JOB NAME	MILLOM LEISURE CENTRE
JOB No.	L2762
DATE	AUG ‘23

DRAINAGE STRATEGY

FURNESS PARTNERSHIP
www.furnesspartnership.com

London 20 Britton Street, London, EC1M 5TX
Bradford The Paper Hall, Anne Gate, Bradford BD1 4EQ

CONTENTS

SCHEDULE OF APPENDICES

REVISION	DATE	ISSUE STATUS	PREPARED BY	CHECKED BY
P1	11.08.23	FOR REVIEW	M.H	C.J.H

1 INTRODUCTION

1.1 This document has been prepared by Furness Partnership and sets out the proposed drainage strategy for the Millom Leisure Centre development. This strategy should be read in conjunction with the following appended documentation:

- Roberts Limbrick Existing Site Plan: 10930-RL-XX-ZZ-DR-A-P0002
- Discovery Surveys Ltd Utilities Scan: 5442CTS 230522 213FD
- Roberts Limbrick Proposed Site Plan: 10930-RL-XX-ZZ-DR-A-P2001
- Roberts Limbrick Change of Use Plan: 10930-RL-XX-ZZ-DR-A-P2002
- Furness Partnership Existing / Proposed Impermeable Areas:
  - L2762-FUR-XX-XX-DR-D-0901 (P1)
  - L2762-FUR-XX-XX-DR-D-0902 (P1)
- Furness Partnership Drainage Drawings:
  - L2762-FUR-XX-XX-DR-D-0911 (P2)
  - L2762-FUR-XX-XX-DR-D-0921 (P2)
  - L2762-FUR-XX-XX-DR-D-0922 (P2)
  - L2762-FUR-XX-XX-DR-D-0923 (P1)
  - L2762-FUR-XX-XX-DR-D-0931 (P2)
  - L2762-FUR-XX-XX-DR-D-0932 (P2)
- United Utilities Pre-Planning Enquiry Response & Sewer Map Records
- GEOL Ground Investigation / Soakaway Test Results Extract
- Furness Partnership MicroDrainage Surface Water Hydraulic Calculations
- Furness Partnership SuDS Maintenance Schedule

2 EXISTING SITE DETAILS & PROPOSED DEVELOPMENT

2.1 The existing site extends over an area of commercial land adjacent to Salthouse Rd, Millom, LA18 5AB. The site currently comprises Millom School, associated outbuildings, playgrounds, an all-weather pitch, and car parking facilities.

2.2 The total area within the site boundary is approx. 3.77 ha.

Fig 2.1 – Site map showing approximate development boundary

2.3 Levels within the site are generally flat with a slight fall from west to east. Levels to the west are circa 8.30m, falling to circa 6.50m to the east of the site.

2.4 The proposed development is split into 3No development zones. The main development zone involves demolishing the existing pavilion building to the east of the site and constructing a new leisure centre and car parking facilities in its place. The second development zone involves demolishing an existing outbuilding to the west of the site known as 'The Bungalow' and constructing a new extended car park in its place. The third development zone is located to the south of the site and involves constructing an extended playground area over an area of existing landscaping.

3 FLOOD RISK STATEMENT

3.1 A Flood Risk Assessment has been carried out by GEOL Consultants, dated April 2023, and the reader is referred to this report for further details regarding the risk of flooding to the site. Conclusions from the report state that the site is not considered to be at significant risk from fluvial flooding as it lies wholly within a Zone 1 flood risk area. The site is also not considered to be at risk from tidal flooding, flooding from artificial sources of water (reservoirs, canals, etc.), or flooding from public sewers, and there are no records of any historical flooding. In general, the site is not shown to be affected by significant pluvial (surface water) flooding however the northeastern portion of the site lies within an area which is at risk from groundwater flooding occurring at surface so any below ground structures should be designed to be waterproof. Provided a suitable drainage strategy is implemented to accommodate the increase in post-development impermeable area, the development will not have an adverse impact on any nearby watercourses, floodplains, and areas of flood storage capacity, nor will the development result in flooding of adjacent sites.

4 SURFACE WATER DRAINAGE

EXISTING

4.1 The existing site comprises brownfield (buildings / car parking / hardstanding) land.

4.2 The nearest watercourse is Salthouse Pool, located 30 m to the east of the site boundary.

4.3 United Utilities asset plans show that there are 4No combined sewers running through the site (see Fig 4.1). There are 300mm & 525mm diameter combined sewers running through the east of the site and 225mm & 900mm diameter combined sewers running through the south of the site.

Fig 4.1 – United Utilities Sewer Map

4.4 A drainage survey has been carried out which shows that most of the site surface water discharges into the combined sewers to the south of the site at various locations through an existing private network. The all-weather pitch has a separate outfall into the nearby watercourse to the east. The Pavilion building to the east of the site could discharge into the 300/525mm United Utilities combined sewer or into the watercourse, however the drainage route was not able to be fully surveyed.

4.5 The existing impermeable area within each of the development zones is shown in Table 4.1:

Table 4.1 Existing Impermeable Areas

Development Zone	Existing Impermeable Area
Leisure Centre	2710 m²
Car Park Extension	300 m²
Playground Extension	0 m²

PROPOSED

4.6 The surface water discharge from the proposed development will be made up from the following elements:

- Building Roof Area
- Access Roads
- Playground Area
- Paved Areas around new development
- Car Parking Bays

4.7 The total proposed impermeable area within each of the development zones is shown in Table 4.2:

Table 4.2 Proposed Impermeable Areas

Development Zone	Proposed Impermeable Area
Leisure Centre	3415 m²
Car Park Extension	1240 m²
Playground Extension	2345 m²

Surface Water Discharge Hierarchy

4.8 The recommended surface water discharge hierarchy set out in the CIRIA SuDS Manual is to utilise soakaways, or infiltration as the preferred option, followed by discharging to an appropriate watercourse. If these options are not feasible then the final option is to discharge to an existing surface water sewer, followed by discharge into a combined public sewer.

4.9 In accordance with the surface water discharge hierarchy, soakaways were initially considered for the discharge of surface water from the new development zones. Falling head tests carried out on site have shown mixed infiltration results ranging from water soaking away too quickly to record, to a rate of 1.47×10^{-7} m/s (which would not be suitable for soakaways). BRE 365 soakaway tests are proposed for the next stage to confirm whether the site is suitable for infiltration. If infiltration is suitable then soakaways will be used for the discharge of surface water from site however, due to the mixed preliminary infiltration results, a backup discharge location for each development zone will be explored in case soakaways are not suitable.

4.10 If soakaways are not suitable the next step in the discharge hierarchy is to consider discharge into a watercourse. The closest watercourse is Salthouse Pool located 30 m to the east of the site boundary. As Salthouse Pool runs adjacent to the eastern site boundary a connection into this watercourse is proposed for the leisure centre site if soakaways are not suitable. It is understood that the existing all-weather pitch has a connection into this watercourse that will be utilised if possible. If the existing connection is already at capacity, then a new connection & outfall will be made into Salthouse Pool for the surface water discharge from the leisure centre development.

4.11 For the car park and playground development zones, it would not be feasible to connect into the Salthouse Pool as this would require crossing over 200m of built-up land within the site. Discharge of surface water into a watercourse is not therefore proposed for these development zones.

4.12 The next step in the discharge hierarchy is to discharge into a public surface water sewer, followed by discharge to a public combined sewer. A pre-development enquiry has been submitted to United Utilities and their response and asset maps are appended to this report. United Utilities have confirmed that the 525mm combined sewer running through the site is suitable to connect into provided the rate of discharge is restricted to match the greenfield runoff rate for each development area. The preferred connection point for the car park and playground developments is the 225mm combined sewer to the south of the site so a request has been made to United Utilities to discharge into this sewer instead. This report will be updated once a response is received and formal approval to connect into the public drainage network will be agreed with United Utilities through the submission of a sewer connection application where necessary.

SuDS Considerations

4.13 SuDS have been considered when producing this drainage strategy to provide effective surface water treatment and slow down the rate of surface water runoff in accordance with National Planning Policy recommendations. The following sustainable drainage systems are proposed:

- Cellular Infiltration Tanks: [subject to infiltration testing] Due to the limited green space & topography on site and low allowable discharge rate an underground tank has been selected as the most efficient method of storing surface water.
  OR
- Cellular Storage Tanks: Due to the limited green space & topography on site and low allowable discharge rate an underground tank has been selected as the most efficient method of storing surface water.

Simple Index Approach & Maintenance Schedule

4.14 In accordance with the CIRIA SuDS Manual, to deliver adequate treatment using SuDS, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

4.15 The land usage and pollution hazard levels for the site are shown in Table 4.3.

Table 4.3 Pollution hazard indices for different land use classifications (CIRIA SuDS Manual)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Leisure Centre Roof	Low	0.3	0.2	0.05
Hardstanding & Car Parking surrounding Leisure Centre	Low	0.5	0.4	0.4
Playground Extension Development	Low	0.3	0.2	0.05
Car Park Extension Development	Medium	0.7	0.6	0.7

4.16 The SuDS components used for treatment on the site and their mitigation indices are shown in Table 4.4.

Table 4.4 Indicative SuDS mitigation indices for discharges to surface waters (CIRIA SuDS Manual)

	Mitigation indices			
Land use to be treated	**Type of SuDS treatment component**	**TSS**	**Metals**	**Hydrocarbons**
Car Park Extension Development	Proprietary Oil Separator - Designed & tested to BS EN858 to address each of the contaminant types to acceptable levels for frequent events up to the 1 in 1 year return period, for inflow concentrations relevant to the contributing drainage area.			

4.17 Discharge of surface water from commercial roofs & areas without vehicular access (i.e., playground extension) is deemed to have a low pollution risk and does not therefore require any additional treatment when discharging into a surface water body according to the CIRIA SuDS Manual, however catchpit manholes have been provided within the drainage network to increase network resiliency. The access road and car parking bays around the leisure centre development are classed as low risk due to the infrequent vehicle use and relatively small area (<800m² & < 50 spaces). It is proposed to treat this area using trapped gullies/channels in accordance with best practice guidelines.

4.18 Surface water runoff from the car park development area, which is classed as medium risk, will be collected in trapped gullies/channels and pass through a class 1 bypass separator to remove oils and silts in accordance with guidance set out in the CIRIA SuDS Manual.

4.19 As the total SuDS mitigation index ≥ pollution hazard index for each proposed land use within the site, the proposed treatment is sufficient.

4.20 A suitable maintenance plan for all SuDS features can be found in the Appendix and should be developed and implemented by the operator once the drainage proposals have been installed to ensure sufficient operation and treatment is maintained throughout the design life of the development.

Design Criteria & Summary

4.21 If additional soakaway testing is not successful, then the surface water from the proposed leisure centre development will discharge into Salthouse Pool to the east of the site and the car park and playground extension areas will discharge into the United Utilities 225mm combined sewer ruing through the south of the site.

4.22 It is proposed that the leisure centre development surface water discharge rate is limited to greenfield runoff rate (Qbar) for all rainfall events up to and including the 1 in 100-year return period in accordance with guidance in the North West England SuDS Pro-forma. Refer to Table 4.5 & Appendix E for details of greenfield runoff rate calculations.

Table 4.5 Proposed Greenfield Runoff Rates

Development Zone	Proposed Impermeable Area	Greenfield Runoff Rate (Qbar)
Leisure Centre	3415 m²	2.7 l/s
Playground Extension	2345 m²	1.9 l/s

4.23 It is also proposed that the playground extension development surface water discharge rate is limited to greenfield runoff rate (Qbar) for all rainfall events up to and including the 1 in 100-year return period in accordance with the agreement with United Utilities and guidance in the North West England SuDS Pro-forma. Refer to Table 4.5 & Appendix E for details of greenfield runoff rate calculations.

4.24 As the car park development is located on a brownfield site it is proposed to limit the surface water discharge rate from this area to provide a 50% betterment on the existing site 1 in 1-year discharge rate for all rainfall events up to and including the 1 in 100-year return period. This is because the calculated greenfield runoff rate for this area is < 1l/s and would therefore require a flow control device with an orifice diameter less than 50mm which would introduce the risk of blockages. A request has been made to United Utilities to allow a 50% betterment for this area of site and this report will be updated once a response is received.

Table 4.6 Care Park Extension Discharge Summary

Development Zone	Existing Impermeable Area	Existing Discharge Rate	Proposed Discharge Rate
Car Park Extension	300 m²	2.9 l/s (Modified Rational Method)	1.4 l/s (>50% betterment)

4.25 Cellular infiltration/attenuation tanks (subject to additional infiltration testing) are proposed to accommodate all surface water discharge from the site and will have sufficient capacity to attenuate flows up to and including the 1 in 100-year return period plus a 40% allowance for climate change.

4.26 All private surface water drains will be designed and constructed in accordance with BS EN 752:2017 and Building Regulations Approved Document H.

5 FOUL WATER DRAINAGE

EXISTING

5.1 The existing site foul drainage infrastructure comprises sewage from the existing school buildings.

5.2 United Utilities asset plans show that there are 4No combined sewers running through the site (see Fig 4.1). There are 300mm & 525mm diameter combined sewers running through the east of the site and 225mm & 900mm diameter combined sewers running through the south of the site.

5.3 A drainage survey has been carried out which shows that the site foul water discharges into the combined sewers to the east & south of the site at various locations through an existing private network.

PROPOSED

Discharge Method

5.4 A pre-development enquiry has been submitted to United Utilities and their response and asset maps are appended to this report. United Utilities have confirmed that the 525mm public combined sewer to the east of the site is suitable to connect into and has sufficient capacity for the proposed leisure centre development.

Design Criteria & Summary

5.5 The foul water from the proposed development will discharge into the 525mm United Utilities combined sewer to the east of the site.

5.6 New foul drains will be provided to serve all foul producing appliances within the proposed development. All drains will be designed in accordance with BS EN 752:2017 and Building Regulations Approved Document H.

Trade Effluent

5.7 Foul waste classified as ‘trade effluent’ will be discharged during backwashing of the swimming pool filters and must be connected into the foul network. Formal approval is required to discharge trade effluent and a trade effluent agreement will need to be arranged between the site operator and the operator’s chosen water retailer. The trade effluent agreement will stipulate the frequency, volume, and maximum rate at which the operator will be able to discharge trade effluent from their site.

5.8 In addition, as part of the pre-development enquiry United Utilities have confirmed that they have capacity within their foul network to accommodate the trade effluent provided the discharge rate is limited to 5l/s.

5.9 Trade effluent from the swimming pool filters will therefore discharge into an isolated trade effluent drainage network and make a separate connection into the main foul drainage network, downstream of a dedicated sampling chamber. The trade effluent network will have a suitably sized backwash storage facility and a mechanism to restrict the flow rate into the main foul drainage network in accordance with the approved trade effluent agreement.

APPENDIX A – ARCHITECTURAL INFORMATION

Responsibility is not accepted for errors made by others in scaling from this drawing. Use only figured dimensions and report any discrepancies or omissions to the Architect immediately.

Rev	Date	By	Chk	Description
P01	01.06.23	JWM	CK	Draft Planning Issue
C01	30.06.23	JWM	LE	Planning Issue

Roberts Limbrick

03333 405 500
mail@robertslimbrick.com
robertslimbrick.com

Project Name
Millom Leisure Centre

Client Name
Alliance Leisure / Copeland BC

Drawing Title
Existing Site Plan

Scale 1 : 500 • A1
Project No. 10930

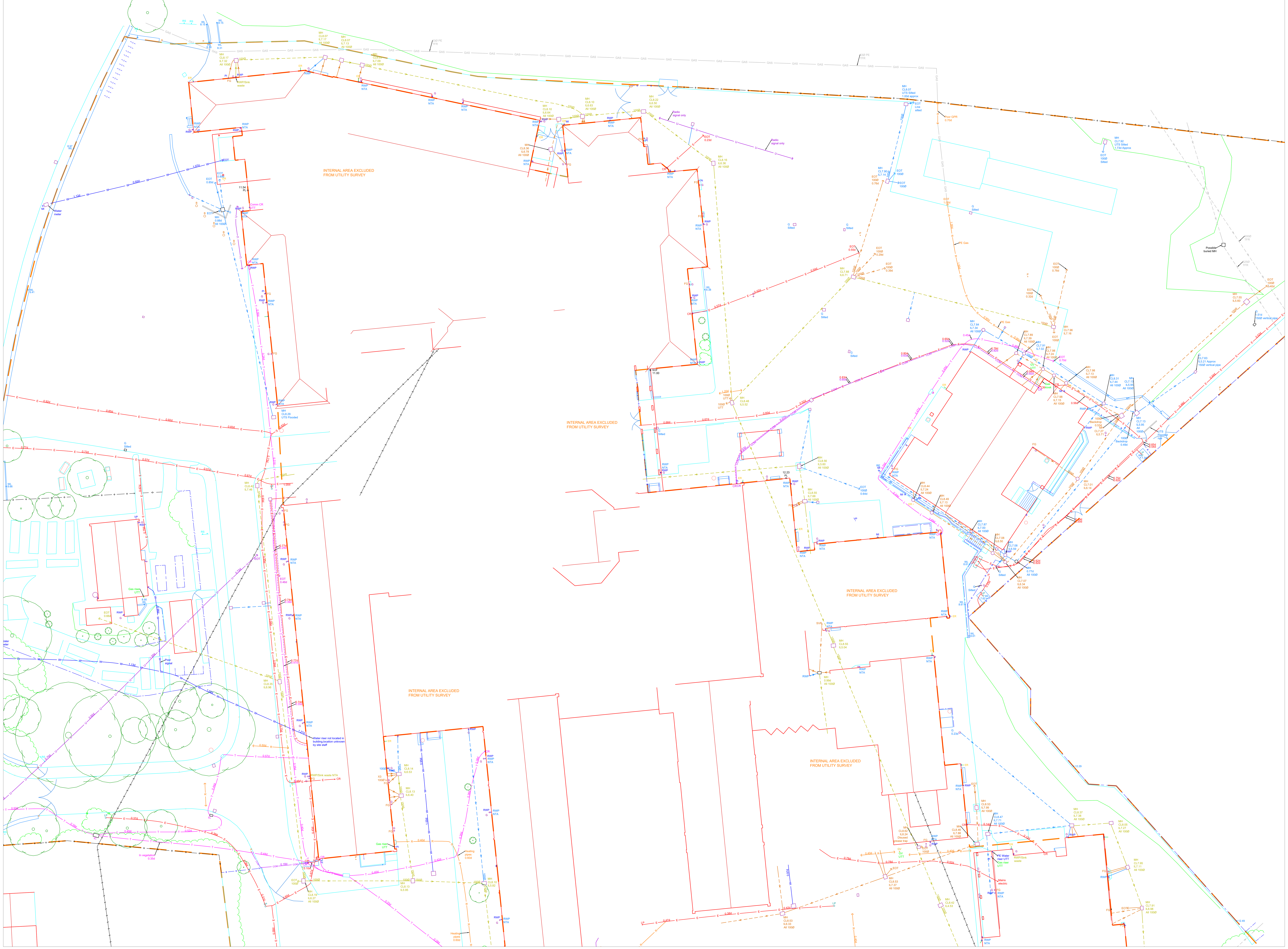
Status A3
Purpose Of Issue Issued for Planning

Project	Org	Vol	Level	Form	Role
10930	RL	XX	ZZ	DR	A

Number P0002
Revision C01

GENERAL NOTES

- Drawing to be used in conjunction with the provided utility record report.
- Foul gullies around building are NTA.



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TOPO • SCAN • UAV • BIM

UNIT 5
KILLINGBECK COURT
LEEDS
LS14 6FD

TEL : 0113 44 00 435
MOB : 07949 195764
EMAIL : MAIL@CT-SURVEYS.COM
WEBSITE : WWW.CT-SURVEYS.COM

Disclaimer

The location of under ground services shown on this drawing has been determined using electro-magnetic and GPR radar techniques and visual observations. No guarantee can be given that all services have been shown on the drawing. The relevant service drawings should be obtained from the appropriate service providers company and used in conjunction with this drawing. No guarantee can be given to the accuracy and completeness of any service provider record information shown in this drawing and no liability will be accepted for any losses that arise due to a lack of accuracy in any service providers record information. Reference should also be made to historical plans and as built drawings. Excavations in the vicinity of services should be carried out with due diligence ref: HSG47 document. Location accuracy is determined by referring to manufacturers guidelines for the systems deployed. Reference should be made to the latest version of Discovery Surveys Ltd site procedures document for utility location surveys.

ABBREVIATIONS

AR	ASSUMED ROUTE	NFI	NO FURTHER INFORMATION
BD	BACKDROP	NTA	NO TRANSMITTER ACCESS
BTIC	BRITISH TELECOM CHAMBER	OSA	OUTSIDE SURVEY AREA
CI	CAST IRON	PE	POLYETHALINE
CL	COVER LEVEL	PR	PIPE RISER
CO	CONCRETE	PVC	POLYVINYL CHLORIDE
CP	CABLE PIT	RE	RODDING EYE
CR	CABLE RISER	RWP	RAINWATER PIPE
d	DEPTH IN METRES	SV	STOP VALVE
EM	EARTH MAT	SVP	SOIL VENT PIPE
EP	ELECTRICITY POLE	TFR	TAKEN FROM RECORDS
EOT	END OF TRACE	TP	TELEGRAPH POLE
FE	FENCE EARTH POINT	UDI	UNRELIABLE DEPTH INFO'
FH	FIRE HYDRANT	UTL	UNABLE TO LOCATE
G	GULLY	UTR	UNABLE TO RAISE
GPR	TRACED BY G.P.R.	UTS	UNABLE TO SURVEY
GV	GAS VALVE	UTT	UNABLE TO TRACE
GR	GAS RISER	WL	WATER LEVEL
IC	INSPECTION CHAMBER	WR	WATER RISER
IL	INVERT LEVEL	VP	VENT PIPE
LP	LAMP POST	VR	VAPOUR RECOVERY
MH	MANHOLE	WM	WATER METER
MCW	MAINS COLD WATER	WO	WASH OUT VALVE
ND	NO DEPTH (Unable to acquire depth)	WWP	WASTE WATER PIPE

LEGEND

CATV	CABLE TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
COM	COMMUNICATIONS CABLE
A	COMPRESSED AIR
	DUCTING
E	ELECTRIC CABLE
EA	EARTH CABLE
	FOUL WATER SEWER
	COMBINED WATER SEWER
	SURFACE WATER SEWER
F	FUEL PIPE
GAS	GAS PIPE
GL	GAUGE LINE
H	HEATING
O	OFFSET FILL PIPE
R	RADAR TRACE
T	TELECOMS CABLE
TL	TRAFFIC LIGHT CABLE
U	UNIDENTIFIED SERVICE
VR	VAPOUR RECOVERY
V	VENT PIPE
W	WATER PIPE
	SURVEY BOUNDARY
	END OF TRACE (Signal lost, unless stated otherwise)

N

No.	Revision/Issue	By	Date
-	-	-	-

Discovery Surveys Ltd
Winning Post Centre
MoorendsThorne
Doncaster
DN8 4PB

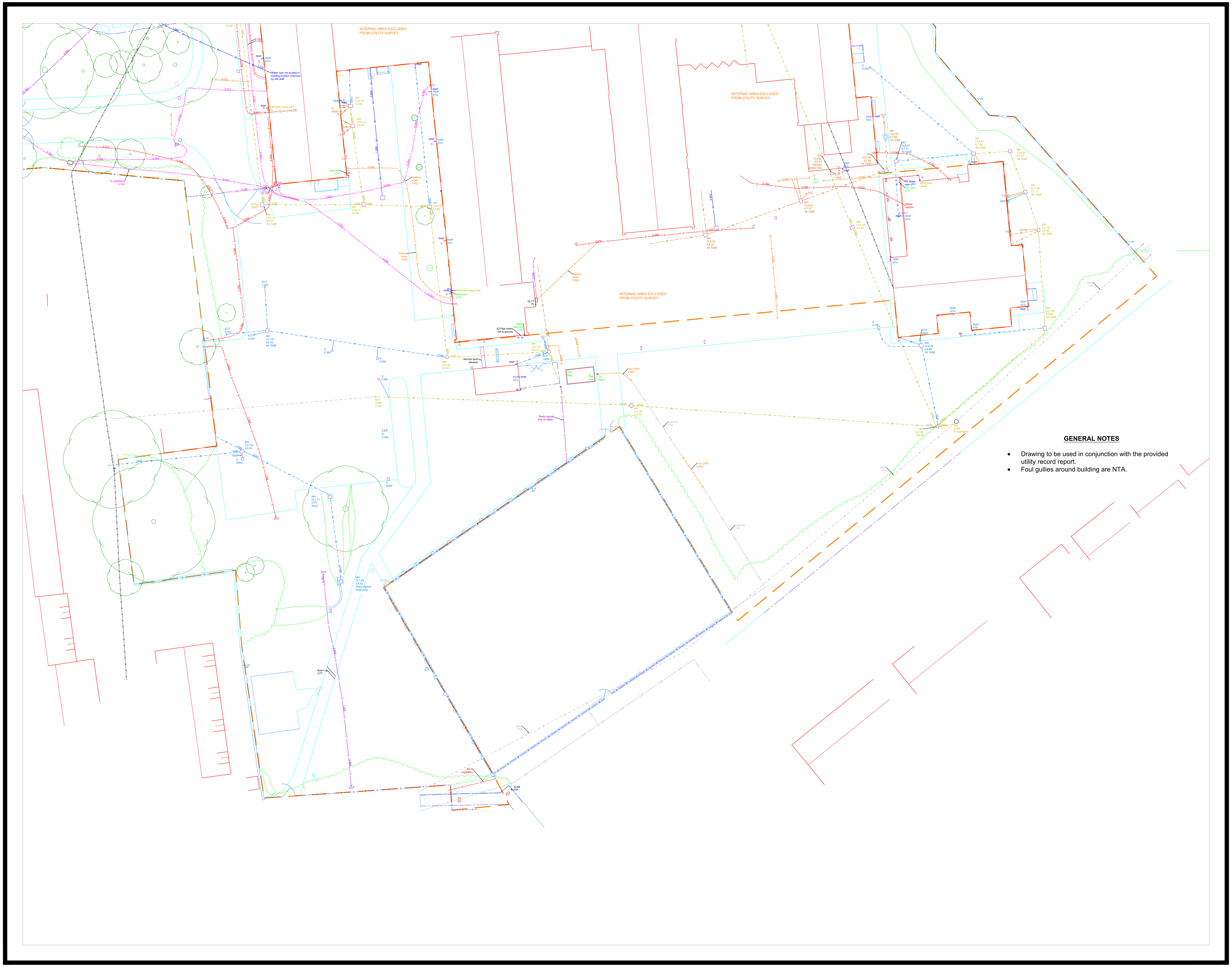
Project Name and Address

Millom School
Salthouse Road
Millom
LA18 5AB

17-06-2022

Discovery Surveys Drawing No: CTS 230522 213	Sheet: 1of3
CT Surveys Drawing No: 5442BM	
Scale: 1:200@A0	

Client	Drawn	Approved
Furness Partnership	JH	SR



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UNIT 5
KILLINGBECK COURT
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TEL : 0113 44 00 435
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LEGEND

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	SURVEY BOUNDARY
	END OF TRACE (Signal lost, unless stated otherwise)

N

No.	Revision/Issue	By	Date
-	-	-	-

Discovery Surveys Ltd
Winning Post Centre
MoorendsThorne
Doncaster
DN8 4PB

Project Name and Address

Millom School
Salthouse Road
Millom
LA18 5AB

17-06-2022

Discovery Surveys Drawing No: CTS 230522 213	Sheet: 3of3
CT Surveys Drawing No: 5442BM	
Scale: 1:200@A0	

Client	Drawn	Approved
Furness Partnership	JH	SR

WIP

0 5 10 25 m

N

S

Site Boundary

Ownership Boundary

Rev	Date	By	Chk	Description
P01	01.06.23	JWM	CK	Draft Planning Issue
P02	21.06.23	CK	LE	Updated Draft Planning Issue
C01	not yet issued	JWM	CK	Planning Issue

Roberts Limbrick

03333 405 500
mail@robertslimbrick.com
robertslimbrick.com

Registered Office: England No. 06658029

Project Name
Millom Leisure Centre

Client Name
Cumberland Council

Drawing Title
Proposed Site Plan

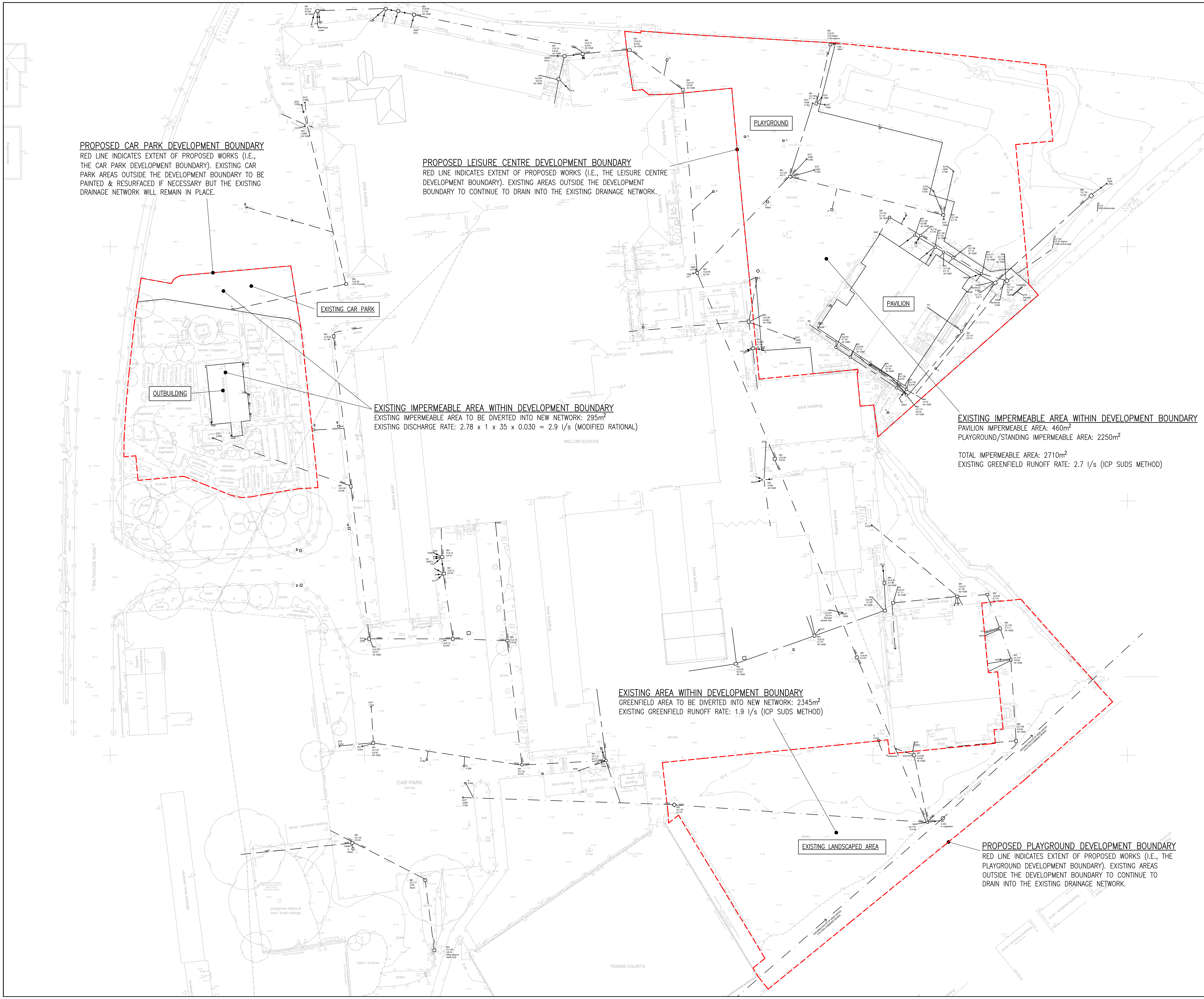
Scale	**Project No.**
1 : 500 • A1	10930

Status	**Purpose Of Issue**
A3	Issued for Planning

Project	Org	Vol	Level	Form	Role
10930	RL	XX	ZZ	DR	A

Number	**Revision**
P2001	**C01**

APPENDIX B – DRAINAGE DRAWINGS



General Notes

P1	11.08.23	ISSUED FOR PLANNING APPROVAL.	M.H	C.J.H
Rev	Date	Comment	By	Check

Status Code: S3

Drawing Status: FOR APPROVAL

This drawing may only be used for construction/manufacture if status is CONSTRUCTION

Furness Partnership
Consulting Structural/Civil Engineers
London 20 Britton Street, London, EC1M 5TX
tel: 020 7490 4353 fax: 020 7490 4354
e-mail: info@furnesspartnership.com
Bradford The Paper Hall, Anne Gate, Bradford, BD1 4EQ
tel: 01274 392092
e-mail: mail@furnesspartnership.com

Project

MILLOM LEISURE CENTRE

Drawing Title

EXISTING DRAINAGE LAYOUT & IMPERMEABLE AREAS

FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	M.H	JUN '23	C.J.H	1:350

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
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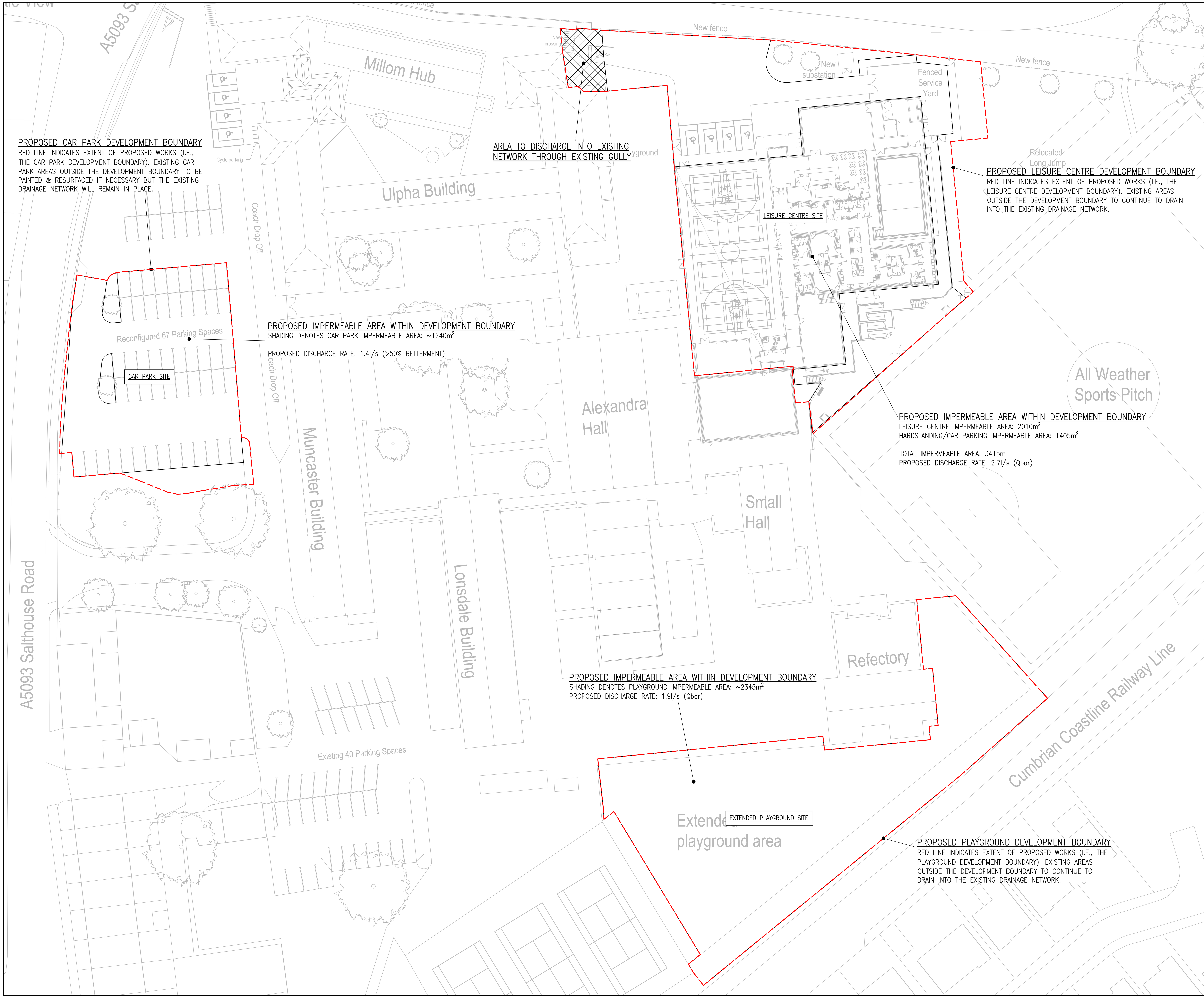

General Notes

Rev	Date	Comment	By	Check
P1	11.08.23	ISSUED FOR PLANNING APPROVAL	M.H	C.J.H

Status Code: S3

Drawing Status: FOR APPROVAL

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Furness Partnership
Consulting Structural/Civil Engineers

London: 20 Britton Street, London, EC1M 5TX
tel: 020 7490 4353 fax: 020 7490 4354
e-mail: info@furnesspartnership.com

Bradford: The Paper Hall, Anne Gate, Bradford, BD1 4EQ
tel: 01274 392092
e-mail: mail@furnesspartnership.com

Project

MILLOM LEISURE CENTRE

Drawing Title

PROPOSED IMPERMEABLE AREAS

FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	M.H	JUN '23	C.J.H	1:350

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0902	P1

ADDITIONAL FOUL WATER DRAINAGE NOTES:

- LOCATION OF ALL EXISTING DRAINAGE TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF WORKS AS IT IS APPROXIMATELY TRANSLATED FROM SURVEY DRAWING.
- ALL DRAINAGE AT MANHOLES/ACCESS CHAMBERS TO CONNECT WITH SOFFITS LEVEL UNLESS OTHERWISE NOTED. MANHOLE INVERT LEVELS SHOWN ON PLAN ARE THAT OF LOWEST OUTGOING PIPE.
- ALL FOUL DRAINAGE TO BE 100mm DIA. UNLESS OTHERWISE NOTED.
- ALL INTERNAL 100mm DIA. SOIL VENT PIPE CONNECTIONS TO BE LAID AT FALLS NOT LESS THAN 1:40 TO SUIT CONNECTION INTO MAIN NETWORK OR 1:80 IF AT LEAST 1 WC IS CONNECTED.
- ALL TOILET/SVP FOUL BRANCH CONNECTIONS TO BE MADE USING OBLIQUE 45° CONNECTION IN THE DIRECTION OF FLOW OF THE MAIN LINE.
- FOR INTERNAL FOUL CONNECTIONS WITHOUT A TOILET/SVP WHERE OBLIQUE CONNECTIONS ARE NOT POSSIBLE 87.5° CURVED SQUARE BRANCH CONNECTIONS TO BE USED IN DIRECTION OF FLOW OF MAIN LINE.
- FOUL RODDING POINTS SHOULD BE PROVIDED, ABOVE SPILLOVER LEVEL OF CONNECTED APPLIANCES, IN DISCHARGE STACKS TO GIVE ACCESS TO ANY LENGTH OF PIPE WHICH CANNOT BE REACHED FROM ANY OTHER PART OF THE NETWORK.
- ALL DRAINAGE WITHIN 300mm OF UNDERSIDE OF STRUCTURAL SLAB TO HAVE FULL GEN 3 CONCRETE BED AND SURROUND.
- ALL INTERNAL MANHOLE & INSPECTION CHAMBERS TO HAVE SCREW DOWN DOUBLE SEAL ACCESS COVERS.
- ALL INTERNAL & EXTERNAL FOUL WATER INSPECTION CHAMBERS SITUATED IN AREAS WITHOUT VEHICULAR ACCESS TO BE TYPE 3 CHAMBERS WITH 150mm DOT TYPE 1 SURROUND UNLESS NOTED OTHERWISE.
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- ALL TYPE 3 INSPECTION CHAMBERS WHERE DEPTH TO INVERT OF CHAMBER IS > 1m SHALL HAVE COVER FRAME WITH ACCESS RESTRICTED TO 350mm DIA. OR 300x300mm SQUARE.
- ALL EXTERNAL FOUL WATER MANHOLES TO BE MIN. 1200mm DIA. WIDE WALL (125mm THICK) TYPE 2 PRECAST CONCRETE CHAMBERS UNLESS NOTED OTHERWISE.
- MANHOLE COVER LEVELS ARE SUBJECT TO CONFIRMATION OF FINAL EXTERNAL & INTERNAL LEVELS.
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  - E600 – HGV/LOADING BAY AREAS
- GRATINGS IN PEDESTRIAN AREAS TO HAVE HEEL SAFE ANTI–SLIP COVERS.
- REFERENCE SHOULD BE MADE TO ARCHITECT & M&E ENGINEERS DRAWINGS FOR ABOVE GROUND DRAINAGE DETAILS & SET–OUT.
- ALL EXISTING DRAINAGE THAT IS MADE REDUNDANT AS A RESULT OF THE WORKS TO BE GRUBBED UP AND REMOVED.
- THE LAYOUT OF PIPELINES, MANHOLES ETC. IS DESIGNED TO SUIT THE PERMANENT CASE. ADDITIONAL LOADS OVER & ABOVE THOSE DESIGNED FOR MAY ARISE DURING THE CONSTRUCTION PROCESS. THE CONTRACTOR SHALL PROVIDE ANY NECESSARY TEMPORARY PROTECTION TO ENSURE THAT PIPELINES, MANHOLES ETC. ARE NOT DAMAGED DURING THE CONSTRUCTION PHASE.

LEGEND.

- EXISTING FOUL SEWERS
- NEW BRANCH FOUL SEWERS
- NEW MAIN FOUL SEWERS
- CONCRETE ENCASED FW SEWER
- FXX — NEW FOUL MANHOLE
- EXISTING FOUL RISING MAIN
- FOUL RISING MAIN
- NEW TRADE EFFLUENT SEWERS
- TEXX — NEW TRADE EFFLUENT MANHOLE
- EXISTING COMBINED SEWERS
- NEW COMBINED SEWERS
- FXX — NEW COMBINED MANHOLE
- SVP — SOIL VENT PIPE (RODDABLE ACCESS)
- g — INTERNAL GULLY (TRAPPED & RODDABLE)
- SS — STUB STACK
- BD — VERTICAL BACK DROP
- DP — INTERNAL CHANNEL DRAIN POINT
- RE — RODDING EYE
- ABANDONED SEWER TO BE REMOVED

General Notes

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6. WHERE DRAINAGE PIPES HAVE LESS THAN 1.2m COVER IN TRAFFICKED AREAS AND LESS THAN 600mm UNDER LANDSCAPED AREAS PIPES SHALL HAVE A FULL CLASS Z CONCRETE SURROUND. CONCRETE PROTECTION TO BE DISCONTINUED AT EACH PIPE JOINT WITH COMPRESSIBLE MATERIAL. ALL OTHER FLEXIBLE PIPES TO HAVE CLASS S GRANULAR BEDDING DETAIL UNLESS OTHERWISE NOTED. ALL OTHER RIGID PIPES TO HAVE CLASS B GRANULAR BEDDING DETAIL UNLESS OTHERWISE NOTED.
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Rev	Date	Comment	By	Check
P2	11.08.23	ISSUED FOR PLANNING APPROVAL.	M.H	C.J.H
P1	06/07/23	PRELIMINARY ISSUE	OJ	

Status Code: S3

Drawing Status: FOR APPROVAL

This drawing may only be used for construction/manufacture if status is CONSTRUCTION

Furness Partnership
Consulting Structural/Civil Engineers

London — 20 Britton Street, London, EC1M 5TX
tel: 020 7490 4353 fax: 020 7490 4354
e-mail: info@furnesspartnership.com

Bradford — The Paper Hall, Anne Gate, Bradford, BD1 4EQ
tel: 01274 392092
e-mail: mail@furnesspartnership.com

Project

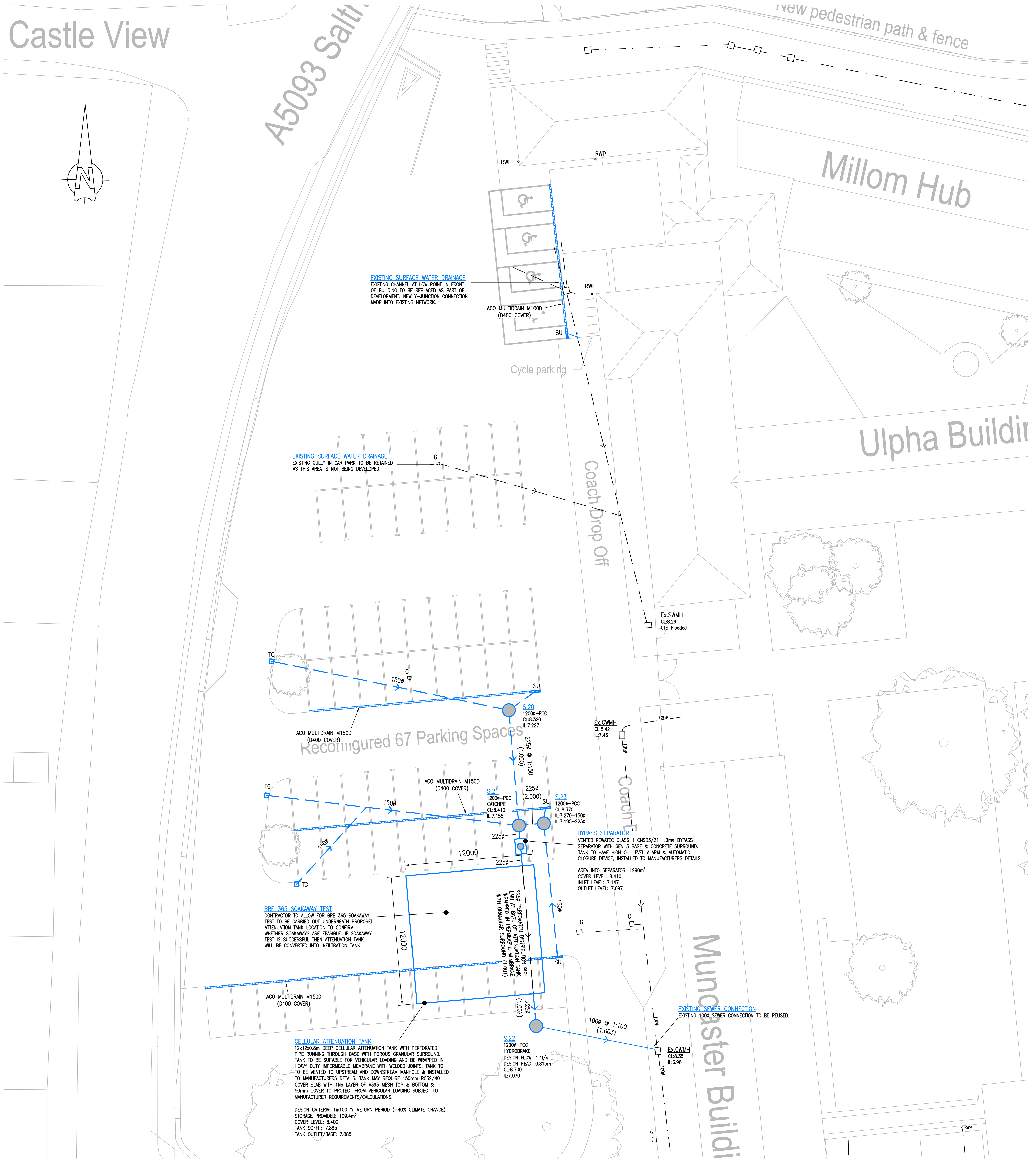
MILLOM LEISURE CENTRE

Drawing Title

PROPOSED FOUL WATER DRAINAGE LAYOUT

FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	O.J	JUN '23	C.J.H	1:200

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0911	P2



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LEGEND.

- ABANDONED SEWER TO BE REMOVED
- EXISTING COMBINED SEWERS
- NEW COMBINED SEWERS
- FXX NEW COMBINED MANHOLE
- EXISTING SURFACE WATER SEWERS
- NEW SURFACE WATER SEWERS
- CONCRETE ENCASED SW SEWER
- SXX NEW SURFACE WATER MANHOLE
- EXISTING SURFACE WATER RISING MAIN
- SURFACE WATER RISING MAIN
- NEW LAND DRAINS
- BD VERTICAL BACK DROP
- PETROL INTERCEPTOR
- DRAINAGE CHANNEL
- G ROAD GULLY
- TG TRAPPED ROAD GULLY
- SU TRAPPED SUMP UNIT
- RWP RAIN WATER PIPE
- RE RODDING EYE
- DT PERMAVOID 150 DISTRIBUTION TANKS

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P2	11.08.23	ISSUED FOR PLANNING APPROVAL.	M.H	C.J.H
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Status Code: S3
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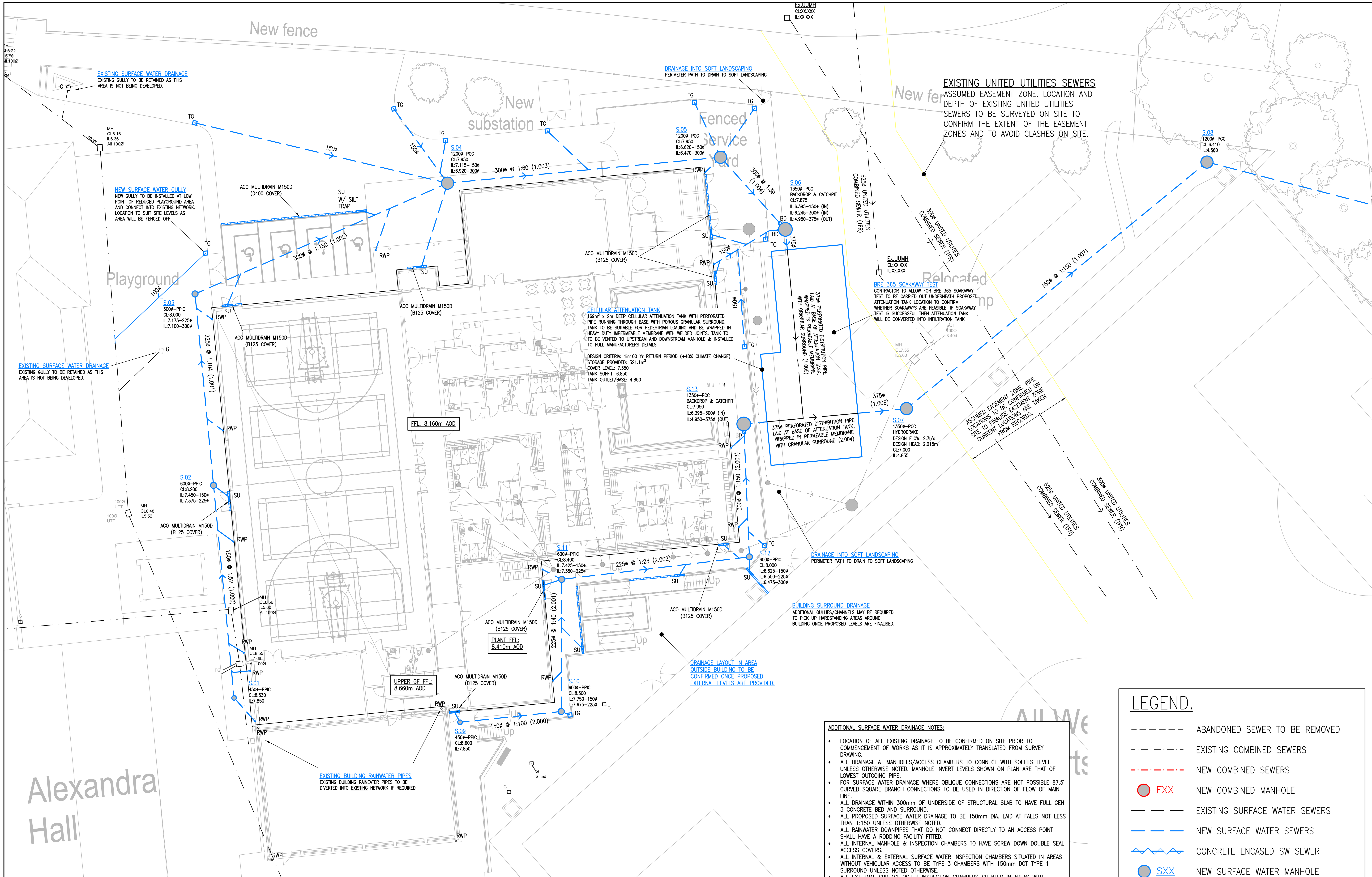
Project
MILLOM LEISURE CENTRE

Drawing Title
PROPOSED SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 3 CAR PARK SITE

FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	O.J	JUN '23	C.J.H	1:200

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0921	P2



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LEGEND.

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	NEW COMBINED SEWERS
FXX	NEW COMBINED MANHOLE
	EXISTING SURFACE WATER SEWERS
	NEW SURFACE WATER SEWERS
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SXX	NEW SURFACE WATER MANHOLE
	EXISTING SURFACE WATER RISING MAIN
	SURFACE WATER RISING MAIN
	NEW LAND DRAINS
BD	VERTICAL BACK DROP
	PETROL INTERCEPTOR
	DRAINAGE CHANNEL
G	ROAD GULLY
TG	TRAPPED ROAD GULLY
SU	TRAPPED SUMP UNIT
RWP	RAIN WATER PIPE
RE	RODDING EYE
DT	PERMAVOID 150 DISTRIBUTION TANKS

General Notes

Rev	Date	Comment	By	Check
P2	11.08.23	ISSUED FOR PLANNING APPROVAL.	M.H	C.J.H
P1	06/07/23	PRELIMINARY ISSUE	OJ	

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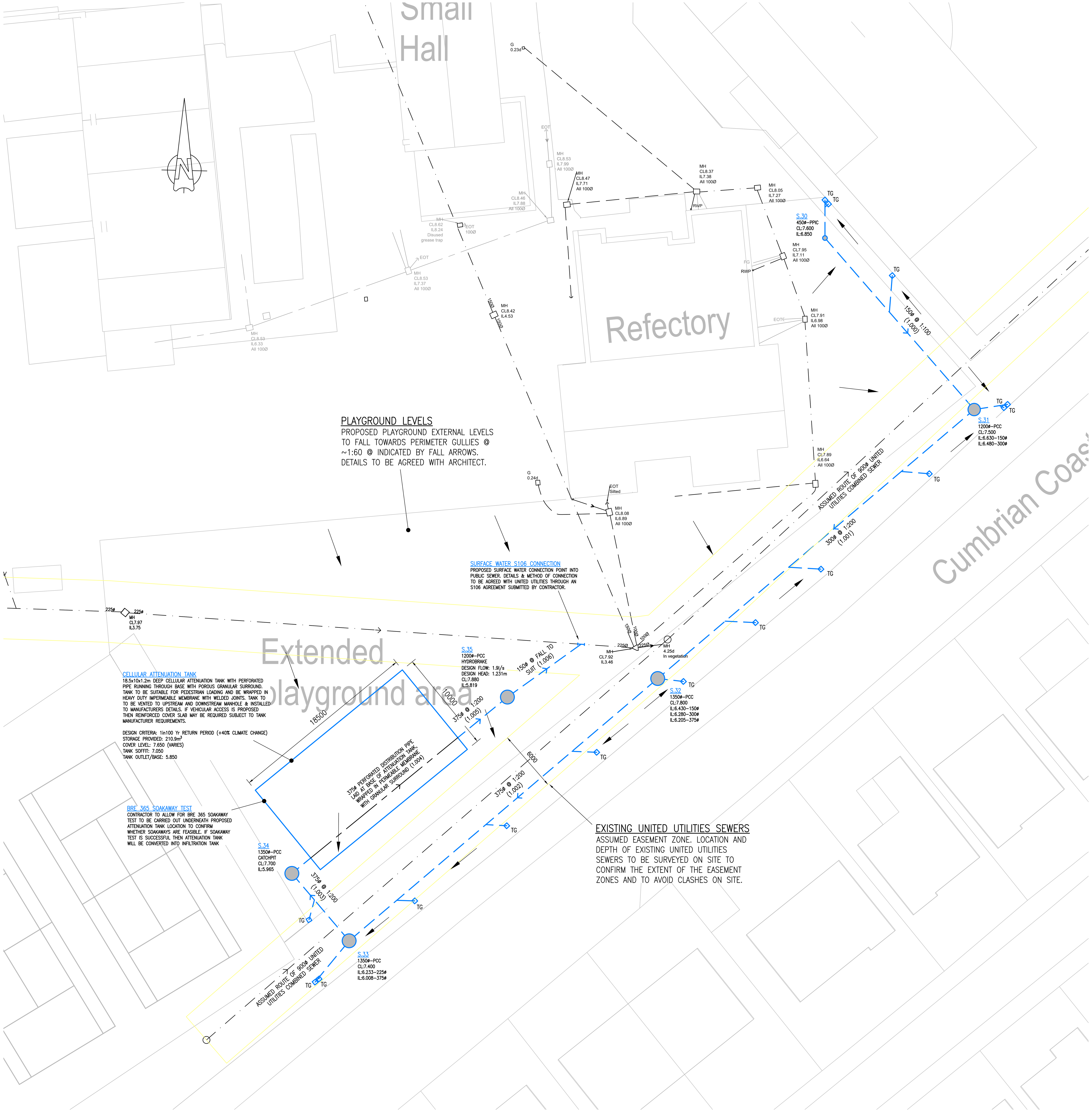
Furness Partnership
Consulting Structural/Civil Engineers
London 20 Britton Street, London, EC1M 5TX
tel: 020 7490 4353 fax: 020 7490 4354
e-mail: info@furnesspartnership.com
Bradford The Paper Hall, Anne Gate, Bradford, BD1 4EQ
tel: 01274 392092
e-mail: mail@furnesspartnership.com

Project
MILLOM LEISURE CENTRE

Drawing Title
PROPOSED SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 3 LEISURE CENTRE SITE

FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	O.J	JUN '23	C.J.H	1:200

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0921	P2



ADDITIONAL SURFACE WATER DRAINAGE NOTES:

- LOCATION OF ALL EXISTING DRAINAGE TO BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF WORKS AS IT IS APPROXIMATELY TRANSLATED FROM SURVEY DRAWING.
- ALL DRAINAGE AT MANHOLES/ACCESS CHAMBERS TO CONNECT WITH SOFFITS LEVEL UNLESS OTHERWISE NOTED. MANHOLE INVERT LEVELS SHOWN ON PLAN ARE THAT OF LOWEST OUTGOING PIPE.
- FOR SURFACE WATER DRAINAGE WHERE OBLIQUE CONNECTIONS ARE NOT POSSIBLE 87.5° CURVED SQUARE BRANCH CONNECTIONS TO BE USED IN DIRECTION OF FLOW OF MAIN LINE.
- ALL DRAINAGE WITHIN 300mm OF UNDERSIDE OF STRUCTURAL SLAB TO HAVE FULL GEN 3 CONCRETE BED AND SURROUND.
- ALL PROPOSED SURFACE WATER DRAINAGE TO BE 150mm DIA. LAID AT FALLS NOT LESS THAN 1:150 UNLESS OTHERWISE NOTED.
- ALL RAINWATER DOWNPIPES THAT DO NOT CONNECT DIRECTLY TO AN ACCESS POINT SHALL HAVE A RODDING FACILITY FITTED.
- ALL INTERNAL MANHOLE & INSPECTION CHAMBERS TO HAVE SCREW DOWN DOUBLE SEAL ACCESS COVERS.
- ALL INTERNAL & EXTERNAL SURFACE WATER INSPECTION CHAMBERS SITUATED IN AREAS WITHOUT VEHICULAR ACCESS TO BE TYPE 3 CHAMBERS WITH 150mm DOT TYPE 1 SURROUND UNLESS NOTED OTHERWISE.
- ALL EXTERNAL SURFACE WATER INSPECTION CHAMBERS SITUATED IN AREAS WITH VEHICULAR ACCESS TO BE TYPE 3 CHAMBERS WITH GEN 3 CONCRETE SURROUND UNLESS NOTED OTHERWISE.
- ALL TYPE 3 INSPECTION CHAMBERS WHERE DEPTH TO INVERT OF CHAMBER IS > 1m SHALL HAVE COVER FRAME WITH ACCESS RESTRICTED TO 350mm DIA. OR 300x300mm SQUARE.
- ALL EXTERNAL SURFACE WATER MANHOLES TO BE MIN. 1200mm DIA. WIDE WALL (125mm THICK) TYPE 2 PRECAST CONCRETE CHAMBERS UNLESS NOTED OTHERWISE.
- MANHOLE COVER LEVELS ARE SUBJECT TO CONFIRMATION OF FINAL EXTERNAL & INTERNAL LEVELS.
- EXTERNAL GULLY/CHANNEL POSITIONS SHOWN ARE INDICATIVE AND SUBJECT TO CHANGE FOLLOWING CONFIRMATION OF FINAL EXTERNAL LEVELS.
- FINAL GULLY POSITIONS TO SUIT SITE LOW POINTS WITH SUFFICIENT SURFACE FALLS TO ENSURE SURFACE WATER DRAINS WITHOUT PONDING (MINIMUM SURFACE FALL OF 1:60 IS RECOMMENDED).
- THE LOAD CLASS OF ALL COVERS, GRATINGS, GULLIES, CHANNELS & FRAMES TO CHAMBERS TO SUIT THEIR LOCATION AS FOLLOWS (REFER TO MANHOLE SCHEDULE FOR CONFIRMATION):
  - A15 – INTERNAL LOCATIONS
  - B125 – EXTERNAL WITH PEDESTRIAN ACCESS ONLY
  - C250 – EXTERNAL LIGHTLY TRAFFICKED AREAS
  - D400 – MAIN ROADS/HIGHWAYS
  - E600 – HGV/LOADING BAY AREAS
- GRATINGS IN PEDESTRIAN AREAS TO HAVE HEEL SAFE ANTI–SLIP COVERS.
- THE CONSTRUCTION OF ALL EXISTING GULLIES, MANHOLE CHAMBERS & THEIR COVERS & GRATINGS TO BE 'MADE GOOD' OR REPAIRED/REPLACED TO SUIT REVISED LEVEL/LOCATION.
- REFERENCE SHOULD BE MADE TO ARCHITECT & M&E ENGINEERS DRAWINGS FOR ABOVE GROUND DRAINAGE DETAILS & SET–OUT.
- ALL EXISTING DRAINAGE THAT IS MADE REDUNDANT AS A RESULT OF THE WORKS TO BE GRUBBED UP AND REMOVED.
- THE LAYOUT OF PIPELINES, MANHOLES ETC. IS DESIGNED TO SUIT THE PERMANENT CASE. ADDITIONAL LOADS OVER & ABOVE THOSE DESIGNED FOR MAY ARISE DURING THE CONSTRUCTION PROCESS. THE CONTRACTOR SHALL PROVIDE ANY NECESSARY TEMPORARY PROTECTION TO ENSURE THAT PIPELINES, MANHOLES ETC. ARE NOT DAMAGED DURING THE CONSTRUCTION PHASE.

LEGEND.

- ABANDONED SEWER TO BE REMOVED
- EXISTING COMBINED SEWERS
- NEW COMBINED SEWERS
- FXX NEW COMBINED MANHOLE
- EXISTING SURFACE WATER SEWERS
- NEW SURFACE WATER SEWERS
- CONCRETE ENCASED SW SEWER
- SXX NEW SURFACE WATER MANHOLE
- EXISTING SURFACE WATER RISING MAIN
- SURFACE WATER RISING MAIN
- NEW LAND DRAINS
- BD VERTICAL BACK DROP
- PETROL INTERCEPTOR
- DRAINAGE CHANNEL
- G ROAD GULLY
- TG TRAPPED ROAD GULLY
- SU TRAPPED SUMP UNIT
- RWP RAIN WATER PIPE
- RE RODDING EYE
- DT PERMAVOID 150 DISTRIBUTION TANKS

General Notes

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. ALL DRAINAGE TO BE TO THE SATISFACTION OF THE LOCAL AUTHORITY BUILDING CONTROL AND MAIN DRAINAGE SECTIONS ON MATTERS INVOLVING PUBLIC SEWERS.
3. ALL PIPEWORK, BENDS AND JUNCTIONS TO BE EXTRA STRENGTH VITRIFIED CLAY TO BS 65:1991, BS EN 295 OR PVCu TO BS EN 1401 TO BE AGREED WITH RELEVANT AUTHORITY.
4. INVERT LEVELS ON EXISTING DRAINS & OUTFALLS TO BE CHECKED PRIOR TO COMMENCEMENT OF WORKS.
5. TRENCH WIDTHS GENERALLY:– AS SMALL AS PRACTICABLE BUT NOT LESS THAN PIPE DIAMETER +300mm OR LARGER IF SPECIFIED. TRENCH SIDES MUST BE VERTICAL FROM BOTTOM UP TO 300mm ABOVE CROWN OF PIPE.
6. WHERE DRAINAGE PIPES HAVE LESS THAN 1.2m COVER IN TRAFFICKED AREAS AND LESS THAN 600mm UNDER LANDSCAPED AREAS PIPES SHALL HAVE A FULL CLASS Z CONCRETE SURROUND. CONCRETE PROTECTION TO BE DISCONTINUED AT EACH PIPE JOINT WITH COMPRESSIBLE MATERIAL. ALL OTHER FLEXIBLE PIPES TO HAVE CLASS S GRANULAR BEDDING DETAIL UNLESS OTHERWISE NOTED. ALL OTHER RIGID PIPES TO HAVE CLASS B GRANULAR BEDDING DETAIL UNLESS OTHERWISE NOTED.
7. GRANULAR BEDDING:
   - 10mm SINGLE SIZED COARSE AGGREGATE SHALL BE USED ON PIPES NOT EXCEEDING 140mm DIAMETER.
   - 2–14mm WELL GRADED COARSE AGGREGATE MAY BE USED ON PIPES EXCEEDING 140mm BUT NOT EXCEEDING 400mm DIAMETER.
   - 4–20mm WELL GRADED COARSE AGGREGATE MAY BE USED ON PIPES EXCEEDING 400mm DIAMETER.
   - THE DEPTH OF GRANULAR BEDDING UNDER THE PIPES SHALL BE X/6 OR 150mm, WHICHEVER IS GREATER, WHERE X=EXTERNAL DIAMETER OF THE PIPE.
8. ADOPTABLE PUBLIC SEWERS TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION, 7th EDITION, SEPTEMBER 2012.
9. ALL PRIVATE DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH "THE BUILDING REGULATIONS APPROVED DOCUMENT H" AND BRITISH STANDARD BS EN 752.
10. ALL NEW DRAINAGE TO BE TESTED PRIOR TO BACKFILL OF THE TRENCHES & PRIOR TO HANDOVER TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
11. THE CONTRACTOR MUST LIAISE WITH THE LOCAL AUTHORITY MAIN DRAINAGE SECTION PRIOR TO COMMENCEMENT OF WORK ON PUBLIC DRAINAGE.
12. TRENCH BACKFILL SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 250mm ONCE 300mm COVER HAS BEEN PROVIDED TO THE TOP OF PIPE.
13. THE CONTRACTOR SHALL ALLOW IN HIS RATES FOR MAINTAINING FLOW IN PUBLIC SEWERS AT ALL TIMES DURING DIVERSION WORKS INCLUDING TEMPORARY PUMPING AND ALSO KEEPING EXCAVATIONS FREE FROM GROUNDWATER INCLUDING PUMPING AND FORMATION OF TEMPORARY SUMPS.
14. THE CONTRACTOR SHALL MAKE PROVISIONS FOR AND LIAISE WITH ALL RELEVANT STATUTORY BODIES FOR THE MANAGEMENT OF TRAFFIC WHILE CARRYING OUT WORKS IN THE PUBLIC HIGHWAY.
15. THE CONTRACTOR IS TO SATISFY HIMSELF TO THE POSITION AND AND DEPTH OF THE PUBLIC UTILITIES AND ALLOW FOR TEMPORARY SUPPORT, PROTECTION AND DIVERSION WORKS AS NECESSARY. THE CONTRACTOR SHALL ALSO INCLUDE FOR ANY TRIAL PIT EXCAVATIONS NECESSARY.
16. BACKFILL TO EXCAVATIONS IN PUBLIC HIGHWAYS TO BE WELL COMPACTED GRANULAR TYPE 1 TO CL.803 OF THE DTp SPECIFICATION FOR HIGHWAY WORKS 2009.
17. ALL EXTERNAL GULLIES TO BE 375mm DIA. MINIMUM, PRECAST CONCRETE, HEAVY DUTY, KITE MARKED & ANTI–THEFT.

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Furness Partnership
Consulting Structural/Civil Engineers
London 20 Britton Street, London, EC1M 5TX
tel: 020 7490 4353 fax: 020 7490 4354
e-mail: info@furnesspartnership.com
Bradford The Paper Hall, Anne Gate, Bradford, BD1 4EQ
tel: 01274 392092
e-mail: mail@furnesspartnership.com

Project

MILLOM LEISURE CENTRE

Drawing Title

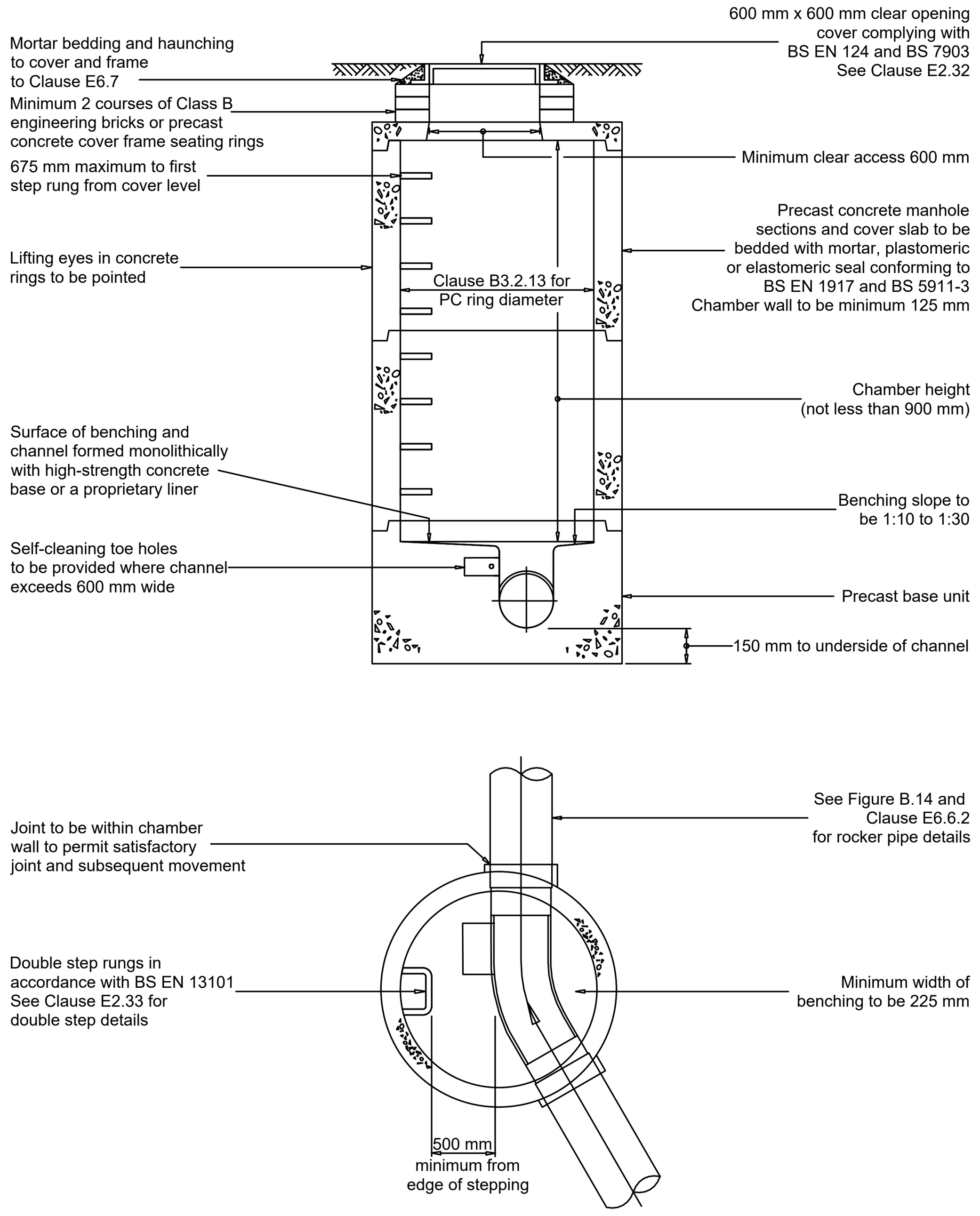
PROPOSED SURFACE WATER DRAINAGE LAYOUT SHEET 3 OF 3 PLAYGROUND SITE

FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	M.H	JUL '23	C.J.H	1:200

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0923	P1

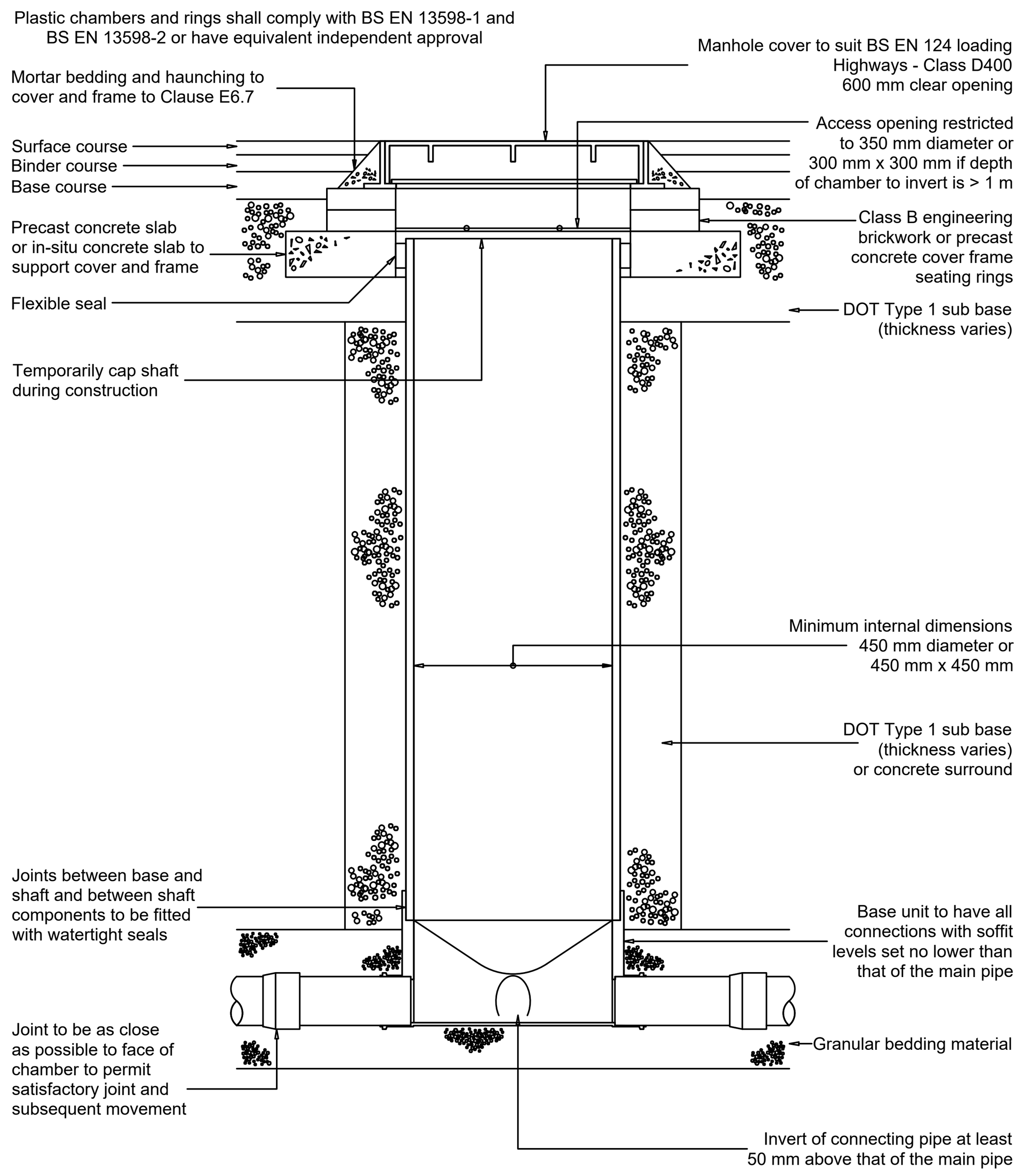
General Notes

FIGURE B.13
TYPICAL MANHOLE DETAIL - TYPE 2 (Alternative construction detail)
Maximum depth from cover level to soffit of pipe 3.0 m



Not to scale

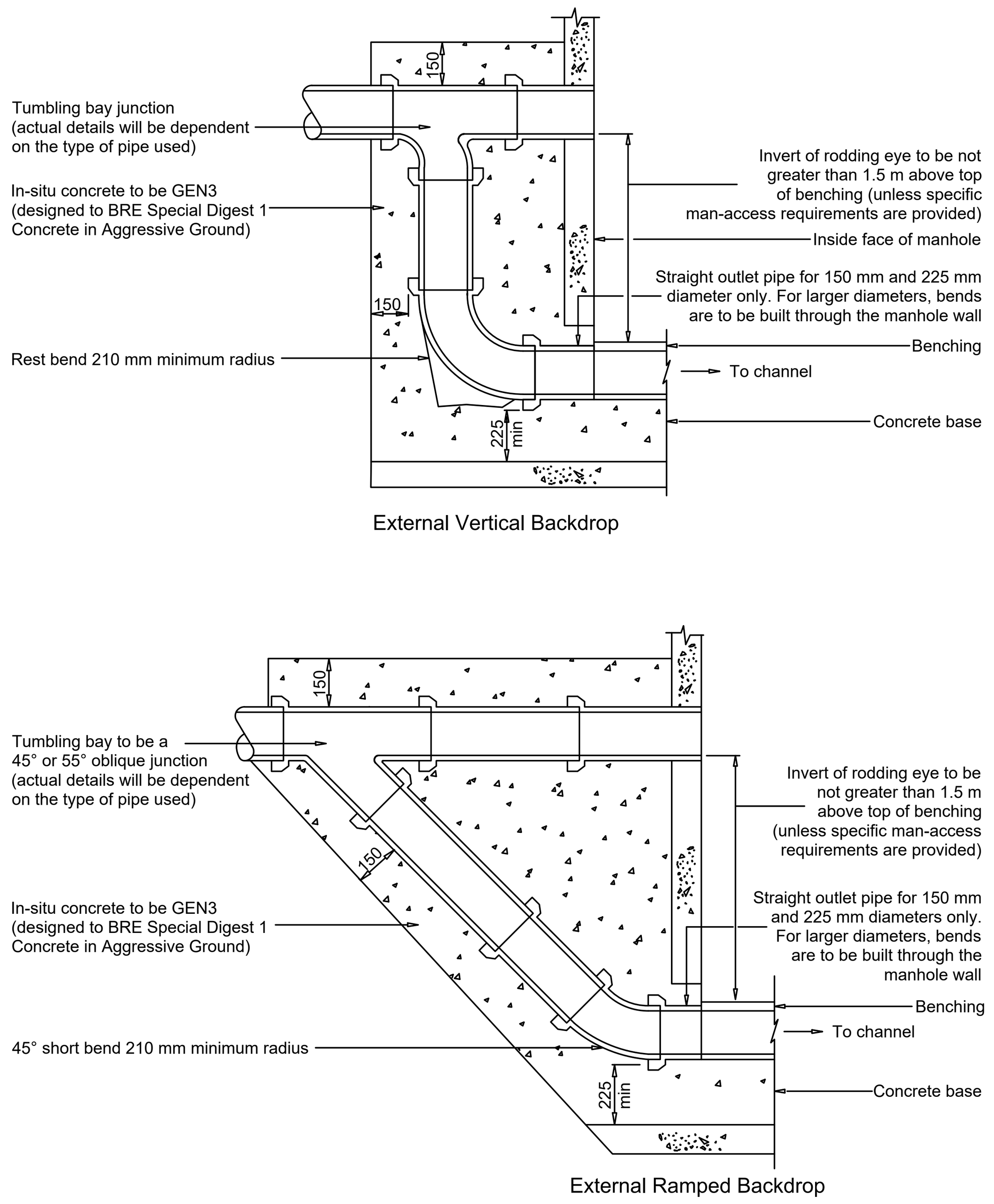
FIGURE B.16
TYPICAL INSPECTION CHAMBER DETAIL - TYPE 3 (Flexible material detail)
Maximum depth from cover level to soffit of pipe in areas subject to vehicle loading 3 m, non-entry



Note: Where the access chamber is in the highway the Highway Authority can have specific requirements

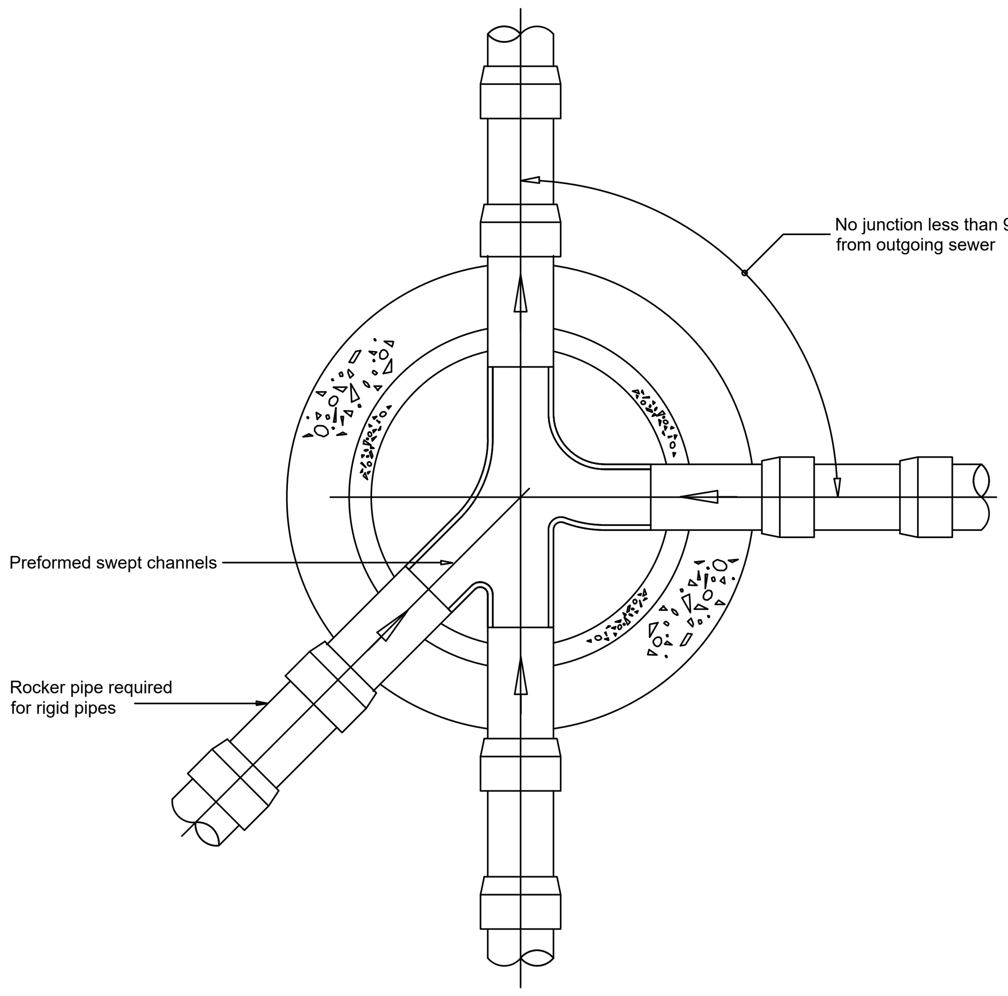
Not to scale

FIGURE B.15
TYPICAL VERTICAL AND RAMPED BACKDROP DETAIL
Note: Steeper gradients are preferred to the use of backdrops.
Type of backdrop to be used to be agreed with Undertaker.



Not to scale, dimensions in millimetres

FIGURE B.14
TYPICAL ARRANGEMENT OF PIPE JUNCTIONS WITHIN MANHOLES



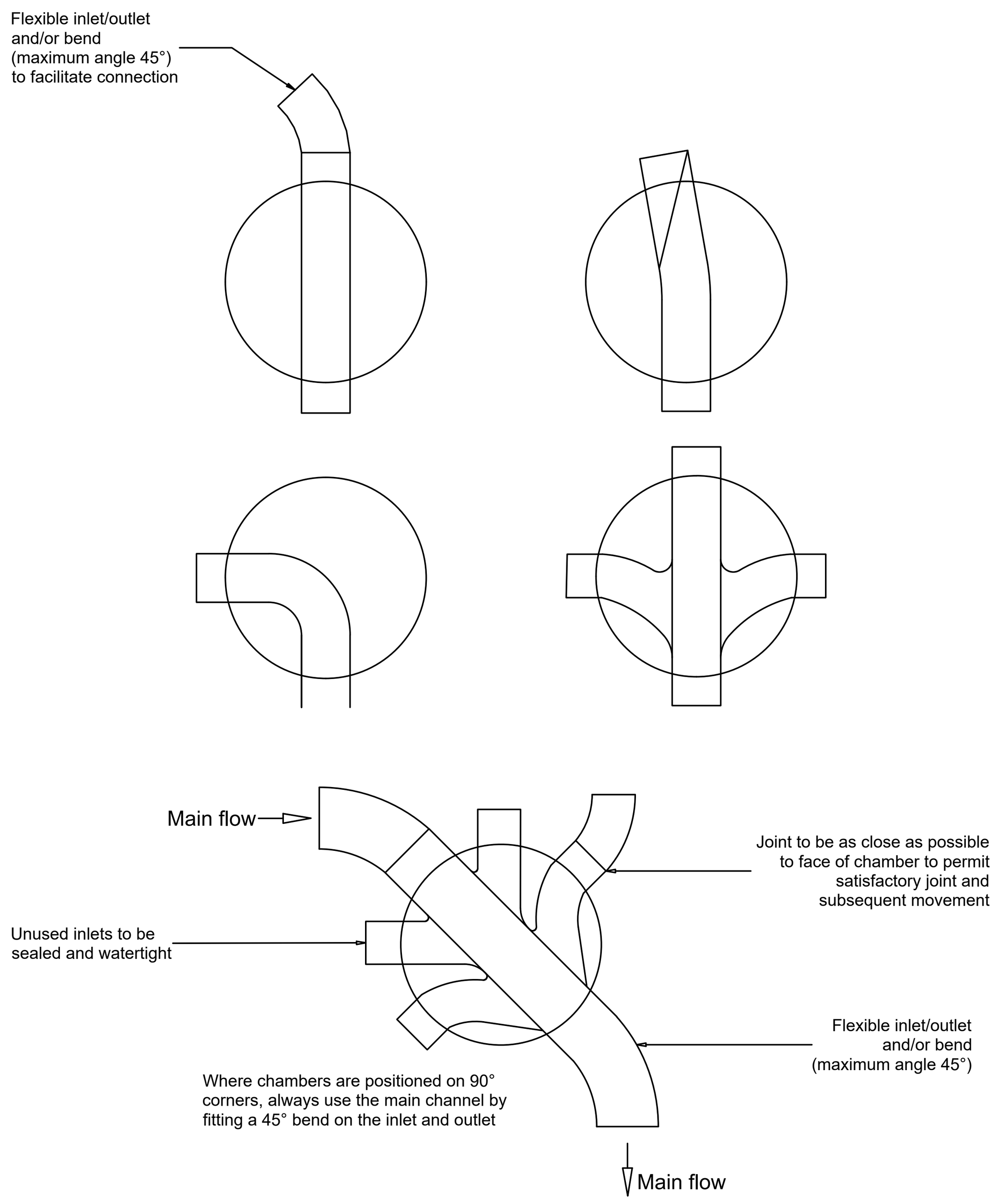
Sectional Plan

Rigid pipes built into manhole should have a flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be as shown.

Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

All pipes entering the bottom of the manhole to have soffits level.

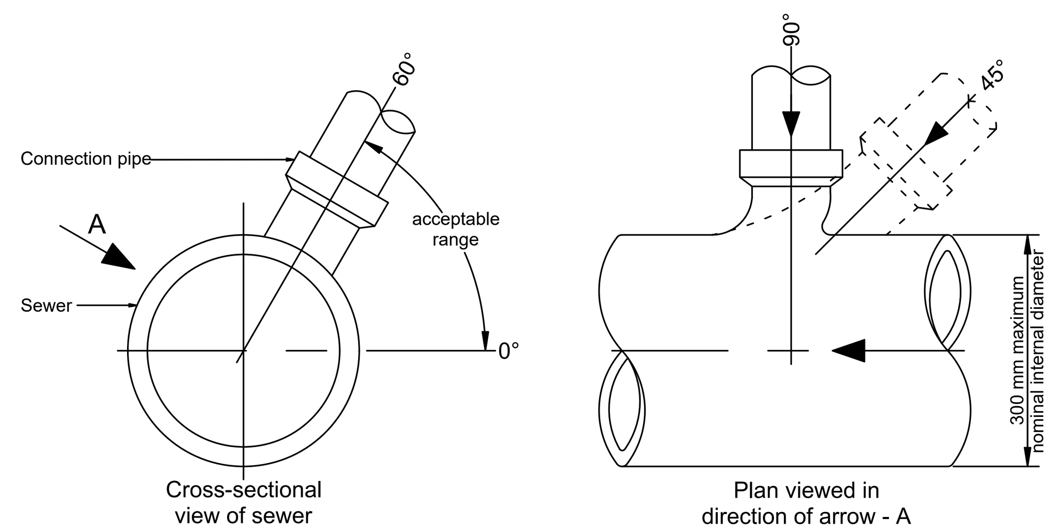
FIGURE B.20
ALTERNATIVE BASE LAYOUTS FOR TYPE 3 CHAMBERS



Note: Where a bend is used immediately outside the manhole, this may be used as the rocker pipe

Not to scale

FIGURE B.24
CONNECTIONS TO SEWER



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Consulting Structural/Civil Engineers
London 20 Britton Street, London, EC1M 5TX tel: 020 7490 4353 fax: 020 7490 4354 e-mail: info@furnesspartnership.com
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Project

MILLOM LEISURE CENTRE

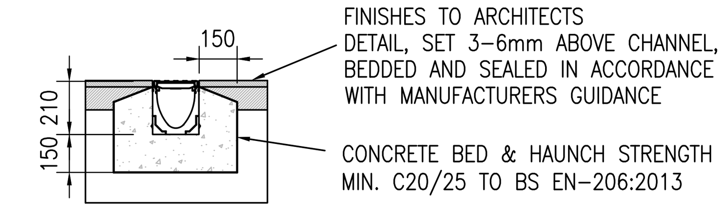
Drawing Title

PROPOSED FOUL WATER DRAINAGE LAYOUT

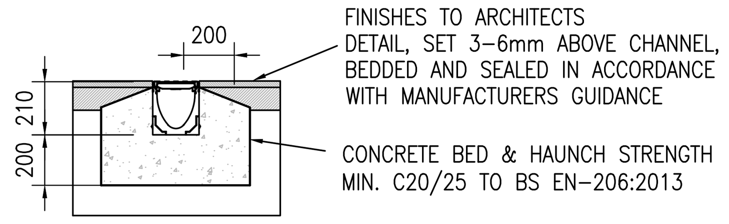
FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	O.J	JUN '23	C.J.H	N/A

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0931	P2

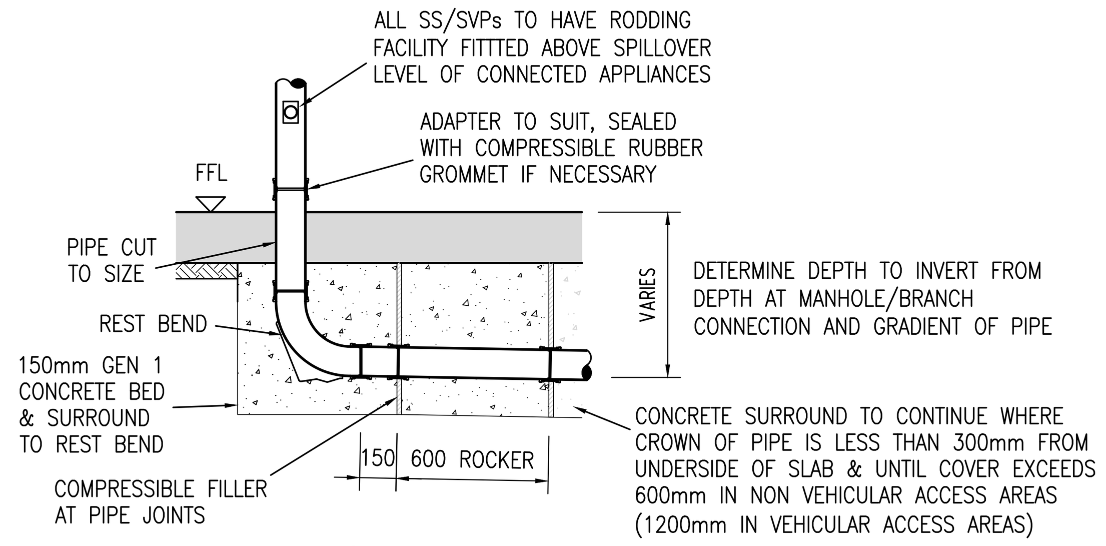
General Notes



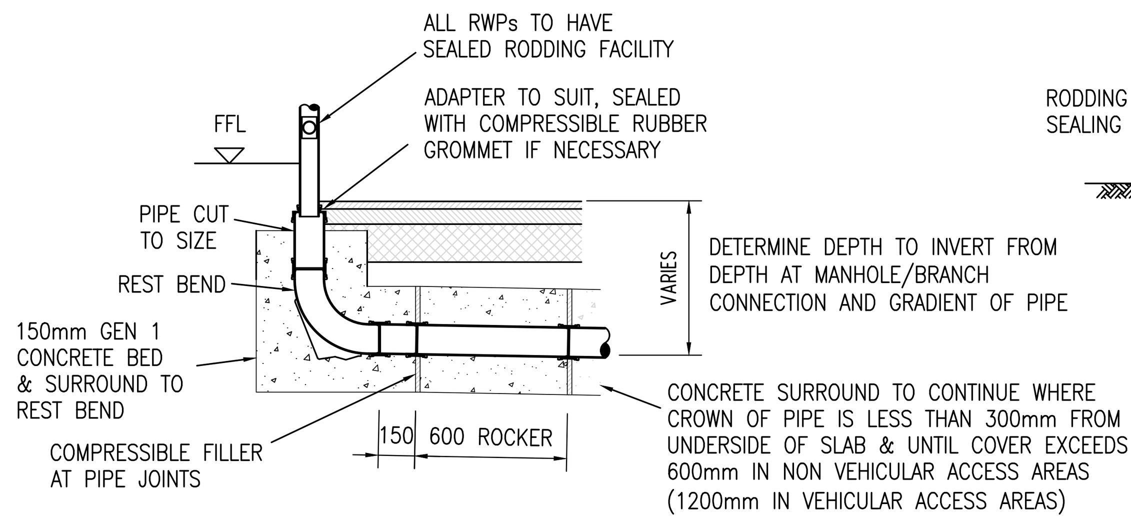
TYPICAL ACO MULTIDRAIN M150D 0.0J DETAIL WITH GRATING TO LOAD CLASS B125/C250.



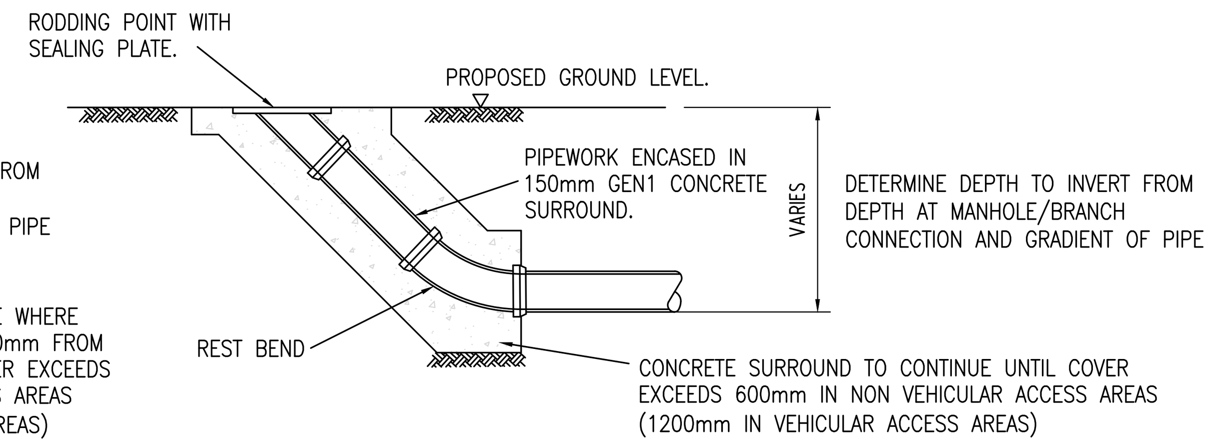
TYPICAL ACO MULTIDRAIN M150D 0.0J DETAIL WITH GRATING TO LOAD CLASS D400.



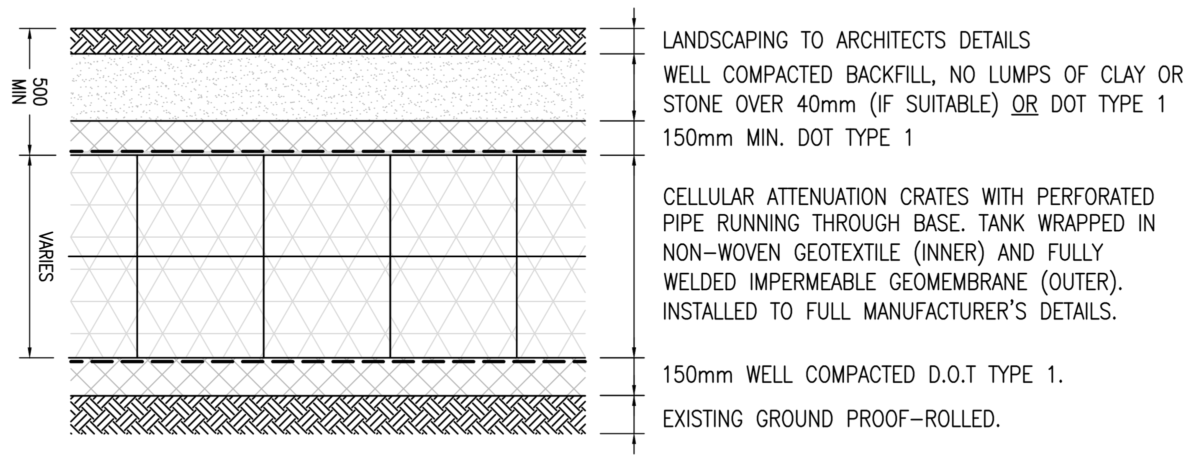
TYPICAL SS/SVP CONNECTION



TYPICAL RWP CONNECTION

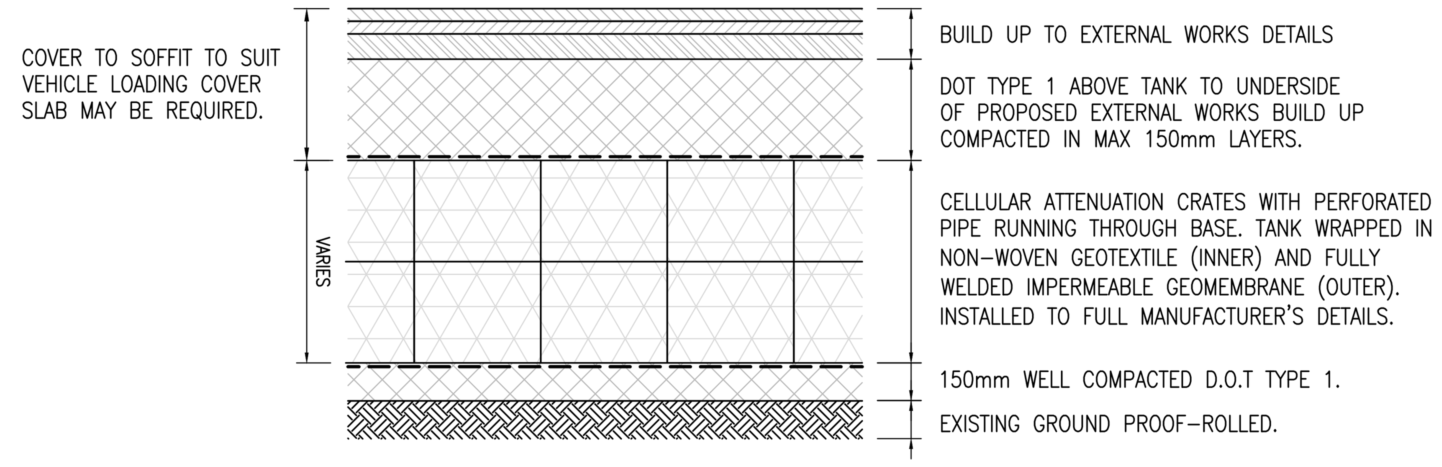


EXTERNAL RODDING EYE DETAIL



BUILD UP ABOVE ATTENUATION CRATES

UNDER SOFT LANDSCAPING

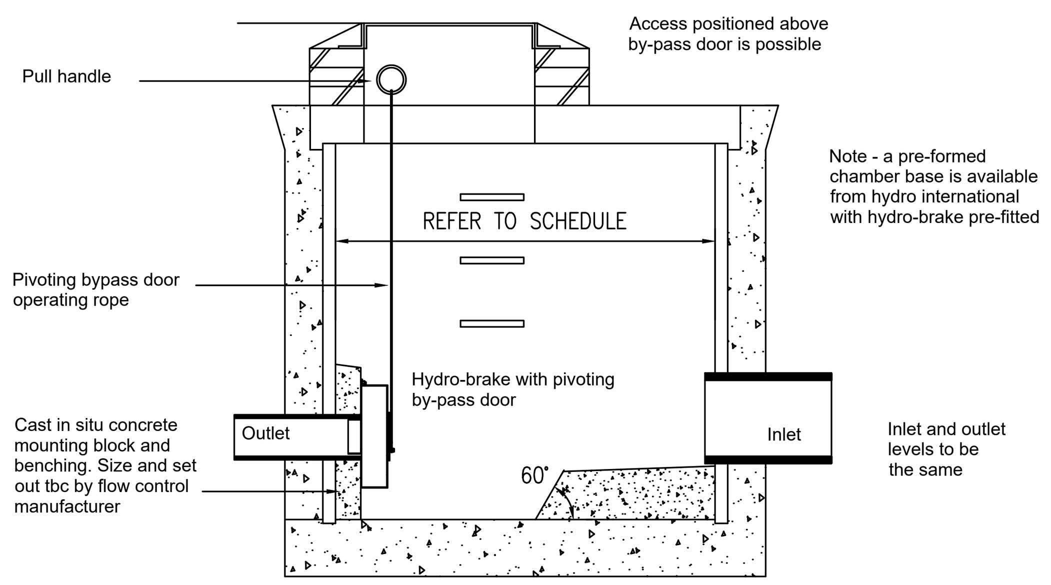


BUILD UP ABOVE ATTENUATION CRATES

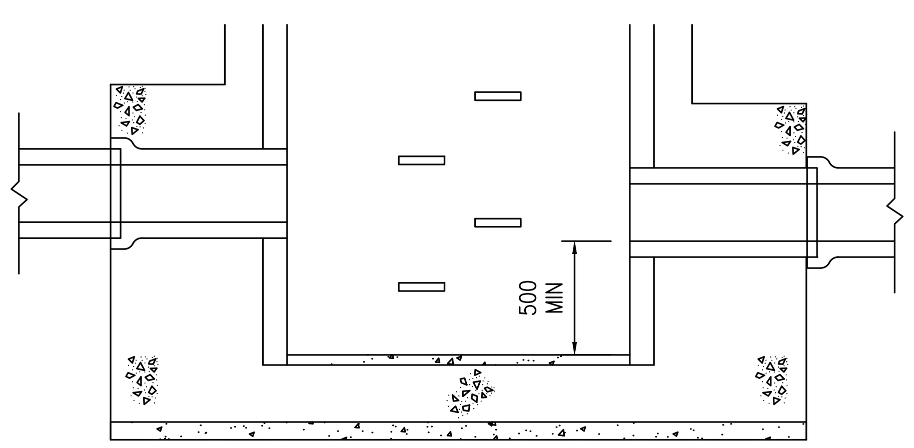
UNDER HARD LANDSCAPING

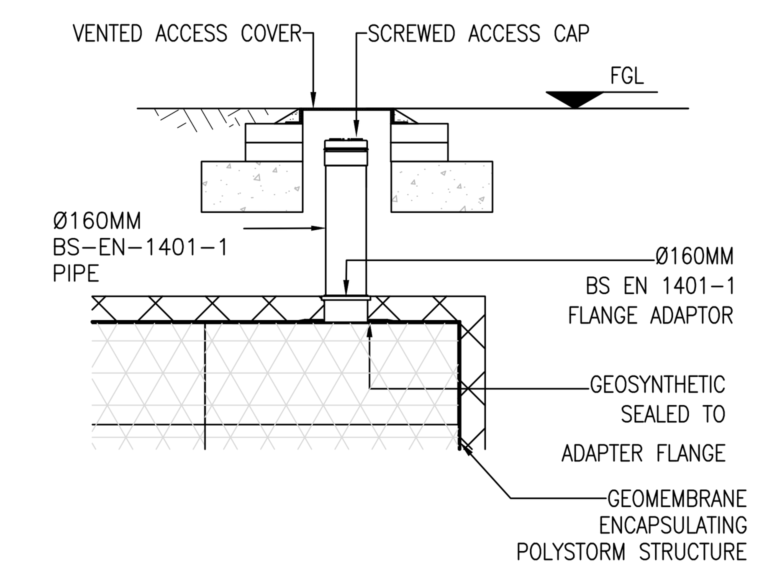
TYPICAL HYDROBRAKE MANHOLE DETAIL

REFER TO HYDRO INTERNATIONAL DRAWINGS FOR SITE SPECIFIC DETAILS

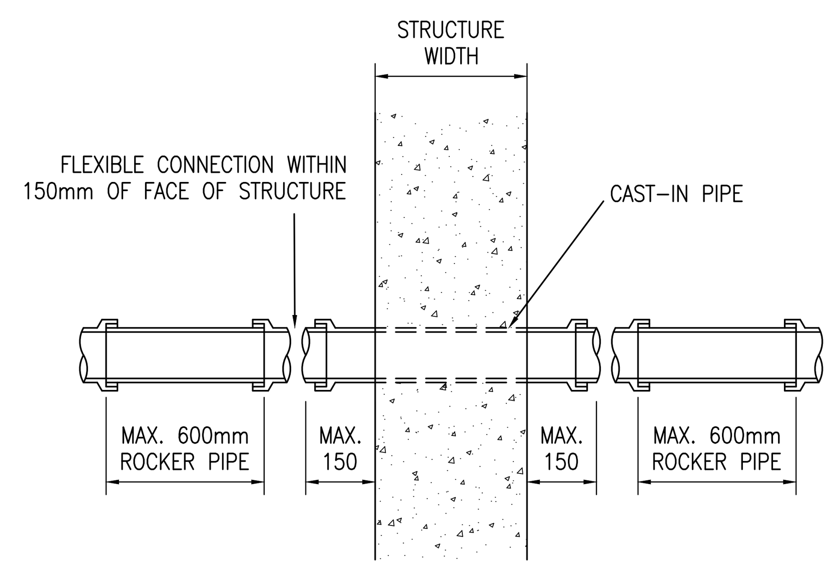


TYPICAL CATCHPIT MANHOLE DETAIL

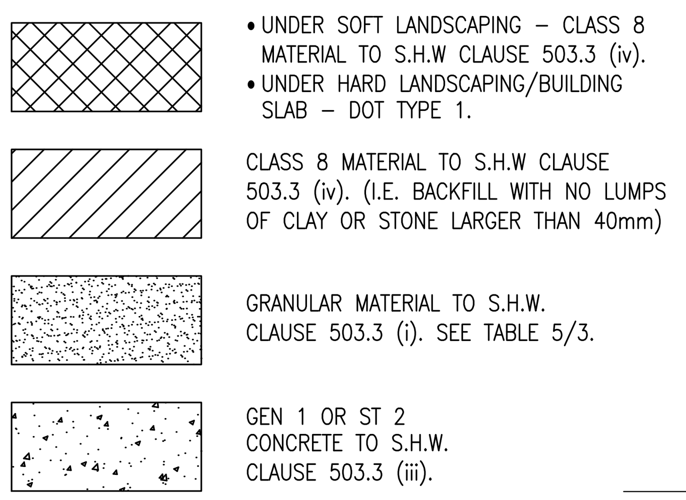




TYPICAL TANK VENTILATION DETAIL

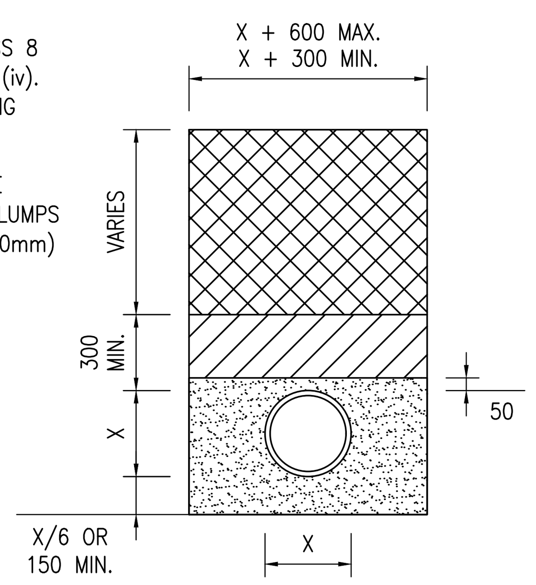


PLAN SHOWING PIPE PENETRATION THROUGH STRUCTURE (ROCKER OPTION)



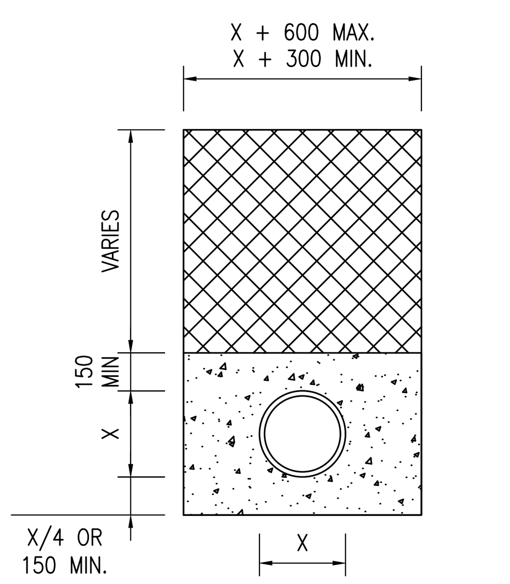
NOTES:

- ALL DIMENSIONS ARE IN MILLIMETRES.
- DIMENSION X IS THE EXTERNAL PIPE DIAMETER.
- THE MIN/MAX WIDTH OF TRENCH APPLIES ON & BELOW A LINE 300mm ABOVE THE TOP OF THE PIPE. ABOVE THE 300mm LINE TRENCH BACKFILL MATERIAL SHALL BE AS DESCRIBED IN CLAUSE 505 OF S.H.W.
- CONCRETE SURROUND MAY EXTEND TO SIDES OF TRENCH OR BE OF MINIMUM WIDTH TO PROVIDE 150mm COVER AT EACH SIDE OF THE PIPE.
- UNTIL THERE IS 300mm COVER OVER CROWN OF PIPE, COMPACT GRANULAR & BACKFILL MATERIAL BY HAND IN 100mm THICK LAYERS.



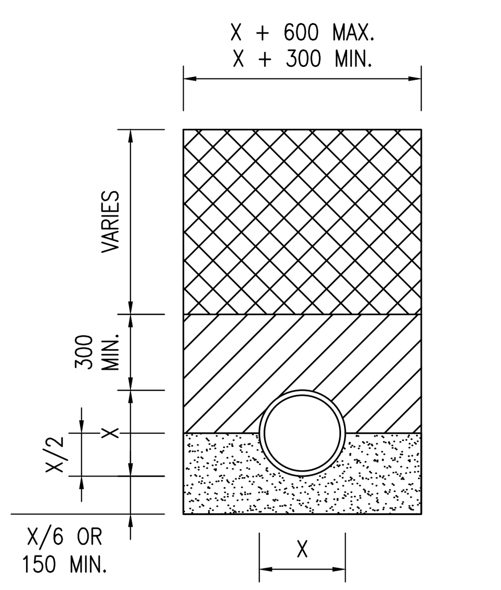
CLASS S BEDDING DETAIL (uPVC/FLEXIBLE PIPES)

FOR USE WHEN COVER TO SOFFIT OF PIPE IS GREATER THAN 600mm IN NON-TRAFFICKED AREAS AND GREATER THAN 1200mm IN AREAS WITH VEHICULAR ACCESS.



CLASS Z BEDDING DETAIL (ALL PIPES)

FOR USE WHEN COVER TO SOFFIT OF PIPE IS LESS THAN 600mm IN NON-TRAFFICKED AREAS AND LESS THAN 1200mm IN AREAS WITH VEHICULAR ACCESS. MIN. 18mm COMPRESSIBLE BOARD AT ALL PIPE JOINTS

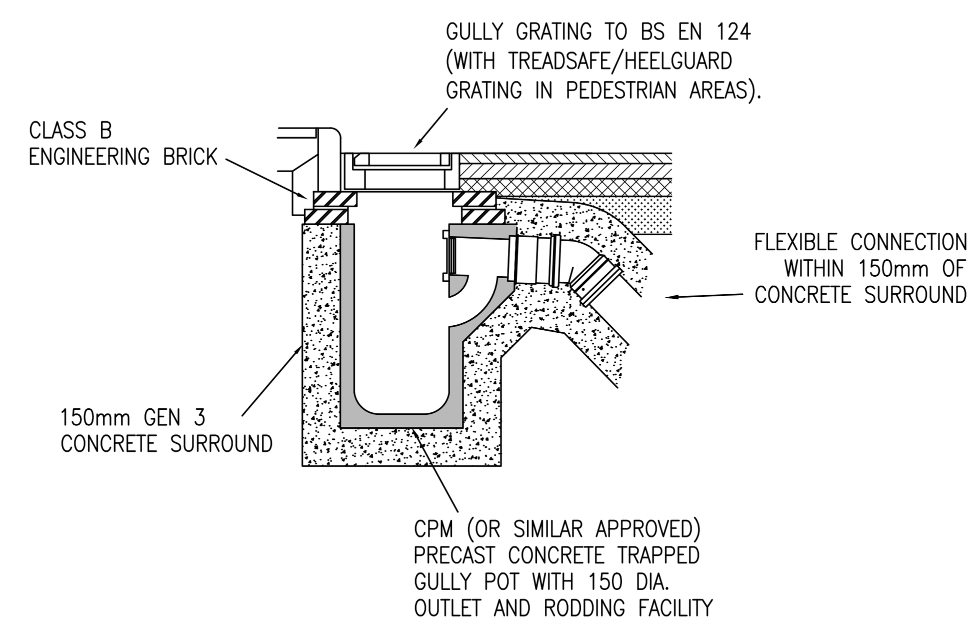


CLASS B BEDDING DETAIL (CLAY/CONCRETE ONLY)

FOR USE WHEN COVER TO SOFFIT OF PIPE IS GREATER THAN 600mm IN NON-TRAFFICKED AREAS AND GREATER THAN 1200mm IN AREAS WITH VEHICULAR ACCESS.

CLASS S/B GRANULAR BEDDING MATERIAL - S.H.W 503 (i) TABLE 5/3 [BS EN 13242] -		
NOMINAL PIPE DIAMETER (mm)	SINGLE SIZED COARSE AGGREGATE (mm)	GRADED COARSE AGGREGATE (mm)
NOT EXCEEDING 140	4/10	-
EXCEEDING 140 BUT NOT EXCEEDING 400	4/10, 6/10 OR 10/20	2/14 OR 4/20
EXCEEDING 400	4/10, 6/14, 10/20 OR 20/40	2/14, 4/20 OR 4/40

CLASS Z COMPRESSIBLE FILLER BOARD DETAILS	
NOMINAL PIPE DIAMETER (mm)	THICKNESS OF COMPRESSIBLE FILLER (mm)
LESS THAN 450	18
450 - 1200	36
GREATER THAN 1200	54



TYPICAL PRECAST CONCRETE ROAD GULLY DETAIL

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London 20 Britton Street, London, EC1M 5TX tel: 020 7490 4353 fax: 020 7490 4354 e-mail: info@furnesspartnership.com
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Project

MILLOM LEISURE CENTRE

Drawing Title

PROPOSED FOUL WATER DRAINAGE LAYOUT

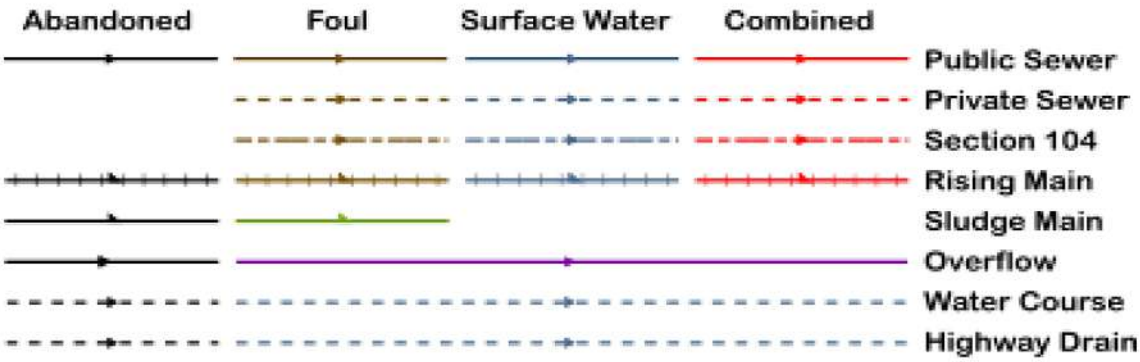
FP Job No.	Drawn	Date	Checked	Scale @ A1
L2762	O.J	JUN '23	C.J.H	N/A

PROJECT	OPERATOR	ZONE / VOLUME	LEVEL / LOCATION	FILE TYPE	ROLE	SHEET No.	Rev.
L2762	FUR	XX	XX	DR	D	0932	P2

APPENDIX C – LOCAL WATER AUTHORITY CONSULTATION & DOCUMENTS

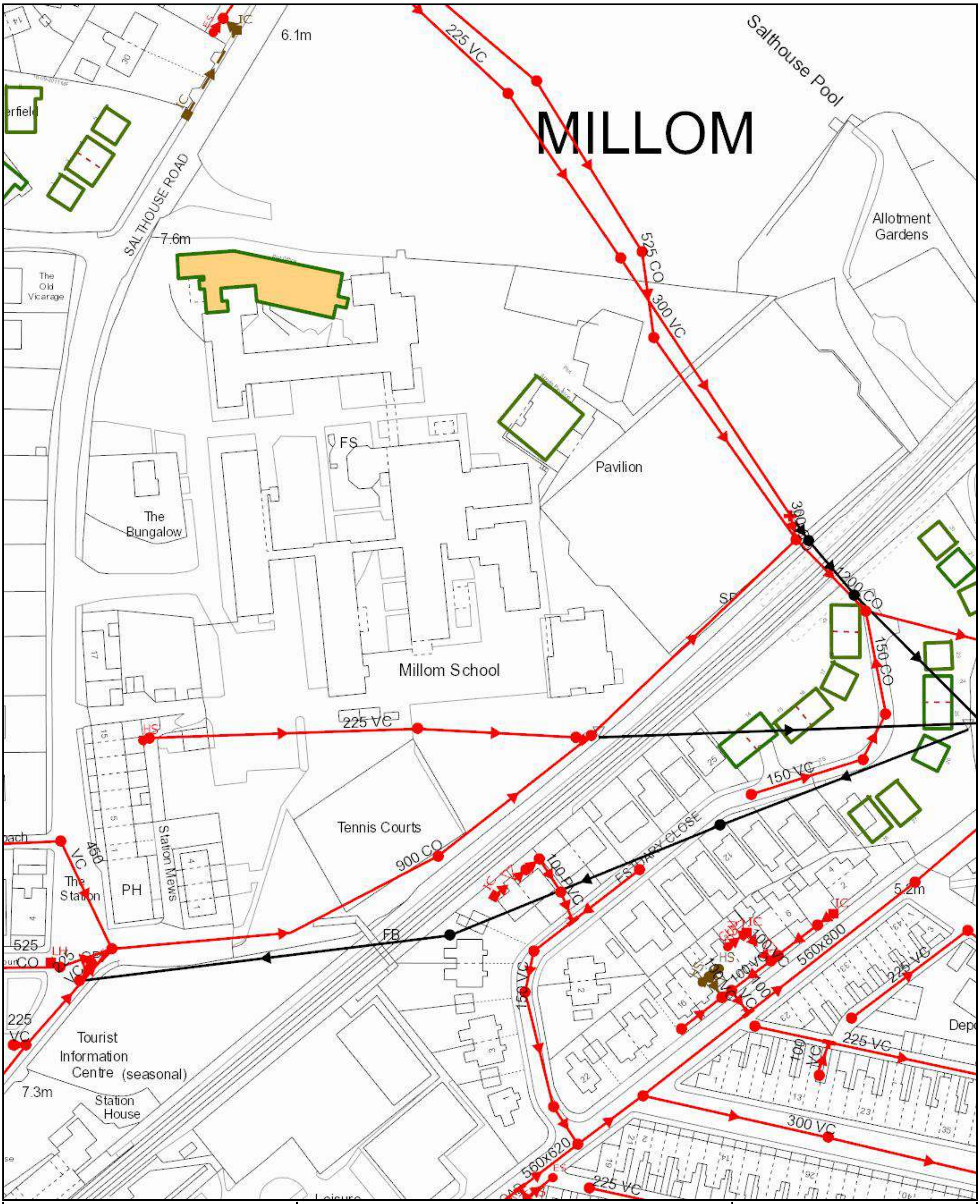
United Utilities
Water for the North West

Wastewater Symbology



All point assets follow the standard colour convention: red – combined; brown - foul; blue – surface water; purple - overflow

Manhole	Side Entry Manhole
HS Head of System	Outfall
ES Extent of Survey	Screen Chamber
RE Rodding Eye	IC Inspection Chamber
IN Inlet	Bifurcation Chamber
DP Discharge Point	LH Lamp Hole
HY Vortex	T Junction / Saddle
PE Penstock	CA Catchpit
WO Washout Chamber	VC Valve Chamber
VA Valve	Vent Column
AV Air Valve	Vortex Chamber
NRV Non Return Valve	Penstock Chamber
SO Soakaway	Network Storage Tank
GU Gully	V Sewer Overflow
CA Cascade	WwTW Ww Treatment Works
FM Flow Meter	Ww Pumping Station
HA Hatch Box	Septic Tank
OI Oil Interceptor	Control Kiosk
SM Summit	
DS Drop Shaft	Change of Characteristic
OP Orifice Plate	



Scale: 1:1713 **Date:** 05/04/2022	**SEWER RECORDS**	United Utilities Water for the North West

Address or Site Reference: MILLOM SCHOOL SALTHOUSE ROAD, MILLOM, LA18 5AB

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Michael Herbert

From: seweradoptions@uuplc.co.uk
Sent: 15 June 2023 15:33
To: Michael Herbert
Subject: RE: Pre Development Enquiry - Millom Leisure Centre [Filed 07 Aug 2023 17:33]

Follow Up Flag: Follow up
Flag Status: Flagged

Good Afternoon Michael,

Pre Development Enquiry – Millom Leisure Centre, Millom School, Salthouse Road, Millom, Cumberland LA18 5AB – UU ref 04140748

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:
https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water
Foul flow from this site will be allowed to drain into the public foul water/combined sewer system. We would have no objections to the proposed connection point (525mm public combined sewer to the north east).
Please confirm if the proposals are to include a swimming pool?
If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.
In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water
All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.
Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.
This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.
The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).
The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.
A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.
Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:
https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs
If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:
https://www.gov.uk/government/publications/groundwater-protection-position-statements
Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Waterbody

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you contact the Lead Local Flood Authority and/or Environment Agency to discuss a point of discharge to the watercourse running through the site boundary, north east of the proposed building. You may need to consider the use of a non-return valve on the outfall.

Public Sewer

We would not consider allowing a connection to the combined sewer network unless both infiltration and discharge to watercourse are evidence as not being possible. In the event that sufficient evidence discounting these options is provided, we would consider allowing surface water to connect at the proposed connection point (525mm combined public sewer) however we would ask that discharge rates are set to greenfield runoff rates.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the pubic sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer. **The public sewers must be accurately located on site at the earliest convenience to understand actual clearance requirements/standoff zones, as our sewer records are indicative only.**

Please be aware that any proposed diversion may require modelling. This process may take up to 6 months in order to reach an acceptable design.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:
https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/

Existing Water Assets Crossing the Site
It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:
https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

Connection Application
Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:
https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/
We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.
If we can be of any further assistance please don't hesitate to contact us further.

Many thanks and kind regards,

Tom

United Utilities
Water for the North West

Thomas Bethell
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880 339 195
unitedutilities.com

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--------------- Original Message ---------------
From: Michael Herbert [m.herbert@furnesspartnership.com]
Sent: 05/06/2023 18:07
To: seweradoptions@uuplc.co.uk
Subject: RE: Pre Development Enquiry - Millom Leisure Centre

Hi,

Please find attached pre-development enquiry for a redevelopment of Millom School, Salthouse Rd, Millom LA18 5AB which includes the construction of a new leisure centre. There is a site investigation report that has been carried out for the site that I can forward if required however the file size is too large for your inbox.

Existing Impermeable Area for new Leisure Centre site: ~2670 m^2

Estimated Brownfield Discharge Rate: 37.3 l/s (based on 50mm/hr rainfall intensity)

Point of proposed connection into public sewer for foul and surface water highlighted in yellow below (assuming soakaways are not feasible):

[Image is no longer available]

Regards

Michael Herbert | Civil Engineer

t: +44 (0)1274 392 092 | **w:** www.furnesspartnership.com

The Paper Hall, Anne Gate, Bradford, BD1 4EQ

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[Image is no longer available] [Image is no longer available]

****

Michael Herbert

From: seweradoptions@uuplc.co.uk
Sent: 01 August 2023 09:39
To: Michael Herbert
Subject: RE: Pre Development Enquiry - Millom Leisure Centre [Filed 07 Aug 2023 17:33]

Hi Michael,

Yes we would accept the backwash at a rate restricted to 5 l/s as suggested.

Please note the following, which is taken from our Trade Effluent FAQ page of our website (found here):

United Utilities considers the backwash water from swimming pools to be in a low risk category and that issuing formal trade effluent consent is not appropriate control for the level of risk. As such we will not normally pursue an application for a 'Consent to Discharge'.
The position statement above applies to the routine discharge of filter backwash water. If you need to empty the content of a swimming pool the following process should be followed.
Swimming pool emptying position:

- *You must obtain formal approval from United Utilities prior to emptying the swimming pool contents*
- *The discharge point and rate for emptying into the public foul sewer will be determined and agreed*
- *This requirement shall relate to each and every pool emptying event*

Please contact your retailer if you need to make an enquiry to discharge the pool content. The following information should be included in your enquiry to enable us to assess the request:

- *Name of Company*
- *Contact name and details including email*
- *Site address – This is the site address where the swimming pool contents are being discharged from*
- *Maximum volume to be discharged m3/day*
- *Discharge flow rate l/sec*
- *Street name where discharge will be made into the public foul sewer*
- *Start date*
- *Completion date*

Many thanks and kind regards,

Tom

United Utilities
Water for the North West

Thomas Bethell
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880 339 195
unitedutilities.com

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--------------- Original Message ---------------
From: Michael Herbert [m.herbert@furnesspartnership.com]
Sent: 21/07/2023 12:50
To: seweradoptions@uuplc.co.uk
Subject: RE: Pre Development Enquiry - Millom Leisure Centre

Hi,

Thanks for the response. I can confirm that the proposal will include a swimming pool with an associated trade effluent discharge. The current proposal will be to attenuate the backwash in an underground tank and release the trade effluent into the foul network at a restricted flow rate (currently 5l/s). We don't have figures on volume of discharge per day at this stage, but it is usually somewhere in the region of 20-30m^3.

Can you confirm if this is feasible, or next steps to take?

Regards

Michael Herbert | Civil Engineer

t: +44 (0)1274 392 092 | **w:** www.furnesspartnership.com

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APPENDIX D – GROUND INVESTIGATION EXTRACT / SOAKAWAY TEST RESULTS

PHASE II GROUND INVESTIGATION REPORT

MILLOM SCHOOL, SALTHOUSE ROAD, MILLOM, CUMBRIA, LA18 5AB

PREPARED FOR ALLIANCE LEISURE SERVICES LIMITED

GEOL CONSULTANTS LTD

4.0 Ground Conditions (Cont'd)

4.1 Soil Profile (Cont'd)

Strata	Depths Recorded	Description & Comments
TOPSOIL	From 0.00m to 0.30m up to 0.50m	At BH06, BH07, BH08 and BH10 the initial surfacing comprised grass over dark grey slightly clayey gravelly soily sand
SUPERFICIAL GEOLOGY Devensian Till	From 0.30m to 2.00m up to 5.45m	The superficial deposits beneath the site initally comprised stiff dark grey slightly sandy slightly gravelly CLAY, transitioning into grey and brown slightly gravelly SAND

There was no obvious visual or olfactory evidence of any fuel / oil type contamination or potential asbestos containing materials (ACM's) or bundles of fibres noted at the borehole locations. Similarly, there was also no evidence of any biodegradable or putrescible deposits at the borehole locations, or ashy deposits.

4.2 Groundwater

The borehole locations were noted to remain dry during the investigation period. However, post fieldwork monitoring encountered water levels in BH10 to the range between 1.05m and 2.95m. Therefore, water ingresses may occur within construction related excavations. and it would be prudent to allow for the introduction of temporary groundwater control techniques (i.e. sump pumping), to take care of any localised ingresses of groundwater, during the construction period, especially during the wetter periods of the year. It should also be noted that instability within such excavations is also likely to occur because of water inflow.

Adequate lateral trench support may also be required for excavations, to prevent trench wall collapse or over excavation, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since the initial topsoil and superficial deposits will be susceptible to deterioration, if left open to the natural elements for any significant period of time.

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Third Avenue, Team Valley Trading Estate
Gateshead, Tyne and Wear
NE11 0BU

5.0 Insitu Geotechnical Testing (Cont'd)

5.4 Insitu Variable (Falling) Head Permeability Tests

Insitu variable (falling) head permeability tests were completed at the locations of BH07, BH08 and BH10, to assess the permeability characteristics of the underlying natural deposits for determining the suitability of using conventional soakaways / SuDS as part of the drainage design scheme for the site. The permeability test results and calculations can be seen on the record sheets attached in Appendix II.

The test section at BH07 extended from 0.12m to 2.85m, however a permeability value could not be calculated due to the water draining within 1 minute, suggesting good drainage characteristics.

The test section at borehole BH08 extended from 0.22m to 4.70m bgl. The result of the test has identified a coefficient of permeability value (k) of 1.17E^{-06} ms^{-1} indicating the deposits tested to have a low permeability classification with poor drainage characteristics.

The test section at borehole BH10 extended from 0.05m to 3.00m bgl. The result of the test has identified a coefficient of permeability value (k) of 1.47E^{-07} ms^{-1} indicating the deposits tested to have a very low permeability classification with poor drainage characteristics.

6.0 Laboratory Testing

6.1 Determination of Chemical Attack on Buried Concrete

Nineteen representative samples of the soil deposits encountered at the windowless sampling borehole locations were tested by Derwentside Environmental Testing Services Limited (DETS) to determine their pH value and soluble sulphate levels, so these materials can be classified in accordance with the guidance BRE Special Digest 1:2005, Concrete in Aggressive Ground. The results of the tests are contained in the DETS Certificate of Analysis Report (references 22-16769 and 22-22649), copies of which can be seen in Appendix III.

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NE11 0BU

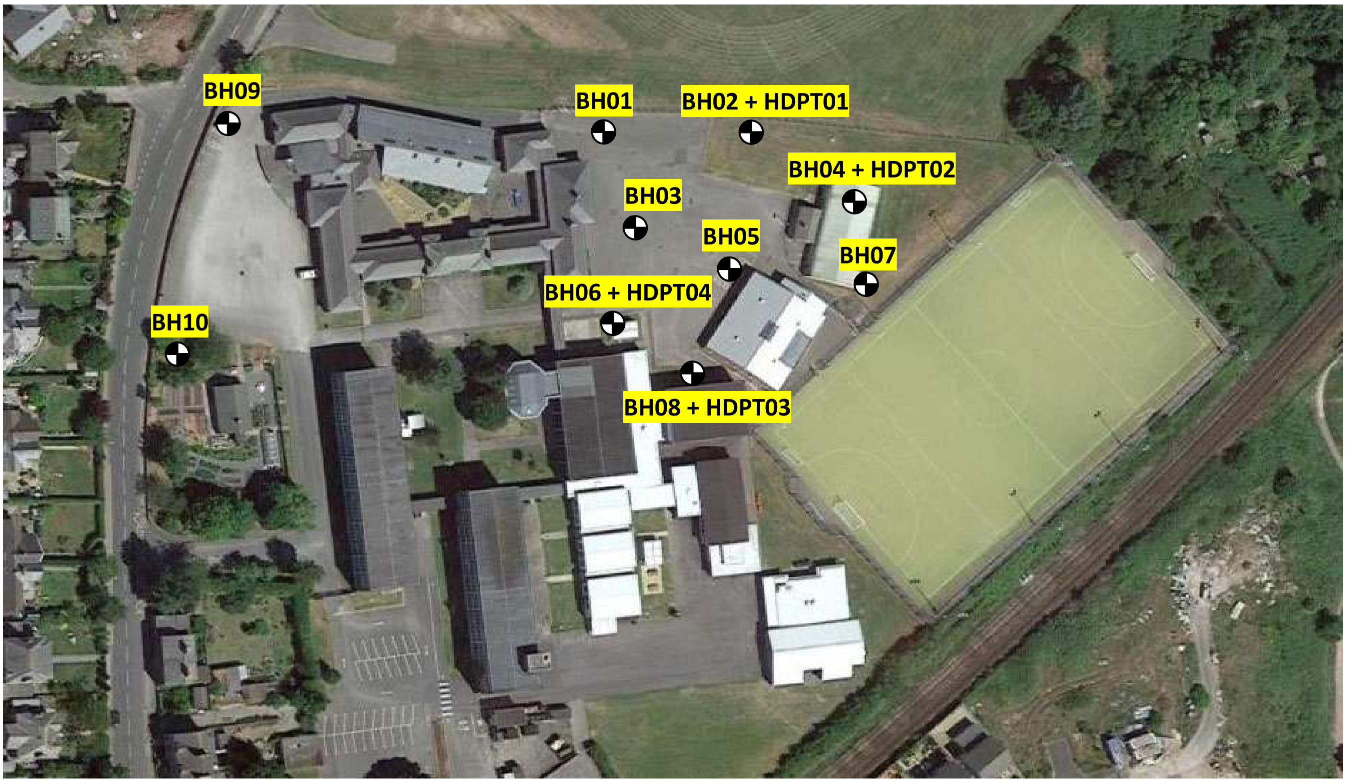
APPENDIX II

Investigation Location Plans
Borehole Record Sheets
DCP Record Sheets &
Falling Head Test Record Sheets

Tectonic House, Unit 11, Queens Court North
Third Avenue, Team Valley Trading Estate
Gateshead, Tyne and Wear
NE11 0BU

GEOL CONSULTANTS LTD

Tectonic House
Unit 11, Queens Court North
Third Avenue, Team Valley Trading Estate
Gateshead, Tyne and Wear
NE11 0BU
Tel: 0191 477 2020
Email: enquiries@geolconsultants.co.uk



Key:

BH01 – Windowless Sampling Borehole

HDPT01 – Hand Dug Pit

INVESTIGATION LOCATION PLAN

Report Type: Phase II Ground Investigation Report
Site Address: Millom School, Salthouse Road, Millom, Cumbria, LA18 5AB
Project No.: GEOL22-8471

Geol Consultants Limited
Tectonic House, Unit 11
Queens Court North, Third Avenue
Team Valley Trading Estate
Gateshead
Tyne and Wear, NE11 0BU
0191 477 2020
enquiries@geolconsultants.co.uk

BOREHOLE LOG

Project				BOREHOLE No
Millom School, Salthouse Road, Millom, Cumbria, LA18 5AB				**BH07**
Job No: GEOL22-8471	Date: 17-08-22 17-08-22	Ground Level (m)	Co-Ordinates ()	
Contractor: Geol Consultants Limited				Sheet: 1 of 1

SAMPLES & TESTS: Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION
0.30	B					(0.50) 0.50	Grass over dark grey slightly clayey gravelly soily sand (TOPSOIL).
1.00 1.00-1.45 1.50 1.90 2.00-2.45	HSVT SPT B HSVT SPT	90kN/m^2 N=14 90kN/m^2 N=25				(1.60) 2.10	Stiff (high strength) dark grey slightly sandy slightly gravelly CLAY (DEVENSIAN TILL).
2.50 3.00-3.20	B SPT	 50 blows for limited penetration				(1.10) 3.20	Very dense grey and brown slightly gravelly SAND (DEVENSIAN TILL).
							Borehole terminated at a depth of 3.20m bgl due to refusal of the sampling and testing equipment.

Geology | Instrument/ Backfill

Windowless Sampling Drilling Progress

Depth	Casing	Diameter	Recovery	Remarks

GENERAL REMARKS

WATER: Borehole remained dry.

ADDITIONAL: Position CAT scanned before breaking ground

All dimensions in metres Scale 1:40.625	Client: Alliance Lesuire Services Limited	Method/ Plant Used: Competitor Dart Rig	Logged By: NW

Geol Consultants Limited
Tectonic House, Unit 11
Queens Court North, Third Avenue
Team Valley Trading Estate
Gateshead
Tyne and Wear, NE11 0BU
0191 477 2020
enquiries@geolconsultants.co.uk

BOREHOLE LOG

Project				BOREHOLE No
Millom School, Salthouse Road, Millom, Cumbria, LA18 5AB				**BH08**
Job No: GEOL22-8471	Date: 17-08-22 17-08-22	Ground Level (m)	Co-Ordinates ()	
Contractor: Geol Consultants Limited				Sheet: 1 of 1

SAMPLES & TESTS / STRATA

Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.30	Grass over dark grey slightly clayey gravelly soily sand (TOPSOIL).		
0.30	B								
0.80	B								
1.00	HSVT	$85kN/m^2$				(1.90)			
2.00	B					2.20	Stiff (high strength) dark grey slightly sandy slightly gravelly CLAY (DEVENSIAN TILL).		
2.00	HSVT	$90kN/m^2$							
3.20	B					(2.80)			
4.50	B					5.00	Grey and brown slightly gravelly SAND (DEVENSIAN TILL).		
							Borehole terminated at a depth of 5.00m bgl.		

Windowless Sampling Drilling Progress

Depth	Casing	Diameter	Recovery	Remarks

GENERAL REMARKS

WATER: Borehole remained dry.

ADDITIONAL: Position CAT scanned before breaking ground

All dimensions in metres Scale 1:40.625	Client: Alliance Lesuire Services Limited	Method/ Plant Used: Competitor Dart Rig	Logged By: NW

Geol Consultants Limited
Tectonic House, Unit 11
Queens Court North, Third Avenue
Team Valley Trading Estate
Gateshead
Tyne and Wear, NE11 0BU
0191 477 2020
enquiries@geolconsultants.co.uk

BOREHOLE LOG

Project				BOREHOLE No
Millom School, Salthouse Road, Millom, Cumbria, LA18 5AB				BH10
Job No: GEOL22-8471	Date: 17-08-22 17-08-22	Ground Level (m)	Co-Ordinates ()	
Contractor: Geol Consultants Limited				Sheet: 1 of 1

SAMPLES & TESTS				STRATA					
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Geology	Instrument/ Backfill
0.30	B					(0.40) 0.40	Grass over dark grey slightly clayey gravelly soily sand (TOPSOIL).		
1.00-1.45	SPT	N=12					Stiff (high strength) dark grey slightly sandy slightly gravelly CLAY (DEVENSIAN TILL).		
1.50	B								
1.50	HSVT	100kN/m²							
2.00-2.45	SPT	N=9				(3.00)			
2.50	B								
2.50	HSVT	90kN/m²							
3.00-3.40	SPT	50 blows for limited penetration				3.40			
							Borehole terminated at a depth of 3.40m bgl due to refusal of the sampling and testing equipment.		

Windowless Sampling Drilling Progress				
Depth	Casing	Diameter	Recovery	Remarks

GENERAL REMARKS

WATER: Borehole remained dry.

ADDITIONAL: Position CAT scanned before breaking ground

All dimensions in metres Scale 1:40.625	Client: Alliance Lesuire Services Limited	Method/ Plant Used: Competitor Dart Rig	Logged By: NW

Geol Consultants Limited

VARIABLE HEAD (FALLING) PERMEABILITY TEST

SITE DETAILS: Millom School, Salthouse Road, Millom
Cumbria, LA18 5AB

BOREHOLE: BH08

Bottom of Borehole	4.70	mBGL
Base of casing	1.00	mBGL
Diameter of casing	100.00	mm
Height of casing	0.00	mAGL
Elevation of Borehole	0.00	mAOD
Groundwater Level	4.70	mBGL

Operator	IH	
Date	27/10/2022	
Time	11:30:00	
Weather	Sunny	
Input volume of water	~	litres
Test Zone	4.48	m

Elapsed (minutes)	Elapsed (seconds)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0	0	0	0.220	4.480	1.000
1	0	60	1.980	2.720	0.607
2	0	120	2.140	2.560	0.571
3	0	180	2.260	2.440	0.545
4	0	240	2.400	2.300	0.513
5	0	300	2.510	2.190	0.489
10	0	600	2.880	1.820	0.406
15	0	900	3.220	1.480	0.330
20	0	1200	3.400	1.300	0.290
25	0	1500	3.530	1.170	0.261
30	0	1800	3.640	1.060	0.237
45	0	2700	3.880	0.820	0.183
60	0	3600	4.050	0.650	0.145

TEST CALCULATION

Intake Factor (F)

$$F = \frac{2\pi L}{\mathrm{Log}_e\left[(L/D) + \sqrt{\{1+(L/D)^2\}}\right]} \qquad \text{(i)}$$

(From BS 5930:2015 for standpipes)

L=length of test zone
D=diameter of standpipe

Permeability (k)

$$k = \frac{A}{F(t_2 - t_1)} \times \mathrm{Log}_e\,(H_1/H_2) \qquad \text{(ii)}$$

or

$$k = \frac{A}{FT} \qquad \text{(iii)}$$

Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37

L=	4.48	m	
D=	0.100	m	
L/D=	44.80		
t_1=	0	s	
t_2=	3600	s	
H_1=	4.48	m	
H_2=	0.65	m	
A=	0.00785	m^2	
F=	6.2616		From (i)
T=	750	s	
k=	6.72596E-07	ms^{-1}	From (ii)
k=	1.67243E-06		From (iii)
Ave k=	1.17251E-06		

Remarks

Drainage Characteristics: POOR
Permeability Classification: LOW

Geol Consultants Limited

VARIABLE HEAD (FALLING) PERMEABILITY TEST

SITE DETAILS: Millom School, Salthouse Road, Millom
Cumbria, LA18 5AB

BOREHOLE: BH10

Bottom of Borehole	3.00	mBGL
Base of casing	1.00	mBGL
Diameter of casing	100.00	mm
Height of casing	0.00	mAGL
Elevation of Borehole	0.00	mAOD
Groundwater Level	2.35	mBGL

Operator	IH	
Date	27/10/2022	
Time	13:00:00	
Weather	Sunny	
Input volume of water	~	litres
Test Zone	2.95	m

TEST CALCULATION

Intake Factor (F)

$$F = \frac{2\pi L}{\text{Log}_e\,[(L/D) + \sqrt{\{1+(L/D)^2\}}]} \qquad \text{(i)}$$

(From BS 5930:2015 for standpipes)

L=length of test zone
D=diameter of standpipe

Permeability (k)

$$k = \frac{A}{F(t_2 - t_1)} \times \text{Log}_e\,(H_1/H_2) \qquad \text{(ii)}$$

or

$$k = \frac{A}{FT} \qquad \text{(iii)}$$

Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37

L=	2.95	m	
D=	0.100	m	
L/D=	29.50		
t_1=	0	s	
t_2=	3600	s	
H_1=	2.30	m	
H_2=	1.69	m	
A=	0.00785	m^2	
F=	4.5454		From (i)
T=	750	s	
k=	1.47917E-07	ms^{-1}	From (ii)
k=			From (iii)
Ave k=			

Elapsed (minutes)	Elapsed (seconds)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0	0	0	0.050	2.300	1.000
1	0	60	0.170	2.180	0.948
2	0	120	0.230	2.120	0.922
3	0	180	0.280	2.070	0.900
4	0	240	0.320	2.030	0.883
5	0	300	0.350	2.000	0.870
10	0	600	0.460	1.890	0.822
15	0	900	0.530	1.820	0.791
20	0	1200	0.560	1.790	0.778
25	0	1500	0.580	1.770	0.770
30	0	1800	0.600	1.750	0.761
45	0	2700	0.630	1.720	0.748
60	0	3600	0.660	1.690	0.735

Remarks

Drainage Characteristics: POOR
Permeability Classification: VERY LOW

Ground Gas Monitoring Record Sheet

Visit	Date	Time	Equipment	Weather	Site Engineer	Comments	Borehole Position	Gas Flow (l/hr)	Atmospheric Pressure (mbar)	Atmospheric Pressure Trend	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Hydrocarbons (GFM 435 only)		Other Gases (PPM)			Depth to Water (m bgl)	Depth to Base (m bgl)
											Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (Isobutylene)	H_2S	CO		
1	14/09/2022	07:30	GFM436	Sunny spells, wet	IH		7	<0.1	1009	Falling 1017 - 1012		0.0		0.0		1.6		18.5	0.000	1.0		0	0	DRY	3.00
							8	<0.1	1009			0.0		0.0		1.4		19.1	0.000	1.0		0	0	DRY	4.80
							10	<0.1	1009			0.0		0.0		2.6		17.8	0.000	1.0		0	0	DAMP 2.95	3.00
2	28/09/2022	16:55	GFM436	Overcast	IH		7	<0.1	996	Falling 1019 - 1000		0.0		0.0		1.5		18.5	0.001	1.0		0	0	DRY	3.00
							8	<0.1	996			0.0		0.0		1.7		18.8	0.001	1.0		0	0	DRY	4.80
							10	<0.1	996			0.0		0.0		2.6		17.6	0.001	1.0		0	0	2.82	3.00
3	27/10/2022	09:00	GFM436	Overcast, wet with occassional light showers	IH		7	<0.1	1007	Rising 995 -1009		0.0		0.0		2.0		18.0	0.005	1.0		0	0	DRY	3.00
							8	<0.1	1007			0.0		0.0		1.8		18.8	0.000	1.0		0	0	DRY	4.80
							10	<0.1	1007			0.0		0.0		1.4		17.8	0.002	1.0		0	0	2.35	3.00
4	10/11/2022	15:20	GFM436	Overcast, wet and windy	IH		7	<0.1	1001	Rising 988 - 1010		0.0		0.0		2.2		17.5	0.004	1.0		0	0	DRY	3.00
							8	<0.1	1001			0.0		0.0		1.9		18.6	0.001	1.0		0	0	DRY	4.80
							10	<0.1	1001			0.0		0.0		2.4		14.5	0.005	1.0		0	0	1.05	3.00
5	15/12/2022	15:30	GFM436	Sunny, cold (Ice)	IH		7	<0.1	1007	Rising 1009 - 1012		0.0		0.0		1.4		17.7	0.028	1.0		0	0	DRY	3.00
							8	<0.1	1008			0.0		0.0		1.3		18.6	0.023	1.0		0	0	DRY	4.80
							10	<0.1	1009			0.0		0.0		0.9		17.6	0.027	1.0		0	0	2.76	3.00
6	22/12/2022	15:00	GFM436	Overcast, wet	IH		7	<0.1	988	Rising 995 - 1001		0.0		0.0		1.9		17.2	0.020	1.0		0	0	DRY	3.00
							8	<0.1	988			0.0		0.0		1.7		18.4	0.020	1.0		0	0	DRY	4.80
							10	<0.1	987			0.0		0.0		1.4		16.5	0.021	1.0		0	0	2.72	3.00

APPENDIX E – HYDRAULIC SURFACE WATER CALCULATIONS

LEISURE CENTRE GREENFIELD RUNOFF RATE CALCUATION (Qbar)

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.470
Area (ha)	0.341	Urban	0.000
SAAR (mm)	1070	Region Number	Region 10

Results	**l/s**
QBAR Rural	2.7
QBAR Urban	2.7
Q1 year	2.4
Q1 year	2.4
Q30 years	4.6
Q100 years	5.6

PLAYGROUND EXTENSION GREENFIELD RUNOFF RATE CALCUATION (Qbar)

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.470
Area (ha)	0.235	Urban	0.000
SAAR (mm)	1070	Region Number	Region 10

Results l/s

QBAR Rural	1.9
QBAR Urban	1.9
Q1 year	1.6
Q1 year	1.6
Q30 years	3.2
Q100 years	3.9

LEISURE CENTRE DEVELOPMENT HYDRAULIC CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.267	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.200	4-8	0.141

Total Area Contributing (ha) = 0.341

Total Pipe Volume (m³) = 12.498

Network Design Table for Storm

« - 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
S1.000	21.000	0.400	52.5	0.047	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S1.001	18.900	0.200	94.5	0.031	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.002	27.100	0.180	150.6	0.048	0.00	0.0	0.600	o	300	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)
S1.000	39.50	5.25	7.850	0.047	0.0	0.0	0.0	1.39	24.6	6.7
S1.001	38.84	5.49	7.375	0.078	0.0	0.0	0.0	1.35	53.5	10.9
S1.002	37.90	5.84	7.100	0.126	0.0	0.0	0.0	1.28	90.4	17.2

Network Design Table for Storm

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
S1.003	27.000	0.450	60.0	0.051	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	9.500	0.225	42.2	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	18.700	0.100	187.0	0.044	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.000	10.000	0.100	100.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	13.000	0.325	40.0	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	18.600	0.800	23.3	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	13.100	0.080	163.8	0.091	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.004	5.900	0.100	59.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	10.200	0.015	680.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	38.300	0.275	139.3	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)
S1.003	37.33	6.06	6.920	0.177	0.0	0.0	0.0	2.03	143.7	23.9
S1.004	37.17	6.13	6.470	0.181	0.0	0.0	0.0	2.43	171.5	24.3
S1.005	36.60	6.36	4.950	0.225	0.0	0.0	0.0	1.32	146.0	29.7
S2.000	39.75	5.17	7.850	0.000	0.0	0.0	0.0	1.00	17.8	0.0
S2.001	39.45	5.27	7.675	0.013	0.0	0.0	0.0	2.07	82.5	1.9
S2.002	39.12	5.38	7.350	0.025	0.0	0.0	0.0	2.73	108.4	3.5
S2.003	38.63	5.56	6.475	0.116	0.0	0.0	0.0	1.23	86.7	16.2
S2.004	38.52	5.60	4.950	0.116	0.0	0.0	0.0	2.36	261.0	16.2
S1.006	36.02	6.61	4.850	0.341	0.0	0.0	0.0	0.69	75.9	44.4
S1.007	34.39	7.36	4.835	0.341	0.0	0.0	0.0	0.85	15.0«	44.4

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	S	6.410	4.560	4.560	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	1.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.267		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: STANK, DS/PN: S1.006, Volume (m^3): 6.0

Unit Reference	MD-SHE-0067-2700-2000-2700
Design Head (m)	2.000
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	4.850
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	2.000	2.7	Kick-Flo®	0.594	1.6
Flush-Flo™	0.289	1.9	Mean Flow over Head Range	-	2.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.6	1.200	2.1	3.000	3.3	7.000	4.8
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.0
0.300	1.9	1.600	2.4	4.000	3.7	8.000	5.2
0.400	1.9	1.800	2.6	4.500	3.9	8.500	5.3
0.500	1.8	2.000	2.7	5.000	4.1	9.000	5.4
0.600	1.6	2.200	2.8	5.500	4.3	9.500	5.6
0.800	1.8	2.400	2.9	6.000	4.5		
1.000	2.0	2.600	3.0	6.500	4.7		

Storage Structures for Storm

Cellular Storage Manhole: STANK, DS/PN: S1.006

Invert Level (m) 4.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	169.0	0.0	2.001	0.0	0.0
2.000	169.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 1.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.267
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS.01	15 Summer	1	+40%	100/15 Summer				7.916
S1.001	SS.02	15 Summer	1	+40%					7.459
S1.002	SS.03	15 Summer	1	+40%					7.206
S1.003	SS.04	15 Summer	1	+40%					7.018
S1.004	SS.05	15 Summer	1	+40%					6.574
S1.005	SS.06	1440 Summer	1	+40%	1/360 Summer				5.459
S2.000	SS.09	15 Summer	1	+40%					7.850
S2.001	SS.10	15 Summer	1	+40%					7.701
S2.002	SS.11	15 Summer	1	+40%					7.380
S2.003	SS.12	15 Summer	1	+40%	100/15 Summer				6.581
S2.004	SS.13	1440 Summer	1	+40%	1/360 Summer				5.458
S1.006	STANK	1440 Summer	1	+40%	1/180 Summer				5.458
S1.007	SS.07	180 Summer	1	+40%					4.871

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS.01	-0.084	0.000	0.39			9.1	OK	
S1.001	SS.02	-0.141	0.000	0.29			14.0	OK	
S1.002	SS.03	-0.194	0.000	0.27			21.8	OK	
S1.003	SS.04	-0.202	0.000	0.23			30.0	OK	
S1.004	SS.05	-0.196	0.000	0.26			30.7	OK	
S1.005	SS.06	0.134	0.000	0.05			5.8	SURCHARGED	
S2.000	SS.09	-0.150	0.000	0.00			0.0	OK	
S2.001	SS.10	-0.199	0.000	0.03			2.1	OK	
S2.002	SS.11	-0.195	0.000	0.04			4.1	OK	
S2.003	SS.12	-0.194	0.000	0.27			19.1	OK	
S2.004	SS.13	0.133	0.000	0.02			3.0	SURCHARGED	
S1.006	STANK	0.233	0.000	0.04		719	1.9	SURCHARGED	
S1.007	SS.07	-0.114	0.000	0.13			1.9	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 1.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.267
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS.01	15 Summer	30	+40%	100/15 Summer				7.967
S1.001	SS.02	15 Summer	30	+40%					7.529
S1.002	SS.03	15 Summer	30	+40%					7.302
S1.003	SS.04	15 Summer	30	+40%					7.106
S1.004	SS.05	15 Summer	30	+40%					6.670
S1.005	SS.06	1440 Winter	30	+40%	1/360 Summer				6.298
S2.000	SS.09	15 Summer	30	+40%					7.850
S2.001	SS.10	15 Summer	30	+40%					7.722
S2.002	SS.11	15 Summer	30	+40%					7.405
S2.003	SS.12	15 Summer	30	+40%	100/15 Summer				6.692
S2.004	SS.13	1440 Winter	30	+40%	1/360 Summer				6.297
S1.006	STANK	1440 Winter	30	+40%	1/180 Summer				6.297
S1.007	SS.07	1440 Winter	30	+40%					4.875

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS.01	-0.033	0.000	0.96			22.2	OK	
S1.001	SS.02	-0.071	0.000	0.80			38.3	OK	
S1.002	SS.03	-0.098	0.000	0.77			62.4	OK	
S1.003	SS.04	-0.114	0.000	0.68			88.0	OK	
S1.004	SS.05	-0.100	0.000	0.76			90.0	OK	
S1.005	SS.06	0.973	0.000	0.06			7.2	SURCHARGED	
S2.000	SS.09	-0.150	0.000	0.00			0.0	OK	
S2.001	SS.10	-0.178	0.000	0.10			6.9	OK	
S2.002	SS.11	-0.170	0.000	0.14			13.3	OK	
S2.003	SS.12	-0.083	0.000	0.87			61.9	OK	
S2.004	SS.13	0.972	0.000	0.03			3.7	SURCHARGED	
S1.006	STANK	1.072	0.000	0.05		1229	2.3	SURCHARGED	
S1.007	SS.07	-0.110	0.000	0.16			2.3	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 1.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.267
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS.01	15 Summer	100	+40%	100/15 Summer				8.155
S1.001	SS.02	15 Summer	100	+40%					7.555
S1.002	SS.03	15 Summer	100	+40%					7.337
S1.003	SS.04	15 Summer	100	+40%					7.138
S1.004	SS.05	960 Winter	100	+40%					6.739
S1.005	SS.06	960 Winter	100	+40%	1/360 Summer				6.738
S2.000	SS.09	15 Summer	100	+40%					7.850
S2.001	SS.10	15 Summer	100	+40%					7.728
S2.002	SS.11	15 Summer	100	+40%					7.413
S2.003	SS.12	15 Summer	100	+40%	100/15 Summer				6.783
S2.004	SS.13	960 Winter	100	+40%	1/360 Summer				6.737
S1.006	STANK	960 Winter	100	+40%	1/180 Summer				6.737
S1.007	SS.07	960 Winter	100	+40%					4.878

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS.01	0.155	0.000	1.18			27.3	SURCHARGED	
S1.001	SS.02	-0.045	0.000	0.96			46.4	OK	
S1.002	SS.03	-0.063	0.000	0.95			77.4	OK	
S1.003	SS.04	-0.082	0.000	0.85			110.4	OK	
S1.004	SS.05	-0.031	0.000	0.08			9.9	OK	
S1.005	SS.06	1.413	0.000	0.10			12.1	SURCHARGED	
S2.000	SS.09	-0.150	0.000	0.00			0.0	OK	
S2.001	SS.10	-0.172	0.000	0.13			8.9	OK	
S2.002	SS.11	-0.162	0.000	0.18			17.1	OK	
S2.003	SS.12	0.008	0.000	1.12			79.7	SURCHARGED	
S2.004	SS.13	1.412	0.000	0.05			6.2	SURCHARGED	
S1.006	STANK	1.512	0.000	0.05		1210	2.6	SURCHARGED	
S1.007	SS.07	-0.107	0.000	0.18			2.6	OK	

CAR PARK DEVELOPMENT HYDRAULIC CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.267	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.084	4-8	0.040

Total Area Contributing (ha) = 0.124

Total Pipe Volume (m³) = 1.353

Network Design Table for Storm

« - 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	10.800	0.072	150.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	2.300	0.040	57.5	0.051	5.00	0.0	0.600	o	225	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	39.74	5.17	7.227	0.059	0.0	0.0	0.0	1.07	42.4	8.5
2.000	40.18	5.02	7.195	0.051	0.0	0.0	0.0	1.73	68.7	7.4

Network Design Table for Storm

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
1.001	13.300	0.070	190.0	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	5.400	0.015	360.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	11.300	0.110	102.7	0.000	0.00	0.0	0.600	o	100	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)
1.001	39.07	5.40	7.155	0.124	0.0	0.0	0.0	0.95	37.6	17.5
1.002	38.70	5.54	7.085	0.124	0.0	0.0	0.0	0.68	27.2	17.5
1.003	38.04	5.78	7.070	0.124	0.0	0.0	0.0	0.76	6.0«	17.5

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		8.350	6.960	6.960	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	1.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.267		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: TANK, DS/PN: 1.002, Volume (m³): 2.0

Unit Reference	MD-SHE-0059-1400-0800-1400
Design Head (m)	0.800
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	7.085
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	1.4	Kick-Flo®	0.510	1.1
Flush-Flo™	0.251	1.4	Mean Flow over Head Range	-	1.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	1.200	1.7	3.000	2.6	7.000	3.8
0.200	1.4	1.400	1.8	3.500	2.7	7.500	3.9
0.300	1.4	1.600	1.9	4.000	2.9	8.000	4.0
0.400	1.3	1.800	2.0	4.500	3.1	8.500	4.2
0.500	1.2	2.000	2.1	5.000	3.2	9.000	4.3
0.600	1.2	2.200	2.2	5.500	3.4	9.500	4.4
0.800	1.4	2.400	2.3	6.000	3.5		
1.000	1.5	2.600	2.4	6.500	3.7		

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 1.002

Invert Level (m) 7.085 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m^2)	Inf. Area (m^2)	Depth (m)	Area (m^2)	Inf. Area (m^2)
0.000	144.0	0.0	0.801	0.0	0.0
0.800	144.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	1.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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 Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.267
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years)	1, 30, 100
Climate Change (%)	40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S.20	15 Summer	1	+40%	30/15 Summer				7.324
2.000	S.23	15 Summer	1	+40%	30/15 Summer				7.303
1.001	S.21	15 Summer	1	+40%	30/15 Summer				7.298
1.002	TANK	960 Summer	1	+40%	30/30 Summer				7.290
1.003	S.22	960 Summer	1	+40%					7.103

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S.20	-0.128	0.000	0.32			11.4	OK	
2.000	S.23	-0.117	0.000	0.33			9.8	OK	
1.001	S.21	-0.082	0.000	0.72			23.4	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	TANK	-0.020	0.000	0.06		379	1.3	OK	
1.003	S.22	-0.067	0.000	0.24			1.3	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 1.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 18.000
Ratio R 0.267
Cv (Summer) 1.000
Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S.20	960 Summer	30	+40%	30/15 Summer				7.599
2.000	S.23	960 Summer	30	+40%	30/15 Summer				7.598
1.001	S.21	960 Summer	30	+40%	30/15 Summer				7.598
1.002	TANK	960 Summer	30	+40%	30/30 Summer				7.596
1.003	S.22	2160 Winter	30	+40%					7.104

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S.20	0.147	0.000	0.11			3.9	SURCHARGED	
2.000	S.23	0.178	0.000	0.11			3.3	SURCHARGED	
1.001	S.21	0.218	0.000	0.25			8.0	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	TANK	0.286	0.000	0.06		638	1.4	SURCHARGED	
1.003	S.22	-0.066	0.000	0.25			1.4	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 1.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.267
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S.20	960 Summer	100	+40%	30/15 Summer				7.777
2.000	S.23	960 Summer	100	+40%	30/15 Summer				7.777
1.001	S.21	960 Summer	100	+40%	30/15 Summer				7.776
1.002	TANK	960 Summer	100	+40%	30/30 Summer				7.774
1.003	S.22	720 Winter	100	+40%					7.104

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S.20	0.325	0.000	0.14			4.9	SURCHARGED	
2.000	S.23	0.357	0.000	0.14			4.2	SURCHARGED	
1.001	S.21	0.396	0.000	0.31			10.2	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	TANK	0.464	0.000	0.06		800	1.4	SURCHARGED	
1.003	S.22	-0.066	0.000	0.25			1.4	OK	

PLAYGROUND DEVELOPMENT HYDRAULIC CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.267	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.166	4-8	0.068

Total Area Contributing (ha) = 0.234

Total Pipe Volume (m³) = 11.599

Network Design Table for Storm

« - 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	22.100	0.220	100.5	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	40.400	0.200	202.0	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	39.400	0.197	200.0	0.105	0.00	0.0	0.600	o	375	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	39.17	5.37	6.850	0.023	0.0	0.0	0.0	1.00	17.7	3.3
1.001	37.54	5.98	6.480	0.075	0.0	0.0	0.0	1.10	77.9	10.2
1.002	36.29	6.49	6.205	0.180	0.0	0.0	0.0	1.28	141.1	23.6

Network Design Table for Storm

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
1.003	8.600	0.043	200.0	0.054	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	18.600	0.115	161.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	8.400	0.031	271.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	8.800	2.000	4.4	0.000	0.00	0.0	0.600	o	100	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)
1.003	36.03	6.60	6.008	0.234	0.0	0.0	0.0	1.28	141.1	30.4
1.004	35.54	6.82	5.965	0.234	0.0	0.0	0.0	1.42	157.1	30.4
1.005	35.26	6.95	5.850	0.234	0.0	0.0	0.0	1.10	121.0	30.4
1.006	35.17	6.99	5.819	0.234	0.0	0.0	0.0	3.71	29.2«	30.4

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		7.960	3.819	3.819	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	1.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.267		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: TANK, DS/PN: 1.005, Volume (m^3): 4.5

Unit Reference	MD-SHE-0063-1900-1200-1900
Design Head (m)	1.200
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	5.850
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.200	1.9	Kick-Flo®	0.558	1.3
Flush-Flo™	0.274	1.7	Mean Flow over Head Range	-	1.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.3
0.200	1.6	1.400	2.0	3.500	3.1	7.500	4.4
0.300	1.7	1.600	2.2	4.000	3.3	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.7
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.8
0.600	1.4	2.200	2.5	5.500	3.8	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.0		
1.000	1.7	2.600	2.7	6.500	4.1		

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 1.005

Invert Level (m) 5.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	185.0	0.0	1.201	0.0	0.0
1.200	185.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	1.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.267
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years)	1, 30, 100
Climate Change (%)	40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S.30	15 Summer	1	+40%					6.903
1.001	S.31	15 Summer	1	+40%	100/360 Summer				6.566
1.002	S.32	15 Summer	1	+40%	30/360 Summer				6.328
1.003	S.33	1440 Summer	1	+40%	30/15 Summer				6.186
1.004	S.34	1440 Summer	1	+40%	30/120 Summer				6.186
1.005	TANK	1440 Summer	1	+40%	30/60 Summer				6.185
1.006	S.35	2160 Summer	1	+40%					5.835

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S.30	-0.097	0.000	0.26			4.4	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	S.31	-0.214	0.000	0.18			12.7	OK	
1.002	S.32	-0.252	0.000	0.23			29.3	OK	
1.003	S.33	-0.197	0.000	0.06			6.1	OK	
1.004	S.34	-0.154	0.000	0.05			6.0	OK	
1.005	TANK	-0.040	0.000	0.02		572	1.7	OK	
1.006	S.35	-0.084	0.000	0.06			1.7	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 1.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.267
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S.30	15 Summer	30	+40%					6.939
1.001	S.31	960 Winter	30	+40%	100/360 Summer				6.677
1.002	S.32	960 Winter	30	+40%	30/360 Summer				6.677
1.003	S.33	960 Winter	30	+40%	30/15 Summer				6.676
1.004	S.34	960 Winter	30	+40%	30/120 Summer				6.675
1.005	TANK	960 Winter	30	+40%	30/60 Summer				6.674
1.006	S.35	240 Winter	30	+40%					5.835

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S.30	-0.061	0.000	0.64			10.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	S.31	-0.103	0.000	0.04			3.2	OK	
1.002	S.32	0.097	0.000	0.06			7.7	SURCHARGED	
1.003	S.33	0.293	0.000	0.09			9.4	SURCHARGED	
1.004	S.34	0.335	0.000	0.07			9.2	SURCHARGED	
1.005	TANK	0.449	0.000	0.02		964	1.7	SURCHARGED	
1.006	S.35	-0.084	0.000	0.06			1.7	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 1.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.267
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S.30	960 Winter	100	+40%					6.958
1.001	S.31	960 Winter	100	+40%	100/360 Summer				6.957
1.002	S.32	960 Winter	100	+40%	30/360 Summer				6.957
1.003	S.33	960 Winter	100	+40%	30/15 Summer				6.955
1.004	S.34	960 Winter	100	+40%	30/120 Summer				6.955
1.005	TANK	960 Winter	100	+40%	30/60 Summer				6.954
1.006	S.35	960 Winter	100	+40%					5.836

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S.30	-0.042	0.000	0.07			1.3	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	S.31	0.177	0.000	0.06			4.1	SURCHARGED	
1.002	S.32	0.377	0.000	0.07			9.4	SURCHARGED	
1.003	S.33	0.572	0.000	0.12			11.7	SURCHARGED	
1.004	S.34	0.615	0.000	0.09			11.6	SURCHARGED	
1.005	TANK	0.729	0.000	0.02		1156	1.8	SURCHARGED	
1.006	S.35	-0.083	0.000	0.07			1.8	OK	

APPENDIX F – SuDS MAINTENANCE SCHEDULE

Project Title:	Millom Leisure Centre Development		
Furness Ref:	L2762	Date:	11.08.23

Proposed SuDS Maintenance Schedule

The following maintenance schedule has been produced in line with CIRIA C753 'The SuDS Manual' recommendations for the Millom Leisure Centre Development. Prior to the completion of the development, ownership & maintenance responsibility for the site drainage network should be clearly defined and agreed between the client, operator, & maintenance contractor/local authority.

Party Responsible for Implementing Maintenance Schedule: ***Cumberland Council***
Refer to following drawings for details: ***L2762-FUR-XX-XX-DR-D-0921, 0922, 0923, 0931, 0932***

Table 1 – Pipe, Manhole & Gully Maintenance Schedule

Maintenance Schedule	***Action***	***Frequency***
Regular Maintenance	Cleaning of gutters and filters on downpipes and brushing/sweeping of leaves debris that may cause blockages in gullies.	Annually
	Inspect for sediment and debris in pre-treatment components (i.e., catchpits and gully silt traps), and inside manhole rings.	Annually (or as required)
Occasional Maintenance	Remove sediment/debris from pre-treatment components (i.e., catchpits).	As required, based on regular inspections
Remedial Actions	Trimming of roots that may be causing blockages and patch repair of pipework that has cracked or deformed.	As required
	Repair/rehabilitate manhole and gully inlets & outlets.	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in 1st year, then annually
	Check to ensure gullies and manholes are emptying fully.	Annually

Table 2 – Cellular Attenuation/Soakaway Tank Maintenance Schedule – *Tank supplier should be contacted once confirmed for product specific maintenance requirements*

Maintenance Schedule	***Action***	***Frequency***
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance [i.e., leaves]).	Monthly (or as required)
	Remove sediment from pre-treatment structures (i.e., catchpits)	Annually (or as required)
Remedial Actions	Repair/rehabilitate inlets, outlets and vents.	As required
Monitoring	Inspect/check all inlets, outlets and vents to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years (or as required)

Table 3 – Oil Separator Maintenance Schedule – *Oil Separator supplier should be contacted once confirmed for product specific maintenance requirements*

Maintenance Schedule	***Action***	***Frequency***
Routine Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Remove sediment, oil, grease and floating debris.	As necessary - indicated by system inspections or immediately following significant spill
Remedial Actions	Replace malfunctioning parts or structures.	As required
Monitoring	Inspect for evidence of poor operation.	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months