The Yard, Field Lane, Littleton Upon Severn

DRAINAGE STRATEGY REPORT

For: James Morris & Catherine Meachin

Date: 19th March 2024

Ref: *2239-YRD-R-001*

Rev: P06

FLOW CIVIL ENGINEERING

DOCUMENT CONTROL SHEET

Details		
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Issue	Status	Date	Revision Details
P01	For Information	22.12.2023	First Issue
P02	For Planning	29.12.2023	Planning Issue
P03	For Planning	02.01.2023	Appendix updates
P04	Planning response	03.03.2024	Discharge restriction and climate change allowance altered. Pump specification added.
P05	For Planning	05.03.2024	Revised landscape plan, appendices updated. Catchment areas adjusted (total same as previous)
P05	For Planning	19.03.2024	Permeable driveway added

CONTENTS

1. INTRODUCTION

1.1 Brief

The Drainage Strategy Report has been prepared on behalf of James Morris & Catherine Meachin to provide information to South Gloucestershire Local Planning Authority and Building Control, to aid satisfying how the new development will discharge storm and foul water from the site and reduce the risk of flooding.

This assessment is to review the SUDs and associated storm and foul water drainage to ensure the proposed development does not increase the risk of flooding to the local area and to ensure the discharge method is in accordance with current design practice and standard.

The information has been reviewed against the following industry design standard to ensure the drainage is compliant;

- Building regulations Part H: Drainage & Waste Disposal;
- Sewers for Adoption/Design and Construction Guidance;
- The requirements of Wessex Water;
- CIRIA C753: The SuDS Manual; and
- Lead Local Flood Authority requirements;
- Flood and Water Management Act 2010
- BS EN 752 - Drain and Sewer Systems Outside Buildings.
- Local Authority Guidance.
- National Planning Policy Framework (NPPF).
- DEFRA Non-Statutory Technical Standards for Sustainable Drainage.
- South Gloucestershire Local Flood and Risk Management Strategy (2022-2027)

The proposed development will effectively drain through on-site sustainable drainage techniques for storm water and how foul water will be dealt with. This report provides guidance and clarification of viable below ground drainage proposals and connections to local infrastructure.

The objectives of the report are to;

- Review the existing drainage arrangements on site for both surface and foul water;
- Assess the options for the disposal of storm water and foul water from the development; and
- Provide a design for surface water strategy

The following tasks will be undertaken to complete this report;

- Undertake a desktop investigation of the site's existing foul and surface water drainage arrangements;

- Outline anticipated solutions for surface water disposal.
- Determine the area of impermeable surfaces that will be added by the proposed development and determine greenfield run-off rates for this area (where applicable);
- Assess the feasibility of using infiltration as a disposal method, based on soakaway test results or any other available information on ground and site conditions;
- Satisfy Condition 8 of the South Gloucestershire Council Planning Condition P23/00673/F

> *Condition 8: Prior to occupation details of the Sewage Package Treatment Plant must be submitted to and approved by the Local Planning Authority, including the location, and method of irrigation for the effluent overflow. A percolation test for discharge to a soakaway is necessary. The applicant must consult the Environment Agency for the need to obtain an 'Environmental Permit' and produce a copy if required. Package Treatment Plants must be located 10 metres away from any watercourse and structures including the public highway.*
>
> *Reason:*
>
> *To ensure a satisfactory means of drainage and pollution control in order to comply with South Gloucestershire Local Plan: Polices, Sites and Places Plan (Adopted) November 2017 Policy PSP21; and South Gloucestershire Local Plan: Core Strategy (Adopted) December 2013 Policy CS9.*

This report is based on information available at the time of preparation. Consequently, there is potential for further information to become available. These changes may lead to future alteration to the conclusions drawn in this report for which Flow Civil Engineering cannot be held responsible.

1.2 Proposed Development

The proposed development is a residential conversion of an existing rural building to a 3-bedroom dwelling with associated parking and amenity space. This report is to be read in accordance with Mitchell Eley Gould architecture design package. Refer to Appendix A for proposed site layout.

2. SITE INFORMATION

2.1 Location

The site is situated in the grounds of The Yard, Field Lane, Littleton Upon Severn. The site location is shown in Figure 1, with the full address and Ordnance Survey Grid reference provided in Table 1. The development is sited on a brownfield land, at the west side of the plot, adjacent to Field lane. The site is situated in a residential area of a rural community.

Site Referencing Information	
Site Address	The Yard, Field Lane, Littleton Upon Severn, BS35 1NU
Grid Referencing	X 360006, Y 189757

Table 1: Site referencing Information

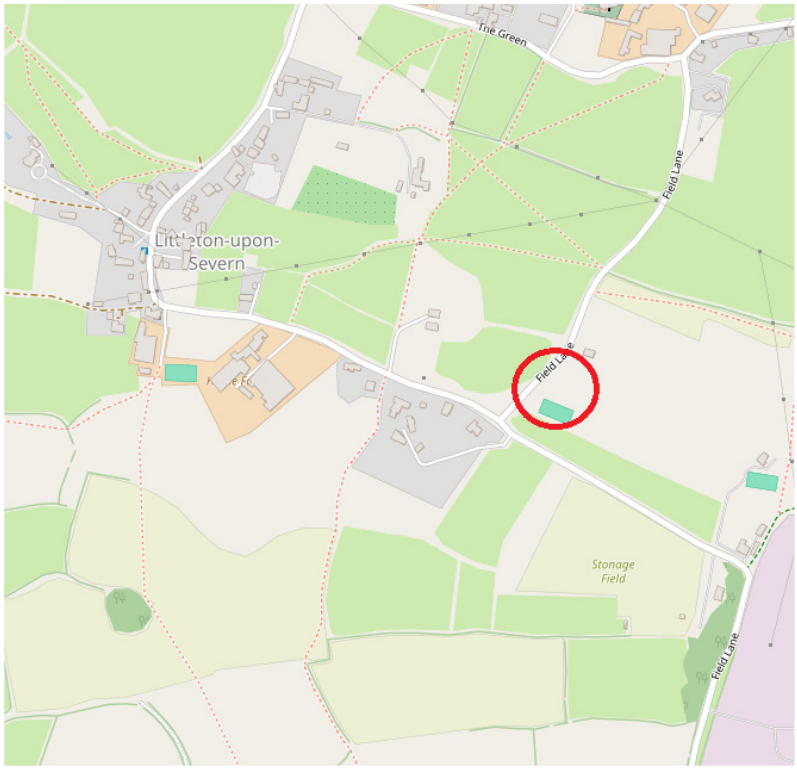


Figure 1: Site Location

2.2 Existing land and drainage

The Yard is located a short distance to the east of Littleton-upon-Severn. The site as a whole extends to approximately 4.4 hectares (11 acres) and comprises pasture divided into paddocks in equestrian use, buildings in equestrian use, a manège, a horsewalker and a parking / yard area. The site as a whole is bounded to the west by Field Lane and a mature hedge with standard trees. The southern boundary is formed by Village Road and a mature hedge. Residential properties adjoin the wider site to the north and east, with agricultural land to the north-east.

A review of topographical survey data indicates an elevation of approx. 50.3m Above Ordnance Datum (AOD) in the north of the site proximal to the site access, with levels falling gently to the south (to approx. 49.1m AOD at the access to the adjoining paddock) to the existing historic stream / ditch. The existing buildings roof catchment and grounds discharge storm water into this ditch (Photo 1). The stream outfalls to a culvert (Photo 1) that crosses Field Lane to a watercourse in the verge. Storm water from this stream enters another culvert and crosses the main highway (to Littleton Upon Severn Village) entering a flowing stream along the side of Elmonger house (Photo 2 and 3). The stream then runs southwards connecting to a more significant watercourse (Photo 4), onwards to the River Severn. Refer to Figure 2 for mapping of these connections and photograph locations.

There are no foul drains on site. Wessex Water Sewer Maps show no records of foul or storm sewers in the vicinity for >100m radius around the site.

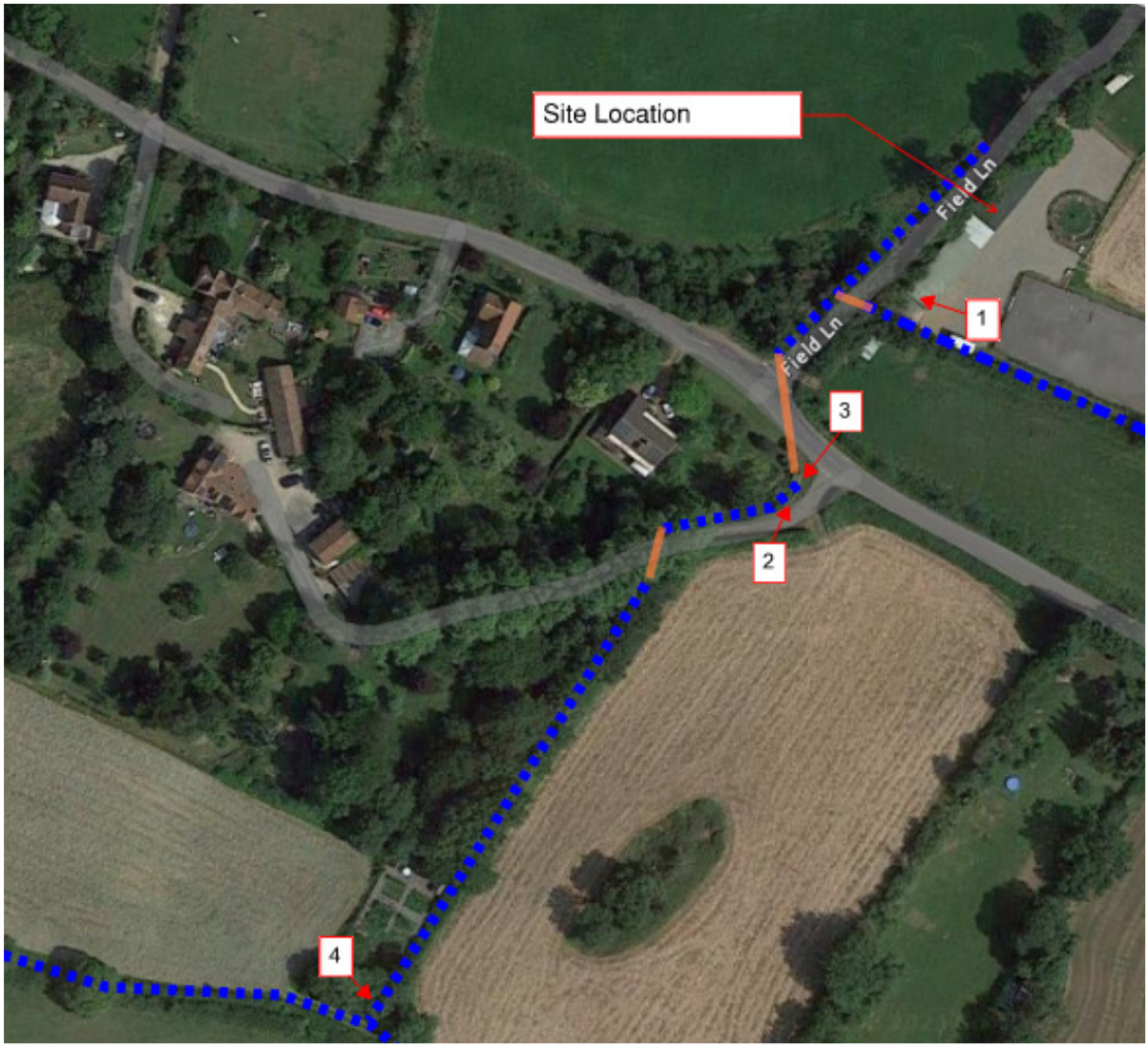


Figure 2: Stream network and photograph locations

Photo 1: Outfall from site to culvert across Field Lane

Photo 2 and 3: Stream adjacent to Elmonger House

Photo 4: Southern Watercourse

2.3 Existing Geology & Infiltration testing

A Geotechnical & Geo-environmental Ground Investigation was carried out by S10 dated the 29th November 2023. Refer to their report reference 23-230 for further information. The ground subgrade was found to be reddish-brown silty clay. As part of the ground investigation testing, infiltration testing was carried out in accordance with BRE 365 Digest and BS6297 Code of practice for design of drainage fields, to establish weather the ground conditions permit the use of soakaways.

S10 Geo-Consulting carried out the ground investigations and concluded the ground conditions has extremely poor infiltration properties and is not suitable for the use of storm soakaways or drainage fields to discharge storm and foul water from the proposed development. Refer to Appendix B for soakaway test record.

The poor percolation conditions were evident on Flow Civil Engineering site visit in September where there was standing water across site as shown in Photo 5.

Photo 5: Water-logged ground conditions on site

3. FOUL DRAINAGE

3.1 Proposed Foul Drainage

Due to the site constraints and absence of existing foul drainage infrastructure, there is limited options to discharge foul drainage. An analysis of the options has been tabulated to identify the best viable solution. Refer to Table 1 below: -

Option	Description	Advantages	Disadvantages	Viability
1	Foul Water Treatment Plant	Treats the foul waste and provides 'clean' water discharge to soakaway /drainage field/watercourse. Running costs and maintenance is lower than cesspits and septic tank	Expensive upfront costs. Minimum annual minor maintenance required. A gravity connection to outfall is not possible due to site levels. Pump required.	There is a stream within site. Due to site ground conditions, it is not possible to discharge to a drainage field.
2	Drainage Field	Avoids the need for treatment plants	Requires a large flat area to install. Long lengths of pipe work required. Requires permeable ground conditions.	Not viable due to poor permeability.
3	Connection to existing drainage			Not viable as no foul water drainage systems exist on site
4	Connection to sewer	Minimises maintenance and very sustainable	Extremely long excavations required to connect to nearest sewer (which is unknown distance away > 500m).	Not viable.
5	Cesspit	Cheaper installation for tank. extremely expensive over the lifetime of the building for regular emptying requirements	Extremely expensive over the lifetime of the building for regular emptying requirements	Not viable for intended use for cost benefits when compare to other more sustainable alternatives.
6	Septic Tank	Under the new regulations (2020), discharge from a septic tank must be to a drainage field or soakaway constructed per BS:6297.		Not viable.

The proposed foul water for the domestic sewage will be collected by gravity drains through to a foul treatment plant. The 'clean' water will overflow to a pump chamber and the treated foul water will be pumped to a break chamber and flow into the stream. Due to level constraints, it is not possible to use a gravity system only. The pump will also be utilised to discharge storm water. The treatment plant will be installed a minimum 10m from the proposed dwelling and 10m from the stream. This strategy complies with Planning condition 8. Approval from Building control will be required. An Environment

Agency Permit is not required to discharge to the surface water as the domestic sewage discharge is less than 5 cubic metres a day and the proposals meet all the general binding rules.

The flow rate is based on peak discharge average over an 8-hour period which reflects a typical period of occupation and allows a more conservative value where residents spend the majority of the day on site.

Foul discharge rate = (6 persons x 150 ltrs x 6 dry weather factor) / (8x60x60) = 0.19 l/s

Foul discharge rate = 0.19 l/s

There will be a minimal foul flow from the single new plot. This is under the treatment plant daily capacity of 0.9m^3. This strategy conforms to LLFA comments on Planning application P23/00673/F (09/03/2023).

Refer to Appendix C for foul drainage layout arrangement.

Refer to Appendix D for details on the Package treatment plant.

The pump specification provided by Duty Point for the packaged pump chamber is reference in Appendix K.

4. STORM DRAINAGE

4.0 Storm Water Design Objective

The objective of the drainage strategy is to provide guidance on how the proposed development site could effectively drain through on-site sustainable drainage techniques and to off-site drainage infrastructure, based on the drainage and ground condition information collected and reviewed to date. This document includes a fixed and calculated drainage strategy, in line with current legislation. The design of a successful compliant drainage system for this site is entirely dependent on sustainable drainage principles and requirements being fully incorporated into the site layout to meet the provisions of the Local Planning Authority and the Flood and Water Management Act 2010.

(a) 4.1 Suitable run-off destinations

An appraisal has been undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development in accordance with the following hierarchy as highlighted in Part H of Building Regulations and the National Planning Policy Framework (NPPF):

1. Infiltration to the ground using a sustainable drainage system.
2. If this is not feasible, discharge to a watercourse or river; generally, at a controlled rate unless it does not affect flood risk e.g., if to the sea or an estuary.
3. Discharge at a controlled rate to a surface water sewer or drain.
4. Discharge at a controlled rate to a combined sewer system, with the approval from the Water Authority.
5. Only if the above have all been investigated and it has been proved that none of these options are suitable will discharge at a controlled rate to a foul sewer system, with the approval from the Water Authority.

The techniques consider the use of soakaways in accordance with the Building Regulations Approved Document H order of priority. As mentioned in Section 2.3, the existing ground conditions are not suitable for the use of soakaways. Consequently, storm water will discharge to the existing ditch.

The discharge of surface water run-off has been considered in accordance with the hierarchical approach:

Method	Reasoning	
Interception / Re-use	Deemed inappropriate.	X
Infiltration	Ground is not suitable for infiltration methods	X
Surface water body	Ditch connected to southern stream and culvert	✓
To dedicated surface water sewer (public, highways or otherwise)	There is no storm sewer in the vicinity	X
To a combined sewer	There is no combined sewer in the vicinity	X
To a foul sewer	There is no foul sewer in the vicinity	X

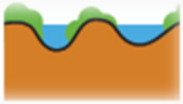
4.3 Suitability of SuDS components

The drainage design should adopt the principles of SuDS where appropriate taking into consideration the site context and location. The principals of SuDS are that they should be designed to maximise the opportunities and benefits that can be secured surface water run-off management in terms of quality, quantity, flood risk, and amenity.

The implementation and selection of SuDS techniques is largely dependent on the site layout and context. Some SuDS techniques may be more appropriate than others.

The suitability of SuDS components has been assessed as follows:

Hierarchy	Description	Setting	Required area	Implemented	
Green roofs 	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.	No. Architect to consider use of green roofs	X
Rainwater harvesting 	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (Underground or above ground).	No. Due to use as residential housing rainwater harvesting considered impractical. It is advised for water butts to be installed at rainwater pipe locations where possible	X
Soakaway 	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or tank installed (i.e. cellular storage). Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependent on runoff volumes, water table and soils.	No. Soakaways are not suitable at this location	X
Filter Strips 	Filter drains are shallow stone filled trenches that provide attenuation, conveyance and treatment of runoff	Open space	Dependent on runoff volumes	Yes for hardstanding areas and protect building from overland flows from adjacent fields	✓
Permeable paving 	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / open space	Can typically drain double its area.	Yes.	✓

Hierarchy	Description	Setting	Required area	Implemented	
Bioretention area or Raingardens 	A vegetated area with gravel and sand layers below designated to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street / open space	Typically, surface area is 5-10% of drained area with storage below.	No. Landscape Architect to consider	X
Swale/Raingarden 	Swales and raingardens are shallow depressions designed to convoy and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street / open space	Account for width to allow safe maintenance typically 2–3 metres wide.	No, levels constraints,	X
Hardscape storage 	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Street / open space	Could be above or below ground and sized to storage need.	No. Below ground storage considered preferable visually and due to limited space.	X
Pond / Basin 	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open space	Dependent on runoff volumes and soils.	No. Levels constraints, and insufficient space	X
Wetland 	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open space	Typically, 5–15% drainage area to provide good treatment.	No. Insufficient space within landscaping scheme for a wetland.	X
Underground storage 	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open space	Dependent on runoff volumes and soils.	Yes. Cellular storage will be utilised	✓

4.4 Storm Water Design Strategy

Storm water from the dwelling roof is to discharge a below ground system and outfall to the stream at a controlled discharge rate, similar to greenfield runoff. Storm water will be attenuated using cellular units located in the gardens and will provide attenuation for 1 in 100 year storm events plus 45% climate change allowance. The driveway catchment area will discharge to a filter drain. This will aid in slowing down storm water, provide improved water quality to the outfall and provide some additional storm water attenuation using the 30% void content in the filter stone medium. This drain discharge to the cellular storage. Due to level constraints a pump and rising main will be installed downstream of the discharge control chamber and be pumped to a break chamber upstream of a headwall into the stream.

Refer to Appendix C for drainage layout.

4.5 Storm Water Design Parameters

The key design parameters for any new storm water drainage shall be:

- No surcharge within the pipe network up to and including a 1:2-year storm event;
- No flooding of the drainage system up to and including a 1:30 year storm event
- No flooding of the drainage system up to the 1:100-year storm event, and

National Planning Policy requires an allowance for the potential impact of climate change on the surface water runoff. This is a critical part of any assessment of flood risk. In accordance with Table 5 of the Planning Policy Technical Guidance, the following climate change allowance will be included in the infrastructure design for the proposed development.

- Surface Water Drainage: additional peak rainfall intensity added = 45%

The proposed storm water drainage has been modelled in Microdrainage software to size the drainage system and calculate the size of the attenuation needed. Refer to Appendix F. Calculations have been carried out for the whole catchment area mentioned above and show no flooding for 1 in 100 year storm event plus 45% allowance for climate change.

This strategy complies with Somerset Council requirements. The storm system will remain private and will not be offered for adoption.

4.7 Storm Water Design Parameters

The impermeable storm water catchment areas post-development are summarised in Table 2 below and shown in Appendix G: -

Post-Development Catchment	Area (m2)
New dwelling	145
Driveway and hardstanding areas	285
Total surface water Area	430m^2 = 0.043 ha

Table 2: Summary of catchment areas

The existing roof and hardstanding area from the existing building discharges directly to the ground surface which is either positively drained by land drain in the yard area and outfalls into the stream, or, overflows directly into the ditch.

In accordance with South Gloucestershire Local Flood and Risk Management Strategy it is best practise to restrict storm water from site into the ditch at greenfield runoff rate QBAR, where possible. The greenfield runoff rate has been based on the above catchment area using ICP SUDS Mean Annual Flood software as follows: -

- QBAR = 0.5 l/s
- Q30 = 0.7 l/s
- Q100 = 0.8 l/s

An orifice plate design with a hole has been design to restrict flow on the outgoing pipe. A restricted discharge rate of 0.5 l/s acquires an orifice plate less than 14mm. This is deemed a high flood risk item as the orifice is highly likely to frequently get blocked. Instead, the proposed restricted discharge rate has been increased marginally to 1 l/s. This allows for a 20mm orifice. This is a minor departure from Flood and Risk Management Strategy and consequently is to be approved by Building control. This rate is **substantially better** than the existing discharge rate from the existing barn and yard where there is no restricted discharge rate. A proposed restricted discharge rate of 1 l/s is therefore a betterment than the existing arrangement.

Where possible it is preferred to increase the permitted discharge to 5 l/s to further mitigate flood risk and will also decrease attenuation volume requirements. This is subject to LPA approval.

A proposed restricted discharge rate of 1 l/s is a betterment >40% than the existing arrangement.

4.5 Pollution Control measure

Incorporation of a filter drain for the access driveway, provides a natural filtration as rain water passes through the stone medium of the drain. This removes pollutants and impurities from the water, which can stop water pollution.

As an additional measure it is proposed to install a catchpit chamber to capture and retain sediments, trash and floatables from surface water runoff prior to the soakaway.

4.6 Exceedance routes

"It is inevitable that as a result of extreme rainfall the capacities of sewers, covered watercourses and other drainage systems will be exceeded on occasion. Periods of exceedance occur when the rate of surface runoff exceeds the drainage system inlet capacity, when the pipe system becomes overloaded, or when the outfall becomes restricted due to flood levels in the receiving water. Underground conveyance cannot economically or sustainably be built large enough for the most extreme events and, as a result, there will be occasions when surface water runoff will exceed the design capacity of drains. When drainage exceedance capacity is exceeded the excess water (exceedance flow) is conveyed above ground, and will travel along streets and paths, between and through buildings and across open space. Indiscriminate flooding of property can occur when this flow of water is not controlled." (CIRIA C753).

Surface levels will be designed to ensure finished levels fall away from the buildings to ensure excessive amount of surface water flow away from the building. Overland flow routes move away from the buildings to the southern and western boundary and flows into the ditch, watercourse and highway to the south. Refer to Appendix H.

4.7 Environment Agency Flood Risk Zone

The site development is less than 1 hector and is located within Flood zone 1, an area shown to be at less than 0.1% chance of flooding in any year. No Flood risk assessment is required for this site. Refer to Appendix I for Environment Agency data.

4.8 Maintenance and operation

The drainage system will be surveyed on completion to ensure that the system is fully operational and maintenance schedules provided in the O&M manual for the owner to maintain the drainage system. The new home owner will be responsible for maintaining SuDS on site, or using a specialist contractor to maintain the drainage systems. Refer to Appendix J for operation and maintenance schedule which shows the management and maintenance plan for the lifetime of the development SuDS and includes details of land ownership; maintenance responsibilities/arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable urban drainage scheme throughout its lifetime; together with a description of the system, the identification of individual assets, services and access requirements and details of routine and periodic maintenance activities.

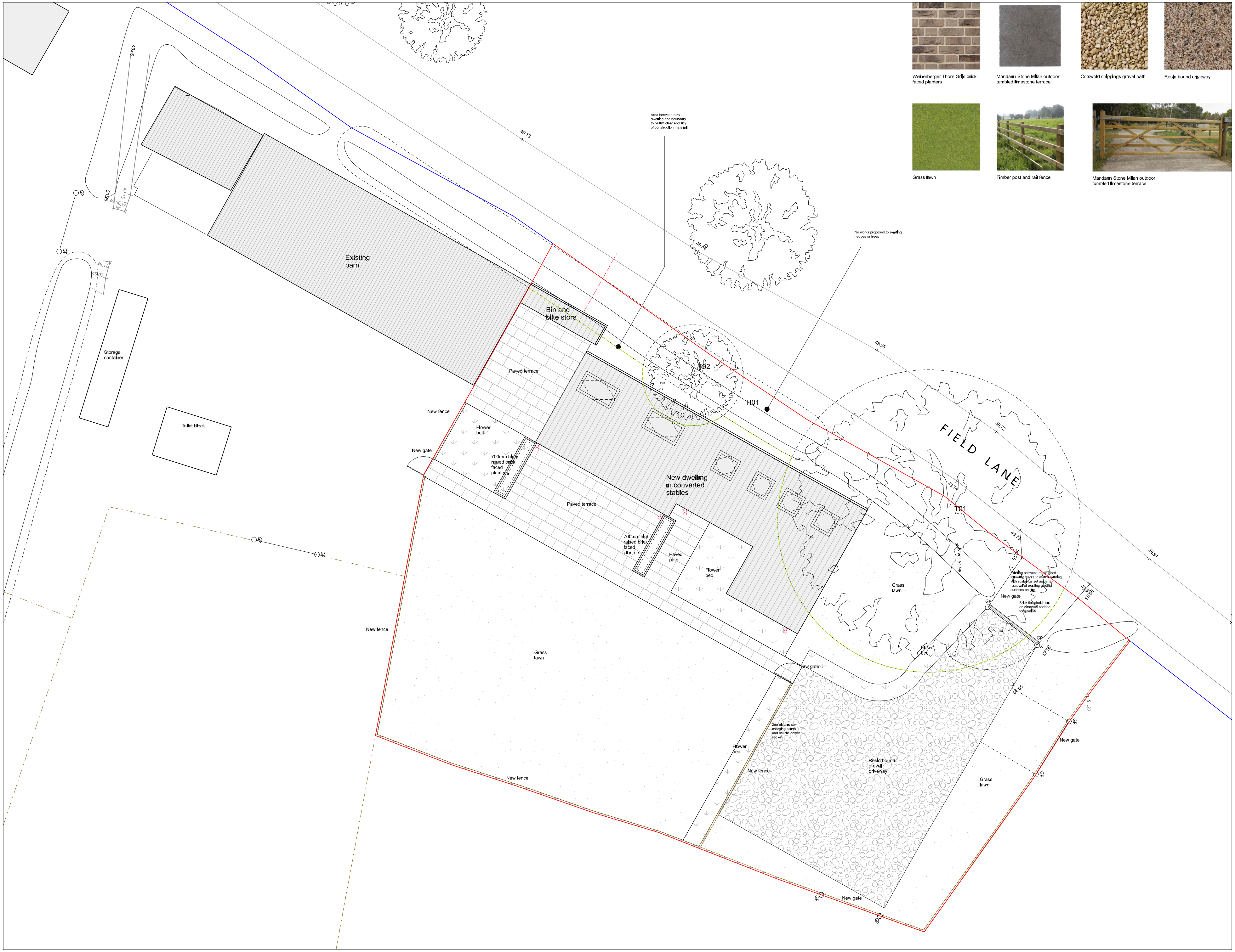
5. CONCLUSION

Storm water from the roof areas and driveway is to discharge to the southern perimeter historic stream at a restricted discharge of 1 l/s. During storm events rain water is attenuated within SuDS systems which has capacity for a 1 in 100 year storm event +45% climate change allowance. This achieves at least a 40% betterment than the existing arrangement. Approval from South Gloucestershire County Building Control is required.

Foul water is to discharge into a foul water treatment plant, and pump clean water to the southern boundary ditch. Approval from South Gloucestershire County Building Control is required.

6. APPENDIX A

(Architects Layout)



To be read in conjunction with all relevant Architect's, Structural Engineer's and Services Engineer's drawings and details.

Do not scale from drawings. All construction information should be taken from written dimensions only. All dimensions in millimetres unless otherwise stated.

Any variations or supplementary drawings are to be commented on by the Architect.

All dimensions and conditions are to be checked on site prior to preparing drawings or commencing any work.

Please report any discrepancies before proceeding.

00 01 02 05m SCALE BAR 1:100

Key

Site boundary
Associated land
Root Protection Area
PIR Wall mounted downlight (PIR as shown)

Detailed hard and soft landscaping specification:

Fence:
Mortised post and 3 rail oak fence to site perimeter

Gates:
New 5 bar braced oak gate and posts
Ironmongery: galvanised steel hook and band hinges, locking gate bolt, drop bolt.

Flower beds:
Prepare planting beds for planting by client: Remove existing scalpings and clay to min 300mm depth / level of clay - whichever is deeper. Lay min 300mm topsoil and compact ready for planting by client. Oak edging board to edges of bed.

Grass lawn:
Prepare planting beds for planting by client: Remove existing scalpings to min 150mm depth / level of clay - whichever is deeper. Lay min 150mm topsoil and level, compact and rake. Sow grass seed according to instructions.

Resin bound gravel driveway: permeable resin bound driveway to specialised contractors specification. Colours as image below. Levels to fall to drains as drainage engineers plan

Paved path and patio : Mandarin Stone Milan outdoor tumbled limestone, free lenght x 600mm (layout shown indicative only, TBA on site). Paving to be fully mortar bedded on minimum 100mm thick type 1 granular subbase. Thoroughly compact subgrade. Levels to fall away from building to soft landscaping

Gravel path: 50mm depth 20mm Cotswold chippings on geotextile membrane on 100mm thick throughly compacted type 1 granular subbase

All levels to fall away from building to soft landscaping

Raised brick planters : 700mm high Weinerberger Thorn Grijs brick facing leaf tie to concrete blockworkbacking leaf planter lined with root protection barrier and filled with topsoil. Foundations to S.Eng specification

Lighting design strategy for biodiversity

The Biodiversty Survey and Report identifed that the hedgerows to the south and west of the buildings have suitability for foraging and commuting bats and there was the potential for roosting within the trees. Other areas were assessed to have negligable suitability for roosting bats. All lighting has been positioned on the east of the building facing away from the hedgerows.

In accordance with the Biodiversity Survey and Report external lighting is kept to a minimum. Where it is essential warm white (long wavelength, not UV) LED lights are specified. Where appropropriate motion sensors on short duration and high motion threshold are fitted.

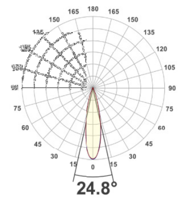
Lights:
Astro Dartmouth Single LED wall mounted matt black vertical down light.
https://www.astrolighting.com/products/1372003-dartmouth-single-led

Controls:
2 no lights by front door and corner of house by parking to be on PIR movement, lighting and timer controlled sensor.
2 no lights by terrace to be switch controlled.

DARTMOUTH SINGLE LED BLACK

LIGHT EFFICIENCY: 52 Lumen/Watt
LIGHT QUALITY: CRI: 82.7
COLOR TEMPERATURE: 3036 K

OUTPUT: 236 lm
PEAK: 1021 cd
POWER: 4.5 W
PF: 0.46



CIE 1931
x: 0.433
y: 0.399

REV DATE DETAILS

MITCHELL
ELEY
GOULD

James Morris & Catherine Meachin
Conversion of stables at Littleton-Upon-Severn
The Yard, Field Lane, Littleton-Upon-Severn
Proposed site plan - discharge of conditions

PLANNING

Planning	05.03.24	1:100@ISO A1	ER	KE
2239	AL(0)02			-

THE ICE HOUSE G/F NORTH OFFICE 124-126 WALCOT STREET BATH BA15BG

USE FIGURED DIMENSIONS ONLY

00 10 20 40 70

7. APPENDIX B

(Infiltration Test)

S10 Geo-Consulting
Geotechnical & Geo-environmental Ground Investigation

	Project Number:	**23-230**	Exploratory Hole Number
	Site Details:	**Littleton Upon Severn**	**TP2**
Soakaway Testing	**Weather**		Test No.
Carried out in line with BS6297 / Building Regulations Approved Doc H2 for foul water	**Overcast & cool; sporadic heavy rain showers (9.11.23)**		1

Site Data

Elapsed Time (mins)	Depth (m)
0	0
22	-0.01
61	-0.02
90	-0.02

N.B. Test terminated due to water level rise

Pit Measurements (m)

Length	0.3	m
Width	0.3	m
Depth	0.3	m
Depth to Water	0.000	m

Storage / Outflow Calculations

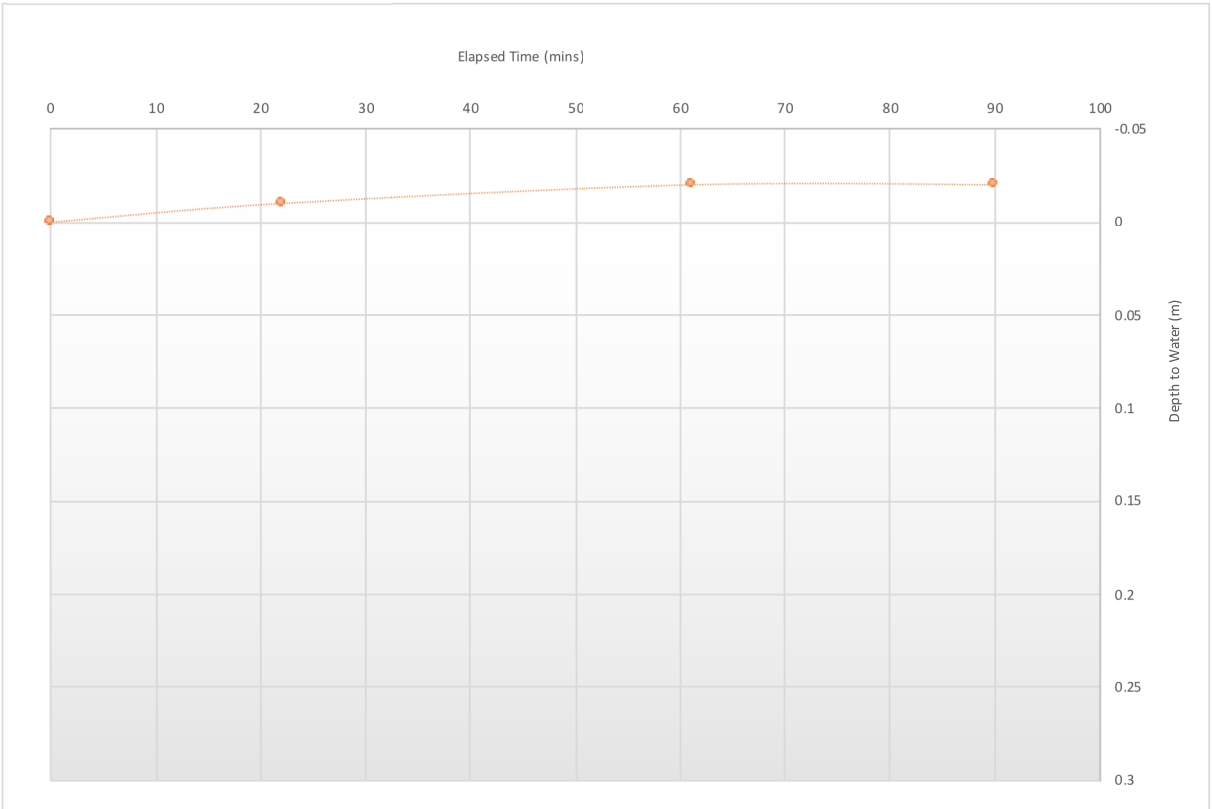
Effective Storage Depth	0.300	m
Effective Storage Volume	0.027	m3
75% Full	0.075	m
25% Full	0.225	m
Vp75-Vp25 (Outflow Vol)	0.014	m3
Ap50 Outflow Area	0.270	m2

Outflow Time at:

75%	n/a	mins
25%	n/a	mins

Outflow tp75-tp25: n/a mins

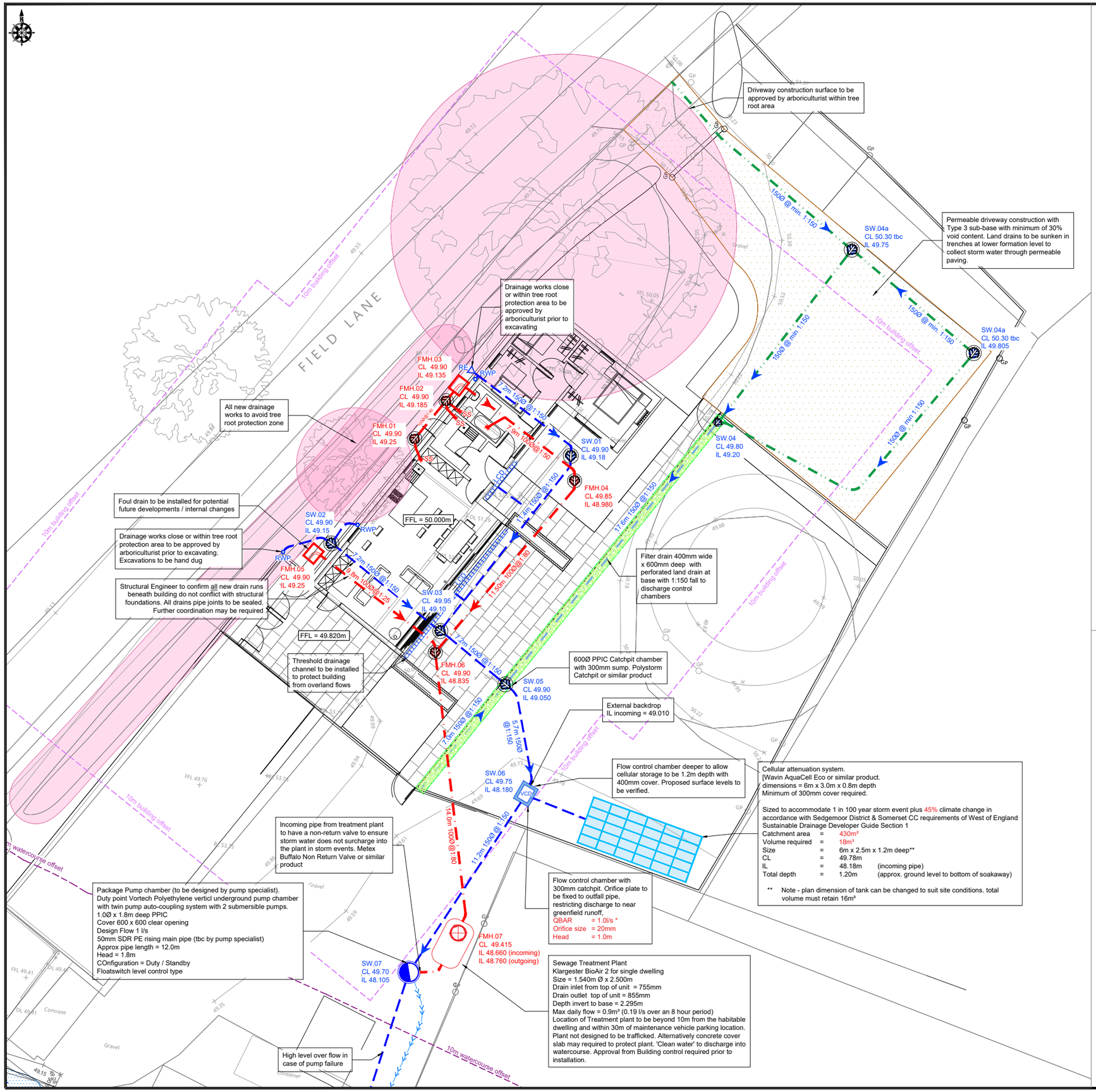
= n/a secs



Calculated Vp	**n/a**	secs/mm

8. APPENDIX C

(Drainage Layout)

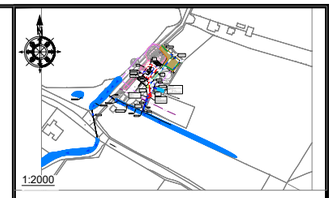


Key

- Existing culvert
- Proposed Storm Water drain
- Private Storm Water 300Ø PPIC
- Private Storm Water 450Ø / 600Ø PPIC Note catchpit where referenced to have min. 300mm sump
- VCD — 1200 X 750mm PCC chamber with orifice plate fixed to outlet pipe
- LDC — ACO Multiline Sealin Linear drainage channel with vertical outlet from sump unit. Colour, material and heel guard grating to be agreed with Architect/ Landscape Architect
- RWP — Proposed Rain Water Pipe (shown indicatively, Architect to confirm).
- ACO SuDS outlet headwall
- Cellular storage for storm water attenuation
- Filter drain Type 3 stone with either grass / gravel finish
- Storm rising pump
- Proposed Private Foul water drain
- Private Foul Water Type 3 PPIC 450Ø
- Private Foul Water Type 4 PPIC 300Ø
- SS — Foul water soil stack. Rest bends must be telescopic to allow for ground movement / heave. Alternatively use OSMA below ground single socket settlement (#4D115) (position shown indicative Architect to confirm setting out. Above ground drainage done by others)
- Private Foul Water Type 3 PPC 1000x750mm
- 10m minimum offset boundary from dwelling
- 10m minimum offset boundary from watercourse
- Watercourse

CAVEATS AND RISK ITEMS

1. All proposed levels shown are indicative based on a finished floor level of 50.0m for main dwelling. Architect to confirm finished floor levels and external levels.
2. The connection to the watercourse to be agreed with Local Authority.
3. Soakaway sized for 1 in 100 year plus 45% climate change allowance in accordance with requirements of South Gloucestershire Council and West of England Sustainable Drainage Developer Guide Section 1 (2015) for a restricted discahrge of 1 l/s. Note a reduction in discharge or increase in climate change allowance will result in additional attenuation volume requirements
4. All rwp and soil stack positions to be confirmed by architect.
5. Where drainage is in close proximity to tree roots, Arboriculturist to confirm proposals.
6. All proposed cover levels are shown indicatively. Landscape Architect / Architect to confirm finished surface levels
7. Cellular storage not designed for vehicle loading
8. Outfall levels to water course to be confirmed.
9. Driveway levels to be designed to fall to positive drainage system and avoid discharging onto Highway.



Notes

1. This drawing is to be read in conjunction with relevant Architects, Engineers and specialist manufacturers drawings, reports and specifications.
2. All levels are shown in metres above Ordnance Datum (m AOD) unless otherwise shown.
3. Any ambiguities or discrepancies within this drawing and any other information given elsewhere must be reported to Mesh Engineering for clarification before pricing / works commence.
4. Do not scale from this drawing for construction purposes.
5. It is recommended that all sewers and drains be laid starting from the downstream connection to the existing sewer/drain and working upstream to the new development.
6. All private drainage to comply with current Building Regulations and relevant British Standards and Codes of Practices.
7. Connections to existing sewers in accordance with the Local Water Authority guidelines & approval.
8. Connections to existing river or watercourse in accordance with the Local Authority and E.A guidelines & approval.
9. Sewers and drains of different diameters should be laid soffit to soffit unless shown otherwise in the drawing.
10. All access chambers covers and frames to be installed to BS EN 124.
11. Private Drainage pipe connection to public sewer to be plastic Hepworth Plastidrain pipe (or similar product) to BS EN 1410 constructed to Water Industry Standard (WIS)-4-35-01.
12. Drainage Pipe work routes under building footprint will require Co-ordination with foundations.
13. Positions of soil pipes, sub stacks, WC outlets etc. are indicative only. The contractor shall confirm all positions with the Architect prior to construction.
14. All foul drainage to be minimum 100mm diameter, all surface water drainage to be minimum 150mm diameter unless otherwise shown.
15. Cover levels shown on this drawing refer to approximate surface levels. It is the contractors responsibility to ensure that access covers and frames are set at the final surface levels.
16. Where possible the contractor is to orientate manhole biscuits and covers to locate them parallel to kerbs and paving.
17. The Contractor should comply with ha(g) 47 "Avoiding Danger from Underground Services" when excavating around existing services.
18. It is the contractors responsibility to determine the location and depth of all existing services, mains and cables prior to construction.
19. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements.
20. The pipe diameters cover and invert levels of any existing manholes are to be verified on site prior to the commencement of the works.
21. All external drainage within trafficked areas with less than 1.2m cover to have type Z cover and surround. All external drainage within landscaped areas with cover less than 0.6m to have type C1 cover and surround. All drainage with greater cover than the minimum required to have type S bed and surround.
22. Prior to commencing the works the contractor is to confirm details of the existing drainage system as noted on the drawing.
23. This drawing is for information only.
24. Drainage outfall connections and strategy to be agreed with Wessex Water Water, Bristol City Council LPA,
25. Foul drainage to be adopted to be Polypipe Polysewer/Osma Ultra rib or other products listed in accordance with Severn Trent Approved product list 19.12.2019 to Water Industry Standard (WIS)-4-35-01.
26. Construction and design in accordance with Sector Guidance in relation to the adoption of sewerage assets by sewerage companies in England ans Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewage companies operating wholly or mainly in England.
27. All connections to sewer directly or indirectly in be agreed with Local Water Authority prior to construction.
28. All cover levels are indicative, to be confirmed and coordinated with Landscape Architect / Architect.

CDM Residual Risks & Hazards

See project specific Mesh Engineering Ltd Specification document for CDM residual risks and hazards.

Project specific hazards are indicated on this drawing by an exclamation mark within a triangle adjacent box notes.

General notes :-

Do not scale off this drawing

Contractors to check all dimensions on site prior to fabrications and report any errors/ommissions to the engineer prior to construction.

This drawing is to be read in conjunction with all relevant Mesh Engineering Ltd and architects drawings

Revisions	Ref	Initial	Date
Driveway updated to permeable paving	P07	GJ	19.03.2024
Site plan updated	P06	GJ	05.03.2024
Climate change allowance increased, discharge reduced, cellular storage increased	P05	GJ	03.03.2024
Tree protection areas updated	P04	GJ	02.01.2024

MESH ENGINEERING

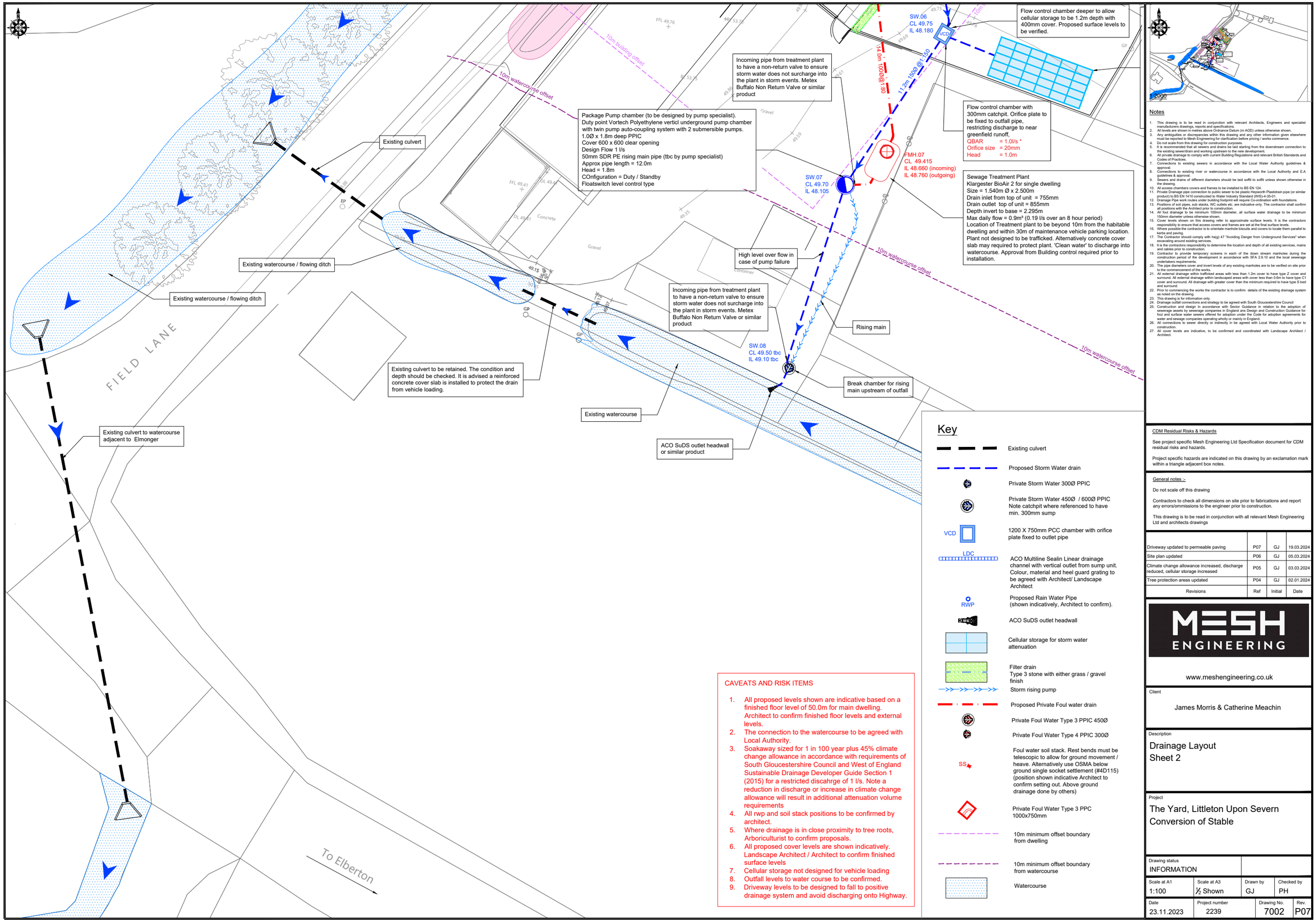
www.meshengineering.co.uk

Client: James Morris & Catherine Meachin

Description: Drainage Layout Sheet 1

Project: The Yard, Littleton Upon Severn Conversion of Stable

Drawing status			
INFORMATION			
Scale at A1	Scale at A3	Drawn by	Checked by
1:100	½ Shown	GJ	PH
Date	Project number	Drawing No.	Rev.
23.11.2023	2239	7001	P07



Key

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6. All proposed cover levels are shown indicatively. Landscape Architect / Architect to confirm finished surface levels
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8. Outfall levels to water course to be confirmed.
9. Driveway levels to be designed to fall to positive drainage system and avoid discharging onto Highway.

Notes

1. This drawing is to be read in conjunction with relevant Architects, Engineers and specialist manufacturers drawings, reports and specifications.
2. All levels are shown in metres above Ordnance Datum (m AOD) unless otherwise shown.
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19. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements.
20. The pipe diameters cover and invert levels of any existing manholes are to be verified on site prior to the commencement of the works.
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22. Prior to commencing the works the contractor is to confirm details of the existing drainage system as noted on the drawing.
23. This drawing is for information only.
24. Drainage outfall connections and strategy to be agreed with South Gloucestershire Council
25. Construction and design in accordance with Sector Guidance in relation to the adoption of sewerage assets by sewerage companies in England ans Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewage companies operating wholly or mainly in England.
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Tree protection areas updated	P04	GJ	02.01.2024

MESH ENGINEERING

www.meshengineering.co.uk

Client: James Morris & Catherine Meachin

Description: Drainage Layout Sheet 2

Project: The Yard, Littleton Upon Severn Conversion of Stable

Drawing status			
INFORMATION			
Scale at A1	Scale at A3	Drawn by	Checked by
1:100	½ Shown	GJ	PH
Date	Project number	Drawing No.	Rev.
23.11.2023	2239	7002	P07

9. APPENDIX D

(Foul Water Treatment Plant Specification)

BIOAIR 2, 3 & 5 MDPE - DECLARATION OF PERFORMANCE

kingspan-klargester-bioair-2-3-5-dop-en-Mar2023-v1

1.Unique identification code of the product-type:

Wastewater Treatment Plant for 6, 9 & 15 Population Equivalents
BioAir 2 (6PE) & BioAir 3 (9PE) & BioAir 5 (15PE)

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:

BioAir Prefabricated Domestic Wastewater Treatment Plant: See CE marking affixed to product
BioAir 2 (6PE) & BioAir 3 (9PE) & BioAir 5 (15PE)

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 & Treatment of Wastewater from Domestic applications up to 15 Population Equivalent

4. Manufacturer name, registered trade name or registered trademark 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:

3

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

EN:12566-3:2005+A2:2013

Notified body/ bodies:

Notified Body No: 1739 + PIA Prüfinstitut für Abwassertechnik GmbH

8. Declared performance/s:

Essential characteristics		Performance		Harmonised technical specification
Structural Behaviour		**Confirmed by Pit Test under the following Conditions - 1.5m Invert: Height of Backfill (from top of Tank) - BioFicient+2 = 1.26m (Includes using extension necks) WET - BioFicient+2 : 2.0m - Maximum water level from bottom of the tank to Shoulder of the Tank (top of tank itself)**		**EN:12566-3:2005+A2:2013**
Reaction to fire		**Class F**		
Water Tightness (water test)		**Water Tight (water test)**		
Material Durability		**MFR (230/2,16) = (4,0± 3,0g)/10 min (EN ISO 1133)**		
		Density ≥ 930 kg/m³ (EN ISO 1133)		
		Tensile Strength	**At Yield (50mm/min) 21MPa**	
			At break (50mm/min) 21MPa	
Treatment Efficiency	**COD**	**93.2%**	**57 mg/l**	
	BOD_5	**97.5%**	**9 mg/l**	
	TN_b**	**60.1%**	**25.4 mg/l**	
	NH_4-N	**67.6%**	**15.6 mg/l**	
	P_{tot}	**46.9%**	**4.3 mg/l**	
	SS	**95.9%**	**16 mg/l**	
		****determined for temperatures > or equal to 12° C in the biozone**		
Electrical Consumption (measured during 38-week test)		**1.2kWh/d**		
Emission of Dangerous Substances		**NPD**		

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 01 March 2023

Water Management Solutions

68 YEARS EXPERIENCE

Klargester BioAir Sewage Treatment Plant

The new Klargester BioAir wastewater treatment plant uses aerated technology to deliver a high level of water discharge quality. Offering flexible installation options to suit a variety of domestic sites and a low impact visual footprint, Klargester BioAir is a cost-efficient choice for your domestic wastewater treatment solution.

UP TO 3 YR WARRANTY PERIOD*

Economically priced

Suitable for installation in traffic areas*
*Structural advice required

Low level visibility

No plastic media

*3 years on Premium model only, 12 months for economy

kingspan.com

Kingspan®

Technical Information

Applications

The Klargester BioAir 2-8 range
is suitable for use across the following applications:

Single &
Multiple Homes

Light Industrial
Premises

Small
Offices

Farms

Barn
Conversions

Product features

97.5%

Improved effluent
quality – BOD_5 97.5%

Third party tested to
EN 12566-3

Easy to install
and operate

Suitable for shallow
dig applications

Affordable service
plans available

BioAir	Model	BioAir 2	BioAir 3	BioAir 4	BioAir 5	BioAir 6	BioAir 7	BioAir 8
Population Equivalent	Unit	6	9	12	15	20	25	35
Daily Flow	m^3/d	0.9	1.35	1.8	2.25	3	3.75	5.25
Daily Load	kg BOD_5/d	0.36	0.54	0.72	0.9	1.2	1.5	2.1
Measurements								
Inlet Invert	mm	455-755	575-875	500-2000	645-945	500-2000	500-2000	500-2000
Discharge Option		Gravity /IPS	Gravity /IPS	Gravity /IPS	Gravity /IPS	Gravity	Gravity	Gravity
Outlet Invert	mm	555-855 /400-700	675-975 /350-650	600-2100	745-1045 /415-715	600-2100	600-2100	600-2100
Diameter	mm	1540	1690	1920	2010	1920	1920	1920
Length	mm	2500	2480	3238	3190	4400	5550	7400
Installation Depth	mm	1805-2105	2075-2375	2245-3745	2485-2785	2245-3745	2245-3745	2245-3745
Inlet Pipework	mm	Ø110	Ø110	Ø110	Ø110	Ø110	Ø110	Ø160
Outlet Pipework (Gravity /IPS)	mm	Ø110 /Ø50	Ø110 /Ø50	Ø110 /Ø50	Ø110 /Ø50	Ø110	Ø110	Ø160
Material Construction	MDPE/GRP	MDPE	MDPE	GRP	MDPE	GRP	GRP	GRP
Unit Weight	kg	170	200	500**	650	800**	1250**	1450**

*BioAir 5 subject to availability
**Tank weight based on 500mm invert

For more information on our new Klargester BioAir:
T: +44 (0) 1296 633 033
E: klargester@kingspan.com
W: Kingspan.co.uk/Klargester

Kingspan®

10. APPENDIX E

(Greenfield Runoff)

.	Greenfield runoff
.	The Yard Field Lane
.	Littleton Upon Severn
Date 18/12/2023 08:55	Designed by G.Jones
File	Checked by
Innovyze	Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	0.043	Urban	0.750
SAAR (mm)	800	Region Number	Region 8

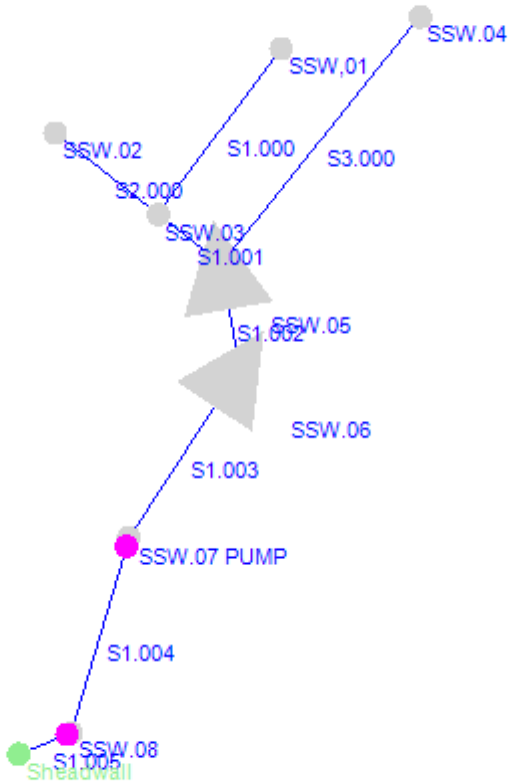
Results l/s

QBAR Rural	0.2
QBAR Urban	0.5
Q100 years	0.8
Q1 year	0.4
Q30 years	0.7
Q100 years	0.8

11. APPENDIX F

(Microdrainage Calculations)

.	Storm Water model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:35	Designed by GJ
File 2239-CAL-C-0005-P03 STORM WATER MODEL_03....	Checked by
Innovyze	Network 2020.1.3



.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.029	4-8	0.014

Total Area Contributing (ha) = 0.043

Total Pipe Volume (m³) = 1.268

Network Design Table for 2239-CAL-C-0005-P01 STORM WATER MODEL.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
S1.000	11.362	0.080	142.0	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	7.233	0.050	144.7	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	4.404	0.050	88.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	17.509	0.150	116.7	0.016	5.00	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	50.00	5.23	49.180	0.006	0.0	0.0	0.0	0.84	14.9	0.8
S2.000	50.00	5.14	49.150	0.010	0.0	0.0	0.0	0.83	14.7	1.4
S1.001	50.00	5.29	49.100	0.016	0.0	0.0	0.0	1.07	18.9	2.2
S3.000	50.00	5.31	49.200	0.016	0.0	0.0	0.0	0.93	16.4	2.2

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

Network Design Table for 2239-CAL-C-0005-P01 STORM WATER MODEL.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
S1.002	5.808	0.040	145.2	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	11.098	0.075	148.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	11.192	0.075	149.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	3.123	0.021	148.7	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)
S1.002	50.00	5.43	49.050	0.043	0.0	0.0	0.0	0.83	14.7	5.8
S1.003	50.00	5.65	48.180	0.043	0.0	0.0	0.0	0.82	14.6	5.8
S1.004	50.00	5.88	48.105	0.043	0.0	0.0	0.0	0.82	14.5	5.8
S1.005	50.00	5.95	48.030	0.043	0.0	0.0	0.0	0.82	14.5	5.8

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

Manhole Schedules for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

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)	Ba
SSW,01	49.900	0.720	Open Manhole	450	S1.000	49.180	150				
SSW.02	49.900	0.750	Open Manhole	450	S2.000	49.150	150				
SSW.03	49.950	0.850	Open Manhole	450	S1.001	49.100	150	S1.000	49.100	150	
								S2.000	49.100	150	
SSW.04	49.800	0.600	Open Manhole	450	S3.000	49.200	150				
SSW.05	49.900	0.850	Open Manhole	450	S1.002	49.050	150	S1.001	49.050	150	
								S3.000	49.050	150	
SSW.06	49.800	1.620	Open Manhole	1200 x 750	S1.003	48.180	150	S1.002	49.010	150	
SSW.07 PUMP	49.550	1.445	Open Manhole	1000	S1.004	48.105	150	S1.003	48.105	150	
SSW.08	49.500	1.470	Open Manhole	450	S1.005	48.030	150	S1.004	48.030	150	
Sheadwall	49.500	1.491	Open Manhole	150		OUTFALL		S1.005	48.009	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SSW,01	359989.104	189754.951	359989.104	189754.951	Required	
SSW.02	359976.623	189750.309	359976.623	189750.309	Required	
SSW.03	359982.313	189745.842	359982.313	189745.842	Required	
SSW.04	359996.781	189756.686	359996.781	189756.686	Required	
SSW.05	359985.750	189743.090	359985.750	189743.090	Required	
SSW.06	359986.763	189737.371	359986.763	189737.371	Required	
SSW.07 PUMP	359980.681	189728.088	359980.681	189728.088	Required	
SSW.08	359977.494	189717.360	359977.494	189717.360	Required	
Sheadwall	359974.596	189716.196			No Entry	

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

PIPELINE SCHEDULES for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

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)
S1.000	o	150	SSW,01	49.900	49.180	0.570	Open Manhole	450
S2.000	o	150	SSW.02	49.900	49.150	0.600	Open Manhole	450
S1.001	o	150	SSW.03	49.950	49.100	0.700	Open Manhole	450
S3.000	o	150	SSW.04	49.800	49.200	0.450	Open Manhole	450
S1.002	o	150	SSW.05	49.900	49.050	0.700	Open Manhole	450
S1.003	o	150	SSW.06	49.800	48.180	1.470	Open Manhole	1200 x 750
S1.004	o	150	SSW.07 PUMP	49.550	48.105	1.295	Open Manhole	1000
S1.005	o	150	SSW.08	49.500	48.030	1.320	Open Manhole	450

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	11.362	142.0	SSW.03	49.950	49.100	0.700	Open Manhole	450
S2.000	7.233	144.7	SSW.03	49.950	49.100	0.700	Open Manhole	450
S1.001	4.404	88.1	SSW.05	49.900	49.050	0.700	Open Manhole	450
S3.000	17.509	116.7	SSW.05	49.900	49.050	0.700	Open Manhole	450
S1.002	5.808	145.2	SSW.06	49.800	49.010	0.640	Open Manhole	1200 x 750
S1.003	11.098	148.0	SSW.07 PUMP	49.550	48.105	1.295	Open Manhole	1000
S1.004	11.192	149.2	SSW.08	49.500	48.030	1.320	Open Manhole	450
S1.005	3.123	148.7	Sheadwall	49.500	48.009	1.341	Open Manhole	150

Free Flowing Outfall Details for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.005	Sheadwall	49.500	48.009	48.009	150	0

.	Storm Model	
.	The Yard	
.	Littleton Upon Severn	
Date 03/03/2024 20:33	Designed by GJ	
File 2239-CAL-C-0005-P03 STO...	Checked by	
Innovyze	Network 2020.1.3	

Simulation Criteria for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.350		

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

Online Controls for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Orifice Manhole: SSW.07 PUMP, DS/PN: S1.004, Volume (m³): 1.3

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.105

Pump Manhole: SSW.08, DS/PN: S1.005, Volume (m³): 0.4

Invert Level (m) 48.030

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0000	0.900	1.0000	1.700	0.0000	2.500	0.0000
0.200	1.0000	1.000	1.0000	1.800	0.0000	2.600	0.0000
0.300	1.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	1.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	1.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	1.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	1.0000	1.500	0.0000	2.300	0.0000		
0.800	1.0000	1.600	0.0000	2.400	0.0000		

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

Storage Structures for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Filter Drain Manhole: SSW.05, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.150
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	2.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	150.0
Invert Level (m)	49.050	Cap Volume Depth (m)	0.000
Trench Width (m)	0.4	Cap Infiltration Depth (m)	0.600
Trench Length (m)	25.0		

Cellular Storage Manhole: SSW.06, DS/PN: S1.003

Invert Level (m)	48.180	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	15.0	15.0	1.201	0.0	35.4
1.200	15.0	35.4			

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SSW,01	15 Winter	1	+0%	100/15 Summer			
S2.000	SSW.02	15 Winter	1	+0%	100/15 Summer			
S1.001	SSW.03	15 Winter	1	+0%	100/15 Summer			
S3.000	SSW.04	15 Winter	1	+0%	100/15 Summer			
S1.002	SSW.05	15 Winter	1	+0%	100/15 Summer			
S1.003	SSW.06	180 Winter	1	+0%	1/30 Summer			
S1.004	SSW.07 PUMP	360 Winter	1	+0%	1/15 Summer			
S1.005	SSW.08	180 Winter	1	+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
S1.000	SSW,01	49.204	-0.126	0.000	0.06			0.8	OK
S2.000	SSW.02	49.183	-0.117	0.000	0.11			1.3	OK
S1.001	SSW.03	49.139	-0.111	0.000	0.15			2.1	OK

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 2239-CAL-C-0005-P01 STORM WATER MODEL.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
S3.000	SSW.04	49.237	-0.113	0.000	0.14			2.1	OK
S1.002	SSW.05	49.120	-0.080	0.000	0.45		6	5.5	OK
S1.003	SSW.06	48.406	0.076	0.000	0.07		105	1.0	SURCHARGED
S1.004	SSW.07 PUMP	48.441	0.186	0.000	0.03			0.4	SURCHARGED
S1.005	SSW.08	48.075	-0.105	0.000	0.04			0.4	OK

PN	US/MH Name	Level Exceeded
S1.000	SSW,01	
S2.000	SSW.02	
S1.001	SSW.03	
S3.000	SSW.04	
S1.002	SSW.05	
S1.003	SSW.06	
S1.004	SSW.07 PUMP	
S1.005	SSW.08	

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SSW,01	15 Winter	30	+0%	100/15 Summer			
S2.000	SSW.02	15 Winter	30	+0%	100/15 Summer			
S1.001	SSW.03	15 Winter	30	+0%	100/15 Summer			
S3.000	SSW.04	15 Winter	30	+0%	100/15 Summer			
S1.002	SSW.05	15 Winter	30	+0%	100/15 Summer			
S1.003	SSW.06	180 Winter	30	+0%	1/30 Summer			
S1.004	SSW.07 PUMP	180 Winter	30	+0%	1/15 Summer			
S1.005	SSW.08	180 Winter	30	+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
S1.000	SSW,01	49.223	-0.107	0.000	0.15			2.0	OK
S2.000	SSW.02	49.215	-0.085	0.000	0.26			3.2	OK
S1.001	SSW.03	49.205	-0.045	0.000	0.34			4.8	OK

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 2239-CAL-C-0005-P01 STORM WATER MODEL.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
S3.000	SSW.04	49.261	-0.089	0.000	0.34			5.2	OK
S1.002	SSW.05	49.196	-0.004	0.000	1.00		4	12.2	OK
S1.003	SSW.06	48.831	0.501	0.000	0.09		162	1.2	SURCHARGED
S1.004	SSW.07 PUMP	48.899	0.644	0.000	0.05			0.7	SURCHARGED
S1.005	SSW.08	48.101	-0.079	0.000	0.07			0.7	OK

PN	US/MH Name	Level Exceeded
S1.000	SSW,01	
S2.000	SSW.02	
S1.001	SSW.03	
S3.000	SSW.04	
S1.002	SSW.05	
S1.003	SSW.06	
S1.004	SSW.07 PUMP	
S1.005	SSW.08	

.	Storm Model	
.	The Yard	
.	Littleton Upon Severn	
Date 03/03/2024 20:33	Designed by GJ	
File 2239-CAL-C-0005-P03 STO...	Checked by	
Innovyze	Network 2020.1.3	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SSW,01	180 Winter	100	+45%	100/15 Summer			
S2.000	SSW.02	180 Winter	100	+45%	100/15 Summer			
S1.001	SSW.03	180 Winter	100	+45%	100/15 Summer			
S3.000	SSW.04	180 Winter	100	+45%	100/15 Summer			
S1.002	SSW.05	180 Winter	100	+45%	100/15 Summer			
S1.003	SSW.06	180 Winter	100	+45%	1/30 Summer			
S1.004	SSW.07 PUMP	180 Winter	100	+45%	1/15 Summer			
S1.005	SSW.08	180 Winter	100	+45%				

.	Storm Model
.	The Yard
.	Littleton Upon Severn
Date 03/03/2024 20:33	Designed by GJ
File 2239-CAL-C-0005-P03 STO...	Checked by
Innovyze	Network 2020.1.3

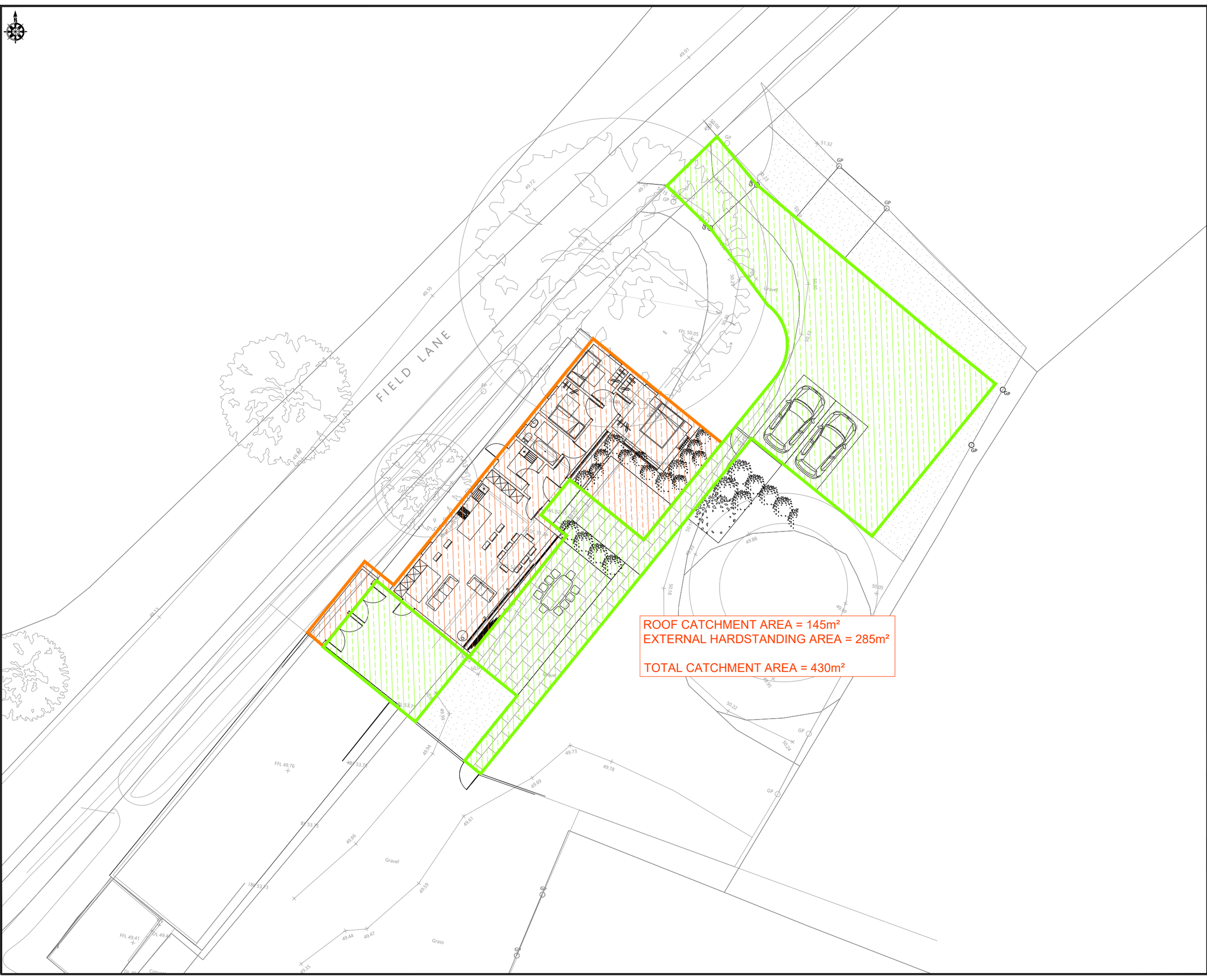
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 2239-CAL-C-0005-P01 STORM WATER MODEL.SWS

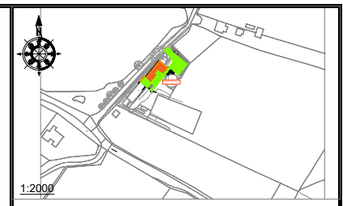
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SSW,01	49.546	0.216	0.000	0.07			0.9	SURCHARGED
S2.000	SSW.02	49.547	0.247	0.000	0.13			1.6	SURCHARGED
S1.001	SSW.03	49.546	0.296	0.000	0.18			2.5	SURCHARGED
S3.000	SSW.04	49.547	0.197	0.000	0.17			2.5	FLOOD RISK
S1.002	SSW.05	49.545	0.345	0.000	0.56		71	6.8	SURCHARGED
S1.003	SSW.06	49.543	1.213	0.000	0.08			1.1	FLOOD RISK
S1.004	SSW.07 PUMP	49.539	1.284	0.000	0.07			1.0	FLOOD RISK
S1.005	SSW.08	48.128	-0.052	0.000	0.09			1.0	OK

PN	US/MH Name	Level Exceeded
S1.000	SSW,01	
S2.000	SSW.02	
S1.001	SSW.03	
S3.000	SSW.04	
S1.002	SSW.05	
S1.003	SSW.06	
S1.004	SSW.07 PUMP	
S1.005	SSW.08	

12. APPENDIX G

(Catchment Area)





Notes

1. This drawing is to be read in conjunction with relevant Architects, Engineers and specialist manufacturers drawings, reports and specifications.
2. All levels are shown in metres above Ordnance Datum (m AOD) unless otherwise shown.
3. Any ambiguities or discrepancies within this drawing and any other information given elsewhere must be reported to Mesh Engineering for clarification before pricing / works commence.
4. Do not scale from this drawing for construction purposes.

KEY

Surface water flow exceedance route

CDM Residual Risks & Hazards

See project specific Mesh Engineering Ltd Specification document for CDM residual risks and hazards.

Project specific hazards are indicated on this drawing by an exclamation mark within a triangle adjacent box notes.

General notes :-

Do not scale off this drawing

Contractors to check all dimensions on site prior to fabrications and report any errors/ommissions to the engineer prior to construction.

This drawing is to be read in conjunction with all relevant Mesh Engineering Ltd and architects drawings

Revisions	Ref	Initial	Date
Site plan updated. catchment areas adjusted	P02	GJ	05.03.2024
Preliminary Issue	P01	GJ	22.12.2023

MESH ENGINEERING

www.meshengineering.co.uk

Client

James Morris & Catherine Meachin

Description

Surface Water Exceedance Routes

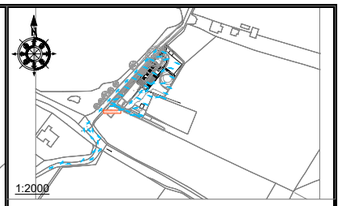
Project

The Yard, Littleton Upon Severn
Conversion of Stable

Drawing status			
INFORMATION			
Scale at A1	Scale at A3	Drawn by	Checked by
1:100	½ Shown	GJ	PH
Date	Project number	Drawing No.	Rev.
22.12.2023	2239	7010	P02

13. APPENDIX H

(Exceedance Routes)



Notes

1. This drawing is to be read in conjunction with relevant Architects, Engineers and specialist manufacturers drawings, reports and specifications.
2. All levels are shown in metres above Ordnance Datum (m AOD) unless otherwise shown.
3. Any ambiguities or discrepancies within this drawing and any other information given elsewhere must be reported to Mesh Engineering for clarification before pricing / works commence.
4. Do not scale from this drawing for construction purposes.
5. It is recommended that all sewers and drains be laid starting from the downstream connection to the existing sewer/drain and working upstream to the new development.
6. All private drainage to comply with current Building Regulations and relevant British Standards and Codes of Practices.
7. Connections to existing sewers in accordance with the Local Water Authority guidelines & approval.
8. Connections to existing river or watercourse in accordance with the Local Authority and E.A guidelines & approval.
9. Sewers and drains of different diameters should be laid soffit to soffit unless shown otherwise in the drawing.
10. All access chambers covers and frames to be installed to BS EN 124.
11. Private Drainage pipe connection to public sewer to be plastic Hepworth Plastidrain pipe (or similar product) to BS EN 1410 constructed to Water Industry Standard (WIS)-4-35-01.
12. Drainage Pipe work routes under building footprint will require Co-ordination with foundations.
13. Positions of soil pipes, sub stacks, WC outlets etc. are indicative only. The contractor shall confirm all positions with the Architect prior to construction.
14. All foul drainage to be minimum 100mm diameter, all surface water drainage to be minimum 150mm diameter unless otherwise shown.
15. Cover levels shown on this drawing refer to approximate surface levels. It is the contractors responsibility to ensure that access covers and frames are set at the final surface levels.
16. Where possible the contractor is to orientate manhole biscuits and covers to locate them parallel to kerbs and paving.
17. The Contractor should comply with hs(g) 47 "Avoiding Danger from Underground Services" when excavating around existing services.
18. It is the contractors responsibility to determine the location and depth of all existing services, mains and cables prior to construction.
19. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements.
20. The pipe diameters cover and invert levels of any existing manholes are to be verified on site prior to the commencement of the works.
21. All external drainage within trafficked areas with less than 1.2m cover to have type Z cover and surround. All external drainage within landscaped areas with cover less than 0.6m to have type C1 cover and surround. All drainage with greater cover than the minimum required to have type S bed and surround.
22. Prior to commencing the works the contractor is to confirm details of the existing drainage system as noted on the drawing.
23. This drawing is for information only.
24. Drainage outfall connections and strategy to be agreed with Wessex Water Water, Bristol City Council LPA.
25. Foul dramage to be adopted to be Polypie Polysewer/Osma Ultra rib or other products listed in accordance with Severn Trent Approved product list 19.12.2019 to Water Industry Standard (WIS)-4-35-01.
26. Construction and design in accordance with Sector Guidance in relation to the adoption of sewerage assets by sewerage companies in England ans Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewage companies operating wholly or mainly in England.
27. All connections to sewer directly or indirectly in be agreed with Local Water Authority prior to construction.
28. All cover levels are indicative, to be confirmed and coordinated with Landscape Architect / Architect.

CDM Residual Risks & Hazards

See project specific Mesh Engineering Ltd Specification document for CDM residual risks and hazards.

Project specific hazards are indicated on this drawing by an exclamation mark within a triangle adjacent box notes.

General notes :-

Do not scale off this drawing

Contractors to check all dimensions on site prior to fabrications and report any errors/ommissions to the engineer prior to construction.

This drawing is to be read in conjunction with all relevant Mesh Engineering Ltd and architects drawings

Revisions	Ref	Initial	Date
Site plan updated	P02	GJ	05.03.2024
Preliminary Issue	P01	GJ	22.12.2023

MESH ENGINEERING

www.meshengineering.co.uk

Client

James Morris & Catherine Meachin

Description

Surface Water Exceedance Routes

Project

The Yard, Littleton Upon Severn
Conversion of Stable

Drawing status			
INFORMATION			
Scale at A1	Scale at A3	Drawn by	Checked by
1:100	½ Shown	GJ	PH
Date	Project number	Drawing No.	Rev.
22.12.2023	2239	7010	P02

14. APPENDIX I

(EA Flood Map)

Flood map for planning

Your reference	Location (easting/northing)	Created
The Yard	**359984/189703**	**21 Dec 2023 15:53**

Your selected location is in flood zone 1, an area with a low probability of flooding.

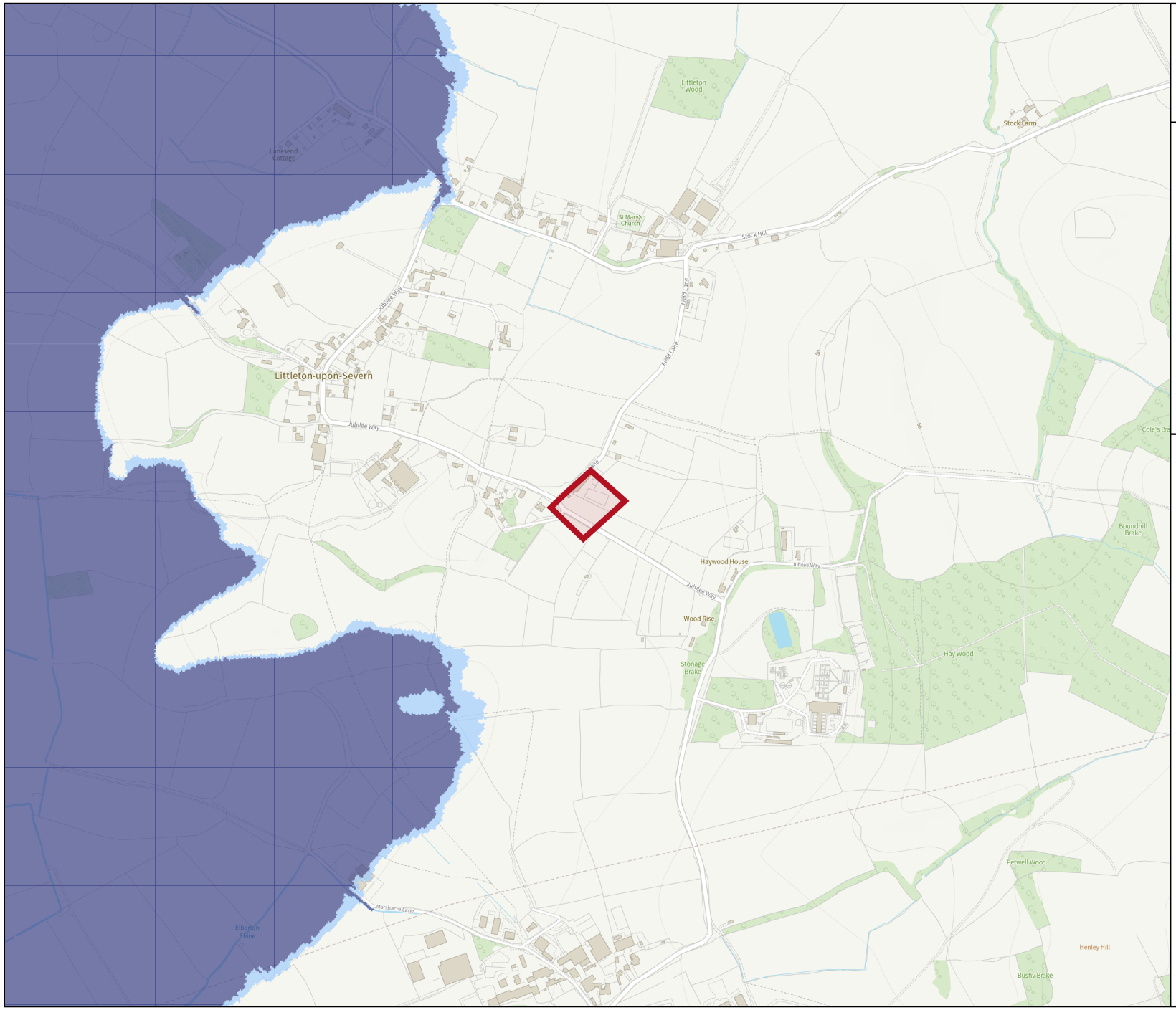
You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
The Yard

Location (easting/northing)
359984/189703

Scale
1:10000

Created
21 Dec 2023 15:53

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 100 200 300m

15. APPENDIX J

(Operations and maintenance manual)

SUSTAINABLE URBAN DRAINAGE OPERATION AND MAINTENACE SCHEDULE

The Yard, Littleton upon Severn

Section 1.01 Guidance

This Drainage Management and Maintenance Plan provides details of the plan proposed for maintenance and management of the drainage scheme associated with the proposed development at The Yard, Field Lane, Littleton Upon Severn, BS35 1NU

On occupation of the development, the maintenance and management plan should be incorporated into the sites Operation and Maintenance Manual with the as-built drainage system operated and maintained in accordance with the regime set out in the tables below. All maintenance tasks will be the responsibility of the land owner.

To ensure longevity and effective operation of SuDS they must be maintained in accordance with

- CIRIA 753 guidance and operation and maintenance
- CIRIA report C768 - Guidance on the construction of SuDS

  Maintenance plan outlined in section 5.2

Section 1.02 Maintenance Plan

Feature	Maintenance	Frequency
Private Drains	Inspection	CCTV survey every 5-10 years.
	Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey)
	Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
Outfall pipes, non-return pipe flaps, and anti-	Inspection	Visually - Quarterly
	Regular Maintenance	Clearance of silt and debris as necessary

Feature	Maintenance	Frequency
scour mat flow channel	Remedial / Occasional Maintenance	Damage to pipes and headwall to be repaired as necessary
Discharge orifice manholes/flow control devices	Inspection	Quarterly
	Regular maintenance	Remove silt and debris as necessary to prevent build up.
Gullies & Drainage Channels	Inspection	Quarterly
	Regular Maintenance	Remove silt and debris as necessary to prevent build up.
Catchpits	Inspection	Quarterly
	Regular maintenance	Remove silt and debris as necessary to prevent build up.
Permeable and porous surface	Cleaning Brush regularly and remove sweepings from all hard surfaces	Monthly or as required
	Permeable Pavements. Brush and vacuum surface once a year to prevent silt blockage and enhance design life.	
	Remedial work Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise Client of possible need for reinstatement of top layers or specialist cleaning. Recent experience suggests jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency.	
Overflows and flood routes	Overflows. Jet pipes leading from overflow structures annually and check by running water through the overflow. Check free flow at next SUDS feature – inlet to basin or chamber.	Annually

Feature	Maintenance	Frequency
	Remove any accumulated grass cuttings or other debris on top of grass weirs or stone filled baskets overflows.	Monthly
	Flood Routes. Make visual inspection. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary.	Monthly
	Overflows. If overflow is not clear then dismantle structure and reassemble to design detail.	As required
Planting and existing vegetation	Amenity Grass - Mow all grass verges, paths and amenity grass at 35-50mm with 75mm max. All cuttings to remain in situ	16 visits
	Rough grass – Mow at 75-100mm but not to exceed 150mm All cuttings to wildlife piles	4 - 8 visits
	Wildflower areas strimmed to 50mm in Sept-Oct or Wildflower areas strimmed to 50mm July and Sept or Wildflower areas strimmed to 50mm on 3 year rotation 30% each year All cuttings to wildlife piles	1 visit 2 visit 1 visit
	Ornamental tree & shrub planting. Weed all shrub beds as detailed spec as necessary. Cut back planting from lights, paths and visibility sight lines in late autumn and as necessary. Cut hedges slightly tapered back from base with flat top at specified height. Do not mulch planting adjacent to permeable/ porous paving surfaces. Remove stakes and ties from trees when no longer needed for support and within 3 years of planting. Protect from strimmer damage and remove competitive growth until well established.	4 visits
	Native trees & shrub planting. Prune to shape in year 1.	1 visit

Feature	Maintenance	Frequency
	Protect trees from strimmer damage and remove competitive growth until well established. Remove stakes and ties from trees when no longer needed for support and within 3 years from planting.	
	Existing trees Check existing trees for safety.	1 visit
	Replace trees and shrubs which fail in the first five years after planting. Carry out tree surgery as necessary.	
	Non-biodegradable products to be deposited. The sewage station is designed to handle natural human waste, biodegradable products and foul and storm water. This could include nappies, cleaning wipes, sanitary towels, condoms or bandages. These products will not be able to break down in the water, and they should be thrown away in a bin.	Daily
Filter Drains	Grass edges Mow 1m min. wide grass surround to drain at 100mm and 150mm maximum to filter runoff and protect drain from silt.	Monthly or as required
	Weeds Hand pull or spot treat individual weed growth only if necessary ensuring weedkiller does not enter the filter drain. Weed growth usually dies in dry weather.	As required
	Siltation at surface Where there is no protective geotextile remove all stone and perforated pipe replacing as original Spec. and include separating geotextile as below. Where there is a separating geotextile (see Spec.) then remove surface stone layer and separating geotextile that protects the stone drain below. Replace geotextile and top stone layer.	As required
Cellular storage	Ensure catchpits are installed upstream and downstream of cellular storage. These are to be emptied.	Quarterly
	Jetting should be carried out along main carrier drain through system.	As required

Feature	Maintenance	Frequency
Foul Treatment Plant (full O&M manual provided by Specialist supplier)	Removal of solidified deposits. Chamber to be emptied to remove blockages. Dirt to be removed and cleaned including sand and gravel. Sump pump to be tested to ensure in full working order.	Annually
	Check of alarm and electrical system	Annually
	Non-biodegradable products to be deposited. The sewage station is designed to handle natural human waste, biodegradable products and foul and storm water. This could include nappies, cleaning wipes, sanitary towels, condoms or bandages. These products will not be able to break down in the water, and they should be thrown away in a bin.	Daily
Pump Chamber (full O&M manual provided by Pump Specialist supplier)	Pump specification to include the following: - • Pump both treated foul and storm water effluent • Polyethylene underground chamber with pre-fitted twin pump auto coupling system, check valves, isolation valve and float switch. 1m dia x 1.8m deep. • 2 no. submersible pumps restricting flow rate to 1 l/s. • 600 x 600mm opening, double sealed. • 24hr storage in case of pump failure.	
	Removal of solidified deposits. Chamber to be emptied to remove blockages. Dirt to be removed and cleaned including sand and gravel. Sump pump to be tested to ensure in full working order.	Annually
	Back up methodologies: - • Dual pumps to be installed in case 1 of the pumps breaks down. • Twin pump control panel with metal enclosure with high level alarm and amber warning light to alert client of pump maintenance is required. • High level gravity overflow to allow water to discharge directly to the watercourse without causing localised flooding in case of pump failure	
	Certified pump maintenance contractor to service the pump and check of alarm and electrical system. Contractor to be chosen by home owner and details to be given to new home owners upon the purchase of the property making them aware of their responsibilities for the structure. Recommend Duty Point Planned preventative maintenance, and adopt a maintenance programme which includes: -	Annually (min) 6 months (recommended)

Feature	Maintenance	Frequency
	- 2 planned site visits per year - 24/7 emergency helpline Address: - Dutypoint Ltd, Unit A, Quedgeley West Business Park, Gloucester, GL2 4PA Tel:= 08082395776	
	Non-biodegradable products to be deposited. The sewage pump station is designed to handle natural human waste, biodegradable products and foul and storm water. This could include nappies, cleaning wipes, sanitary towels, condoms or bandages. These products will not be able to break down in the water, and they should be thrown away in a bin.	Daily

Section 1.03 Maintenance obligations and safety

The Site Manager should ensure that the Maintenance Contractor tasked with carrying out any maintenance works provides a risk assessment and method statement that adopts best practice health and safety policies for maintenance personnel throughout the duration of any maintenance works. Measures may include:

- Ensure the use of safe systems of work and procedures are followed.

- Certificated operatives only to be used for all confined space entry.

- Ensure appropriate PPE is worn at all times including the use of safety goggles, ear defenders and other relevant equipment when using high pressure jetting.

- Do not work in weather conditions where flooding or surging is likely.

- Erect barriers where appropriate and provide adequate lighting.

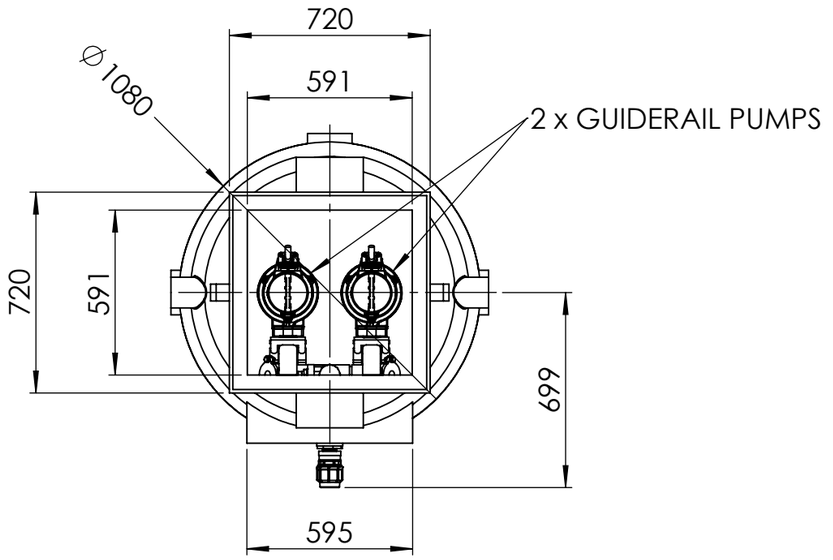
- No operations to be carried out by operatives working alone

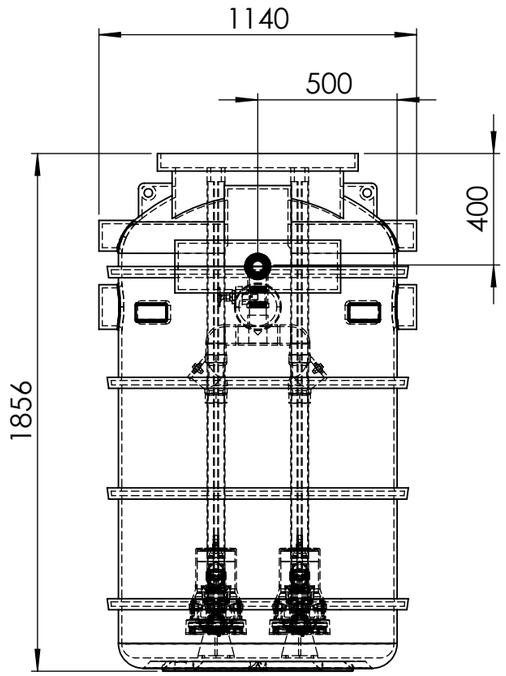
- Time maintenance to not conflict with other on-site activities.

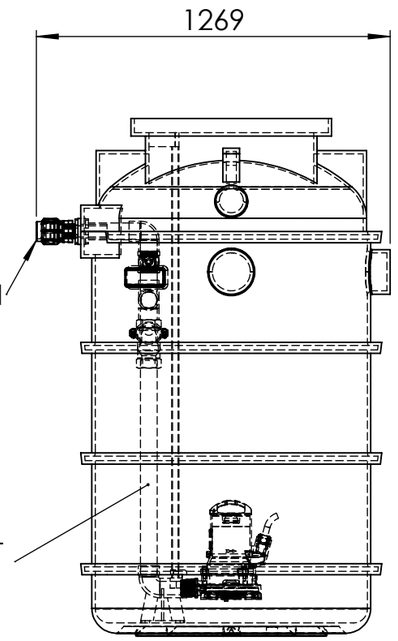
- Method statement to be prepared and approved prior to entry into confined space.

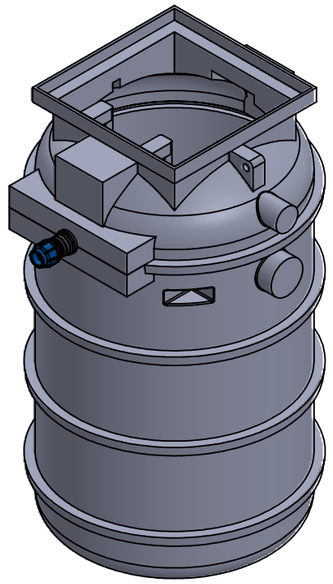
16. APPENDIX K

(Pump specification and design)









- IMPORTANT: The tank must be surrounded in concrete as per installation procedures. Refer to installation manual available from Dutypoint Ltd.
- Inlets and cable entry points to be formed in the correct positions to suit site requirements. Further detail is available in the installation manual
- Dimensions are approximate due to manufacturing tolerances. If critical, check physically prior to installation.

CUSTOMER:	
PRINT NAME:	
DATE:	
SIGNATURE:	

DUTYPOINT SETTING THE BAR

SHEPHERD ROAD, GLOUCESTER GL2 5EL
(T): 01452 300 110

PROPRIETARY & CONFIDENTIAL
DO NOT SCALE THIS DRAWING
IF IN DOUBT

THIRD ANGLE

DRAWING NO:	**10-005079-000**		REV:	**01.00**
BIM NO:	XXX-XXX-XX-XX-XX-X-XX_XX_XX-XXXX-XX-XXX			
DESCRIPTION:	T10.190.2P.50.GR			
PROJECT NAME:				
MODEL NO.				
SERIAL NO.			SHEET NO.	1 OF 1
PROJECT NO.			SCALE:	1:22
DRAWN BY:	DARREN LUSTY	28/04/2022	SHEET SIZE:	A3
APPROVED BY:	-	-	WEIGHT KG:	

DUTYPOINT

PUMPS I SYSTEMS I SERVICING I KNOW-HOW

Flow Civil Engineering
118 Tuffley Avenue
Gloucester

GL1 5NS

	Proposal No. 501518/599277
Date	05/01/2024
Attention	Gareth Jones
Sales Contact	Nick Tanner
Direct Dial	07385 974479
Email	nick.tanner@dutypoint.com
Your Ref	The Yard, Littleton Upon Severn - 501518

Product Proposal

The Yard, Littleton Upon Severn - 501518

Dear Gareth,

Reference your enquiry for packaged pumping stations for above project, I have pleasure in offering a quotation for the pump station and other associated equipment.

Full details are attached but please do not hesitate to contact me should you require any further information.

Regards,

Nick Tanner

Notes:

- Please check the key selection criteria information stated within this quotation. Where key information is not available, assumptions may have been made in order to complete the selection for quoting purposes. Any changes to the selection criteria may result in a change of required pump station specification and assicated costs.

- Please check cable lengths specified. Cable is required to reach from the bottom of the chamber to the control panel via cable duct, with minimum 2m spare flex. If longer length is required additional costs will apply.

Pump Station 1 (Combined Pump Station)

Key Selection Criteria: **(Scheme Drainage Plans ref. 2239 - 7002 Rev. P04)**

Effluent Type	:	Foul and SW	**Final Outfall Level**	:	49.100
Cover Level	:	49.700	**Top Water Level**	:	48.375
Lowest Inlet Level	:	48.375 *(1.325 m below CL)*	**Rising Main Length**	:	26m
Maximum ground water level	:	49.200	**Distance from Pump Chamber to Control Panel**	:	<10m

Scope of supply:

- Vortech Polyethylene vertical underground chamber pre-fitted with twin pump auto-coupling system, guiderails, internal pipework, check valves, isolation valve and float switch bracket, c/w inlet and vent/duct connections to suit site requirements
- 2no submersible drainage pumps c/w lifting chains and D shackles
- 400v DOL Twin Pump Control Panel with metal enclosure, adjustable overloads, VFC's, klixons, hand/off/auto selectors, run and trip lamps and high level alarm. Timer added to control panel to restrict flow to an average of 1 litres/sec.
- 4no Single Acting Float Switches
- Galvanized Pressed Steel Access Cover 600x600 clear opening, Facta AAA (2.5T SMWL) Load Rating, Double Seal with Locking Screws
- Delivery to site of all the above (offloading by others)

Specification:

Civils Data:

System Type	:	T10.190.2P.50P.GR02
Chamber Size	:	1m Ø x 1.8m deep
Access Size	:	600x600
Cover Depth	:	100mm (depth from cover level to top of turret)
Total Storage Volume	:	1060 Litres
Design Storage Volume	:	220 Litres (below TWL of 48.375)
Rising Main Required (by others)	:	50mm SDR11 PE100 Pipe
Discharge Connection	:	50mm Compression to suit PE pipe

Inlet Connections Included:

110mm:	:	0
160mm	:	2
200mm	:	0
300mm	:	0
450mm	:	0
600mm	:	0

M&E Data:

Pump Model	:	F-05U 0.4kW 2" 3ph	**Impeller Type**	:	Vortex
Design Flow Rate	:	1 l/sec	**Design Total Head**	:	1.8 m
No of pumps	:	Two	**Configuration**	:	Duty / Standby
Motor Rating	:	0.4 kW	**Full Load Current**	:	1.3 Amps per pump
Motor Speed	:	2780 RPM	**Internal Pipework**	:	50mm PVC
Cable Length	:	10 m	**Level Control Type**	:	Floatswitch
Control Panel	:	CK19T/1-1.6	**Method of Starting**	:	Direct Online
Supply Voltage	:	400/3/50			

Total Package Price	:	**£3,440.00**
Commissioning Price	:	**£550.00**
Estimated Lead Time	:	**2 Weeks***

VORTECH™ by DUTYPOINT

Optional Additional Items

Commissioning

Commissioning is priced per pumping station (see previous pages) and is based on the selection criteria stated for each pump station. Any changes to this critera may affect the price.

Commissioning includes pulling pumps and float cables through the cable duct and connecting into the control panel, installing pumps into the chamber, setting float switches to the required levels, testing and commissioning the installation. Basic tasks as outlined in our pre-commissioning checklist are to be carried out by others prior to commissioning. Should an additional visit be required due to incompletion of any of these tasks (unless by prior agreement), additional charges will apply.

Please allow 4 weeks lead in from booking to commissioning date to allow for completion of the necessary pre-commissioning checks. In some cases we may arrange an engineer inspection visit prior to the commissioning date.

A package discount may be available If multiple pumping stations can be commissioned within the same visit. Please contact your sales representative for further information.

SMS Autodial Alarm System (per pump station) **£520.00**

Messages including power failure, pump/s tripped, high level alarm can be sent to up to 3 mobile numbers/email addresses on the standard module, additional users can be added at extra cost.

GRP Kiosk (per pump station) **£560.00**

Weatherproof GRP Green Kiosk 1250 High x 750 Wide x 400 Deep. For protection of control panels where situated outdoors.

Flashing Alarm Beacon **£32.00**

24V AC/DC Red LED Flashing beacon, suitable for direct mounting onto GRP Kiosk

Hole Saw Kits - For correct drilling of holes in tank wall for fitting rubber inlet seals (poly tanks)

HSK-140 - 140mm hole saw to suit 110mm wall seal	**£35.00**
HSK-177 - 177mm hole saw to suit 160mm wall seal	**£43.00**
Arbor for Hole Saw	**£15.00**

Clients Responsibility:

- Unloading at site (unless otherwise stated by Dutypoint in writing)
- Cable containment between pump chamber and control panel.
- Installation of control panel kiosk (if applicable)
- Mounting of control panel in final location
- Provision of mains power and isolation to the control panel
- All civil works including tank installation and inter-tank connections (if applicable)
- To make certain that any equipment purchased is suitable for the duty and medium type
- To assess ground conditions and advise if ground water could exceed 2m above the base of the manufactured chamber or there is a possibility of flooding. In this situation a different specification may be required.
- To assess vehicular loading requirements if applicable, and ensure the chamber backfill & cover slab design (by others) is sufficient to protect the chamber from direct loading.
- To assess required cable lengths. Standard cable length offered is stated in above specification. Minimum cable length required is the depth of chamber plus distance via duct/cable containment to the control panel, plus 3m spare.
- To install equipment in accordance with instructions, paying attention to the effects of up-thrust created by chambers containing air when being installed and in operation.
- To ensure the solids handling capability of the pumps is suitable for the duty and to ensure the system is only required to handle waste water or human waste and normal toilet paper as appropriate. Systems to handle wipes or other fibrous material can be specified if required.

***Despatch:**	Lead times quoted are in working weeks, and subject to current production availability at time of order. Where drawing sign-off is required, the quoted lead time is from receipt of drawing approval.
***Validity:**	30 days from date of quotation
***Carriage:**	Included (with offloading by others unless otherwise stated by Dutypoint in writing)
***Payment:**	30 Days from invoice date subject to approved credit account
***VAT:**	All prices are subject to VAT at the relevant current rate
***Terms:**	Dutypoint Ltd Terms and Conditions of Sale apply available at www.dutypoint.com
***Discount:**	The prices quoted are net and main contractors discount is not applicable
***Retention:**	No retention time/percentage will apply unless otherwise stated by Dutypoint in writing
***Contract:**	The goods are quoted on a 'supply' basis and a sub-contract cannot be accepted for this quotation unless otherwise stated by Dutypoint in writing. Where installation or commissioning is quoted and the customer requires these elements to be carried out as a sub-contract, a separate sub-contract may be accepted subject to the specific terms.