Piggotts Farm, Albury End, SG11 2HS

Drainage Design

04/04/2023

Version 4.0

RAB: 2878_FRD

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Quality Control

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Revision History

Version	Date	Amendments	Issued to
1.0	22/03/2022	First Issue	Hollyhock Trust Ltd T/A Hockley Farms
2.0	25/03/2022	Change to drawings in Appendix C	Hollyhock Trust Ltd T/A Hockley Farms
3.0	31/03/2022	Minor change	Hollyhock Trust Ltd T/A Hockley Farms
4.0	04/04/2023	Small change to development plans	Hollyhock Limited

Contents

1.0 Introduction

RAB Consultants has prepared this Drainage Design in support of the proposed agricultural development located at Piggotts Farm, Albury End.

The Secretary of State for Communities and Local Government laid a Written Ministerial Statement in the House of Commons on 18th December 2014 setting out changes to planning that will apply for major development from 6 April 2015. Therefore, from 6 April 2015 local planning policies and decisions on planning applications relating to major development are required to ensure that sustainable drainage systems (SuDS) are used for the management of surface water. As the Lead Local Flood Authority, Hertfordshire County Council is required under Article 18 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 (the Development Management Procedure Order) to provide consultation response on the surface water drainage provisions associated with major development.

Major development is defined within the Development Management Procedure Order as development that involves any one or more of the following:

1. the winning and working of minerals or the use of land for mineral working deposits;
2. waste development;
3. the provision of dwelling houses where:
   i. the number of dwelling houses to be provided is 10 or more; or
   ii. the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph 3.1;
4. the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
5. development carried out on a site having an area of 1 hectare or more.

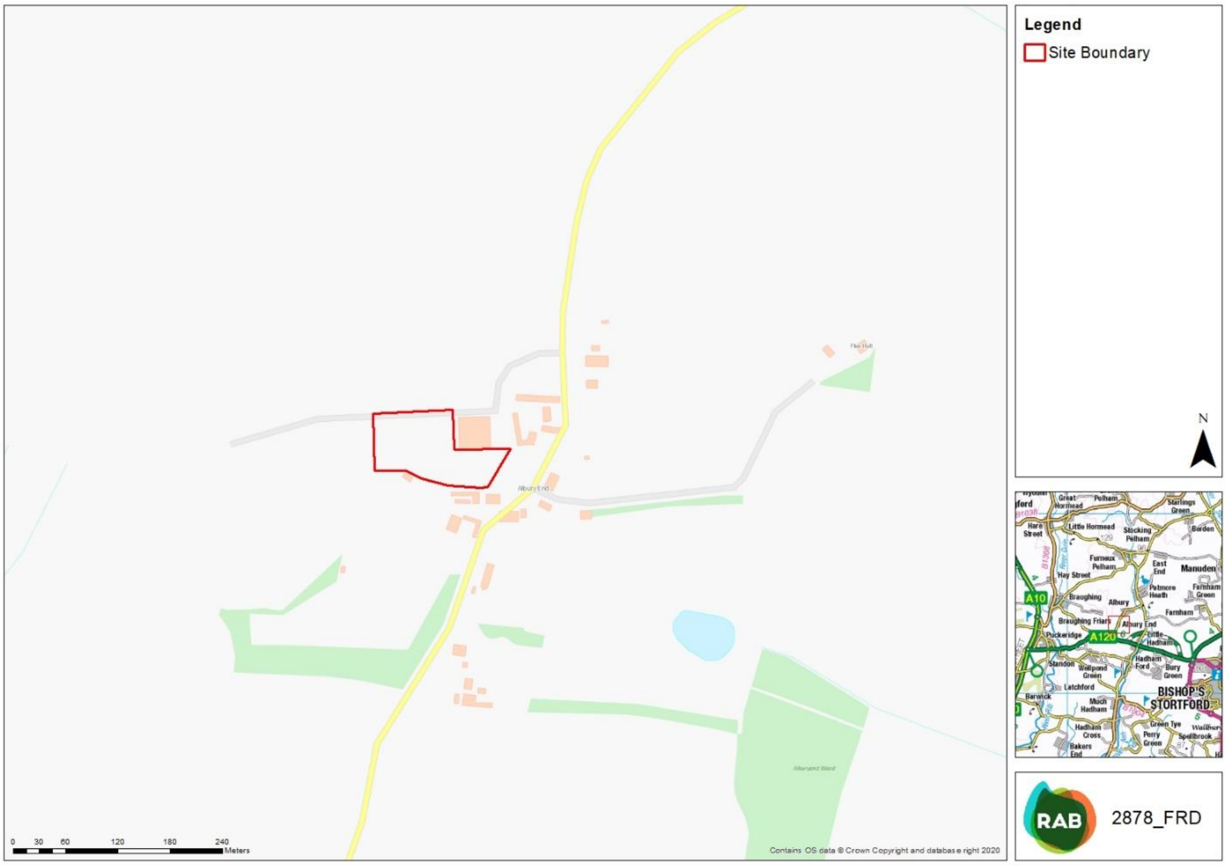
In this instance a drainage design has been requested by the council under condition 6 of the decision notice stating: *No development shall take place until a detailed drainage strategy has been submitted to and approved in writing by the local planning authority.* This drainage design will be produced in accordance with the local drainage policies listed within Hertfordshire County Council's LLFA Summary Guidance for developers document updated in August 2021.

2.0 Site details

2.1 Site location

TABLE 1: SITE LOCATION

Site address:	Piggotts Farm, Albury End, SG11 2HS
Site area:	0.885ha
Existing land use:	Agricultural land
OS NGR:	TL428238
Local Planning Authority:	East Hertfordshire Council



2.2 Site description

The site is currently used as an agricultural field serving Piggotts Farm and can be accessed from Albury End Road. The site is bounded by agricultural land to the north, east, and west and by residential land to the south.

There are no known main rivers that run in close proximity to the site however, drainage ditches are present at the site.

2.3 Development proposal

Development proposals include the construction of a grain store with PV panels and a section of hardstanding to the east of the proposed structure.

3.0 Drainage Strategy

3.1 Existing site constraints

3.1.1 Fluvial flood risk

The site is located within Flood Zone 1, which is described in the NPPF as land having a less than 1 in 1,000 annual probability of river or sea flooding (less than 0.1% AEP).

3.1.2 Surface water flood risk

When the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded, excess rainwater flows overland. This water will collect in topographic depressions and at obstructions, which can inundate development in low lying areas. The severity of the rainfall event, the degree of saturation of the soil before the event, the permeability of soils and geology, and the gradient of the surrounding land and it's use; all contribute to and affect the severity of overland flow.

The Environment Agency Flood Map for Surface Water (Figure 1), can be used to see the approximate areas that would experience surface water flooding from a range of AEPs, which is used to categorise the risk (Table 2).

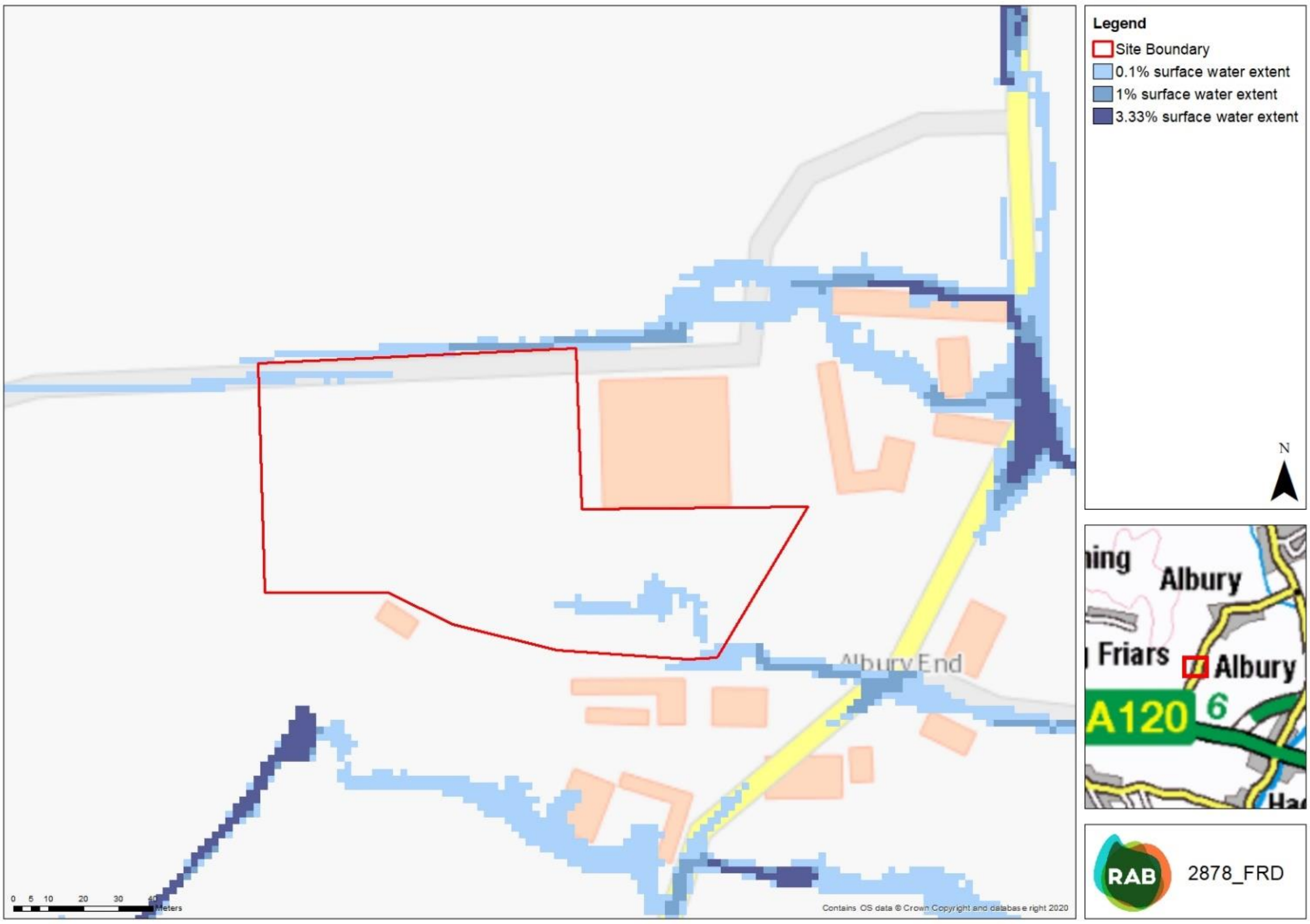


FIGURE 1: ENVIRONMENT AGENCY FLOOD RISK FROM SURFACE WATER

TABLE 2: ENVIRONMENT AGENCY SURFACE WATER RISK CATEGORIES

Surface Water Risk Category	Surface water flooding Annual Exceedance Probability
Very Low	< 0.1%
Low	Between 1% and 0.1% (1 in 100 years and 1 in 1000 years)
Medium	Between 1% and 3.3% (1 in 100 years and 1 in 30 years)
High	> 3.3% (1 in 30 years)

The Surface Water map identifies that there is a low risk of surface water flooding for the site. There are two parts of the site that are shown to be affected by the severe 0.1% AEP surface water event (Figure 1) which experience depths of up to 150mm in the north and in the south. The location where the proposed grain store structure is located is at very low risk of surface water flooding. SuDS measures will offer betterment by capturing this runoff and managing it in a sustainable manner.

3.1.3 Groundwater flood risk

British Geological Survey (BGS) records indicate that the proposed development site overlies bedrock composed of Thanet Formation – clay, silt and sand. This is overlain (superficial deposits) by Lowestoft Formation – diamicton.

The Soilscapes application details the site to be located within an area comprising *lime-rich loamy and clayey soils with impeded drainage*. As such, the risk of emerging ground water is low. In addition, infiltration will be quite challenging at site level due to the impeded drainage quality of the soils.

As there is a high degree of variability when considering groundwater flooding, using historic flooding is not a robust measure of the risk of flooding in future years.

3.1.4 Sewers flood risk

Thames Water is responsible for the adopted surface and foul sewer networks within the District and maintain a DG5 register of sites affected by sewer flood incidents on a post code basis. According to the East Herts 2016 SFRA (Strategic Flood Risk Assessment), the post code area of 'SG11 2' has experienced 4 instances of sewer flooding. The site owner suggested that there have been no instances of sewer related flooding.

It is important to note that previous sewer flood incidents, or the lack thereof, do not indicate the current or future risk to the site. Upgrade work could have been carried out to alleviate any issues or conversely, in areas that have not experienced sewer flooding incidents, the local drainage infrastructure could deteriorate leading to future flooding.

3.2 Existing runoff condition

3.2.1 Existing drainage arrangements

The location where the grain store is proposed is currently greenfield agricultural land and does not contain any existing drainage infrastructure. The existing barn to the east of the proposed build area utilises a piped drainage system to discharge runoff into a ditch at the site entrance.

3.2.2 Natural flow path

As shown in Figure 2 below, the land slopes south-east towards Kennel Cottage with a gradient of approximately 1:36. The drainage scheme will aim to mimic the natural slope of the site in line with the SuDS Manual (2015) design approach.

FIGURE 2: NATURAL FLOW PATH

3.2.3 Greenfield runoff

The greenfield runoff rate was calculated using the IH124 method for determining Greenfield runoff rate built into Microdrainage WinDes 2013.1 (including the modification given in the Interim Code of Practice for SUDS, Chapter 6):

- SAAR (mm) = 635
- Area (ha) = 0.511
- Soil = 0.400
- Region = 6

The QBAR was calculated at 1.53l/s (see Appendix C). The greenfield runoff rate was calculated on the basis of the proposed hardstanding area of 0.511ha.

TABLE 3: GREENFIELD RUNOFF RATES

AEP (%)	Greenfield peak flow rate (l/s/ha)	Greenfield peak flow rate (l/s)
100	2.60	1.33
QBAR	3.00	1.53
3.33	6.90	3.53
1	9.70	4.96
1 +22% Climate Change*	11.8	6.03

*Thames Upper Lee river basin higher central allowance for flow estimations

3.3 SuDS feasibility

The SuDS Manual (2015) discusses the SuDS approach to managing surface water runoff which is intended to mimic the natural catchment process as closely as is possible. The approach sets out the design objectives in respect of SuDS:

- Use of surface water runoff as a resource;
- Manage rainwater close to where it falls (at source);
- Manage runoff on the surface (above ground);
- Allow rainwater to soak into the ground (infiltration);
- Promote evapotranspiration;
- Slow and store runoff to mimic natural runoff rates and volumes;
- Reduce contamination of runoff through pollution prevention and by controlling the runoff at source; and
- Treat runoff to reduce the risk of urban contaminants causing environmental pollution.

Depending on the characteristics of the site and local requirements, these may be used in conjunction and varying degrees. Table 6 presents the functions of the SuDS components (from which a management train can be created) and their feasibility in respect of the site.

TABLE 4: FEASIBILITY IF SUDS TECHNIQUES AT THE DEVELOPMENT SITE

Technique	Description	Feasibility Y / N / M (Maybe)
Good building design and rainwater harvesting	Components that capture rainwater and facilitate its use within the building or local environment.	Y – there is opportunity to use rainwater harvesting tanks at the grain store for re-use on the adjacent agricultural fields.
Porous and pervious surface materials	Structural surfaces that allow water to penetrate, thus offering attenuation potential, while reducing the rate of runoff (green roofs, pervious paving).	N – there is no available room on site for porous materials given the need for concrete pads for heavy loading.
Infiltration Systems	Components that facilitate the infiltration of water into the ground. These often include temporary storage zones to accommodate runoff volumes before slow release to the soil.	N – the site's geology, as discussed in Section 3.1.3, would not allow for infiltration devices to be feasible.
Conveyance Systems	Components that convey flows to downstream storage systems (e.g. swales, watercourses).	Y – there is available room on site for conveyance systems.

Technique	Description	Feasibility Y / N / M (Maybe)
Storage Systems	Components that control the flows and, where possible, volumes of runoff being discharged from the site, by storing water and releasing it slowly (attenuation). These systems may also provide further treatment of the runoff (e.g. ponds, wetlands, and detention basins).	Y – there is room on site for sub-surface and surface storage structures such as cellular storage and ponds.
Treatment Systems	Components that remove or facilitate the degradation of contaminants present in the runoff.	Y – the above SuDS features can provide treatment benefits to the surface water.

The site has the potential to incorporate a number of SuDS options to manage surface water. These are discussed in more detail below.

3.4 Proposed discharge

The 2015 SuDS Manual recommends a specific hierarchy in terms of surface water discharge destinations:

1. Discharge into the ground.
2. Discharge into a surface water body.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

As described in Section 3.1.3, the geology of the site comprises diamicton rock with clayey soils resulting in impeded drainage issues. Therefore, infiltration is not viable at the site.

According to the topographic survey, there are drainage ditches that run alongside Albury End which is where the existing surface water system discharges to. As such, the scheme should aim to discharge into the ditch on Albury End utilising the on-site drainage system given the lack of an available surface water sewer.

3.5 Proposed surface water management

The proposed drainage scheme has been modelled in Microdrainage Network to understand the evolving flow regime under flood conditions and the potential for flooding. The proposed scheme (see Appendix C) will integrate a range of features, in line with the SuDS Manual philosophy, taking into consideration site constraints. In detail, a cellular storage device and dry basin will act as the attenuation features managing the runoff from a total impermeable area of 0.511ha.

A series of surface water pipes and an ACO QMAX slot drainage system will capture and convey runoff into the attenuation features, as shown in relevant drawings in Appendix C.

The tank will manage roof runoff and road runoff from an area of 4536m^2 before discharging to the onsite drainage system at a rate of 1.1 l/s, for all events up to and including the 1% AEP + 40% CC. A Hydrobrake (or similar) flow control device should be used to limit the flow rate from the cellular storage tank.

Due to the site topography and space constraints, part of the drained area needs to be managed via a separate storage feature. This is to avoid the use of pumps which are highly unsustainable and may increase the risk of flooding to others downstream. As such, a dry basin will manage road runoff from a small part of the proposed site. A Hydrobrake (or similar) flow control device should be used to limit the flow rate to 1 l/s for all events up to and including the 1% AEP + 40% CC.

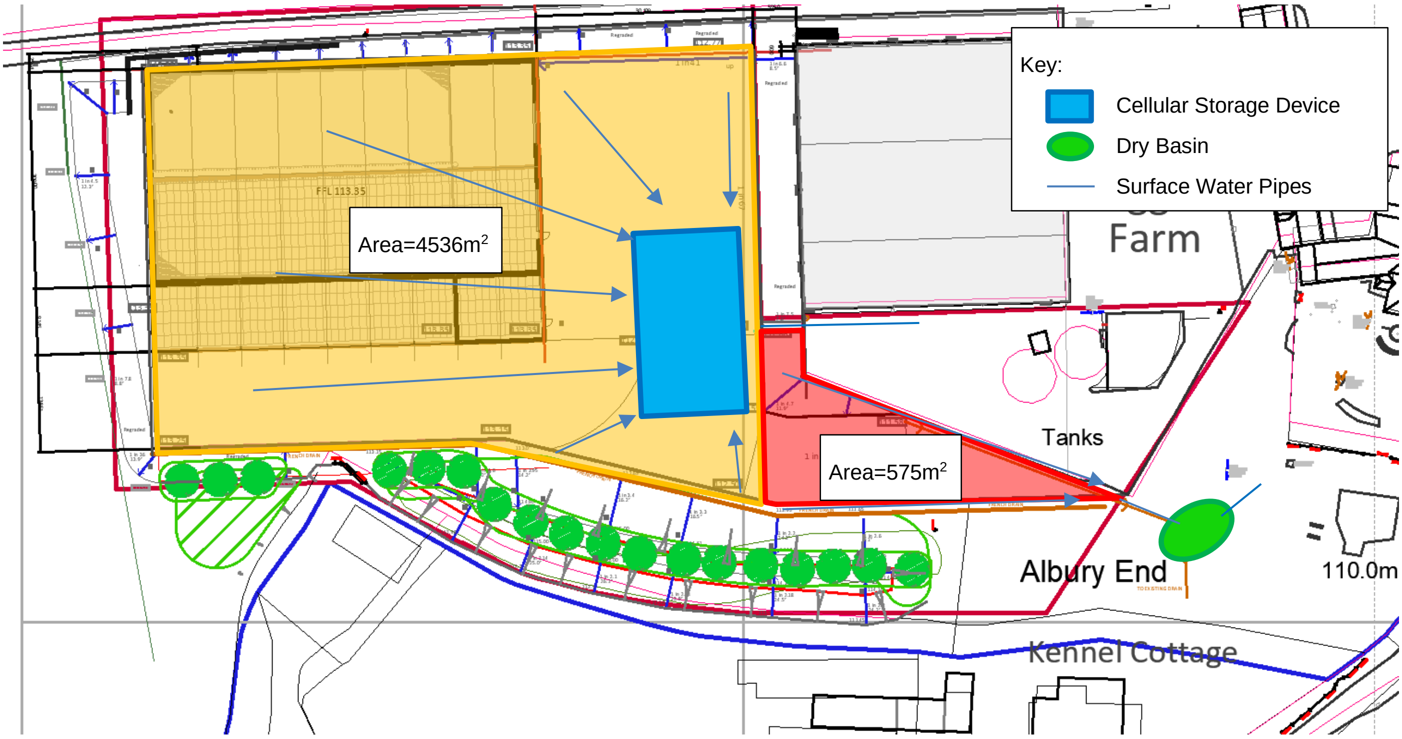


Figure 3: Site drainage areas

As such, the total discharge rate from the site will be 2.1 l/s for all events up to and including the 1% AEP +40% CC. The low discharge rate impacts the half drain time during the 1% AEP +40% CC of the tank however, the system will not be infiltrating, and a balance had to be struck between low rate and half drain time. A low rate would ensure no increase of flood risk to others downstream. In addition, the orifice size for both flow controls is ≥50mm to reduce the risk of blockages.

Rainwater harvesting tanks are also being proposed to store roof runoff from the grain store to be used on-site however, these have not been included in the model given the uncertainty with storage volumes during storm periods.

A layout of the proposed scheme can be found in Appendix C along with typical construction details.

3.5.1 Dry basin

The basin will manage the surface water runoff from the eastern triangle section of the proposed concrete apron which has a total area of approximately 575m^2. The basin should have an area of 45.2m^2 at the surface and 9m^2 at the base with a depth to invert of 0.7m.

The side slopes of the dry basin should be set at a minimum of 1 in 3 and planted with short grass (50 mm-75mm) and native vegetation species in a sparse fashion along the benches. The base of the basin should be planted with water tolerant reed species (approximately 50 stems per m^2) to reduce the erosion potential. Contractor must identify measures to ensure vegetation establishment and reduce the risk of erosion post-construction; such measures may include (but not limited to) the use of erosion control mats, hydroseeding, etc. The basin must therefore be installed in line with the CIRIA C768 report (2017) Guidance on the construction of SuDS.

3.5.2 Cellular storage

A cellular storage tank (ACO Stormbrixx or similar) should be used to manage the runoff from the grain store and the majority of the concrete apron (impermeable area = 4536m^2). The tank should have an area of 475m^2 and a depth of 0.914m giving a total storage capacity of 412.4425m^3. A minimum cover depth would usually be required given the heavy loading present on site however, the concrete apron will act as structural protection for the tank and therefore, the tank can be located directly below the concrete slab. The tank manufacturer must confirm structural reliability.

The tanks will receive runoff via appropriate piped network and an ACO QMAX slot drainage system (see Appendix C). All inlets into the tank should have a SDS Aqua-Swirl (or similar) installed upstream to prevent build-up of silt in the tank, reducing its total storage capacity.

The cellular storage units must be installed in line with the CIRIA C768 report (2017) Guidance on the construction of SuDS.

3.5.3 Water quantity benefits

The scheme will offer significant reductions in runoff rates, compared with the greenfield rates in the 3.33% AEP events and above, as shown in the below table. This is to counterbalance the increased volume of runoff as a result of the development.

As such, the proposed scheme provides water quantity benefits, in line with the 2015 SuDS Manual.

TABLE 5: EXISTING AND PROPOSED PEAK FLOW RUNOFF RATES

AEP (%)	Greenfield peak flow rate (l/s)	Proposed peak flow rate (l/s)	Change (%)
50	1.53	2.1	37.3
3.33	3.53	2.1	40.5
1	4.96	2.1	57.7
1 +40%CC**	6.03	2.1	65.2

3.5.4 Water quality benefits

In line with the SuDS Manual, the water must receive a certain degree of treatment. There are no significant risks of pollution as a result of the development as it is classed a low density residential with no major risks.

According to Table 26.2 of the SuDS Manual and based on the land use, the site has a low pollution hazard level. In detail, the pollution hazard indices are:

- Total Suspended Solids= 0.5
- Heavy Metals= 0.4
- Hydrocarbons= 0.4

Consequently, the proposed SuDS feature(s) must have a higher mitigation index. Mitigation indices for various SuDS components can be found in Table 26.3 of the SuDS Manual (2015).

Total SuDS Mitigation Index = mitigation index$_1$ + (0.5 x mitigation index$_n$)

Where mitigation index$_n$ = mitigation index for component n.

The proposed drainage scheme utilises a cellular storage device, rainwater harvesting and a dry basin.

Using Table 26.3 of the SuDS Manual (2015), the mitigation indices for each pollutant and for each feature were identified:

- TSS – SuDS mitigation index = 0.5 > 0.5
- Heavy Metals – SuDS mitigation index = 0.5 > 0.4
- Hydrocarbons – SuDS mitigation index = 0.6 > 0.4

The cellular storage device should utilise an SDS Aqua-Swirl (or similar) upstream to mitigate the pollution hazards of the relevant site runoff. The product must have mitigation indices higher than the hazard indices identified above. It is our understanding that SDS Aqua Swirl offers such mitigation indices but there are other products which could also be used.

Consequently, the proposed scheme is in line with the water quality requirements of the SuDS Manual (2015).

3.6 Future resilience

3.6.1 Designing for exceedance

It is inevitable that as a result of heavy or extreme rainfall, the capacities of sewers and other drainage systems will be exceeded on occasion. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, when the outfall becomes restricted due to flood levels in the receiving water, or due to poor maintenance of the SuDS features.

The scheme has been modelled in Microdrainage Network to manage the total proposed site runoff with no flooding during the 1% AEP + 40% CC event. Nevertheless, exceedance routes have been mapped in drawing RAB2878_001 to show how water will flow onsite should a failure occurs in the system.

The half drain time is shown in the calculations to exceed the recommended 1440-minute threshold however, this is expected as the final discharge rate is extremely low comparatively to the drained area. A higher discharge rate from the cellular storage would enable a half drain time lower than 1440 minutes however since the scheme is not infiltrating, this should not be an issue. A higher discharge rate would need to be accepted by the local authority as the scheme is not discharging to a public sewer.

3.6.2 Urban creep

In line with the local policies of Hertfordshire County Council, a 10% increase to the total impermeable site area has been applied to the scheme to ensure it can cope with additional flows from extension work (see Appendix C). It should be noted that there is no scope to further expand the layout and any expansion would require planning approval and an appropriate drainage strategy which would most likely utilise new SuDS.

3.7 Amenity and biodiversity

Primary consideration should be given to locally native species, and plants that benefit wildlife through their nectar, fruit, or berries. Generally, the choice of plant species should reflect the usual design decisions relating to their location in terms of aspect, sun or shade, height, from, colour, whether evergreen or deciduous, native or ornamental, and soil factors such as pH, depth, nutrient status and organic content. However, the consideration has to be their ability to withstand the fluctuations in soil moisture that will occur.

4.0 Maintenance and Management Plan

The following maintenance and management plan has been formed to assist with ensuring the longevity of the surface water scheme to provide multiple benefits throughout its lifetime. The plan will also aim to prevent any blockages or damage occurring to each component of the scheme to minimise the risk of flooding as much as possible.

The level of inspection and maintenance will vary depending on the type of SuDS component and scheme, the land use, and the type of vegetation. It is vital that SuDS construction is supervised and inspected on completion if owners are to avoid taking on liabilities and to ensure the specified materials are being used and placed correctly. Incorrect materials or installation should be rejected as they will adversely affect the performance, maintenance costs and ultimately the design life of the SuDS components.

The site manager must maintain maintenance logs for all elements.

The SuDS features incorporated to this particular design have to be maintained in order to ensure efficient water treatment and water management.

4.1 SuDS features checklist

- **Rainwater harvesting** is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used as a supply of water for domestic, commercial, industrial and/or institutional properties.
- **Proprietary treatments systems** are manufactured products that remove specified pollutants from surface water runoff. they are often (but not always) subsurface structures and can often be complementary to landscaped features, reducing pollutant levels in the runoff and protecting the amenity and/or biodiversity functionality of downstream SuDS components.
- **Attenuation tanks** are used to create a below-ground void space for the temporary storage of surface water before infiltration, controlled release or use.
- **Basins, ponds and wetlands** are depressions in the ground where water is stored and treated. Water levels rise after rain and then drops to the normal level as the excess is released slowly to a watercourse or drain. Some water maybe held back as a pond for final treatment, amenity or wildlife interest.
- **SuDS flow control structures** are usually small orifices in control chamber, slots or V notches in weirs. They are usually near the surface so are accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- **Inspection Chambers** and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

4.2 Sustainable Drainage Maintenance Specification

4.2.1 General requirements

Maintenance	Frequency	Owner
Maintenance activities comprise: • Regular maintenance • Occasional tasks • Remedial Work	Will vary depending on activity	(Private or adopted)

Regular maintenance (including inspections and monitoring). Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).

Remedial maintenance Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design.

Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

Avoid use of weedkillers and pesticides to prevent chemical pollution.

4.2.2 Detention basin

TABLE 6: MAINTENANCE SCHEDULE FOR THE BASIN, ADAPTED FROM CIRIA RP992/23 & C753

Maintenance	Frequency	Owner
Regular maintenance		Private (Site owner)
• Mow grass access paths and verges surrounding ponds at 35mm-50mm minimum and 75mm maximum or as specified to provide a cared for appearance and allow pedestrian access.	Monthly or as required	
• Mow rough grass areas for occasional access or habitat reasons at 100mm and maximum 150mm with cuttings removed to wildlife piles.	As required 4-6 times annually	
• Grass areas not required for access may be managed for wildlife interest and to reduce costs.	Annually or as required	
Occasional tasks		

Maintenance	Frequency	Owner
• Where silt accumulates on apron or area in front of inlet or outlet then remove and land apply within design profile of SuDS. • Remove silt as instructed but not more than 30% of pond area at any one time and to an agreed depth but not subsoil layer. • Retain as much representative existing vegetation as possible to ensure rapid re-colonisation of open areas. • Monitor presence of wildlife and log any changes in terms of species variety, population numbers, and any signs of concern (dead amphibians, etc.).	Annually or every 3 years as required	
Remedial Work • Although not usually required this may be needed due to damage to liners or control structures.	As required	

4.2.3 Rainwater Harvesting

Table 7: Maintenance schedule for the rainwater harvesting system, adapted from CIRIA RP992/23 and C753

Maintenance	Frequency	Owner
Regular Monitoring • Inspection of the tank for debris and sediment build-up. • Inspection and cleaning of the tank, inlet/outlets, gutters, withdrawal devices and roof drain filters of silt and other debris.	Annually (and following poor performance)	Private (Site owner)
Occasional Tasks • Cleaning and/or replacement of any filters.	Three monthlies (or as required)	
Remedial Work • Pump repairs. • Overflow erosion damage and damage to tank repairs.	As required	

4.2.4 Cellular storage

Table 8: Maintenance schedule for the cellular storage tank, adapted from CIRIA RP992/23 and C753

Maintenance	Frequency	Owner
Regular Cleaning • Inspect and identify any areas that are not operating correctly and ensure free flow is viable. If required, take remedial action. • Remove litter and debris from the catchment surface.	Monthly for 3 months, then annually. Monthly	Private (Site owner)
Regular Monitoring • Inspect/check all rainwater pipe inlets, pump chamber and vent to ensure that they are in good condition and operating as designed; repair/rehabilitate inlets, outlet,	Annually	

Maintenance	Frequency	Owner
and vent if required following advice from manufacturer. • Make visual inspection of exceedance route and check route is not blocked by new fences, walls, bollards, etc. Remove as necessary.		
Occasional Tasks • Survey inside of tank for sediment build-up and remove if necessary*. • Replace cellular storage tank at the end of design life**	Every 5 years or as required* Every 25 to 50 years**	

*Silt disposal to be undertaken in line with the Environment Agency Regulatory Position Statement 055 and by a qualified professional.

**Assuming maintenance schedule is followed, and remedial action is taken when required.

It is imperative that the management company maintains record logs, including dated images, of the cellular storage access chamber, all inlets, outlet flow control chamber, and silt traps. These records should be shared with the site owner.

Following 25 years from the installation of the proposed cellular storage tank, the tank manufacturer must review the records from the last 5 years and identify whether there is a requirement for replacement of the feature. Should a tank replacement be required, a qualified contractor must be appointed and develop a construction phase plan taking into consideration the piled foundations while clearly identifying the required temporary works to enable the tank replacement.

4.2.5 Inlets, outlets, controls and inspection chambers

Please note that the flow control chambers will require regular maintenance. The maintenance schedule for the control chambers must be also informed by the manufacturer as different features have different requirements.

TABLE 9: MAINTENANCE SCHEDULE FOR THE INLETS, OUTLETS, CONTROL STRUCTURES AND INSPECTION CHAMBERS/MANHOLES

Maintenance	Frequency	Owner
Regular maintenance Inlets, outlets: • Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage • Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly	Private (Site owner)
Inspection chambers/manholes and below ground flow control chambers: • Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. • Undertake inspection after leaf fall in autumn.	Monthly for 12 months, then annually.	
Occasional tasks • Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage.	As necessary	

Maintenance	Frequency	Owner
Remedial Work • Repair physical damage if necessary.	As required	

4.2.6 Drainage network

TABLE 10: MAINTENANCE SCHEDULE FOR PIPED DRAINAGE NETWORK

Drainage Element	Maintenance	Frequency	Owner
Downpipes and gullies	**Regular maintenance** • Open any covers, inspect integrity of gullies and repair as necessary.	Monthly	Private (Site owner)
	• Remove silt / debris by suction.	Annually or as required	
Pipe network	**Regular maintenance** • Remove any sediment within the network and inspection chambers.	Every 3 years or as required	
	• Open covers inspect integrity of chambers and repair as necessary. • Remove silt / debris by suction.	Annually	

5.0 Conclusion

The proposed development at Piggotts Farm, Albury End, SG11 2HS is located in Flood Zone 1 as defined in the NPPF. The proposal includes the construction of a grain store and concrete apron (Appendix A).

On the basis of the available information from the Environment Agency and East Hertfordshire Council, the site is at low risk from fluvial, surface water, groundwater and sewer flooding.

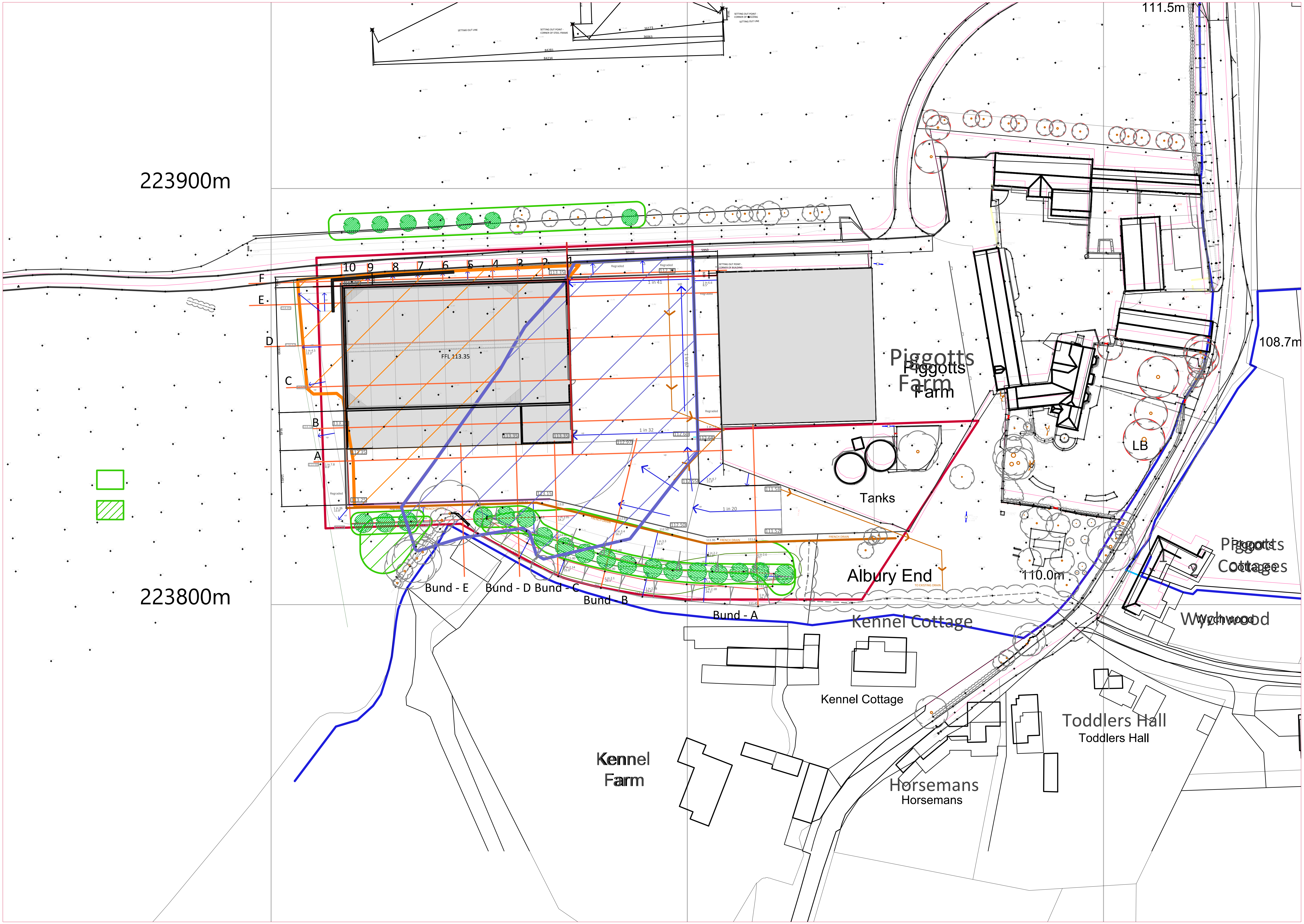
The proposed development must incorporate SuDS as described in Section 3.5 of this report and in the relevant drawings in Appendix C.

The proposed development can be deemed appropriate, provided that the recommendations in this report are adhered to, it will not increase the flood risk to other people, and it will provide multiple benefits with respect to the sustainable management of surface water runoff.

6.0 Recommendations

- The site should manage surface water through the use of SuDS as described in this report.
- Construction (Design and Management) Regulations 2015 (CDM Regulations):
  - The revised CDM Regulations came into force in April 2015 to update certain duties on all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities is to ensure that the client organisation, in this instance Hollyhock Ltd is made aware of their duties under the CDM Regulations.
  - Contractor to prepare a Construction Phase Plan, in line with CDM (2015).
  - Principal designer to develop a health and safety design risk assessment and an accident prevention plan, in line with CDM (2015).
- All SuDS features must be constructed in line with recommendations made in the CIRIA SuDS Manual (2015), Water UK's Design and Construction Guidance (2020), and the CIRIA Guidance on the Construction of SuDS (2017).
- Manufacturer to confirm structural reliability of the cellular storage device.
- Dry basin must be planted with short native grass and pre-established native species, to reduce the impact of erosion.
- The site should limit discharge to 2.1 l/s through the use of flow control chambers (Hydro-brake, orifice plate etc.)
- All SuDS features should be maintained in line with Table 6, Table 7, Table 8, Table 9 and Table 10.
- Developer to confirm SuDS maintenance owner.

Appendix A – Development proposals



111.5m
223900m
108.7m
10
9
8
7
6
5
4
3
2
1
F
E
D
C
B
A
FFL 113.35
1 in 41
1 in 32
1 in 20
Piggotts Farm
Tanks
LB
Albury End
110.0m
Piggotts Cottages
Wychwood
223800m
Bund - E
Bund - D
Bund - C
Bund - B
Bund - A
Kennel Cottage
Toddlers Hall
Horsemans
Kennel Farm

Appendix B – Topographic Survey

SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
C1	542874.992	223889.575	110.489	PK Nail
C2	542901.194	223874.801	109.576	PK Nail
C6	542865.915	223842.989	111.530	PK Nail
C7	542856.004	223885.404	111.525	PK Nail
C21	542919.145	223873.513	108.981	PK Nail
C22	542934.518	223869.925	108.559	PK Nail
C24	542898.434	223796.721	109.695	PK Nail
C200	542917.019	223895.760	109.807	PK Nail
C201	542900.313	223894.238	110.020	PK Nail
1	542747.603	223881.374	114.199	PK Nail
2	542639.259	223876.435	115.885	PK Nail

THE SURVEY ASSOCIATION

GLOBAL SURVEYS
3 Brookfield, Duncan Close,
Moulton Park, Northampton NN3 6WL
Tel: 01604 491543
Email: info@globalsurveys.co.uk

Site: Piggotts Farm, Albury End, SG11 2HS

Client: Hollyhock Trust Ltd T/A Hockley Farms

Survey Description: Topographical Survey

Date	October 2018	Scale	1/200 @ A0
Dwg No.	18452-TOPO	Surveyor	CJN
Sheet	2 of 3	Checked	MSW

General Notes:

1. Man entry to sewers has not been undertaken. Depths, pipe sizes and quantity of pipes are measured from the surface. We therefore cannot guarantee the completeness or accuracy of the sewer data which should be checked with the local authority and/or on site.

2. All tree heights and spreads are approximate. The plan position of trunks are taken at ground level. Girth measurements are taken at c 1.5m height. We have attempted to identify tree species, however if tree species are critical specialist advice should be sought.

3. Survey information is as result of measurement to existing features and does not imply legal ownership of boundaries or land divisions. Where boundary alignment lines are added to the survey drawing and are taken from legal documents or other information supplied they are done so within the constraints of drawing quality and scale. They are provided on the basis of opinion and do not imply legal contract.

Plan Coordinate Control:-
Plan Coordinates relate to National Grid OSGB36(02) using GPS.
LSF 1.000 at Stn 2

Level Datum:-
All Levels relate to OSGB36(02) using GPS

Sheet Location Diagram:

THE SURVEY ASSOCIATION

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3 Brookfield, Duncan Close,
Moulton Park, Northampton NN3 6WL
Tel: 01604 491543
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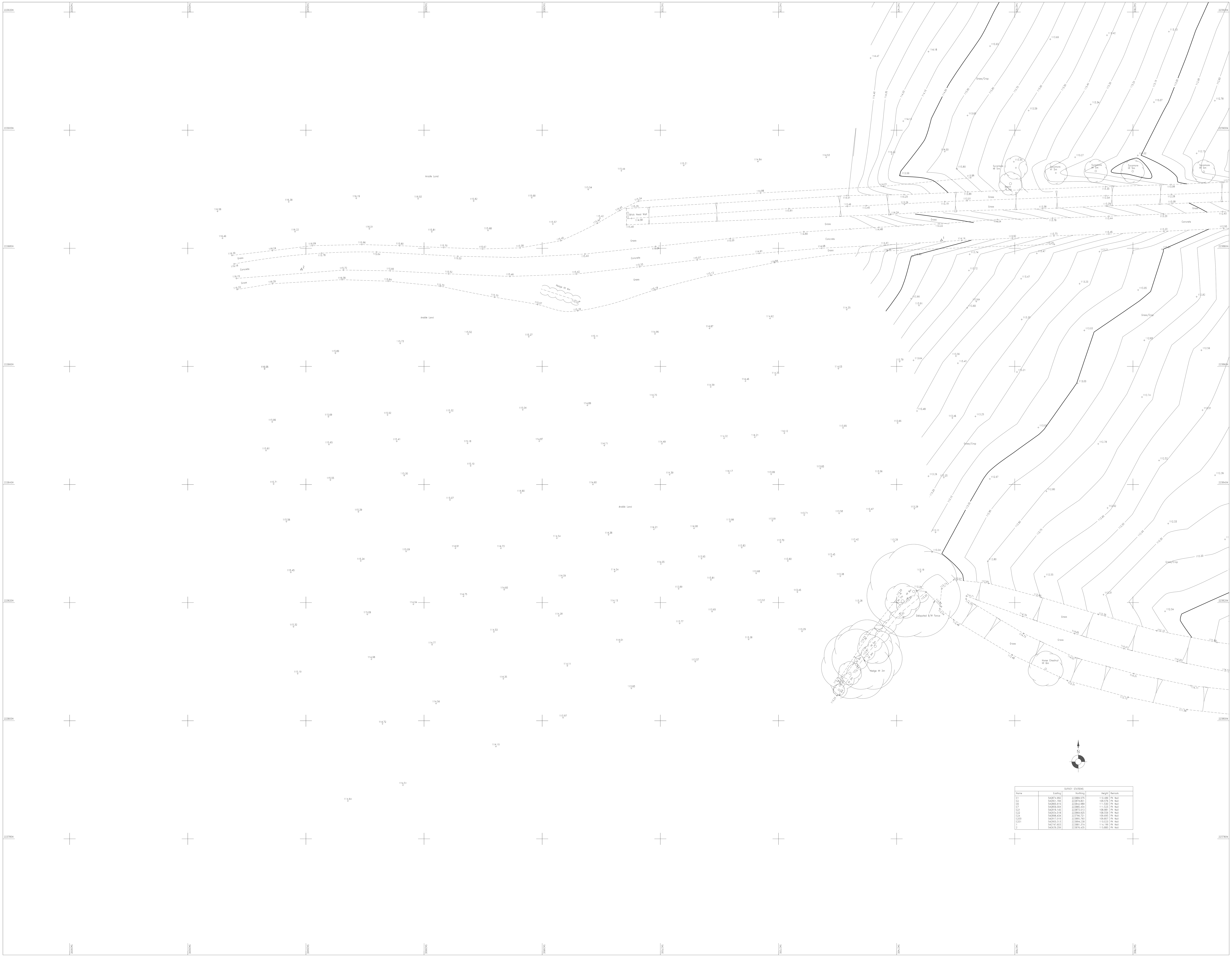
Survey Description: Topographical Survey

Date	October 2018	Scale	1/200 @ A0
Dwg No.	18452-TOPO	Surveyor	CJN
Sheet	1 of 3	Checked	MSW



SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
C1	542874.992	223889.575	110.489	PK Nail
C2	542901.194	223874.801	109.576	PK Nail
C6	542865.915	223842.989	111.530	PK Nail
C7	542856.004	223885.404	111.525	PK Nail
C21	542919.145	223873.513	108.981	PK Nail
C22	542934.518	223869.925	108.559	PK Nail
C24	542898.434	223796.721	109.695	PK Nail
C200	542917.019	223895.760	109.807	PK Nail
C201	542900.313	223894.238	110.020	PK Nail
1	542747.603	223881.374	114.199	PK Nail
2	542639.259	223876.435	115.885	PK Nail

Legend

General Notes:

1. Man entry to sewers has not been undertaken. Depths, pipe sizes and quantity of pipes are measured from the surface. We therefore cannot guarantee the completeness or accuracy of the sewer data which should be checked with the local authority and/or on site.

2. All tree heights and spreads are approximate. The plan position of trunks are taken at ground level. Girth measurements are taken at c 1.5m height. We have attempted to identify tree species, however if tree species are critical specialist advice should be sought.

3. Survey information is as result of measurement to existing features and does not imply legal ownership of boundaries or land divisions. Where boundary alignment lines are added to the survey drawing and are taken from legal documents or other information supplied they are done so within the constraints of drawing quality and scale. They are provided on the basis of opinion and do not imply legal contract.

Plan Coordinate Control:–
Plan Coordinates relate to National Grid OSGB36(02) using GPS.
LSF 1.000 at Stn 2

Level Datum:–
All Levels relate to OSGB36(02) using GPS

Sheet Location Diagram:

1
3
2

Notes:

THE SURVEY ASSOCIATION

GLOBAL SURVEYS

3 Brookfield, Duncan Close,
Moulton Park, Northampton NN3 6WL
Tel: 01604 491543
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Site: Piggotts Farm, Albury End, SG11 2HS

Client: Hollyhock Trust Ltd T/A Hockley Farms

Survey Description: Topographical Survey

Date	October 2018	Scale	1/200 @ A0
Dwg No.	18452-TOPO	Surveyor	CJN
Sheet	3 of 3	Checked	MSW

Appendix C – Drainage

- Microdrainage Calculations:
    - 1% AEP + 40% CC
    - 1% AEP
    - 3.33% AEP
    - 50% AEP
    - QBAR
    - Urban Creep
- RAB Drawings

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

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
S1.000	34.891#	0.233	149.7	0.076	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	40.003#	0.233	171.7	0.067	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	12.774#	0.812	15.7	0.067	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	42.500#	0.175	242.9	0.039	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	32.000#	0.650	49.2	0.037	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	49.500#	0.220	225.0	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	11.000#	0.050	220.0	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	11.333#	0.659	17.2	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	19.216#	0.146	131.6	0.073	0.00	0.0	0.600	o	150	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)
S1.000	164.73	5.55	112.850	0.076	0.0	0.0	0.0	1.07	42.4	33.9
S2.000	163.33	5.67	112.850	0.067	0.0	0.0	0.0	0.99	39.6	29.6
S1.001	162.61	5.73	112.617	0.210	0.0	0.0	0.0	3.32	131.8	92.5
S3.000	161.34	5.85	112.900	0.039	0.0	0.0	0.0	0.83	33.2	17.0
S3.001	158.26	6.13	112.725	0.076	0.0	0.0	0.0	1.87	74.3	32.6
S4.000	160.23	5.95	112.345	0.022	0.0	0.0	0.0	0.87	34.5	9.5
S4.001	157.99	6.16	112.125	0.054	0.0	0.0	0.0	0.88	34.9	23.1
S3.002	157.36	6.22	112.075	0.169	0.0	0.0	0.0	3.17	126.1	72.0
S1.002	153.60	6.59	111.416	0.452	0.0	0.0	0.0	0.87	15.4«	188.0

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S5.000	48.000	0.630	76.2	0.034	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S6.000	47.000	0.640	73.4	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S5.001	4.232#	0.520	8.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S5.002	11.015	0.260	42.4	0.000	0.00	0.0	0.600	o	150	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)
S5.000	163.06	5.69	111.600	0.034	0.0	0.0	0.0	1.15	20.4	15.0
S6.000	163.36	5.67	111.610	0.025	0.0	0.0	0.0	1.17	20.8	11.1
S5.001	162.84	5.71	110.820	0.059	0.0	0.0	0.0	3.55	62.8	26.0
S5.002	161.53	5.83	110.300	0.059	0.0	0.0	0.0	1.55	27.4	26.0

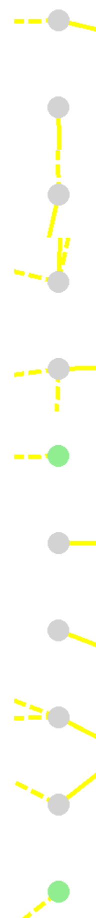
Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	113.350	0.500	Open Manhole	1200	S1.000	112.850	225				
S1a	113.350	0.500	Open Manhole	1200	S2.000	112.850	225				
S2	113.350	0.733	Open Manhole	1200	S1.001	112.617	225	S1.000	112.617	225	
								S2.000	112.617	225	
S2a	113.250	0.350	Open Manhole	1200	S3.000	112.900	225				
S2b	113.150	0.425	Open Manhole	1200	S3.001	112.725	225	S3.000	112.725	225	
S3a	112.770	0.425	Open Manhole	1200	S4.000	112.345	225				
S3b	112.550	0.425	Open Manhole	1200	S4.001	112.125	225	S4.000	112.125	225	
S2c	112.500	0.425	Open Manhole	1200	S3.002	112.075	225	S3.001	112.075	225	
								S4.001	112.075	225	
S3	112.680	1.264	Open Manhole	1200	S1.002	111.416	150	S1.001	111.805	225	464
								S3.002	111.416	225	
S	111.770	0.500	Open Manhole	0		OUTFALL		S1.002	111.270	150	
S9	111.950	0.350	Open Manhole	1200	S5.000	111.600	150				
S8	111.960	0.350	Open Manhole	1200	S6.000	111.610	150				
S10	111.320	0.500	Open Manhole	1200	S5.001	110.820	150	S5.000	110.970	150	150
								S6.000	110.970	150	150
S11	111.000	0.700	Open Manhole	5000	S5.002	110.300	150	S5.001	110.300	150	
S	110.820	0.780	Open Manhole	0		OUTFALL		S5.002	110.040	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	542738.841	223837.965	542738.841	223837.965	Required	
S1a	542771.721	223878.196	542771.721	223878.196	Required	
S2	542773.026	223838.790	542773.026	223838.790	Required	
S2a	542725.161	223824.579	542725.161	223824.579	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2b	542767.095	223825.684	542767.095	223825.684	Required	
S3a	542801.187	223878.393	542801.187	223878.393	Required	
S3b	542802.376	223829.460	542802.376	223829.460	Required	
S2c	542799.769	223817.934	542799.769	223817.934	Required	
S3	542800.817	223842.486	542800.817	223842.486	Required	
S	542820.646	223843.024			No Entry	
S9	542803.501	223817.244	542803.501	223817.244	Required	
S8	542807.772	223834.542	542807.772	223834.542	Required	
S10	542851.608	223817.776	542851.608	223817.776	Required	
S11	542858.432	223814.301	542858.432	223814.301	Required	
S	542867.080	223821.124			No Entry	



PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S1	113.350	112.850	0.275	Open Manhole	1200
S2.000	o	225	S1a	113.350	112.850	0.275	Open Manhole	1200
S1.001	o	225	S2	113.350	112.617	0.508	Open Manhole	1200
S3.000	o	225	S2a	113.250	112.900	0.125	Open Manhole	1200
S3.001	o	225	S2b	113.150	112.725	0.200	Open Manhole	1200
S4.000	o	225	S3a	112.770	112.345	0.200	Open Manhole	1200
S4.001	o	225	S3b	112.550	112.125	0.200	Open Manhole	1200
S3.002	o	225	S2c	112.500	112.075	0.200	Open Manhole	1200
S1.002	o	150	S3	112.680	111.416	1.114	Open Manhole	1200
S5.000	o	150	S9	111.950	111.600	0.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	34.891#	149.7	S2	113.350	112.617	0.508	Open Manhole	1200
S2.000	40.003#	171.7	S2	113.350	112.617	0.508	Open Manhole	1200
S1.001	12.774#	15.7	S3	112.680	111.805	0.650	Open Manhole	1200
S3.000	42.500#	242.9	S2b	113.150	112.725	0.200	Open Manhole	1200
S3.001	32.000#	49.2	S2c	112.500	112.075	0.200	Open Manhole	1200
S4.000	49.500#	225.0	S3b	112.550	112.125	0.200	Open Manhole	1200
S4.001	11.000#	220.0	S2c	112.500	112.075	0.200	Open Manhole	1200
S3.002	11.333#	17.2	S3	112.680	111.416	1.039	Open Manhole	1200
S1.002	19.216#	131.6	S	111.770	111.270	0.350	Open Manhole	0
S5.000	48.000	76.2	S10	111.320	110.970	0.200	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	150	S8	111.960	111.610	0.200	Open Manhole	1200
S5.001	o	150	S10	111.320	110.820	0.350	Open Manhole	1200
S5.002	o	150	S11	111.000	110.300	0.550	Open Manhole	5000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	47.000	73.4	S10	111.320	110.970	0.200	Open Manhole	1200
S5.001	4.232#	8.1	S11	111.000	110.300	0.550	Open Manhole	5000
S5.002	11.015	42.4	S	110.820	110.040	0.630	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.076	0.076	0.076
2.000	-	-	100	0.067	0.067	0.067
1.001	-	-	100	0.067	0.067	0.067
3.000	-	-	100	0.039	0.039	0.039
3.001	-	-	100	0.037	0.037	0.037
4.000	-	-	100	0.022	0.022	0.022
4.001	-	-	100	0.032	0.032	0.032
3.002	-	-	100	0.039	0.039	0.039
1.002	-	-	100	0.073	0.073	0.073
5.000	-	-	100	0.034	0.034	0.034
6.000	-	-	100	0.025	0.025	0.025
5.001	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.511	0.511	0.511

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S3, DS/PN: S1.002, Volume (m^3): 2.3

Unit Reference	MD-SHE-0049-1200-1264-1200
Design Head (m)	1.264
Design Flow (l/s)	1.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	111.416
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.264	1.2	Kick-Flo®	0.432	0.7
Flush-Flo™	0.212	0.9	Mean Flow over Head Range	-	0.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	0.8	1.200	1.2	3.000	1.8	7.000	2.6
0.200	0.9	1.400	1.3	3.500	1.9	7.500	2.7
0.300	0.9	1.600	1.3	4.000	2.0	8.000	2.8
0.400	0.8	1.800	1.4	4.500	2.1	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.2	9.000	3.0
0.600	0.9	2.200	1.5	5.500	2.3	9.500	3.0
0.800	1.0	2.400	1.6	6.000	2.4		
1.000	1.1	2.600	1.7	6.500	2.5		

Hydro-Brake® Optimum Manhole: S11, DS/PN: S5.002, Volume (m^3): 13.8

Unit Reference	MD-SHE-0051-1000-0700-1000
Design Head (m)	0.700
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51

Hydro-Brake® Optimum Manhole: S11, DS/PN: S5.002, Volume (m³): 13.8

Invert Level (m) 110.300
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	1.0	Kick-Flo®	0.449	0.8
Flush-Flo™	0.222	1.0	Mean Flow over Head Range	-	0.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	1.3	3.000	1.9	7.000	2.9
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.6	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.7		
1.000	1.2	2.600	1.8	6.500	2.8		

Storage Structures for Storm

Cellular Storage Manhole: S3, DS/PN: S1.002

Invert Level (m) 111.416 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	475.0	0.0	0.915	0.0	0.0
0.914	475.0	0.0			

Tank or Pond Manhole: S11, DS/PN: S5.002

Invert Level (m) 110.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	9.0	0.700	45.2

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
S1.000	S1	0.500
S2.000	S1a	0.500
S1.001	S2	0.500
S3.000	S2a	0.500
S3.001	S2b	0.500
S4.000	S3a	0.500
S4.001	S3b	0.500
S3.002	S2c	0.500
S1.002	S3	0.500
S5.000	S9	0.500
S6.000	S8	0.500
S5.001	S10	0.500
S5.002	S11	0.500

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet 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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 542875 223875 TL 42875 23875
Data Type	Point
Cv (Summer)	0.840
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+40%	100/15 Summer				113.246
S2.000	S1a	15 Summer	100	+40%	100/15 Summer				113.210
S1.001	S2	15 Summer	100	+40%	100/15 Summer				112.940
S3.000	S2a	15 Summer	100	+40%					113.058
S3.001	S2b	15 Summer	100	+40%					112.871
S4.000	S3a	15 Summer	100	+40%					112.451
S4.001	S3b	15 Summer	100	+40%	100/15 Summer				112.367
S3.002	S2c	15 Summer	100	+40%					112.294
S1.002	S3	960 Winter	100	+40%	100/15 Summer				112.235
S5.000	S9	15 Summer	100	+40%	100/15 Summer				111.818

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

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
S1.000	S1	0.171	0.000	1.14			45.6	FLOOD RISK	
S2.000	S1a	0.135	0.000	1.07			40.2	FLOOD RISK	
S1.001	S2	0.098	0.000	1.06			119.9	SURCHARGED	
S3.000	S2a	-0.067	0.000	0.80			25.3	FLOOD RISK	
S3.001	S2b	-0.079	0.000	0.72			50.3	FLOOD RISK	
S4.000	S3a	-0.119	0.000	0.43			14.2	OK	
S4.001	S3b	0.017	0.000	1.15			33.8	FLOOD RISK	
S3.002	S2c	-0.006	0.000	1.00			106.9	FLOOD RISK	
S1.002	S3	0.669	0.000	0.07		3630	1.0	SURCHARGED	
S5.000	S9	0.068	0.000	1.05			20.9	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	S8	15 Summer	100	+40%					111.716
S5.001	S10	240 Winter	100	+40%	100/120 Winter				110.998
S5.002	S11	240 Winter	100	+40%	100/15 Summer				110.996

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
S6.000	S8	-0.044	0.000	0.83			16.8	FLOOD RISK	
S5.001	S10	0.028	0.000	0.17			7.5	SURCHARGED	
S5.002	S11	0.546	0.000	0.04			1.0	FLOOD RISK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 542875 223875 TL 42875 23875
Data Type	Point
Cv (Summer)	0.840
Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+0%					113.020
S2.000	S1a	15 Summer	100	+0%					113.012
S1.001	S2	15 Summer	100	+0%					112.784
S3.000	S2a	15 Summer	100	+0%					113.026
S3.001	S2b	15 Summer	100	+0%					112.842
S4.000	S3a	15 Summer	100	+0%					112.433
S4.001	S3b	15 Summer	100	+0%					112.290
S3.002	S2c	15 Summer	100	+0%					112.225
S1.002	S3	960 Winter	100	+0%	100/15 Summer				111.987
S5.000	S9	15 Summer	100	+0%					111.705

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

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
S1.000	S1	-0.055	0.000	0.90			36.0	OK	
S2.000	S1a	-0.063	0.000	0.84			31.5	OK	
S1.001	S2	-0.058	0.000	0.88			99.6	OK	
S3.000	S2a	-0.099	0.000	0.57			18.1	FLOOD RISK	
S3.001	S2b	-0.108	0.000	0.52			35.9	OK	
S4.000	S3a	-0.137	0.000	0.31			10.1	OK	
S4.001	S3b	-0.060	0.000	0.87			25.6	FLOOD RISK	
S3.002	S2c	-0.075	0.000	0.75			80.4	FLOOD RISK	
S1.002	S3	0.421	0.000	0.06		2685	0.9	SURCHARGED	
S5.000	S9	-0.045	0.000	0.82			16.4	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	S8	15 Summer	100	+0%					111.694
S5.001	S10	15 Summer	100	+0%					110.906
S5.002	S11	180 Winter	100	+0%	100/15 Summer				110.818

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
S6.000	S8	-0.066	0.000	0.60			12.0	FLOOD RISK	
S5.001	S10	-0.064	0.000	0.63			28.4	OK	
S5.002	S11	0.368	0.000	0.04			1.0	FLOOD RISK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet 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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 542875 223875 TL 42875 23875
Data Type	Point
Cv (Summer)	0.840
Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+0%					112.992
S2.000	S1a	15 Summer	30	+0%					112.986
S1.001	S2	15 Summer	30	+0%					112.757
S3.000	S2a	15 Summer	30	+0%					113.008
S3.001	S2b	15 Summer	30	+0%					112.826
S4.000	S3a	15 Summer	30	+0%					112.421
S4.001	S3b	15 Summer	30	+0%					112.264
S3.002	S2c	15 Summer	30	+0%					112.202
S1.002	S3	720 Winter	30	+0%	30/15 Summer				111.839
S5.000	S9	15 Summer	30	+0%					111.688

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

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
S1.000	S1	-0.083	0.000	0.70			28.1	OK	
S2.000	S1a	-0.089	0.000	0.65			24.6	OK	
S1.001	S2	-0.085	0.000	0.68			77.7	OK	
S3.000	S2a	-0.117	0.000	0.45			14.1	FLOOD RISK	
S3.001	S2b	-0.124	0.000	0.40			27.9	OK	
S4.000	S3a	-0.149	0.000	0.24			7.9	OK	
S4.001	S3b	-0.086	0.000	0.68			20.0	FLOOD RISK	
S3.002	S2c	-0.098	0.000	0.59			62.8	FLOOD RISK	
S1.002	S3	0.273	0.000	0.06		1925	0.9	SURCHARGED	
S5.000	S9	-0.062	0.000	0.64			12.8	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	S8	15 Summer	30	+0%					111.682
S5.001	S10	15 Summer	30	+0%					110.894
S5.002	S11	180 Summer	30	+0%	30/15 Summer				110.692

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
S6.000	S8	-0.078	0.000	0.46			9.4	FLOOD RISK	
S5.001	S10	-0.076	0.000	0.49			22.2	OK	
S5.002	S11	0.242	0.000	0.04			1.0	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet 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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 542875 223875 TL 42875 23875
Data Type	Point
Cv (Summer)	0.840
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	2	+0%					112.936
S2.000	S1a	15 Summer	2	+0%					112.933
S1.001	S2	15 Summer	2	+0%					112.698
S3.000	S2a	15 Summer	2	+0%					112.969
S3.001	S2b	15 Summer	2	+0%					112.784
S4.000	S3a	15 Summer	2	+0%					112.394
S4.001	S3b	15 Summer	2	+0%					112.203
S3.002	S2c	15 Summer	2	+0%					112.146
S1.002	S3	720 Winter	2	+0%	2/120 Summer				111.631
S5.000	S9	15 Summer	2	+0%					111.654

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

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
S1.000	S1	-0.139	0.000	0.31			12.2	OK	
S2.000	S1a	-0.142	0.000	0.28			10.7	OK	
S1.001	S2	-0.144	0.000	0.28			31.8	OK	
S3.000	S2a	-0.156	0.000	0.19			6.1	FLOOD RISK	
S3.001	S2b	-0.166	0.000	0.16			10.9	OK	
S4.000	S3a	-0.176	0.000	0.10			3.4	OK	
S4.001	S3b	-0.147	0.000	0.26			7.6	OK	
S3.002	S2c	-0.154	0.000	0.22			23.6	OK	
S1.002	S3	0.065	0.000	0.06		942	0.9	SURCHARGED	
S5.000	S9	-0.096	0.000	0.28			5.6	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	S8	15 Summer	2	+0%					111.656
S5.001	S10	15 Summer	2	+0%					110.867
S5.002	S11	180 Summer	2	+0%	2/120 Summer				110.484

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
S6.000	S8	-0.104	0.000	0.20			4.1	OK	
S5.001	S10	-0.103	0.000	0.21			9.6	OK	
S5.002	S11	0.034	0.000	0.04			1.0	SURCHARGED	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.076	0.076	0.076
2.000	-	-	100	0.077	0.077	0.077
1.001	-	-	100	0.077	0.077	0.077
3.000	-	-	100	0.049	0.049	0.049
3.001	-	-	100	0.047	0.047	0.047
4.000	-	-	100	0.033	0.033	0.033
4.001	-	-	100	0.032	0.032	0.032
3.002	-	-	100	0.039	0.039	0.039
1.002	-	-	100	0.073	0.073	0.073
5.000	-	-	100	0.034	0.034	0.034
6.000	-	-	100	0.025	0.025	0.025
5.001	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.562	0.562	0.562

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

Simulation Criteria

Areal Reduction Factor 1.000   Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0   MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0   Inlet 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 Offline Controls 0   Number of Time/Area Diagrams 0
Number of Online Controls 2   Number of Storage Structures 2   Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 542875 223875 TL 42875 23875
Data Type	Point
Cv (Summer)	0.840
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Summer	100	+40%	100/15 Summer			
S2.000	S1a	15 Summer	100	+40%	100/15 Summer	100/15 Summer		
S1.001	S2	15 Summer	100	+40%	100/15 Summer			
S3.000	S2a	15 Summer	100	+40%				
S3.001	S2b	15 Summer	100	+40%				
S4.000	S3a	15 Summer	100	+40%				
S4.001	S3b	15 Summer	100	+40%	100/15 Summer			
S3.002	S2c	15 Summer	100	+40%	100/15 Summer			
S1.002	S3	1440 Winter	100	+40%	100/15 Summer			
S5.000	S9	15 Summer	100	+40%	100/15 Summer			

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

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
S1.000	S1	113.318	0.243	0.000	1.10			43.8	FLOOD RISK
S2.000	S1a	113.350	0.275	0.058	1.17			43.9	FLOOD
S1.001	S2	113.046	0.204	0.000	1.11			125.8	SURCHARGED
S3.000	S2a	113.104	-0.021	0.000	0.98			31.0	FLOOD RISK
S3.001	S2b	112.901	-0.049	0.000	0.88			61.2	FLOOD RISK
S4.000	S3a	112.569	-0.001	0.000	0.59			19.4	FLOOD RISK
S4.001	S3b	112.495	0.145	0.000	1.36			40.0	FLOOD RISK
S3.002	S2c	112.423	0.123	0.000	1.08			115.6	FLOOD RISK
S1.002	S3	112.403	0.837	0.000	0.07		3925	1.1	FLOOD RISK
S5.000	S9	111.818	0.068	0.000	1.05			20.9	FLOOD RISK

PN	US/MH Name	Level Exceeded
S1.000	S1	
S2.000	S1a	1
S1.001	S2	
S3.000	S2a	
S3.001	S2b	
S4.000	S3a	
S4.001	S3b	
S3.002	S2c	
S1.002	S3	
S5.000	S9	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	S8	15 Summer	100	+40%					111.716
S5.001	S10	240 Winter	100	+40%	100/120 Winter				110.998
S5.002	S11	240 Winter	100	+40%	100/15 Summer				110.996

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
S6.000	S8	-0.044	0.000	0.83			16.8	FLOOD RISK	
S5.001	S10	0.028	0.000	0.17			7.5	SURCHARGED	
S5.002	S11	0.546	0.000	0.04			1.0	FLOOD RISK	

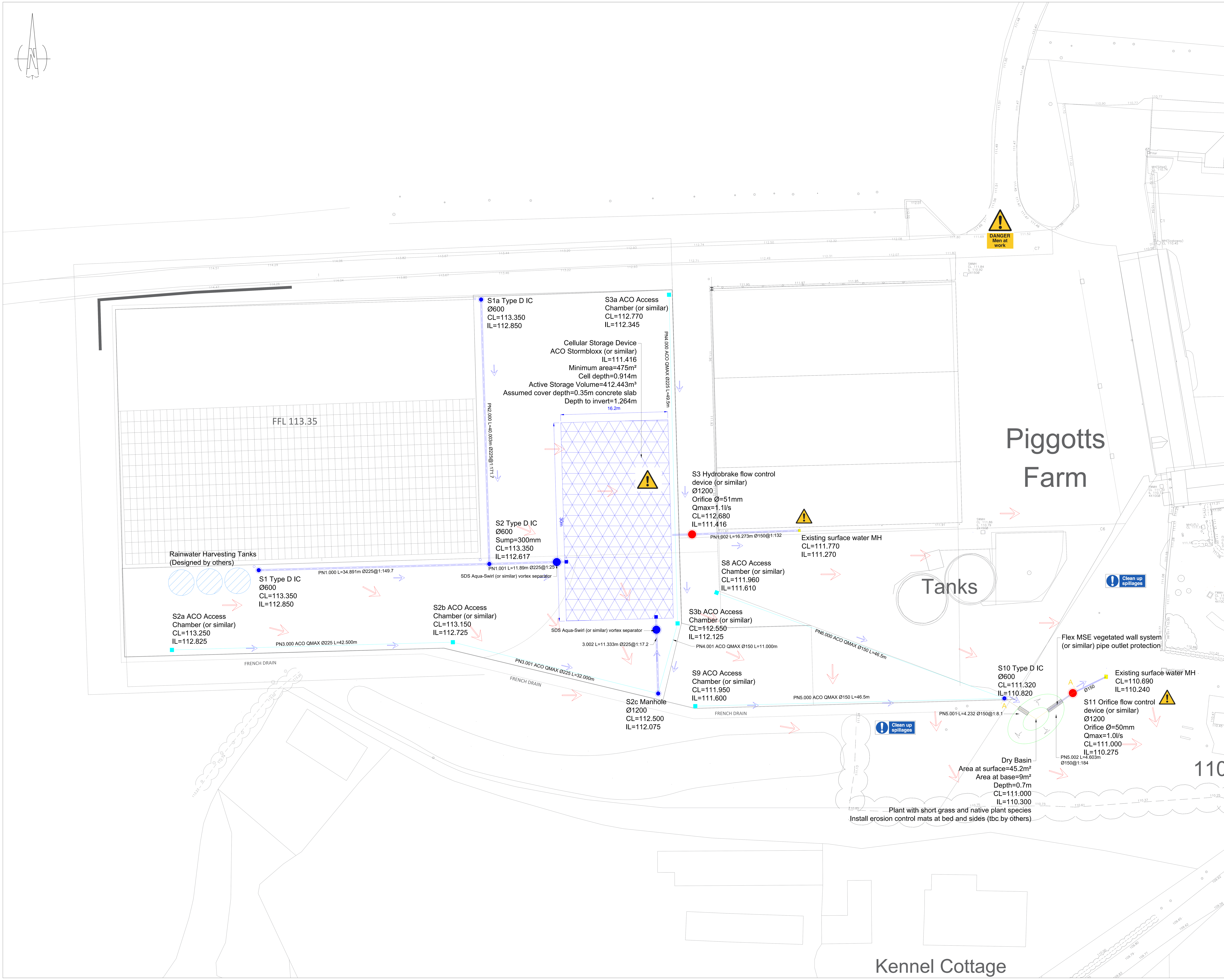
ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	635	Urban	0.000
Area (ha)	1.000	Soil	0.400	Region Number	Region 6

Results l/s

QBAR Rural	3.0
QBAR Urban	3.0
Q100 years	9.7
Q1 year	2.6
Q30 years	6.9
Q100 years	9.7



LEGEND

- Cellular Storage Device
- Surface Water Pipes
- ACO QMAX
- ACO Access Chamber
- Exceedance Flow Routes
- Inspection Chamber
- Flow Control Device
- Dry Basin
- System Flow Direction
- Rainwater Harvesting Tanks

Notes:

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. This drawing must be read in conjunction with all relevant drawings and with the drainage report (RAB2878_FRD).
3. A construction phase plan, in line with CDM 2015, must be prepared by the principal contractor prior to any work taking place. The Contractor must comply with all current legislation relating to health and safety.
3. Connections to Public sewers to be agreed and inspected by Water Authority.
4. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and not for construction. Should the contractor commence the work prior to such approval being given, it is entirely at his own risk.
5. Contractor to confirm details of all pipe couplers, joints specification, apron surfacing materials, backdrops, geotextiles, and liaise with relevant manufacturers for installation details.
6. Drainage to be in accordance with BS 7533-13:2009, Building Regulations Part H: Drainage and Waste Disposal, *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,* CIRIA Guidance on the Construction of (C768) SuDS and CIRIA SuDS Manual (C735).
7. The minimum depth of cover to the crown of gravity pipes without protection should be 0.35m for domestic gardens and pathways without any possibility of vehicular access; 0.5m in domestic driveways, parking areas and yards with height restrictions to prevent entry by vehicles weighing >7.5 tonnes; 0.9m in domestic driveways, parking areas and narrow streets without footways with limited access for vehicles with a gross vehicle weight in excess of 7.5 tonnes; 1.2m in highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes.
8. All pipes not meeting the criteria 7 MUST include a minimum 150mm thick Class GEN3 Concrete surround in line with the 2020 Design And Construction Guidance document.
9. Where pipes are bedded and surrounded in concrete, flexible joints should be provided. Compressible boards (fibreboard or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints). The boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 18mm for pipes up to 450mm nominal diameter and 36mm for pipes over 450mm nominal diameter.
10. The Contractor shall make allowance for raising / lowering all access covers & frames to suit finished levels.
11. Cover Class to manholes/inspection chambers are to suit anticipated vehicular loadings in accordance with BSEN 124:2015 (D400 where potential for HGV loading, C250/B125/A15 in footway trafficked areas not accessible by vehicles.
12. All soft / hard paved areas affected by the works shall be fully reinstated upon completion of the works. All surface markings damaged by the works shall be fully reinstated.
13. Before handover, all manholes shall be inspected, all rubble removed, and the whole system shall be thoroughly flushed and cleaned.
14. All levels are in Ordnance datum unless otherwise specified.
15. All pipe runs near buildings to comply with the Building Regulations 2002 Part H1. where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 Concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 Concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases, the pipe shall be bedded and surrounded in 150mm thick class GEN3 Concrete.
16. Typical pipe bedding to drainage for pipes up to D=525mm is to be Class S (i.e. 10-14mm).
17. **Trench temporary formwork is required to all excavations exceeding 1.2m depth to provide adequate support and stability at all times.**
18. Sewers are to be constructed in single sections between manholes only. Trenches to be backfilled prior to excavating the succeeding sewer run.
19. All concrete products to be in accordance with BRE 363 for sulphates.
20. No SuDS features should receive construction-related runoff. Alternative methods of surface water disposal must be employed.
21. Where sewer or drains are to be abandoned they shall be removed or infilled by grouting in accordance with the Civil Engineer Specification for the Water Industry 7th edition, Clause S.23.
22. All manholes shall be watertight.
20. CBR value must be confirmed prior to installation.
21. Client must fulfil his/her duties under CDM 2015.
22. Structural integrity of the cellular storage tank to be confirmed by manufacturer.
23. The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.
24. RAB Consultants accepts no liability should the proposed drainage not be installed and maintained correctly and to standards, and structural/functional failure occurs.
24. The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such utilities plant or apparatus may also be present but not shown. The Contractor must therefore undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect the design installation and/or their operations, prior to the commencement of any works and inform the designer should there be any clashes. Should the contractor commence the work prior to such an investigation, it is entirely at his own risk. RAB Consultants accepts no liability should existing utilities clash with the proposed design.
25. A planting schedule should be confirmed by others and should ensure vegetation establishment occurs. Erosion control matting to be provided should construction occur after summer season.
30. A detailed H&S Design Risk Assessment must be undertaken prior to the construction. Preliminary residual risks have been identified in this drawing.

H&S Icons:

Follow standard HSE protocol during the installation of manholes and structures, placing of fill material, and excavations especially close to watercourses.

DANGER Men at work — Follow standard site protection HSE protocol during construction to ensure no unauthorized personnel enters the site.

Clean up spillages — Adopt appropriate methods to protect the local environment from construction activities (for example install silt-trap at culvert inlet, train operatives for fuel spillages and use maintained/certified plant.

The contractor is advised to undertake a thorough investigation and assessment of the impact of utilities on site and take appropriate H & S mitigation measures.

RAB RESILIENCE & FLOOD RISK
Kingsbrook House,
7 Kingsway,
Bedford,
MK42 9BA

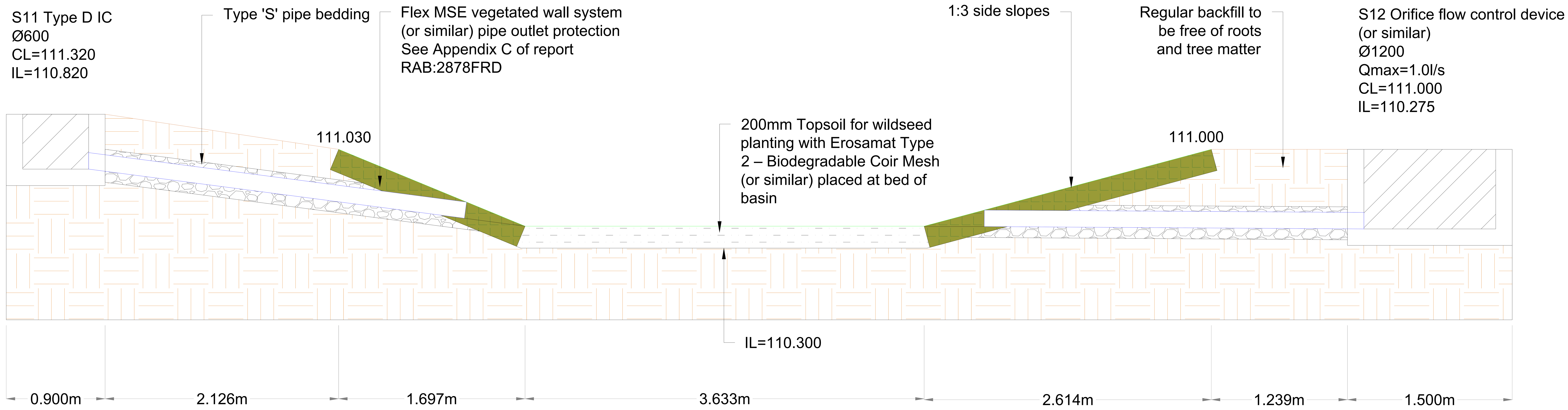
Client: Hollyhock Trust Ltd T/A Hockley Farms

Project: Piggotts Farm

Drawing: Drainage Design Plan View

Checked by AT	Approved by AT	
Drawn by JL	Date: 04/04/2023	Scale: 1:250@ A1

Drawing No. RAB2878_001 — Revision 3



Section A-A

LEGEND

- Type D IC
- Orifice flow control device
- Granular Material for pipe bedding
- Backfill to be free of roots and organic matter
- 200mm subsoil/planting medium for planting of wildflowers and reed beds
- Flex MSE vegetated wall system

Notes:

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. This drawing must be read in conjunction with all relevant drawings and with the drainage report (RAB2878_FRD).
3. A construction phase plan, in line with CDM 2015, must be prepared by the principal contractor prior to any work taking place. The Contractor must comply with all current legislation relating to health and safety.
3. Connections to Public sewers to be agreed and inspected by Water Authority.
4. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and not for construction. Should the contractor commence the work prior to such approval being given, it is entirely at his own risk.
5. Drainage to be in accordance with BS 7533-13:2009, Building Regulations Part H: Drainage and Waste Disposal, *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,* CIRIA Guidance on the Construction of (C768) SuDS and CIRIA SuDS Manual (C735).
6. The minimum depth of cover to the crown of gravity pipes without protection should be 0.35m for domestic gardens and pathways without any possibility of vehicular access; 0.5m in domestic driveways, parking areas and yards with height restrictions to prevent entry by vehicles weighing >7.5 tonnes; 0.9m in domestic driveways, parking areas and narrow streets without footways with limited access for vehicles with a gross vehicle weight in excess of 7.5 tonnes; 1.2m in highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes.
7. All pipes not meeting the criteria 6 MUST include a minimum 150mm thick Class GEN3 Concrete surround in line with the 2020 Design And Construction Guidance document.
8. The Contractor shall make allowance for raising / lowering all access covers & frames to suit finished levels.
9. Cover Class to manholes/inspection chambers are to suit anticipated vehicular loadings in accordance with BSEN 124:2015 (D400 where potential for HGV loading, C250/B125/A15 in footway trafficked areas not accessible by vehicles.
10. All soft / hard paved areas affected by the works shall be fully reinstated upon completion of the works. All surface markings damaged by the works shall be fully reinstated.
11. Before handover, all manholes shall be inspected, all rubble removed, and the whole system shall be thoroughly flushed and cleaned.
12. All levels are in Ordnance datum unless otherwise specified.
13. All pipe runs near buildings to comply with the Building Regulations 2002 Part H1. where a pipe is within 1m of a foundation the trench shall be filled with class GEN3 Concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN3 Concrete to a level below the lowest level for the foundation equal to the distance from the foundation less 150mm. In both cases, the pipe shall be bedded and surrounded in 150mm thick class GEN3 Concrete.
14. Typical pipe bedding to drainage for pipes up to D=525mm is to be Class S (i.e. 10-14mm).
15. **Trench temporary formwork is required to all excavations exceeding 1.2m depth to provide adequate support and stability at all times.**
16. Sewers are to be constructed in single sections between manholes only. Trenches to be backfilled prior to excavating the succeeding sewer run.
17. All concrete products to be in accordance with BRE 363 for sulphates.
18. No SuDS features should receive construction-related runoff. Alternative methods of surface water disposal must be employed.
19. Where sewer or drains are to be abandoned they shall be removed or infilled by grouting in accordance with the Civil Engineer Specification for the Water Industry 7th edition, Clause S.23.
20. All manholes shall be watertight.
21. All geotextiles and erosion turf matts to be installed strictly to manufacturer's instructions.
22. All pipe couplers, sockets, joints to be specified by contractor.
23. Client must fulfil his/her duties under CDM 2015.
24. Structural integrity of the cellular storage tank to be confirmed by manufacturer.
25. The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.
26. RAB Consultants accepts no liability should the proposed drainage not be installed and maintained correctly and to standards, and structural/functional failure occurs.

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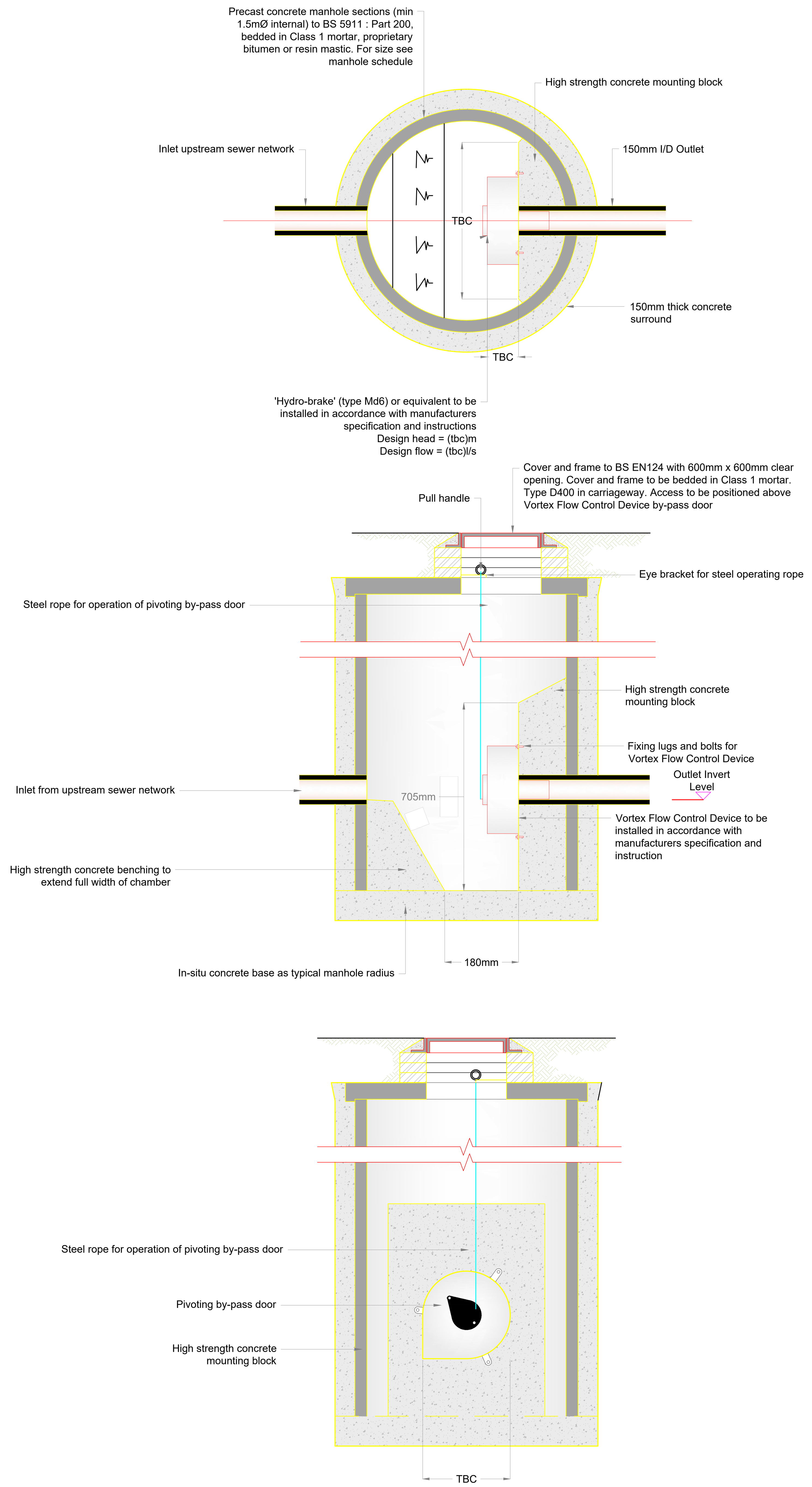
Client
Hollyhock Trust Ltd
T/A Hockley Farms

Project
Piggotts Farm

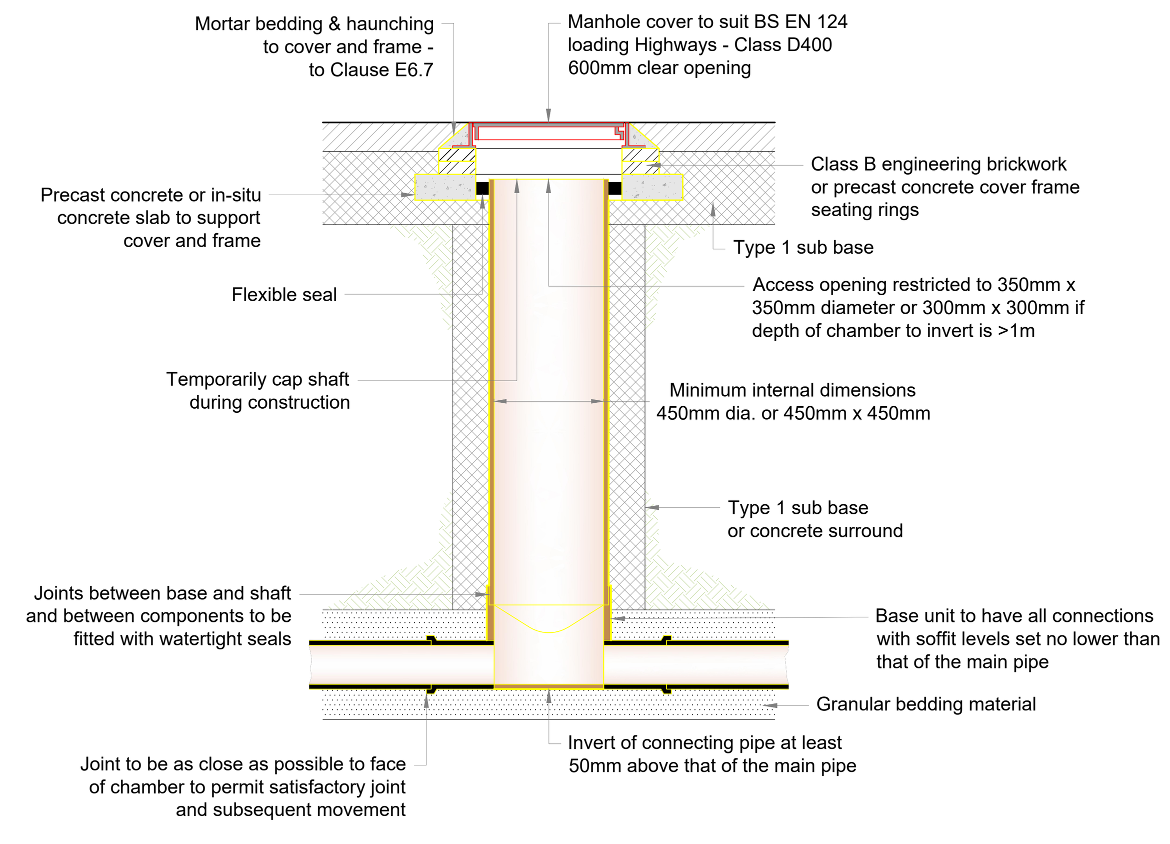
Drawing
Dry Basin Section A-A

Checked by AT	Approved by AT		
Drawn by JL	Date: 31/03/2023	Scale: 1:20@ A1	
Drawing No. RAB2878_002			Revision 2



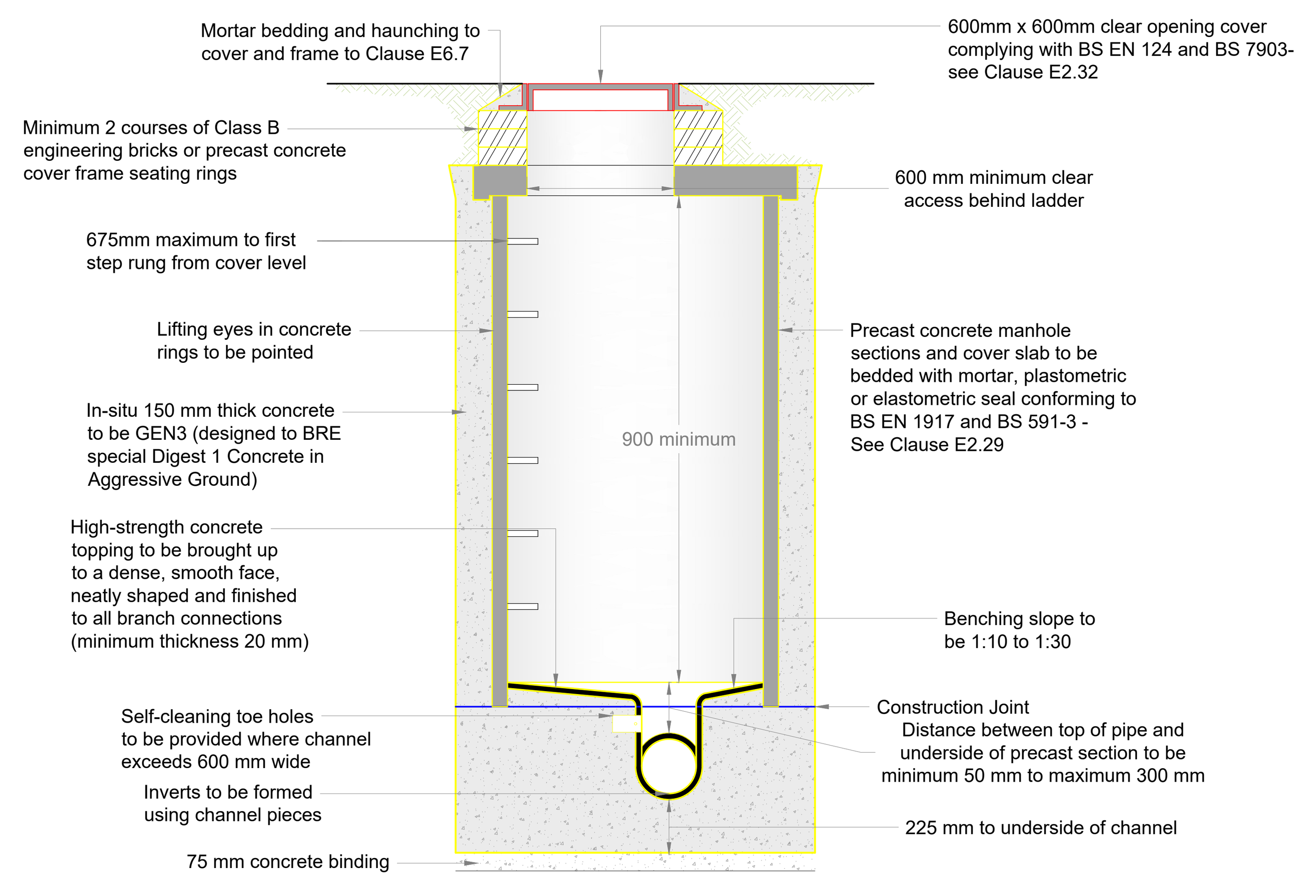
Typical Vortex Flow Control Manhole

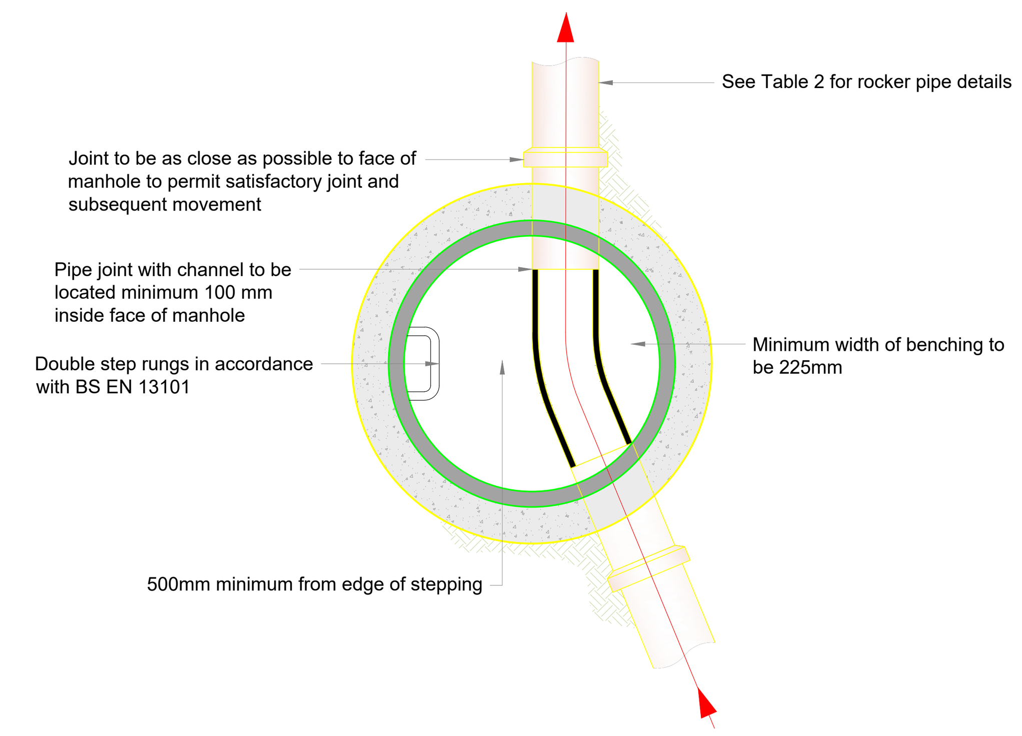
(Scale 1:25)



Typical Inspection Chamber Detail - Type D

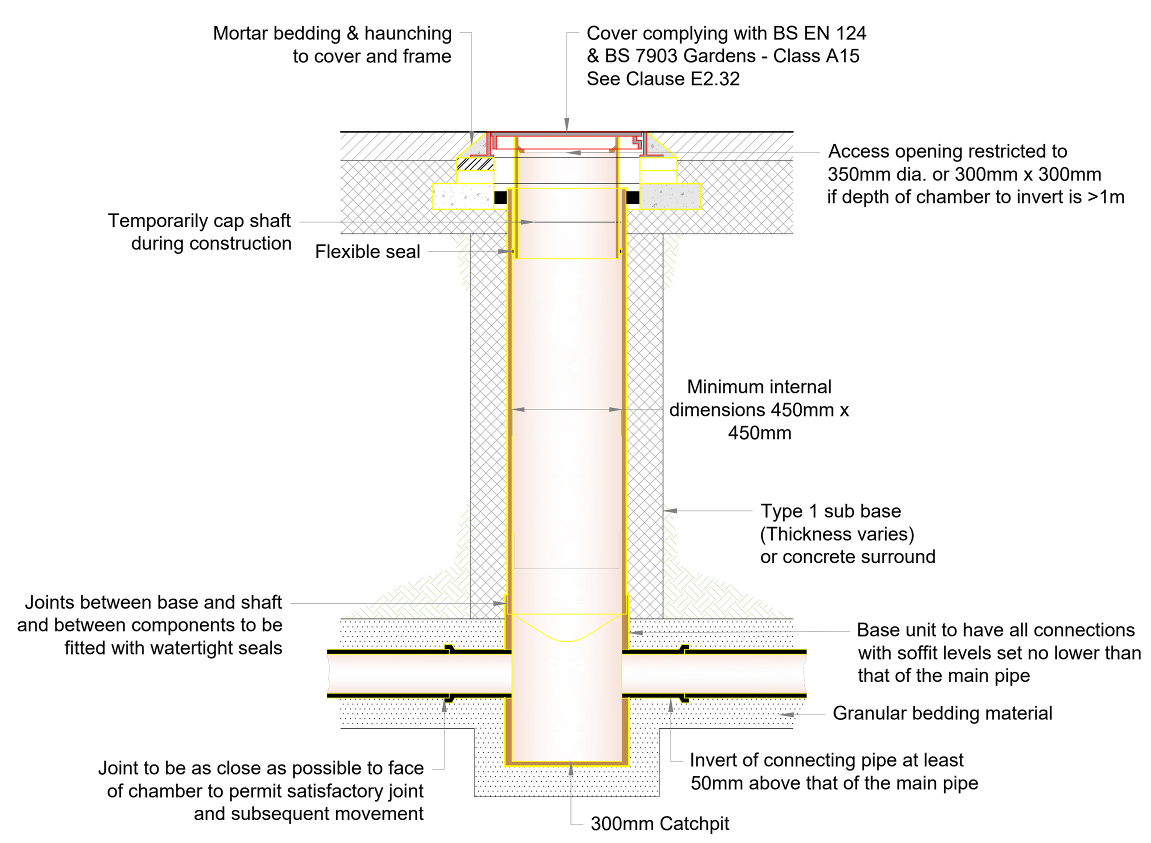
Max depth from cover level to soffit of pipe in areas subject to vehicle loading 3.0m, non-entry





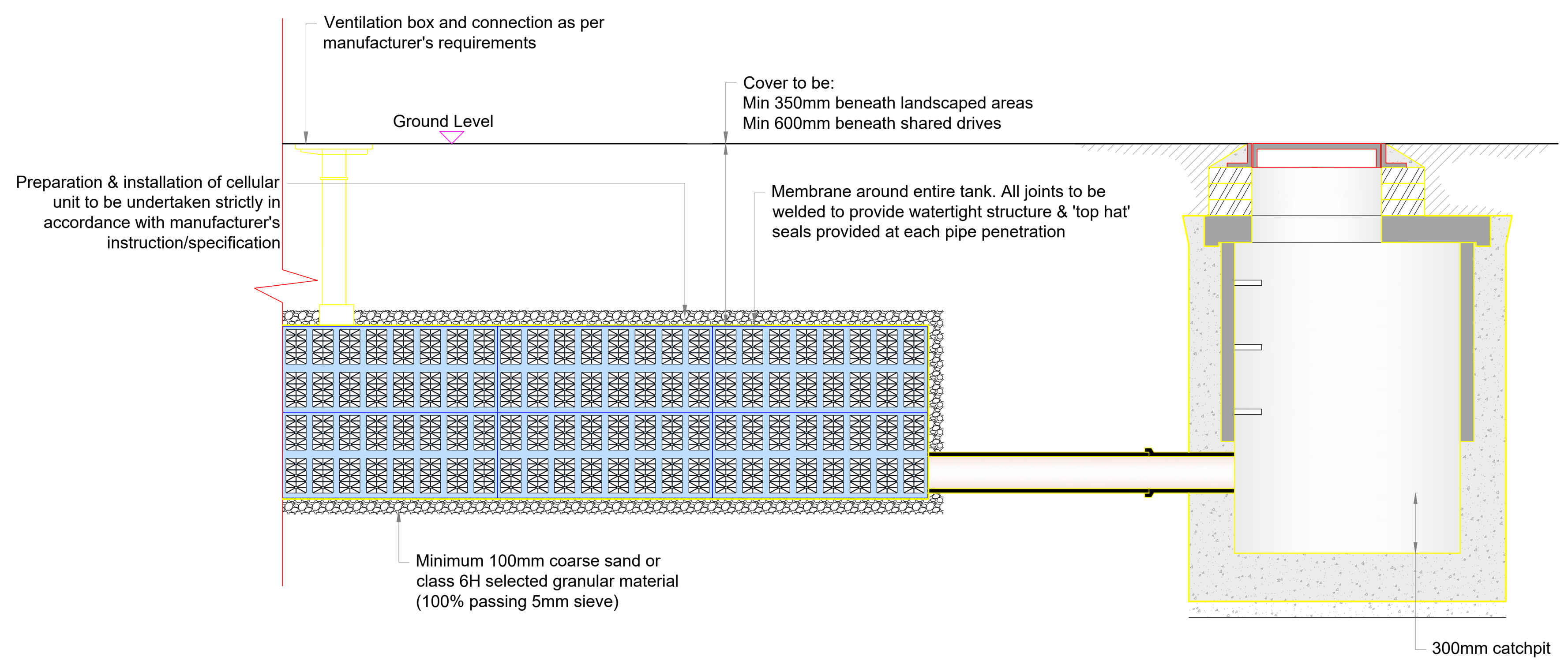
Typical Manhole Detail - Type B

Max depth from cover level to soffit of pipe 3.0m

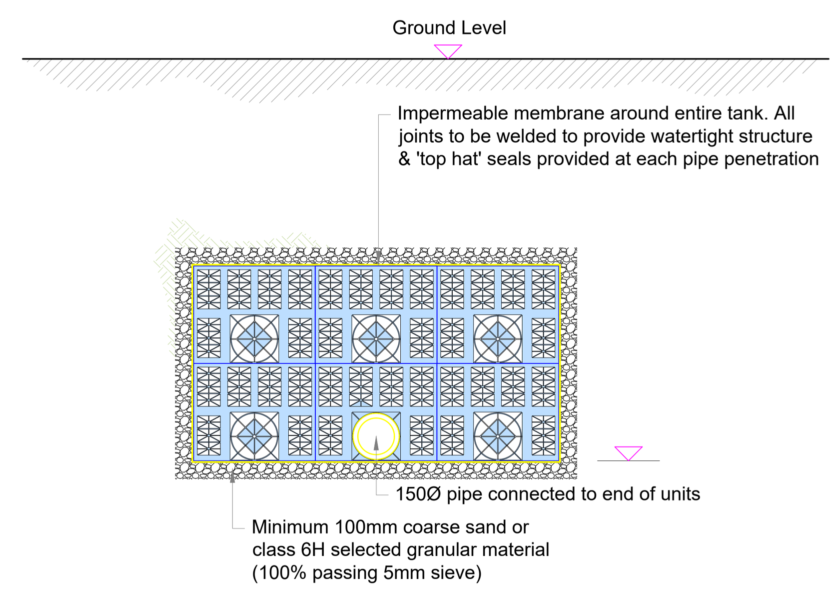


Typical Inspection Chamber Detail with Catchpit - Type D

Max depth from cover level to soffit of pipe in areas subject to vehicle loading 3.0m, non-entry



Modular Storage Detail with Catchpit Chamber



Modular Storage Section

Notes:

1. All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
2. This drawing must be read in conjunction with all relevant drawings and with the drainage report (RAB2878_FRD).
3. A construction phase plan, in line with CDM 2015, must be prepared by the principal contractor prior to any work taking place. The Contractor must comply with all current legislation relating to health and safety.
3. Until technical approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and not for construction. Should the contractor commence the work prior to such approval being given, it is entirely at his own risk.
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5. The Contractor shall make allowance for raising / lowering all access covers & frames to suit finished levels.
6. Cover Class to manholes/inspection chambers are to suit anticipated vehicular loadings in accordance with BSEN 124:2015 (D400 where potential for HGV loading, C250/B125/A15 in footway trafficked areas not accessible by vehicles.
7. Before handover, all manholes shall be inspected, all rubble removed, and the whole system shall be thoroughly flushed and cleaned.
8. Typical pipe bedding to drainage for pipes up to D=525mm is to be Class S (i.e. 10-14mm).
9. **Trench temporary formwork is required to all excavations exceeding 1.2m depth to provide adequate support and stability at all times.**
18. Sewers are to be constructed in single sections between manholes only. Trenches to be backfilled prior to excavating the succeeding sewer run.
19. All concrete products to be in accordance with BRE 363 for sulphates.
20. No SuDS features should receive construction-related runoff. Alternative methods of surface water disposal must be employed.
21. All manholes shall be watertight.
22. CBR value must be confirmed prior to installation.
23. Client must fulfil his/her duties under CDM 2015.
24. RAB Consultants accepts no responsibility should the proposed drainage not be installed correctly and to standards, and structural/functional failure occurs.

RESILIENCE & FLOOD RISK

Kingsbrook House,
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Client

Hollyhock Trust Ltd
T/A Hockley Farms

Project

Piggotts Farm

Drawing

Typical Details

Checked by AT	Approved by AT	
Drawn by JL	Date: 31/03/2023	Scale: NOT TO SCALE

Drawing No. RAB2878_003

Revision 2