



Sustainable Drainage Strategy

10a & 10b Burwell Road, Stevenage

Application No: 22/00437/FPM - Conditions 12 & 13

April 2024

Prepared for
S J M and Co Ltd

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1. Introduction

- 1.1 Fernbrook Consulting Engineers has been appointed by S J M and Co to provide a Sustainable Drainage Strategy for the proposed residential development at 10a and 10b Burwell Road, Stevenage.
- 1.2 The aim of this report is to discharge conditions 12 and 13 of Stevenage Borough Council application reference 22/00437/FPM.

Site Characteristics

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

Table 1-1 Site Details

| | |
|-----------------------|---|
| Site Address | 10a & 10b Burwell Road, Stevenage, SG2 9RF |
| Grid reference | 526005mE, 223680mN (TL 26005 23680) |
| Site Area | 0.153 ha |
| Existing Use | Residential |
| Boundaries | North – Burwell Road East – Chertsey Rise South – Residential / Access road West – Burwell Court (Residential) |
| Access | Chertsey Rise |

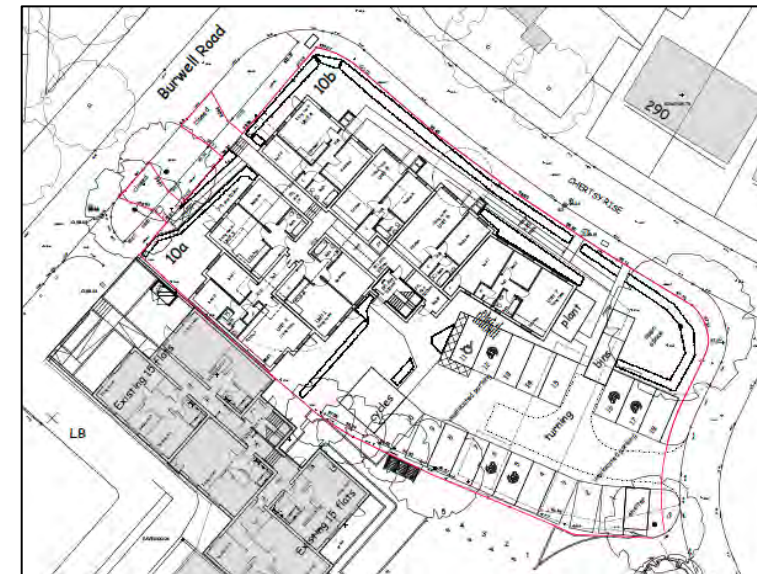
Figure 1-1 Site Location Plan



Development Proposals

- 1.4 The development proposals are comprised of the demolition of existing 2no. semi-detached houses and erection of 20 no. flats comprising 12 no. 1 bed and 8 no. 2 bed, associated parking and ancillary works. An excerpt of the proposed development plan is included in **Figure 1-2** below, and the full plan is included in **Appendix A**.

Figure 1-2 Proposed Development Plan



2. Surface Water Management

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

2.2 In accordance with the NPPF, the proposed residential development will allow for an increase to rainfall intensity to allow for predicted impacts of climate change on surface water runoff. Refer to **Table 2-1** below for climate change allowances used.

Table 2-1 Climate change allowances

| Return period | Climate change allowance |
|---------------|--------------------------|
| 30 year | 35% |
| 100 year | 40% |

Pre-development surface water run-off conditions

2.3 The existing site is comprised of 2no. residential dwellings. The total site area is 0.153 ha and is comprised of approximately 0.073 ha impermeable area. Based on the proximity of the existing Thames Water surface water sewers it is assumed that runoff is conveyed to the existing surface water sewer at an unrestricted rate.

Sustainable Drainage Systems

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

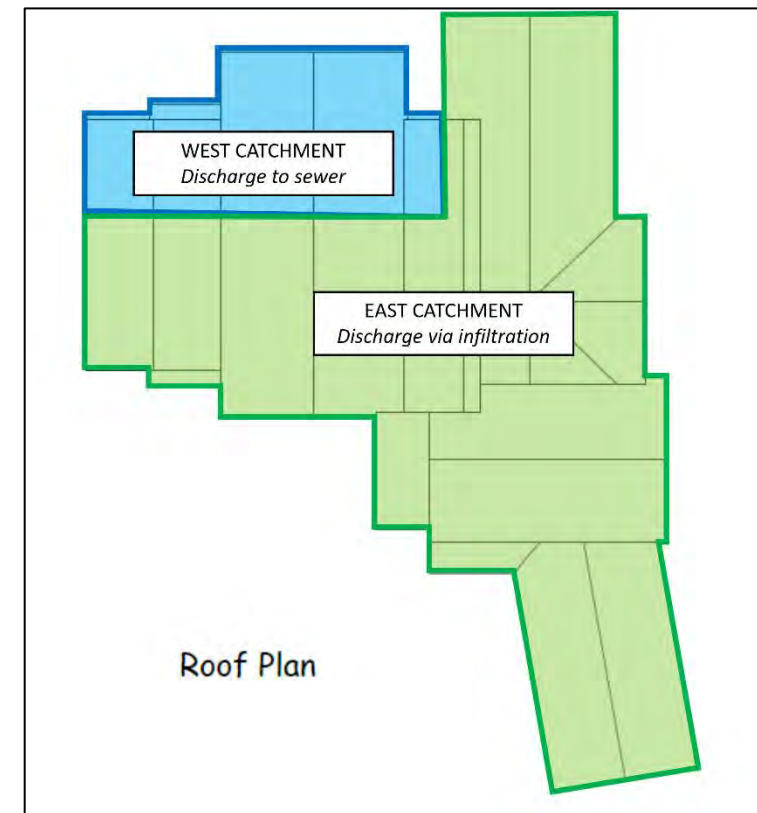
2.5 Based on the SuDS Hierarchy, the most appropriate SuDS for this development are rainwater re-use, sedum/green roofs, raingardens, permeable paving and tanked systems for the removal of gross solids and sediments from the roof drainage catchment.

Peak Flow Control

2.6 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 40% for climate change will be contained on site within the parking area.

2.7 Due to the varying levels across the site and proximity of the public sewer, the western roof areas (166m²) will be drained to the existing surface water sewer in Burwell Road. Refer to **Figure 2-1** below for an indicative roof catchment plan.

Figure 2-1 Indicative Roof Catchment Plan



2.8 Runoff from impermeable areas in the east catchment will be conveyed towards a geo-cellular soakaway tank below the permeable paving in the parking area.

2.9 Therefore, the proposed drainage strategy will seek to restrict the total surface water runoff from the site to a maximum of 2.0 l/s using a flow control device for all events up to the 1 in 100 year plus 40% climate change rainfall event.

2.10 The risk of blockage will be managed through appropriate mitigation methods, including the filtration of solids via the raingardens and a flow control chamber with a protected orifice plate and removable filter for simple maintenance.

2.11 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 2-2** below.

Table 2-2 Comparison of runoff rates

| Return Period | Existing Brownfield Rate (l/s) | Max Rate (l/s) | Reduction |
|------------------------|--------------------------------|----------------|-----------|
| 1 in 1 year | 10.3 | 2.0 | -81% |
| 1 in 30 year | 22.9 | 2.0 | -91% |
| 1 in 100 year | 29.2 | 2.0 | -93% |
| 1 in 100 year + 40% CC | - | 2.0 | - |

2.12 Thames Water has been consulted on the proposals under Pre-planning enquiry ref. **DS6091986** and confirmed sewer capacity to accept flows from the proposed development. Refer to **Appendix C** for Thames Water correspondence.

Storage Requirements

2.13 Runoff from the west catchment will be conveyed to the existing surface water sewer in Burwell. To restrict runoff to 2 l/s, 4.9m³ geo-cellular storage will be provided within the rain-garden.

2.14 Runoff from the east catchment will be conveyed to permeable paving and a soakaway tank in the parking area. The soakaway has been sized following in-situ soakaway testing, which confirmed the site is underlain by Chalk geology 1.3-1.4m below ground level. Soakaway testing confirmed an infiltration rate 5.4 x10⁻⁵ m/s. Refer to **Appendix D** for the site investigation report.

2.15 The soakaway will be 900mm deep over 113m² in the car parking, providing a total volume of 96.6m³ (95% void ratio). The base of the soakaway will be a minimum of 1m above existing groundwater levels.

2.16 The proposed soakaway will include a filter trench to provide maintenance access via a perforated pipe and a stage of water treatment prior to discharging to ground.

2.17 Refer to **Table 2-3** for the soakaway volumes and **Appendix E** for drawing **21210-MA-XX-XX-DR-C-0500** illustrating how the Site could be drained, accompanied by MicroDrainage calculations.

2.18 The calculations have conservatively not allowed for the 30m³ storage volume available within the permeable paving sub-base (30% void ratio) to allow for exceedance events.

Table 2-3 Soakaway Volumes and Half-drain times

| Return period | Volume (m ³) | Half-drain time (mins) | Water Depth (mm) | Capacity (m ³) |
|-------------------|--------------------------|------------------------|------------------|----------------------------|
| 2 year | 26.7 | 1549 | 237 | 72.5 |
| 10 year | 41.1 | 2238 | 363 | 58.1 |
| 30 year + 35% CC | 72.8 | 3618 | 648 | 26.4 |
| 100 year + 40% CC | 95.5 | 4346 | 852 | 3.7 |

Urbanisation & Long Term Storage

2.19 The calculations have allowed for 10% uplift impermeable area for urban creep. The site area is 0.153 ha and post-development impermeable areas on site will be 0.111 ha. An additional 0.011 ha has been included in the calculations to allow for urban creep. Refer to **Table 2-4** below for catchment areas.

Table 2-4 Catchment Areas

| Catchment | Impermeable Area (ha) | Urban creep (ha) | Sub-total (ha) |
|-------------------|-----------------------|------------------|----------------|
| West | 0.0155 | 0.0015 | 0.017 |
| East | 0.0952 | 0.0095 | 0.105 |
| Total (ha) | | | 0.122 |

2.20 The proposed strategy will infiltrate surface water runoff, therefore there is no requirement to provide long term storage.

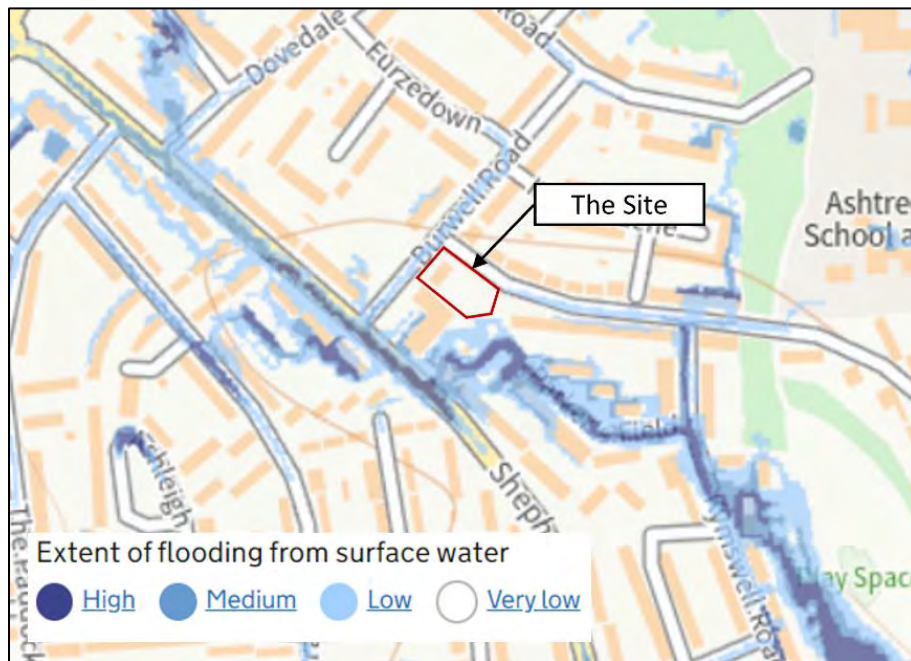
Overland Flow Routes

2.21 The proposed surface water drainage network within the Site will be designed to accommodate rainfall events up to the 1 in 100 year plus climate change scenario.

2.22 During exceedance events overland flows from the site will be conveyed away from the building towards the public highway and parking area.

2.23 Existing levels along Burwell Road are relatively steep and it is not expected that the proposed development will increase flood risk on or off site or exacerbate flood risk locally. Based on the Environment Agency's flood risk data, the site is at very low risk of surface water flooding. Refer to **Figure 2-2** below.

Figure 2-2 EA Flood risk from surface water



2.24 The surface water flow paths present along Burwell Road start upstream of the site and continue towards Shephall Way beyond the site. Based on the EA data, it is likely that surface water runoff remains within the highway based on the standard 125mm kerbs along Burwell Road. Refer to **Figure 2-3** below for the streetview image of Burwell Road along the site's front elevation.

Figure 2-3 Burwell Road



2.25 Refer to drawing **21210-MA-XX-XX-DR-D-0515** for the Indicative Overland Flow Routes in **Appendix E**.

Water Quality Management

- 2.26 SuDS will be provided to form a management train in line with the best practice. Source control techniques including sedum roofs, rain gardens and permeable paving will be provided within the catchments to manage runoff and reduce the time of concentration within the pipe network, reducing the risk of sewer surcharge and flash flooding, and provide water quality benefits.
- 2.27 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 proposed SuDS. The recommended stages of treatment in terms of water quality would be provided through the raingardens, sedum roof, permeable paving and filter trench between the soakaway tank. Refer to **Table 2-5** below for the Simple Index Method assessment.

Table 2-5 Simple Index Method

| Pollution Hazard Indices | | | |
|---------------------------------------|--------------|--------------|--------------|
| Pollution hazard | TSS | Metals | Hydrocarbons |
| Low – Residential | 0.50 | 0.40 | 0.40 |
| Pollution Mitigation Indices provided | | | |
| SuDS component | TSS | Metals | Hydrocarbons |
| Permeable Paving | 0.70 | 0.60 | 0.70 |
| Check | +0.20 | +0.20 | +0.30 |

Maintenance

- 2.28 The maintenance of all SuDS components will be in accord with the best practices and the CIRIA C753 The SuDS Manual.
- 2.29 The drainage will likely be maintained privately by a management company. A management company would likely be financed by a yearly maintenance fee chargeable to residents.
- 2.30 The recommended Operation and Maintenance requirements for the proposed SuDS are outlined in **Table 2-6**.

Table 2-6 SuDS Management Plan

| Maintenance Task | Description | Frequency |
|--|---|------------------------|
| <i>Regular Maintenance</i> | | |
| Litter management | Pick up all litter in SuDS and landscape areas and remove from site | Monthly |
| Tree / Grass maintenance | Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ. | As required or 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. Maintain annual vacuum in autumn following leaf fall. | Annually |
| <i>Occasional tasks</i> | | |
| Inspection and control chambers | Annual inspection, remove silt and check free flow | Annually |
| Silt management | Inspect catchpits for silt accumulation | Annually |
| | Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows, spread, rake and overseed. | As required |
| <i>Remedial work</i> | | |
| Repairs | Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required. | As required |

3. Protection of surface water environment during construction

- 3.1 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.
- 3.2 The protection of the surface water environment will be achieved by adopting the following measures to minimising and controlling contaminated run-off:
- Divert clean surface water away from exposed soils and working areas by constructing diversion drains, as appropriate lined with a non-erodible material.
 - Site drainage must be controlled during construction so that it does not enter the public drains without appropriate prior treatment.
 - Site management should also consider that heavy rain can give rise to unforeseen contaminated site run-off, both within and outside normal working hours.
 - Suitable layout of the construction site and application of suitable management techniques to prevent runoff from stockpiles directly into watercourses/groundwater.
 - All fuel bowsers 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.

Pollution mitigation during construction phase

- 3.3 A filter trench will be provided along to the site's southern perimeter to collect and manage surface water runoff from the site during construction.
- 3.4 Refer to drawing 21020-FCE-XX-XX-DR-D-0501 in Appendix E for an indicative surface water management strategy during construction.
- 3.5 All temporary drainage features including ditches and filter drains will be lined with an impermeable membrane to prevent groundwater pollution.
- 3.6 The new sewer connection from the site to the existing sewer would be constructed prior to the contributing impermeable areas (i.e. buildings and roads) discharging into the sewer. This is to prevent surface water runoff increasing during construction.
- 3.7 The proposed flow control chamber includes a 350mm sump below the incoming inlet. This will facilitate the deposition of silt and debris and prevent them from entering the sewer network.

It will be the responsibility of the Site Manager to carry out periodic removal of silt accumulations from the drainage system.

- 3.8 The Site Manager will regularly inspect the construction phase surface water management methods to monitor performance both from a quantity and quality perspective. This inspection will take place weekly and after any heavy rainfall events.
- 3.9 Work will be undertaken in accordance with best practice and the following documents:
- The Water Environment (England and Wales) regulation 2009
 - Land Drainage Act 1991
 - SEPA Engineering in the Water Environment Good Practice Guide Temporary Construction Methods
 - Control of Water Pollution from Construction Sites – Guide to Good Practice (SP156)
 - Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (C532)
 - Environmental Good Practice – Site Guide (C650)
 - BS 8582:2013 Code of practice for surface water management for development sites

4. Conclusion

- 4.1 Fernbrook Consulting Engineers has been appointed by S J M and Co to provide a Sustainable Drainage Strategy for the proposed residential development at Land to the rear of 10a and 10b Burwell Road, Stevenage, SG2 9RF.
- 4.2 The development proposals are comprised of the provision of up to 20no. residential dwellings with access from Chertsey Rise.
- 4.3 The proposed drainage strategy will seek to dispose of surface water runoff from the east catchment via infiltration to the underlying chalk geology. Runoff from the site's west catchment would be conveyed to the Thames Water sewer in Burwell at a maximum runoff rate of 2.0 l/s for all rainfall events up to the 1 in 100 year rainfall event plus 40% climate change allowance scenario.
- 4.4 The drainage strategy will provide 99.2m³ attenuation storage within geo-cellular soakaway tank in the parking area
- 4.5 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. Surface water runoff can be adequately managed without increasing the risk of flooding on site or elsewhere.

APPENDIX A – PROPOSED DEVELOPMENT PLAN



plant selection and spec.

- rosemary - 'miss jessopp' variety - evergreen, summer interest and aroma
- rosemary - 'prostratus' variety - evergreen, summer interest and aroma
- cordylina australis - structural plant
- lavender - 'hidcote' variety - summer interest and aroma
- nandina domestica - evergreen, autumn interest
- hebe - evergreen
- euonymus fortunei - emerald gaitery - evergreen
- viburnum tinus - evergreen, pink flowering
- cistus laurifolius - pink/white summer flowering.

planting density - approx. 7/8 plants per sqm

plants ideally of larger pot size e.g. 5-7 litre pots - planted into a minimum of 600mm topsoil depth through a geotextile membrane with bark mulch on top to discourage weed growth. overall level of soil / mulch to be just below top of the planter or border to prevent wash of mulch / soil onto surrounding areas.

planting to only be done in the winter months (november - march)

1. plant stock and timing

all plants and planting shall conform to BS 3936 and be 5236, to be container-grown stock where planted between mid-march and october. it is strongly advised that all planting be undertaken between november and january, when the ground is free from frost and snow, when there is no drought and in the absence of severe waterlogging. soil shall be clear of building debris and contaminants detrimental to plant health, e.g. oil, builder's sand and cement. imported topsoil shall be provided where existing topsoil is unsatisfactory. all soil shall conform to BS 3882, be of good quality, weed and stone free, to the following depths:

tree pits : 80 - 1.00 metre
 shrub beds : 25 - 0.30 metre
 grass areas : 10 - 0.15 metre

2. herbicide treatment

all areas to be kept weed-free. herbicide treatment must comply with the 1986 pesticide regulations and the type of herbicide needed will depend on the weed problem and time of year. where weeds are well established a total systemic herbicide may be used, e.g. glyphosate, which will take 14 days to be effective.

3. tree planting

tree sizes must be clearly stated on planting plan. in housing areas all trees shall be at least standards, to a minimum girth of 8-10cm and, where trees may be subject to vandalism, 12-14cm girth, with a metal tree guard, e.g. jackson heavy gauge, pre-galvanised, 1.7m high x 200mm diameter, tel: ashford (01233) 75393. all to be staked (non-crocoated), tied and receive a rabbit-guard.

4. trees

trees planted in open ground should be protected from weeds with individual mulches or mulching materials or regularly herbicide treated in the early years. mulch-mats are available from: acom planting products - tel: (01505) 28763, a'dare products - tel: horsham (01403) 68292, somerford - tel: seagry (01249) 720442.

5. bare root stock

all bare root stock should be soaked in water immediately prior to planting and, if delays prior to planting are foreseen, soaked in broadleaf root dip. 1kg 150 water, for details contact agricultural polymers ltd - tel: Gloucester (01452) 21733. during transit all root-balls must be protected in sealed polythene bags.

6. soil texture

to improve soil texture in tree pits a 50:50 backfill material with a compost, e.g. fisons tree planting and mulching compost, at 10 litres per tree pit for standards and 80 litres (1 bag) for standards and heavy standards. contact fisons plc, horticultural division - tel: spawich (01473) 830492. alternatively a non-peat based compost can be used, e.g. natgro by hemaby biotech ltd - tel: ramsey (01487) 842562, or cowpact by cowpact ltd - tel: ashted (01289) 847748, or mushroom compost, locally wilton & frost - tel: stanton (01359) 50309.

7. water retention

to improve water retention in the soil use broadleaf p4 water storing granules. the granules are mixed with pit soil at a rate of 1gm per litre of planting medium. so, for a standard tree with a pocket 1 x 1 x 0.75m = 750 litres of soil = 750gm of broadleaf p4, less a 25% proportion for the root-ball. for details contact agricultural polymers ltd - tel: Gloucester (01452) 21733.

8. nutrient capacity

to increase nutrient capacity, incorporate slow release fertilizer with pit soil at time of planting or on surface subsequently, e.g. emmag at a surface rate of approximately 100g/m², produced by ici - tel: farnham (01252) 734242.

9. shrub planting

individual plant sizes and centres must be clearly stated on planting plan. for general guidance, shrub planting shall be to the following densities: large shrubs: 2 or 3 per m² smaller shrubs 3 or 4 per m² ground cover: 4 or 5 per m² hedgerow planting spaced at 400mm centres climber: min of 2 per climber area

10. shrub beds

to improve soil texture in shrub beds, treat with compost (see 9 above) applying 80 litre bag at over 5cm² or 5cm layer spreading evenly and incorporating into the top 200-300mm.

11. water granules

shrubs beds may also receive broadleaf p4 water storing granules applied to soil at 50 gms per m² and cultivated into the top 200ms of soil.

12. hedgerow planting

hedgerow planting should be protected by 60cm rabbit-guards, supported by a bamboo cane. weed prevention is most effective with a mulch roll, e.g. acom planting products or somerford, alternatively careful and regular herbicide spraying during the following 3 summers.

13. shrub beds

shrubs beds can be laid with a 7.5cm layer of bark mulch, to prevent a weed problem and provide an attractive finish, e.g. cambark 100 from cambark products ltd - tel: newmarket (01638) 721100, woodgrow horticulture plc - tel: derby (01332) 516392, woodland bark - tel: caistor (01472) 89457, woodgrow horticulture - tel: derby (01332) 516392.

14. existing trees, hedges & planting

Where trees are to be retained the root plates, trunks and canopies should be adequately protected from damage before any works start on site. This can be achieved by erecting robust fencing to the outermost spread of the canopy, e.g. 1.2m high chestnut paling attached to post and rail fencing retained for the duration of the works. Within the fenced area no works should take place, no materials stored, mixed or disposed of, no machinery or site-huts located, no ground level changes or service trenches dug. Reference should be made to the NHBC Practice Note 3 (1985) Building Near Trees and BS 5837 : 2012, Trees in Relation to Construction.

waste standards

flat developments

200 litres allowance per unit for refuse
 55 litres allowance for recycling
 1100 litre bins supplied for refuse
 240 litre blue bins for recycling of glass, cans and plastic/can

12 flats x 200 litres = 2400 litres = 3 x 1100 litre bins
 12 flats x 55 litres = 660 litres divided by 240 litres = 2.75 (1 paper, 1 glass and 1 for plastic/cans)

bin store should be enclosed on all sides with roof to minimise noise pollution and odour pollution. doors provided as access.
 road surface should be tarmac or concrete. gravel roads cannot be serviced.
 distance from bin store to the freighter should be no more than 25 metres.
 dropped kerb to be provided near to bin store.

1100 litre bins are:
 2500mm high with lid open
 1200mm wide
 1100mm deep

240 litre bins are:
 1200mm high with lid open
 700mm wide
 800mm deep

if it is required that when a development consists of individual properties, albeit that they have open plan gardens, that they are served with their own individual containers, rather than communal bins in a bin store. this will enable them to be served under the arc system with waste collections one week and recycling and composting (garden, food and cardboard) the next. this is proven to reduce the amount of waste generated and increase recycling/composting.

because we currently do not provide composting facilities to communal properties, although we will look at the feasibility of this, they have to be served weekly as we are not removing their food waste separately.

notes:

any discrepancies should be reported immediately

all dimensions should be checked on site prior to commencement of work

site/survey based on ordnance survey information provided by prodat systems plc, (www.promap.co.uk) prodat does not guarantee that all past or current uses or features will be identified in the product

the product does not give details about the actual state or condition of the site nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the site for any particular purpose, or relied upon for determining suitability or value, or used as a substitute for any physical investigation or inspection.

drawings to be read in accordance with the dwelling emission rate (der/ter) calculation. the building must be built 'as designed' meeting the criteria set for air permeability.

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note
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 also that the scale bars on the plan measure correctly.

Date Description Rev

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Description
 Project Burwell 10 & 10a
 Stevenage
 SG2 9RF

Drawing

Date 12/10/2022
 Scale
 Sheet size A1
 Drawn

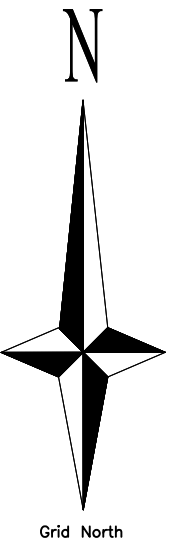
13761-13761-Master-WD-1st



APPENDIX B – TOPOGRAPHICAL SURVEY

| Co-ordinate Table | | | | |
|-------------------|---------|--------------|---------------|------------|
| Station | Type | Easting (mE) | Northing (mN) | Level (m2) |
| S1 | PK Nail | 526026.596 | 223664.658 | 96.240 |
| S2 | PK Nail | 526020.099 | 223684.684 | 98.105 |

SURVEY RELATED TO OSGB36(15) ORDNANCE SURVEY GRID CO-ORDINATES TRANSFORMED FROM ETRS89 (WGS84) USING GEIOP MODELS OSGM15/OSTN15



Grid North

NOTES

- GRID AND LEVELS RELATED TO ORDNANCE SURVEY GPS NETWORK
- ALL LEVELS ON KERB LINES ARE CHANNEL LEVELS UNLESS NOTED OTHERWISE.
- SERVICE ROUTES HAVE BEEN IDENTIFIED BY LIFTING OF INSPECTION COVERS & VISUAL INSPECTION FROM THE SURFACES.
- FOR SAFETY REASONS, DRAINAGE PIPE SIZES HAVE BEEN DETERMINED FROM THE SURFACE AND SHOULD BE TREATED AS APPROXIMATE ONLY.
- DRAINAGE PIPE SIZES ARE DIAMETERS AND ARE SHOWN IN MILLIMETERS.
- TREE SPECIES SHOULD BE CHECKED BY AN ARBORIST IF CRITICAL.

Revisions

| Revision | Description |
|----------|-------------|
| A | |
| B | |
| C | |

Drawing No: SJG3870
 Drawn By: MJ
 Checked By: SJ
 Sheet Size: A1
 Date: 23/12/2021
 Revision: 1/1

Client: Clovercourt Ltd.
 Scale: 1:200

Project: 10a & 10b Burwell Road, Stevenage.

| SYMBOLS | LEGEND |
|---------|-------------------------|
| | AV Air Valve |
| | BD Bollard |
| | BI Borehole |
| | CB Cable Box |
| | CHY Chimney |
| | CL Cover Level |
| | CONC Concrete |
| | CTV Cable TV |
| | DK Drop Kerb |
| | DP Down Pipe |
| | DR Drain |
| | E/C Electricity |
| | EP Elec Pole |
| | ER Earth Rod |
| | FB Flower Bed |
| | FF Fire Hydrant |
| | FP Footpath |
| | GV Gully |
| | GP Gate Post |
| | GV Gas Valve |
| | IC Inspec. Cover |
| | IL Invert Level |
| | JB Junction Box |
| | KD Kerb Outlet |
| | LB Letter Box |
| | LP Lamp Post |
| | MH Manhole |
| | MK Marker |
| | MF Name Plate |
| | O/H Overhead |
| | OSM Ordnance Bench Mark |
| | P Post Or Pillar |
| | PK Parking Meter |
| | RS Road Sign |
| | SAP Sapling |
| | SC Stop Cock |
| | SL Sump Level |
| | ST Stop Tap |
| | SV Slice Valve |
| | TAR Tarmac |
| | TC Telecom Cover |
| | TCB Telephone Call Box |
| | TL Traffic Lights |
| | TF Telegraph Pole |
| | TV Television Box |
| | U/L Unable to lift |
| | VP Vent Pipe |
| | WL Water Level |
| | WM Water Meter |
| | WO Wash Out |

FENCE TYPES
 B/W Barbed Wire
 C/B Close Boarded
 C/I Corrugated Iron
 C/L Chainlink
 C/P Chestnut Paling
 I/R Iron Railing
 I/W Interscreen
 P/R Post & Rail
 P/S Palisade
 P/W Post & Wire

BOX AROUND LEVEL INDICATES LEVEL AT TOP OF FEATURE

SURVEYED BY:-



48c Thoroughfare
 Halesworth
 Suffolk
 IP19 8AR
 Tel. 01986 872716
 email. mail@sjgeomatics.co.uk
 web. www.sjgeomatics.co.uk

Company Registration Number 8081329



APPENDIX C – SOAKAWAY TEST RESULTS

GEOTECHNICAL REPORT

| | |
|---------------|--|
| Site Address: | 10 Burwell Road, Stevenage, Herts, SG2 9RF |
| Report Date: | 26 th March 2024 |
| Project No.: | 18824 |
| Prepared for: | SJM & Co Ltd Brandon House, First Floor, 90 The Broadway, Chesham, Bucks HP5 1EG |



Contents

REPORT

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APPENDICES

Appendix 1 – Site Plan

Appendix 2 – Borehole / Trial pit Logs

Appendix 3 – Laboratory Testing

Appendix 4 – BRE 365 Test Logs

Appendix 5 – Chemical Analysis Results

SUMMARY

ADDRESS: 10 Burwell Road, Stevenage, Herts, SG2 9RF

SOIL OVERVIEW:

| | | |
|------------|-----------------------|---|
| BH1 | GL – 0.25m bgl | MADE GROUND (Topsoil) |
| | 0.25m bgl – 0.90m bgl | Stiff slightly silty CLAY with some fine chalk & gravel fragments |
| | 0.90m bgl – 1.60m bgl | Weak CHALK |
| | 0.30m bgl – 2.00m bgl | Weak white CHALK |
| BH2 | GL – 0.20m bgl | MADE GROUND (Topsoil) |
| | 0.20m bgl – 1.40m bgl | Stiff slightly silty CLAY with some fine chalk & gravel fragments |
| | 1.40m bgl – 2.00m bgl | Weak CHALK |
| SA1 | GL – 0.30m bgl | MADE GROUND (Topsoil) |
| | 0.30m bgl – 1.40m bgl | Stiff slightly silty CLAY with some fine chalk & gravel fragments |
| | 1.40m bgl – 2.00m bgl | Weak CHALK |
| SA2 | GL – 0.60m bgl | MADE GROUND (Topsoil) |
| | 0.60m bgl – 1.30m bgl | Stiff slightly silty CLAY with some fine chalk & gravel fragments |
| | 1.30m bgl – 1.60m bgl | Weak white CHALK |

ROOT DEPTH OVERVIEW:

| | |
|------------|----------------------------|
| BH1 | Roots present to 1.00m bgl |
| BH2 | Roots present to 1.10m bgl |
| SA1 | Roots present to 1.60m bgl |
| SA2 | Roots present to 0.90m bgl |

GROUNDWATER OVERVIEW:

| | |
|------------|-----|
| BH1 | DRY |
| BH2 | DRY |
| SA1 | DRY |
| SA2 | DRY |

SOIL ANALYSIS:**Fine Soils**

| | |
|---------------------------------|---------------------|
| Plasticity: | intermediate – High |
| Plasticity Index: | 26 - 33% |
| NHBC Classification: | Moderate |
| Significant Desiccation: | None Present |
| Sulphate Content: | DS-1/AC-1s |

Granular Soils

No granular soils were encountered upon the site.

1. Introduction

- 1.1 In accordance with your instructions, we visited the above site on the 7th & 14th of March 2024.
- 1.2 The purpose of our visit was to undertake two hand augured borehole & two mechanically excavated trial pits (including BRE 365 Soakage Tests), across the above site, in order to identify the underlying subsoil conditions.
- 1.3 The comments and opinions expressed are based purely on the conditions encountered and the subsequent laboratory.
- 1.4 Therefore, it is possible that some special conditions prevailing on site have not been encountered or considered.
- 1.5 Unless otherwise stated, all groundwater recordings relate to short term observations and do not consider fluctuations in elevation due to seasonal, tidal, or other effects. It is possible that fluctuations in the groundwater elevation may have an impact on the proposed design and as such, it is recommended that long term monitoring is undertaken to obtain accurate information relevant to the proposed design in terms of the ground water level.

2. Description of Site

- 2.1 At the time of our visit the site consisted of a recently demolished structure with various single storey structures across the site. The site was surrounded residential housing.
- 2.2 The site is shown within the British Geological Survey Online Geology Viewer (Scale 1:50 000, Solid & Drift), which shows that the site is situated within an area of Lowestoft Formation – Diamicton over Lewes Nodular Chalk Formation and Seaford Chalk Formation - Chalk.

3. Fieldwork

- 3.1 The hand augured boreholes and mechanically excavated trial pits were undertaken in order to detail the underlying geology at depth, while the BRE 365 soakage tests were undertaken in order to calculation the percolation value for the in-situ geology. The location of these excavations is shown on the site plan forming Appendix 1.
- 3.2 The various strata encountered were noted and are recorded within the borehole / trial pit logs forming Appendix 2.

- 3.3 Disturbed samples were recovered from the hand augured boreholes, as noted within the associated log for laboratory testing.

4. Laboratory Testing

- 4.1 All samples were tested in accordance with BS: 1377-2:2022 Methods of Test for Soils for Civil Engineering purposes.
- 4.2 Selected samples were tested to determine their, Moisture Content, Atterberg Limits, Soluble sulphate content and pH value.
- 4.3 The results of all laboratory testing are summarised in Appendix 3.

5. Fieldwork Results

5.1 Hand Augured Boreholes

- a) Borehole one, recovered MADE GROUND to a depth of 0.25m bgl, over a stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel. Between 0.60m bgl and 0.90m bgl a stiff light orange slightly silty CLAY with much medium CHALK fragments & occasional medium gravel was seen. Beyond this a weak white / cream CHALK was then found to the close of the borehole at 1.60m bgl.
- b) Borehole two, recorded MADE GROUND to a depth of 0.20m bgl, overlying a stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel. Between 1.10m bgl & 1.40m bgl a stiff light orange slightly silty CLAY with much medium CHALK fragments & occasional medium gravel was found. Beyond this a weak white / cream CHALK was then seen to the close of the borehole at 2.00m bgl.

5.2 Mechanically Excavated Trial Pits

- a) Trial pit one, found MADE GROUND (Topsoil) to a depth of 0.30m bgl, over a stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel. From 1.40m bgl a weak white / cream CHALK was seen. The trial pit was then closed at 2.00m bgl.
- b) Trial pit two, recorded MADE GROUND (Topsoil) to a depth of 0.60m bgl, over a stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel to a depth of 1.30m bgl. Beyond this and found to the close of the trial pits at 1.60m bgl a weak white / cream CHALK was present.

5.3 BRE 365 Results

- a) The BRE 365 soakage tests were undertaken within mechanically excavated trial pits.
- b) The results of this testing can be found within the attached appendices and show that the underlying geology to have soil infiltration rates between 5.4×10^{-6} m/s and 7.7×10^{-6} m/s.

5.4 All trial pits were excavated until no further penetration of the geology could be undertaken or their required depth reached. As detailed within the associated logs forming Appendix 2.

5.5 The borehole / trial pit logs can be found forming Appendix 2.

6. Other Observations from Site Works

6.1 No groundwater was encountered within the excavations undertaken across the site as shown within the attached trial pit logs.

6.2 Within the underlying CHALK geology, SPT 'N' values of 28 - 30+ were achieved. Therefore, the minimum safe bearing capacity of 150 kN/m² can be used within any design calculations.

6.3 Roots were encountered across the site within the excavations as shown below and within the attached trial pit and borehole logs.

| | |
|-----|----------------------------|
| BH1 | Roots present to 1.00m bgl |
| BH2 | Roots present to 1.10m bgl |
| SA1 | Roots present to 1.60m bgl |
| SA2 | Roots present to 0.90m bgl |

7. Laboratory Testing Results

7.1 The laboratory testing confirmed the CLAY to be of Intermediate - High plasticity (PI = 26 - 33%) which indicates a Moderate susceptibility of movement associated with moisture content change.

7.2 As the site contains less than 0.50g/l of soluble sulphate it can be categorised as a class 1 site, in accordance with ACEC, and as such any concrete in contact with the subsoil needs no special precautions (DS-1 / AC-1s).

- 7.3 In addition to the above geotechnical testing, we were asked to recover two samples for 'muck away' chemical testing. These were sent to an independent analytical chemist.
- 7.4 The results of this testing can be found within the attached appendices and should be passed over to the intended recipient of the material so they can make their own assessment of the material.

8. Conclusions

- 8.1 In conclusion we would suggest that the proposed footing be seated a minimum of 300mm within the underlying CHALK geology.
- 8.2 Any new foundations will need to be deeper than softened zones or old foundations. This requirement may make the footing deep depending on the proposed layout of the scheme, engineer design or NHBC requirements.
- 8.3 If the proposed footing exceeds 1.50m, then a suspended ground floor should be included within the design, incorporating the minimum void dimension of 150mm.
- 8.4 The site is ultimately underlain by CHALK and as such the possibility of solution features must not be overlooked, we recommend a solution feature report by Stantec be undertaken.
- 8.5 All foundations should be designed by a suitably qualified structural engineer in terms of the proposed project and all aspects of the ground, groundwater, loadings of the proposed structure etc. Should any elements of this report be unclear, consultation with ourselves should be sought to clarify any elements prior to a final design being made.

We hope that this is of satisfactory, however if you should require any further information, please do not hesitate to contact us.

Yours faithfully,



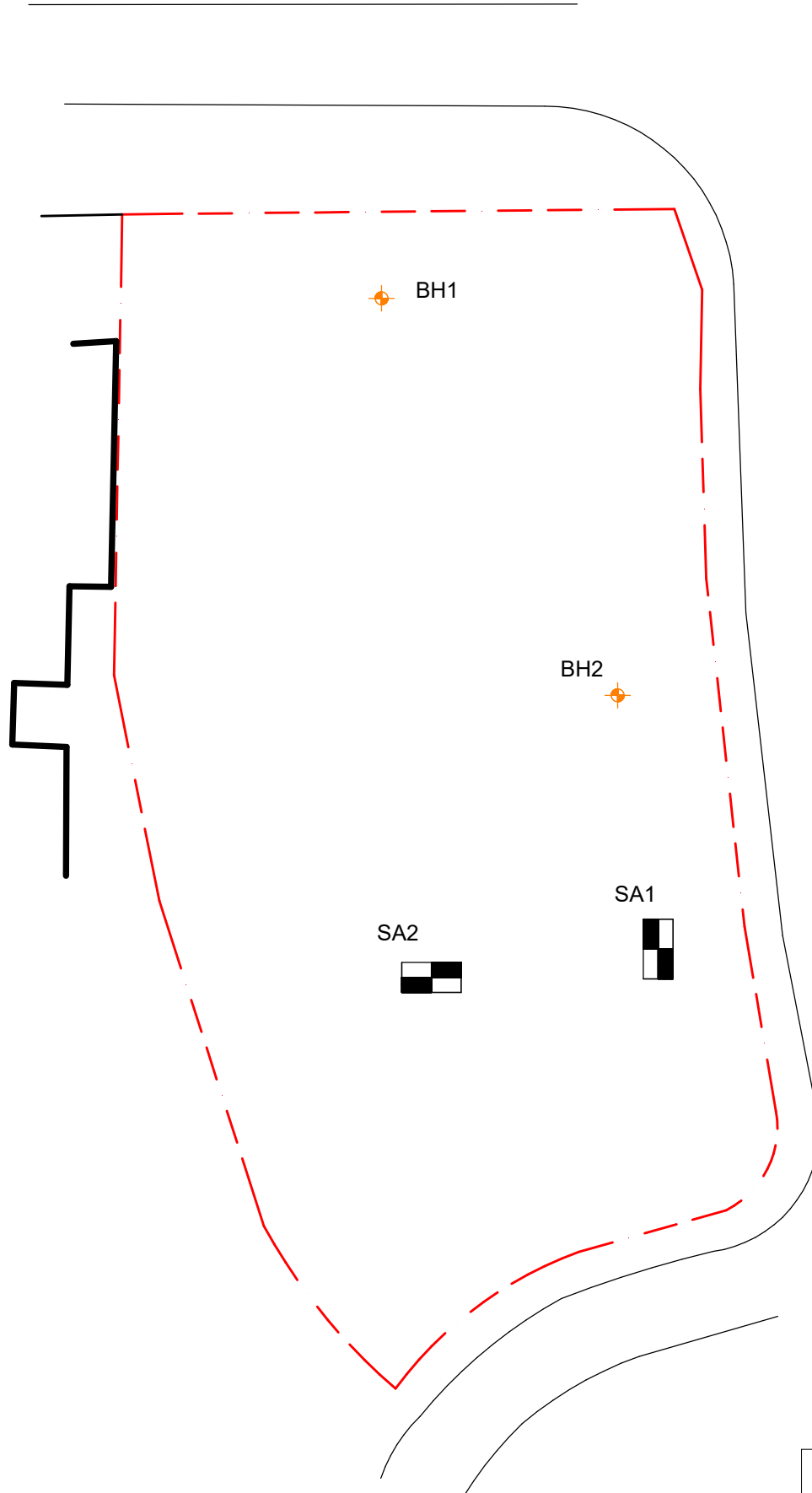
D A Hudd
Senior Contract Engineer



C S Gray MSc
Principal Engineer

10 Burwell Road, Stevenage, Herts, SG2 9RF

Site Plan



Not to Scale

10 Burwell Road, Stevenage, Herts, SG2 9RF

Borehole One

| Description of Stratum | Legend | Depth | Thickness (m) | Water Level | Samples | | | S.P.T N-Value or Vane Strength | VOC's (ppm) | Installations | Casing Depth, (m) |
|--|--------|-------|---------------|-------------|---------|------|-----------|--------------------------------|-------------|---------------|-------------------|
| | | | | | No | Type | Depth (m) | | | | |
| Loose dark brown topsoil with some - much angular / sub-angular gravel - MADE GROUND | | 0.25 | 0.25 | DRY | | | | | | | |
| Stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel | | 0.60 | 0.35 | | | | | | | | |
| Stiff light orange slightly silty CLAY with much medium CHALK fragments & occasional medium gravel | | 0.90 | 0.30 | | | | | | | | |
| Weak white / cream CHALK | | | | | 1 | D | 1.00 | 28 | | | |
| | | | | | 1 | N | 1.00 | | | | |
| | | | | 2 | D | 1.50 | 28 | | | | |
| | | | | 2 | N | 1.50 | | | | | |
| Borehole Closed at 1.60m bgl | | | | | | | | | | | |
| No Further Progress | | | | | | | | | | | |

Remarks - Roots present to 1.00m bgl

Key : U - Undisturbed Sample
(100mm diameter)

B - Bulk Sample
▼ - Water Struck

D - Disturbed Sample
≡ - Water Standing

W - Water Sample
T - Chemical Tub

N - SPT N-Value
V - Vane Test, (kN.m²)

10 Burwell Road, Stevenage, Herts, SG2 9RF

Borehole Two

| Description of Stratum | Legend | Depth | Thickness (m) | Water Level | Samples | | | S.P.T N-Value or Vane Strength | VOC's (ppm) | Installations | Casing Depth, (m) |
|--|--------|-------|---------------|-------------|---------|------|-----------|--------------------------------|-------------|---------------|-------------------|
| | | | | | No | Type | Depth (m) | | | | |
| Loose dark brown topsoil with some - much angular / sub-angular gravel - MADE GROUND | | 0.20 | 0.20 | DRY | | | | 150+ | | | |
| Stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel | | | 0.90 | | | | | | | | |
| | | 1.10 | | | 1 | D | 1.00 | | | | |
| | | | | | 1 | V | 1.00 | | | | |
| Stiff light orange slightly silty CLAY with much medium CHALK fragments & occasional medium gravel | | 1.40 | 0.30 | | | | | | | | |
| Weak white / cream CHALK | | | | | | | 30+ | | | | |
| | | 2.00 | | 2 | D | 1.50 | | | | | |
| | | | | | 1 | N | 1.50 | | | | |
| Borehole Closed at 2.00m bgl | | | | | 3 | D | 2.00 | 30+ | | | |
| No Further Progress | | | | | 2 | N | 2.00 | | | | |

Remarks - Roots present to 1.10m bgl

10 Burwell Road, Stevenage, Herts, SG2 9RF

Soakaway Trial Pit One

| Description of Stratum | Legend | Depth | Thickness (m) | Water Level | Samples | | | S.P.T N-Value or Vane Strength | VOC's (ppm) | Installations | Casing Depth, (m) |
|--|--------|-------|---------------|-------------|---------|------|-----------|--------------------------------|-------------|---------------|-------------------|
| | | | | | No | Type | Depth (m) | | | | |
| Loose dark brown topsoil with some - much angular / sub-angular gravel - MADE GROUND | | 0.30 | 0.30 | DRY | | | | | | | |
| Stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel | | 1.10 | | | | | | | | | |
| Weak white / cream CHALK | | 1.40 | | | | | | | | | |
| Borehole Complete at 2.00m bgl | | 2.00 | | | | | | | | | |

Remarks - Roots present to 1.60m bgl

10 Burwell Road, Stevenage, Herts, SG2 9RF

Soakaway Trial Pit Two

| Description of Stratum | Legend | Depth | Thickness (m) | Water Level | Samples | | | S.P.T N-Value or Vane Strength | VOC's (ppm) | Installations | Casing Depth, (m) |
|--|--------|-------|---------------|-------------|---------|------|-----------|--------------------------------|-------------|---------------|-------------------|
| | | | | | No | Type | Depth (m) | | | | |
| Loose dark brown topsoil with some - much angular / sub-angular gravel - MADE GROUND | | 0.60 | 0.60 | DRY | | | | | | | |
| Stiff dark brown slightly silty CLAY with some fine chalk fragments & occasional medium rounded gravel | | 1.30 | 0.70 | | | | | | | | |
| Weak white / cream CHALK | | 1.60 | | | | | | | | | |
| Borehole Complete at 1.60m bgl | | | | | | | | | | | |

Remarks - Roots present to 0.90m bgl

Key : U - Undisturbed Sample
(100mm diameter)

B - Bulk Sample
▼ - Water Struck

D - Disturbed Sample
≡ - Water Standing

W - Water Sample
T - Chemical Tub

N - SPT N-Value
V - Vane Test, (kN.m²)



HESI

Herts & Essex Site
Investigations

Unit J8 | Peek Business Park | Woodside
Bishops Stortford | CM23 5RG

01920 822233 | www.hesi.co.uk | info@hesi.co.uk

APPENDIX 3
SHEET 1
JOB NUMBER 18824
DATE Mar-24

Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

LOCATION 10A and 10B Burwell Road, Stevenage, Herts, SG2 9RF

ATTERBERG LIMITS TEST DATA

| Excavation Location Number | Depth (m) | Sample | Natural Moisture Content (%) | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | Group Symbol | Ammended Plasticity Index (%) | Desiccation Profile | Percentage Retained on 425 Micron Sieve (%) |
|----------------------------|-----------|--------|------------------------------|------------------|-------------------|----------------------|--------------|-------------------------------|---------------------|---|
| BH1 | 1.00 | D1 | 26 | 49 | 19 | 30 | CI | 26 | No | 12 |
| BH2 | 1.00 | D1 | 24 | 57 | 22 | 35 | CH | 33 | Slight | 5 |



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Unit J8 | Peek Business Park | Woodside
Bishops Stortford | CM23 5RG

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APPENDIX

3

SHEET

2

JOB NUMBER

18824

DATE

Mar-24

Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

LOCATION 10A and 10B Burwell Road, Stevenage, Herts, SG2 9RF

SULPHATE ANALYSIS

| Excavation Location Number | Depth (m) | Sample | Concentrations of Soluble Sulphate | | Classification | pH | |
|----------------------------------|------------------|--------|------------------------------------|--------------------------------|----------------|--------------|-------------|
| | | | Soil | | | | Groundwater |
| | | | Total SO4 (%) | SO4 in 2:1 Water:soil (g/l) | | | |
| BH1 | 1.00 | D1 | | 0.23 | | DS-1 / AC-1s | 7.68 |
| BH2 | 1.00 | D1 | | 0.30 | | DS-1 / AC-1s | 7.74 |

Soakaway No.: SA1

Site Address: 10 Burwell Road, Stevenage, Herts, SG2 9RF

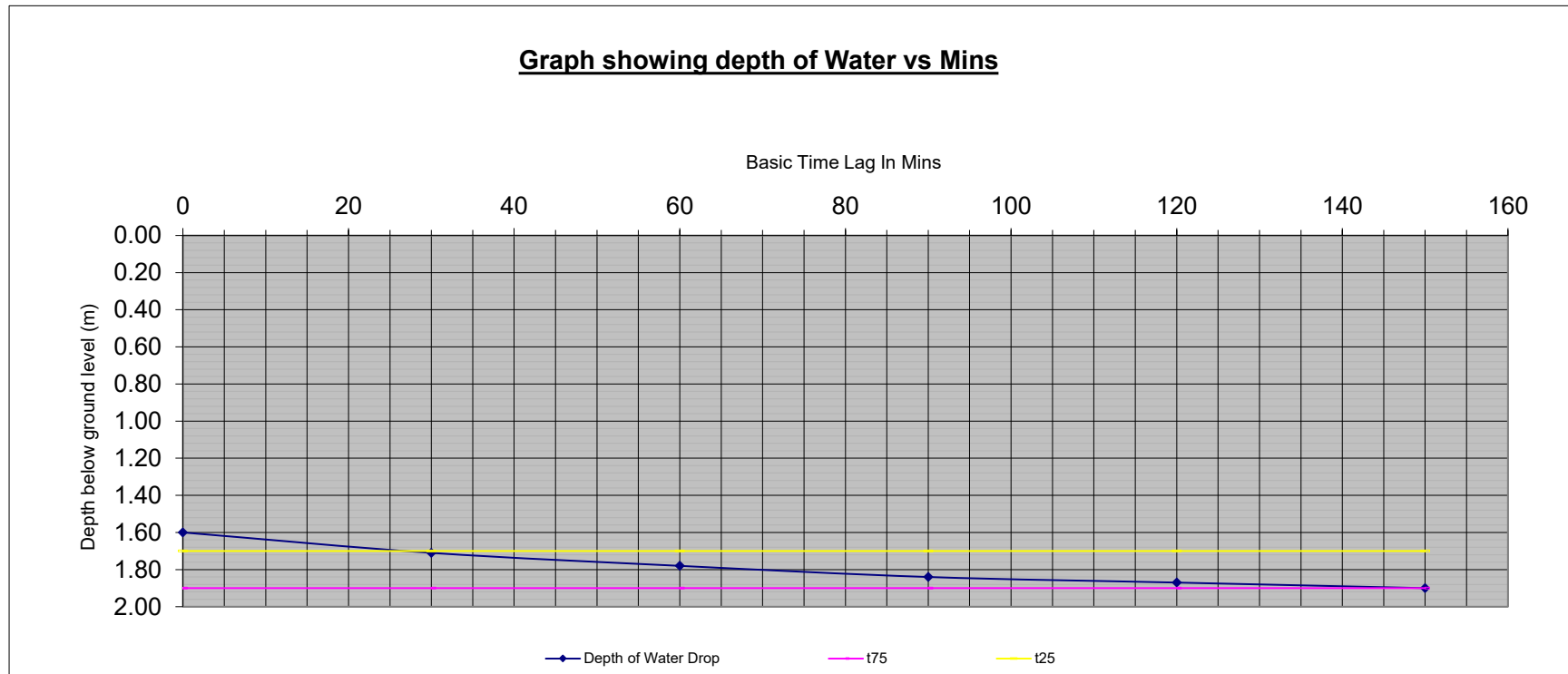
Fill No.: One

B.R.E 365 - Soil Infiltration Rate

Depth of Test Hole 2.00 m
Dimensions of Test Hole Width 0.50 m
Length 2.00 m
Depth to Top of Water at Start of Test 1.60 m
Depth to discharge Drain 1.00 m
75% 0.10
25% 0.30
V75%-25% 0.20
apbU 3.5
tp75-25 124

| Start Time (Mins) | Depth of Water Drop (m) | Depth of Water (m) | Value to Note time at (m) | Time Equals (Mins) |
|-------------------|-------------------------|--------------------|---------------------------|--------------------|
| 0 | 0.000 | 0.400 | 1.90 | 150 = t75 |
| 30 | 0.110 | 0.290 | 1.70 | 26 = t25 |
| 60 | 0.180 | 0.220 | | |
| 90 | 0.240 | 0.160 | | |
| 120 | 0.270 | 0.130 | | |
| 150 | 0.300 | 0.100 | | |

Soil Infiltration Rate is 7.7E-06 m/s



Soakaway No.: SA1

Site Address: 10 Burwell Road, Stevenage, Herts, SG2 9RF

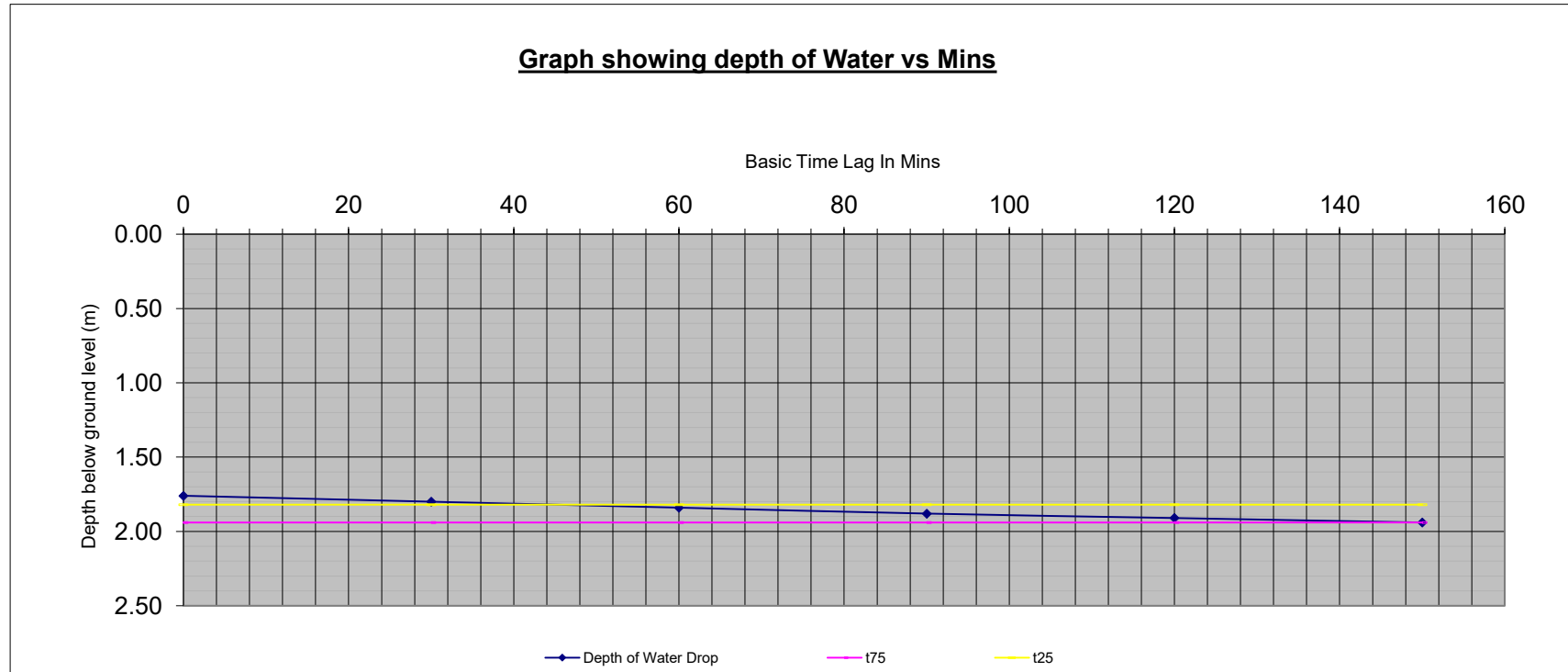
Fill No.: Two

B.R.E 365 - Soil Infiltration Rate

Depth of Test Hole 2.00 m
Dimensions of Test Hole Width 0.50 m
Length 2.00 m
Depth to Top of Water at Start of Test 1.76 m
Depth to discharge Drain 1.00 m
75% 0.06
25% 0.18
V75%-25% 0.12
ap50 3.5
tp75-25 104

| Start Time (Mins) | Depth of Water Drop (m) | Depth of Water (m) | Value to Note time at (m) | Time Equals (Mins) |
|-------------------|-------------------------|--------------------|---------------------------|--------------------|
| 0 | 0.000 | 0.240 | 1.94 | 150 = t75 |
| 30 | 0.040 | 0.200 | 1.82 | 46 = t25 |
| 60 | 0.080 | 0.160 | | |
| 90 | 0.120 | 0.120 | | |
| 120 | 0.150 | 0.090 | | |
| 150 | 0.180 | 0.060 | | |

Soil Infiltration Rate is 5.5E-06 m/s



Soakaway No.: SA2

Site Address: 10 Burwell Road, Stevenage, Herts, SG2 9RF

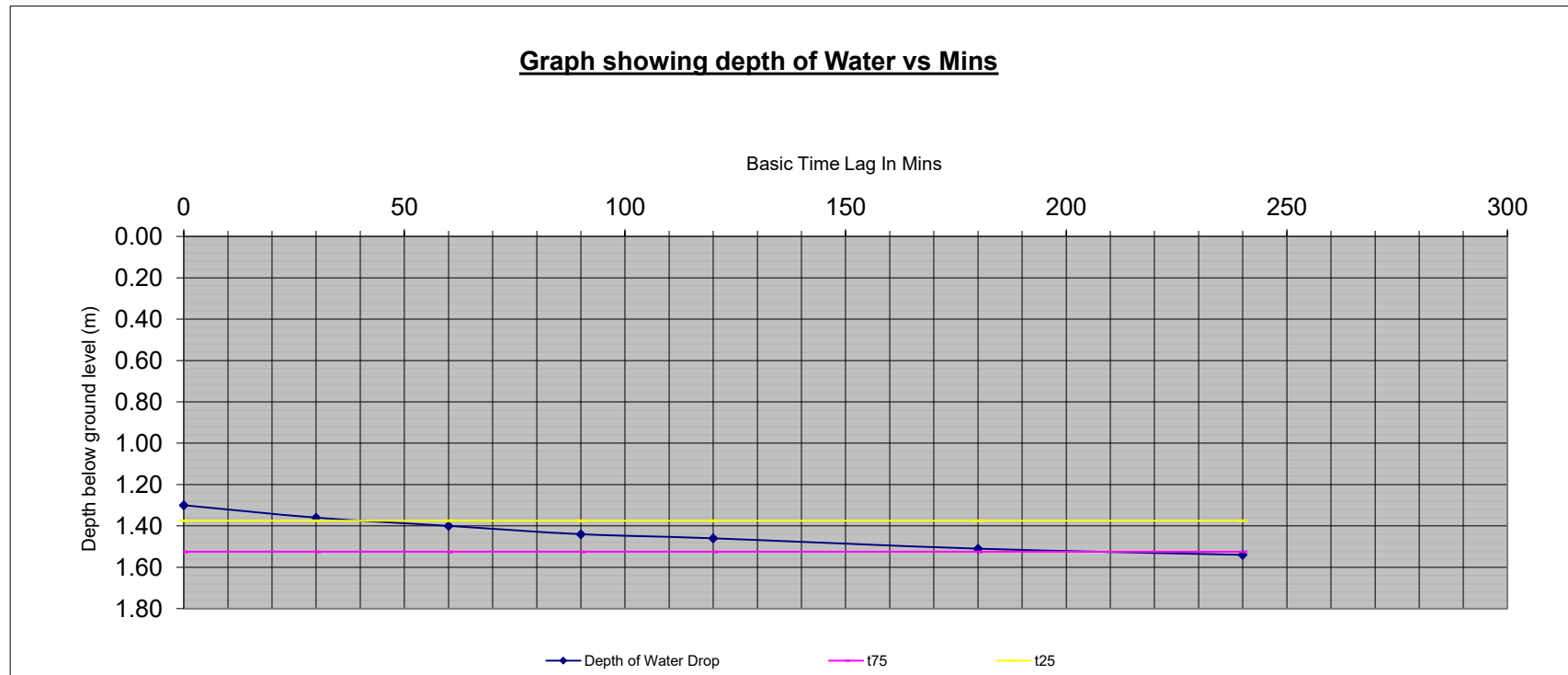
Fill No.: One

B.R.E 365 - Soil Infiltration Rate

Depth of Test Hole 1.60 m
Dimensions of Test Hole Width 0.50 m
Length 1.50 m
Depth to Top of Water at Start of Test 1.30 m
Depth to discharge Drain 1.00 m
75% 0.08
25% 0.23
V75%-25% 0.11
ap50 1.95
tp75-25 167

| Start Time (Mins) | Depth of Water Drop (m) | Depth of Water (m) | Value to Note time at (m) | Time Equals (Mins) |
|-------------------|-------------------------|--------------------|---------------------------|--------------------|
| 0 | 0.000 | 0.300 | 1.53 | 207 = t75 |
| 30 | 0.060 | 0.240 | 1.38 | 40 = t25 |
| 60 | 0.100 | 0.200 | | |
| 90 | 0.140 | 0.160 | | |
| 120 | 0.160 | 0.140 | | |
| 180 | 0.210 | 0.090 | | |
| 240 | 0.240 | 0.060 | | |

Soil Infiltration Rate is 5.8E-06 m/s



Soakaway No.: SA2

Site Address: 10 Burwell Road, Stevenage, Herts, SG2 9RF

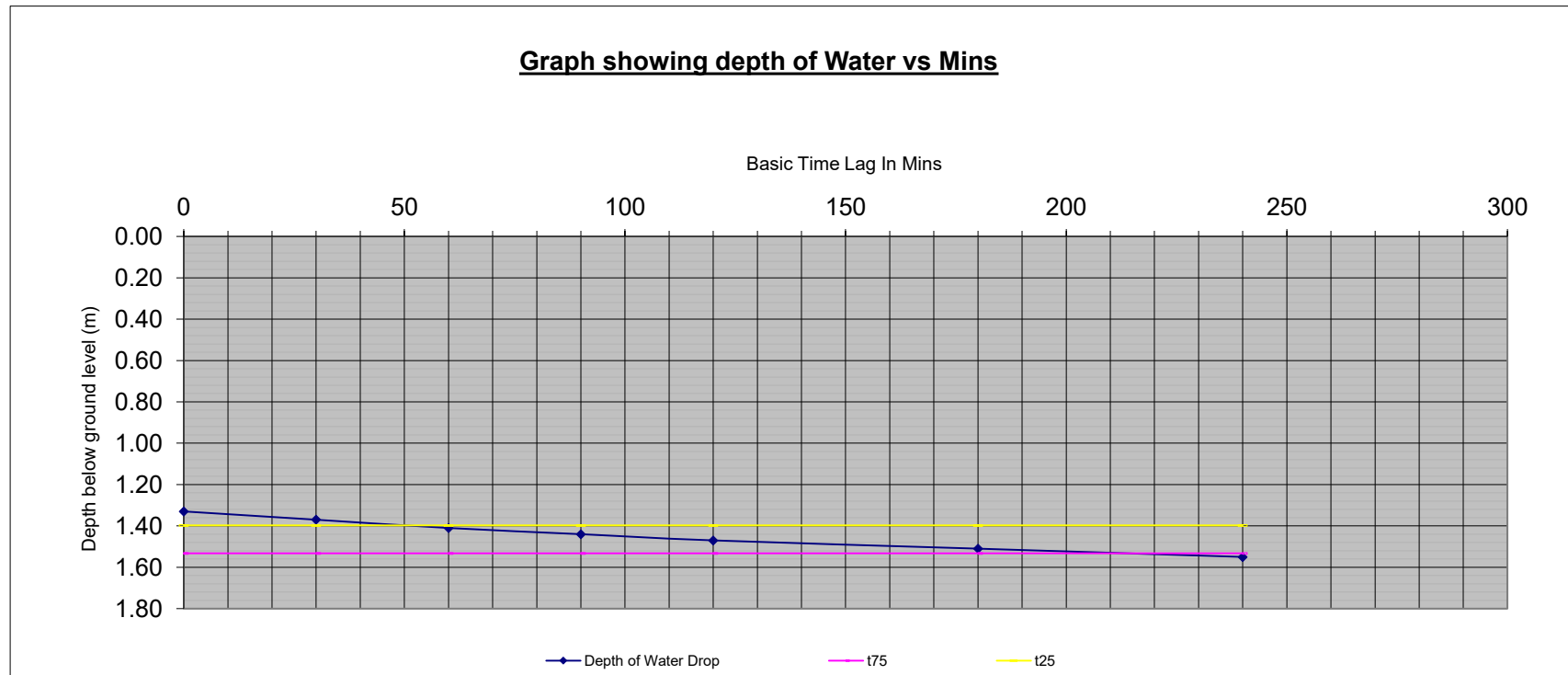
Fill No.: Two

B.R.E 365 - Soil Infiltration Rate

Depth of Test Hole 1.60 m
Dimensions of Test Hole Width 0.50 m
Length 1.50 m
Depth to Top of Water at Start of Test 1.33 m
Depth to discharge Drain 1.00 m
75% 0.07
25% 0.20
V75%-25% 0.10
ap50 1.95
tp75-25 160

| Start Time (Mins) | Depth of Water Drop (m) | Depth of Water (m) | Value to Note time at (m) | Time Equals (Mins) |
|-------------------|-------------------------|--------------------|---------------------------|--------------------|
| 0 | 0.000 | 0.270 | 1.53 | 210 = t75 |
| 30 | 0.040 | 0.230 | 1.40 | 50 = t25 |
| 60 | 0.080 | 0.190 | | |
| 90 | 0.110 | 0.160 | | |
| 120 | 0.140 | 0.130 | | |
| 180 | 0.180 | 0.090 | | |
| 240 | 0.220 | 0.050 | | |

Soil Infiltration Rate is 5.4E-06 m/s





Final Report

Report No.: 24-07294-1

Initial Date of Issue: 18-Mar-2024

Re-Issue Details:

Client: Herts & Essex Site Investigations

Client Address: Unit J8
Peek Business Park
Woodside
Bishops Stortford
Hertfordshire
CM23 5RG

Contact(s): Ben McCulloch
Chris Gray
Dafydd Hudd
Rebecca Chamberlain

Project: 18824 10A and 10B Burwell Road,
Stevenage, Herts

Quotation No.: **Date Received:** 08-Mar-2024

Order No.: 18824 **Date Instructed:** 08-Mar-2024

No. of Samples: 2

Turnaround (Wkdays): 5 **Results Due:** 14-Mar-2024

Date Approved: 18-Mar-2024

Approved By:

Details: Stuart Henderson, Technical
Manager

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 18824 10A and 10B Burwell Road, Stevenage, Herts

| Client: Herts & Essex Site Investigations | | Chemtest Job No.: | | | | 24-07294 | 24-07294 |
|---|-------------|----------------------|------|-------|-------|----------------------|----------------------|
| Quotation No.: | | Chemtest Sample ID.: | | | | 1777760 | 1777761 |
| Order No.: 18824 | | Client Sample Ref.: | | | | CHEM1 | CHEM2 |
| | | Sample Location: | | | | BH1 | BH2 |
| | | Sample Type: | | | | SOIL | SOIL |
| | | Top Depth (m): | | | | 0.20 | 0.20 |
| | | Date Sampled: | | | | 07-Mar-2024 | 07-Mar-2024 |
| | | Asbestos Lab: | | | | DURHAM | DURHAM |
| Determinand | HWOL Code | Accred. | SOP | Units | LOD | | |
| ACM Type | | U | 2192 | | N/A | - | - |
| Asbestos Identification | | U | 2192 | | N/A | No Asbestos Detected | No Asbestos Detected |
| Moisture | | N | 2030 | % | 0.020 | 20 | 15 |
| Stones and Removed Materials | | N | 2030 | % | 0.020 | < 0.020 | < 0.020 |
| pH at 20C | | U | 2010 | | 4.0 | 8.2 | 8.3 |
| Electrical Conductivity (2:1) | | N | 2020 | µS/cm | 1.0 | 220 | 190 |
| Boron (Hot Water Soluble) | | U | 2120 | mg/kg | 0.40 | 0.55 | 0.59 |
| Sulphate (2:1 Water Soluble) as SO4 | | U | 2120 | g/l | 0.010 | < 0.010 | < 0.010 |
| Cyanide (Free) | | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Cyanide (Total) | | U | 2300 | mg/kg | 0.50 | 0.50 | < 0.50 |
| Sulphate (Total) | | U | 2430 | % | 0.010 | 0.090 | 0.22 |
| Arsenic | | U | 2455 | mg/kg | 0.5 | 25 | 21 |
| Cadmium | | U | 2455 | mg/kg | 0.10 | 0.29 | 1.2 |
| Copper | | U | 2455 | mg/kg | 0.50 | 31 | 110 |
| Mercury | | U | 2455 | mg/kg | 0.05 | 0.20 | 0.22 |
| Nickel | | U | 2455 | mg/kg | 0.50 | 33 | 34 |
| Lead | | U | 2455 | mg/kg | 0.50 | 66 | 95 |
| Selenium | | U | 2455 | mg/kg | 0.25 | 1.3 | 1.3 |
| Zinc | | U | 2455 | mg/kg | 0.50 | 100 | 370 |
| Chromium (Trivalent) | | N | 2490 | mg/kg | 1.0 | 31 | 28 |
| Chromium (Hexavalent) | | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Aliphatic VPH >C5-C6 | HS_2D_AL | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |
| Aliphatic VPH >C6-C7 | HS_2D_AL | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |
| Aliphatic VPH >C7-C8 | HS_2D_AL | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |
| Aliphatic VPH >C6-C8 (Sum) | HS_2D_AL | N | 2780 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aliphatic VPH >C8-C10 | HS_2D_AL | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |
| Total Aliphatic VPH >C5-C10 | HS_2D_AL | U | 2780 | mg/kg | 0.25 | < 0.25 | < 0.25 |
| Aliphatic EPH >C10-C12 MC | EH_2D_AL #1 | U | 2690 | mg/kg | 2.00 | 4.0 | 4.2 |
| Aliphatic EPH >C12-C16 MC | EH_2D_AL #1 | U | 2690 | mg/kg | 1.00 | 2.6 | 2.8 |
| Aliphatic EPH >C16-C21 MC | EH_2D_AL #1 | U | 2690 | mg/kg | 2.00 | < 2.0 | < 2.0 |
| Aliphatic EPH >C21-C35 MC | EH_2D_AL #1 | U | 2690 | mg/kg | 3.00 | 5.8 | 4.3 |
| Aliphatic EPH >C35-C40 MC | EH_2D_AL #1 | N | 2690 | mg/kg | 10.00 | < 10 | < 10 |
| Total Aliphatic EPH >C10-C35 MC | EH_2D_AL #1 | U | 2690 | mg/kg | 5.00 | 13 | 13 |
| Total Aliphatic EPH >C10-C40 MC | EH_2D_AL #1 | N | 2690 | mg/kg | 10.00 | 13 | 13 |
| Aromatic VPH >C5-C7 | HS_2D_AR | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |
| Aromatic VPH >C7-C8 | HS_2D_AR | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |

Results - Soil

Project: 18824 10A and 10B Burwell Road, Stevenage, Herts

| Client: Herts & Essex Site Investigations | | Chemtest Job No.: | | | | 24-07294 | 24-07294 |
|---|----------------|----------------------|------|-------|-------|-------------|-------------|
| Quotation No.: | | Chemtest Sample ID.: | | | | 1777760 | 1777761 |
| Order No.: 18824 | | Client Sample Ref.: | | | | CHEM1 | CHEM2 |
| | | Sample Location: | | | | BH1 | BH2 |
| | | Sample Type: | | | | SOIL | SOIL |
| | | Top Depth (m): | | | | 0.20 | 0.20 |
| | | Date Sampled: | | | | 07-Mar-2024 | 07-Mar-2024 |
| | | Asbestos Lab: | | | | DURHAM | DURHAM |
| Determinand | HWOL Code | Accred. | SOP | Units | LOD | | |
| Aromatic VPH >C8-C10 | HS_2D_AR | U | 2780 | mg/kg | 0.05 | < 0.05 | < 0.05 |
| Total Aromatic VPH >C5-C10 | HS_2D_AR | U | 2780 | mg/kg | 0.25 | < 0.25 | < 0.25 |
| Aromatic EPH >C10-C12 MC | EH_2D_AR_#1 | U | 2690 | mg/kg | 1.00 | < 1.0 | < 1.0 |
| Aromatic EPH >C12-C16 MC | EH_2D_AR_#1 | U | 2690 | mg/kg | 1.00 | < 1.0 | < 1.0 |
| Aromatic EPH >C16-C21 MC | EH_2D_AR_#1 | U | 2690 | mg/kg | 2.00 | < 2.0 | < 2.0 |
| Aromatic EPH >C21-C35 MC | EH_2D_AR_#1 | U | 2690 | mg/kg | 2.00 | < 2.0 | < 2.0 |
| Aromatic EPH >C35-C40 MC | EH_2D_AR_#1 | N | 2690 | mg/kg | 1.00 | 3.1 | 2.2 |
| Total Aromatic EPH >C10-C35 MC | EH_2D_AR_#1 | U | 2690 | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Total Aromatic EPH >C10-C40 MC | EH_2D_AR_#1 | N | 2690 | mg/kg | 10.00 | < 10 | < 10 |
| Total VPH >C5-C10 | HS_2D_Total | U | 2780 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Total EPH >C10-C35 MC | EH_2D_Total_#1 | U | 2690 | mg/kg | 10.00 | 15 | 14 |
| Total EPH >C10-C40 MC | EH_2D_Total_#1 | N | 2690 | mg/kg | 10.00 | 19 | 17 |
| Organic Matter | | U | 2625 | % | 0.40 | 2.6 | 2.1 |
| Naphthalene | | U | 2700 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Acenaphthylene | | U | 2700 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Acenaphthene | | U | 2700 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Fluorene | | U | 2700 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Phenanthrene | | U | 2700 | mg/kg | 0.10 | 0.14 | 0.31 |
| Anthracene | | U | 2700 | mg/kg | 0.10 | < 0.10 | 0.11 |
| Fluoranthene | | U | 2700 | mg/kg | 0.10 | 0.39 | 1.5 |
| Pyrene | | U | 2700 | mg/kg | 0.10 | 0.44 | 1.7 |
| Benzo[a]anthracene | | U | 2700 | mg/kg | 0.10 | 0.35 | 1.0 |
| Chrysene | | U | 2700 | mg/kg | 0.10 | 0.45 | 1.8 |
| Benzo[b]fluoranthene | | U | 2700 | mg/kg | 0.10 | 0.75 | 1.3 |
| Benzo[k]fluoranthene | | U | 2700 | mg/kg | 0.10 | 0.44 | 0.65 |
| Benzo[a]pyrene | | U | 2700 | mg/kg | 0.10 | 0.24 | 1.1 |
| Indeno(1,2,3-c,d)Pyrene | | U | 2700 | mg/kg | 0.10 | < 0.10 | 0.78 |
| Dibenz(a,h)Anthracene | | U | 2700 | mg/kg | 0.10 | < 0.10 | 0.28 |
| Benzo[g,h,i]perylene | | U | 2700 | mg/kg | 0.10 | < 0.10 | 2.5 |
| Total Of 16 PAH's | | U | 2700 | mg/kg | 2.0 | 3.2 | 13 |
| Benzene | | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Toluene | | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Ethylbenzene | | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| o-Xylene | | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Methyl Tert-Butyl Ether | | U | 2760 | µg/kg | 1.0 | < 1.0 | < 1.0 |
| Total Phenols | | U | 2920 | mg/kg | 0.10 | < 0.10 | < 0.10 |

Test Methods

| SOP | Title | Parameters included | Method summary | Water Accred. |
|------|---|--|--|---------------|
| 2010 | pH Value of Soils | pH at 20°C | pH Meter | |
| 2020 | Electrical Conductivity | Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil | Measurement of the electrical resistance of a 2:1 water/soil extract. | |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. | |
| 2040 | Soil Description(Requirement of MCERTS) | Soil description | As received soil is described based upon BS5930 | |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES | |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry | |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. | |
| 2430 | Total Sulphate in soils | Total Sulphate | Acid digestion followed by determination of sulphate in extract by ICP-OES. | |
| 2455 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. | |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine. | |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. | |
| 2690 | EPH A/A Split | Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 | Acetone/Heptane extraction / GCxGC FID detection | |
| 2700 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds) | |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. | |
| 2780 | VPH A/A Split | Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10 | Water extraction / Headspace GCxGC FID detection | |
| 2920 | Phenols in Soils by HPLC | Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded. | 60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection. | |

Report Information

Key

| | |
|-----|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |
| SOP | Standard operating procedure |
| LOD | Limit of detection |

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water

GW - Ground Water

LE - Land Leachate

NA - Not Applicable

PL - Prepared Leachate

PW - Processed Water

Report Information

RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX D – THAMES WATER CORRESPONDENCE



Dominic Ramdeen

Fernbrook Consulting Engineers
Forma Suite
40 Bowling Green Lane
London
EC1R 0NE



03 March 2022

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 10a & 10b Burwell Road, Stevenage, SG2 9RF

Dear Dominic,

Thank you for providing information on your development.

Existing site: general housing (2 units)

Proposed site: flats (20 units)

Proposed foul water discharge by gravity to TWMH 961A

Proposed surface water: 8.5l/s discharged to TWMH 9653 & 1.6l/s to TWMH 0650.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:



1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 10.1 l/s then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

Diversion

There are existing public sewers crossing the site. New buildings will need to be kept between 3 and 6.5m away from existing sewer depending on the size and depth of the sewer. Alternatively, it may be possible for sewers to be diverted around the new development. If you wish us to review a diversion proposal, please submit this via a Section 185 Diversion application. On some occasions it may be possible to abandon existing public sewers. Please contact us for further information on this process.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 0800 009 3921.

Kind Regards,

Leigh Khan
Developer Services – Adoptions Engineer
Tel: 0800 009 3921

developer.services@thameswater.co.uk

Get advice on making your sewer connection correctly at connectright.org.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB

Find us online at developers.thameswater.co.uk

APPENDIX E - DRAINAGE STRATEGY CALCULATIONS & DRAWINGS

Parameters

Rainfall model: FEH22

Calculation type: Design rainfall


Calculation mode: For a point

Calculation locat: Point

Fixed duration: no

Annual maximum: yes

| Duration hours | Duration days | 2 year rainfall (t 10 year rainfall) | 30 year rainfall | 100 year rainfall (mm) | Duration hours | Duration days | 2 year rainfall (t 10 year rainfall) | 30 year rainfall | 100 year rainfall (mm) | Duration hours | Duration days | 2 year rainfall (t 10 year rainfall) | 30 year rainfall | 100 year rainfall (mm) | Duration hours | Duration days | 2 year rainfall (t 10 year rainfall) | 30 year rainfall | 100 year rainfall (mm) |
|----------------|---------------|--------------------------------------|------------------|------------------------|----------------|---------------|--------------------------------------|------------------|------------------------|----------------|---------------|--------------------------------------|------------------|------------------------|----------------|---------------|--------------------------------------|------------------|------------------------|
| 0.25 | 0.010416667 | 7.48 | 15.16 | 19.81 | 24.92 | 32.5 | 1.354166667 | 35.43 | 54.33 | 66.72 | 80.08 | 64.75 | 2.697916667 | 42.28 | 62.45 | 74.37 | 88.85 | | |
| 0.5 | 0.020833333 | 9.53 | 19.44 | 25.6 | 32.53 | 32.75 | 1.384583333 | 35.49 | 54.4 | 66.79 | 80.16 | 65 | 2.708333333 | 42.33 | 62.51 | 74.43 | 88.91 | | |
| 0.75 | 0.03125 | 10.76 | 20.14 | 29.1 | 37.23 | 33 | 1.375 | 35.55 | 54.47 | 66.87 | 80.24 | 65.25 | 2.71875 | 42.38 | 62.57 | 74.49 | 89.08 | | |
| 1 | 0.041666667 | 11.71 | 23.94 | 31.71 | 40.53 | 32.25 | 1.385416667 | 35.61 | 54.54 | 66.94 | 80.32 | 65.5 | 2.729166667 | 42.43 | 62.63 | 74.55 | 89.04 | | |
| 1.25 | 0.052083333 | 13.04 | 25.96 | 34.13 | 43.36 | 33.5 | 1.395833333 | 35.67 | 54.61 | 67.02 | 80.4 | 65.75 | 2.739583333 | 42.48 | 62.69 | 74.61 | 89.1 | | |
| 1.5 | 0.0625 | 14.42 | 27.82 | 36.24 | 45.75 | 33.75 | 1.40625 | 35.72 | 54.68 | 66.1 | 80.48 | 66 | 2.75 | 42.53 | 62.75 | 74.68 | 89.16 | | |
| 1.75 | 0.072916667 | 15.76 | 29.49 | 38.08 | 47.8 | 34 | 1.416666667 | 35.78 | 54.75 | 66.17 | 80.56 | 66.25 | 2.760416667 | 42.58 | 62.81 | 74.74 | 89.22 | | |
| 2 | 0.083333333 | 17 | 30.99 | 39.69 | 49.59 | 34.25 | 1.427083333 | 35.84 | 54.82 | 66.25 | 80.64 | 66.5 | 2.770833333 | 42.63 | 62.86 | 74.8 | 89.28 | | |
| 2.25 | 0.09375 | 17.92 | 32.19 | 41.04 | 51.12 | 34.5 | 1.4375 | 35.9 | 54.89 | 66.32 | 80.71 | 66.75 | 2.78125 | 42.68 | 62.92 | 74.86 | 89.34 | | |
| 2.5 | 0.104166667 | 18.74 | 33.27 | 42.23 | 52.49 | 34.75 | 1.447916667 | 35.96 | 54.96 | 66.39 | 80.79 | 67 | 2.791666667 | 42.73 | 62.98 | 74.92 | 89.4 | | |
| 2.75 | 0.114583333 | 19.48 | 34.22 | 43.3 | 53.72 | 35 | 1.458333333 | 36.02 | 55.03 | 66.47 | 80.87 | 67.25 | 2.802083333 | 42.78 | 63.04 | 74.98 | 89.46 | | |
| 3 | 0.125 | 20.14 | 35.09 | 44.26 | 54.84 | 35.25 | 1.46875 | 36.07 | 55.1 | 66.54 | 80.96 | 67.5 | 2.8125 | 42.83 | 63.1 | 75.04 | 89.52 | | |
| 3.25 | 0.135416667 | 20.74 | 35.84 | 45.14 | 55.86 | 35.5 | 1.479166667 | 36.13 | 55.17 | 66.62 | 81.02 | 67.75 | 2.822916667 | 42.88 | 63.15 | 75.1 | 89.58 | | |
| 3.5 | 0.145833333 | 21.3 | 36.59 | 45.94 | 56.8 | 35.75 | 1.489583333 | 36.19 | 55.23 | 66.69 | 81.1 | 68 | 2.833333333 | 42.93 | 63.21 | 75.16 | 89.64 | | |
| 3.75 | 0.15625 | 21.81 | 37.25 | 46.68 | 57.67 | 36 | 1.5 | 36.24 | 55.3 | 66.76 | 81.18 | 68.25 | 2.84375 | 42.98 | 63.27 | 75.23 | 89.7 | | |
| 4 | 0.166666667 | 22.28 | 37.86 | 47.36 | 58.48 | 36.25 | 1.510416667 | 36.3 | 55.37 | 66.84 | 81.25 | 68.5 | 2.854166667 | 43.03 | 63.33 | 75.29 | 89.76 | | |
| 4.25 | 0.177083333 | 22.7 | 38.42 | 47.99 | 59.23 | 36.5 | 1.520833333 | 36.36 | 55.44 | 66.91 | 81.33 | 68.75 | 2.864583333 | 43.07 | 63.39 | 75.35 | 89.82 | | |
| 4.5 | 0.1875 | 23.09 | 38.93 | 48.58 | 59.94 | 36.75 | 1.53125 | 36.42 | 55.5 | 66.98 | 81.41 | 69 | 2.875 | 43.12 | 63.44 | 75.41 | 89.88 | | |
| 4.75 | 0.197916667 | 23.46 | 39.41 | 49.12 | 60.6 | 37 | 1.541666667 | 36.47 | 55.57 | 67.05 | 81.48 | 69.25 | 2.885416667 | 43.17 | 63.5 | 75.47 | 89.94 | | |
| 5 | 0.208333333 | 23.8 | 39.85 | 49.63 | 61.22 | 37.25 | 1.552083333 | 36.53 | 55.64 | 67.13 | 81.56 | 69.5 | 2.895833333 | 43.22 | 63.56 | 75.53 | 90 | | |
| 5.25 | 0.21875 | 24.13 | 40.28 | 50.11 | 61.81 | 37.5 | 1.5625 | 36.58 | 55.71 | 67.2 | 81.63 | 69.75 | 2.90625 | 43.27 | 63.62 | 75.59 | 90.06 | | |
| 5.5 | 0.229166667 | 24.43 | 40.67 | 50.57 | 62.36 | 37.75 | 1.572916667 | 36.64 | 55.77 | 67.27 | 81.7 | 70 | 2.916666667 | 43.32 | 63.68 | 75.65 | 90.12 | | |
| 5.75 | 0.239583333 | 24.72 | 41.05 | 50.99 | 62.88 | 38 | 1.583333333 | 36.7 | 55.84 | 67.34 | 81.78 | 70.25 | 2.927083333 | 43.37 | 63.73 | 75.71 | 90.18 | | |
| 6 | 0.25 | 25 | 41.4 | 51.4 | 63.38 | 38.25 | 1.59375 | 36.75 | 55.91 | 67.41 | 81.85 | 70.5 | 2.9375 | 43.42 | 63.79 | 75.77 | 90.24 | | |
| 6.25 | 0.260416667 | 25.26 | 41.73 | 51.77 | 63.84 | 38.5 | 1.604166667 | 36.81 | 55.97 | 67.49 | 81.93 | 70.75 | 2.947916667 | 43.47 | 63.85 | 75.83 | 90.3 | | |
| 6.5 | 0.270833333 | 25.51 | 42.04 | 52.13 | 64.28 | 38.75 | 1.614583333 | 36.86 | 56.04 | 67.56 | 82 | 71 | 2.958333333 | 43.51 | 63.91 | 75.89 | 90.36 | | |
| 6.75 | 0.28125 | 25.75 | 42.34 | 52.46 | 64.7 | 39 | 1.625 | 36.92 | 56.1 | 67.63 | 82.07 | 71.25 | 2.96875 | 43.56 | 63.96 | 75.95 | 90.42 | | |
| 7 | 0.291666667 | 25.97 | 42.63 | 52.79 | 65.1 | 39.25 | 1.635416667 | 36.98 | 56.17 | 67.7 | 82.15 | 71.5 | 2.979166667 | 43.61 | 64.02 | 76.01 | 90.48 | | |
| 7.25 | 0.302083333 | 26.19 | 42.89 | 53.09 | 65.48 | 39.5 | 1.645833333 | 37.03 | 56.23 | 67.77 | 82.22 | 71.75 | 2.989583333 | 43.66 | 64.08 | 76.07 | 90.54 | | |
| 7.5 | 0.3125 | 26.4 | 43.15 | 53.39 | 65.85 | 39.75 | 1.65625 | 37.09 | 56.3 | 67.84 | 82.29 | 72 | 3 | 43.71 | 64.14 | 76.13 | 90.59 | | |
| 7.75 | 0.322916667 | 26.6 | 43.4 | 53.67 | 66.2 | 40 | 1.666666667 | 37.14 | 56.37 | 67.91 | 82.36 | 72.25 | 3.010416667 | 43.76 | 64.19 | 76.19 | 90.65 | | |
| 8 | 0.333333333 | 26.8 | 43.64 | 53.95 | 66.54 | 40.25 | 1.677083333 | 37.2 | 56.43 | 67.98 | 82.44 | 72.5 | 3.020833333 | 43.81 | 64.25 | 76.25 | 90.71 | | |
| 8.25 | 0.34375 | 26.99 | 43.88 | 54.21 | 66.86 | 40.5 | 1.6875 | 37.25 | 56.5 | 68.05 | 82.51 | 72.75 | 3.03125 | 43.86 | 64.31 | 76.31 | 90.77 | | |
| 8.5 | 0.354166667 | 27.17 | 44.1 | 54.46 | 67.17 | 40.75 | 1.697916667 | 37.31 | 56.56 | 68.12 | 82.58 | 73 | 3.041666667 | 43.9 | 64.37 | 76.37 | 90.83 | | |
| 8.75 | 0.364583333 | 27.34 | 44.32 | 54.71 | 67.47 | 41 | 1.708333333 | 37.36 | 56.62 | 68.19 | 82.65 | 73.25 | 3.052083333 | 43.95 | 64.42 | 76.43 | 90.89 | | |
| 9 | 0.375 | 27.51 | 44.53 | 54.94 | 67.76 | 41.25 | 1.71875 | 37.41 | 56.69 | 68.25 | 82.72 | 73.5 | 3.0625 | 43.99 | 64.47 | 76.49 | 90.95 | | |
| 9.25 | 0.385416667 | 27.67 | 44.73 | 55.17 | 68.05 | 41.5 | 1.729166667 | 37.47 | 56.75 | 68.33 | 82.79 | 73.75 | 3.072916667 | 44.05 | 64.54 | 76.55 | 91.01 | | |
| 9.5 | 0.395833333 | 27.83 | 44.93 | 55.39 | 68.32 | 41.75 | 1.739583333 | 37.52 | 56.82 | 68.4 | 82.86 | 74 | 3.083333333 | 44.1 | 64.59 | 76.61 | 91.07 | | |
| 9.75 | 0.40625 | 27.99 | 45.12 | 55.61 | 68.58 | 42 | 1.75 | 37.58 | 56.88 | 68.46 | 82.93 | 74.25 | 3.09375 | 44.15 | 64.65 | 76.67 | 91.12 | | |
| 10 | 0.416666667 | 28.14 | 45.3 | 55.82 | 68.83 | 42.25 | 1.760416667 | 37.63 | 56.95 | 68.53 | 83 | 74.5 | 3.104166667 | 44.19 | 64.71 | 76.73 | 91.18 | | |
| 10.25 | 0.427083333 | 28.28 | 45.49 | 56.02 | 69.08 | 42.5 | 1.770833333 | 37.69 | 57.01 | 68.6 | 83.07 | 74.75 | 3.114583333 | 44.24 | 64.77 | 76.79 | 91.24 | | |
| 10.5 | 0.4375 | 28.42 | 45.66 | 56.22 | 69.32 | 42.75 | 1.78125 | 37.74 | 57.07 | 68.67 | 83.14 | 75 | 3.125 | 44.29 | 64.82 | 76.85 | 91.3 | | |
| 10.75 | 0.447916667 | 28.56 | 45.83 | 56.41 | 69.55 | 43 | 1.791666667 | 37.79 | 57.14 | 68.74 | 83.21 | 75.25 | 3.135416667 | 44.34 | 64.88 | 76.91 | 91.36 | | |
| 11 | 0.458333333 | 28.7 | 46 | 56.6 | 69.77 | 43.25 | 1.802083333 | 37.85 | 57.2 | 68.81 | 83.28 | 75.5 | 3.145833333 | 44.39 | 64.94 | 76.97 | 91.42 | | |
| 11.25 | 0.46875 | 28.83 | 46.16 | 56.78 | 69.99 | 43.5 | 1.8125 | 37.9 | 57.26 | 68.87 | 83.35 | 75.75 | 3.15625 | 44.44 | 64.99 | 77.03 | 91.48 | | |
| 11.5 | 0.479166667 | 28.95 | 46.32 | 56.96 | 70.21 | 43.75 | 1.822916667 | 37.95 | 57.33 | 68.94 | 83.42 | 76 | 3.166666667 | 44.48 | 65.05 | 77.09 | 91.53 | | |
| 11.75 | 0.489583333 | 29.08 | 46.48 | 57.13 | 70.41 | 44 | 1.833333333 | 38.01 | 57.39 | 69.01 | 83.49 | 76.25 | 3.177083333 | 44.53 | 65.11 | 77.15 | 91.59 | | |
| 12 | 0.5 | 29.2 | 46.63 | 57.3 | 70.61 | 44.25 | 1.84375 | 38.06 | 57.45 | 69.08 | 83.56 | 76.5 | 3.1875 | 44.58 | 65.16 | 77.21 | 91.65 | | |
| 12.25 | 0.510416667 | 29.32 | 46.78 | 57.47 | 70.81 | 44.5 | 1.854166667 | 38.11 | 57.52 | 69.14 | 83.63 | 76.75 | 3.197916667 | 44.63 | 65.22 | 77.27 | 91.71 | | |
| 12.5 | 0.520833333 | 29.43 | 46.92 | 57.63 | 70.99 | 44.75 | 1.864583333 | 38.17 | 57.58 | 69.21 | 83.7 | 77 | 3.208333333 | 44.68 | 65.28 | 77.33 | 91.77 | | |
| 12.75 | 0.53125 | 29.54 | 47.07 | 57.79 | 71.18 | 45 | 1.875 | 38.22 | 57.64 | 69.28 | 83.76 | 77.25 | 3.21875 | 44.72 | 65.33 | 77.39 | 91.83 | | |
| 13 | 0.541666667 | 29.65 | 47.21 | 57.95 | 71.36 | 45.25 | 1.885416667 | 38.27 | 57.7 | 69.35 | 83.83 | 77.5 | 3.229166667 | 44.77 | 65.39 | 77.45 | 91.88 | | |
| 13.25 | 0.552083333 | 29.76 | 47.35 | 58.11 | 71.53 | 45.5 | 1.895833333 | 38.33 | 57.77 | 69.41 | 83.9 | 77.75 | 3.239583333 | 44.82 | 65.45 | 77.51 | 91.94 | | |
| 13.5 | 0.5625 | 29.86 | 47.48 | 58.25 | 71.7 | 45.75 | 1.90625 | 38.38 | 57.83 | 69.48 | 83.97 | 78 | 3.25 | 44.87 | 65.5 | 77.56 | 92 | | |
| 13.75 | 0.572916667 | 29.97 | 47.62 | 58.4 | 71.87 | 46 | 1.916666667 | 38.43 | 57.89 | 69.55 | 84.04 | 78.25 | 3.260416667 | 44.92 | 65.56 | 77.62 | 92.06 | | |
| 14 | 0.583333333 | 30.07 | 47.75 | 58.55 | 72.03 | 46.25 | 1.927083333 | 38.48 | 57.95 | 69.61 | 84.1 | 78.5 | 3.270833333 | 44.96 | 65.62 | 77.68 | 92.11 | | |
| 14.25 | 0.59375 | 30.17 | 47.88 | 58.69 | 72.2 | 46.5 | 1.9375 | 38.54 | 58.01 | 69.68 | 84.17 | 78.75 | 3.28125 | 45.01 | 65.67 | 77.74 | 92.17 | | |
| 14.5 | 0.604166667 | 30.27 | 48 | 58.83 | 72.35 | 46.75 | 1.947916667 | 38.59 | 58.08 | 69.75 | 84.24 | 79 | 3.291666667 | 45.06 | 65.73 | 77.8 | 92.23 | | |
| 14.75 | 0.614583333 | 30.36 | 48.13 | 58.96 | 72.51 | 47 | 1.958333333 | 38.64 | 58.14 | 69.81 | | | | | | | | | |

| | | |
|--|--|---|
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

| | | | |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years) | 2 | PIMP (%) | 100 |
| M5-60 (mm) | 20.000 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.407 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Soffits

Time Area Diagram for Storm at outfall TWMH 9653 (pipe 1.001)

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|-------------|-----------|-------------|-----------|
| 0-4 | 0.017 | 4-8 | 0.000 |

Total Area Contributing (ha) = 0.017

Total Pipe Volume (m³) = 0.223

Time Area Diagram at outfall (pipe 2.005)

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|-------------|-----------|-------------|-----------|
| 0-4 | 0.099 | 4-8 | 0.006 |

Total Area Contributing (ha) = 0.105


Total Pipe Volume (m³) = 2.151

Network Design Table for Storm

- Indicates pipe length does not match coordinates

| PN | Length | Fall | Slope | I.Area | T.E. | Base | k | HYD | DIA | Section | Type | Auto |
|----|--------|------|-------|--------|--------|------------|------|------|------|---------|------|--------|
| | (m) | (m) | (1:X) | (ha) | (mins) | Flow (l/s) | (mm) | SECT | (mm) | | | Design |

Network Results Table

| | | |
|--|--|---|
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Network Design Table for Storm

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|----|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
|----|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|

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Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|-------|------------|----------|-------------|-------------|-------------|-----------------|--------|----------|----------|--------------|-------------|
| 1.000 | 11.225 | 1.250 | 9.0 | 0.017 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 1.001 | 1.382 | 0.140 | 9.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.000 | 5.000 | 0.250 | 20.0 | 0.000 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.001 | 28.577 | 0.650 | 44.0 | 0.005 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.002 | 4.728# | 1.000 | 4.7 | 0.015 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 3.000 | 17.000# | 0.800 | 21.3 | 0.020 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.003 | 10.000# | 1.250 | 8.0 | 0.015 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.004 | 10.601 | 0.100 | 106.0 | 0.050 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 2.005 | 3.510 | 0.050 | 70.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |

Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|-------|--------------|-------------|-----------|---------------|-------------------|------------|----------------|-----------|-----------|------------|
| 1.000 | 50.00 | 4.06 | 98.200 | 0.017 | 0.0 | 0.0 | 0.0 | 3.38 | 59.8 | 2.3 |
| 1.001 | 50.00 | 4.06 | 96.950 | 0.017 | 0.0 | 0.0 | 0.0 | 3.23 | 57.0 | 2.3 |
| 2.000 | 50.00 | 4.04 | 98.350 | 0.000 | 0.0 | 0.0 | 0.0 | 2.26 | 40.0 | 0.0 |
| 2.001 | 50.00 | 4.35 | 98.100 | 0.005 | 0.0 | 0.0 | 0.0 | 1.52 | 26.9 | 0.7 |
| 2.002 | 50.00 | 4.37 | 97.450 | 0.020 | 0.0 | 0.0 | 0.0 | 4.67 | 82.5 | 2.7 |
| 3.000 | 50.00 | 4.13 | 97.250 | 0.020 | 0.0 | 0.0 | 0.0 | 2.19 | 38.8 | 2.7 |
| 2.003 | 50.00 | 4.41 | 96.450 | 0.055 | 0.0 | 0.0 | 0.0 | 3.58 | 63.3 | 7.4 |
| 2.004 | 50.00 | 4.53 | 95.200 | 0.105 | 0.0 | 0.0 | 0.0 | 1.53 | 107.9 | 14.2 |
| 2.005 | 50.00 | 4.56 | 95.100 | 0.105 | 0.0 | 0.0 | 0.0 | 1.88 | 132.8 | 14.2 |

Free Flowing Outfall Details for Storm


| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---------------------|--------------|--------------|--------------|------------------|----------|--------|
|---------------------|--------------|--------------|--------------|------------------|----------|--------|

1.001 TWMH 9653 98.890 96.810 96.810 1200 0

Free Flowing Outfall Details for Storm

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---------------------|--------------|--------------|--------------|------------------|----------|--------|
|---------------------|--------------|--------------|--------------|------------------|----------|--------|

2.005 96.600 95.050 95.850 0 0

| | | |
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Online Controls for Storm

Orifice Manhole: 2, DS/PN: 1.001, Volume (m³): 2.3

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 96.950

Depth/Flow Relationship Manhole: 11, DS/PN: 2.005, Volume (m³): 2.2

Invert Level (m) 95.100

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.200 | 0.0000 | 1.800 | 0.0000 | 3.400 | 0.0000 | 5.000 | 0.0000 |
| 0.400 | 0.0000 | 2.000 | 0.0000 | 3.600 | 0.0000 | 5.200 | 0.0000 |
| 0.600 | 0.0000 | 2.200 | 0.0000 | 3.800 | 0.0000 | 5.400 | 0.0000 |
| 0.800 | 0.0000 | 2.400 | 0.0000 | 4.000 | 0.0000 | 5.600 | 0.0000 |
| 1.000 | 0.0000 | 2.600 | 0.0000 | 4.200 | 0.0000 | 5.800 | 0.0000 |
| 1.200 | 0.0000 | 2.800 | 0.0000 | 4.400 | 0.0000 | 6.000 | 0.0000 |
| 1.400 | 0.0000 | 3.000 | 0.0000 | 4.600 | 0.0000 | | |
| 1.600 | 0.0000 | 3.200 | 0.0000 | 4.800 | 0.0000 | | |

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Storage Structures for Storm

Cellular Storage Manhole: 2, DS/PN: 1.001


Invert Level (m) 97.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m ²) | Inf. Area (m ²) | Depth (m) | Area (m ²) | Inf. Area (m ²) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000 | 9.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 9.0 | 0.0 | | | |

Cellular Storage Manhole: 11, DS/PN: 2.005

Invert Level (m) 95.100 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.01944 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m ²) | Inf. Area (m ²) | Depth (m) | Area (m ²) | Inf. Area (m ²) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000 | 116.0 | 116.0 | 0.901 | 0.0 | 116.0 |
| 0.900 | 116.0 | 116.0 | | | |

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2 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 * 10m ³ /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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

Synthetic Rainfall Details

| | |
|------------------------------------|---|
| Rainfall Model | FEH |
| FEH Rainfall Version | 2013 |
| Site Location | GB 526004 223679 TL 26004 23679 |
| Data Type | Point |
| Cv (Summer) | 1.000 |
| Cv (Winter) | 1.000 |
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| DVD Status | OFF |
| Inertia Status | OFF |
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760 |
| Return Period(s) (years) | 2, 10, 30, 100 |
| Climate Change (%) | 0, 0, 35, 40 |


WARNING: Half Drain Time has not been calculated as the structure is too full.

| US/MH PN | Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------------|------|------------|------------------|-------------------|------------------------|--------------------|-----------------------|------------------|-----------------------|
| 1.000 | 1 | 15 Summer | 2 | +0% | 100/30 Summer | | | | 98.226 |
| 1.001 | 2 | 30 Summer | 2 | +0% | 2/15 Summer | | | | 97.697 |
| 2.000 | 3 | 15 Summer | 2 | +0% | | | | | 98.350 |
| 2.001 | 4 | 15 Summer | 2 | +0% | | | | | 98.118 |
| 2.002 | 5 | 15 Summer | 2 | +0% | | | | | 97.472 |
| 3.000 | 7 | 15 Summer | 2 | +0% | | | | | 97.285 |
| 2.003 | 6 | 15 Summer | 2 | +0% | | | | | 96.494 |
| 2.004 | 9 | 720 Winter | 2 | +0% | 30/120 Summer | | | | 95.337 |
| 2.005 | 11 | 720 Winter | 2 | +0% | 10/180 Summer | | | | 95.337 |

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

| PN | US/MH Name | Surcharged Flooded | | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|-------|---------------|--------------------|-----------------------------|----------------|-------------------|------------------------------|-----------------------|------------|-------------------|
| | | Depth (m) | Volume (m ³) | | | | | | |
| 1.000 | 1 | -0.124 | 0.000 | 0.07 | | | 3.8 | OK | |
| 1.001 | 2 | 0.597 | 0.000 | 0.05 | | 15 | 1.1 | SURCHARGED | |
| 2.000 | 3 | -0.150 | 0.000 | 0.00 | | | 0.0 | OK | |
| 2.001 | 4 | -0.132 | 0.000 | 0.03 | | | 0.8 | OK | |
| 2.002 | 5 | -0.128 | 0.000 | 0.05 | | | 3.4 | OK | |
| 3.000 | 7 | -0.115 | 0.000 | 0.12 | | | 4.5 | OK | |
| 2.003 | 6 | -0.106 | 0.000 | 0.18 | | | 10.4 | OK | |
| 2.004 | 9 | -0.163 | 0.000 | 0.02 | | | 2.0 | OK | |
| 2.005 | 11 | -0.063 | 0.000 | 0.00 | | | 0.0 | OK | |

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10 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 * 10m ³ /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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

Synthetic Rainfall Details


| | |
|----------------------|---------------------------------|
| Rainfall Model | FEH |
| FEH Rainfall Version | 2013 |
| Site Location | GB 526004 223679 TL 26004 23679 |
| Data Type | Point |
| Cv (Summer) | 1.000 |
| Cv (Winter) | 1.000 |

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

| | |
|--------------------------|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760 |
| Return Period(s) (years) | 2, 10, 30, 100 |
| Climate Change (%) | 0, 0, 35, 40 |


WARNING: Half Drain Time has not been calculated as the structure is too full.

| US/MH PN | Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------------|------|------------|------------------|-------------------|------------------------|--------------------|-----------------------|------------------|-----------------------|
| 1.000 | 1 | 15 Summer | 10 | +0% | 100/30 Summer | | | | 98.235 |
| 1.001 | 2 | 30 Summer | 10 | +0% | 2/15 Summer | | | | 97.929 |
| 2.000 | 3 | 15 Summer | 10 | +0% | | | | | 98.350 |
| 2.001 | 4 | 15 Summer | 10 | +0% | | | | | 98.127 |
| 2.002 | 5 | 15 Summer | 10 | +0% | | | | | 97.485 |
| 3.000 | 7 | 15 Summer | 10 | +0% | | | | | 97.297 |
| 2.003 | 6 | 15 Summer | 10 | +0% | | | | | 96.514 |
| 2.004 | 9 | 720 Winter | 10 | +0% | 30/120 Summer | | | | 95.463 |
| 2.005 | 11 | 720 Winter | 10 | +0% | 10/180 Summer | | | | 95.463 |

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

| PN | US/MH Name | Surcharged Flooded | | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|-------|---------------|--------------------|-----------------------------|----------------|-------------------|------------------------------|-----------------------|------------|-------------------|
| | | Depth (m) | Volume (m ³) | | | | | | |
| 1.000 | 1 | -0.115 | 0.000 | 0.12 | | | 6.6 | OK | |
| 1.001 | 2 | 0.829 | 0.000 | 0.05 | | 20 | 1.3 | SURCHARGED | |
| 2.000 | 3 | -0.150 | 0.000 | 0.00 | | | 0.0 | OK | |
| 2.001 | 4 | -0.123 | 0.000 | 0.08 | | | 1.9 | OK | |
| 2.002 | 5 | -0.115 | 0.000 | 0.12 | | | 7.8 | OK | |
| 3.000 | 7 | -0.103 | 0.000 | 0.22 | | | 7.8 | OK | |
| 2.003 | 6 | -0.086 | 0.000 | 0.38 | | | 21.4 | OK | |
| 2.004 | 9 | -0.037 | 0.000 | 0.04 | | | 2.8 | OK | |
| 2.005 | 11 | 0.063 | 0.000 | 0.00 | | | 0.0 | SURCHARGED | |

| | | |
|--------------------------------|------------------------------|---|
| Fernbrook Consulting Engineers | | Page 10 |
| . | Job No. 21210 |  |
| London | 10A Burwell Road, Stevenage | |
| BR1 4DQ | Surface Water Drainage Calcs | |
| Date 30/04/2024 17:36 | Designed by DR | |
| File 240430.MDX | Checked by CR | |
| Innovyze | Network 2020.1.3 | |

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

Simulation Criteria

| | | | |
|---------------------------------|-------|--|-------|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m ³ /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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

Synthetic Rainfall Details


| | |
|----------------------|---------------------------------|
| Rainfall Model | FEH |
| FEH Rainfall Version | 2013 |
| Site Location | GB 526004 223679 TL 26004 23679 |
| Data Type | Point |
| Cv (Summer) | 1.000 |
| Cv (Winter) | 1.000 |

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

| | |
|--------------------------|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760 |
| Return Period(s) (years) | 2, 10, 30, 100 |
| Climate Change (%) | 0, 0, 35, 40 |


WARNING: Half Drain Time has not been calculated as the structure is too full.

| US/MH PN | Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------------|------|------------|------------------|-------------------|------------------------|--------------------|-----------------------|------------------|-----------------------|
| 1.000 | 1 | 15 Summer | 30 | +35% | 100/30 Summer | | | | 98.247 |
| 1.001 | 2 | 60 Summer | 30 | +35% | 2/15 Summer | | | | 98.146 |
| 2.000 | 3 | 15 Summer | 30 | +35% | | | | | 98.350 |
| 2.001 | 4 | 15 Summer | 30 | +35% | | | | | 98.136 |
| 2.002 | 5 | 15 Summer | 30 | +35% | | | | | 97.497 |
| 3.000 | 7 | 15 Summer | 30 | +35% | | | | | 97.314 |
| 2.003 | 6 | 15 Summer | 30 | +35% | | | | | 96.540 |
| 2.004 | 9 | 960 Winter | 30 | +35% | 30/120 Summer | | | | 95.748 |
| 2.005 | 11 | 960 Winter | 30 | +35% | 10/180 Summer | | | | 95.748 |

| | | |
|--|--|---|
| Fernbrook Consulting Engineers | | Page 11 |
| . London BR1 4DQ | Job No. 21210 10A Burwell Road, Stevenage Surface Water Drainage Calcs |  |
| Date 30/04/2024 17:36 File 240430.MDX | Designed by DR Checked by CR | |
| Innovyze | Network 2020.1.3 | |

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

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m ³) | Flow / Overflow Cap. (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|-------|---------------|----------------------------|--|-------------------------------------|------------------------------|-----------------------|------------|-------------------|
| | | | | | | | | |
| 1.000 | 1 | -0.103 | 0.000 | 0.22 | | 11.7 | OK | |
| 1.001 | 2 | 1.046 | 0.000 | 0.06 | 38 | 1.4 | SURCHARGED | |
| 2.000 | 3 | -0.150 | 0.000 | 0.00 | | 0.0 | OK | |
| 2.001 | 4 | -0.114 | 0.000 | 0.13 | | 3.4 | OK | |
| 2.002 | 5 | -0.103 | 0.000 | 0.22 | | 13.7 | OK | |
| 3.000 | 7 | -0.086 | 0.000 | 0.38 | | 13.7 | OK | |
| 2.003 | 6 | -0.060 | 0.000 | 0.67 | | 37.7 | OK | |
| 2.004 | 9 | 0.248 | 0.000 | 0.05 | | 3.6 | SURCHARGED | |
| 2.005 | 11 | 0.348 | 0.000 | 0.00 | | 0.0 | SURCHARGED | |

| | | |
|--------------------------------|---|---|
| Fernbrook Consulting Engineers | | Page 12 |
| . | Job No. 21210 |  |
| London BR1 4DQ | 10A Burwell Road, Stevenage Surface Water Drainage Calcs | |
| Date 30/04/2024 17:36 | Designed by DR | |
| File 240430.MDX | Checked by CR | |
| 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 * 10m ³ /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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

Synthetic Rainfall Details

| | |
|------------------------------------|--|
| Rainfall Model | FEH |
| FEH Rainfall Version | 2013 |
| Site Location | GB 526004 223679 TL 26004 23679 |
| Data Type | Point |
| Cv (Summer) | 1.000 |
| Cv (Winter) | 1.000 |
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| DVD Status | OFF |
| Inertia Status | OFF |
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760 |
| Return Period(s) (years) | 2, 10, 30, 100 |
| Climate Change (%) | 0, 0, 35, 40 |

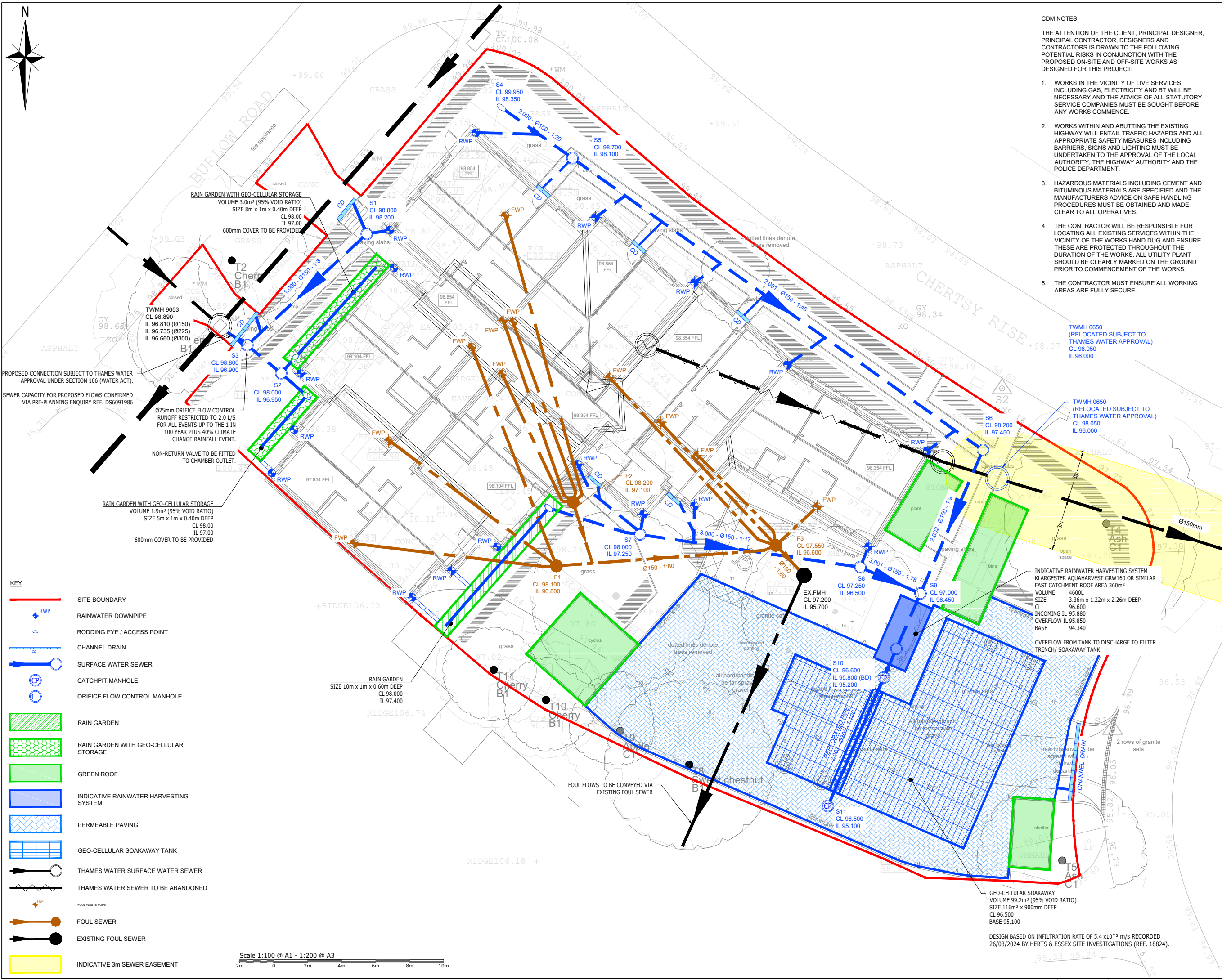
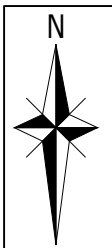
WARNING: Half Drain Time has not been calculated as the structure is too full.

| 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 | 1 | 60 Summer | 100 | +40% | 100/30 Summer | | | | 98.485 |
| 1.001 | 2 | 60 Summer | 100 | +40% | 2/15 Summer | | | | 98.479 |
| 2.000 | 3 | 15 Summer | 100 | +40% | | | | | 98.350 |
| 2.001 | 4 | 15 Summer | 100 | +40% | | | | | 98.142 |
| 2.002 | 5 | 15 Summer | 100 | +40% | | | | | 97.504 |
| 3.000 | 7 | 15 Summer | 100 | +40% | | | | | 97.325 |
| 2.003 | 6 | 15 Summer | 100 | +40% | | | | | 96.559 |
| 2.004 | 9 | 1440 Winter | 100 | +40% | 30/120 Summer | | | | 95.952 |
| 2.005 | 11 | 1440 Winter | 100 | +40% | 10/180 Summer | | | | 95.952 |

| | | |
|--|--|---|
| Fernbrook Consulting Engineers | | Page 13 |
| . London BR1 4DQ | Job No. 21210 10A Burwell Road, Stevenage Surface Water Drainage Calcs |  |
| Date 30/04/2024 17:36 File 240430.MDX | Designed by DR Checked by CR | |
| Innovyze | Network 2020.1.3 | |

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

| PN | US/MH Name | Surcharged Flooded | | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|-------|---------------|--------------------|-----------------------------|----------------|-------------------|------------------------------|-----------------------|------------|-------------------|
| | | Depth (m) | Volume (m ³) | | | | | | |
| 1.000 | 1 | 0.135 | 0.000 | 0.17 | | | 9.4 | SURCHARGED | |
| 1.001 | 2 | 1.379 | 0.000 | 0.07 | | 50 | 1.6 | SURCHARGED | |
| 2.000 | 3 | -0.150 | 0.000 | 0.00 | | | 0.0 | OK | |
| 2.001 | 4 | -0.108 | 0.000 | 0.17 | | | 4.5 | OK | |
| 2.002 | 5 | -0.096 | 0.000 | 0.29 | | | 17.9 | OK | |
| 3.000 | 7 | -0.075 | 0.000 | 0.50 | | | 17.9 | OK | |
| 2.003 | 6 | -0.041 | 0.000 | 0.87 | | | 49.2 | OK | |
| 2.004 | 9 | 0.452 | 0.000 | 0.04 | | | 3.3 | SURCHARGED | |
| 2.005 | 11 | 0.552 | 0.000 | 0.00 | | | 0.0 | SURCHARGED | |



- 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.

- 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 FILE REFERENCE "13761-Master-WD" RECEIVED FROM HERTFORD PLANNING SERVICE ON 23.04.2024.
 - THIS DRAWING HAS BEEN BASED ON DRAWING No. SJG3870, BY SJ GEOMATICS, DATED 23.12.2021.
 - ALL SURFACE WATER SEWERS TO BE Ø150mm AND LAID MIN. 1:100 GRADIENT UNLESS OTHERWISE NOTED.
 - ALL FOUL SEWERS TO BE Ø100mm AND LAID MIN. 1:80 GRADIENT UNLESS OTHERWISE NOTED.
 - REFER TO ARCHITECTS LAYOUT TO CONFIRM RWP, SVP & SS LOCATIONS AND SETTING OUT.
 - RAINWATER HARVESTING SYSTEM SHOWN INDICATIVELY. VENTILATION, ELECTRICAL SUPPLY AND INTEGRATION WITH WATER SUPPLY DESIGN BY OTHERS.

PROPOSED CONNECTION SUBJECT TO THAMES WATER APPROVAL UNDER SECTION 106 (WATER ACT).
SEWER CAPACITY FOR PROPOSED FLOWS CONFIRMED VIA PRE-PLANNING ENQUIRY REF. DS6091986

Ø25mm ORIFICE FLOW CONTROL RUNOFF RESTRICTED TO 2.0 L/S FOR ALL EVENTS UP TO THE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE RAINFALL EVENT.
NON-RETURN VALVE TO BE FITTED TO CHAMBER OUTLET.

RAIN GARDEN WITH GEO-CELLULAR STORAGE
VOLUME 1.9m³ (95% VOID RATIO)
SIZE 5m x 1m x 0.40m DEEP
CL 98.00
IL 97.00
600mm COVER TO BE PROVIDED

- KEY**
- SITE BOUNDARY
 - RAINWATER DOWNPIPE
 - RODDING EYE / ACCESS POINT
 - CHANNEL DRAIN
 - SURFACE WATER SEWER
 - CATCHPIT MANHOLE
 - ORIFICE FLOW CONTROL MANHOLE
 - RAIN GARDEN
 - RAIN GARDEN WITH GEO-CELLULAR STORAGE
 - GREEN ROOF
 - INDICATIVE RAINWATER HARVESTING SYSTEM
 - PERMEABLE PAVING
 - GEO-CELLULAR SOAKAWAY TANK
 - THAMES WATER SURFACE WATER SEWER
 - THAMES WATER SEWER TO BE ABANDONED
 - FOUL WASTE POINT
 - FOUL SEWER
 - EXISTING FOUL SEWER
 - INDICATIVE 3m SEWER EASEMENT

Scale 1:100 @ A1 - 1:200 @ A3
2m 0 2m 4m 6m 8m 10m

TWMH 0650
(RELOCATED SUBJECT TO THAMES WATER APPROVAL)
CL 98.050
IL 96.000

TWMH 0650
(RELOCATED SUBJECT TO THAMES WATER APPROVAL)
CL 98.050
IL 96.000

INDICATIVE RAINWATER HARVESTING SYSTEM
KLARGESTER AQUAHARVEST GRW160 OR SIMILAR
EAST CATCHMENT ROOF AREA 360m²
VOLUME 4600L
SIZE 3.36m x 1.22m x 2.26m DEEP
CL 96.600
INCOMING IL 95.880
OVERFLOW IL 95.850
BASE 94.340

OVERFLOW FROM TANK TO DISCHARGE TO FILTER TRENCH/ SOAKAWAY TANK.

GEO-CELLULAR SOAKAWAY
VOLUME 99.2m³ (95% VOID RATIO)
SIZE 116m² x 900mm DEEP
CL 96.500
BASE 95.100

DESIGN BASED ON INFILTRATION RATE OF 5.4 x 10⁻⁵ m/s RECORDED 26/03/2024 BY HERTS & ESSEX SITE INVESTIGATIONS (REF. 18824).

FOR INFORMATION ONLY

| | | | | | |
|-------|------------------|-----|-----|-----|----------|
| P04 | FOR INFORMATION | DR | CR | DR | 30.04.24 |
| P04.1 | FOR INFORMATION | DR | CR | DR | 26.04.24 |
| P03 | FOR INFORMATION | DR | CR | DR | 06.10.23 |
| P02 | FOR INFORMATION | DR | CR | DR | 22.02.23 |
| P01 | FOR INFORMATION | DR | CR | DR | 08.04.22 |
| P01.2 | FOR COORDINATION | DR | CR | DR | 16.02.22 |
| P01.1 | FOR COORDINATION | DR | CR | DR | 07.02.22 |
| Rev | Description | Drm | Chk | App | Date |

FERNBROOK

The Fernbrook Business Centre
40 Bowling Green Lane
London
EC1R 0NE
info@fernbrook.co

Client
S J M AND CO LIMITED

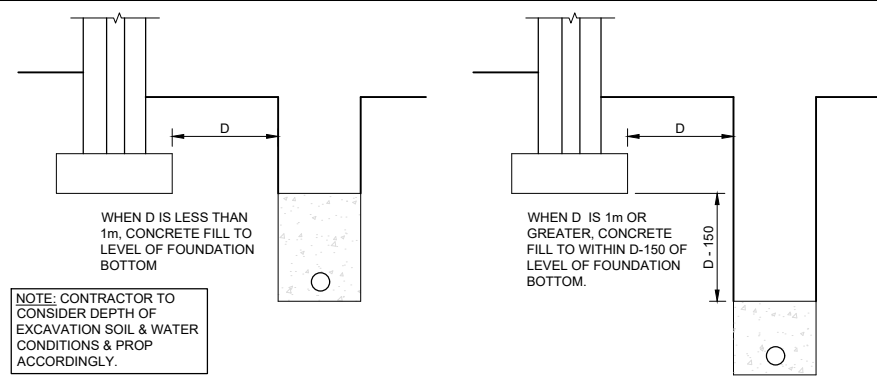
Project Title
**10A & 10B BURWELL ROAD
STEVENAGE, SG2 9RF**

Drawing Title
**PROPOSED SURFACE WATER
& FOUL DRAINAGE STRATEGY**

| | | |
|----------|------------|-------------|
| A1 Scale | Date | Designed by |
| 1:100 | FEB 2022 | DR |
| Drawn by | Checked by | Approved by |
| DR | CR | DR |

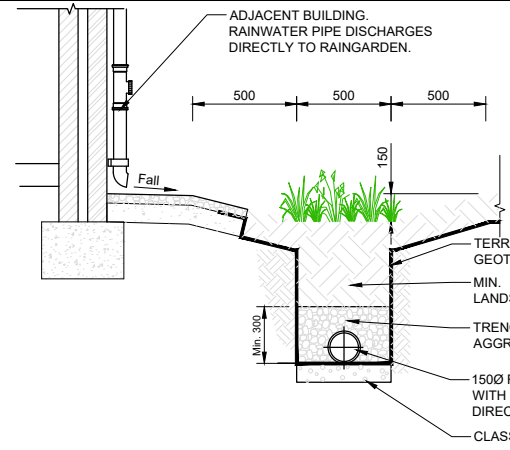
Drawing Number
21210-FCE-XX-XX-DR-D-0500

Rev
P04



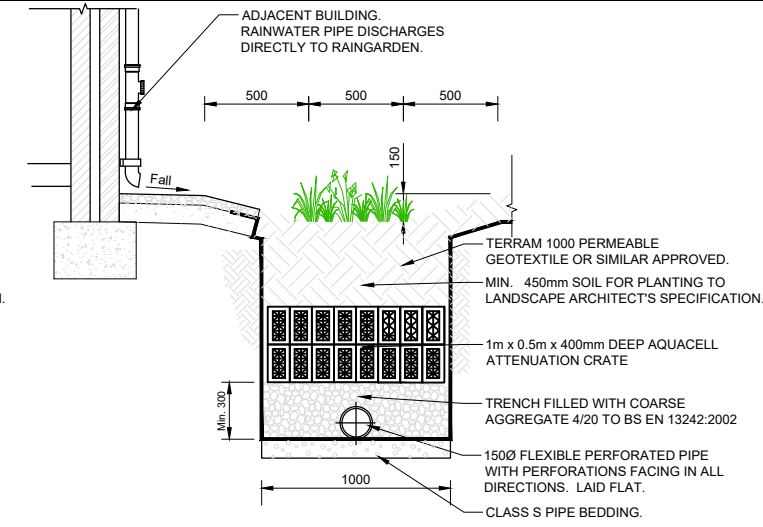
PIPES NEAR BUILDINGS

SCALE NTS



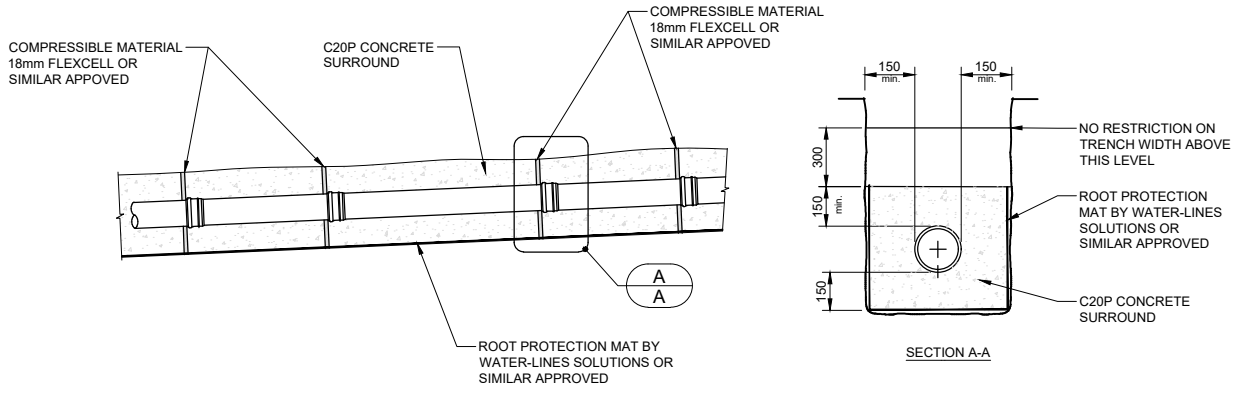
TYPICAL RAIN GARDEN DETAIL

(SCALE 1:20)



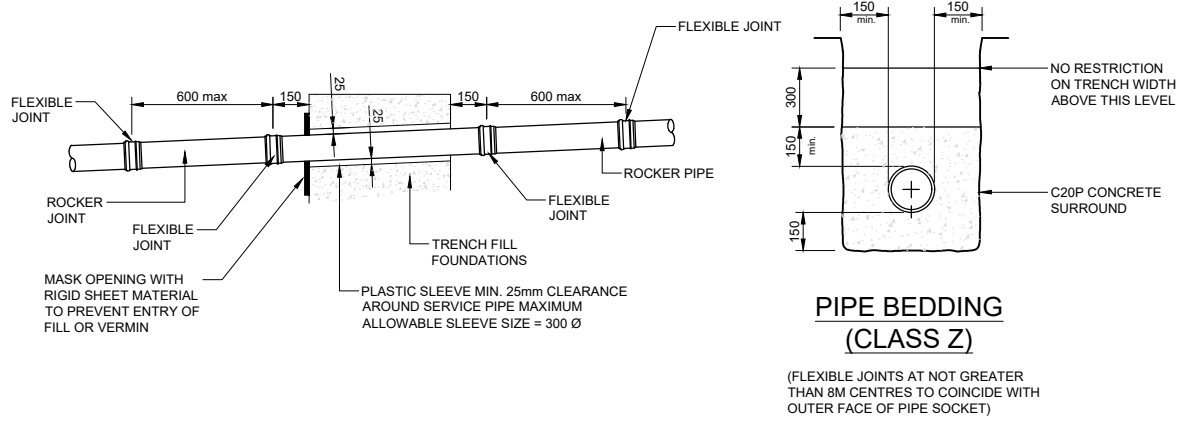
TYPICAL RAIN GARDEN DETAIL WITH GEO-CELLULAR STORAGE

(SCALE 1:20)



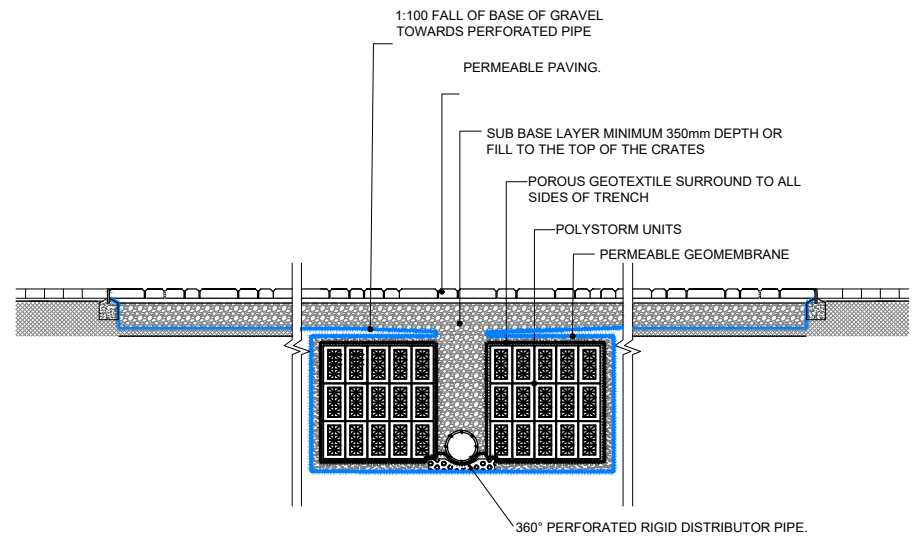
PIPE PROTECTION AGAINST ROOT INTRUSION

(FLEXIBLE JOINTS AT JOINT OF PIPES) SCALE NTS



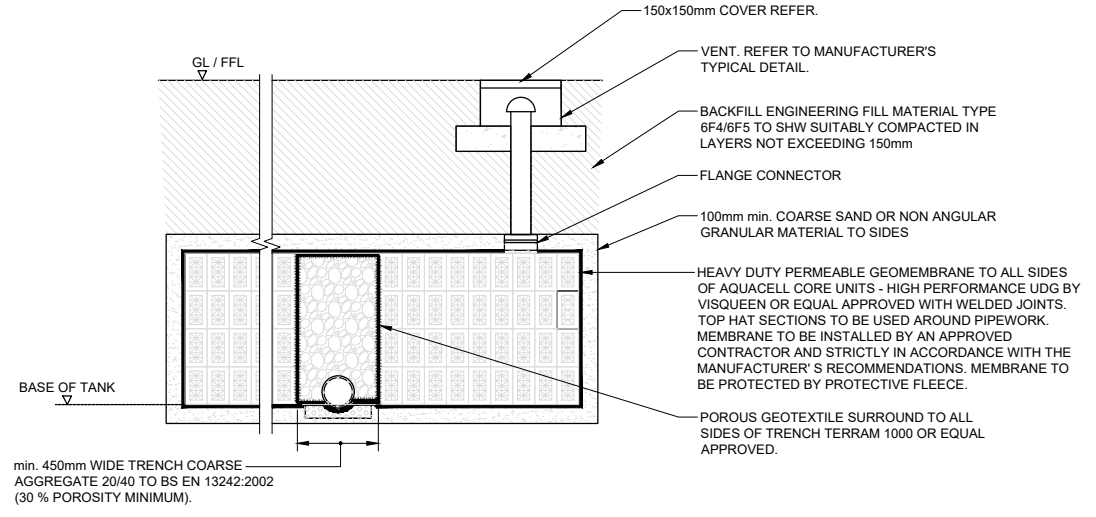
CONCRETE PROTECTION FOR PIPE CROSSOVERS

SCALE 1:20



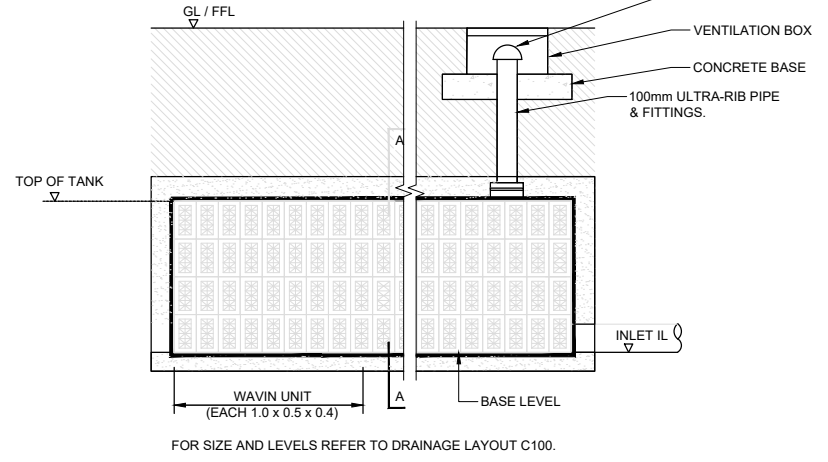
TYPICAL PERMEABLE PAVING WITH GEO-CELLULAR SUB-BASE DETAIL

(NOT TO SCALE)



CROSS SECTION A-A

AQUACELL UNITS TO BE LAID PARALLEL HORIZONTALLY AND BONDED LIKE BRICKS VERTICAL IN ORDER TO AVOID CONTINUOUS VERTICAL JOINTS. SINGLE LAYER APPLICATIONS SHOULD BE FIXED USING WAVIN CLIPS AND MULTI LAYER APPLICATIONS SHOULD BE FIXED USING SHEAR CONNECTORS AND CLIPS. ALL TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.



TYPICAL GEO-CELLULAR SOAKAWAY TANK DETAIL

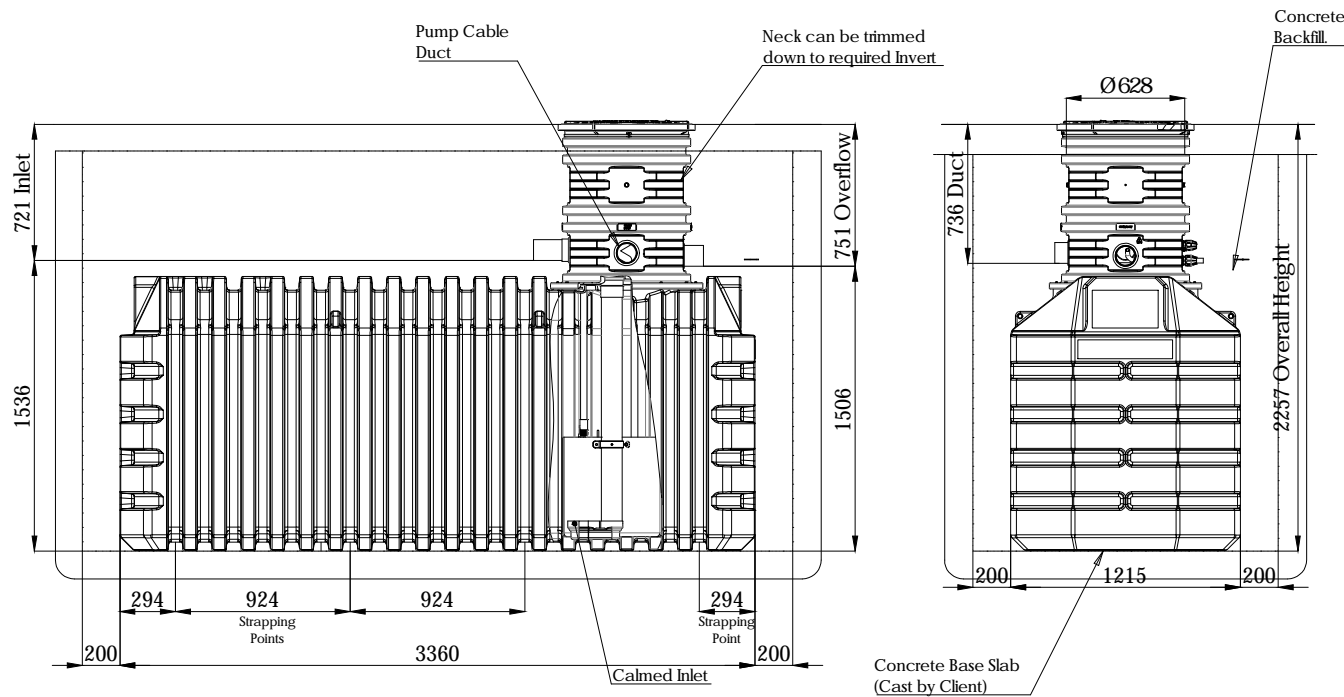
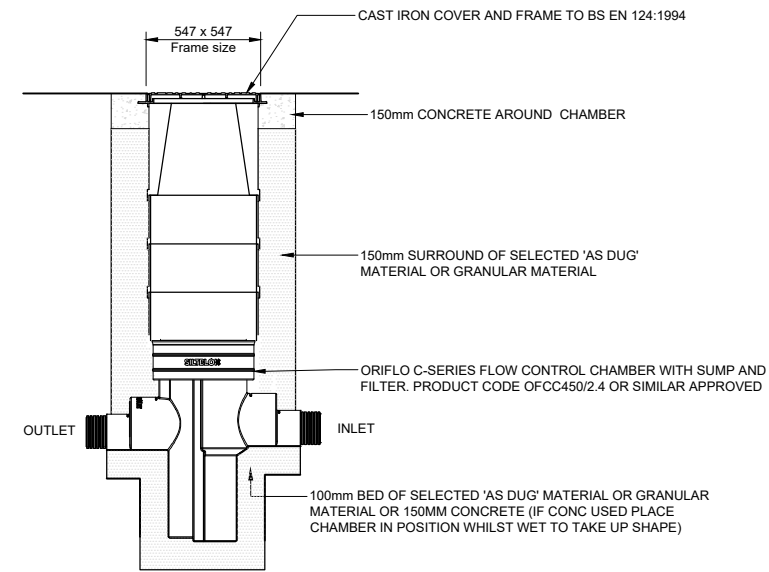
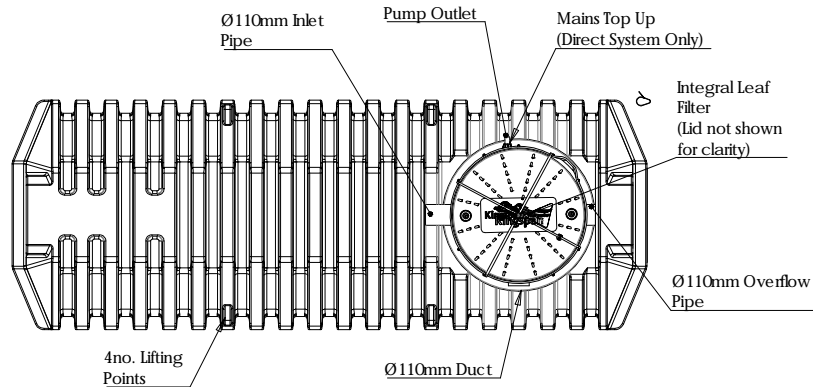
NOT TO SCALE

- NOTES**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 2. 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.
 3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
 4. 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.
 5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

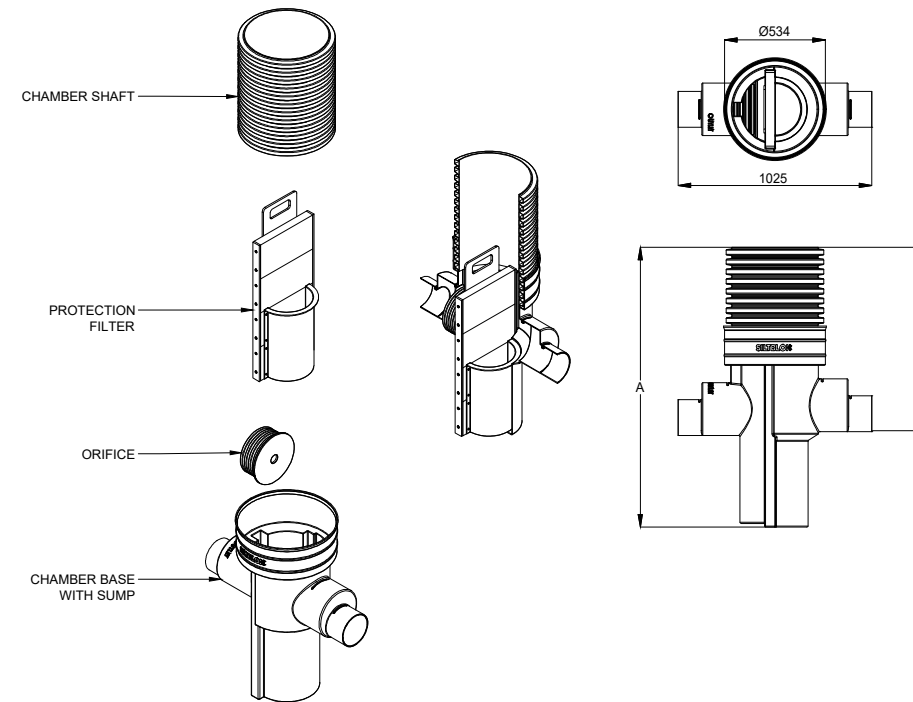
FOR INFORMATION ONLY

| | | | | | |
|--|---------------------------|-------------|-----|-----|----------|
| P01 | FOR INFORMATION | DR | CR | DR | 30.04.24 |
| Rev | Description | Drm | Chk | App | Date |
| <p>The Finbury Business Centre 40 Bowring Green Lane London EC1R 0NE info@fernbrook.co</p> | | | | | |
| <p>S J M AND CO LIMITED</p> | | | | | |
| <p>Project Title: 10A & 10B BURWELL ROAD, STEVENAGE, SG1 9RF</p> | | | | | |
| <p>Drawing Title: TYPICAL DRAINAGE DETAILS SHEET 2</p> | | | | | |
| A1 Scale | Date | Designed by | | | |
| AS NOTED | APR 24 | DR | | | |
| Drawn by | Checked by | Approved by | | | |
| DR | CR | DR | | | |
| Drawing Number | 21210-FCE-XX-XX-DR-D-0551 | | | | Rev |
| | | | | | P01 |

- Notes:
1. This drawing is for 'Dimensional Information' only. It is essential that this drawing is read in conjunction with the 'Installation Guidelines' supplied with the unit (copies available from the sales department)
 2. Pump Outlet and Mains Top up connections are $\varnothing 25$ mm (3/4")
 3. Electrical and water connections from the tank to appliances to be the responsibility of others.
 4. Tank has a trimmable Inlet Invert from 220mm to 720mm. Neck can be trimmed at 100mm increments to required Invert. Refer to drawing DS1296P.
 5. Dry Site and Wet Site: Backfill with Concrete
 6. Tank Weight (Empty) - 310 Kgs



| Strapping Positions | | | | |
|---------------------|-------|-------|-------|-------|
| Unit | 1 | 2 | 3 | 4 |
| GRW160 | 295mm | 925mm | 925mm | 295mm |



| PRODUCT CODE | Pipework Options Ø (mm) | Depth A (mm) | Invert B (mm) | Approx Weight (Kg) | Pallet Qty |
|--------------|----------------------------|-----------------|------------------|--------------------|------------|
| OFCC500/1.5 | 150-225 | 1480 | 965 | 34 | 2 |
| OFCC500/2 | 150-225 | 1990 | 1475 | 39 | 2 |
| OFCC500/2.4 | 150-225 | 2400 | 1885 | 44 | N/A |
| OFCC500/3 | 150-225 | 3000 | 2485 | 50 | N/A |

**ORIFICE PLATE FLOW CONTROL CHAMBER
PLATE PROTECTION MODEL
BY TURTLE ENVIRO OR SIMILAR APPROVED.**
NOT TO SCALE

**RAINWATER HARVESTING SYSTEM
AQUAHARVEST DOMESTIC - 4600L PRODUCT CODE GRW 160
BY KINGSPAN OR SIMILAR APPROVED.**

NOT TO SCALE

- NOTES
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 2. 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.
 3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
 4. 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.
 5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

FOR INFORMATION ONLY

| | | | | |
|---|------------------------|-------------|-----|----------|
| FOR INFORMATION | DR | CR | DR | 09.02.24 |
| Rev | Description | Drn | Chk | App |
| | | | | |
| The Fernbrook Business Centre 40 Soaring Green Lane London EC1R 0NE info@fernbrook.co | | | | |
| Client | | | | |
| S J M AND CO LIMITED | | | | |
| Project Title: | | | | |
| 10A & 10B BURWELL ROAD, STEVENAGE, SG1 9RF | | | | |
| Drawing Title: | | | | |
| TYPICAL DRAINAGE DETAILS SHEET 3 | | | | |
| A1 Scale | Date | Designed by | | |
| AS NOTED | APR 24 | DR | | |
| Drawn by | Checked by | Approved by | | |
| DR | CR | DR | | |
| Drawing Number | 21210-FCE-XX-DR-D-0552 | | | Rev |
| | | | | P01 |

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. 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.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. 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.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.



FOR INFORMATION ONLY

| | | | | | |
|-------|------------------|----|----|----|----------|
| P03 | FOR INFORMATION | DR | CR | DR | 30.04.24 |
| P02 | FOR INFORMATION | DR | CR | DR | 22.02.23 |
| P01 | FOR INFORMATION | DR | CR | DR | 08.04.22 |
| P01.1 | FOR COORDINATION | DR | CR | | 16.02.22 |

| Rev | Description | Drm | Chk | App | Date |
|-----|-------------|-----|-----|-----|------|
|-----|-------------|-----|-----|-----|------|



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40 Bowling Green Lane
London
EC1R 0NE
info@fernbrook.co

Client
S J M AND CO LIMITED

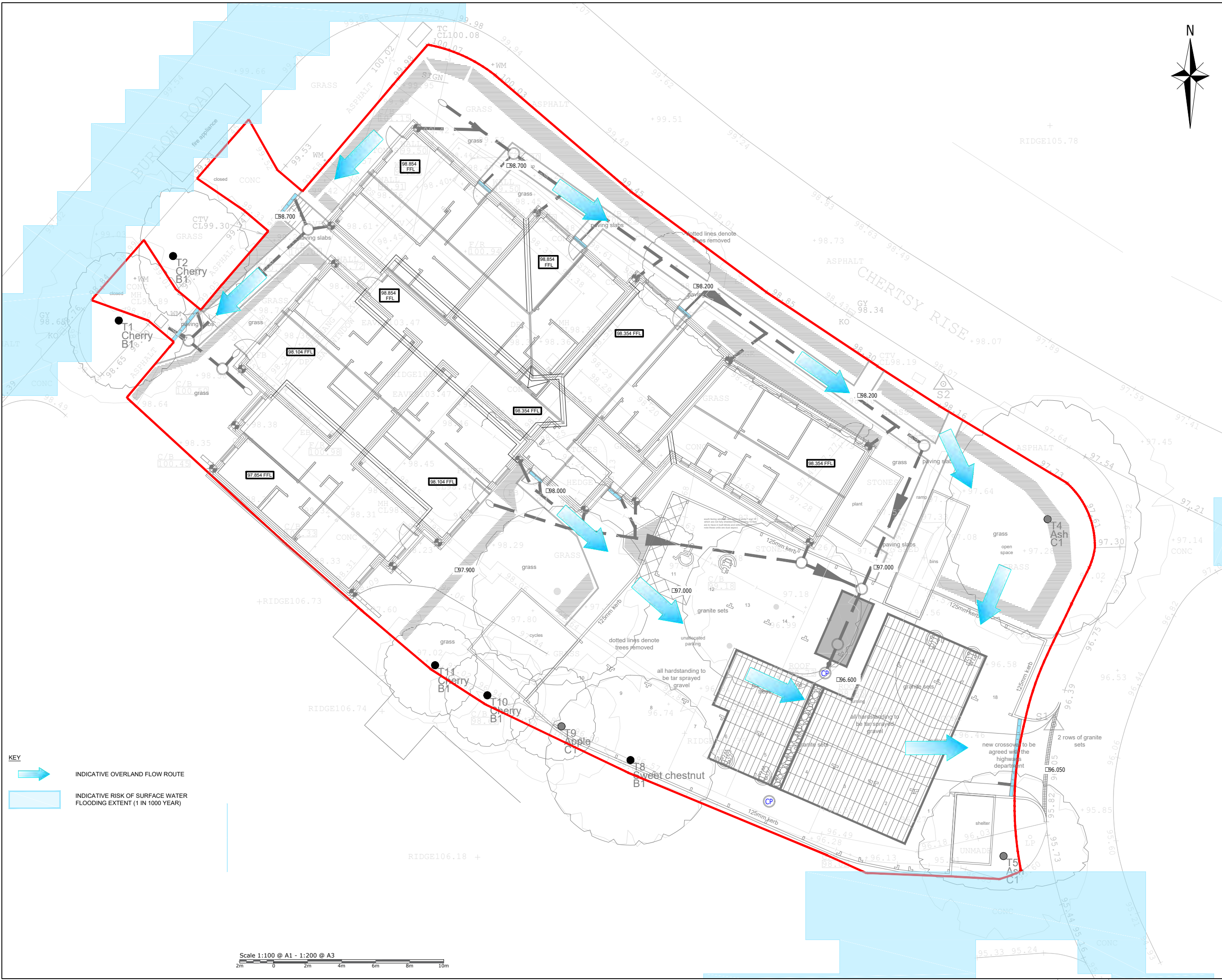
Project Title:
**10A & 10B BURWELL ROAD
STEVENAGE, SG2 9RF**

Drawing Title:
INDICATIVE OVERLAND FLOW ROUTES

| | | |
|----------|------------|-------------|
| A1 Scale | Date | Designed by |
| 1:100 | FEB 2022 | DR |
| Drawn by | Checked by | Approved by |
| DR | CR | DR |

Drawing Number
21210-FCE-XX-XX-DR-D-0515

Rev
P03



KEY

INDICATIVE OVERLAND FLOW ROUTE

INDICATIVE RISK OF SURFACE WATER FLOODING EXTENT (1 IN 1000 YEAR)

Scale 1:100 @ A1 - 1:200 @ A3

APPENDIX F – TEMPORARY & INTERIM DRAINAGE DURING CONSTRUCTION



Scale 1:100 @ A1 - 1:200 @ A3
 2m 0 2m 4m 6m 8m 10m

- NOTES**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 2. 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.
 3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
 4. 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.
 5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
 6. THIS DRAWING HAS BEEN BASED ON DRAWING "W-020 - SJM - Site Set Plan" DATED APRIL 2024.

- 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:
1. 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.
 2. 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.
 3. 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.
 4. 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.
 5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

FOR INFORMATION ONLY

| | | | | | |
|---|-----------------|-------------|-----|-----|----------|
| P01 | FOR INFORMATION | DR | CR | DR | 30.04.24 |
| Rev | Description | Drm | Chk | App | Date |
| | | | | | |
| The Finbury Business Centre 40 Bowring Green Lane London EC1R 0NE info@fernbrook.co | | | | | |
| S J M AND CO LIMITED | | | | | |
| Project Title: 10A & 10B BURWELL ROAD STEVENAGE, SG2 9RF | | | | | |
| Drawing Title: TEMPORARY SURFACE WATER DRAINAGE STRATEGY | | | | | |
| A1 Scale | Date | Designed by | | | |
| 1:100 | APR 2024 | DR | | | |
| Drawn by | Checked by | Approved by | | | |
| DR | CR | DR | | | |
| Drawing Number | Rev | | | | |
| 21210-FCE-XX-XX-DR-D-0501 | P01 | | | | |