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DRAINAGE AND SUDS STRATEGY

166 Leatherhead Road, Chessington, KT9 2HU

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Quality Standards Control

The signatories below verify that this document has been prepared in accordance with our quality control requirements. These procedures do not affect the content and views expressed by the originator.

This document must only be treated as a draft unless it has been signed by the originators and approved by a director.

Revision	*V01*
Date	08/03/2024
Prepared by	A Wallace
Checked by	A Alsop
Authorised by	A Wallace

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EXECUTIVE SUMMARY

This Drainage Assessment reviews the existing drainage arrangement at the application site and proposes a surface water drainage strategy in line with Local Authority and Lead Local Flood Authority (LLFA) guidance.

The site is currently occupied by a building and is located at 166 Leatherhead Rd, Chessington, KT9 2HU.

The proposed development comprises the construction of a new multi unit residential development and associated external works.

Surface Water Drainage

The proposed strategy presented in detail in this report aims to use tanked permeable paving to store water and discharge at a maximum of 5l/s to the existing sewer in the street.

Storage is provided for all storm events up to and including the 1 in 100-year storm plus 40% allowance for climate change.

All external areas will be constructed with permeable materials where possible to limit the flow into the sewer system.

Maintenance/management of all onsite drainage infrastructure has been considered within a separate maintenance plan appended to this report. This will be updated through the development process.

The proposed drainage strategy is entirely based on-site with the exception of the new sewer connections if required.

Overall, the proposals provide a high level of water treatment, runoff reduction and flooding protection for the proposed development and are in accordance with all requirements of the Lead Local Flood Authority (LLFA).

Foul Drainage

It is proposed to discharge the foul drainage from the site into the existing Thames Water sewer.

1 INTRODUCTION

1.1 Background

1.1.1 Jomas was commissioned to undertake a Drainage Assessment for the proposed development of land located at 166 Leatherhead Rd, Chessington, KT9 2HU.

1.1.2 The proposed development comprises the construction of a new multi unit residential development and associated external works.

1.1.3 This Drainage Assessment has been produced in support of a planning application and should be read in conjunction with the other planning documents.

2 SITE DESCRIPTION

2.1.1 The site is located at 166 Leatherhead Rd, Chessington, KT9 2HU.

2.1.2 The site is approximately 1462 square metres in size and is occupied by an existing building.

2.1.3 Pre-development, the site is approximately 31% impermeable (460 square metres). Post development, the impermeable area will increase to 68% (996 square metres).

2.1.4 The site location information is as follows:

- Nearest Postcode: KT9 2HU.

2.2 Topography

Site Topography

2.2.1 The topographic survey plan is provided in appendix B. The site is irregular in shape and falls gently from east to west.

3 DESIGN PRINCIPLES AND POLICY REQUIREMENTS

3.1.1 Since April 2015, Lead Local Flood Authorities (LLFA's) have become a statutory consultee on surface water drainage for many planning applications. For this site, the following is considered to be the required level of detail required for planning approval:

3.1.2 Report to be prepared in accordance with the National Planning Policy Framework (NPPF), the accompanying Planning Practice Guidance (PPG), Local Authority and Lead Local Flood Authority (LLFA) guidance and Strategic Flood Risk Assessments.

3.2 General Principles for Surface Water Drainage

3.2.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015), the Local Authority Flood Risk Management Strategy, Level 2 Strategic Flood Risk Assessment and the Local Flood Risk Management Strategy require sustainable drainage systems in all development to reduce surface water runoff and provide water treatment on site. This includes but is not limited to addressing the following issues in order of preference:

- Store rainwater for later use.
- Use infiltration techniques, such as porous surfaces in non-clay areas.
- Attenuate rainwater in ponds or open water features for gradual release.
- Attenuate rainwater by storing in tanks or sealed water features for gradual release.
- Discharge rainwater direct to a watercourse.
- Discharge rainwater to a surface water sewer/drain.
- Discharge rainwater to the combined sewer.

3.2.2 Consideration must be given to the direction of water flow across the site and where this may be dispersed and incorporating any features that will help reduce surface water run-off. All developments should follow the drainage hierarchy and aim to achieve greenfield run off with at least a 50% reduction in surface water discharge and this needs to be demonstrated as part of the planning submission.

4 SITE DRAINAGE INFORMATION

4.1.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

4.1 Discharge to Ground

4.1.1 The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

4.1.2 The British Geological Survey (BGS) mapping available on line suggests that the area is underlain by:

Bedrock of London Clay Formation - Clay, Silt And Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.

Superficial Geology - None recorded.

4.1.3 It is noted that the site and surrounds are urban in nature and are likely to have existing surface water sewer connections. Based on the impermeable geology it is unlikely that infiltration will work.

4.1.4 Infiltration testing will be completed prior to construction and the design revised as necessary should infiltration prove to be viable.

4.2 Discharge to Surface Water Body

4.2.1 There are no suitable surface water bodies near to the site that can be used for surface water discharge.

4.3 Discharge to Surface Water Sewer/Combined Sewer

4.3.1 Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

4.3.2 As there are sewers in the street, it is proposed to connect into the surface water sewer.

4.4 Sustainable Drainage Systems (SuDS)

4.4.1 To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 1 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Table 1: SuDS Selection Based on the SuDS Hierarchy

Component	Recommendation
Green/Blue roofs	Whilst the use of green and blue roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority. If feasible, depending on the roof design, a green/blue roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green/blue roof/s will offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1in2 year storms) will result in no run-off for the building. Green roofs are not suitable for the proposed pitched roofs.
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. There are no open areas on the site which are suitable for basins or ponds.
Filter Strips and Swales	Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within run-off. They also create biodiverse areas for planting and habitat. Swales are not considered suitable for this site.
Infiltration Devices	Infiltration devices are likely to be suitable for the main drainage system due to the permeable nature of the existing ground. Infiltration is not possible for this site.
Permeable Paving	Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel. Tanked permeable paving will be used for the extensive driveway area.
Tanked Systems	This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to an acceptable discharge rate. There are no tanks proposed.

5 SURFACE WATER DRAINAGE DESIGN

5.1 Site Areas

5.1.1 The development area currently comprises an existing dwelling. The existing and proposed areas are summarised below.

Table 2: Site Areas

Parameter	Existing (m2)	Existing (%)	Proposed (m2)	Proposed (%)
Impermeable area	460	31	996	68
Permeable area	1002	69	466	32
Total area	1462	100	1462	100

5.1.2 It is assumed that the surface water runoff from the site currently discharges into the sewers in the street.

5.2 Design Considerations

5.2.1 Consideration has been given to the following when calculating the proposed impermeable areas.

- The 2013 EA 'Rainfall Run-off Management for Developments' Report (SC030219) states that urban creep, the process of gradually increasing impermeable area within an urban area (through paving soft landscaped surfaces and constructed outbuildings etc), is an acknowledged issue. To include an allowance for urban creep, the impermeable area used in the drainage calculations would normally be increased by 10% in accordance with the recommendation made in SC030219, however as the site is already 100% impermeable, there is no need to increase the impermeable area.

5.2.2 The climate change allowance used in the Drainage Strategy is in line with updated EA guidance values published in February 2016 for increased rainfall intensities by 2115.

5.3 Greenfield Run-Off Rates

5.3.1 The greenfield run off rates have been calculated using the Wallingford method. Calculations are provided in Appendix C and summarised in the table below.

5.4 Existing Run-Off Rates

5.4.1 The existing run-off rates for a variety of return periods have been calculated using the Wallingford method.

5.4.2 The total site area is 1462 square metres and is 31% impermeable, resulting in an impermeable area of 460 square metres. Taking conservative peak 1 year, 30 year and 100 year rainfall rates of 50mm/hr, 125mm/hr and 185mm/hr respectively, the maximum existing peak discharge rates have been calculated as follows.

Contributing Area (ha) x 1 yr Rainfall (mm/hr) x 2.78

460/1000 x 50 x 2.78 = **6.4 l/s**

Contributing Area (ha) x 30 yr Rainfall (mm/hr) x 2.78

460/1000 x 125 x 2.78 = **16.0 l/s**

Contributing Area (ha) x 100yr Rainfall (mm/hr) x 2.78

460/1000 x 185 x 2.78 = **23.7 l/s**

5.4.3 The discharge rates for the existing and proposed site are summarised below.

Table 3: Existing Run-off Rates

Parameter	Greenfield Discharge (l/s)	Existing Discharge (l/s)	Proposed Discharge Total (l/s)
QBAR	**0.63**	**-**	**NA**
1 year	**0.54**	**6.4**	**3.9**
30 year	**1.46**	**16.0**	**4.3**
100 year	**2.02**	**23.7**	**4.5**
100 year +40%	**NA**	**NA**	**4.9**

5.4.4 Site discharge should be as close to the greenfield rates as possible. However as the discharge rates are low, discharge will be reduced to less than 5l/s.

5.5 Attenuation

5.5.1 It is proposed to discharge to the existing sewer as close to greenfield rates as possible. In accordance with best practice, outflow controls will be set to discharge at a rate of 5 litres/second or less which is less than existing for all storm events.

5.5.2 Calculations for the required attenuation is provided in Appendix C. The total attenuation volume is approximately 40 cubic metres to cater for the 100 year +40% storm event. Storage will be provided within the voids of tanked permeable paving.

5.5.3 Discharge is proposed to limited to 5l/s or less for all storm events up to and including the 100 year + 40% storm.

5.5.4 Thames Water will be contacted for approval of the discharge to their sewer if required. See Appendix C for calculations and Thames Water sewer locations.

5.6 Consents, Offsite Works and Diversions

5.6.1 The proposed surface water drainage strategy is accommodated entirely on site.

5.6.2 Consent will be required for the discharge to the sewer.

5.7 Maintenance

5.7.1 A SuDS maintenance plan has been prepared to outline the management of the potential SuDS features. The maintenance plan is provided in Appendix D.

5.8 Exceedance Flooding and Overland Flow

5.8.1 The drainage system has been designed to cater for the 1 in 100 year + 40% climate change storm. ie in this storm event all surface water will be collected on site and slowly released. Thus, the overland flow route for the site drainage will only be in use in the event of drainage network failure, storms in excess of the 1 in 100 year + 40% climate change storm or flows from offsite flowing through the site.

5.8.2 Overland flow will discharge towards the west and out to Nigel Fisher Way

5.8.3 See Appendix C for overland flow plan.

5.9 Foul Drainage

5.9.1 Foul drainage will discharge to the existing sewer in the street. A Sewer connection application will be submitted for approval.

6 WATER QUALITY

6.1 Post-Development Water Quality Treatment

6.1.1 In line with the 2015 SuDS Manual (CIRIA C753), certain criteria should be applied to manage the quality of run-off to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising the following principles:

- Manage surface water run-off close to source
- Treat surface water run-off on the surface
- Treat surface water run-off to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts from accidental spills

6.1.2 Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

6.1.3 The proposed development comprises two types of land use; residential roofs and external areas/driveways. Thes land uses are classified as having very low and low pollution levels respectively. This table is provided below in Table 4.

Table 4: Pollution Hazard Indices from 2015 SuDS Manual (C753)

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

6.1.4 The proposed drainage strategy utilises the following SuDS features:

- Permeable Paving

6.1.5 The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed for the roof and paving. This table is provided below in Table 5.

Table 5: Indicative SuDS Mitigation Indices from 2015 SuDS Manual (C753)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices[1] TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

6.1.6 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type), as follows:

Total SuDS mitigation index ≥ pollution hazard index

(for each contaminant type) (for each contaminant type)

6.1.7 For each type of land-use, the pollution hazard indices, mitigation indices and concluding hazard have been outlined in Table 6 below.

Table 6: Roof Space Water Quality Mitigation Summary

Residential Roofs				**SuDS Manual Reference**
	TSS	**Metals**	**Hydrocarbons**	
Pollution Hazard Index	0.2	0.2	0.05	Table 26.2
Mitigation Index (Permeable Paving)	0.7	0.6	0.7	Table 26.3
Total Mitigation index	0.7	0.6	0.7	Worst case only
Result	Total SuDS mitigation index ≥ pollution hazard index and therefore hazard is exceeded			

Table 7: Roof Space Water Quality Mitigation Summary

Driveways				SuDS Manual Reference
	TSS	**Metals**	**Hydrocarbons**	
Pollution Hazard Index	0.5	0.4	0.4	Table 26.2
Mitigation Index (Green Roof)	0.7	0.6	0.7	Table 26.3
Total Mitigation index	0.7	0.6	0.7	Worst case only
Result	Total SuDS mitigation index ≥ pollution hazard index and therefore hazard is exceeded			

6.1.8 Therefore, it can be concluded that the provision of the permeable paving exceeds the required pollution mitigation indices and provides sufficient treatment as part of the surface water management train in accordance with the 2015 SuDS Manual (CIRIA C753).

7 DRAINAGE DURING CONSTRUCTION

7.1 Construction Run-off Management

7.1.1 Installing the surface water and foul drainage system, whilst managing temporary run-off, are key aspects of the construction works involved in any development. The information provided below is in accordance with the 'C698 Site handbook for the construction of SUDS' (CIRIA, 2007).

7.1.2 Please note that the measures recommended below are recommendations only and need to be confirmed at the construction stage by the client and the contractor.

7.2 Management of Construction (Including Drainage)

7.2.1 Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site.

7.2.2 A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known. However, the following key points are general construction issues associated with SuDS which will be addressed when these plans are complete:

- Silt-laden waters from construction sites represent a common form of waterborne pollution;
- These silt-laden waters cannot enter SUDS drainage systems unless specifically designed to accept this as it can clog the systems and pollute receiving waters. Therefore, piped drainage systems should not be connected to the attenuation SuDS devices until the late stages of construction.
- Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to the attenuation SuDS devices.

7.3 Temporary Drainage During Construction

7.3.1 The three principal aspects of drainage control during construction are trapping sediment, conveying run-off, and controlling run-off.

7.3.2 Sediment traps and barriers can include basin traps and sediment fences (with any necessary boundary controls). The principal basins are to be installed after the construction site is accessed. Sediment fences and barriers will then be installed as needed during grading.

7.3.3 Conveyance of run-off can be achieved through small ditches/stream, storm drains, channels and sloped drains with sufficient inlet/outlet protection.

7.3.4 Slope stability needs to be considered when using any channels to convey run-off across the site into any basins etc.

7.3.5 Run-off control measures will need to be implemented in order not overwhelm the temporary system and cause flooding issues. Run-off rates from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading.

7.3.6 Run-off control to include provision of perimeter ditches or appropriate levels grading to direct any water from the construction site to remain on site.

7.3.7 Any necessary surface stabilisation measures are to be applied immediately on all disturbed areas where construction work is either delayed or incomplete.

7.3.8 Maintenance inspections are to be performed weekly, and maintenance repairs to be made immediately after periods of rainfall.

7.4 Protection of Drainage Infrastructure during Construction

7.4.1 All drainage infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.

APPENDIX A: PROPOSED DEVELOPMENT DETAILS

KEY

1 Storey House
3 Bed 6 Person
GIA: 94 sqm

2 Storey House with Loft
3 bed 5/6 Person
GIA: 94 sqm + Loft

Rev:	Description:	Date:	Drw:	Chk:
P07	Issued for Information	30/01/24	TB	MA
P06	Issued for comment	11/01/24	TB	MA
P05	Issued for Information	15/12/23	TB	MA
P04	Issued for comment	07/12/23	TB	MA
P03	Issued for comment	22/11/23	TB	MA
P02	Pre App	20/10/23	TB	MA
P01	Issued for Information	26/07/23	TB	MA

Scale 0m 1 2.5 5 10

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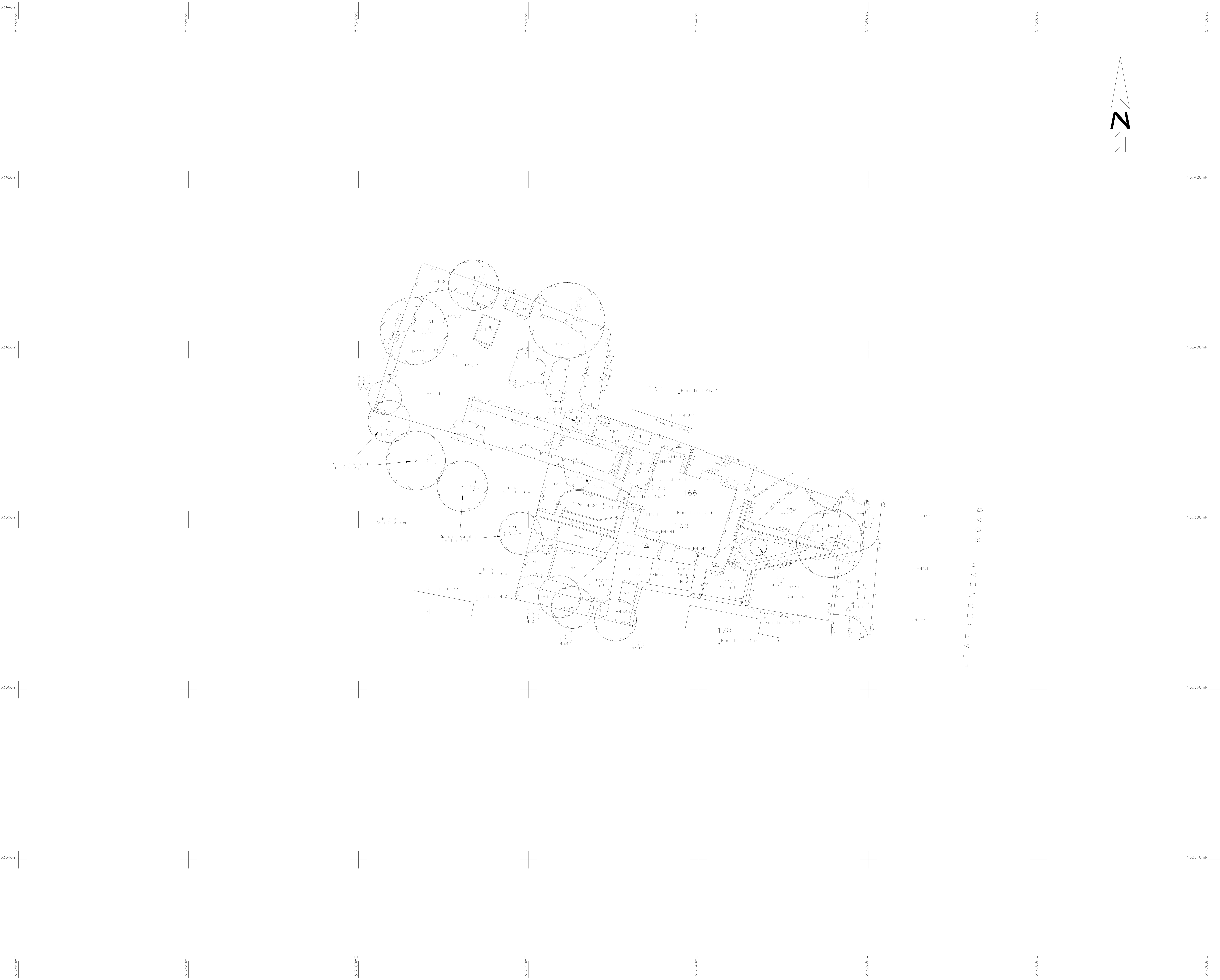
Client:
Dave Tippets

Project Name:
166 Leatherhead Road

Drawing Title:
Site & General Setting Out:
Site Plan

N

Drawing Status:	Status Code:	Project No:	Scale at A1:
Stage 3 - Preliminary	**S0**	**DTP01**	**1:100**
Drawing No:	Revision:	Date:	Scale at A3:
DTP01-MAA-02-XX-DG-A-0001	**P07**	**DEC. 23**	**1:200**



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DATUM NOTES

GRID ORIGIN IS BASED UPON SURVEY STATION PGM 6 FIXED TO THE ORDNANCE SURVEY NATIONAL GRID BY LEICA SMARTNET GPS NETWORK. A SCALE FACTOR OF 1 APPLIES TO THIS DRAWING.

ie. MEASURED DISTANCES ON THE GROUND WITHOUT GPS WILL BE THE SAME AS THOSE MEASURED ON THIS DRAWING

LEVELS ARE RELATED TO :–
ORDNANCE SURVEY GPS ACTIVE NETWORK AND TRANSFORMED USING THE OSGM15 & OSTN15 MODEL

SITE BENCH MARK ESTABLISHED IS LOCATED AT :–
SURVEY STATION 6

VALUE GIVEN AS: 44.065m

SURVEY CONTROL STATIONS SHOWN

ABBREVIATIONS (where applicable)

AV	Air Valve	MH	Manhole Cover
BK	Brick	MK	Marker
BL	Bollard	MS	Milestone
BS	Bus Stop	MT	Meter
BT	British Telecom	MY	Mercury
CB	Control Box	OH	Overhead
C/B	Close Boarded	PAV	Paving
CL	Cover Level	PB	Post Box
CLK	Chainlink	PE	Pipe
CO	Column	PM	Parking Meter
Conc	Concrete	P/R	Post and Rail
CP	Catch Pit	PT	Post
CPS	Concrete Paving Slabs	P/W	Post and Wire
CATV	Cable Television	RE	Rodding Eye
DC	Drainage Channel	RET	Retaining
DP	Drain Pipe	RS	Road Sign
EC	Electricity Cover	RSJ	Rolled Steel Joist
ER	Earthing Rod	SC	Stop Cock
FB	Flower Bed	SK	Soakaway
FE	Fence	SP	Signpost
FH	Fire Hydrant	ST	Silt Trap
FL	Floor Level	SV	Stop Valve
FP	Flag Pole	SVC	Security Video Camera
GP	Gate Post	TCB	Telephone Call Box
GV	Gas Valve	TK	Tank
GY, G	Gully	TL	Traffic Light
HT	Height	TP	Telegraph Pole
IC	Inspection Cover	UG	Underground
IL	Invert Level	UTF	Unable To Trace Further
IN	Interceptor	UTL	Unable To Lift
I/R	Iron Railings	VP	Vent Pipe
KO	Kerb Outlet	WL	Water Level
LB	Litter Bin	WM	Water Meter
LP	Lamp Post	WO	Wash Out

B	Floor to Beam Height in cms
C	Floor to Ceiling Height in cms
Cr.	Floor to Crown Height in cms
D	Floor to Door Head Height in cms
FC	Floor to False Ceiling Height in cms
FF	False Floor Level
H	Floor to Head Height in cms
S	Floor to Sill Height in cms
Spr.	Floor to Springer Height in cms

NOTES

* Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded as approximate only.
* Tree species (where shown) should be treated with caution and expert identification is advised.
* Although this is a digital survey the accuracy and amount of detail shown is only commensurate with the graphical scale of mapping as specified. Care should be exercised when working to larger scales.
* Visible features in the vicinity of the boundaries as shown above, may not represent the extent of legally conveyed ownership.
* Whilst every effort has been made to achieve accuracy on this plan, CRUCIAL clearance dimensions, levels and invert levels should be checked prior to design and construction.
* Kerb levels have been taken in the bottom of the channel.
* Areas of dense undergrowth cannot be surveyed in detail, these areas will be shown in outline only and marked as 'dense undergrowth' on the plan.

SHEET LAYOUT
NOT TO SCALE

166–168 LEATHERHEAD ROAD CHESSINGTON KT9 2HU

TOPOGRAPHICAL SURVEY

SURVEYED FOR JDT PROPERTIES LIMITED
UNIT A BLENHEIM HOUSE
1 BLENHEIM ROAD
EPSOM
KT19 9BE

SURVEYOR L.P
DATE JULY/2023

NO	DATE	REVISION

DRAWING NO	L 11723	REV 0
SCALE	1 : 200 @ A1	
SEE ALSO DWG NOS		
SHEET	1 of 1	
REF NO	L 11723	


LEATHERHEAD ROAD
162
166
168
170
4
Chain Link Fence Ht 2.40m
Surveyed Remotely Location Approx
No Access Area Overgrown
Grass
Shed
Building Materials
Pond
Concrete
Shrubs
Gravel
Asphalt
Brick Wall Ht 1.80m
Overhead Cable
Ridge Level 50.09
Ridge Level 53.66
Ridge Level 48.57
Eave Level 45.60
Eave Level 49.52
Site Datum 44.050

APPENDIX B: DRAINAGE DRAWINGS AND CALCULATIONS

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	andrew wallace
Site name:	Leatherhead Rd
Site location:	Chessington

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.35702° N
Longitude:	0.31102° W
Reference:	1256418303
Date:	Mar 07 2024 12:20

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.1462

Methodology

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

Soil characteristics

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	639	639
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

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

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	0.63	0.63
1 in 1 year (l/s):	0.54	0.54
1 in 30 years (l/s):	1.46	1.46
1 in 100 year (l/s):	2.02	2.02
1 in 200 years (l/s):	2.37	2.37

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR
NOTE: CONTRACTOR TO NOTE THE LIKELY PRESENCE OF MULTIPLE EXISTING SERVICES.
ALL SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION AND DIVERTED AS NECESSARY

Job. No. P5581J2966 Rev.

DRAINAGE NOTES

1. THIS DRAWING IS FOR PLANNING ONLY AND IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT SERIES DESIGN DRAWINGS, SPECIFICATIONS AND DOCUMENTATION.
2. CONSTRUCTION TO BE IN ACCORDANCE WITH ALL BRITISH AND EUROPEAN STANDARDS AND BUILDING REGULATIONS.
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5. ALL EXISTING SERVICES ARE TO BE LOCATED PRIOR TO THE COMMENCEMENT OF ANY WORKS. THE CONTRACTOR MUST NOTIFY THE ENGINEER IMMEDIATELY OF ANY CONFLICT WITH THE PROPOSED WORKS.
6. THE GENERAL SPECIFICATION OF MATERIALS AND WORKMANSHIPS FOR THE CONSTRUCTION OF THE ACCESS ROAD, FOOTPATHS AND OTHER AREAS OF HARDSTANDING SHALL BE THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOLUME 1. SPECIFICATION OF HIGHWAY WORKS (SHW) PUBLISHED BY THE STATIONARY OFFICE.
7. ALL LEVELS SHOWN ARE ASSUMED ONLY AND SUBJECT TO SURVEY AND DETAILED DESIGN.
8. ALL RWP AND FO SHOWN ARE INDICATIVE ONLY AND SUBJECT TO APPROVAL AND SETTING OUT BY THE ARCHITECT.
9. NODE NUMBERS REFER TO DRAINAGE MODEL
10. UNLESS NOTED OTHERWISE, PIPES TO BE:
    FOUL PIPES UNDER BUILDING ø100@1:40,
    FOUL PIPES EXTERNAL ø100@1:80,
    SURFACE WATER PIPES ø100@1:100

Notes.

Key dimensions to be checked by engineer before major structural works commence on site.

1. This survey has been computed and drawn about O S National Grid.
2. All levels are in metres and relate to O S National Datum by GPS instruments.
3. This survey was measured for a scale of 1:100, any subsequent enlargements should be verified on site.

Amendments

Rev	Date		By	Chkd

JOMAS
ENGINEERING
ENVIRONMENTAL
Jomas Associates Ltd.
Unit 24 Sarum Complex,
Salisbury Road,
Uxbridge, UB8 2RZ

Client
JDT Properties Ltd

Project
166 Leatherhead Road, Chessington, KT9 2HU

Drawing
Proposed Drainage Plan

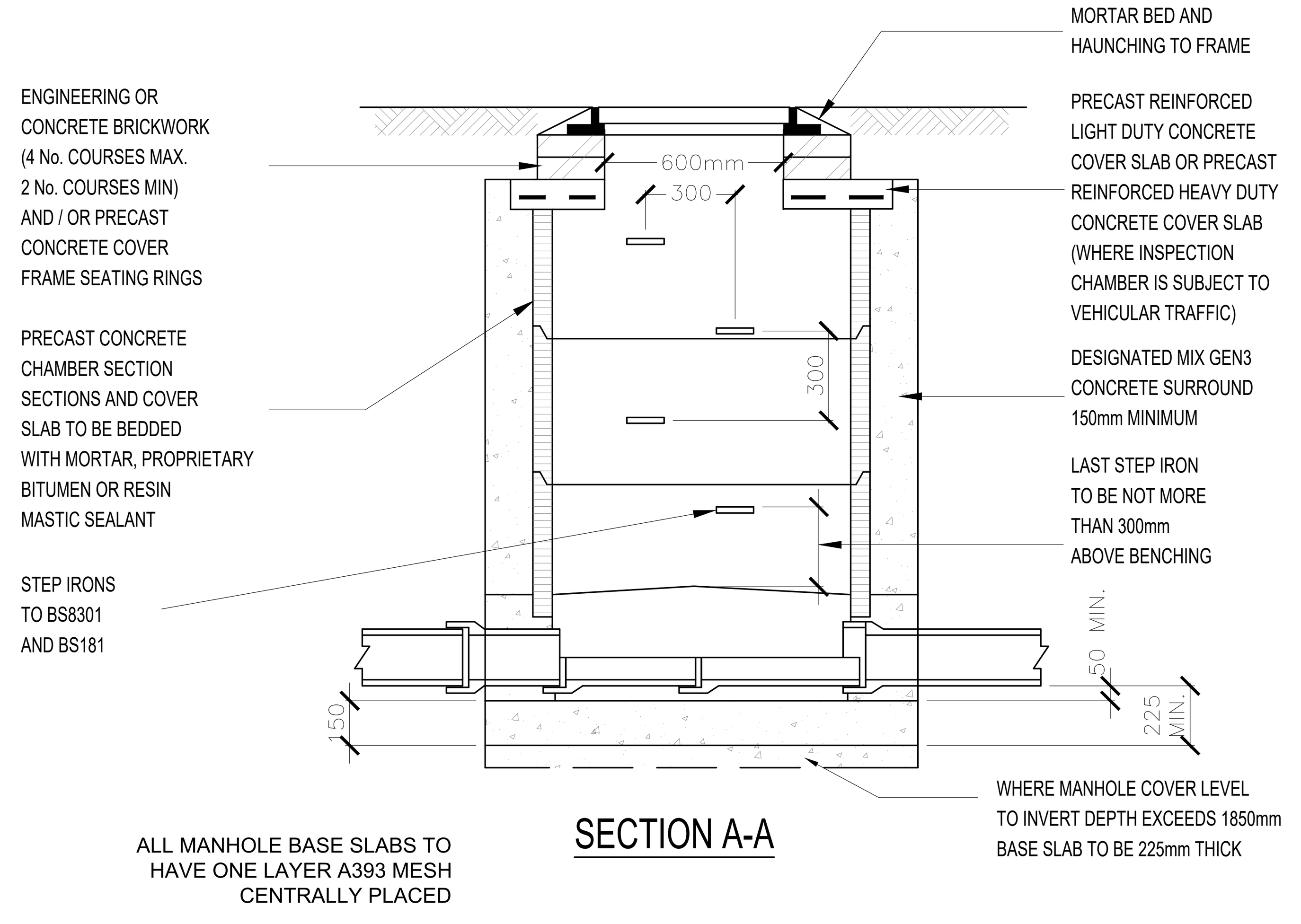
Dwg no	Checked	Surveyor
C01	AW	NA

Date 05.03.24 Scale 1:100 @ A1

Job No. P5581J2966 Rev. -

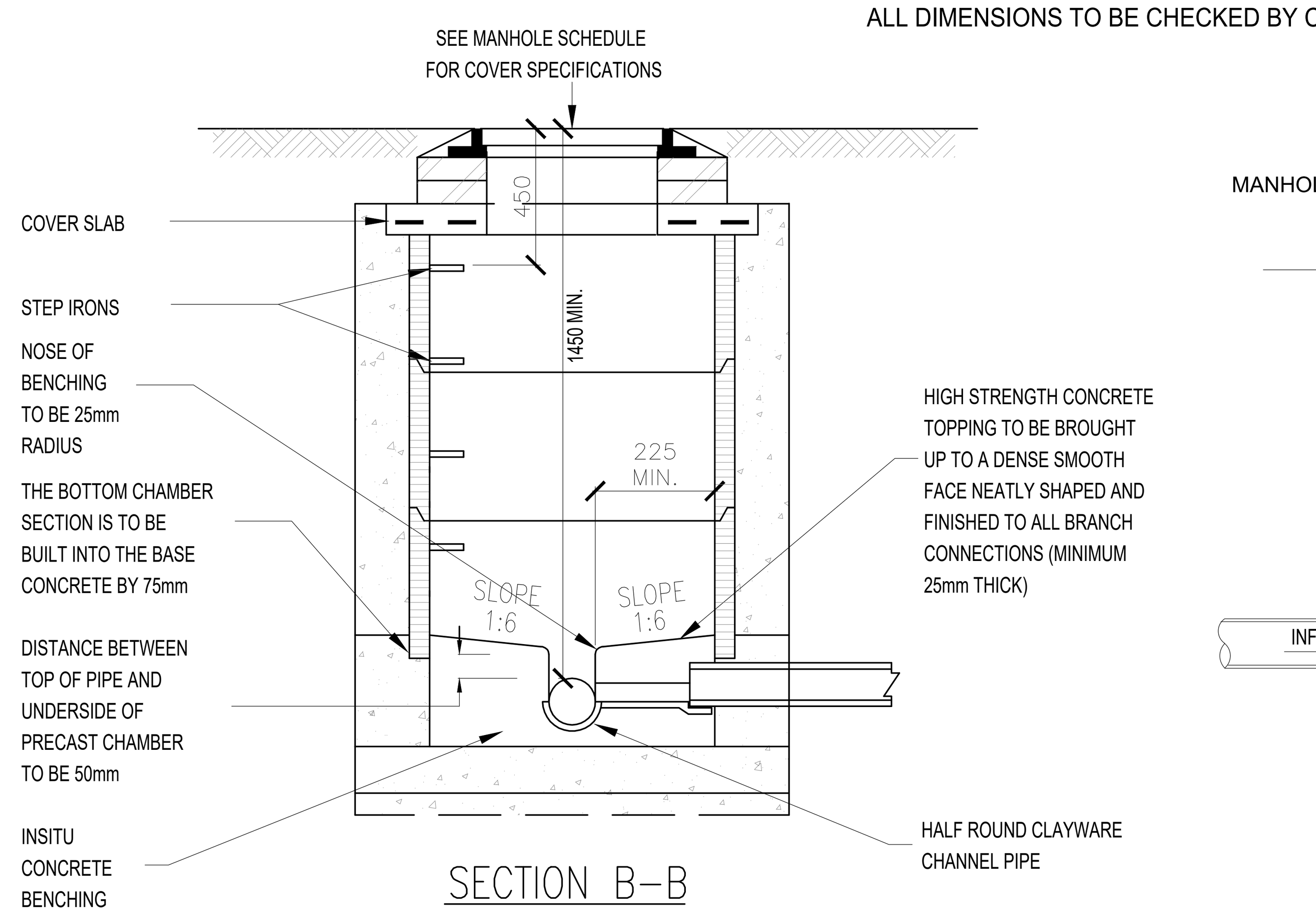
Grid | Contours | Level Datum

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR



ALL MANHOLE BASE SLABS TO HAVE ONE LAYER A393 MESH CENTRALLY PLACED

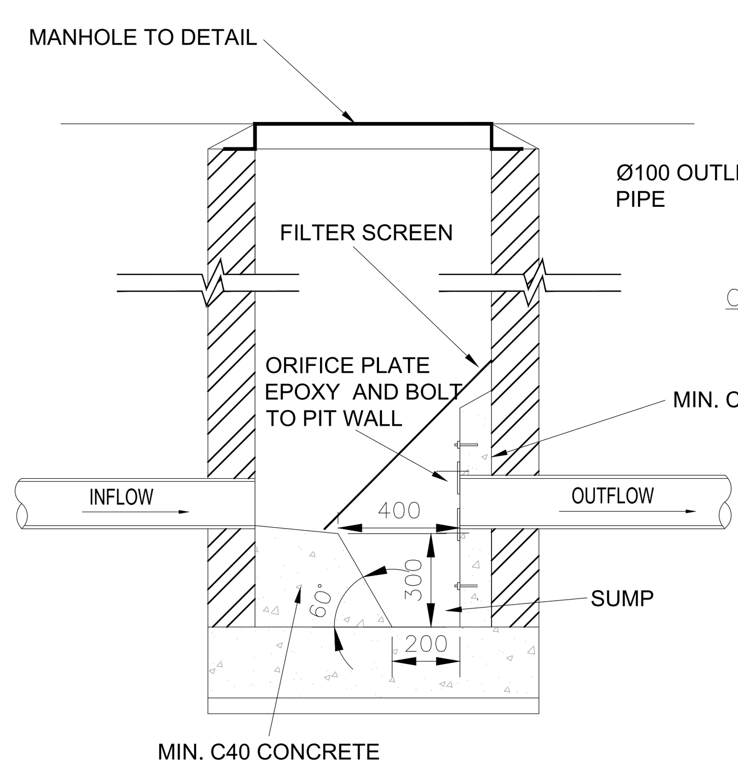
SECTION A-A



SECTION B-B

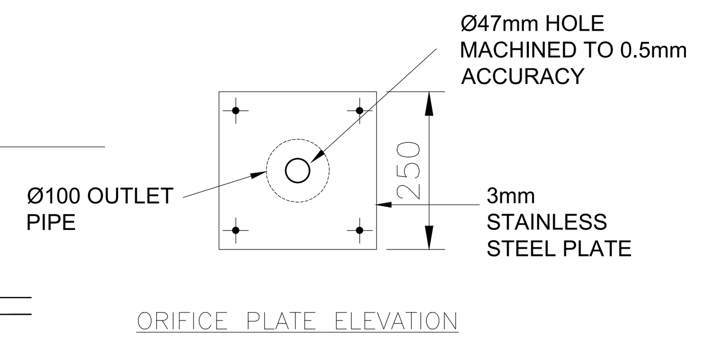
PRECAST CONCRETE MANHOLE TYPE B (PCC) IN EXTERNAL AREAS DETAIL

SCALE 1:20

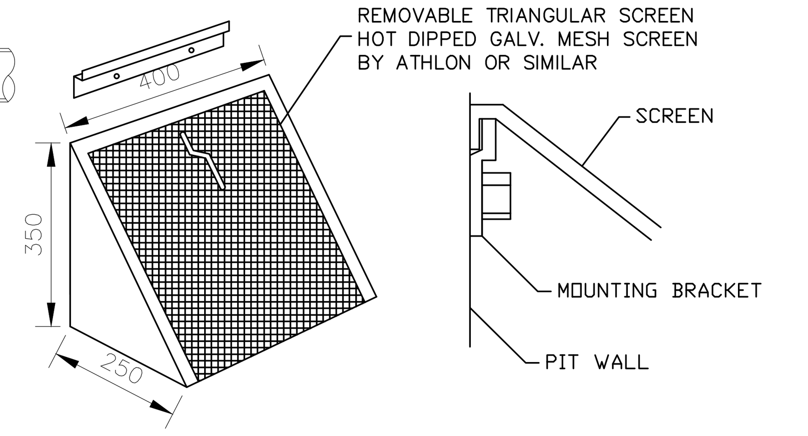


ORIFICE PLATE MANHOLE

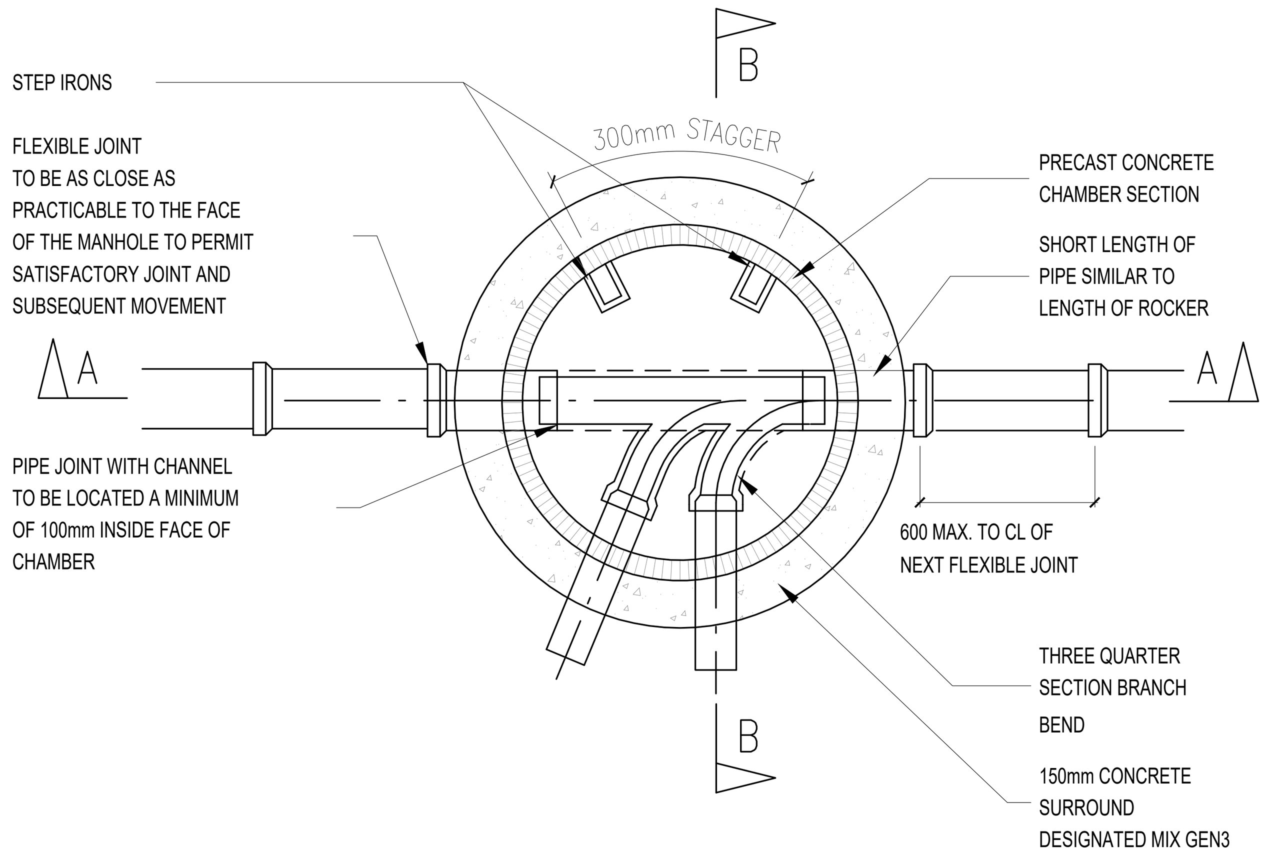
NOT TO SCALE



ORIFICE PLATE ELEVATION
SCALE 1:20



MULTI PURPOSE FILTER SCREEN

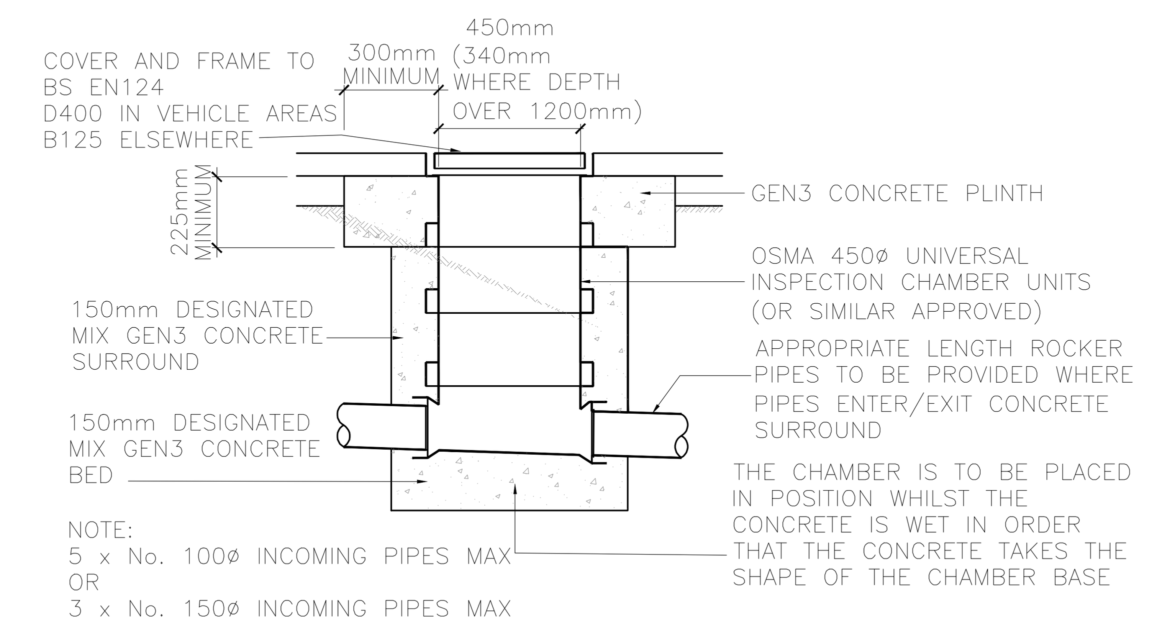


PLAN

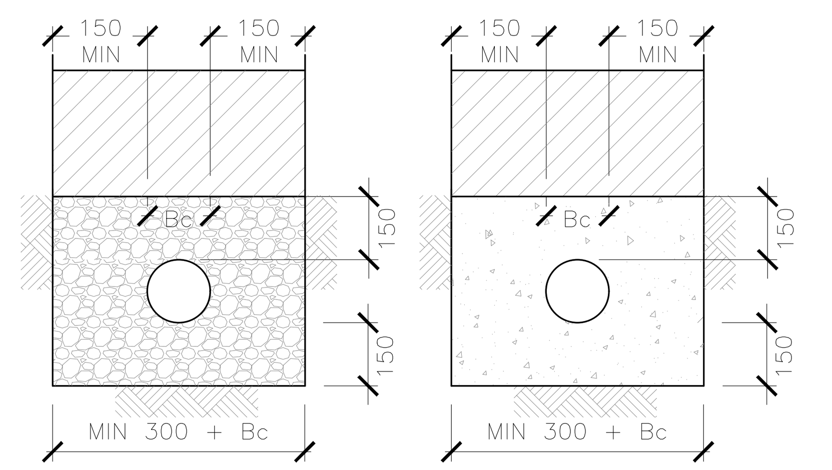
PIPE DIAMETER	ROCKER PIPE * LENGTH
150mm-450mm	500mm-750mm
475mm-750mm	750mm-1000mm
OVER 750mm	1200mm

* OR LINTEL AND COMPRESSIBLE SEALANT IN ACCORDANCE WITH CLAUSE 689 OF THE SPECIFICATION.

NOTES:
CHAMBERS WITH OUTGOING PIPES GREATER THAN 500mm DIAMETER SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER SAFETY DEVICES. TOE HOLES TO BE PROVIDED IN BENCHING OF SEWERS GREATER THAN 450mm DIAMETER FOR ACCESS TO INVERT. WHERE INTERNAL HEIGHT EXCEEDS 1800mm MANHOLE MAY BE PROVIDED WITH REDUCING COVER AND SHAFT. SHAFT DIAMETER TO BE 600mm DIAMETER OR 900mm DIAMETER IF LONGER THAN 900mm.



EXTERNAL POLYPROPYLENE INSPECTION CHAMBER (PPIC)
MAXIMUM DEPTH TO INVERT OF CHAMBER TO BE 1200mm (3000mm FOR REDUCED ACCESS)
CUT TO INTERMEDIATE SIZES
SCALE 1:20



GENERAL PIPE BEDDING DETAIL

PIPE BEDDING DETAIL FOR ALL PIPES THAT PASS BELOW OR NEAR FOUNDATIONS, PIPES WITH LESS THAN 600mm COVER IN ALL EXTERNAL AREAS AND PIPES WITH LESS THAN 1200mm COVER BELOW ROADS AND DRIVEWAYS

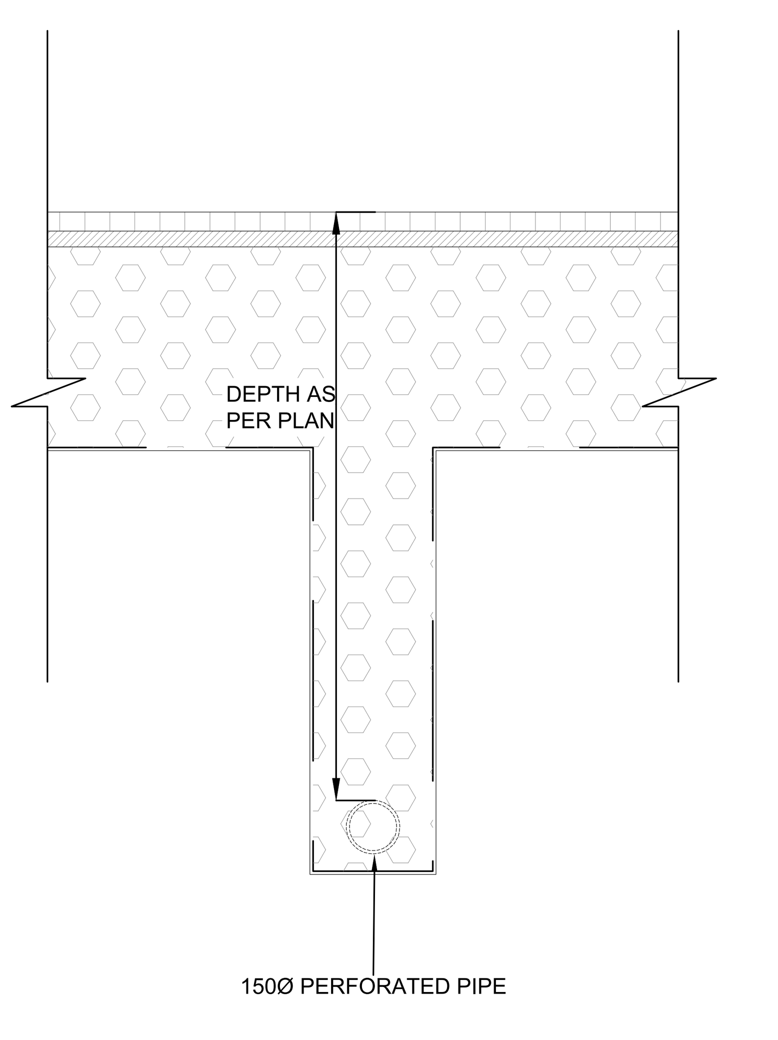
SELECTED FILL: FREE FROM STONES LARGER THAN 40mm, LUMPS OF CLAY OVER 100mm, TIMBER, FROZEN MATERIAL, VEGETABLE MATTER.

GRANULAR MATERIAL: TO CONFORM TO BS EN 1610 ANNEX B TABLE B.15 AND SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5mm UP TO A MAXIMUM SIZE OF 10mm FOR 100mm PIPES, 14mm FOR 150mm PIPES, 20mm FOR PIPES FROM 150mm UP TO 600mm DIAMETER AND 40mm FOR PIPES MORE THAN 600mm DIAMETER.

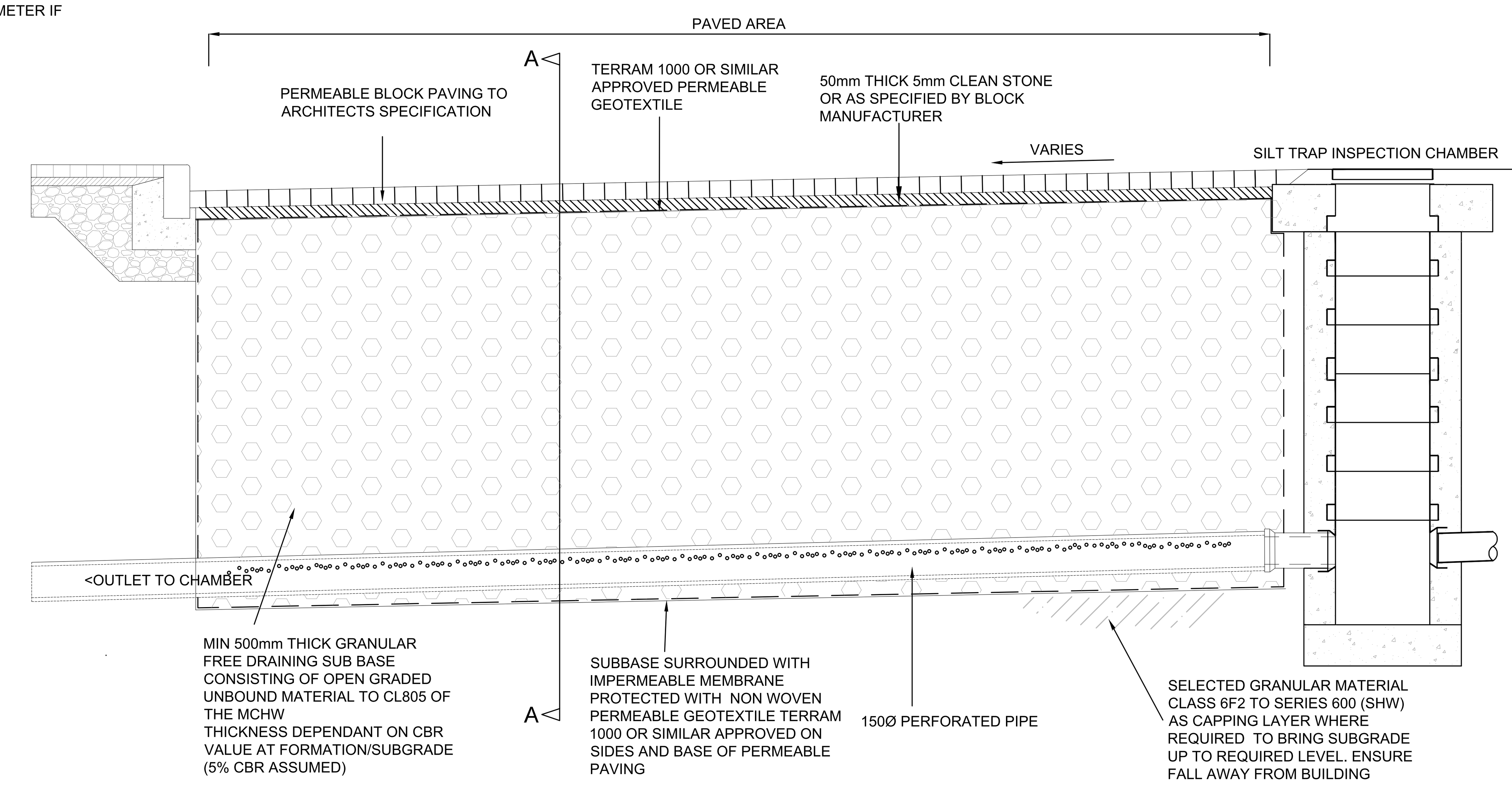
GEN1 CONCRETE IN ACCORDANCE WITH BS 8500-1:2002.

NOTE:
PIPES LESS THAN 1200mm BELOW ROADS AND LESS THAN 600mm BELOW OTHER EXTERNAL AREAS SHALL HAVE A 150mm GEN1 CONCRETE SURROUND. OTHER THAN PIPES CAST WITHIN PILECAPS ALL PIPES BELOW SUSPENDED SLAB SHALL HAVE GRANULAR SURROUND AS SHOWN.

PIPE BEDDING DETAIL
SCALE 1:10



SECTION A-A



TANKED PERMEABLE PAVING DETAIL WITH SILT TRAP MANHOLE

SCALE 1:20

Job. No. P5581J2966 | Rev.

NOTES

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5. FOR GRAVITY SEWERS, ALL DRAINAGE AND FITTINGS ARE TO BE FLEXIBLY JOINTED UPVC TO BS EN 1401-1 OR CLAYWARE TO BS EN295 OR CONCRETE TO BS5911 PART 100
6. CHAMBER WALLS 225 THICK TO BE CONSTRUCTED IN CLASS B ENGINEERING BRICKS TO SHW SERIES 2400 IN DESIGNATION (i) MORTAR OR IN-SITU STRENGTH CLASS C16/20 CONCRETE TO CLAUSE 2602
7. CHAMBER WALLS AND COVER SLAB TO BE CONSTRUCTED IN PRECAST CONCRETE TO BS EN 1917 AND BS 5911-3.
8. CONCRETE MIXES INDICATED ON THIS DRAWING ARE DESIGNATED MIXES IN ACCORDANCE WITH BS8500-1:2006. ALL CONCRETE TO BE SULPHATE RESISTANT
9. BACKFILL TO ALL TRENCHES UNDER CARRIAGEWAYS TO BE TYPE 1 SUB-BASE MATERIAL, ELSEWHERE BACKFILL TO BE IN ACCORDANCE WITH THE SPECIFICATION, FREE DRAINING READILY COMPACTIBLE MATERIAL, FREE FROM RUBBISH AND ORGANIC MATTER, FROZEN SOIL CLAY LUMPS AND LARGE STONES. TO BE COMPACTED IN LAYERS NOT EXCEEDING 150mm THICK.
10. A FLEXIBLE JOINT SHALL BE PROVIDED AS CLOSE AS IS FEASIBLE TO OUTSIDE FACE OF ANY STRUCTURE INTO WHICH A PIPE IS BUILT, IN ACCORDANCE WITH THE DETAIL.
11. THE GENERAL SPECIFICATION OF MATERIALS AND WORKMANSHIPS FOR THE CONSTRUCTION OF THE ACCESS ROAD, FOOTPATHS AND OTHER AREAS OF HARDSTANDING SHALL BE THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOLUME 1. SPECIFICATION OF HIGHWAY WORKS (SHW) PUBLISHED BY THE STATIONARY OFFICE.
12. ALL PIPES TO BE LAID SOFFIT TO SOFFIT UNLESS NOTED OTHERWISE.
13. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH BS EN124 AND SHALL BE OF A NON-ROCKING DESIGN WHICH DOES NOT RELY ON THE USE OF CUSHION INSERTS. CLASS D COVERS SHALL BE USED IN CARRIAGEWAYS, HARD SHOULDERS AND PARKING AREAS USED BY ALL TYPE OF ROAD VEHICLES. CLASS C SHALL BE USED IN FOOTWAYS, PEDESTRIAN AREAS AND ALL COMPARABLE LOCATIONS.

Notes.

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Amendments

Rev	Date		By	Chkd

JOMAS
ENGINEERING
ENVIRONMENTAL
Jomas Associates Ltd.
Unit 24 Sarum Complex,
Salisbury Road,
Uxbridge, UB8 2RZ

Client
JDT Properties Ltd

Project
166 Leatherhead Road,
Chessington, KT9 2HU

Drawing
Proposed Drainage Details

Dwg no	Checked	Surveyor
C02	AW	NA
Date 05.03.24	Scale AS SHOWN	
Job No. P5581J2966	Rev. -	
Grid	Contours	Level Datum

Job. No. P5581J2966 Rev.

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   FOUL PIPES EXTERNAL ø100@1:80,
   SURFACE WATER PIPES ø150@1:100

STORMWATER CONCEPT LEGEND

Overland flow

Notes.

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Rev	Date		By	Chkd

JOMAS ENGINEERING ENVIRONMENTAL

Jomas Associates Ltd.
Unit 24 Sarum Complex,
Salisbury Road,
Uxbridge, UB8 2RZ

Client
JDT Properties Ltd

Project
166 Leatherhead Road, Chessington, KT9 2HU

Drawing
Proposed Overland Flow

Dwg no	Checked	Surveyor
C03	AW	NA
Date 05.03.24	Scale 1:100 @ A1	

Job No. P5581J2966 Rev. -

Grid	Contours	Level Datum

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	10	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.600
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1			44.000	1200	100.000	100.000	2.200
2			44.000	450	95.000	100.000	2.100
3	0.050	5.00	44.000	1200	90.000	100.000	2.000
4	0.020	5.00	43.300	450	70.000	100.000	1.100
5	0.020	5.00	43.500	450	65.000	110.000	1.200
6	0.020	5.00	43.300	450	65.000	90.000	0.900

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.003	2	1	5.000	0.600	41.900	41.800	0.100	50.0	100	5.66	50.0
1.002	3	2	5.000	0.600	42.000	41.900	0.100	50.0	150	5.59	50.0
1.001	4	3	20.000	0.600	42.200	42.000	0.200	100.0	150	5.53	50.0
1.000	5	4	11.180	0.600	42.300	42.200	0.100	111.8	150	5.20	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.003	1.092	8.6	14.9	2.000	2.100	0.110	0.0	100	1.122
1.002	1.426	25.2	14.9	1.850	1.950	0.110	0.0	83	1.483
1.001	1.005	17.8	8.1	0.950	1.850	0.060	0.0	71	0.983
1.000	0.949	16.8	2.7	1.050	0.950	0.020	0.0	41	0.699

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	6	4	11.180	0.600	42.400	42.200	0.200	55.9	150	5.14	50.0

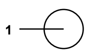
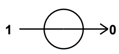
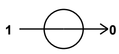
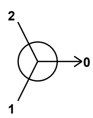
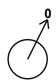
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.348	23.8	2.7	0.750	0.950	0.020	0.0	34	0.900

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)
1.003	5.000	50.0	100	Circular	44.000	41.900	2.000	44.000	41.800	2.100
1.002	5.000	50.0	150	Circular	44.000	42.000	1.850	44.000	41.900	1.950
1.001	20.000	100.0	150	Circular	43.300	42.200	0.950	44.000	42.000	1.850
1.000	11.180	111.8	150	Circular	43.500	42.300	1.050	43.300	42.200	0.950
2.000	11.180	55.9	150	Circular	43.300	42.400	0.750	43.300	42.200	0.950

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	2	450	Manhole	Adoptable	1	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	2	450	Manhole	Adoptable
1.001	4	450	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.000	5	450	Manhole	Adoptable	4	450	Manhole	Adoptable
2.000	6	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	100.000	100.000	44.000	2.200	1200		1	1.003	41.800	100
2	95.000	100.000	44.000	2.100	450		1	1.002	41.900	150
							0	1.003	41.900	100
3	90.000	100.000	44.000	2.000	1200		1	1.001	42.000	150
							0	1.002	42.000	150
4	70.000	100.000	43.300	1.100	450		1	2.000	42.200	150
							2	1.000	42.200	150
							0	1.001	42.200	150
5	65.000	110.000	43.500	1.200	450		0	1.000	42.300	150
6	65.000	90.000	43.300	0.900	450		0	2.000	42.400	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
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)	5.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 3 Online Orifice Control

Flap Valve	x	Invert Level (m)	42.000	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.047		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	42.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	58

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	0.0	0.500	100.0	0.0	0.501	0.1	0.0

Node 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	42.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	90

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.500	150.0	0.0	0.501	0.1	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Coordinates	✓
Node Losses	✓	Accuracy (m)	1.000
Link Size	✓	Crossings	✓
Minimum Diameter (mm)	150	Cover Depth	✓
Link Length	✓	Minimum Cover Depth (m)	
Maximum Length (m)	100.000	Maximum Cover Depth (m)	3.000

Approval Settings

Backdrops	✓	Surcharged Depth	✓
Minimum Backdrop Height (m)		Return Period (years)	
Maximum Backdrop Height (m)	1.500	Maximum Surcharged Depth (m)	0.100
Full Bore Velocity	✓	Flooding	✓
Minimum Full Bore Velocity (m/s)		Return Period (years)	30
Maximum Full Bore Velocity (m/s)	3.000	Time to Half Empty	x
Proportional Velocity	✓	Discharge Rates	✓
Return Period (years)		Discharge Volume	✓
Minimum Proportional Velocity (m/s)	0.750	100 year 360 minute (m^3)	
Maximum Proportional Velocity (m/s)	3.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991
1 year 15 minute winter	76.857	30.991
1 year 30 minute summer	71.439	20.215
1 year 30 minute winter	50.133	20.215
1 year 60 minute summer	48.435	12.800
1 year 60 minute winter	32.179	12.800
1 year 120 minute summer	30.053	7.942
1 year 120 minute winter	19.966	7.942
1 year 180 minute summer	23.233	5.979
1 year 180 minute winter	15.102	5.979
1 year 240 minute summer	18.475	4.882
1 year 240 minute winter	12.274	4.882
1 year 360 minute summer	14.169	3.646
1 year 360 minute winter	9.210	3.646
1 year 480 minute summer	11.185	2.956
1 year 480 minute winter	7.431	2.956
1 year 600 minute summer	9.182	2.511
1 year 600 minute winter	6.274	2.511
1 year 720 minute summer	8.203	2.199
1 year 720 minute winter	5.513	2.199
1 year 960 minute summer	6.768	1.782
1 year 960 minute winter	4.483	1.782
1 year 1440 minute summer	4.949	1.326
1 year 1440 minute winter	3.326	1.326
1 year 2160 minute summer	3.574	0.988
1 year 2160 minute winter	2.462	0.988
1 year 2880 minute summer	2.986	0.800
1 year 2880 minute winter	2.007	0.800
1 year 4320 minute summer	2.276	0.595
1 year 4320 minute winter	1.499	0.595
1 year 5760 minute summer	1.885	0.483
1 year 5760 minute winter	1.220	0.483
1 year 7200 minute summer	1.609	0.410
1 year 7200 minute winter	1.038	0.410
1 year 8640 minute summer	1.409	0.359
1 year 8640 minute winter	0.910	0.359
1 year 10080 minute summer	1.260	0.322
1 year 10080 minute winter	0.813	0.322
10 year 15 minute summer	211.819	59.937

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 15 minute winter	148.645	59.937
10 year 30 minute summer	136.831	38.718
10 year 30 minute winter	96.022	38.718
10 year 60 minute summer	90.826	24.003
10 year 60 minute winter	60.342	24.003
10 year 120 minute summer	54.899	14.508
10 year 120 minute winter	36.474	14.508
10 year 180 minute summer	41.666	10.722
10 year 180 minute winter	27.084	10.722
10 year 240 minute summer	32.645	8.627
10 year 240 minute winter	21.689	8.627
10 year 360 minute summer	24.632	6.339
10 year 360 minute winter	16.012	6.339
10 year 480 minute summer	19.260	5.090
10 year 480 minute winter	12.796	5.090
10 year 600 minute summer	15.690	4.291
10 year 600 minute winter	10.720	4.291
10 year 720 minute summer	13.925	3.732
10 year 720 minute winter	9.358	3.732
10 year 960 minute summer	11.365	2.993
10 year 960 minute winter	7.528	2.993
10 year 1440 minute summer	8.174	2.191
10 year 1440 minute winter	5.493	2.191
10 year 2160 minute summer	5.799	1.603
10 year 2160 minute winter	3.996	1.603
10 year 2880 minute summer	4.788	1.283
10 year 2880 minute winter	3.218	1.283
10 year 4320 minute summer	3.587	0.938
10 year 4320 minute winter	2.362	0.938
10 year 5760 minute summer	2.932	0.751
10 year 5760 minute winter	1.898	0.751
10 year 7200 minute summer	2.475	0.631
10 year 7200 minute winter	1.597	0.631
10 year 8640 minute summer	2.148	0.548
10 year 8640 minute winter	1.387	0.548
10 year 10080 minute summer	1.906	0.486
10 year 10080 minute winter	1.230	0.486
30 year 15 minute summer	268.706	76.035
30 year 15 minute winter	188.566	76.035
30 year 30 minute summer	174.929	49.499
30 year 30 minute winter	122.757	49.499
30 year 60 minute summer	116.589	30.811
30 year 60 minute winter	77.459	30.811
30 year 120 minute summer	70.438	18.615
30 year 120 minute winter	46.797	18.615
30 year 180 minute summer	53.298	13.715
30 year 180 minute winter	34.645	13.715
30 year 240 minute summer	41.604	10.995
30 year 240 minute winter	27.641	10.995
30 year 360 minute summer	31.221	8.034
30 year 360 minute winter	20.295	8.034
30 year 480 minute summer	24.324	6.428

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 480 minute winter	16.160	6.428
30 year 600 minute summer	19.756	5.404
30 year 600 minute winter	13.498	5.404
30 year 720 minute summer	17.490	4.687
30 year 720 minute winter	11.754	4.687
30 year 960 minute summer	14.215	3.743
30 year 960 minute winter	9.416	3.743
30 year 1440 minute summer	10.161	2.723
30 year 1440 minute winter	6.829	2.723
30 year 2160 minute summer	7.160	1.979
30 year 2160 minute winter	4.933	1.979
30 year 2880 minute summer	5.883	1.577
30 year 2880 minute winter	3.953	1.577
30 year 4320 minute summer	4.374	1.143
30 year 4320 minute winter	2.880	1.143
30 year 5760 minute summer	3.554	0.910
30 year 5760 minute winter	2.301	0.910
30 year 7200 minute summer	2.987	0.762
30 year 7200 minute winter	1.928	0.762
30 year 8640 minute summer	2.583	0.659
30 year 8640 minute winter	1.667	0.659
30 year 10080 minute summer	2.284	0.583
30 year 10080 minute winter	1.474	0.583
100 year 15 minute summer	348.738	98.681
100 year 15 minute winter	244.728	98.681
100 year 30 minute summer	228.965	64.789
100 year 30 minute winter	160.677	64.789
100 year 60 minute summer	153.288	40.510
100 year 60 minute winter	101.841	40.510
100 year 120 minute summer	92.562	24.461
100 year 120 minute winter	61.496	24.461
100 year 180 minute summer	69.806	17.964
100 year 180 minute winter	45.376	17.964
100 year 240 minute summer	54.269	14.342
100 year 240 minute winter	36.055	14.342
100 year 360 minute summer	40.484	10.418
100 year 360 minute winter	26.315	10.418
100 year 480 minute summer	31.414	8.302
100 year 480 minute winter	20.871	8.302
100 year 600 minute summer	25.431	6.956
100 year 600 minute winter	17.376	6.956
100 year 720 minute summer	22.452	6.017
100 year 720 minute winter	15.089	6.017
100 year 960 minute summer	18.166	4.784
100 year 960 minute winter	12.033	4.784
100 year 1440 minute summer	12.896	3.456
100 year 1440 minute winter	8.667	3.456
100 year 2160 minute summer	9.021	2.493
100 year 2160 minute winter	6.216	2.493
100 year 2880 minute summer	7.371	1.975
100 year 2880 minute winter	4.954	1.975
100 year 4320 minute summer	5.435	1.421

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 4320 minute winter	3.579	1.421
100 year 5760 minute summer	4.390	1.124
100 year 5760 minute winter	2.841	1.124
100 year 7200 minute summer	3.670	0.936
100 year 7200 minute winter	2.368	0.936
100 year 8640 minute summer	3.160	0.806
100 year 8640 minute winter	2.039	0.806
100 year 10080 minute summer	2.784	0.710
100 year 10080 minute winter	1.797	0.710
100 year +40% CC 15 minute summer	488.233	138.153
100 year +40% CC 15 minute winter	342.620	138.153
100 year +40% CC 30 minute summer	320.551	90.705
100 year +40% CC 30 minute winter	224.948	90.705
100 year +40% CC 60 minute summer	214.603	56.713
100 year +40% CC 60 minute winter	142.577	56.713
100 year +40% CC 120 minute summer	129.587	34.246
100 year +40% CC 120 minute winter	86.094	34.246
100 year +40% CC 180 minute summer	97.729	25.149
100 year +40% CC 180 minute winter	63.526	25.149
100 year +40% CC 240 minute summer	75.977	20.078
100 year +40% CC 240 minute winter	50.477	20.078
100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 600 minute winter	24.327	9.738
100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 1440 minute winter	12.134	4.839
100 year +40% CC 2160 minute summer	12.630	3.490
100 year +40% CC 2160 minute winter	8.702	3.490
100 year +40% CC 2880 minute summer	10.319	2.766
100 year +40% CC 2880 minute winter	6.935	2.766
100 year +40% CC 4320 minute summer	7.609	1.989
100 year +40% CC 4320 minute winter	5.011	1.989
100 year +40% CC 5760 minute summer	6.145	1.573
100 year +40% CC 5760 minute winter	3.978	1.573
100 year +40% CC 7200 minute summer	5.137	1.311
100 year +40% CC 7200 minute winter	3.316	1.311
100 year +40% CC 8640 minute summer	4.424	1.129
100 year +40% CC 8640 minute winter	2.855	1.129
100 year +40% CC 10080 minute summer	3.897	0.994
100 year +40% CC 10080 minute winter	2.515	0.994

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	25	41.847	0.047	3.9	0.0000	0.0000	OK
30 minute winter	2	25	41.951	0.051	3.9	0.0081	0.0000	OK
30 minute winter	3	24	42.723	0.723	6.6	1.5985	0.0000	SURCHARGED
30 minute winter	4	25	42.726	0.526	8.2	1.3217	0.0000	SURCHARGED
15 minute summer	5	11	42.727	0.427	5.2	0.1033	0.0000	SURCHARGED
30 minute winter	6	25	42.726	0.326	2.2	0.0881	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)
30 minute winter	2	1.003	1	3.9	1.009	0.450	0.0191	9.3
30 minute winter	3	Orifice	2	3.9				
30 minute winter	4	1.001	3	3.8	0.246	0.216	0.3521	
15 minute summer	5	1.000	4	2.6	0.379	0.158	0.1968	
30 minute winter	6	2.000	4	2.7	0.360	0.114	0.1968	

Results for 10 year Critical Storm Duration. Lowest mass balance: 98.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	29	41.849	0.049	4.1	0.0000	0.0000	OK
30 minute winter	2	29	41.953	0.053	4.1	0.0084	0.0000	OK
30 minute winter	3	29	42.814	0.814	11.7	4.4644	0.0000	SURCHARGED
30 minute winter	4	29	42.818	0.618	12.1	5.4863	0.0000	SURCHARGED
30 minute winter	5	29	42.818	0.518	4.2	0.1254	0.0000	SURCHARGED
30 minute winter	6	29	42.818	0.418	4.2	0.1129	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)
30 minute winter	2	1.003	1	4.1	1.024	0.478	0.0200	17.9
30 minute winter	3	Orifice	2	4.1				
30 minute winter	4	1.001	3	3.3	0.255	0.187	0.3521	
30 minute winter	5	1.000	4	4.0	0.328	0.236	0.1968	
30 minute winter	6	2.000	4	4.0	0.364	0.166	0.1968	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	49	41.850	0.050	4.3	0.0000	0.0000	OK
60 minute winter	2	49	41.954	0.054	4.3	0.0087	0.0000	OK
60 minute winter	3	49	42.876	0.876	10.1	6.3846	0.0000	SURCHARGED
60 minute winter	4	49	42.880	0.680	10.1	8.2823	0.0000	SURCHARGED
60 minute winter	5	49	42.880	0.580	3.5	0.1404	0.0000	SURCHARGED
60 minute winter	6	49	42.880	0.480	3.5	0.1296	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 winter	2	1.003	1	4.3	1.032	0.496	0.0206	28.5
60 minute winter	3	Orifice	2	4.3				
60 minute winter	4	1.001	3	4.0	0.246	0.226	0.3521	
60 minute winter	5	1.000	4	3.3	0.302	0.197	0.1968	
60 minute winter	6	2.000	4	3.3	0.332	0.139	0.1968	

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	56	41.851	0.051	4.5	0.0000	0.0000	OK
60 minute winter	2	56	41.956	0.056	4.5	0.0090	0.0000	OK
60 minute winter	3	56	42.974	0.974	12.6	9.4507	0.0000	SURCHARGED
60 minute winter	4	54	42.978	0.778	13.3	12.7378	0.0000	SURCHARGED
60 minute winter	5	53	42.979	0.679	4.6	0.1642	0.0000	SURCHARGED
60 minute winter	6	53	42.979	0.579	4.6	0.1562	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 winter	2	1.003	1	4.5	1.045	0.524	0.0215	37.5
60 minute winter	3	Orifice	2	4.5				
60 minute winter	4	1.001	3	4.2	0.250	0.238	0.3521	
60 minute winter	5	1.000	4	4.3	0.325	0.258	0.1968	
60 minute winter	6	2.000	4	4.3	0.356	0.182	0.1968	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	59	41.854	0.054	4.9	0.0000	0.0000	OK
60 minute winter	2	59	41.960	0.060	4.9	0.0095	0.0000	OK
60 minute winter	3	59	43.146	1.146	16.8	14.8341	0.0000	SURCHARGED
60 minute winter	4	59	43.151	0.951	18.7	20.5611	0.0000	FLOOD RISK
60 minute winter	5	59	43.151	0.851	6.5	0.2060	0.0000	SURCHARGED
60 minute winter	6	59	43.151	0.751	6.5	0.2029	0.0000	FLOOD RISK

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 winter	2	1.003	1	4.9	1.064	0.570	0.0230	52.4
60 minute winter	3	Orifice	2	4.9				
60 minute winter	4	1.001	3	4.2	0.240	0.235	0.3521	
60 minute winter	5	1.000	4	6.1	0.349	0.364	0.1968	
60 minute winter	6	2.000	4	6.1	0.382	0.256	0.1968	

APPENDIX C: DRAINAGE MAINTENANCE PLAN

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DRAINAGE MAINTENANCE PLAN

166 Leatherhead Road, Chessington, KT9 2HU

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Report Title: **Drainage and SUDS Maintenance Plan for 166 Leatherhead Road, Chessington, KT9 2HU**

Report Status: **Final**

Job No: **P5581J2966**

Date: **March 2024**

Control: Previous Release

Version	Date	Issued By
V1.0	08/03/2024	A Wallace

Prepared by: JOMAS ASSOCIATES LTD **For:** **JDT Properties Ltd**

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1.1 General

1.1.1 Sustainable Drainage Systems (SuDS) are an environmentally friendly approach to managing rainfall. SuDS techniques use landscape features to deal with surface water with the aim to:

- Control the flow, volume and frequency of water leaving a development.
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces.
- Provide attractive surroundings for the community.

1.1.2 The surface water drainage strategy for this development utilises permeable paving as the main SUDS feature. The following sections provides a brief description of these features and outlines the maintenance programme that should be adopted.

1.2 Cleaning of the Drainage System

1.2.1 Drainage systems should be inspected at regular intervals and where necessary, thoroughly cleaned out at the same time. Any defects discovered should be made good.

1.2.2 The following operations should be carried out during the periodic cleaning of a drainage system.

Table 1: Drainage Maintenance

Product Type	Period	Responsibility	Maintenance Methods
Silt Trap	As necessary and before wet season	Owner or Maintenance Company for communal areas	• Sediment and debris that accumulated during summer needs to be removed before the wet season. • Inspect and clean out routinely prior to inlet pipework to minimise debris reaching the tank. • Conduct inspections more frequently during the wet season for the area where sediment or trash accumulates more often. Clean and repair as needed.
Standard Manholes/ Inspection Chambers	As necessary	Owner or Maintenance Company for communal areas	• Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole. • Renew/replace any damaged/missing bolts and damaged/missing manhole covers.
Drainage Pipes	Six monthly interval	Owner or Maintenance Company for communal areas	• Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.

Product Type	Period	Responsibility	Maintenance Methods
Permeable Paving	As required	Owner/ Maintenance Company	• Inspect the roof after any precipitation to ensure no displacement of any debris onto the surface.
	Six monthly (Ideally, this activity to be carried out in spring and autumn seasons)	Owner/ Maintenance Company	• Debris removal from catchment surface (where may cause risks to performance).
	Annually and after large storms	Owner/ Maintenance Company	• Inspection/check of all inlets to ensure that they are in good condition and operating as designed.
Flow control	As required	Owner/ Maintenance Company	• Regular maintenance and desilting as required
	Annually and after large storms	Owner/ Maintenance Company	• Inspection/check of all inlets to ensure that they are in good condition and operating as designed. • Renew and replace any damaged/missing items.

1.3 Sketches and Plans

1.3.1 The locations of the above features can be found by examining Drawing P5581J2966-C01

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