

LAND ADJACENT TO 67 CHAPELGATE DRAINAGE STRATEGY AND CALCULATIONS



CLIENT:	Ec Holmes Community Trust
ARCHITECT:	GWP Architecture
SITE ADDRESS:	Land Adjacent to 67 Chapel Gate, Scholes, Holmfirth, HD9 1SX
REFERENCE (REV):	22055-DCE-XX-XX-T-C-001-C04
DATE:	09/07/2026

AUTHOR:	O.Bastain	DATE:	09/07/2026
CHECKER:	S.Reid	DATE:	09/07/2026



CONTENTS

EXISTING SITE	1
PROPOSED DEVELOPMENT	1
SURFACE WATER DRAINAGE STRATEGY	2
FOUL WATER DRAINAGE STRATEGY	6
TEMPORARY, CONSTRUCTION PHASE AND LAND DRAINAGE STRATEGY	7
MAINTENANCE OF DRAINAGE SYSTEMS	7
DRAINAGE DESIGN PARAMETERS	10

REVISION	DATE	AUTHOR	CHECKER	COMMENTS
C01	08/04/2022	S.Reid	P.Dixon	Construction Issue
C02	11/01/2025	S.Reid	P.Dixon	Appendices Updated
C03	16/12/2025	O.Bastain	S.Reid	Updates to suit LLFA Comments from 23.10.25
C04	09/07/2026	O.Bastain	S.Reid	Updates to suit Revised Site Layout

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EXISTING SITE

The existing brownfield site is a former quarry located between two roads to the north and east of the site. Along the west and southern boundaries are former quarry faces which are up to 5m high. The site generally has a level around 239.5m AOD and has a steep embankment down to the highway on its eastern boundary and cut stone faces.

Based off the topographical survey, which was undertaken in September 2023, it suggests that the site is generally flat with levels ranging between 238.262m AOD and 245.540m AOD, levels begin to increase where there is an existing embankment to the west. The topographical survey, appended to the rear end of this document, indicates no drainage features within the site and no drainage survey has been undertaken since February 2022 to determine the presence of drainage facilities within the site. After analysing Yorkshire Water Records, it could be seen that there is existing adopted combined water sewer which runs underneath Chapelgate to the north of the site and an existing adopted surface water sewer which runs underneath Dean Bridge Lane to the east.

PROPOSED DEVELOPMENT

The proposed development comprises of ten plots; each dwelling will have associated parking which will be situated adjacent to the access road. The access road is to provide a turning head which is required for HGVs to allow them to turn around and exit the site subject to the removal of waste from the bin collection point. There is abundant vegetation, a play area and numerous bike stores, each amenity which will contribute to an aesthetically pleasing environment.

The total site area is 1893m² or 0.189ha of which 1365m² is impermeable as show on drawing 22055-DCE-XX-XX-D-C-103 'Proposed Impermeable Areas' in the appendices. Most of the site levels are proposed to be as close to existing as possible with the finished floor levels of the properties at 239.00m AOD.



Figure 1 - Proposed Site Plan



SURFACE WATER DRAINAGE STRATEGY

DESIGN STANDARDS

Drainage systems on this site have been designed in accordance with the following standards as required:

- CIRIA C753 – The SuDS Manual (2015)
- British Standard 8582:2013 – Code of Practice for Surface Water Management for Development Sites
- British Standard 752:2017 – Drain and Sewer Systems Outside Building – Sewer System Management
- British Standard 8533:2017 - Assessing and managing flood risk in development - code of practice
- Building Regulations Part H
- Sewerage Industry Guidance – Codes for Adoption
- Design Manual for Roads and Bridges
- Kirklees Local Plan (February 2019)
- National Standards for Sustainable drainage systems (SuDS) (July 2025)

SURFACE WATER DRAINAGE HIERARCHY

Infiltration

The existing site consists of areas of made ground which consists of clays, gravels over the quarried stone. Within the gravels clinker and contaminants have been identified, which presents a medium risk to groundwater as detailed within the Phase 2 SI.

These contaminants will need to be explored further, as recommended in the SI, to ensure that these contaminants do not impact the underlying groundwater table. With the site being elevated above the adjacent highway, combined with this risk of contamination, soakaway has been discounted for the developed portion of the site. The land drainage within the site, including around the boundary, will utilise infiltration as it is expected that these drains will be in areas of low contamination risk, and are outside the quarry works.

Soakaway tests were undertaken within the site in March 2022, and it was identified that the site would not be suitable for soakaways as the fractured rock within the site was fully saturated and had water escaping and bubbling into the trial pits. This will need to be considered during the structural design of retaining walls, foundations and the floatation of the attenuation tank.

Watercourse

Satellite imagery indicates that there are no existing watercourses within the vicinity of the site. The nearest watercourse is Dean Dike, this is approximately 210m away to the south-east of the site. This would require crossing third party land and extensive lengths of drainage would be required. Therefore, a connection into Dean Dike has been considered unviable.

Surface Water Drainage

The site is not served by a YW surface water sewer, but there is a possible route to the watercourse via an existing 300mm highway drain located to the east of the site. It is proposed to use this as the discharge point for this development for surface water. Surveys on this drain have confirmed a continuous, unrestricted route to a headwall at Dean Bridge.



PEAK FLOW CONTROL FROM SITE

The surface water is to be accommodated in a geocellular storage tank, equating to 89.775m³. The hydraulic calculations indicate that there is no flooding of the surface water system in the 1 in 2-year event, 1 in 30, 1 in 30 + 40% climate change event and a 1 in 100 and 1 in 100 + 45% climate change event. The climate change allowances that have been used are the Aire and Calder Management Catchment peak rainfall allowances for the 2070's epoch, in line with the Flood Risk and Coastal Change Planning Practice guidance.

FLOOD RISK AND FLOOD EXCEEDANCE

The site is in Flood Zone 1 and this is shown on the flood map for planning below. The DEFRA website for historical flood data shows that there is no record of historical flooding on site.

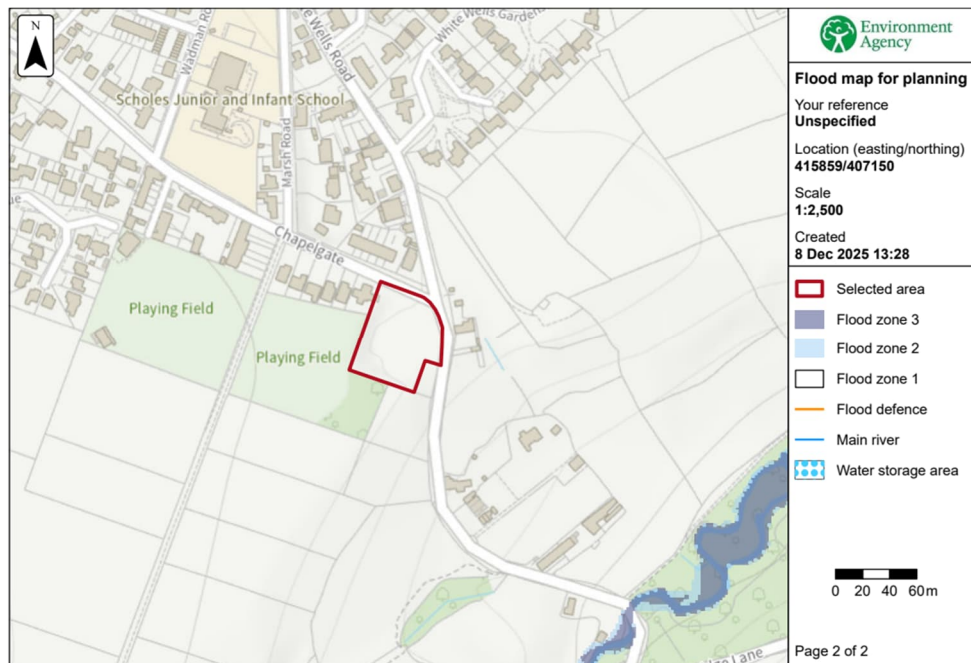


Figure 2 - Flood Map for Planning (EA)



Fluvial (River) Flooding

The map below shows that there is no risk of flooding from Rivers or Sea, as there are no immediate watercourses near the site. Therefore, the risk of fluvial flooding is considered to be low.

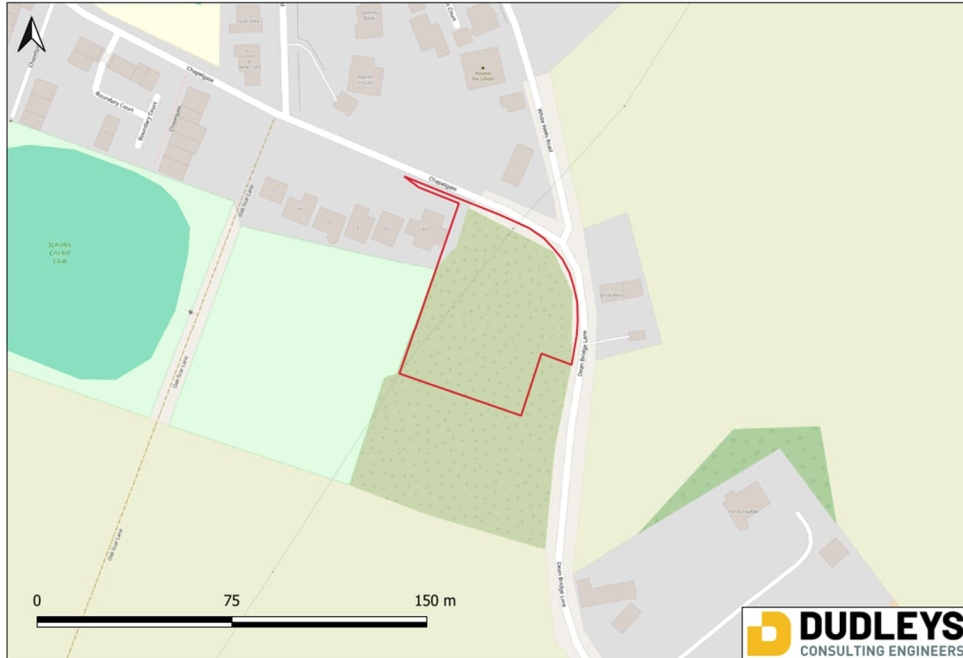


Figure 3 - Fluvial Flooding (EA)

Pluvial (Surface Water) Flooding

The map below shows that the site is not at risk from pluvial flooding. Therefore, the risk of surface water flooding is considered to be low.

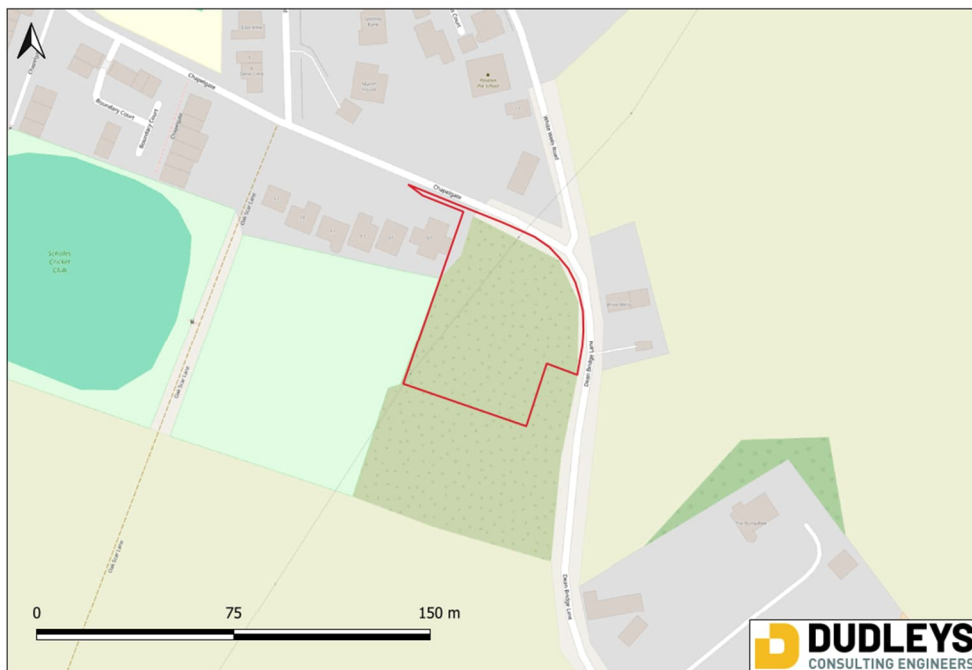


Figure 4 – Pluvial Flooding (EA)



Groundwater Flooding

The site investigation report undertaken by JNP Group Consulting Engineers in June 2022 states that during the ground investigation one ground water strike was encountered within one window sample location. 'Groundwater was only encountered in WS05 at 1.20m below ground level. This is noted to be within the gravelly clay made ground and as such is possibly perched groundwater. Subsequent monitoring visits has indicated that limited groundwater is present within the boreholes of WS02 and WS06' please refer to the geotechnical phase 2 ground investigation report appended to the rear end of this document.

Sewer Flooding

There is an existing combined water sewer to the north of the site adopted by Yorkshire Water. If flooding occurs, water will flood Chapelgate within the channel line, having no detrimental effect on the proposed site.

Reservoir and Other Artificial Sources of Flooding

The map below shows that there is no risk from reservoirs or other artificial sources. Therefore, the risk of reservoir flooding is considered to be low.

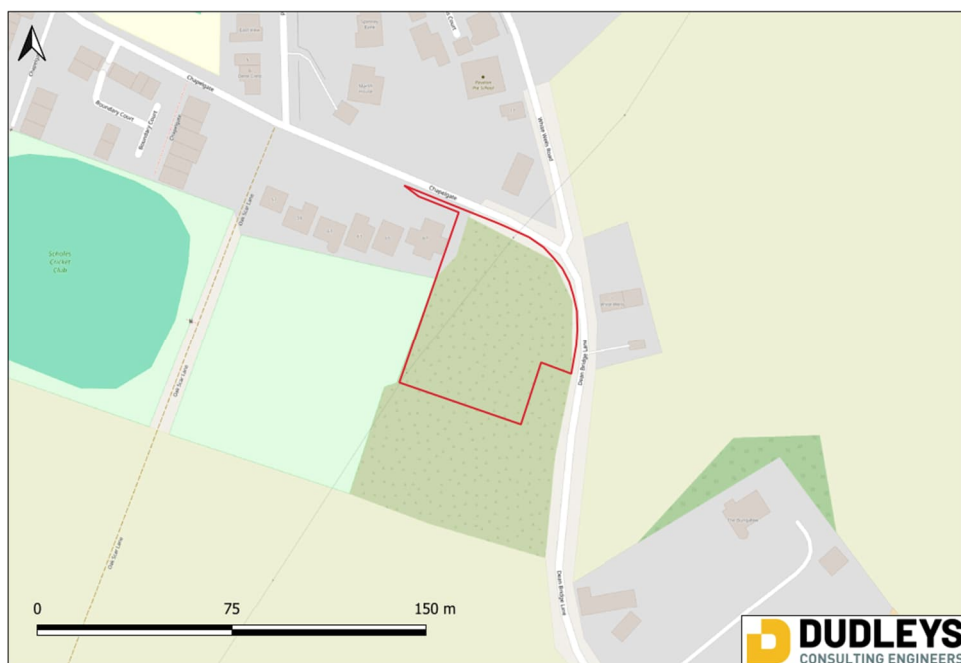


Figure 5 – Reservoir Flooding (EA)

Flood Exceedance

While the system is designed to attenuate flows within the site and manage extreme events up to 1:100 + 45% climate change underground, it is envisaged that in a more extreme storm scenario water may exceed the capacity of this system and water will leave the drainage system causing flooding. In the event beyond the design, water will be contained on the site access road and will be directed towards the landscaped area located at the centre of the site. If flood water exceeds the kerb upstand, the steep batters around the perimeter of the site will prevent the neighbouring properties from flooding, in line with national policies. Any flooding around the perimeter of the houses will be directed away towards the landscaped areas without imposing any flood risk.



WATER QUALITY AND POLLUTION CONTROL

The site has been assessed for pollution risk in accordance with Table 26.2 of the CIRIA SUDS Manual 2015 using the Simple Index Approach method. The site is split into the following areas according to their level of risk and drainage outfall.

- Access Road

Figure 6 - Access Road - Simple Index Approach

Access Road – Proposed Pollution Risk				
	Hazard Level	TSS	Metals	Hydrocarbons
Access Road	Low	0.5	0.4	0.4
Access Road - Proposed Pollution Mitigation				
Hydro International - Downstream Defender Select – Vortex Plus	X 1.0	0.5	0.4	0.5
Mitigation Index Achieved		0.5	0.4	0.5
Mitigation Index Required		0.5	0.4	0.4
		OK	OK	OK

In accordance with table 26.2 of the CIRIA SuDS Manual 2015, a low classification is assigned to individual property driveways, residential car parks, low traffic roads (e.g. Cul de sacs, home zones and general access road) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day.

DRAINAGE DESIGN

The proposed surface water drainage system incorporates an SDS Geolight 400 attenuation tank which will accommodate run-off from the hardstanding areas such as the access road, parking bays and houses. In the event of a 1 in 100-year + 45% climate change storm, it has the capacity to store 89.8m³ of storm water with voids taken into account. Prior to the tank is a Hydro International Downstream Defender, this vortex separator is to provide the required pollution mitigation indices (in accordance with the CIRIA SuDS Manual 2015) to treat run-off from the access road bays, please refer to the 'Water Quality and Pollution Control' section above. The final precast concrete manhole in the network is an FP McCann Stormbrake. This device is a flow control which will discharge surface water 3.00l/s.

FOUL WATER DRAINAGE STRATEGY

Foul drainage will be discharged to the YW sewer located opposite the development. Due to the development being at a lower level than this sewer, a foul water pump station will be required on the site. A section 106 from Yorkshire Water and a highway permit will be required to accommodate the rising main crossing the highway and connecting into the sewer. Due to the shallow nature of this connection a concrete slab in the highway is required, two options are provided for this on drawing 115 and 116.



TEMPORARY, CONSTRUCTION PHASE AND LAND DRAINAGE STRATEGY

The construction phase plan, developed by the Principal Contractor, will detail temporary management of water on the site. It is expected that water will be intercepted locally on the site, with silt and other runoff filtered and pumped from the site to the watercourse. This will be detailed within the Principal Contractor's Construction Phase Plan. It is expected that the contractor will construct the flow control and outfall first. A 5-stage silt buster upstream of the tank linked to dewater pumps will allow the site water run-off to be managed during the construction phase.

MAINTENANCE OF DRAINAGE SYSTEMS

The private systems will be managed by the landowner and the individual tenants for the site. The system has been designed so that the drainage system is fully accessible and maintainable with flooding easily visible if it occurs. The maintenance schedule for the individual elements of the scheme is as per manufacturer's recommendations and as follows.

Pipe Network	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions.	Monthly for 3 months as a part of normal post completion monitoring, then biannually. If flooding is identified, take immediate action.
Debris removal from manholes (where may cause risk performance)	As required, but at least twice a year
Where rainfall into network from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually, or as required and after large storms



Vortex Separator	
Operation	Frequency
Desludging and removal of debris	Every 3 months or as recommended by the Manufacturer
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for first half year of operation, then every six months, or as required by the Manufacturer.
Repair/check all inlets, outlets and overflow pipes	As required
Replace malfunctioning parts or structures	As required
Inspect filter media and establish appropriate replacement frequencies	Six monthly or as required by the Manufacturer.
Note – All Vortex Interceptors should be maintained and monitored under a Service Plan which is compatible with the Manufacturer's warranty and suited to the plant used.	

Flow Control	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions.	Monthly for 3 months as a part of normal post completion monitoring, then biannually
Debris removal from manholes (where may cause risk performance)	Monthly
Where rainfall into network from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Repair/check all inlets, outlets and overflow pipes	As required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually and after large storms



Attenuation Tank	
Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthly
Debris removal from attenuation tank (where may cause risk performance)	As required, but at least twice a year
Where rainfall into attenuation tank from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least twice a year
Remove sediment from upstream surface water network by jetting.	Annually or as required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed.	Annually and after large storms with remedials as required.
Survey inside of tank for sediment build up and remove if necessary.	Every 5 years.

Pump Station	
Operation	Frequency
Desludging and removal of debris	Every 3 months or as recommended by the Manufacturer
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for first half year of operation, then every six months, or as required by the Manufacturer.
Repair/check all inlets, outlets and overflow pipes	As required
Replace malfunctioning parts or structures	As required
Inspect filter media and establish appropriate replacement frequencies	Six monthly or as required by the Manufacturer.
Note – All Package Treatment Plants and Pumping Stations should be maintained and monitored under a Service Plan which is compatible with the Manufacturer's warranty and suited to the plant used.	

The maintenance of the drainage network and SuDS features are to be linked with the wider site maintenance.

A log of all maintenance activities is to be kept and made available to the local planning authority (LPA) and / or the Lead Local Flood Authority (LLFA) on request.

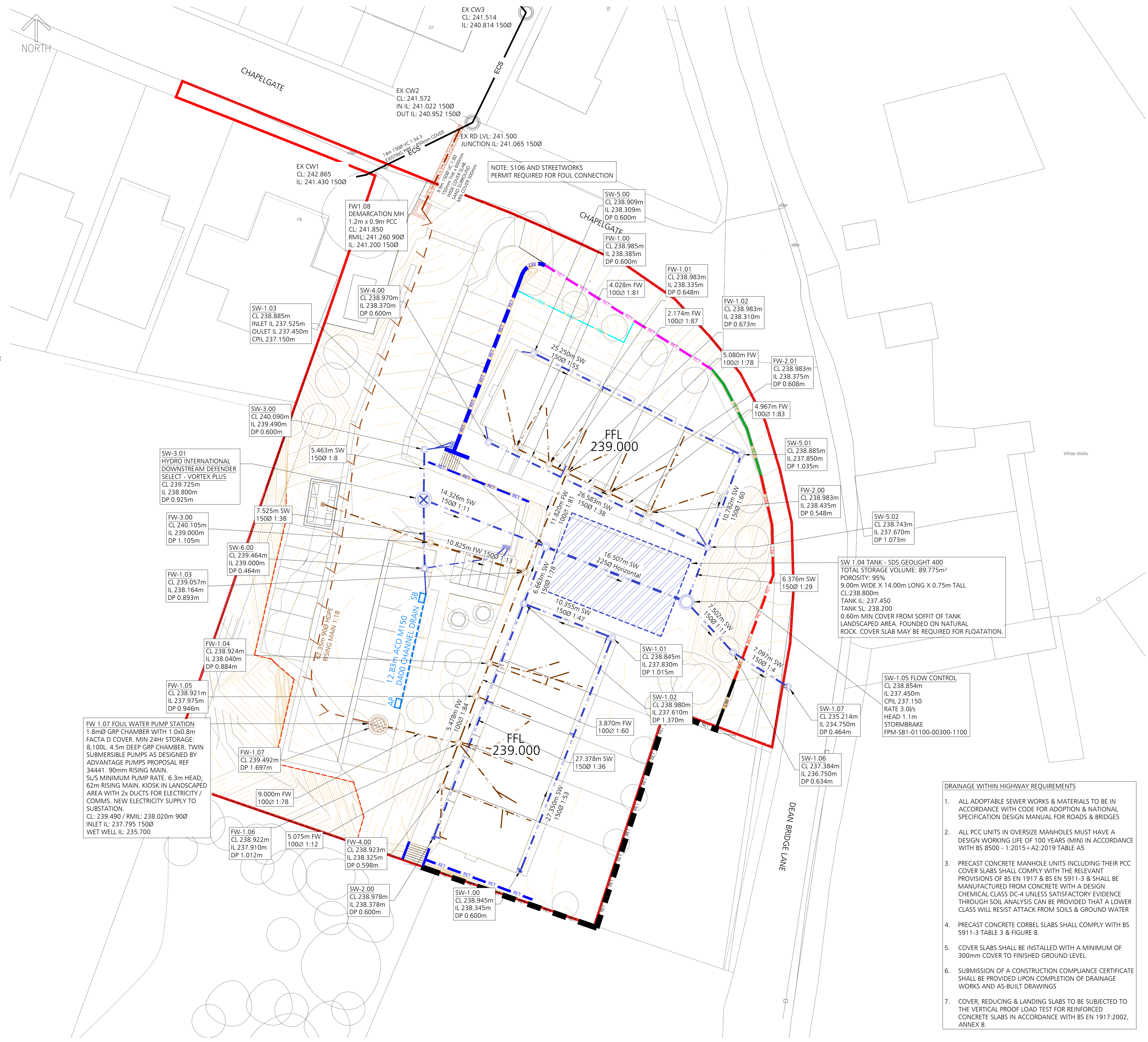


DRAINAGE DESIGN PARAMETERS

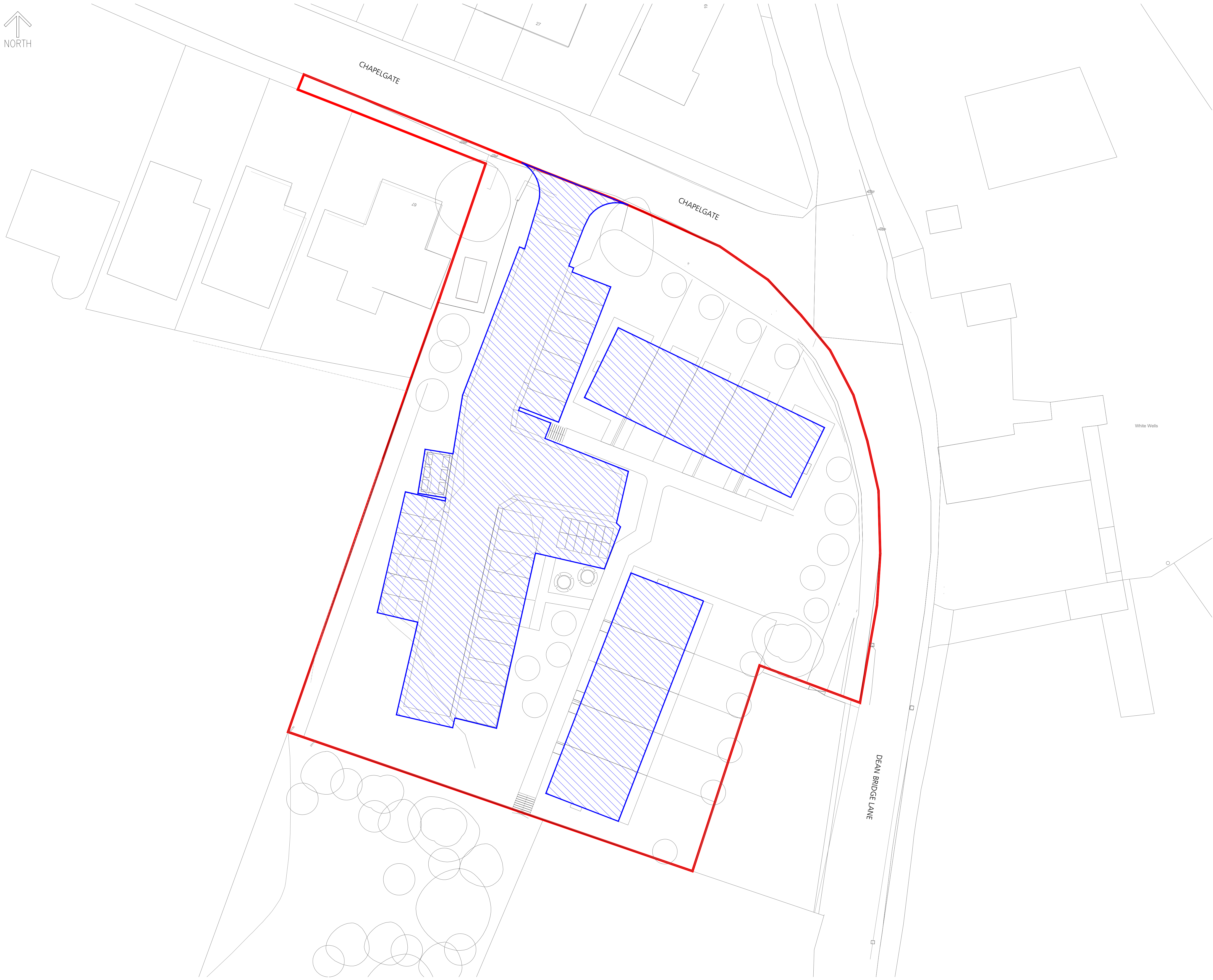
Drainage Outfalls	Consultation with LLFA/IDB/EA/Water Co?	None undertaken
	Soakaway Viable / Rate	Unviable, based on ground conditions
	Groundwater Level	1.20m BGL at WS05
	Watercourse	Across third party land / not easily accessible
	Surface Water Sewer	Available in adjacent road to the east, Dean Bridge Lane, existing adoptable surface water sewer
	Combined Sewer	Available in adjacent road to the north, Chapelgate, existing adoptable foul water sewer
	Invert Level of Outfalls	SW:234.750m AOD FW:241.065m AOD
Surface Water Drainage Assessment Constants	Scenarios to be Tested	1:2, 1:30, 1:30 + 40% CC, 1:100, 1:100 + 45% CC
	Discharge rate	3.00l/s
	Proposed Impermeable Area	1365m ²
	Attenuation Storage Method	SDS Geolight 400 - Geocellular Crates with perforated pipe through the tank
	Proposed Attenuation Volume	89.775m ³
	Flow Control Unit	FP McCANN - Stormbrake
Surface Water Hydraulic Modelling Parameters	Rainfall Model Parameters (FEH/FSR)	FEH 22 data used
	Modelling Parameters assume MADD of 0, Default Time of Entry of 5 Mins and Summer and Winter Coefficients of 1.0. Default Rainfall of 50mm used with 720min drain down.	
Foul Water Drainage	Assessment Method and Assumptions (DU, F&L4, BR Part H2, SFA)	Flows and Loads 4
	Foul Discharge Quantity	8,100 litres per day
	Pump / Treatment Plant Spec	1.8m dia. GRP Chamber
SUDS	Water Quality	Vortex separator
	Pollution Control Risk Level	Low
	Silt Capture Method Spec	Vortex separator, catchpit manholes, silt boxes



Information Provided	22055-DCE-XX-XX-D-C-100-C05 Drainage Strategy 22055-DCE-XX-XX-D-C-103-C01 Proposed Impermeable Area 22055-DCE-XX-XX-D-C-156-C02 Levels Strategy 22055-DCE-XX-XX-M-C-004-C03 Hydraulic Calculations 2112-GWP-01-01-D-A-(SK)-0072 Proposed Site Plan 5126-01 Topographical Survey Attenuation Calculation S106 Longsections Flow Control Stormbrake Details Phase 2 SI Summary and Contamination Recommendations Greenfield Runoff Rate LLFA Comments Hydro Int. Downstream Defender Spec. Infiltration Testing SDS Geolight Attenuation Tank
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DRAWING NO.	REV.
22055-DCE-XX-XX-D-C-100	C06



DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.



ABNORMAL
HAZARD
REFERENCE

NOTES

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- THIS DRAWING HAS BEEN ORIENTATED TO OS BRITISH NATIONAL GRID (EPSG:27700 OSG836). EXISTING SURVEY STATIONS ARE SHOWN ON THE TOPOGRAPHICAL SURVEY.
- THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
 - 5126-01 - TOPOGRAPHICAL SURVEY BY MOBILE CAD SURVEYING SOLUTIONS DATED FEBRAURY 2026
 - 2112-GWP-01-01-D-A-(SK)-0072 - SITE LAYOUT PLAN BY GWPA DATED JANUARY 2025

KEY

-  PROPOSED IMPERMEABLE
AREA: 1365m² / 0.137ha
-  SITE
BOUNDARY

02.07.26	TENDER ISSUE	OB	SDR	C01
DATE	REVISION DESCRIPTION	BY	CHK.	REV.



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Leeds, LS18 5UJ
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PROJECT
**SCHOLES
CHAPELGATE, HOLMFIRTH
HD9 1SX**

TITLE
PROPOSED IMPERMEABLE AREAS

SCALE	PAPER	STAGE	STATUS
1:200	A1	TENDER	

DRAWING NO.	REV.
22055-DCE-XX-XX-D-C-103	C01



DO NOT SCALE

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 - 2112-GWP-01-01-D-A-(SK)-0072 - SITE LAYOUT PLAN BY GWPA DATED JANUARY 2025
- ALL WORK TO BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS, SEWERAGE SECTOR CODES OF PRACTICE, AND THE RELEVANT LOCAL HIGHWAY AUTHORITY STANDARDS.

KEY

- 240.100 PROPOSED SPOT LEVELS
- FFL 239.000 PROPOSED FINISHED FLOOR LEVELS
- EX. LEVEL 240.690m EXISTING SPOT LEVELS
- RET EXISTING RETAINING WALL
- RW 1.2m PROPOSED RETAINING WALL
- FOE 0.45m PROPOSED FLAG ON EDGE
- TW 0.5m PROPOSED TIMBER SLEEPER WALL
- RET EXISTING RETAINING WALL TO REMAIN
- RW 0.5m EXISTING MASONRY WALL TO BE REINSTATED (AS PER PLAN)
- MW 0.9m PROPOSED MASONRY WALL
- 1:63 PROPOSED GRADIENTS
- S STEPPED APPROACH
- PROPOSED BATTER
- SITE BOUNDARY

ASSUMED LEVEL AT
BOTTOM OF ROCK
FACE - 239.80m AOD.

ASSUMED LOCATION OF ROCK FACE
(ONCE BROUGHT BACK). AREA TO
THE SOUTH-WEST OF THE PROPOSED
ACCESS ROAD TO BE SURVEYED,
ONCE ROCK FACE HAS BEEN
BROUGHT BACK, TO ENSURE
ACCURATE DESIGN IS ACHIEVED.

EXISTING MASONRY WALL TO
BE RE-USED DEPENDING ON
CONDITION, OR RE-BUILT AS
PER RETAINING WALL DETAILS.

(WALL MAY REQUIRE
RE-BUILDING FOLLOWING
VEGETATION CLEARANCE.
ALLOWANCE TO BE MADE).

02.07.26	REVISED TO SUIT UPDATED SITE LAYOUT DESIGNED BY GWPA ON 28.01.25	OB	SDR	CO2
07.06.24	TENDER ISSUE	KB	KL	CO1
DATE	REVISION DESCRIPTION	BY	CHK.	REV.

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PROJECT
**SCHOLES
CHAPELGATE, HOLMFIRTH
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TITLE
LEVELS STRATEGY

SCALE 1:200	PAPER A1	STAGE TENDER	STATUS
DRAWING NO. 22055-DCE-XX-XX-D-C-156	REV. CO2		

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m ³ /ha)	0.0	Check Discharge Volume	x
Rainfall Events	Singular	Skip Steady State	x	Starting Level (m)			
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Rate(s)	x		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	0	0
30	40	0	0				

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
SW 1.00	0.006	5.00	238.945	450	415862.172	407117.535	0.600	238.345
SW 1.01	0.006	5.00	238.845	450	415872.195	407142.983	1.015	237.830
SW 2.00	0.006	5.00	238.978	450	415852.685	407121.158	0.600	238.378
SW 1.02	0.006	5.00	238.980	450	415862.532	407146.704	1.370	237.610
SW 3.00	0.026	5.00	240.119	450	415851.658	407163.537	0.629	239.490
SW 6.00	0.062	5.00	240.041	450	415851.531	407153.720	1.041	239.000
SW 3.01			239.723	1200	415851.577	407158.075	0.923	238.800
SW 1.03			238.885	450	415864.942	407152.916	1.435	237.450
SW 5.00	0.006	5.00	238.909	450	415863.620	407174.080	0.600	238.309
SW 5.01	0.006	5.00	238.885	450	415886.297	407162.977	1.035	237.850
SW 4.00	0.006	5.00	238.970	450	415858.660	407164.347	0.600	238.370
SW 5.02	0.006	5.00	238.743	450	415882.623	407152.840	1.073	237.670
SW 1.05 FC			238.854	1200	415880.312	407146.897	1.404	237.450
SW 1.06			237.384	450	415885.389	407141.374	0.637	236.747
SW 1.07			235.214	450	415891.408	407137.614	0.467	234.747
SW 1.04 TANK			238.800		415872.627	407149.907	1.350	237.450

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	SW 1.00	SW 1.01	27.350	0.600	238.345	237.830	0.515	53.1	150	5.33	46.8
1.001	SW 1.01	SW 1.02	10.355	0.600	237.830	237.610	0.220	47.1	150	5.45	46.4
2.000	SW 2.00	SW 1.02	27.378	0.600	238.378	237.610	0.768	35.6	150	5.27	47.0
1.002	SW 1.02	SW 1.03	6.663	0.600	237.610	237.525	0.085	78.4	150	5.54	46.1
3.000	SW 3.00	SW 3.01	5.463	0.600	239.490	238.800	0.690	7.9	150	5.03	47.7
6.000	SW 6.00	SW 3.01	4.355	0.600	239.000	238.800	0.200	21.8	150	5.03	47.6
3.001	SW 3.01	SW 1.03	14.326	0.600	238.800	237.525	1.275	11.2	150	5.11	47.4
1.003	SW 1.03	SW 1.04 TANK	8.253	0.600	237.450	237.450	0.000	0.0	225	5.68	45.3
5.000	SW 5.00	SW 5.01	25.250	0.600	238.309	237.850	0.459	55.0	150	5.31	46.9
5.001	SW 5.01	SW 5.02	10.782	0.600	237.850	237.670	0.180	59.9	150	5.45	46.4
4.000	SW 4.00	SW 5.02	26.583	0.600	238.370	237.670	0.700	38.0	150	5.27	47.0
5.002	SW 5.02	SW 1.05 FC	6.376	0.600	237.670	237.525	0.145	44.0	150	5.52	46.2
1.005	SW 1.05 FC	SW 1.06	7.502	0.600	237.450	236.750	0.700	10.7	150	5.86	45.1
1.006	SW 1.06	SW 1.07	7.097	0.600	236.747	234.747	2.000	3.5	150	5.88	45.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.383	24.4	1.0	0.450	0.865	0.006	0.0
1.001	1.470	26.0	2.1	0.865	1.220	0.012	0.0
2.000	1.691	29.9	1.0	0.450	1.220	0.006	0.0
1.002	1.136	20.1	4.1	1.220	1.210	0.025	0.0
3.000	3.603	63.7	4.5	0.479	0.773	0.026	0.0
6.000	2.167	38.3	10.6	0.891	0.773	0.062	0.0
3.001	3.022	53.4	15.1	0.773	1.210	0.088	0.0
1.003	1.000	39.8	18.5	1.210	1.125	0.113	0.0
5.000	1.359	24.0	1.0	0.450	0.885	0.006	0.0
5.001	1.302	23.0	2.0	0.885	0.923	0.012	0.0
4.000	1.638	28.9	1.0	0.450	0.923	0.006	0.0
5.002	1.521	26.9	4.0	0.923	1.179	0.024	0.0
1.005	3.095	54.7	22.3	1.254	0.484	0.137	0.0
1.006	5.388	95.2	22.3	0.487	0.317	0.137	0.0

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)
1.004	SW 1.04 TANK	SW 1.05 FC	8.253	0.600	237.450	237.450	0.000	0.0	225	5.82	45.3

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.004	1.000	39.8	18.4	1.125	1.179	0.113	0.0

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	27.350	53.1	150	Circular	238.945	238.345	0.450	238.845	237.830	0.865
1.001	10.355	47.1	150	Circular	238.845	237.830	0.865	238.980	237.610	1.220
2.000	27.378	35.6	150	Circular	238.978	238.378	0.450	238.980	237.610	1.220
1.002	6.663	78.4	150	Circular	238.980	237.610	1.220	238.885	237.525	1.210
3.000	5.463	7.9	150	Circular	240.119	239.490	0.479	239.723	238.800	0.773
6.000	4.355	21.8	150	Circular	240.041	239.000	0.891	239.723	238.800	0.773
3.001	14.326	11.2	150	Circular	239.723	238.800	0.773	238.885	237.525	1.210
1.003	8.253	0.0	225	Circular	238.885	237.450	1.210	238.800	237.450	1.125
5.000	25.250	55.0	150	Circular	238.909	238.309	0.450	238.885	237.850	0.885

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW 1.00	450	Manhole	Adoptable	SW 1.01	450	Manhole	Adoptable
1.001	SW 1.01	450	Manhole	Adoptable	SW 1.02	450	Manhole	Adoptable
2.000	SW 2.00	450	Manhole	Adoptable	SW 1.02	450	Manhole	Adoptable
1.002	SW 1.02	450	Manhole	Adoptable	SW 1.03	450	Manhole	Adoptable
3.000	SW 3.00	450	Manhole	Adoptable	SW 3.01	1200	Manhole	Adoptable
6.000	SW 6.00	450	Manhole	Adoptable	SW 3.01	1200	Manhole	Adoptable
3.001	SW 3.01	1200	Manhole	Adoptable	SW 1.03	450	Manhole	Adoptable
1.003	SW 1.03	450	Manhole	Adoptable	SW 1.04 TANK		Junction	
5.000	SW 5.00	450	Manhole	Adoptable	SW 5.01	450	Manhole	Adoptable

Pipeline Schedule

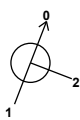
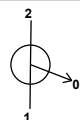
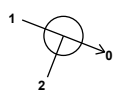
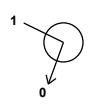
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.001	10.782	59.9	150	Circular	238.885	237.850	0.885	238.743	237.670	0.923
4.000	26.583	38.0	150	Circular	238.970	238.370	0.450	238.743	237.670	0.923
5.002	6.376	44.0	150	Circular	238.743	237.670	0.923	238.854	237.525	1.179
1.005	7.502	10.7	150	Circular	238.854	237.450	1.254	237.384	236.750	0.484
1.006	7.097	3.5	150	Circular	237.384	236.747	0.487	235.214	234.747	0.317
1.004	8.253	0.0	225	Circular	238.800	237.450	1.125	238.854	237.450	1.179

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.001	SW 5.01	450	Manhole	Adoptable	SW 5.02	450	Manhole	Adoptable
4.000	SW 4.00	450	Manhole	Adoptable	SW 5.02	450	Manhole	Adoptable
5.002	SW 5.02	450	Manhole	Adoptable	SW 1.05 FC	1200	Manhole	Adoptable
1.005	SW 1.05 FC	1200	Manhole	Adoptable	SW 1.06	450	Manhole	Adoptable
1.006	SW 1.06	450	Manhole	Adoptable	SW 1.07	450	Manhole	Adoptable
1.004	SW 1.04 TANK		Junction		SW 1.05 FC	1200	Manhole	Adoptable

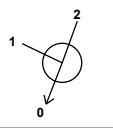
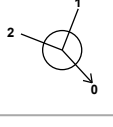
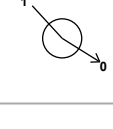
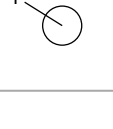
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SW 1.00	415862.172	407117.535	238.945	0.600	450		0	1.000	238.345	150
SW 1.01	415872.195	407142.983	238.845	1.015	450		1	1.000	237.830	150
							0	1.001	237.830	150
SW 2.00	415852.685	407121.158	238.978	0.600	450		0	2.000	238.378	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SW 1.02	415862.532	407146.704	238.980	1.370	450		1	2.000	237.610	150
							2	1.001	237.610	150
							0	1.002	237.610	150
SW 3.00	415851.658	407163.537	240.119	0.629	450		0	3.000	239.490	150
SW 6.00	415851.531	407153.720	240.041	1.041	450		0	6.000	239.000	150
SW 3.01	415851.577	407158.075	239.723	0.923	1200		1	6.000	238.800	150
							2	3.000	238.800	150
							0	3.001	238.800	150
SW 1.03	415864.942	407152.916	238.885	1.435	450		1	3.001	237.525	150
							2	1.002	237.525	150
							0	1.003	237.450	225
SW 5.00	415863.620	407174.080	238.909	0.600	450		0	5.000	238.309	150
SW 5.01	415886.297	407162.977	238.885	1.035	450		1	5.000	237.850	150
							0	5.001	237.850	150
SW 4.00	415858.660	407164.347	238.970	0.600	450		0	4.000	238.370	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SW 5.02	415882.623	407152.840	238.743	1.073	450		1	4.000	237.670	150
							2	5.001	237.670	150
							0	5.002	237.670	150
SW 1.05 FC	415880.312	407146.897	238.854	1.404	1200		1	5.002	237.525	150
							2	1.004	237.450	225
							0	1.005	237.450	150
SW 1.06	415885.389	407141.374	237.384	0.637	450		1	1.005	236.750	150
							0	1.006	236.747	150
SW 1.07	415891.408	407137.614	235.214	0.467	450		1	1.006	234.747	150
SW 1.04 TANK	415872.627	407149.907	238.800	1.350			1	1.003	237.450	225
							0	1.004	237.450	225

Node SW 1.05 FC Online StormBrake™ Control

Flap Valve	x	Design Depth (m)	1.100	Min Outlet Diameter (m)	0.150
Replaces Downstream Link	x	Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200
Invert Level (m)	237.450	Product Code	FPM-SB1-01100-00300-1100		

Node SW 1.04 TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	237.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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	126.0	0.0	0.750	126.0	0.0	0.751	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW 1.00	11	238.366	0.021	1.0	0.0033	0.0000	OK
15 minute summer	SW 1.01	11	237.858	0.028	2.0	0.0045	0.0000	OK
15 minute summer	SW 2.00	11	238.397	0.019	1.0	0.0030	0.0000	OK
15 minute summer	SW 1.02	11	237.658	0.048	4.0	0.0077	0.0000	OK
15 minute summer	SW 3.00	10	239.516	0.026	4.3	0.0042	0.0000	OK
15 minute summer	SW 6.00	10	239.059	0.059	10.1	0.0093	0.0000	OK
15 minute summer	SW 3.01	10	238.855	0.055	14.4	0.0626	0.0000	OK
480 minute summer	SW 1.03	288	237.600	0.150	4.9	0.0239	0.0000	OK
15 minute summer	SW 5.00	10	238.330	0.021	1.0	0.0033	0.0000	OK
15 minute summer	SW 5.01	10	237.879	0.029	2.0	0.0047	0.0000	OK
15 minute summer	SW 4.00	10	238.389	0.019	1.0	0.0030	0.0000	OK
15 minute summer	SW 5.02	11	237.710	0.040	3.9	0.0064	0.0000	OK
480 minute summer	SW 1.05 FC	288	237.600	0.150	2.4	0.1692	0.0000	OK
480 minute summer	SW 1.06	288	236.764	0.017	2.4	0.0027	0.0000	OK
480 minute summer	SW 1.07	288	234.764	0.016	2.4	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 summer	SW 1.00	1.000	SW 1.01	1.0	0.537	0.041	0.0513	
15 minute summer	SW 1.01	1.001	SW 1.02	2.0	0.570	0.077	0.0371	
15 minute summer	SW 2.00	2.000	SW 1.02	1.0	0.355	0.033	0.0842	
15 minute summer	SW 1.02	1.002	SW 1.03	4.0	0.854	0.199	0.0312	
15 minute summer	SW 3.00	3.000	SW 3.01	4.3	1.105	0.067	0.0218	
15 minute summer	SW 6.00	6.000	SW 3.01	10.1	1.639	0.263	0.0268	
15 minute summer	SW 3.01	3.001	SW 1.03	14.3	2.492	0.267	0.0821	
480 minute summer	SW 1.03	1.003	SW 1.04 TANK	4.8	0.419	0.122	0.2321	
15 minute summer	SW 5.00	5.000	SW 5.01	1.0	0.507	0.041	0.0489	
15 minute summer	SW 5.01	5.001	SW 5.02	1.9	0.621	0.083	0.0334	
15 minute summer	SW 4.00	4.000	SW 5.02	1.0	0.398	0.034	0.0673	
15 minute summer	SW 5.02	5.002	SW 1.05 FC	3.8	1.039	0.141	0.0233	
480 minute summer	SW 1.05 FC	1.005	SW 1.06	2.4	1.532	0.044	0.0119	
480 minute summer	SW 1.06	1.006	SW 1.07	2.4	2.273	0.026	0.0076	38.2

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	SW 1.04 TANK	288	237.600	0.150	4.8	18.8857	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)
480 minute summer	SW 1.04 TANK	1.004	SW 1.05 FC	2.2	0.129	0.056	0.2316	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW 1.00	10	238.377	0.032	2.5	0.0051	0.0000	OK
15 minute summer	SW 1.01	10	237.874	0.044	5.0	0.0070	0.0000	OK
15 minute summer	SW 2.00	10	238.407	0.029	2.5	0.0047	0.0000	OK
480 minute summer	SW 1.02	312	237.775	0.165	2.0	0.0263	0.0000	SURCHARGED
15 minute summer	SW 3.00	10	239.532	0.042	10.8	0.0066	0.0000	OK
15 minute summer	SW 6.00	10	239.109	0.109	25.3	0.0174	0.0000	OK
15 minute summer	SW 3.01	10	238.893	0.093	36.0	0.1053	0.0000	OK
480 minute summer	SW 1.03	312	237.775	0.325	8.8	0.0517	0.0000	SURCHARGED
15 minute summer	SW 5.00	10	238.341	0.032	2.5	0.0052	0.0000	OK
15 minute summer	SW 5.01	10	237.896	0.046	4.9	0.0074	0.0000	OK
15 minute summer	SW 4.00	10	238.399	0.029	2.4	0.0046	0.0000	OK
480 minute summer	SW 5.02	312	237.775	0.105	2.0	0.0167	0.0000	OK
480 minute summer	SW 1.05 FC	312	237.775	0.325	3.1	0.3674	0.0000	SURCHARGED
120 minute summer	SW 1.06	112	236.766	0.019	3.0	0.0030	0.0000	OK
120 minute summer	SW 1.07	112	234.765	0.018	3.0	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 summer	SW 1.00	1.000	SW 1.01	2.5	0.701	0.101	0.0973	
15 minute summer	SW 1.01	1.001	SW 1.02	4.9	0.708	0.190	0.0742	
15 minute summer	SW 2.00	2.000	SW 1.02	2.5	0.431	0.083	0.1697	
480 minute summer	SW 1.02	1.002	SW 1.03	1.8	0.547	0.089	0.1173	
15 minute summer	SW 3.00	3.000	SW 3.01	10.8	1.420	0.169	0.0423	
15 minute summer	SW 6.00	6.000	SW 3.01	25.2	1.994	0.659	0.0550	
15 minute summer	SW 3.01	3.001	SW 1.03	35.1	2.843	0.657	0.1853	
480 minute summer	SW 1.03	1.003	SW 1.04 TANK	8.7	0.546	0.220	0.3282	
15 minute summer	SW 5.00	5.000	SW 5.01	2.5	0.667	0.102	0.0938	
15 minute summer	SW 5.01	5.001	SW 5.02	4.8	0.782	0.208	0.0663	
15 minute summer	SW 4.00	4.000	SW 5.02	2.4	0.491	0.082	0.1337	
480 minute summer	SW 5.02	5.002	SW 1.05 FC	2.0	0.670	0.074	0.0981	
480 minute summer	SW 1.05 FC	1.005	SW 1.06	3.0	1.626	0.055	0.0138	
120 minute summer	SW 1.06	1.006	SW 1.07	3.0	2.417	0.031	0.0088	45.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	SW 1.04 TANK	312	237.775	0.325	8.7	40.9685	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute summer	SW 1.04 TANK	1.004	SW 1.05 FC	2.9	0.126	0.073	0.3282	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW 1.00	10	238.383	0.038	3.5	0.0061	0.0000	OK
600 minute summer	SW 1.01	405	237.967	0.137	1.2	0.0217	0.0000	OK
15 minute summer	SW 2.00	10	238.413	0.035	3.5	0.0055	0.0000	OK
600 minute summer	SW 1.02	405	237.967	0.357	2.4	0.0567	0.0000	SURCHARGED
15 minute summer	SW 3.00	10	239.540	0.050	15.1	0.0079	0.0000	OK
15 minute summer	SW 6.00	10	239.214	0.214	35.4	0.0340	0.0000	SURCHARGED
15 minute summer	SW 3.01	11	238.926	0.126	49.9	0.1422	0.0000	OK
600 minute summer	SW 1.03	405	237.967	0.517	10.6	0.0821	0.0000	SURCHARGED
15 minute summer	SW 5.00	10	238.347	0.038	3.4	0.0060	0.0000	OK
600 minute summer	SW 5.01	405	237.966	0.116	1.2	0.0185	0.0000	OK
15 minute summer	SW 4.00	10	238.405	0.035	3.4	0.0055	0.0000	OK
600 minute summer	SW 5.02	405	237.966	0.296	2.4	0.0471	0.0000	SURCHARGED
600 minute summer	SW 1.05 FC	405	237.966	0.516	3.1	0.5838	0.0000	SURCHARGED
60 minute summer	SW 1.06	140	236.766	0.019	3.0	0.0030	0.0000	OK
60 minute summer	SW 1.07	140	234.765	0.018	3.0	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 summer	SW 1.00	1.000	SW 1.01	3.5	0.771	0.142	0.1242	
600 minute summer	SW 1.01	1.001	SW 1.02	1.2	0.459	0.046	0.1783	
15 minute summer	SW 2.00	2.000	SW 1.02	3.5	0.465	0.117	0.2830	
600 minute summer	SW 1.02	1.002	SW 1.03	2.3	0.446	0.114	0.1173	
15 minute summer	SW 3.00	3.000	SW 3.01	15.1	1.478	0.237	0.0568	
15 minute summer	SW 6.00	6.000	SW 3.01	34.8	2.026	0.910	0.0727	
15 minute summer	SW 3.01	3.001	SW 1.03	49.4	2.833	0.925	0.2390	
600 minute summer	SW 1.03	1.003	SW 1.04 TANK	10.5	0.590	0.264	0.3282	
15 minute summer	SW 5.00	5.000	SW 5.01	3.4	0.713	0.141	0.1206	
600 minute summer	SW 5.01	5.001	SW 5.02	1.2	0.506	0.052	0.1738	
15 minute summer	SW 4.00	4.000	SW 5.02	3.4	0.531	0.117	0.1753	
600 minute summer	SW 5.02	5.002	SW 1.05 FC	2.2	0.547	0.081	0.1122	
600 minute summer	SW 1.05 FC	1.005	SW 1.06	3.0	1.626	0.055	0.0138	
60 minute summer	SW 1.06	1.006	SW 1.07	3.0	2.417	0.031	0.0088	46.6

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	SW 1.04 TANK	405	237.966	0.516	10.5	65.0661	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	SW 1.04 TANK	1.004	SW 1.05 FC	2.9	-0.121	0.073	0.3282	

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW 1.00	10	238.381	0.036	3.2	0.0058	0.0000	OK
720 minute summer	SW 1.01	465	237.886	0.056	1.0	0.0089	0.0000	OK
15 minute summer	SW 2.00	10	238.411	0.033	3.2	0.0052	0.0000	OK
720 minute summer	SW 1.02	465	237.886	0.276	2.0	0.0439	0.0000	SURCHARGED
15 minute summer	SW 3.00	10	239.537	0.047	13.6	0.0075	0.0000	OK
15 minute summer	SW 6.00	10	239.139	0.139	31.9	0.0221	0.0000	OK
15 minute summer	SW 3.01	10	238.909	0.109	45.3	0.1229	0.0000	OK
720 minute summer	SW 1.03	465	237.886	0.436	8.6	0.0693	0.0000	SURCHARGED
15 minute summer	SW 5.00	10	238.345	0.036	3.1	0.0058	0.0000	OK
15 minute summer	SW 5.01	10	237.903	0.053	6.2	0.0085	0.0000	OK
15 minute summer	SW 4.00	10	238.403	0.033	3.1	0.0052	0.0000	OK
720 minute summer	SW 5.02	465	237.886	0.216	2.0	0.0343	0.0000	SURCHARGED
720 minute summer	SW 1.05 FC	465	237.886	0.436	3.1	0.4927	0.0000	SURCHARGED
60 minute summer	SW 1.06	113	236.766	0.019	3.0	0.0030	0.0000	OK
60 minute summer	SW 1.07	113	234.765	0.018	3.0	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 summer	SW 1.00	1.000	SW 1.01	3.2	0.751	0.129	0.1157	
720 minute summer	SW 1.01	1.001	SW 1.02	1.0	0.421	0.038	0.1223	
15 minute summer	SW 2.00	2.000	SW 1.02	3.2	0.449	0.106	0.2645	
720 minute summer	SW 1.02	1.002	SW 1.03	1.9	0.446	0.093	0.1173	
15 minute summer	SW 3.00	3.000	SW 3.01	13.6	1.470	0.213	0.0502	
15 minute summer	SW 6.00	6.000	SW 3.01	31.7	2.051	0.828	0.0668	
15 minute summer	SW 3.01	3.001	SW 1.03	45.1	2.884	0.844	0.2240	
720 minute summer	SW 1.03	1.003	SW 1.04 TANK	8.5	0.496	0.214	0.3282	
15 minute summer	SW 5.00	5.000	SW 5.01	3.1	0.697	0.127	0.1117	
15 minute summer	SW 5.01	5.001	SW 5.02	6.1	0.817	0.264	0.0802	
15 minute summer	SW 4.00	4.000	SW 5.02	3.1	0.516	0.106	0.1617	
720 minute summer	SW 5.02	5.002	SW 1.05 FC	1.8	0.547	0.068	0.1122	
720 minute summer	SW 1.05 FC	1.005	SW 1.06	3.0	1.626	0.055	0.0138	
60 minute summer	SW 1.06	1.006	SW 1.07	3.0	2.417	0.031	0.0088	44.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	SW 1.04 TANK	465	237.886	0.436	8.5	54.9182	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	SW 1.04 TANK	1.004	SW 1.05 FC	2.9	0.129	0.073	0.3282	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW 1.00	10	238.389	0.044	4.6	0.0070	0.0000	OK
720 minute summer	SW 1.01	510	238.295	0.465	1.4	0.0739	0.0000	SURCHARGED
15 minute summer	SW 2.00	10	238.418	0.040	4.6	0.0063	0.0000	OK
720 minute summer	SW 1.02	510	238.295	0.685	2.8	0.1089	0.0000	SURCHARGED
15 minute summer	SW 3.00	12	239.725	0.235	19.7	0.0374	0.0000	SURCHARGED
15 minute summer	SW 6.00	11	240.017	1.017	46.2	0.1616	0.0000	FLOOD RISK
15 minute summer	SW 3.01	12	239.653	0.853	59.3	0.9649	0.0000	FLOOD RISK
720 minute summer	SW 1.03	510	238.295	0.845	12.4	0.1343	0.0000	SURCHARGED
15 minute summer	SW 5.00	10	238.353	0.044	4.5	0.0070	0.0000	OK
720 minute summer	SW 5.01	510	238.295	0.445	1.4	0.0707	0.0000	SURCHARGED
15 minute summer	SW 4.00	10	238.410	0.040	4.5	0.0063	0.0000	OK
720 minute summer	SW 5.02	510	238.295	0.625	2.8	0.0993	0.0000	SURCHARGED
720 minute summer	SW 1.05 FC	510	238.295	0.844	3.1	0.9551	0.0000	SURCHARGED
60 minute summer	SW 1.06	257	236.766	0.019	3.0	0.0030	0.0000	OK
60 minute summer	SW 1.07	257	234.765	0.018	3.0	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 summer	SW 1.00	1.000	SW 1.01	4.6	0.819	0.187	0.2327	
720 minute summer	SW 1.01	1.001	SW 1.02	1.4	0.421	0.054	0.1823	
15 minute summer	SW 2.00	2.000	SW 1.02	4.6	0.470	0.153	0.2919	
720 minute summer	SW 1.02	1.002	SW 1.03	2.6	0.446	0.132	0.1173	
15 minute summer	SW 3.00	3.000	SW 3.01	18.8	1.510	0.295	0.0962	
15 minute summer	SW 6.00	6.000	SW 3.01	42.1	2.393	1.100	0.0767	
15 minute summer	SW 3.01	3.001	SW 1.03	56.1	3.188	1.051	0.2522	
720 minute summer	SW 1.03	1.003	SW 1.04 TANK	12.3	0.605	0.310	0.3282	
15 minute summer	SW 5.00	5.000	SW 5.01	4.5	0.759	0.186	0.1493	
720 minute summer	SW 5.01	5.001	SW 5.02	1.4	0.499	0.060	0.1898	
15 minute summer	SW 4.00	4.000	SW 5.02	4.5	0.557	0.154	0.2177	
720 minute summer	SW 5.02	5.002	SW 1.05 FC	2.6	0.547	0.098	0.1122	
720 minute summer	SW 1.05 FC	1.005	SW 1.06	3.0	1.626	0.055	0.0138	
60 minute summer	SW 1.06	1.006	SW 1.07	3.0	2.417	0.031	0.0088	49.0

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	SW 1.04 TANK	510	238.295	0.845	12.3	94.5630	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	SW 1.04 TANK	1.004	SW 1.05 FC	2.8	-0.130	0.071	0.3282	

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All drawings and specifications should be read in conjunction with the project contract and any plan, any possible conflict should be presented to the Planning Committee.
All work to be carried out in accordance with current Building Regulations.
Contractors must verify all dimensions of the job before commencing any work or making this drawing.
Written dimensions should be taken.
Do not scale off drawing.
Do not take digital dimensions from this drawing.
Any discrepancies to be reported to the Architect.



- Key:**
- Site Development Boundary
 - Retained Trees
 - Proposed Trees

2b 4p Home	7
2b 4p Home Part M4(3)	1
3b 4p Home	2
Total Dwellings	10

Kirklees Refuse Vehicle Dimensions
Length: 10.22m
Width: 2.53m
Height: 3.21m
Turning Radius: 9.45m

Tree layout outside site ownership boundary indicative.
Confirmation subject to tree survey

- New Village Welcome Sign.
Exact location TBC
- Existing Levels (Survey 28.03.24)



Bin store

5 Individual bike stores for Units 1-5 with additional storage inside each store.
And separate Communal Tool Store.

Pedestrian Visibility:
Existing low level drystone wall, set back from the edge of the road. Adjacent planting low height for pedestrian visibility.

5 Individual bike stores for Units 1-5 with additional storage inside each store.
And separate Communal Tool Store.

Survey 28.03.24
External face of quarry

Rev	Date	Comment	Dr	Ch
SK01	28.01.25	Option 01	CT	RT



CHARTERED ARCHITECTS
INTERIOR DESIGNERS
SPACE PLANNERS
PROJECT MANAGERS
LANDSCAPE ARCHITECTS

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architectural@gwp-arch.com | www.gwp-arch.com

GWP Ref: (462)2112

Job Title: Chippings Dump Site



Option Proposed Site Plan

Name	2112-GWP-01-01-D-A-(SK)-0072		
Scale	1:200@A1	Revision	SK01
Drawn/Checked	CT / DT	First Issue	29.01.25
Drawing Status	S4 - SK		

Project Ref: 2112-GWP-01-01-D-A-(SK)-0072
A: Architects, GWP/Model/AC28 - Chippings Dump Site - (462)2112-GWP-01-006
M: Landscape, 2112-006





PROJECT: TOPOGRAPHICAL SURVEY

ADDRESS: DEAN BRIDGE LANE,
SCHOLDS,

DWG NO.: 5126 - 01

DWG TITLE: TOPOGRAPHICAL SURVEY

DWG DATE: FEBRUARY 2026

DWG SIZE: 1:200 @ A1

DRAWN:	MW	CHECKED:	EW	ISSUED:

www.mobcad.co.uk

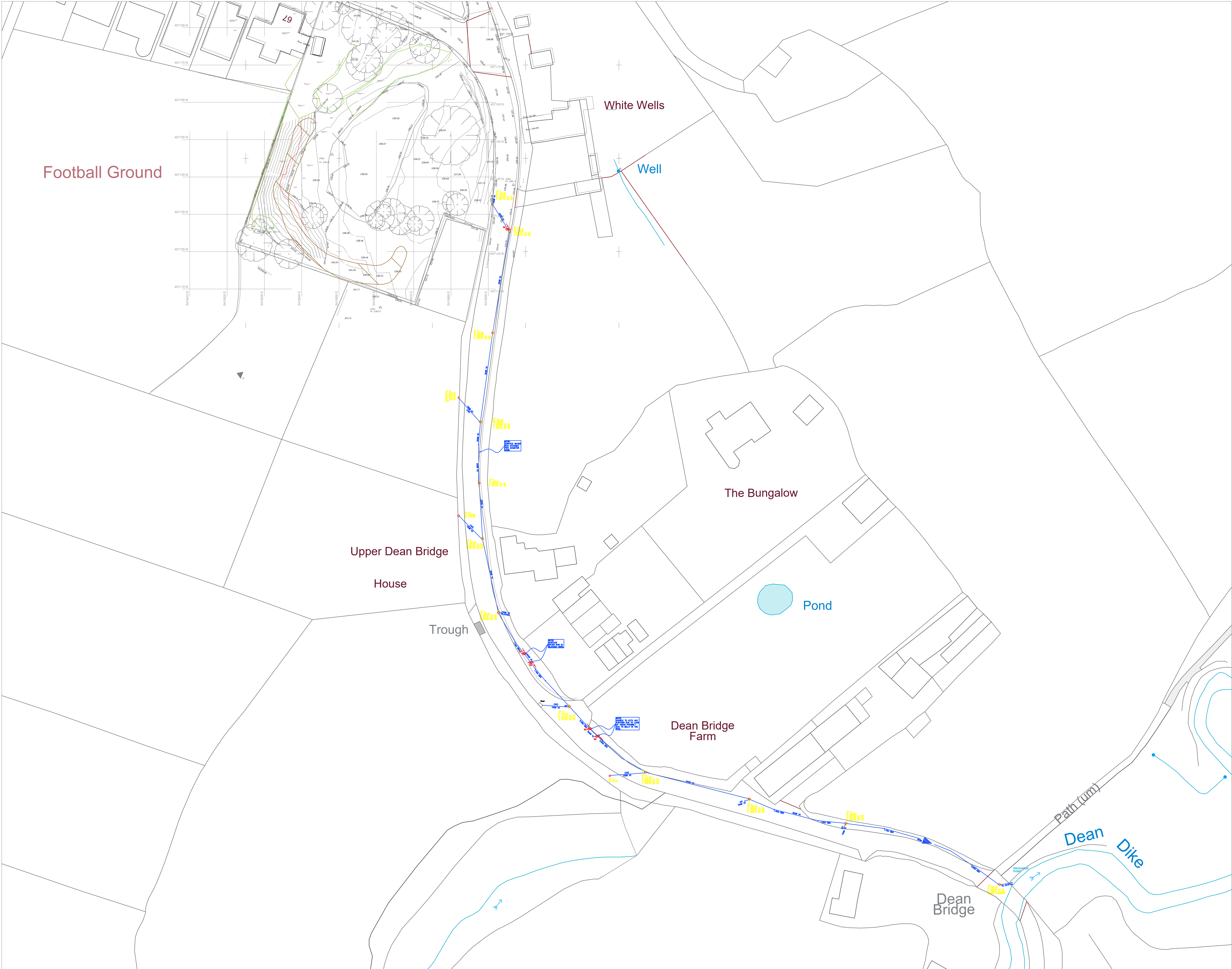
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2 Hargreave Lane
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West Yorkshire
HA5 7JY

01977 525 676

Surveying @ mobcad.co.uk

London Office:
122 - 160 City Road
London
EC2Y 2NH

020 2198 1197



Drainage Route
1:500 Scale

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DO NOT SCALE THIS DRAWING - CHECK ALL DIMENSIONS ON SITE

Note:

Areas drawn indicatively noted and indicated by grey dashed line as line below

LEVEL DATUM & ORIENTATION

LEVELS & DRAWING ORIENTATION CO-ORDINATED TO WORLD CO-ORDINATES USING GPS EQUIPMENT. PERMANENT STATIONS LOCATED IN POSITIONS INDICATED ON PLAN AS FOLLOWS:-

STN 01-	E-415843.339,	N-407195.958,	HT - 242.299m
STN 02-	E-415846.930,	N-407194.371,	HT - 242.035m
STN 03-	E-415890.540,	N-407190.233,	HT - 239.296m
STN 04-	E-415891.871,	N-407185.889,	HT - 239.192m

ABBREVIATIONS & LEGEND:

LEVELS & HEIGHTS CL - COVER LEVEL IL - INVERT LEVEL HT - HEIGHT STN - SURVEY STATION BM - BEAM CE - CEILING J - JOISTS RA - RAFTERS E - EAVES F - FENCE UIS - UNDERSIDE OF RL - ROOF LINE FR - FLAT ROOF HL - HIP LINE VL - VALLEY LINE PWP - PARAPET WALL SL - SLAB SF - SOFFIT T - TREE THR - THRESHOLD To - TOP OF W - WALL HH - HEAD HEIGHT OH - OPENING HEIGHT SH - SILL HEIGHT	SERVICES BT - BRITISH TELECOMS CATV - CABLE TELEVISION ER - EARTHING ROD ES - ELECTRICAL SUPPLY FH - FIRE HYDRANT GAS - GAS SUPPLY PO - POST OFFICE TELEPHONE SV - STOP VALVE TSSU - TRAFFIC LIGHT SIGNALS	GENERAL NOTES AB - ADVERTISING BOARD AC - AIR CONDITIONING UNIT AHU - AIR HANDLING UNIT AP - INTRUDER ALARM PANEL B - BOLLARD BA - BARRIER BE - BENCH BS - BUS STOP BLR - BOILER BKO - BOXING OUT CAH - CEILING ACCESS HATCH CHY - CHIMNEY CPD - CUPBOARD DW - DRAINAGE CHANNE DW - DRAINAGE CHANNE DK - DROP KERB EDR - ELECTRICAL DISTRIBUTION BOARD EG - EXTRACT GRILLE EM - ELECTRIC METER FB - FUSE BOX PP - PREPARE FAP - FIRE ALARM PANEL GR - GRASS GU - GUARDING GM - GAS METER HWC - HOT WATER CYLINDER LB - LITTER BIN LP - LAMP POST PC - PELICAN CROSSING PS - PAVING SLABS PL - PAVEMENT LIGHT PLT - PLANTING PB - POST BOX RB - RAILING RS - ROAD SIGN RFL - ROAD LIGHT SB - SPEED BUMP SG - SIGNAGE SN - STREET NAME SIGN SWR - SHOWER SHV - SHELVE TB - TELEPHONE BOX THR - THRESHOLD TL - TRAFFIC LIGHT TM - TONK MACHINE TP - TELEGRAPH POLE VE - VEGETATION WA - WATER WD - WARDROBE WH - WATER HEATER ZC - ZEBRA CROSSING
--	--	--

TYPICAL DRAWING SYMBOLS

SPOT LEVEL × 96.256

SURVEY STATION

MANHOLE / INSPECTION CHAMBER

SURVEY HEIGHT

WINDOW TAG

DOOR TAG

RADIATOR TAG

TOP & BOTTOM OF KERB × 34.500

TOPOGRAPHICAL SYMBOLS

OVERHEAD ELECTRICAL

OVERHEAD TELEPHONE

FENCE LINE

VEGETATION OUTLINE

SINGLE GATE

DOUBLE GATE

TREE

CONTOURS - 92.000m

SLOPING DIRECTION LINE

UTILITY SURVEY LEGEND

General Information	Utility Type
Access Point	City
Post Office Utility	Earth Cable
Sewer Capped Run	Electricity (240V)
Survey Abandoned	Electricity (240V)
Internal Valve	Electricity (240V)
Underground Boundary	Gas
Underground Chambers	Gas
Verification Trial Hole / Excavation	Gas
Access Grates	Overhead Electric
Assumed Route	Overhead Electric
Vertical Information	Overhead Electric (240V)
Horizontal Information	Overhead Electric (240V)
Cable Duct	Overhead Electric (240V)
Back Drop	Overhead Electric (240V)
P Trap	Overhead Electric (240V)
Utility Crosser	Overhead Electric (240V)
Survey Boundary	Overhead Electric (240V)
Horizontal Utility	Overhead Electric (240V)
Utility Warning	Overhead Electric (240V)
Ditch	Overhead Electric (240V)

REV	DATE	AMENDMENTS

MOBILE CAD Surveying Solutions

www.mobcad.co.uk

London Office: 100 City Road, EC2V 2NX

West Yorkshire: W15 1JY

PROJECT: TOPOGRAPHICAL SURVEY

ADDRESS: DEAN BRIDGE LANE, SCHOLES.

DWG NO.: 5126-02

DWG TITLE: DRAINAGE ROUTE

DWG DATE: FEBRUARY 2026

DWG SIZE: 1:500 @ A1

DRAWN: MW

CHECKED: EW

ISSUE:



Structural & Civil Consultants

Tithe House 35 Town St, Horsforth Leeds LS18 5LJ
T 0113 258 3611

Project

CHAPELGATE, SCHOLES

Drainage Storage

Project No.

22055

SHEET No.

C- D01

BY

SM

DATE

Apr 2022

Drainage Calculations for 1 in 30yr, 1 in 100yr return periods & 1 in 100yr + climate change;

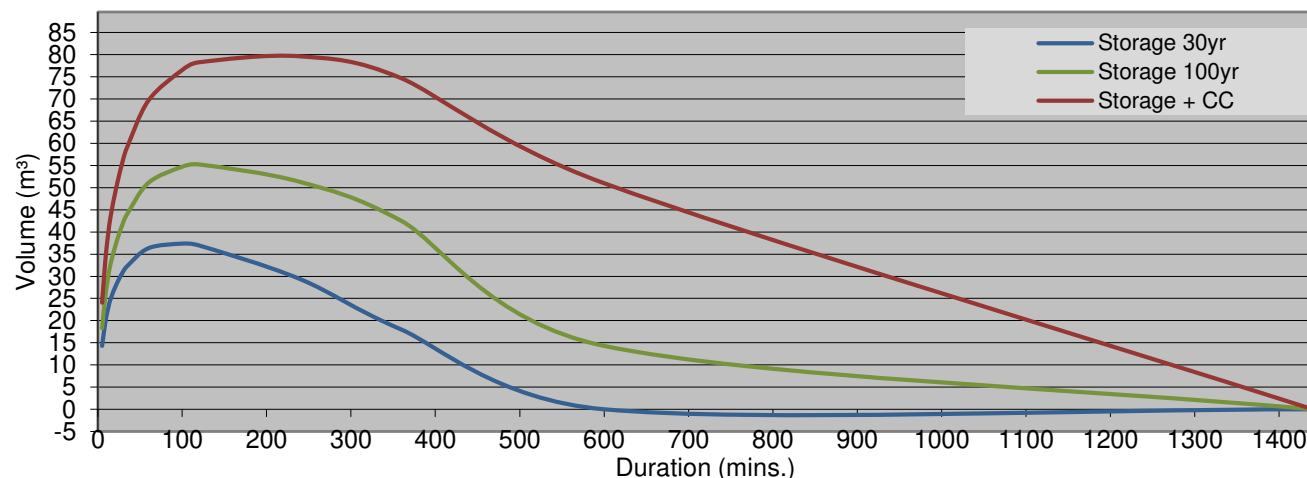
Storage Requirements:

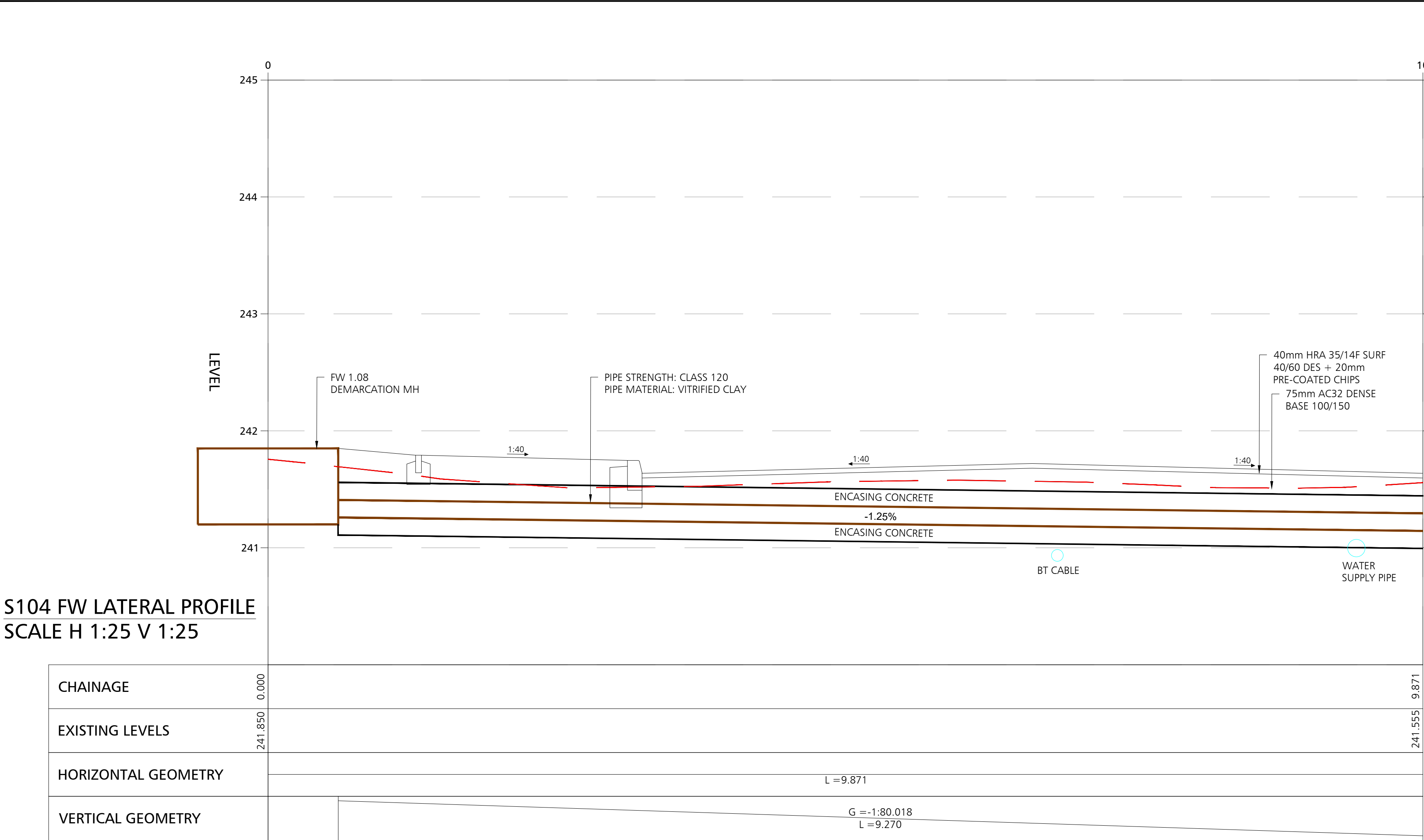
Input Data

M5-60 =	19mm	Fig A.1	
r =	0.3	Fig A.2	
T =	30 yr	C =	2.78
T =	100 yr		
Max. Allowable Flow =	3.00l/s		
Contributing Area =	1610.0m ²	1610.0m ²	
Flow/Ha =	18.63	l/s/Ha	
Percentage Increase =	30%		

Output Data

Duration	Z1	M5-D (M5-60)*Z1	Z2 30 yr	Z2 100 yr	I (30yr) mm/h	I (100 yr) mm/h	Increased (100yr)	Qp 30 l/s	Qp 100 l/s	Increased l/s	Storage (30yr) m ³	Storage (100yr) m ³	Storage (+CC) m ³
5	0.34	6.5	1.45	1.83	113	143	186	51	64	83	14.3	18.3	24.1
7.5	0.43	8.1	1.47	1.86	95	121	158	43	54	71	17.8	23.1	30.4
10	0.50	9.5	1.48	1.90	84	108	140	38	48	63	20.9	27.2	35.9
12.5	0.55	10.5	1.49	1.92	75	97	126	34	43	56	23.0	30.2	39.9
15	0.60	11.4	1.50	1.93	68	88	114	31	39	51	24.8	32.8	43.4
22	0.69	13.2	1.51	1.96	54	71	92	24	32	41	28.2	37.7	50.2
30	0.78	14.8	1.53	1.99	45	59	77	20	26	34	31.1	42.1	56.4
35	0.83	15.7	1.53	2.00	41	54	70	18	24	31	32.3	44.1	59.3
60	1.00	19.0	1.54	2.02	29	38	50	13	17	22	36.3	51.1	69.7
100	1.18	22.3	1.54	2.02	21	27	35	9	12	16	37.4	54.7	76.5
120	1.25	23.7	1.54	2.02	18	24	31	8	11	14	37.0	55.2	78.3
240	1.56	29.7	1.51	1.97	11	15	19	5	7	9	29.3	51.3	79.6
360	1.81	34.4	1.49	1.93	9	11	14	4	5	6	18.0	42.5	74.7
600	2.12	40.2	1.47	1.89	6	8	10	3	3	4	0.0	14.3	51.0
1440	2.81	53.4	1.41	1.79	3	4	5	1	2	2	0.0	0.0	0.0





DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.



ABNORMAL
HAZARD
REFERENCE

NOTES

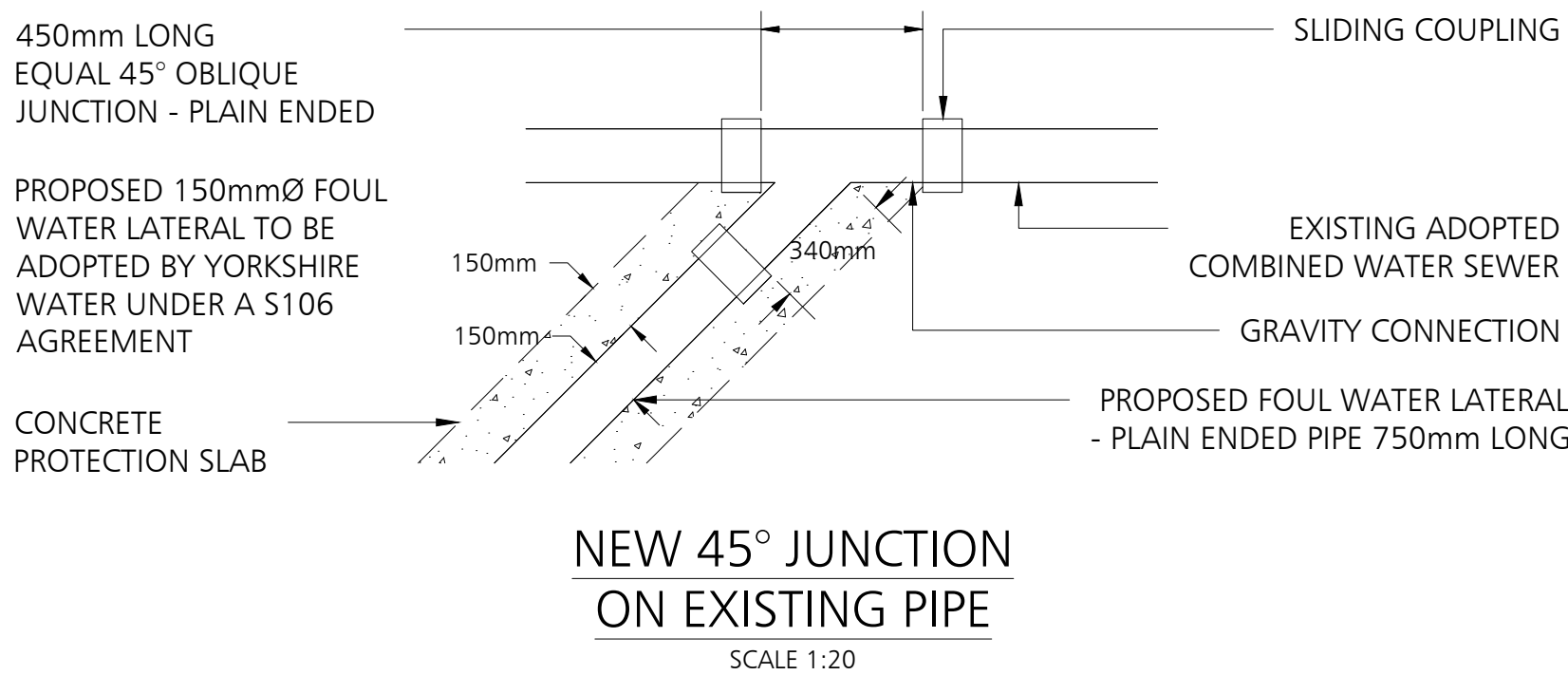
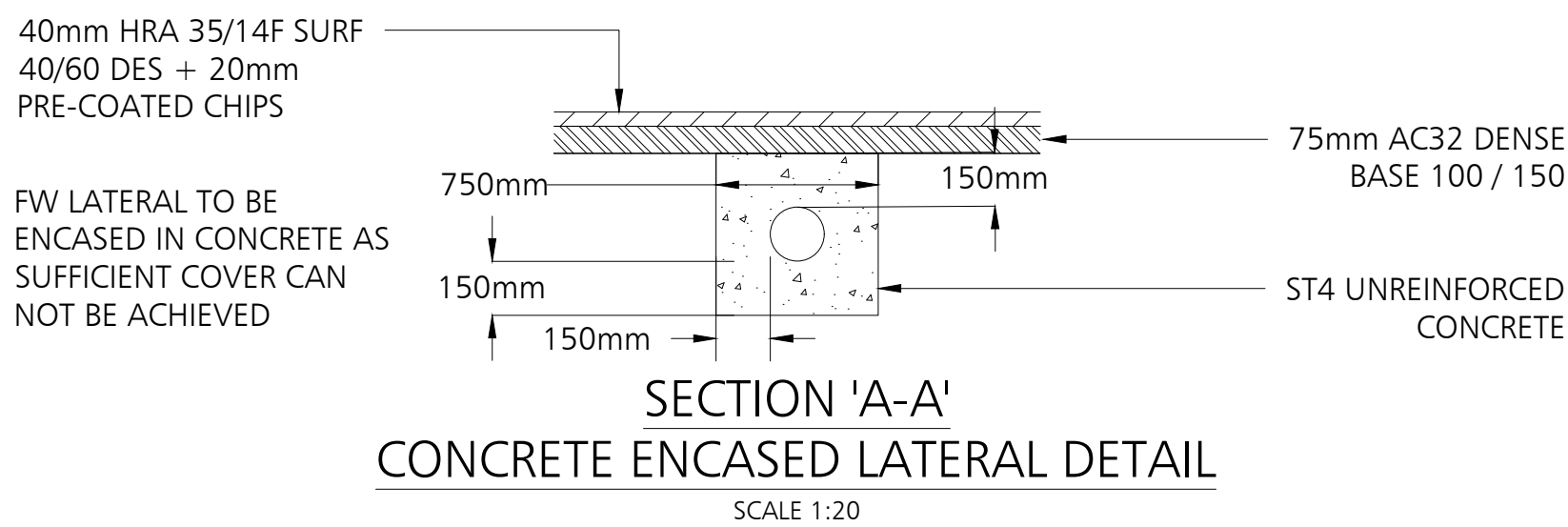
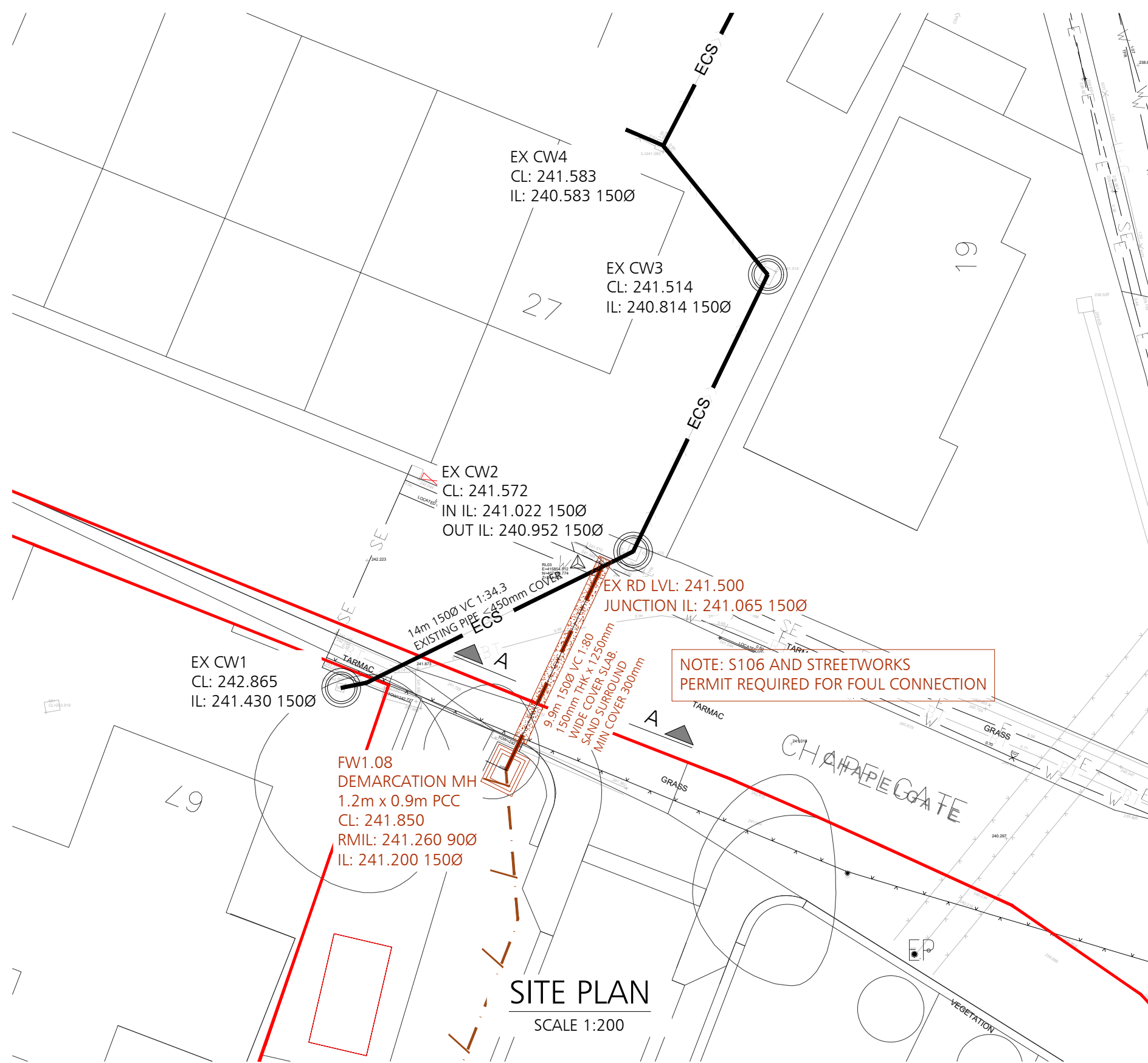
- DO NOT SCALE FROM THIS DRAWING.
- THIS DRAWING IS TO BE REPRODUCED IN COLOUR.
- IF ANY DISCREPANCIES ARE FOUND IN THIS DRAWING, PLEASE REPORT TO DUDLEYS CONSULTING ENGINEERS
- THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
 - EH-CG6230-01 - REV A - TOPOGRAPHICAL AND UTILITY SURVEY BY 1ST HORIZON DATED MARCH 2022
 - (462) - GWP-01-01-D-A-(00)-003 - SITE LAYOUT PLAN BY 1ST HORIZON DATED AUGUST 2023

KEY - S104 FW LATERAL PROFILE

- EXISTING SERVICES
- EXISTING SURFACE
- CONCRETE PROTECTION SLAB

KEY - SITE PLAN DRAINAGE

- PROPOSED ADOPTED S104 FOUL WATER DEMARCATION MANHOLE
- PROPOSED ADOPTED S104 FOUL WATER LATERAL
- EXISTING ADOPTED COMBINED WATER MANHOLE
- EXISTING ADOPTED COMBINED WATER SEWER



26.09.25	CONSTRUCTION ISSUE	OB	SDR	C01
DATE	REVISION DESCRIPTION	BY	CHK.	REV.



PROJECT
**SCHOLES
CHAPEL GATE**

TITLE
**FOUL WATER LATERAL
LONGITUDINAL SECTION
OPTION 2**

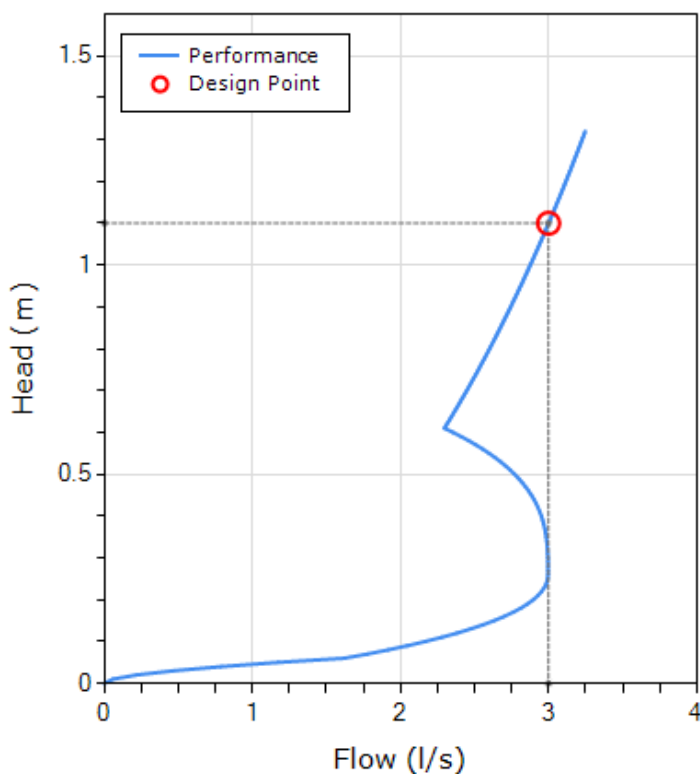
SCALE	PAPER	STAGE	STATUS
AS SHOWN	A1	CONSTRUCTION	

DRAWING NO.	REV.
22055-DCE-XX-XX-D-C-116	C01

Contractor: Dudleys
Site: Chapelgate, Scholes
Date: 09/07/2026
Created By: Oli Bastain
Device Ref: FPM-SB1-01100-00300-0100

Head(m): 1.1
Flow(l/s): 3
Chamber Ref: SW 1.05
Mounting Style: LUGS (Default)

StormBrake™ Performance



	Head (m)	Flow (l/s)
Design Point	1.10	3.00
Flush Flow	0.26	3.00
Kick Back	0.61	2.30

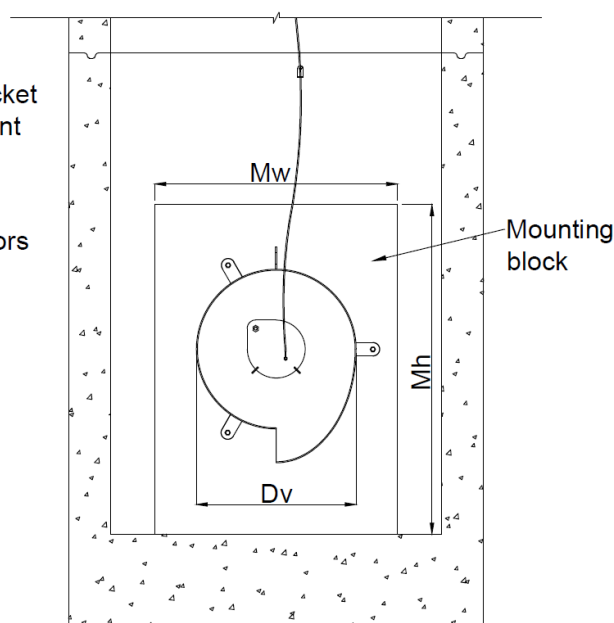
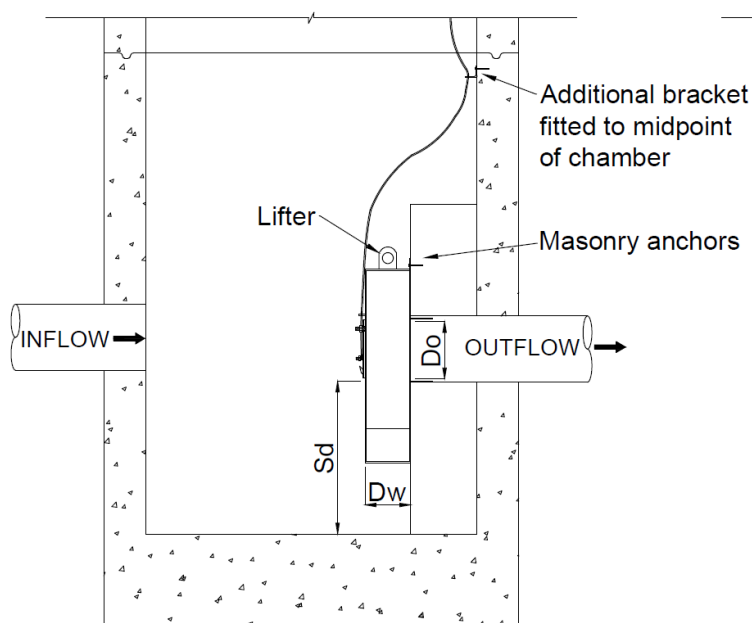
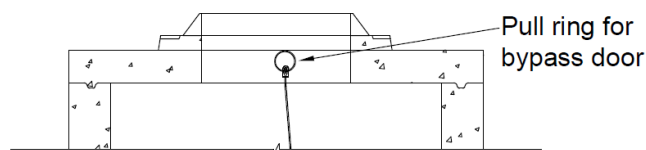
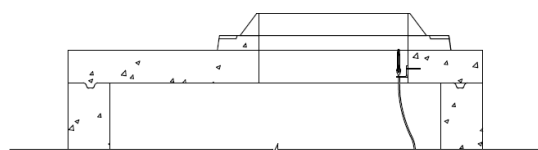
	Dims (mm)
Min. Chamber Diameter	1200
Min. Outlet Pipe Diameter	150
Min. Sump Depth	230

Head (m)	Flow (l/s)
0	0.00
0.05	1.00
0.09	2.06
0.14	2.53
0.18	2.82
0.23	2.97
0.27	3.00
0.32	2.99
0.36	2.98
0.41	2.94
0.46	2.87
0.5	2.77
0.55	2.61
0.59	2.40
0.64	2.34
0.68	2.42
0.73	2.49
0.77	2.56
0.82	2.63
0.86	2.69
0.91	2.76
0.96	2.82
1	2.88
1.05	2.94
1.09	2.99
1.14	3.04
1.18	3.10
1.23	3.15
1.27	3.20
1.32	3.25

The unique performance characteristics of this StormBrake™ are derived from extensive dynamic modelling using parametric experimental testing and computational fluid dynamics.

INSTALLATION INSTRUCTIONS

1. Position the StormBrake™ so that the inlet is at the bottom and the device outlet is in line with the chamber outlet pipe.
2. Mark the locations of the mounting points on the chamber/mounting wall.
3. Using the marked locations, drill holes to the required thickness and depth for the supplied masonry anchors (M10 throughbolts require 11 mm holes). Fit the bolts to the holes.
4. Attach the StormBrake™ to the anchor points, ensuring the neoprene gasket is flush with the chamber wall, and fasten the device by tightening the bolts. This will compress the neoprene gasket to provide a watertight seal between the StormBrake™ and the wall.
5. Fix the stainless steel wire cable from the front bypass door to the underside of the manhole cover, vertically above the device. A secondary bracket is supplied and should be fitted halfway up the chamber to guide the bypass door cable to the top.
6. Adjust the length of the bypass door cable accordingly, so that it reaches the ground level whilst ensuring the bypass door can open if required. Ensure the bypass door is closed for normal operating conditions.



Geometry	Annotation	(mm)
Device Vortex Diameter	Dv	374
Device Width	Dw	84
Device Orifice	Do	81
Sump Depth (outlet Ø150mm)	Sd	230
Mounting Block Width	Mw	610
Mounting Block Height	Mh	660

Dimensions quoted are minimum values based on the geometry of this unique StormBrake™ unit. These ensure the device can be fitted to the flow control chamber without restriction and meet the performance specification.

EXECUTIVE SUMMARY

Site location	Land adjacent to 67 Chapel Gate, Scholes, Holmfirth, HD9 1SX	
Development scheme	Ten affordable two-storey residential properties with private gardens.	
NGR	415861, 407155	
Current use	On-site: Disused overgrown quarry with public footpath running through.	On-site: Residential and agricultural.
Historical use And UXO	The site was undeveloped agricultural land in 1854 and was then quarried by 1888. The shape and size of the quarry did not change from 1888 until 1965-1970, when the topography of the north-western corner of the site changed, with a slope shown falling south-east into the centre of the site; this may represent the site being partially filled with road chippings – as per local anecdotal evidence. The site then remained the same until the present day. In 1854, the surrounding area was mostly occupied by small agricultural fields, with several small villages around the north and east of the site, including residential properties and several inns and mills. There were also several quarries – most of which were labelled as sandstone quarries – immediately north of the site, and between 300m to 750m south and west of the site. By 1888 there were several new mill ponds 250m north of the site, and along Dean Dike, 250m to 400m east of the site. The area around the site largely remained the same until the present day. A low UXO risk has been identified at the site.	
Geology	Rough Rock (sandstone) – Rossendale Formation.	
Hydrogeology	Secondary A Aquifer.	
Hydrology	The Dean Dike / New Mill Dike runs south-west to north-east 270m south-east of the site.	
Environmentally sensitive sites	Based on report ref 4046-CWS-01, Produced by Cotswold Wildlife Services, Dated 20/06/21, the site was concluded to be of low wildlife interest.	
Geology (from GI)	Made ground Brown to dark brown to black, clay, sand and gravel. The proportion of clay, sand and gravel varied between exploratory holes. The gravel fraction comprised tarmac, brick, pottery, mudstone and glass with rare clinker. Rough Rock Soft/very loose becoming medium dense, yellowish light brown, clayey sandy to very sandy gravel, occasionally gravelly clay, in the upper zones. With all the holes terminating on a strong yellow sandstone with the exception of WS05, this terminating on a weathered grey sandstone.	
Groundwater	Trapped pockets of surface water infiltration within the made ground.	

Foundation design	Traditional strip / trench foundations recommended placed within the intact sandstone of the Rough Rock assuming levels are not altered significantly. Should foundations be constructed within the influence of trees, a void may be required due to heave forces, this should be in line with NHBC guidance. Design Sulphate Class of DS4, with an ACEC of AC-4, would apply for the made ground in WS02. Made ground in WS6 and natural soils of the Rough Rock Formation recorded a Design Sulphate Class of DS1 and a ACEC of AC-1
Road construction	A CBR of 3% is anticipated for the natural shallow strata and <2% for the made ground. This should be checked on site with plate bearing tests.
Contamination	Medium Risk - elevated concentrations of lead, beryllium, PAH and TPH in the near surface soils, hence remedial actions at the site are considered necessary in these areas.
Ground gas	Characteristic situation 1 / Green – Gas monitoring is still ongoing. To date, no gas protection measures required (slightly elevated CO₂). Risk to construction workers during below ground works due to depleted O₂ levels. . No radon protection measures required.

7.6 Preliminary Risk Assessment

7.6.1 From the information obtained from the desk study JNP Group has undertaken a preliminary risk assessment.

Table 7.2 Preliminary Risk Assessment

Risk Receptor	Risk		Justification
HUMAN HEALTH	MEDIUM		Historical land use as a quarry, suspected to be partially infilled with road chippings, suggests potential sources of contamination present on site. Potential for direct contact / inhalation of vapours or gases with residential receptors.
GROUNDWATER	MEDIUM		The site is located on productive strata (Secondary Aquifer) and is not within a SPZ, although there is a well 30m east of the site.
SURFACE WATER	MEDIUM		The nearest surface water course is located 270m to the south-west, hydrologically downgradient of the site.
ECOLOGY	NONE		Based on the assumption that there are no sensitive/ protected species on site (subject to any ecological survey undertaken).
PROPERTY & INFRASTRUCTURE	MEDIUM		Historic land use as a partially infilled quarry suggests potential sources of contamination present on site. Potential sources of vapours or gases on-site or migration of gases may occur from off-site sources.

7.6.2 In line with BS ISO 18400-202:2018 based on the conceptual site model as above the site is considered to be probably contaminated.

8 CONCLUSIONS OF DESK STUDY & RECOMMENDATIONS

8.1 Conclusions

8.1.1 The desk-based research has identified that:

- The geological succession below the site comprises the Rough Rock sandstone of the Rossendale Formation.
- It identifies that the site has an historic potentially contaminative use as a partially infilled quarry.

Potential On-Site Sources of Contamination:

- The earliest available maps show the site was a sandstone quarry from the late 19th century and has not been developed since. Local anecdotal evidence suggests that the quarry was later partially infilled with road chippings, and the historical maps indicate that the topography of the site changed slightly between 1955 and 1965, which could be a result of this infilling. However, there is nothing to suggest the original depth of the quarry, and the thickness of any infill material.
- Heavy metals, hydrocarbons, and soil gas associated with limited made ground materials may be present due to the quarry being partially infilled with imported and site generated fill materials – particularly given the potential composition of the infill material (road chippings, containing coal tar), which may cause significantly elevated concentrations of hydrocarbons to be present.
- Based upon guidance given in CL:AIRE research bulletin RB17 (CL:AIRE 2012), as likely depth of the infilled ground is unlikely to be greater than 5.00m, and the soil atmosphere is likely to be aerobic and of small area, the former quarry is unlikely to generate significant volumes of ground gas. RB17 indicates that even where ground gas is present from made ground and recycled soils, it generally does not pose a risk. In addition, RB17 indicates that based upon available case studies, sites where fill is >30 years old, the gassing regime results in a characteristic situation 1 classification, where gas protection measures are not required. The likely date of infilling was between 1955 and 1965, so if the pit was backfilled or partially backfilled, it was over 50 years ago.

Potential Off-Site Sources of Contamination:

- There are several disused quarries around the site, which may have been infilled or partially infilled. The material used to infill these quarries is unknown and should therefore be considered a potential source of hazardous land gas. However, based on the age of the quarries, and the likely age of the fill, JNP Group considers the risk of ground gas generation to be low. In addition, JNP Group consider that material used would have most likely to have been inert, with a low organic content, such as recycled soils, or rubble rather than domestic waste, chemical or industrial waste.
- Based upon guidance given in CL:AIRE research bulletin RB17 (CL:AIRE 2012), as likely depth of the infilled ground is unlikely to be greater than 5m, and the soil atmosphere is likely to be aerobic and of small area, the former quarries are unlikely to generate significant volumes of ground gas. RB17 indicates that even where ground gas is present from made ground and recycled soils, it generally does not pose a risk. In addition, RB17

indicates that based upon available case studies, sites where fill is > 30 years old, the gassing regime results in a characteristic situation 1 classification, where gas protection measures are not required. The quarry 70m north-west of the site does not change shape from 1893, although it does appear to be partially infilled by 1976-1977 – if it was infilled or partially infilled, it was over 40 years ago.

- There are no other potential off-site sources of contamination that could impact on ground conditions at the site. The site is surrounded by residential properties and agricultural fields. In addition, all the mills to the north, north-east, and east of the site are topographically and hydrologically downgradient of the site, and as such should not have had any impact on the site.

8.1.2 No radon protection measures are required.

8.1.3 The site is not in an area predicted to be at risk of fluvial flooding. The centre of the site has a surface water flooding risk of 1 in 30 year, 0.3m – 1.0m.

8.1.4 Based on information contained within desk study or from the previous investigation, it is the opinion of JNP Group that the potential site conditions provide a MEDIUM to LOW environmental risk and hence further investigation and assessment is required.

8.2 Recommendations

8.2.1 Based on the conclusions from the desk study and the intended redevelopment of the site JNP Group recommends that the following intrusive works are undertaken:

- One day of dynamic sampling boreholes (to target depths of 5m bgl) with representative sampling and in-situ testing.
- Three gas and groundwater monitoring standpipe installations with 6 monitoring visits over 3 months.
- Engineering laboratory testing of recovered soil samples, including testing to identify volume change potential of any cohesive material, and concrete classification.
- Chemical laboratory testing of soil samples. The testing should comprise an extensive suite of contaminants, particularly those associated with road chippings/asphalt, including metals, Total Petroleum Hydrocarbons, and Polycyclic Aromatic Hydrocarbons.

8.2.2 The site lies with an area of Low risk of unexploded ordnance (UXO).

Calculated by:

Site name:

Site location:

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:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics Default Edited

SOIL type:

HOST class:

SPR/SPRHOST:

Hydrological characteristics Default Edited

SAAR (mm):

Hydrological region:

Growth curve factor 1 year:

Growth curve factor 30 years:

Growth curve factor 100 years:

Growth curve factor 200 years:

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):	1.19	1.19
1 in 1 year (l/s):	1.02	1.02
1 in 30 years (l/s):	2.08	2.08
1 in 100 year (l/s):	2.47	2.47
1 in 200 years (l/s):	2.82	2.82

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.

Pre-Application Consultation Request

Town and Country Planning Act 1990

Observations By:	KC, Lead Local Flood Authority
Application No.	2021/20912
Proposed Development:	Pre application advice for residential development
Location:	Land Adjacent, 67, Chapelgate, Scholes, Holmfirth, HD9 1SX
Applicant/Agent:	Catalina Tudor
Planning Officer	

Your comments on the above proposal are requested. Please e-mail your comments to the DC Admin in either a Microsoft Word or PDF Document to DC.Admin@kirklees.gov.uk by **28-Sep-2021**.

The submitted plans and documents for the application can be viewed using Documents from Anite or Anite, please use the application number above.

If I do not receive your response by **28-Sep-2021** then the application may be decided without the benefit of your views.

Dated: 14-Sep-2021

Mathias Franklin
Head of Planning and Development

**Consultation Response from KC,
Lead Local Flood Authority**
2021/20912 at Land Adjacent, 67, Chapelgate, Scholes, Holmfirth, HD9 1SX
Pre application advice for residential development
Date Responded:
Responding Officer:
Responding Ref:
Contours

The proposed site is located on relatively steep land. The Western part of the site is about 240m above ordnance datum (AOD), whereas the East is about 235, AOD.

Water Features

There are no known water features on the proposed site. The closest water feature is a stream 30m East of the site.

Main River Flood Risk

Flood Zone 1 - land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)

The proposed site is located in flood zone 1. The closest area within a flood zone is 230m South East in flood zone 3.

Sequential Test

This application would not be subject to a sequential test.

Surface Water Flood Risk

The proposed site has some surface water flood risk. The central section of the site has predicted surface water flooding of up to 0.3m, in the 1 in 100 annual flood event.

Flood Incidents

It is Kirklees Councils statutory duty as the LLFA to record all incidents of flooding in the district. This information gives us a wider understanding of flooding issues.

There have been no previously reported flood incidents on the proposed site. The closest reported incident was 105m North, and caused by a culvert.

Flood Routing/Site Layout

During intense rainfall events drainage systems can often become blocked or overwhelmed. We expect developers to understand where the flow of water will be in these circumstances and avoid unnecessary risk.

Any water which makes its way on site will run straight of site, towards the East. The option 2, site layout, poses less risk to the site as it reduces the risk of ponding water at the front of the houses.

Surface Water Drainage Strategy

At Kirklees Council we aim to promote sustainable drainage throughout the district. As the Lead Local Flood Authority we expect developers to follow our drainage strategy hierarchy.

We would encourage the developer to investigate the potential for soakaways on the proposed site. Although the site is relatively steep, the site has a BGS score of 1 which means that the subsurface is likely to be suitable for free-draining infiltration SuDS. Soakaways must be 5m away from properties and should not encroach this sphere of influence on 3rd part land. We recommend early dialogue with our section 38 team on highway soakaways positioning and stand-off. At the moment a landscaped area to be signed over to highways is favoured.

Connecting to a watercourse would be a viable option as the Dean Dike runs 230m to the South East.

Connecting to a Yorkshire Water sewer is unlikely to be a viable option, as there are few sewers in this location. The most Likely connection point is 35m North of the site and has a diameter of 100mm, which is probably not big enough for the site.

Attenuation must store the critical 1 in 30 year storm. Volumes generated by storms up to and including the 1 in 100 + 30% climate change critical storm also has to be stored on site. Opportunities to store the additional volume in safe areas on the surface can be explored however the majority of sites in Kirklees will be sloping and this volume may also need to be stored in an underground system. If attenuation span is greater than 1500mm and positioned under highway this is likely to preclude adoption by Kirklees Council. Please speak to our Structures department for more information. Storage in landscaped areas or non-adoptable highway is unaffected.

Section 106 – Management Company

The LPA is obligated under House of Commons Written Statement 161 to ensure the maintenance and management of sustainable drainage for the lifetime of the site. This includes the period from construction up until a date of adoption by the statutory undertaker (Yorkshire Water). There is no guarantee that systems will be adopted even if an agreement is signed to do so. It is vital therefore that an undertaking is ensured in the planning process to maintain these systems to manage flood risk. A detailed maintenance plan including access and safety is expected to be included so it can be enforced against non-compliance.

Temporary Drainage

Run off can increase post soil and vegetation strip and the risk of sediment entering the local drainage systems and watercourse. A plan to manage risk of flooding to nearby property and land and to protect watercourses from pollution will be required.

Downstream Defender®

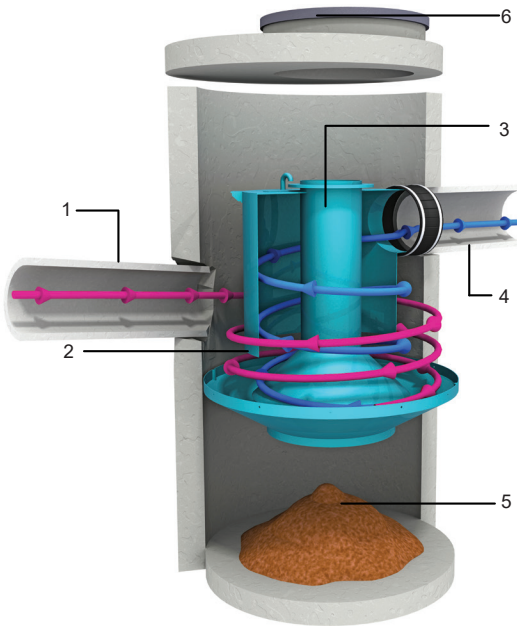
Advanced Hydrodynamic Separator

Product Summary

Exceptional Pollutant Capture in a Compact Profile

Downstream Defender is an advanced hydrodynamic vortex separator that provides impressive and reliable removal of fine and coarse particles, hydrocarbons, and floatable debris from surface water runoff, delivering high levels of stormwater treatment over a wide range of flow rates.

Available in a range of sizes, it can function as either pretreatment or as a stand-alone device, providing engineers and contractors with a flexible, cost-effective stormwater management option.



Product Profile

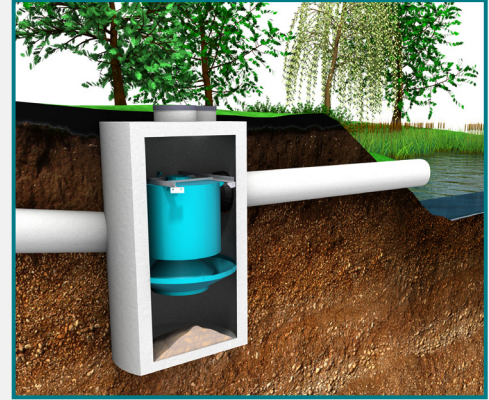
- | | |
|------------------------------------|--------------------------|
| 1. Inlet to Precast Vortex Chamber | 4. Outlet Pipe |
| 2. Cylindrical Baffle | 5. Sediment Storage Sump |
| 3. Center Shaft | 6. Access Lid |

Applications

- » Areas requiring a minimum of 50% TSS removal
- » Highways, parking lots, industrial areas and urban developments
- » Pre-treatment to ponds, storage systems, green infrastructure
- » Areas where high solids and trash capture are a must

How it Works

Tangential Inlet for Superior Vortex Action



Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (magenta arrow) and inner (blue arrow) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe.

Benefits

Tight & Mighty

- » Save space and money: treat high peak flows in as little as half of the footprint of other structural BMP systems.
- » Cut headloss: Low headloss means more site flexibility and provides engineers with design options for shallower sites.
- » Increase Pollutant Capture: Carefully designed internal components isolate the pollution storage areas, ensuring that what is captured is retained, even during high flows.
- » Adapt to Your Site: accommodate a change in outlet pipe direction to suit site-specific requirements.



Stormwater Solutions

→ hydro-int.com/downstreamdefender

Sizing & Design

The Downstream Defender can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (**Table 1**). Selection and layout of the appropriate Downstream Defender model depends on site hydraulics, site constraints and local regulations. Both online (**Fig.3a**) and offline (**Fig.3b**) configurations are common.

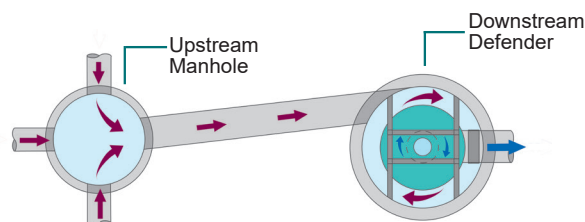


Fig.3a The Downstream Defender in an online configuration.

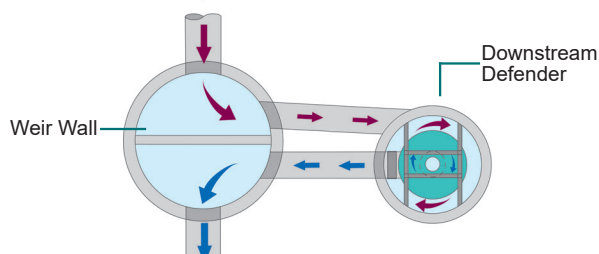


Fig.3b The Downstream Defender in an offline configuration.

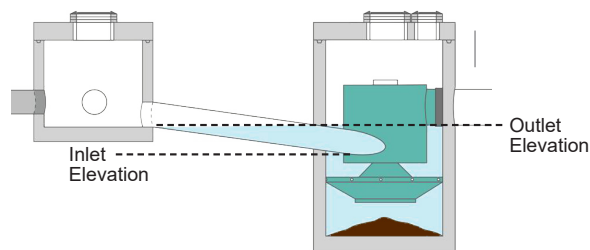


Fig.2 The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.

Online Sizing Tool



This simple online tool will recommend the best separator, model size and online or offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Model Number and Diameter		Peak Treatment Flow Rate		Maximum Pipe Diameter		Oil Storage Capacity		Sediment Storage Capacity		Minimum Distance from Outlet Invert to Top of Rim		Standard Height from Outlet Invert to Sump Floor	
(ft)	(m)	(cfs)	(L/s)	(in)	(mm)	(gal)	(L)	(yd³)	(m³)	(ft)	(m)	(ft)	(m)
4	1.2	3.0	85	12	300	70	265	0.70	0.53	2.8	0.85	4.1	1.25
6	1.8	8.0	227	18	450	216	818	2.10	1.61	3.2	0.98	5.9	1.80
8	2.4	15.0	425	24	600	540	2,044	4.65	3.56	4.2	1.28	7.7	2.35
10	3.0	25.0	708	30	750	1,050	3,975	8.70	6.65	5.0	1.52	9.4	2.85
12*	3.7	38.0	1,076	36	900	1,770	6,700	14.70	11.24	5.6	1.71	11.2	3.41

*Not available in all areas. Contact Hydro International for details.

Maintenance

The Downstream Defender® is designed with maintenance in mind. Floatable trash and debris can be removed from the surface with a net. Vactor hose access through the center shaft of the system makes for quick, simple sump cleanout. These design features expedite maintenance procedures, reducing long-term operational cost.



📍 Hydro International, 94 Hutchins Drive, Portland, ME 04102

☎ Tel: (207) 756-6200

✉ Email: stormwaterinquiry@hydro-int.com

🌐 Web: www.hydro-int.com/downstreamdefender

Download Drawings!

→ hydro-int.com/dd-drawings

Access the Operation & Maintenance Manual

→ hydro-int.com/dd-om

Soakaway test hole locations Chippings HD9 1SX

Trial holes for Phase 2 requested locations ▲
Actual location of gas test holes ▲

Soakaway test hole 1

0.8m wide, 3.3m long, 1.4m deep

Base of hole was bed rock

Water started seeping into hole immediately from fractured rock layer approx. 0.5 – 1.4m deep

Soakaway test hole 2

0.45m wide x 3.0 long x 1.8-1.9m deep

base of hole was fractured rock, but water started seeping into hole from around 1m deep

Soakaway test hole 3

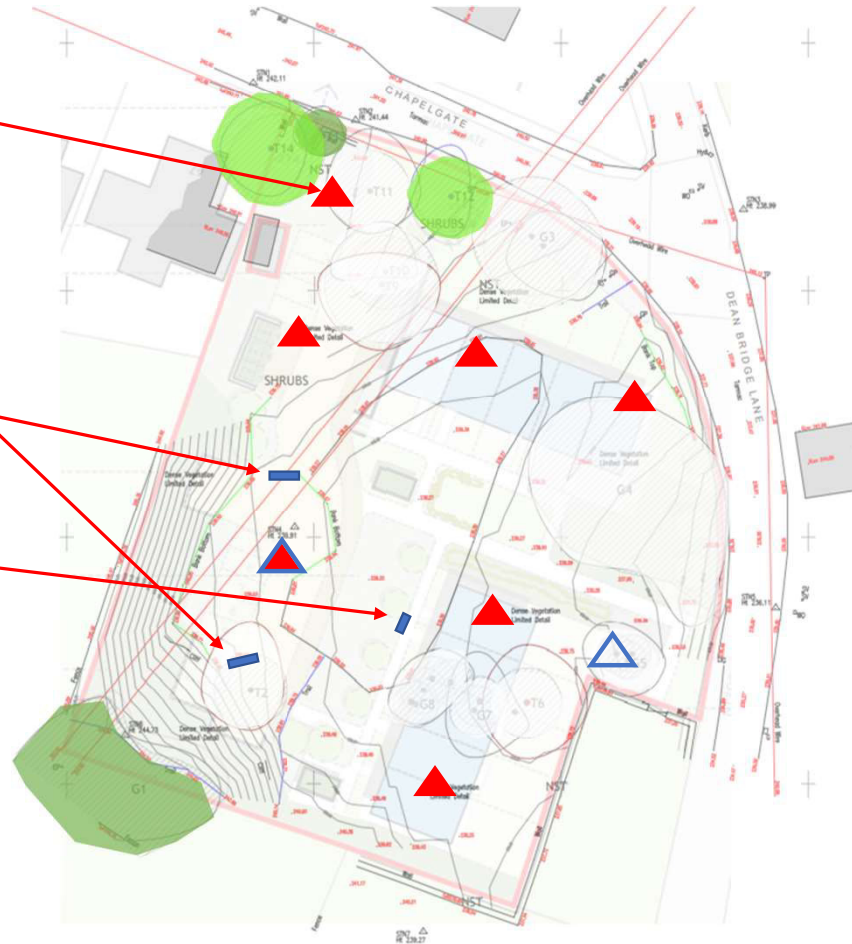
0.45m wide x 1.6m long x 1.0-1.4m deep

Base of hole was rock

Water seeping in quickly

Note all holes backfilled on same day, hole 3 ground was 'like porridge' with fine chippings and a lot of water. Extra layer of chippings added but still very soft.

Matthew Tulley
10/3/2022



Soakaway test hole 1

Soakaway test hole 1
0.8m wide, 3.3m long, 1.4m deep
Base of hole was bed rock
Water started seeping into hole immediately from fractured rock layer approx. 0.5 – 1.4m deep

At end, water level was approx. same as base of quarry (water table is just below quarry base and very permeable)



Time	Depth of water (mm)	Top of water to top of hole (mm)	Comments
11:20	175		Water running in
11:40	325		
12:25	350		
12:50		785	
13:20		785	
13:33		785	
13:49		785	Water level with quarry base

Soakaway test hole 2

Soakaway test hole 2
0.45m wide x 3.0 long x 1.8-1.9m deep
base of hole was fractured rock, but water started
seeping into hole from around 1m deep

At end, water level still rising slowly, but not much
below quarry base. (water table is just below quarry
base and very permeable)



Time	Depth of water (mm)	Top of water to top of hole (mm)	Comments
11:30	200		Water running in
11:45	400		
12:20	925		
12:51		840	
13:13		750	
13:34		680	
13:48		660	Water level not much above quarry base

Soakaway test hole 3

Soakaway test hole 3
0.45m wide x 1.6m long x 1.0-1.4m deep
Base of hole was rock
Water seeping in quickly

This was not an 'official test' but wanted to see how far below the surface the water table was. In centre of quarry 1.5m from centre path

At end water was 100 below surface

Any digging in quarry for footings will need drainage ditches first, or a BIG pump. Maybe a land drain around cliff base to pick up and divert aquifer water?



Time	Depth of water (mm)	Top of water to top of hole (mm)	Comments
13:15	50		Just digging
13:27	700		
13:36	940	100	Sides falling in, bottom rising

Soakaway Summary

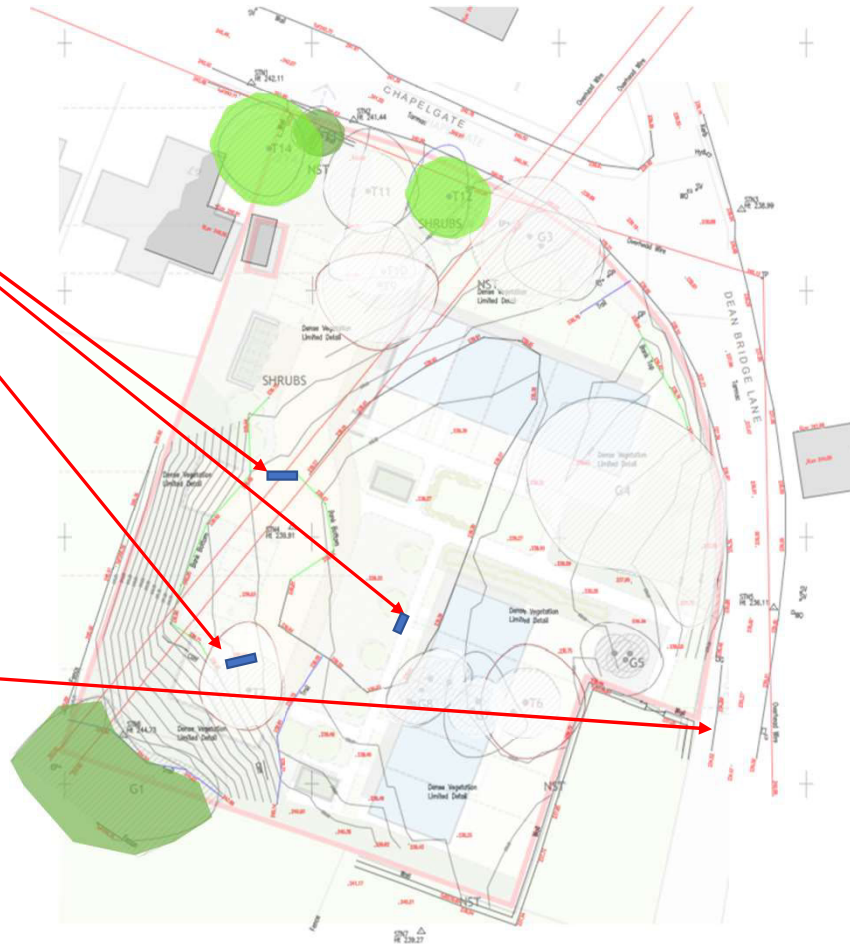
Soakaways are unlikely to work

Water table is just below quarry base, about 100mm. Broken stone at 0.5 – 1.5m down (virgin ground) is very permeable and running with water. Springs are seen in the quarry base during wet weather (eg at S quarry face under rock overhang)

After backfilling the holes the ground was like porridge! Should settle down after a few days but lots of water and a bit of JCB = bit of a mess. NOTE we didn't add any water for any of these tests – all of it came for free from underground

Road gully on corner of site takes surface water down Dean Bridge Lane. Shown on Utility Scan as a 300mm drain. Flood water from quarry currently spills into road anyway

Matthew Tulley
Survey and report date 10/3/2022
Weather dry, dry yesterday too.



SDS GEOLight®

Stormwater Management System

Product Profile

SDS GEOLight® is an ultra lightweight honeycombed modular structure made from recycled PVC. The ready to install units are preformed to provide an underground stormwater storage facility, for the application of stormwater attenuation or infiltration.

The high void rate (>95%), high compressive strength (to 1000KN/m²) and low resistance to water flow makes

SDS GEOLight® an ideal material for cost efficient and maintainable underground water storage during storm conditions.

SDS GEOLight® Benefits

- High compressive strength – can be located under all roads, car parks and amenity area surfaces.
- Reduced excavation costs – the very high void rate (95%) minimises the required volume of earthworks.
- Speed of installation – 1000m³ reservoir, completed in one week.
- Light and easy to handle.
- Excellent hydraulic characteristics.
- The honeycomb structure is highly permeable, offering low resistance to water flow.
- SDS GEOLight®'s unique lateral and vertical filling arrangement requires a minimum amount of pipework and stone.
- Depth of tank invert reduced by using patented lateral supply.
- Simplified distribution pipe network, easy maintenance – dispensing with costly and complicated pipework configurations.
- Modular format offers design flexibility to overcome topographical constraints and architectural requirements.
- Greatly reduces the risk of flooding when used as stormwater storage.
- Can also be used for water recycling and combining with irrigation systems.
- Can virtually eliminate pollution when used in combination with specialist separation and filtration technology such as SDS Aqua-Swirl™ and SDS Aqua-Filter™.
- Design service available, including calculations.



APPLICATIONS



RETAIL



INFRASTRUCTURE



INDUSTRIAL



RESIDENTIAL



COMMERCIAL



PUBLIC SECTOR



Material	Recycled Rigid PVC		
Colour	Dark grey to black		
Standard length of a block	2000 mm	2000 mm	2000 mm
Standard width of a block	500 mm	500 mm	500 mm
Standard height of a block*	750 mm	750 mm	750 mm

Void Ratio	> 95%	> 95%	> 95%
Compressive Strength	420 kN/m ²	610 kN/m ²	800 kN/m ²



SDS GEOLight® 400	SDS GEOLight® 600	SDS GEOLight® 800
APPLICATIONS		
Stormwater Management		
Attenuation / Infiltration		
Bacterial filter-bed for biological treatment		
Hydrocarbon Separation		
Filtration and Separation Units		
SPECIFICATIONS		
Recycled Rigid PVC		
Dark grey to black		
2000 mm	2000 mm	2000 mm
500 mm	500 mm	500 mm
750 mm	750 mm	750 mm
*Other block sizes available on request		
> 95%	> 95%	> 95%
420 kN/m ²	610 kN/m ²	800 kN/m ²
ADVANTAGES		
Highly cost effective		
Reduced excavation costs		
High void capacity		
Good UV resistance		
Good hydrocarbon resistance		