not been incorporated into this project, providing enhanced water quality as well as amenity and biodiversity features.

Figure 2 - Sub-surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc.	<u>Suitable:</u> The use of geocellular attenuation could be used to retain excess storm water.
Large Diameter Pipes / Culverts	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. - Generally suitable for adoption by the statutory water company.	<u>Suitable:</u> - The use of oversized pipes may be possible to retain excess storm water. - Used primarily on adopted drainage networks but may be suitable for this, planned unadopted, development.

6. SuDS Hierarchal Approach

Based on the SuDS assessment in **Figure 9** and **Figure 10**, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below (see **Figure 11**).

Figure 3 - SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Underlying geology contains deposits of Devensian Till (boulder clay). Infiltration highly unlikely and therefore not feasible.
Connection to Watercourse	No	No watercourses are within the existing site boundary.
Connection to Surface Water Sewer	Yes	UU surface water chamber 6602 is located along Unsworth street along the West of the site.
Connection to a Combined Sewer	Yes	UU combined sewer chamber 6603 is located along Unsworth street along the West of the site.

7. SuDS Design Philosophy

The SuDS assessment and hierarchical approach discussed in **Figures 1, 2 and 3** have defined the overall SuDS strategy. Thus, the SuDS philosophy for the main development site is the promotion of Source Control and Site Control techniques, to reduce the risk of both site and downstream flooding.

The following design philosophy is proposed:

- Surface water treatment using the petrol/oil separator, providing water quality/treatment features.
- The flows from the impermeable carriageway areas will be captured and conveyed using gullies which will then transfer through catchpits and pipework.
- Excess site flow control also contained in an underground attenuation tank to provide the necessary storage so that no flooding occurs during a critical 1in100 year storm +30% Climate Change.
- A petrol/oil interceptor has been used to mitigate the risk of any hydrocarbons from the proposed car park area of the site entering the existing United Utilities network.
- Connection is then made into available existing United Utilities asset 6602 at a proposed restricted flow rate of 2.54l/s.

Conclusion

Outline Drainage Strategy

1. The proposed drainage strategy plan can be viewed in **Appendix B**.
2. A 1 in 100-year +30%CC return period event has been used in calculations to ensure there is no flood risk to the site and surrounding areas.
3. The outline strategy is to collect surface water runoff from the proposed impermeable areas using drains or gullies, use treatment features to remove pollutants, use SuDS features to attenuate runoff and ultimately discharge treated flows into a nearby UU surface water system.
4. This can be achieved through the following:
 - Surface water runoff from the proposed parking areas and any proposed footways will be collected using traditional highway gullies.
 - Surface water from the pavilion will be collected using rainwater down pipes.
 - The runoff will be conveyed into the respective proposed surface water drainage networks and back up into the attenuation storage tank.
 - The attenuation will have enough capacity to attenuate the surface water runoff from a 1 in 100-year storm event + 30% climate change.
 - The surface water runoff from the car park will be conveyed through a petrol interceptor to remove pollutants from the flow before being conveyed through a carrier pipe which connect to a rising main.
 - The rising main chamber is designed to restrict the discharge flow rate to 2.54 l/s, and ultimately this flow discharges into the existing UU surface water system at manhole 6602.

Appendices

Appendix A – IH124 Greenfield Runoff

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Tom Hustwitt

Site name: Redbank Playing Fields

Site location: Unsworth Street

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.

Site Details

Latitude: 53.56539° N

Longitude: 2.33734° W

Reference: 987370227

Date: Oct 21 2022 09:32

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.330

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1043	1043
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

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 ≤ 0.3?

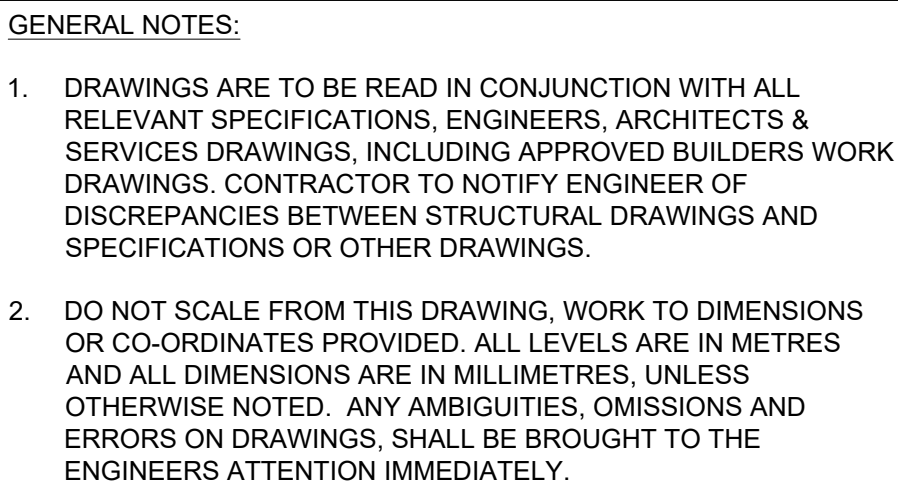
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	2.54	2.54
1 in 1 year (l/s):	2.21	2.21
1 in 30 years (l/s):	4.32	4.32
1 in 100 year (l/s):	5.28	5.28
1 in 200 years (l/s):	6.02	6.02

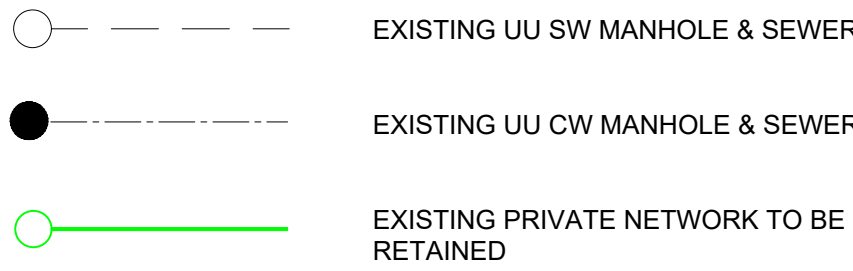
This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this 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.

Appendix B – Proposed Drainage Layout

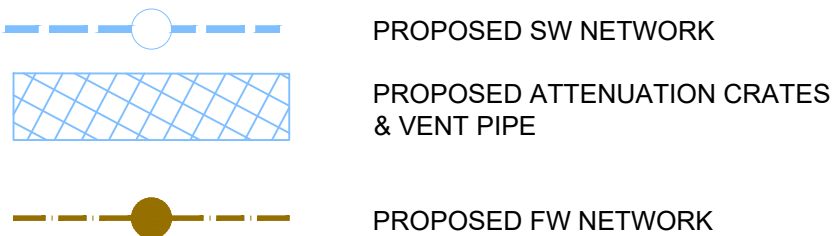


1. PROPOSED PUMP TO BE DESIGNED BY SPECIALIST.

EXISTING DRAINAGE KEY:



PROPOSED DRAINAGE KEY



02			FOR INFORMATION				25.11.22	WF	
02			FOR INFORMATION				21.10.22	WF	
ot			Purpose of Issue				Date	Auth	
02			AMENDED LAYOUT	TH		25.11.22	WF	WF	
01			FIRST ISSUE	TH		21.10.22	WF	WF	
ev			Description	By		Date	Chk'd	Auth	

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Client



Project

REDBANK PLAYING FIELDS

PROPOSED DRAINAGE LAYOUT

Sheet Size A1	Original Scale 1:250	Designed/Drawn TH	Checked WF	Authorised WF
		Date 21.10.22	Date 21.10.22	Date 21.10.22
Status S2	Drawing Number 22051-ZZ-05-DR-D-0001			Rev P02

Appendix C – MicroDrainage Calculations

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Wilton Centre	Redbank Playing Fields	
Redcar	Surface Water	
TS10 4RF	Drainage Design Rev-P02	
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XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 01 SW NETWORK

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	30
Ratio R	0.322	Minimum Backdrop Height (m)	20.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for 01 SW NETWORK

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	46.532	0.274	169.8	0.069	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	38.070	0.224	170.0	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	7.269	0.043	170.0	0.027	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	27.722	0.277	100.0	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	18.731	0.187	100.0	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	22.001	0.607	36.2	0.078	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	18.731	0.069	270.0	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	3.235	0.012	270.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	29.054	0.291	100.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	37.391	-2.374	-15.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	5.911	0.059	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.78	87.773	0.069	0.0	0.0	2.8	1.00	39.8	12.1
1.001	50.00	6.41	87.499	0.127	0.0	0.0	5.2	1.00	39.8	22.4
1.002	50.00	6.53	87.275	0.154	0.0	0.0	6.3	1.00	39.8	27.1
2.000	50.00	5.46	88.248	0.013	0.0	0.0	0.5	1.00	17.8	2.3
3.000	50.00	5.31	89.540	0.020	0.0	0.0	0.8	1.00	17.8	3.5
3.001	50.00	5.53	89.353	0.098	0.0	0.0	4.0	1.68	29.6	17.3
1.003	50.00	6.86	87.157	0.311	0.0	0.0	12.6	0.95	67.3	54.7
1.004	50.00	6.92	87.087	0.311	0.0	0.0	12.6	0.95	67.3	54.7
4.000	50.00	5.48	88.619	0.019	0.0	0.0	0.8	1.00	17.8	3.3
1.005	50.00	7.54	87.075	0.330	0.0	0.0	13.4	1.00	17.8«	58.1
1.006	50.00	5.10	89.449	0.000	2.8	0.0	0.6	1.00	17.7	2.8

Manhole Schedules for 01 SW NETWORK

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN Invert Level (m)	Diameter (mm)	Pipes In PN Invert Level (m)	Diameter (mm)	Backdrop (mm)
SWS1.01	89.089	1.316	Open Manhole	1200	1.000	87.773	225		
SWS1.02	89.468	1.969	Open Manhole	1200	1.001	87.499	225	1.000	87.499
SWS1.03	90.198	2.923	Open Manhole	1200	1.002	87.275	225	1.001	87.275
SWS1.04	89.598	1.350	Open Manhole	1200	2.000	88.248	150		
SWS1.05	90.890	1.350	Open Manhole	1200	3.000	89.540	150		
SWS1.06	90.861	1.508	Open Manhole	1200	3.001	89.353	150	3.000	89.353
SWS1.07	90.096	2.939	Open Manhole	1350	1.003	87.157	300	1.002	87.232
								2.000	87.971
								3.001	88.746
SWS1.08	89.979	2.892	Open Manhole	1500	1.004	87.087	300	1.003	87.088
SWS1.09	89.969	1.350	Open Manhole	1200	4.000	88.619	150		
SWS1.10	90.107	3.032	Open Manhole	1200	1.005	87.075	150	1.004	87.075
								4.000	88.328
SWS1.11	91.402	1.953	Open Manhole	1200	1.006	89.449	150	1.005	89.449
SW	91.150	1.760	Open Manhole	0		OUTFALL		1.006	89.390

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XP Solutions	Network 2018.1	

PIPELINE SCHEDULES for 01 SW NETWORK

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	SWS1.01	89.089	87.773	1.091	Open Manhole	1200
1.001	o	225	SWS1.02	89.468	87.499	1.744	Open Manhole	1200
1.002	o	225	SWS1.03	90.198	87.275	2.698	Open Manhole	1200
2.000	o	150	SWS1.04	89.598	88.248	1.200	Open Manhole	1200
3.000	o	150	SWS1.05	90.890	89.540	1.200	Open Manhole	1200
3.001	o	150	SWS1.06	90.861	89.353	1.358	Open Manhole	1200
1.003	o	300	SWS1.07	90.096	87.157	2.639	Open Manhole	1350
1.004	o	300	SWS1.08	89.979	87.087	2.592	Open Manhole	1500
4.000	o	150	SWS1.09	89.969	88.619	1.200	Open Manhole	1200
1.005	o	150	SWS1.10	90.107	87.075	2.882	Open Manhole	1200
1.006	o	150	SWS1.11	91.402	89.449	1.803	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	46.532	169.8	SWS1.02	89.468	87.499	1.744	Open Manhole	1200
1.001	38.070	170.0	SWS1.03	90.198	87.275	2.698	Open Manhole	1200
1.002	7.269	170.0	SWS1.07	90.096	87.232	2.639	Open Manhole	1350
2.000	27.722	100.0	SWS1.07	90.096	87.971	1.976	Open Manhole	1350
3.000	18.731	100.0	SWS1.06	90.861	89.353	1.358	Open Manhole	1200
3.001	22.001	36.2	SWS1.07	90.096	88.746	1.200	Open Manhole	1350
1.003	18.731	270.0	SWS1.08	89.979	87.088	2.592	Open Manhole	1500
1.004	3.235	270.0	SWS1.10	90.107	87.075	2.732	Open Manhole	1200
4.000	29.054	100.0	SWS1.10	90.107	88.328	1.629	Open Manhole	1200
1.005	37.391	-15.8	SWS1.11	91.402	89.449	1.803	Open Manhole	1200
1.006	5.911	100.2	SW	91.150	89.390	1.610	Open Manhole	0

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Redcar	Surface Water	
TS10 4RF	Drainage Design Rev-P02	
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XP Solutions	Network 2018.1	

Area Summary for 01 SW NETWORK

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.069	0.069	0.069
1.001	-	-	100	0.058	0.058	0.058
1.002	-	-	100	0.027	0.027	0.027
2.000	-	-	100	0.013	0.013	0.013
3.000	-	-	100	0.020	0.020	0.020
3.001	-	-	100	0.078	0.078	0.078
1.003	-	-	100	0.046	0.046	0.046
1.004	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.019	0.019	0.019
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.330	0.330	0.330

Free Flowing Outfall Details for 01 SW NETWORK

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	SW	91.150	89.390	89.300	0	0

Online Controls for 01 SW NETWORK

Pump Manhole: SWS1.10, DS/PN: 1.005, Volume (m³): 4.1

Invert Level (m) 87.075

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5000	2.374	2.5000

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Storage Structure	Total
		Volume (m³)	Volume (m³)
1.000	SWS1.01	0.000	0.000
1.001	SWS1.02	0.000	0.000
1.002	SWS1.03	0.000	0.000
2.000	SWS1.04	0.000	0.000
3.000	SWS1.05	0.000	0.000
3.001	SWS1.06	0.000	0.000
1.003	SWS1.07	0.000	0.000
1.004	SWS1.08	216.660	216.660
4.000	SWS1.09	0.000	0.000
1.005	SWS1.10	0.000	0.000
1.006	SWS1.11	0.000	0.000
Total		216.660	216.660

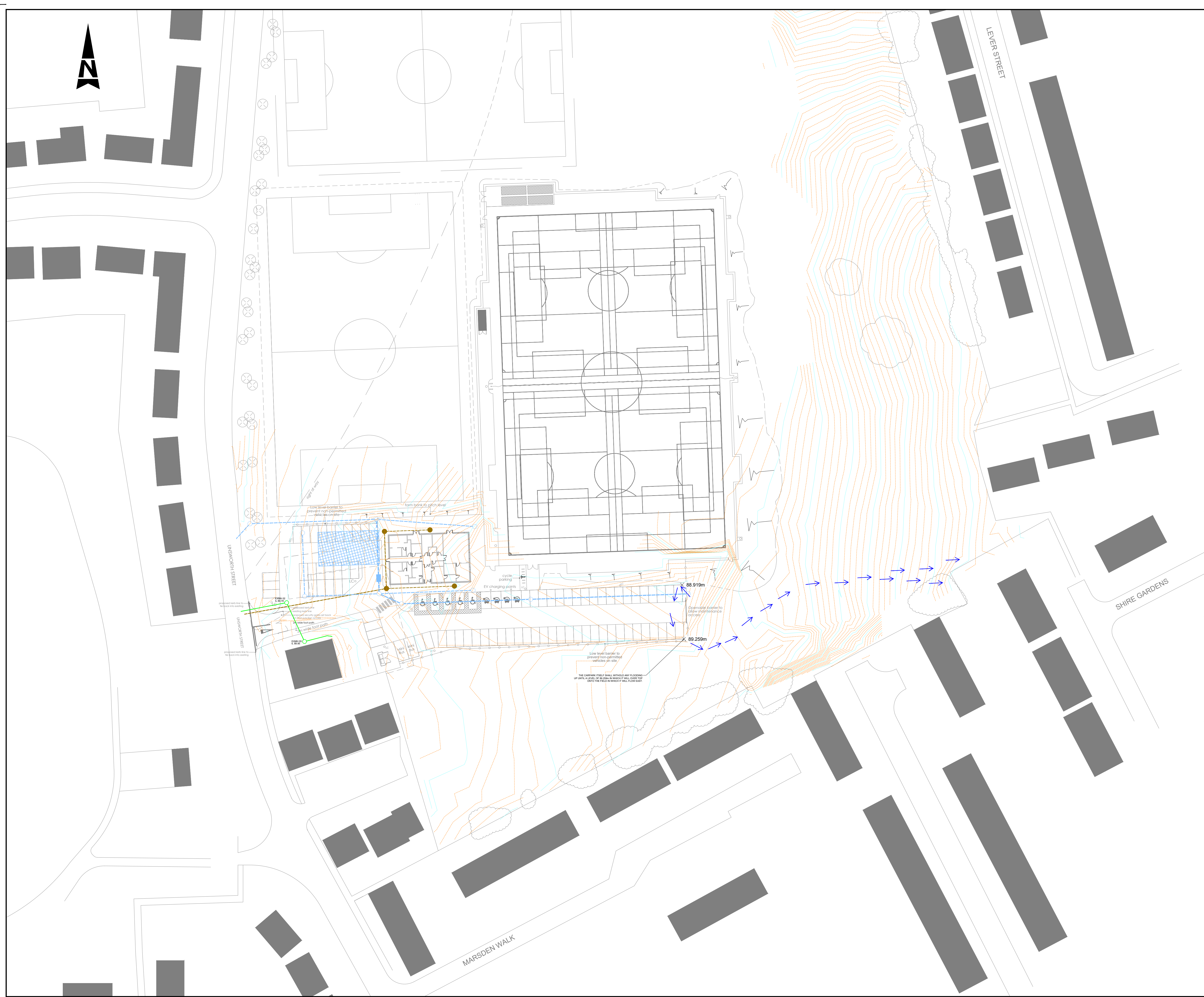
Summary of Critical Results by Maximum Level (Rank 1) for 01 SW NETWORK

Simulation Criteria			
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	1
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.000	Cv (Summer) 1.000
Region	England and Wales	Ratio R	0.322
		Cv (Winter)	1.000
Margin for Flood Risk Warning (mm)			450.0
Analysis Timestep	2.5	Second Increment	(Extended)
DTS Status			ON
DVD Status			OFF
Inertia Status			OFF
Profile(s)			Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440		
Return Period(s) (years)			1, 30, 100
Climate Change (%)			0, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SWS1.01	15 Summer	100	+30%	30/15 Summer				89.085	1.087	0.000
1.001	SWS1.02	15 Summer	100	+30%	30/15 Summer				88.827	1.103	0.000
1.002	SWS1.03	480 Winter	100	+30%	30/15 Summer				88.691	1.191	0.000
2.000	SWS1.04	480 Winter	100	+30%	100/480 Summer				88.690	0.292	0.000
3.000	SWS1.05	15 Summer	100	+30%	30/15 Summer				90.875	1.185	0.000
3.001	SWS1.06	15 Summer	100	+30%	30/15 Summer				90.821	1.318	0.000
1.003	SWS1.07	480 Winter	100	+30%	30/15 Summer				88.690	1.233	0.000
1.004	SWS1.08	480 Winter	100	+30%	30/15 Summer				88.688	1.301	0.000
4.000	SWS1.09	15 Summer	100	+30%					88.714	-0.055	0.000
1.005	SWS1.10	480 Winter	100	+30%	1/30 Summer				88.687	1.462	0.000
1.006	SWS1.11	1440 Summer	30	+30%					89.490	-0.109	0.000

Pipe						
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SWS1.01	1.00		38.1	FLOOD RISK	
1.001	SWS1.02	1.65		62.0	SURCHARGED	
1.002	SWS1.03	0.37		11.1	SURCHARGED	
2.000	SWS1.04	0.06		1.0	SURCHARGED	
3.000	SWS1.05	0.88		14.6	FLOOD RISK	
3.001	SWS1.06	1.74		48.9	FLOOD RISK	
1.003	SWS1.07	0.40		23.5	SURCHARGED	
1.004	SWS1.08	0.09		4.6	SURCHARGED	
4.000	SWS1.09	0.71		12.1	OK	
1.005	SWS1.10	0.47		2.5	SURCHARGED	
1.006	SWS1.11	0.17		2.5	OK	

Appendix D – Proposed Exceedance Flows



GENERAL NOTES:

- DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
- DO NOT SCALE FROM THIS DRAWING, WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.

DRAINAGE NOTES

- PROPOSED PUMP IS TO BE DESIGNED BY SPECIALIST.
- IN THE EVENT OF PUMP FAILURE THE SYSTEM WILL BE ABLE TO WITHOLD ANY 1 IN 1 YEAR STORM.
- IN THE EVENT OF PUMP FAILURE THE SYSTEM WILL BE ABLE TO HANDLE A 1 IN 30 YEAR STORM +30% CLIMATE CHANGE UP UNTIL 960 MINUTES WHEN IT WILL FLOOD BY 38.620m³.
- THE WORST CASE SCENARIO FOR A 1 IN 30 YEAR +30% CLIMATE CHANGE WILL BE FLOODING OF 70.481m³ AT1440 MINUTES.
- IN THE EVENT PUMP FAILURE THE SYSTEM WILL BE ABLE T HANDLE A 1 IN 100 YEAR STORM +30% CLIMATE CHANGE UP UNTIL 240 MINUTES WHEN IT WILL FLOOD BY 7.817m³.
- THE WORST CASE SCENARIO FOR A 1 IN 100 YEAR +30% CLIMATE CHANGE WILL BE FLOODING OF 149.429m³ AT 1440 MINUTES.

EXISTING DRAINAGE KEY:

EXISTING UU SW MANHOLE & SEWER

EXISTING UU CW MANHOLE & SEWER

EXISTING PRIVATE NETWORK TO BE RETAINED

PROPOSED DRAINAGE KEY:

PROPOSED SW NETWORK

PROPOSED ATTENUATION CRATES & VENT PIPE

PROPOSED FW NETWORK

INDICATIVE FLOOD FLOW

LEVELS KEY:

MAJOR CONTOUR (0.5m)

MINOR CONTOUR (0.1m)

PROPOSED LEVELS

× 89.500m

S2	FOR INFORMATION		25.11.22	WF	
S2	FOR INFORMATION		21.10.22	WF	
Stat	Purpose of Issue		Date	Auth	
P02	AMENDED LAYOUT	TH	25.11.22	WF	WF
P01	FIRST ISSUE	TH	21.10.22	WF	WF
Rev	Description	By	Date	Chk'd	Auth

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Client

STEVE WELLS

ASSOCIATES

Project

REDBANK PLAYING FIELDS

Title

DRAINAGE EXCEEDANCE ROUTE

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised
A1	1:250	TH	WF	WF
Status	Drawing Number	Date	Date	Date
S2	22051-ZZ-05-DR-D-0002	21.10.22	21.10.22	21.10.22
				Rev
				P02

Appendix E – Existing UU Drainage Layout

