# Conditions 7,9 & 27 – Drainage Statement

**at**

## St Columba's Close, Gravesend, Kent

**for**

**Project No. 11270**

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## 1.0 Introduction

Gurney Consulting Engineers have been commissioned by Oakwood Building Contractors to prepare a drainage statement in support of a discharge of conditions application to Gravesham Borough Council (GBC) for residential re-development at St Columba's Close, Gravesend, in Kent.

Planning permission was granted by GBC in April 2023 under reference 20221179 for the demolition of Nos 1-12 St Patricks Gardens, Nos 36-41 St Patricks Gardens and Nos 28-42 even nos. only St Columba's Close, and the caretakers facility. Erection of 2no. 2 storey buildings, 1no 3 storey building and 1no. part 3 and part 4 storey building to provide 46 residential dwellings (Class C3) residential use, with associated vehicle and pedestrian access, amenity space with hard and soft landscaping, car and cycle parking, refuse and cycle storage provision and other associated works stipulating the following conditions in respects to drainage and flood risk;

***Condition 7 – Sustainable Surface Water Drainage***
*'No development approved by this permission shall be commenced until a scheme for sustainable surface water drainage has been submitted to and approved in writing, by the Local Planning Authority. The detailed drainage scheme submitted shall.*

1. *Demonstrate that both the rate and volume of run-off leaving the site post-development will be restricted to that of the existing site during any rainfall event (up to and including the climate change adjusted 100 year critical storm).*

2. *Demonstrate that the existing on-site surface water flow-routes and accumulation points will not be altered in such a way that the development places property at risk of from flooding during any rainfall event, up to and including the climate change adjusted critical 100 year storm,*

3. *Demonstrate that infiltration features are not located on parts of the site where contamination might be present.*

4. *Include a timetable for its implementation.*

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5. *Include a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage system throughout its lifetime.*

*The surface water drainage scheme shall thereafter be implemented in full prior to first residential occupation of the development and thereafter maintained and managed in accordance with the approved scheme.*

*Reason: To ensure that the principles of sustainable drainage are incorporated into this proposal; to ensure that the development does not contribute to, or is not put at risk from, or adversely affected by, unacceptable levels of water pollution caused by mobilised contaminants and to*

*ensure ongoing efficacy of the drainage provisions in accordance with policies CS18 and Cs19 of the Gravesham Local Plan Core strategy (September 2014).*

***Condition 9 – Foul and Surface Water Sewerage Disposal***
*Notwithstanding the details shown on the approved plans, submitted documents and application form, before any above ground works commence details of the proposed means of foul and surface water sewerage disposal shall be submitted to and approved in writing by, the Local Planning Authority with Southern Water. The development shall be carried out in accordance with the approved details.*

*Reason: To ensure that the principles of sustainable drainage are incorporated into this proposal; to ensure that the development does not contribute to, or is not put at risk from, or adversely affected by, unacceptable levels of water pollution caused by mobilised contaminants and to ensure ongoing efficacy of the drainage provisions in accordance with policies CS18 and Cs19 of the Gravesham Local Plan Core strategy (September 2014).*

***Condition 27 – Infiltration of Surface Water Drainage***
*No infiltration of surface water drainage into the ground is permitted other than with the written consent of the Local Planning Authority.*

*Reason: To ensure that the development does not contribute to, or is not put at unacceptable risk from, or adversely affected by, unacceptable levels of water pollution caused by mobilised contaminants in line with paragraph 174 of the National Planning policy Framework (2021) and in accordance with policy Cs19 of the Gravesham Local Plan Core strategy (2014).'*

The purpose of this statement is to provide sufficient information to GBC in regard to surface water management and foul drainage in line with the requirements of the LLFA and conditions 7 & 9.

## Limitations

The general limitations of this assessment are that:

- A number of data sources have been used in compiling this statement. Whilst Gurney Consulting engineers believe them to be trustworthy; it is unable to guarantee the accuracy of the information that has been provided by others.
- This report is based on information available at the time of preparation. There is potential for further information to become available, which may create a need to modify conclusions drawn in this report.

## 2.0 Existing Drainage Regime

An assessment of the existing surface water and foul water drainage regime for the site has been undertaken following a review of the following information annexed within **Appendix A**:

- EDI Surveys Ltd Underground Services Survey
- Southern Water Drainage Searches
- First About Plumbing Drainage Report (28th June 2023)

Findings from the review confirm the site to benefit from a positively drained sewer network which discharges to existing Southern Water foul sewers within the site towards a mains 750mm trunk foul sewer in Valley Drive.

**Existing Storm Regime**

Roof runoff from Nos 1-12 and 36-41 St Patricks Gardens and Nos 28-34 and 36-42 St Columba's Close discharge at an unrestricted rate into the existing foul sewer network. The existing site does not benefit from any form of SuDS or flow control.

Areas of existing hardstanding do not benefit from a positively drained network but rather discharge overland onto areas of soft landscaping.

There are no watercourses or open drainage features within or around the immediate vicinity of the site.

**Existing Foul Regime**

Foul discharge from the site is conveyed via an existing sealed pipe foul sewer network traversing the site discharging towards the mains 750mm sewer located in Valley Drive.

## 3.0 Surface Water Management

Kent County Council (KCC) are the Lead Local Flood Authority (LLFA) and the statutory consultee on surface water management on all planning applications within the borough.

The surface water management section should ensure that there is no adverse impact on flood risk elsewhere resulting from a change in the surface water runoff regime from the re-development.

### 3.1 Design Principles

Key design principles in the following guidance documents steer the approach to managing surface water runoff at sites:

- Building Regulations hierarchy of drainage (H3).
- Interim Code of Practice for SuDS; and
- CIRIA best practice guidance, including the use of the 'SUDS management train'.

Building Regulations hierarchy of drainage outlines the preferred methods for the disposal of surface water with infiltration methods being the preferred option. If this is not possible the next favoured option is to drain to an existing watercourse. If neither of these options are feasible, the regulations state that rainwater discharge should be directed to a sewer.
The Interim Code of Practice for SUDS provides guidance about the hydraulic design criteria for Sustainable drainage systems. This in general refers to both peak rate of runoff and the volume of runoff, post development. Prior to mitigation measures such as the use of SuDS attenuation features, both the volume and peak rate of runoff may increase post development.

The design principles for surface water management extend beyond simple hydraulic criteria. CIRIA guidance promotes the use of the SUDS management train, a concept where SUDS techniques are used to treat, convey and store surface water runoff. This approach is considered as part of the SUDS selection methodology.

### 3.2 National Planning Policy

The Government's National Planning Policy Framework (NPPF), originally published by the Department for Communities and Local Government in March 2012 was last updated in September 2023 and sets out the Government's planning policies for England and how they should be applied. Key priorities for planning to address, including climate change, flood risk, water quality and biodiversity are included within the document.

Planning Practice Guidance last updated in August 2022 brings together planning practice guidance for England and it provides advice on how planning can take account of the risks associated with flooding and coastal change in plan-making and the planning application process. This includes demonstrating how flood risk will be managed now and over the lifetime of the development, taking climate change into account.

### 3.3 Sustainable Drainage Systems

Paragraph 54 of the Flood Risk and Coastal Change Planning Practice Guidance (Reference ID: 7-054-20220825) advises that sustainable drainage systems (or SuDS) are designed to control surface water runoff close to where it falls, combining a mixture of built and nature based techniques to mimic natural drainage as closely as possible and accounting for the predicted impacts of climate change. They provide benefits for water quality, biodiversity and amenity. Sustainable drainage systems provide opportunities to:

- Replenish groundwater resources;
- Capture and re-use rainwater;
- Create and connect valuable areas of blue-green infrastructure
- Enhance the attractiveness and value of new development by integrating water management with habitat for wildlife and opportunities for amenity and recreation.

Paragraph 55 of the Flood Risk and Coastal Change Planning Practice Guidance (Reference ID: 7-055-20220825) advises that, the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer.

### 3.4 Non-Statutory technical standards for sustainable drainage systems

The non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems to drain surface water have been published by Defra. The standards apply to systems that drain surface water from housing, non-residential or mixed-use developments for the lifetime of the developments. The non-statutory technical standards for sustainable drainage systems are to be used in conjunction with the National Planning Policy Framework, and Planning Practice Guidance on Flood Risk & Coastal Change that was revised in light of these changes in March 2015.

The Government's 'Non-statutory technical standards for sustainable drainage systems' set out peak flow control standards (S2 and S3) and volume control technical standards (S4, S5 and S6).

For the proposed development site, the following non-technical standards apply for existing brownfield development –

**Peak Flow Control**

Standard S3 states: For developments which were previously developed, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year

rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event but should never exceed the rate of discharge from the development prior to redevelopment for that event.

**Volume Control**

Standard S5 states: Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development site prior to redevelopment for that event.

Standard S6 states: Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk

## 3.5 Catchment Areas

The impermeable site areas have been reviewed based upon the extent of redevelopment noting that the site boundary includes areas of existing built development which are to be retained. Results from the review are listed in Table 1 below**.** (See also drawing 11207-450 in **Appendix B**).

| | **Impermeable** (Hardstanding's) | **Total Site Area** (Redline boundary) |
|---|---|---|
| **Existing Site Impermeable Areas** | 1,723 m² | 10,729 m² |
| **Development impermeable Areas** | 4,170 m² | 10,729 m² |
| **Development Impermeable Areas + 10% uplift for urban creep (where applicable)** | 4,204 m² | 10,729 m² |

**Table 1:** Catchment Areas

There will be a net increase of 2,447m² in impermeable area owing to the redevelopment. Taking into account a 10% increase on the development impermeable areas attributed to the terrace units to allow for urban creep, the total increase is 2,481m²

**Urban creep**

The development areas summarised in Table 1 above have been colour coded on drawing 11207-450 included within Appendix B.

This separates areas of private residential development (where the likelihood of future property extensions would occur) from areas of strategic highway, flats, maisonettes and parking areas . Reviewing the site proposals, urban creep has been applied to residential terraces (T01) which is approximately 338m². A 10% increase has been applied to this area to allow for urban creep (338m² x 0.1 = 372m²).

The remaining development accounts for approximately 3,832m² of impermeable area, and as such the total catchment which needs to be accommodated within the surface water management strategy is 0.420ha

### 3.6 Pre Development Run off

An assessment of the pre-development Brownfield run-off from the site has been calculated using parameters specified within, 'The Wallingford Procedure, Volume 4 - The Modified Rational Method' (*Q=2.78CiA*) –
Where;

C = runoff coefficient, (83% assumed for winter), Q= flow (l/s)

I = rainfall intensity (mm/hr), A = Impermeable Area (ha)

An assessment of the proposed peak discharge volume for a 360min 100 year winter storm duration (with climate change) has been carried out based upon the impermeable area, rainfall depth and coefficient of runoff. For the redeveloped site, the runoff volume is calculated as: 0.83% runoff x 0.062m rainfall depth for 100 year 360 minute storm, x 1,723 m² impermeable area x 1.4 for 40% climate change.

| **Pre Development Brownfield runoff** | | | | | |
|---|---|---|---|---|---|
| **Event** | **C** | **I** | **A** | **Flow (l/s)** | **6hr 100 Year CC winter Volume** |
| 1 in 2 year | 0.83 | 36.438 | 0.172 | **14.5** | **154.164 m³** |
| 1 in 30 years | 0.83 | 117.080 (+35% cc) | 0.172 | **46.4** | |
| 1 in 100 years | 0.83 | 158.471 (+40% cc) | 0.172 | **62.9** | |

**Table 2:** Summary of Pre Development Brownfield Runoff

A greenfield run-off assessment has also been carried out for the site utilising FEH 2013 rainfall data to evaluate the pre-development greenfield run-off rates in line with requirements of the LLFA. Findings are summarised in table 3 below.

| **Return period** | **Winter (l/s/ha)** |
|---|---|
| **Qbar (2 year)** | **0.7** |
| 1 in 1 year | 0.6 |
| 1 in 30 years | 2.0 |
| 1 in 100 years | 2.9 |

**Table 3:** Summary of Greenfield runoff rates (FEH 2013 rainfall data)

The assessment is based upon a 1.0ha catchment area to determine the equivalent greenfield runoff rates for the FEH data in litres per second per hectare.

### 3.7 Post Development Runoff

The post development run-off rates for the sites impermeable areas has also been calculated by using parameters specified within, 'The Wallingford Procedure, Volume 4 - The Modified Rational Method' and findings presented in table 4 below.

| **Post Development runoff** | | | | | |
|---|---|---|---|---|---|
| **Event** | **C** | **I** | **A** | **Flow (l/s)** | **6hr 100 Year CC winter Volume** |
| 1 in 2 year | 0.83 | 36.438 | 0.420 | **35.3** | **376.149 m³** |
| 1 in 30 years | 0.83 | 117.080 (+35% cc) | 0.420 | **113.5** | |
| 1 in 100 years | 0.83 | 158.471 (+40% cc) | 0.420 | **153.6** | |

**Table 4:** Summary of Post Development Runoff prior to mitigation

In accordance with the requirements of the LLFA and non-statutory technical standards for sustainable drainage systems, development flows should seek to discharge surface water run-off at a rate as close as reasonably practical to existing greenfield run-off rates.
A copy of the pre and post development parameters can be found in **Appendix C.**

### 3.8 Proposed Discharge Location

In accordance with the building regulations hierarchy, NPPF and SUDS best practice, and the requirements of conditions 7 and 27, the discharge location for surface water flows has been reviewed for applicability within the site:

***Infiltration Drainage***

Intrusive ground investigations were undertaken by RPS group in December 2022 summarising the following encountered ground conditions as depicted in extract Figure 1 below.

**Table 5-1: Encountered Strata**

| Strata | Depth to Top of Strata (m bgl) [mAOD] | Thickness (m) |
|---|---|---|
| Topsoil | Ground Level [31.4 to 24.34] | 0.0 to 0.2 |
| Made Ground | Ground Level to 0.2 [31.20 to 23.07] | 0.40 to 1.90 |
| Head Deposits | 0.75 to 0.90 [25.35 to 22.32] | 0.20 to 2.10 |
| Seaford Chalk Formation | 0.60 to 2.90 [30.8 to 21.44] | Proven to 9.4 |

**Figure 1:** Extract table 5-1 from RPS Phase 2 Geotechnical Site Investigation

BRE DG 365 soakage tests were undertaken within three trial pits across the site yielding soil infiltration rates ranging from 3.49 x $10^{-6}$m/s to 3.49 x $10^{-5}$m/s. The variable test results were considered indicative of the nature of the remoulded chalk matrix which was encountered as grade Dc and Dm structureless chalk.

The preliminary geo-technical risk register included within the RPS investigation concluded that the risk of ground dissolution features and natural cavities was low but given a medium risk rating.

No groundwater was encountered at the time of the investigations

Follow up investigations were undertaken by RPS in February 2023 which included additional winter groundwater monitoring and further soakage tests.

4No full scale BRE 365 soakage tests were undertaken within the site yielding soil infiltration rates ranging from 2.02 x $10^{-3}$m/s to 2.00 x $10^{-5}$m/s confirming the site soils suitable for infiltration.

Noting that the tests were undertaken within the chalk bedrock it was advised that infiltration devices should be sited at least 5.00m – 10.00m away from any structure following the recommendations of CIRIA C574.

No groundwater was encountered upon the return visit

On the basis of the RPS investigations it is concluded that discharge location criteria has been met with proposals to discharge surface water runoff from the re-developed site via infiltration .

Extracts of the RPS ground investigations have been annexed within **Appendix D**.

***Discharge to a watercourse***
There are no watercourses or water features within or around the vicinity of the site.

***Discharge to a surface water sewer***
There are no surface water sewers within or around the vicinity of the site

## 3.9 Surface Water Drainage Scheme

**SuDS Selection Criteria**
The SuDS strategy for the site has sought to follow a hierarchy approach. This is tabulated below with comments and reasons where certain SuDS features have been included or excluded from the drainage scheme.

| SuDS Technique | Included / Excluded | Comments |
|---|---|---|
| Living Roofs (green roofs / blue roofs) | Included | Green roofs are proposed for the proposed cycle store and bin store areas across the site. |
| Raingardens/Bio retention areas/Water Butts | Excluded | Considered but excluded as proposed green roofs and SuDS features proposed are in accordance with the approved strategy. |
| Basin / ponds | Excluded | There is limited available open space to provide and attenuation basin or pond. This was considered but |

| | | |
|---|---|---|
| | | ruled out due to layout constraints and site topography. |
| Filter Strips and Swales | Excluded | Excluded due to layout constraints . |
| Infiltration Devices | Included | Cellular storage soakaways and Type A permeable pavements which allow full infiltration are proposed |
| Permeable surfaces | Included | Type A Permeable paving has been incorporated within the scheme. |
| Tanked systems | Included | Geocellular storage tanks are proposed as outfalls for the development. These tanks store peak volumes during the 1% AEP plus 40% climate change. |
| Proprietary treatment systems | Included | Noting that the site falls within a zone 2 ground water source protection zone, 2No Stage 1 bypass separators are proposed for water treatment upstream of the soakaway outfalls. |

**Table 5:** SuDS Hierarchy Approach

In view of the requirements of conditions 7 and 27, the LPA, the LLFA and design parameters and constraints associated with redeveloping this site, a detailed surface water drainage scheme has been devised and hydraulically modelled to demonstrate that the scheme can be suitably implemented without increasing the level of flood risk, when the surface water drainage system experiences a 1:100-year rainfall event (including 40% allowance for climate change).

The surface water drainage scheme has been designed to ensure:

- A reduction in the pre-development site discharge for peak storm events.
- Sustainable Urban Drainage systems are incorporated within the scheme.
- Consideration is given for the improvement of water quality within the design.
- The designed drainage scheme can satisfactorily retain a critical 1 in 100 Year storm event with climate change.

Surface water drainage is to be discharged via a series of measures that utilise infiltration SuDS. These measures are as follows –

**Storm Network 1 – Outfall Soakaway CS1**

- Roof runoff discharges into a sealed pipe sewer network at ground level which outfalls to a mains storm sewer network within the access. Green roofs have been incorporated within the scheme for bin and cycle stores only. These shall connect directly into a privately maintained below ground storm drain prior to connecting into the mains sewer network within the access.
- Surface water runoff associated with the main access road shall discharge via a series of trapped road gullies into the mains storm system. This outfalls to a Klargester bypass separator to provide water treatment.

- The treated surface water runoff discharges into a cellular storage soakaway with a clean stone surround and filtration textile prior to infiltrating into the underlying soils.
- Noting the geological constraints and recommendations within the RPA site investigations, the soakaway has been sited 10m from existing and proposed buildings.

**Storm Network 2 – Outfall Soakaway CS2**

- Roof runoff discharges into a sealed pipe sewer network at ground level which outfalls to a mains storm sewer network within the shared access prior to discharging into a bypass separator.
- The treated surface water runoff discharges into a cellular storage soakaway located within the access which infiltrates into the underlying soils.
- As with CS1, the soakaway has been sited 10m from existing and proposed buildings.

**Shared Access and On Plot Parking**

- The shared access link to St Patricks Gate and associated parking for Block B shall be constructed in a Type A (full infiltration) heavy duty permeable paving system. Source control modelling suggest a minimum thickness of 250mm clean stone sub-base material with 32% void ratio sufficient to provide attenuation storage.
- On plot parking bays shall be constructed in a light duty type A permeable pavement with 150mm minimum thickness of clean stone filter material.

A drainage scheme has been devised and hydraulically assessed incorporating the above mentioned SuDS measures. A copy of the detailed surface water drainage proposals developed for this scheme can be found in **Appendix E.**

The hydraulic modelling of the storm network is based upon micro drainage and source control simulations under various scenarios up to and including the critical 1 in 100 Year storm event with additional 40% allowance for climate change.

The simulations confirm that the storm can be managed and maintained within the site. The hydraulic model of the proposed surface water network and SuDS devices can be found in **Appendix F**.

The above plan and calculations demonstrate that a suitable means of drainage can be provided to drain the re-developed site in terms of surface water runoff in accordance with best practice guidance and standards.

The proposed drainage scheme ensures that surface water arising from the re-developed site would be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account as required by Condition 7.

**Water Quality**

It is important to address issues with regards to quality when considering surface water management. As surface water is proposed to be discharge to the existing public sewer, treatment is proposed as part of a SuDS Management Train in accordance with the recommendations of the SuDS Manual (CIRIA 753) and as required by the LLFA.

Chapter 26 of the CIRIA SuDS Manual (2015) provides guidance on methods that should be used to design SuDS to meet the water quality design criteria and good practice design standards. Diffusion of urban pollution is a significant factor in compromising groundwater and receiving water standards that are required under the EA Water Framework Directive. Chapter 4 of the SuDs Manual summarises factors, which influence pollution levels in urban run-off. This summary is presented in **Figure 1:**

**Factors influencing pollution levels in urban run-off**

The amount and type of pollution washed off a surface will depend on many things including:

- Planning activities on, above and adjacent to the surface that affect the deposition of pollutants, their retention on the surface and the extent to which they are mixed with runoff (including pollution prevention strategies)
- Unplanned activities (accidents and spillages) that can cause temporary unexpected high pollution concentrations.
- The surface location and type, affecting wash-off rates and contaminant movement mechanisms.
- The drainage path.
- The length of the dry weather period before the rainfall event
- The intensity and the duration of the rainfall, and the associated flow velocities
- Any further pollutant transformations occurring during residence and conveyance within gullies, chambers, pipe or channel networks, gravels, soils and vegetation and quiescent bodies of water.

**Figure 1:** Extract of Box 4.1 of the SuDS Manual (CIRIA C753)

Table 4.3 of the SuDS Manual classifies the pollution hazard level for individual property driveways, roofs, low traffic roads and non-residential parking as being "low" and thus only requiring a "Simple index approach" in terms of the requirements for the discharge to surface waters.

The SuDS Manual summarises the steps for the simple index approach:

**Step 1** – *Allocated suitable pollution hazard indices for the proposed land use.*

**Step 2** – *Select SuDS with a total pollution mitigation index that equals or exceeds the pollution index.*

**Step 3** – *Where the discharge to a protected surface waters or groundwater, consider the need for a more precautionary approach.*

The SuDS Manual describes "protected surface waters" as protected surface water resources, which include those designated for drinking water abstraction or for other environmental protection reasons". Table 26.2 of the SuDS manual notes the following pollution hazard indices for the residential land use as depicted in Table 6 below:

| Land Use | Pollution Hazard Level | Total suspended solids (TSS) | Metals | Hydrocarbons |
|---|---|---|---|---|
| Residential Roofs | Low | 0.2 | 0.2 | 0.05 |
| Individual property driveways, residential car parks, low traffic roads (e.g., cul-de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e. Less than 300 vehicle movements/day | Low | 0.5 | 0.4 | 0.4 |

**Table 6:** Pollution Hazard Indices (CIRIA Report C753 Table 26.2)

The indicative SuDS mitigation indices for discharges to surface water sewers for the features proposed are summarised in Table 7 below.

| Component | Total Suspended Solids (TSS) | Metals | Hydrocarbons |
|---|---|---|---|
| Proprietary Treatment Systems | These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area | | |

**Table 7:** Indicative SuDS mitigation Indices for discharges to surface water sewers (CIRIA Report C753 Table 26.3)

The indicative SuDS mitigation indices for discharges to groundwaters for the features proposed are summarised in Table 8 below.

| Characteristics of material overlying the proposed infiltration surface through which runoff percolates | Total Suspended Solids (TSS) | Metals | Hydrocarbons |
|---|---|---|---|
| A soil with good contaminant attenuation potential of at least 300mm in depth | 0.4 | 0.3 | 0.3 |

| | | | |
|---|---|---|---|
| Constructed permeable pavement (where a suitable filtration layer is included that provides treatment and including a geotextile at the base separating the foundation from the sub-grade) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth | 0.7 | 0.6 | 0.7 |

**Table 8:** Indicative SuDS mitigation Indices for discharges to groundwater (CIRIA Report C753 Table 26.4)

As the proposed mitigation indices exceed the land use pollution hazard the proposed SuDS components are considered sufficient in providing pollution risk mitigation in accordance with the SuDS Manual Ciria C753

**Construction and Maintenance**

Construction of temporary drainage facilities during the construction phase will be the responsibility of the Contractor developing the site who will provide details of temporary drainage proposals prior to Construction.

This is to include consideration of programming, layout, erosion, sediment and pollution control measures.

Construction works are scheduled to commence in July 2024 with an estimated completion date of March 2026 for final handover.

This construction phase includes timescales for adoption of the surface water management system associated with Network 1 under a S104 agreement with Southern Water noting that it is intended for the main access road to be forwarded to KCC highways under a S38 agreement.

Consideration has therefore been given to the long term maintenance of the proposed drainage structures associated with the development. The SuDS, cellular storage tank (CS1), upstream bypass separator and associated mains sewers will be forwarded for adoption to Southern Water under a S104 agreement. Southern Water have their own maintenance regimes for adopted public sewers.

The permeable paving, cellular storage tank CS2, green roofs and all associated external pipework, chambers and manholes will be the responsibility of the developer.

A maintenance plan has been developed for the proposed SuDS features associated with this scheme and can be found within **Appendices G**.

**Exceedance**

Whilst the drainage system has been designed to a very high standard (1 in 100 Year storm event including climate change), it is possible that a more extreme event will occur and that the design standard for the system will be exceeded. It is best practice to design the drainage system to shed water, primarily into landscaped and other areas, therefore reducing the risk of flooding areas of built development during extreme events.

Exceedance routes should be designed to mimic historic flow paths or provide betterment in order to reduce the risk of flooding as a result of built development in accordance with the requirements of the LLFA and NPPF.

A strategy for directing overland flows has been carried out based upon a detailed design levels review and assessment of existing site topography as illustrated on the exceedance flow paths drawing presented in **Appendix H.**

The proposed flow paths mimic the historic regime whilst providing betterment. This is based upon the fact that the historic surface water drainage regime discharged combined flows unrestricted into the existing foul sewer and a new surface water management system is now proposed and designed to manage the peak 100 year storm return (including climate change) .

## 4.0 Foul Water Drainage

**Pre and Post Development Discharge**
Paragraph B3.1 of Appendix C 'Design and Construction Guidance for foul and surface water sewers under the Code for adoption agreements (CFAG) states *'The peak design flow rates for dwellings should, at the discretion of the designer, be either;*

*a) Calculated in accordance with BS EN 12056-2 system II) or*

*b) 4000 litres per dwelling per day (0.05 litres per dwelling)'*

In this case, option b has been adopted for the pre and post development assessment.

**Pre Development**
The consented scheme includes demolition of approximately 25 dwellings. The pre-development discharge is therefore estimated as 1.25 litres per second (25 dwellings x 0.05).

**Post Development**
The post development discharge for the ne 46 dwellings is calculated as 2.3 litres per second (46 dwellings x 0.05).

**Foul Drainage Strategy**
As identified within section 2.0 and Appendix A of the report, Southern Water public foul sewers have been identified within and around the vicinity of site.

To enable the construction of Blocks A, Terrace 01 and Block B, there will be a requirement for a number of sewers and drains to be abandoned and diverted in order for the development to progress. A S185 application will be made by the developer to Southern Water for these works.

It is proposed that the sewer diversion will be incorporated into a new mains gravity foul sewer network which will serve the development with outfall to the existing 375mm diameter public foul sewer discharging towards Valley Drive.

For representation of the foul drainage proposals, refer to the drainage layout annexed in Appendix E.

**Long Term Maintenance**

Consideration has been given to the long term maintenance of the proposed foul drainage network. It is proposed that the on-site mains foul water drainage network will be forwarded for adoption to Southern Water by the developer under a S104 agreement.

## 5.0 Conclusion

The findings presented within this statement conclude sufficient information and details provided for the discharge of condition 7, 9 and 27.

# APPENDICES

**APPENDIX A**

EXISTING DRAINAGE REGIME

Original Drawing Size: A0

NOTES:-
The accuracy and content of this drawing are dependent on the original specification and EDI should be consulted before use at other scales.

Where underground services are shown, all reasonable care has been taken within the spirit of the original specification and requirement. Before use of this information the user should consult EDI and satisfy themselves of the completeness and accuracy of such information. Underground services may not be shown due to the limitations of techniques imposed by ground conditions and the detection equipment; no guarantee can be given that all services have been recorded. Trial holes should be dug at critical locations.

All reasonable care has been taken in the survey detail represented on this drawing but any discrepancies must be reported to EDI immediately.

Our aim is to produce the best possible results within the specification and cost constraints of our clients. Any comments are most welcome.

Levels shown at kerbs are channel level unless stated.

GRID NORTH

LEGEND

Features:
AV Air Valve
AB Air Brick
BH Borehole
BM Benchmark
BOL Bollard Post
BS Box Sing
BT British Telecom
CAB Cabinet
COL Column
CTV Cable TV Cover
DP Down Pipe Spiral
DF Drinking Fountain
DIS Disused
DPC Damp proof Course
EXC Electricity IC
EJ Expansion Joint
ER Earth Rod
FH Fire Hydrant
FHR Fire Hydrant Reel
FG Flagstaff
G Gully
GV Gas Valve
IC Inspection Cover
IL Invert Level
KER Kerb Stone
KO Kerb Outlet
LB Letter Box
LP Lamp Post
LVP Low Level LP
LP Lamp Post
MH Manhole
MS Mile Stone
MT Mercury Telecom
OHL Overhead Line
PB Power Box
OP Overflow Pipe
PM Parking Meter
PP Power Pole
RE Rodding Eye
RM Road Name Plate
RP Road Post
RSD Roller Shutter Door
RWP Rain Water Pipe
SP Soil Pipe
SV Stop Valve
TCB Telephone Call Box
TL Traffic Light
TS Traffic Signs
UB Universal Beam
UC Universal Column
UP Urinal
UTL Unable to lift
V Vent
VP Vent Pipe
WM Water Meter
WP Water Point
WT Waste Pipe

Building Level Details:
D Door
EL Eave Level
F Floor Level
FRL Flat Roof Level
HL Head Level
PL Parapet Wall
RL Ridge Level
SL Sill Level
SOA Springing of Arch
TA Top of Arch
W Window
CLG Ceiling/Beam Soffit

Boundary Types:
BW Barbed Wire
CB Close Boarded
CH Chain
C Corrugated Iron
CP Chestnut Paling
HH Hedge Hog
HI Interwoven
LL Larch Lap
PA Picket Fence
PR Post & Rail
PW Post & Wire
RPR Ranch Post & Rail
RTW Retaining Wall
VSF Vehicle Safety Fence
WB Wattle Hurdle
CPF Concrete Panel Fence
CBW Concrete Block Wall

Surfaces & Finishes:
B Brickwork
BR Breeze Block
C Concrete
CLT Clay Tiles
CP Crazy Paving
CPS Concrete Paving Slabs
CR Corrugated Iron
CR Concrete Render
CT Ceramic Tiles
G Glass
HBD Hardboard
L Linoleum
PL Plastic
PAV Brick Pavors
S Steel work
T Timber
TSP Textured Safety Paving
VT Vinyl Tiles

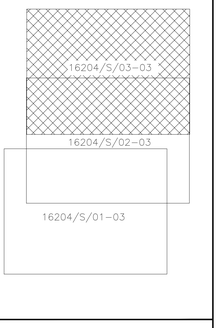
Services
CATV cables
Electric cables
Data cables
Electric cables
Fluid water
Gas pipes
Manhole duct
Service ducts
Storm water
Telecom cab. Underfloor
Water pipes
Pipe Diameter/Flow
Overhead Lines

Survey Station
Fence
Gate
Painted Road Markings
Edge of Vegetation
Kerb/Drop Kerb
Tree
Top
Trunk
Banks
Building
Overhead Building Detail
Wall

Control: All levels and co-ordinates are related to the datums described.
The horizontal control of this survey is based on Ordnance Survey grid as translated from GPS coordinates using Leica's SmartNet service. We have applied a reverse scale factor to convert the coordinates to ground level coordinates. The vertical control of this survey is based on OS datum as translated from GPS coordinates using the OSGM15 transformation as supplied by the OS. This may differ from the existing OS benchmarks in the area which should be disregarded; all levels should be taken from EDI survey stations.

The services on this survey have been traced using a combination of Radiodetection RD8000 and EDI Dual Detector Ground Penetrating Radar. Whilst every effort has been made to locate all services no system or equipment is able to locate 100% of services without excavation. The GPR system is capable of locating services in undisturbed but works less well in very wet or very dry soils and ground which has been generally disturbed or built up, it also works better with larger diameter cables and pipes – for example it is difficult to trace small bore cables and pipes and impossible to trace fibre optic cables, distinguish between services if they are adjacent, cannot always distinguish small pipes/cables adjacent to large ones and can be swamped by radiation from buildings (when very close to them) or high voltage overhead lines.

SHEET LAYOUT




Station Schedule

| Station | Easting | Northing | Level | Type |
|---|---|---|---|---|
| 1 | 565978.561 | 172151.951 | 29.939 | Road Nail |
| 2 | 565952.156 | 172153.831 | 23.782 | Hilti Nail |
| 3 | 565909.453 | 172082.538 | 25.023 | Hilti Nail |
| 4 | 565908.873 | 172082.987 | 25.023 | Hilti Nail |
| 5 | 565886.892 | 172015.654 | 26.012 | Hilti Nail |
| 6 | 565915.419 | 171998.990 | 30.096 | Peg |
| 7 | 565940.977 | 171980.007 | 32.498 | Hilti Nail |
| 8 | 565947.465 | 171970.515 | 33.741 | Hilti Nail |
| 9 | 565934.745 | 171973.869 | 32.573 | Peg |
| 11 | 565934.622 | 171952.340 | 33.161 | Hilti Nail |
| 12 | 565943.662 | 171943.327 | 34.135 | Hilti Nail |
| 18 | 566017.167 | 172014.780 | 35.686 | Peg |
| 19 | 566054.979 | 172074.910 | 34.554 | Peg |
| 20 | 566018.833 | 172141.724 | 29.816 | Peg |
| 22 | 565995.044 | 172120.056 | 28.707 | Hilti Nail |
| 23 | 565963.650 | 172133.225 | 26.214 | Peg |
| 24 | 566019.888 | 172166.745 | 29.347 | Peg |
| 25 | 566057.757 | 172163.315 | 28.263 | Hilti Nail |
| 26 | 566002.087 | 172163.827 | 27.968 | Hilti Nail |
| 27 | 565996.186 | 172170.796 | 27.066 | Peg |
| 28 | 565987.561 | 172167.694 | 26.435 | Hilti Nail |
| 29 | 565960.566 | 172152.651 | 24.307 | Hilti Nail |
| 29A | 565951.156 | 172152.651 | 24.307 | Hilti Nail |
| 50 | 565947.970 | 172103.537 | 25.647 | Hilti Nail |
| 58 | 565912.562 | 172026.973 | 26.627 | Hilti Nail |
| 6A | 565921.435 | 172036.397 | 28.376 | Hilti Nail |
| 75 | 565923.730 | 172052.456 | 27.030 | Hilti Nail |
| G2 | 565938.291 | 172183.860 | 23.544 | Road Nail |
| G3 | 565917.347 | 172128.857 | 24.314 | Road Nail |
| G8 | 565872.494 | 172027.698 | 25.821 | Hilti Nail |
| 100 | 565855.191 | 171966.485 | 30.893 | Hilti Nail |
| 101 | 565851.641 | 171944.426 | 30.956 | Hilti Nail |
| 102 | 566039.151 | 172074.803 | 32.074 | Hilti Nail |
| 103 | 565981.443 | 172025.974 | 33.343 | Peg |
| 125 | 566013.835 | 172144.660 | 29.171 | Peg |
| G10 | 565919.127 | 172016.405 | 30.053 | Peg |
| G14 | 565983.410 | 171915.993 | 38.077 | Hilti Nail |
| G15 | 566015.831 | 171876.758 | 41.926 | Hilti Nail |
| G16 | 566001.676 | 171918.962 | 38.946 | Hilti Nail |
| G17 | 566063.760 | 171955.350 | 27.775 | Peg |
| G19 | 566044.898 | 172075.307 | 32.808 | Peg |
| G20 | 566038.286 | 172119.508 | 30.721 | Peg |
| G21 | 566038.286 | 172159.508 | 30.721 | Peg |
| G23 | 566015.342 | 171921.866 | 40.051 | Hilti Nail |
| G27 | 565876.280 | 171945.032 | 35.549 | Hilti Nail |
| G28 | 565967.870 | 171945.310 | 36.200 | Peg |
| G29 | 565952.086 | 171956.663 | 34.695 | Hilti Nail |

| Rev. | Job. No. | Date | Revision Detail | Surveyor | Chkd |
|---|---|---|---|---|---|

CLIENT
Potter Raper Partnership
10 Lindsey Street
London
EC1A 9HP

PROJECT
Underground Services Survey
St Columba's Close
Gravesend
DA12 4AH

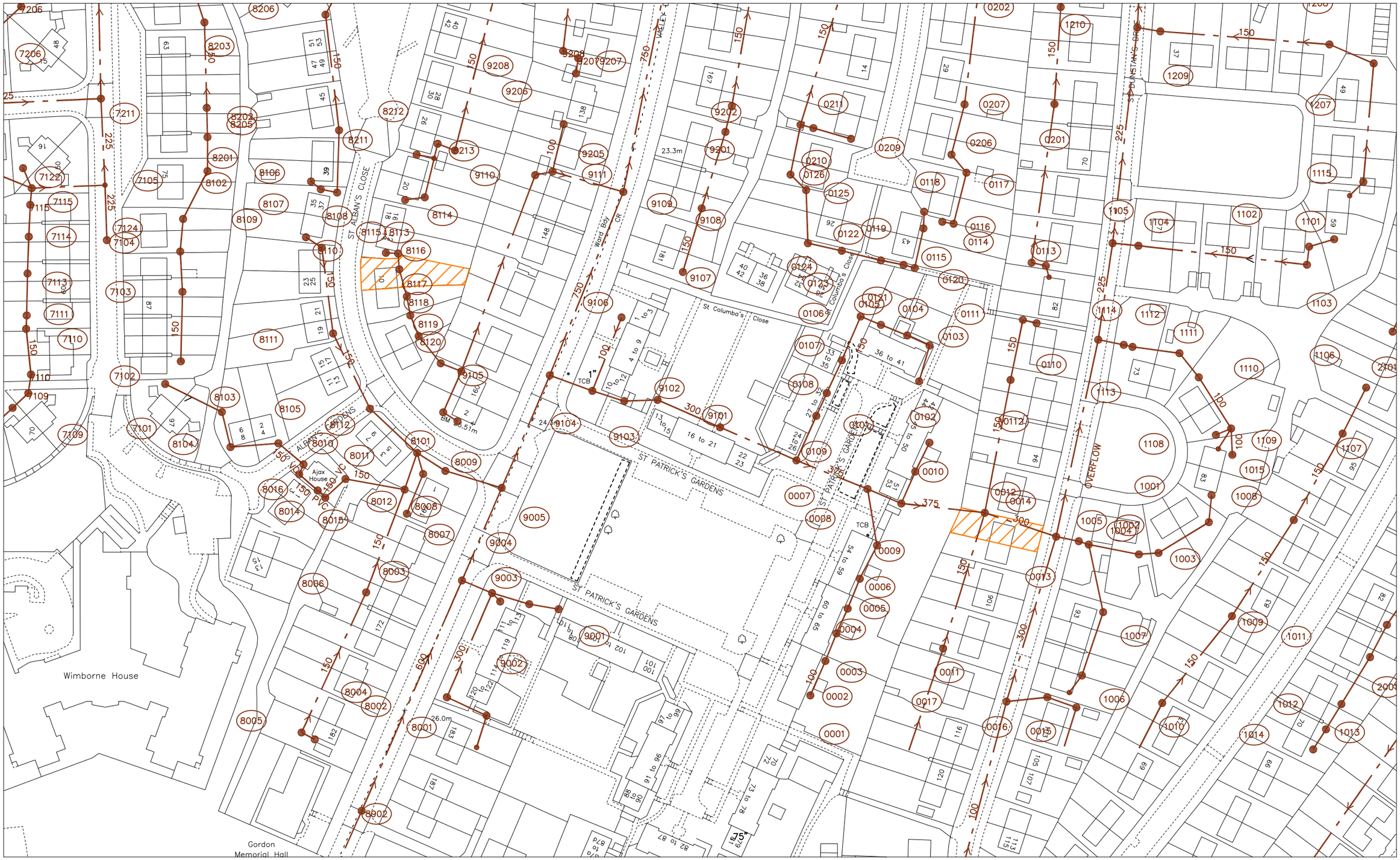
| Job No. | Surveyor | Checked | Date | Scale |
|---|---|---|---|---|
| 16204 | G Pugh | RJA | March 2017 | 1:200 |

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DRAWING No. 16204/S/03–03
REV. –

# SEWER RECORDS PAGE 1 OF 2

172252




171964

565736

566206

| | | |
|---|---|---|
| O.S. REF. TQ6572SE | Drawn by: yadavsa | The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.<br>The actual positions should be determnined on site.<br>WARNING: BAC pipes are constructed of Bonded Asbestos Cement<br>WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement |
| | Scale: 1:1250 | |
| Title: 232113_St Columbas Close, Grav | Date: 12/01/2017 | Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530. |

N

Southern Water

# SEWER RECORDS PAGE 2 OF 2

| Node | Cover | Invert | Size | Material | Shape |
|---|---|---|---|---|---|
| 0001X | | | 100 | UNK | CIRC |
| 0002X | | | UNK | UNK | CIRC |
| 0003X | | | UNK | UNK | CIRC |
| 0004X | | | 150 | UNK | CIRC |
| 0005X | | | UNK | UNK | CIRC |
| 0006X | | | UNK | UNK | CIRC |
| 0007X | | | 375 | UNK | CIRC |
| 0008X | | | UNK | UNK | CIRC |
| 0009X | | | 375 | UNK | CIRC |
| 000DX | | | UNK | UNK | CIRC |
| 0010X | | | UNK | UNK | CIRC |
| 0011X | | | 150 | UNK | CIRC |
| 0012X | | | 300 | UNK | CIRC |
| 0013X | | | 225 | UNK | CIRC |
| 0014X | | | 150 | UNK | CIRC |
| 0015X | | | UNK | UNK | CIRC |
| 0016X | | | UNK | UNK | CIRC |
| 0017X | | | 300 | UNK | CIRC |
| 0101X | | | UNK | UNK | CIRC |
| 0102X | | | UNK | UNK | CIRC |
| 0103X | | | UNK | UNK | CIRC |
| 0104X | | | UNK | UNK | CIRC |
| 0105X | | | 100 | UNK | CIRC |
| 0106X | | | 150 | UNK | CIRC |
| 0107X | | | UNK | UNK | CIRC |
| 0108X | | | UNK | UNK | CIRC |
| 0109X | | | UNK | UNK | CIRC |
| 010DX | | | UNK | UNK | CIRC |
| 0110X | | | UNK | UNK | CIRC |
| 0111X | | | 150 | UNK | CIRC |
| 0112X | | | 150 | UNK | CIRC |
| 0113X | | | UNK | UNK | CIRC |
| 0114X | | | UNK | UNK | CIRC |
| 0115X | | | UNK | UNK | CIRC |
| 0116X | | | UNK | UNK | CIRC |
| 0117X | | | UNK | UNK | CIRC |
| 0118X | | | UNK | UNK | CIRC |
| 0119X | | | 100 | UNK | CIRC |
| 0120X | | | UNK | UNK | CIRC |
| 0121X | | | 100 | UNK | CIRC |
| 0122X | | | UNK | UNK | CIRC |
| 0123X | | | 150 | UNK | CIRC |
| 0124X | | | UNK | UNK | CIRC |
| 0125X | | | UNK | UNK | CIRC |
| 0126X | | | UNK | UNK | CIRC |
| 0201X | | | 150 | UNK | CIRC |
| 0202X | | | UNK | UNK | CIRC |
| 0206X | | | UNK | UNK | CIRC |
| 0207X | | | 150 | UNK | CIRC |
| 0209X | | | UNK | UNK | CIRC |
| 0210X | | | UNK | UNK | CIRC |
| 0211X | | | 150 | UNK | CIRC |
| 1001X | | | UNK | UNK | CIRC |
| 1002X | | | 150 | UNK | CIRC |
| 1003X | | | UNK | UNK | CIRC |
| 1004X | | | UNK | UNK | CIRC |
| 1005X | | | UNK | UNK | CIRC |
| 1006X | | | UNK | UNK | CIRC |
| 1007X | | | UNK | UNK | CIRC |
| 1008X | | | 150 | UNK | CIRC |
| 1009X | | | 150 | UNK | CIRC |
| 1010X | | | 150 | UNK | CIRC |
| 1011X | | | 100 | UNK | CIRC |
| 1012X | | | UNK | UNK | CIRC |
| 1013X | | | 150 | UNK | CIRC |
| 1014X | | | UNK | UNK | CIRC |
| 1015X | | | 100 | UNK | CIRC |
| 1101X | | | UNK | UNK | CIRC |
| 1102X | | | UNK | UNK | CIRC |
| 1103X | | | 150 | UNK | CIRC |
| 1104X | | | UNK | UNK | CIRC |
| 1105X | | | 225 | UNK | CIRC |
| 1107X | | | 100 | UNK | CIRC |
| 1108X | | | UNK | UNK | CIRC |
| 1109X | | | 100 | UNK | CIRC |
| 110DX | | | UNK | UNK | CIRC |
| 1110X | | | UNK | UNK | CIRC |
| 1111X | | | UNK | UNK | CIRC |
| 1112X | | | UNK | UNK | CIRC |
| 1113X | | | 150 | UNK | CIRC |
| 1114X | | | 225 | UNK | CIRC |
| 1115X | | | UNK | UNK | CIRC |
| 111DX | | | UNK | UNK | CIRC |
| 1207X | | | UNK | UNK | CIRC |
| 1208X | | | 150 | UNK | CIRC |
| 1209X | | | UNK | UNK | CIRC |
| 1210X | | | 300 | UNK | CIRC |
| 2001X | | | UNK | UNK | CIRC |
| 2101X | | | UNK | UNK | CIRC |
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| 7102X | 35.347 | 34.417 | 150 | UNK | CIRC |
| 7103X | 35.521 | 33.961 | UNK | UNK | CIRC |
| 7104X | | | UNK | UNK | CIRC |
| 7105X | | | UNK | UNK | CIRC |
| 7109X | | | 150 | UNK | CIRC |
| 710DX | | | 225 | UNK | CIRC |
| 7110X | | | 150 | UNK | CIRC |
| 7111X | | | 150 | UNK | CIRC |
| 7112X | 39.789 | | 150 | UNK | CIRC |
| 7113X | 39.453 | 37.433 | UNK | UNK | CIRC |
| 7114X | | | UNK | UNK | CIRC |
| 7115X | | | UNK | UNK | CIRC |
| 7122X | 38.907 | 37.647 | 100 | UNK | CIRC |
| 7123X | | | UNK | UNK | CIRC |
| 7124X | 37.233 | | 225 | UNK | CIRC |
| 7125X | | | 100 | UNK | CIRC |
| 7206X | | | 150 | UNK | CIRC |
| 7211X | 36.638 | | 225 | UNK | CIRC |
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| 8002X | 26.071 | | 300 | UNK | CIRC |
| 8003X | 25.413 | | UNK | UNK | CIRC |
| 8004X | 26.948 | 26.548 | 100 | UNK | CIRC |
| 8005X | | | 150 | UNK | CIRC |
| 8006X | 26.183 | 24.663 | 150 | UNK | CIRC |
| 8007X | 25.46 | 24.78 | 100 | UNK | CIRC |
| 8008X | 25.443 | 24.533 | UNK | UNK | CIRC |
| 8009X | 25.437 | | 225 | UNK | CIRC |
| 800DX | | | 300 | UNK | CIRC |
| 8010X | 29.522 | 28.052 | 150 | PVC | CIRC |
| 8011X | 28.956 | 27.396 | 150 | UNK | CIRC |
| 8012X | 25.447 | 24.107 | UNK | UNK | CIRC |
| 8014X | | | 150 | PVC | CIRC |
| 8015X | | | 150 | VC | CIRC |
| 8016X | | | 150 | PVC | CIRC |
| 8101X | | | UNK | UNK | CIRC |
| 8102X | 35.2 | 33.17 | 150 | UNK | CIRC |
| 8103X | | | UNK | UNK | CIRC |
| 8104X | 33.649 | 32.029 | 100 | UNK | CIRC |
| 8105X | 31.396 | 29.846 | 150 | VC | CIRC |
| 8106X | 32.221 | | 100 | UNK | CIRC |
| 8107X | 32.079 | | 100 | UNK | CIRC |
| 8108X | 32.058 | 30.878 | 150 | UNK | CIRC |
| 8109X | 32.27 | 30.94 | 100 | UNK | CIRC |
| 810DX | | | UNK | UNK | CIRC |
| 8110X | 31.818 | 30.828 | 150 | UNK | CIRC |
| 8111X | 30.072 | 28.942 | 150 | UNK | CIRC |
| 8112X | 28.311 | 26.701 | UNK | UNK | CIRC |
| 8113X | 30.157 | | UNK | UNK | CIRC |
| 8114X | | | UNK | UNK | CIRC |
| 8115X | 30.098 | 28.4 | 100 | UNK | CIRC |
| 8116X | 29.756 | | UNK | UNK | CIRC |
| 8117X | | | UNK | UNK | CIRC |
| 8118X | | | UNK | UNK | CIRC |
| 8119X | | | UNK | UNK | CIRC |
| 8120X | | | UNK | UNK | CIRC |
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| 8124X | | | 150 | UNK | CIRC |
| 8201X | | | 150 | UNK | CIRC |
| 8202X | | | 150 | UNK | CIRC |
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| 8205X | 31.848 | 30.598 | 150 | UNK | CIRC |
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| 8211X | | | UNK | UNK | CIRC |
| 8212X | 29.194 | 27.944 | 150 | UNK | CIRC |
| 8213X | | | 150 | UNK | CIRC |
| 8902X | 26.57 | 24.38 | 600 | UNK | CIRC |
| 9001X | 27.778 | 24.628 | 150 | UNK | CIRC |
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| 9005X | 24.948 | | UNK | UNK | CIRC |
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| 9102X | 86.035 | | 300 | UNK | CIRC |
| 9103Y | 24.511 | | 300 | UNK | CIRC * |
| 9103X | 24.511 | 23.121 | 300 | UNK | CIRC * |
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| 9106X | 24.383 | 23.858 | 100 | UNK | CIRC |
| 9107X | 24.752 | 23.362 | 150 | UNK | CIRC |
| 9108X | 24.231 | 22.991 | UNK | UNK | CIRC |
| 9109X | 23.442 | | 750 | UNK | CIRC |
| 9110X | | | UNK | UNK | CIRC |
| 9111X | 24.152 | | 225 | UNK | CIRC |
| 9201X | | | UNK | UNK | CIRC |
| 9202X | 23.24 | | 150 | UNK | CIRC |
| 9205X | 24.016 | 23.226 | 100 | UNK | CIRC |
| 9206X | 23.575 | | UNK | UNK | CIRC |
| 9207X | | | UNK | UNK | CIRC |
| 9208X | | | UNK | UNK | CIRC |

LINE STYLES / COLOURS

Brown — Foul
Foul Syphon Sewer
Foul Vacuum Main
Foul Rising Main
Red — Combined
Combined Syphon Sewer
Combined Rising Main
Lateral Drain
Orange — Building Over Agreement Area
Dark Blue — Treated Effluent
Purple — Sludge
Sewer Catchment
Section 104 Area
Light Blue — Surface Water
Surface Water Rising Main
Yellow — Private
Green — Access Shaft
Decommissioned

MATERIALS

| | |
|---|---|
| AK | Alkathene |
| BAC | Bonded Asbestos Cement |
| BRC | Brick (Common) |
| BRE | Brick (Engineering) |
| CC | Concrete Box Culvert |
| CI | Cast Iron |
| CO | Concrete (In-Situ) |
| CP | Concrete (Pre-Cast) |
| CSB | Concrete Segments (bolted) |
| CSU | Concrete Segments (unbolted) |
| DI | Ductile Iron |
| GRC | Glass Reinforced Concrete |
| GRP | Glass Reinforced Plastic |
| MAC | Masonry in regular Courses |
| MAR | Masonry in random Courses |
| PE | Polyethylene |
| PF | Pitch Fibre |
| PP | Polypropylene |
| PVC | Polyvinyl Chloride |
| RPM | Reinforced Plastic Matrix |
| SI | Spun Iron |
| ST | Steel |
| VC | Vitrified Clay |
| XXX | Other |
| ZZZ | Unknown |

LEGEND - SEWERS

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry Manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Mnwe (SW)
Flushing ch. Mnwe (F&C)
Flushing ch. Nowe (SW)
Flushing ch. Nowe (F&C)
Demarcation Chamber

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Outfall
Penstock chamber
Damboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change in sewer (s)
Change in sewer
Reflux valve
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Emptying valve
Catchpit
Soakaway
Inlet
Ballancing Pond

Wastewater treatment works
Marine treatment works
Outfall headworks
Vent
Vent column
Tidal storage tank
Blank end
Head of Public Sewer
Micro Pumping Station

SHAPES (S)

| | | | |
|---|---|---|---|
| A | Arched | R | Rectangular |
| B | Barrel | S | Square |
| C | Circular | T | Trapezoidal |
| E | Egg | U | U Shape |
| H | Horseshoe | X | Other |

NODE REFERENCING SYSTEM

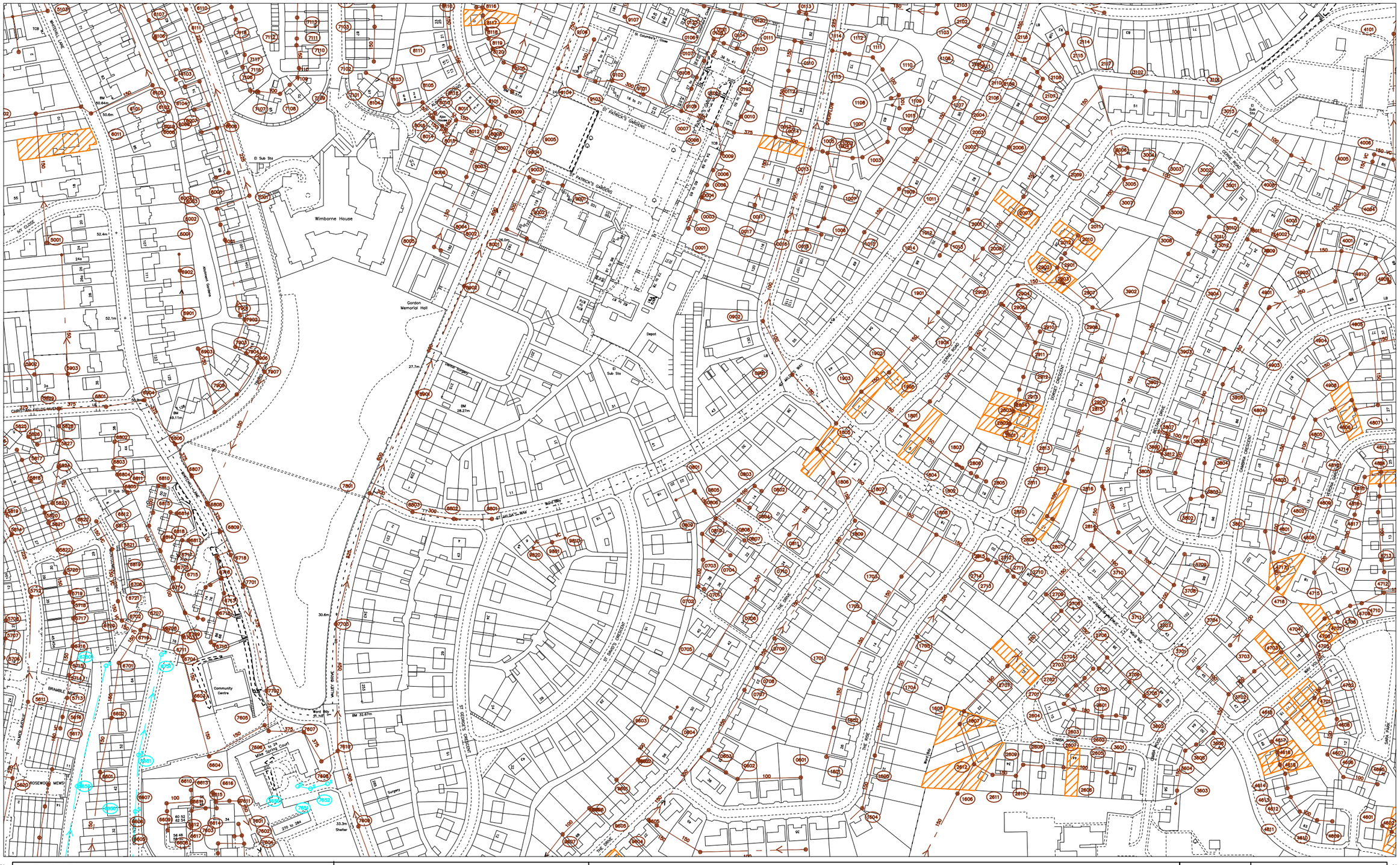
1st digit: hundred metre easting identifier
2nd digit: hundred metre northing identifier
3rd digit: sewer type identifier
0-4 = Foul/Combined
5-9 = Surface Water
4th digit: next sequential node

| | |
|---|---|
| Drawn by: | yadavsa |
| Title: | 232113_St Columbas Close, Grav |
| Date: | 12/01/2017 |

Southern Water

# SEWER RECORDS PAGE 1 OF 2

172171




171593

565545

566487

| | | |
|---|---|---|
| O.S. REF. TQ6671NW | Drawn by: rogersc | The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement |
| Title: 232113 - St Columbus Close | Scale: 1:2500 | Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530. |
| | Date: 18/01/2017 | N |

Southern Water

# SEWER RECORDS PAGE 2 OF 2

| Node | Cover | Invert | Size | Material | Shape |
|---|---|---|---|---|---|
| 0001X | | | 100 | UNK | CIRC |
| 0002X | | | UNK | UNK | CIRC |
| 0003X | | | UNK | UNK | CIRC |
| 0004X | | | 150 | UNK | CIRC |
| 0005X | | | UNK | UNK | CIRC |
| 0006X | | | UNK | UNK | CIRC |
| 0007X | | | 375 | UNK | CIRC |
| 0008X | | | UNK | UNK | CIRC |
| 0009X | | | 375 | UNK | CIRC |
| 000DX | | | UNK | UNK | CIRC |
| 0010X | | | UNK | UNK | CIRC |
| 0011X | | | 150 | UNK | CIRC |
| 0012X | | | 300 | UNK | CIRC |
| 0013X | | | 225 | UNK | CIRC |
| 0014X | | | 150 | UNK | CIRC |
| 0015X | | | UNK | UNK | CIRC |
| 0016X | | | UNK | UNK | CIRC |
| 0017X | | | 300 | UNK | CIRC |
| 0101X | | | UNK | UNK | CIRC |
| 0102X | | | UNK | UNK | CIRC |
| 0103X | | | UNK | UNK | CIRC |
| 0104X | | | UNK | UNK | CIRC |
| 0105X | | | 100 | UNK | CIRC |
| 0106X | | | 150 | UNK | CIRC |
| 0107X | | | UNK | UNK | CIRC |
| 0108X | | | UNK | UNK | CIRC |
| 0109X | | | UNK | UNK | CIRC |
| 010DX | | | UNK | UNK | CIRC |
| 0110X | | | UNK | UNK | CIRC |
| 0111X | | | 150 | UNK | CIRC |
| 0112X | | | 150 | UNK | CIRC |
| 0113X | | | UNK | UNK | CIRC |
| 0114X | | | UNK | UNK | CIRC |
| 0120X | | | UNK | UNK | CIRC |
| 0121X | | | 100 | UNK | CIRC |
| 0122X | | | UNK | UNK | CIRC |
| 0123X | | | 150 | UNK | CIRC |
| 0501X | | | 100 | UNK | CIRC |
| 0502X | 55.837 | 53.387 | 150 | UNK | CIRC |
| 0601X | 57.06 | | 100 | UNK | CIRC |
| 0602X | | | 100 | UNK | CIRC |
| 0603X | 52.992 | | 100 | UNK | CIRC |
| 0604X | 52.35 | | 150 | UNK | CIRC |
| 060DX | | | 150 | UNK | CIRC |
| 061DX | | | 150 | UNK | CIRC |
| 0701X | 47.512 | 46.702 | 100 | UNK | CIRC |
| 0702X | 47.014 | 46.164 | 100 | UNK | CIRC |
| 0703X | 46.64 | 45.52 | 100 | UNK | CIRC |
| 0704X | | | UNK | UNK | CIRC |
| 0705X | | | UNK | UNK | CIRC |
| 0706X | | | 150 | UNK | CIRC |
| 0707X | 51.965 | 50.495 | 150 | UNK | CIRC |
| 0708X | 51.544 | 50.214 | 150 | UNK | CIRC |
| 0709X | 51.807 | 49.967 | 150 | UNK | CIRC |
| 0710X | 52.013 | 49.313 | 150 | UNK | CIRC |
| 0801X | 42.947 | 40.947 | 150 | UNK | CIRC |
| 0802X | 46.915 | 45.915 | 100 | UNK | CIRC |
| 0803X | 46.172 | 45.352 | 100 | UNK | CIRC |
| 0804X | 46.959 | | 100 | UNK | CIRC |
| 0805X | 45.991 | | 100 | UNK | CIRC |
| 0806X | 45.505 | | 150 | UNK | CIRC |
| 0807X | 47.697 | 46.507 | 100 | UNK | CIRC |
| 0808X | 46.073 | 44.523 | 100 | UNK | CIRC |
| 0809X | 45.539 | 44.329 | 100 | UNK | CIRC |
| 0810X | 46.209 | | 100 | UNK | CIRC |
| 0811X | 49.464 | 46.934 | 150 | UNK | CIRC |
| 0812X | 48.325 | 46.165 | 150 | UNK | CIRC |
| 0901X | 43.593 | 42.043 | 100 | UNK | CIRC |
| 0902X | 41.266 | 39.976 | 100 | UNK | CIRC |
| 1001X | | | UNK | UNK | CIRC |
| 1002X | | | 150 | UNK | CIRC |
| 1003X | | | UNK | UNK | CIRC |
| 1004X | | | UNK | UNK | CIRC |
| 1005X | | | UNK | UNK | CIRC |
| 1006X | | | UNK | UNK | CIRC |
| 1007X | | | UNK | UNK | CIRC |
| 1008X | | | 150 | UNK | CIRC |
| 1009X | | | 150 | UNK | CIRC |
| 1010X | | | 150 | UNK | CIRC |
| 1011X | | | 100 | UNK | CIRC |
| 1012X | | | UNK | UNK | CIRC |
| 1013X | | | 150 | UNK | CIRC |
| 1014X | | | UNK | UNK | CIRC |
| 1015X | | | 100 | UNK | CIRC |
| 1103X | | | 150 | UNK | CIRC |
| 1107X | | | 100 | UNK | CIRC |
| 1108X | | | UNK | UNK | CIRC |
| 1109X | | | 100 | UNK | CIRC |
| 1110X | | | UNK | UNK | CIRC |
| 1111X | | | UNK | UNK | CIRC |
| 1112X | | | UNK | UNK | CIRC |
| 1113X | | | 150 | UNK | CIRC |
| 1114X | | | 225 | UNK | CIRC |
| 111DX | | | UNK | UNK | CIRC |
| 1601X | 57.697 | 56.637 | 100 | UNK | CIRC |
| 1602X | | | 150 | UNK | CIRC |
| 1604X | 60.29 | | 100 | UNK | CIRC |
| 1605X | 59.39 | 57.95 | 150 | UNK | CIRC |
| 1606X | 62.771 | 61.561 | 150 | UNK | CIRC |
| 1607X | 62.258 | 60.968 | 150 | UNK | CIRC |
| 1608X | 61.696 | 60.646 | 150 | UNK | CIRC |
| 1701X | 56.406 | | 150 | UNK | CIRC |
| 1702X | | | 150 | UNK | CIRC |
| 1703X | | | 150 | UNK | CIRC |
| 1704X | 58.644 | 57.354 | 150 | UNK | CIRC |
| 1705X | 58.081 | 56.601 | 150 | UNK | CIRC |
| 1801X | 50.354 | | 150 | UNK | CIRC |
| 1802X | 54.92 | 54.24 | 100 | UNK | CIRC |
| 1803X | 54.014 | 53.254 | 100 | UNK | CIRC |
| 1804X | 53.995 | 52.195 | 150 | UNK | CIRC |
| 1805X | 47.38 | | 150 | UNK | CIRC |
| 1806X | | | 150 | UNK | CIRC |
| 1807X | 52.529 | 50.719 | 150 | UNK | CIRC |
| 1808X | | | 150 | UNK | CIRC |
| 1809X | 51.949 | 48.529 | 150 | UNK | CIRC |
| 1901X | | | 150 | UNK | CIRC |
| 1902X | 47.565 | 46.025 | 150 | UNK | CIRC |
| 1903X | 47.459 | 45.409 | 150 | UNK | CIRC |
| 1904X | 51.396 | 49.836 | 150 | UNK | CIRC |
| 1905X | 50.657 | 48.667 | 150 | UNK | CIRC |
| 2001X | | | UNK | UNK | CIRC |
| 2002X | | | 100 | UNK | CIRC |
| 2003X | | | UNK | UNK | CIRC |
| 2004X | | | 150 | UNK | CIRC |
| 2005X | | | UNK | UNK | CIRC |
| 2006X | | | 150 | UNK | CIRC |
| 2007X | | | 150 | UNK | CIRC |
| 2008X | | | UNK | UNK | CIRC |
| 2009X | | | 100 | UNK | CIRC |
| 2010X | | | UNK | UNK | CIRC |
| 2011X | | | 100 | UNK | CIRC |
| 2012X | | | UNK | UNK | CIRC |
| 2101X | | | UNK | UNK | CIRC |
| 2102X | | | UNK | UNK | CIRC |
| 2103X | | | UNK | UNK | CIRC |
| 2106X | | | UNK | UNK | CIRC |
| 2107X | | | UNK | UNK | CIRC |
| 2108X | | | UNK | UNK | CIRC |
| 2109X | | | UNK | UNK | CIRC |
| 210DX | | | 150 | UNK | CIRC |
| 2110X | | | UNK | UNK | CIRC |
| 2111X | | | 150 | UNK | CIRC |
| 2113X | | | 150 | UNK | CIRC |
| 2114X | | | UNK | UNK | CIRC |
| 2115X | | | 150 | UNK | CIRC |
| 2116X | | | UNK | UNK | CIRC |
| 2117X | | | 150 | UNK | CIRC |
| 2601X | 63.859 | 62.719 | 100 | UNK | CIRC |
| 2602X | 63.811 | 62.491 | 100 | UNK | CIRC |
| 2603X | | | 100 | UNK | CIRC |
| 2604X | | | 150 | UNK | CIRC |
| 2605X | 64.505 | 63.465 | 100 | UNK | CIRC |
| 2606X | 64.424 | 63.394 | 100 | UNK | CIRC |
| 2607X | | | 150 | UNK | CIRC |
| 2608X | 63.975 | 62.605 | 150 | UNK | CIRC |
| 2609X | 63.73 | 62.32 | 150 | UNK | CIRC |
| 2610X | 63.595 | 62.195 | 150 | UNK | CIRC |
| 2611X | 63.348 | 61.858 | 150 | UNK | CIRC |
| 2612X | 62.686 | 61.486 | 150 | UNK | CIRC |
| 2701X | 62.828 | 62.568 | 100 | UNK | CIRC |
| 2702X | 63.168 | 62.338 | 100 | UNK | CIRC |
| 2703X | 62.835 | 62.225 | 100 | UNK | CIRC |
| 2705X | | | UNK | UNK | CIRC |
| 2706X | 62.994 | | 150 | UNK | CIRC |
| 2707X | 61.458 | 60.058 | 150 | UNK | CIRC |
| 2708X | 61.307 | 59.347 | 150 | UNK | CIRC |
| 2709X | 60.664 | 58.574 | 150 | UNK | CIRC |
| 2710X | | | 100 | UNK | CIRC |
| 2711X | 58.924 | 57.824 | 100 | UNK | CIRC |
| 2712X | 58.715 | 57.535 | 100 | UNK | CIRC |
| 2713X | 58.179 | 57.169 | 100 | UNK | CIRC |
| 2714X | 57.961 | 56.941 | 100 | UNK | CIRC |
| 2715X | 57.736 | 55.488 | 150 | UNK | CIRC |
| 2801X | | | UNK | UNK | CIRC |
| 2802X | | | UNK | UNK | CIRC |
| 2803X | 55.514 | 54.564 | 100 | UNK | CIRC |
| 2804X | 55.746 | 54.516 | 100 | UNK | CIRC |
| 2805X | 56.262 | 55.281 | 100 | UNK | CIRC |
| 2806X | 55.418 | 54.608 | 100 | UNK | CIRC |
| 2807X | 60.417 | 57.907 | 150 | UNK | CIRC |
| 2809X | 58.826 | 58.246 | 100 | UNK | CIRC |
| 280DX | | | 150 | UNK | CIRC |
| 2810X | 58.816 | 58.106 | 100 | UNK | CIRC |
| 2811X | 58.45 | 57.83 | 100 | UNK | CIRC |
| 2812X | 58.317 | 57.567 | 100 | UNK | CIRC |
| 2813X | 58.161 | 57.311 | 100 | UNK | CIRC |
| 2814X | 60.616 | 59.866 | 100 | UNK | CIRC |
| 2815X | 59.603 | 56.593 | 150 | UNK | CIRC |
| 2816X | 59.943 | 57.263 | 150 | UNK | CIRC |
| 2901X | 54.682 | 53.512 | 100 | UNK | CIRC |
| 2902X | 54.697 | 53.337 | 100 | UNK | CIRC |
| 2903X | 54.982 | | 150 | UNK | CIRC |
| 2904X | 53.294 | 51.704 | 150 | UNK | CIRC |
| 2905X | 52.588 | | 150 | UNK | CIRC |
| 2906X | 53.93 | 52.49 | 150 | UNK | CIRC |
| 2907X | 56.435 | 54.855 | 150 | UNK | CIRC |
| 2908X | 57.226 | 55.186 | 150 | UNK | CIRC |
| 2909X | 57.731 | 56.011 | 150 | UNK | CIRC |
| 2910X | | | 100 | UNK | CIRC |
| 2911X | 55.255 | | 150 | UNK | CIRC |
| 2912X | 55.254 | 54.184 | 150 | UNK | CIRC |
| 2913X | 55.139 | 54.309 | 100 | UNK | CIRC |
| 3001X | | | UNK | UNK | CIRC |
| 3002X | | | 100 | UNK | CIRC |
| 3003X | | | 100 | UNK | CIRC |
| 3004X | | | UNK | UNK | CIRC |
| 3005X | | | UNK | UNK | CIRC |
| 3006X | | | 150 | UNK | CIRC |
| 3007X | | | UNK | UNK | CIRC |
| 3008X | | | 150 | UNK | CIRC |
| 3009X | | | UNK | UNK | CIRC |
| 3010X | | | UNK | UNK | CIRC |
| 3011X | | | 150 | UNK | CIRC |
| 3012X | | | UNK | UNK | CIRC |
| 3013X | | | 100 | UNK | CIRC |
| 3101X | | | 100 | UNK | CIRC |
| 3102X | | | UNK | UNK | CIRC |
| 3601X | 64.029 | 62.959 | 100 | UNK | CIRC |
| 3602X | 64.084 | 63.084 | 100 | UNK | CIRC |
| 3603X | 64.89 | | 150 | UNK | CIRC |
| 3604X | 64.728 | 62.958 | 150 | UNK | CIRC |
| 3605X | 64.61 | 62.68 | 150 | UNK | CIRC |
| 3606X | 64.604 | 62.554 | 150 | UNK | CIRC |
| 360DX | | | 150 | UNK | CIRC |
| 3701X | 63.589 | 62.679 | 100 | UNK | CIRC |
| 3702X | 64.227 | 62.217 | 150 | UNK | CIRC |
| 3703X | | | 150 | UNK | CIRC |
| 3704X | 63.64 | 62.72 | 100 | UNK | CIRC |
| 3705X | 63.829 | 62.629 | 100 | UNK | CIRC |
| 3706X | 63.503 | 62.003 | 100 | UNK | CIRC |
| 3707X | 62.805 | 61.865 | 100 | UNK | CIRC |
| 3708X | 62.407 | | 100 | UNK | CIRC |
| 3709X | 62.125 | 61.365 | 100 | UNK | CIRC |
| 3710X | 61.219 | 59.369 | 150 | UNK | CIRC |
| 3711X | 61.931 | 61.001 | 100 | UNK | CIRC |
| 3801X | 62.122 | 60.732 | 150 | UNK | CIRC |
| 3802X | 61.515 | 60.575 | 100 | UNK | CIRC |
| 3803X | 61.296 | 60.286 | 100 | UNK | CIRC |
| 3804X | 60.875 | 59.595 | 100 | UNK | CIRC |
| 3805X | 60.503 | 59.843 | 100 | UNK | CIRC |
| 3806X | 60.236 | 59.416 | 100 | UNK | CIRC |
| 3807X | | | 100 | PF | CIRC |
| 380DX | | | UNK | UNK | CIRC |
| 380ZX | | | 150 | UNK | CIRC |
| 3812X | | | UNK | UNK | CIRC |
| 3901X | 58.879 | 55.909 | 150 | UNK | CIRC |
| 3902X | | | UNK | UNK | CIRC |
| 3904X | 58.596 | 57.286 | 100 | UNK | CIRC |
| 3905X | 59.914 | 58.594 | 150 | UNK | CIRC |
| 4001X | | | 150 | UNK | CIRC |
| 4002X | | | UNK | UNK | CIRC |
| 4003X | | | 150 | UNK | CIRC |
| 4004X | | | 150 | VC | CIRC |
| 4005X | | | 150 | VC | CIRC |
| 4006X | | | 150 | VC | CIRC |
| 4007X | | | UNK | UNK | CIRC |
| 4008X | | | UNK | UNK | CIRC |
| 4009X | | | 150 | UNK | CIRC |
| 4101X | | | 225 | UNK | CIRC |
| 4601X | 65.972 | | 100 | UNK | CIRC |

LINE STYLES / COLOURS

Brown — Foul
Foul Syphon Sewer
Foul Vacuum Main
Foul Rising Main
Red — Combined
Combined Syphon Sewer
Combined Rising Main
Lateral Drain
Orange — Building Over Agreement Area
Dark Blue — Treated Effluent
Purple — Sludge
Sewer Catchment
Section 104 Area
Light Blue — Surface Water
Surface Water Rising Main
Yellow — Private
Green — Access Shaft
Decommissioned

MATERIALS

AK Alkathene
BAC Bonded Asbestos Cement
BRC Brick (Common)
BRE Brick (Engineering)
CC Concrete Box Culvert
CI Cast Iron
CO Concrete (In-Situ)
CP Concrete (Pre-Cast)
CSB Concrete Segments (bolted)
CSU Concrete Segments (unbolted)
DI Ductile Iron
GRC Glass Reinforced Concrete
GRP Glass Reinforced Plastic
MAC Masonry in regular Courses
MAR Masonry in random Courses
PE Polyethylene
PF Pitch Fibre
PP Polypropylene
PVC Polyvinyl Chloride
RPM Reinforced Plastic Matrix
SI Spun Iron
ST Steel
VC Vitrified Clay
XXX Other
ZZZ Unknown

LEGEND - SEWERS

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry Manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Mnhe (SW)
Flushing ch. Mnhe (F&C)
Flushing ch. Nhe (SW)
Flushing ch. Nhe (F&C)
Demarcation Chamber

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Outfall
Penstock chamber
Damboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change in sewer (s)
Change in sewer
Reflux valve
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Emptying valve
Catchpit
Soakaway
Inlet
Ballancing Pond

Wastewater treatment works
Marine treatment works
Outfall headworks
Vent
Vent column
Tidal storage tank
Blank end
Head of Public Sewer
Micro Pumping Station

SHAPES (S)

A Arched
B Barrel
C Circular
E Egg
H Horseshoe
R Rectangular
S Square
T Trapezoidal
U U Shape
X Other

NODE REFERENCING SYSTEM

1st digit: hundred metre easting identifier
2nd digit: hundred metre northing identifier
3rd digit: sewer type identifier
0-4 = Foul/Combined
5-9 = Surface Water
4th digit: next sequential node

| | |
|---|---|
| Drawn by: | rogersc |
| Title: | 232113 - St Columbus Close |
| Date: | 18/01/2017 |

Southern Water

FIRST ABOUT PLUMBING
& CARPENTRY LTD.
CONSTRUCTION & ENGINEERING SERVICES

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26b CHAPTER ROAD
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Fax: (01634) 716073
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www.1stap.co.uk

Gravesham Borough Council
Brookvale Springhead Road
Northfleet
Kent
DA11 8HW

Date 28/06/23

R E P O R T

For the Attention of Simon Doherty

Site Address: St Columba's Close

As requested following confirmation with surveyors, attend site to carry out visual survey to invert levels to areas highlighted on the submitted drawing, please see attached, for St Patrick's Gardens in preparation for construction works to the blocks in St Columba's Close. The attached drawing as requested showing direction of flow and invert levels for main runs and laterals including dimensions of drain runs. During this site visit it was explained that various areas and manholes were blocked and required jetting and cleaning down of chambers to allow these inspections. With reference to the CCTV request, this was found to be a problem due to a proper visual report was unobtainable as the main 300 run was continually running at high capacity which was causing any CCTV footage to be impractical as confirmed at the time. It was also noted that throughout the whole site, to be heavily scaled and requiring substantial cleaning before any major CCTV work could be established. This could involve another 4-5 days cleaning through the runs, jetting and having a tanker and crawler unit on site for part of these times to assist with these works. Due to the details given that St Patricks Gardens, blocks 1-12 is to be demolished in conjunction with St Columba's Close blocks 28-34 and 36-42 this would allow new connections in manholes FW1 and FW2 which are connected to the main 300mm outfall. We would hope the detail given on the layout drawing would confirm these details. Should you require any further updates on our findings, please contact me.

I hope that the above meets your requirements. Should you require any further information please do not hesitate to contact me on 07768598511 or Tania Carter at the office on the above number.

Yours Sincerely
Alan Carter
1st About Plumbing & Carpentry Ltd

Lorem ipsum

**FW1**
Invert 1560mm
Mainline Dia. 300mm
2 x 100mm Laterals
1 x 150mm Lateral

**FW2**
Invert 1360mm
Mainline Dia. 300mm
2 x 100mm laterals
1 x 150mm lateral

**FW3**
Invert 2250mm
Mainline Dia. 300mm
1 x 100mm lateral

**FW4**
Invert 1590mm
Mainline Dia. 150mm
1 x 100mm lateral

**FW5**
Invert 850mm
Mainline Dia. 100mm
2 x 100mm laterals

**FW6**
Invert 500mm
Mainline Dia. 300mm

**FW7**
Unable to lift as
located in rear garden

**FW8**
Invert 700mm
Mainline Dia. 100mm
1 x 100mm lateral

**FW9**
Unable to lift as
located in rear garden

**FW10**
Unable to lift as
located in rear garden

**FW11**
Invert 1760mm
Mainline Dia. 300mm
1 x 100mm lateral

**FW12**
Invert 890mm
Mainline Dia. 150mm
1 x 100mm lateral

**FW13**
Invert 730mm
Mainline Dia. 150mm
1 x 100mm lateral

**FW14**
Invert 1840mm
Mainline Dia. 300mm
2 x 100mm laterals

**FW15**
Invert 1160mm
Mainline Dia. 150mm
2 x 100mm laterals

**FW16**
Invert 980mm
Mainline Dia. 150mm
2 x 100mm laterals

**FW17**
Invert 620mm
Mainline Dia. 150mm
2 x 100mm laterals

**FW18**
Invert 1420mm
Mainline Dia. 150mm
1 x 100mm lateral

**FW19**
Unable to lift as
located in rear garden

**FW20**
Unable to lift as
located in rear garden

**FW21**
Invert 1020mm
Mainline Dia. 100mm
1 x 100mm lateral

**FW22**
Invert 710mm
Mainline Dia. 100mm
1 x 100mm lateral

**FW23**
Invert 620mm
Mainline Dia. 100mm
1 x 100mm lateral

**FW24**
Unable to lift as
located in rear garden

**FW25**
Invert 1320mm
Mainline Dia. 300mm
2 x 100mm laterals

**FW26**
Invert 1880mm
Mainline Dia. 300mm
2 x 100mm laterals
1 x 150mm lateral

**FW27**
Invert 1710mm
Mainline Dia. 150mm
1 x 100mm lateral

**FW28**
Invert 380mm
Mainline Dia. 100mm
2 x 100mm laterals

**FW29**
Internal tumblre
back drop
Invert 1930mm
Mainline Dia. 100mm

**FW30**
Invert 1670mm
Mainline Dia. 100mm
2 x 100mm laterals

**FW31**
Invert 610mm
Mainline Dia. 100mm
3 x 100mm laterals

**FW32**
Upstream back drop
Invert 1670mm
Mainline Dia. 100mm
1 x 100mm lateral

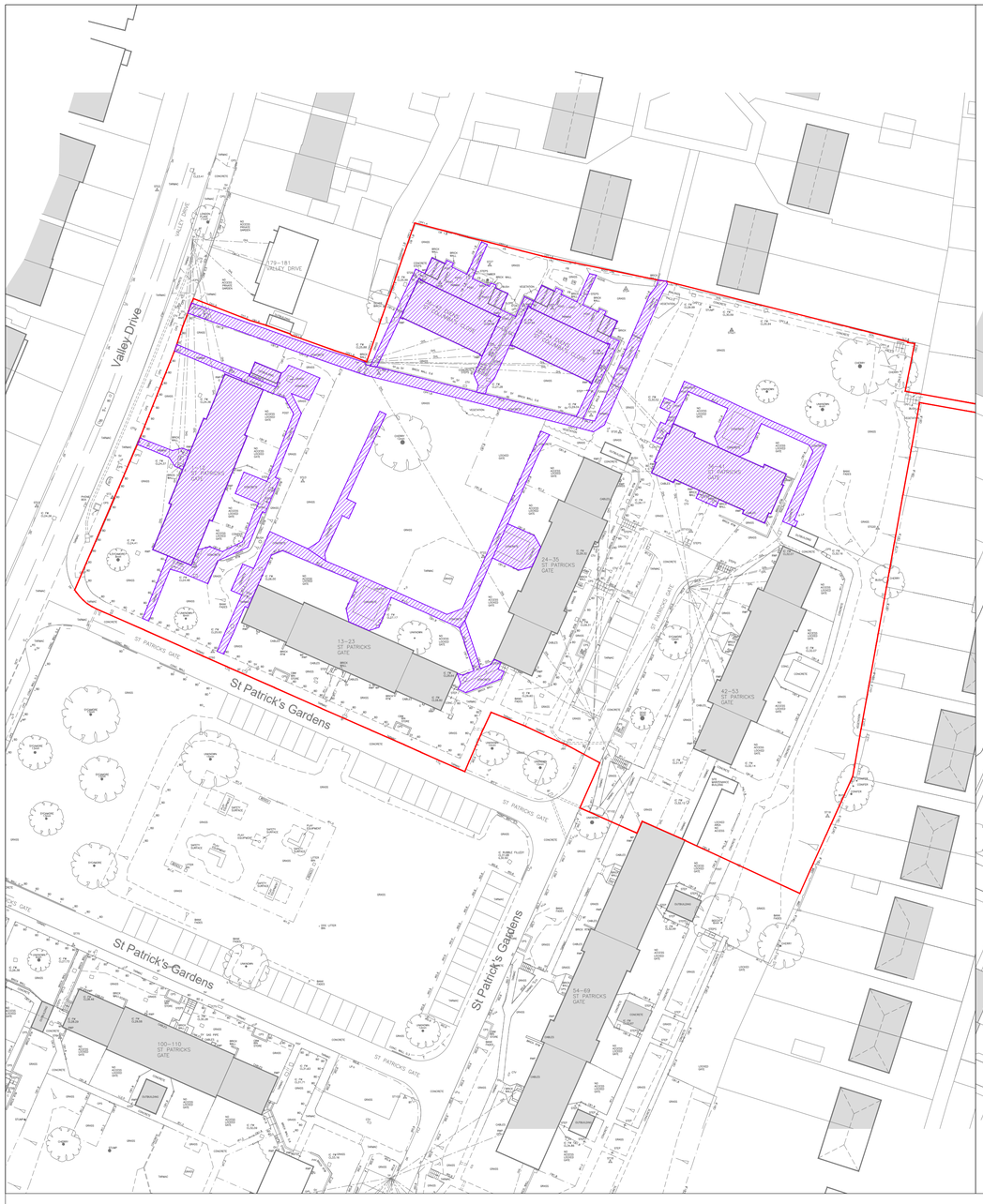
**FW33**
Invert 900mm
Mainline Dia. 100mm
2 x 100mm laterals

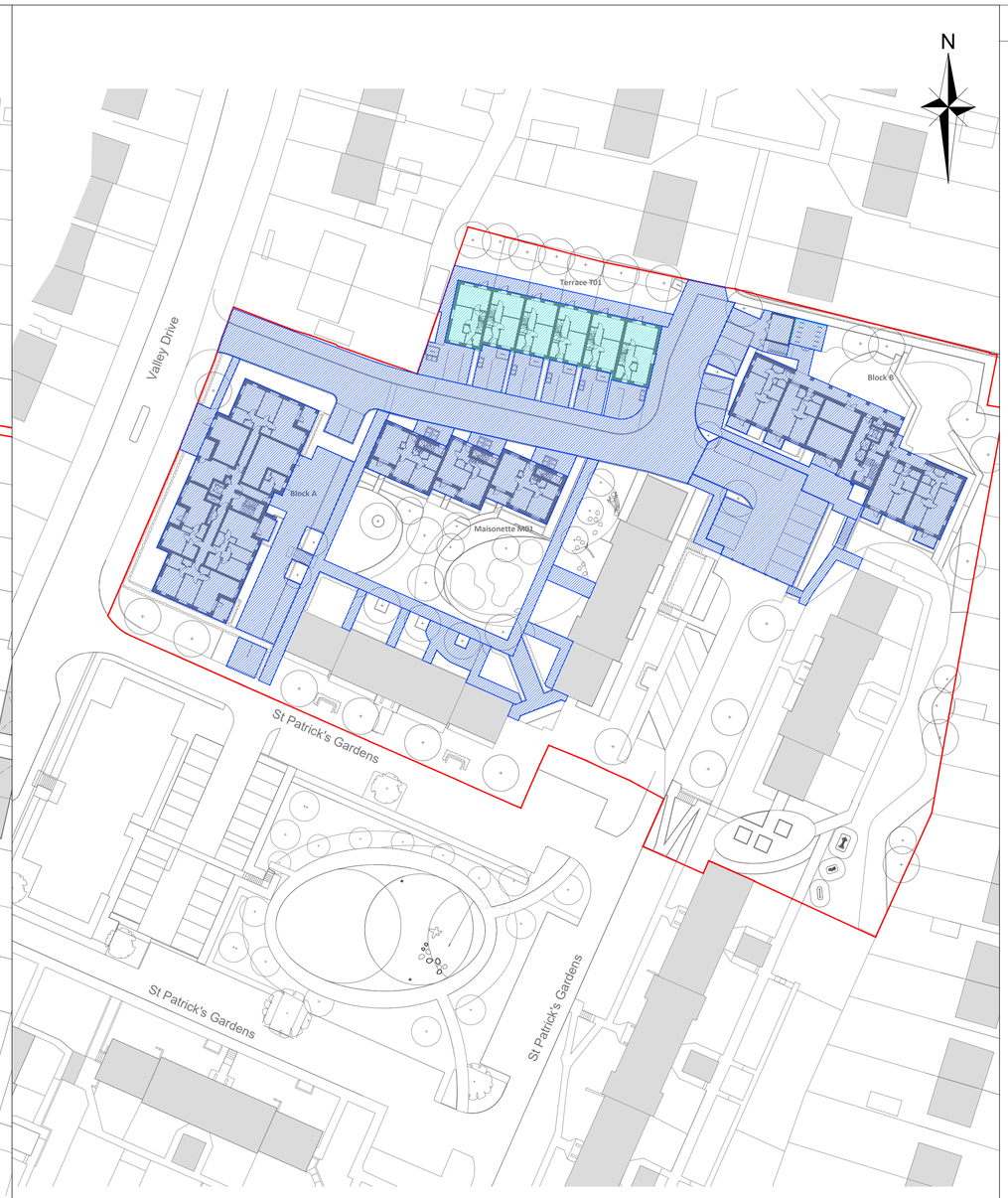
**FW34**
Invert 1400mm
Mainline Dia. 100mm
1 x 100mm lateral

*Caretaker's Hut*
*No. 13 - 23 St. Patrick's Gardens*
*No. 42 - 53 St. Patrick's Gardens*
*No. 24 - 35 St. Patrick's Gardens*
*No. 50 - 61 St. Patrick's Gardens*
*No. 1 - 12 St. Patrick's Gardens*
*No. 28- 34 St. Columbas Close*
*No. 36 - 42 St. Columbas Close*
*Sheds*
*Sheds*

**APPENDIX B**

CATCHMENT AREAS




## Existing Site Impermeable Areas

Site Area: 10,729m² / 1.073ha
Existing Impermeable Area: 1,723m² / 0.172ha

## Development Impermeable Areas

Development Impermeable Area Residential Plots (Subject to urban creep): 338m² / 0.034ha
Development Impermeable Areas: 3,832m² / 0.383ha

- DO NOT SCALE FROM THIS DRAWING -
All dimensions in mm U.N.O

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
3. 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
4. LOCATION AND LEVELS OF EXISTING PUBLIC SEWERS HAVE BEEN TRANSCRIBED FROM THAMES WATER ASSET PLANS

| Rev | | By | Chk'd | Date |
|---|---|---|---|---|

Status: PRELIMINARY

Client: OAKWOOD BUILDING CONTRACTORS

Project: ST COLUMBA'S CLOSE
GRAVESEND, KENT

Title: CATCHMENT AREAS

GURNEY consulting engineers

| Job No. | Drg No. | Rev |
|---|---|---|
| 11270 | 450 | - |

| Drawn by | Date |
|---|---|
| TL | March 24 |
| Checked by | Scale |
| MD | 1:500 on A1 |

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tel: 01483 721721 fax: 01483 725073 e-mail: gce@gurneyce.com

**APPENDIX C**

PRE & POST DEVELOPMENT RUN OFF

# Appendix C: Pre & Post Development Calculations

## FEH 2013 Rainfall Intensity

15 minute 2 year Winter I+0%
Average Rainfall Intensity 36.438 mm/hr

15 minute 30 year Winter I+35%
Average Rainfall Intensity 117.080 mm/hr

15 minute 100 year Winter I+40%
Average Rainfall Intensity 158.471 mm/hr

## 6hr rainfall depth

360 minute 100 year Winter I+0%
Average Rainfall Intensity 12.883 mm/hr

(6hr x 12.883mm) = 77.298mm

## Pre – Development run-off

The Wallingford Procedure, Volume 4 - The Modified Rational Method' (*Q=2.78CiA*)

Q2 Year = 2.78 x 0.83 x 36.438 x 0.172 = 14.5 l/s

Q30 Year = 2.78 x 0.83 x 117.080 x 0.172 = 46.4 l/s

Q100 Year = 2.78 x 0.83 x 158.471 x 0.172 = 62.9 l/s

## Pre – Development 6hr Volume

(Cv x i6hr x A x CC)

0.83 x 0.077 x 1,723 x 1.4 = 154.164m$^3$

## Post – Development run-off

The Wallingford Procedure, Volume 4 - The Modified Rational Method' (*Q=2.78CiA*)

Q2 Year = 2.78 x 0.83 x 36.438 x 0.420 = 35.3 l/s

Q30 Year = 2.78 x 0.83 x 117.080 x 0.420 = 113.5 l/s

Q100 Year = 2.78 x 0.83 x 158.471 x 0.420 = 153.6 l/s

## Post – Development 6hr Volume

(Cv x i6hr x A x CC)

0.83 x 0.077 x 4,204 x 1.4 = 376.149 m$^3$

## ReFH2 Rural Runoff Peak Flows

Input

| | |
|---|---|
| Return Period (Years) | 100 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Season | Summer |
| Country | England/Wales/Northern Ireland |
| Area (ha) | 1.000 |
| SAAR (mm) | 573 |
| BFIHOST | 0.928 |
| FARL | 0.000 |
| SPRHOST | 0.000 |
| URBEXT (2000) | 0.0000 |

Results

| Return Period (Years) | Rural (l/s) | Urban (l/s) |
|---|---|---|
| User | 2.9 | 2.9 |
| Q1 | 0.6 | 0.6 |
| Q2 | 0.7 | 0.7 |
| Q5 | 1.1 | 1.1 |
| Q10 | 1.4 | 1.4 |
| Q30 | 2.0 | 2.0 |
| Q50 | 2.3 | 2.3 |
| Q75 | 2.6 | 2.6 |
| Q100 | 2.9 | 2.9 |
| Q200 | 3.7 | 3.7 |
| Q1000 | 6.2 | 6.2 |

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**APPENDIX D**

GROUND INVESTIGATIONS

# 5 SITE INVESTIGATION FINDINGS

## 5.1 Geology

5.1.1 The strata encountered during the intrusive investigation are summarised in the table below and described in the following section.

**Table 5-1: Encountered Strata**

| Strata | Depth to Top of Strata (m bgl) [mAOD] | Thickness (m) |
|---|---|---|
| Topsoil | Ground Level [31.4 to 24.34] | 0.0 to 0.2 |
| Made Ground | Ground Level to 0.2 [31.20 to 23.07] | 0.40 to 1.90 |
| Head Deposits | 0.75 to 0.90 [25.35 to 22.32] | 0.20 to 2.10 |
| Seaford Chalk Formation | 0.60 to 2.90 [30.8 to 21.44] | Proven to 9.4 |

5.1.2 General descriptions of the strata encountered during the intrusive investigation are summarised below. Reference should be made to the exploratory hole logs within Appendix E of this report for full descriptions of ground conditions underlying the site.

5.1.3 Geotechnical laboratory results are provided as Appendix F.

### Made Ground

5.1.4 Made Ground was generally present throughout the site, ranging in thickness from approximately 0.40m to 1.90m.

5.1.5 The stratum was variable, consisting of sandy silt in the western sections and sand to sandy gravel in the eastern sections. The gravel portion comprised rounded to angular fine to coarse flint, concrete, and glass with varying portions of rootlets.

5.1.6 One Standard Penetration Test (SPTs) was undertaken within the Made Ground.

5.1.7 The $N_{60}$ values have been converted from SPT N values using an energy ratio of 69.0%. A graph showing SPT $N_{60}$ vs depth is presented as Figure 5.

5.1.8 Moisture content testing was undertaken on one sample of Made Ground collected at 0.5m bgl (23.84 m AOD) gave value of 15.3%.

### Head Deposits

5.1.9 Head Deposits were encountered beneath the Made Ground only within the exploratory holes in the western and southwestern sections of the site at depths ranging from approximately 0.75m to 0.90m bgl (25.35m to 22.32m AOD). The stratum comprised brown gravelly sandy silt. The sand inclusions were fine to medium, and gravel was angular to subrounded fine to coarse of flint and chalk fragments.

5.1.10 Four SPT's undertaken within the Head Deposits at depths ranging from 1.00m to 2.50m bgl gave $N_{60}$ values ranging from 10 to 52. A graph showing SPT $N_{60}$ vs depth is presented as Figure 5.

5.1.11 Atterberg limit testing was undertaken on a single sample collected from the Head Deposits at 2.00m bgl (22.34m AOD) which gave a Liquid Limit (LL) of 31%, Plastic Limit (PI) of 19%, and a corresponding Plasticity Index (PI) of 12%. The moisture content testing was undertaken on this sample which gave a result of 13.9%. As such the results suggest that the Head Deposits are a low plasticity clay. A calculated modified PI of 8% is indicated the Head Deposit falls in low volume

change potential category. One moisture content test was also undertaken on Head Deposit sample collected at 1.00m bgl (23.34m AOD) gave value of 16.9%.

### Seaford Chalk Formation

5.1.12 The Seaford Chalk Formation was encountered beneath the Made Ground and Head Deposits (where encountered) throughout the site within the exploratory holes at depths ranging from 0.60m to 2.90m bgl (30.80m to 21.44m AOD). The stratum comprised structureless chalk off-white cream and brown with rare orange staining sandy silty angular to subrounded gravel. Sand is fine to coarse. Clasts are extremely weak to weak low to medium density. In accordance with CIRIA C574 Engineering in Chalk (2002) the chalk is considered as Grade $D_c$ and $D_m$.

5.1.13 14 SPTs were undertaken within the Seaford Chalk Formation at depth ranging from 1.50m to 10.00m bgl (29.90m to 14.34 mAOD) gave the $N_{60}$ values ranging from 11 to 29. A graph showing SPT $N_{60}$ vs depth is presented as Figure 5. As such, given that the majority of SPT results are less than 25 it is not possible to distinguish a relative weathering profile within the chalk vs depth. In addition, it is possible that higher blow counts may be affected by the presence of flints.

5.1.14 Particle Size Distribution (PSD) testing were undertaken on 15 samples taken from Seaford Chalk Formation in ranging of 1.00m to 9.00m bgl (30.40m to 15.34m AOD). Since the weight of the small samples collected from borehole CP01 and CP02 were not suitable for undertaking PSD testing, samples with the same description were mixed to generate three adequate samples. PSD testing was also undertaken on a bulk sample collected from TP02 at 1.50m to 2.00m bgl (28.95m to 28.45m AOD).

5.1.15 Saturated Moisture Content and intact bulk/dry density testing were undertaken on three samples collected at depth raging from 0.50m to 2.00m bgl gave the saturation moisture content ranging from 27% to 28% and dry density from 1.53 mg/m$^3$ to 1.56 mg/m$^3$. Intact dry density results indicated medium density chalk which is compliant with chalk grade $D_m$. Natural moisture content of samples ranged from 20% to 28%.

5.1.16 Calcium Carbonated Content (CCC) tests were undertaken on nine samples collected at depth of ranging from 1.00m to 9.75m bgl gave the CCC values in ranging from 49% to 99%.

5.1.17 Infiltration testing was undertaken as part of the previous ground investigation in 2012 and as part of the recent investigation. Tests were carried out in general accordance with the guidance presented in BRE DG 365 (2016). Tests were repeated where possible. The infiltration rates were calculated and are presented in Appendix J. The base of all the test pits was in the Seaford Chalk Formation. The test results are summarised in Section 9 below.

## 5.2 Groundwater

5.2.1 No groundwater was not encountered within the exploratory holes during drilling.

5.2.2 Groundwater monitoring recorded during subsequent visits to site similarly recorded dry conditions. This is summarised in the table below:

**Table 5-2: Groundwater Level Data**

| Monitoring Well ID | Well Screen Depth (m bgl) [m AOD] | Strata | Depth to Water (m bgl) [m AOD] 08/07/2022 | 21/07/2022 | 28/07/2022 |
|---|---|---|---|---|---|
| WS02A | 1.50 to 2.00 [24.65 to 24.15] | Seaford Chalk Formation | Dry | Dry | Dry |
| WS05A | 0.80 to 2.40 [28.88 to 27.28] | Seaford Chalk Formation | Dry | Dry | Dry |
| CP01 | 2.00 to 10.00 | Seaford Chalk Formation | Dry | Dry | Dry |

| Monitoring Well ID | Well Screen Depth (m bgl) [m AOD] | Strata | Depth to Water (m bgl) [m AOD] 08/07/2022 | 21/07/2022 | 28/07/2022 |
|---|---|---|---|---|---|
| | [22.34 to 14.34] | | | | |
| CP02 | 1.0 to 10.00 [30.40 to 21.40] | Seaford Chalk Formation | Dry | Dry | Dry |

5.2.3 It is noted that based on BGS borehole records in the general vicinity of the site (BGS Ref TQ67SE148 – located at Whitehall Road to the north of the site, that groundwater within the chalk is likely to be located at circa 4.00m AOD, i.e. around 20m bgl at the site's lowest recorded elevation.

## 5.3 Field Evidence of Contamination

### Visual and Olfactory Evidence of Contamination

5.3.1 No visual or olfactory evidence of contamination were noted within groundwater during the intrusive investigation and subsequent monitoring visits.

### Photo-Ionisation Detector (PID) Readings

5.3.2 Soil arisings from each exploratory hole were screened for the presence of iVOCs using a PID.

5.3.3 A PID reading of 0.8ppm was recorded at 0.80m bgl within FP04. All other PID readings were 0.1ppm or below the limits of detection (<0.1ppm).

5.3.4 Full records of PID readings are presented on the exploratory logs within Appendix E.

5.3.5 During the subsequent monitoring, readings were recorded ranging from below the instrument limit of detection (<0.1ppm) to 6.7ppm (CP02).

## 5.4 Ground Gas Monitoring

5.4.1 Ground gas monitoring has been undertaken on three occasions on 8th, 21st and 28th July 2022. Installations were monitored for concentrations of methane, carbon dioxide and oxygen. In addition, the flow rate and barometric pressure were recorded. The results of the ground gas monitoring are presented in Appendix G.

5.4.2 Methane was not recorded at concentrations above the instrument limit of detection (<0.1% v/v) on any of the monitoring visits. Carbon dioxide was recorded at a maximum concentration of 2.1% v/v within monitoring wells WS02A, screened within the chalk, on 21st July 2022.

5.4.3 All flow rates recorded were below the limit of detection (0.1l/h).

5.4.4 The lowest recorded oxygen concentration was 19.4% v/v within monitoring well WS02A on 21st July 2022. Atmospheric pressure ranged from 1014mb to 1030mb during the three monitoring periods.

5.4.5 The CIRIA Report C665 '*Assessing risks posed by hazardous ground gases to buildings*' outlines indicative guideline concentrations for carbon dioxide and methane in association with gas flow rates for which gas protection measures may be required in new residential or commercial developments. The methodology is based on the Modified Wilson and Card approach that characterises the gas regime into a series of Characteristic Situations (1 to 5), with corresponding indicative gas protection measures. Using this methodology, the ground gas regime at this site corresponds to Characteristic Situation 1, whereby no specific gas protection measures are required.

# 8 GEOTECHNICAL ANALYSIS

## 8.1 Introduction

8.1.1 The development proposals comprise the demolition of 26 homes (including caretaker's facility) and construction of 46 new homes (including reprovision of the caretaker's facility) within two blocks of flats and two house and maisonette terraces with associated carparking and cycle storage. Block A is to consist of three and four storeys; Block B three storeys; Terrace 01 (houses) two and a half storeys; and Terrace 02 (Maisonettes) three storeys.

8.1.2 A proposed development plan is provided as Figure 3.

8.1.3 No preliminary structural loads have been received. Therefore, the preliminary recommendations below will need to be reviewed in light of subsequent detailed design.

## 8.2 Preliminary Geotechnical Risk Register

8.2.1 The table below summarises the potential geotechnical hazards associated with the development. The table provides an assessment of whether the site is likely to be affected by the hazard and the possible consequences and engineering considerations.

**Table 8-1: Preliminary Geotechnical Risk Register**

| Hazard Description | Potential for Hazard (High / Medium / Low / NA) | Comments / Possible Engineering Requirements |
|---|---|---|
| Sudden lateral / vertical changes in ground conditions | L | The ground conditions from existing ground level are generally consistent with Made Ground of shallow depth overlying a limited thickness of Head Deposits at the western and eastern sections of the site respectively overlying the Seaford Chalk Formation.<br>The Head deposits and Seaford Chalk Formation will provide a suitable bearing stratum for low to moderate loads, where this is at least medium dense silt or white chalk grade $D_c$ or $D_m$. For more heavily loaded structures, piled foundations, terminating in the deeper layers of the Seaford Chalk Formation will be required. |
| Highly compressible / low bearing capacity soils, (including peat and soft clay) | L | A limited thickness of Made Ground and Head Deposits were encountered across the site, up to 2 m in depth. |
| Ground dissolution features / natural cavities | M | Based on BGS database potential natural cavities around the site is low and the potential of chalk dissolution is considered low. |
| Shrinking and swelling clays | M | Based on the Atterberg Test results the Seaford Chalk Formation LL is 31% and since the content of the caly in the chalk is greater than 60%, chalk is liable to be shrinkable. |
| Slope stability issues | L | Whilst no significant slopes are present on site, any temporary excavations created as part of the development should be subject to appropriate geotechnical design based on site-specific site investigation information. |
| High groundwater table (including waterlogged ground) | L | No groundwater encountered during the site investigations and subsequent site visit. Groundwater is anticipated to at c. 20m depth below current ground levels based on BGS records.<br>Therefore, groundwater exclusion and control measures are not likely to be required, and any water ingress into |

| Hazard Description | Potential for Hazard (High / Medium / Low / NA) | Comments / Possible Engineering Requirements |
|---|---|---|
| | | excavations should not be excessive and likely to be controllable via localised sump and pumping. |
| Filled and Made Ground (including embankments) | L/M | Made Ground was encountered to a maximum depth of up to 2.00m bgl beneath the site and was generally between 1.00m and 2.00m in thickness. |
| Obstructions (including foundations, services, basements, tunnels and adjacent sub-structures) | M | The site has no significant development history and relic structures were not encountered during the investigation, but it could be present within the footprint of former structures, which may require removal to enable the construction of the proposed development. It is likely these obstructions, if encountered may be removed using standard construction plant. |
| Collapsible Ground / Underground mining | L | Based on Groundsure database searches including the Stantec Natural Cavities and non coal mining databases and in consideration of the topography and geological setting of the site the risk of voided or collapsible ground as a result of mining activity is low. |
| Concrete classification | L | Testing has indicated a Design Sulphate Class of DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) Classification of AC-1 would be appropriate for all buried concrete structures. |
| Seismic Activity | L | The Eurocode 8 seismic hazard zoning maps for the UK (Musson and Sargeant, 2007) indicate that horizontal Peak Ground Acceleration (PGA) values with 10% probability of being exceeded in 50 years (475 year return period) are between 0.00 and 0.02g, which is considered very low. |

## 8.3 Preliminary Geotechnical Parameters

8.3.1 The following table shows the ground model and geotechnical parameters based of the findings of the intrusive investigation and subsequent testing.

**Table 8-2: Ground Model and Geotechnical Parameters**

| Stratum | Depth to Top of Stratum (m bgl) [m AOD] | Unit Weight, $\gamma_b$ Bulk [Dry] (kN/m$^3$) | Cohesion, C' (kPa) | Angle of Friction, φ' (°) | Young's Modulus, E (MPa) | Yielding Young's Modulus, $E_y$ (MPa) |
|---|---|---|---|---|---|---|
| Made Ground | 0.00 to 0.20 [31.2 to 23.07] | 18 | - | 28[a] | 10[a] | - |
| Head Deposits | 0.75 to 0.90 [25.35 to 22.32] | 18 | - | 28[a] | 10[a] | - |
| Seaford Chalk Formation ($D_{c/m}$) | 060 to 2.90 [30.8 to 21.44] | 18.9 [15.5] | 10[b] | 31[b] | 6[c] | 19[c] |

a. Conservative estimate
b. Lord J.A., Clayton C.R.I. and Mortimore R.N. - Engineering in Chalk_CIRIA C574, 2002
c. Lord J.A., Twine D. and Yeow H. – Foundations in Chalk_CIRIA Project Report PR11, 1994

## 8.4 Site Preparation

8.4.1 The precise development levels of the site are yet to be confirmed, but it is likely that only limited earthworks will be required to prepare development platforms for new buildings. It is anticipated that the shallow soils will be readily excavated using conventional plant.

## 8.5 Foundation Solutions

### Traditional Foundations

8.5.1 Due to the inherent textural, compositional variability and compressibility of the Made Ground, this is considered unsuitable as a bearing stratum for shallow foundations.

8.5.2 At the time of writing this report no structural loading were provided by the Structural Engineer. Based on the SPTs value undertaken on Head deposits and Seaford Chalk Formation, these strata are suitable to bear the low to moderate superstructure loads.

8.5.3 A presumed bearing value of about 150 kN/m$^2$ is likely to be suitable for shallow foundations of not greater than 1m width bearing on firm clays of the Head Deposits Foundations should penetrate at least 300mm within Head Deposits.

8.5.4 The Seaford Chalk Formation is considered to comprise a grade $D_c$ or $D_m$ material, and as such based on the guidelines in CIRIA PG11[1] and CIRIA C574[2] , an allowable bearing capacity of 225kN/m$^2$ is anticipated for shallow foundation that installed on $D_c$ or $D_m$ chalk.

### Piled Foundations

8.5.5 Based on the setting of the site and ground conditions, it is anticipated that bored or rotary bored or Continuous Flight Auger (CFA) piles, terminating in the underlying Seaford Chalk Formation would be most suitable on the subject site for more heavily loaded structures.

8.5.6 Preliminary pile capacities for a range of pile diameters between 450mm to 750mm are presented in the Table 8-3, based on CFA or bored cast in place piles constructed on site.

8.5.7 The preliminary pile capacities provided are based on the parameters outlined in Table 8-2 and the following:

- CFA/Bored piles with no pile tests;
- Maximum shaft resistance $\bar{\tau} = 0.8\,\overline{\sigma_v'}$ for bored piles;
- Maximum shaft resistance $\bar{\tau} = 0.45\,\overline{\sigma_v'}$ for CFA piles; and
- Maximum allowable base resistance of $q_b$=600kN/m$^2$ for both CFA and bored piles.

**Table 8-3: Preliminary Pile Resistance Assessment (kN)**

| Pile Toe Level (m bgl) | Load Type | Pile Type and Diameter (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Bored | | | CFA | | |
| | | 450 (mm) | 600 (mm) | 750 (mm) | 450 (mm) | 600 (mm) | 750 (mm) |
| 6 | Compression | 160 | 225 | 327 | 263 | 363 | 469 |
| | Tension | 133 | 177 | 221 | 236 | 314 | 393 |

[1] Lord J.A., Twine D. and Yeow H. – Foundations in Chalk_CIRIA Project Report PR11, 1994

[2] Lord J.A., Clayton C.R.I. and Mortimore R.N. - Engineering in Chalk_CIRIA C574, 2002

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | Compression | 311 | 427 | 579 | 532 | 722 | 917 |
| | Tension | 284 | 379 | 473 | 505 | 673 | 841 |
| 10 | Compression | 519 | 705 | 926 | 902 | 1215 | 1534 |
| | Tension | 492 | 656 | 820 | 875 | 1166 | 1458 |

8.5.8 Partial safety factors have been applied to the calculated pile capacities above in accordance with CIRIA PG11 are adopted as 1.5 against shaft resistance and 3.5 against base resistance respectively.

8.5.9 The loads provided in the tables should be compared against appropriately factored actions.

8.5.10 Loads are based on single piles only and do not take into account the action of groups of piles. This should be considered at the detailed design stage. The pile capacity estimates presented above are preliminary and are based on a conservative soil profile derived from exploratory holes undertaken onsite.

8.5.11 Early consultation with an appropriate piling contractor is recommended to confirm pile working capacities and to ensure the contractor can achieve the required depths and capacities. Specialist piling contractors may potentially show greater load capacities than those shown above based on specific knowledge of their piling equipment, supported by testing evidence that may be acceptable to the Local Authority.

8.5.12 An appropriate piling platform should be designed and constructed in accordance with BRE Digest 470 (Working Platforms for Tracked Plant).

## 8.6 Ground Floor Slabs

8.6.1 Given the depth of Made Ground on the Site consideration should be given to designing and constructing the floor slabs to be suspended.

## 8.7 Pavements

8.7.1 Eleven Dynamic Cone Penetrometer (DCP) tests were performed throughout the proposed internal access road and car parks as shown in Figure 4. DCPs are performed in accordance with TRL Report 277[3] up to depth of 1.40m bgl and results of the tests shown in Appendix K. A graphical presentation of cumulative blows versus the depth is shown in Figure 6.

8.7.2 Based on the results of DCP01, 02, 06, 09 along the proposed internal access road, and with reference to CIRIA C574, a CBR value of not greater than 2% is recommended for the subgrade between 0.20m to 0.60m bgl.

8.7.3 Pavements carried on a suitable depth of capping/sub-base should prove adequate provided the exposed deposits are compacted by a heavy smooth wheeled roller and any soft or degradable materials removed and replaced with compacted granular fill. Similarly any remains of walls, foundations or exposed pieces of demolition material would need to be removed to prevent any development of concentrations of stress in the pavement.

8.7.4 It should be noted that the geotechnical tests results indicate that the Head deposits are shrinkable, and the underlying Chalk Formation is also susceptible to frost heave. As such a minimum pavement thickness of 0.75m should be adopted to protect against frost heave.

[3] Jones C – Dynamic Cone Penetrometer tests and analysis: Technical Information Note, TRL Project Report PR/INT/277/04 (R8157), (2004)

## 8.8 Chemical Attack on Buried Concrete

8.8.1 Samples collected from the Made Ground and Head Deposits were tested for pH and for sulphate content. The results are presented below:

**Table 8-4: pH and Sulphate Analytical Data**

| Strata | No. of samples | pH Range | Characteristic pH | Sulphate Range (mg/l) | Characteristic Sulphate (mg/l) | Design Sulphate Class | ACEC Class |
|---|---|---|---|---|---|---|---|
| Made Ground | 2 | 8.2 to 8.6 | 8.6 | 10 | 10 | DS-1 | AC-1 |
| Head Deposits | 1 | 8.7 | 8.7 | <10 | 10 | DS-1 | AC-1 |

8.8.2 The data was used to assess appropriate classification for buried concrete in accordance with BRE Special Digest 1, based on the following assumptions:

- Brownfield ground conditions; and
- Mobile groundwater conditions.

8.8.3 Based on the results indicated in Table 8-4, it is considered that a Design Sulphate Class of DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) Classification of AC-1 would be appropriate for all buried concrete structures.

## 8.9 Ground Infiltration Assessment

8.9.1 To evaluate the infiltration potential of the shallow ground across the site three soakage tests were undertaken in TP01, TP02 and TP03. The results of the tests are presented in Appendix J and a summary of the results are shown in Table 8-5 below:

**Table 8-5: Summary of the Soakage test results**

| | Soil Infiltration Rate by Interpolation (m/s) | | | | Soil Infiltration Rate by Regress Analysision (m/s) | | | |
|---|---|---|---|---|---|---|---|---|
| Trial Pit ID | 1st test | 2nd test | 3rd test | Average | 1st test | 2nd test | 3rd test | Average |
| TP01 | 3.76E-06 | - | - | - | 3.49E-06 | - | - | - |
| TP02 | 6.19E-05 | 3.8E-05 | 3.94E-05 | 4.66E-05 | 6.98E-05 | 4.85E-05 | 4.76E-05 | 5.53E-05 |
| TP03 | 6.00E-05 | 4.6E-05 | 4.95E-05 | 5.18E-05 | 6.85E-05 | 5.33E-05 | 5.65E-05 | 5.94E-05 |

8.9.2 As can be seen in Table 8-5, the soil infiltration rate varies from 3.49 x $10^{-6}$ m/s to 3.94 x $10^{-5}$ m/s. The variable test results are indicative of the nature of the remoulded chalk matrix and are to be expected.

8.9.3 It should be noted however that chalk stratum is highly variable and higher values of infiltration may be possible should more competent fractured material be encountered at depth.

8.9.4 Consideration may be given to deeper borehole soakaways in this regard but would be critically subject to confirmation and further details of soakage method be determined.

8.9.5 Should soakaways be considered for the infiltration drainage of the site the recommendations of CIRIA C574 should be followed and as such concentrations of rainwater percolating into the ground should be avoided by careful detailing of the structure. Soakaways should be avoided if at all possible. If unavoidable, they should be sited at least 5.00m to 10.00m away from any structure.

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | CP01 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 3 |
| JER9191 | 27/06/2022 | 28/06/2022 | TC | PRELIMINARY | |
| Cable Percussion Borehole Log | Easting: 565942.5 | Northing: 172144.7 | Ground Level: 24.34mOD | Plant Used: Dando 1500 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Design depth. | SPT Hammer: N/R, Energy Ratio: 73%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | 24.14 | 0.20 | | Grass over desiccated brown gravelly SILT with frequent rootlets throughout. Gravel is angular to rounded fine to coarse of flint, glass and concrete. TOPSOIL | | |
| 0.50 | D1 | | PID 0.50m, 0.1ppm | | (0.60) | | Desiccated brown gravelly SILT. Gravel is angular to rounded fine to coarse of flint, glass and concrete. MADE GROUND | | |
| | | | | 23.54 | 0.80 | | Desiccated brown gravelly sandy SILT. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of flint and chalk fragments. HEAD | | |
| 1.00 | D2 | | | | | | | | |
| | | SPT(S) 1.50m, N=14 (2,4/3,3,4,4) | | | | | | | |
| | | | | | (2.10) | | | | |
| 2.00 | D3 | | | | | | | | |
| | | SPT(S) 2.50m, N=50 (6,9/15,20,15 ,) | | | | | | | |
| | | | | 21.44 | 2.90 | | Structureless CHALK composed of off-white and cream slightly gravelly SILT. Gravel is weak and medium density. Frequent angular to rounded fine to coarse gravel of flint. (Grade Dm). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| 3.00 | D4 | | PID 3.00m, 0.1ppm | | | | | | |
| | | SPT(S) 3.50m, N=26 (5,6/6,5,6,9) | | | | | | | |
| | | | | | (4.10) | | | | |
| 4.00 | D5 | | | | | | | | |
| | | SPT(S) 4.50m, N=20 (3,2/4,5,5,6) | | | | | | | |

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Dia (mm) |
| 1 | 0.00 | 2.00 | PLAIN | |
| 1 | 2.00 | 10.00 | SLOTTED | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Chiselling | | | |
|---|---|---|---|
| From (m) | To (m) | Duration | Remarks |

| Borehole Diameter | |
|---|---|
| Depth (m) | Dia (mm) |

| Casing Diameter | |
|---|---|
| Depth (m) | Dia (mm) |

Water Strikes

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | CP01 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 2 of 3 |
| JER9191 | 27/06/2022 | 28/06/2022 | TC | PRELIMINARY | |
| Cable Percussion Borehole Log | Easting: 565942.5 | Northing: 172144.7 | Ground Level: 24.34mOD | Plant Used: Dando 1500 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Design depth. | SPT Hammer: N/R, Energy Ratio: 73%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 5.25 | D6 | | | | | | | | |
| | | SPT(S) 6.00m, N=13 (2,3/2,3,4,4) | | | | | | | |
| 6.75 | D7 | | | | | | | | |
| | | | | 17.34 | 7.00 | | Structureless CHALK composed of off-white slightly gravelly SILT. Gravel is weak and medium density. (Grade Dm). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | SPT(S) 7.50m, N=15 (3,4/3,3,4,5) | | | | | | | |
| 8.25 | D8 | | | | (3.00) | | | | |
| | | SPT(S) 9.00m, N=13 (2,2/3,3,3,4) | | | | | | | |
| 9.75 | D9 | | | | | | | | |
| | | | | 14.34 | 10.00 | | | | |

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Dia (mm) |
| 1 | 0.00 | 2.00 | PLAIN | |
| 1 | 2.00 | 10.00 | SLOTTED | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Chiselling | | | |
|---|---|---|---|
| From (m) | To (m) | Duration | Remarks |

| Borehole Diameter | |
|---|---|
| Depth (m) | Dia (mm) |

| Casing Diameter | |
|---|---|
| Depth (m) | Dia (mm) |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |

| Contract Name: | | | Client: | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | | Gravesham Borough Council | | CP01 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 3 of 3 |
| JER9191 | 27/06/2022 | 28/06/2022 | TC | PRELIMINARY | |
| Cable Percussion Borehole Log | Easting: 565942.5 | Northing: 172144.7 | Ground Level: 24.34mOD | Plant Used: Dando 1500 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Design depth. | SPT Hammer: N/R, Energy Ratio: 73%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | SPT(S) 10.00m, N=30 (3,5/4,10,9,7) | | | | | End of Borehole at 10.00m | | |

11 12 13 14 15

**Start & End of Shift Observations**

| Date | Time | Depth (m) | Casing (m) | Water (m) |
|---|---|---|---|---|

**Installation**

| Ref | Top (m) | Base (m) | Type | Dia (mm) |
|---|---|---|---|---|
| 1 | 0.00 | 2.00 | PLAIN | |
| 1 | 2.00 | 10.00 | SLOTTED | |

**Remarks:**

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

**Chiselling**

| From (m) | To (m) | Duration | Remarks |
|---|---|---|---|

**Borehole Diameter**

| Depth (m) | Dia (mm) |
|---|---|

**Casing Diameter**

| Depth (m) | Dia (mm) |
|---|---|

**Water Strikes**

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | CP02 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 3 |
| JER9191 | 28/06/2022 | 29/06/2022 | TC | PRELIMINARY | |
| Cable Percussion Borehole Log | Easting: 566049.2 | Northing: 172147.3 | Ground Level: 31.40mOD | Plant Used: Dando 1500 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Design depth. | SPT Hammer: N/R, Energy Ratio: 73%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | PID 0.25m, 0.0ppm | 31.20 | 0.20 | | Grass over brown slightly sandy silty angular to subrounded fine to coarse GRAVEL of brick, concrete and chalk fragments. Sand is fine to coarse. TOPSOIL | | |
| | | | PID 0.40m, 0.1ppm | 31.10 | 0.30 | | Brown slightly sandy silty angular to subrounded fine to coarse GRAVEL of brick, concrete and chalk fragments. Sand is fine to coarse. MADE GROUND | | |
| 0.50 | D | | | | (0.30) | | | | |
| | | | | 30.80 | 0.60 | | Brown slightly clayey gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse of flint and chalk fragments. MADE GROUND | | |
| 1.00 | D | | | | | | Structureless CHALK composed of silty angular to subrounded GRAVEL. Clasts are medium strong to strong, low and medium density. Matrix is off-white and light brown. Frequent angular to rounded fine to coarse gravel of flint. (Grade Dm). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | SPT(S) 1.50m, N=33 (5,4/9,9,7,8) | | | | | | | |
| 2.00 | D | | | | | | | | |
| | | SPT(S) 2.50m, N=23 (3,6/5,5,5,8) | | | | | | | |
| | | | | | (5.40) | | | | |
| 3.00 | D | | | | | | | | |
| | | SPT(S) 3.50m, N=33 (4,4/11,8,8,6) | | | | | | | |
| 4.00 | D | | PID 4.00m, 0.0ppm | | | | | | |
| | | SPT(S) 4.50m, N=29 (4,6/7,6,8,8) | | | | | | | |

1 2 3 4 5

**Start & End of Shift Observations**

| Date | Time | Depth (m) | Casing (m) | Water (m) |
|---|---|---|---|---|
| | | | | |

**Installation**

| Ref | Top (m) | Base (m) | Type | Dia (mm) |
|---|---|---|---|---|
| 1 | 0.00 | 1.00 | PLAIN | |

**Remarks:**

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

**Chiselling**

| From (m) | To (m) | Duration | Remarks |
|---|---|---|---|
| | | | |

**Borehole Diameter**

| Depth (m) | Dia (mm) |
|---|---|
| | |

**Casing Diameter**

| Depth (m) | Dia (mm) |
|---|---|
| | |

**Water Strikes**

| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
|---|---|---|---|---|---|
| | | | | | |

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | CP02 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 2 of 3 |
| JER9191 | 28/06/2022 | 29/06/2022 | TC | PRELIMINARY | |
| Cable Percussion Borehole Log | Easting: 566049.2 | Northing: 172147.3 | Ground Level: 31.40mOD | Plant Used: Dando 1500 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Design depth. | SPT Hammer: N/R, Energy Ratio: 73%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 5.25 | D | | | | | | | | |
| | | SPT(S) 6.00m, N=24 (3,4/6,5,6,7) | | 25.40 | 6.00 | | Structureless CHALK composed of gravelly SILT. Gravel is very weak and weak, low and medium density. Matrix is off-white and light brown. (Grade Dm). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| 6.75 | D | | | | | | | | |
| | | SPT(S) 7.50m, N=19 (3,5/4,4,6,5) | | | (4.00) | | | | |
| 8.25 | D | | | | | | | | |
| | | SPT(S) 9.00m, N=31 (4,7/7,9,7,8) | PID 9.00m, 0.0ppm | | | | | | |
| 9.75 | D | | | | | | | | |
| | | | | 21.40 | 10.00 | | | | |

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |
| | | | | |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Dia (mm) |
| 1 | 0.00 | 1.00 | PLAIN | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Chiselling | | | |
|---|---|---|---|
| From (m) | To (m) | Duration | Remarks |
| | | | |

| Borehole Diameter | | Casing Diameter | |
|---|---|---|---|
| Depth (m) | Dia (mm) | Depth (m) | Dia (mm) |
| | | | |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
| | | | | | |

| | | | | |
|---|---|---|---|---|
| Contract Name: St Columba's Close | | | Client: Gravesham Borough Council | Borehole ID: CP02 |
| Contract Number: JER9191 | Start Date: 28/06/2022 | End Date: 29/06/2022 | Checked By: TC | Status: PRELIMINARY |
| Cable Percussion Borehole Log | Easting: 566049.2 | Northing: 172147.3 | Ground Level: 31.40mOD | Plant Used: Dando 1500 |
| Logged By: NW | Scale: 1:25 | | | Sheet 3 of 3 |
| Weather: Sunny | Termination: Design depth. | | SPT Hammer: N/R, Energy Ratio: 73% | |

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | SPT(S) 10.00m, N=30 (5,4/9,7,7,7) | | | | | End of Borehole at 10.00m | | |

11
12
13
14
15

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Dia (mm) |
| 1 | 0.00 | 1.00 | PLAIN | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Chiselling | | | |
|---|---|---|---|
| From (m) | To (m) | Duration | Remarks |

| Borehole Diameter | |
|---|---|
| Depth (m) | Dia (mm) |

| Casing Diameter | |
|---|---|
| Depth (m) | Dia (mm) |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |

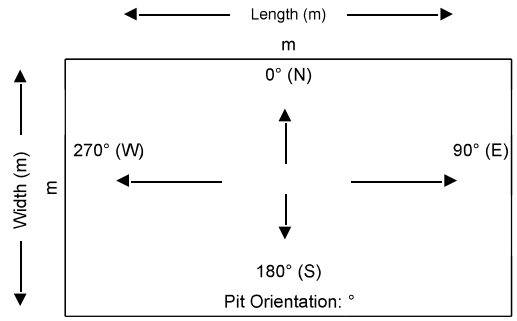
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|---|---|---|---|---|---|---|
| | Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | | Trial Pit ID: FIP01 |
| | Contract Number: JER9191 | Start Date: 27/06/2022 | End Date: 27/06/2022 | Checked By: TC | Status: PRELIMINARY | Sheet 1 of 1 |
| Trial Pit Log | Easting: 565939.4 | Northing: 172130.9 | Ground Level: 23.24mOD | Plant Used: Hand tools | Logged By: NW | Scale: 1:25 |
| Weather: Sunny | | Hole Termination: Electrical cable found at 0.40m bgl. | | Stability: Stable. | | |

| Samples & In Situ Testing | | | Strata Details | | | | | |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water | Backfill |
| 0.20 | ES1 | | 22.84 | (0.40)<br>0.40 | | Desiccated brown slightly gravelly SILT with occasional rootlets. Gravel is angular to subrounded fine to coarse of flint, concrete and wood. Low cobble content of concrete. MADE GROUND<br>End of Trial Pit at 0.40m | | |

1 2 3

## Dimensions:

Final Depth: 0.40m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

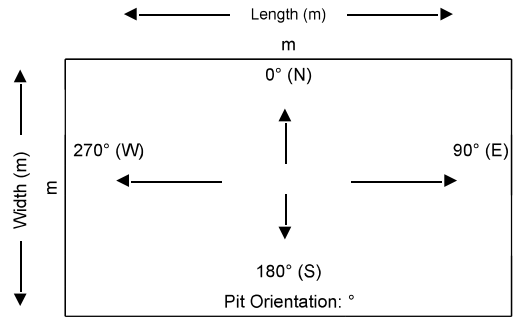
| | | | | | |
|---|---|---|---|---|---|
| Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | | Trial Pit ID: FIP01A |
| Contract Number: JER9191 | Start Date: 27/06/2022 | End Date: 27/06/2022 | Checked By: TC | Status: PRELIMINARY | Sheet 1 of 1 |
| Trial Pit Log | Easting: 565941.1 | Northing: 172127.3 | Ground Level: 23.24mOD | Plant Used: Hand tools | Logged By: NW | Scale: 1:25 |
| Weather: Sunny | Hole Termination: Foundation uncovered. | | Stability: Stable. | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| | | | 23.14 | 0.10 | | Grass over desiccated brown slightly gravelly SILT with rootlets throughout. Gravel is angular to subrounded fine to coarse of flint, concrete, charcoal and wood. Low cobble content of concrete. TOPSOIL | | |
| 0.30 | ES1 | | | (0.90) | | Desiccated brown slightly gravelly SILT with occasional rootlets. Gravel is angular to subrounded fine to coarse of flint, concrete, charcoal and wood. Low cobble content of concrete. MADE GROUND | | |
| 0.80 | ES2 | PID 0.80m, 0.1ppm | | | | | | |
| | | | 22.24 | 1.00 | | End of Trial Pit at 1.00m | | |

1
2
3

## Dimensions:

Final Depth: 1.00m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

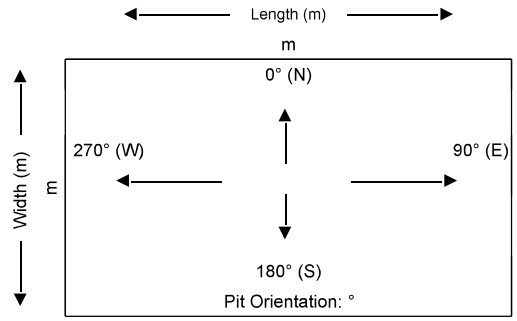
| | | | | | |
|---|---|---|---|---|---|
| | Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | Trial Pit ID: FIP02 |
| | Contract Number: JER9191 | Start Date: 27/06/2022 | End Date: 27/06/2022 | Checked By: TC | Status: PRELIMINARY |
| | | | | | Sheet 1 of 1 |
| Trial Pit Log | Easting: 565992.8 | Northing: 172154.1 | Ground Level: 26.70mOD | Plant Used: Hand tools | Logged By: NW |
| | | | | | Scale: 1:25 |
| Weather: Sunny | | Hole Termination: Foundation uncovered. | | Stability: Stable. | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| | | | 26.60 | 0.10 | | Grass over very light grey slightly sandy silty angular to subrounded fine to coarse GRAVEL of flint, brick and chalk fragments with frequent rootlets throughout. Sand is fine to coarse TOPSOIL | | |
| 0.40 | ES1 | | | | | Very light grey slightly sandy silty angular to subrounded fine to coarse GRAVEL of flint, brick and chalk fragments. Sand is fine to coarse. MADE GROUND | | |
| 0.50 | ES2 | PID 0.50m, 0.0ppm | | (1.00) | | | | |
| | | | 25.60 | 1.10 | | End of Trial Pit at 1.10m | | |

1 2 3

## Dimensions:

Final Depth: 1.10m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

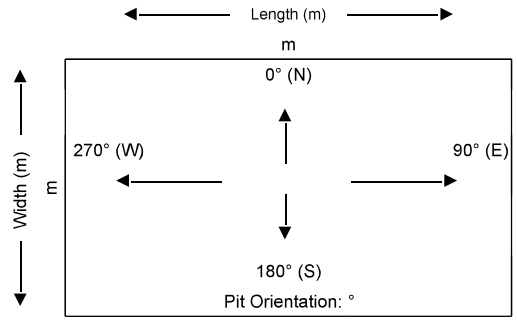
| | | | | | |
|---|---|---|---|---|---|
| Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | | Trial Pit ID: FIP03 |
| Contract Number: JER9191 | Start Date: 27/06/2022 | End Date: 27/06/2022 | Checked By: TC | Status: PRELIMINARY | Sheet 1 of 1 |
| Trial Pit Log | Easting: 566024.8 | Northing: 172142.6 | Ground Level: 30.37mOD | Plant Used: Hand tools | Logged By: NW | Scale: 1:25 |
| Weather: Sunny | Hole Termination: Design depth. | | Stability: Stable. | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| 0.50 | ES1 | PID 0.50m, 0.0ppm | | (1.20) | | Desiccated greyish white slightly sandy gravelly SILT. Gravel is angular to subrounded fine to coarse of flint, chalk and wood. MADE GROUND | | |
| | | | 29.17 | 1.20 | | End of Trial Pit at 1.20m | | |

1 2 3

## Dimensions:

Final Depth: 1.20m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

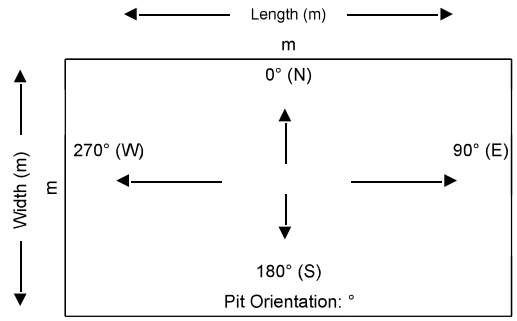
| | | | | | |
|---|---|---|---|---|---|
| | Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | Trial Pit ID: FIP04 |
| | Contract Number: JER9191 | Start Date: 28/06/2022 | End Date: 28/06/2022 | Checked By: TC | Status: PRELIMINARY |
| | | | | | Sheet 1 of 1 |
| Trial Pit Log | Easting: 566018.6 | Northing: 172159.3 | Ground Level: 29.13mOD | Plant Used: Takeuchi TB125 | Logged By: NW |
| | | | | | Scale: 1:25 |
| Weather: Sunny | | Hole Termination: Foundation uncovered. | | Stability: Stable. | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| 0.30 | ES1 | PID 0.30m, 0.0ppm | | (0.60) | | Light grey sandy angular to rounded fine to coarse GRAVEL of concrete, brick, metal, glass, plastic and flint. Frequent cobbles of concrete throughout. MADE GROUND | | |
| 0.80 | ES2 | PID 0.80m, 0.8ppm | 28.53 | 0.60 | | Structureless CHALK composed of off-white silty angular to subrounded GRAVEL. Clasts are weak and medium density. Frequent cobble content of flint. SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | | 28.23 | (0.30) 0.90 | | End of Trial Pit at 0.90m | | |

1 2 3

## Dimensions:

Final Depth: 0.90m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

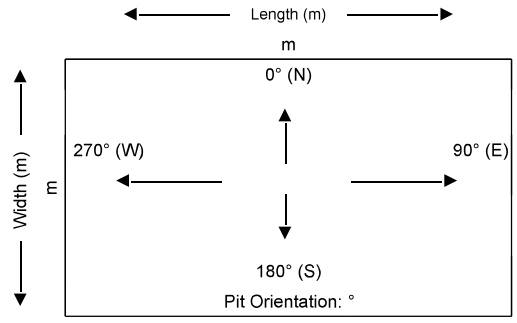
| | | | | | |
|---|---|---|---|---|---|
| | Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | Trial Pit ID: TP01A |
| | Contract Number: JER9191 | Start Date: 28/06/2022 | End Date: 28/06/2022 | Checked By: TC | Status: PRELIMINARY |
| | | | | | Sheet 1 of 1 |
| Trial Pit Log | Easting: 565952.6 | Northing: 172155.7 | Ground Level: 24.45mOD | Plant Used: Takeuchi TB125 | Logged By: NW |
| | | | | | Scale: 1:25 |
| Weather: Sunny | Hole Termination: Excavator unstable. | | Stability: Stable. | | |

| Samples & In Situ Testing | | | Strata Details | | | | | |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water | Backfill |
| 0.40 | D1 | | | (1.00) | | Grass over desiccated brown slightly sandy gravelly SILT. Gravel is angular to rounded fine to coarse of brick, flint, concrete, ceramic, organic material and chalk fragments. MADE GROUND | | |
| | | | 23.45 | 1.00 | | Brown slightly gravelly SILT. Gravel is angular to rounded fine to coarse of flint and brick. Low cobble content of brick. MADE GROUND | | |
| 1.40 | D2 | | | (1.00) | | | | |
| 1.80 | B1 | | | | | *Between 1.70 to 2.00m bgl: Band of flint cobbles.* | | |
| | | | 22.45 | 2.00 | | Structureless CHALK composed of white and light brown gravelly SILT. Gravel is very weak to medium strong, low density angular to subrounded. Frequent cobbles of flint throughout. (Grade Dm). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| 2.60 | D3 | | | (0.80) | | | | |
| 2.70 | ES1 | | | | | | | |
| | | | 21.65 | 2.80 | | End of Trial Pit at 2.80m | | |

1 2 3

## Dimensions:

Final Depth: 2.80m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

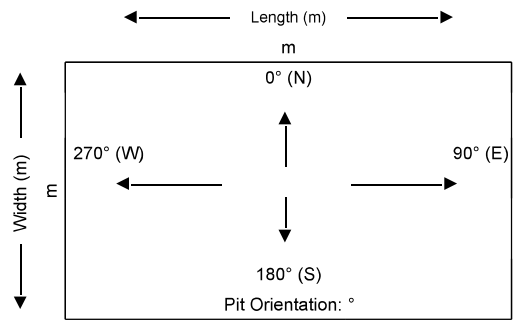
| | | | | | |
|---|---|---|---|---|---|
| Contract Name: St Columba's Close | | | Client: Gravesham Borough Council | | Trial Pit ID: TP02 |
| Contract Number: JER9191 | Start Date: 28/06/2022 | End Date: 28/06/2022 | Checked By: TC | Status: PRELIMINARY | Sheet 1 of 1 |
| Trial Pit Log | Easting: 566032.4 | Northing: 172155.0 | Ground Level: 30.48mOD | Plant Used: Takeuchi TB125 | Logged By: NW | Scale: 1:25 |
| Weather: Sunny | Hole Termination: Excavator unstable. | | Stability: Stable. | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| 0.10 - 0.50 | B1 | | | (0.70) | | Grass over brown slightly sandy silty angular to subrounded fine to coarse GRAVEL of brick, concrete, plastic, metal and chalk fragments with occasional rootlets. Sand is fine to coarse. MADE GROUND | | |
| 0.30 | ES1 | | | | | | | |
| 0.50 | D1 | | | | | | | |
| 0.50 - 1.00 | B2 | | 29.78 | 0.70 | | Structureless CHALK composed of silty angular to rounded GRAVEL. Clasts are very weak and weak, low and medium density. Matrix is off-white and light brown. (Grade Dc). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | | | (0.40) | | *At 1.00m bgl: Band of flint cobbles.* | | |
| | | | 29.38 | 1.10 | | Structureless CHALK composed of silty angular to subrounded GRAVEL and COBBLES. Clasts are weak and medium strong, medium and high density. Matrix is off-white. (Grade Dc). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| 1.50 - 2.00 | B3 | | | | | | | |
| 1.70 | D2 | | | (1.50) | | | | |
| 2.60 | D3 | | 27.88 | 2.60 | | End of Trial Pit at 2.60m | | |

1
2
3

## Dimensions:

Final Depth: 2.60m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

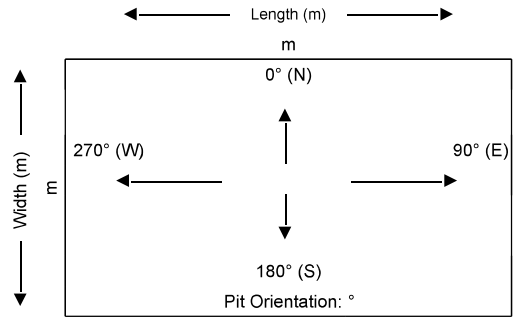
| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

| Contract Name: | | Client: | | | Trial Pit ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | TP03 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 1 |
| JER9191 | 28/06/2022 | 28/06/2022 | TC | PRELIMINARY | |
| Trial Pit Log | Easting: 566055.5 | Northing: 172128.5 | Ground Level: 31.68mOD | Plant Used: Takeuchi TB125 | Logged By: AA | Scale: 1:25 |
| Weather: Sunny | Hole Termination: Excavator unstable. | | Stability: Stable. | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| 0.30 | ES1 | PID 0.30m, 0.0ppm | | (0.70) | | Grass over brown slightly sandy silty angular to subrounded fine to coarse GRAVEL of brick, concrete, plastic, metal and chalk fragments with occasional rootlets. Sand is fine to coarse. MADE GROUND | | |
| 0.50 | ES2 | PID 0.50m, 0.0ppm | | | | | | |
| | | | 30.98 | 0.70 | | Structureless CHALK composed of silty angular to rounded GRAVEL. Clasts are very weak and weak, low and medium density. Matrix is off-white and light brown. (Grade Dc) SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | | | (0.50) | | | 1 | |
| | | | 30.48 | 1.20 | | Structureless CHALK composed of silty angular to subrounded GRAVEL and COBBLES. Clasts are weak and medium strong, medium and high density. Matrix is off-white. (Grade Dc). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | | | (0.80) | | | | |
| 2.00 | ES3 | PID 2.00m, 0.1ppm | 29.68 | 2.00 | | End of Trial Pit at 2.00m | 2 | |
| | | | | | | | 3 | |

## Dimensions:

Final Depth: 2.00m




## General Remarks:

1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | |

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | WS01 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 1 |
| JER9191 | 27/06/2022 | 27/06/2022 | TC | PRELIMINARY | |
| Windowless Borehole Log | Easting: 565934.8 | Northing: 172115.0 | Ground Level: 23.07mOD | Plant Used: Dart 312 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Refused at 1.70m bgl. | SPT Hammer: N/R, Energy Ratio: 69%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | (0.30) | | Dark grey gravelly silty fine to coarse SAND. Gravel is angular to subangular of flint and chalk fragments. MADE GROUND | | |
| 0.25 | ES | | PID 0.25m, 0.1ppm | 22.77 | 0.30 | | | | |
| | | | | | (0.45) | | Dark grey gravelly silty fine to coarse SAND. Gravel is angular to rounded fine to coarse of flint, brick and concrete. Low cobble content of flint. MADE GROUND | | |
| 0.80 | ES | | PID 0.80m, 0.2ppm | 22.32 | 0.75 | | Dark brown gravelly slightly sandy SILT. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of flint and chalk fragments. HEAD | | |
| | | SPT(C) 1.00m, N=11 (1,1/1,1,3,6) | | | | | *At 0.80m bgl: Becoming slightly sandy.* | | |
| | | | | | (0.95) | | *Between 1.50 to 1.70m bgl: Dense flint band.* | | |
| | | SPT(C) 1.70m, N=60 (10,12/14,16, 16,14) | | 21.37 | 1.70 | | End of Borehole at 1.70m | | |

1 2 3 4 5

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Diameter (mm) |
| 1 | 0.00 | 0.70 | PLAIN | |
| 1 | 0.70 | 1.70 | SLOTTED | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Windowless Sample Run Details | | | | |
|---|---|---|---|---|
| Test Number | Diameter (mm) | Depth Top (m) | Depth Base (m) | Recovery (%) |

| Casing | |
|---|---|
| Depth (m) | Diameter (mm) |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |

| | | | | | |
|---|---|---|---|---|---|
| | Contract Name: St Columba's Close | | Client: Gravesham Borough Council | | Borehole ID: WS02 |
| | Contract Number: JER9191 | Start Date: 27/06/2022 | End Date: 27/06/2022 | Checked By: TC | Status: PRELIMINARY |
| | | | | | Sheet 1 of 1 |
| Windowless Borehole Log | Easting: 565972.6 | Northing: 172147.7 | Ground Level: 26.15mOD | Plant Used: Dart 312 | Logged By: AA |
| | | | | | Scale: 1:25 |
| Weather: Sunny | | Termination: Magnetometer picked up signal at 1.00m bgl. | | | |

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.30 | ES1 | | | | (0.80) | | Dark grey gravelly silty fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint, brick, chalk and concrete fragments. MADE GROUND | | |
| | | | | 25.35 | 0.80 | | Desiccated dark brown slightly sandy gravelly SILT. Gravel is angular to subrounded fine to medium flint and chalk fragments. HEAD | | |
| | | | | 25.15 | 1.00 | | End of Borehole at 1.00m | | |

1 2 3 4 5

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |
| | | | | |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Diameter (mm) |
| | | | | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Windowless Sample Run Details | | | | |
|---|---|---|---|---|
| Test Number | Diameter (mm) | Depth Top (m) | Depth Base (m) | Recovery (%) |
| | | | | |

| Casing | |
|---|---|
| Depth (m) | Diameter (mm) |
| | |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |
| | | | | | |

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | WS02A |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 1 |
| JER9191 | 27/06/2022 | 27/06/2022 | TC | PRELIMINARY | |
| Windowless Borehole Log | Easting: 565972.6 | Northing: 172147.7 | Ground Level: 26.15mOD | Plant Used: Dart 312 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Refused at 2.00m bgl. | SPT Hammer: N/R, Energy Ratio: 69%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.20 | ES1 | | PID 0.20m, 0.1ppm | | | | Grey gravelly silty fine to coarse SAND. Gravel is angular to subrounded fine to coarse of flint, brick and concrete fragments. MADE GROUND | | |
| 0.30 | D | | PID 0.30m, 0.1ppm | | (0.90) | | | | |
| 0.80 | ES2 | | PID 0.80m, 0.0ppm | | | | | | |
| 1.00 | ES3 | SPT(C) 1.00m, N=14 (2,2/2,2,2,8) | | 25.25 | 0.90 | | Dark brown slightly sandy gravelly SILT. Gravel is angular to subangular fine to medium of flint and chalk fragments. HEAD | | |
| | | | | | (0.50) | | | | |
| | | | | 24.75 | 1.40 | | Structureless CHALK composed of sandy GRAVEL. Sand is fine to coarse. Clasts are off-white brown and cream with rare black specks rinded flints and orange staining very weak to weak low to medium density. (Grade Dc). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | | | | (0.60) | | | | |
| | | SPT(C) 2.00m, N=48 (4,16/12,12,12,12) | | 24.15 | 2.00 | | End of Borehole at 2.00m | | |

1 2 3 4 5

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Diameter (mm) |
| 1 | 0.00 | 1.50 | PLAIN | |
| 1 | 1.50 | 2.00 | SLOTTED | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Windowless Sample Run Details | | | | |
|---|---|---|---|---|
| Test Number | Diameter (mm) | Depth Top (m) | Depth Base (m) | Recovery (%) |

| Casing | |
|---|---|
| Depth (m) | Diameter (mm) |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | WS04 |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 1 |
| JER9191 | 27/06/2022 | 27/06/2022 | TC | PRELIMINARY | |
| Windowless Borehole Log | Easting: 565988.8 | Northing: 172141.8 | Ground Level: 27.02mOD | Plant Used: Dart 312 | Logged By: NW | Scale: 1:25 |

Weather: Sunny | Termination: Refused at 3.00m bgl. | SPT Hammer: N/R, Energy Ratio: 69%

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| 0.20 | ES1 | | PID 0.20m, 0.0ppm | | (0.45) | | Desiccated dark grey slightly sandy gravelly clayey SILT. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of flint and brick. MADE GROUND | | |
| | | | | 26.57 | 0.45 | | | | |
| 0.70 | ES2 | | PID 0.70m, 0.1ppm | | (0.30) | | Desiccated brown gravelly slightly sandy clayey SILT. Sand is fine to medium. Gravel is angular to rounded fine to medium of flint and chalk. MADE GROUND | | |
| | | | | 26.27 | 0.75 | | Structureless CHALK composed of off-white cream and brown with rare orange staining sandy silty angular to subrounded GRAVEL. Sand is fine to coarse. Clasts are extremely weak to weak low to medium density. (Grade Dc). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| | | SPT(C) 1.00m, N=44 (12,12/12,10, 10,12) | | 26.02 | 1.00 | | | | |
| | | | | 25.77 | 1.25 | | Structureless CHALK composed of off-white and cream gravelly sandy SILT. Sand is fine to coarse. Gravel is extremely weak to very weak low density with rare rinded flint. (Grade Dm). SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) | | |
| 1.60 | ES3 | | PID 1.60m, 0.0ppm | | | | Structureless CHALK composed of off-white cream and brown with rare orange staining slightly sandy silty angular to subrounded GRAVEL. Sand is fine to coarse. Clasts are extremely weak to weak low to medium density. (Grade Dc). SEAFORD CHALK FORMATION | | |
| | | SPT(C) 2.00m, N=21 (4,5/4,5,6,6) | | | (1.75) | | | | |
| | | SPT(C) 3.00m, N=50 (6,6/12,12,14 ,12) | | 24.02 | 3.00 | | End of Borehole at 3.00m | | |

1 2 3 4 5

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Diameter (mm) |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Windowless Sample Run Details | | | | |
|---|---|---|---|---|
| Test Number | Diameter (mm) | Depth Top (m) | Depth Base (m) | Recovery (%) |

| Casing | |
|---|---|
| Depth (m) | Diameter (mm) |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |

| Contract Name: | | Client: | | | Borehole ID: |
|---|---|---|---|---|---|
| St Columba's Close | | Gravesham Borough Council | | | WS05A |
| Contract Number: | Start Date: | End Date: | Checked By: | Status: | Sheet 1 of 1 |
| JER9191 | 27/06/2022 | 27/06/2022 | TC | PRELIMINARY | |
| Windowless Borehole Log | Easting: 566022.8 | Northing: 172150.8 | Ground Level: 29.68mOD | Plant Used: Dart 312 | Logged By: AA | Scale: 1:25 |
| Weather: Sunny | Termination: Refused at 2.40m bgl. | SPT Hammer: N/R, Energy Ratio: 69% | | | |

| Samples & In Situ Testing | | | | Strata Details | | | | Groundwater | |
|---|---|---|---|---|---|---|---|---|---|
| Depths | Type/ Ref | SPT | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water Strike | Backfill/ Installation |
| | | | | | (0.40) | | Grey gravelly silty fine to coarse SAND. Gravel is angular to subangular fine to coarse of flint and chalk fragments. MADE GROUND | | |
| 0.30 | ES1 | | | 29.28 | 0.40 | | | | |
| 0.55 | ES2 | | PID 0.55m, 0.0ppm | | (0.30) | | Grey and off-white very gravelly silty fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint and chalk fragments. MADE GROUND | | |
| 0.80 | ES3 | | | 28.98 | 0.70 | | Structureless chalk composed of off-white and cream sandy angular to subrounded fine to coarse GRAVEL. Sand is fine to coarse. Clasts are weak to medium strong low to medium density. Low gravel content of flint. SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) *At 1.00m bgl: Chalk becoming extremely weak to weak.* | | |
| 1.00 | ES4 | SPT(C) 1.00m, N=26 (4,6/6,4,8,8) | PID 1.00m, 0.0ppm | | | | | | |
| | | | | | (1.70) | | | | |
| 2.00 | ES5 | SPT(C) 2.00m, N=32 (8,8/8,8,8,8) | | | | | | | |
| | | SPT(C) 2.50m, N=50 (10,12/12,14, 12,12) | | 27.28 | 2.40 | | End of Borehole at 2.40m | | |

1 2 3 4 5

| Start & End of Shift Observations | | | | |
|---|---|---|---|---|
| Date | Time | Depth (m) | Casing (m) | Water (m) |

| Installation | | | | |
|---|---|---|---|---|
| Ref | Top (m) | Base (m) | Type | Diameter (mm) |
| 1 | 0.00 | 0.90 | PLAIN | |
| 1 | 0.90 | 2.40 | SLOTTED | |

Remarks:
1. No visual or olfactory signs of contamination.
2. No groundwater encountered.

| Windowless Sample Run Details | | | | |
|---|---|---|---|---|
| Test Number | Diameter (mm) | Depth Top (m) | Depth Base (m) | Recovery (%) |

| Casing | |
|---|---|
| Depth (m) | Diameter (mm) |

| Water Strikes | | | | | |
|---|---|---|---|---|---|
| Strike (m) | Casing (m) | Sealed (m) | Time (mins) | Rose to (m) | Remarks |

20 Farringdon Street
London, EC4A 4AB
T +44 20 3691 0500

**Our ref: 230215-L-JER10012-JL**

Date: 17th February 2023

Sarah Holmes
Housing Development and Strategy Manager
Gravesham Borough Council
Civic Centre
Windmill Street
Gravesend
Kent
DA12 1AU

Dear Sarah,

**Re: Additional Winter Groundwater Monitoring and Soakaway Testing – St. Columbas Close, Gravesend, Kent DA12 4AJ**

Please find below the results of the additional winter groundwater monitoring and soakaway testing recently undertaken at the above site.

## 1.1 Background

The site covers approximately 1.07 hectares and currently comprises four residential housing blocks with open landscaping and trees. The site slopes downwards significantly from east to west. The surrounding land use is predominantly residential. A site location plan is provided as *Drawing 1*.

The development proposals comprise the demolition of 26 homes (including caretaker's facility) and construction of 46 new homes (including reprovision of the caretaker's facility) within two blocks of flats and two house and maisonette terraces with associated carparking and cycle storage.

RPS has previously undertaken a Phase 1 Preliminary Risk Assessment and a Phase 2 Geo-Environmental and Geotechnical Site Investigation at the site (RPS ref: 220303 R JER9191 NW V1 R1, dated December 2022).

Ground conditions encountered during the intrusive investigation comprised Topsoil and/or Made Ground to a maximum depth of 1.90m below ground level (bgl), overlying superficial Head deposits to a maximum depth of 2.10m bgl, overlying Seaford Chalk Formation to the maximum investigation depth of 10.00m bgl. The Head deposits overlying the chalk bedrock were only encountered within the exploratory holes in the western and southwestern sections of the site.

No groundwater was encountered during intrusive investigation works or within monitoring wells installed up to 10.00m bgl during subsequent monitoring visits.

Soakaway testing undertaken as part of the investigation recorded soil infiltration rates varying from 3.49 x 10-6 m/s to 3.94 x 10-5 m/s. The variable test results were considered to be indicative of the nature of the remoulded chalk matrix.

## 1.2 Aims

The aims of the additional works were to:

- Confirm whether any rise in groundwater levels beneath the site had occurred during the winter months; and
- To determine the infiltration rate within shallow soils in the confirmed locations of the eastern and western soakaways and to provide further information in support of the preliminary drainage design for the proposed development.

## 1.3 Methodology

Return visits for groundwater sampling were carried out on the 3rd and 15th February 2023. Each monitoring well was inspected for the presence of free-phase hydrocarbon product using an oil/water interface probe and the depth to groundwater (where present) was recorded.

The location and depth of the soakaway test pits was specified in advance by Ridge and Partners LLP (R&P). The soakaway tests were carried out in general accordance with the methodology detailed within BRE Digest 365 'Soakaway Design'. Four soakaway test pits (test pits TP104 to TP107) were excavated at the site using a mechanical excavator on the 15th February 2023. Test pit locations are indicated on Drawing *2*.

The proposed invert level of the eastern soakaway were provided by R&P as approximately 1.28m bgl (28.72m AOD) and as approximately 5.30m bgl (21.02m AOD) for the western soakaway.

Test pits TP104 and TP105 were positioned in the proposed location of the western soakaway and test pits TP106 and TP107 in the proposed location of the eastern soakaway. Test pits TP104 and TP105 were excavated to a depth of 2.40m bgl (approximately 23.83m and 24.40m AOD respectively) and test pits TP106 and TP107 to a depth of approximately 2.10m bgl (approximately 28.70m and 29.42m AOD respectively).

Once excavated, the test pits were filled with potable water and left to drain into the ground. The depth to water was recorded at regular time intervals during each soakaway test. This process was repeated a total of three times at each location

Upon completion of the soakaway testing and trial pitting, each of the test pits were carefully backfilled with arisings in reverse order. During backfilling the materials were compacted at regular intervals with the back of the excavator bucket.

## 1.4 Ground Conditions

The encountered ground conditions comprised the following:

- Topsoil: Ranging in thickness from approximately 0.30m to 0.40m. This generally comprised brown friable slightly gravelly slightly sandy silt.
- Made Ground: Encountered in test pit TP104 only as light brown slightly gravelly silt with brick cobbles.
- Head: Encountered in test pits TP104 and TP105 only as orangish brown and off-white gravelly silt with gravel of chalk and flint (occasional chalk cobbles at depth).
- Seaford Chalk Formation: Encountered in test pits TP106 and TP107 only comprising structureless chalk composed of silty sub-angular to subrounded fine to coarse gravel with chalk cobbles at depth.

Groundwater was not encountered within any of the test pits.

Test pit logs are provided in *Appendix A* and photos of the typical test pit arisings are presented in *Appendix B*.

## 1.5 Groundwater

No groundwater was encountered during the additional two rounds of groundwater monitoring carried out during February 2023. The groundwater level data for the five monitoring rounds undertaken at the site to date are presented in the table below.

**Table 1 – Groundwater Level Data**

| Monitoring Well ID | Well Screen Depth (m bgl) [m AOD] | Strata | Depth to Water (m bgl) [m AOD] 08/07/2022 | 21/07/2022 | 28/07/2022 | 03/02/2023 | 15/02/2023 |
|---|---|---|---|---|---|---|---|
| WS02A | 1.50 to 2.00 [24.65 to 24.15] | Seaford Chalk Formation | Dry | Dry | Dry | Dry | Dry |
| WS05A | 0.80 to 2.40 [28.88 to 27.28] | Seaford Chalk Formation | Dry | Dry | Dry | Dry | Dry |
| CP01 | 2.00 to 10.00 [22.34 to 14.34] | Seaford Chalk Formation | Dry | Dry | Dry | Dry | Dry |
| CP02 | 1.0 to 10.00 [30.40 to 21.40] | Seaford Chalk Formation | Dry | Dry | Dry | Dry | Dry |

Monitoring well locations are indicated on Figure 2.

No groundwater has been encountered to a maximum depth of 10m bgl (14.34m AOD) during any of the five groundwater monitoring visits undertaken.

## 1.6 Soakaway Test Results

Infiltration rates are calculated by measuring the time taken for the water level to fall from 75% to 25% of the effective storage depth in the test pit.

Three complete infiltration tests were undertaken in all test pits (TP104 to TP107) within the time frame of the site works.

The calculated infiltration rates for the soakaway tests in each test pit is summarised in the table below and the soakaway test calculations are presented in *Appendix C*.

**Table 2 – Results of Soakaway Testing**

| Trial Pit ID | Soil Infiltration Rate by Interpolation (m/s) | | | |
|---|---|---|---|---|
| | 1st test | 2nd test | 3rd test | Average |
| TP104 | 2.49E-05 | 2.52E-05 | 2.38E-05 | 2.46E-05 |
| TP105 | 2.50E-05 | 2.40E-05 | 2.00E-05 | 2.30E-05 |
| TP106 | 2.02E-03 | 1.13E-03 | 6.72E-04 | 1.27E-03 |
| TP107 | 1.05E-03 | 1.12E-03 | 1.45E-03 | 1.21E-03 |

As can be seen in Table 2, the soil infiltration rate in the location of the proposed western soakaway (TP104 and TP105) varies from $2.00x10^{-05}$ to $2.52x10^{-05}$ with that for the eastern soakaway (TP106 and TP107) from $2.02x10^{-03}$ to $6.72x10^{-04}$.

The infiltration rates in the location of the eastern soakaway (TP106 and TP107) were recorded to be significantly quicker than those in the location of the western soakaway with chalk bedrock encountered in the location of the eastern soakaway.

Plant access restrictions limited the depth to which the test pits could be excavated. Whilst the depth to invert for the eastern soakaway were achievable, the pits for the western soakaway terminated at depths shallower than the proposed invert level. Higher values of infiltration are likely to be possible in the structureless chalk material (as evidenced above) which would be anticipated at the invert level depth proposed in the location of the western soakaway.

Should soakaways be used for the infiltration of drainage at the site then the recommendations within CIRIA C574 should be considered.

We trust the above is satisfactory, however, please do not hesitate to contact us should you wish to discuss further.

Yours sincerely,
for RPS Consulting Services Ltd

**Jim Lightbown**
Technical Director

Click or tap here to enter text.

Enc:
Figure 1: Exploratory Hole Location Plan
Appendix A: Test Pit Logs
Appendix B: Photolog
Appendix C: Soakaway Test Calculations
Appendix D: General Notes

# Appendix A

## Test Pit Logs

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Notes

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| Rev | Description | By | CB | Date |
|---|---|---|---|---|
| | | | | |
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Client Gravesham Borough Council

Project St Columba's Close

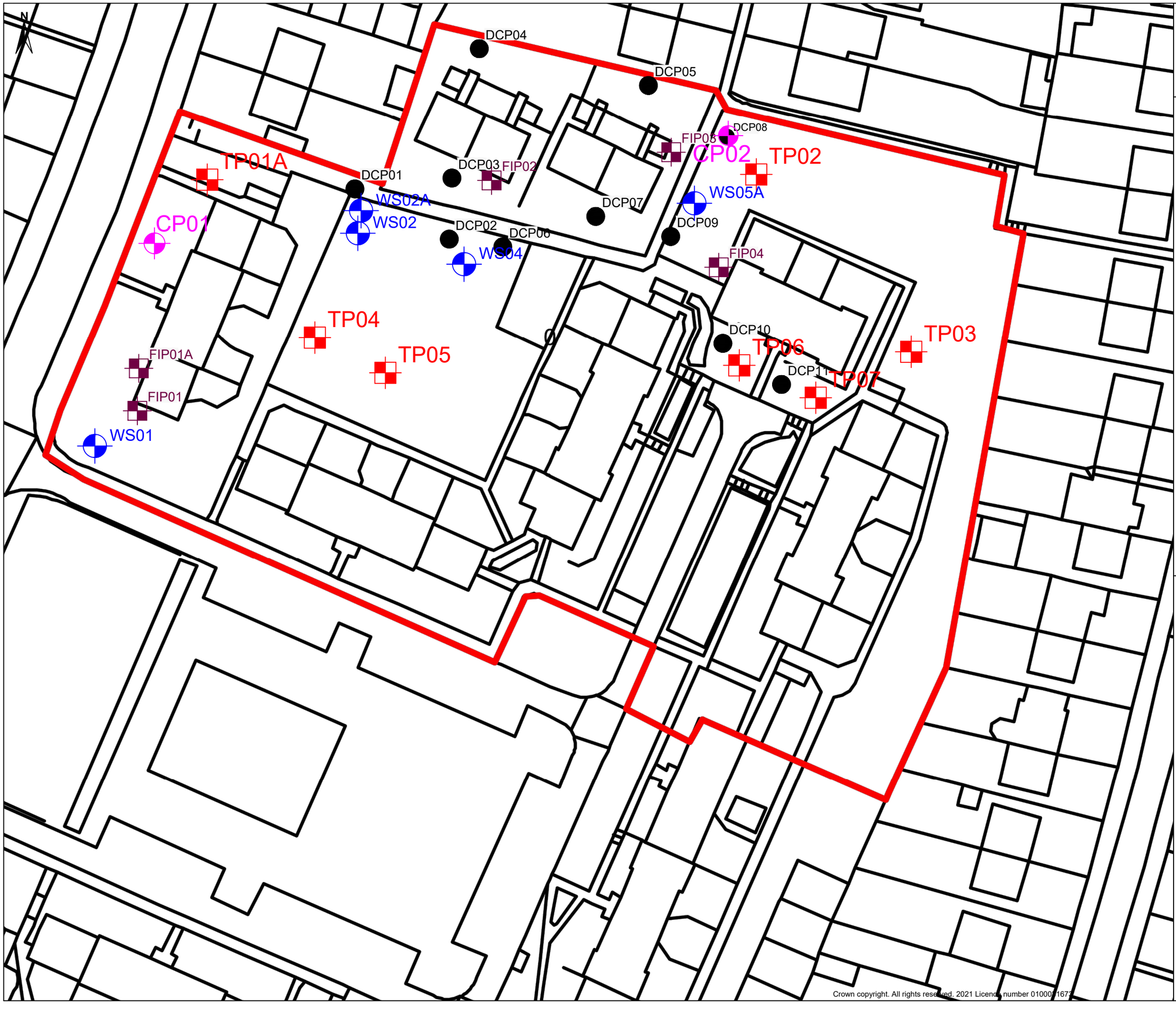
Title Site Location Plan

| Status | Drawn By | PM/Checked by |
|---|---|---|
| Draft | NW | - |

| Job Ref | Scale @ A3 | Date Created |
|---|---|---|
| JER9191 | NTS | July 22 |

| RPS Drawing / Figure Number | Rev |
|---|---|
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TP — Trial Pit (~3.50m bgl)

WS — Window Sample Borehole (5m bgl)

CP — Cable Percussive Borehole (10m bgl)

FIP — Foundation Inspection Pit

Site Boundary

DCP

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Client: Gravesham Borough Council

Project: St Columba's Close

Title: Exploratory Hole Location Plan

| Status | Drawn By | PM/Checked by |
|---|---|---|
| Final | TR | JL |
| **Job Ref** | **Scale @ A3** | **Date Created** |
| JER10012 | NTS | Feb 2023 |
| **Drawing Number** | | **Rev** |
| 2 | | 04 |

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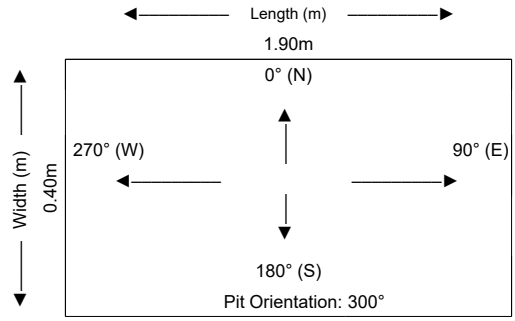
| | | | | | | |
|---|---|---|---|---|---|---|
| A TETRA TECH COMPANY | Contract Name: Columba's Close Additional Monitoring | | Client: Gravesham Borough Council | | | Trial Pit ID: TP104 |
| | Contract Number: JER10012 | Start Date: 14/02/2023 | End Date: 14/02/2023 | Checked By: TR | Status: FINAL | Sheet 1 of 1 |
| Trial Pit Log | Easting: 565968.0 | Northing: 172127.0 | Ground Level: 26.23mOD | Plant Used: Mini-excavator | Logged By: GS | Scale: 1:33 |
| Weather: Clear | Hole Termination: Maximum depth excavator could reach safely. | | Stability: Stable | | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| | | | 25.93 | (0.30) 0.30 | | Grass over brown friable slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to rounded of flint with frequent rootlets. [TOPSOIL] | | |
| | | | | (0.80) | | Light brown slightly gravelly SILT. Gravel is fine to coarse sub-angular to sub-rounded of flint with rare cobbles of brick. [MADE GROUND] | | |
| | | | 25.13 | 1.10 | | Orangish brown and off-white gravelly SILT. Gravel is fine to coarse angular to sub-rounded of chalk and flint. [HEAD] | | |
| | | | | (1.30) | | *(2.00-2.40m) Average chalk gravel particle size increases.* | | |
| | | | 23.83 | 2.40 | | End of Trial Pit at 2.40m | | |

1 2 3 4 5

**Dimensions:**

Final Depth: 2.40m




**General Remarks:**

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | No groundwater encountered. |

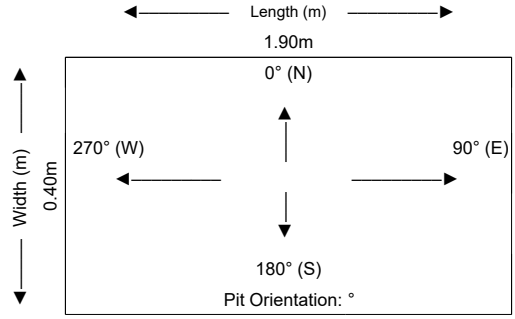
| | | | | | |
|---|---|---|---|---|---|
| A TETRA TECH COMPANY | Contract Name: Columba's Close Additional Monitoring | | Client: Gravesham Borough Council | | Trial Pit ID: TP105 |
| | Contract Number: JER10012 | Start Date: 14/02/2023 | End Date: 14/02/2023 | Checked By: TR | Status: FINAL — Sheet 1 of 1 |
| Trial Pit Log | Easting: 565974.0 | Northing: 172126.0 | Ground Level: 26.80mOD | Plant Used: Mini excavator | Logged By: GS — Scale: 1:33 |
| Weather: Clear | Hole Termination: Maximum depth excavator could reach safely. | | Stability: Stable | | |

| Samples & In Situ Testing | | | Strata Details | | | | | |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | Water | Backfill |
| | | | 26.40 | (0.40) 0.40 | | Grass over brown friable sandy gravelly SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to rounded of flint with frequent rootlets and rare cobbles of brick. [TOPSOIL] | | |
| | | | | (1.10) | | Orangish brown mottled white gravelly SILT. Gravel is fine to coarse sub-angular to sub-rounded of flint with occasional cobbles of flint. [HEAD] | | |
| | | | 25.30 | 1.50 | | Light orangish brown and off-white very gravelly sandy SILT. Sand is fine to coarse. Gravel is fine to coarse angular to sub-rounded of flint and chalk with occasional cobbles of flint. [HEAD] | | |
| | | | | (0.90) | | *(2.00-2.10m) Boulder of flint.* | | |
| | | | 24.40 | 2.40 | | End of Trial Pit at 2.40m | | |

1 2 3 4 5

## Dimensions:

Final Depth: 2.40m




## General Remarks:

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | No groundwater encountered. |

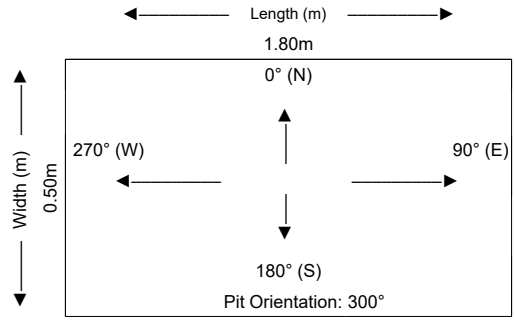
| | | | | | |
|---|---|---|---|---|---|
| A TETRA TECH COMPANY | Contract Name: Columba's Close Additional Monitoring | | Client: Gravesham Borough Council | | Trial Pit ID: TP106 |
| | Contract Number: JER10012 | Start Date: 13/02/2023 | End Date: 13/02/2023 | Checked By: TR | Status: FINAL |
| | | | | | Sheet 1 of 1 |
| Trial Pit Log | Easting: 566031.0 | Northing: 172128.0 | Ground Level: 30.80mOD | Plant Used: Mini excavator | Logged By: GS |
| | | | | | Scale: 1:33 |
| Weather: Clear | Hole Termination: Target depth reached. | | Stability: Unstable | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| | | | 30.40 | (0.40) 0.40 | | Brown friable slightly gravelly slightly sandy SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded of flint and chalk. [TOPSOIL] | | |
| | | | | (1.70) | | Structureless CHALK composed of silty sub-angular to sub-rounded fine to coarse GRAVEL. Clasts are weak and medium strong, low and medium density. Matrix is off-white to light brown. (Grade Dc) [SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION] | | |
| | | | | | | *(1.70-1.90m) Brick gravel and cobbles on the northern pit wall, approximately 200mm high and 400mm wide.* | | |
| | | | 28.70 | 2.10 | | End of Trial Pit at 2.10m | | |

1 2 3 4 5

## Dimensions:

Final Depth: 2.10m




## General Remarks:

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | No groundwater encountered. |

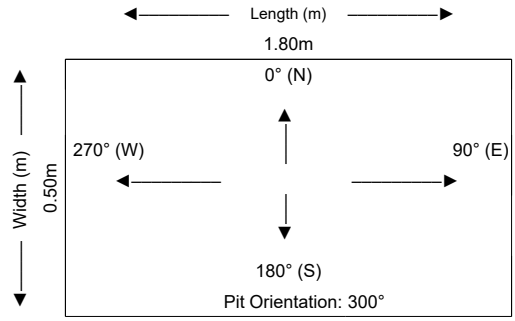
| | | | | | |
|---|---|---|---|---|---|
| RPS A TETRA TECH COMPANY | Contract Name: Columba's Close Additional Monitoring | | Client: Gravesham Borough Council | | Trial Pit ID: TP107 |
| | Contract Number: JER10012 | Start Date: 13/02/2023 | End Date: 13/02/2023 | Checked By: TR | Status: FINAL |
| | | | | | Sheet 1 of 1 |
| Trial Pit Log | Easting: 566040.0 | Northing: 172126.0 | Ground Level: 31.52mOD | Plant Used: Mini excavator | Logged By: GS |
| | | | | | Scale: 1:33 |
| Weather: Clear | Hole Termination: Target depth reached. | | Stability: Unstable | | |

| Samples & In Situ Testing | | | Strata Details | | | | Water | Backfill |
|---|---|---|---|---|---|---|---|---|
| Depths | Type/Ref | Testing | Level (mAOD) | Depth (m) (Thickness) | Legend | Strata Description | | |
| | | | 31.22 | (0.30) 0.30 | | Grass over brown friable slightly sandy gravelly SILT. Sand is fine to coarse. Gravel is fine to coarse angular to sub-rounded of flint and chalk. [TOPSOIL] | | |
| | | | | (1.20) | | Structureless CHALK composed of silty angular to sub-rounded GRAVEL. Clasts are weak low and medium density. Matrix is white to off-white. (Grade Dc) [SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION] | | |
| | | | 30.02 | 1.50 | | Structureless CHALK composed of silty very angular to sub-angular fine to coarse GRAVEL and COBBLES. Clasts are weak to medium strong, medium to high density. Matrix is white to off-white. (Grade Dc) [SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION] | | |
| | | | | (0.60) | | | | |
| | | | 29.42 | 2.10 | | End of Trial Pit at 2.10m | | |

1 2 3 4 5

Dimensions:

Final Depth: 2.10m




General Remarks:

| Water Strikes | |
|---|---|
| Strike (m) | Remarks |
| | No groundwater encountered. |

# Appendix B

## Photolog



Photo 01: Head arisings encountered within test pit TP104.



Photo 02:Chalk arisings encountered within test pit TP107.

# Appendix C

## Soakage Test Calculations

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 104 |
| Test No: | 1 |
| Date of Test: | 14/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 0.90 |
| 1 | 0.96 |
| 2 | 1.00 |
| 3 | 1.01 |
| 4 | 1.03 |
| 5 | 1.05 |
| 7 | 1.08 |
| 9 | 1.10 |
| 14 | 1.22 |
| 22 | 1.35 |
| 34 | 1.45 |
| 42 | 1.51 |
| 52 | 1.63 |
| 61 | 1.67 |
| 73 | 1.71 |
| 86 | 1.77 |
| 93 | 1.85 |
| 105 | 1.96 |
| 109 | 2.05 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.90 | m |
| Width of Pit | 0.40 | m |
| Depth of Pit | 2.40 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 0.90 | m bgl |
| Effective storage depth | 1.50 | m |
| Depth to water 75% full | 1.28 | m bgl |
| Depth to water 25% full | 2.03 | m bgl |
| Volume 75% to 25% depth | 0.57 | $m^3$ |
| Mean surface area of outflow | 4.21 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

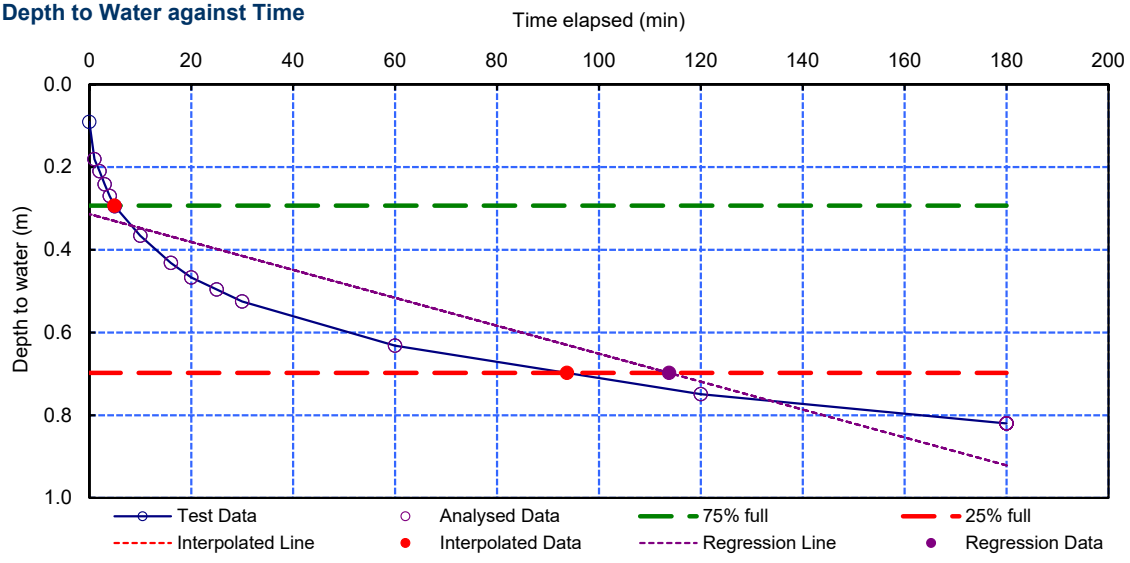
| | | |
|---|---|---|
| Time 75% full | 17 | min |
| Time 25% full | 108 | min |
| Time for outflow | 91 | min |
| **Soil Infiltration Rate** | **2.49E-05** | **m/s** |

### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 109 | mins |
| Time 75% full | | 26 | min |
| Time 25% full | | 106 | min |
| Time for outflow | | 80 | min |
| **Soil Infiltration Rate** | | **2.81E-05** | **m/s** |

Note: Values in blue denote input data

### Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP104.xlsx]1st Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 104 |
| Test No: | 2 |
| Date of Test: | 14/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.00 |
| 1 | 1.02 |
| 2 | 1.05 |
| 4 | 1.10 |
| 5 | 1.12 |
| 7 | 1.13 |
| 10 | 1.16 |
| 14 | 1.20 |
| 23 | 1.28 |
| 31 | 1.43 |
| 34 | 1.50 |
| 43 | 1.52 |
| 60 | 1.63 |
| 72 | 1.67 |
| 81 | 1.74 |
| 90 | 1.90 |
| 95 | 1.95 |
| 102 | 1.99 |
| 115 | 2.05 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.90 | m |
| Width of Pit | 0.40 | m |
| Depth of Pit | 2.40 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.00 | m bgl |
| Effective storage depth | 1.40 | m |
| Depth to water 75% full | 1.35 | m bgl |
| Depth to water 25% full | 2.05 | m bgl |
| Volume 75% to 25% depth | 0.53 | $m^3$ |
| Mean surface area of outflow | 3.98 | $m^2$ |

## Soil Infiltration Rate

### - by extrapolation

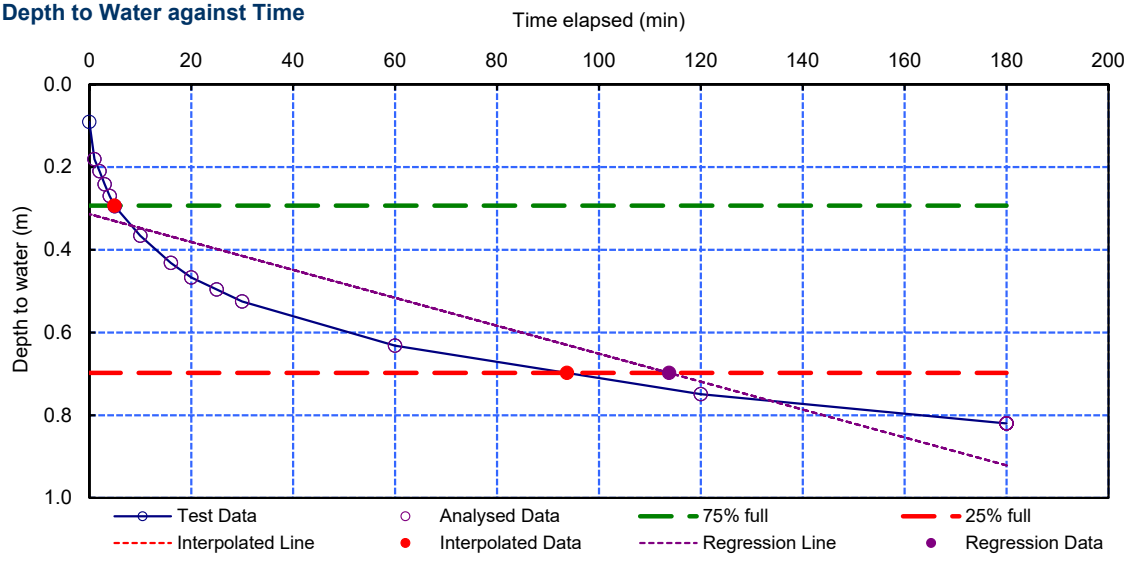
| | | |
|---|---|---|
| Time 75% full | 27 | min |
| Time 25% full | 115 | min |
| Time for outflow | 88 | min |
| **Soil Infiltration Rate** | **2.52E-05** | **m/s** |

### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 115 | mins |
| Time 75% full | | 30 | min |
| Time 25% full | | 109 | min |
| Time for outflow | | 79 | min |
| **Soil Infiltration Rate** | | **2.83E-05** | **m/s** |

Note: Values in blue denote input data

## Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP104.xlsx]2nd Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 104 |
| Test No: | 3 |
| Date of Test: | 14/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.00 |
| 1 | 1.07 |
| 2 | 1.10 |
| 3 | 1.12 |
| 5 | 1.15 |
| 7 | 1.18 |
| 11 | 1.26 |
| 20 | 1.37 |
| 32 | 1.47 |
| 41 | 1.55 |
| 47 | 1.62 |
| 59 | 1.71 |
| 69 | 1.75 |
| 77 | 1.80 |
| 83 | 1.85 |
| 93 | 1.95 |
| 100 | 2.00 |
| 106 | 2.03 |
| 112 | 2.05 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.90 | m |
| Width of Pit | 0.40 | m |
| Depth of Pit | 2.40 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.00 | m bgl |
| Effective storage depth | 1.40 | m |
| Depth to water 75% full | 1.35 | m bgl |
| Depth to water 25% full | 2.05 | m bgl |
| Volume 75% to 25% depth | 0.53 | $m^3$ |
| Mean surface area of outflow | 3.98 | $m^2$ |

## Soil Infiltration Rate

### - by extrapolation

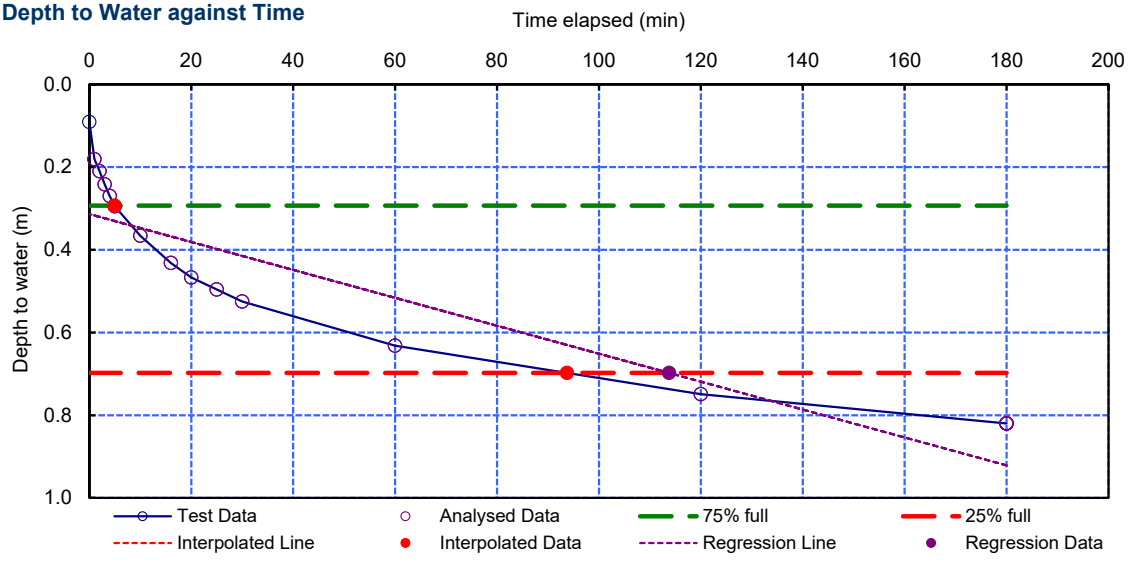
| | | |
|---|---|---|
| Time 75% full | 18 | min |
| Time 25% full | 112 | min |
| Time for outflow | 94 | min |
| **Soil Infiltration Rate** | **2.38E-05** | **m/s** |

### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 112 | mins |
| Time 75% full | | 24 | min |
| Time 25% full | | 105 | min |
| Time for outflow | | 80 | min |
| **Soil Infiltration Rate** | | **2.78E-05** | **m/s** |

Note: Values in blue denote input data

## Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP104.xlsx]3rd Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 105 |
| Test No: | 1 |
| Date of Test: | 14/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 0.90 |
| 2 | 1.00 |
| 3 | 1.01 |
| 5 | 1.03 |
| 7 | 1.07 |
| 9 | 1.10 |
| 14 | 1.22 |
| 22 | 1.35 |
| 34 | 1.45 |
| 42 | 1.51 |
| 52 | 1.63 |
| 61 | 1.67 |
| 73 | 1.71 |
| 86 | 1.77 |
| 93 | 1.85 |
| 98 | 1.90 |
| 104 | 1.96 |
| 109 | 2.05 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.90 | m |
| Width of Pit | 0.40 | m |
| Depth of Pit | 2.40 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 0.90 | m bgl |
| Effective storage depth | 1.50 | m |
| Depth to water 75% full | 1.28 | m bgl |
| Depth to water 25% full | 2.03 | m bgl |
| Volume 75% to 25% depth | 0.57 | $m^3$ |
| Mean surface area of outflow | 4.21 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

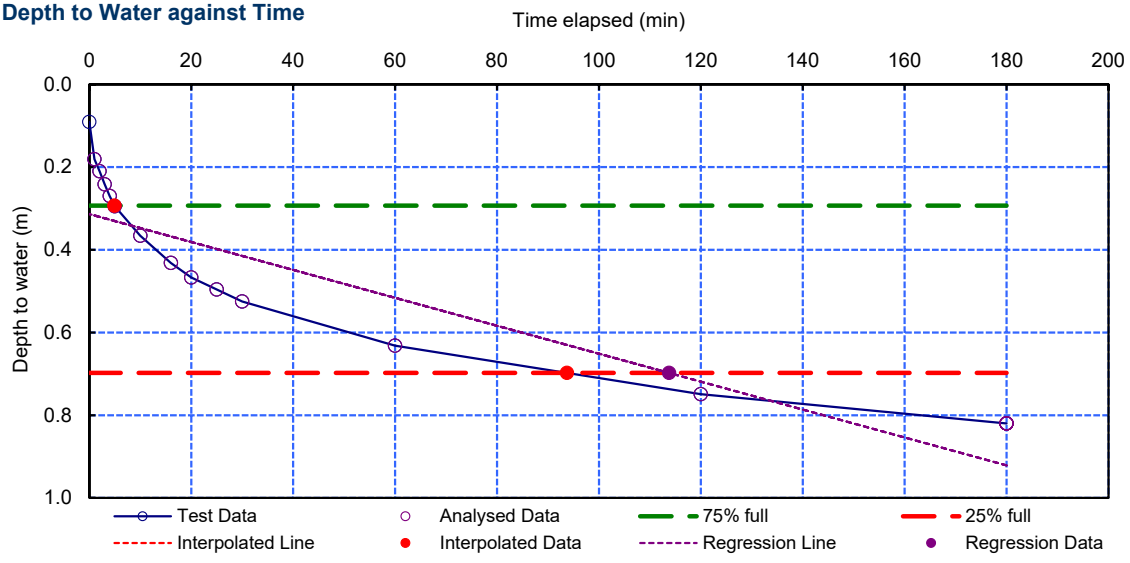
| | | |
|---|---|---|
| Time 75% full | 17 | min |
| Time 25% full | 108 | min |
| Time for outflow | 90 | min |
| **Soil Infiltration Rate** | **2.50E-05** | **m/s** |

### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 109 | mins |
| Time 75% full | | 25 | min |
| Time 25% full | | 107 | min |
| Time for outflow | | 83 | min |
| **Soil Infiltration Rate** | | **2.73E-05** | **m/s** |

Note: Values in blue denote input data

### Depth to Water against Time






Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP105.xlsx]1st Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 105 |
| Test No: | 2 |
| Date of Test: | 14/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.00 |
| 4 | 1.10 |
| 6 | 1.11 |
| 7 | 1.12 |
| 9 | 1.16 |
| 10 | 1.17 |
| 14 | 1.20 |
| 23 | 1.28 |
| 31 | 1.43 |
| 34 | 1.50 |
| 43 | 1.57 |
| 54 | 1.63 |
| 60 | 1.67 |
| 72 | 1.74 |
| 81 | 1.90 |
| 90 | 1.95 |
| 100 | 1.99 |
| 113 | 2.03 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.90 | m |
| Width of Pit | 0.40 | m |
| Depth of Pit | 2.40 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.00 | m bgl |
| Effective storage depth | 1.40 | m |
| Depth to water 75% full | 1.35 | m bgl |
| Depth to water 25% full | 2.05 | m bgl |
| Volume 75% to 25% depth | 0.53 | $m^3$ |
| Mean surface area of outflow | 3.98 | $m^2$ |

## Soil Infiltration Rate

### - by extrapolation

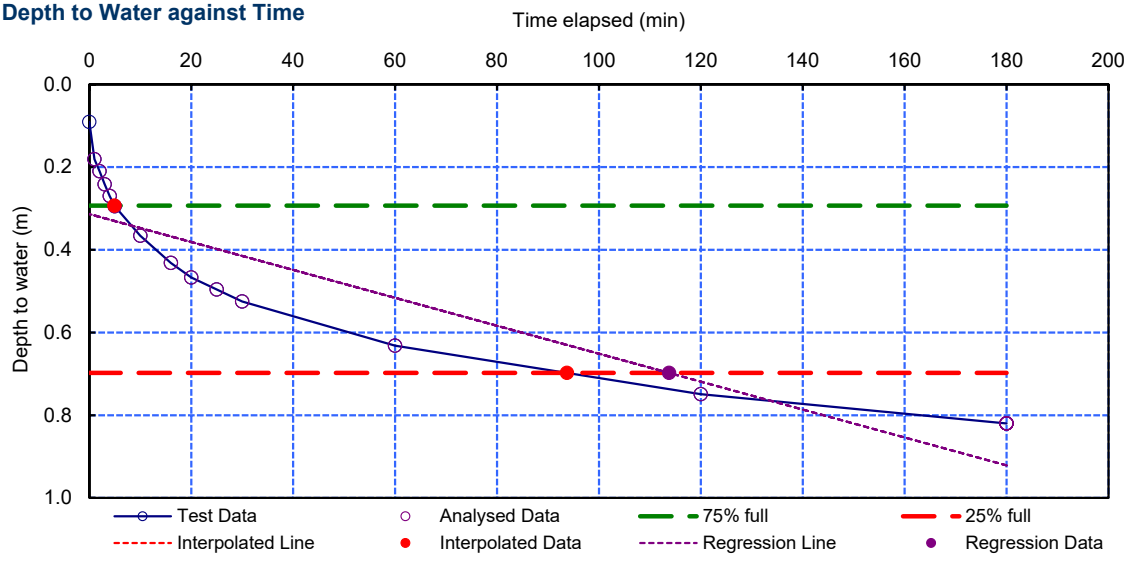
| | | |
|---|---|---|
| Time 75% full | 27 | min |
| Time 25% full | 120 | min |
| Time for outflow | 93 | min |
| **Soil Infiltration Rate** | **2.40E-05** | **m/s** |

### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 113 | mins |
| Time 75% full | | 28 | min |
| Time 25% full | | 104 | min |
| Time for outflow | | 76 | min |
| **Soil Infiltration Rate** | | **2.93E-05** | **m/s** |

Note: Values in blue denote input data

### Depth to Water against Time



# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 105 |
| Test No: | 3 |
| Date of Test: | 14/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 0.95 |
| 1 | 0.99 |
| 2 | 1.03 |
| 3 | 1.05 |
| 5 | 1.08 |
| 7 | 1.10 |
| 11 | 1.15 |
| 18 | 1.20 |
| 25 | 1.27 |
| 36 | 1.35 |
| 46 | 1.43 |
| 52 | 1.47 |
| 56 | 1.50 |
| 65 | 1.57 |
| 70 | 1.60 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.90 | m |
| Width of Pit | 0.40 | m |
| Depth of Pit | 2.40 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 0.95 | m bgl |
| Effective storage depth | 1.45 | m |
| Depth to water 75% full | 1.31 | m bgl |
| Depth to water 25% full | 2.04 | m bgl |
| Volume 75% to 25% depth | 0.55 | $m^3$ |
| Mean surface area of outflow | 4.10 | $m^2$ |

## Soil Infiltration Rate

### - by extrapolation

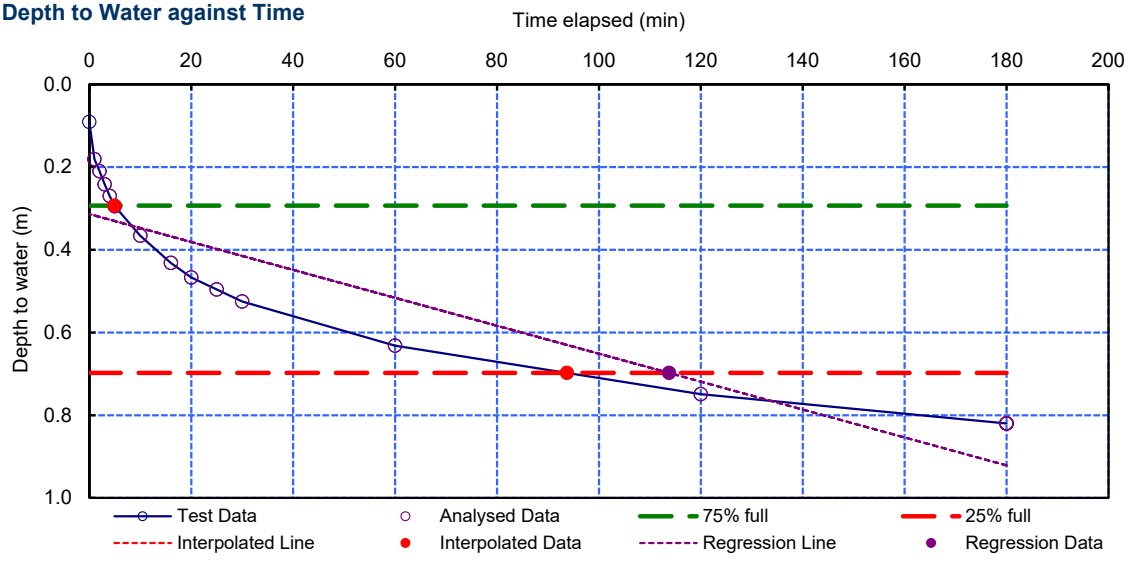
| | | |
|---|---|---|
| Time 75% full | 31 | min |
| Time 25% full | 143 | min |
| Time for outflow | 112 | min |
| **Soil Infiltration Rate** | **2.00E-05** | **m/s** |

### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 70 | mins |
| Time 75% full | | 33 | min |
| Time 25% full | | 119 | min |
| Time for outflow | | 86 | min |
| **Soil Infiltration Rate** | | **2.60E-05** | **m/s** |

Note: Values in blue denote input data

## Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP105.xlsx]3rd Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 106 |
| Test No: | 1 |
| Date of Test: | 13/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.61 |
| 1 | 1.78 |
| 2 | 2.10 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.80 | m |
| Width of Pit | 0.50 | m |
| Depth of Pit | 2.10 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.61 | m bgl |
| Effective storage depth | 0.49 | m |
| Depth to water 75% full | 1.73 | m bgl |
| Depth to water 25% full | 1.98 | m bgl |
| Volume 75% to 25% depth | 0.22 | $m^3$ |
| Mean surface area of outflow | 2.03 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

| | | |
|---|---|---|
| Time 75% full | 1 | min |
| Time 25% full | 2 | min |
| Time for outflow | 1 | min |

**Soil Infiltration Rate** **2.02E-03 m/s**

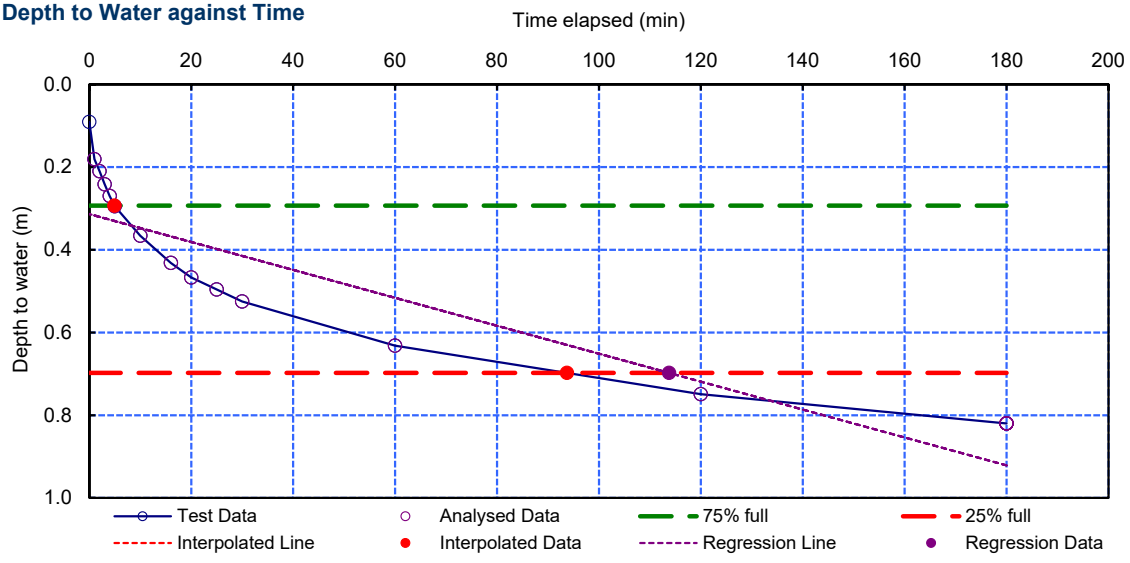
### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 2 | mins |
| Time 75% full | | 1 | min |
| Time 25% full | | 2 | min |
| Time for outflow | | 1 | min |

**Soil Infiltration Rate** **2.37E-03 m/s**

Note: Values in blue denote input data

### Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 106 |
| Test No: | 2 |
| Date of Test: | 13/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.58 |
| 1 | 1.80 |
| 2 | 1.93 |
| 3 | 2.10 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.80 | m |
| Width of Pit | 0.50 | m |
| Depth of Pit | 2.10 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.58 | m bgl |
| Effective storage depth | 0.52 | m |
| Depth to water 75% full | 1.71 | m bgl |
| Depth to water 25% full | 1.97 | m bgl |
| Volume 75% to 25% depth | 0.23 | $m^3$ |
| Mean surface area of outflow | 2.10 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

| | | |
|---|---|---|
| Time 75% full | 1 | min |
| Time 25% full | 2 | min |
| Time for outflow | 2 | min |

**Soil Infiltration Rate** **1.13E-03 m/s**

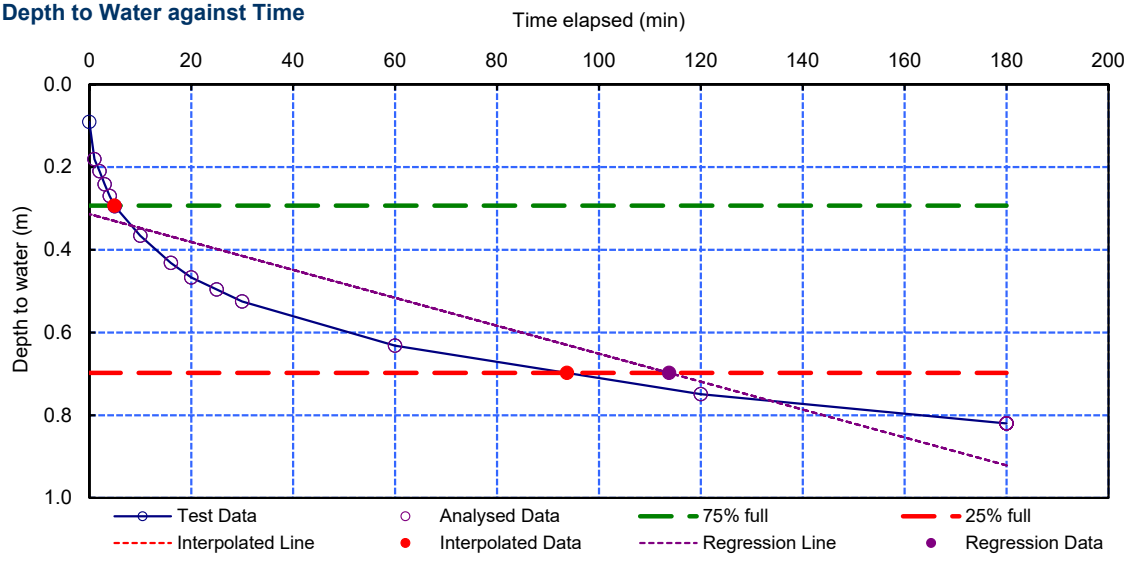
### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 3 | mins |
| Time 75% full | | 0 | min |
| Time 25% full | | 2 | min |
| Time for outflow | | 2 | min |

**Soil Infiltration Rate** **1.07E-03 m/s**

Note: Values in blue denote input data

### Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP106.xlsx]2nd Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 106 |
| Test No: | 3 |
| Date of Test: | 13/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.54 |
| 1 | 1.66 |
| 2 | 1.80 |
| 3 | 1.90 |
| 4 | 1.96 |
| 5 | 2.10 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.80 | m |
| Width of Pit | 0.50 | m |
| Depth of Pit | 2.10 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.54 | m bgl |
| Effective storage depth | 0.56 | m |
| Depth to water 75% full | 1.68 | m bgl |
| Depth to water 25% full | 1.96 | m bgl |
| Volume 75% to 25% depth | 0.25 | $m^3$ |
| Mean surface area of outflow | 2.19 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

| | | |
|---|---|---|
| Time 75% full | 1 | min |
| Time 25% full | 4 | min |
| Time for outflow | 3 | min |

**Soil Infiltration Rate** **6.72E-04 m/s**

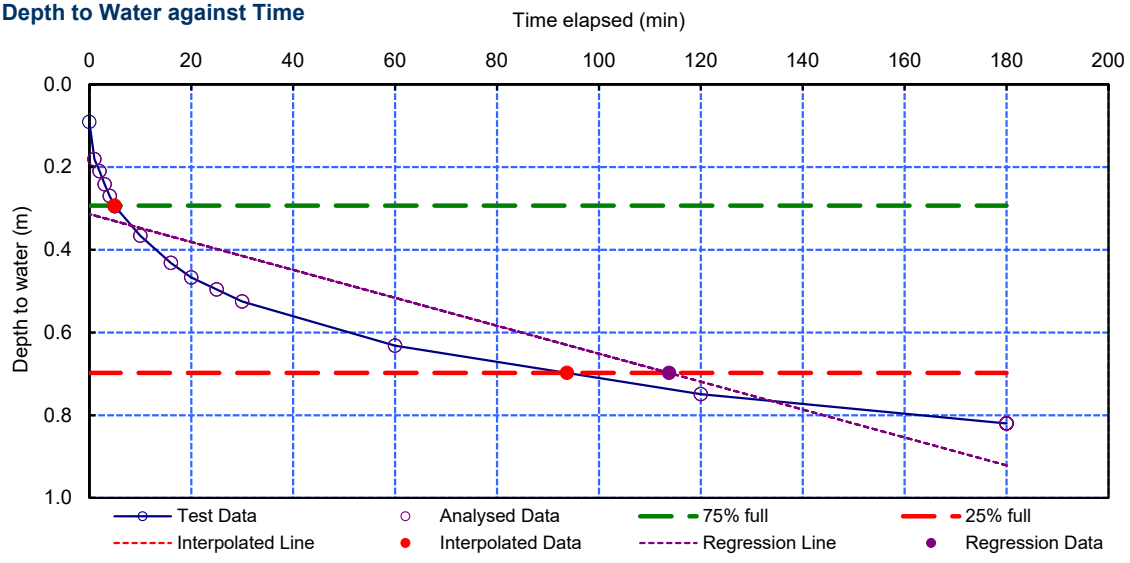
### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 5 | mins |
| Time 75% full | | 1 | min |
| Time 25% full | | 4 | min |
| Time for outflow | | 3 | min |

**Soil Infiltration Rate** **7.13E-04 m/s**

Note: Values in blue denote input data

### Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 107 |
| Test No: | 1 |
| Date of Test: | 13/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.30 |
| 1 | 1.48 |
| 2 | 1.70 |
| 3 | 1.88 |
| 4 | 2.00 |
| 5 | 2.10 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.80 | m |
| Width of Pit | 0.50 | m |
| Depth of Pit | 2.10 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.30 | m bgl |
| Effective storage depth | 0.80 | m |
| Depth to water 75% full | 1.50 | m bgl |
| Depth to water 25% full | 1.90 | m bgl |
| Volume 75% to 25% depth | 0.36 | $m^3$ |
| Mean surface area of outflow | 2.74 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

| | | |
|---|---|---|
| Time 75% full | 1 | min |
| Time 25% full | 3 | min |
| Time for outflow | 2 | min |

**Soil Infiltration Rate** **1.05E-03 m/s**

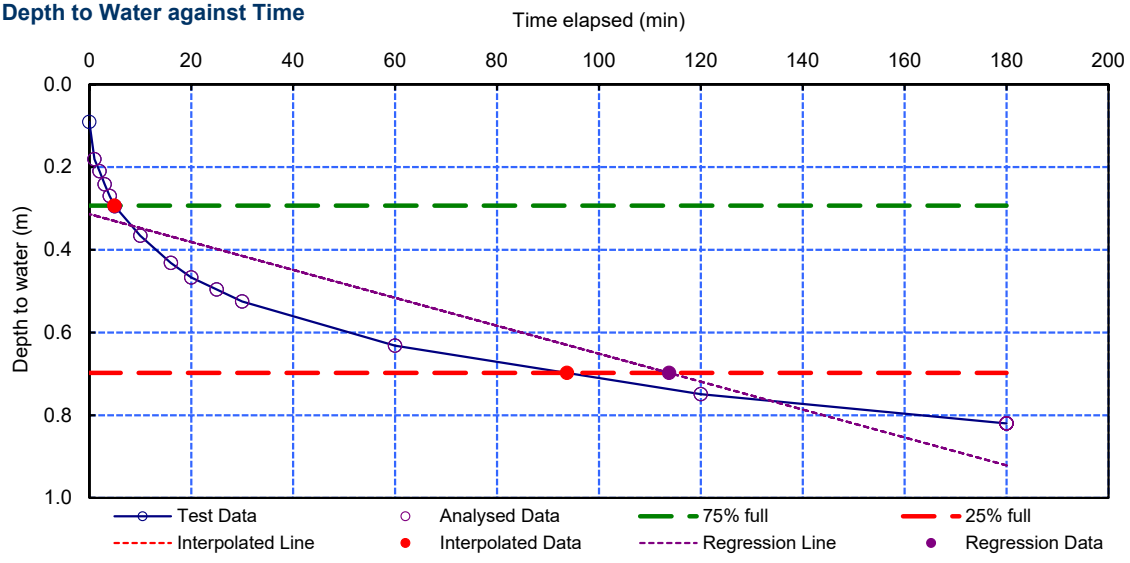
### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 5 | mins |
| Time 75% full | | 1 | min |
| Time 25% full | | 3 | min |
| Time for outflow | | 3 | min |

**Soil Infiltration Rate** **8.43E-04 m/s**

Note: Values in blue denote input data

### Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

Y:\JER10012 - Columba's Close Additional Monitoring\3. Data\8. Geotechnics\Soakage\[TP107.xlsx]1st Test

# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 107 |
| Test No: | 2 |
| Date of Test: | 13/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.28 |
| 1 | 1.46 |
| 2 | 1.64 |
| 3 | 1.88 |
| 4 | 2.01 |
| 5 | 2.10 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.80 | m |
| Width of Pit | 0.50 | m |
| Depth of Pit | 2.10 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.28 | m bgl |
| Effective storage depth | 0.82 | m |
| Depth to water 75% full | 1.49 | m bgl |
| Depth to water 25% full | 1.90 | m bgl |
| Volume 75% to 25% depth | 0.37 | $m^3$ |
| Mean surface area of outflow | 2.79 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

| | | |
|---|---|---|
| Time 75% full | 1 | min |
| Time 25% full | 3 | min |
| Time for outflow | 2 | min |

**Soil Infiltration Rate** **1.12E-03 m/s**

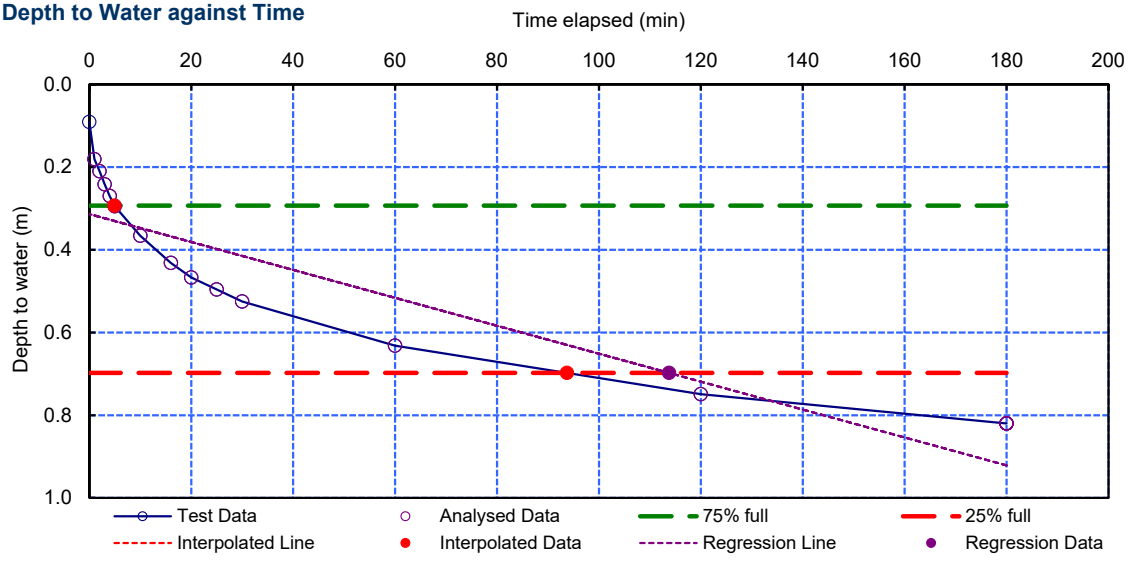
### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 5 | mins |
| Time 75% full | | 1 | min |
| Time 25% full | | 3 | min |
| Time for outflow | | 2 | min |

**Soil Infiltration Rate** **8.88E-04 m/s**

Note: Values in blue denote input data

### Depth to Water against Time



# Record Sheet

DETERMINATION OF SOIL INFILTRATION RATE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Title | St. Columba's Road | | | | | | |
| Project No | JER10012 | | By | GS | Chkd | Date | 17/02/2023 |

## Test Details

| | |
|---|---|
| Trial Pit : | 107 |
| Test No: | 3 |
| Date of Test: | 13/02/2023 |

## Test Data

| Elapsed Time (mins) | Depth to Water (m) |
|---|---|
| 0 | 1.34 |
| 1 | 1.47 |
| 2 | 1.68 |
| 3 | 1.98 |
| 4 | 2.02 |
| 5 | 2.10 |

## Trial Pit Details

| | | |
|---|---|---|
| Length of Pit | 1.80 | m |
| Width of Pit | 0.50 | m |
| Depth of Pit | 2.10 | m |

## Conditions of Test Zone

| | | |
|---|---|---|
| Depth to water at start | 1.34 | m bgl |
| Effective storage depth | 0.76 | m |
| Depth to water 75% full | 1.53 | m bgl |
| Depth to water 25% full | 1.91 | m bgl |
| Volume 75% to 25% depth | 0.34 | $m^3$ |
| Mean surface area of outflow | 2.65 | $m^2$ |

## Soil Infiltration Rate

### - by interpolation

| | | |
|---|---|---|
| Time 75% full | 1 | min |
| Time 25% full | 3 | min |
| Time for outflow | 1 | min |

**Soil Infiltration Rate** **1.45E-03 m/s**

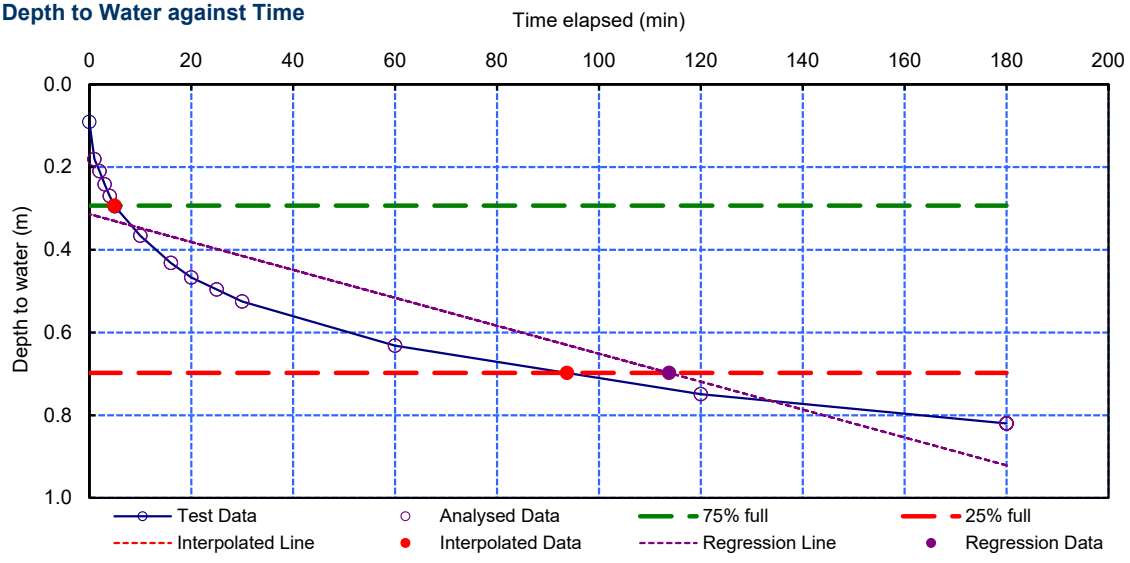
### - by regression analysis

| | | | |
|---|---|---|---|
| Analysed data | T1 | 0 | mins |
| | to T2 | 5 | mins |
| Time 75% full | | 1 | min |
| Time 25% full | | 3 | min |
| Time for outflow | | 2 | min |

**Soil Infiltration Rate** **9.06E-04 m/s**

Note: Values in blue denote input data

### Depth to Water against Time




| | | | | |
|---|---|---|---|---|
| Sheet | 01 | of | 01 | |

# Appendix D

## General Notes

## RPS CONSULTING SERVICES LTD

## PHASE 2 – SITE INVESTIGATIONS

General Notes

1. The assessments made in this report are based on the ground conditions as revealed by intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination ("hot spots") and there can be no certainty that any or all such areas have been located and/or sampled.
2. There may be special conditions appertaining to the site which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.
3. Where any data supplied by the Client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by RPS Companies for inaccuracies within the data supplied by other parties.
4. Whilst the report may express an opinion on possible ground conditions between or beyond trial pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.
5. Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.
6. This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a re-interpretation of the report in whole or part after its original submission.
7. The copyright in the written materials shall remain the property of the RPS Company but with a royalty-free perpetual licence to the client deemed to be granted on payment in full to the RPS Company by the client of the outstanding amounts.
8. The report is provided for sole use by the Client and is confidential to them and their professional advisors. No responsibility whatsoever for the contents of the report will be accepted to any person other than the Client.
9. These terms apply in addition to the RPS Group "Standard Terms of Business" (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing. (In the event of a conflict between these terms and the said Standard Terms of Business the said Standard Terms of Business shall prevail). In the absence of such a written contract the Standard Terms of Business will apply.

**APPENDIX E**

DRAINAGE PROPOSALS

## Foul Drainage Key:

- Existing Foul Manhole and FWS
- Mains Adoptable Foul Manhole and FWS
- Existing Public Foul sewers to be abandoned
- Existing private foul/combined drains to be abandoned
- Foul Drain (100Ø Unless Noted Otherwise)
- Private Non-Entry FW PPIC Inspection Chamber
- Non-Entry Mini Access Chamber (0.6m to invert)
- Domestic Foul Water Outlet / Soil Pipe

## Storm Drainage Key:

- Mains Adoptable Storm Manhole and SWS
- Mains Private Storm Manhole and SWS
- Non entry SW Inspection Access Chamber & drain
- SW Rodding Eye
- Road Gully
- Level Threshold Drain (Aco type as specified by architect. Refer to architectural working drawings for detail)
- Linear Aco Drain
- SUDs Type A Permeable Paving FULL INFILTRATION
- SUDs Cellular Storage Tank
- SuDS Green roofs to cycle stores and bin stores

IMPORTANT NOTE ON DEEP DRAINS:
WHERE A DRAIN RUN PASSES NEAR A BUILDING WITHIN THE 45 DEGREE LOADLINE, THE DRAINAGE TRENCH SHALL BE BACKFILLED WITH CONCRETE TO THE BUILDING FOUNDATION FORMATION LEVEL.

N

Valley Drive

St Patrick's Gardens

FFL 26.300 | FFL 26.750 | FFL 27.200 | FFL 27.650 | FFL 28.100 | FFL 28.550

FFL 29.550 | FFL 30.450

FFL 24.200 | FFL 26.200 | FFL 26.800 | FFL 27.550

FFL 30.450 | FFL 32.850

S1 CL 28.93 IL 27.15 | S2 CL 28.67 IL 27.55 | S3 CL 26.11 IL 24.68 | S4 CL 23.98 IL 22.48 | S5 CL 25.26 IL 23.84 (bd) IL 23.39 | S6 CL 25.11 IL 22.58 | S7 CL 24.13 IL 22.30 | S8 CL 32.70 IL 31.20 | S9 CL 29.25 IL 28.10 | S10 CL 30.00 IL 27.83

F1 CL 26.80 IL 25.00 | F2 CL 25.97 IL 24.10 | F3 CL 25.15 IL 23.38 | F4 CL 24.14 IL 23.26 | F5 CL 24.26 IL 22.90 | F6 CL 25.34 IL 24.26 (bd) IL 22.83 | F7 CL 24.49 IL 22.73 | F8 CL 24.30 IL 22.69 | F9 CL 31.65 IL 30.24(Bd) IL 28.74

FMH 9105 CL 24.26 IL 22.84 | FMH 9104 CL 24.41 IL 22.84 | FMH 9103 CL 24.48 IL 23.11 | FMH 9102 CL 26.00 IL 23.76 | FMH 9101 CL 27.17 IL 25.44 | FMH 9106 CL 24.36 IL 23.84 | FMH 0105 CL 30.52 IL 29.10 | FMH 0106 CL 29.17 IL 28.55 | FMH 0107 CL 29.32 IL 28.31 | FMH 0108 CL 29.31 IL 28.22 | FMH 0109 CL 29.60 IL 27.77 | FMH 0103 CL 32.07 IL 31.02 | FMH 0111 | FMH 0010 CL 32.07 IL 31.44 | FMH 0009 | FMH 0008 CL 32.14 IL 30.81 | FMH 0007 CL 31.97 IL 30.05 | FMH 0006

Existing 375Ø FWS | Existing 375Ø Fws | Existing 375Ø Cor. Pws | Existing 150Ø FWS | Existing 100Ø FWS | Existing 100Ø Fws | Existing 375Ø Cor. Pws | Existing 375Ø Cor. Fws | Existing 375Ø Cor. Fws | Existing 375Ø Cor. Pws

2.000 300Ø V.C Sws / 1:240 | 1.000 150Ø V.C Fws / 1:18 | 1.000 225Ø V.C Sws / 1:15 | 1.000 100Ø V.C Fws / 1:15 | 1.000 225Ø V.C Sws / 1:16 | 1.000 225Ø V.C Sws / 1:168 | 1.000 150Ø V.C Fws / 1:48 | 1.000 300Ø V.C Sws / 1:41 | 1.000 150Ø V.C Fws / 1:24 | 1.000 300Ø V.C Sws / 1:241 | 1.000 300Ø Cor. / 1:8 | 1.000 150Ø V.C Sws / 1:100 | 1.000 100Ø V.C Fws / 1:110 | 1.000 100Ø Fws / 1:10 | 1.000 150Ø Sws / 1:10 | 1.000 375Ø Cor. Pws / 1:194 | 1.000 375Ø Cor. Fws / 1:167 | 3.000 150Ø V.C / 1:167

Stage 1 Bypass Separator as Klargester NSBP006 (Subject to Southern Water approval).

Bypass Pl CL 25.92 Inlet IL 22.27

Bypass Pl CL 30.06 Inlet IL 27.82

Stage 1 Bypass Separator as Klargester NSBP003.

**IMPORTANT NOTE:**
Deep excavation required for cellular storage tank due to site topography, catchment area and FEH rainfall. Risk assessment / method statement for tank installation to be provided by the Contractor and agreed with Southern Water.

**CELLULAR SOAKAWAY (CS1)**
5.5m wide x 17.0m length x 2.4m deep Polystorm (or similar Southern Water approved) Cellular storage soakaway tank (95% void ratio)
GL: 26.23 (Varies)
Tank Soffit: 22.55m
Inlet IL: 22.25m
Base IL: 20.15m
Catchment area: (0.026ha inc. UC)
Peak 1 in 100 year water level plus CC: 22.49m
Peak 1 in 100 year volume + CC: 208.10m³
Infiltration rate (TP105): 2.0x10-5m/s (0.072m/hr)

**CELLULAR SOAKAWAY (CS2)**
5.0m width x 4.0m length x 0.8m deep Polystorm (or similar) cellular storage soakaway tank (95% void ratio)
GL: 30.10 (Varies)
Tank Soffit: 28.12m
Inlet IL: 27.82m
Base IL: 27.32m
Catchment area: 0.070ha
Peak 1 in 100 year water level plus CC: 28.11m
Peak 1 in 100 year volume + CC: 15.33m³
Infiltration rate (TP106): 6.72x10-4m/s (2.4192m/hr)

**FOUL SEWER DIVERSION**
Make new 100Ø foul connection to manhole 0106 SUBJECT TO SOUTHERN WATER APPROVAL.

**FOUL SEWER DIVERSION (MH 9102)**
Foul sewer diversion from manhole 9102 via new foul manhole F5. Existing 375Ø downstream sewers including manholes 9103, 9104 and 9106 & 100Ø fws to be abandoned & removed. SUBJECT TO SOUTHERN WATER APPROVAL

**FOUL SEWER DIVERSION (MH 0103)**
Existing 100Ø FWS from manhole 0103 to 0106 to be abndond / removed. sewer to be diverted with new connection into MH 0106. SUBJECT TO SOUTHERN WATER APPROVAL

**FOUL OUTFALL (MH F8)**
Construct new foul manhole F8 over existing 375Ø foul water sewer. SUBJECT TO SOUTHERN WATER APPROVAL.

Note: The approximate, depth, invert level and location MUST be confirmed by the Client / Contractor and findings reported to the engineer for checking prior to any drainage works on site. Existing IL interpolated from available sewer information.

**COMBINED SEWER DIVERSION**
Existing 150Ø combined drain to be diverted into manhole F7

Ex.FIC CL 25.93 IL 24.32

Sewer Easement

- 79–181 VALLEY DRIVE
- 24–35 ST PATRICKS GATE
- 13–23 ST PATRICKS GATE
- 42–53 ST PATRICKS GATE

SCALE 1:250

0 2m 4m 6m 8m 10m 16m 20m

## - DO NOT SCALE FROM THIS DRAWING -
All dimensions in mm U.N.O

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
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4. ALL LEVELS STATED ARE IN METRES ABOVE ORDNANCE DATUM.
5. 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.
6. PRIOR TO THE COMMENCEMENT OF THE WORKS, THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF THE EXISTING SPURS AND MANHOLE CHAMBERS TO WHICH ANY CONNECTIONS ARE TO BE MADE. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
7. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
8. ALL MANHOLES AND SEWERS, AND ANY OTHER PART OF THE WORKS INTENDED FOR ADOPTION UNDER A SECTION 104 AGREEMENT, ARE TO BE CONSTRUCTED IN ACCORDANCE WITH APPENDIX C - DESIGN AND CONSTRUCTION GUIDANCE FOR FOUL AND SURFACE WATER SEWERS OFFERED FOR ADOPTION UNDER THE CODE FOR ADOPTION AGREEMENTS FOR WATER AND SEWERAGE COMPANIES OPERATING WHOLLY OR MAINLY IN ENGLAND ("THE CODE") APPROVED VERSION 2.2 AND THE REQUIREMENTS OF SOUTHERN WATER..
9. ALL MATERIALS AND WORKMANSHIP RELATING TO REINSTATEMENT OR REPAIRS TO EXISTING/PARTIALLY CONSTRUCTED ADOPTABLE HIGHWAY SHALL COMPLY FULLY WITH VOLUME ONE - SPECIFICATION FOR HIGHWAY WORKS AND THE REQUIREMENTS OF KENT COUNTY COUNCIL.
10. THE CONTRACTOR SHALL UNDERTAKE SUCH MATERIALS TESTING AS INDICATED IN THE SPECIFICATIONS AND SHALL INCLUDE THE COST OF TESTING IN THE TENDER
11. UNLESS STATED OTHERWISE, ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF AT AN APPROVED TIP OFF-SITE
12. THE PUBLIC HIGHWAY AND WORKS WILL BE KEPT CLEAN AND FREE OF DEBRIS BY USE OF WHEEL WASHING FACILITIES AND ROAD SWEEPERS TO THE COUNCIL'S SATISFACTION
13. UPON COMPLETION OF THE WORKS, THE CONTRACTOR SHALL UNDERTAKE ALL NECESSARY MAINTENANCE REPAIRS TO RETURN THE HIGHWAY TO ITS FORMER CONDITION
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE LOCAL AUTHORITY PRIOR TO COMMENCING WORKS ON EXISTING OR PARTLY CONSTRUCTED ADOPTABLE HIGHWAY
15. ALL EXISTING LEVELS, GRADIENTS, DEPTHS ETC. TO BE CHECKED ON SITE PRIOR TO CONSTRUCTION AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
16. THE SETTING OUT OF THE DRAINAGE WORKS IS TO BE AGREED ON-SITE WITH THE ENGINEER, PRIOR TO THE COMMENCEMENT OF THE WORKS.
17. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE DRAINAGE WORKS FOR THE DURATION OF THE CONTRACT.
18. THE CONTRACTOR SHALL CONTACT ALL OF THE APPROPRIATE STATUTORY UNDERTAKERS AND ESTABLISH THE EXACT LOCATION OF ALL SERVICES, PRIOR TO THE COMMENCEMENT OF THE WORKS, BY HAND DUG TRIAL PITS.
19. ALL ADOPTABLE SEWER PIPES UP TO AND INCLUDING 300MM IN DIAMETER TO BE VITRIFIED CLAY TO BS 65 AND BS EN295. PIPES GREATER THAN 300MM IN DIAMETER TO BE PRE-CAST CONCRETE TO CLASS 120 OF BS EN 1916:2002 AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
20. ALL CONCRETE AND CONCRETE PRODUCTS BELOW GROUND LEVEL SHALL BE SULPHATE RESISTING PORTLAND CEMENT.
21. MANHOLE COVERS AND FRAMES SITUATED WITHIN THE CARRIAGEWAY SHALL BE CLASS D400 IN ACCORDANCE WITH BS EN124.
22. ALL PIPE CONNECTIONS SHALL BE MADE SOFFIT TO SOFFIT EXCEPT IN HYDRO-BRAKE CHAMBERS OR WHERE NOTED OTHERWISE.
23. ALL PIPES SHALL HAVE FLEXIBLE JOINTS.
24. STATED COVER LEVELS ARE FOR GUIDANCE ONLY AND SHALL BE SET TO THE FINISH LEVEL OF THE CARRIAGEWAY/ FOOTWAY/ VERGE.
25. ALL PIPE SIZES STATED ARE NOMINAL INTERNAL DIAMETERS IN MILLIMETRES.

CDM NOTES:

1. THE ATTENTION OF THE CLIENT AND THE PRINCIPAL CONTRACTOR IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT.
2. 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.
3. 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.
4. 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.
5. 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.
6. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

| Rev | | By | Chk'd | Date |
|---|---|---|---|---|

Status: PRELIMINARY

Client: OAKWOOD BUILDING CONTRACTORS

Project: ST COLUMBA'S CLOSE GRAVESEND, KENT

Title: DRAINAGE LAYOUT

GURNEY consulting engineers

| Job No. | Drg No. | Rev |
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| 11270 | 400 | - |

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| TGL | March 24 |
| Checked by | Scale |
| ICD | 1:250 on A1 |

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tel: 01483 721721 fax: 01483 725073 e-mail: gce@gurneyce.com

## MAINS STORM MANHOLE SCHEDULE - OUTFALL CS1

| Manhole Number | Diagram | Cover Level | Inverts | Pipe Ø | MH depth to soffit of pipe | MH Ø | MH Type |
|---|---|---|---|---|---|---|---|
| S1<br>E 566018.925<br>N 172155.404 |  | 28.93 | 27.15 | 225Ø<br>(outlet) | 1.550 | 1200Ø | MH B |
| S2<br>E 566015.186<br>N 172139.218 |  | 28.67 | 27.05<br>27.05 | 225Ø<br>225Ø<br>(outlet) | 1.393 | 1350Ø | MH C |
| S3<br>E 565977.653<br>N 172147.663 |  | 26.11 | 24.68<br>24.68 | 225Ø<br>225Ø<br>(outlet) | 1.200 | 1350Ø | MH C |
| S4<br>E 565946.074<br>N 172158.837 |  | 23.98 | 22.48 | 300Ø<br>(outlet) | 1.200 | 1350Ø | MH C |
| S5<br>E 565964.939<br>N 172150.523 |  | 25.26 | 23.84<br>22.39<br>22.39 | 225Ø<br>300Ø<br>300Ø<br>(outlet) | 2.570 | 1200Ø | MH B |
| S6<br>E 565947.241<br>N 172110.364 |  | 25.11 | 22.58 | 225Ø<br>(outlet) | 2.306 | 1200Ø | MH B |
| S7<br>E 565955.528<br>N 172129.168 |  | 24.13 | 22.30<br>22.37<br>22.30 | 300Ø<br>225Ø<br>300Ø<br>(outlet) | 1.533 | 1350Ø | Catchpit MH |
| Bypass-PI<br>E 565960.600<br>N 172126.933 |  | 25.92 | 22.27<br>22.27 | 300Ø<br>300Ø<br>(outlet) | 3.348 | 1700 x 1350 | Klargester Bypass NSBP006 Petrol Interceptor |
| SA-CS1<br>E 565964.752<br>N 172125.103 |  | 26.23 | 22.25 | 300Ø | 3.675 | Cellular Soakaway | Cellular Soakaway |

## MAINS FOUL MANHOLE SCHEDULE

| Manhole Number | Diagram | Cover Level | Inverts | Pipe Ø | MH depth to soffit of pipe | MH Ø | MH Type |
|---|---|---|---|---|---|---|---|
| F1<br>E 565988.655<br>N 172146.662 |  | 26.80 | 25.00 | 100Ø<br>(outlet) | 1.702 | 1200Ø | MH B |
| F2<br>E 565976.522<br>N 172149.392 |  | 25.97 | 24.15<br>24.10 | 100Ø<br>150Ø<br>(outlet) | 1.723 | 1200Ø | MH B |
| F3<br>E 565964.296<br>N 172152.142 |  | 25.15 | 23.38<br>23.38 | 150Ø<br>150Ø<br>(outlet) | 1.619 | 1200Ø | MH B |
| F4<br>E 565957.046<br>N 172135.588 |  | 24.14 | 23.26<br>23.26 | 150Ø<br>150Ø<br>(outlet) | 0.725 | 450Ø | MH D |
| 9102<br>E 565956.326<br>N 172117.938 |  | 26.00 | 23.76 | 375Ø<br>(outlet) | 1.865 | 1350Ø | MH B |
| F5<br>E 565950.415<br>N 172120.543 |  | 24.28 | 23.13<br>22.90<br>22.90 | 150Ø<br>375Ø<br>375Ø<br>(outlet) | 1.000 | 1350Ø | MH C |
| Ex.FIC<br>E 565951.387<br>N 172107.945 |  | 25.93 | 24.32 | 150Ø<br>(outlet) | 1.460 | Existing | Existing |
| F6<br>E 565945.187<br>N 172108.678 |  | 25.34 | 22.83<br>24.26<br>22.83 | 375Ø<br>150Ø<br>375Ø<br>(outlet) | 2.132 | 1350Ø | MH B |
| F7<br>E 565927.042<br>N 172116.675 |  | 24.49 | 22.73<br>22.73 | 375Ø<br>375Ø<br>(outlet) | 1.390 | 1350Ø | MH C |
| F8<br>E 565929.363<br>N 172122.980 | | 24.30 | 22.69 | 375Ø | | 1350Ø | MH C |

## MAINS STORM MANHOLE SCHEDULE - OUTFALL CS2

| Manhole Number | Diagram | Cover Level | Inverts | Pipe Ø | MH depth to soffit of pipe | MH Ø | MH Type |
|---|---|---|---|---|---|---|---|
| S8<br>E 566060.842<br>N 172125.533 |  | 32.70 | 31.20 | 150Ø<br>(outlet) | 1.350 | 1350Ø | MH C |
| S9<br>E 566026.681<br>N 172140.588 |  | 29.25 | 28.10 | 150Ø<br>(outlet) | 1.000 | 1350Ø | MH C |
| S10<br>E 566037.048<br>N 172136.019 |  | 30.00 | 27.98<br>27.98<br>27.83 | 150Ø<br>150Ø<br>300Ø<br>(outlet) | 1.868 | 1350Ø | Catchpit MH |
| BypassPI<br>E 566036.123<br>N 172133.936 |  | 30.06 | 27.82<br>27.82 | 300Ø<br>300Ø<br>(outlet) | 1.935 | 1700 x 1350 | Klargester Bypass NSBP004 Petrol Interceptor |
| SA-CS2<br>E 566035.368<br>N 172132.239 |  | 30.11 | 27.82 | 300Ø | 1.989 | Cellular Soakaway | Cellular Soakaway |

## MAINS FOUL MANHOLE SCHEDULE

| Manhole Number | Diagram | Cover Level | Inverts | Pipe Ø | MH depth to soffit of pipe | MH Ø | MH Type |
|---|---|---|---|---|---|---|---|
| 0103<br>E 566046.642<br>N 172124.250 |  | 32.07 | 31.02 | 100Ø<br>(outlet) | 0.949 | Existing | Existing |
| F9<br>E 566039.384<br>N 172121.157 |  | 31.65 | 30.24<br>28.74 | 100Ø<br>150Ø<br>(outlet) | 2.760 | 1200Ø | MH B |
| 0106<br>E 566020.349<br>N 172129.618 | | 29.17 | 28.55 | 150Ø | | Existing | Existing |




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All dimensions in mm U.N.O

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6. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

| Rev | | By | Chk'd | Date |
|---|---|---|---|---|

Status: PRELIMINARY

Client: OAKWOOD BUILDING CONTRACTORS

Project: ST COLUMBA'S CLOSE GRAVESEND, KENT

Title: MANHOLE SCHEDULES

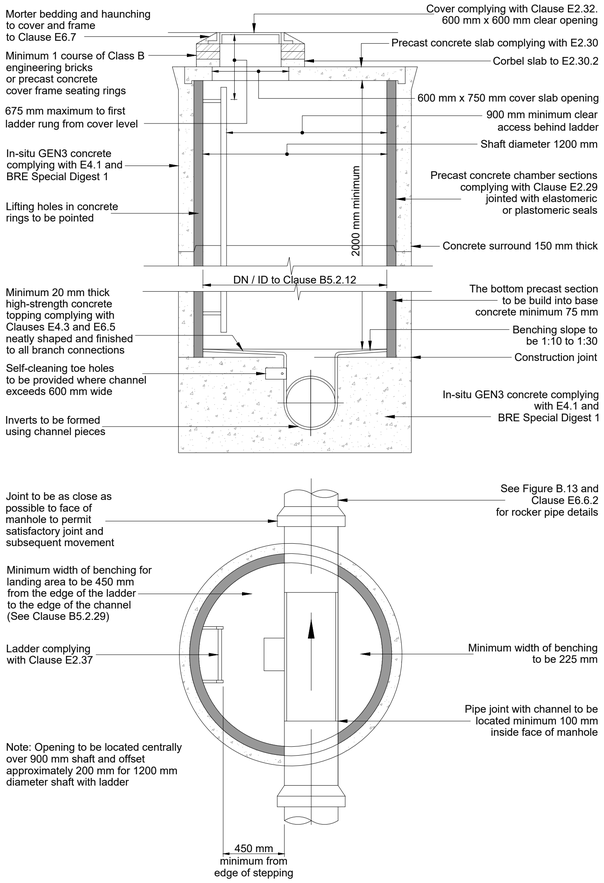
GURNEY consulting engineers

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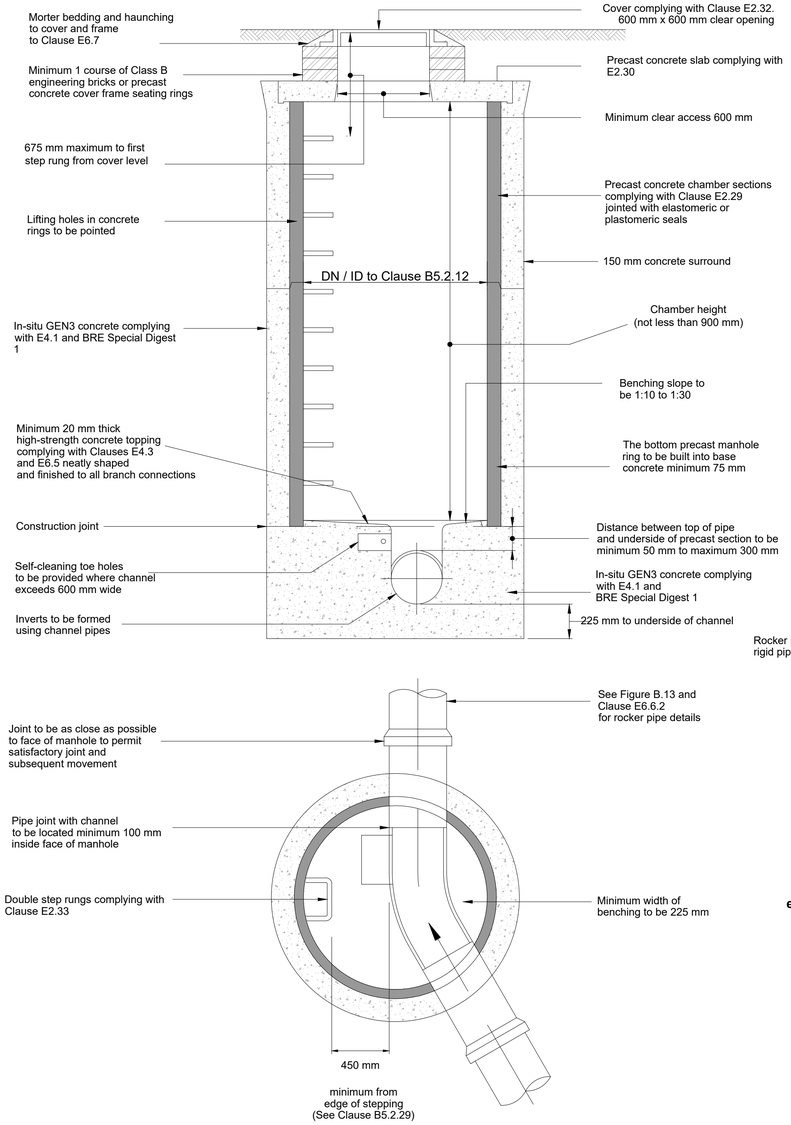
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| TGL | March 24 |
| Checked by | Scale |
| ICD | 1:250 on A1 |

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Hallmark House, 10/12 St.Johns Rd, Woking, Surrey, GU21 7SE
tel: 01483 721721 fax: 01483 725073 e-mail: gce@gurneyce.com

## Figure B 7
## Typical manhole detail - Type A2
Depth from cover level to soffit of pipe 3 m to 6 m with ladder
Alternative rigid material construction with concrete surround



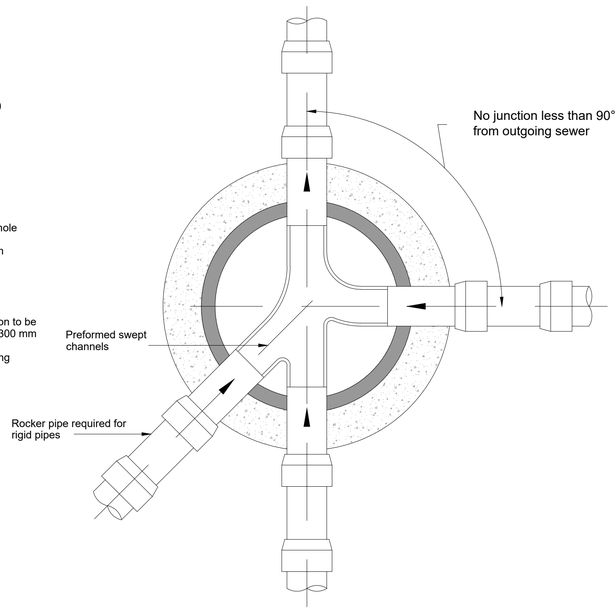

## Figure B 10
## Typical manhole detail - Type B
Depth from cover level to soffit of pipe 1.5 m to 3 m
Alternative rigid material construction with concrete surround




## Table B 1
## Manhole diameters

| Nominal Internal Diameter of Largest Pipe in Manhole (mm) | Nominal Internal Diameter of Largest Pipe in Manhole (mm) |
|---|---|
| Less than 375 | 1200 |
| 375 - 450 | 1350 |
| 500 - 700 | 1500 |
| 750 - 900 | 1800 |
| Greater than 900 | Pipe diameter + 900 |

## Figure B 13
## Typical arrangement of pipe junctions within manholes

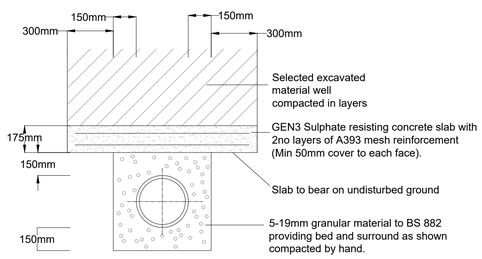



Sectional Plan

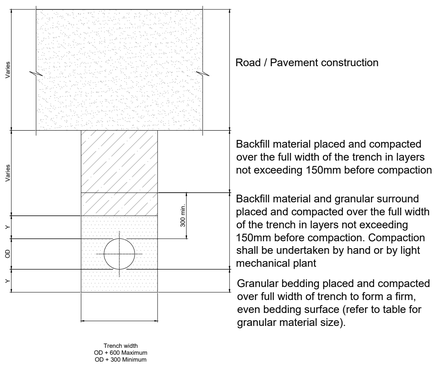
**Rigid pipes built into manhole should have a flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be as shown.**

| Nominal diameter (mm) | Maximum effective length (m) |
|---|---|
| 150 - 600 | 0.6 |
| 601 - 750 | 1.00 |
| over 750 | 1.25 |

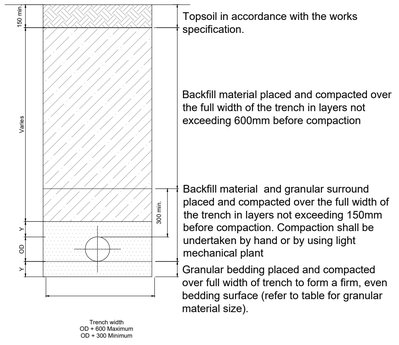
**All pipes entering the bottom of the manhole to have soffits level.**



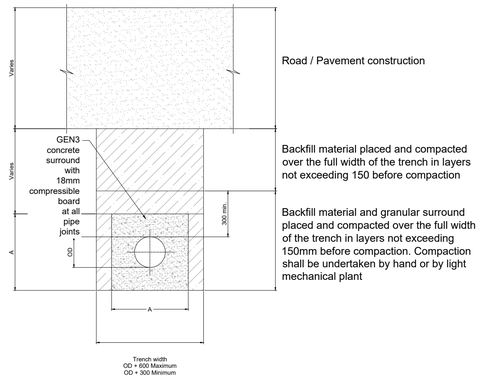

**Concrete Protection Slab**
(1:20 Scale)




CLASS S BEDDING
(Granular bed and surround - Trafficked Areas)
Scale: 1:10
Y = ¼ OD (min. 100)




CLASS S BEDDING
(Granular bed and surround - Landscaped Areas)
Scale: 1:10
Y = ¼ OD (min. 100)




CLASS Z BEDDING
(Concrete bed and surround)
Scale: 1:10
A = The larger of 1 ½ OD or OD+300mm

- DO NOT SCALE FROM THIS DRAWING -
All dimensions in mm U.N.O

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Title: MAIN DRAINAGE DETAILS
SHEET 1

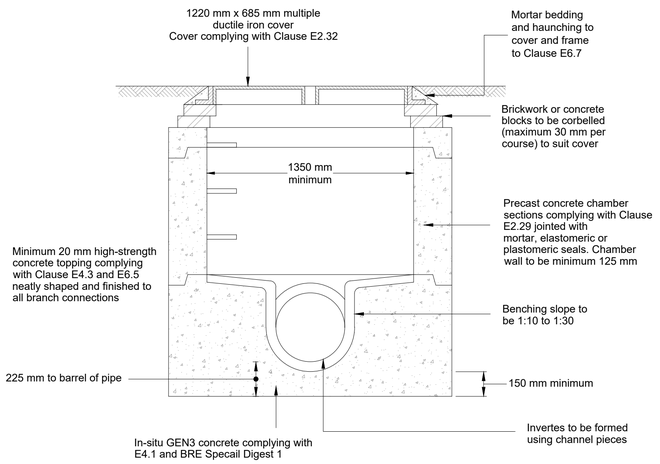
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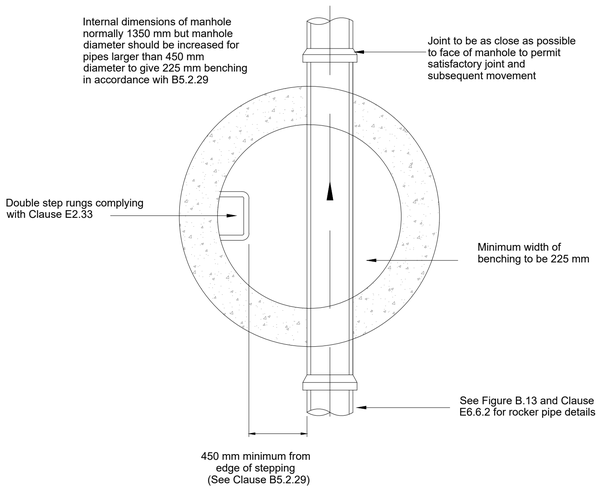
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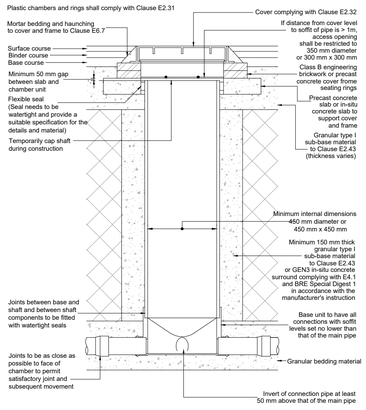
## Figure B 15
## Typical manhole detail - Type C
Depth from cover level to soffit of pipe less than 1.5 m
Maximum pipe size 450 mm diameter
Rigid material construction




Note: The use of precast concrete chamber units to E2.29 with 150 mm GEN3 in-situ concrete complying with E4.1 and BRE Special Digest 1 in place of brickwork construction is permitted.

## Figure B 18
## Typical inspection chamber detail - Type D
Depth from cover level to soffit of pipe up to 2m
Flexible material construction for use in areas subject to vehicle loading



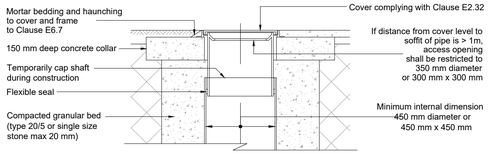

Note: Where the access chamber is in the highway (including any footway), the highway autority can have specific requirements.

Not to scale

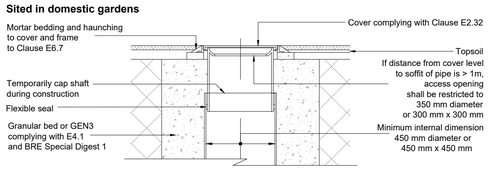
## Figure B 19
## Typical inspection chamber detail - Type D
Flexible material construction alternative top details for use in areas of light vehicle loading or landscaped areas

Plastic chambers and rings shall comply with Clause E2.31

**Sited in domestic driveways or footways**



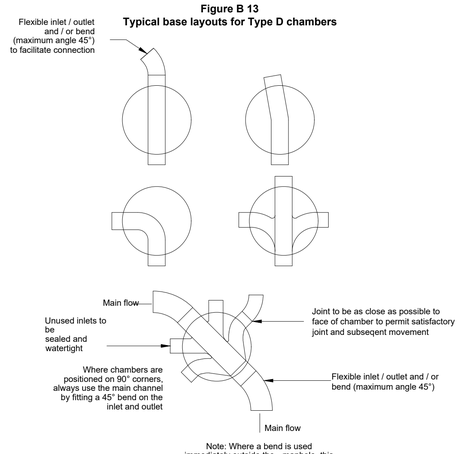

**Sited in domestic gardens**




Note: Where the access chamber is in the highway (including any footway), the highway autority can have specific requirements.

Not to scale

## Figure B 13
## Typical base layouts for Type D chambers

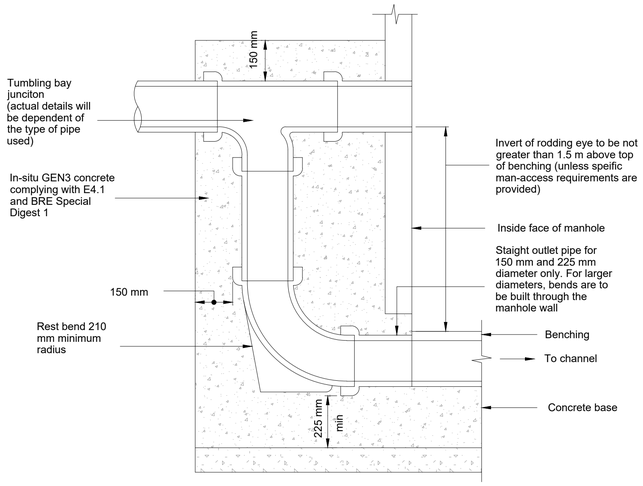



Note: Where a bend is used immediately outside the manhole, this may be used as the rocker pipe.

Not to scale

## Figure B 16
## Typical vertical backdrop detail (rigid materials)
For use in manhole types A to D

Note: Steeper gradients are preferred to the use of backdrops.
Type of backdrop to be used to be agreed with the sewerage company.




**External Vertical Backdrop**

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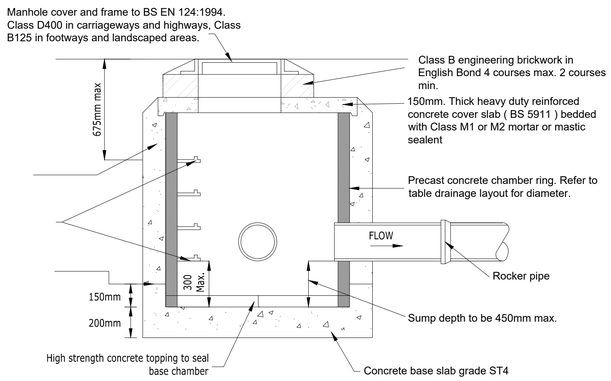
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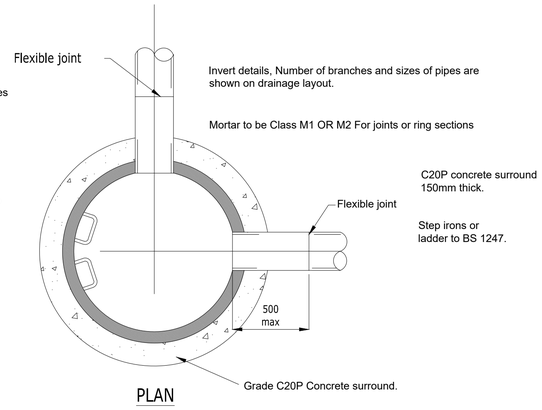
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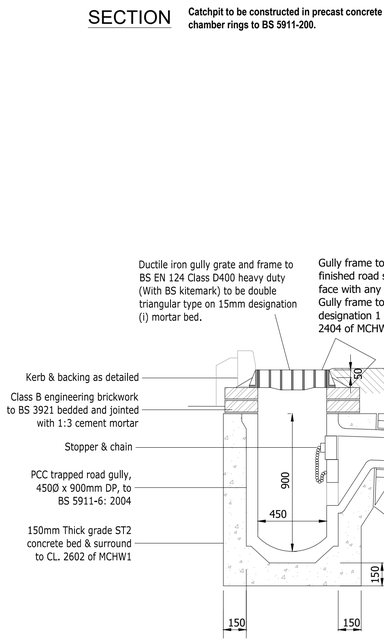
**Catchpit to be constructed in precast concrete chamber rings to BS 5911-200.**



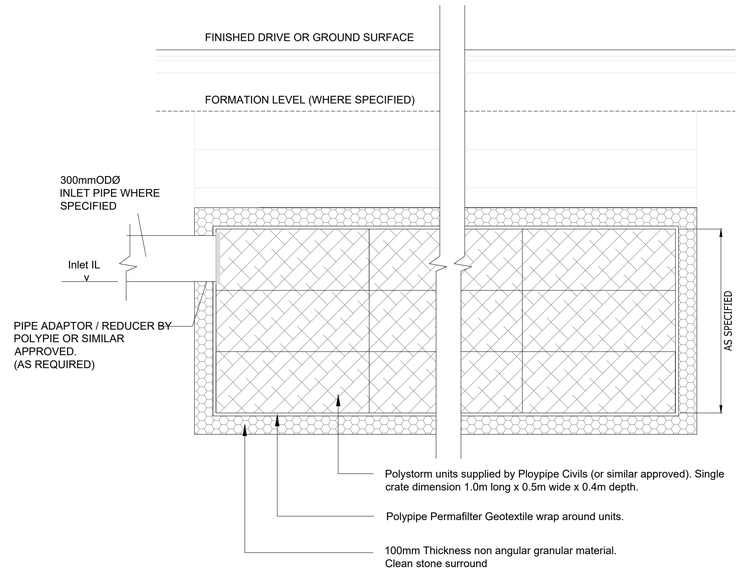

PLAN

# Typical Catchpit Manhole Details

**For full configuration of inlets, outlets, cover and invert levels refer to Drainage Layout.**




Road Gully Detail
(1:20)




## TYPICAL CELLULAR SOAKAWAY DETAIL

The soakaway is to be constructed and backfilled in accordance with the specification of the manufacturer of the modular storage units.

SURFACE WATER STORAGE SYSTEM NOTES

STORAGE SYSTEM DETAIL SHOWN ON THIS DRAWING IS SUBJECT TO A FULL DESIGN BY POLYPIPE CIVILS (OR MANUFACTURER WHERE SIMILAR APPROVED PRODUCTS USED).

POLYSTORM GEOTEXTILE TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.

CONNECTORS, FLANGE ADAPTORS AS SPECIFIED BY THE MANUFACTURER.

FOLLOWING THE INSTALLATION ALL CONNECTING INSPECTION CHAMBERS AND CATCHPITS ARE TO BE INSPECTED TO ENSURE THEY ARE FREE OF SILT AND CONSTRUCTION DEBRIS

VENTING REQUIREMENTS TO BE AGREED BY THE CONTRACTOR WITH THE MANUFACTURER PRIOR TO CONSTRUCTION / INSTALLATION

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|---|---|---|
| 11270 | 412 | - |

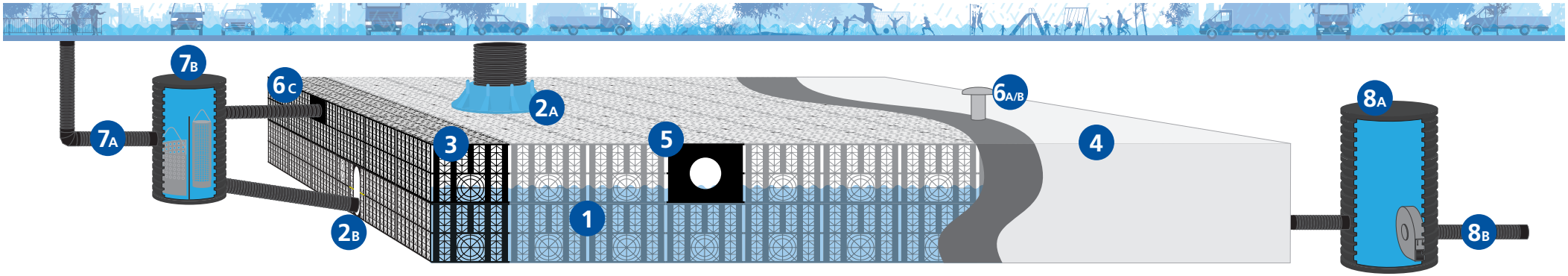
| Drawn by | Date |
|---|---|
| TL | April 2024 |
| **Checked by** | **Scale** |
| MD | 1:20@A1 |

GURNEY consulting engineers

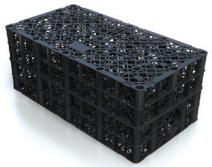
© Copyright belongs to **GURNEY** consulting engineers
Hallmark House, 10/12 St.Johns Rd, Woking, Surrey. GU21 7SE
tel: 01483 721721 fax: 01483 725073 e-mail: gce@gurneyce.com

# An 8 step guide to a total Polystorm system

Issue 04 | November 2018




## 1 Select modular cell



### Polystorm Lite
Product code: PSM2

Vertical compressive strength: 20 tonne/m²

**Landscaped/pedestrian**

Polystorm Lite has been specifically designed for non-trafficked, landscaped and pedestrian applications.

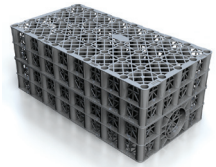


### Polystorm-R
Product code: PSM1A

Vertical compressive strength: 61 tonne/m²

**Trafficked**

The standard Polystorm cell for trafficked and loaded applications at greater depths has the added benefits of a higher recycled material content.

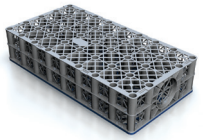


### Polystorm
Product code: PSM1

Vertical compressive strength: 44 tonne/m²

**Trafficked**

The Polystorm cell, made of virgin material, is ideally suited for trafficked and loaded applications at greater depths.

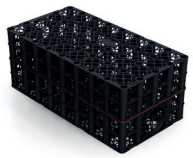


### Polystorm Xtra
Product code: PSM3

Vertical compressive strength: 83 tonne/m²

**Heavily trafficked or reduced cover**

Designed for use in heavily trafficked areas for shallow, non sub-base applications where reduced cover is required.



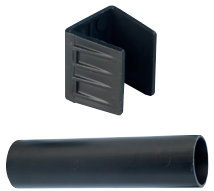
### Polystorm Deep
Product code: PSM5

Vertical compressive strength: 61 tonne/m²

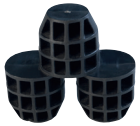
**Trafficked, deep and hybrid tanks**

Polystorm Deep has been designed for use in trafficked applications such as lorry parks and industrial access roads. It can be buried deeper than any other Polystorm cell and can be value engineered as part of a hybrid system.

### Connection accessories



- Clips
  Product code: PSMCLIP
- Shear Connectors
  Product code: PSMSC

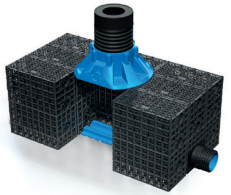


- Brick Bond Connectors
  Product code: PSMBBSC

Note: Clips and shear connectors are supplied with all Polystorm units.

## 2 Select access if maintenance and inspection is required

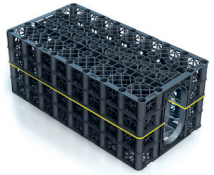
### 2A



### Polystorm Access

Polystorm Access provides a 1m x 0.5m vertical shaft within a Polystorm geocellular structure to enable surface access for remote camera inspection and maintenance activities such as flushing and rodding.

### 2B

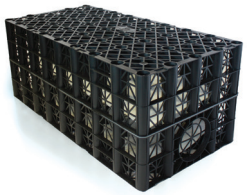


### Polystorm Inspect
Product code: PSM4

Polystorm Inspect provides a tunnel along the length of a fully installed Polystorm system to enable horizontal access for inspection and maintenance. It can also be used in conjunction with Polystorm Access.

Polypipe

## 3 Select if treatment is required



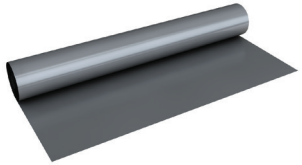
### Permavoid Medium Duty with Biomat

Product code: PSM1BM

Comprising of a high strength, low density, oil treating geosynthetic floating mat for use with the Polystorm range of modular geocellular units.

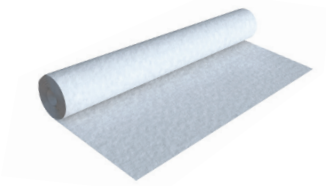
For multi-stage oil interception the Permavoid Medium Duty with Biomat can be used in conjunction with Permatreat or Permachannel (linear treatment) or a pre-fabricated RIDGISTORMSeparate-X4 Chamber (point treatment).

## 4 Select wrap



### Geomembrane for retention and attenuation

An impermeable membrane for encapsulating geocellular structures to form watertight tanks. This is then wrapped in Permatex 300 to protect the geomembrane from puncture.



### Permatex 300 for protection

A non-woven protective geotextile used externally to a geomembrane for added protection.



### Polystorm Soakaway Geotextiles for infiltration

Available as standard (PVTS1000) or heavy duty (PVTS2000), non-woven infiltration geotextiles for encapsulating geocellular structures to form soakaway tanks.

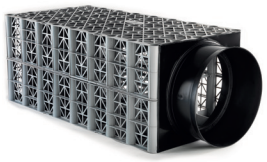


### Permafilter Geotextile for treatment and infiltration

This geotextile has been specifically designed to remove hydrocarbon pollution, treating the captured water before infiltrating it into the ground.

## 5 Pipe Connections

A flange adaptor is attached at both the inlet and outlet points to allow water to enter and exit the tank via connecting pipes.



Polystorm cell with Ridgidrain Flange Connection



Flange Adaptor to EN1401

- Polystorm cells with Flange Connections to Ridgidrain drainage pipes: PSMCRD225 (225mm), PSMCRD300 (300mm)
- Polystorm Inspect cells with Flange Connections to Ridgidrain drainage pipes: PSM4CRD225 (225mm), PSM4CRD300 (300mm)
- Flange Adaptor to EN1401: PSMFA110 (110mm), PSMFA160 (160mm)
- Flange Adaptor to Ridgidrain: PSMFA150 (150mm), PSMFA225 (225mm), PSMFA300 (300mm), PSMFA375 (375mm), PSMFA400 (400mm),PSMFA450 (450mm), PSMFA500 (500mm), PSMFA600 (600mm)

## 6 Venting

Every attenuation tank requires at least one vent to maximise hydraulic performance and reduce stress on encapsulating geomembranes. This can be done by installing either a Vent Cowl or a connection pipe to vent air directly into an upstream chamber.

### 6A

Vent Cowl

Product code: SCV40

To vent air above ground.

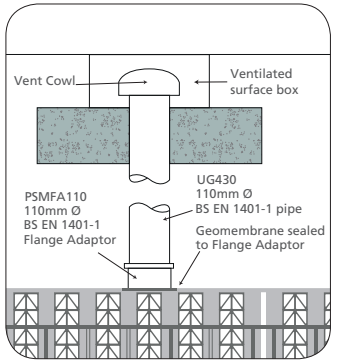


### 6B

BS EN1401-1 pipe

Product code: UG430



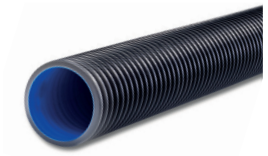



### 6C

150mm Ridgidrain pipe

Product code: RD150X6PE

For ventilation into the upstream chamber.



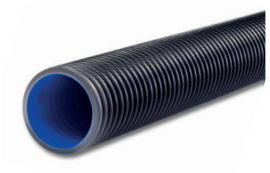
Polypipe

# 7 Associated upstream products

## 7A

### Ridgidrain

Ridgidrain can be utilised within a Polystorm system by conveying captured surface water to the attenuation or infiltration tank.



## 7B

### Polystorm Catchpits & RIDGISTORMSeparate Chambers

Polystorm Catchpits and RIDGISTORMSeparate Chambers are easily maintainable and prevent the ingress of debris, silt, organic and other particles into the Polystorm structure, extending its useful life.

### Polystorm Catchpits

A pre-fabricated 600mm diameter catchpit with three inlet/outlet sizes available in 150mm, 225mm and 300mm.



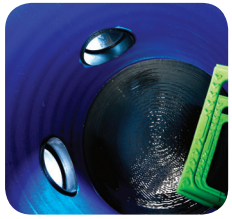
### Silt Traps

320 - 460mm Silt traps are available from the RIDGISTORMSeparate Silt Traps range.



### Mini & Basic Catchpits

450 - 3000mm diameter bespoke catchpits are available from the RIDGISTORMSeparate range.



### Advanced Catchpits

In addition to silt traps and catchpits, we also offer RIDGISTORMSeparate Advanced Catchpits with additional treatment features.



# 8 Associated downstream products

## 8A

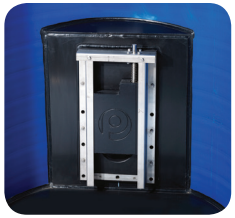
### RIDGISTORMCheck

A choice of Vortex or Orifice Plate Flow Control Chambers for precise control of site discharge rates.



### RIDGISTORMControl

Pre-fabricated structured wall chambers which feature 'in-line' system components such as penstocks, gate valves or flap valves to control system flows and facilitate maintenance.



Penstock



Gate valve

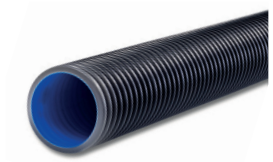


Flap valve

## 8B

### Ridgidrain

Ridgidrain can be utilised to drain away stored water from a Polystorm attenuation tank.



For full datasheets of products in the Polystorm system, please visit our website www.polypipe.com/civils-technical-hub

Polypipe Civils Head Office, Charnwood Business Park, North Road, Loughborough, LE11 1LE
Tel: +44 (0)1509 615100 Fax: +44 (0)1509 610215 Email: civils@polypipe.com
www.polypipe.com

Polypipe

## NS PLASTIC BYPASS SEPARATORS - DECLARATION OF PERFORMANCE

kingspan-klargester-nsbp-003-006-dop-en-oct2021-v1

1.Unique identification code of the product-type:

**Separator Systems for Light Liquids, Plastic Construction**
**NSBP003, NSBP004 & NSBP006**

2. Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4) of the CPR:

**Serial Number/Works Order Number printed on the Product Information Label & affixed to product**

3. Intended use/es of the product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer:

**To be used for Collection & Separation of Light Liquids from Wastewater by means of gravity and/or coalescence**

4. Manufacturer name, registered trade name or registered trade mark and contact address as required under Article 11(5):

**Kingspan Water & Energy Ltd**
**College Rd North**
**Aston Clinton, Aylesbury, Buckinghamshire**
**HP22 5EW**

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2):

**N/A**

6. System/s of assessment and verification of constancy of performance (AVCP) of the product as set out in CPR, Annex V:

**4**

7. In case of the declaration of performance concerning a construction product covered by a harmonised standard:

**EN:858-1:2002**

Notified body/ bodies:

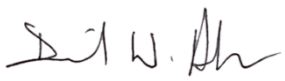
**Notified Body No: 1739 + PIA Prüfinstitut für Abwassertechnik GmbH**

8. Declared performance/s:

| Essential characteristics | | Performance | | | Harmonised technical specification |
|---|---|---|---|---|---|
| Crushing Resistance (vertical load test) | | Pass (also wet conditions) | | | EN:858-1:2002 |
| Structural Behaviour | | Pass | | | |
| Reaction to fire | | Class E | | | |
| Water Tightness (water test) | | Pass | | | |
| Material Durability | | MFR (190/2,16) = 3.0± 1g/10 min (ISO 1133) | | | |
| | | Density ≥ 930 kg/m³ (ISO 1872) | | | |
| | | Yield Stress ≥ 19 Mpa (ISO 527-2) | | | |
| | | Pressure A1 = 1 (EN1778) | | | |
| | | Pressure A2K = 1 (EN1778) | | | |
| Treatment Efficiency | Sample | Specified Maximum Light Liquid (mg/l) | Actual Light Liquid (mg/l) | | |
| | 1 | ≤10 | 0.37 | Pass | |
| | 2 | ≤10 | 0.22 | Pass | |
| | 3 | ≤10 | 0.35 | Pass | |
| | 4 | ≤10 | 0.23 | Pass | |
| | 5 | ≤10 | 0.35 | Pass | |
| | Average | ≤5 | 0.30 | Pass | |
| Electrical Consumption | | n/a | | | |

9. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:



David Anderson – Water Business Unit Director

At Portadown on 22 September 2021

**APPENDIX F**

MICRO DRAINAGE HYDRAULIC MODELS

## Time Area Diagram for SW NET1-CS1.sws

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|
| 0-4 | 0.195 | 4-8 | 0.066 |

Total Area Contributing (ha) = 0.261

Total Pipe Volume (m³) = 7.521

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## STORM SEWER DESIGN by the Modified Rational Method

### Network Design Table for SW NET1-CS1.sws

| 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 | 16.612 | 0.099 | 167.8 | 0.025 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| 1.001 | 38.471 | 2.372 | 16.2 | 0.040 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| 1.002 | 13.032 | 0.846 | 15.4 | 0.069 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| 2.000 | 20.616 | 0.086 | 239.7 | 0.036 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 1.003 | 23.337 | 0.097 | 240.6 | 0.020 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 3.000 | 20.549 | 0.210 | 97.9 | 0.060 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| 1.004 | 5.543 | 0.023 | 241.0 | 0.011 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 1.005 | 4.537 | 0.019 | 238.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 1.006 | 2.500 | 0.010 | 250.0 | 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 | 5.28 | 27.154 | 0.025 | 0.0 | 0.0 | 0.0 | 1.01 | 40.0 | 3.4 |
| 1.001 | 50.00 | 5.47 | 27.055 | 0.065 | 0.0 | 0.0 | 0.0 | 3.27 | 129.8 | 8.8 |
| 1.002 | 50.00 | 5.54 | 24.683 | 0.134 | 0.0 | 0.0 | 0.0 | 3.35 | 133.2 | 18.1 |
| 2.000 | 50.00 | 5.34 | 22.478 | 0.036 | 0.0 | 0.0 | 0.0 | 1.01 | 71.5 | 4.9 |
| 1.003 | 50.00 | 5.92 | 22.392 | 0.190 | 0.0 | 0.0 | 0.0 | 1.01 | 71.3 | 25.7 |
| 3.000 | 50.00 | 5.26 | 22.580 | 0.060 | 0.0 | 0.0 | 0.0 | 1.32 | 52.6 | 8.1 |
| 1.004 | 50.00 | 6.01 | 22.295 | 0.261 | 0.0 | 0.0 | 0.0 | 1.01 | 71.3 | 35.3 |
| 1.005 | 50.00 | 6.09 | 22.272 | 0.261 | 0.0 | 0.0 | 0.0 | 1.01 | 71.6 | 35.3 |
| 1.006 | 50.00 | 6.13 | 22.253 | 0.261 | 0.0 | 0.0 | 0.0 | 0.99 | 70.0 | 35.3 |

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## Storage Structures for SW NET1-CS1.sws

### Cellular Storage Manhole: SA-CS1, DS/PN: 1.006

Invert Level (m) 20.153 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.07200 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.07200

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 93.5 | 93.5 | 2.401 | 0.0 | 201.5 |
| 2.400 | 93.5 | 201.5 | | | |

### Volume Summary (Static)

Length Calculations based on True Length

| Pipe Number | USMH Name | Manhole Volume (m³) | Pipe Volume (m³) | Storage Structure Volume (m³) | Total Volume (m³) |
|---|---|---|---|---|---|
| 1.000 | S1 | 2.007 | 0.610 | 0.000 | 2.617 |
| 1.001 | S2 | 2.316 | 1.476 | 0.000 | 3.792 |
| 1.002 | S3 | 2.040 | 0.467 | 0.000 | 2.507 |
| 2.000 | S4 | 2.147 | 1.367 | 0.000 | 3.514 |
| 1.003 | S5 | 3.246 | 1.559 | 0.000 | 4.805 |
| 3.000 | S6 | 2.862 | 0.766 | 0.000 | 3.629 |
| 1.004 | S7 | 2.624 | 0.284 | 0.000 | 2.908 |
| 1.005 | Bypass-PI | 8.372 | 0.239 | 0.000 | 8.612 |
| 1.006 | SA-CS1 | 1.124 | 0.156 | 213.210 | 214.489 |
| Total | | 26.738 | 6.925 | 213.210 | 246.873 |

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## 2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET1-CS1.sws

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 | 1 |
| Number of Online Controls | 1 | 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 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |

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

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 15 Summer | 2 | +0% | | | | |
| 1.001 | S2 | 15 Summer | 2 | +0% | | | | |
| 1.002 | S3 | 15 Summer | 2 | +0% | | | | |
| 2.000 | S4 | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| 1.003 | S5 | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| 3.000 | S6 | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| 1.004 | S7 | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| 1.005 | Bypass-PI | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| 1.006 | SA-CS1 | 240 Winter | 2 | +0% | | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 27.205 | -0.174 | 0.000 | 0.11 | | | 4.1 | OK |

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## 2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET1-CS1.sws

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | S2 | 27.097 | -0.183 | 0.000 | 0.08 | | | 9.6 | OK |
| 1.002 | S3 | 24.745 | -0.163 | 0.000 | 0.17 | | | 19.1 | OK |
| 2.000 | S4 | 22.559 | -0.219 | 0.000 | 0.09 | | | 5.7 | OK |
| 1.003 | S5 | 22.541 | -0.151 | 0.000 | 0.42 | | | 26.8 | OK |
| 3.000 | S6 | 22.649 | -0.156 | 0.000 | 0.21 | | | 9.8 | OK |
| 1.004 | S7 | 22.495 | -0.100 | 0.000 | 0.76 | | | 37.1 | OK |
| 1.005 | Bypass-PI | 22.475 | -0.097 | 0.000 | 0.79 | | | 37.5 | OK |
| 1.006 | SA-CS1 | 20.610 | -1.943 | 0.000 | 0.00 | | 321 | 0.0 | OK |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| 1.000 | S1 | |
| 1.001 | S2 | |
| 1.002 | S3 | |
| 2.000 | S4 | |
| 1.003 | S5 | |
| 3.000 | S6 | |
| 1.004 | S7 | |
| 1.005 | Bypass-PI | |
| 1.006 | SA-CS1 | |

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## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET1-CS1.sws

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 | 1 |
| Number of Online Controls | 1 | 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 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |

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

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 15 Summer | 30 | +35% | | | | |
| 1.001 | S2 | 15 Summer | 30 | +35% | | | | |
| 1.002 | S3 | 15 Summer | 30 | +35% | | | | |
| 2.000 | S4 | 15 Summer | 30 | +35% | 30/15 Summer | | | |
| 1.003 | S5 | 15 Summer | 30 | +35% | 30/15 Summer | | | |
| 3.000 | S6 | 15 Summer | 30 | +35% | 30/15 Summer | | | |
| 1.004 | S7 | 15 Summer | 30 | +35% | 30/15 Summer | | | |
| 1.005 | Bypass-PI | 15 Summer | 30 | +35% | 30/15 Summer | | | |
| 1.006 | SA-CS1 | 480 Winter | 30 | +35% | | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 27.249 | -0.130 | 0.000 | 0.37 | | | 13.1 | OK |

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## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET1-CS1.sws

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | S2 | 27.139 | -0.141 | 0.000 | 0.30 | | | 36.7 | OK |
| 1.002 | S3 | 24.819 | -0.089 | 0.000 | 0.67 | | | 77.5 | OK |
| 2.000 | S4 | 23.340 | 0.562 | 0.000 | 0.32 | | | 20.3 | SURCHARGED |
| 1.003 | S5 | 23.324 | 0.632 | 0.000 | 1.54 | | | 97.7 | SURCHARGED |
| 3.000 | S6 | 23.206 | 0.401 | 0.000 | 0.62 | | | 29.4 | SURCHARGED |
| 1.004 | S7 | 23.095 | 0.500 | 0.000 | 2.70 | | | 131.3 | SURCHARGED |
| 1.005 | Bypass-PI | 22.818 | 0.246 | 0.000 | 2.75 | | | 130.3 | SURCHARGED |
| 1.006 | SA-CS1 | 21.722 | -0.831 | 0.000 | 0.00 | | 811 | 0.0 | OK |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| 1.000 | S1 | |
| 1.001 | S2 | |
| 1.002 | S3 | |
| 2.000 | S4 | |
| 1.003 | S5 | |
| 3.000 | S6 | |
| 1.004 | S7 | |
| 1.005 | Bypass-PI | |
| 1.006 | SA-CS1 | |

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## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET1-CS1.sws

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 | 1 |
| Number of Online Controls | 1 | 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 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |

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

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 15 Summer | 100 | +40% | | | | |
| 1.001 | S2 | 15 Summer | 100 | +40% | | | | |
| 1.002 | S3 | 15 Summer | 100 | +40% | | | | |
| 2.000 | S4 | 15 Summer | 100 | +40% | 30/15 Summer | | | |
| 1.003 | S5 | 15 Summer | 100 | +40% | 30/15 Summer | | | |
| 3.000 | S6 | 15 Summer | 100 | +40% | 30/15 Summer | | | |
| 1.004 | S7 | 15 Summer | 100 | +40% | 30/15 Summer | | | |
| 1.005 | Bypass-PI | 15 Summer | 100 | +40% | 30/15 Summer | | | |
| 1.006 | SA-CS1 | 480 Winter | 100 | +40% | | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S1 | 27.268 | -0.111 | 0.000 | 0.50 | | | 17.7 | OK |

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## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET1-CS1.sws

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | S2 | 27.155 | -0.125 | 0.000 | 0.40 | | | 49.7 | OK |
| 1.002 | S3 | 24.852 | -0.056 | 0.000 | 0.91 | | | 104.9 | OK |
| 2.000 | S4 | 23.970 | 1.192 | 0.000 | 0.46 | | | 28.7 | FLOOD RISK |
| 1.003 | S5 | 23.898 | 1.206 | 0.000 | 2.05 | | | 129.4 | SURCHARGED |
| 3.000 | S6 | 23.671 | 0.866 | 0.000 | 0.82 | | | 39.1 | SURCHARGED |
| 1.004 | S7 | 23.511 | 0.916 | 0.000 | 3.56 | | | 173.0 | SURCHARGED |
| 1.005 | Bypass-PI | 23.028 | 0.456 | 0.000 | 3.66 | | | 173.1 | SURCHARGED |
| 1.006 | SA-CS1 | 22.487 | -0.066 | 0.000 | 0.00 | | 1040 | 0.0 | OK |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| 1.000 | S1 | |
| 1.001 | S2 | |
| 1.002 | S3 | |
| 2.000 | S4 | |
| 1.003 | S5 | |
| 3.000 | S6 | |
| 1.004 | S7 | |
| 1.005 | Bypass-PI | |
| 1.006 | SA-CS1 | |

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## Time Area Diagram for SW NET2-CS2.sws

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|
| 0-4 | 0.057 | 4-8 | 0.013 |

Total Area Contributing (ha) = 0.070

Total Pipe Volume ($m^3$) = 1.058

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## STORM SEWER DESIGN by the Modified Rational Method

### Network Design Table for SW NET2-CS2.sws

| 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 | 26.001 | 3.216 | 8.1 | 0.020 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.000 | 11.330 | 0.113 | 100.3 | 0.032 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 1.001 | 2.279 | 0.010 | 227.9 | 0.018 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 1.002 | 1.857 | 0.008 | 232.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| 1.003 | 1.500 | 0.006 | 250.0 | 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 | 5.12 | 31.200 | 0.020 | 0.0 | 0.0 | 0.0 | 3.57 | 63.0 | 2.7 |
| 2.000 | 50.00 | 5.19 | 28.097 | 0.032 | 0.0 | 0.0 | 0.0 | 1.00 | 17.7 | 4.3 |
| 1.001 | 50.00 | 5.22 | 27.834 | 0.070 | 0.0 | 0.0 | 0.0 | 1.04 | 73.3 | 9.5 |
| 1.002 | 50.00 | 5.25 | 27.824 | 0.070 | 0.0 | 0.0 | 0.0 | 1.03 | 72.6 | 9.5 |
| 1.003 | 50.00 | 5.28 | 27.816 | 0.070 | 0.0 | 0.0 | 0.0 | 0.99 | 70.0 | 9.5 |

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## Storage Structures for SW NET2-CS2.sws

### Cellular Storage Manhole: SA-CS2, DS/PN: 1.003

Invert Level (m) 27.316 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 2.41920 Porosity 0.95
Infiltration Coefficient Side (m/hr) 2.41920

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 20.0 | 20.0 | 0.801 | 0.0 | 34.4 |
| 0.800 | 20.0 | 34.4 | | | |

### Volume Summary (Static)

Length Calculations based on True Length

| Pipe Number | USMH Name | Manhole Volume (m³) | Pipe Volume (m³) | Storage Structure Volume (m³) | Total Volume (m³) |
|---|---|---|---|---|---|
| 1.000 | S8 | 2.147 | 0.436 | 0.000 | 2.583 |
| 2.000 | S9 | 1.646 | 0.176 | 0.000 | 1.822 |
| 1.001 | S10 | 3.103 | 0.053 | 0.000 | 3.157 |
| 1.002 | Bypass PI | 5.129 | 0.055 | 0.000 | 5.185 |
| 1.003 | SA-CS2 | 0.364 | 0.090 | 15.206 | 15.661 |
| Total | | 12.390 | 0.811 | 15.206 | 28.407 |

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## 2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET2-CS2.sws

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 | 1 |
| Number of Online Controls | 1 | 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 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |

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

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S8 | 15 Summer | 2 | +0% | | | | | 31.223 |
| 2.000 | S9 | 15 Summer | 2 | +0% | 30/15 Summer | | | | 28.156 |
| 1.001 | S10 | 15 Summer | 2 | +0% | | | | | 27.927 |
| 1.002 | Bypass PI | 15 Summer | 2 | +0% | | | | | 27.916 |
| 1.003 | SA-CS2 | 15 Winter | 2 | +0% | | | | | 27.396 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S8 | -0.127 | 0.000 | 0.05 | | | 3.3 | OK | |
| 2.000 | S9 | -0.091 | 0.000 | 0.33 | | | 5.2 | OK | |
| 1.001 | S10 | -0.207 | 0.000 | 0.21 | | | 10.9 | OK | |
| 1.002 | Bypass PI | -0.208 | 0.000 | 0.20 | | | 11.0 | OK | |
| 1.003 | SA-CS2 | -0.720 | 0.000 | 0.00 | | 6 | 0.0 | OK | |

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## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET2-CS2.sws

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 | 1 |
| Number of Online Controls | 1 | 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 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |

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

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S8 | 15 Summer | 30 | +35% | | | | | 31.242 |
| 2.000 | S9 | 15 Summer | 30 | +35% | 30/15 Summer | | | | 28.253 |
| 1.001 | S10 | 15 Summer | 30 | +35% | | | | | 28.021 |
| 1.002 | Bypass PI | 15 Summer | 30 | +35% | | | | | 28.007 |
| 1.003 | SA-CS2 | 30 Winter | 30 | +35% | | | | | 27.862 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S8 | -0.108 | 0.000 | 0.18 | | | 10.6 | OK | |
| 2.000 | S9 | 0.006 | 0.000 | 1.04 | | | 16.6 | SURCHARGED | |
| 1.001 | S10 | -0.113 | 0.000 | 0.70 | | | 37.1 | OK | |
| 1.002 | Bypass PI | -0.117 | 0.000 | 0.68 | | | 36.9 | OK | |
| 1.003 | SA-CS2 | -0.254 | 0.000 | 0.00 | | 16 | 0.0 | OK | |

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## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NET2-CS2.sws

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 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 | 1 |
| Number of Online Controls | 1 | 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 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |

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

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S8 | 15 Summer | 100 | +40% | | | | | 31.250 |
| 2.000 | S9 | 15 Summer | 100 | +40% | 30/15 Summer | | | | 28.361 |
| 1.001 | S10 | 30 Winter | 100 | +40% | | | | | 28.134 |
| 1.002 | Bypass PI | 30 Winter | 100 | +40% | | | | | 28.124 |
| 1.003 | SA-CS2 | 30 Winter | 100 | +40% | | | | | 28.114 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | S8 | -0.100 | 0.000 | 0.24 | | | 14.3 | OK | |
| 2.000 | S9 | 0.114 | 0.000 | 1.42 | | | 22.7 | SURCHARGED | |
| 1.001 | S10 | 0.000 | 0.000 | 0.72 | | | 38.4 | OK | |
| 1.002 | Bypass PI | 0.000 | 0.000 | 0.70 | | | 38.2 | OK | |
| 1.003 | SA-CS2 | -0.002 | 0.000 | 0.00 | | 21 | 0.0 | OK | |

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## Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 28.972 | 0.222 | 5.5 | 0.9 | Flood Risk |
| 30 min Summer | 28.977 | 0.227 | 5.7 | 0.9 | Flood Risk |
| 60 min Summer | 28.948 | 0.198 | 4.9 | 0.7 | Flood Risk |
| 120 min Summer | 28.901 | 0.151 | 3.8 | 0.4 | Flood Risk |
| 180 min Summer | 28.873 | 0.123 | 3.1 | 0.3 | Flood Risk |
| 240 min Summer | 28.853 | 0.103 | 2.6 | 0.2 | Flood Risk |
| 360 min Summer | 28.829 | 0.079 | 2.0 | 0.1 | Flood Risk |
| 480 min Summer | 28.814 | 0.064 | 1.6 | 0.1 | Flood Risk |
| 600 min Summer | 28.804 | 0.054 | 1.3 | 0.1 | Flood Risk |
| 720 min Summer | 28.799 | 0.049 | 1.2 | 0.0 | Flood Risk |
| 960 min Summer | 28.793 | 0.043 | 0.9 | 0.0 | Flood Risk |
| 1440 min Summer | 28.787 | 0.037 | 0.7 | 0.0 | Flood Risk |
| 2160 min Summer | 28.781 | 0.031 | 0.5 | 0.0 | Flood Risk |
| 2880 min Summer | 28.777 | 0.027 | 0.4 | 0.0 | Flood Risk |
| 4320 min Summer | 28.773 | 0.023 | 0.3 | 0.0 | Flood Risk |
| 5760 min Summer | 28.771 | 0.021 | 0.2 | 0.0 | Flood Risk |
| 7200 min Summer | 28.769 | 0.019 | 0.2 | 0.0 | Flood Risk |
| 8640 min Summer | 28.767 | 0.017 | 0.1 | 0.0 | Flood Risk |
| 10080 min Summer | 28.766 | 0.016 | 0.1 | 0.0 | Flood Risk |
| 15 min Winter | 28.979 | 0.229 | 5.7 | 0.9 | Flood Risk |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 158.471 | 0.0 | 14 |
| 30 min Summer | 103.727 | 0.0 | 22 |
| 60 min Summer | 64.567 | 0.0 | 36 |
| 120 min Summer | 39.741 | 0.0 | 66 |
| 180 min Summer | 29.863 | 0.0 | 96 |
| 240 min Summer | 24.305 | 0.0 | 126 |
| 360 min Summer | 18.036 | 0.0 | 186 |
| 480 min Summer | 14.460 | 0.0 | 246 |
| 600 min Summer | 12.122 | 0.0 | 306 |
| 720 min Summer | 10.464 | 0.0 | 362 |
| 960 min Summer | 8.253 | 0.0 | 490 |
| 1440 min Summer | 5.866 | 0.0 | 730 |
| 2160 min Summer | 4.162 | 0.0 | 1088 |
| 2880 min Summer | 3.264 | 0.0 | 1468 |
| 4320 min Summer | 2.322 | 0.0 | 2132 |
| 5760 min Summer | 1.832 | 0.0 | 2840 |
| 7200 min Summer | 1.533 | 0.0 | 3624 |
| 8640 min Summer | 1.332 | 0.0 | 4328 |
| 10080 min Summer | 1.187 | 0.0 | 5104 |
| 15 min Winter | 158.471 | 0.0 | 14 |

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## Summary of Results for 100 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 30 min Winter | 28.970 | 0.220 | 5.5 | 0.9 | Flood Risk |
| 60 min Winter | 28.922 | 0.172 | 4.3 | 0.5 | Flood Risk |
| 120 min Winter | 28.867 | 0.117 | 2.9 | 0.2 | Flood Risk |
| 180 min Winter | 28.840 | 0.090 | 2.2 | 0.1 | Flood Risk |
| 240 min Winter | 28.823 | 0.073 | 1.8 | 0.1 | Flood Risk |
| 360 min Winter | 28.805 | 0.055 | 1.4 | 0.1 | Flood Risk |
| 480 min Winter | 28.797 | 0.047 | 1.1 | 0.0 | Flood Risk |
| 600 min Winter | 28.793 | 0.043 | 0.9 | 0.0 | Flood Risk |
| 720 min Winter | 28.790 | 0.040 | 0.8 | 0.0 | Flood Risk |
| 960 min Winter | 28.786 | 0.036 | 0.6 | 0.0 | Flood Risk |
| 1440 min Winter | 28.780 | 0.030 | 0.5 | 0.0 | Flood Risk |
| 2160 min Winter | 28.775 | 0.025 | 0.3 | 0.0 | Flood Risk |
| 2880 min Winter | 28.772 | 0.022 | 0.2 | 0.0 | Flood Risk |
| 4320 min Winter | 28.769 | 0.019 | 0.2 | 0.0 | Flood Risk |
| 5760 min Winter | 28.767 | 0.017 | 0.1 | 0.0 | Flood Risk |
| 7200 min Winter | 28.766 | 0.016 | 0.1 | 0.0 | Flood Risk |
| 8640 min Winter | 28.765 | 0.015 | 0.1 | 0.0 | Flood Risk |
| 10080 min Winter | 28.764 | 0.014 | 0.1 | 0.0 | Flood Risk |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 30 min Winter | 103.727 | 0.0 | 22 |
| 60 min Winter | 64.567 | 0.0 | 36 |
| 120 min Winter | 39.741 | 0.0 | 66 |
| 180 min Winter | 29.863 | 0.0 | 96 |
| 240 min Winter | 24.305 | 0.0 | 126 |
| 360 min Winter | 18.036 | 0.0 | 186 |
| 480 min Winter | 14.460 | 0.0 | 248 |
| 600 min Winter | 12.122 | 0.0 | 302 |
| 720 min Winter | 10.464 | 0.0 | 356 |
| 960 min Winter | 8.253 | 0.0 | 480 |
| 1440 min Winter | 5.866 | 0.0 | 738 |
| 2160 min Winter | 4.162 | 0.0 | 1100 |
| 2880 min Winter | 3.264 | 0.0 | 1436 |
| 4320 min Winter | 2.322 | 0.0 | 2084 |
| 5760 min Winter | 1.832 | 0.0 | 2704 |
| 7200 min Winter | 1.533 | 0.0 | 3504 |
| 8640 min Winter | 1.332 | 0.0 | 4168 |
| 10080 min Winter | 1.187 | 0.0 | 5304 |

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## Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| Return Period (years) | 100 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 565974 172138 TQ 65974 72138 |
| Data Type | Point |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.790 |
| Cv (Winter) | 0.830 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 0.013

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.007 | 4 | 8 | 0.006 |

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## Model Details

Storage is Online Cover Level (m) 29.000

## Porous Car Park Structure

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 2.41920 | Width (m) | 7.4 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 17.3 |
| Max Percolation (l/s) | 35.6 | Slope (1:X) | 15.0 |
| Safety Factor | 3.0 | Depression Storage (mm) | 5 |
| Porosity | 0.32 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 28.750 | Cap Volume Depth (m) | 0.250 |

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## Network Area Key:

**SW NETWORK 1 - OUTFALL SA-CS1 (0.261ha)**

| Pipe Node | Key | Area | Area + UC | Pn Model Total (ha) |
|---|---|---|---|---|
| 1.000 | | 0.012 | 0.013 | |
| 1.000 | | 0.012 | N/A | **0.025** |
| 1.001 | | 0.040 | N/A | **0.040** |
| 1.002 | | 0.022 | 0.024 | |
| 1.002 | | 0.045 | N/A | **0.069** |
| 2.000 | | 0.036 | N/A | **0.036** |
| 1.003 | | 0.020 | N/A | **0.020** |
| 3.000 | | 0.060 | N/A | **0.060** |
| 1.004 | | 0.011 | N/A | **0.011** |

**SW NETWORK 2 - OUTFALL SA-CS2 (0.070ha)**

| Pipe Node | Key | Area |
|---|---|---|
| 1.000 | | 0.020 |
| 2.000 | | 0.032 |
| 1.001 | | 0.018 |

**PERMEABLE PAVING (0.064ha)**

| TYPE | Key | Area |
|---|---|---|
| HD | | 0.031 |
| LD | | 0.033 |

**AMENITY / PEDESTRIAN PATHS (DISCHARGING TO LANDSCAPE AREAS**

| Key | Area |
|---|---|
| | 0.025 |

**IMPERMEABLE AREA TOTAL: 0.420ha**




## - DO NOT SCALE FROM THIS DRAWING -

All dimensions in mm U.N.O

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER
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3. 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
4. LOCATION AND LEVELS OF EXISTING PUBLIC SEWERS HAVE BEEN TRANSCRIBED FROM THAMES WATER ASSET PLANS

| Rev | | By | Chk'd | Date |
|---|---|---|---|---|

Status: PRELIMINARY

Client: OAKWOOD BUILDING CONTRACTORS

Project: ST COLUMBA'S CLOSE GRAVESEND, KENT

Title: NETWORK DISTRIBUTION PLAN

| Job No. | Drg No. | Rev |
|---|---|---|
| 11270 | 451 | - |

| Drawn by | Date |
|---|---|
| TL | March 24 |
| **Checked by** | **Scale** |
| MD | 1:250 on A1 |

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**APPENDIX G**

MAINTENANCE AND MANAGEMENT

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# TECHNICAL NOTE

| | | |
|---|---|---|
| PROJECT | : | St Columba's Close, Gravesend, Kent |
| NOTE REF. | : | 11270/24002/SMM |
| NOTE TITLE | : | SuDS Maintenance and Management Plan |
| AUTHOR | : | Tafari Lewis |
| APPROVED | : | Ian Durkin |
| DATE | : | 2nd April 2024 |

## 1.0 INTRODUCTION

This file note provides information on the proposed maintenance and management plan for the development of land at Redhill St Columba's Close, Gravesend in Kent. The details provided in this document are indicative only and are to be used as a guide.

The purpose of this document is to ensure that the adopting authority / management company is entrusted with a robust inspection and maintenance programme to ensure the optimum operational efficiency of the surface water drainage network is maintained for the lifetime of the development.

This plan has been developed in direct reference to CIRIA C753 The SuDS Manual.

Adopting authorities may have their own specific maintenance requirements which may not be as per the information provided within this document.

This file note will review the following aspects:

- Who is to maintain / Adopt the SuDS and associated features
- Indicate a Maintenance Management Plan which reviews the activities to be undertaken, frequency and inspections
- Actions required in the case of a network blockage or pollution incident.

## 2.0 SuDS LAYOUT & DESIGN

The following provides an indication of the intentions for adoption and maintenance for the drainage as detailed on drawing 400 entitled Drainage Layout.

There are 4 main SuDS components associated with the surface water drainage strategy on this scheme:

Green roofs

Green roofs are proposed for bin and cycle stores.

Proprietary Treatment Systems

Stage 1 Bypass separators have been specified to treat surface water run-off.

Permeable Paving

Parking areas and the shared access link to St Patrick's Gate shall be constructed with a permeable surface which allows surface water to infiltrate through into the underlying sub-base filter material. Type A (full infiltration) permeable paving has been specified. These areas allow surface water to drain through to a stone sub-base, slowing, collecting and filtering the surface water flows prior to discharging into the underlying soils.

Attenuation Modular Storage Tanks

Attenuation storage crates have been specified as outfalls for the development. Storm water is temporarily stored in the attenuation tanks during the 1:100 year peak surface flow events (with climate change allowance) prior to controlled release into the underlying soils.

## 3.0 ADOPTION AND MAINTENANCE & ACCESS

Maintenance refers to the inspections required to identify performance issues and plan maintenance as required, operation and maintenance of the drainage system, landscape management and waste management associated with contaminated silt and other waste materials resulting from maintenance.

CIRIA C753 The SuDS Manual provides information in Chapter 32 for the operation and maintenance of SuDS. The maintenance activities are broadly defined as regular, occasional and remedial maintenance. It is noted that some scenarios may require one-off maintenance activities. The SuDS Manual defines maintenance as –

- Regular Maintenance: consists of basic tasks carried out to a frequent and predictable schedule, including inspections/monitoring, silt or oil removal if required more frequently than once a year, vegetation management, sweeping or surfaces and litter / debris removal.

- Occasional maintenance: comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks.

- Remedial maintenance: describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised with good design, constructions and regular maintenance activities.

Maintenance regimes are to be reviewed on an annual basis to ensure that the approach adopted is meeting its objectives. All those responsible for the maintenance operations should adhere to the relevant health and safety legislation for the activities listed within this report

(Including lone working, if relevant). Method statements and risk assessments should always be completed prior to the undertaking of any works.

### Adoption

The SuDS, cellular storage tank (CS1), bypass separator and associated mains sewers for network 1 will be forwarded for adoption to Southern Water under a S104 agreement. Southern Water have their own maintenance regimes for adopted public sewers.

The permeable paving, cellular storage tank CS2, green roofs and all associated external pipework, chambers and manholes will be the responsibility of the developer. These features shall remain private and maintained by the developers appointed management company.

### Access

Access to SuDS elements is provided by the main site access off Valley Drive.

## 5.0 MAINTENANCE MANAGEMENT PLAN

The information below is reproduced from Table 32.1 of CIRIA C753 The SuDS Manual and is used to indicate the maintenance and operation activities that each authority or management company is to apply –

| Operation and maintenance activity | SuDS Component | | | |
|---|---|---|---|---|
| | Green roofs | Proprietary treatment systems | Pervious Pavements | Modular Storage |
| **Regular Maintenance** | | | | |
| Inspection | ▪ | ▪ | ▪ | ▪ |
| Litter & Debris removal | | ▫ | ▪ | ▫ |
| Grass Cutting | | | ▫ | ▫ |
| Weed and Invasive plant control | ▪ | | ▫ | |
| Shrub Management (including Pruning) | | | ▫ | |
| Shoreline vegetation management | | | | |
| Aquatic vegetation management | | | | |
| **Occasional Maintenance** | | | | |
| Sediment Management | | ▪ | | ▪ |
| Vegetation Replacement | ▪ | | | |
| Vacuum sweeping and brushing | | | ▫ | |
| **Remedial Maintenance** | | | | |
| Structure rehabilitation / repair | ▫ | | ▫ | ▫ |
| Infiltration surface reconditioning | ▫ | | ▫ | ▫ |

Key

▪ will be required

▫ may be required

Extract from Table 32.1 CIRIA C753 The SuDS Manual

## Green Roofs

Green roofs are areas of living vegetation, installed on the top of buildings, for a range of reasons including visual benefit, ecological value, enhanced building performance and the reduction of surface water run-off.

A green roof consists of a system in which several materials are layered to achieve the desired vegetation cover and drainage characteristics. Design components may vary depending on the green roof type and site constraints.

The table below gives a summary of the operation and maintenance requirements for Green Roofs

| GREEN ROOFS | |
|---|---|
| **Regular Inspections** | **Frequency** |
| Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability | Annually and after severe storms |
| Inspect soil substrate for evidence of erosion channels and identify sediment sources | Annually and after severe storms |
| Inspect drain inlets to ensure unrestricted run-off from the drainage layer to the conveyance or roof drain system | Annually and after severe storms |
| Inspect underside of roof for evidence of leakage | Annually and after severe storms |
| **Occasional Tasks** | **Frequency** |
| Removal of debris and litter to prevent clogging of inlet drains and interference with plant growth | Every six months or as required |
| Remove fallen leaves and debris from deciduous plant foliage. | Every six months or as required |
| During establishment (i.e year one), replace dead plants as required | In accordance with manufactures recommendations |
| Post establishment, replace dead plants as required (where >5% coverage) | Annually (in autumn) |
| Remove nuisance and invasive vegetation, including weeds | Every six months or as required |
| Mow grass, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate | Every six months or as required |
| **Remedial Works** | **Frequency** |
| If erosion channels are evident, these should be stabilised with extra soil substrate or similar material and sources of erosion damage identified and controlled | As required |
| If drain inlet has settled, cracked or moved, investigate and repair as appropriate. | As required |

## Proprietary Treatment Systems

Regular inspection and maintenance are required to ensure the effective long-term operation of proprietary treatment systems.

Inspection and maintenance of the tank will be dependent upon the manufacturers recommendations and installation as per manufacturers details.

The table below gives a summary of the typical operation and maintenance requirements for proprietary treatment systems –

| PROPRIETARY TREATMENT SYSTEMS | |
|---|---|
| **Regular Maintenance** | **Frequency** |
| Remove litter and debris and inspect for sediment, oil and grease accumulation | Six monthly |
| Change the filter media | As recommended by manufacturer |
| Removal sediment, oil, grease and floatables | As necessary – indicated by system inspections or immediately following significant spill. |
| **Remedial Works** | **Frequency** |
| Replace malfunctioning parts or structures | As required |
| **Monitoring** | **Frequency** |
| Inspect for evidence of poor operation | Six monthly |
| Inspect filter media and establish appropriate replacement frequencies | Six monthly |
| Inspect sediment accumulation rates and establish appropriate removal frequencies | Monthly during first year of operation, then every six months. |

### Permeable Surfaces

Permeable surfaces including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

Regular inspection and maintenance are important for the effective operation of permeable pavements, they should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. In instances where jointing material is lost, this material this should be replaced immediately.

Depending on the amount of usage and the environment that the permeable pavement has been exposed to, the laying course material may require either replacement or cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. If this situation should occur, the uplifting and cleaning (or replacing, depending on the costings of the activity) of the laying course may be considered. The laying course material, jointing and blocks may be reused (once cleaned), to aid in minimising costs. Inspection and maintenance of the permeable surfaces will be dependent upon the manufacturer's recommendations and installation as per manufacturers details.

The table below gives a summary of the operation and maintenance requirements for permeable paving –

| PERMEABLE AND POROUS SURFACES | |
|---|---|
| **Regular Maintenance** | **Frequency** |
| Brush regularly and remove sweepings from all hard surfaces | Three times a year at end of winter, mid-summer and after autumnal leaf fall, or as required based upon site specific observations or as per manufacturers recommendations |
| **Occasional Tasks** | **Frequency** |
| Removal of weeds | As required |
| Stabilise and mow contributing and adjacent areas | As required |
| **Remedial Works** | **Frequency** |
| Remediate any landscaping which, through vegetation maintenance or soil slip has encroached upon the permeable surface | As required |
| Remedial work to any depressions, rutting, cracked or broken blocks considered to be detrimental to the structure or that pose a hazard to users | As required |
| Rehabilitation of surface and upper substructure by sweeping | As required if infiltration performance is reduced |
| **Monitoring** | **Frequency** |
| Initial Inspection | Monthly for 3 months after installation / regular usage |
| Inspection for evidence of poor operation and / or weed growth | 3 monthly & 48 hours after large storms |
| Inspection of silt accumulation | Annually |
| Monitoring of inspection chambers | Annually |
| Inspection for depressions, ponding or rutting | Annually |

### Modular Storage

Regular inspection and maintenance are required to ensure the effective long-term operation of below ground modular storage systems.

Catchpits are installed at the inlet to the tanks to allow for removal of silt / debris as required. The tanks are utilised for the 1:100 year storm event and as such are envisaged to have minimal levels of silt due to the use of trapped gullies within the system.

Inspection and maintenance of the tank will be dependent upon the manufacturers recommendations and installation as per manufacturers details.

The table below gives a summary of the operation and maintenance requirements for modular storage –

| MODULAR STORAGE | |
|---|---|
| **Regular Maintenance** | **Frequency** |
| Inspect and identify any areas that are not operating correctly | Monthly for 3 months after installation / regular usage |
| Debris and silt removal from catchment areas | Monthly |
| Removal of sediment from pre-treatment structures | Annually or as required |

| Remedial Works | Frequency |
|---|---|
| Repair / rehabilitation of inlets, outlets, overflows and vents | As required |
| **Monitoring** | **Frequency** |
| Inspect / check all inlets, inspection wells, outlets, vents and overflows to ensure that they are in good condition and operating as designed. | Annually and after large storms |
| Inspection of surface above units for sag points or depressions which may indicate structural failure. | Annually |
| Survey inside of the tank for sediment build-up and removal as required | Every 5 years or as required |

### Pipes and Chambers

| PIPES AND GULLIES | | |
|---|---|---|
| **Maintenance schedule** | **Required Action** | **Frequency** |
| Regular Maintenance | Remove sediment and debris from inspection chambers | Annually |
| | Remove any root ingress | As required |
| Occasional Maintenance | CCTV survey of drains to check alignment, cracking and joint displacement | 10 year intervals |

## 6.0 BLOCKAGES AND SPILLAGES

### Blockage

In the event of a blockage within the drainage network, the key risk is that of flooding to the surrounding area. The extent and location of flooding is dependent upon the location of the blockage and the associated storm event.

In the event of a blockage within the network, the network is to be drained down by use of suction equipment and the blockage removed.

### Spillages

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung. Contact the Environment Agency immediately.

**APPENDIX H**

EXCEEDANCE FLOW PATHS




**Existing Flow Paths - Existing**

Existing Flood Flow Path




**Exceedance Flow Paths - Proposed**

Proposed Exceedance Flow Path

N

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All dimensions in mm U.N.O

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4. LOCATION AND LEVELS OF EXISTING PUBLIC SEWERS HAVE BEEN TRANSCRIBED FROM THAMES WATER ASSET PLANS

SCALE 1:500
0 10m 20m 40m

| Rev | | By | Chk'd | Date |
|---|---|---|---|---|

Status: PRELIMINARY

Client: OAKWOOD BUILDING CONTRACTORS

Project: ST COLUMBA'S CLOSE
GRAVESEND, KENT

Title: EXCEEDANCE FLOW PATHS

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| Job No. | Drg No. | Rev |
|---|---|---|
| 11270 | 452 | - |

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|---|---|
| TL | March 24 |
| Checked by | Scale |
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