



Sustainable Water Management Strategy

15 Green Lane, Northwood

May 2022

Prepared for
Westcombe Developments

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Contents

LONDON SUSTAINABLE DRAINAGE PROFORMA..... 2

1. INTRODUCTION..... 4

2. BASELINE CONDITIONS..... 5

3. SUSTAINABLE DRAINAGE SYSTEMS 6

4. WATER EFFICIENCY..... 10

5. CONCLUSION 13

Tables

Table 1-1 Site Details..... 4

Table 3-1 Pre-development runoff rates..... 6

Table 3-2 Drainage Hierarchy Assessment..... 6

Table 3-3 SuDS Hierarchy 7

Table 3-4 Comparison of runoff rates 7

Table 3-5 Attenuation Volumes and Half-drain times 7

Table 3-6 Simple Index Method 8

Table 3-7 SuDS Management Plan 9

Table 4.1 Maximum Fittings Consumption Level..... 12

Table 4.2 Water Efficiency 12

Figures

Figure 1-1 Site Location Plan

Figure 1-2 Proposed Development Plan

Figure 2-1 Bedrock Geology

Figure 2-2 Source Protection Zone

Figure 2-3 Thames Water Sewer Record Extract

Figure 3-1 Attenuation Tank

Figure 4-1 Water Hierarchy

Appendices

Appendix A – Proposed Development Plans

Appendix B – Thames Water Records

Appendix C – Drainage Strategy Calculations & Drawings

Appendix D – Water Efficiency Calculations

London Sustainable Drainage Proforma

1. Project & Site Details	Project / Site Name	15 Green Lane
	Address & post code	15 Green Lane, Northwood, HA6 2UZ
	OS Grid ref. (Easting, Northing)	E 508827
		N 191550
	LPA reference (if applicable)	Hillingdon Council
	Brief description of proposed work	Demolition of existing building to provide 12no. units
	Total site Area	1626m ²
	Total existing impervious area	557m ²
	Total proposed impervious area	700m ²
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No.
	Existing drainage connection type and location	Discharge to sewer in Green Lane
	Designer Name	Dominic Ramdeen
	Designer Position	Director
	Designer Company	Fernbrook Consulting Engineers

2. Proposed Discharge Arrangements	2a. Infiltration Feasibility		
	Superficial geology classification	N/A	
	Bedrock geology classification	Lambeth Group (Clay, Silt, and Sand)	
	Site infiltration rate	N/A	m/s
	Depth to groundwater level	N/A	m below ground level
	Is infiltration feasible?	No	
	2b. Drainage Hierarchy		
		Feasible (Y/N)	Proposed (Y/N)
	1 store rainwater for later use	Y	Y
	2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
	3 attenuate rainwater in ponds or open water features for gradual release	N	N
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
	5 discharge rainwater direct to a watercourse	N	N
	6 discharge rainwater to a surface water sewer/drain	y	Y
	7 discharge rainwater to the combined sewer.	N	N
	2c. Proposed Discharge Details		
	Proposed discharge location	Thames Water surface water in Green Lane	
	Has the owner/regulator of the discharge location been consulted?	Yes, via Pre-planning enquiry ref. DS6091918	

3. Drainage Strategy	3a. Discharge Rates & Required Storage				
		Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m³)	Proposed discharge rate (l/s)
	Qbar	0.75			
	1 in 1	0.63	7.9	7.8	0.5
	1 in 30	1.72	17.6	18.7	0.8
	1 in 100	2.38	22.40	25.1	1.0
	1 in 100 + CC			28.9	1.8
	Climate change allowance used		40%		
	3b. Principal Method of Flow Control		30mm Orifice plate		
	3c. Proposed SuDS Measures				
			Catchment area (m²)	Plan area (m²)	Storage vol. (m³)
	Rainwater harvesting		0		0
	Infiltration systems		0		0
	Green roofs		0	0	0
	Blue roofs		0	0	0
	Filter strips		0	0	0
	Filter drains		0	0	0
	Bioretention / tree pits		0	0	0
	Pervious pavements		700	94	26.8
	Swales		0	0	0
	Basins/ponds		0	0	0
	Attenuation tanks				0
	Total		700		26.8

4. Supporting Information	4a. Discharge & Drainage Strategy	Page/section of drainage report
	Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Figure 2-1 Bedrock Geology, Page 5
	Drainage hierarchy (2b)	Page 6
	Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix B
	Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix C
	Proposed SuDS measures & specifications (3b)	Appendix C
	4b. Other Supporting Details	Page/section of drainage report
	Detailed Development Layout	Page 4 / Appendix A
	Detailed drainage design drawings, including exceedance flow routes	Appendix C
	Detailed landscaping plans	N/A
	Maintenance strategy	Page 9, Report ref. 22000-FCE-XX-XX-RP-D-0002
	Demonstration of how the proposed SuDS measures improve:	
	a) water quality of the runoff?	Table 3-6, Page 8
	b) biodiversity?	Page 8
	c) amenity?	Page 8

1. Introduction

- 1.1 Fernbrook Consulting Engineers has been appointed by Westcombe Developments to provide a Sustainable Water Management Strategy for the proposed redevelopment at 15 Green Lane, Northwood.
- 1.2 This report has been prepared with specific reference to the requirements of the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG). This report also takes into consideration the requirements of the Local Flood Risk Management Strategy, the Non-Statutory Technical Standards for Sustainable Drainage Systems and CIRIA C753 The SuDS Manual.
- 1.3 The aim of this report is to discharge condition 12 of Hillingdon Council application reference: **68153/APP/2019/1319**.

Site Characteristics

- 1.4 Refer to **Table 1-1** below for details of the site and the site location plan shown in **Figure 1-1** below.

Table 1-1 Site Details

Site Address	15 Green Lane, Northwood, HA6 2UZ
Grid reference	508827mE, 191550mN (TQ 08827 91550)
Topography	Generally falling north to south
Geology	Lambeth Group
Site Area	0.16 ha
Existing Use	Nursery
Access	Green Lane

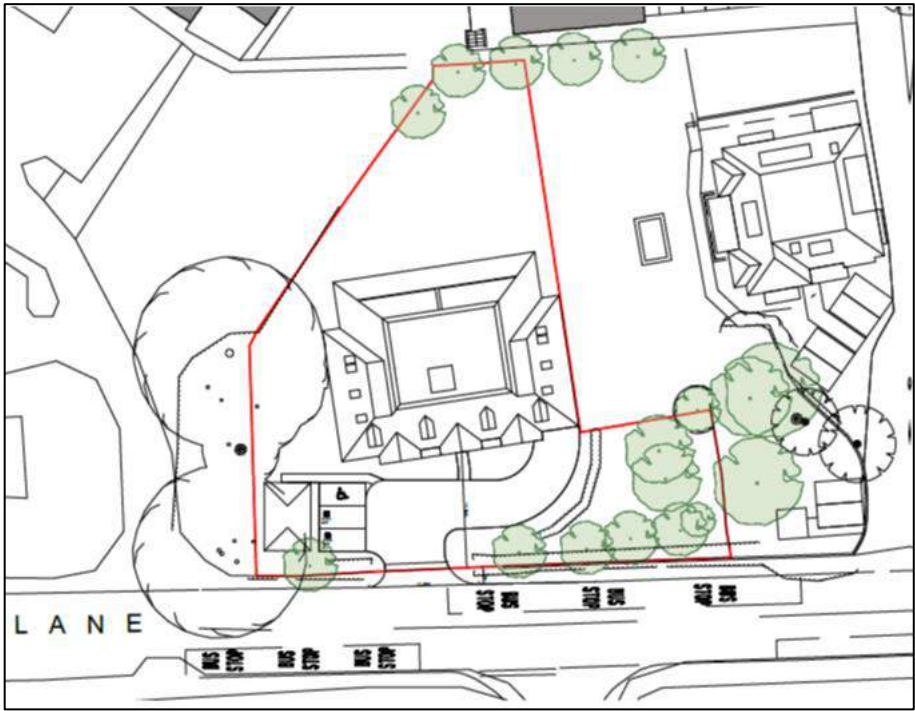
Figure 1-1 Site Location Plan

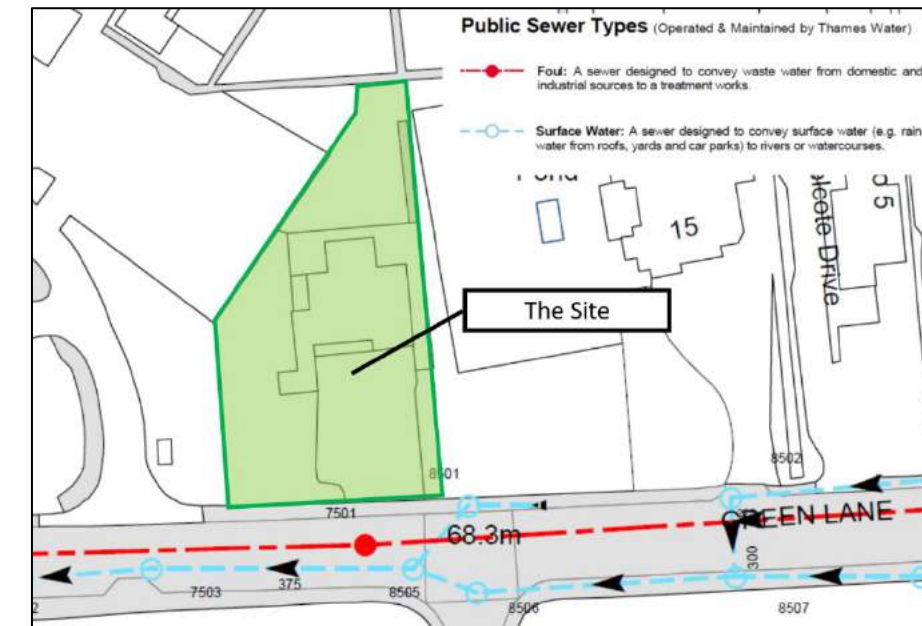


Development Proposals

- 1.5 The proposed development will seek to demolish the existing building to provide a new building comprised of 2no. 1-bed and 10no. 2-bed residential units.
- 1.6 An excerpt of the proposed lower ground floor development plan is included in **Figure 1.2** below, and the full plan is included in **Appendix A**.

Figure 1-2 Proposed Development Plan





3. Sustainable Drainage Systems

3.1 This section of the report seeks to provide greater detail on the drainage proposals to demonstrate that surface water can be managed without increasing flood risk on site or elsewhere.

Pre-development surface water run-off conditions

3.2 The total site area is 0.163 ha and is comprised of approximately 0.056 ha impermeable area. It is assumed that surface water runoff from the existing site is conveyed to the Thames Water surface water sewer in Green Lane at an unrestricted rate.

3.3 To ensure that pre-development runoff rates are not exceeded, the brownfield runoff rates were calculated. The brownfield rates were determined using the Wallingford procedure rational method for an assumed critical 5-minute storm: $Q = 2.78 \times C \times i \times A$

Where: Q = Peak discharge (l/s)
 C = Dimensionless Runoff coefficient
 i = Rainfall intensity (mm/hr)
 A = Contributing impermeable areas (ha)

3.4 Refer to **Table 3-1** below for results, and **Appendix C** for calculations.

Table 3-1 Pre-development runoff rates

Rainfall event	Greenfield Runoff rate (l/s)	Brownfield Runoff rate (l/s)
Q1	0.63	7.9
Q30	1.72	17.6
Q100	2.38	22.4

3.5 Policy 5.13 of the London Plan sets out the drainage hierarchy to ensure that reasonable measures are taken to sustainably manage and reduce the overall amount of rainfall being discharged from a development site in the following order of preference:

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

3.6 Refer to **Table 3-2** for an assessment of the drainage hierarchy.

Table 3-2 Drainage Hierarchy Assessment

Disposal method	Feasible	Comments
1st) Store rainwater for later use	✓	Provide rainwater butts in the garden
2nd) Infiltration	✗	The site appears to be underlain by clay.
3rd) Attenuate rainwater in ponds or open water features	✗	Limited space for open water features at the proposed outfall.
4th) Attenuate rainwater by storing in tanks or sealed water features	✓	Attenuation can be provided in the parking area.
5th) Watercourse	✗	No clear route to convey runoff to local watercourses.
6th) Surface Water sewer	✓	Thames Water Surface water sewer in Green Lane.
7th) Combined sewer	N/A	Separate surface water and foul sewers present in close proximity to the site.

3.7 Based on the drainage hierarchy assessment, the proposed drainage strategy will seek to convey surface water runoff to the Thames Water sewer in Green Lane.

Sustainable Drainage Systems

3.8 The proposed strategy will seek to maximise the use of Sustainable Drainage Systems (SuDS) to control discharge volumes, manage water quality, increase the biodiversity, and provide amenity.

3.9 The opportunities and constraints for the use of SuDS within the site are assessed in **Table 3-3**. The assessment is based on the management train approach outlined in CIRIA C753 "The SuDS Manual".

Table 3-3 SuDS Hierarchy

SuDS Component	Feasible	Comment
Sedum Roofs	✗	Unfeasible due to pitched roof.
Rain gardens	✓	Incorporated within landscaped areas.
Swales / Basins	✗	Unfeasible due to spatial constraints.
Permeable Surfacing	✗	Electrical vehicle charging points to be provided in parking bays and the access road slopes down to the basement.
Tanked systems	✓	Should attenuation be required this could be achieved by use of oversized sewers or geo-cellular storage attenuation below the surface.

- 3.10 Based on the SuDS Hierarchy, the most appropriate SuDS for this development are rainwater butts, rain gardens, and permeable paving.

Peak Flow Control

- 3.11 In accordance with the NPPF, the proposed residential development will allow a 40% increase in rainfall intensity to allow for predicted impacts of climate change on surface water runoff.
- 3.12 The proposed drainage will be designed to ensure that flooding does not occur on any part of the site for the 1 in 30 year rainfall event, and any flooding up to the 1 in 100 year plus climate change will be contained on site.
- 3.13 Therefore, the proposed drainage strategy will seek to restrict surface water runoff to a maximum of 1.8 l/s using a flow control device for all events up to the 1 in 100 year plus 40% climate change rainfall event.
- 3.14 Thames Water has been consulted on the proposals under Pre-planning enquiry ref. **DS6091918**.
- 3.15 The peak surface water run-off generated from the Site for the 1 year, 30 year and 100 year rainfall events, for the pre and post-development scenarios, is detailed in **Table 3-4** below.

Table 3-4 Comparison of runoff rates

Return Period	Existing Brownfield Rate (l/s)	Max Rate (l/s)	Reduction
1 in 1 year	7.9	0.5	-94%
1 in 30 year	17.6	0.8	-95%
1 in 100 year	22.4	1.0	-96%
1 in 100 year + 40% CC	-	1.8	-

Storage Requirements

- 3.16 The site area is 0.163 ha and post-development the proposed development impermeable areas on site will be 0.056 ha (34% PIMP overall). Runoff from the impermeable areas across the site could be managed by conveying flows towards permeable paving with a geo-cellular sub-base in the forecourt at the front of the site. Refer to **Figure 3-1** below for an indicative illustration of a permeable paving with a geo-cellular sub-base.

Figure 3-1 Permeable paving with geo-cellular sub-base



- 3.17 Refer to **Table 3-5** for the storage volumes and **Appendix C** for MicroDrainage calculations.

Table 3-5 Attenuation Volumes and Half-drain times

Return period	Max Water depth (mm)	Volume (m³)	Half-drain time (mm)	Max Discharge rate (l/s)
1 in 1 year	86	7.8	204	0.5
1 in 30 year	206	18.7	243	0.8
1 in 100 year	276	25.1	273	1.0
1 in 100 year + 40% CC	954 (4mm flooding)	28.9	348	1.8

- 3.18 Refer to **Appendix C** for drawing **22000-FCE-XX-XX-DR-D-0500** illustrating how the Site could be drained.
- 3.19 In accordance with the Non-statutory Technical Guidance for Sustainable Drainage Systems, the post-development discharge rate does not exceed the rate of discharge from the development prior to redevelopment. Therefore, the risk of flooding from impermeable areas is assessed as low.

Urbanisation

- 3.20 Based on the proposed development of a single building, it is unlikely that the building will be extended. Therefore, urban creep has not been considered.

Overland Flow Routes

- 3.21 The site will be designed so that exceedance flows above the 1 in 100 year, including climate change rainfall event will generally and flow away from the building towards the car park area.

Water Quality Management

- 3.22 In line with CIRIA C753 The SuDS Manual, Tables 26.2 and 26.3, the pollution hazards indices associated with a residential development are mitigated by the permeable paving in the forecourt area. Refer to **Table 3-6** below for the Simple Index Method assessment.

Table 3-6 Simple Index Method

Pollution Hazard Indices			
Pollution hazard	TSS	Metals	Hydrocarbons
Low – Residential	0.5	0.4	0.4
Pollution Mitigation Indices provided			
SuDS component	TSS	Metals	Hydrocarbons
Permeable Paving	0.8	0.4	0.9
Check	+0.3	+0.0	+0.5

Biodiversity & Amenity Benefits

SuDS components can provide an array of amenity, recreational and biodiversity benefits by creating habitats that encourage biodiversity and simultaneously provide open space. Biodiversity often has an important role in delivering good amenity for residents and visitors of development sites.

- 3.23 Providing rainwater butts will encourage residents to water plants and connecting people to water and wildlife. The permeable paving will also be more visually attractive space compared to asphalt.

Management of groundwater during construction phase

- 3.24 Prior to construction, the Contractor will ensure that consultation with the local sewerage undertakers and the relevant environmental agencies has been undertaken to ensure that all necessary permissions / discharge consents are obtained prior to works commencing.
- 3.25 A methodology for surface water management and groundwater protection during construction will be developed by the contractor and detailed in the Construction Environmental Management Plan (CEMP). At this stage it is expected that the CEMP will include provisions such as:
- New temporary and /or permanent drainage ditches to prevent uncontrolled surface runoff of contaminated water.
 - Silt traps within drainage ditches to reduce the flow of suspended solids from site.
 - Suitable layout of the construction site and application of suitable management techniques to prevent runoff from stockpiles directly into watercourses/groundwater.
 - All fuel bowzers will be bunded to 110% of their capacity; all re-fuelling will be undertaken at a designated location on site and services of mobile plant will only be permitted on site in exceptional circumstances.

Maintenance

- 3.26 The maintenance of all SuDS components will be in accord with the best practices and the CIRIA C753 The SuDS Manual.
- 3.27 The recommended Operation and Maintenance requirements for the proposed drainage system are outlined in **Table 3-7**. Refer to document ref **2200-FCE-XX-XX-RP-D-0002** for the Drainage Maintenance Plan.

Table 3-7 SuDS Management Plan

Maintenance Task	Description	Frequency
Regular Maintenance		
Litter management	Pick up all litter in garden, bin store, and planters and remove from site.	Monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access.	Monthly
Hard surfaces	Sweep all paving regularly.	As required
Occasional tasks		
Inspection and control chambers	Annual inspection, remove silt and check free flow.	Annually
Remedial work		
Repairs	Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required.	As required

4. Water efficiency

Water Hierarchy

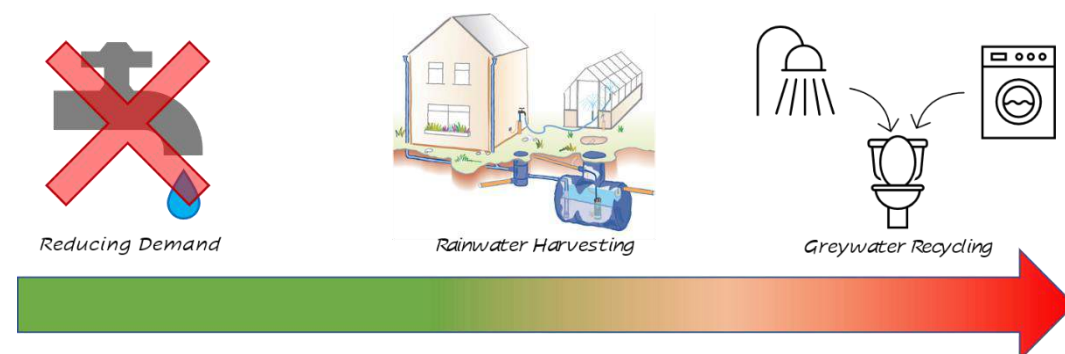
4.1 Policy 5.15 of the London Plan sets out how the Mayor will work in partnership with appropriate agencies within London and adjoining regional and local planning authorities to protect and conserve water supplies and resources in order to secure London's needs in a sustainable manner by:

- 1) *minimising use of mains water*
- 2) *reaching cost-effective minimum leakage levels*
- 3) *in conjunction with demand side measures, promoting the provision of additional sustainable water resources in a timely and efficient manner, reducing the water supply deficit and achieving security of supply in London*
- 4) *minimising the amount of energy consumed in water supply*
- 5) *promoting the use of rainwater harvesting and using dual potable and grey water recycling systems, where they are energy and cost-effective*
- 6) *maintaining and upgrading water supply infrastructure*
- 7) *ensuring the water supplied will not give rise to likely significant adverse effects to the environment particularly designated sites of European importance for nature conservation.*

4.2 The principles of the water hierarchy can be implemented to reduce potable water use. The most effective way to reduce water use is to first reduce demand. The second step is to intercept and use rainwater before returning it to mains, or ideally through a sustainable drainage system. The third step level involves the interception of water already used for a lower grade use such as waste removal (e.g. using shower water for toilet flushing).

4.3 The principles of the water hierarchy to reduce water use are illustrated in Figure 4-1 below.

Figure 4-1 Water Hierarchy



4.4 It is also possible to reduce potable water demand by raising awareness and educating residents and installing smart meters. User awareness can have a great impact if people take on board the advice given. Turning off taps while brushing teeth is one example of how water can be saved easily. The installation of visible/smart water meters can also have an impact on user awareness, as homeowners will have a financial incentive to save water.

4.5 However, it is difficult to quantify the effectiveness of raising awareness and smart meters at this stage in the design process. Therefore, this strategy will focus on the provision of efficient fittings to reduce water use and rainwater harvesting, as part of a sustainable drainage system.

Efficient Fittings

4.6 Efficient fittings can take the form of low flow showers and taps, dual flush toilets and smaller baths and basins. Water-efficient appliances in the form of low consumption dishwashers and washing machines can be used to further reduce the demand for potable water. Individual applications are described below.

WC Flushing

4.7 Toilet flushing is one of the largest uses of water within the home; therefore, a reduction of water consumption here can have a dramatic effect on the overall use of water.

4.8 Under the requirements of the Water Supply (Water Fitting) Regulations 1999, toilet cisterns are limited to using no more than 6 litres per flush. Further reductions can be made through the use of dual-flush WC, with a choice of full or partial flush. The low flush of a dual flush toilet should use no more water than 67% of the full flush.

Showers

4.9 Homeowners are usually aware that showers use much less water than taking a bath. There are typically three types of shower used within domestic dwellings:

- Mixer showers supplied from mains hot and cold water
- Power showers supplied from mains hot and cold water
- Electric showers supplied from cold water only

4.10 Out of the above three types of shower, electric showers are typically the most efficient in the use of water and energy.

4.11 The Water Supply (Water Fittings) Regulations 1999 states that consent from the local water company is required where showers using greater than 12 litres per minute are to be fitted.

4.12 A low flow shower head can reduce consumption to as low as 6 litres per minute, saving up to half the amount used by some less efficient showers. The use of specially designed shower heads can reduce flow without a large impact on the perceived flow by the user.

Bath

4.13 Depending on the exact size, a typical bath can use between 100 and 250 litres of water, assuming they are filled to the overflow. Fitting smaller baths can reduce the consumption of water in two ways:

- Less water is required to fill the bath; and

- Smaller baths may cause people to enjoy bathing less, thus promoting the use of more efficient showers.

4.14 In some cases, a bath may not be necessary and therefore can be left out entirely.

Wash Basin

4.15 Wash basins in bathrooms are typically used for personal washing. Great amounts of waste can be generated here due to lack of consideration or education of the user. Typical inefficient waste through wash basins include:

- Leaving the tap running unnecessarily when brushing teeth.
- Leaving the tap running when shaving, when simply filling the basin with a small amount of water would be sufficient.

Kitchen Sink

4.16 Typically, the tap in the kitchen is used to fill pots, pans kettles etc. In this case, reducing the flow rate would not have a major impact on the amount of water required, but could irritate the user, especially if they are waiting for a washing bowl to fill.

4.17 Some uses of the kitchen tap can waste water, such as rinsing plates before they are put in the dishwasher, therefore there is a small element of waste here. As such, the flow rate at the kitchen tap should be restricted to no less than 4 litres per minute.

Dishwasher

4.18 Like washing machines, savings here can be made by ensuring that the dishwasher is only used when full.

Washing Machine

4.19 Washing machines consume large quantities of water and are a good place to make savings. Efficient appliances not only save water, but also save energy. A typical washing machine can use over 70 litres per wash. Most manufactures are trying to reduce this figure and there are now many that use less than 50 litres per wash.

4.20 Further savings on water consumption can be made by ensuring that the washing machine is only used to wash full loads, although some high-end machines can detect the load size and adjust the amount of water required accordingly.

Leaks from taps

4.21 The most effective methods of reducing water use from taps are to fit spray inserts, flow restrictors or aerators to new or existing taps. Most European taps have threaded outlets to which these can be fitted. There are also taps where the user has to consciously increase water flow and switch to hot water (saving energy), this is done by implementing a two-position stop on the tap, which requires extra force to move onto the next stop. Hot water would only be available when specifically selecting it, instead of it being on by default during water flow.

4.22 Efficient taps can reduce water flow from many litres per minute down to 1.7 litres per minute without a reduction in perceived flow. This is done through the use of spray fittings. Higher quality taps are also less susceptible to developing leaks.

Rainwater Harvesting

4.23 The Water Hierarchy encourages the use of rainwater for garden watering, although this is not a mandatory element.

4.24 A rainwater butt can be installed at the down pipe from the roof, diverting water into the butt and overflowing to the surface water drainage system.

4.25 The size requirement for the water butt is dependent on the type of garden and size of the property and can range from 100 to 200 litres.

4.26 Such rainwater collection systems depend on the availability of a roof drainage down pipe in a suitable location on the property.

Education & Raising Awareness

4.27 Although, it is not easy to measure the effects of raising awareness to educate residents in the efficient use of water, it should still be considered. The following can help to raise awareness of end users:

- The installation of a visible water meter gives residents a financial incentive to save water as their consumption is proportional to the amount they pay for their supply;
- Resident welcome packs should be provided containing information on water efficient fittings installed in the home, how to use them efficiently and where to find equivalent replacements when required;
- Stickers or notices in discrete locations to remind users to save water; and
- Periodic leaflet delivery reminding users how to save water, why it is important and the financial benefits.

Reducing Water Demand

4.28 In accordance with Policy 5.15 of the London Plan, the strategy will minimise the use of mains water by:

- incorporating water saving measures and equipment; and
- designing residential development so that mains water consumption would meet a target of 105 litres or less per head per day.

4.29 This will be achieved through the provision of efficient fittings that do not exceed the maximum consumptions listed in **Table 4.1** below, which is based on the Fittings approach in Building Regulations Part G2.

Table 4.1 Maximum Fittings Consumption Level

Water fitting	Maximum consumption
Dual Flush W/C	4 L (Full) / 2.6 L (Partial)
Shower	8 L/min
Bath	150 L
Basin taps	5 L/min
Sink taps	6 L/min
Dishwasher	1.25 L/place setting
Washing machine	8.17 L/kg

- 4.30 Based on the efficient fittings approach it is possible to achieve a water efficiency of 101.3 litres per person per day - meeting the requirements of London Plan Policy 15.5. Refer to **Table 4.2** below and **Appendix E** for calculations.

Table 4.2 Water Efficiency

Installation Type	Water Consumption (L / person/ day)
Dual Flush W/C	13.5
Shower	35.0
Bath	18.7
Basin taps	9.5
Kitchen / Utility Sink taps	13.0
Dishwasher	4.5
Washing machine	17.2
<i>TOTAL (inc. NORMALISATION)</i>	<i>101.3</i>

- 4.31 Rainwater butts will also be specified where feasible as part of the sustainable drainage strategy.

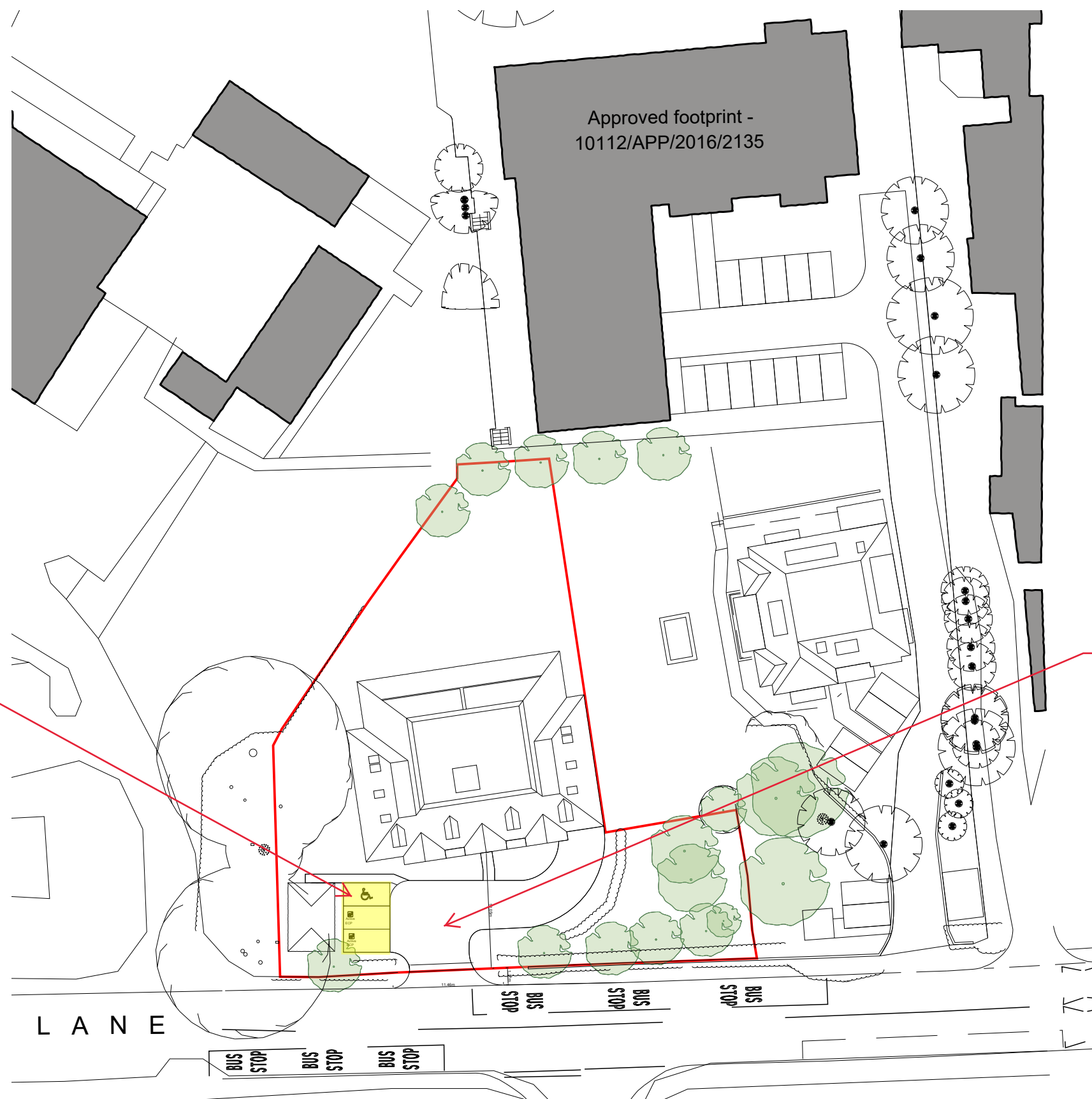
5. Conclusion

- 5.1 Fernbrook Consulting Engineers has been appointed by Westcombe Developments to provide a Sustainable Water Management Strategy for the proposed residential redevelopment at 15 Green Lane, Northwood, HA6 2UZ.
- 5.2 The development proposals are comprised of erection of single storey rear extension at lower ground floor level, infill at rear ground floor level. Removal of part of soil from raised garden level.
- 5.3 The proposed drainage strategy will seek to discharge surface water runoff to the Thames Water sewer in Green Lane at 1.8 l/s for all rainfall events up to the 1 in 100 year rainfall event plus 40% climate change allowance scenario. This is a 50% betterment compared to the pre-development scenario.
- 5.4 The drainage strategy will provide 26.8m³ attenuation storage below the forecourt at the front of the site.
- 5.5 In conclusion, this report demonstrates that the proposals are consistent with the aims of the NPPF and its Planning Practice Guidance, along with the aims of the Local Flood Risk Management Strategy and the London Plan. Surface water runoff can be adequately managed without increasing the risk of flooding on site or elsewhere.
- 5.6 The Water Conservation Strategy will ensure a water efficiency of less than 105 litres per person per day, through the provision of efficient fittings that do not exceed the maximum consumptions listed in the Table below, which is based on the Fittings approach in Building Regulations Part G2.

Water fitting	Maximum consumption
Dual Flush W/C	4 L (Full) / 2.6 L (Partial)
Shower	8 L/min
Bath	170 L
Basin taps	5 L/min
Sink taps	6 L/min
Dishwasher	1.25 L/place setting
Washing machine	8.17 L/kg

- 5.7 Based on the efficient fittings approach it is possible to achieve a water efficiency of 101.3 litres per person per day, which is 32% less than a typical demand of 150 litres per person per day.
- 5.8 Rainwater butts will also be included where feasible as part of the sustainable drainage strategy, for the irrigation of private gardens.
- 5.9 Therefore, this strategy demonstrates that the proposed residential development can reduce water demand in compliance with the London Plan.

APPENDIX A – PROPOSED DEVELOPMENT PLANS



Paved car parking area

Surfaced road and access to basement

Rev	Date	Description

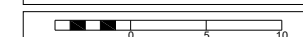
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WEB: FLUENT-ADS.CO.UK

Client :
Green Lane Estates Ltd

Wetherbys Nursery
Green Lane, Northwood

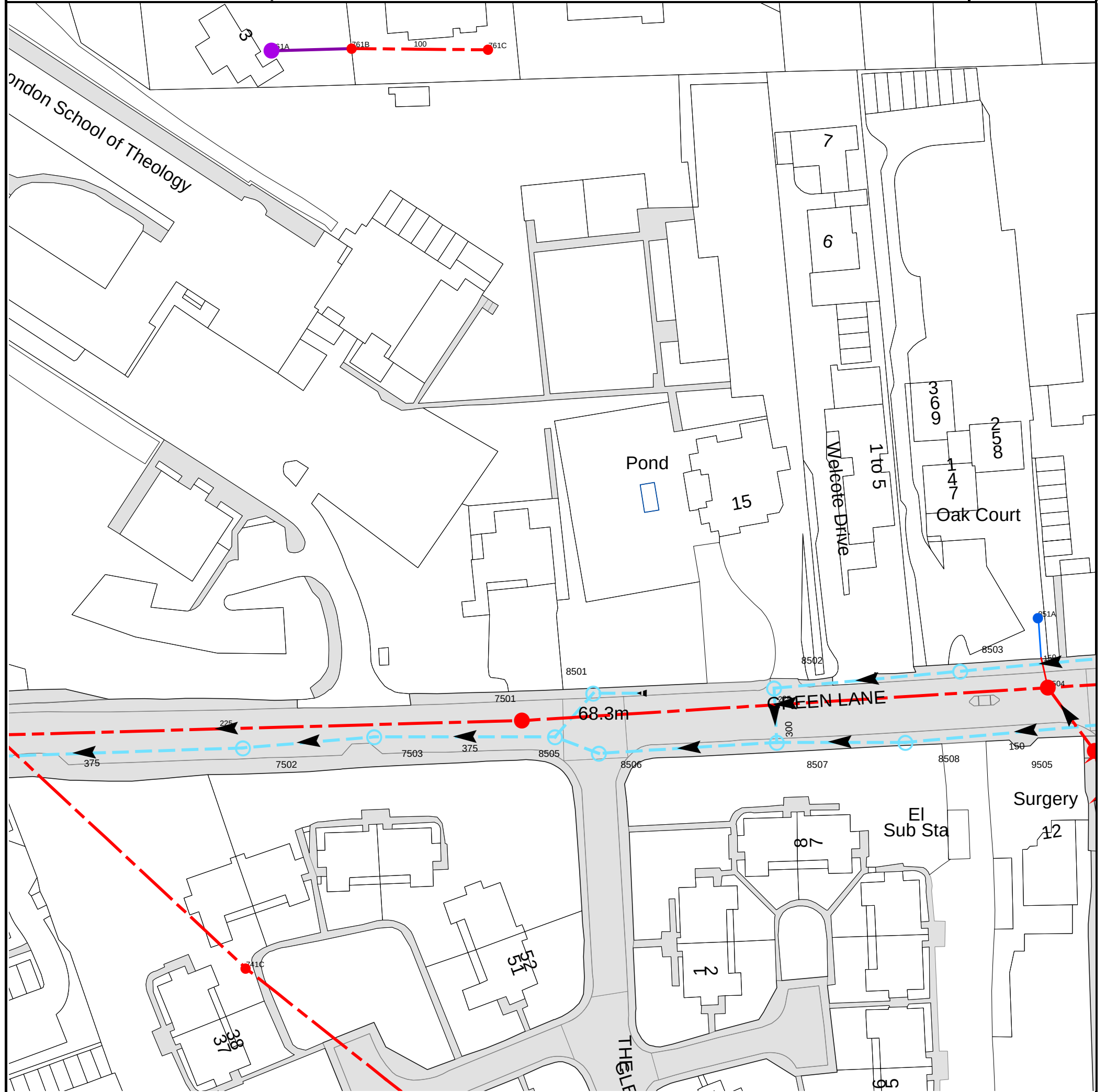
Site Plan



Scale 1:500 @ A3	Dwg No.
Date	Rev
Drawn	

APPENDIX B – THAMES WATER RECORDS

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4033480



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 508802,191544

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8501	69.52	68.33
8506	69.13	67.6
8502	68.32	67.4
8507	68.35	66.87
8508	68.15	66.93
8503	68.2	67.09
851A	n/a	n/a
8504	68.18	64.76
9505	n/a	n/a
7502	67.44	65.15
741C	n/a	n/a
761A	n/a	n/a
761B	n/a	n/a
7503	67.75	65.89
761C	n/a	n/a
7501	68.19	64.46
8505	68.28	66.26
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

	Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Trunk Surface Water
	Trunk Foul
	Storm Relief
	Trunk Combined
	Vent Pipe
	Bio-solids (Sludge)
	Proposed Thames Surface Water Sewer
	Proposed Thames Water Foul Sewer
	Gallery
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Sludge Rising Main
	Proposed Thames Water Rising Main
	Vacuum

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Outfall
	Undefined End
	Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

	Foul Sewer		Surface Water Sewer
	Combined Sewer		Gully
	Culverted Watercourse		Proposed
			Abandoned Sewer

APPENDIX C – DRAINAGE STRATEGY CALCULATIONS & DRAWINGS

Calculated by:

Site name:

Site location:

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

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics Default Edited

SOIL type:

HOST class:

SPR/SPRHOST:

Hydrological characteristics Default Edited

SAAR (mm):

Hydrological region:

Growth curve factor 1 year:

Growth curve factor 30 years:

Growth curve factor 100 years:

Growth curve factor 200 years:

Notes

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

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

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

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

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

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0.75	0.75
1 in 1 year (l/s):	0.63	0.63
1 in 30 years (l/s):	1.72	1.72
1 in 100 year (l/s):	2.38	2.38
1 in 200 years (l/s):	2.79	2.79

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

EXISTING SITE INFORMATION

Total Site Area	0.1630	ha
Impermeable Area	0.056	ha
PIMP	34	%

MODIFIED RATIONALE METHOD

$$Q_n = 2.78 CiA$$

where:

C	Runoff Coefficients	=	1	(in this case 1 as using impermeable area)
i_n	Rainfall Intensity for n return period (mm/hr)			
A	Impermeable Area (Ha)			
Q_n	Runoff for n return period (l/s)			

Rainfall Intensity

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.8 mm/hr
i_{10}	94.9 mm/hr
i_{30}	113.02 mm/hr
i_{100}	143.9 mm/hr

PRE-DEVELOPMENT SURFACE WATER RUNOFF

		C	i_n	A		Q_n	
Q_1	2.78	1	50.8	0.056	=	7.91	l/s
Q_{10}	2.78	1	94.9	0.056	=	14.77	l/s
Q_{30}	2.78	1	113.0	0.056	=	17.59	l/s
Q_{100}	2.78	1	143.9	0.056	=	22.40	l/s



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Innovyze

Network 2020.1.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	70.200	0.750	Open Manhole	1200	1.000	69.450	150				
2	70.000	0.800	Open Manhole	1200	1.001	69.200	150	1.000	69.200	150	
4	68.500	0.250	Open Manhole	1200	1.002	68.250	150	1.001	68.250	150	
5	68.500	0.900	Open Manhole	1200	1.003	67.600	150	1.002	67.600	150	
6	68.500	0.950	Open Manhole	1200	1.004	67.550	150	1.003	67.550	150	
TWS	68.200	1.800	Open Manhole	0		OUTFALL		1.004	66.400	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	1681.062	-108.643	1681.062	-108.643	Required	
2	1656.649	-112.252	1656.649	-112.252	Required	
4	1656.743	-134.382	1656.743	-134.382	Required	
5	1666.478	-134.374	1666.478	-134.374	Required	
6	1666.478	-141.374	1666.478	-141.374	Required	
TWS	1665.556	-149.807			No Entry	

		Page 3
		
Date 17/05/2022 22:45 File 22000-MD-SW-02_220517.MDX	Designed by dramdeen Checked by	
Innovyze	Network 2020.1.3	
<u>Online Controls for Storm</u> <u>Orifice Manhole: 6, DS/PN: 1.004, Volume (m³): 1.2</u> Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 67.550		
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		Page 4																		
																				
Date 17/05/2022 22:45 File 22000-MD-SW-02_220517.MDX	Designed by dramdeen Checked by																			
Innovyze	Network 2020.1.3																			
<u>Storage Structures for Storm</u>																				
<u>Cellular Storage Manhole: 6, DS/PN: 1.004</u>																				
Invert Level (m) 67.550 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000																				
<table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td></tr><tr><td>0.000</td><td>94.0</td><td>0.0</td><td>0.301</td><td>0.0</td><td>0.0</td></tr><tr><td>0.300</td><td>94.0</td><td>0.0</td><td></td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	94.0	0.0	0.301	0.0	0.0	0.300	94.0	0.0			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)															
0.000	94.0	0.0	0.301	0.0	0.0															
0.300	94.0	0.0																		

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

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Rainfall Model	FSR	Ratio R	0.412
Region England and Wales Cv (Summer)			0.750
M5-60 (mm)	20.100 Cv (Winter)		0.840

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
n Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

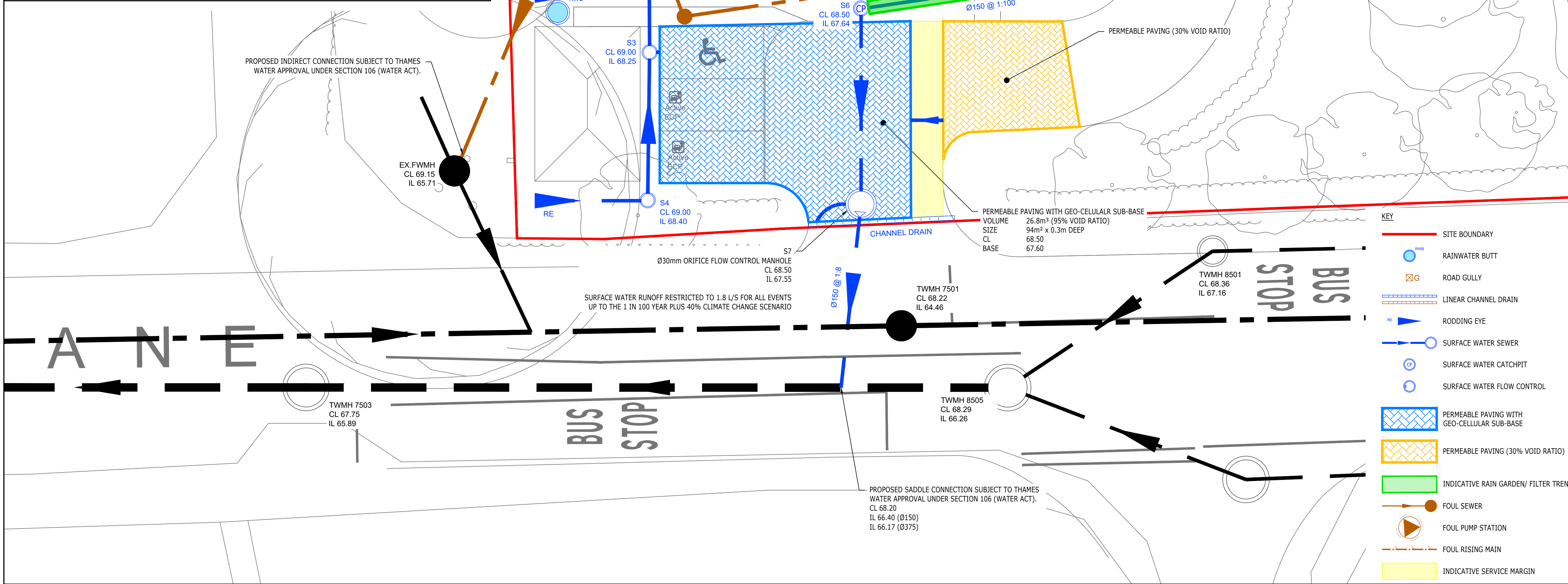
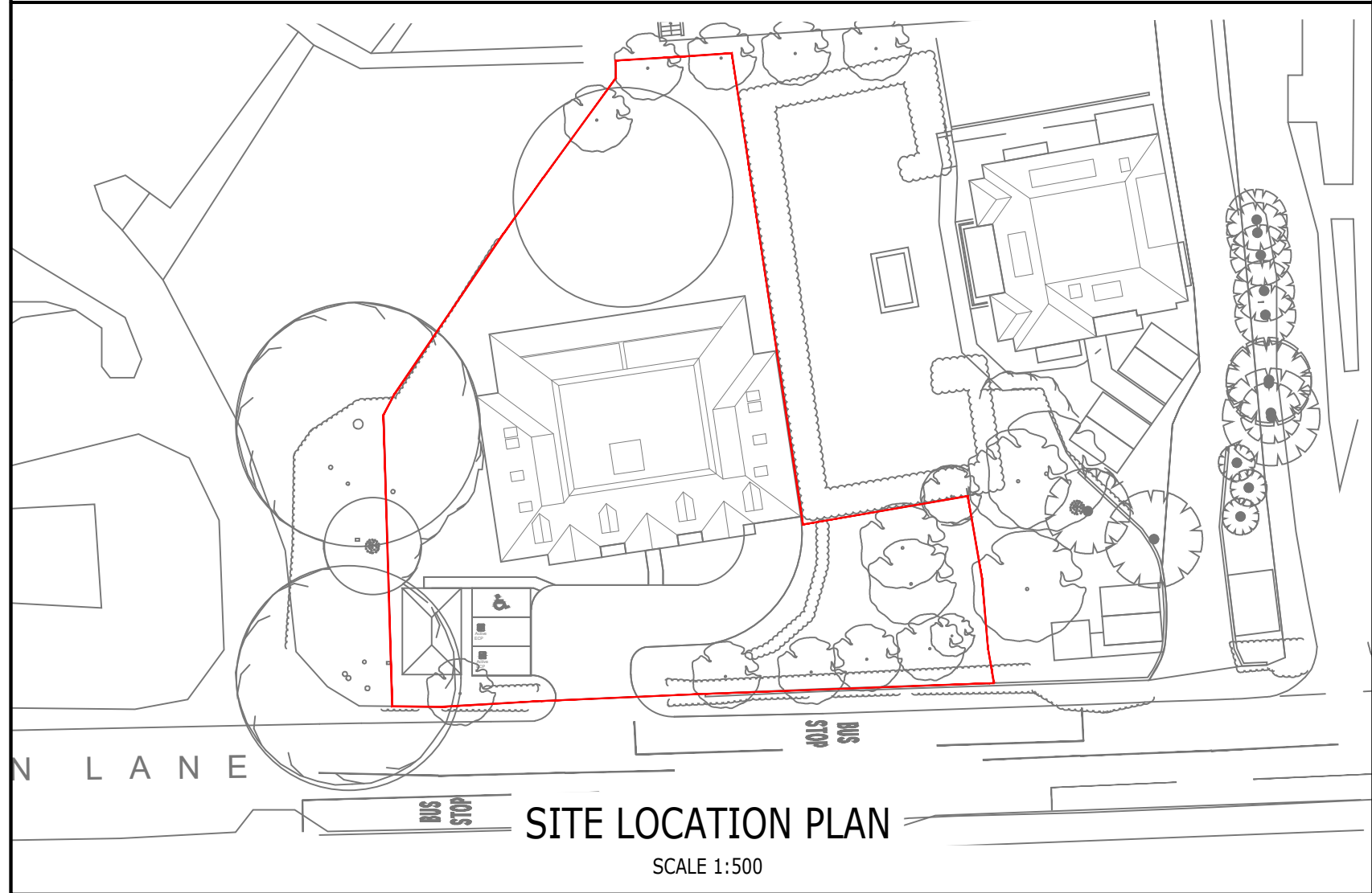
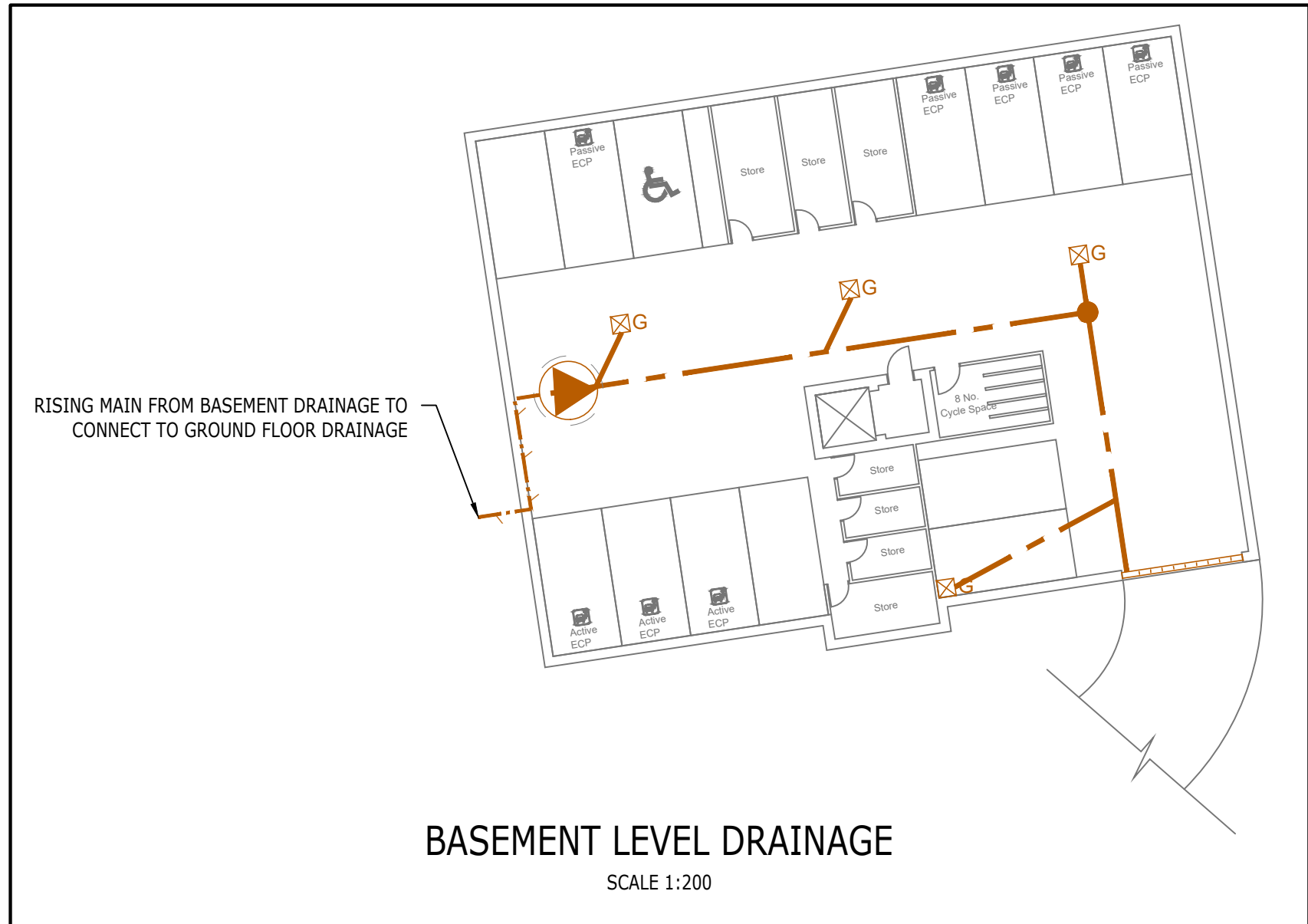
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	1	+0%					69.496
1.001	2	15 Winter	1	+0%					69.243
1.002	4	15 Winter	1	+0%					68.291
1.003	5	15 Winter	1	+0%	30/15 Summer				67.694
1.004	6	240 Winter	1	+0%	30/30 Winter				67.636

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Half Drain Pipe		Status	Level Exceeded
		Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		
1.000	S1	-0.104	0.000	0.20			3.5	OK	
1.001	2	-0.107	0.000	0.18			6.1	OK	
1.002	4	-0.109	0.000	0.16			6.7	FLOOD RISK	
1.003	5	-0.056	0.000	0.71			9.1	OK	
1.004	6	-0.064	0.000	0.01		204	0.5	OK	

		Page 6	
			
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Innovyze		Network 2020.1.3	
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>			
<u>Simulation Criteria</u>			
Areal Reduction Factor		1.000 Additional Flow - % of Total Flow 0.000	
Hot Start (mins)		0 MADD Factor * 10m³/ha Storage 2.000	
Hot Start Level (mm)		0 Inlet Coefficient 0.800	
Manhole Headloss Coeff (Global)		0.500 Flow per Person per Day (l/per/day) 0.000	
Foul Sewage per hectare (l/s)		0.000	
Number of Input Hydrographs 0		Number of Offline Controls 0	
Number of Online Controls 1		Number of Time/Area Diagrams 0	
		Number of Storage Structures 1	
		Number of Real Time Controls 0	
<u>Synthetic Rainfall Details</u>			
Rainfall Model		FSR Ratio R 0.412	
Region England and Wales		Cv (Summer) 0.750	
M5-60 (mm)		20.100 Cv (Winter) 0.840	
Margin for Flood Risk Warning (mm)		300.0 DVD Status OFF	
Analysis Timestep		Fine Inertia Status OFF	
DTS Status		ON	
<u>Profile(s)</u>			
Duration(s) (mins)		15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080	
Return Period(s) (years)		1, 30, 100	
Climate Change (%)		0, 0, 0	

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Innovyze		Network 2020.1.3						
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.412 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 100 Climate Change (%) 40								
PN	US/MH Name	Storm	Return Climate Period Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	100 +40%					69.562
1.001	2	15 Winter	100 +40%					69.310
1.002	4	180 Winter	100 +40%	100/15 Summer	100/15 Summer			68.504
1.003	5	360 Winter	100 +40%	100/15 Summer	100/60 Winter			68.502
1.004	6	360 Winter	100 +40%	100/15 Summer	100/60 Winter			68.501
Surcharged Flooded				Half Drain Pipe				
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Level Exceeded
1.000	S1	-0.038	0.000	0.91			15.4	OK
1.001	2	-0.040	0.000	0.88			30.9	OK
1.002	4	0.104	3.652	0.20			8.0	FLOOD 13
1.003	5	0.752	2.139	0.46			5.8	FLOOD 8
1.004	6	0.801	1.165	0.03		348	1.8	FLOOD 5
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- NOTES
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 - DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
 - ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 - NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
 - THIS DRAWING HAS BEEN BASED ON "GROUND FLOOR PLAN", DRAWING No. FLU.441.3.04 REV C DATED 24.02.19, BY FLUENT ARCHITECTURAL DESIGN SERVICES.

- CDM NOTES
- THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:
- WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
 - WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
 - HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
 - THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
 - THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

FOR INFORMATION ONLY

P02	FOR COORDINATION	DR	CR	DR	18.05.22
P02.2	FOR COORDINATION	DR	CR	DR	13.05.22
P02.1	FOR COORDINATION	DR	CR	DR	11.05.22
P01	FOR INFORMATION	DR	CR	DR	25.01.22
P01.1	FOR COORDINATION	DR	CR	-	24.01.22
Rev	Description	Dm	Chk	App	Date

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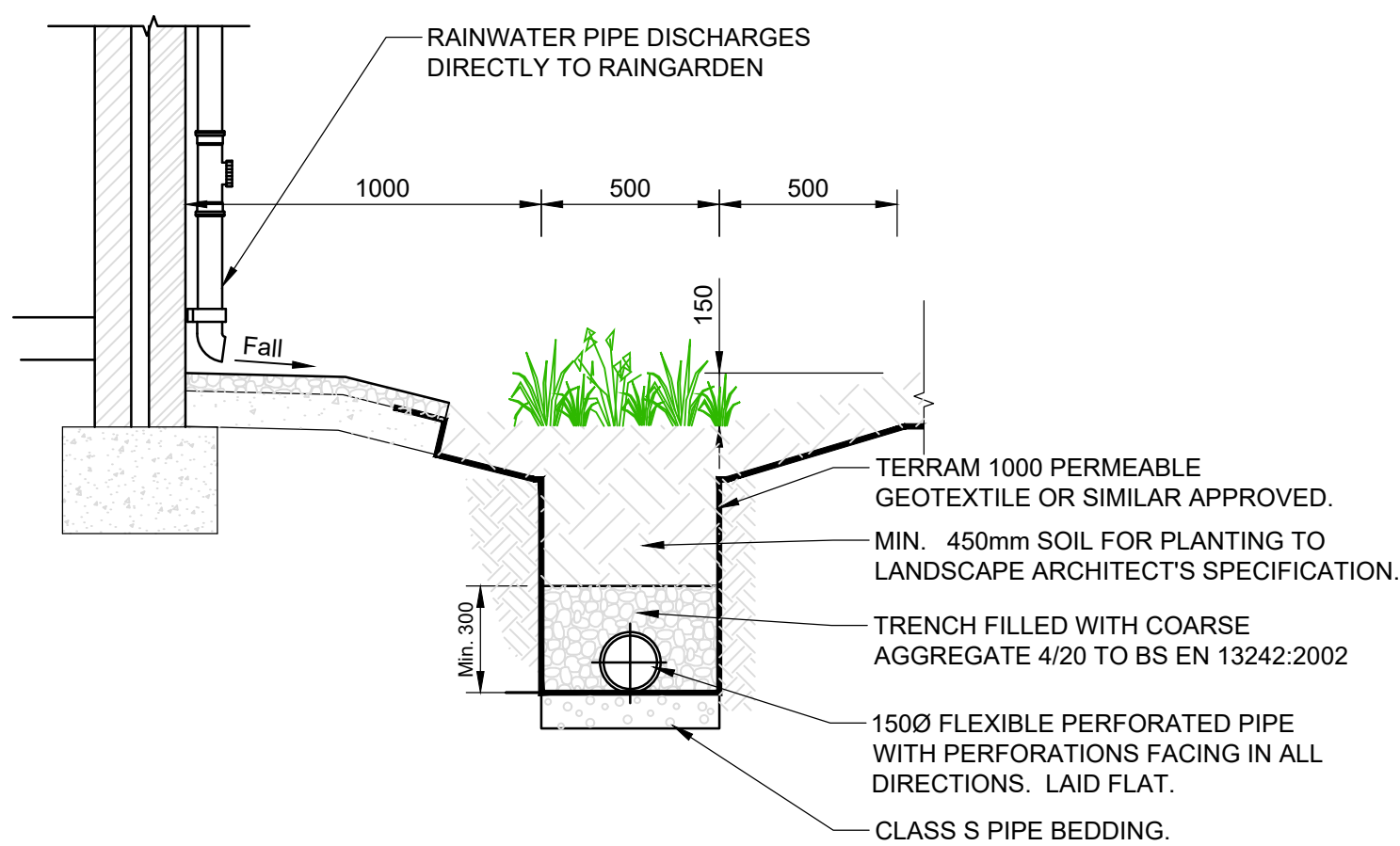
Client

WESTCOMBE DEVELOPMENTS

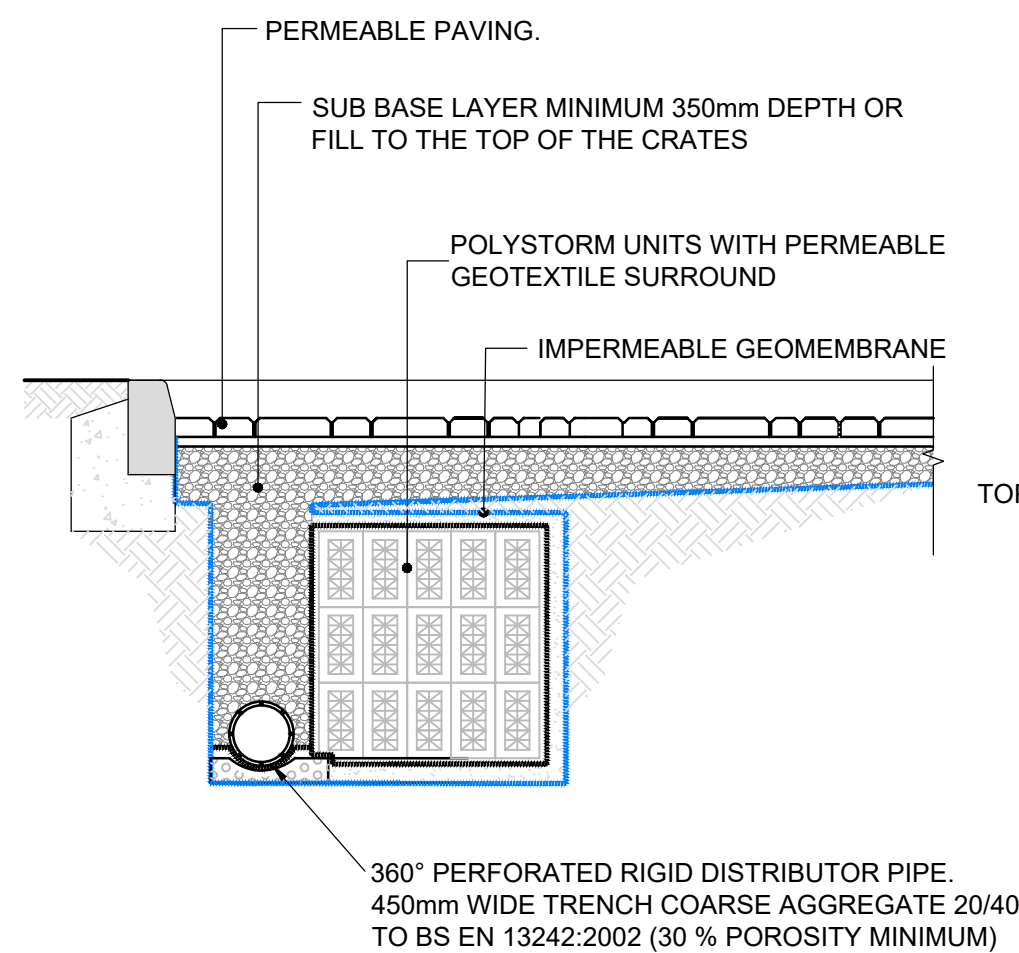
Project Title:
15 GREEN LANE, NORTHWOOD

Drawing Title:
PROPOSED SURFACE WATER & FOUL DRAINAGE STRATEGY

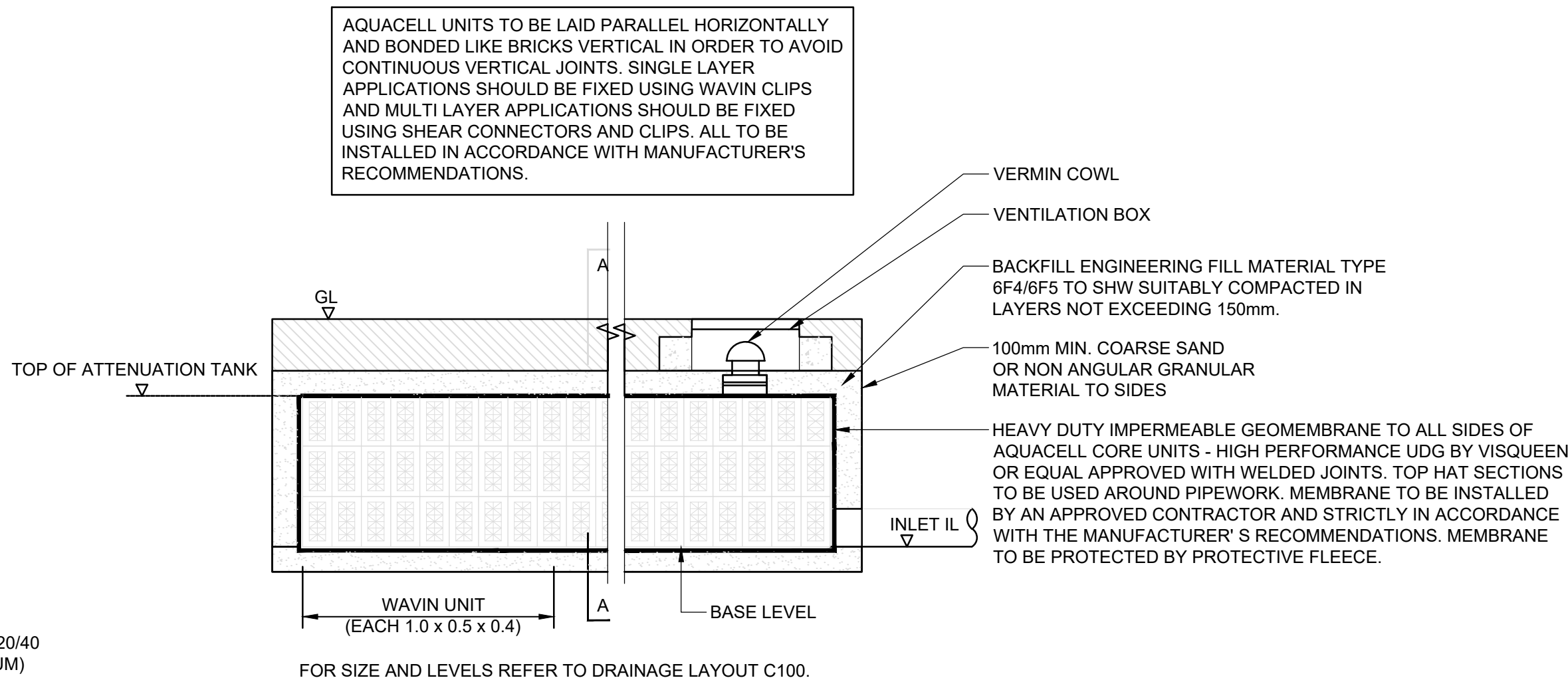
A1 Scale	Date	Designed by
1:100	JAN 2022	DR
Drawn by	Checked by	Approved by
DR	CR	DR
Drawing Number	22000-FCE-XX-XX-DR-D-0500	Rev
		P02



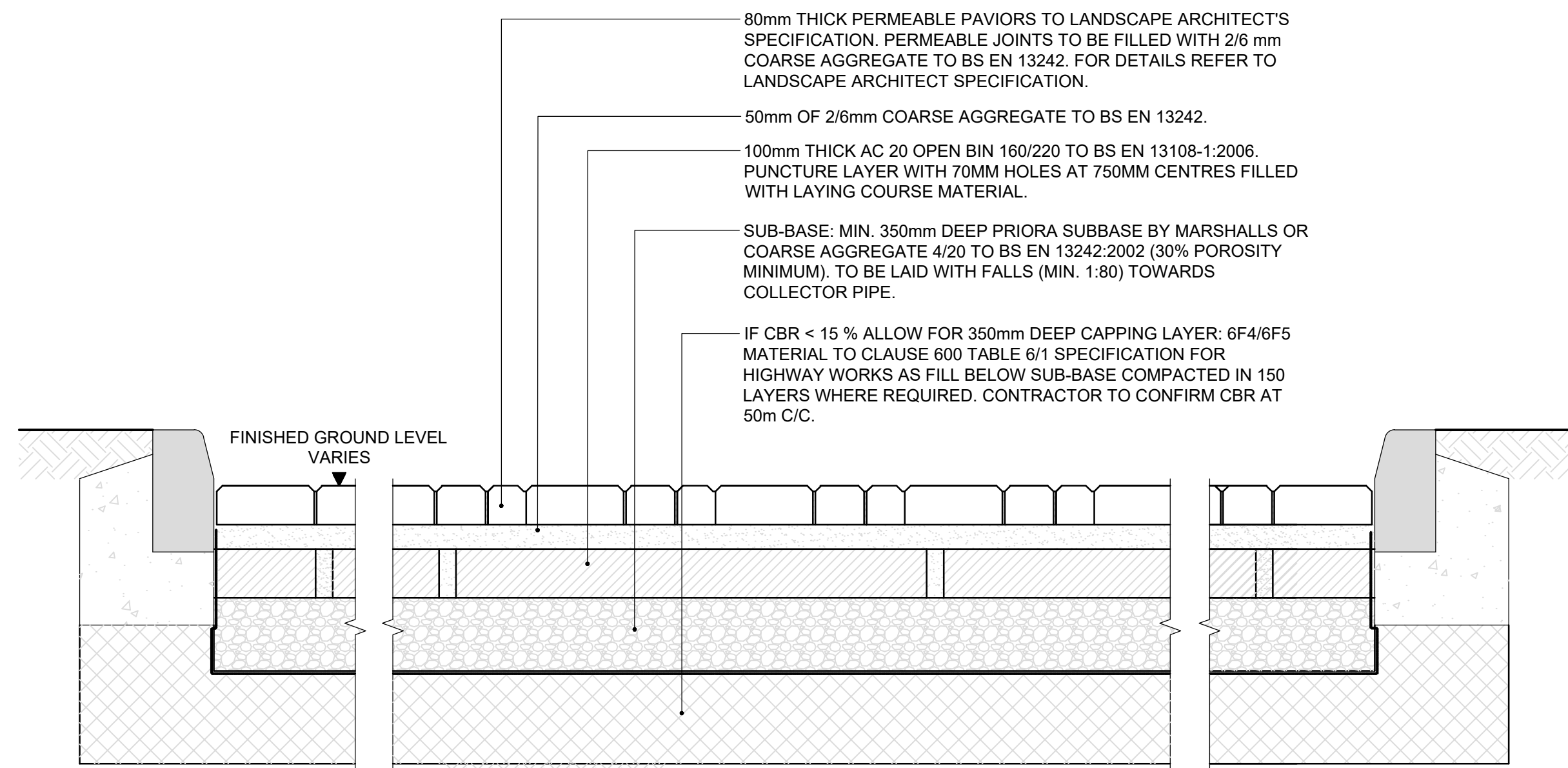
TYPICAL RAIN GARDEN DETAIL
(SCALE 1:20)



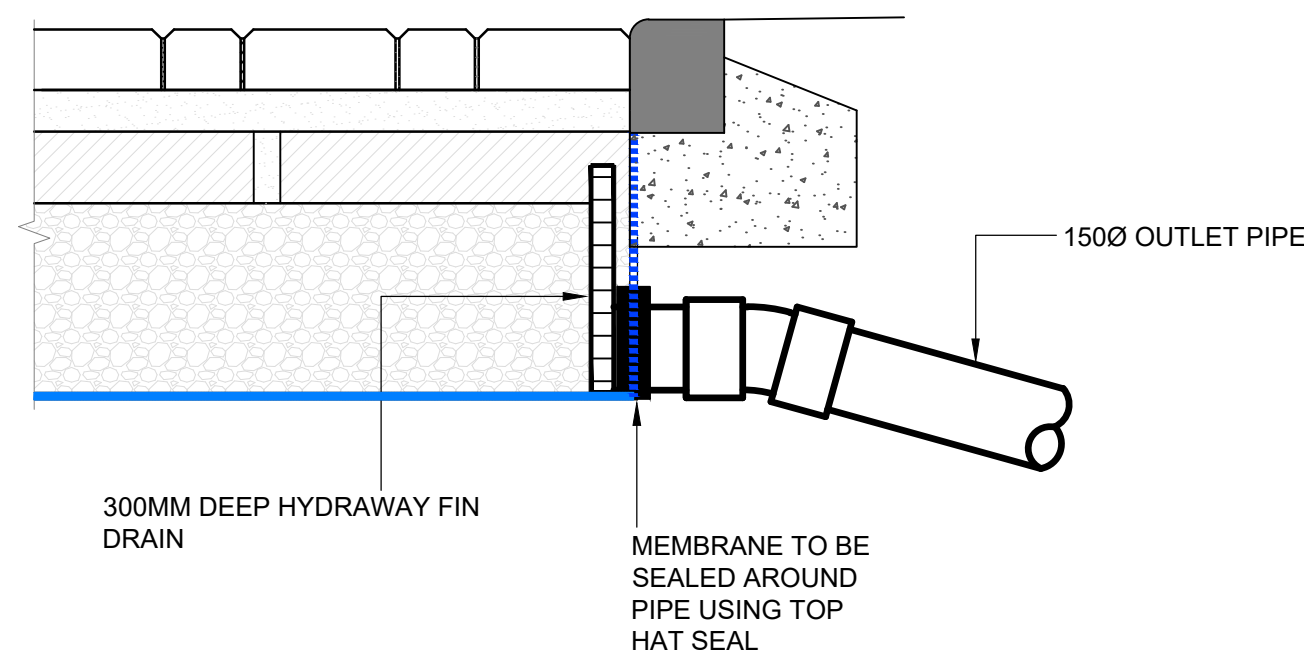
CROSS SECTION A-A



ATTENUATION TANK WITH PERMEABLE PAVING ABOVE DETAIL
(NOT TO SCALE)



TYPICAL SECTION THROUGH PERMEABLE PAVING
(SCALE 1:10)



PERMEABLE PAVEMENT OUTLET PIPE DETAIL
(SCALE 1:10)

NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
- ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
- ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
- NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.



FOR INFORMATION
ONLY

P02	FOR INFORMATION	DR	CR	DR	18.05.22
P01	FOR INFORMATION	DR	CR	DR	25.01.22
P01.1	FOR COORDINATION	DR	CR	-	24.01.22
Rev	Description	Dm	Chk	App	Date

FERNBROOK
CONSULTING ENGINEERS

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London
EC1R 0NE

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Client

WESTCOMBE DEVELOPMENTS

Project Title:

15 GREEN LANE, NORTHWOOD

Drawing Title:

PROPOSED SUDS DETAILS

A1 Scale	Date	Designed by
1:20mm	JAN 2022	DR
Drawn by	Checked by	Approved by
DR	CR	DR
Drawing Number	22000-FCE-XX-XX-DR-D-0505	Rev
		P02



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Controflow 500 Series Universal Level Invert

SUDS02005

Applications – all SuDS elements, particularly where an internal overflow is required, and at the end of the management train.

A flexible, universal flow control chamber suitable for any SuDS technique, with level inverts. The slide-out centre plate contains a circular orifice (to specified diameter), protected by an upstream guard, and acts as an overflow weir. Additional orifices can be added to order.

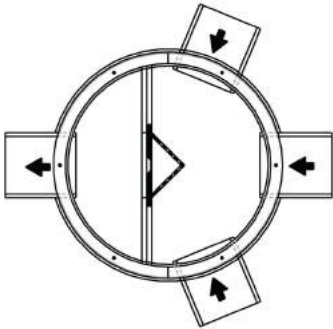
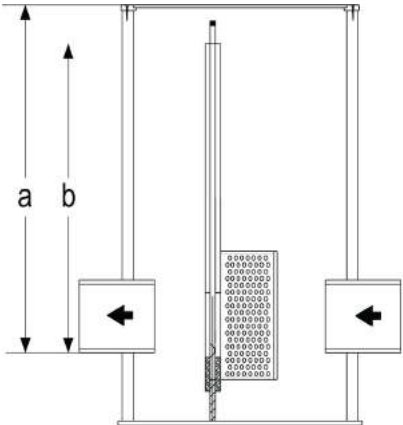
Three 160mm diameter inlet pipe connection stubs offer layout flexibility. Supplied with a temporary protective site cover (permanent cover and frame not included). Suitable for depths ranging from 537mm to 1.2m (finished cover to base). An optional foul air trap is available for use when connected to combined sewers. The chamber is fully compatible with 'Cloud Water Control' wireless SuDS monitoring systems to remotely monitor live and historical stormwater performance.



Please specify:

- Cover to inlet depth 'a'
- Weir to inlet depth 'b'
- Type/depth of cover/frame to be used
- Any additional orifice positions and diameters
- If foul air trap is required
- Orifice diameter = 29.36mm

Flow Rate (l/s) Head Driving Flow (m)



APPENDIX D – WATER EFFICIENCY CALCULATIONS

Calculations based on Building Regulations Part G2 - Appendix A

Installation Type	Unit of measure	Capacity/ Flow rate	Use Factor	Fixed use	L/person/day
WC	Full (L)	4	1.46	0	5.84
	Partial (L)	2.6	2.96	0	7.70
Basin Tap	L/min	5	1.58	1.58	9.48
Bath with Shower	L	170	0.11	0	18.70
Shower	L/min	8	4.37	0	34.96
Kitchen / Utility Tap	L/min	6	0.44	10.36	13.00
Washing Machine	L/kg	8.17	2.1	0	17.16
Dishwasher	L/place	1.25	3.6	0	4.50

Total calculated use	111.3
Normalisation Factor	0.91

External Water Use	0.0
Total Consumption (L/person/day)	101.3