



Drainage Strategy Report

LITTLEHAMPTON, Land at Watersmead Business Park

1 May 2019

Prepared for:



**STRUCTURAL • CIVIL • DUE DILIGENCE • ENGINEERING MASTERPLANNING
FLOOD MANAGEMENT • INFRASTRUCTURE DESIGN
PRE-DEVELOPMENT ENGINEERING • BIM • TRANSPORTATION**

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APPROVALS

	Name	Position	Date
Prepared by	Andrew Quinn	Civil Engineer	01.05.19
Reviewed by	David Meigh	Director	01.05.19
Approved by	David Meigh	Director	01.05.19

VERSIONS

Number	By	Date	Context
1.0	Andrew Quinn	15.04.19	For Comment
2.0	Andrew Quinn	01.05.19	Updated from Comments

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1 INTRODUCTION

Pinnacle Consulting Engineers Ltd have been commissioned by Amazon to carry out a Drainage Strategy report for a proposed development of a site off Norway Lane, Watersmead Business Park, Toddington, BN17 6GY. A site location plan is enclosed in Appendix A.

1.1 Site description

The proposed development is located at National Grid Reference (NGR) 503839, 103654 off Norway Lane, Watersmead Business Park, Toddington, BN17 6GY.

The existing site consists of three large warehouse buildings, associated service yards, circulation routes and HGV parking areas. The site is located to the east of Wick, in the north of Toddington and just north of A259. The site is bound to the north by railway tracks between Angmering and Ford, to the south by parking and circulation roads associated with the Bodyshop HQ building and the “kids unlimited” pre-school, to the west by The Co-operative Childcare nursery and residential dwellings along Gratwicke Drive and to the east by a large feature lake running northwards towards Black Ditch. An approximately 0.5ha feature lake can be identified to the east of the site and appears to run into a complex of interconnecting tributaries and reservoirs roughly 140m north of the site.



Figure 2.1 – Aerial View of the existing development site (approximate site boundary edged red)

1.2 Topography

The development site is relatively flat with ground levels across the site varying between approximately 5m and 4m Above Ordnance Datum (AOD). The site falls generally in a south direction.

Topographical survey has been commissioned to confirm the levels across the site.

Details of existing development site levels are enclosed in Appendix B.

1.3 Geological ground conditions

Geological conditions at the site are detailed below and are based on a British Geological Survey (BGS) report and the Short Form Geotechnical Report carried out by Deltasimons in March 2019. The focus of this study on geology is on the potential movement of water through Made Ground, Drift Geology and Solid Geology.

Formation	Description
Artificial Ground (Made Ground)	Artificial deposits delineated in available Dynamic Sampler on site identify Made Ground prove to approximately 0.45m bgl.
Superficial Deposits (Drift Deposits)	River Terrace Deposits (undifferentiated) - Sand, Silt and Clay. These deposits are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river or estuary. These deposits have been proven to approximately 2.43m bgl.
Bedrock	New Pit Chalk Formation - Chalk. These sedimentary rocks are shallow-marine in origin. They are biogenic and detrital, generally comprising carbonate material (coccoliths), forming distinctive beds of chalk. Chalk deposits have been proven to 45.72m bgl.
Water Table	Available boreholes identify a water table at 5.18m deep that is not expected to significantly impact drainage design or associated earthworks activities.

Table 1.0 – Geological Ground Conditions

1.4 Proposed Development

The proposed development comprises installation of 5 no. 'vehicle-to-ground' lifts and a canopy cover over the associated service yard area for a temporary period of five years, minor alterations to the internal access road, including widening works, creation of a new spur, provision of a pedestrian footbridge, and associated lighting and drainage infrastructure provision.

The proposed development plans are enclosed in Appendix D.

2 EXISTING SURFACE WATER MANAGEMENT

2.1 Existing surface water management

A GPR survey was conducted by Malcom Hughes Chartered Land Surveyors in March of 2019 to define the location of existing infrastructure within the site. Current survey records identify that the site has two fully operational, primary, positive surface water networks, with separate discharge locations serving the existing site. Due to the lack of evidence to suggest otherwise, it is reasonable to assume the identified networks discharge into the large feature lake situated approximately 20m to the east of the site. Assumed outfall locations are positioned along the eastern perimeter of the site. One of sewers are assumed to outfall from the north east corner of the site via a Ø375mm and the other discharges immediately to the east of the central service yard via a Ø1050mm pipe. Following a critique of the existing networks, it is assumed that surface water runoff discharges into the pond at an unrestricted rate.

A series of gullies are depicted running along the inner kerb lines bordering the large warehouse to the north and are assumed to connect into the adjacent sewers, which roughly follow the centre line of the existing circulation routes. A series of surface water sewers are identified running parallel to the existing buildings along the centre of the site; they are shown to serve the central service yard, the large distribution centre to the north and both warehouse buildings to the south.

The existing drainage arrangement shown on the drainage survey is provided from the GPR Survey and enclosed in Appendix B.

The Environmental Agency's Flood map for planning indicates that the site is located mostly in Flood Zone 1 - little or no risk, with annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000 year rainfall event).

3 LOCAL POLICY

3.1 Arun District Council's Adopted Local Plan (July 2018)

The information provided below is an extract from Arun District Council's Adopted Local Plan (July 2018) found on the council website (<https://www.arun.gov.uk/adopted-local-plan>). The excerpt is part of Policy W DM3 found under section 18.4 titled "Sustainable Drainage Systems". The following policy is applicable to flood risk and management of drainage:

Sustainable Urban Drainage Systems

"To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process. Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. These features include:

- Green roofs*
- Permeable driveways and parking*
- Soakaways*
- Water harvesting and storage features including water butts.*

Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development and must:

- a) Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system.*
- b) Effectively manage water (including its quality)*
- c) Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and*
- d) Provide amenity for local residents (ensuring a safe environment)*
- e) Retain the existing drainage network of the site and the wider area,*
- f) Be maintained in perpetuity, supported through a Maintenance and Management Plan/Regime, including its financing, agreed with the Local Planning Authority.*

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- g) Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.*
- h) Undertake up to six months groundwater monitoring within the winter period.*
- i) Undertake winter percolation testing in accordance with BRE365.*
- j) The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.*
- k) The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas."*

4 PROPOSED DRAINAGE

4.1 Surface Water Discharge Location

Traditional approaches to urban drainage have comprised of underground tanks and pipe networks. More recently, the benefits and opportunities to use Sustainable Drainage Systems (SuDS) have been realised and encouragement to use such systems is promoted throughout Flood Risk Management policy at all levels. SuDS is a term which encompasses a variety of approaches to managing surface water in a way which is more sympathetic to the natural and human environment than conventional piped drainage systems. Management of surface water is an essential element for reducing flood risk and SuDS techniques are often designed to achieve this in a way that mimics the natural environment.

The Building Regulations (H3) states the priority for discharging surface water runoff from a development is as follows:

1. Infiltration into the ground;
2. Discharge into a watercourse;
3. Discharge into a sewer.

Therefore, the preferred solution would be to replicate the natural drainage regime and to infiltrate surface water runoff into the ground. It is imperative that a site-specific infiltration test to BRE Digest 365 is commissioned at a number of locations around the site, to ascertain whether infiltration would be a suitable method of surface water management.

4.2 Proposed Development Runoff Rate

It can be seen from the enclosed drawings in Appendix C that the existing impermeable area for the site and therefore the existing positively drained area is 24,647m². The proposed impermeable area is 25,436m², resulting in an increase of 789m² of impermeable area.

Despite the greenfield runoff rate calculations (Appendix E) yielding a discharge rate of 0.3l/s Qbar, such a restriction is not deemed to be practicable and therefore 2.5l/s is proposed as this is to ensure that there will be no adverse effect on the existing drainage infrastructure.

4.3 Proposed Development Surface Water Drainage Strategy

As part of the proposed drainage strategy it is assumed that the majority of the infrastructure will remain un-altered. It is also important to note the existing warehouse buildings have a fully operational, positive drainage system that discharges into the aforementioned pond as described in section 2.1.

As part of the proposal, an additional impermeable area of 789m² will be produced by extending the kerb line along the northern perimeter and by providing an additional road section for circulation. The proposed drainage channel along this area will collect surface water runoff to be attenuated, before being conveyed into the existing network at a restricted rate of 2.5l/s via a hydrobrake.

4.4 Surface Water Discharge Rate and Attenuation

As mentioned in section 4.2, the proposed impermeable area compared to the original design will increase by approximately 789m². Based on calculations for all storms up to a 1 in 100 year rainfall event plus a 30% allowance to accommodate climate change (as is required by clause 'k' of Policy W DM3 in section 3.1 of this report); it is deduced that additional attenuation storage is needed. An additional required attenuation storage volume of 35m³ has been deduced using the "Quick Storage Estimate" programme on MicroDrainage. The results of the calculations are attached as part of Appendix E.

The proposed network will collect the surface water from the site via rainwater downpipes, drainage channels and gullies passing through petrol interceptor where necessary. Flows from the additional impervious areas to the north of the site will be attenuated by the proposed tank which will discharge via a Ø225mm pipe into a hydrobrake with a minimum sump depth of 300mm. The water will discharge through a hydrobrake into the existing private sewer network. The proposed drainage layout is included as Appendix F.

Additional information has been provided in the Appendix H which comprises of a filled copy of Arun District Council's Drainage Checklist.

4.5 SuDS Features

The proposed Geolight (or equivalent) attenuation tank includes a perforated/ slotted distribution pipe surrounded by granular material providing filtration and treatment for surface water flows. This in conjunction with the proposed oil separator and a catchpit manhole (silt trap) is considered appropriate for the scale and nature of the development.

Refer to Appendix F for proposed the proposed drainage layout.

4.6 Attenuation Tank

The proposed Geolight (or equivalent) attenuation tank includes a perforated/ slotted distribution pipe surrounded by granular material providing filtration and treatment for surface water flows. This in conjunction with the proposed catchpit manhole (silt trap) is considered appropriate for the scale and nature of the development.

4.7 Maintenance Requirements

It is anticipated that a private management company will be employed to maintain the completed drainage network for the development incorporating the following activities and frequency for each SUDS component.

4.7.1 Gullies/Channels/Pipes/Manholes

All components are to be periodically cleaned of foreign particles and silt accumulation, on a quarterly basis. Components located in unadopted areas will be maintained by the landowner. Those located in adopted areas will be maintained by the adopting authority.

4.7.2 Proprietary Systems

Proprietary systems will require routine maintenance by the owner to ensure continuing operation to design performance standards. A typical maintenance schedule is detailed below in table 14.2 from the CIRIA SuDS manual.

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	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 filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

5 CONCLUSION

The proposed development is centred at National Grid Reference (NGR) 503839, 103654 off Norway Lane, Watersmead Business Park, Toddington, BN17 6GY. The existing site consists of three large warehouse buildings, associated service yards, circulation routes and HGV parking areas.

The development site is relatively flat with ground levels falling in a southerly direction from approximately 5.20m to 4.28m Above Ordnance Datum (AOD).

The proposed development comprises installation of 5 no. 'vehicle-to-ground' lifts and a canopy cover over the associated service yard area for a temporary period of five years, minor alterations to the internal access road, including widening works, creation of a new spur, provision of a pedestrian footbridge, and associated lighting and drainage infrastructure provision.

The site has two fully operational, primary, positive surface water networks, with separate discharge locations. Both networks are assumed to discharge into the pond situated 20m to the east of the site. The proposed increase in impermeable area is 789m². Based on calculations for all storms up to a 1 in 100 year rainfall event with a 30% climate change allowance an additional storage volume of 35m³ will be required. The rate of discharge from the additional drainage apparatus into the existing infrastructure will be restricted to 2.5l/s.

Appendix A – Site Location Plan



GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

— SITE BOUNDARY

0 50MM ON A1 DWG. 50

TI	FOR TENDER	RW	JJ	01.03.19
REV	DESCRIPTION	BY	CHK	DATE

CLIENT

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PROJECT
LITTLEHAMPTON
DBN3 REFURBISHMENT

DRAWING TITLE
SITE LOCATION

PINNACLE
CONSULTING ENGINEERS

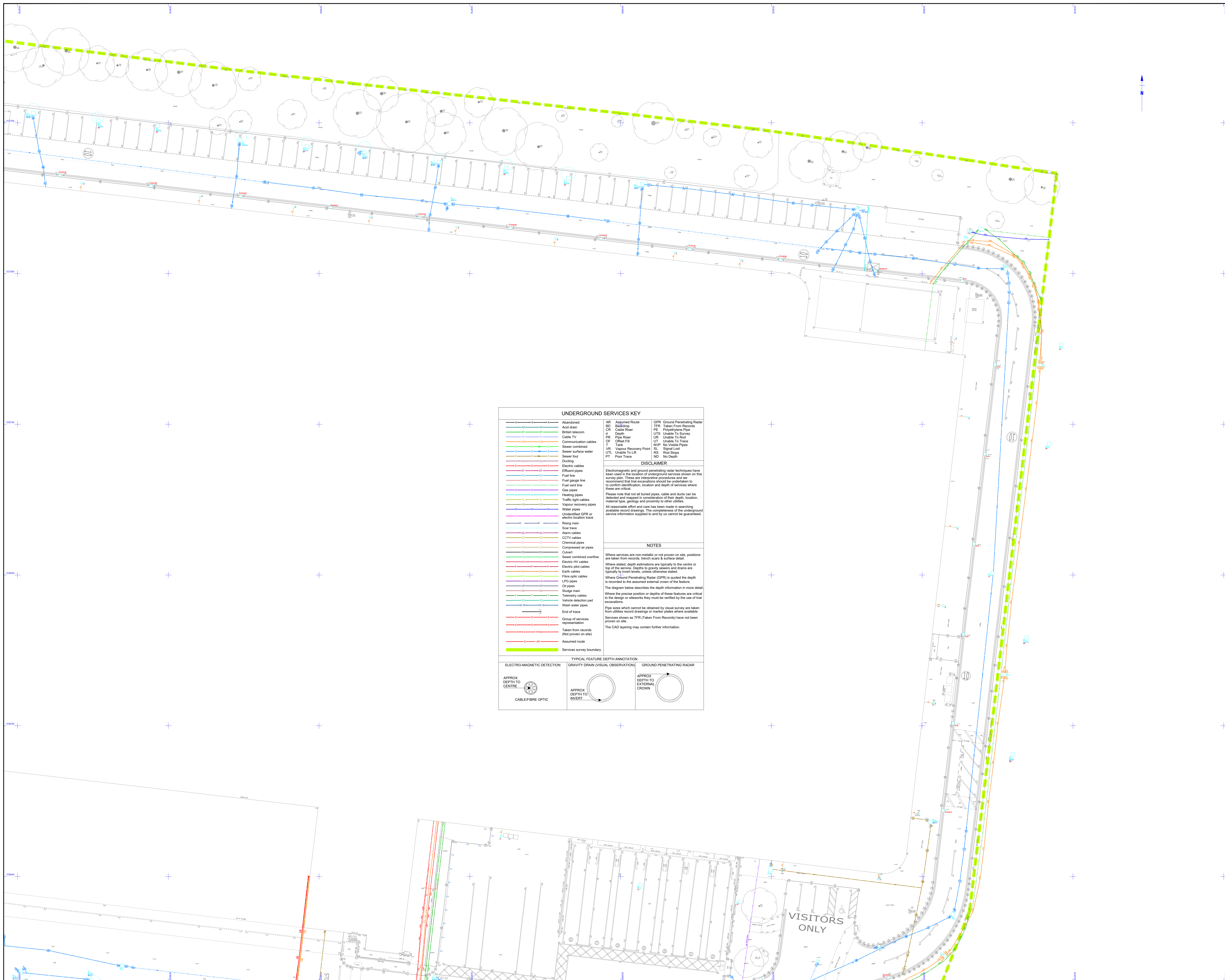
ALCHEMY,
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NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
TENDER			
SCALE @ A1 1:2000	DATE FEB '19	DRAWN BY RW	CHECKED JJ
DRG NO. 190213-PIN-00-XX-DR-C-0200	REVISION TI		

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Appendix B – GPR Survey



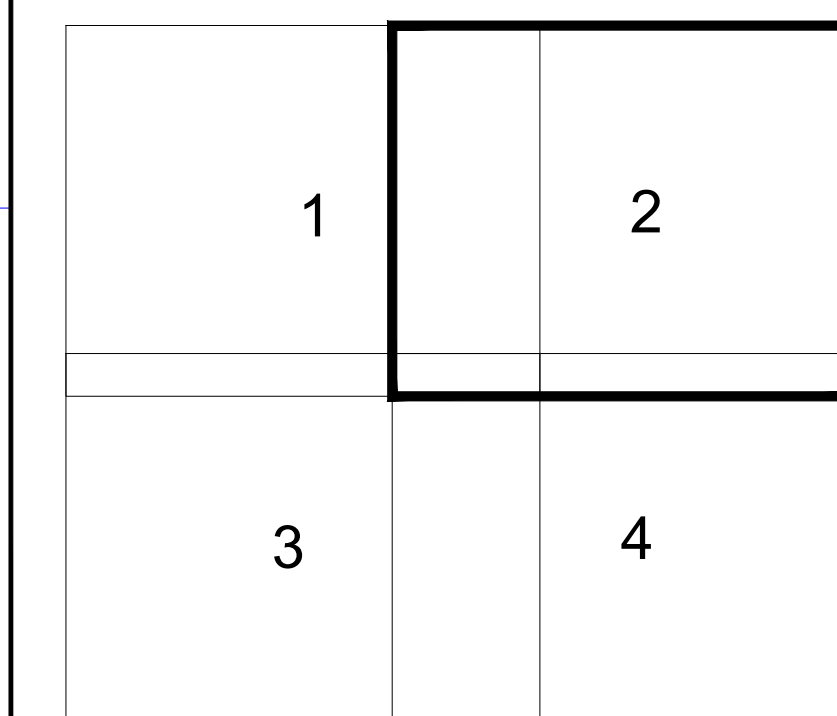
Survey Notes
Grid: Local Plane Metric related to National Grid at survey control SC2
Levels: Related to OS datum from GNSS positioning,
converted using the National Geoid Model OSGM15.

Notes

Topographical Survey Legend

[illegible]

Sheet Index

[illegible]



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HUGHES**

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LAND SURVEYORS**

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survey@mh.co.uk

Accreditations








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SMR ARCHITECTS
FLOOR 2, THE EXCHANGE, STATION PARADE
HARROGATE, HG1 1TS

Project

THE BODY SHOP
NORWAY LANE, WICK
LITTLEHAMPTON BN17 6LS

Drawing Title

UNDERGROUND SERVICES

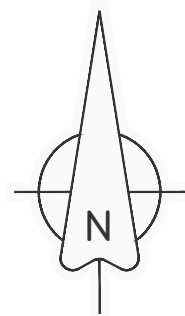
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Checked by	DJ	05/03/19	Scale	A0@1:200
Drawing No			Revision	
53168/2				

Sheet Index

The diagram shows a 2x2 grid of sheets. The sheets are labeled 1, 2, 3, and 4. Sheet 4 is highlighted with a thick black border.

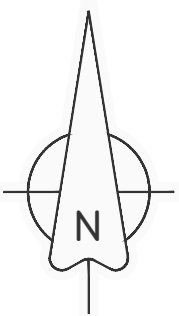
[illegible]

Appendix C – Existing & Proposed Impermeable Areas



EXISTING SITE

TOTAL IMPERMEABLE AREA = 24,647M²
TOTAL PERMEABLE AREA = 2,927M²



PROPOSED SITE

TOTAL IMPERMEABLE AREA = 25,436M²
TOTAL PERMEABLE AREA = 2,132M²

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LEGEND

-  SITE BOUNDARY
-  PERMEABLE AREA
-  IMPERMEABLE AREA

0 50MM ON A1 DWG. 50

TI	FOR TENDER	AO	JJ	XX.04.19
REV	DESCRIPTION	BY	CHK	DATE

CLIENT



PROJECT
LITTLEHAMPTON
DBN3 REFURBISHMENT

DRAWING STATUS
EXISTING AND PROPOSED
IMPERMEABLE AREAS

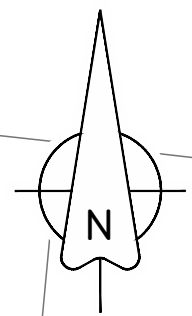
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DRAWING STATUS			
TENDER			
SCALE @ A1 1:1000	DATE APR'19	DRAWN BY AO	CHECKED JJ
DRG NO. 190213-PIN-00-XX-DR-C-0205	REVISION TI		REF: 190213

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Appendix F – Proposed Drainage Strategy



DESIGN NOTE
3 NO. ON SITE INFILTRATION TESTS TO BRE 365 ARE TO BE CONDUCTED. WITH RESULTS PROVIDED TO THE ENGINEERS.

PROPOSED CELLULAR ATTENUATION TANK
(SDS GEOLIGHT OR SIMILAR APPROVED)
18.5M X 2M X 1M (DP) 95% VOID
REQUIRED STORAGE VOLUME = 35M³

DESIGN NOTE
SURFACE WATER DISCHARGE RATE IS 2.5L/S. SUBJECT TO LEAD LOCAL FLOOD AUTHORITY APPROVAL.

LEGEND

- SITE BOUNDARY
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING PRIVATE SURFACE WATER SEWER
- PROPOSED GULLY
- PROPOSED SURFACE WATER PIPE
- PROPOSED DRAINAGE CHANNEL
- OUTLET BOX
- PROPOSED ATTENUATION TANK
- PROPOSED RAINWATER DOWN PIPE

GENERAL NOTES

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DRAINAGE NOTES

- CONTRACTOR TO CONFIRM THE APPROVAL FOR THE TYPE OF PIPE AND BEDDING BEING USED WITH THE PERMITTING AUTHORITY PRIOR TO ANY CONSTRUCTION COMMENCING.
- ANY TRAFFIC MANAGEMENT REQUIRED TO UNDERTAKE WORKS IN THE PUBLIC HIGHWAY MUST BE APPROVED BY THE LOCAL AUTHORITY PRIOR TO THESE WORKS COMMENCING.
- ALL WORKS IN THE PUBLIC HIGHWAY MUST BE CARRIED OUT WITH THE PRIOR APPROVAL AND TO THE SATISFACTION OF THE LOCAL AUTHORITY.
- THE CONTRACTOR IS TO LIAISE WITH THE WATER AUTHORITY ENGINEER, AFFORDING THEM REASONABLE NOTICE TO INSPECT THE WORKS DURING CONSTRUCTION.
- THE CONTRACTOR IS TO ALLOW FOR JET WASHING ALL LENGTHS OF EXISTING SEWERS WHICH ARE TO BE RETAINED.
- ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH BS EN 752.
- THE CONTRACTOR MUST CHECK THE LEVELS AND CONDITION OF ALL EXISTING MANHOLES AND DRAINAGE OUTFALLS PRIOR TO CONSTRUCTION OF ANY DRAINAGE, UNLESS OTHERWISE AGREED, TO ENSURE THE PROPOSED DESIGN MAY BE ACHIEVED. ANY DISCREPANCIES MUST BE REPORTED TO PINNACLE IMMEDIATELY.
- ALL RWP POSITIONS ARE TO BE CONFIRMED BY THE ARCHITECT.
- WHERE RWPS ARE CONNECTED DIRECT TO THE DRAIN, RODDING ACCESS PLATES ARE TO BE PROVIDED.
- CONTRACTOR IS TO ALLOW FOR ALL ABANDONED DRAINAGE RUNS AND MANHOLES / SOAKAWAYS TO BE FULLY GROUTED UP OR REMOVED AS NECESSARY.
- ALL BURIED MANHOLES TO BE REINSTATED AND INVERT LEVELS SUPPLIED TO PINNACLE. MANHOLE COVERS ARE TO BE BROUGHT UP TO THE REQUIRED LEVELS.
- ALL GULLIES TO BE SET 5MM LOWER THAN THE PROPOSED FINISHED LEVELS.
- ALL SURFACE WATER AND RAIN WATER PIPEWORK TO BE Ø150MM, LAID TO A MINIMUM FALL OF 1 IN 100 U.N.O.

0 50MM ON A1 DWG. 50

REV	DESCRIPTION	BY	CHK	DATE
P03	FOR INFORMATION		AO	01.05.19
P02	FOR INFORMATION		AO	16.04.19
P01	FOR INFORMATION		AO	15.04.19
TI	FOR TENDER		RW	01.03.19
REV	DESCRIPTION		BY	CHK

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PROJECT
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PROPOSED DRAINAGE
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DRAWING STATUS			
INFORMATION			
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1:500	FEB '19	RW	JJ
DRG NO.			REVISION
190213-PIN-00-XX-DR-C-0220			P03

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DESIGN NOTE
THE PROPOSED DRAINAGE STRATEGY IS BASED ON THE ASSUMPTION THAT INFILTRATION IS A NON VIABLE METHOD OF SURFACE WATER DISCHARGE.



CDM NOTES
CONTRACTOR IS TO ENSURE EXISTING PIPES ARE ADEQUATELY PROTECTED FOR THE DURATION OF THE CONSTRUCTION PHASE.

BODYSHOP DISTRIBUTION CENTRE

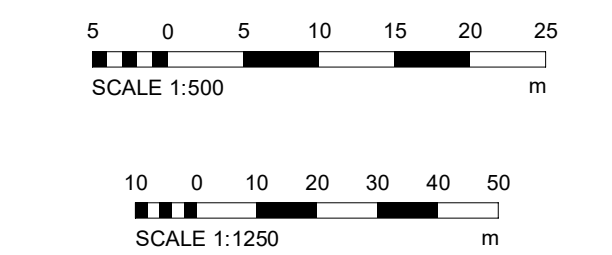
BUILDING 5

BUILDING 6

Appendix D – Proposed Development Plans

Architects are to be notified of any discrepancies.
Contractors must check all dimensions on site.
This drawing is subject to copyright law and is to be used only for the project only.
The drawing is to be used only for the information as stated only.
For other information refer to the latest revision of any other referenced drawings.
To be read in conjunction with relevant design standards/protocols.

This is a colour drawing. In order to ensure any subsequent reproduction is viewed correctly it should be printed in full colour.



REFER TO ARBORICULTURAL REPORT FOR LOCATIONS OF TREES AND VEGETATION

NO NEW BOUNDARY TREATMENTS

NO PUBLIC RIGHTS OF WAY ACROSS SITE

- EXISTING LANDSCAPED AREA TO BE RETAINED: 2128 m²
- LANDSCAPED AREA TO BE REPLACED WITH VEHICLE HARDSTANDING: 592 m²
- KERBED AREA TO BE REPLACED WITH VEHICLE HARDSTANDING: 25 m²



PROPOSED SITE PLAN
1 : 500

P9	CANOPY ADJUSTED	04.04.19	JN	MB
P8	PEDESTRIAN BRIDGE REPLACED WITH CROSSING	29.03.19	MB	SR
P7	UPDATED TRACKING	12.03.19	BC	MB
P6	UPDATED VOGH	06.03.19	MB	SR
P5	ASPIRING AMENDED	20.12.19	MB	SR
P4	LANDSCAPE AREAS SHOWN	05.02.19	MB	SR
P3	REVISED AFTER PLANNING REVIEW	01.02.19	JN	MB
P2	REVISED FOLLOWING PLANNING CALL	29.01.19	KDK	SR
P1	FIRST ISSUE	24.1.19	MB	SR
Rev	Description	Date	By	Chk

Status
PLANNING

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01423 707 757 admin@smrarchitects.co.uk

Project
DBN3 - NEW COURTWICK LANE, LITTLEHAMPTON

Client
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Drawing Title PROPOSED SITE BLOCK PLAN									
Proj Ref	Origin	Zone	Level	Type	Rate	Num	Status	Rev	
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SMR Job Ref	Sheet	AO	Scale	Drawn					
7260-00-2001			NOTED	MAB					

Appendix E – Drainage Calculations

Calculated by:

Site name:

Site location:

Site coordinates

Latitude:

Longitude:

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference:

Date:

Methodology

IH124

Site characteristics

Total site area (ha)	0.1
----------------------	-----

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	3	3
HOST class	---	---
SPR/SPRHOST	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm)	722	722
Hydrological region	7	7
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

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

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

Where flow rates are less than 5.0 l/s consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

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

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	0.3	0.3
1 in 1 year (l/s)	0.25	0.25
1 in 30 years (l/s)	0.69	0.69
1 in 100 years (l/s)	0.95	0.95

Quick Storage Estimate



Variables

FSR Rainfall

Return Period (years)

Region

Map

Ratio R

Cv (Summer)

Cv (Winter)

Impervious Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Quick Storage Estimate



Results

Global Variables require approximate storage of between 25 m³ and 40 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Appendix G –Drainage Construction Details

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

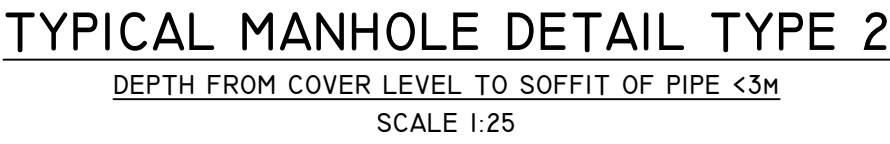
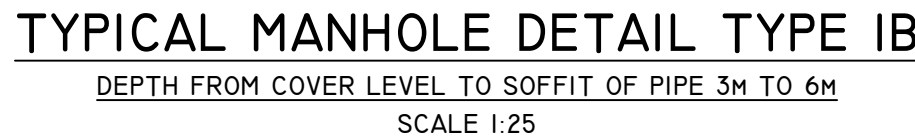
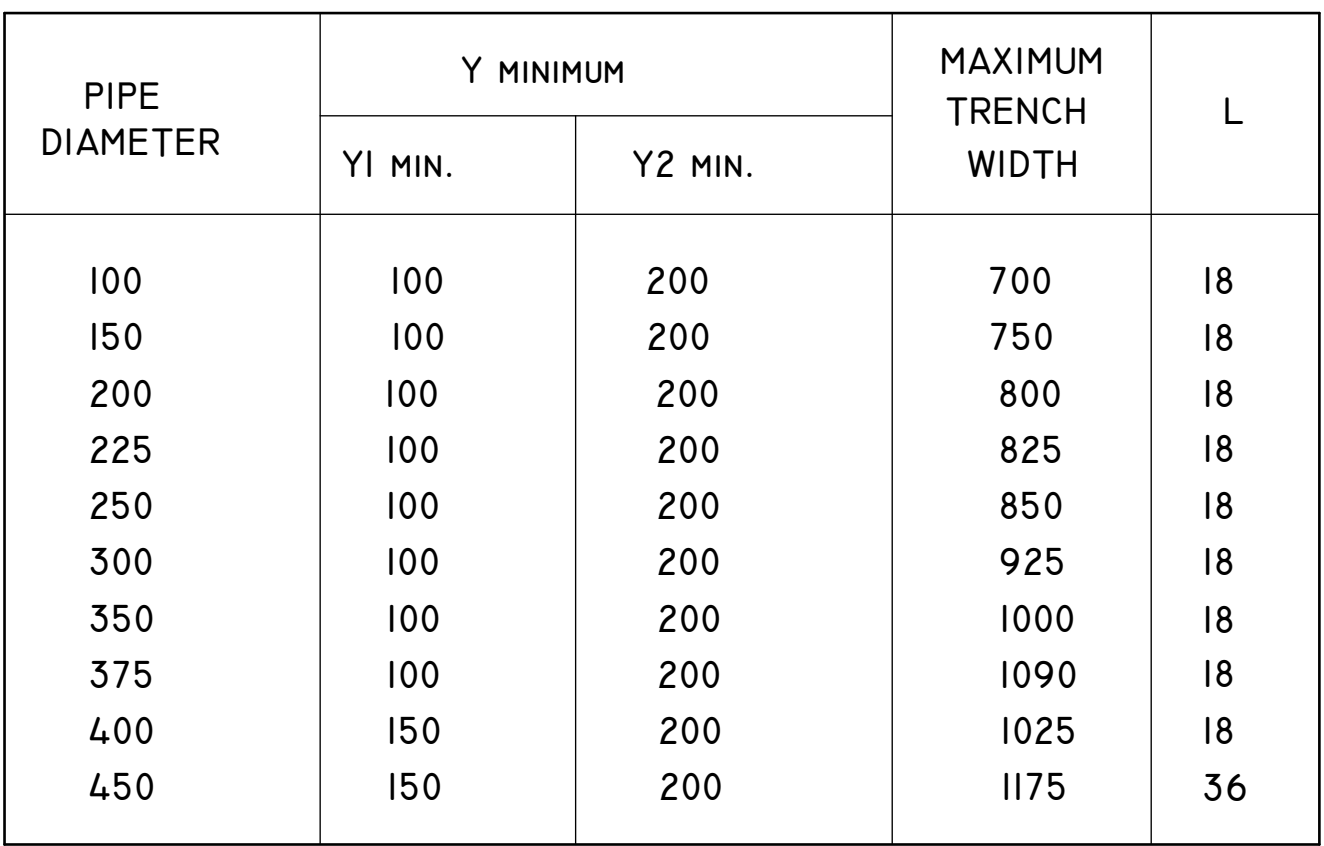


Diagram illustrating the internal structure of a 4-way manhole. The diagram shows a circular manhole with four preformed swept channels leading to four rigid pipes. The labels indicate the following details:

- INTERNAL INTERNAL MANHOLE (MM)
- NO JUNCTION LESS THAN 90° FROM OUTGOING SEWER
- PREFORMED SWEEP CHANNELS.
- ROCKER PIPE REQUIRED FOR RIGID PIPES.
- MINIMUM WIDTH OF BENCHING TO BE 225MM.

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,

ALL PIPES ENTERING THE BOTTOM OF
THE MANHOLE TO HAVE SOFFITS LEVEL



0 50MM ON AI DWG. 50

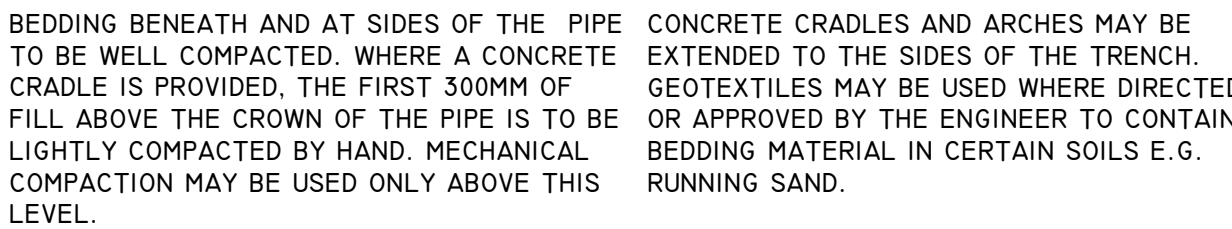
amazonlogistics

DRAWING TITLE

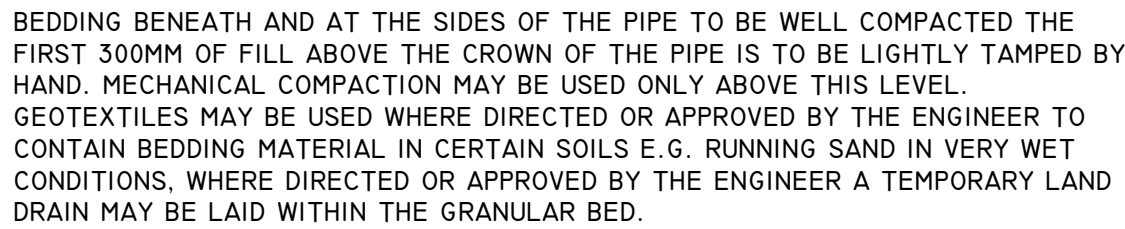
DRAINAGE CONSTRUCTION
DETAILS SHEET I

ALCHEMY,
LESSEMER ROAD,
VELWYN GARDEN CITY,
PERTS.
TEL 7 1HE. TELEPHONE: 01707 527 630
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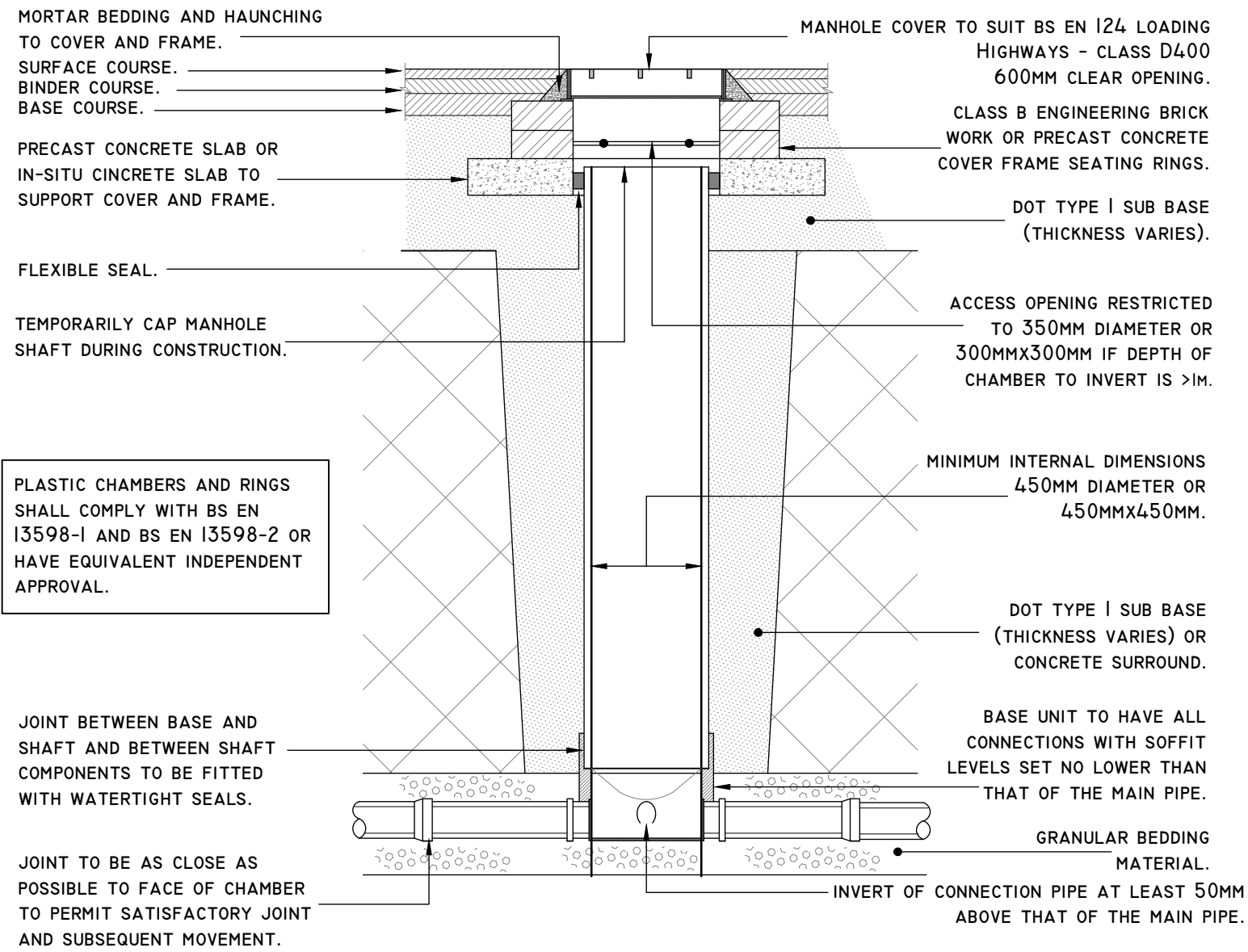


NOT TO SCALE



NOT TO SCALE

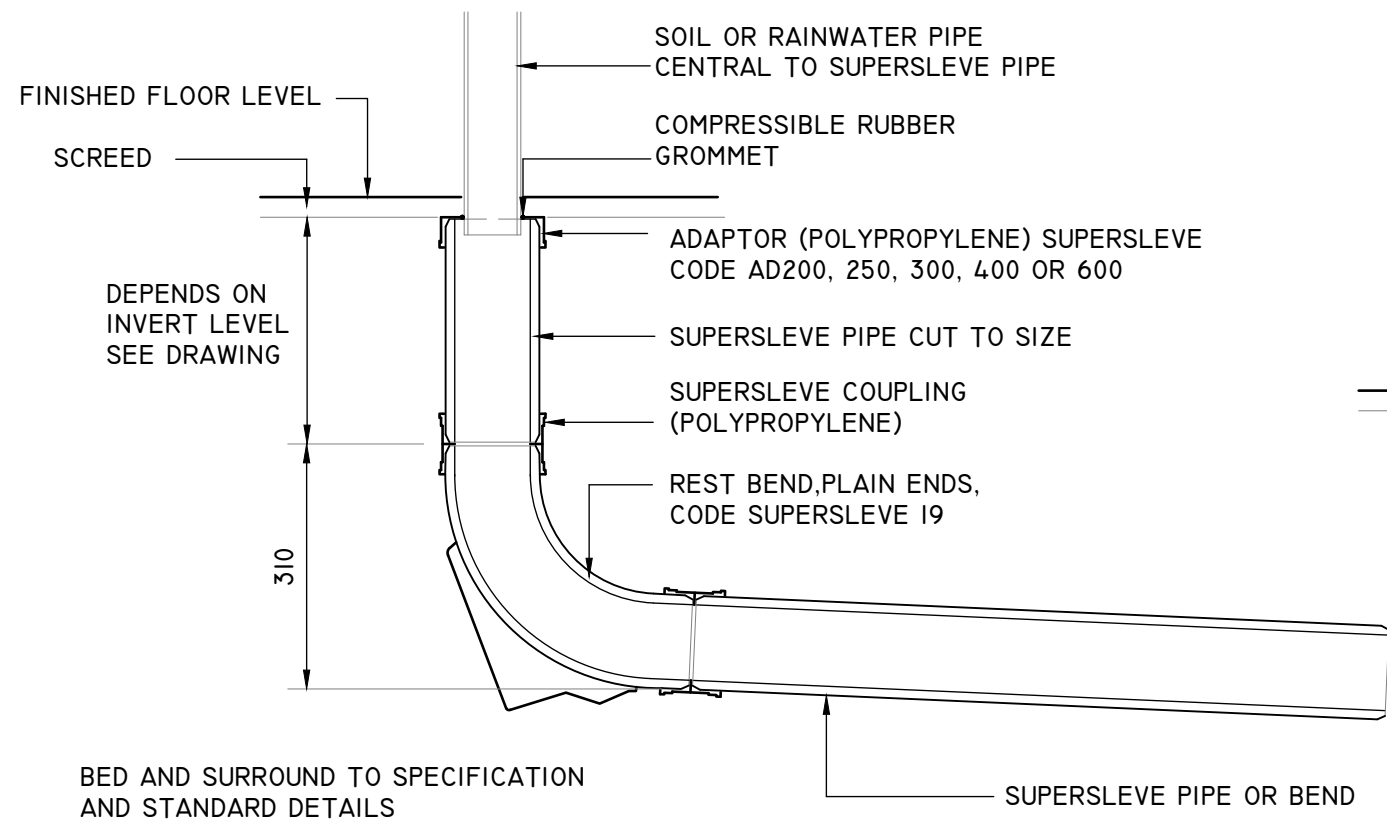
GRANULAR BEDDING & SIDEFILL MATERIALS FOR RIGID + FLEXIBLE PIPES



TYPICAL INSPECTION CHAMBER DETAIL - TYPE 3 (FLEXIBLE MATERIAL DETAIL)

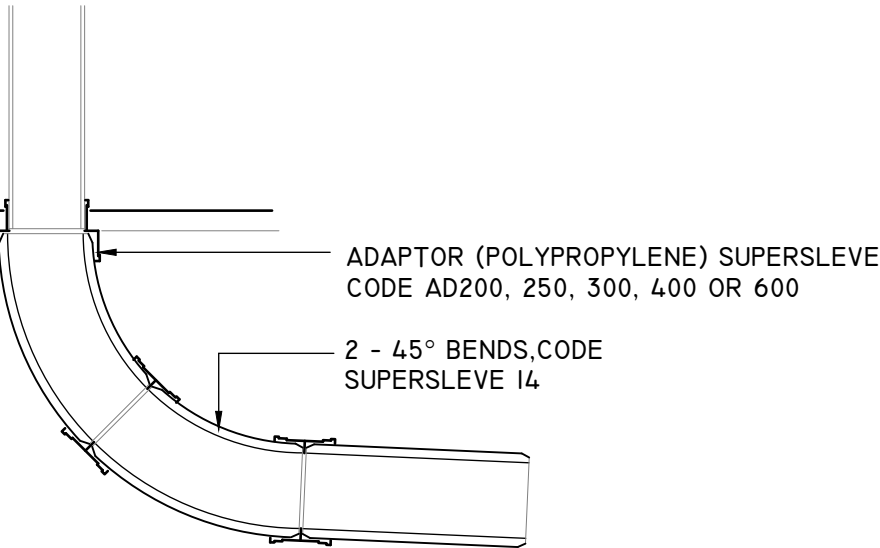
MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE IN
AREAS SUBJECT TO VEHICLE LOADING 3M, NON ENTRY

SCALE 1:25

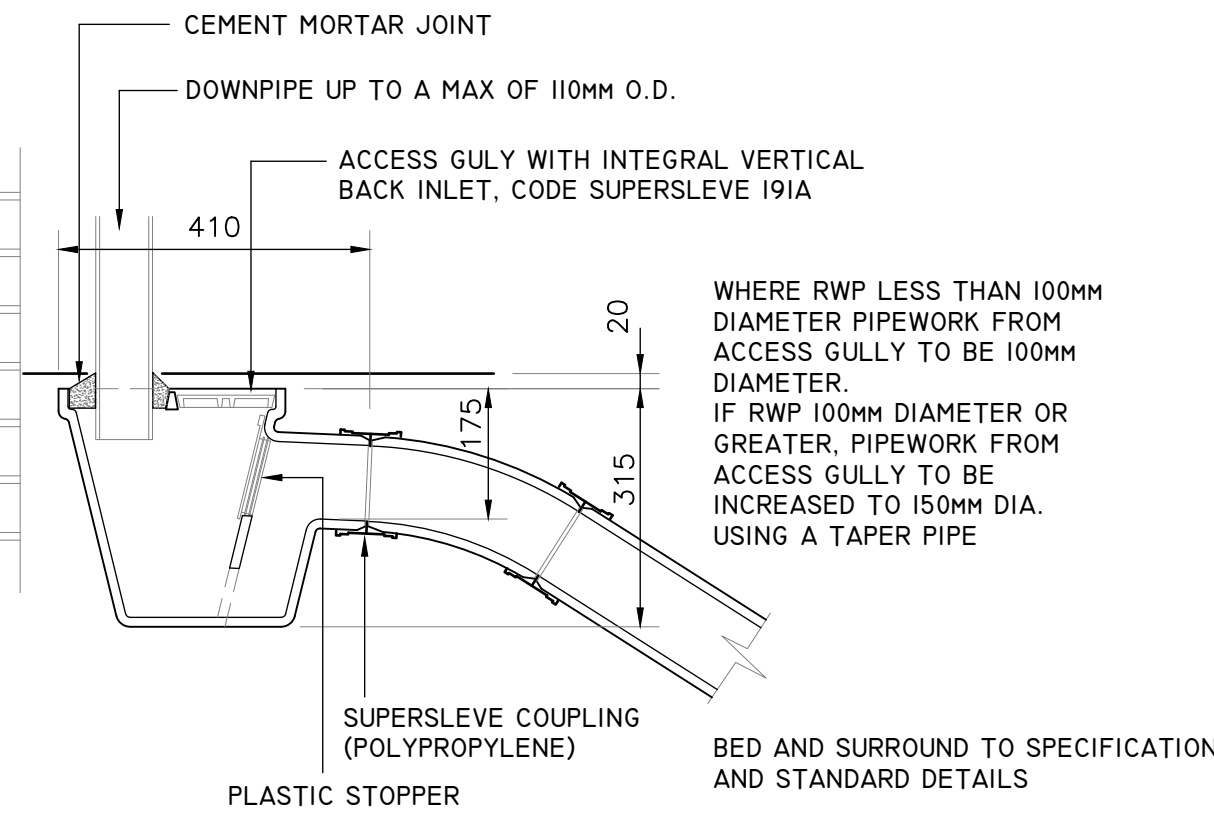


CONNECTION TO SOIL OR RAINWATER PIPES

NOT TO SCALE

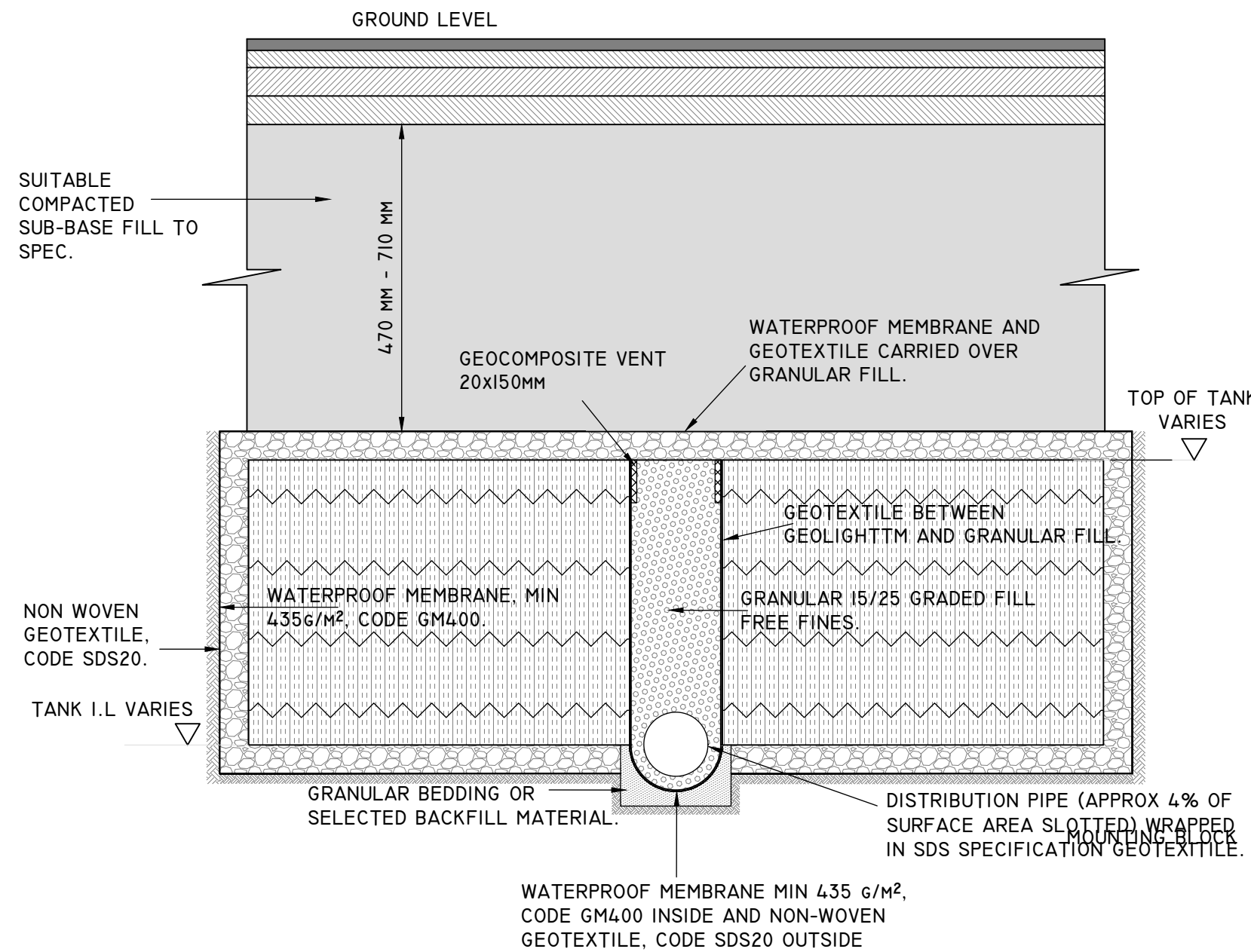


PROTECTION FOR PIPES LAID AT SHALLOW DEPTHS



CONNECTION TO RWP

NOT TO SCALE



SURFACE WATER ATTENUATION TANK TYPICAL CROSS SECTION

NOT TO SCALE

0 50MM ON A1 DWG. 50

NOTE
ATTENUATION TANK DETAILS TO MANUFACTURERS
DESIGN AND SPECIFICATION

POI	FOR INFORMATION	AO	AO	01.05.19
TI	FOR TENDER	RC	JJ	01.03.19
REV	DESCRIPTION	BY	CHK	DATE

CLIENT

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PROJECT
LITTLEHAMPTON
DBN3 REFURBISHMENT

DRAINAGE CONSTRUCTION
DETAILS SHEET 2

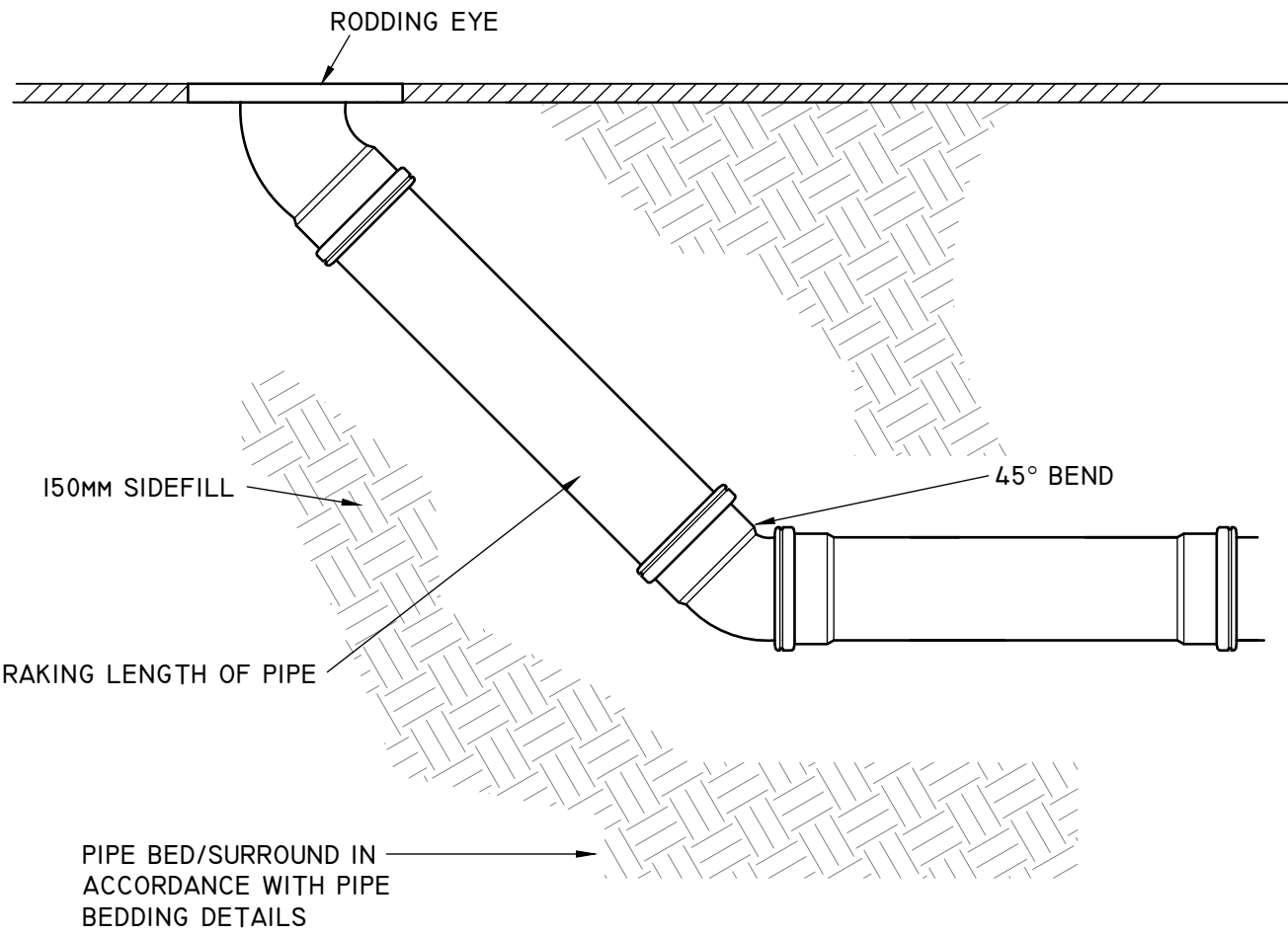
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CONSULTING ENGINEERS

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WELWYN GARDEN CITY,
HERTS
AL7 1HE. TELEPHONE: 01707 527 630
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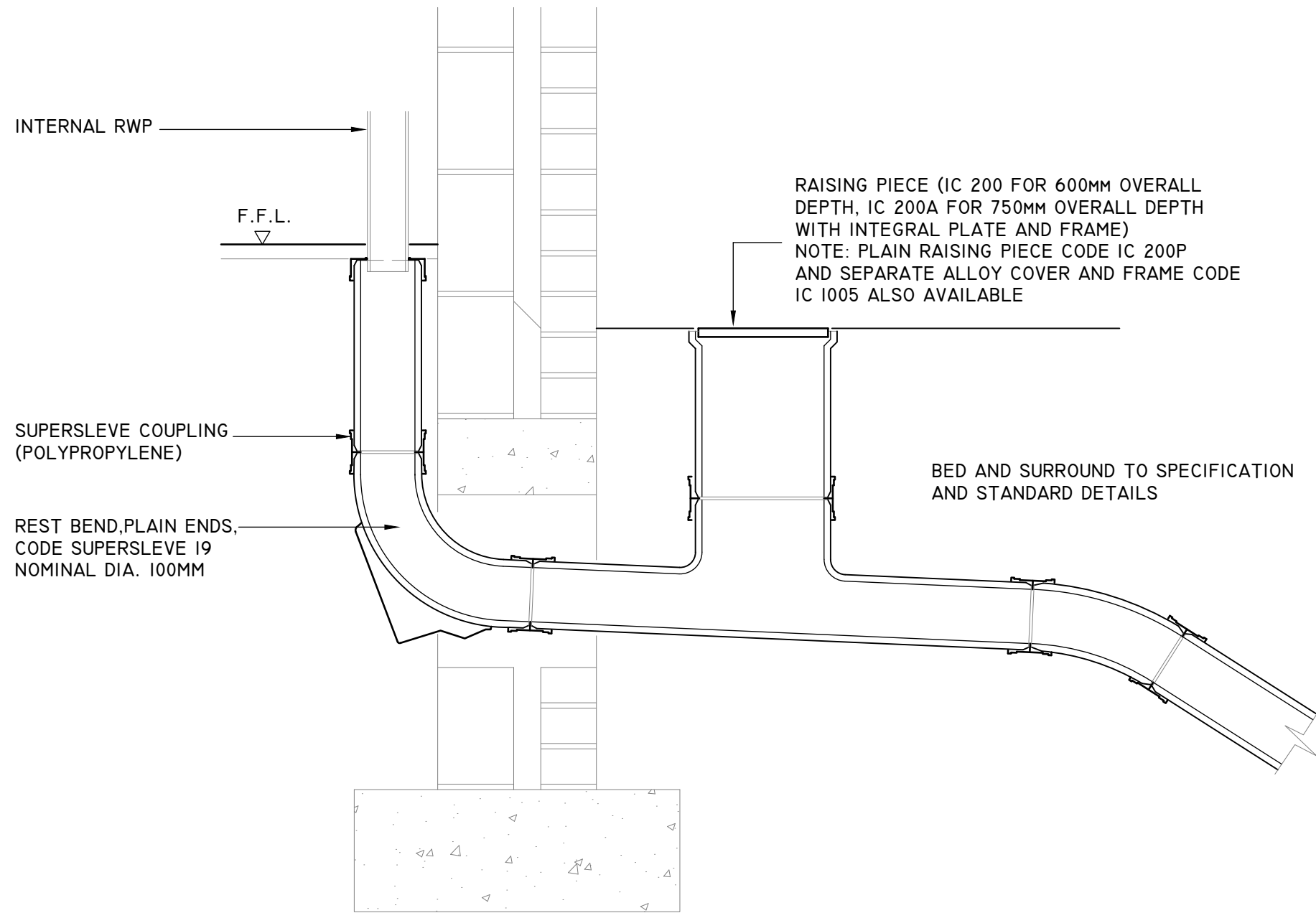
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INFORMATION			
SCALE	DATE	DRAWN BY	CHECKED
NTS	FEB '19	RC	JJ
DRG NO.	REVISION		
190213-PIN-00-XX-DR-C-0226	P01		

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REF: 190213

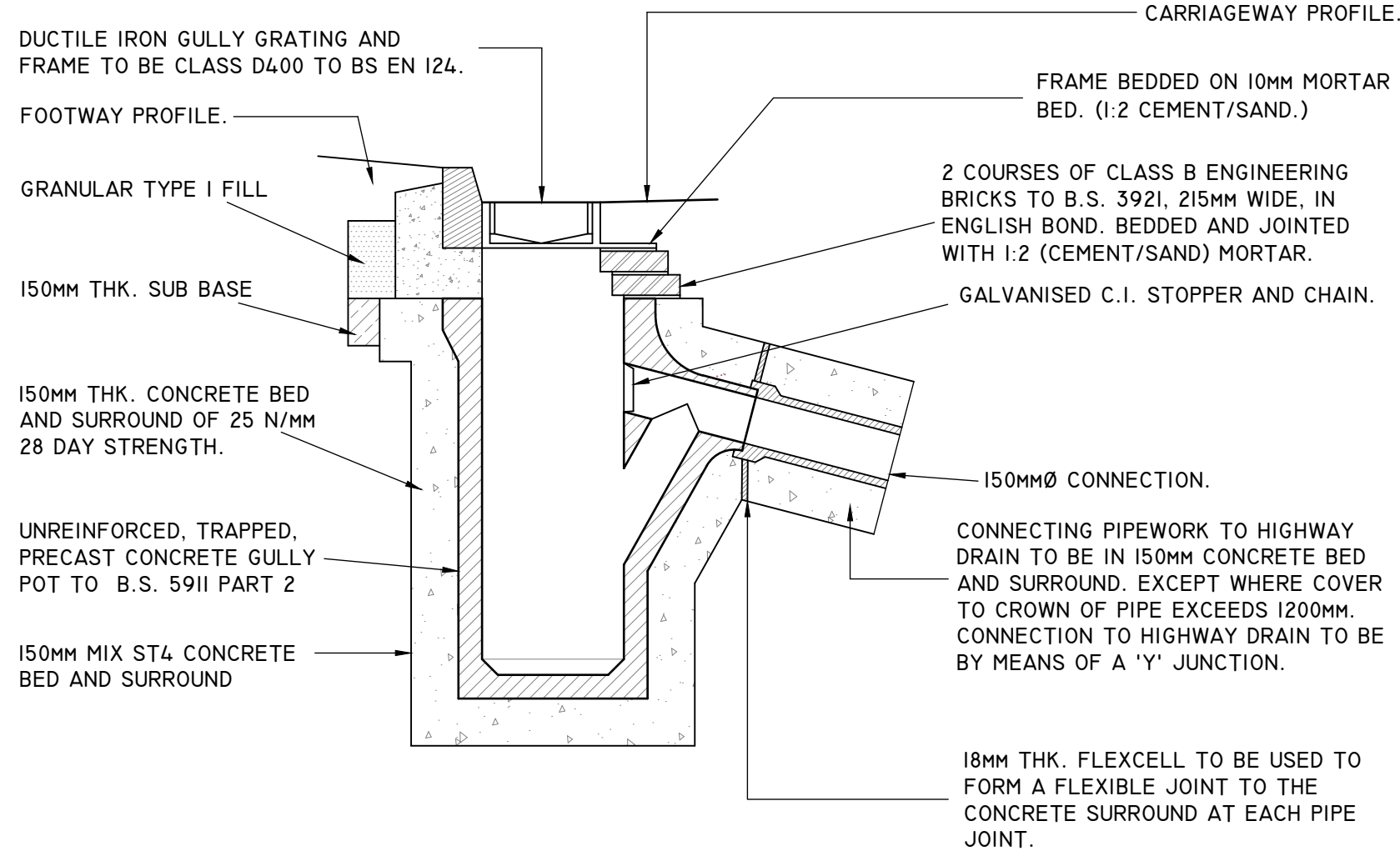


TYPICAL RODDING EYE DETAIL.



TYPICAL DETAIL OF RWP RODDING FACILITY

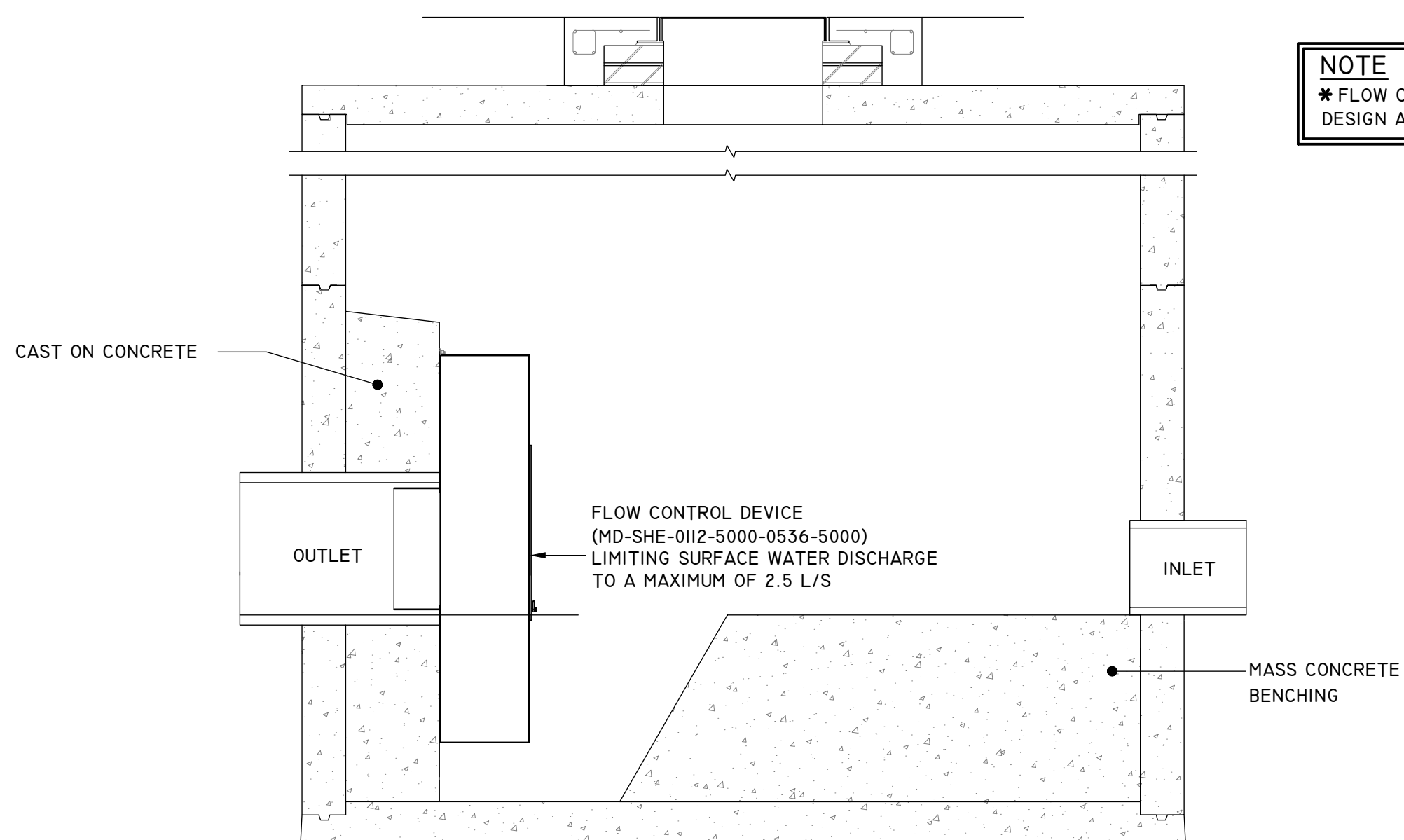
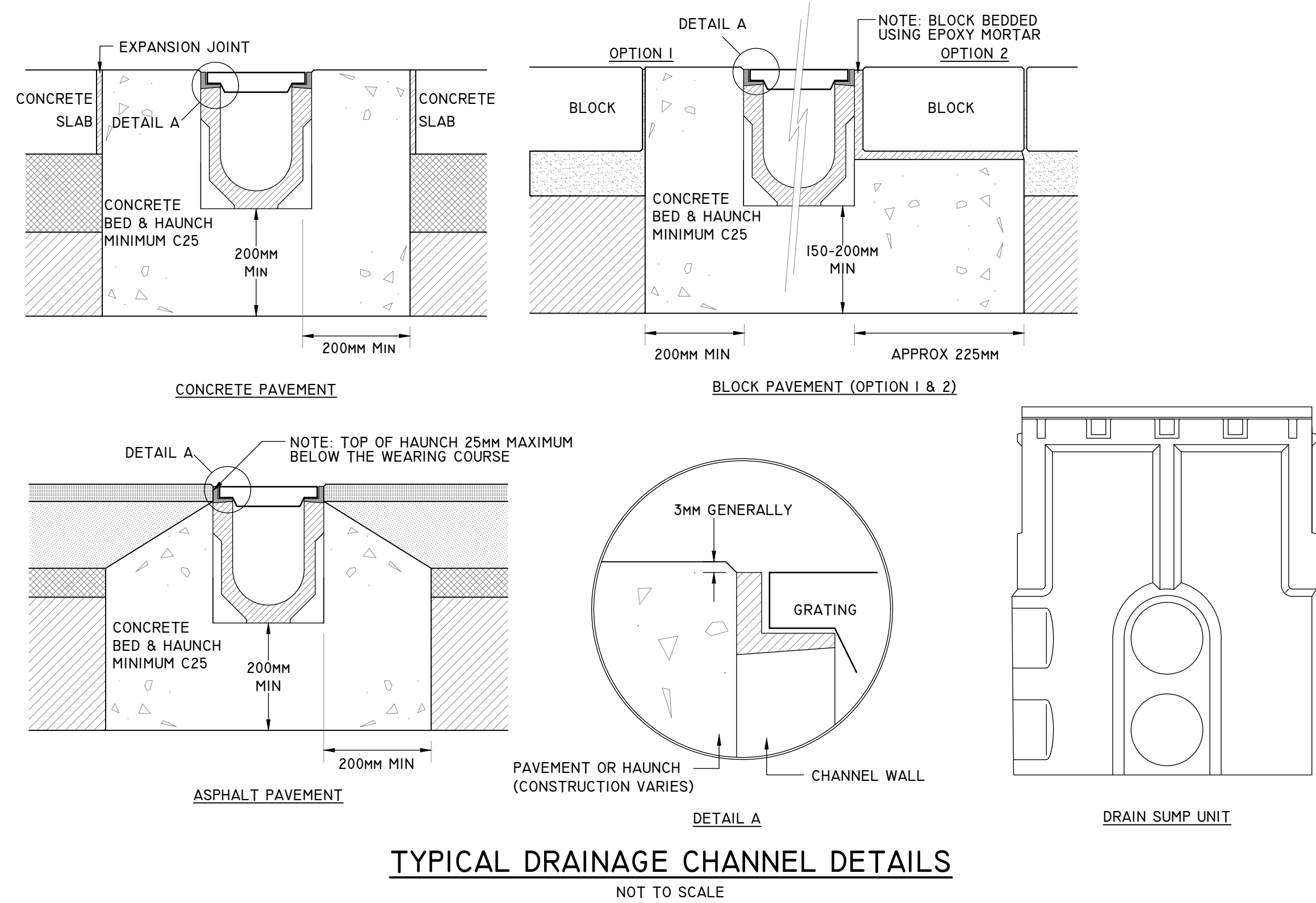
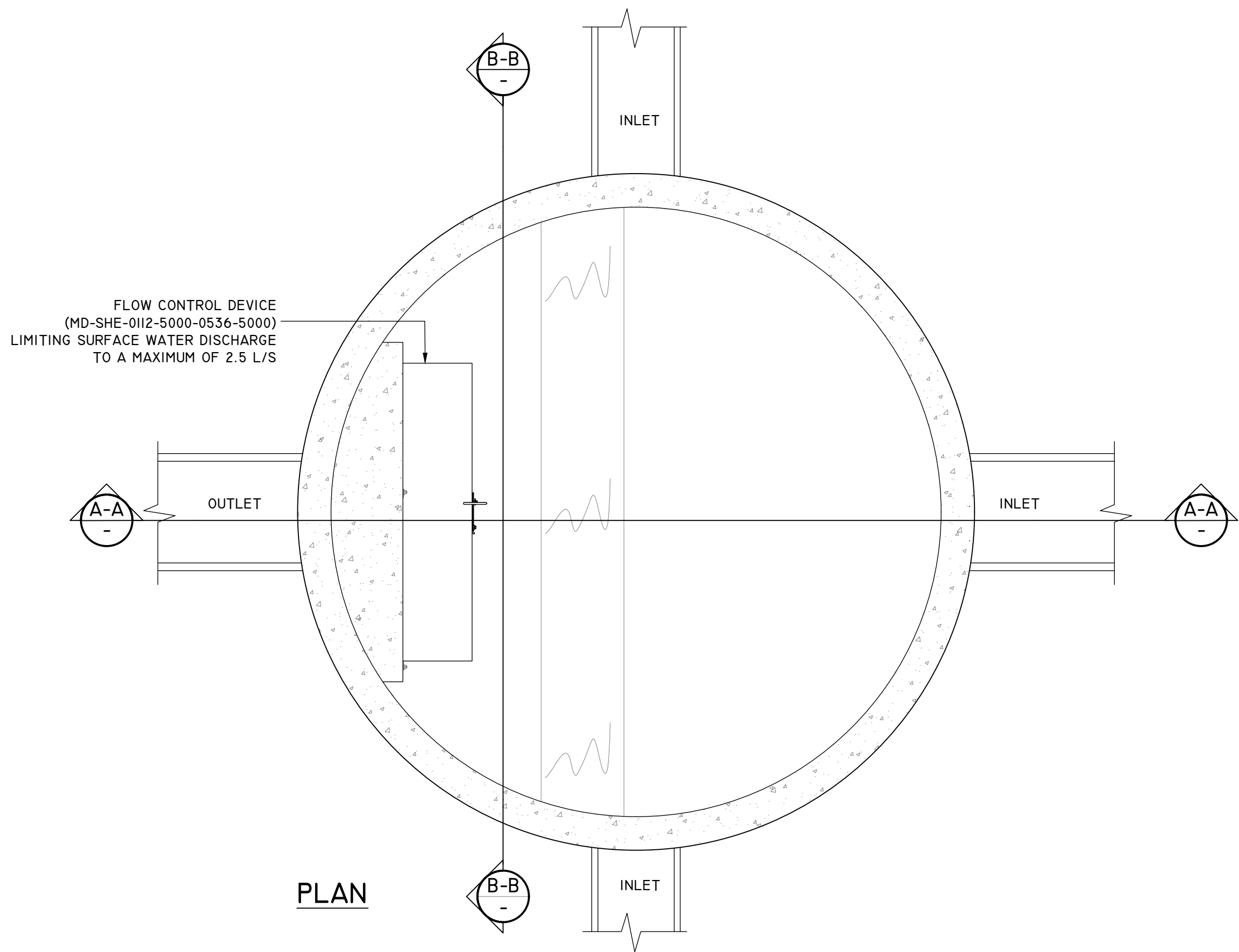
NOT TO SCALE



SECTION THROUGH TYPICAL GULLY

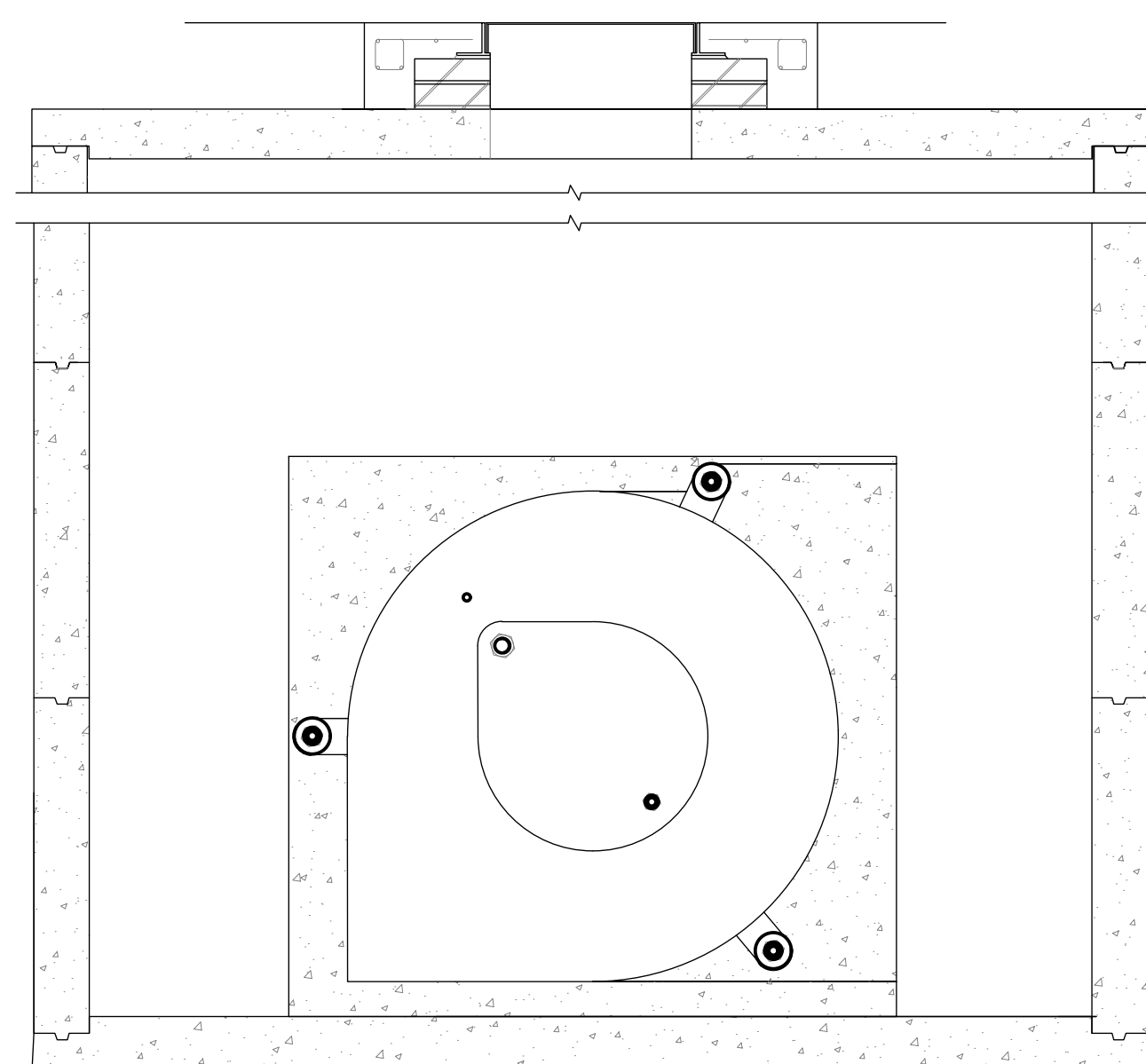
(450MM x 900MM FOR ROAD GULLY, 375MM x 750MM FOR CAR PARK GULLY)

NOT TO SCALE



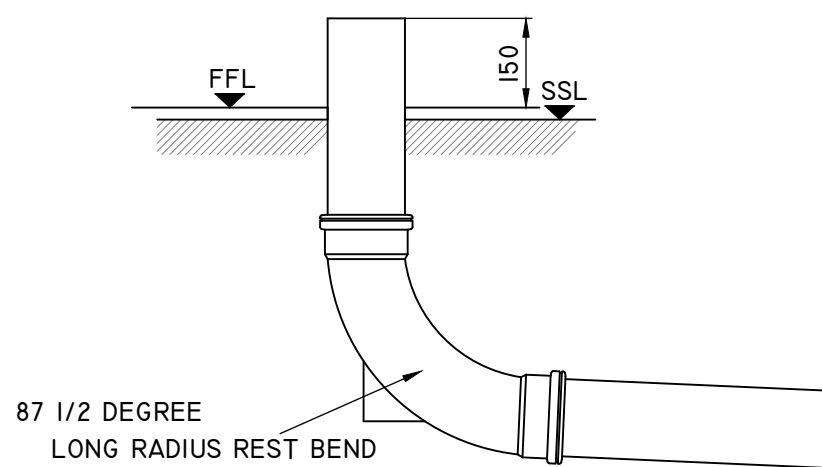
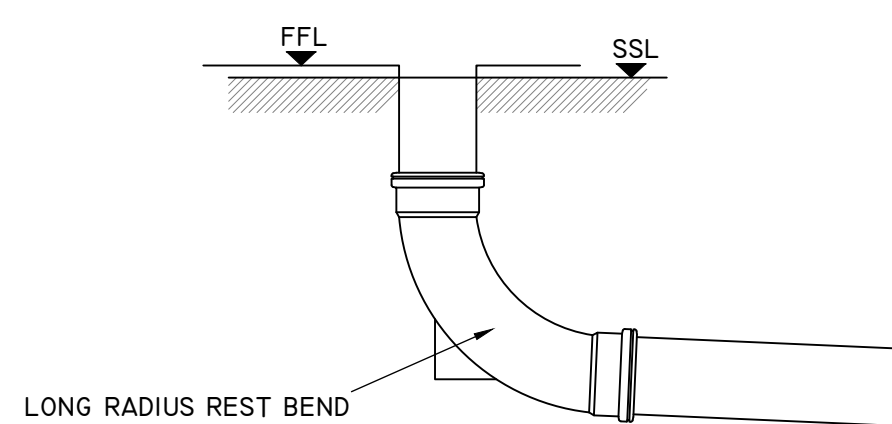
NOTE

* FLOW CONTROL DEVICE DETAILS TO MANUFACTURERS DESIGN AND SPECIFICATION



SECTION A-A

SECTION B-B



GENERAL NOTES

- DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
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0 50MM ON A1 DWG. 50

POI	FOR INFORMATION	AO	AO	01.05.19
TI	FOR TENDER	RC	JJ	01.03.19
REV	DESCRIPTION	BY	CHK	DATE

CLIENT

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DRAWING TITLE
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INFORMATION			
SCALE @ A1	DATE	DRAWN BY	CHECKED
NTS	FEB '19	RC	JJ
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Appendix H – Arun District Council Drainage Checklist

[Home](#) | [Planning Applications](#) | Drainage Checklist

Drainage Checklist

Surface Water Drainage Proposal Checklist

Foreword

Before completing this checklist you are advised to read "[Arun/Chichester District Council Supplementary Requirements for Surface Water Drainage Proposals](#)".

The Surface Water Drainage Proposals Checklist is designed to clearly outline Arun/Chichester District Council's expectations and requirements for Surface Water Drainage Proposals and to expedite their review. This document should be used when completing Discharge of Conditions Applications or if the applicant wishes to avoid pre-commencement conditions relating to surface water drainage.

The Town and Country Planning Regulations now require pre-commencement conditions to have the prior agreement of the applicant regarding their wording and use. If an applicant wishes to avoid surface water drainage pre-commencement conditions they will need to submit detailed surface water drainage proposals in line with the Surface Water Drainage Proposal Checklist.

The below details are required to enable Arun/Chichester District Council to examine if proposals follow the hierarchy for sustainable drainage and if the design will adequately drain the site.

N.B. It will be difficult for Arun/Chichester District Council to undertake an appropriate and therefore timely assessment of your application if you answer "no" to any of the questions below, or if you fail to provide any of the information requested.

Checklist

Winter groundwater monitoring results included	Y/ N
Winter infiltration test results included	Y/ N
Period of winter groundwater monitoring	N/A
Maximum recorded groundwater level (AOD)	N/A
Date of infiltration testing	Testing to be carried out on site
Minimum infiltration rate recorded (at location of infiltrating structure)	Testing to be carried out on site
Plan showing the location of winter groundwater monitoring and infiltration testing included	Locations to be provided Y/N
Method of surface water disposal proposed (Delete as appropriate)	Infiltration / Attenuation with discharge to watercourse Attenuation with discharge to surface water sewer/ Attenuation with discharge to foul sewer
If infiltration is <u>not</u> to be used: Justification supplied	Y /N
If infiltration is proposed: half drain time for 10 year event + climate change allowance (hours)	N/A

If infiltration is proposed: half drain time for 100 year event + climate change allowance (hours) If infiltration is proposed: lowest base level of infiltrating structure	N/A	
If attenuation is proposed: calculations of pre-development runoff rates included *	☒ Y / ☐ N	Rate l/s 0.34/s
If attenuation is proposed: is proposed discharge rate less than or equal to pre-development rate?*	☒ Y / ☐ N	Rate l/s 2.54/s
Calculations included demonstrating that the 1 in 100 year plus climate change event can be accommodated on site**	☒ Y / ☐ N	
If proposing an impermeable lined attenuation feature/s, calculations included demonstrating that resistance to floatation (due to groundwater levels) is achieved and catered for in the design	Y/N/Not applicable	
If alterations or discharge to an ordinary watercourse is proposed: has Ordinary Watercourse Land Drainage Consent been sought?	Y/N Not Required	
Drainage layout plans included***	☒ Y / ☐ N	
Construction detail plans included****	☒ Y / ☐ N	
Exceedance flow route plans included (Not required for <5 properties)	Y/N/Not applicable	

*If developing brownfield sites, please provide fully detailed plans of the existing surface water drainage arrangements on site, including impermeable areas, gullies, outfalls, pipes & diameters, manholes, etc.

**If infiltration is proposed the following factor of safety should be applied to calculations (in accordance with CIRIA R156/ CIRIA C609)

Size of area to be drained	Consequences of failure					
	No damage or inconvenience		Minor inconvenience, e.g. surface water on car park		Damage to buildings or structures or roads	
	Cv=1.0	Cv=0.75	Cv=1.0	Cv=0.75	Cv=1.0	Cv=0.75
<100 m sq	1.5	2	2	3	10	13
100m sq to 1000m sq	1.5	2	3	4	10	13
>1000m sq	1.5	2	5	6.5	10	13

***Please note that drainage layout plans should include:

- All surface water drainage pipes labelled with; diameters, pipe materials, falls and invert levels.
- All infiltrating and attenuating structures (including permeable paving) labelled with; dimensions, invert and cover levels.
- All manholes labelled with; cover levels, invert levels, cover types detailed.
- All silt traps clearly labelled with sump depths.
- Control structures with outflow rates and invert levels.
- Proposed/existing levels of any areas subject to ground raising, together with suitable measures/detailed drawings for the associated managing of surface water runoff. Please note that ground raising should be avoided unless there are exceptional circumstances.

****If your proposed drainage scheme includes any of the following elements site specific construction detail plans should be supplied: pipe bed and surround; infiltrating structures; attenuating structures; manholes; catchpits/silt traps; control devices; permeable paving; headwalls.

Arun Civic Centre ([map](#))

Maltravers Road

Littlehampton

West Sussex

BN17 5LF

DX: 57406 Littlehampton

Monday - Thursday: 8:45am - 5:15pm

Friday: 8:45am - 4:45pm

Bognor Regis Town Hall ([map](#))

Clarence Road

Bognor Regis

West Sussex

PO21 1LD

Monday to Thursday: 8:45am - 5:15pm

Friday: 8:45am - 4:45pm

Benefits: 01903 737753

Rubbish & Recycling: 01903 737754

Council Tax & Business Rates: 01903 737752

Environmental Health: 01903 737755

Housing Repairs/Maintenance: 01903 737827

Planning & Building Control: 01903 737756

Elections: 01903 737616

[More telephone numbers & email addresses](#)

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