Technical Note
SuDS Drainage (Discharge of Planning Conditions)

Proposed Development, New Dwellings, 1515 Ashton Old Road, Fairfield Manchester

CLIENT
KMM Homes

DOCUMENT NUMBER
23065-AJF-ZZ-ZZ-RP-D-002

AJF ENGINEERING CONSULTANTS Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW

0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

AJF ENGINEERING CONSULTANTS

Prepared by:	B Patel MEng(Hons) MICE		March 2023
Checked by:	Lisulo Sitali MEng(Hons) CEng MICE		March 2023
Approved by:	Alex Fairhurst MEng(Hons) CEng MIStructE		March 2023

Rev:	Date:	By:	Chkd:	Aprvd:	Summary:
R01	31/03/2023	BP	CLS	AJF	For Approval

CONTENTS

1. INTRODUCTION....1
2. SITE DESCRIPTION....2
3. PROPOSED SITE DRAINAGE....3
4. FLOOD RISK....7
5. OPERATION AND MAINTENANCE....8
6. CONCLUSIONS....9
7. APPENDICES....10

Appendices

Appendix A – Proposed Site Plan

Appendix B – United Utilities Sewer Records

Appendix C - Proposed Drainage Foul & Surface Water Layout

Appendix D - Drainage Modelling & Calculations

1. INTRODUCTION

Background

1.1. This report has been prepared by AJF Structural Engineering, on behalf of our client KMM Homes, to discharge the planning conditions relating to the drainage arrangements for the proposed site.

1.2. The proposed development comprises the construction of 3no. new dwellings with associated landscaping and car parking and vehicle access.

1.3. This report outlines the proposed foul and surface water drainage arrangements and aims to establish whether the proposed development is at risk of any form flooding. The report will also aim to demonstrate that a reduction in surface water run-off from the site can be achieved.

1.4. The proposed development is located on the land behind 1515 Ashton Old Road, Fairfield, Manchester

1.5.

1.6. The local authority is Manchester City Council.

1.7. The technical note has been prepared in accordance with current Lead Local Flood Authority (LLFA) and National Planning Policy Framework (NPPF) policy.

1.8. The general limitations of this report are as follows;

- Several data sources have been utilised in the compiling of this report. Whilst AJF Structural Engineering believe them to be accurate and trustworthy it cannot guarantee the accuracy of the information provided by others beyond reasonable doubt.

- This report is based on the most update information available at the time of writing and preparation. There is always the potential of further information becoming available, which may result in the need to amend the findings/conclusions of this report.

Planning Conditions Relating to Drainage

1.9. Planning permission has been granted for the development and a copy of the planning decision notice is enclosed. For information from the planning application please refer to Manchester City Council planning application number – **133433/FO/2022**. The specific conditions relating to drainage are as follows;

Condition 19	**19) Development shall not begin until a surface water drainage scheme for the site, based on sustainable drainage principles has been submitted to and approved in writing by the local planning authority. The development shall be constructed and completed in accordance with the approved details.** **Reason - To prevent the increased risk of flooding, to improve and protect water quality and ensure future maintenance of the surface water drainage system pursuant to policy EN17 of the Core Strategy for the City of Manchester.**
Condition 20	**20) Prior to occupation of the development a sustainable drainage management and maintenance plan for the lifetime of the development shall be submitted to the local planning authority and agreed in writing. The sustainable drainage management and maintenance plan shall include as a minimum:** **a. Arrangements for adoption by an appropriate public body or statutory undertaker, or, management and maintenance by a resident's management company; and** **b. Arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage system to secure the operation of the surface water drainage scheme throughout its lifetime.**

	The development shall subsequently be completed, maintained and managed in accordance with the approved plan. **Reason: To manage flooding and pollution and to ensure that a managing body is in place for the sustainable drainage system and there is funding and maintenance mechanism for the lifetime of the development, pursuant to policies EN8 and EN14 of the Core Strategy for the City of Manchester and the guidance within the National Planning Policy Framework.**

Statutory Requirements and Guidance

1.10. The following documentation has been utilised to develop this drainage report;

- (Lead Local Flood Authority) Surface Water Guidance.
- Department for Communities and Local Government National Planning Policy Framework, 2012.
- CIRIA 753, 2012: The SuDS Manual This document provides current best practice national guidance on the planning, design, construction, operation and maintenance of SuDS to facilitate their effective implementation within developments.
- Flood Estimation for Small Catchments, Report 124; Institute of Hydrology, 1994.
- EA / DEFRA Report SC030219: Rainfall Run-off Management for Developments.
- Sewers for Adoption - A Design and Construction Guide for Developers.
- Strategic Flood Risk Assessment - March 2016
- BS EN 752 – Drain and Sewer Systems Outside Buildings
- BS EN 12056 – Gravity Drainage Systems Inside Buildings
- Building Regulations Approved Document Part H – Drainage and waste disposal
- BRE Digest 365 – Soakaway Design
- Sewerage Sector Guidance Appendix C – Design and Construction Guidance

2. SITE DESCRIPTION

Existing Surface Water Drainage Arrangements

2.1. Existing sewer / survey records have been obtained by the client during the planning phase, the drainage authority responsible for the sewage services in the area is United Utilities. The survey record can be found in **Appendix B.** The survey record indicates a 225mm diameter combined sewer within Club Street and continues towards Ashton Old Road. No existing sewers within the site are indicated on the survey.

Existing Site Foul Water Drainage Arrangements

2.2. The existing buildings that were demolished are assumed to have had unrestricted discharge to the local combined sewer network. The survey record indicates a 225mm diameter combined sewer within Club Street and continues towards Ashton Old Road. No existing sewers within the site are indicated on the survey.

Geological Site Assessment

2.3. A Phase 2 Geo-Environmental Site Investigation has been undertaken for the site. This indicates that infiltration via soakaways is not viable for the site. Please refer to page 4 of the Ground Investigation report which state the following;

"Falling Head Permeability tests were attempted in each of the boreholes within the clay stratum. Each test showed no measurable drop in water levels, conclusively indicating that soakaway drainage is not feasible on this site."

3. PROPOSED SITE DRAINAGE

SuDS - Drainage Design Parameters

3.1. Surface water arising from a developed site should, as far as practical, be managed in a sustainable manner to mimic the surface water flows arising from the undeveloped site through the application of nature-based solutions where possible.

3.2. Planning policy states that all new developments should attempt to, where at all practical, restrict run-off to simulate a pre-development greenfield scenario.

3.3. There are several potential SuDS components that can be implemented on this site. They have been assessed and can be seen in the table below:

SuDS Feature	Environmental Benefits	Water Quality Improvement	Suitability for low permeability Soils	Ground-water recharge	Suitable for small / confined sites?	Site specific restrictions	Appropriate for subject site?
Wetlands	√	√	√	X	X	Site Constraints	No
Retention ponds	√	√	√	X	X	Site Constraints	No
Detention basins	√	√	√	X	X	Site Constraints	No
Infiltration basins	√	√	X	√	X	Site Constraints	No
Soakaways	X	√	X	√	√	None	Yes
Underground storage	X	X	√	X	√	None	Yes
Swales	√	√	√	√	X	Site Constraints	No
Filter strips	√	√	√	√	√	None	No
Rainwater harvesting	X	√	√	√	√	None	Water Butts
Permeable paving	X	√	√	√	√	None	No
Green roofs	√	√	√	X	√	Pitched Roof	No
Rain Garden (external)	√	√	√	X	X	Site Constraints	No
Rain Garden (planter)	√	√	√	X	X	Site Constraints	No

3.4. Suitably designed Sustainable Drainage Systems (SUDS) can be utilised such that they not only attenuate flows but also provide a level of improvement to the quality of the water passed onto water bodies or into the ground. It is proposed that the site has two levels of treatment. Prevention and source control are considered as the first level of treatment and the site control as the second.

3.5. The proposed surface water flow from the proposed development must drain in accordance with the SUDs hierarchy as outlined in the National Planning Practice Guidance (NPPG). In addition to the NPPG guidance, the industry standards along with the Environment Agency and Design & Construction Guide dictates for below ground surface water drainage such that:

- There will be no surcharging of the drainage system for a 1 in 2-year storm.
- The drainage can be surcharged with no flooding for a 1 in 30-year storm.
- The drainage can flood on-site for a 1 in a 100-year storm with a 45% Climate Change allowance provided the flood water remains on site and does not affect safe ingress and egress to the site for occupiers.

SuDS Hierarchy – Outfall Options

3.6. A number of outfall options have been assessed for discharge of surface water drainage for the proposed development. The National Planning Practice Guidance stipulates those sites should "aim to discharge surface water run-off as high up the SUDs hierarchy as reasonably practicable". These outfall options are as follows:

Into the ground (infiltration).	Not viable
To a surface water body.	N/A
To a surface water sewer or highway drain.	N/A – None within proximity of site
To a combined sewer.	Proposed Option

Surface Water Drainage Proposals

3.7. The proposal is for surface water runoff from the roofs and external areas to be directed to the below ground gravity network. This water is considered to be generally clean and with limited contamination and may be discharged directly to the new drainage infrastructure and SuDS components. Silt is to be prevented from entering the drainage system using trapped gullies, channel drains with silt traps, catchpit chambers or by the use of other sustainable drainage techniques. A surface water drainage model has been created with the above drainage components and the results of the drainage modelling are included in **Appendix D.**

Discharge to Ground (Soakaway Infiltration Option)

3.8. Discharge to ground via soakaway is the preferred option but the Phase 2 Ground Investigation report has indicated that infiltration to ground is not viable for this site. Please refer to Ground investigation report for further details.

Discharge to Watercourse

3.9. Discharge directly to watercourse is not deemed to be feasible as there are no watercourse or rivers nearby. To discharge to any watercourse would mean crossing third party land and various public highways which is not feasible.

Discharge to Public Sewer Network

3.10. This is the proposed discharge option given all other options are not feasible. The discharge will be restricted to the greenfield rate of 2 l/s as detailed in the drainage strategy report submitted for planning.

3.11. The site survey record indicates a 225mm diameter combined sewer within Club Street, that we propose to connect to as detailed in the planning drainage strategy report. This connection and discharge are subject to United Utilities approval. A CCTV survey is conducted to verify the invert levels and conditions of the sewer.

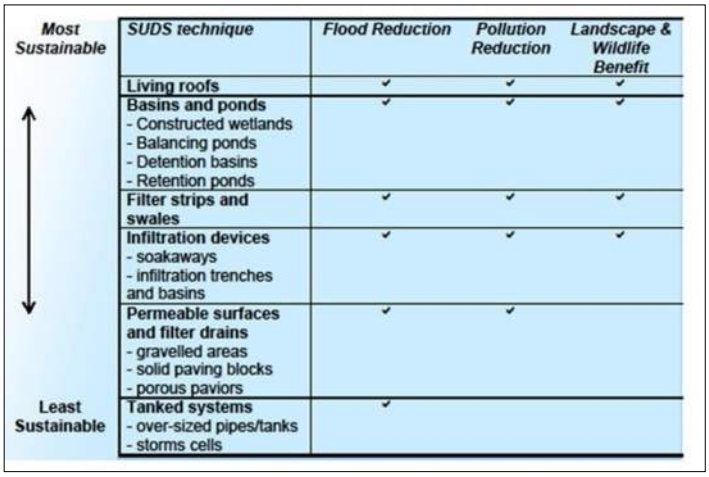
3.12. United Utilities will be required to confirm that have capacity for any additional surface water discharge into the combined sewer and a peak discharge rate will be agreed.

Attenuation Requirements

3.13. To reduce the site surface water discharge rate into the public sewer, attenuation would be required on site. This attenuation will be provided with Sustainable Drainage Systems (SuDS) as outlined previously.

3.14. This would follow a cascading SuDS principle looking to attenuate surface water as close to source as possible. Adequate water treatment would be provided on site to ensure all discharge from site meets the appropriate water quality criteria.

3.15. Options for proposed attenuation have been assessed in accordance with the SUDS hierarchy as per CIRIA The SuDS Manual C753 (below).



3.16. Several potential storage options are available including proposed communal gardens, permeable paving and below ground storage tanks or oversized pipes.

3.17. The proposed attenuation tank at the rear of the site has been designed and modelled to provide adequate attenuation for the plots for all storm events including the 1 in 100-year storm event plus a 45% climate change allowance.

Surface Water Storage Details

3.18. Below ground storage in the form of a tank, oversized pipes or cellular attenuation will be provided to achieve the storage requirement prior to controlled discharge into the public sewer. Cellular storage at the rear of the site is the preferred attenuation method.

Surface Water Exceedance Events

3.19. If the proposed drainage system were to become blocked or an event above the design event occur, then exceedance flows would be routed away from the building towards the front gardens and access road area to the side and rear of the site. This would mimic what would occur naturally on the site in its existing condition and would ensure that the proposed dwellings are safe during an exceedance event.

Water Quality

3.20. A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate “train” or sequence of SuDS components that are connected in series.

3.21. The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

3.22. The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015).

3.23. The proposed development is a combination of very low (roof water) to low hazard (runoff from small car parking areas), as indicated on the table below:

Hazard	Source of Hazard	Present
Very Low	Residential Roof Drainage	**Yes**
Low	Residential amenity uses – low car parking spaces and roads, other roof drainage.	**Yes**
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage roads and motorways)	**No**
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste	**No**

3.24. The site does not lie within a source protection zone and therefore additional treatment stages are not required.

3.25. The extent of treatment depends on land use, level of pollution prevention in the catchment and the natural protection afforded by underlying soil layers. A high hazard site will require more treatment than low hazard one.

3.26. The treatment processes provided by different SuDS components will have varying capabilities for removal of different types of contaminants as per the table below:

Hazard	Requirements for discharge to surface water and ground water	Present
Very Low	Removal of solids and sediments only.	**Yes**
Low	Simple index approach	**Yes**
Medium	Surface water : Simple Index approach Ground water: Simple Index approach & risk screening	**No**
High	Discharge may require environmental permit or licence. Risk assessment likely required. Seek advise from Environmental regulator.	**No**

3.27. Treatment has been provided in the form of catchpit manholes to remove sediment and contaminated particles as well as geotextiles as a filter medium, where appropriate.

Allowance For Climate Change

3.28. In line with the current legislation and regulations, the proposed site drainage has been designed to accommodate the following climate change allowances based on the design life of the development of 100 years.

- The allowance for climate change 'central estimate' of 30% is used for design purposes to assess the performance of the drainage system and ensure it can cope with the critical duration design rainfall event.

- The allowance for climate change 'upper end' of 45% is used in sensitivity analysis to assess the potential flood risk implications both on and off-site in the critical duration design rainfall event. When using the upper end figure, it must be ensured that surface water is wholly contained on site and that flood hazard is within acceptable tolerances using the Defra/Environment Agency document (Flood Risk Assessment Guidance for New Development) (ref: FD2320)

Proposed Foul Water Drainage

3.29. A review of the survey information identifies there to be public combined water sewer to the west of the site (refer to survey information within **Appendix B**). The demolished property that stood on the site is understood to have discharged foul water into the existing public sewer network.

3.30. The below ground foul drainage system shall be designed to latest Design & Construction Guide, BS EN 752 Parts 3 and 4, and the Building Regulations Document H.

3.31. A new foul drainage system will be provided within the site to pick up proposed internal connections and will discharge to the United Utilities 225mm diameter combined sewer within Club Street. A new connection will be constructed via an existing manhole or saddle connection to be agreed with United Utilities. All new connections to the existing sewer will be subject to a Section 106 agreement with United Utilities.

3.32. A detailed design has been undertaken and is included on Drawing 23065-AJF-ZZ-ZZ-DR-D-001 – Proposed Surface and Foul Drainage Layout – **Appendix C.**

Abandonments & Diversions

3.33. The private and United Utilities existing sewers within the proposed site will need to be abandoned or diverted to accommodate the proposed development. The extents and alignment of the existing sewers within the site are to be confirmed by a CCTV drainage survey prior to any works being undertaken.

4. FLOOD RISK

Surface Water Flood Risk

4.1. Overland flow / Surface water flooding may occur when rainwater is unable to drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. It can run quickly off land and result in localised flooding.

4.2. The EA's surface water flood map identifies that the majority of the site has a 'very low' surface water flood risk which is defined where "each year, this area has a chance of flooding of less than 1 in 1000 (0.1%)."

4.3. Any residual flood risk associated with surface water will be reduced through the appropriate design of site levels and implementation of formal surface water drainage infrastructure. It is recommended that the finished floor levels of the proposed dwellings are raised above the proposed external levels by a minimum 150mm following the proposed site regrade. This will assist in protecting the properties from the ingress of excess surface water run-off. The site regrading and levels should also be designed to maintain the existing overland flow routes within the site, directing excess surface water away from the dwellings. Any proposed overland exceedance should be designed to ensure no increased flood risk to others would result from the residual surface water.

Flood Risk Mitigation Measures & Residual Risks

4.4. Although the site is located within Flood zone 1 and at low risk of flooding from the various sources reviewed, there is still a need to implement some straightforward mitigation measures to safeguard the proposed development from any residual flood risks including that indicated from sewers. These also take into account any uncertainties relating to climate change in accordance with the NPPF and CIRIA 753.

Proposed Mitigation Measures

4.5. It is proposed that the finished floor levels of the new residential development are set to a minimum of 150mm above the external site levels following any regrading or cut & fill exercise. This should mitigate against any potential risk from overland run-offs or surface water flooding.

4.6. The new surface water drainage system should be designed to retain surface water up to and including the 1 in 100-year return period storm event with a 45% allowance for climate change all contained within the site.

4.7. The proposed drainage system should be regularly maintained in accordance with the drainage maintenance plan and regime to avoid any blockages with the foul and surface water systems. Any drainage not offered up for adoption by the Statutory undertaker should be maintained and inspected by a suitability qualified person or company.

5. OPERATION AND MAINTENANCE

5.1. The proposed sustainable drainage systems will require routine maintenance throughout their lifespan to ensure they operate to the design performance standards. To ensure a robust maintenance regime is maintained a sustainable drainage management and maintenance plan will be developed prior to the development being occupied. The client will be responsible for developing this plan in conjunction with their designers.

5.2. The sustainable drainage management and maintenance plan should include arrangements "for the sustainable drainage systems to be adopted by an appropriate public body or statutory undertaker under a Section 104 Agreement, or management and maintenance by a resident's management company."

5.3. The management and maintenance plan should also include arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage system to secure the operation of the surface water drainage scheme throughout its lifetime.

5.4. CIRIA C753 provides guidance on the operation and maintenance requirements of sustainable drainage systems and shall be referred to during the detailed design for the proposed development. The Construction (Design and Management) Regulations 2015 also requires designers to consider all maintenance risks and ensure they are eliminated, reduced, or controlled where appropriate. The project health and safety file will be required to contain this information.

5.5. The design life of some SuDS elements and drainage elements of the proposed system is shorter than the predicted design life of the development. Therefore, the design and maintenance regime take into account any potential replacement works (such as replacing permeable paving).

5.6. A separate operation and maintenance plan has been prepared for the site in accordance with CIRIA C753 – refer to Document 23065-AJF-ZZ-ZZ-RP-D-001 SDMMP for further details.

6. CONCLUSIONS

6.1. AJF Structural Engineering were instructed to produce a SuDS Technical Note under the National Planning Policy Framework (NPPF) to discharge planning conditions outlined by the Manchester City Council Lead Local Flood Authority.

6.2. This SuDS Technical Note outlines the various proposals for the sustainable drainage systems for the proposed development.

6.3. Consultation of the Environment Agency website has confirmed that the site is within Flood Zone 1.

6.4. By ensuring the surface water run-off is managed appropriately the risk of increased flooding offsite as a result of the development will be minimised which conforms with the local and national planning guidance.

6.5. The proposed surface water drainage to retain surface water on-site for the storm events up to and including the 1 in 100-year return period with 45% allowance for climate change.

6.6. The surface water is proposed to discharge to the United Utilities 225mm diameter combined sewer at a restricted rate of 2 l/s in line with the SuDS hierarchy requirements.

6.7. All external hard-standing areas will be drained via conventional means such as gullies, channel drains all of which will have trapped outlets and suitable silt catch pits in accordance with Planning Policy Statement 3 (PPS3). The surface water will be discharged to the combined sewer at a restricted rate of 2 l/s. The foul water drainage will discharge to United Utilities existing combined sewer at an unrestricted rate to be agreed by United Utilities.

6.8. Section 106 agreements will be required if the new drainage is to be connected to the existing United Utilities sewers. All below ground drainage is to be designed in accordance with Sewers for Adoption 7th edition, BS EN 752 Parts 3 and 4, and Building Regulations Part H.

6.9. The report has demonstrated that the proposed drainage measures ensure that no property will be at risk of flooding if the development proceeds and that suitable means of surface water and foul drainage can be achieved for the proposed development.

7. APPENDICES

Appendix A

Proposed Site Plan

NOTES

Copyright: All rights reserved.
This drawing must not be reproduced without permission.
This drawing must not be scaled. Dimensions are in millimetres unless specified.



MASTERPLAN
1 : 100

KEY:

SITE BOUNDARY LINE

HARDWORKS

TEGULA MODULAR PAVING
To building frontage + Driveways
Dimensions: 160 x 120mm - nominal joints 5mm

MACADAM
To driveways

SOFTWORKS

PROPOSED LAWN WITH PLANTING
Rolled turf laid onto minimum depth of 200mm topsoil.
Planted into minimum depth of 450mm topsoil.

LAWN
Rolled turf laid onto minimum depth of 200mm topsoil.

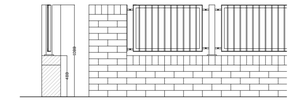
PROPOSED TREE
Planted into minimum depth of 450mm topsoil.

BOUNDARY TREATMENTS

REAR FENCING
Location - Rear
Material - Timber 1800mm Feather Edge Board Fence

RAILING
Location - Front
Material - Black painted (see below image)

LOW LEVEL WALL 488mm
Location - Front
Material - Red Brick - to match existing street scene along club street/ old ashton road)



LOW LEVEL WALL 488mm WITH RAILING

HIGH LEVEL WALL 1800mm
Location - Corner plot Club Street
Material - Red Brick - to match existing street scene along club street/ old ashton road)

BINS, RUBBISH AND RECYCLING

Bins from houses to be put out for emptying at the front of property.
Including:

1 x 140lt **Brown** Slimline Wheelie Bin

1 x 140lt **Green** Slimline Wheelie Bin

1 x 140lt **Grey** Slimline Wheelie Bin

1 x 140lt **Blue** Slimline Wheelie Bin

Blue, Brown and Green bin to be substituted for box or caddy where storage at the front of property is not sufficient.

OTHER

EV — **ELECTRIC CAR CHARGING POINT**
Location - Parking Bays

STORAGE/ BIKE SHED
Location - To rear of properties

DRIVEWAY GATE
Location - Driveways to rear of plot 01. Materials to match houses along Old Ashton Road.



HOUSE TYPES

TYPE	NUMBER	HEIGHT/ STOREY	BED/ PER	AREA GEA/ GIA
01	03	3	3B6P	135SQM/ 113SQM
TOTAL:	3			

Notes:

THE CONTENT OF THIS DRAWING IS FOR DESIGN INTENT AND REQUIRES FURTHER DESIGN DEVELOPMENT AND COORDINATION WITH ALL RELEVANT CONSULTANTS, SUB-CONTRACTORS, SPECIALIST DESIGNERS AND STATUTORY AUTHORITIES.

1 0 1 2 3 4 5
SCALE 1: 100 m

NORTH

REV	DATE	REVISION NOTE	BY	CHECK
P4	08.07.22	Amended in-line with comments from CC	RM	CC
P3	07.07.22	Amended in-line with highway comments	RM	CC
P2	Date 2	Amended in-line with comments from CG	RM	CC
P1	24.03.22	Amended in-line with comments from CC	RM	CC

THE GROVE SITE

SITE PLAN

0000_ 70400 REV P4

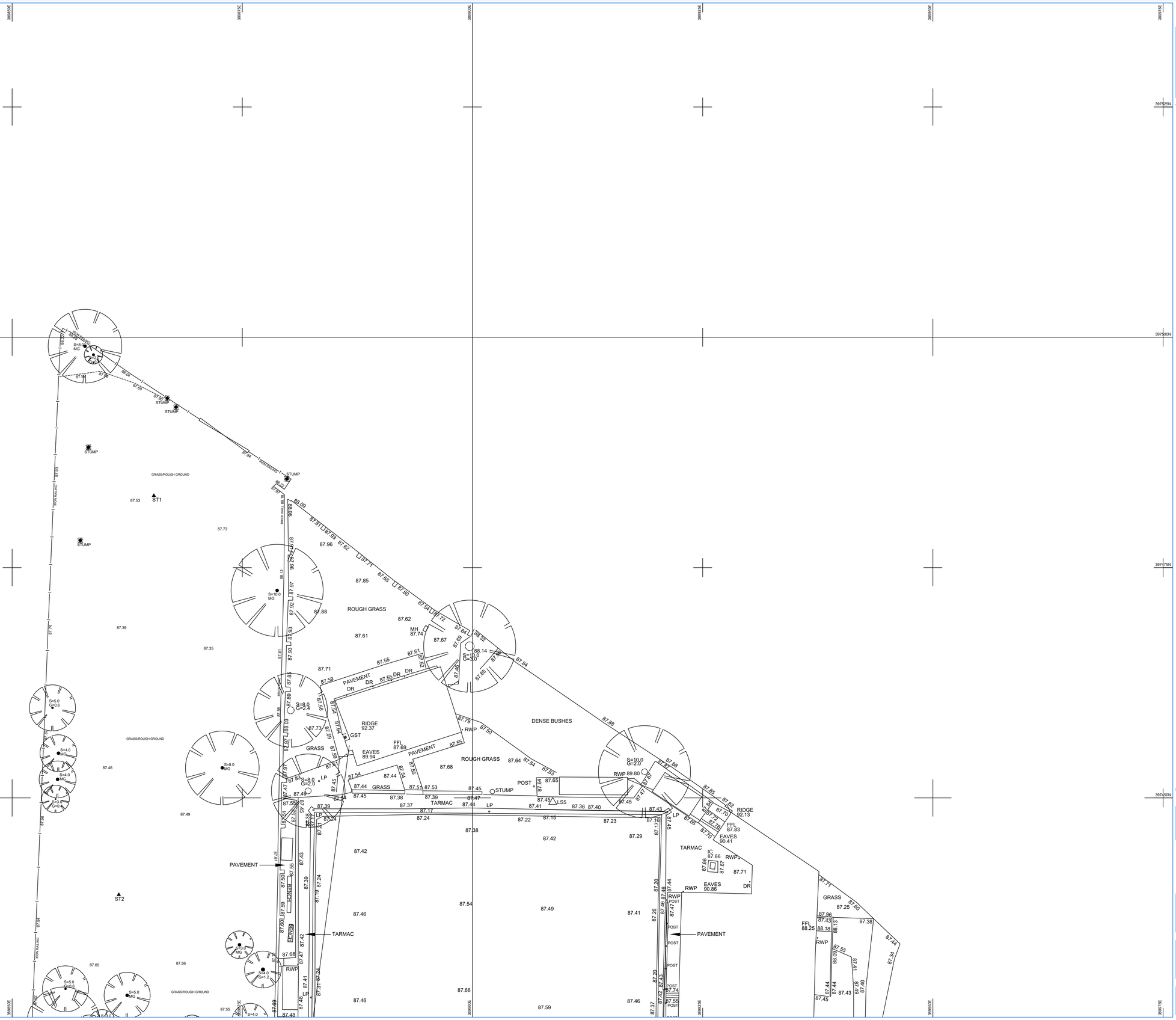
STATUS | PLANNING
SCALE | As indicated
DRAWN BY | RM
DATE | 23.03.22

BG- EWA- ZZ- 00- DR- A- 70400

Appendix B

Site Survey Record and Topo Survey

© Layer Surveys Ltd. 2022
Reproduction in whole or in part by any means is prohibited without the prior permission of Layer Surveys Ltd.


398850E
398875E
398900E
398925E
398950E
398975E
397525N
397500N
397475N
397450N
S=8.0 MG
S=10.0 MG
S=5.0 G=0.6
S=4.0 MG
S=5.0 MG
S=4.0 G=1.2
S=8.0 G=2.0
S=10.0 G=2.0
MH 87.74
RWP 89.80
RWP 88.14
RWP 87.66
RWP 90.86
RWP 87.74
RWP 87.50
RWP 87.55
RWP 87.60
RWP 87.54
RWP 87.72
RWP 87.64
RWP 87.32
RWP 87.84
RWP 87.88
RWP 87.82
RWP 87.70
RWP 87.78
RWP 87.68
RWP 87.70
RWP 87.71
RWP 87.60
RWP 87.46
RWP 87.47
RWP 87.48
RWP 87.24
RWP 87.31
RWP 87.53
RWP 87.62
RWP 87.71
RWP 87.65

© Layer Surveys Ltd. 2022
Reproduction in whole or in part by any means is prohibited without the prior permission of Layer Surveys Ltd.

BACKWELL STREET

CLUB STREET

ASHTON OLD ROAD

ARTIFICAIL GRASS

PAVEMENT

TARMAC

CONCRETE

GRASS

EXISTING BUILDING
THE GROVE PUB

EXISTING OUTHOUSE

EXISTING BUILDING

IRON RAILING

BRICK WALL

PLAN GRID NORTH

File Name: LAYER5DEV001176.dwg

LEGEND

AV	AIR VALVE	PP	PETROL PUMP
BH	BOREHOLE / INSPECTION COVER	RE	RODDING EYE
CB	CONTROL BOX	RWP	RAINWATER PIPE
CCTV	CCTV CAMERA POST	SOF	SOFFIT LEVEL
COV	CABLE / INSPECTION COVER	TC	TOP OF CURB
CW	CABLE TELEVISION	TEL	TELEPHONE CALL BOX
DC	DRAINAGE CHANNEL	TL	TRAFFIC LIGHT
DP	DOWN PIPE	TLB	TRAFFIC LIGHT BOX
DR	DRAIN	TP	TELEGRAPH POLE
EIC	ELEC. INSPECTION COVER	WM	WATER METER
ELB	ELECTRIC BOX	WO	WATER OUTLET
EP	ELECTRIC POLE	WSV	WATER STOP TAP
FH	FIRE HYDRANT	WSC	WATER STOP VALVE
FFL	FINISHED FLOOR LEVEL	EOT	END OF TRACK
FH	FIRE HYDRANT	OSA	OUT OF SURVEY AREA
G	GULLY	UIC	UNABLE TO LIFT
GLT	GROUND LIGHT	UTS	UNABLE TO SPACE
GST	GAS TAP	UTT	UNABLE TO TRACE
GV	GAS VALVE	VEG	VEGETATION
IC	INSPECTION COVER	BLK	BLOCKED
IL	INVERT LEVEL	NFN	NO FURTHER GPR CONTACTS
LP	LAMP POST	NVP	NO VISIBLE PIPE
LP	LAMP POST	NVS	NO VISIBLE SPG
MH	MANHOLE	TOP	TOP OF PIPE
MP	MARKER POST	EOT	EOT SYMBOL
OP	OVERFLOW PIPE	DIR	DIRECTION
PN	PYLON	GPR	GPR EOT SYMBOL

BT
CABLE DUCT
CABLE TV
CCTV
TELECOMS
EARTH ROD STRIP
FIBRE OPTICS
FIBRE OPTICS
FUEL LINE
HIGH TENSION LINE
MAINS GAS
MAINS WATER
SEWER CW
SEWER FW
SEWER UNK
TRAFFIC SIGNAL CABLE
UNIDENTIFIED TRACE
UNIDENTIFIED CABLE
UNIDENTIFIED PIPE
VEHICLE DETECTION CABLE
Rail

Linetypes With Suffixes (S) (A) (R) show Statutory Authority, Assumed and Recorded Underground Data.

NOTES:

All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

Services shown as From Statutory Authority Plans' line styles are taken from Statutory Records plans supplied by the relevant regional authority. These services were not located and are shown for indicative purposes only.

Please note survey control established for mapping only. Control shouldn't be used by third parties without confirmation from Layer Surveys Ltd.

Additional survey areas added to drawing LAYER*20933.

DISCLAIMER:

At Layer Surveys staff use skilled and experienced staff, modern up to date techniques and top of the range electromagnetic and radar technology to locate and trace sub-surface utilities. However the performance of the equipment employed in non-invasive surveys can be adversely affected by factors outside the control of Layer Surveys. Therefore Layer Surveys cannot guarantee that all utilities present on site have been located. It is the responsibility of the client to obtain additional authority records and undertake trial digs where appropriate.

Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience overspill from the adjacent service and thus give a false impression of an isolated line. The displayed depth will refer to the shallowest detected utility.

Successful tracing of non-conductive materials may be limited. Drainage gullys are dye tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 2m deep may be accurate to +/-200mm) but this cannot be guaranteed. Depths shown usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey, it is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or rough/uneven ground.

Existing record information that was made available to Layer Surveys by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

Excavation in the vicinity of services shown should be carried out with due diligence (Ref. HSG47).

0 20m 40m 80m 120m
SCALE BAR 1:200

REV	DATE	DESCRIPTION

Layer Surveys Ltd
See the Complete Picture

Client
KMM Homes
Stockport Road
Cheadle
SK8 2EA

Project Title
The Fairfield
Backwell Street
M11 1NE

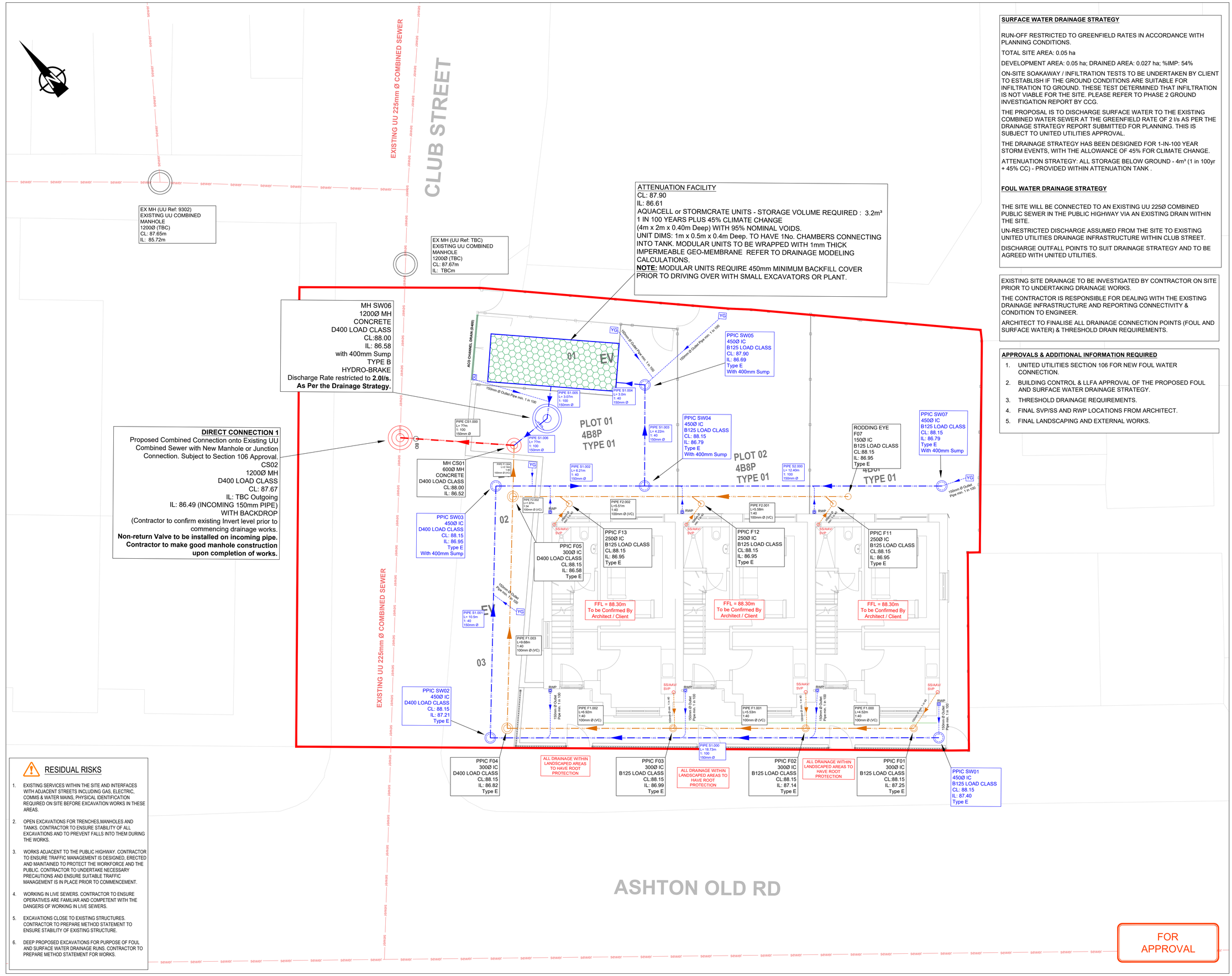
Surveyed	Drawn	Checked
S.T/T.W	J.S	Layer Surveys

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	March 22	1176	02	A1	

Appendix C

Proposed Drainage Foul & Surface Water Layout

ISO A0 841mm x 1189mm



SURFACE WATER DRAINAGE STRATEGY

RUN-OFF RESTRICTED TO GREENFIELD RATES IN ACCORDANCE WITH PLANNING CONDITIONS.

TOTAL SITE AREA: 0.05 ha

DEVELOPMENT AREA: 0.05 ha; DRAINED AREA: 0.027 ha; %IMP: 54%

ON-SITE SOAKAWAY / INFILTRATION TESTS TO BE UNDERTAKEN BY CLIENT TO ESTABLISH IF THE GROUND CONDITIONS ARE SUITABLE FOR INFILTRATION TO GROUND. THESE TEST DETERMINED THAT INFILTRATION IS NOT VIABLE FOR THE SITE. PLEASE REFER TO PHASE 2 GROUND INVESTIGATION REPORT BY CCG.

THE PROPOSAL IS TO DISCHARGE SURFACE WATER TO THE EXISTING COMBINED WATER SEWER AT THE GREENFIELD RATE OF 2 l/s AS PER THE DRAINAGE STRATEGY REPORT SUBMITTED FOR PLANNING. THIS IS SUBJECT TO UNITED UTILITIES APPROVAL.

THE DRAINAGE STRATEGY HAS BEEN DESIGNED FOR 1-IN-100 YEAR STORM EVENTS, WITH THE ALLOWANCE OF 45% FOR CLIMATE CHANGE.

ATTENUATION STRATEGY: ALL STORAGE BELOW GROUND - 4m³ (1 in 100yr + 45% CC) - PROVIDED WITHIN ATTENUATION TANK .

FOUL WATER DRAINAGE STRATEGY

THE SITE WILL BE CONNECTED TO AN EXISTING UU 225Ø COMBINED PUBLIC SEWER IN THE PUBLIC HIGHWAY VIA AN EXISTING DRAIN WITHIN THE SITE.

UN-RESTRICTED DISCHARGE ASSUMED FROM THE SITE TO EXISTING UNITED UTILITIES DRAINAGE INFRASTRUCTURE WITHIN CLUB STREET.

DISCHARGE OUTFALL POINTS TO SUIT DRAINAGE STRATEGY AND TO BE AGREED WITH UNITED UTILITIES.

EXISTING SITE DRAINAGE TO BE INVESTIGATED BY CONTRACTOR ON SITE PRIOR TO UNDERTAKING DRAINAGE WORKS.

THE CONTRACTOR IS RESPONSIBLE FOR DEALING WITH THE EXISTING DRAINAGE INFRASTRUCTURE AND REPORTING CONNECTIVITY & CONDITION TO ENGINEER.

ARCHITECT TO FINALISE ALL DRAINAGE CONNECTION POINTS (FOUL AND SURFACE WATER) & THRESHOLD DRAIN REQUIREMENTS.

APPROVALS & ADDITIONAL INFORMATION REQUIRED

1. UNITED UTILITIES SECTION 106 FOR NEW FOUL WATER CONNECTION.
2. BUILDING CONTROL & LLFA APPROVAL OF THE PROPOSED FOUL AND SURFACE WATER DRAINAGE STRATEGY.
3. THRESHOLD DRAINAGE REQUIREMENTS.
4. FINAL SVP/SS AND RWP LOCATIONS FROM ARCHITECT.
5. FINAL LANDSCAPING AND EXTERNAL WORKS.

RESIDUAL RISKS

1. EXISTING SERVICES WITHIN THE SITE AND INTERFACES WITH ADJACENT STREETS INCLUDING GAS, ELECTRIC, COMMS & WATER MAINS, PHYSICAL IDENTIFICATION REQUIRED ON SITE BEFORE EXCAVATION WORKS IN THESE AREAS.
2. OPEN EXCAVATIONS FOR TRENCHES,MANHOLES AND TANKS. CONTRACTOR TO ENSURE STABILITY OF ALL EXCAVATIONS AND TO PREVENT FALLS INTO THEM DURING THE WORKS.
3. WORKS ADJACENT TO THE PUBLIC HIGHWAY. CONTRACTOR TO ENSURE TRAFFIC MANAGEMENT IS DESIGNED, ERECTED AND MAINTAINED TO PROTECT THE WORKFORCE AND THE PUBLIC. CONTRACTOR TO UNDERTAKE NECESSARY PRECAUTIONS AND ENSURE SUITABLE TRAFFIC MANAGEMENT IS IN PLACE PRIOR TO COMMENCEMENT.
4. WORKING IN LIVE SEWERS. CONTRACTOR TO ENSURE OPERATIVES ARE FAMILIAR AND COMPETENT WITH THE DANGERS OF WORKING IN LIVE SEWERS.
5. EXCAVATIONS CLOSE TO EXISTING STRUCTURES. CONTRACTOR TO PREPARE METHOD STATEMENT TO ENSURE STABILITY OF EXISTING STRUCTURE.
6. DEEP PROPOSED EXCAVATIONS FOR PURPOSE OF FOUL AND SURFACE WATER DRAINAGE RUNS. CONTRACTOR TO PREPARE METHOD STATEMENT FOR WORKS.

NOTES

1. DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS.
2. ALL PIPE DIAMETERS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES UNLESS OTHERWISE STATED.
3. LOCATIONS AND LEVELS OF CONNECTIONS TO EXISTING SEWERS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO COMMENCING WORKS. ANOMALIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. COVER LEVELS FOR MANHOLES AND INSPECTION CHAMBERS ARE INDICATIVE ONLY - THEY SHALL BE LAID FLUSH WITH THE ADJACENT SURFACING.
5. ALL WORKS TO COMPLY WITH "DESIGN & CONSTRUCTION GUIDE LATEST EDITION". ALL WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS OTHERWISE STATED.
6. PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
   - PROPOSED PIPEWORK WITH <1.2m DEPTH TOSOFFIT IN ROADS/SERVICE AREAS.
   - OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS.
   - OR 0.6m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS Z BEDDING.
7. INSPECTION CHAMBERS IN DRIVEWAYS ARE TO HAVE CLASS C250 COVERS AND FRAMES.
8. PIPEWORK BUILT THROUGH STRUCTURAL WALL SHALL HAVE 50mm CLEARANCE AND A SUITABLE LINTEL INSTALLED TO OPENING.FLEXIBLE JOINTS EITHER SIDE OF THE WALL SHOULD BE LOCATED NOT MORE THEN 150mm FROM THE FACE.
9. TYPE 3 AND 4 PPIC'S ARE BY WAVIN OR SIMILAR APPROVED.
10. ANY 100mm DIA PIPE WITHOUT A WC CONNECTION SHOULD NOT BE FLATTER THAN 1:40
11. ALL RWP'S ARE TO OUTFALL VIA PLASTIDRAIN INLET HOPPER GULLY - BN 110 PIE OR SIMILAR APPROVED.
12. A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL. IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
13. ALL AREAS TO BE SCANNED FOR EXISTING BURIED SERVICES OR OTHER OBSTRUCTIONS PRIOR TO EXCAVATION WORKS.
14. PROPOSED FOUL DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS 2010 DRAINAGE & WASTE DISPOSAL - PART H 2015 EDITION.
15. ALL MANHOLE COVER LEVELS AND EXTERNAL FINISHED FLOOR LEVELS ARE TO BE CONFIRMED BY THE ARCHITECT. COVER LEVELS FOR MANHOLES AND INSPECTION CHAMBERS ARE INDICATIVE ONLY - THEY SHALL BE LAID FLUSH WITH THE ADJACENT SURFACING.
16. CONTRACTOR TO CONFIRM INVERT LEVELS OF PROPOSED CONNECTION ON EXISTING WELSH WATER SEWERS.
17. ALL SOIL STACK CONNECTIONS TO BELOW GROUND DRAINAGE TO BE 100mm Ø LAID AT MINIMUM 1:80 GRADIENT (MIN. 1WC), UNLESS OTHERWISE STATED ON DRAWING.
18. ANY REQUIRED FOUNDATION PENETRATION DETAILS TO BE PROVIDED BY STRUCTURAL ENGINEER.
19. CONNECTIONS UPSTREAM TO SVP/SS TO BE DESIGNED BY OTHERS.
20. THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED ADOPTABLE LATERAL DRAIN ARE IN ACCORDANCE WITH THOSE SET OUT IN 'SEWERS FOR ADOPTION' 7TH EDITION, AND THE REQUIREMENTS OF UU AS THE STATUTORY SEWERAGE UNDERTAKER.
21. FOUL PIPEWORK TO BE VITRIFIED CLAY OR PLASTIC .VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
22. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF E2.21 & E2.22 (PAGE 89) OF SEWERS FOR ADOPTION 7TH EDITION.
23. ANY PIPE RUNS WITH LESS THAN 0.9m COVER LOCATED WITHIN NON-TRAFFICKED AREAS ARE TO BE 150mm GEN CONCRETE BED AND SURROUND.
24. ANY INTERNAL MANHOLES COVERS ARE TO BE LAID FLUSH WITH FINISHED FLOOR LEVEL AND ARE TO BE DOUBLE SEALED AIR TIGHT ODOUR-LESS COVERS.
25. THE LOCATION OF ANY INTERNAL MANHOLES TO BE CONFIRMED WITH ARCHITECT TO ENSURE MANHOLES ARE SUITABLE AND ACCESSIBLE WITH RESPECT TO FLOOR FINISHES.
26. ANY GREASE DRAINS THAT ARE DIRECTED TO GREASE TRAPS MUST USE CAST IRON PIPING SYSTEMS THAT ALLOW MECHANICAL CLEANING WHEN BLOCKAGES OCCUR.
27. ALL SVP LOCATIONS AND DISCHARGE UNITS ARE PROVIDED BY M&E ENGINEER OR ARCHITECT.
28. ALL SVPs ARE TO HAVE LOW LEVEL ACCESS PLATES.
29. FOUL DRAINAGE REST BENDS TO BE MINIMUM -450mm DEEP.
30. DRAINAGE CONNECTIONS TO BE MADE SOFFIT TO SOFFIT FOR SURFACE WATER.
31. A SECTION 106 APPLICATION TO CONNECT TO THE FOUL & SURFACE WATER DRAINAGE SYSTEMS MUST BE MADE TO UNITED UTILITIES, THE DEVELOPER SHALL GIVE 21 DAYS' NOTICE PRIOR TO CONNECTION. THE WORKS MAY ONLY BE UNDERTAKEN BY AN SSIP HEALTH AND SAFETY APPROVED CONTRACTOR."

KEY

- SITE BOUNDARY
- SW 1 — PROPOSED SURFACE WATER DRAIN
- TW 1 — PROPOSED SURFACE WATER DRAIN
- sewer — EXISTING UU COMBINED SEWER
- sewer — EXISTING UU SURFACE WATER SEWER
- PROPOSED OUTLET PIPE
- PROPOSED COMBINED SEWER
- PROPOSED COMBINED WATER PRECAST MANHOLE - TYPE B (600 - 1500mmØ)
- PROPOSED COMBINED WATER PRECAST MANHOLE - TYPE B (1050 -1800mmØ)
- PROPOSED SURFACE WATER POLYPROPYLENE INSPECTION CHAMBER - TYPE E (300mm Ø - 600mmØ)
- PROPOSED SURFACE WATER OSMA SIC BY WAVIN OR SIMILAR APPROVED. TYPE E (250mm Ø)
- PROPOSED FOUL WATER POLYPROPYLENE INSPECTION CHAMBER - TYPE E (300mm Ø - 450mm Ø)
- PROPOSED SURFACE WATER OSMA SIC BY WAVIN OR SIMILAR APPROVED. TYPE E (250mm Ø)
- SVP — SOIL VENT PIPE
- RWP — RAINWATER PIPE DOWNPIPE
- CU — CHANNEL DRAIN OUTLET UNIT
- ACO M100D D400 SLOPED CHANNEL DRAIN
- YG — YARD / ROAD GULLY
- PROPOSED ROOT PROTECTION BARRIER (EXACT SPECIFICATION BY ARCHITECT)
- PROPOSED ATTENUATION - AQUACELL OR STORMCRATE UNITS BY WAVIN / BRETT MARTIN OR SIMILAR APPROVED

FOR APPROVAL

Rev:	Date:	Description:
R1	31/03/23	For Approval

Copyright AJF Engineering Consultants Ltd. All rights Reserved. This document is not to be copied wholly or in part, or used by any third party without express written consent of AJF Engineering Consultants Ltd. AJF Engineering Consultants Ltd accepts no responsibility or liability which may arise from reliance or use of this document by any other party or for any other purpose.

Project:
Proposed Development, New Dwellings, 1515 Ashton Old Road, Manchester
Client:
KMM Homes Ltd

Drawing Title:
Proposed Foul & Surface Water Drainage Layout

Scale (@ A0):	Drawn by:	Chkd by:	Aprvd by:
1:50	CLS	BP	AJF

Drawing Number:	Date:	Rev:
23065-AJF-ZZ-ZZ-DR-D-001	March 23	R1

AJF Engineering Consultants Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW
0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

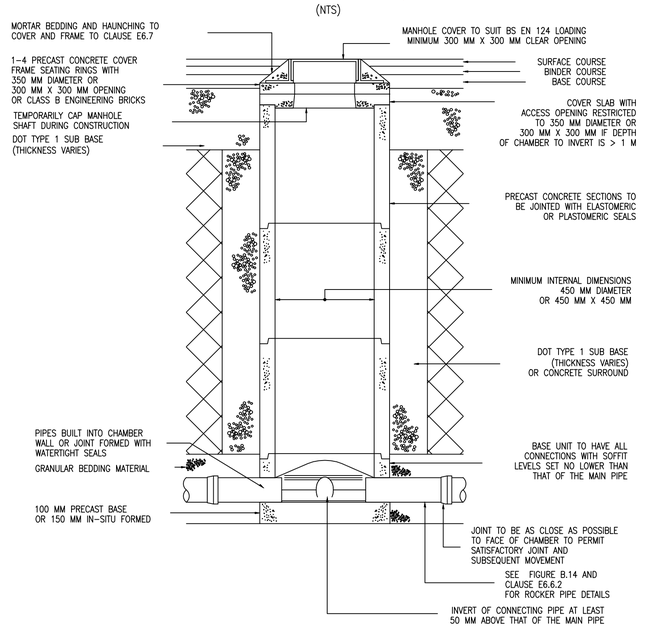
Filename: C:\USERS\BUILDS\TAL\AJF STRUCTURAL ENGINEERING LTD\AJF ENGINEERING - GENERAL\AJF\JOBS\23\23065 THE FAIRFIELDS, OPENSHAW\04_DRAWINGS\DRAINAGE\23065-AJF-ZZ-ZZ-DR-D-001 R1 - PROPOSED FW & SW DRAINAGE LAYOUT.DWG

ISO A1 594mm x 841mm

FIGURE B.18
TYPICAL INSPECTION CHAMBER DETAIL – TYPE D (RIGID MATERIAL DETAIL)

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE
IN AREAS SUBJECT TO VEHICLE LOADING 3m, NON–ENTRY

(NTS)

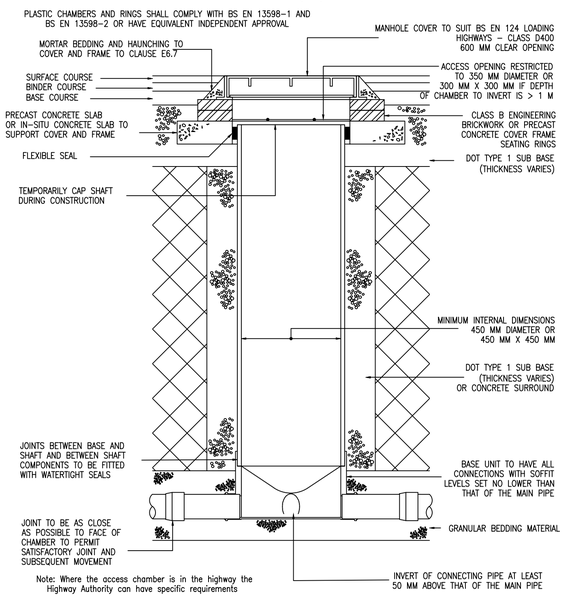


NOTE: WHERE THE ACCESS CHAMBER IS IN THE HIGHWAY THE HIGHWAY AUTHORITY CAN HAVE SPECIFIC REQUIREMENTS

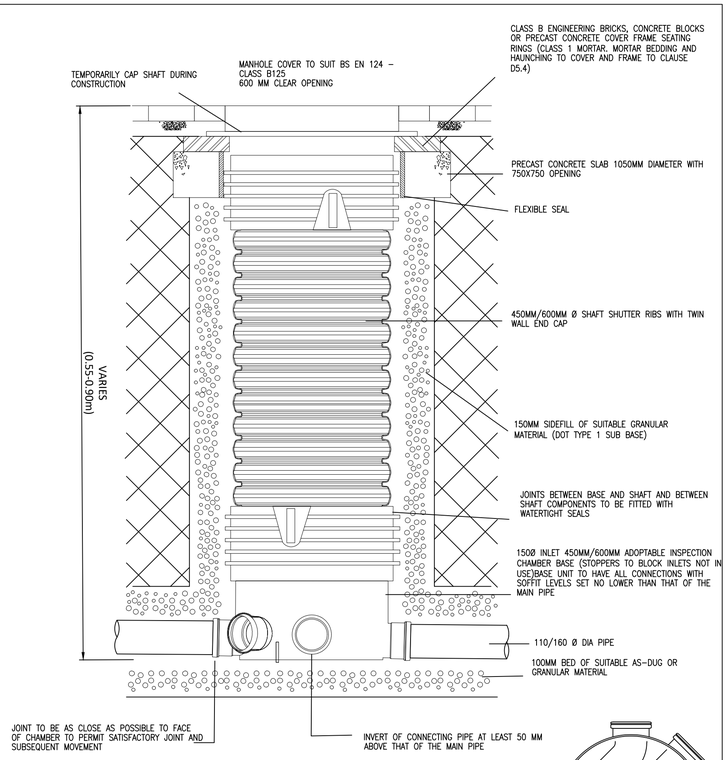
FIGURE B.16
TYPICAL INSPECTION CHAMBER DETAIL – TYPE D (FLEXIBLE MATERIAL DETAIL)

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE
IN AREAS SUBJECT TO VEHICLE LOADING 3m, NON–ENTRY

(NTS)



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



PPIC INSPECTION CHAMBER

BY WAVIN OR SIMILAR APPROVED
(NTS)

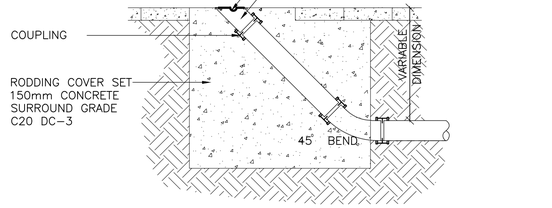
150Ø PIPE, 450MM/600MM Ø ADOPTABLE INSPECTION CHAMBER BASE (STOPPERS TO BLOCK INLETS NOT IN USE)BASE UNIT TO HAVE ALL CONNECTIONS WITH SOFFIT LEVELS SET NO LOWER THAN THAT OF THE MAIN PIPE

NOTES

1. DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS
2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS STATED OTHERWISE
3. THE LENGTH OF THE NEXT PIPE (ROCKER PIPE) AWAY FROM THE STRUCTURE SHALL BE:

PIPE DIAMETER (mm)	LENGTH (m)
DN150 - DN600	0.6

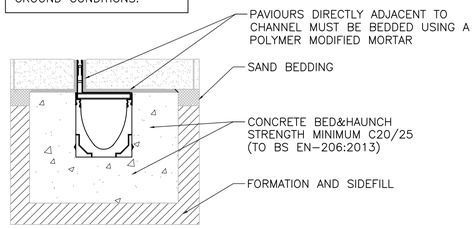
4. ALL DIMENSIONS ARE IN MILLIMETRES
5. PROPOSED MANHOLES ARE TO BE TO SEWERS FOR ADOPTION 7th EDITION AND THE DESIGN & CONSTRUCTION GUIDANCE.
6. DETAILS SHOWN FOR TYPE E PPIC CHAMBERS ARE TAKEN FROM WAVIN DETAILS. THESE CHAMBERS SHALL BE INSTALLED TO THE MANUFACTURERS SPECIFICATION. IF ALTERNATIVE CHAMBERS ARE PROPOSED THE DETAILS MAY VARY AND SHOULD BE SUBMITTED TO TO THE DESIGNER. ALL PART NUMBERS SHOWN RELATE TO WAVIN PRODUCTS.
7. ALL WORKS TO COMPLY WITH "SEWERS FOR ADOPTION-7th EDITION" AND THE DESIGN & CONSTRUCTION GUIDANCE.
8. INSPECTION CHAMBERS IN PAVED AREAS ARE TO HAVE CLASS D400 COVERS AND FRAMES.
9. A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL.IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
10. PIPEWORK TO BE VITRIFIED CLAY OR PLASTIC. VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
11. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION.
12. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF THE DESIGN & CONSTRUCTION GUIDANCE.
13. THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED DRAINAGE ARE IN ACCORDANCE WITH THOSE SET OUT IN THE DESIGN & CONSTRUCTION GUIDANCE, BUILDING REGULATIONS AND THE REQUIREMENT OF UU AS THE STATUTORY SEWERAGE UNDERTAKER.
14. PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
- PROPOSED PIPEWORK WITH <1.2m DEPTH TO SOFFIT IN ROADS/SERVICE AREAS.
- OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS.
- OR <0.6m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS Z BEDDING*



RODDING EYE IN CARRIAGEWAY/HARD LANDSCAPE

SCALE 1:20

FOR CONSTRUCTION DETAILS REFER TO MANUFACTURER REQUIREMENTS CONSIDERING LOADING, LOCATION AND GROUND CONDITIONS.

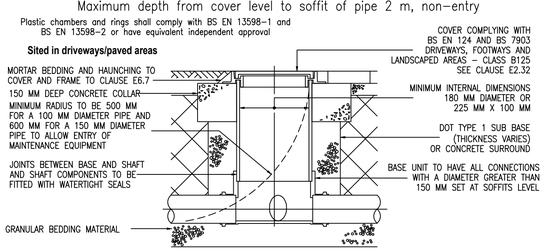


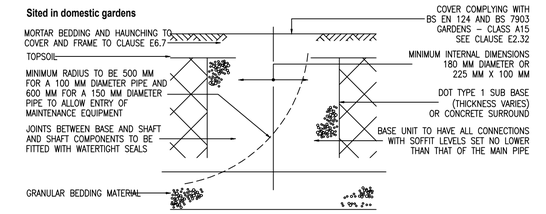
ACO MULTIDRAIN BRICKSLOT CHANNEL INSTALLATION

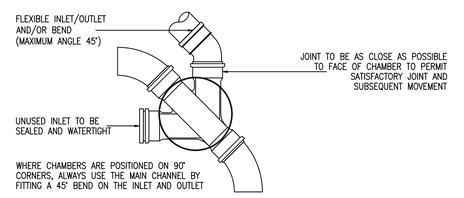
SCALE 1:20

FIGURE B.21
TYPICAL INSPECTION CHAMBER DETAIL – TYPE E (Flexible material detail)

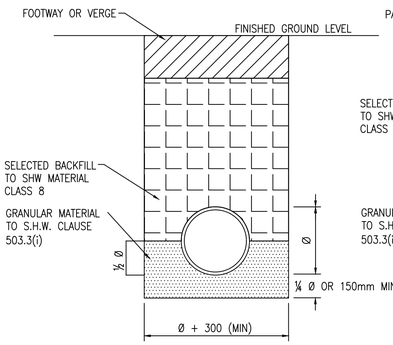
Maximum depth from cover level to soffit of pipe 2 m, non–entry





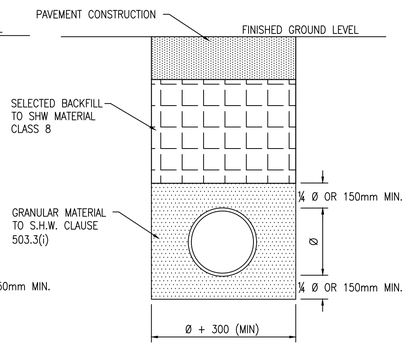


NOTE: WHERE THE ACCESS CHAMBER IS IN THE HIGHWAY THE HIGHWAY AUTHORITY CAN HAVE SPECIFIC REQUIREMENTS



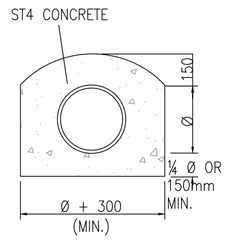
TYPICAL TYPE B BEDDING DETAIL

(TO BE USED WHEN COVER IS GREATER THAN 900mm UNDER NON–TRAFFICKED AREA)



TYPICAL TYPE S BEDDING DETAIL

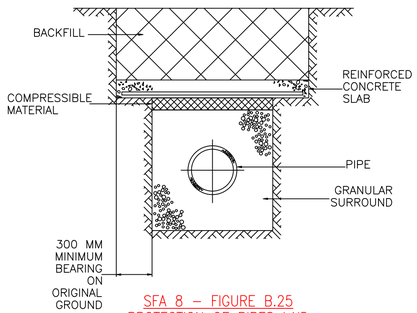
(TO BE USED WHEN COVER IS GREATER THAN 900mm UNDER TRAFFICKED AREA)



TYPICAL TYPE Z BEDDING DETAIL

(TO BE USED WHEN COVER IS LESS THAN 900mm TO PIPE SOFFIT UNDER–TRAFFICKED AREA)

(NTS)



SFA 8 – FIGURE B.25 PROTECTION OF PIPES LAID AT SHALLOW DEPTHS

Rev:	Date:	Description:
R1	31/03/23	For Information.

Copyright AJF Engineering Consultants Ltd. All rights Reserved. This document is not to be copied wholly or in part. or used by any third party without express written consent of AJF Engineering Consultants Ltd. AJF Engineering Consultants Ltd accepts no responsibility or liability which may arise from reliance or use of this document by any other party or for any other purpose.

Project:

Proposed Development, New Dwellings, 1515 Ashton Old Road, Manchester

Client:

KMM Homes Ltd

Drawing Title:

Drainage Standard Details - Sheet 1

Scale (@ A0):	Drawn by:	Chkd by:	Aprvd by:
NTS	CLS	BP	AJF

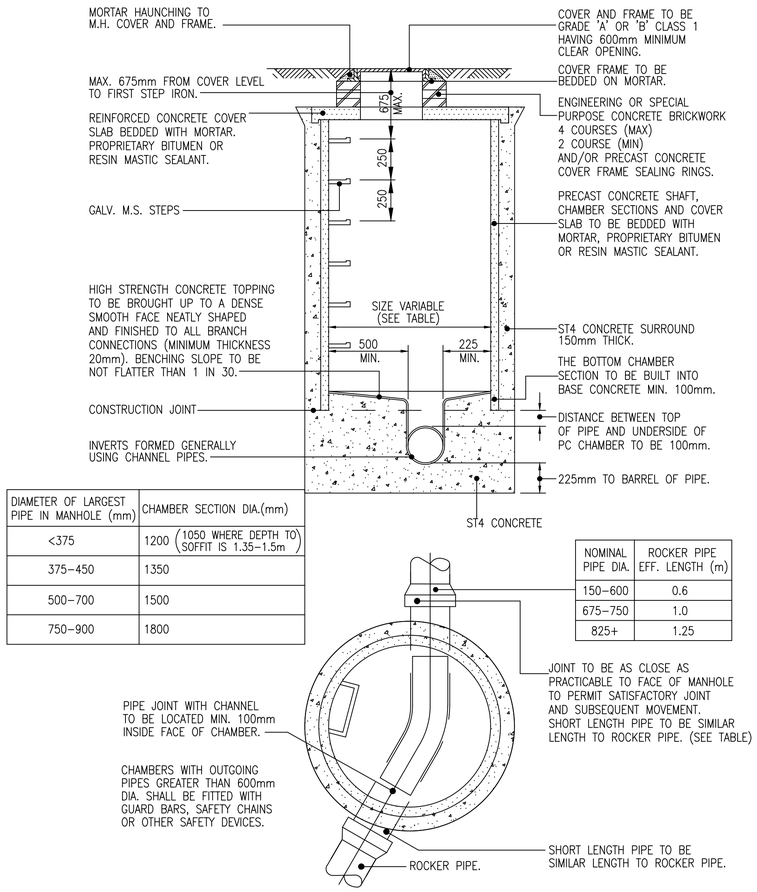
Drawing Number:	Date:	Rev:
23065-AJF-ZZ-ZZ-DR-D-003	March 23	R1

AJF Engineering Consultants Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW

0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

Printed on 100% Post-Consumer Recycled Content Paper

ISO A1 594mm x 841mm



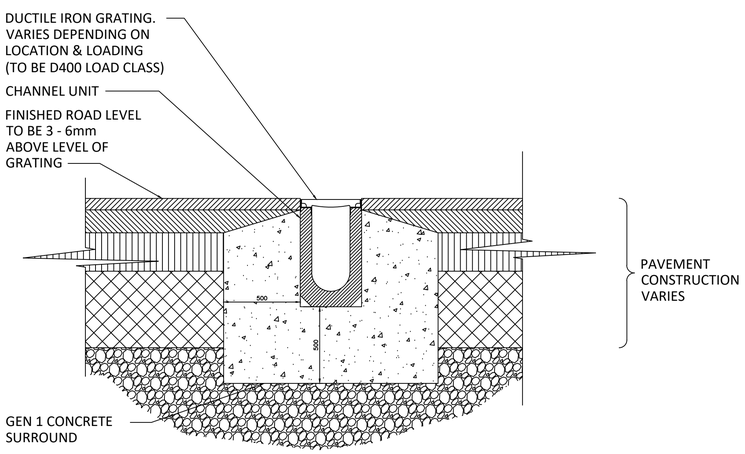
DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	CHAMBER SECTION DIA.(mm)
<375	1200 (1050 WHERE DEPTH TO SOFFIT IS 1.35–1.5m)
375–450	1350
500–700	1500
750–900	1800

NOMINAL PIPE DIA.	ROCKER PIPE EFF. LENGTH (m)
150–600	0.6
675–750	1.0
825+	1.25

THE SAFETY POLICY OF INDIVIDUAL SEWERAGE UNDERTAKERS MAY REQUIRE A LARGER MINIMUM CLEAR OPENING INTO MANHOLES AND THE FITTING OF GUARD BARS, SAFETY CHAINS OR OTHER SAFETY DEVICES IN MANHOLES WITH OUTGOING PIPES OF LESS THAN 600mm DIA.

TYPICAL MANHOLE DETAIL – TYPE B

(MAX. DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 1.35 – 3.0m)
(NTS)



CHANNEL DRAIN DETAIL

(NTS)

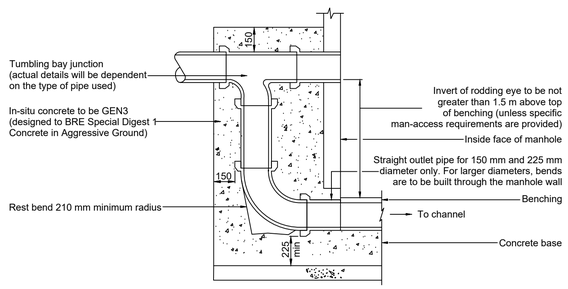
Minimum Dimensions for Access Fittings and Chambers						
Type	Internal Sizes				Cover Sizes	
	Depth to soffit (m)	Size of largest pipe (DN)	Length x Width (mm)	Circular (mm)	Length x Width (mm)	Circular (mm)
Rodding Eye	As Drain but Minimum 100mm					
Shallow Access						
Small	0.6 or less	150	150x100	150	150x100	150
Large			225x100	225	225x100	
Inspection Chamber	0.6 or less			190		190
	1.2 or less	150	450x450	450	450x450	450
	1.2 - 3.0		450x450	450	300x300	350
Manhole	1.5 or less	150	675x750	1200	675x750	n/a
		225	675x1200	1200	1200x675	n/a
		300	675x1200	1200	1200x675	n/a
		>300	DN+450 x1800	The larger of 1800 or (DN+450)	1200x675	n/a
	Over 1.5	225	1200x1000	1200	600x600	600
		300	1200x1075	1200	600x600	600
		375-450	1350x1225	1200	600x600	600
		>450	DN+775 x1800	The larger of 1800 or (DN+775)	1200x675	600
Manhole Shaft	Over 3.0					
- Steps			1050x800	1050	600x600	600
- Ladder			1200x800	1200	600x600	600
- Winch			900x800	900	600x600	600

BUILDING REGULATIONS MINIMUM DIMENSIONS FOR MANHOLES

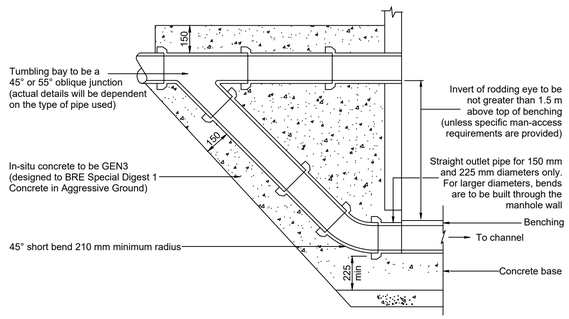
(Not to Scale)

This plan complies with the Building Regulations 2010 Section 'H' - Drainage & Waste Disposal.

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.

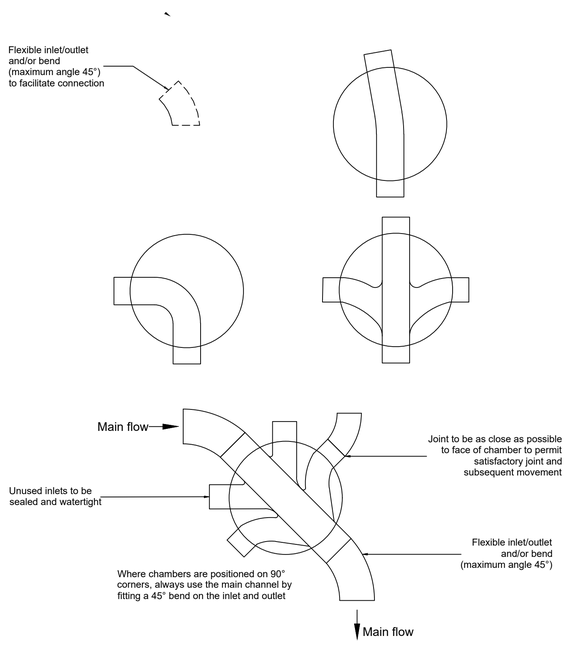


External Vertical Backdrop



External Ramped Backdrop

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

NOTES

1. DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS
2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS STATED OTHERWISE
3. THE LENGTH OF THE NEXT PIPE (ROCKER PIPE) AWAY FROM THE STRUCTURE SHALL BE:

PIPE DIAMETER (mm)	LENGTH (m)
DN150 - DN600	0.6

4. ALL DIMENSIONS ARE IN MILLIMETRES
5. PROPOSED MANHOLES ARE TO BE TO SEWERS FOR ADOPTION 7th EDITION AND THE DESIGN & CONSTRUCTION GUIDANCE.
6. DETAILS SHOWN FOR TYPE E PPIC CHAMBERS ARE TAKEN FROM WAVIN DETAILS. THESE CHAMBERS SHALL BE INSTALLED TO THE MANUFACTURERS SPECIFICATION. IF ALTERNATIVE CHAMBERS ARE PROPOSED THE DETAILS MAY VARY AND SHOULD BE SUBMITTED TO TO THE DESIGNER. ALL PART NUMBERS SHOWN RELATE TO WAVIN PRODUCTS.
7. ALL WORKS TO COMPLY WITH "SEWERS FOR ADOPTION-7th EDITION" AND THE DESIGN & CONSTRUCTION GUIDANCE.
8. INSPECTION CHAMBERS IN PAVED AREAS ARE TO HAVE CLASS D400 COVERS AND FRAMES.
9. A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL.IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
10. PIPEWORK TO BE VITRIFIED CLAY OR PLASTIC. VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
11. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION.
12. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF THE DESIGN & CONSTRUCTION GUIDANCE.
13. THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED DRAINAGE ARE IN ACCORDANCE WITH THOSE SET OUT IN THE DESIGN & CONSTRUCTION GUIDANCE, BUILDING REGULATIONS AND THE REQUIREMENT OF UU AS THE STATUTORY SEWERAGE UNDERTAKER.
14. PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
- PROPOSED PIPEWORK WITH <1.2m DEPTH TO SOFFIT IN ROADS/SERVICE AREAS.
- OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS.
- OR <0.6m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS Z BEDDING*

Rev:	Date:	Description:
R1	31/03/23	For Information.

Copyright AJF Engineering Consultants Ltd. All rights Reserved. This document is not to be copied wholly or in part, or used by any third party without express written consent of AJF Engineering Consultants Ltd. AJF Engineering Consultants Ltd accepts no responsibility or liability which may arise from reliance or use of this document by any other party or for any other purpose.

Project:
Proposed Development, New Dwellings, 1515 Ashton Old Road, Manchester
Client:
KMM Homes Ltd

Drawing Title:
Drainage Standard Details - Sheet 2

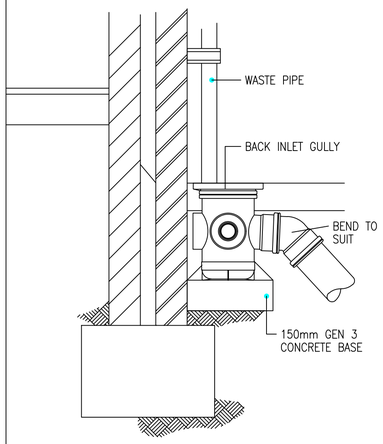
Scale (@ A0):	Drawn by:	Chkd by:	Aprvd by:
NTS	CLS	BP	AJF

Drawing Number: 23065-AJF-ZZ-ZZ-DR-D-004
Date: March 23
Rev: R1

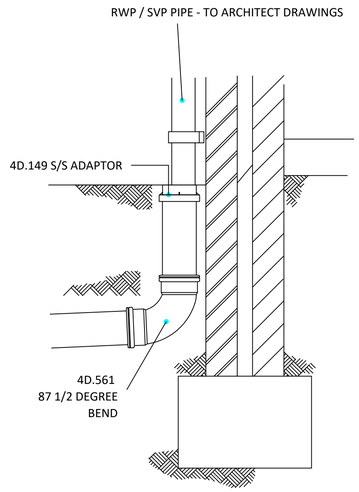
AJF Engineering Consultants Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW
0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

Printed on 100% Post-Consumer Recycled Content Paper

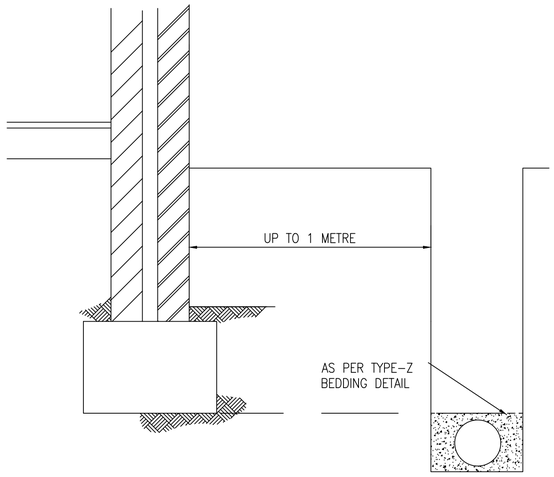
ISO A1 594mm x 841mm



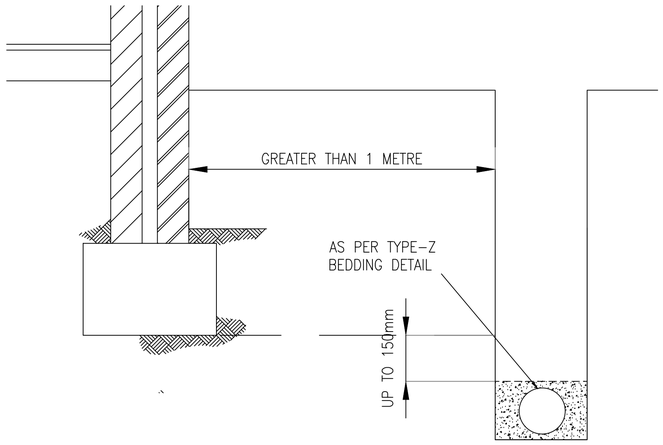
BACK INLET GULLY DETAIL
(NTS)



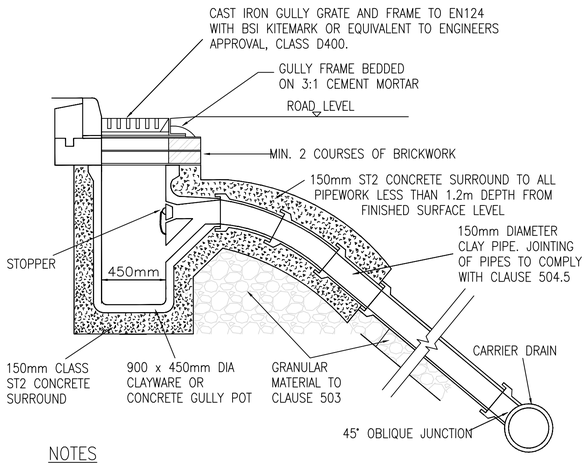
RWP / SVP DETAIL
(NTS)



PIPEWORK LESS THAN A METRE FROM STRUCTURE
(NTS)



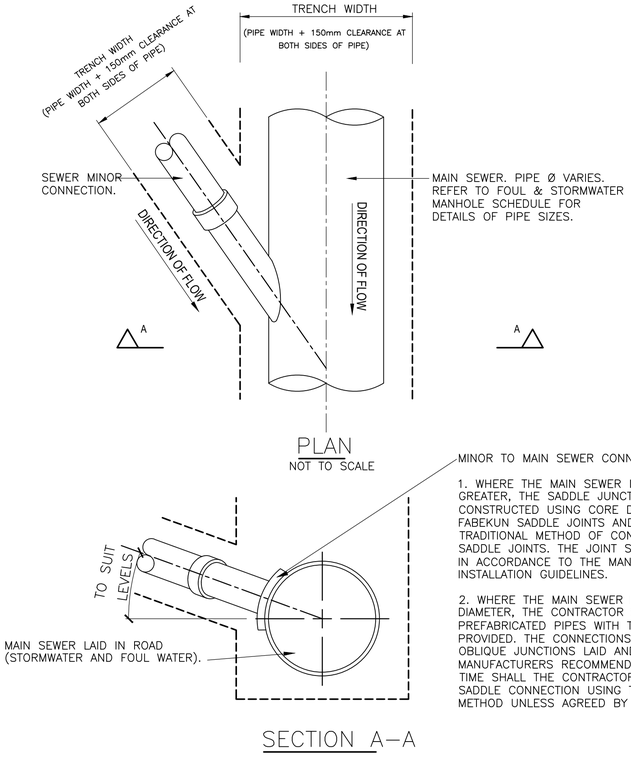
PIPEWORK MORE THAN A METRE FROM STRUCTURE
(NTS)



NOTES

1. STANDARD GULLY POT TO BE OF 90 LITRES CAPACITY (450mm DIAMETER).
2. MAXIMUM TRENCH WIDTH FOR 150mm GULLY LEAD IS 600mm.
3. CLAUSE NUMBERS REFER TO SPECIFICATION FOR HIGHWAY WORKS, AMENDED AS APPROPRIATE.
4. NUMBER OF BENDS MAY VARY DUE TO SITE DIFFERENCES.
5. CONCRETE TO COMPLY WITH CLAUSE 2602 TABLE 26/1.
6. CONCRETE SURROUND TO PIPES SHALL ALWAYS FINISH AT A JOINT.

TYPICAL GULLEY DETAIL
(NTS)

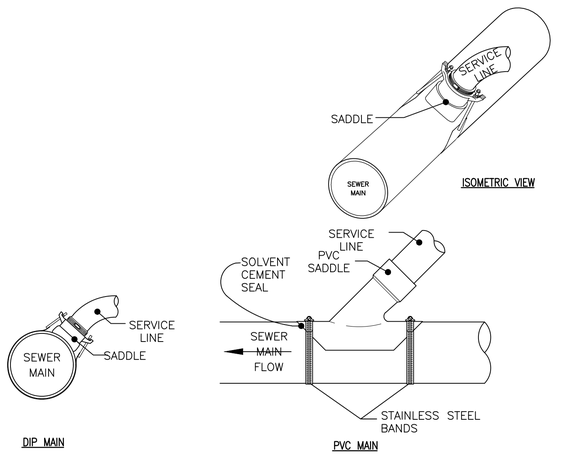


MINOR TO MAIN SEWER CONNECTIONS:

1. WHERE THE MAIN SEWER IS 600mm OR GREATER, THE SADDLE JUNCTION SHALL BE CONSTRUCTED USING CORE DRILLED EPOXY FABEKUN SADDLE JOINTS AND NOT THE TRADITIONAL METHOD OF CONSTRUCTING SADDLE JOINTS. THE JOINT SHALL BE INSTALLED IN ACCORDANCE TO THE MANUFACTURER'S INSTALLATION GUIDELINES.

2. WHERE THE MAIN SEWER IS LESS THAN 600mm DIAMETER, THE CONTRACTOR SHALL USE PREFABRICATED PIPES WITH THE SADDLE JOINT PROVIDED. THE CONNECTIONS SHALL BE 45° OBLIQUE JUNCTIONS LAID AND JOINTED TO THE MANUFACTURERS RECOMMENDATIONS. AT NO TIME SHALL THE CONTRACTOR CONSTRUCT A SADDLE CONNECTION USING THE TRADITIONAL METHOD UNLESS AGREED BY THE ENGINEER.

SEWER CONNECTION DETAIL FOR MINOR PIPES CONNECTING INTO MAIN SEWER
NOT TO SCALE



NOTES:
1) PVC SOLVENT CEMENT SHALL BE USED FOR PVC SADDLES.
2) TRUSS SADDLES SHALL BE USED WITH TRUSS PIPE.
3) IN–LINE WYE FITTING TO BE PROVIDED WITH NEW CONSTRUCTION.

SADDLE CONNECTION
(NTS)

NOTES

1. DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS
2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS STATED OTHERWISE
3. THE LENGTH OF THE NEXT PIPE (ROCKER PIPE) AWAY FROM THE STRUCTURE SHALL BE:

PIPE DIAMETER (mm)	LENGTH (m)
DN150 - DN600	0.6

4. ALL DIMENSIONS ARE IN MILLIMETRES
5. PROPOSED MANHOLES ARE TO BE TO SEWERS FOR ADOPTION 7th EDITION AND THE DESIGN & CONSTRUCTION GUIDANCE.
6. DETAILS SHOWN FOR TYPE E PPIC CHAMBERS ARE TAKEN FROM WAVIN DETAILS. THESE CHAMBERS SHALL BE INSTALLED TO THE MANUFACTURERS SPECIFICATION. IF ALTERNATIVE CHAMBERS ARE PROPOSED THE DETAILS MAY VARY AND SHOULD BE SUBMITTED TO TO THE DESIGNER. ALL PART NUMBERS SHOWN RELATE TO WAVIN PRODUCTS.
7. ALL WORKS TO COMPLY WITH "SEWERS FOR ADOPTION-7th EDITION" AND THE DESIGN & CONSTRUCTION GUIDANCE.
8. INSPECTION CHAMBERS IN PAVED AREAS ARE TO HAVE CLASS D400 COVERS AND FRAMES.
9. A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL.IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
10. PIPEWORK TO BE VITRIFIED CLAY OR PLASTIC. VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
11. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION.
12. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF THE DESIGN & CONSTRUCTION GUIDANCE.
13. THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED DRAINAGE ARE IN ACCORDANCE WITH THOSE SET OUT IN THE DESIGN & CONSTRUCTION GUIDANCE, BUILDING REGULATIONS AND THE REQUIREMENT OF UU AS THE STATUTORY SEWERAGE UNDERTAKER.
14. PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
- PROPOSED PIPEWORK WITH <1.2m DEPTH TO SOFFIT IN ROADS/SERVICE AREAS.
- OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS.
- OR <0.6m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS Z BEDDING"

Rev:	Date:	Description:
R1	31/03/23	For Information.

Copyright AJF Engineering Consultants Ltd. All rights Reserved. This document is not to be copied wholly or in part, or used by any third party without express written consent of AJF Engineering Consultants Ltd. AJF Engineering Consultants Ltd accepts no responsibility or liability which may arise from reliance or use of this document by any other party or for any other purpose.

Project:
Proposed Development, New Dwellings, 1515 Ashton Old Road, Manchester
Client:
KMM Homes Ltd

Drawing Title:
Drainage Standard Details - Sheet 3

Scale (@ A0):	Drawn by:	Chkd by:	Aprvd by:
NTS	CLS	BP	AJF

Drawing Number: 23065-AJF-ZZ-ZZ-DR-D-005
Date: March 23
Rev: R1

AJF Engineering Consultants Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW

0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

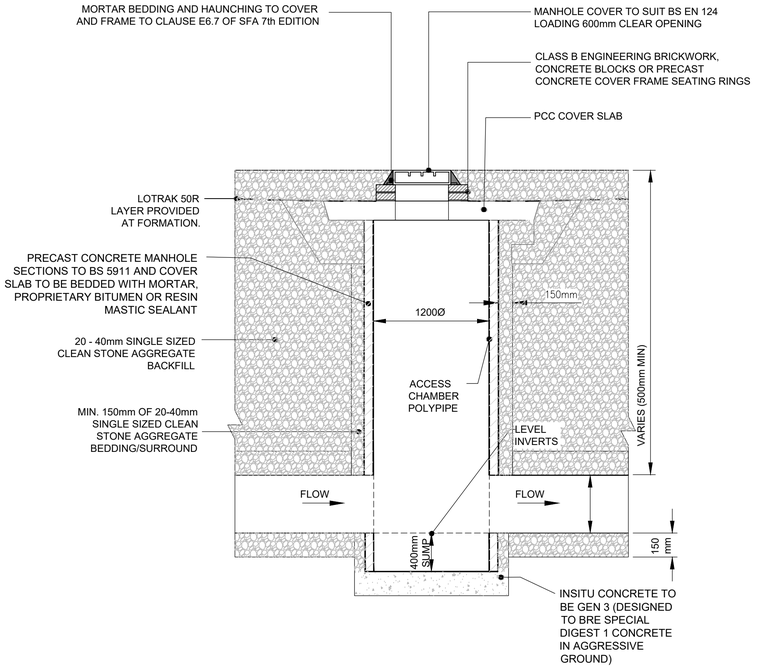
Printed on 100% Post-Consumer Recycled Content Paper

ISO A1 594mm x 841mm

Minimum Dimensions for Access Fittings and Chambers						
Type	Internal Sizes				Cover Sizes	
	Depth to soffit (m)	Size of largest pipe (DN)	Length x Width (mm)	Circular (mm)	Length x Width (mm)	Circular (mm)
Rodding Eye	As Drain but Minimum 100mm					
Shallow Access						
Small	0.6 or less	150	150x100	150	150x100	150
Large			225x100	225	225x100	
Inspection Chamber	0.6 or less			190		190
	1.2 or less	150	450x450	450	450x450	450
	1.2 - 3.0		450x450	450	300x300	350
Manhole	1.5 or less	150	675x750	1200	675x750	n/a
		225	675x1200	1200	1200x675	n/a
		300	675x1200	1200	1200x675	n/a
		>300	DN+450 x1800	The larger of 1800 or (DN+450)	1200x675	n/a
	Over 1.5	225	1200x1000	1200	600x600	600
		300	1200x1075	1200	600x600	600
		375-450	1350x1225	1200	600x600	600
		>450	DN+775 x1800	The larger of 1800 or (DN+775)	1200x675	600
Manhole Shaft	Over 3.0					
- Steps			1050x800	1050	600x600	600
- Ladder			1200x800	1200	600x600	600
- Winch			900x800	900	600x600	600

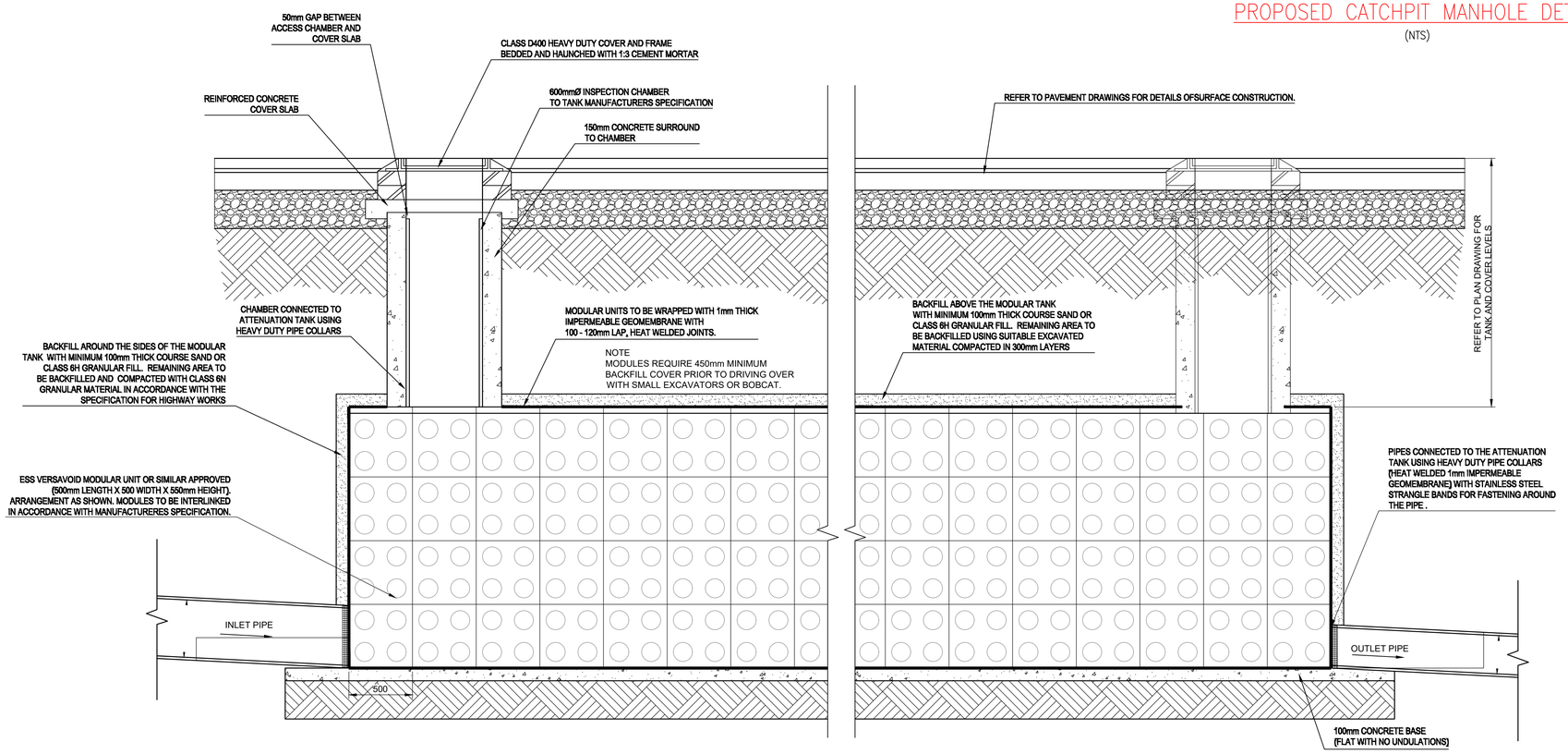
BUILDING REGULATIONS MINIMUM DIMENSIONS FOR MANHOLES

(Not to Scale)



PROPOSED CATCHPIT MANHOLE DETAIL

(NTS)



ALL ATTENUATION TANK WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURERES SPECIFICATIONS, METHOD STATEMENTS AND RECOMMENDATIONS.

THE CONTRACTOR SHALL ALOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT TO ALL EXISTING SERVICES.

THE CONTRACTOR SHALL ALLOW FOR DEALING WITH SURFACE WATER AND GROUND WATER RUNOFF INTO EXCAVATIONS BY MEANS OF SUMPS, PUMPING AND DE-WATERING AS APPROPRIATE IN ORDER TO KEEP THE EXCAVATION AS DRY AS POSSIBLE DURING THE CONSTRUCTION OF THE WORKS.

ALL LEVEL AND DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR THE THE COMMENCEMENT OF THE WORKS. ANY DISCREPANCIES TO BE IMMEDIATELY REPORTED TO THE ENGINEER.

ATTENUATION TANK SPECIFICATION REQUIREMENTS:

TO COMPLY WITH REQUIREMENTS OF CIRIA C680.

TO BE CAPABLE OF HGV LOADING AT THE DEPTHS SHOWN.

TYPICAL SECTION THROUGH ATTENUATION TANK

(NTS)

NOTES

1. DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS
2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS STATED OTHERWISE
3. THE LENGTH OF THE NEXT PIPE (ROCKER PIPE) AWAY FROM THE STRUCTURE SHALL BE:

PIPE DIAMETER (mm)	LENGTH (m)
DN150 - DN600	0.6

4. ALL DIMENSIONS ARE IN MILLIMETRES
5. PROPOSED MANHOLES ARE TO BE TO SEWERS FOR ADOPTION 7th EDITION AND THE DESIGN & CONSTRUCTION GUIDANCE.
6. DETAILS SHOWN FOR TYPE E PPIC CHAMBERS ARE TAKEN FROM WAVIN DETAILS. THESE CHAMBERS SHALL BE INSTALLED TO THE MANUFACTURERS SPECIFICATION. IF ALTERNATIVE CHAMBERS ARE PROPOSED THE DETAILS MAY VARY AND SHOULD BE SUBMITTED TO TO THE DESIGNER. ALL PART NUMBERS SHOWN RELATE TO WAVIN PRODUCTS.
7. ALL WORKS TO COMPLY WITH "SEWERS FOR ADOPTION-7th EDITION" AND THE DESIGN & CONSTRUCTION GUIDANCE.
8. INSPECTION CHAMBERS IN PAVED AREAS ARE TO HAVE CLASS D400 COVERS AND FRAMES.
9. A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL.IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
10. PIPEWORK TO BE VITRIFIED CLAY OR PLASTIC. VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
11. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION.
12. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF THE DESIGN & CONSTRUCTION GUIDANCE.
13. THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED DRAINAGE ARE IN ACCORDANCE WITH THOSE SET OUT IN THE DESIGN & CONSTRUCTION GUIDANCE, BUILDING REGULATIONS AND THE REQUIREMENT OF UU AS THE STATUTORY SEWERAGE UNDERTAKER.
14. PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
- PROPOSED PIPEWORK WITH <1.2m DEPTH TO SOFFIT IN ROADS/SERVICE AREAS.
- OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS.
- OR <0.6m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS Z BEDDING"

Rev:	Date:	Description:
R1	31/03/23	For Information.

Copyright AJF Engineering Consultants Ltd. All rights Reserved. This document is not to be copied wholly or in part, or used by any third party without express written consent of AJF Engineering Consultants Ltd. AJF Engineering Consultants Ltd accepts no responsibility or liability which may arise from reliance or use of this document by any other party or for any other purpose.

Project:

Proposed Development, New Dwellings, 1515 Ashton Old Road, Manchester

Client:

KMM Homes Ltd

Drawing Title:

Drainage Standard Details - Sheet 4

Scale (@ A0):	Drawn by:	Chkd by:	Aprvd by:
NTS	CLS	BP	AJF

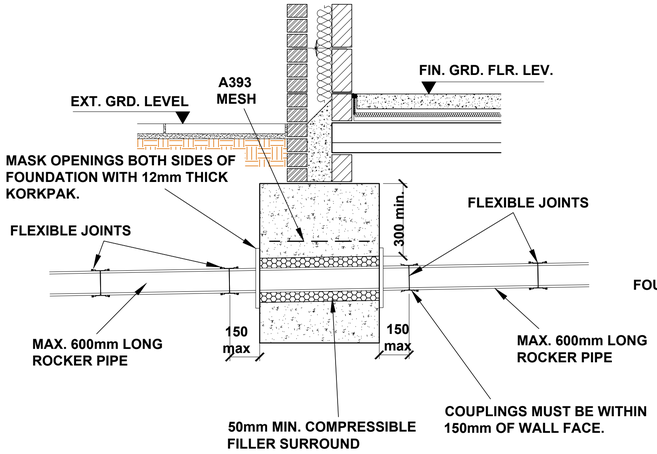
Drawing Number:	Date:	Rev:
23065-AJF-ZZ-ZZ-DR-D-006	March 23	R1

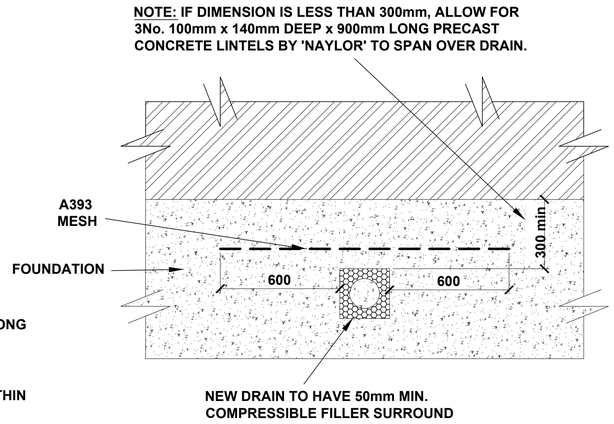
AJF Engineering Consultants Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW

0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

Printed on 100% Post-Consumer Recycled Content Paper

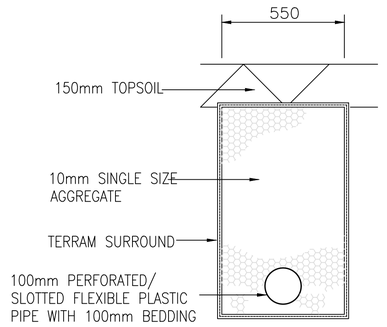
ISO A1 594mm x 841mm





TYPICAL DETAIL OF DRAIN PASSING THROUGH FOUNDATION

(NTS)



TYPICAL LAND DRAIN DETAIL

(NTS)

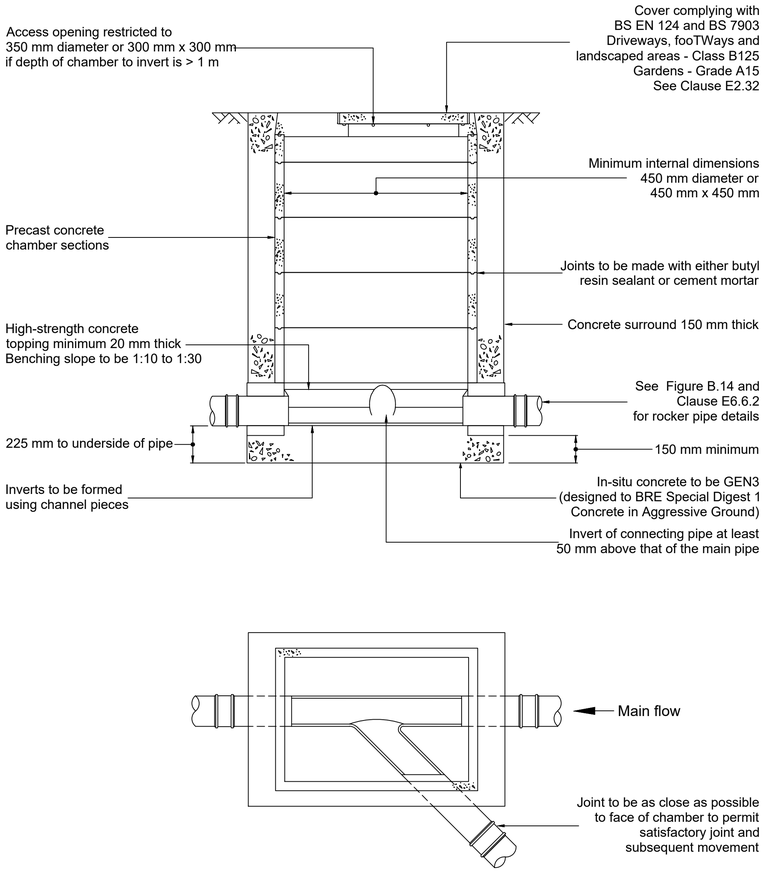


FIGURE B.19 – SFA 7
TYPICAL INSPECTION CHAMBER DETAIL – TYPE D (Rigid material detail)

Alternative maximum depth from cover level to soffit of pipe 3 m for areas not subject to vehicle loading or areas subject to light vehicle loading, non–entry

NOTES

1. DO NOT SCALE FROM THIS DRAWING. USE ONLY WRITTEN DIMENSIONS
2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) UNLESS STATED OTHERWISE
3. THE LENGTH OF THE NEXT PIPE (ROCKER PIPE) AWAY FROM THE STRUCTURE SHALL BE:

PIPE DIAMETER (mm)	LENGTH (m)
DN150 - DN600	0.6

4. ALL DIMENSIONS ARE IN MILLIMETRES
5. PROPOSED MANHOLES ARE TO BE TO SEWERS FOR ADOPTION 7th EDITION AND THE DESIGN & CONSTRUCTION GUIDANCE.
6. DETAILS SHOWN FOR TYPE E PPIC CHAMBERS ARE TAKEN FROM WAVIN DETAILS. THESE CHAMBERS SHALL BE INSTALLED TO THE MANUFACTURERS SPECIFICATION. IF ALTERNATIVE CHAMBERS ARE PROPOSED THE DETAILS MAY VARY AND SHOULD BE SUBMITTED TO TO THE DESIGNER. ALL PART NUMBERS SHOWN RELATE TO WAVIN PRODUCTS.
7. ALL WORKS TO COMPLY WITH "SEWERS FOR ADOPTION-7th EDITION" AND THE DESIGN & CONSTRUCTION GUIDANCE.
8. INSPECTION CHAMBERS IN PAVED AREAS ARE TO HAVE CLASS D400 COVERS AND FRAMES.
9. A 30mm REDUCTION IN LEVEL HAS BEEN ALLOWED FOR IN THE CALCULATION OF INVERT LEVELS FOR ALL BRANCH CONNECTIONS TO PLASTIC INSPECTION CHAMBERS (AS PER WAVIN DETAILS). INVERT LEVELS REFER TO MAIN CHANNEL.IF ALTERNATIVE CHAMBERS ARE PROPOSED THIS VALUE MAY VARY AND THE DESIGNER SHOULD BE CONSULTED.
10. PIPEWORK TO BE VITRIFIED CLAY OR PLASTIC. VITRIFIED CLAY PIPES SHOULD COMPLY WITH REQUIREMENTS BS EN 295 FOR FOUL PIPES.
11. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION.
12. PLASTIC PIPEWORK IS TO BE INSTALLED (POLYPIPE OR SIMILAR APPROVED) IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION. ALL THERMOPLASTIC PIPEWORK SHALL COMPLY WITH THE REQUIREMENTS OF THE DESIGN & CONSTRUCTION GUIDANCE.
13. THE DEVELOPER MUST SELF-VET AND CERTIFY THAT THE DESIGN CRITERIA, MATERIAL STANDARDS AND WORKMANSHIP SPECIFICATIONS FOR THE PROPOSED DRAINAGE ARE IN ACCORDANCE WITH THOSE SET OUT IN THE DESIGN & CONSTRUCTION GUIDANCE, BUILDING REGULATIONS AND THE REQUIREMENT OF UU AS THE STATUTORY SEWERAGE UNDERTAKER.
14. PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
- PROPOSED PIPEWORK WITH <1.2m DEPTH TO SOFFIT IN ROADS/SERVICE AREAS.
- OR <0.9m DEPTH TO SOFFIT IN PEDESTRIAN AREAS.
- OR <0.6m DEPTH TO SOFFIT IN LANDSCAPED AREAS REQUIRES CLASS Z BEDDING"

Rev:	Date:	Description:
R1	31/03/23	For Information.

Copyright AJF Engineering Consultants Ltd. All rights Reserved. This document is not to be copied wholly or in part, or used by any third party without express written consent of AJF Engineering Consultants Ltd. AJF Engineering Consultants Ltd accepts no responsibility or liability which may arise from reliance or use of this document by any other party or for any other purpose.

Project:
Proposed Development, New Dwellings, 1515 Ashton Old Road, Manchester

Client:
KMM Homes Ltd

Drawing Title:
Drainage Standard Details - Sheet 5

Scale (@ A0):	Drawn by:	Chkd by:	Aprvd by:
NTS	CLS	BP	AJF

Drawing Number:	Date:	Rev:
23065-AJF-ZZ-ZZ-DR-D-007	March 23	R1

AJF Engineering Consultants Ltd
Thursby House, 1 Thursby Road
Bromborough, Wirral, CH62 3PW

0151 374 0545
info@ajfengineering.co.uk
ajfengineering.co.uk

Printed on 100% Post-Consumer Recycled Content Paper

Appendix D

Drainage Modelling & Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.004	5.00	88.150	450	389927.977	397344.515	0.750
2	0.004	5.00	88.150	450	389909.373	397346.653	0.936
3	0.004	5.00	88.150	450	389910.808	397357.075	1.199
4	0.004	5.00	88.150	450	389916.977	397356.363	1.354
5	0.004	5.00	87.900	450	389917.475	397360.556	1.210
TANK 01			88.000		389914.940	397362.195	1.385
6	0.004	5.00	88.000	1200	389913.256	397359.630	1.416
CS01			88.000	600	389911.757	397358.675	1.460
CS02			87.670	1200	389907.071	397359.535	1.178
7	0.004	5.00	88.000	450	389929.302	397354.942	0.750

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	18.726	0.600	87.400	87.214	0.186	100.7	150	5.31	50.0
1.001	2	3	10.520	0.600	87.214	86.951	0.263	40.0	150	5.42	50.0
1.002	3	4	6.210	0.600	86.951	86.796	0.155	40.0	150	5.49	50.0
1.003	4	5	4.222	0.600	86.796	86.690	0.106	40.0	150	5.53	50.0
1.004	5	TANK 01	3.019	0.600	86.690	86.615	0.075	40.0	150	5.56	50.0
1.005	TANK 01	6	3.068	0.600	86.615	86.584	0.031	100.0	150	5.61	50.0
1.006	6	CS01	1.777	0.600	86.584	86.540	0.044	40.0	150	5.63	50.0
1.007	CS01	CS02	4.764	0.600	86.540	86.492	0.048	99.3	150	5.71	50.0
2.000	7	4	12.407	0.600	87.250	86.796	0.454	27.3	150	5.11	50.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	18.726	100.7	150	Circular	88.150	87.400	0.600	88.150	87.214	0.786
1.001	10.520	40.0	150	Circular	88.150	87.214	0.786	88.150	86.951	1.049
1.002	6.210	40.0	150	Circular	88.150	86.951	1.049	88.150	86.796	1.204
1.003	4.222	40.0	150	Circular	88.150	86.796	1.204	87.900	86.690	1.060

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	450	Manhole	Adoptable	2	450	Manhole	Adoptable
1.001	2	450	Manhole	Adoptable	3	450	Manhole	Adoptable
1.002	3	450	Manhole	Adoptable	4	450	Manhole	Adoptable
1.003	4	450	Manhole	Adoptable	5	450	Manhole	Adoptable

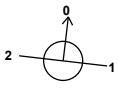
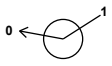
Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.004	3.019	40.0	150	Circular	87.900	86.690	1.060	88.000	86.615	1.235
1.005	3.068	100.0	150	Circular	88.000	86.615	1.235	88.000	86.584	1.266
1.006	1.777	40.0	150	Circular	88.000	86.584	1.266	88.000	86.540	1.310
1.007	4.764	99.3	150	Circular	88.000	86.540	1.310	87.670	86.492	1.028
2.000	12.407	27.3	150	Circular	88.000	87.250	0.600	88.150	86.796	1.204

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.004	5	450	Manhole	Adoptable	TANK 01		Junction	
1.005	TANK 01		Junction		6	1200	Manhole	Adoptable
1.006	6	1200	Manhole	Adoptable	CS01	600	Manhole	Adoptable
1.007	CS01	600	Manhole	Adoptable	CS02	1200	Manhole	Adoptable
2.000	7	450	Manhole	Adoptable	4	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	389927.977	397344.515	88.150	0.750	450	 0	1.000	87.400	150
2	389909.373	397346.653	88.150	0.936	450	 1	1.000	87.214	150
						0	1.001	87.214	150
3	389910.808	397357.075	88.150	1.199	450	 1	1.001	86.951	150
						0	1.002	86.951	150
4	389916.977	397356.363	88.150	1.354	450	 1	2.000	86.796	150
						2	1.002	86.796	150
						0	1.003	86.796	150
5	389917.475	397360.556	87.900	1.210	450	 1	1.003	86.690	150
						0	1.004	86.690	150
TANK 01	389914.940	397362.195	88.000	1.385		 1	1.004	86.615	150
						0	1.005	86.615	150
6	389913.256	397359.630	88.000	1.416	1200	 1	1.005	86.584	150
						0	1.006	86.584	150
CS01	389911.757	397358.675	88.000	1.460	600	 1	1.006	86.540	150
						0	1.007	86.540	150

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
CS02	389907.071	397359.535	87.670	1.178	1200	1	1.007	86.492	150
7	389929.302	397354.942	88.000	0.750	450	0	2.000	87.250	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node 6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	86.584	Product Number	CTL-SHE-0071-2000-0750-2000
Design Depth (m)	0.750	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node TANK 01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.5	Invert Level (m)	86.615
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	96

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.0	0.0	0.400	8.0	0.0	0.401	0.0	0.0

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	100 year 15 minute summer	348.738	98.681
1 year 15 minute winter	76.857	30.991	100 year 15 minute winter	244.728	98.681
1 year 30 minute summer	71.439	20.215	100 year 30 minute summer	228.965	64.789
1 year 30 minute winter	50.133	20.215	100 year 30 minute winter	160.677	64.789
1 year 60 minute summer	48.435	12.800	100 year 60 minute summer	153.288	40.510
1 year 60 minute winter	32.179	12.800	100 year 60 minute winter	101.841	40.510
1 year 120 minute summer	30.053	7.942	100 year 120 minute summer	92.562	24.461
1 year 120 minute winter	19.966	7.942	100 year 120 minute winter	61.496	24.461
1 year 180 minute summer	23.233	5.979	100 year 180 minute summer	69.806	17.964
1 year 180 minute winter	15.102	5.979	100 year 180 minute winter	45.376	17.964
1 year 240 minute summer	18.475	4.882	100 year 240 minute summer	54.269	14.342
1 year 240 minute winter	12.274	4.882	100 year 240 minute winter	36.055	14.342
1 year 360 minute summer	14.169	3.646	100 year 360 minute summer	40.484	10.418
1 year 360 minute winter	9.210	3.646	100 year 360 minute winter	26.315	10.418
1 year 480 minute summer	11.185	2.956	100 year 480 minute summer	31.414	8.302
1 year 480 minute winter	7.431	2.956	100 year 480 minute winter	20.871	8.302
1 year 600 minute summer	9.182	2.511	100 year 600 minute summer	25.431	6.956
1 year 600 minute winter	6.274	2.511	100 year 600 minute winter	17.376	6.956
1 year 720 minute summer	8.203	2.199	100 year 720 minute summer	22.452	6.017
1 year 720 minute winter	5.513	2.199	100 year 720 minute winter	15.089	6.017
1 year 960 minute summer	6.768	1.782	100 year 960 minute summer	18.166	4.784
1 year 960 minute winter	4.483	1.782	100 year 960 minute winter	12.033	4.784
1 year 1440 minute summer	4.949	1.326	100 year 1440 minute summer	12.896	3.456
1 year 1440 minute winter	3.326	1.326	100 year 1440 minute winter	8.667	3.456
30 year 15 minute summer	268.706	76.035	100 year +45% CC 15 minute summer	505.670	143.087
30 year 15 minute winter	188.566	76.035	100 year +45% CC 15 minute winter	354.856	143.087
30 year 30 minute summer	174.929	49.499	100 year +45% CC 30 minute summer	332.000	93.944
30 year 30 minute winter	122.757	49.499	100 year +45% CC 30 minute winter	232.982	93.944
30 year 60 minute summer	116.589	30.811	100 year +45% CC 60 minute summer	222.268	58.739
30 year 60 minute winter	77.459	30.811	100 year +45% CC 60 minute winter	147.669	58.739
30 year 120 minute summer	70.438	18.615	100 year +45% CC 120 minute summer	134.215	35.469
30 year 120 minute winter	46.797	18.615	100 year +45% CC 120 minute winter	89.169	35.469
30 year 180 minute summer	53.298	13.715	100 year +45% CC 180 minute summer	101.219	26.047
30 year 180 minute winter	34.645	13.715	100 year +45% CC 180 minute winter	65.795	26.047
30 year 240 minute summer	41.604	10.995	100 year +45% CC 240 minute summer	78.690	20.795
30 year 240 minute winter	27.641	10.995	100 year +45% CC 240 minute winter	52.280	20.795
30 year 360 minute summer	31.221	8.034	100 year +45% CC 360 minute summer	58.701	15.106
30 year 360 minute winter	20.295	8.034	100 year +45% CC 360 minute winter	38.157	15.106
30 year 480 minute summer	24.324	6.428	100 year +45% CC 480 minute summer	45.550	12.038
30 year 480 minute winter	16.160	6.428	100 year +45% CC 480 minute winter	30.262	12.038
30 year 600 minute summer	19.756	5.404	100 year +45% CC 600 minute summer	36.875	10.086
30 year 600 minute winter	13.498	5.404	100 year +45% CC 600 minute winter	25.195	10.086
30 year 720 minute summer	17.490	4.687	100 year +45% CC 720 minute summer	32.556	8.725
30 year 720 minute winter	11.754	4.687	100 year +45% CC 720 minute winter	21.879	8.725
30 year 960 minute summer	14.215	3.743	100 year +45% CC 960 minute summer	26.340	6.936
30 year 960 minute winter	9.416	3.743	100 year +45% CC 960 minute winter	17.448	6.936
30 year 1440 minute summer	10.161	2.723	100 year +45% CC 1440 minute summer	18.700	5.012
30 year 1440 minute winter	6.829	2.723	100 year +45% CC 1440 minute winter	12.567	5.012

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	87.420	0.020	0.7	0.0054	0.0000	OK
15 minute summer	2	11	87.237	0.023	1.4	0.0056	0.0000	OK
15 minute summer	3	11	86.979	0.028	2.1	0.0063	0.0000	OK
15 minute summer	4	11	86.834	0.038	3.5	0.0082	0.0000	OK
30 minute summer	5	23	86.738	0.048	3.6	0.0108	0.0000	OK
30 minute summer	TANK 01	22	86.730	0.115	5.4	0.8757	0.0000	OK
30 minute summer	6	22	86.733	0.149	5.3	0.1768	0.0000	OK
30 minute summer	CS01	23	86.575	0.035	1.9	0.0100	0.0000	OK
30 minute summer	CS02	23	86.525	0.033	1.9	0.0000	0.0000	OK
15 minute summer	7	11	87.265	0.015	0.7	0.0040	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.7	0.451	0.040	0.0291	
15 minute summer	2	1.001	3	1.4	0.717	0.050	0.0206	
15 minute summer	3	1.002	4	2.1	0.741	0.074	0.0177	
15 minute summer	4	1.003	5	3.5	0.961	0.124	0.0163	
30 minute summer	5	1.004	TANK 01	3.7	0.945	0.131	0.0288	
30 minute summer	TANK 01	1.005	6	4.8	0.423	0.272	0.0492	
30 minute summer	6	Hydro-Brake®	CS01	1.9				
30 minute summer	CS01	1.007	CS02	1.9	0.639	0.108	0.0144	2.8
15 minute summer	7	2.000	4	0.7	0.352	0.020	0.0271	

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	87.432	0.032	1.8	0.0085	0.0000	OK
15 minute summer	2	10	87.250	0.036	3.6	0.0088	0.0000	OK
30 minute winter	3	28	87.001	0.050	3.9	0.0113	0.0000	OK
30 minute winter	4	28	87.001	0.205	6.5	0.0447	0.0000	SURCHARGED
30 minute winter	5	28	87.001	0.311	7.6	0.0699	0.0000	SURCHARGED
30 minute winter	TANK 01	29	87.000	0.385	6.9	2.9286	0.0000	SURCHARGED
30 minute winter	6	29	87.000	0.416	4.9	0.4937	0.0000	SURCHARGED
120 minute winter	CS01	98	86.576	0.036	2.0	0.0101	0.0000	OK
120 minute winter	CS02	98	86.526	0.034	2.0	0.0000	0.0000	OK
15 minute summer	7	10	87.273	0.023	1.8	0.0062	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	1.8	0.594	0.100	0.0558	
15 minute summer	2	1.001	3	3.5	0.918	0.124	0.0403	
30 minute winter	3	1.002	4	3.9	0.902	0.138	0.0706	
30 minute winter	4	1.003	5	6.3	1.061	0.225	0.0743	
30 minute winter	5	1.004	TANK 01	6.9	1.013	0.244	0.0531	
30 minute winter	TANK 01	1.005	6	4.1	0.401	0.232	0.0540	
30 minute winter	6	Hydro-Brake®	CS01	2.0				
120 minute winter	CS01	1.007	CS02	2.0	0.645	0.112	0.0148	10.5
15 minute summer	7	2.000	4	1.8	0.436	0.052	0.1142	

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	87.436	0.036	2.3	0.0097	0.0000	OK
60 minute summer	2	46	87.274	0.060	3.0	0.0147	0.0000	OK
60 minute summer	3	46	87.273	0.322	4.5	0.0729	0.0000	SURCHARGED
60 minute summer	4	46	87.273	0.477	7.5	0.1040	0.0000	SURCHARGED
60 minute summer	5	46	87.273	0.583	7.8	0.1311	0.0000	SURCHARGED
60 minute summer	TANK 01	46	87.272	0.657	7.3	3.0438	0.0000	SURCHARGED
60 minute summer	6	46	87.272	0.688	4.8	0.8164	0.0000	SURCHARGED
60 minute summer	CS01	98	86.576	0.036	2.0	0.0101	0.0000	OK
60 minute summer	CS02	98	86.526	0.034	2.0	0.0000	0.0000	OK
15 minute summer	7	10	87.276	0.026	2.3	0.0070	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	2.3	0.637	0.128	0.0668	
60 minute summer	2	1.001	3	3.0	0.897	0.106	0.1271	
60 minute summer	3	1.002	4	4.5	0.919	0.160	0.1093	
60 minute summer	4	1.003	5	6.3	1.031	0.224	0.0743	
60 minute summer	5	1.004	TANK 01	7.3	1.013	0.258	0.0531	
60 minute summer	TANK 01	1.005	6	4.2	0.418	0.234	0.0540	
60 minute summer	6	Hydro-Brake®	CS01	2.0				
60 minute summer	CS01	1.007	CS02	2.0	0.645	0.112	0.0148	11.6
15 minute summer	7	2.000	4	2.3	0.441	0.067	0.1218	

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	1	48	87.685	0.285	2.8	0.0759	0.0000	SURCHARGED
60 minute summer	2	48	87.685	0.471	5.8	0.1154	0.0000	SURCHARGED
60 minute summer	3	48	87.685	0.734	6.6	0.1658	0.0000	SURCHARGED
60 minute summer	4	48	87.685	0.889	9.6	0.1937	0.0000	SURCHARGED
60 minute summer	5	48	87.684	0.994	10.3	0.2236	0.0000	FLOOD RISK
60 minute summer	TANK 01	48	87.683	1.068	9.3	3.0438	0.0000	SURCHARGED
60 minute summer	6	48	87.683	1.099	5.3	1.3044	0.0000	SURCHARGED
60 minute summer	CS01	48	86.579	0.039	2.4	0.0111	0.0000	OK
60 minute summer	CS02	48	86.529	0.037	2.4	0.0000	0.0000	OK
60 minute summer	7	48	87.685	0.435	2.7	0.1156	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	1	1.000	2	2.2	0.631	0.124	0.3297	
60 minute summer	2	1.001	3	4.4	0.963	0.156	0.1852	
60 minute summer	3	1.002	4	5.4	0.911	0.192	0.1093	
60 minute summer	4	1.003	5	8.2	0.949	0.291	0.0743	
60 minute summer	5	1.004	TANK 01	9.3	1.094	0.328	0.0531	
60 minute summer	TANK 01	1.005	6	4.8	0.400	0.271	0.0540	
60 minute summer	6	Hydro-Brake®	CS01	2.4				
60 minute summer	CS01	1.007	CS02	2.4	0.676	0.134	0.0168	16.4
60 minute summer	7	2.000	4	2.2	0.441	0.064	0.2184	

Flow+ v10.5.1 Copyright © 1988-2023 Causeway Technologies Ltd