PROPOSED DEVELOPMENT ON LAND AT No.22 STATION ROAD. WARMINSTER. BA12 9BR

FLOOD RISK ASSESSMENT INCORPORATING SUSTAINABLE SURFACE WATER DRAINAGE STRATEGY

J-2865-Rev.02

Engineering & Development Solutions

www.eadsolutions.co.uk

PROPOSED DEVELOPMENT ON LAND
AT
No.22 STATION ROAD. WARMINSTER.
BA12 9BR

FLOOD RISK ASSESSMENT INCORPORATING SUSTAINABLE SURFACE WATER DRAINAGE STRATEGY

Report No.	Issue Detail	Originator	Date	Checked by	Date
J-2865	02	TPS	15/05/24	LT	15/05/24

For: Gainsborough Group Construction Ltd
Western Farm
32 Taunton Road
Pedwell
Ashcott
TA7 9BG

Job No: J-2865
Date: May 2024
Edition: 02

CONTENTS

Item	Content	Page No.
1.0	Introduction	1
2.0	Site Location and Description	2
	2.1 Site Setting	2
	2.2 Topography	3
	2.3 Site Setting Site	3
	2.3 Hydrology	3
	2.4 Geology	5
3.0	Site Usage	8
	3.1 Current Use	8
	3.2 Proposed Use	8
4.0	Assessment of Flood Risks	9
	4.1 Fluvial and Tidal Flooding	9
5.0	Design Standards	14
6.0	Proposed Sustainable Drainage System (SuDS)	16
7.0	Proposed foul Drainage System	21
8.0	Summary and Conclusions	22

APPENDICES

Appendix A	Proposed Site Layout and Site Topographic Survey
Appendix B	BGS Borehole Log
Appendix C	Plans Showing Conceptual Surface and Foul Water Drainage Solutions
Appendix D	Results of Percolation Testing
Appendix E	Hydraulic Calculations for Soakaways

1.0 INTRODUCTION

Gainsborough Group Construction Ltd are proposing to undertake a development on land situated at no. 22 Station Road in the town of Warminster, Wiltshire.

According to flood risk maps published by GOV.UK the site lies entirely within Flood Zone 1 (low risk of flooding from fluvial and tidal sources). The site is not located within a designated Critical Drainage Area or within an area known to be affected by other sources of flooding. However, the development would be classified as a Major Development in planning terms and as such will require a Flood Risk Assessment (FRA) in accordance with National Planning Policy Framework and Environment Agency Guidance.

This report represents the FRA for the proposed development in line with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and Drainage Guidance for Wiltshire.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Setting

The site of the proposed development is located within the town of Warminster in Wiltshire in the north part of the town between the Swan (Were) River and the Salisbury to Trowbridge railway line. More specifically, it is situated between Station Road and the Central Carpark. (see **Figures 1** and **2** below).The National Ordnance Grid Reference for the centre of the site is ST 87649 45175. The site previously formed part of the external areas and parking facilities associated with the former Warminster Police Station on Station Road.

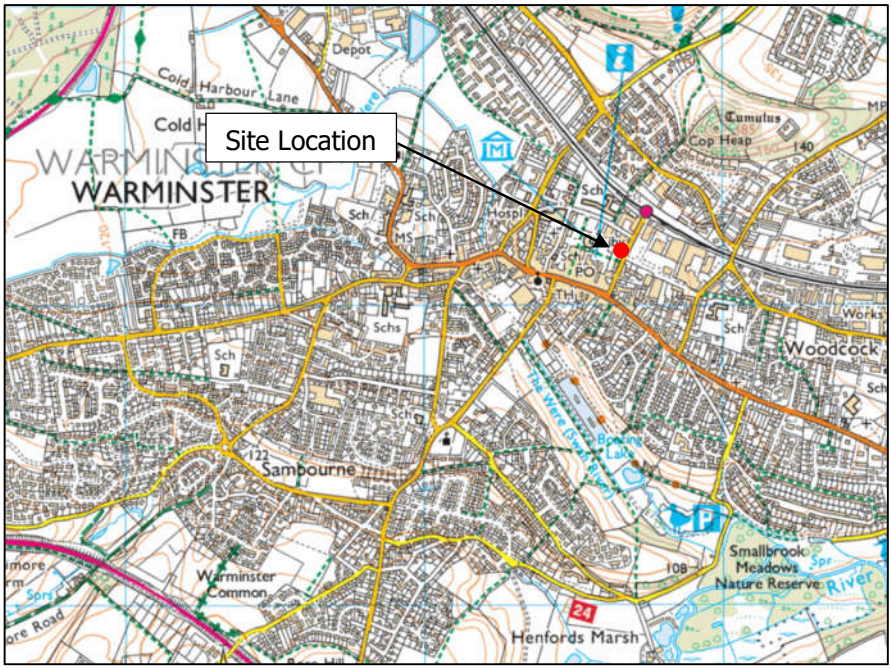


Figure 1 Site Location Plan

Vehicular access to the site is from Station Road via the service road leading to the Central Carpark. The Central Carpark lies to the immediate west of the development site and buildings associated with the former police station abut the east boundary of the site. There are existing residential properties to the immediate north of the site and commercial/retail premises to the south.

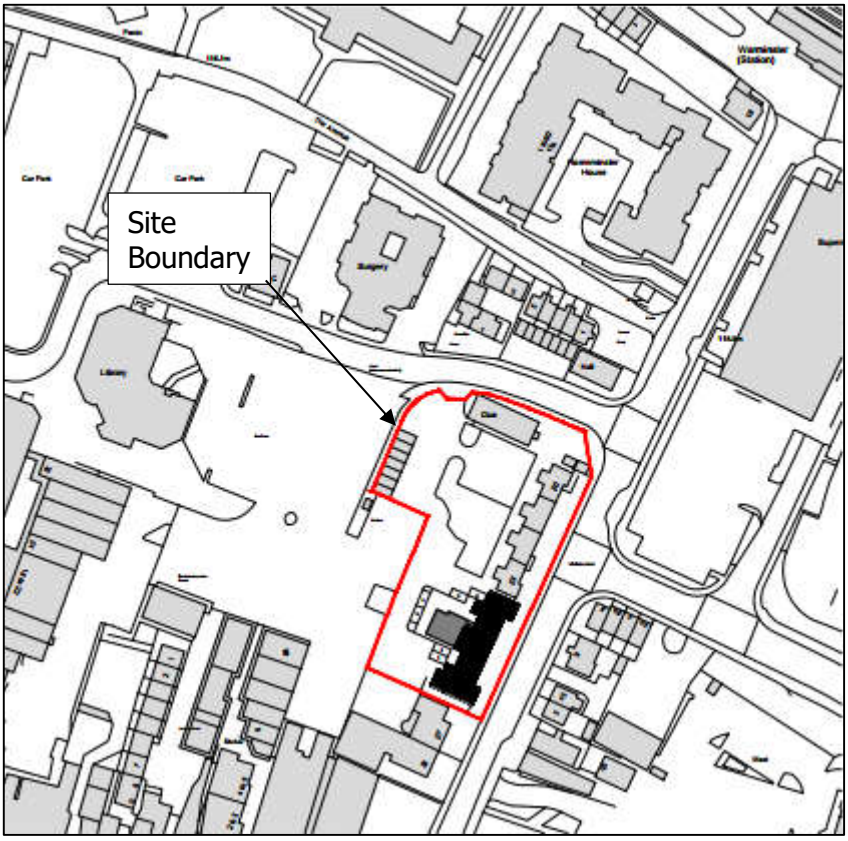


Figure 2 Site Boundary Plan

2.2 Topography

With respect to topography, the site is relatively flat and set at a typical elevation of about 117.50m AOD; there is a gentle fall across the site generally from east to west at a gradient of about 1 in 60. In the wider context the land surrounding the site is also similarly level, with a gentle overall fall in a southerly direction towards the valley base of the Swan (Were) River. The land rises to the north of the site to a local high point at the tumulus at Cop Head which is set at an elevation of about 185m AOD.

2.3 Hydrology

Considering local hydrology, the site lies within the catchment of the Swan (Were) River; see **Figure 3** below. The catchment area of the watercourse is about 13.8km^2 measured at the location of site; the catchment drains the urbanised areas in the northwest of the town and the rural area further to the north west as far as Upton Scudamore.

The watercourse runs at a distance of about 370m to the south west of the site; it is culverted at its closest point to the site. It enters the culvert just north of George Street and issues to the surface on the south east side of Weymouth Street (see **Figure 4** below). It then runs in open channel alongside the boating lake and joins with the River Wylye at the south east extent of the town.

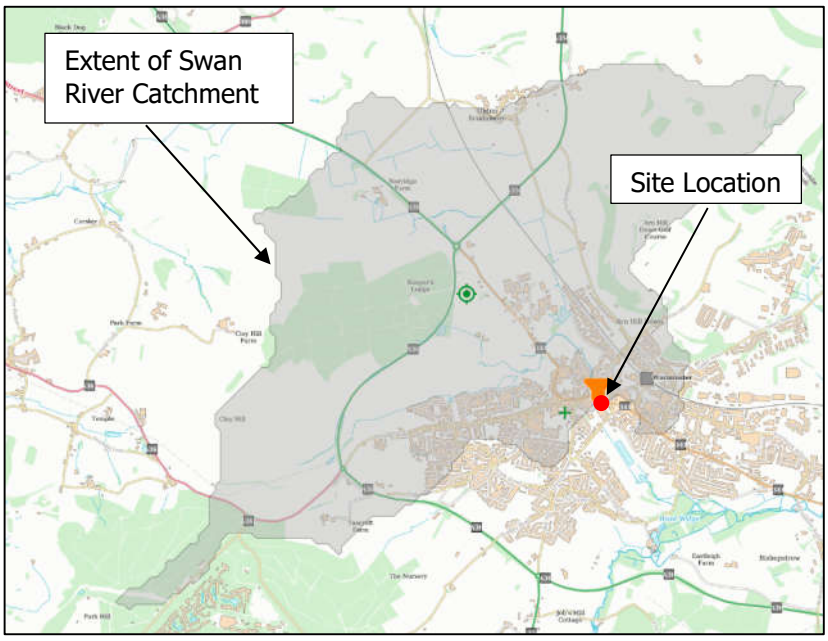


Figure 3 Plan Showing Extent of Catchment of The Swan (Were) River

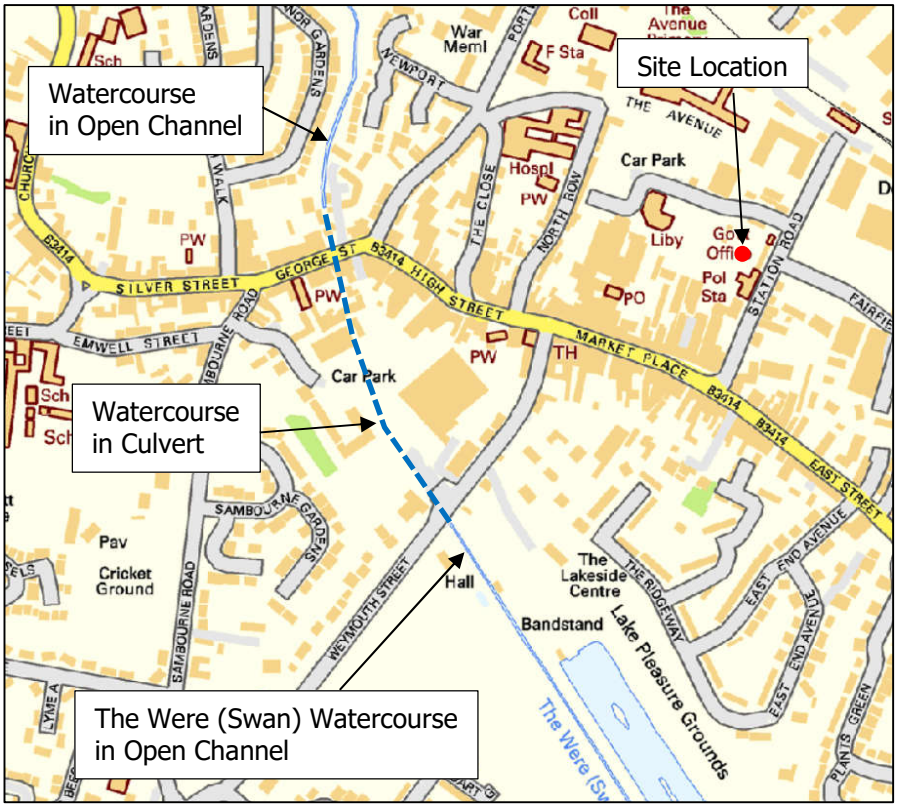


Figure 4 Plan Showing Route of The Swan (Were) River

There are no other readily apparent significant hydrological features in the vicinity of the site.

2.4 Geology

With respect to its geology, reference to British Geological Service (BGS) information indicates that the site in underlain by the Boyne Hollow Chert strata; see **Figure 5** below. This comprises a sandstone sedimentary bedrock. There are no superficial deposits shown to exist on the site.

The nearest chalk deposits are shown to lie on the north side of the railway line at some distance from the site.



Figure 5 BGS Plan Showing Local Bedrock Geology

The Wiltshire Council Strategic Flood Risk Assessment Level 1 document (Figure 4.1) confirms that the site lies just within the Gault and Upper Greensand formations of mudstone, sandstone and limestone.

There are a number of BGS boreholes located close to the site as demonstrated in **Figure 6** below. Borehole reference ST84NE111 is located close to the site and is fairly representative of ground conditions encountered in the nearby boreholes; a copy of the associated borehole log is appended in **Appendix B**. The borehole log shows made ground present to a depth of 0.4m below ground level (bgl) overlying a loose silty SAND (UPPER GREENSAND); the sand is described as becoming denser with depth and containing bands of weak sandstone. This material is proven to a depth of 3.45m bgl.

No ground water is shown within the log; however, a slight seepage is noted at the base of the pit (3.45m bgl). It is noted that the borehole was constructed in late February when seasonal groundwater is likely to have been at its highest level.

Trial pitting has been undertaken on the site in connection with this application for the purposes of undertaking percolation testing in accordance with Building Research Establishment Digest 365.This trial pitting has confirmed the presence of the UPPER GREENSAND commencing at a depth of about 0.6m below ground level (see Photo 1).

No groundwater was observed in any of the trial pits to a depth of about 2.2m bgl. The trial pits were constructed in February and March 2023, again when seasonal groundwater is likely to have been at its highest level.

When considering all available information, the site geology is confirmed to be a shallow mantle (0.4m - 0.6m) of made ground/topsoil overlying silty SAND (UPPER GREENSAND) which is most likely residual weathered sandstone from the Boyne Hollow Chert strata. The sand becomes denser with depth transitioning into a weak sandstone bedrock at further depth. The water table is typically at a depth of 3.45m bgl or lower during the late winter season.

There are no chalk deposits under the site.

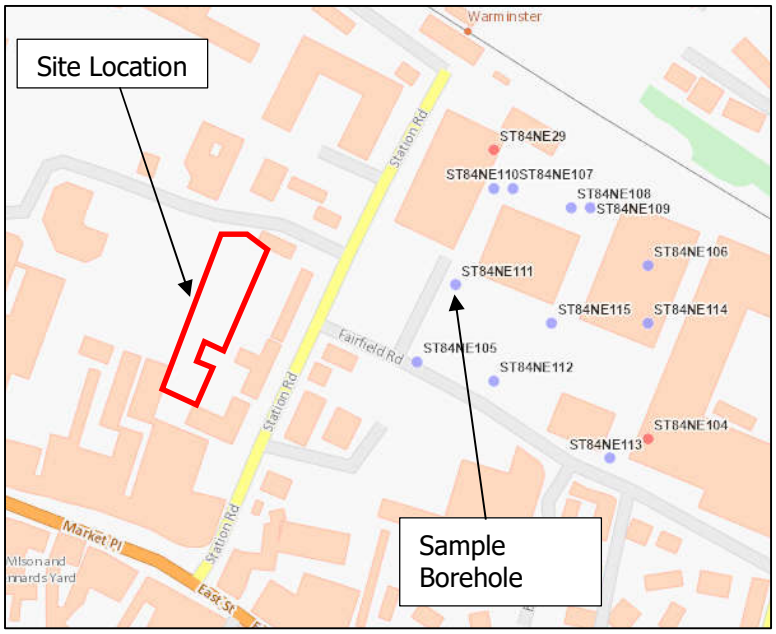


Figure 6 Plan Showing Local BGS Borehole Records



Photo 1 View of BRE 365 Trial Pit

3.0 SITE USAGE

3.1 Current Use

The site currently comprises disused car parking facilities and external landscape areas associated with the historic operation of the former police station on Station Road. There is a disused single storey building located close to the north boundary of the site and flat roof garage block located against the west boundary of the site.

Vehicular access into the site is directly off the side road onto Station Road which serves the local car park. A topographic survey of the existing site is provided with **Appendix A**.

3.2 Proposed Use

The development proposal is to construct two main apartment blocks (Blocks A and B) on the site in the approximate location of the existing buildings; these two block will accommodate 17no. residential units. A coach house (Block C) accommodating three residential units is proposed in the centre of the site and a cottage block (Block D) accommodating two units is proposed at the south end of the site. Parking and access roads will be provided on site to serve the new buildings. The access into the site off the side road from Station Road will be retained.

The proposed arrangement is demonstrated within the drawings attached in **Appendix A**.

4.0 ASSESSMENT OF FLOOD RISKS

4.1 Fluvial and Tidal Flooding

With reference to published Environment Agency (EA) flood risk maps (see **Figure 7** below) it is apparent that the footprint of the site lies entirely within Flood Zone 1; the principal access/egress route to the site along Station Road to the B3414 and beyond also lies within Flood Zone 1.

The nearest area of Flood Zone 3 (high risk) lies along the corridor of the Swan (Were) River and around the Warminster Lake Pleasure Grounds; this is a distance of some 350m and downslope of the site, so represents no meaningful flood risk to the proposed development.

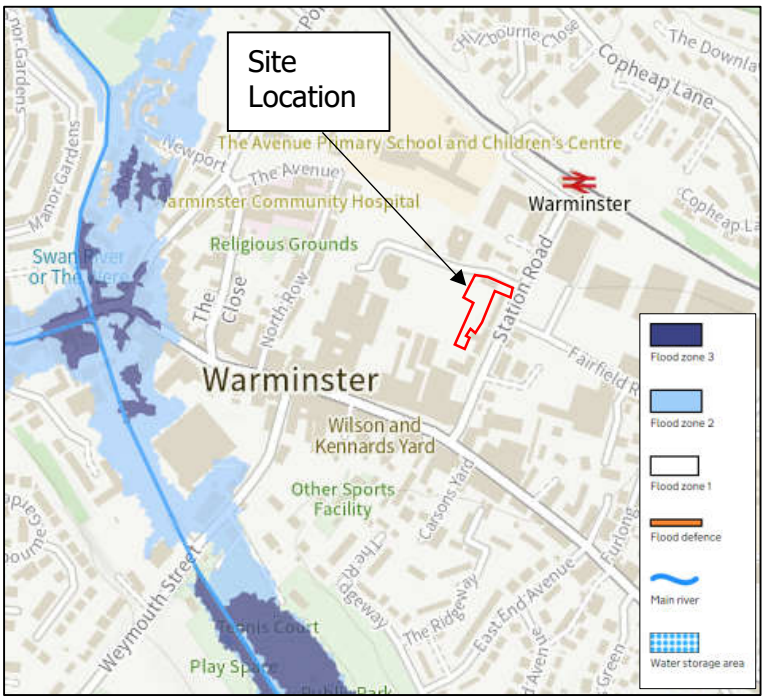


Figure 7 Environment Agency Flood Zone Map Extract

Being at an elevation of 117m AOD, tidal flood risk is not a consideration.

Groundwater Flooding

Groundwater flooding is linked to the ability of the ground to hold water and the presence of aquifers; flooding occurs when the level of the groundwater reaches the ground surface and subterranean water is issued to the surface.

The Wiltshire Council Level 1 Strategic Flood Risk Assessment (SFRA) provides some advice on the risk of flooding from groundwater within the County. The SFRA notes that the highest risk areas can be found in the western part of Salisbury and to the south of the town east of Bodenham.

Other high-risk areas are given as including Chippenham, Calne, Melksham, Trowbridge and Cricklade. Examples of historic flood records are also provided but no reference is made to Warminster in any of the SFRA text with respect to groundwater flooding.

The Wilshire Council Groundwater Management Strategy 2016 document notes that groundwater flooding in Wiltshire is primarily due to flooding mechanisms in the chalk and occurs mainly in the south and south east of the county. No reference is made to Warminster within the groundwater management strategy nor is it classified as an area being at significant risk from groundwater flooding or an area with a history of groundwater flooding.

Therefore, on the basis of the SFRA and the Groundwater Management Strategy document ,there is no reason to conclude that Warminster is an area at significant risk of flooding from groundwater sources.

In addition to this, intrusive trail pitting and boreholes undertaken close to the site indicate that the groundwater level is depressed to a level of at least 3.5m below ground level in the winter period.

The site and the surrounding land fall at a relatively constant rate and the site is not situated in a depression in the local landscape or other feature which would act to impound the onward flow of groundwater. Therefore, in the unlikely event that groundwater did issue to the surface for any reason, then it would be free to flow away across the surface of the ground at shallow depth.

Given the above, it is considered that groundwater flooding does not pose a significant risk to the site, so groundwater flooding will not be considered further in this report.

Overland/Surface Water Flow

The land profile in the vicinity of the site rises very gently to the north towards the railway line and then rises more steeply to the north east up to the high point at Cop Head and ridge linking Cop Head with West Wilts Golf Club.

In consideration of this it is apparent that the immediate upslope catchment comprises the urbanised area of the north part of the town becoming more rural but steeper in nature towards the top of the catchment. There is potential for runoff generated over this area to approach towards the site.

It is anticipated that a large proportion of overland flows generated in the upper catchment would be intercepted by the railway line and carried along the corridor of the railway line and as such would not encroach onto the site. Residual flows from the catchment downslope of the railway line are likely to be intercepted by the surrounding highway and drainage networks with the channels of the roads acting as overland conveyance features. It is anticipated that Station Road would act as a principal conveyance feature and carry flows to the south into the lower part of the town.

The EA map extract, **Figure 8** below, shows the risk of flooding from surface water for the site.

This shows surface water from the upper catchment to be intercepted within the corridor of the railway line as anticipated; the flow runs to the east along the railway line without approaching towards the site.

Surface water in the lower catchment is shown to pond on Fairfield Road and on Station Road where a medium risk of flooding is shown to exist. The access road into the site and the section of Station

Road to the north up to the railway station is shown to be completely free of flooding. Otherwise, all flow is shown to be retained within the channel of the road and no flow enters onto the site.

In consideration of this, flooding from surface water is not considered to represent a significant risk to the development and it is discounted from further consideration.



Figure 8 Environment Agency Risk of Surface Water Flooding Map

Flooding from Reservoirs, Canals and other Artificial Sources

With reference to the 1:25,000 Ordnance Survey mapping there appear to be no impounded waterbodies within the vicinity of the site apart from the Shear Water Reservoir. This reservoir is situated within the adjacent valley to the site, so any catastrophic release from this reservoir should be retained within the adjacent river valley.

The GOV.UK long term flood risk map provides a predicted extent of inundation from failure of the Shear Water Reservoir and this shows that the site lies outside of the flooded extent. Notwithstanding this, current regulations included in the 'Reservoirs Act' and the recent changes under the 'Flood Water Management Act' aim to ensure that reservoirs are inspected regularly, and the owners are obliged to inspect their reservoirs and ensure essential safety work is carried out.

This system ensures that the risk of catastrophic failure of reservoirs in the UK is extremely low.

The water body associated with the Warminster Lake Pleasure Grounds is set at an elevation some 3m below the site so any release of flow from this feature is unlikely to move towards the site. In consideration of the above it is concluded that the risk of flooding to the site from reservoirs and artificial sources is extremely low and this mechanism of flooding is discounted from further consideration.

Flooding From Sewers

Reference to Wessex Water`s (WW) asset mapping system indicates that there is a 150mm diameter foul sewer routed under Station Road flowing in a southerly direction; there are also 225mm and 150mm foul sewers routed under Fairfield Road which discharge into the sewer in Station Road adjacent to the site, see **Figure 9** below. The sewer in Station Road is located nominally downslope of the site.

In the event of wastewater being issued to the surface from chambers on the sewer, then flow would run to the south along Station Road with the fall of the land; flow would most likely be retained within the channel of the roadway by the edging kerbs and would not encroach towards the site As such, the risk of flooding from sewerage is considered to be very low and entirely acceptable.

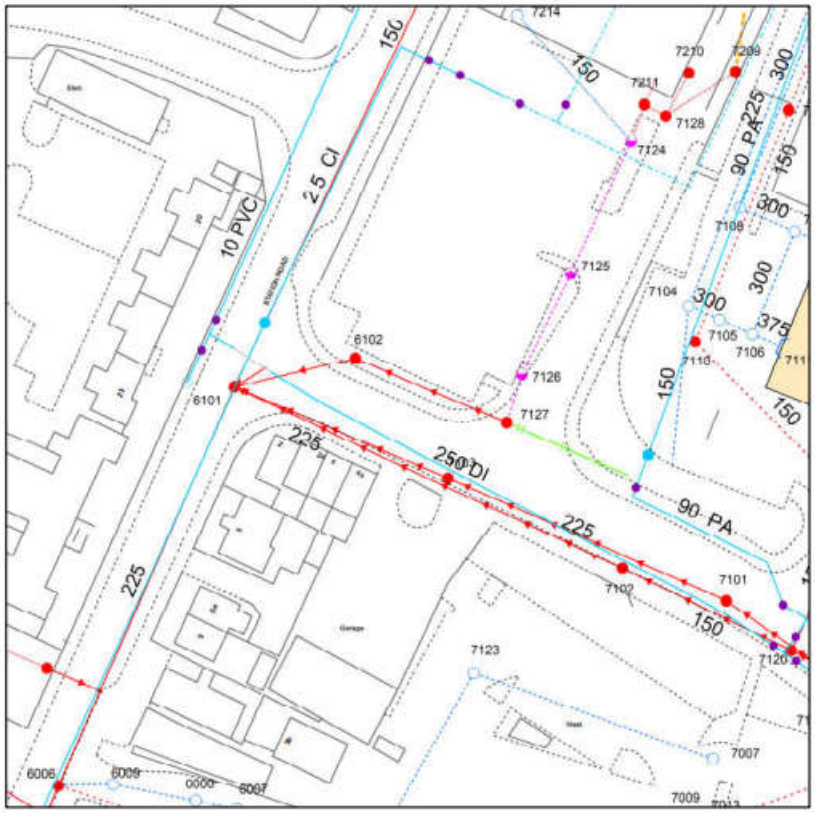


Figure 9 Extract from Wessex Water Sewer Mapping

Flooding as a Result of Development

Development and paving of permeable areas has the potential to increase flood risk to properties downslope of the proposed development.

In this case the proposed development will result in the introduction of new roof and parking areas totalling some 1,600m^2 in surface area, though this will be offset to some extent by existing impermeable areas on the site which will be removed.

The design of the proposed sustainable drainage system serving the development is key to mitigating flood risks associated with surface water runoff . By designing the surface water drainage infrastructure in accordance with the advice reproduced in **Section 5**, the proposed development will offer a betterment in flood risk to third parties downslope.

In consideration of the above the proposed sustainable drainage system to be installed within the development is described in more detail in **Section 6** of this report.

5.0 DESIGN STANDARDS

Design of the site drainage infrastructure and Sustainable Drainage System (SuDS) is to be carried out in line with best practice, and to industry standard design procedures. Several publications, including design guidance and best practice guidance will be applied to different components of the final SuDS infrastructure. The sections below provide an overview of the design standards to be used on this project for various aspects of the SuDS infrastructure design.

The CIRIA SuDS Manual (C753)

This document is a comprehensive publication covering design, construction, operation, and maintenance of SuDS. The advice and best practice outlined in this document has been used in the design of the site SuDS features which have been detailed in this report.

Building Regulations Part H

Building Regulations Part H 'Drainage and Waste Disposal' covers the design and installation of surface water systems. All private drainage including pipes, manholes, down pipes, and other drainage infrastructure on the site should be designed and installed in accordance with this document.

The Wallingford Procedure

Developed by HR Wallingford, this publication covers the design of urban drainage systems. In addition, the document includes regional rainfall data for use in design for varying return period events. Basic sizing calculations for the proposed SuDS system and the estimation of the runoff volumes have been made using this method.

National Planning Policy Framework

The National Planning Policy Framework (NPPF) contains policy relating to the appropriate assessment of flood risk within the UK. The associated technical guidance provides further details on the definitions, classifications and constraints used to apply national policy to new developments.

It contains details on flood zone definition, site specific FRAs, vulnerability classifications, appropriate development, climate change allowances, residual risk management, flood resilience, the sequential test and the exception test.

Wiltshire County Council Design Guidance

Wiltshire County Council (WCC) have published relevant guidance for developers on flooding, drainage and SuDS including the following;

- WCC Developers Guidance Note – Flooding, Drainage and SUDs
- WCC Developers Guidance Note – Surface Water Soakaways

Sewerage Sector Guidance

This document offers guidance in relation to the adoption of sewerage assets by sewerage companies in England.

Any surface water sewers to be offered for adoption by WW will be designed in accordance with Design and Construction Guidance for surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code").

6.0 PROPOSED SUSTAINABLE DRAINAGE SYSTEM (SUDS)

The preferred surface water drainage solution for the site would be to drain all surface water runoff from the development using infiltration methods, in line with best practice guidance for sustainable drainage.

To this end percolation testing has been undertaken on the site in accordance with BRE Digest 365; the testing was undertaken over the period February and March 2023. Test pit locations are demonstrated within drawing **J-2865 -3001** attached within **Appendix C** and test results are attached in **Appendix D.** Testing showed that the Upper Greensand subsoil on the site has fast to moderate infiltration rates of 0.15 m/hr to 0.18m/hr.

No groundwater was observed during the testing ,however, information from nearby boreholes suggests that groundwater levels in the winter will be depressed to a level of at least 1.3m below the base of any soakaway.

In view of the favourable ground conditions a fully infiltration based drainage system is proposed for the management of surface water runoff from the development.

Reference has been made to Wessex Water Infiltration Reduction Area mapping (see **Figure 10** below) and it is noted that the town of Warminster is not classified as an Infiltration Consultation Area regardless of the size of development. This supports the concept of using infiltration drainage for surface water disposal at this site.

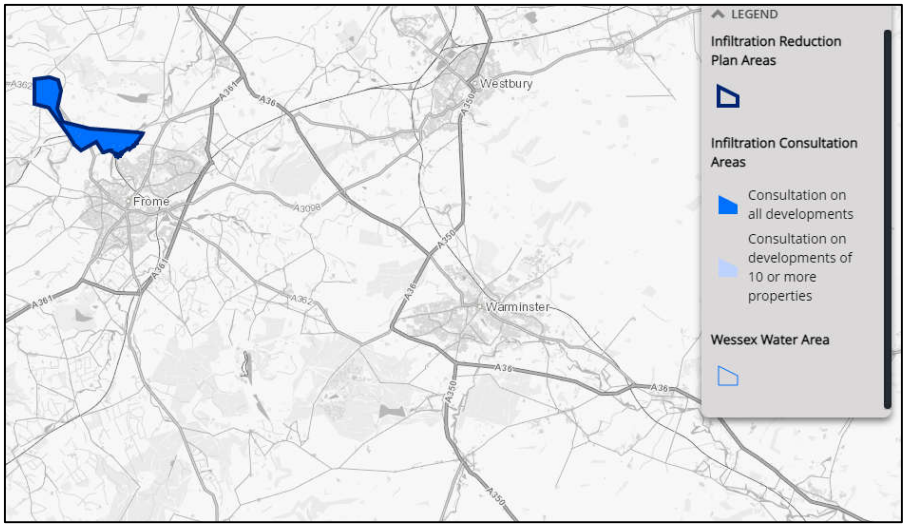


Figure 10 Extract from WW Infiltration Reduction Plan Areas

It is confirmed that the site lies outside of a drinking water Source Protection Zone (SPZ).

Engineering and Development Solutions Ltd
Registered Office: Engineering and Development Solutions, Unit E4, Truro Business Park, Truro, Cornwall, TR4 9DL
Registered in England and Wales No. 10467487
Phone 01872 306311 Mobile 07973816457

It is proposed to discharge all surface runoff from the development to ground infiltration drainage systems constructed within the curtilage of the site. Roof runoff from the four accommodation blocks will be directed to ground soakaways constructed from modular infiltration units. With regard to external paved areas such as the access road, parking areas and turning heads, these areas will be constructed in permeable materials with a porous sub base such that precipitation falling on these areas will permeate through the surface construction and infiltrate into the subsoil beneath.

The proposed surface water drainage layout is demonstrated within drawing **J-2865-3001** attached in **Appendix C**.

There is limited soft landscaping area available within the proposed development layout to accommodate soakaways. The potential available area is further reduced when taking into account the 5m exclusion distance required between buildings and soakways under the Building Regulations. As such, it has been necessary to position the proposed soakaways for the accommodation blocks beneath the parking and turning head areas.

With reference to drawing **J-2865-3001** ,it is proposed that runoff from the roofs of the two principal accommodation blocks ,apartment Blocks A and B, will be taken to a common soakaway (SA1) constructed beneath the parking area adjacent to Block B.

Runoff from the roof of the Coach House (Block C) will be taken to a single soakaway (SA2) constructed beneath the adjacent turning head. Runoff from the roof of the Cottage Block (Block D) will be taken to a single soakaway (SA3) constructed beneath the adjacent turning head.

Soakaways will be constructed from modular units suitable for installation beneath trafficked areas such as the Wavin Aquacell Core R System which may be installed with a ground cover of 0.6m or greater in such situations. Catchpit chambers will be provided at the inlet to each soakaway for the removal of grit and gross solids.

All soakaway units have been sized using Micro Drainage software for a rainfall event with a 1 in 100 years return period with 50% uplift on rainfall to allow for climate change effects. Associated hydraulic calculations are provided within **Appendix E**. The area of permeable paving directly above the soakaways have been allowed for within the hydraulic design of the respective soakaways.

Rainfall precipitation on the access road ,parking spaces and turning head will permeate through the surface construction into the subsoil beneath. The surface of these areas will be constructed in permeable materials such as open joint block paving or porous asphalt and the finished surface will be set at a shallow gradient of no more than 1 in 60 to encourage direct percolation. A suitable depth of Type 3 (SfHW 805) open graded granular subbase, calculated to be 300mm, will be provided beneath the surface layer for the storage and dispersal of the rainfall.

Impermeable areas used in the design of the soakaways are summarized in **Figure 11** and **Table 1** below.

Soakaway Ref.	Component Areas (m2)	Total Imp. Area (m2)	Soakaway Size L x W x D (m)

SA1	(210+248) +30	488	12 x 2.5 x 1.2
SA2	202+12.5	215	5 x 2.5 x 1.2
SA3	93+7.5	101	3.0 x 2.5 x 1.2
Permeable Paving	Per m2	Per m2	0.3m Deep

Table 1 Summary of Soakaway Details

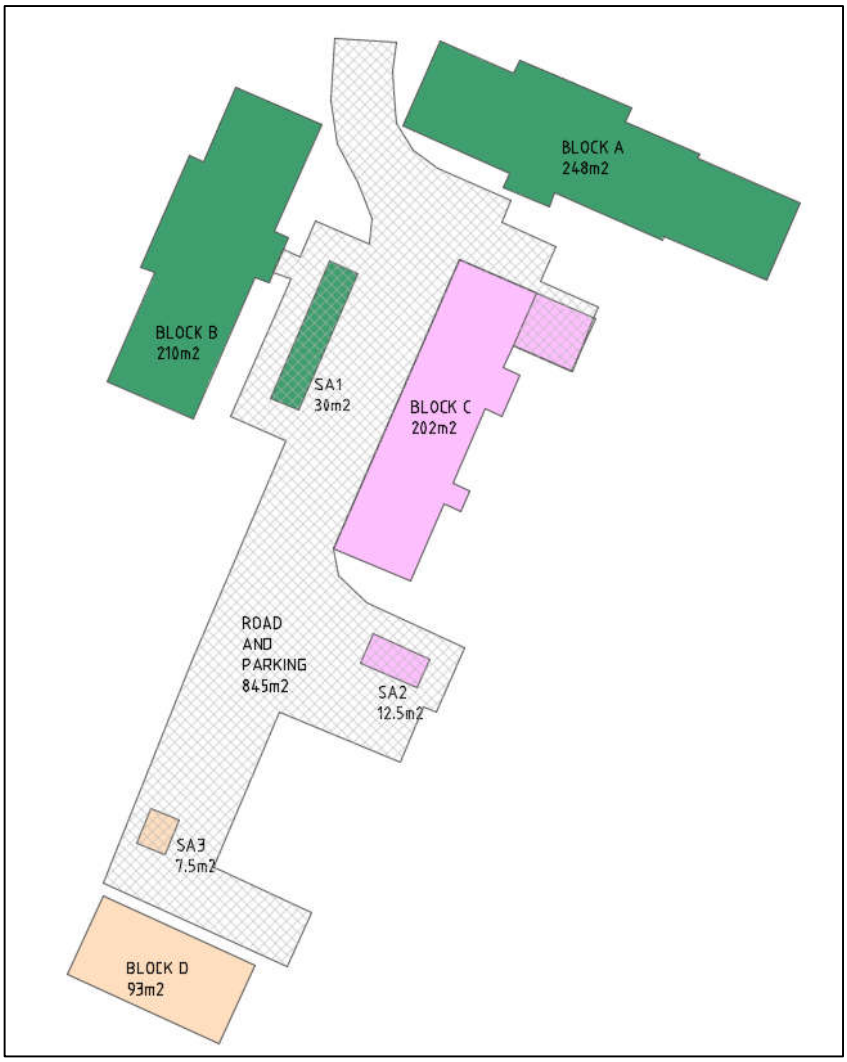


Figure 11 Impermeable Area Plan

Exceedance Events

In the unlikely event of a storm in excess of the 1 in 100-year return period rainfall event (including climate change allowance), or if the proposed drainage systems were to become blocked, water could potentially surcharge from the system.

The site is relatively flat ,however, there is a slight fall from east to west at a typical gradient of about 1 in 60. There is also a localised fall to the north onto the service around the access into the site.

As such, exceedance flows will generally run from east to west and onto the public car park on the immediate west boundary of the site. Around the site entrance, exceedance flows will be onto the service road and then to the west towards the car park.

Existing ground levels will be largely preserved within the design of the final scheme; therefore, exceedance flow routes will be unaffected by the proposed development. Due to the storage provided in the proposed drainage systems, any exceedance flows are likely to be lower than would flow off the site in the pre-development scenario for a similar storm event

Maintenance

It is proposed that all elements of the surface water drainage system will remain in private ownership and maintenance responsibilities will therefore lay with the householders or the development management company.

Maintenance activities will broadly comprise regular maintenance, monitoring and remedial work where necessary, as per the guidance in the CIRIA SuDS Manual C753 and general Susdrain guidance which is summarised in **Tables 2** and **3** below.

SOAKAWAYS		
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will required reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year then annually
	Check soakaway to ensure emptying is occurring	Annually

Table 2 Summary of Maintenance Requirements for Soakaways

GUTTERING AND RAINWATER DOWNPIPES

Regular maintenance	Inspect guttering for leaves and moss or other debris	6 monthly (or as required based on inspections)
	Cleaning of gutters and any back inlet gully grids	6 monthly (or as required based on inspections)
	Check for leaks , cracks or loose brackets	Annually (or as required)
Remedial actions	Repair and leaks or cracks in guttering and downpipes	As required
	Repair/replace loose fixing brackets	As required
Monitoring	Inspect system for satisfactory operation during heavy rainfall and check for overflow/spillages	As required

Table 3 Summary of Maintenance Requirements for Downpipes and Guttering

Residual Risks After Development

Rainfall over and above the design event could cause the sustainable drainage system to surcharge, however, any exceedance flows would be dealt with as outlined above.

The sustainable surface water drainage system proposed in this report has been designed for the volume of surface runoff resulting from the proposed development alone, thus any unauthorised future connections into the drainage network could potentially overload the system. Any future development on the site, beyond the current proposal, should be suitably planned and considered.

7.0 PROPOSED FOUL DRAINAGE SYSTEM

The preferred foul drainage solution for the site would be to drain all foul water to the public sewer in line with foul drainage hierarchy guidance.

There is a 150mm public foul sewer routed under Station Road in close proximity to the site. Therefore it is proposed to drain foul flows from the site to the public sewer; the proposed routing for the foul sewerage and connection points into the combined sewer are demonstrated within drawing **J-2865-3001** attached in **Appendix C**.

A connection point is proposed at the north end of the site to pick up foul flows from Apartment Blocks A ,B and C and this would discharge into the foul sewer by means of a new manhole to be constructed on the sewer in the road. It is envisaged that a gravity connection will be possible subject to confirmation of the depth of the sewer in Station Road.

A second connection point is proposed at the south end of the site to pick up flows from the Cottage Block building; this connection will discharge into an existing public foul water manhole situated outside of no. 27 Station Road. It is envisaged that existing private pipework serving the former police station premises will be used in part to provide a connection to the manhole.

A Section 106 application will be submitted to Wessex Water (WW) in due course to formalise both connection applications, however, this should not be unreasonably withheld by WW given that this is a foul only application discharging to a combined sewer.

8.0 SUMMARY AND CONCLUSIONS

This study has investigated mechanisms of flooding and the potential for Sustainable Drainage (SuDS) to be implemented within the proposed residential development on land at no. 22 Station Road Warminster

Environment Agency (EA) indicative flood mapping shows that the proposed development site is located entirely within Flood Zone 1; at little or no risk from tidal or fluvial flooding and is therefore suitable for all types of development.

The study has investigated alternative mechanisms for flooding at the site and has concluded that the site is not at significant risk of flooding and will not cause any increase in flood risk elsewhere, once the proposed sustainable drainage systems are operational.

The site is underlain with silty SAND (UPPER GREENSAND) which is most likely residual weathered sandstone from the Boyne Hollow Chert strata. The sand becomes denser with depth transitioning into a weak sandstone bedrock at further depth. The water table is typically at a depth of 3.45m bgl or lower during the late winter season.

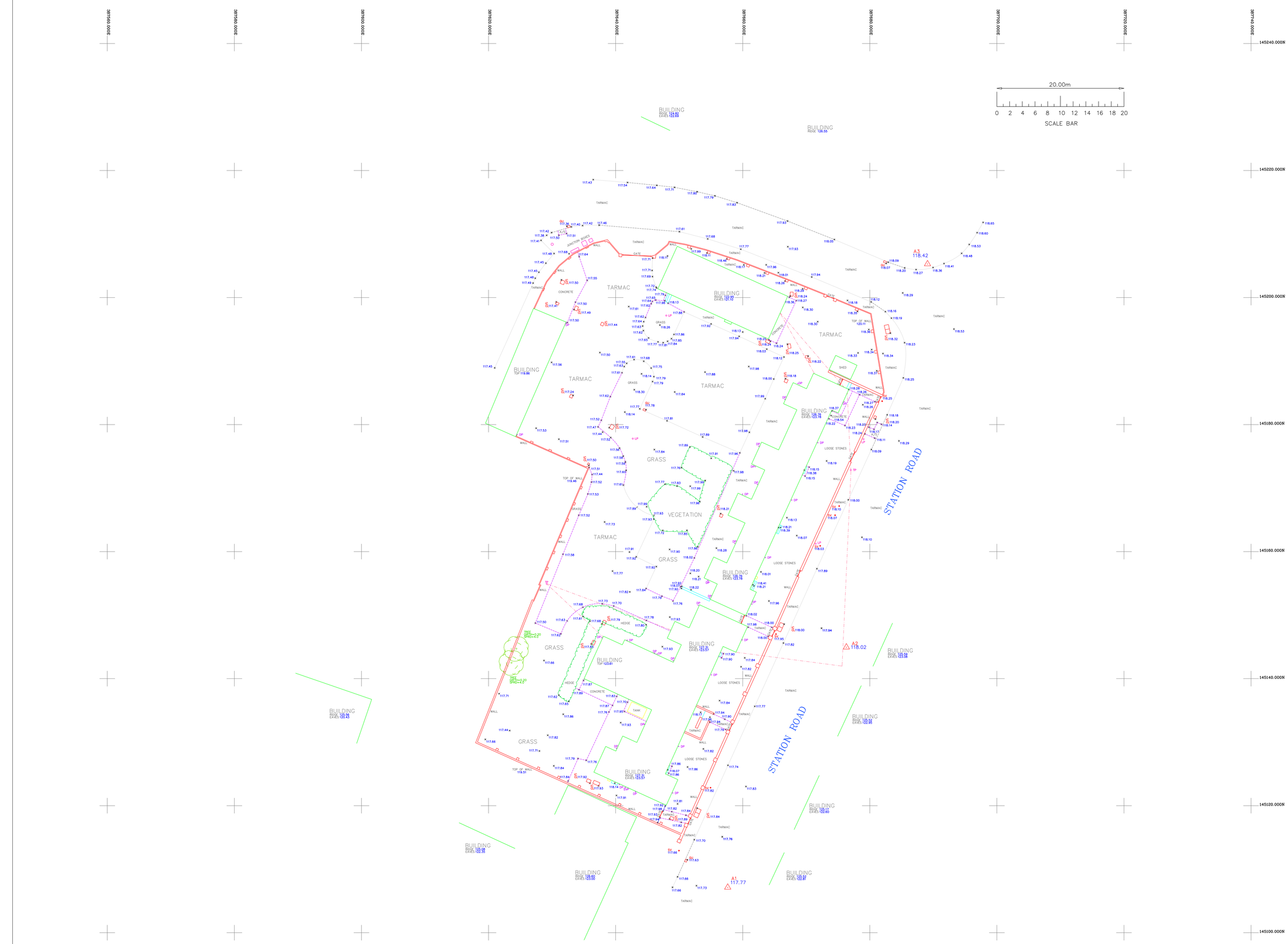
Percolation testing on site in accordance with BRE 365 has shown that the subsoil on site has fast to moderate percolation properties and is suitable for the use of infiltration drainage. As such, it is proposed to discharge all surface runoff from the development to a combination of ground soakways constructed from modular infiltration units and permeable paving, all located within the curtilage of the site.

It is proposed that foul drainage from the development will be discharged into the existing public foul sewer which is routed under Station Road.

The proposed surface and foul water drainage layout is demonstrated with drawing **J-2865-3001** attached in **Appendix C** and associated hydraulic calculation are attached within **Appendix E.**

Provided the recommendations outlined in this report are adopted in the development proposal, then there is the capacity to manage the surface water runoff from the development. The proposed drainage infrastructure has been designed in accordance with guidance outlined in the NPPF, PPG, and WCC SuDS Guidance and therefore the development is considered to be entirely appropriate on this site from a flood risk perspective.

APPENDIX A EXISTING AND PROPOSED LAYOUTS



Topographical Abbreviations

A/R	Assumed Route	MKR	Marker
BH	Borehole	MT	Mercury Telecom Cover
BOL	Bollard	OHC	Overhead Cable
BT	British Telecom Cover	OHP	Overhead Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
BWK	Brickwork	PB	Post Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker
CB	Close Boarded Fence	PR	Post & Rail Fence
CCTV	Closed Circuit TV	PW	Post & Wire Fence
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence
CHPL	Chestnut Paling Fence	RE	Rodding Eye
CL	Cover Level	RG	Road Gully
CM	Cable Marker	RN	Road Name
CP	Catch Pit	RS	Road Sign
CPL	Catch Pit Base Level	RW	Retaining Wall
DIA	Diameter	RWP	Rain Water Pipe
DK	Drop Kerb	SAP	Sapling
DP	Down Pipe	SC	Stop Cock
EJB	Electricity Junction Box	SPR	Spread
EC	Electricity Cover	STA	Traverse Station
EP	Electricity Pole	SV	Stop Valve
ER	Earthing Rod	SVP	Soil Vent Pipe
FH	Fire Hydrant	SW	Storm Water
FIG	Feed Into Ground	TB	Telephone Box
FW	Foul Water	TBM	Temporary Bench Mark
GU	Gully	TFR	Taken From Records
GV	Gas Valve	THL	Threshold Level
H	Height	TJB	Telephone Junction Box
IC	Inspection Cover	TPT	Trial Pit
IL	Invert Level	TL	Traffic Light
IR	Iron Railing Fence	TP	Telephone Pole
KO	Kerb Outlet	UTL	Unable To Lift
LB	Litter Bin	UTT	Unable To Trace
LC	Lamp Column	VP	Vent Pipe
LP	Lamp Post	WKH	Water Key Hole
MH	Manhole	WM	Water Meter
		WV	Water Valve
		- - -	Approximate

THIS SURVEY DATA HAS BEEN PREPARED FOR THE CLIENT DETAILED BELOW TO AN AGREED SPECIFICATION. UNLESS OTHERWISE AGREED IN WRITING THE LIABILITY OF REED GEOMATICS LTD IS LIMITED TO THE CLIENT OR HIS APPOINTED AGENT AND DOES NOT EXTEND TO USE BEYOND THE LIMITATIONS OF THE SPECIFICATION.

Survey Station Information

STA No.	Easting	Northing	Level	Type
STN A1	387657.639	145107.135	117.77	Nail
STN A2	387676.312	145144.948	118.02	Nail
STN A3	387689.084	145205.286	118.42	Nail

Notes

Grid: Survey is based on a modified Ordnance Survey National Grid (OSGB36), site centered (or centered on STN A1 where present) with a scale factor of 1 applied.

Values have been derived via GPS using the OS active network using the OSGM15 transformation and OSGM15 geoid model.

Level datum: Ordnance Datum Newlyn (ODN).

Rev	QA Check	Description	Date
5	"	-	-
4	"	-	-
3	"	-	-
2	"	-	-
1	"	-	-
0	GR	First Complete Issue	06-10-2022
Prelim	"	Preliminary - Not Complete	-

© Copyright Reed Geomatics Ltd 2022

REEDgeomatics
SURVEYED BY
REED Geomatics Ltd
HEAD OFFICE
16 St NICHOLAS DRIVE
SHEPPERTON
MIDDX
TW17 9LD
BRANCH OFFICE
BRANDONS VENNS GATE
CHEDDAR
SOMERSET
BS27 3LW
TEL 01932 221358
CELL 07939 100008
E-MAIL info@reedgeomatics.com
www.reedgeomatics.com

SURVEYED	TR	CLIENT:
DRAWN	TR	Gainsborough Group Construction
SCALE	1:200	

TOPOGRAPHICAL SURVEY

ADDRESS:
22 STATION ROAD
WARMINSTER
BA12 9BR

JOB No	DRAWING NUMBER
RG22 2506	01

A0 Sheet



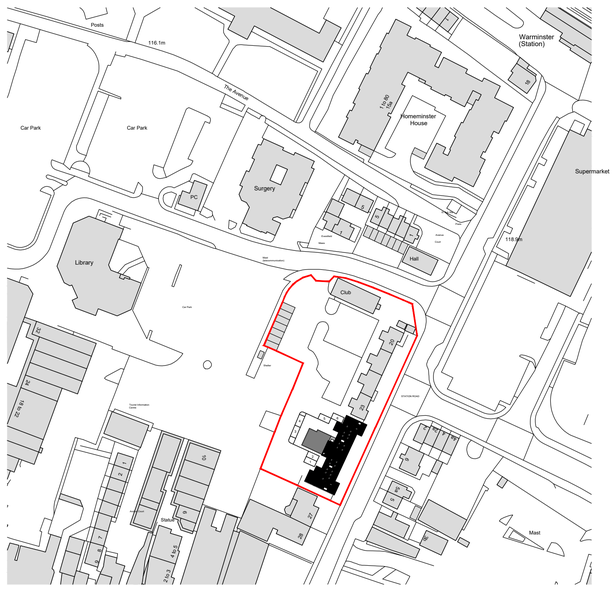
Site Layout Plan
scale 1:200

Scales
1:200 Metric Scale Bar
0 2 4 6 8 10 12

Accommodation Schedule

Type/location	Apt. no	Floor	Beds	floor area m²
Apt/Block A	1	Ground	2	68
Apt/Block A	2	Ground	2	68
Apt/Block A+	3	Ground	1	47
Apt/Block A	4	First	2+office	76
Apt/Block A	5	First	2	68
Apt/Block A+	6	First	1	56
Apt/Block A	7	Second	2+office	76
Apt/Block A	8	Second	2	68
Apt/Block A	9	Third	1	54
Apt/Block A	10	Third	1+office	61
Apt/Block B	1	Ground	2	68
Apt/Block B	2	Ground	2	68
Apt/Block B	3	First	2+office	76
Apt/Block B	4	First	2+office	88
Apt/Block B	5	Second	2+office	76
Apt/Block B	6	Second	1+office	54
Apt/Block B	7	Third	2+office	74
coach house Block C	1	First	1	50
coach house Block C	2	First	1	50
coach house Block C	3	First	1	50
cottage Block D	1	Ground&First	2	72
cottage Block D	2	Ground&First	2	72
Total	22			1440

Total Parking allocation spaces 21+6 conversion



Location Plan
scale 1:1250

Scale
1:1250 Metric Scale Bar
0 10 20 30 50 100

Scales
1:200 Metric Scale Bar
0 2 4 6 8 10 18

Note:
All designs and information conveyed are the intellectual property of APEX PLANNING DESIGN. The unauthorised copying,usage or distribution of this drawing or the contents of; in part or in whole is forbidden without express permission. All dimensions to be checked on site and any discrepancy immediately reported to APEX PLANNING DESIGN.
©Copyright all rights reserved.APEX PLANNING DESIGN 2023.

Client

Gainsborough Group Construction Ltd

Job

Proposed new development of former police station at 22 Station Road, Warminster, Wiltshire. BA12 9BR

Title

Proposed revised site layout

Scale

1:200,1:1250@A1

Date

March 2024

Drawn

Stewart Maxwell BSc. (Hons)

Drg Number

APD-03-24-04

APEX PLANNING DESIGN

Email: adrian@apexpd.co.uk

APPENDIX B BGS BOREHOLE LOG

IGES Talisman House, 11 Talisman Square, KENILWORTH, CV8 1JB.
e-mail:info@iges.co.uk
Tel: 01926 851113 Fax: 01926 851394

Job No. 7329

Site : Fairfield Road, Warminster
Client : Countrywide Homes
Engineer :
387751
145184

BOREHOLE LOG

BH 3

Sheet 1 of 1

Method	Date	Drilling Crew	Logged By	Scale
Light Cable Percussion.	19/02/01 - 19/02/01		RSK	1:50

Dia (mm) 102 | Coord | Ground Level m. 120.50

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
	0.30	D				0.20	Brown sandy TOPSOIL with limestone gravel.(MADE GROUND).	
						0.40	Pieces of concrete, sandstone and brick fragments in a brown sandy and gravelly matrix.(MADE GROUND).	
	1.00 - 1.45	SPT		8N		1.00	Loose brown silty clayey SAND.(UPPER GREENSAND). -Becoming lighter brown with occasional shell fragments. ~~Dense mottled brown to yellow brown silty clayey SAND.(UPPER GREENSAND).~~ -Becoming grey green to green and glauconitic	
	2.00 - 2.45	SPT		32N			-Becoming dense below 2.0m	
							-Band of light brown weak sandstone	
	3.00 - 3.45	SPT		50/ 450MM				
19/02/01						3.45		

Remarks
1/ Slight groundwater inflow at base of hole
2/ Hole collapsed to 2.4m

GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks

British Geological Survey

APPENDIX C PLANS SHOWING CONCEPTUAL SURFACE AND FOUL WATER DRAINAGE SOLUTIONS

KEY

- PROPOSED PRIVATE SURFACE WATER SEWER 150mmØ AT 1:150 UNLESS SHOWN OTHERWISE TAKING RUNOFF FROM ROADS AND PARKING
- PROPOSED PRIVATE SURFACE WATER SEWER 150mmØ AT 1:150 UNLESS SHOWN OTHERWISE TAKING RUNOFF FROM ROOF AREAS
- PROPOSED PRIVATE FOUL SEWER/DRAIN 150mmØ 1:150 MIN UNLESS SHOWN OTHERWISE
- EXISTING FOUL WATER DRAINAGE PUBLIC
- PROPOSED PRIVATE SOAKAWAY CONSTRUCTED USING MODULAR INFILTRATION UNITS
- PROPOSED PRIVATE SURFACE WATER POLYPROPYLENE INSPECTION CHAMBER (475Ø/450Ø P.P.I.C.)
- PROPOSED PRIVATE SURFACE WATER MINI ACCESS CHAMBER (MAC) 600mm MAX DEPTH
- PERCOLATION TEST LOCATION
- CP PROPOSED SURFACE WATER CATCHPIT CHAMBER (1200Ø P.C.C.)
- PROPOSED PRIVATE FOUL WATER POLYPROPYLENE INSPECTION CHAMBER (475Ø/450Ø P.P.I.C.)
- FLOOD ROUTING

CAUTION !
UNDERGROUND UTILITY SERVICES NOT SHOWN ON DRAWING

LINEAR DRAIN TO BE PROVIDED AT ACCESS THRESHOLD TO PREVENT LOCALISED RUNOFF ONTO PUBIC HIGHWAY

SA1
PROPOSED SOAKAWAY CONSTRUCTED FROM MODULAR INFILTRATION UNITS OF 95% VOID CONTENT- WAVIN AQUACELL CORE R OR EQUIVALENT
SIZE 12m (L) x 2.5m (W) x 1.2m (D)
TO DRAIN IMPERMEABLE AREA OF ROOF 458m2 AND SELF AREA 30m2 = 490m2
GL 117.70 (approx)
BASE 115.50 (approx)

SOAKAWAY 1

TRIAL PIT SA1 Q=9.18 m/h

ACCESS ROAD , PARKING SPACES AND TURNING HEAD TO BE CONSTRUCTED IN PERMEABLE MATERIALS WITH 300mm DEEP POROUS SUB BASE OF MIN 30% VOID CONTENT SUBJECT TO MINIMUM STRUCTURAL REQUIREMENTS. FINISHED SURFACE GRADIENTS TO BE 1 IN 60 MAX

SA2
PROPOSED SOAKAWAY CONSTRUCTED FROM MODULAR INFILTRATION UNITS OF 95% VOID CONTENT- WAVIN AQUACELL CORE R OR EQUIVALENT
SIZE 5m (L) x 2.5m (W) x 1.2m (D)
TO DRAIN IMPERMEABLE AREA OF ROOF 202m2 AND SELF AREA 12.5m2 = 220m2
GL 117.90 (approx)
BASE 115.70 (approx)

SA3
PROPOSED SOAKAWAY CONSTRUCTED FROM MODULAR INFILTRATION UNITS OF 95% VOID CONTENT- WAVIN AQUACELL CORE R OR EQUIVALENT
SIZE 3m (L) x 2.5m (W) x 1.2m (D)
TO DRAIN IMPERMEABLE AREA OF ROOF 93m2 AND SELF AREA 7.5m2 = 110m2
GL 117.70 (approx)
BASE 115.50 (approx)

TRIAL PIT SA3 Q=0.15m/h

PROPOSED FOUL DRAINAGE TO CONNECT INTO EXISTING CHAMBER
ASSUMED IL 116.90m AOD OR LOWER

ASSUMED ROUTE OF EXISTING FW PIPEWORK

PROPOSED FOUL DRAINAGE CONNECTION POINT FOR BLOCKS A AND B INTO NEW MANHOLE CONSTRUCTED ON EXISTING WW FOUL SEWER ASSUMED IL 116.00m AOD OR LOWER FOR GRAVITY CONNECTION
S106 APPLICATION REQUIRED

PROPOSED FOUL DRAINAGE CONNECTION POINT FOR COACH HOUSE INTO EXISTING WW FOUL SEWER.
ASSUMED IL 116.40m AOD OR LOWER.
S106 APPLICATION REQUIRED

STATION ROAD

Garage

PLAN SHOWING PRELIMINARY FOUL AND SURFACE WATER DRAINAGE PROPOSALS
(Scale 1:200)

Copyright - This drawing and any ancillary drawings or data are copyright of EDS and may not be used, copied or amended for any purpose whatsoever without written approval.

NOTES

1. This drawing is copyright. Refer to details above.
2. This drawing is only to be used for the purposes described in the status box below.
   Work to figured dimensions only, do not scale for construction purposes.
3. This drawing is to be read in conjunction with all other drawings, details and specifications pertaining to the work described. It should only be used for the purpose marked in the status box below, and shall not be used for construction unless clearly marked CONSTRUCTION.
4. Materials and workmanship shall comply to the appropriate British Standards and Codes of Practice unless otherwise stated.
5. The activities required to construct the work, shown on drawings clearly marked CONSTRUCTION, may be subject to the provisions of the Construction (Design & Management) Regulations 2015. The Contractor and Client must ensure that they are adequately conversant with these regulations and that the appropriate procedures required under the regulations are observed at all times.
6. The contractor is responsible for locating services prior to excavation. Any services shown on the drawing should be considered 'indicative' only. Where no services are shown on the drawing it does not necessarily mean there are no services present, only that a services search has not been undertaken. Where in doubt refer to HSE booklet "avoiding danger from underground services"
7. Design Risk Assessment

   A risk assessment relating to potential hazards associated with the works described within this drawing, in so far as they have been designed by EDS Ltd, has been undertaken. Risks identified have been eliminated by design wherever practicable. The status with regard to residual risks is as follows:

   The work is at an early planning stage and is not sufficiently advanced to allow a meaningful assessment of risks to be undertaken at this time.

   Designer - EDS Drawing revision - A
   Date - 30.05.23

8. Pipe routing and chamber locations shown indicative only.

DATE.	DRWN.	CHKD.	REV.	NOTES.
15.05.24	TPS	LT	C	DRAINAGE PROPOSALS AMENDED TO SUIT REVISED DEVELOPMENT LAYOUT
31.05.23	TPS	LT	B	SOUTHERN FOUL DRAINAGE ROUTE AMENDED
30.05.23	TPS	LT	A	PRELIMINARY ISSUE

PROJECT MANAGER:-	TIM SULLIVAN
PROJECT ENGINEER:-	TIM SULLIVAN
DRAWN DATE:-	MAY 2023
SCALE & SHEET SIZE:-	1:200 @ A1

PRELIMINARY

EDS
Engineering & Development Solutions
- Flood Risk Assessment
- SuDS and Surface Water
- Foul and Sewage Treatment
- Highway Design
- Civil Engineering
- Statutory Approvals

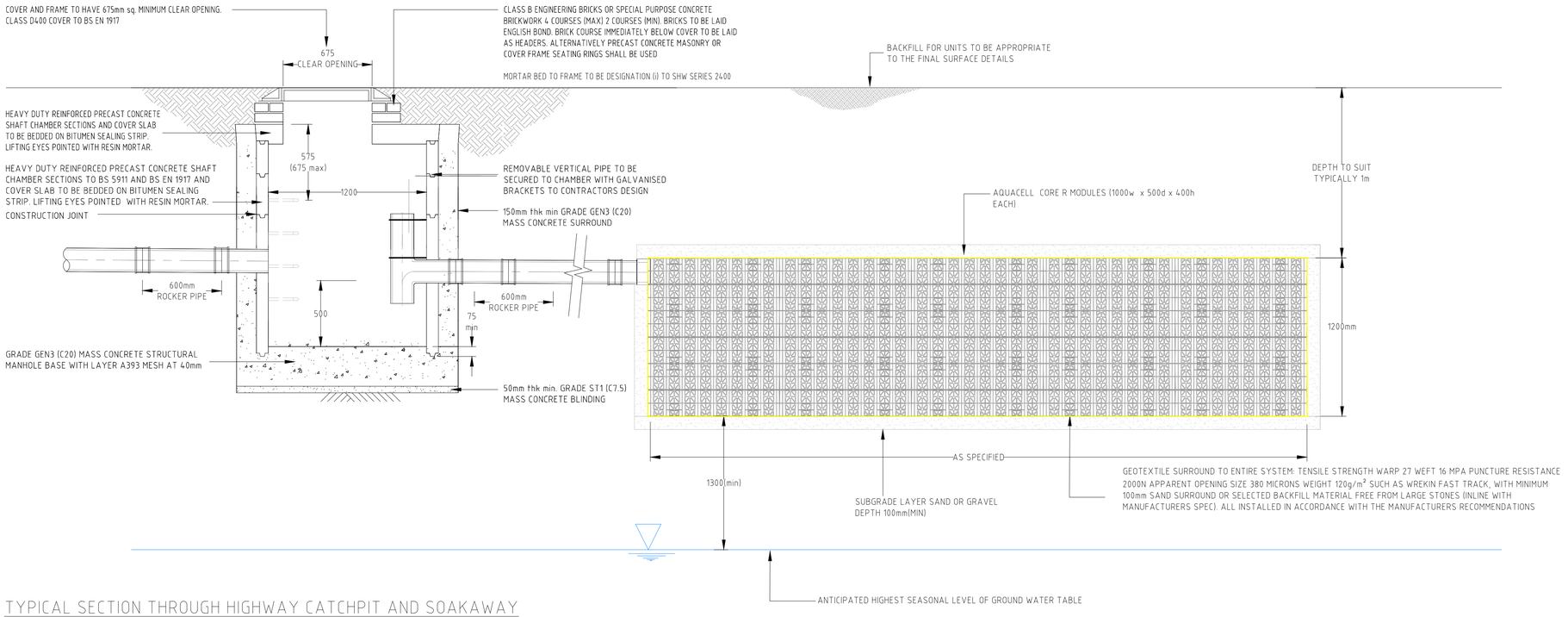
EDS, Unit E4, Threemilestone Industrial Estate, Threemilestone, Truro, Cornwall TR4 9LD (01872) 306311 (Mob) 07973816457
Email: jan@eadsolutions.co.uk
www.eadsolutions.co.uk

CLIENT
GAINSBOROUGH GROUP CONSTRUCTION LTD.

PROJECT
REDEVELOPMENT OF LAND AT 22 STATION ROAD. WARMINSTER.BA12 9BR

DRAWING TITLE
PLAN SHOWING PRELIMINARY FOUL AND SURFACE WATER DRAINAGE PROPOSALS

PROJECT No.	DRAWING No.	REV.
J-2865	3001	C



TYPICAL SECTION THROUGH HIGHWAY CATCHPIT AND SOAKAWAY

1:20

Copyright - This drawing and any ancillary drawings or data are copyright of EDS and may not be used, copied or amended for any purpose whatsoever without written approval.

NOTES

1. This drawing is copyright. Refer to details above.
2. This drawing is only to be used for the purposes described in the status box below.
   Work to figured dimensions only, do not scale for construction purposes.
3. This drawing is to be read in conjunction with all other drawings, details and specifications pertaining to the work described. It should only be used for the purpose marked in the status box below, and shall not be used for construction unless clearly marked CONSTRUCTION.
4. Materials and workmanship shall comply to the appropriate British Standards and Codes of Practice unless otherwise stated.
5. The activities required to construct the work, shown on drawings clearly marked CONSTRUCTION, may be subject to the provisions of the Construction (Design & Management) Regulations 2015. The Contractor and Client must ensure that they are adequately conversant with these regulations and that the appropriate procedures required under the regulations are observed at all times.
6. The contractor is responsible for locating services prior to excavation. Any services shown on the drawing should be considered 'indicative' only. Where no services are shown on the drawing it does not necessarily mean there are no services present, only that a services search has not been undertaken. Where in doubt refer to HSE booklet "avoiding danger from underground services"
7. Design Risk Assessment

   A risk assessment relating to potential hazards associated with the works described within this drawing, in so far as they have been designed by EDS Ltd, has been undertaken. Risks identified have been eliminated by design wherever practicable. The status with regard to residual risks is as follows:

   The work is at an early planning stage and is not sufficiently advanced to allow a meaningful assessment of risks to be undertaken at this time.

Designer - EDS Drawing revision - A
Date - 01:06:23

DATE	DRWN	CHKD.	REV.	NOTES.
01:06:23	TPS	LT	A	PRELIMINARY ISSUE

PROJECT MANAGER:-	TIM SULLIVAN
PROJECT ENGINEER:-	TIM SULLIVAN
DRAWN DATE:-	MAY 2023
SCALE & SHEET SIZE:-	1:20 @ A1

PRELIMINARY

Engineering & Development Solutions

- Flood Risk Assessment
- SuDS and Surface Water
- Foul and Sewage Treatment
- Highway Design
- Civil Engineering
- Statutory Approvals

EDS, Unit E4, Threemilestone Industrial Estate, Threemilestone, Truro, Cornwall TR4 9LD (01872) 306311 (Mob) 07973816457

Email: jan@eadsolutions.co.uk
www.eadsolutions.co.uk

CLIENT
GAINSBOROUGH GROUP CONSTRUCTION LTD.

PROJECT
REDEVELOPMENT OF LAND AT 22 STATION ROAD. WARMINSTER.BA12 9BR

DRAWING TITLE
TYPICAL SECTION THROUGH PROPOSED SOAKAWAY AND CATCHPIT CHAMBER

PROJECT No.	DRAWING No.	REV.
J-2865	3002	A

APPENDIX D PERCOLATION TEST RESULTS

Engineering & Development Solutions	Job No.	Job Name	Prepared	Date
Unit E4 Truro Business Park, Threemilestone, Truro, TR4 9LD Tel 07973816457	J-2865	Former Warminster Police Stn.	EDS	25/05/2023

Pit Dimensions

Depth (m)	Length (m)	Width (m)
2.20	1.80	1.20

Test Date:	21/02/2023
Trial Pit No.:	SA1
Test No.:	1

Soakaway test - tabulated data

Time (hh:mm)	Depth to Water (m)	Elapsed Time (sec)	Water Depth (m)	% Effective	Volume (m^3)
12:00	1.20	0	1.00	100%	2.16
12:02	1.30	120	0.90	90%	1.94
12:03	1.40	180	0.80	80%	1.73
12:07	1.50	420	0.70	70%	1.51
12:13	1.60	780	0.60	60%	1.30
12:20	1.70	1200	0.50	50%	1.08
12:30	1.80	1800	0.40	40%	0.86
12:45	1.90	2700	0.30	30%	0.65
12:58	2.00	3480	0.20	20%	0.43
13:47	2.10	6420	0.10	10%	0.22
14:34	2.20	9240	0.00	0%	0.00

% Effective	Vol (m^3)	T (sec)
80%	1.73	180
70%	1.51	420
75%	1.62	300
30%	0.65	2700
20%	0.43	3480
25%	0.54	3090
75%-25%	1.08	2790

Effective Values Summary

Datum (0,0) is ground level at pit

Initial Depth	1.20	m (below datum)
Final Depth	2.20	m (below datum)
Storage Depth	1.00	m (effective depth)
$a_{p50\%}$	5.16	m^2

$$q = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

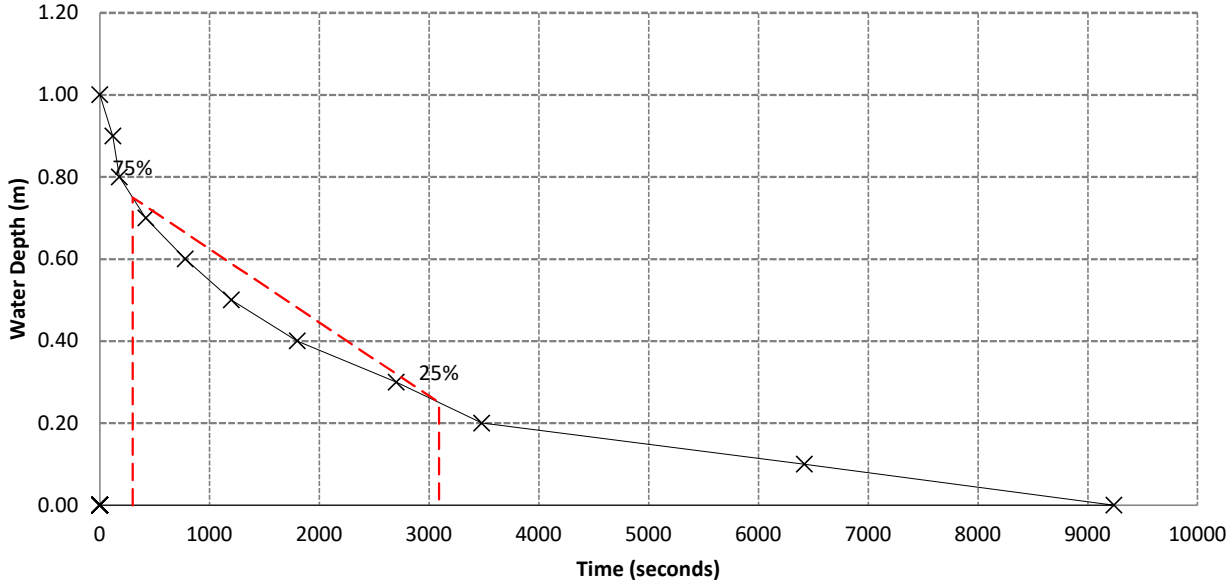
$a_{p50\%}$: Internal surface area of pite up to 50% effective depth, including base area

t_{p75-25}: Time for water to dall from 75% to 25% effective depth

V_{p75-25}: Effective storage volume between 75% & 25% effective depth

q= **7.50E-05** m/sec

0.270 m/hr



Engineering & Development Solutions	Job No.	Job Name	Prepared	Date
Unit E4 Truro Business Park, Threemilestone, Truro, TR4 9LD Tel 07973816457	J-2865	Former Warminster Police Stn.	EDS	25/05/2023

Pit Dimensions

Depth (m)	Length (m)	Width (m)
2.20	1.80	1.20

Test Date:	22/02/2023
Trial Pit No.:	SA1
Test No.:	2

Soakaway test - tabulated data

Time (hh:mm)	Depth to Water (m)	Elapsed Time (sec)	Water Depth (m)	% Effective	Volume (m^3)
12:00	1.20	0	1.00	100%	2.16
12:03	1.30	180	0.90	90%	1.94
12:08	1.40	480	0.80	80%	1.73
12:14	1.50	840	0.70	70%	1.51
12:22	1.60	1320	0.60	60%	1.30
12:32	1.70	1920	0.50	50%	1.08
12:44	1.80	2640	0.40	40%	0.86
13:04	1.90	3840	0.30	30%	0.65
13:34	2.00	5640	0.20	20%	0.43
15:39	2.10	13140	0.10	10%	0.22
16:02	2.20	14520	0.00	0%	0.00

% Effective	Vol (m^3)	T (sec)
80%	1.73	480
70%	1.51	840
75%	1.62	660
30%	0.65	3840
20%	0.43	5640
25%	0.54	4740
75%-25%	1.08	4080

Effective Values Summary

Datum (0,0) is ground level at pit

Initial Depth	1.20	m (below datum)
Final Depth	2.20	m (below datum)
Storage Depth	1.00	m (effective depth)
$a_{p50\%}$	5.16	m^2

$$q = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

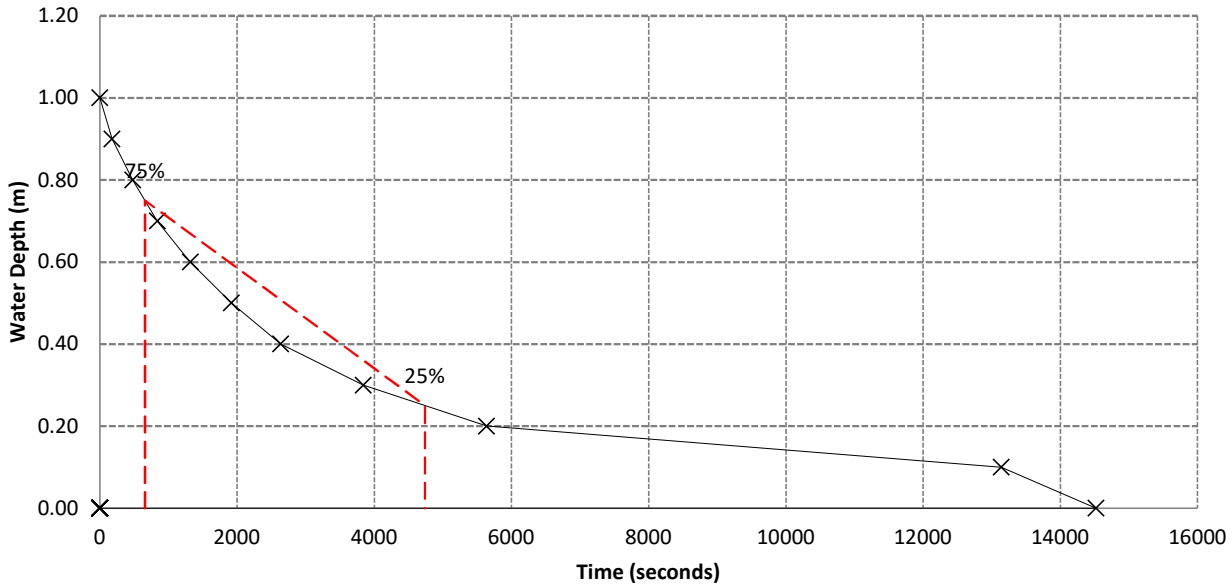
$a_{p50\%}$: Internal surface area of pite up to 50% effective depth, including base area

t_{p75-25}: Time for water to dall from 75% to 25% effective depth

V_{p75-25}: Effective storage volume between 75% & 25% effective depth

q= **5.13E-05** m/sec

0.185 m/hr



Engineering & Development Solutions	Job No.	Job Name	Prepared	Date
Unit E4 Truro Business Park, Threemilestone, Truro, TR4 9LD Tel 07973816457	J-2865	Former Warminster Police Stn.	EDS	25/05/2023

Pit Dimensions

Depth (m)	Length (m)	Width (m)
2.20	2.00	0.70

Test Date:	23/03/2023
Trial Pit No.:	SA3
Test No.:	1

Soakaway test - tabulated data

Time (hh:mm)	Depth to Water (m)	Elapsed Time (sec)	Water Depth (m)	% Effective	Volume (m^3)
12:00	1.20	0	1.00	100%	1.40
12:01	1.30	60	0.90	90%	1.26
12:02	1.40	120	0.80	80%	1.12
12:07	1.50	420	0.70	70%	0.98
12:13	1.60	780	0.60	60%	0.84
12:21	1.70	1260	0.50	50%	0.70
12:32	1.80	1920	0.40	40%	0.56
12:48	1.90	2880	0.30	30%	0.42
13:08	2.00	4080	0.20	20%	0.28
13:33	2.10	5580	0.10	10%	0.14
14:18	2.20	8280	0.00	0%	0.00

% Effective	Vol (m^3)	T (sec)
80%	1.12	120
70%	0.98	420
75%	1.05	270
30%	0.42	2880
20%	0.28	4080
25%	0.35	3480
75%-25%	0.70	3210

Effective Values Summary

Datum (0,0) is ground level at pit

Initial Depth	1.20	m (below datum)
Final Depth	2.20	m (below datum)
Storage Depth	1.00	m (effective depth)
$a_{p50\%}$	4.10	m^2

$$q = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

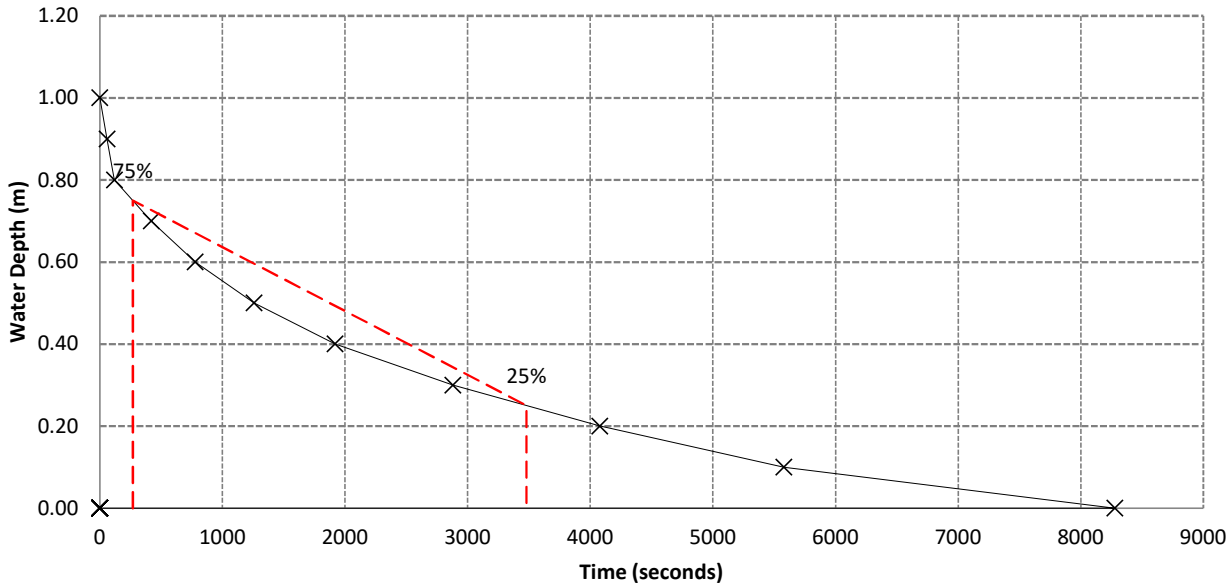
$a_{p50\%}$: Internal surface area of pite up to 50% effective depth, including base area

t_{p75-25}: Time for water to dall from 75% to 25% effective depth

V_{p75-25}: Effective storage volume between 75% & 25% effective depth

q= **5.32E-05** m/sec

0.191 m/hr



Engineering & Development Solutions	Job No.	Job Name	Prepared	Date
Unit E4 Truro Business Park, Threemilestone, Truro, TR4 9LD Tel 07973816457	J-2865	Former Warminster Police Stn.	EDS	25/05/2023

Pit Dimensions

Depth (m)	Length (m)	Width (m)
2.20	2.00	0.70

Test Date:	24/03/2023
Trial Pit No.:	SA3
Test No.:	2

Soakaway test - tabulated data

Time (hh:mm)	Depth to Water (m)	Elapsed Time (sec)	Water Depth (m)	% Effective	Volume (m^3)
12:00	1.20	0	1.00	100%	1.40
12:03	1.30	180	0.90	90%	1.26
12:07	1.40	420	0.80	80%	1.12
12:13	1.50	780	0.70	70%	0.98
12:20	1.60	1200	0.60	60%	0.84
12:30	1.70	1800	0.50	50%	0.70
12:43	1.80	2580	0.40	40%	0.56
13:03	1.90	3780	0.30	30%	0.42
13:34	2.00	5640	0.20	20%	0.28
14:15	2.10	8100	0.10	10%	0.14
14:40	2.20	9600	0.00	0%	0.00

% Effective	Vol (m^3)	T (sec)
80%	1.12	420
70%	0.98	780
75%	1.05	600
30%	0.42	3780
20%	0.28	5640
25%	0.35	4710
75%-25%	0.70	4110

Effective Values Summary

Datum (0,0) is ground level at pit

Initial Depth	1.20	m (below datum)
Final Depth	2.20	m (below datum)
Storage Depth	1.00	m (effective depth)
$a_{p50\%}$	4.10	m^2

$$q = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

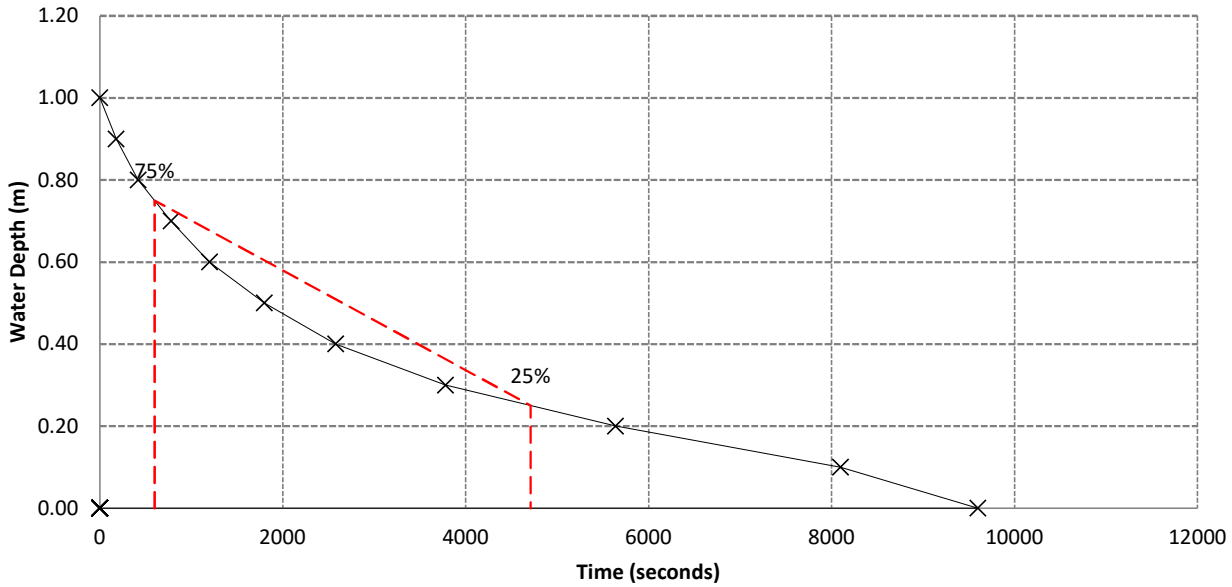
$a_{p50\%}$: Internal surface area of pite up to 50% effective depth, including base area

t_{p75-25}: Time for water to dall from 75% to 25% effective depth

V_{p75-25}: Effective storage volume between 75% & 25% effective depth

q= **4.15E-05** m/sec

0.150 m/hr



APPENDIX E HYDRAULIC CALCULATIONS FOR SOAKAWAYS

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 294 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.494	0.494	0.7	14.1	O K
30 min Summer	116.651	0.651	0.8	18.6	O K
60 min Summer	116.804	0.804	0.9	22.9	O K
120 min Summer	116.901	0.901	0.9	25.7	O K
180 min Summer	116.940	0.940	1.0	26.8	O K
240 min Summer	116.954	0.954	1.0	27.2	O K
360 min Summer	116.966	0.966	1.0	27.5	O K
480 min Summer	116.965	0.965	1.0	27.5	O K
600 min Summer	116.954	0.954	1.0	27.2	O K
720 min Summer	116.938	0.938	1.0	26.7	O K
960 min Summer	116.898	0.898	0.9	25.6	O K
1440 min Summer	116.806	0.806	0.9	23.0	O K
2160 min Summer	116.665	0.665	0.8	18.9	O K
2880 min Summer	116.543	0.543	0.8	15.5	O K
4320 min Summer	116.353	0.353	0.7	10.1	O K
5760 min Summer	116.225	0.225	0.6	6.4	O K
7200 min Summer	116.142	0.142	0.6	4.0	O K
8640 min Summer	116.089	0.089	0.5	2.5	O K
10080 min Summer	116.058	0.058	0.5	1.7	O K
15 min Winter	116.555	0.555	0.8	15.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	142.200	0.0	18
30 min Summer	95.627	0.0	33
60 min Summer	61.464	0.0	62
120 min Summer	37.188	0.0	122
180 min Summer	27.787	0.0	180
240 min Summer	22.622	0.0	218
360 min Summer	16.952	0.0	280
480 min Summer	13.820	0.0	346
600 min Summer	11.774	0.0	414
720 min Summer	10.312	0.0	484
960 min Summer	8.326	0.0	624
1440 min Summer	6.082	0.0	896
2160 min Summer	4.358	0.0	1296
2880 min Summer	3.419	0.0	1672
4320 min Summer	2.410	0.0	2420
5760 min Summer	1.886	0.0	3120
7200 min Summer	1.577	0.0	3816
8640 min Summer	1.371	0.0	4496
10080 min Summer	1.225	0.0	5144
15 min Winter	142.200	0.0	18

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	116.733	0.733	0.9	20.9	O K
60 min Winter	116.909	0.909	0.9	25.9	O K
120 min Winter	117.027	1.027	1.0	29.3	O K
180 min Winter	117.079	1.079	1.0	30.8	O K
240 min Winter	117.102	1.102	1.0	31.4	O K
360 min Winter	117.112	1.112	1.0	31.7	O K
480 min Winter	117.110	1.110	1.0	31.6	O K
600 min Winter	117.093	1.093	1.0	31.2	O K
720 min Winter	117.068	1.068	1.0	30.4	O K
960 min Winter	117.005	1.005	1.0	28.6	O K
1440 min Winter	116.867	0.867	0.9	24.7	O K
2160 min Winter	116.667	0.667	0.8	19.0	O K
2880 min Winter	116.503	0.503	0.7	14.3	O K
4320 min Winter	116.261	0.261	0.6	7.4	O K
5760 min Winter	116.111	0.111	0.6	3.2	O K
7200 min Winter	116.049	0.049	0.5	1.4	O K
8640 min Winter	116.043	0.043	0.4	1.2	O K
10080 min Winter	116.038	0.038	0.4	1.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.627	0.0	33
60 min Winter	61.464	0.0	62
120 min Winter	37.188	0.0	118
180 min Winter	27.787	0.0	176
240 min Winter	22.622	0.0	230
360 min Winter	16.952	0.0	290
480 min Winter	13.820	0.0	366
600 min Winter	11.774	0.0	446
720 min Winter	10.312	0.0	522
960 min Winter	8.326	0.0	674
1440 min Winter	6.082	0.0	966
2160 min Winter	4.358	0.0	1380
2880 min Winter	3.419	0.0	1760
4320 min Winter	2.410	0.0	2508
5760 min Winter	1.886	0.0	3168
7200 min Winter	1.577	0.0	3672
8640 min Winter	1.371	0.0	4376
10080 min Winter	1.225	0.0	5104

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 387652 145140 ST 87652 45140
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.055

Time (mins) From:	To:	Area (ha)
0	4	0.055

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 118.000

Cellular Storage Structure

Invert Level (m) 116.000 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.18000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.18000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	30.0	30.0	1.300	0.0	64.8
1.200	30.0	64.8			

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 315 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.476	0.476	0.3	5.7	O K
30 min Summer	116.628	0.628	0.3	7.5	O K
60 min Summer	116.779	0.779	0.3	9.2	O K
120 min Summer	116.877	0.877	0.4	10.4	O K
180 min Summer	116.920	0.920	0.4	10.9	O K
240 min Summer	116.937	0.937	0.4	11.1	O K
360 min Summer	116.953	0.953	0.4	11.3	O K
480 min Summer	116.957	0.957	0.4	11.4	O K
600 min Summer	116.950	0.950	0.4	11.3	O K
720 min Summer	116.938	0.938	0.4	11.1	O K
960 min Summer	116.902	0.902	0.4	10.7	O K
1440 min Summer	116.818	0.818	0.3	9.7	O K
2160 min Summer	116.689	0.689	0.3	8.2	O K
2880 min Summer	116.576	0.576	0.3	6.8	O K
4320 min Summer	116.399	0.399	0.3	4.7	O K
5760 min Summer	116.276	0.276	0.2	3.3	O K
7200 min Summer	116.193	0.193	0.2	2.3	O K
8640 min Summer	116.134	0.134	0.2	1.6	O K
10080 min Summer	116.093	0.093	0.2	1.1	O K
15 min Winter	116.535	0.535	0.3	6.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	142.200	0.0	19
30 min Summer	95.627	0.0	33
60 min Summer	61.464	0.0	62
120 min Summer	37.188	0.0	122
180 min Summer	27.787	0.0	180
240 min Summer	22.622	0.0	224
360 min Summer	16.952	0.0	284
480 min Summer	13.820	0.0	348
600 min Summer	11.774	0.0	418
720 min Summer	10.312	0.0	488
960 min Summer	8.326	0.0	626
1440 min Summer	6.082	0.0	898
2160 min Summer	4.358	0.0	1300
2880 min Summer	3.419	0.0	1696
4320 min Summer	2.410	0.0	2424
5760 min Summer	1.886	0.0	3168
7200 min Summer	1.577	0.0	3888
8640 min Summer	1.371	0.0	4576
10080 min Summer	1.225	0.0	5248
15 min Winter	142.200	0.0	18

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	116.707	0.707	0.3	8.4	O K
60 min Winter	116.879	0.879	0.4	10.4	O K
120 min Winter	116.998	0.998	0.4	11.8	O K
180 min Winter	117.053	1.053	0.4	12.5	O K
240 min Winter	117.080	1.080	0.4	12.8	O K
360 min Winter	117.094	1.094	0.4	13.0	O K
480 min Winter	117.098	1.098	0.4	13.0	O K
600 min Winter	117.087	1.087	0.4	12.9	O K
720 min Winter	117.067	1.067	0.4	12.7	O K
960 min Winter	117.011	1.011	0.4	12.0	O K
1440 min Winter	116.886	0.886	0.4	10.5	O K
2160 min Winter	116.703	0.703	0.3	8.4	O K
2880 min Winter	116.552	0.552	0.3	6.6	O K
4320 min Winter	116.325	0.325	0.2	3.9	O K
5760 min Winter	116.176	0.176	0.2	2.1	O K
7200 min Winter	116.084	0.084	0.2	1.0	O K
8640 min Winter	116.048	0.048	0.2	0.6	O K
10080 min Winter	116.043	0.043	0.2	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.627	0.0	33
60 min Winter	61.464	0.0	62
120 min Winter	37.188	0.0	118
180 min Winter	27.787	0.0	176
240 min Winter	22.622	0.0	230
360 min Winter	16.952	0.0	296
480 min Winter	13.820	0.0	370
600 min Winter	11.774	0.0	446
720 min Winter	10.312	0.0	526
960 min Winter	8.326	0.0	676
1440 min Winter	6.082	0.0	968
2160 min Winter	4.358	0.0	1384
2880 min Winter	3.419	0.0	1788
4320 min Winter	2.410	0.0	2548
5760 min Winter	1.886	0.0	3232
7200 min Winter	1.577	0.0	3888
8640 min Winter	1.371	0.0	4408
10080 min Winter	1.225	0.0	5128

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 387652 145140 ST 87652 45140
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.022

Time (mins) From:	To:	Area (ha)
0	4	0.022

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 118.000

Cellular Storage Structure

Invert Level (m) 116.000 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.15000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	12.5	12.5	1.300	0.0	30.5
1.200	12.5	30.5			

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 271 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.431	0.431	0.2	3.1	O K
30 min Summer	116.567	0.567	0.2	4.0	O K
60 min Summer	116.699	0.699	0.2	5.0	O K
120 min Summer	116.779	0.779	0.2	5.6	O K
180 min Summer	116.808	0.808	0.2	5.8	O K
240 min Summer	116.821	0.821	0.2	5.8	O K
360 min Summer	116.831	0.831	0.2	5.9	O K
480 min Summer	116.830	0.830	0.2	5.9	O K
600 min Summer	116.821	0.821	0.2	5.8	O K
720 min Summer	116.806	0.806	0.2	5.7	O K
960 min Summer	116.770	0.770	0.2	5.5	O K
1440 min Summer	116.688	0.688	0.2	4.9	O K
2160 min Summer	116.566	0.566	0.2	4.0	O K
2880 min Summer	116.463	0.463	0.2	3.3	O K
4320 min Summer	116.307	0.307	0.2	2.2	O K
5760 min Summer	116.202	0.202	0.1	1.4	O K
7200 min Summer	116.134	0.134	0.1	1.0	O K
8640 min Summer	116.089	0.089	0.1	0.6	O K
10080 min Summer	116.061	0.061	0.1	0.4	O K
15 min Winter	116.484	0.484	0.2	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	142.200	0.0	18
30 min Summer	95.627	0.0	33
60 min Summer	61.464	0.0	62
120 min Summer	37.188	0.0	122
180 min Summer	27.787	0.0	180
240 min Summer	22.622	0.0	206
360 min Summer	16.952	0.0	270
480 min Summer	13.820	0.0	338
600 min Summer	11.774	0.0	408
720 min Summer	10.312	0.0	476
960 min Summer	8.326	0.0	616
1440 min Summer	6.082	0.0	882
2160 min Summer	4.358	0.0	1280
2880 min Summer	3.419	0.0	1668
4320 min Summer	2.410	0.0	2380
5760 min Summer	1.886	0.0	3112
7200 min Summer	1.577	0.0	3816
8640 min Summer	1.371	0.0	4496
10080 min Summer	1.225	0.0	5144
15 min Winter	142.200	0.0	18

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	116.638	0.638	0.2	4.5	O K
60 min Winter	116.790	0.790	0.2	5.6	O K
120 min Winter	116.888	0.888	0.2	6.3	O K
180 min Winter	116.928	0.928	0.2	6.6	O K
240 min Winter	116.944	0.944	0.2	6.7	O K
360 min Winter	116.952	0.952	0.2	6.8	O K
480 min Winter	116.948	0.948	0.2	6.8	O K
600 min Winter	116.932	0.932	0.2	6.6	O K
720 min Winter	116.908	0.908	0.2	6.5	O K
960 min Winter	116.851	0.851	0.2	6.1	O K
1440 min Winter	116.729	0.729	0.2	5.2	O K
2160 min Winter	116.560	0.560	0.2	4.0	O K
2880 min Winter	116.425	0.425	0.2	3.0	O K
4320 min Winter	116.230	0.230	0.1	1.6	O K
5760 min Winter	116.109	0.109	0.1	0.8	O K
7200 min Winter	116.050	0.050	0.1	0.4	O K
8640 min Winter	116.043	0.043	0.1	0.3	O K
10080 min Winter	116.039	0.039	0.1	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.627	0.0	33
60 min Winter	61.464	0.0	62
120 min Winter	37.188	0.0	118
180 min Winter	27.787	0.0	174
240 min Winter	22.622	0.0	226
360 min Winter	16.952	0.0	282
480 min Winter	13.820	0.0	360
600 min Winter	11.774	0.0	438
720 min Winter	10.312	0.0	514
960 min Winter	8.326	0.0	664
1440 min Winter	6.082	0.0	952
2160 min Winter	4.358	0.0	1360
2880 min Winter	3.419	0.0	1756
4320 min Winter	2.410	0.0	2504
5760 min Winter	1.886	0.0	3168
7200 min Winter	1.577	0.0	3672
8640 min Winter	1.371	0.0	4408
10080 min Winter	1.225	0.0	5136

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 387652 145140 ST 87652 45140
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)
0	4	0.012

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 118.000

Cellular Storage Structure

Invert Level (m) 116.000 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 0.15000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	7.5	7.5	1.300	0.0	20.7
1.200	7.5	20.7			

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 37 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	116.238	0.238	8.4	21.5	O K
30 min Summer	116.260	0.260	9.1	25.5	O K
60 min Summer	116.270	0.270	9.5	27.7	O K
120 min Summer	116.262	0.262	9.2	25.9	O K
180 min Summer	116.251	0.251	8.8	23.8	O K
240 min Summer	116.240	0.240	8.4	21.8	O K
360 min Summer	116.221	0.221	7.8	18.5	O K
480 min Summer	116.205	0.205	7.2	15.9	O K
600 min Summer	116.191	0.191	6.7	13.8	O K
720 min Summer	116.178	0.178	6.3	12.1	O K
960 min Summer	116.157	0.157	5.5	9.4	O K
1440 min Summer	116.127	0.127	4.5	6.1	O K
2160 min Summer	116.097	0.097	3.4	3.6	O K
2880 min Summer	116.078	0.078	2.7	2.3	O K
4320 min Summer	116.056	0.056	2.0	1.2	O K
5760 min Summer	116.047	0.047	1.6	0.8	O K
7200 min Summer	116.043	0.043	1.3	0.7	O K
8640 min Summer	116.040	0.040	1.1	0.6	O K
10080 min Summer	116.038	0.038	1.0	0.5	O K
15 min Winter	116.254	0.254	8.9	24.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	142.200	0.0	16
30 min Summer	95.627	0.0	26
60 min Summer	61.464	0.0	44
120 min Summer	37.188	0.0	78
180 min Summer	27.787	0.0	110
240 min Summer	22.622	0.0	144
360 min Summer	16.952	0.0	206
480 min Summer	13.820	0.0	268
600 min Summer	11.774	0.0	330
720 min Summer	10.312	0.0	390
960 min Summer	8.326	0.0	510
1440 min Summer	6.082	0.0	750
2160 min Summer	4.358	0.0	1104
2880 min Summer	3.419	0.0	1468
4320 min Summer	2.410	0.0	2200
5760 min Summer	1.886	0.0	2920
7200 min Summer	1.577	0.0	3624
8640 min Summer	1.371	0.0	4272
10080 min Summer	1.225	0.0	5136
15 min Winter	142.200	0.0	16

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	116.277	0.277	9.7	29.1	O K
60 min Winter	116.287	0.287	10.1	31.2	O K
120 min Winter	116.272	0.272	9.6	28.1	O K
180 min Winter	116.255	0.255	9.0	24.7	O K
240 min Winter	116.239	0.239	8.4	21.7	O K
360 min Winter	116.212	0.212	7.5	17.1	O K
480 min Winter	116.190	0.190	6.7	13.7	O K
600 min Winter	116.172	0.172	6.0	11.2	O K
720 min Winter	116.156	0.156	5.5	9.3	O K
960 min Winter	116.132	0.132	4.6	6.6	O K
1440 min Winter	116.100	0.100	3.5	3.8	O K
2160 min Winter	116.073	0.073	2.6	2.0	O K
2880 min Winter	116.057	0.057	2.0	1.2	O K
4320 min Winter	116.045	0.045	1.4	0.8	O K
5760 min Winter	116.040	0.040	1.1	0.6	O K
7200 min Winter	116.037	0.037	0.9	0.5	O K
8640 min Winter	116.034	0.034	0.8	0.4	O K
10080 min Winter	116.032	0.032	0.7	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	95.627	0.0	28
60 min Winter	61.464	0.0	46
120 min Winter	37.188	0.0	84
180 min Winter	27.787	0.0	118
240 min Winter	22.622	0.0	152
360 min Winter	16.952	0.0	216
480 min Winter	13.820	0.0	278
600 min Winter	11.774	0.0	338
720 min Winter	10.312	0.0	398
960 min Winter	8.326	0.0	518
1440 min Winter	6.082	0.0	752
2160 min Winter	4.358	0.0	1104
2880 min Winter	3.419	0.0	1468
4320 min Winter	2.410	0.0	2204
5760 min Winter	1.886	0.0	2904
7200 min Winter	1.577	0.0	3632
8640 min Winter	1.371	0.0	4304
10080 min Winter	1.225	0.0	5032

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 387652 145140 ST 87652 45140
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.100

Time (mins) From:	To:	Area (ha)
0	4	0.100

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 118.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.15000	Width (m)	31.6
Membrane Percolation (mm/hr)	1000	Length (m)	31.6
Max Percolation (l/s)	277.4	Slope (1:X)	80.0
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	116.000	Membrane Depth (m)	0

©1982-2020 Innovyze

Engineering and Development Solutions Ltd
Registered Office: Unit E4 | Truro Business Park| Truro | Cornwall | TR4 9LD
Registered in England No. 10467487