

PROPOSED DEVELOPMENT AT FORD LANE, YAPTON

**DRAINAGE STATEMENT
INCORPORATING DRAINAGE MAINTENANCE
MANAGEMENT PLAN**

Report No. 18-344-05

Prepared by

Odyssey

Tuscany House

White Hart Lane

Basingstoke

RG21 4AF

Tel: 01256 331144

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1.0 INTRODUCTION

1.1 Odyssey has been commissioned by Redrow Homes to prepare this drainage report in support of their Reserved Matters (RM) application for the residential development at Ford Lane, Yapton. This follows the grant of outline planning permission on 15th January 2019 (Ref: **Y/80/16/OUT**). This report also sets out the background, existing drainage regime, proposed drainage regime, overland flow routes and maintenance of SuDS features.

1.2 The description of the development at the outline application was:

“Outline application with some matters reserved for 4.5 hectares of residential development comprising 3.4 hectares of land for up to 100 dwellings (up to 30 (30%) affordable housing) together with 1.1 hectares of land set aside for public open space and strategic landscaping and 2.2 hectares of public open space and green corridors with vehicular access from Ford Lane and pedestrian/cycle access only from North End Road.”

1.3 The aim of this report is to support the discharge of Conditions 11 and 15 which are set out below:

Condition 11

“No development shall take place until details of the implementation, maintenance and management of a sustainable drainage scheme have been submitted to and approved in writing by the LPA. The scheme shall be implemented and thereafter managed and maintained in accordance with the approved details. Those details shall include:

- i) A timetable for the scheme’s implementation; and*
- ii) A management and maintenance plan for the lifetime of the development which shall include the arrangements for the adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.*

Condition 15

“Construction of the development shall not commence until details of the proposed means of foul water sewerage have been submitted to and approved in writing by the LPA. No dwelling shall be occupied until works for the disposal of sewerage have been fully implemented in accordance with the approved details.”



2.0 EXISTING SITE

- 2.1 The proposed development site comprises of 6.7ha of greenfield land and is located off Ford Lane to the north east of Yapton Village in West Sussex. The site is surrounded by arable land to the north and east, Orchard Business Park and residential dwellings to the south and North End Road to the west.
- 2.2 The topographical survey shows the site to be relatively flat with one half of site falling from north to west and the other falling from north to south. Levels range from approximately 8.24m AOD in the north to 6.46m AOD in the west.
- 2.3 It is understood that there are no public surface water sewers in close proximity to the site and the existing drainage regime relies on surface water infiltrating through the underlying strata.
- 2.4 An intrusive ground investigation was conducted by LEAP Environmental in January 2019. A total of 20 No. trial pits were excavated throughout the development site to a maximum depth of 3.5m. The findings in their report indicate that the existing geology consists predominantly of river terrace sands and clays underlain by the chalk.
- 2.5 Infiltration testing carried out on 3 No. trial pits in accordance with BRE365 showed the geology of the shallow soils to be unsuitable for conventional soakaways but it was indicated that deepened soakaways into more structured chalk at depth may be viable.
- 2.6 Further infiltration testing was undertaken in March 2019. A total of 2 No. boreholes were excavated to a maximum depth of 10m. A falling head test was carried out on both and results identified rates of 5.73×10^{-5} m/s and 9.60×10^{-6} m/s.
- 2.7 Throughout the first phase of testing, groundwater was not encountered in any of the trial pits. Groundwater was found at a depth of approximately 6.6m bgl during the excavation of the 2 No. boreholes.
- 2.8 In accordance with the Arun DC requirements, winter groundwater monitoring (October to March inclusive) is currently being undertaken. Data will be provided upon completion.
- 2.9 It is also understood that there are no foul water sewers present within the site. The nearest public foul water sewer is located in North End Road and currently serves existing residential dwellings in the surrounding area.



3.0 PROPOSED DRAINAGE

- 3.1 New foul and surface water drainage networks are proposed across the development site. The proposed foul and surface water drainage strategies are shown on Odyssey drawing **18-344/104** provided with this report in **Appendix A**.

Design Criteria

- 3.2 The design criteria applied for proposed drainage are as follows:
- Pipework beneath existing and proposed highways is to have a depth of at least 1.2m where possible
 - Private foul and surface water drainage is to be in accordance with Approved Document H of the Building Regulations
 - Adoptable drainage is to be in accordance with Sewers for Adoption and West Sussex County Council requirements
 - 10% urban creep has been allowed for the dwellings' hard standing areas (roofs and garages)

Surface Water Drainage

- 3.3 The proposed surface water strategy has been designed in accordance with the strategy set out in the Flood Risk Assessment submitted as part of outline planning application for the site. The FRA proposes the use of sustainable drainage techniques to control the surface water from the development.
- 3.4 Based on the testing undertaken by LEAP, the site lends itself to infiltration at depth and as a result the strategy is to infiltrate surface water run-off from roads, roofs, parking bays and parking courts into the chalk strata.
- 3.5 The proposed scheme splits the development into 4 No. catchments, as shown on drawing **18-344/108** in **Appendix C**. Two of the catchments drain to cellular soakaways located within areas of public open space (POS).
- 3.6 The southern catchment drains to the south before discharging into an infiltration basin with granular soakaway.
- 3.7 The remaining catchment covering the proposed extent of the public highway drains to the east and discharges into an enhanced swale with granular soakaway. The extent of highway adoption is shown on drawing **18-344/109** in **Appendix D** and is subject to approval from WSCC.



- 3.8 The surface water drainage system has been designed to accommodate all rainfall events up to 1 in 100 year event plus climate change (+40%). Supporting calculations can be found within **Appendix E**.
- 3.9 In parking courts and non-adoptable roads, the use of lined permeable paving system has been proposed to in order to provide additional storage and treatment. The permeable paving will also ensure that any surface water runoff generated outside of the proposed adoptable extent will be contained within the private drainage network without draining onto the public highway.
- 3.10 Surface water treatment will be provided by the permeable paving via both the grit layer and geotextile that the blocks are bedded on, as well as the underlying gravel media comprising of washed no fines material. These measures provide filtration and the breakdown of hydrocarbons as the water is conveyed through the system and into the piped network.

Urban Creep

- 3.11 The CIRIA SuDS Manual states that urban creep is defined as any increase in the impervious area that is drained to an existing drainage system without planning permission being required, and therefore without any consideration of whether the capacity of the receiving sewer system can accommodate the increased flow. An increase of 10% has been applied to areas which may be subject to urban creep; private drives and plot roof areas, to allow for future urban expansion on a local scale.



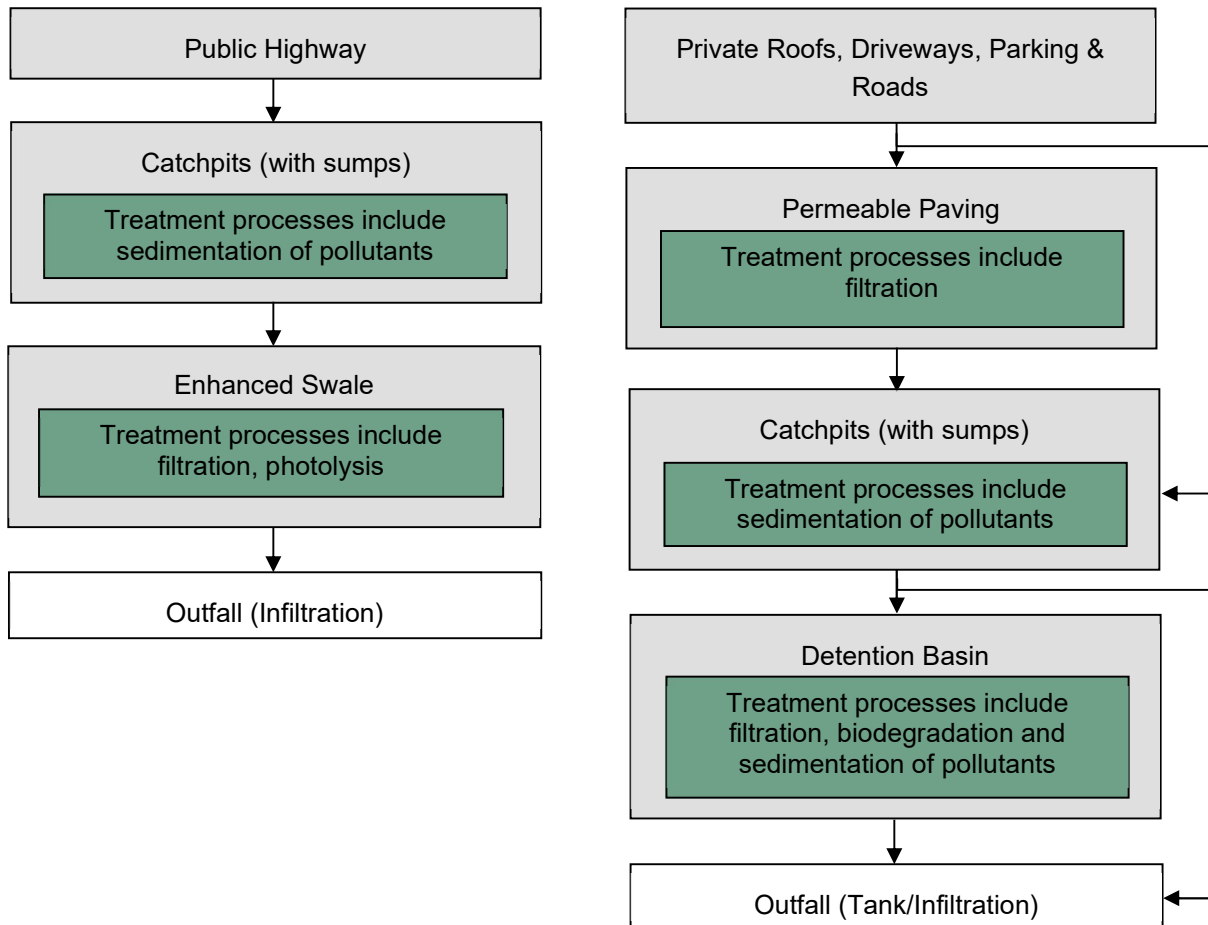
Foul Drainage

- 3.12 The proposed foul water drainage strategy utilises a combination of gravity and pumped systems.
- 3.13 It is proposed that foul flows from the majority of the development will be conveyed by gravity and discharge into the existing Southern Water sewer located in the North End Road via a new manhole, subject to Southern Water approval.
- 3.14 Due to the existing topography of the site, foul flows from a number of dwellings to the east will be conveyed to an adopted pumping station located towards the south of the site before being pumped north via a rising main into the main network.
- 3.15 Foul drainage not adopted, will be maintained by an appointed management company and subject to the maintenance schedules set out in Section 6 of this document.



4.0 TREATMENT OF SURFACE WATER RUN-OFF

4.1 Surface water will be subject to the following treatment train prior to infiltration. The levels of proposed treatment are shown below.





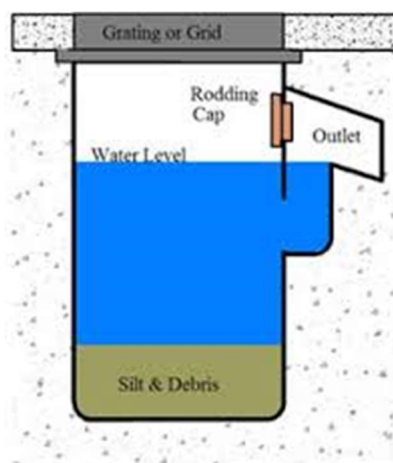
5.0 OVERLAND FLOW ROUTES AND EXCEEDANCE ROUTES

- 5.1 The calculations provided in **Appendix E** show there is no flooding for storm events up to and including the 1 in 100 year plus 40% climate change. If an event greater than the design storm, or a drainage system failure occurs levels have been designed such that overland flow will run away from buildings and be conveyed within the main highways and ultimately to the open spaces on site.
- 5.2 Overland flow routes have been shown on Odyssey drawing 18-344/107, which is supplied in **Appendix B**.



6.0 MAINTENANCE OF PIPE SYSTEMS, GULLIES AND MANHOLES

Description



- 6.1 Drainage systems comprising of pipe runs, manholes and gullies are a more conventional method of draining surface water run-off from highway areas.
- 6.2 Surface water falling on impermeable areas, such as roads and footways, drain at surface level to gullies which convey the water below ground to the main drainage network. Manholes are also provided on the main drainage system at regular intervals, changes in sewer direction, gradient or pipe diameter. This type of drainage system can be accessed from the gullies or manholes for routine inspection and maintenance.
- 6.3 Gullies are to be 'trapped' such that on collecting and conveying surface water they trap sediment and prevent any unpleasant odors returning from the sewers.

Table 6.1: Pipe Systems, Gullies and Manholes Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Inspect and identify any areas that are not operating correctly.	Gullies and manholes.	Monthly (for the first 3 months) then annually.
	Remove debris from gratings, sumps / silt traps.		Annually
Infrequent Maintenance	Clear blockages.	Piped system.	As required.



Table 6.2: Pipe Systems, Gullies and Manholes Inspection & Frequency

Inspection Activity	Comments	Frequency
Clearing of gullies / sumps	Gullies found to be non-functioning/blocked on annual inspection will be noted and cleared at 6 monthly intervals. Recurring blockages should be investigated.	Annually (or 6 monthly if blocked annually).
Cleaning / jetting	Pipes and manholes.	When required.



7.0 MAINTENANCE OF INFILTRATION BASINS



Description

- 7.1 Detention basins are generally dry, intermittently wet, SuDS that are used in the later stages of the treatment train, and they are seen as site or regional controls. Detention basins attenuate and treat the runoff through sedimentation and biological degradation.
- 7.2 Detention basins are visually pleasing and can offer various types of planting, such as woodland and manicured parkland around the perimeter, aquatic vegetation in the base, as well as ornamental shrubs.



Table 7.1: Basin Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Litter and debris removal.	Litter & debris to be removed prior to any grass cutting activity (of perimeter areas) to minimise risk of shredding litter. Particular attention should be paid to inlet pipes and grilles (if in place)	Monthly.
	Grass cutting: landscaped areas, spillways and access routes.	All cuttings to be removed from SUDS component.	Monthly (during growing season) or as required.
	Grass cutting: meadow grass.	All cuttings to be removed from SUDS component.	Half yearly (Spring before nesting season, and Autumn).
	Remove dead vegetation from pond edge.		1-3 years, or as required.
	Hand cut submerged and emergent aquatic plants (at a minimum of 0.1m above pond base; max 1/3 of pond surface).	Thinning of emergent barrier vegetation. Areas of tall emergent plants obscuring visual inspection (for safety) of the open water should be regularly trimmed.	As required.
	Cut and remove bank vegetation from waters edge to a minimum of 1m above water level.	To provide access to pond edge / emergent vegetation for maintenance and inspection.	Monthly (for first 3 years) then as required.
	Manage other vegetation and remove nuisance plants.	Weeding should be conducted by hand or use non-toxic and biodegradable weed killer. Invasive species should be removed in accordance with best practice.	Monthly (at implementation) then as required.
	Tidy all dead growth before start of growing season.		Annually.
Infrequent Maintenance	Re-seed or replant areas of poor vegetation growth.		As required.
	Prune and trim trees and remove cuttings.	Where vegetation is planted as a barrier management of upward growth to encourage outward growth is necessary (after shrub seedlings are established).	As required.
	Remove sediment from forestry and main body of large ponds when pool volume is reduced by 20%.	Sediment level will be dependent upon presence and type of upstream SUDS, size and land use of catchment as well as local soil conditions.	>25 years usually, or as required.



		Refer to above point for pond liner.	
Corrective Maintenance	Repair erosion or other damage.		As required.
	Repair / rehabilitation of inlets.		As required.

Table 7.2: Basin Inspection & Frequency

Inspection Activity	Comments	Frequency
Inspect structures for evidence of poor operation		Monthly.
Inspect banksides, structures, pipework etc. for evidence of physical damage.		Monthly.
Inspect water body for signs of eutrophication.		Monthly (May – October).
Inspect inlets and pre-treatment components for silt accumulation.	Includes visual inspection of chamber (where present)	Half yearly.



8.0 MAINTENANCE OF CELLULAR SYSTEMS



Description

- 8.1 Cellular (or Modular) systems provide storage within a void space. They are usually built out of plastic, or other man-made materials, and can store and infiltrate (where conditions permit) run-off. Cellular systems are sub-surface components that can cater for vehicle loading, given appropriate specification and installation depth.
- 8.2 As cellular systems only offer a limited improvement in water quality, it is preferable that they form one part of a treatment train. It is important to pre-treat upstream as this will curtail sediment influx and increase the system's longevity.
- 8.3 Surface water flow to the cellular system will be via trapped gullies prior to connecting to the piped network. All manholes immediately upstream of the cellular storage structure will incorporate a silt trap / sump. The above system will offer treatment of surface water prior to entering the cellular system.



Table 8.1: Cellular System Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Inspect and identify any areas that are not operating correctly.		Monthly (for the first 3 months) then six monthly.
	Remove sediment from upstream silt trap (sump).	Remove sediment from sump when 50% volume lost. N.B. Sumps must be maintained to limit sediment entry into the underground cells.	Six monthly, or as required.
Infrequent Maintenance	Clear blockage of ½ perforated underflow pipes (Stormcell only) by rodding / jetting.	Stormcell system (if used) should be designed with underflow pipes laid at self-cleansing velocity; reducing likelihood of blockage.	As required.
Corrective Maintenance	Excavate, uncover & jet cells to remove sediment (Wavin Aquacell or similar).		As required.

Table 8.2: Cellular System Inspection & Frequency

Inspection Activity	Comments	Frequency
Inspect all inlets / outlets, vents and overflows to check they are in good condition and operating as designed.		Annually.
Check mechanical devices within associated chambers.		Half yearly.

- 8.4 The above maintenance and inspection regime is recommended however reference should also be made to the appropriate manufacturers guidance and recommendations and the more frequent maintenance and inspection regime implemented.



9.0 MAINTENANCE OF PERMEABLE PAVING



Description

- 9.1 Permeable Block Paving allows water to pass through the gaps between the blocks into underlying sand and gravel layers allowing for the attenuation, conveyance and where possible infiltration, of surface water runoff.
- 9.2 Permeable paving will cleanse surface water run-off. The initial cleansing occurs within the sand bedding layer where hydrocarbons are collected. The layer of geotextile below the sand acts as a secondary filter before infiltration through to the sub-base further filters the discharge before connecting into the downstream pipe network.
- 9.3 A cellular diffuser unit will be utilised at the outlet of each area of permeable paving to filter outflow and mitigate any 'wash-out' of the granular material.



Table 9.1: Permeable Paving Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Visual inspection of paving.	Ensure joints are kept fully filled.	Monthly (depending on local environment)
	Paving should be agitated (e.g. brushed, vacuumed, etc.)	To ensure no vegetation of any sort is allowed to grow and develop in the joints.	Six monthly or as required (Spring and Autumn seasons).
	Paving should be inspected after any heavy precipitations.	Ensure no displacement of any organic matter into the surface of the pavement.	As required.
Corrective Maintenance	Inspection of outfall should be undertaken.	Non-infiltration systems to have outfall checked for debris and blockages.	Six monthly or as required.
	Removal of weeds.	To ensure weeds are killed effectively they should be actively growing so that the glyphosate will go down to the roots. Glyphosate based weed killers include Roundup and Tumbleweed.	As required.
	Laying material may require cleaning and /or replacing.	Depending on the environment the permeable pavement has received and been exposed to.	25 to 30 year period.

Table 9.2: Permeable Paving Inspection & Frequency

Inspection Activity	Comments	Frequency
Visual inspection of permeable surface for poor operation.	Includes visual inspection of blocks, water ponding, weeds and to make sure joints are kept full.	Monthly.
Visual inspection of outfall.	Includes visual inspection of control structures and outfall to check for damage and blockages.	Monthly.

- 9.4 It is recommended that the surfaces should be regularly inspected and cleaned accordingly. Based on the results of full-scale trials carried out by Aggregate Industries, the most effective method is to use a cleaner with suction only. Even if the surface has become completely clogged, trials have shown that this method of cleaning can rehabilitate the surface to an acceptable level.



- 9.5 The maintenance and inspection regime is recommended however reference should also be made to the appropriate manufacturers guidance and recommendations and the more frequent maintenance and inspection regime implemented.



10.0 MAINTENANCE OF SWALE WITH GRANULAR SOAKAWAY



Description

- 10.1 Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat and often attenuate surface water runoff.
- 10.2 When incorporated into site design, they can enhance the natural landscape and provide aesthetic and biodiversity benefits.
- 10.3 The standard swale is broad, shallow and covered by grass to slow the water



Table 10.1: Swales Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Remove litter and debris	Litter & debris to be removed prior to any grass cutting activity (of perimeter areas) to minimise risk of shredding litter. Particular attention should be paid to inlet/outlet pipes and grilles (if in place)	Monthly, or as required
	Manage other vegetation and remove nuisance plants	Weeding should be conducted by hand or use non-toxic and biodegradable weed killer. Invasive species should be removed in accordance with best practice.	
	Cut grass	All cuttings to be removed from SUDS component.	Monthly, or where required
Infrequent Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions if required.		Monthly at start, then as required
Corrective Maintenance	Repair erosion or other damage by re-turfing or reseedling		Monthly at start, then as required
	Relevel uneven surfaces and reinstate design levels		Half yearly.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface		As required or if bare soil is exposed over 10% or more of the swale treatment area.
	Remove and dispose of oils or petrol residues using safe standard practices		As required



Table 10.: Swales Maintenance Activities & Frequency

Inspection Activity	Comments	Frequency
Inspect inlets, outlets and overflows for blockages. Clear if required.		Monthly
Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours		Monthly at start, then as required
Inspect vegetation coverage		Monthly for six months, quarterly for 2 years, then half yearly



11.0 MAINTENANCE OF FLOW CONTROL DEVICES (HYDROBRAKE OR SIMILAR)



Description

- 11.1 A flow control device usually comprises of a fixed orifice or an alternative form of throttle such as a vortex flow control unit. Its principle function is to throttle the discharge passed down stream and thereby retain water upstream within associated storage facilities.
- 11.2 The vortex flow controls provide a non-linear flow curve and as such, can respond to both high and low intensity rainfall events.
- 11.3 This site utilises a vortex flow control device (Hydrobrake or similar) and will usually contain a sump within the flow control chamber and associated parts for access and maintenance.
- 11.4 Normally, little maintenance is required as there are no moving parts within the Flow Control device and generally if blockages occur, they do so at the intake and can be due to poor installation or upstream treatment of water entering the system.
- 11.5 The vortex flow control is to be fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.



Table 11.1: Flow Control Devices Maintenance Activities & Frequency

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Inspect and identify any areas that are not operating correctly.		Monthly (for the first 3 months) then six monthly.
	Remove sediment from upstream silt trap (sump).		Six monthly, or as required.
	Hose down unit / chamber		Six monthly, or as required.
Infrequent Maintenance	Clear blockages	Pivoting bypass door to ensure manhole can be drained in the event of a blockage.	As required.

Table 11.2: Flow Control Inspection & Frequency

Inspection Activity	Comments	Frequency
Inspect all inlets / outlets, to check they are in good condition and operating as designed.		Annually.
Check mechanical devices within associated chambers		Half yearly.

11.6 The above maintenance and inspection regime is recommended however reference should also be made to the appropriate manufacturer's guidance and recommendations and the more frequent maintenance and inspection regime implemented.



12.0 GLOSSARY

Amenity grass	Close mown grass, cut 16 times per annum to a length of 50-65mm.
Attenuation	Storage of runoff; used with a flow control to control discharge.
Baseflow	Sustained (or constant) flow required for wetlands.
Barrier vegetation	Vegetation to deter access.
Berm	A mound of earth used to control flow (similar to a submerged dam or weir).
Check dam	Small dam used to control flow, common (for swales) where site slope exceeds 4%.
Conveyance	Movement of runoff from one point to another.
Diaphragm trench	Small trench (normally containing pea gravel) acting as a silt trap prior to sheet flow onto a filter strip.
Design level (or flood level)	Level of water storage within SUDS.
Emergent vegetation	Vegetation which grows in water but which pierces the surface, e.g. <i>Phragmites</i> .
Energy dissipation technique	A method to reduce energy of water flow to prevent damage / erosion to the structure.
Filter bed	A gravel filled base designed to ensure the base of a structure remains dry during small storm events. Similar in nature and construction to a filter trench.
Flow control	A device used to control the discharge from a structure, e.g. weir, orifice.
Flow spreading technique	A method to reduce intensity of flow, scattering across a wider area, reducing erosion and scour.
Forebay	Small basin designed to capture and retain sediment.
Gabion	Wire baskets filled with large boulders, offering reinforcement whilst allowing water to drain through.
Geocellular system	Plastic storage system used to attenuate runoff.
Geotextile	Synthetic permeable fabric commonly used in SUDS construction, e.g. filter trenches, helping to retain sediment.
Groundwater recharge	Where surface water moves downward to groundwater.
Half drain down	Time taken for the attenuated volume (in SUDS) to reduce to half of the storage volume by infiltration or use of flow control.



Hydro-Brake	Control device to regulate flow. Uses a vortex system to achieve design flow.
Infiltration	Process by which water on the ground surface enters the soil.
Inspection chamber	Open chamber used to assess level of sediment in the structure and assess half drain down time.
Long grass	Similar to meadow grass but without wildflower mix.
Meadow (or long) grass	Long grass with wildflower mix (sown or natural) cut 1-2 times per annum.
Modular system	See geocellular system.
Overflow weir	Type of weir (hard or soft engineered) to control flow when design level is exceeded.
Penstock	An adjustable vertical sliding plate to control flow.
Permeable paving	Paving designed to allow infiltration of runoff between blocks; can be designed to attenuate or allow infiltration into the ground.
Permanent water level	Static level of water within a pond. Storage capacity is the volume above this.
Point flow	Inflow from a specific source, i.e. a pipe.
Regional control	Management of runoff from a site or several sites, typically a pond or wetland.
Reno mattress	Type of gabion, typically wider and shallower (in depth) than normal gabions.
Rip-rap	Rock or other material used to prevent erosion, reduce velocity and dissipate flow.
Runoff	Surface runoff is water from rain, snow melt or other sources that flows over the land surface.
Safety bench	Shallow sloped margin areas normally used around pond edges to reduce risk of falling in and allows ease of exit from the water following an emergency.
Scarify	Method to break up silt deposits, remove dead grass and other organic deposits and relieves compaction of the soil surface.
Scour	Localised erosion usually as a result of high flows (or velocities of flow).
Sediment forebay	See forebay.
Sheet flow	Runoff that moves as overland flow in very shallow depths.
Site control	Management of runoff from a local area or site, typically detention basins or infiltration basins.



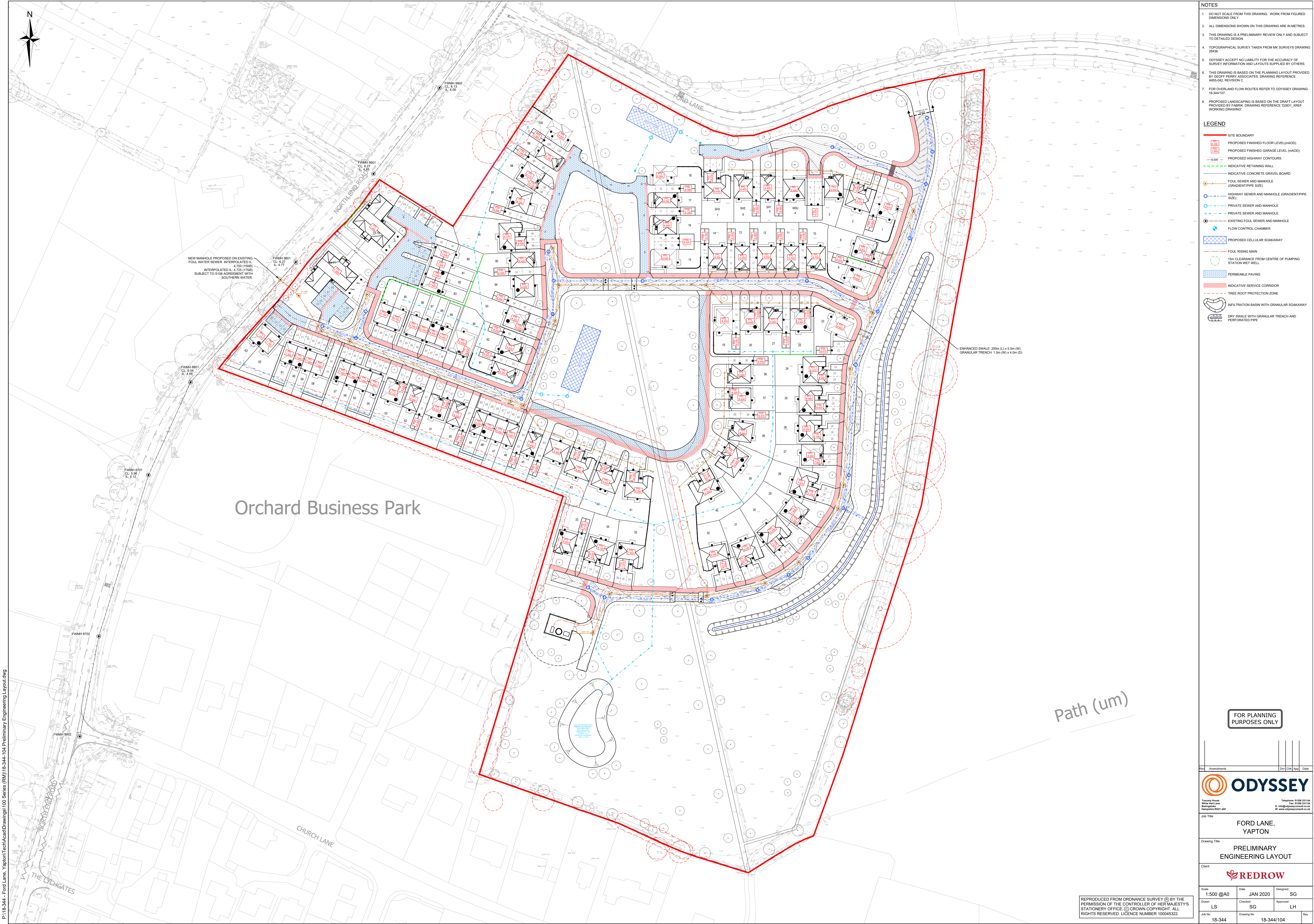
Slotted (or perforated) pipe	Pipe usually (UPVC) with holes or slots at regular intervals allowing water to drain out or in as required.
Source control	Control of runoff at or near its source, e.g. soakaway.
Spike	Method (usually mechanical) to open up soil, improving infiltration.
Spillway	Structure allowing the controlled release of water when design levels are exceeded. Can be soft or hard engineered.
Storage	See attenuation.
Stormwater	An interchangeable term for surface water runoff. See runoff.
Surface blinding	Blockage of the soil (normally by sediment) preventing infiltration.
Treatment	Improving water quality by physical, chemical and/or biological means.
Treatment train	Series of SUDS component used to provide incremental water quality improvement and storage.
Void space	The storage volume between gravel particles (usually for filter/infiltration trenches).
Weir	Horizontal structure designed to control flow.

Abbreviations

Ha	Hectare (1ha = 10,000 square metres)
SUDS	Sustainable Urban Drainage Systems

APPENDIX A

Odyssey Drawing 18-344/104



P:\18-344 - Ford Lane, Yapton\Tech\Acad\Drawings\100 Series (RM)\18-344-104 Preliminary Engineering Layout.dwg

- NOTES**
- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
 - THIS DRAWING IS A PRELIMINARY REVIEW ONLY AND SUBJECT TO DETAILED DESIGN.
 - TOPOGRAPHICAL SURVEY TAKEN FROM MK SURVEYS DRAWING 26436.
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 - FOR OVERLAND FLOW ROUTES REFER TO ODYSSEY DRAWING 18-344/107.
 - PROPOSED LANDSCAPING IS BASED ON THE DRAFT LAYOUT PROVIDED BY FABRIK. DRAWING REFERENCE 10031_XREF WORKING DRAWING.

LEGEND

- SITE BOUNDARY
- PROPOSED FINISHED FLOOR LEVEL (HMOD)
- PROPOSED FINISHED GARAGE LEVEL (HMOD)
- PROPOSED HIGHWAY CONTOURS
- INDICATIVE RETAINING WALL
- INDICATIVE CONCRETE GRAVEL BOARD
- FOUL SEWER AND MANHOLE (GRADIENT/PIPE SIZE)
- PRIVATE SEWER AND MANHOLE
- EXISTING FOUL SEWER AND MANHOLE
- FLOW CONTROL CHAMBER
- PROPOSED CELLULAR SOAKAWAY
- FOUL RISING MAIN
- 15m CLEARANCE FROM CENTRE OF PUMPING STATION WET WELL
- PERMEABLE PAVING
- INDICATIVE SERVICE CORRIDOR
- TREE ROOT PROTECTION ZONE
- INFILTRATION BASIN WITH GRANULAR SOAKAWAY
- DRY SWALE WITH GRANULAR TRENCH AND PERFORATED PIPE

FOR PLANNING PURPOSES ONLY



FORD LANE, YAPTON

PRELIMINARY ENGINEERING LAYOUT

REDROW

Scale	1:500 @A0	Date	JAN 2020	Designed	SG
Drawn	LS	Checked	SG	Approved	LH
Job No	18-344	Drawing No	18-344/104	Rev	

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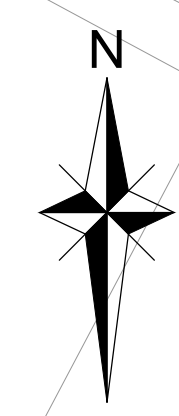
APPENDIX B

Odyssey Drawing 18-344/107



APPENDIX C

Odyssey Drawing 18-344/108



Orchard Business Park

Path (um)

NOTES

- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
- ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
- THIS DRAWING IS A PRELIMINARY REVIEW ONLY AND SUBJECT TO DETAILED DESIGN.
- ODYSSEY ACCEPTS NO LIABILITY FOR THE ACCURACY OF SURVEY INFORMATION AND LAYOUTS SUPPLIED BY OTHERS.
- THIS DRAWING IS BASED ON THE PLANNING LAYOUT PROVIDED BY GEOFF PERRY ASSOCIATES. DRAWING REFERENCE: ASS-042, REVISION C.

LEGEND

- TANK 1 CATCHMENT
- TANK 2 CATCHMENT
- Basin Catchment
- Swale Catchment

FOR PLANNING PURPOSES ONLY

Rev	Amendments	Des	Chk	App	Date

ODYSSEY

Tecwyn House
White Hart Lane
Barnsley
S70 2AT

Telephone: 01226 321144
Fax: 01226 321144
Email: info@odysseyconsult.co.uk
Web: www.odysseyconsult.co.uk

Job Title

FORD LANE, YAPTON

Drawing Title

SURFACE WATER CATCHMENT PLAN

Client

REDROW

Scale	1:500 @A0	Date	JAN 2020	Designed	SG
Drawn	LP	Checked	SG	Approved	LH
Job No	18-344	Drawing No	18-344/108	Rev	

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APPENDIX D

Odyssey Drawing 18-344/109



NOTES

1. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.

2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.

3. ODYSSEY ACCEPTS NO LIABILITY FOR THE ACCURACY OF SURVEY INFORMATION AND LAYOUTS SUPPLIED BY OTHERS.

4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL THE RELATED DRAWINGS ISSUED BY THE ARCHITECT AND ENGINEER, WEST SUSSEX COUNTY COUNCIL STANDARDS, NHBC STANDARDS AND REDROW STANDARDS.

LEGEND

SITE BOUNDARY

PROPOSED EXTENT OF ADOPTABLE HIGHWAY

FOR PLANNING PURPOSES ONLY

Rev

Amendments

Dis

Chg

App

Date

ODYSSEY

Tecent House
White Hart Lane
Barnsley
S62 4AF

Telephone: 01226 321144
Fax: 01226 321144
Email: info@odysseyconsult.co.uk
Web: www.odysseyconsult.co.uk

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Job Title

FORD LANE,
YAPTON

Drawing Title

PROPOSED EXTENT OF
ADOPTABLE HIGHWAY PLAN

Client

REDROW

Scale

1:500 @A0

Date

JAN 2020

Designed

SG

Drawn

LS

Checked

SG

Approved

LH

Job No

18-344

Drawing No

18-344/109

Rev

APPENDIX E

Windes Calculations

Odyssey Markides		Page 1
Tuscany House	18-344	
White Hart Lane	Ford Lane, Yapton	
Basingstoke RG21 4AF	Highway Drainage	
Date 15/01/2020	Designed by THR	
File 18-344 HIGHWAY DRAINAGE...	Checked by SG	
XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	1999
Site Location GB 498650 101750 SU 98650 01750	
C (1km)	-0.025
D1 (1km)	0.390
D2 (1km)	0.245
D3 (1km)	0.403
E (1km)	0.310
F (1km)	2.321
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.209	4-8	0.334	8-12	0.059

Total Area Contributing (ha) = 0.602

Total Pipe Volume (m³) = 42.731

Network Design Table for Storm

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

Network Results Table

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

Odyssey Markides											Page 2		
Tuscany House White Hart Lane Basingstoke RG21 4AF						18-344 Ford Lane, Yapton Highway Drainage							
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...						Designed by THR Checked by SG							
XP Solutions						Network 2018.1							
<u>Network Design Table for Storm</u>													
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	15.615	0.094	166.1	0.023	4.00	0.0	0.600	o	225	Pipe/Conduit			
S2.000	12.366	0.240	51.5	0.022	4.00	0.0	0.600	o	225	Pipe/Conduit			
S1.001	77.320	0.463	167.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit			
S1.002	39.691	0.167	238.0	0.063	0.00	0.0	0.600	o	300	Pipe/Conduit			
S1.003	14.532	0.061	238.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit			
S3.000	13.078	1.651	7.9	0.018	4.00	0.0	0.600	o	225	Pipe/Conduit			
S1.004	39.044	0.164	238.1	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit			
S1.005	72.039	0.303	237.8	0.084	0.00	0.0	0.600	o	300	Pipe/Conduit			
S1.006	33.905	0.108	313.9	0.022	0.00	0.0	0.600	o	375	Pipe/Conduit			
S4.000	15.087	0.090	167.0	0.021	4.00	0.0	0.600	o	225	Pipe/Conduit			
S4.001	14.479	0.087	167.0	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit			
S5.000	44.095	1.060	41.6	0.033	4.00	0.0	0.600	o	225	Pipe/Conduit			
S4.002	24.808	0.149	167.0	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit			
S4.003	35.146	0.820	42.9	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit			
<u>Network Results Table</u>													
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	4.26	5.811	0.023	0.0	0.0	0.0	1.01	40.2	3.2			
S2.000	50.00	4.11	5.957	0.022	0.0	0.0	0.0	1.83	72.6	3.0			
S1.001	50.00	5.53	5.717	0.079	0.0	0.0	0.0	1.01	40.1	10.7			
S1.002	50.00	6.19	5.179	0.143	0.0	0.0	0.0	1.01	71.7	19.3			
S1.003	50.00	6.43	5.012	0.143	0.0	0.0	0.0	1.01	71.7	19.3			
S3.000	50.00	4.05	6.677	0.018	0.0	0.0	0.0	4.68	186.0	2.4			
S1.004	48.31	7.07	4.951	0.182	0.0	0.0	0.0	1.01	71.7	23.8			
S1.005	43.84	8.25	4.787	0.266	0.0	0.0	0.0	1.02	71.8	31.5			
S1.006	42.09	8.80	4.409	0.287	0.0	0.0	0.0	1.02	112.3	32.8			
S4.000	50.00	4.25	5.597	0.021	0.0	0.0	0.0	1.01	40.1	2.8			
S4.001	50.00	4.49	5.507	0.045	0.0	0.0	0.0	1.01	40.1	6.1			
S5.000	50.00	4.36	6.480	0.033	0.0	0.0	0.0	2.03	80.9	4.5			
S4.002	50.00	4.90	5.420	0.097	0.0	0.0	0.0	1.01	40.1	13.1			
S4.003	50.00	5.19	5.271	0.112	0.0	0.0	0.0	2.00	79.7	15.1			
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Odyssey Markides		Page 3
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.007	25.218	0.081	311.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.008	48.521	0.155	313.0	0.055	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	14.708	0.038	387.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.000	8.496	0.300	28.3	0.018	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	47.056	0.282	166.9	0.057	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.002	20.509	0.123	166.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.003	15.220	0.091	167.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.004	11.339	0.068	166.8	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.005	26.725	1.294	20.7	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.010	10.411	0.027	385.6	0.000	0.00	0.0	0.600	o	450	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)
S1.007	40.90	9.22	4.301	0.399	0.0	0.0	0.0	1.02	112.8	44.2
S1.008	38.83	10.01	4.220	0.454	0.0	0.0	0.0	1.02	112.5	47.8
S1.009	38.26	10.25	3.990	0.454	0.0	0.0	0.0	1.03	163.4	47.8
S6.000	50.00	4.06	6.335	0.018	0.0	0.0	0.0	2.47	98.1	2.4
S6.001	50.00	4.83	6.035	0.075	0.0	0.0	0.0	1.01	40.1	10.1
S6.002	50.00	5.17	5.753	0.075	0.0	0.0	0.0	1.01	40.1	10.1
S6.003	50.00	5.42	5.630	0.075	0.0	0.0	0.0	1.01	40.1	10.1
S6.004	50.00	5.61	5.539	0.099	0.0	0.0	0.0	1.01	40.1	13.4
S6.005	50.00	5.77	5.471	0.147	0.0	0.0	0.0	2.89	115.0	19.9
S1.010	37.87	10.42	3.952	0.602	0.0	0.0	0.0	1.03	163.7	61.7

Odyssey Markides		Page 4
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	7.236	1.425	Open Manhole	1200	S1.000	5.811	225				
S2	7.382	1.425	Open Manhole	1200	S2.000	5.957	225				
S3	7.507	1.790	Open Manhole	1200	S1.001	5.717	225	S1.000	5.717	225	
								S2.000	5.717	225	
S4	7.868	2.689	Open Manhole	1200	S1.002	5.179	300	S1.001	5.254	225	
S5	8.105	3.093	Open Manhole	1200	S1.003	5.012	300	S1.002	5.012	300	
S6	8.102	1.425	Open Manhole	1200	S3.000	6.677	225				
S7	8.240	3.289	Open Manhole	1200	S1.004	4.951	300	S1.003	4.951	300	
								S3.000	5.026	225	
S8	7.762	2.975	Open Manhole	1200	S1.005	4.787	300	S1.004	4.787	300	
S9	8.490	4.081	Open Manhole	1350	S1.006	4.409	375	S1.005	4.484	300	
S10	7.022	1.425	Open Manhole	1200	S4.000	5.597	225				
S11	7.525	2.018	Open Manhole	1200	S4.001	5.507	225	S4.000	5.507	225	
S12	7.905	1.425	Open Manhole	1200	S5.000	6.480	225				
S13	8.030	2.610	Open Manhole	1200	S4.002	5.420	225	S4.001	5.420	225	
								S5.000	5.420	225	
S14	8.519	3.248	Open Manhole	1200	S4.003	5.271	225	S4.002	5.271	225	
S15	8.332	4.031	Open Manhole	1350	S1.007	4.301	375	S1.006	4.301	375	
								S4.003	4.451	225	
S16	8.080	3.860	Open Manhole	1350	S1.008	4.220	375	S1.007	4.220	375	
S17	7.588	3.598	Open Manhole	1350	S1.009	3.990	450	S1.008	4.065	375	
S18	7.760	1.425	Open Manhole	1200	S6.000	6.335	225				
S19	7.589	1.554	Open Manhole	1200	S6.001	6.035	225	S6.000	6.035	225	
S20	7.734	1.981	Open Manhole	1200	S6.002	5.753	225	S6.001	5.753	225	
S21	7.879	2.249	Open Manhole	1200	S6.003	5.630	225	S6.002	5.630	225	
S22	7.709	2.170	Open Manhole	1200	S6.004	5.539	225	S6.003	5.539	225	
S23	7.570	2.099	Open Manhole	1200	S6.005	5.471	225	S6.004	5.471	225	
S24	7.441	3.489	Open Manhole	1350	S1.010	3.952	450	S1.009	3.952	450	
								S6.005	4.177	225	
S	7.263	3.338	Open Manhole	0		OUTFALL		S1.010	3.925	450	

Odyssey Markides		Page 5
Tuscany House	18-344	
White Hart Lane	Ford Lane, Yapton	
Basingstoke RG21 4AF	Highway Drainage	
Date 15/01/2020	Designed by THR	
File 18-344 HIGHWAY DRAINAGE...	Checked by SG	
XP Solutions	Network 2018.1	

Simulation Criteria for Storm

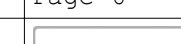
Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 498650 101750 SU 98650 01750
C (1km)	-0.025
D1 (1km)	0.390
D2 (1km)	0.245
D3 (1km)	0.403
E (1km)	0.310
F (1km)	2.321
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Odyssey Markides		Page 6
Tuscany House	18-344	
White Hart Lane	Ford Lane, Yapton	
Basingstoke RG21 4AF	Highway Drainage	
Date 15/01/2020	Designed by THR	
File 18-344 HIGHWAY DRAINAGE...	Checked by SG	
XP Solutions	Network 2018.1	

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

Simulation Criteria

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

Synthetic Rainfall Details

```
Margin for Flood Risk Warning (mm) 300.0      DVD Status OFF
      Analysis Timestep    Fine Inertia Status OFF
      DTS Status          ON
```

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, 40

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1	15 Winter	1	+0%	100/15 Summer				5.852
S2.000	S2	15 Summer	1	+0%	100/15 Summer				5.986
S1.001	S3	15 Winter	1	+0%	100/15 Summer				5.787
S1.002	S4	15 Winter	1	+0%	100/15 Summer				5.271
S1.003	S5	15 Winter	1	+0%	100/15 Summer				5.108
S3.000	S6	15 Winter	1	+0%					6.690
S1.004	S7	15 Winter	1	+0%	100/15 Summer				5.051
S1.005	S8	15 Winter	1	+0%	30/15 Winter				4.905
S1.006	S9	15 Winter	1	+0%	100/15 Summer				4.530
S4.000	S10	15 Winter	1	+0%	100/15 Summer				5.635
S4.001	S11	15 Winter	1	+0%	100/15 Summer				5.560

Odyssey Markides		Page 7
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

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

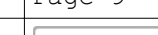
PN	US/MH Name	Surcharged Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	
S1.000	S1	-0.184	0.000	0.08	2.7	OK
S2.000	S2	-0.196	0.000	0.04	2.5	OK
S1.001	S3	-0.155	0.000	0.21	8.1	OK
S1.002	S4	-0.208	0.000	0.20	13.4	OK
S1.003	S5	-0.204	0.000	0.22	13.2	OK
S3.000	S6	-0.212	0.000	0.01	2.0	OK
S1.004	S7	-0.200	0.000	0.24	16.0	OK
S1.005	S8	-0.182	0.000	0.31	21.5	OK
S1.006	S9	-0.254	0.000	0.23	22.9	OK
S4.000	S10	-0.187	0.000	0.07	2.4	OK
S4.001	S11	-0.171	0.000	0.13	4.5	OK

Odyssey Markides		Page 8
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

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

PN	US/MH		Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level
	Name	Storm							(m)
S5.000	S12	15 Winter	1	+0%					6.512
S4.002	S13	15 Winter	1	+0%	100/15 Summer				5.499
S4.003	S14	15 Winter	1	+0%	100/15 Summer				5.329
S1.007	S15	15 Winter	1	+0%	100/15 Summer				4.447
S1.008	S16	15 Winter	1	+0%	100/15 Summer				4.369
S1.009	S17	15 Winter	1	+0%	100/15 Summer				4.186
S6.000	S18	15 Winter	1	+0%	100/15 Summer				6.359
S6.001	S19	15 Winter	1	+0%	100/15 Summer				6.101
S6.002	S20	15 Winter	1	+0%	100/15 Summer				5.819
S6.003	S21	15 Winter	1	+0%	100/15 Summer				5.697
S6.004	S22	15 Winter	1	+0%	100/15 Summer				5.617
S6.005	S23	15 Winter	1	+0%					5.523
S1.010	S24	15 Winter	1	+0%	100/15 Summer				4.156

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
S5.000	S12	-0.193	0.000	0.05		3.8	OK	
S4.002	S13	-0.146	0.000	0.27		9.9	OK	
S4.003	S14	-0.167	0.000	0.15		11.2	OK	
S1.007	S15	-0.229	0.000	0.32		31.1	OK	
S1.008	S16	-0.226	0.000	0.33		33.9	OK	
S1.009	S17	-0.254	0.000	0.31		33.8	OK	
S6.000	S18	-0.201	0.000	0.03		2.0	OK	
S6.001	S19	-0.159	0.000	0.18		7.0	OK	
S6.002	S20	-0.159	0.000	0.19		6.9	OK	
S6.003	S21	-0.158	0.000	0.20		6.9	OK	
S6.004	S22	-0.147	0.000	0.26		8.8	OK	
S6.005	S23	-0.173	0.000	0.12		12.8	OK	
S1.010	S24	-0.246	0.000	0.42		43.1	OK	

Odyssey Markides		Page 9
Tuscany House	18-344	
White Hart Lane	Ford Lane, Yapton	
Basingstoke RG21 4AF	Highway Drainage	
Date 15/01/2020	Designed by THR	
File 18-344 HIGHWAY DRAINAGE...	Checked by SG	
XP Solutions	Network 2018.1	

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

Simulation Criteria

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

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location GB 498650 101750 SU 98650 01750	
C (1km)	-0.025
D1 (1km)	0.390
D2 (1km)	0.245
D3 (1km)	0.403
E (1km)	0.310
F (1km)	2.321
Cv (Summer)	0.750
Cv (Winter)	0.840

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, 40

Odyssey Markides		Page 10
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

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

		Surcharged	Flooded			Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(1/s)	Status	Exceeded
S1.000	S1	-0.142	0.000	0.24		8.5		OK
S2.000	S2	-0.171	0.000	0.13		8.1		OK
S1.001	S3	-0.080	0.000	0.68		26.5		OK
S1.002	S4	-0.109	0.000	0.70		46.6		OK
S1.003	S5	-0.079	0.000	0.72		43.4		OK
S3.000	S6	-0.196	0.000	0.04		6.4		OK
S1.004	S7	-0.057	0.000	0.79		52.3		OK
S1.005	S8	0.006	0.000	1.00		69.0	SURCHARGED	
S1.006	S9	-0.065	0.000	0.73		73.0		OK
S4.000	S10	-0.153	0.000	0.22		7.6		OK
S4.001	S11	-0.106	0.000	0.46		16.1		OK

Odyssey Markides		Page 11
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S5.000	S12	15 Winter	30	+0%					6.539
S4.002	S13	15 Winter	30	+0%	100/15 Summer				5.593
S4.003	S14	15 Winter	30	+0%	100/15 Summer				5.387
S1.007	S15	15 Winter	30	+0%	100/15 Summer				4.665
S1.008	S16	15 Winter	30	+0%	100/15 Summer				4.590
S1.009	S17	15 Winter	30	+0%	100/15 Summer				4.440
S6.000	S18	15 Winter	30	+0%	100/15 Summer				6.378
S6.001	S19	15 Winter	30	+0%	100/15 Summer				6.176
S6.002	S20	15 Winter	30	+0%	100/15 Summer				5.895
S6.003	S21	15 Winter	30	+0%	100/15 Summer				5.775
S6.004	S22	15 Winter	30	+0%	100/15 Summer				5.716
S6.005	S23	15 Winter	30	+0%					5.577
S1.010	S24	15 Summer	30	+0%	100/15 Summer				4.402

PN	US/MH Name	Depth (m)	Surcharged Volume (m ³)	Flooded Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.000	S12	-0.166	0.000	0.16		12.1	OK	
S4.002	S13	-0.052	0.000	0.93		34.2	OK	
S4.003	S14	-0.109	0.000	0.52		39.3	OK	
S1.007	S15	-0.011	0.000	0.96		94.1	OK	
S1.008	S16	-0.005	0.000	0.97		100.7	OK	
S1.009	S17	0.000	0.000	0.91		100.2	OK	
S6.000	S18	-0.182	0.000	0.08		6.5	OK	
S6.001	S19	-0.084	0.000	0.68		26.1	OK	
S6.002	S20	-0.083	0.000	0.72		26.1	OK	
S6.003	S21	-0.080	0.000	0.73		25.7	OK	
S6.004	S22	-0.048	0.000	0.94		32.2	OK	
S6.005	S23	-0.119	0.000	0.44		47.1	OK	
S1.010	S24	0.000	0.000	1.20		121.5	OK	

Odyssey Markides		Page 12
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FEH
 FEH Rainfall Version 1999
 Site Location GB 498650 101750 SU 98650 01750
 C (1km) -0.025
 D1 (1km) 0.390
 D2 (1km) 0.245
 D3 (1km) 0.403
 E (1km) 0.310
 F (1km) 2.321
 Cv (Summer) 0.750
 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

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, 40

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1 15	Winter	100	+40%	100/15	Summer			7.039
S2.000	S2 15	Winter	100	+40%	100/15	Summer			7.035
S1.001	S3 15	Winter	100	+40%	100/15	Summer			7.022
S1.002	S4 15	Winter	100	+40%	100/15	Summer			6.733
S1.003	S5 15	Winter	100	+40%	100/15	Summer			6.604
S3.000	S6 15	Winter	100	+40%					6.721
S1.004	S7 15	Winter	100	+40%	100/15	Summer			6.545
S1.005	S8 15	Winter	100	+40%	30/15	Winter			6.331
S1.006	S9 15	Winter	100	+40%	100/15	Summer			5.545
S4.000	S10 15	Winter	100	+40%	100/15	Summer			6.174
S4.001	S11 15	Winter	100	+40%	100/15	Summer			6.155

Odyssey Markides		Page 13
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Drainage	
Date 15/01/2020 File 18-344 HIGHWAY DRAINAGE...	Designed by THR Checked by SG	
XP Solutions	Network 2018.1	

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

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
S1.000	S1	1.003	0.000	0.35		12.4	FLOOD RISK	
S2.000	S2	0.853	0.000	0.22		13.8	SURCHARGED	
S1.001	S3	1.080	0.000	0.93		36.2	SURCHARGED	
S1.002	S4	1.254	0.000	0.99		66.0	SURCHARGED	
S1.003	S5	1.292	0.000	1.02		61.3	SURCHARGED	
S3.000	S6	-0.181	0.000	0.09		13.7	OK	
S1.004	S7	1.294	0.000	1.16		77.2	SURCHARGED	
S1.005	S8	1.244	0.000	1.60		110.0	SURCHARGED	
S1.006	S9	0.761	0.000	1.15		116.0	SURCHARGED	
S4.000	S10	0.352	0.000	0.37		13.2	SURCHARGED	
S4.001	S11	0.423	0.000	0.83		29.1	SURCHARGED	

Odyssey Markides								Page 14																																																																																																																																																																											
Tuscany House				18-344																																																																																																																																																																															
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<table><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Water</td></tr><tr><td>PN</td><td>US/MH</td><td></td><td>Return</td><td>Climate</td><td>First (X)</td><td>First (Y)</td><td>First (Z)</td><td>Overflow</td><td>Level</td></tr><tr><td></td><td>Name</td><td>Storm</td><td>Period</td><td>Change</td><td>Surcharge</td><td>Flood</td><td>Overflow</td><td>Act.</td><td>(m)</td></tr><tr><td>S5.000</td><td>S12</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>6.569</td></tr><tr><td>S4.002</td><td>S13</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>6.112</td></tr><tr><td>S4.003</td><td>S14</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>5.848</td></tr><tr><td>S1.007</td><td>S15</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>5.402</td></tr><tr><td>S1.008</td><td>S16</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>5.160</td></tr><tr><td>S1.009</td><td>S17</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>4.655</td></tr><tr><td>S6.000</td><td>S18</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>6.639</td></tr><tr><td>S6.001</td><td>S19</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>6.627</td></tr><tr><td>S6.002</td><td>S20</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>6.215</td></tr><tr><td>S6.003</td><td>S21</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>6.030</td></tr><tr><td>S6.004</td><td>S22</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>5.877</td></tr><tr><td>S6.005</td><td>S23</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>5.629</td></tr><tr><td>S1.010</td><td>S24</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>4.550</td></tr></table>																			Water	PN	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level		Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	S5.000	S12	15 Winter	100	+40%					6.569	S4.002	S13	15 Winter	100	+40%	100/15 Summer				6.112	S4.003	S14	15 Winter	100	+40%	100/15 Summer				5.848	S1.007	S15	15 Winter	100	+40%	100/15 Summer				5.402	S1.008	S16	15 Winter	100	+40%	100/15 Summer				5.160	S1.009	S17	15 Winter	100	+40%	100/15 Summer				4.655	S6.000	S18	15 Winter	100	+40%	100/15 Summer				6.639	S6.001	S19	15 Winter	100	+40%	100/15 Summer				6.627	S6.002	S20	15 Winter	100	+40%	100/15 Summer				6.215	S6.003	S21	15 Winter	100	+40%	100/15 Summer				6.030	S6.004	S22	15 Winter	100	+40%	100/15 Summer				5.877	S6.005	S23	15 Winter	100	+40%					5.629	S1.010	S24	15 Winter	100	+40%	100/15 Summer				4.550										
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S4.003	S14	15 Winter	100	+40%	100/15 Summer				5.848																																																																																																																																																																										
S1.007	S15	15 Winter	100	+40%	100/15 Summer				5.402																																																																																																																																																																										
S1.008	S16	15 Winter	100	+40%	100/15 Summer				5.160																																																																																																																																																																										
S1.009	S17	15 Winter	100	+40%	100/15 Summer				4.655																																																																																																																																																																										
S6.000	S18	15 Winter	100	+40%	100/15 Summer				6.639																																																																																																																																																																										
S6.001	S19	15 Winter	100	+40%	100/15 Summer				6.627																																																																																																																																																																										
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	US/MH		Surcharged	Flooded		Pipe																																																																																																																																																																													
	Name	Depth	Volume	Flow /	Overflow	Flow		Level																																																																																																																																																																											
PN		(m)	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded																																																																																																																																																																											
S5.000	S12	-0.136	0.000	0.33		25.7	OK																																																																																																																																																																												
S4.002	S13	0.467	0.000	1.66		61.4	SURCHARGED																																																																																																																																																																												
S4.003	S14	0.352	0.000	0.85		63.8	SURCHARGED																																																																																																																																																																												
S1.007	S15	0.726	0.000	1.73		169.3	SURCHARGED																																																																																																																																																																												
S1.008	S16	0.565	0.000	1.77		183.6	SURCHARGED																																																																																																																																																																												
S1.009	S17	0.215	0.000	1.67		183.0	SURCHARGED																																																																																																																																																																												
S6.000	S18	0.079	0.000	0.15		11.6	SURCHARGED																																																																																																																																																																												
S6.001	S19	0.367	0.000	1.31		50.2	SURCHARGED																																																																																																																																																																												
S6.002	S20	0.237	0.000	1.26		45.8	SURCHARGED																																																																																																																																																																												
S6.003	S21	0.175	0.000	1.30		45.9	SURCHARGED																																																																																																																																																																												
S6.004	S22	0.113	0.000	1.63		55.7	SURCHARGED																																																																																																																																																																												
S6.005	S23	-0.067	0.000	0.81		86.2	OK																																																																																																																																																																												
S1.010	S24	0.148	0.000	2.44		248.0	SURCHARGED																																																																																																																																																																												
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<p style="text-align: center;"><u>Summary of Results for 10 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 797 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>3.436</td><td>0.636</td><td>1.2</td><td>57.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>3.594</td><td>0.794</td><td>1.5</td><td>71.5</td><td>O K</td></tr><tr><td>60 min Summer</td><td>3.782</td><td>0.982</td><td>1.9</td><td>88.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>4.000</td><td>1.200</td><td>1.9</td><td>108.0</td><td>O K</td></tr><tr><td>180 min Summer</td><td>4.138</td><td>1.338</td><td>1.9</td><td>120.4</td><td>O K</td></tr><tr><td>240 min Summer</td><td>4.237</td><td>1.437</td><td>1.9</td><td>129.4</td><td>O K</td></tr><tr><td>360 min Summer</td><td>4.372</td><td>1.572</td><td>1.9</td><td>141.5</td><td>O K</td></tr><tr><td>480 min Summer</td><td>4.458</td><td>1.658</td><td>1.9</td><td>149.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>4.515</td><td>1.715</td><td>1.9</td><td>154.3</td><td>O K</td></tr><tr><td>720 min Summer</td><td>4.561</td><td>1.761</td><td>1.9</td><td>158.5</td><td>O K</td></tr><tr><td>960 min Summer</td><td>4.539</td><td>1.739</td><td>1.9</td><td>156.5</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>4.484</td><td>1.684</td><td>1.9</td><td>151.5</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>4.381</td><td>1.581</td><td>1.9</td><td>142.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>4.271</td><td>1.471</td><td>1.9</td><td>132.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>4.185</td><td>1.385</td><td>1.9</td><td>124.6</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>4.080</td><td>1.280</td><td>1.9</td><td>115.2</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>3.979</td><td>1.179</td><td>1.9</td><td>106.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>3.890</td><td>1.090</td><td>1.9</td><td>98.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>3.818</td><td>1.018</td><td>1.9</td><td>91.6</td><td>O K</td></tr><tr><td>15 min Winter</td><td>3.513</td><td>0.713</td><td>1.4</td><td>64.1</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>51.534</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>32.474</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>20.463</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>12.894</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>9.842</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>8.125</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>6.202</td><td>0.0</td><td>360</td></tr><tr><td>480 min Summer</td><td>5.120</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>4.413</td><td>0.0</td><td>562</td></tr><tr><td>720 min Summer</td><td>3.908</td><td>0.0</td><td>620</td></tr><tr><td>960 min Summer</td><td>3.095</td><td>0.0</td><td>742</td></tr><tr><td>1440 min Summer</td><td>2.227</td><td>0.0</td><td>996</td></tr><tr><td>2160 min Summer</td><td>1.603</td><td>0.0</td><td>1404</td></tr><tr><td>2880 min Summer</td><td>1.269</td><td>0.0</td><td>1812</td></tr><tr><td>4320 min Summer</td><td>0.974</td><td>0.0</td><td>2596</td></tr><tr><td>5760 min Summer</td><td>0.807</td><td>0.0</td><td>3352</td></tr><tr><td>7200 min Summer</td><td>0.698</td><td>0.0</td><td>4104</td></tr><tr><td>8640 min Summer</td><td>0.619</td><td>0.0</td><td>4832</td></tr><tr><td>10080 min Summer</td><td>0.560</td><td>0.0</td><td>5456</td></tr><tr><td>15 min Winter</td><td>51.534</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	3.436	0.636	1.2	57.3	O K	30 min Summer	3.594	0.794	1.5	71.5	O K	60 min Summer	3.782	0.982	1.9	88.4	O K	120 min Summer	4.000	1.200	1.9	108.0	O K	180 min Summer	4.138	1.338	1.9	120.4	O K	240 min Summer	4.237	1.437	1.9	129.4	O K	360 min Summer	4.372	1.572	1.9	141.5	O K	480 min Summer	4.458	1.658	1.9	149.2	O K	600 min Summer	4.515	1.715	1.9	154.3	O K	720 min Summer	4.561	1.761	1.9	158.5	O K	960 min Summer	4.539	1.739	1.9	156.5	O K	1440 min Summer	4.484	1.684	1.9	151.5	O K	2160 min Summer	4.381	1.581	1.9	142.3	O K	2880 min Summer	4.271	1.471	1.9	132.4	O K	4320 min Summer	4.185	1.385	1.9	124.6	O K	5760 min Summer	4.080	1.280	1.9	115.2	O K	7200 min Summer	3.979	1.179	1.9	106.1	O K	8640 min Summer	3.890	1.090	1.9	98.1	O K	10080 min Summer	3.818	1.018	1.9	91.6	O K	15 min Winter	3.513	0.713	1.4	64.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	51.534	0.0	19	30 min Summer	32.474	0.0	34	60 min Summer	20.463	0.0	64	120 min Summer	12.894	0.0	122	180 min Summer	9.842	0.0	182	240 min Summer	8.125	0.0	242	360 min Summer	6.202	0.0	360	480 min Summer	5.120	0.0	480	600 min Summer	4.413	0.0	562	720 min Summer	3.908	0.0	620	960 min Summer	3.095	0.0	742	1440 min Summer	2.227	0.0	996	2160 min Summer	1.603	0.0	1404	2880 min Summer	1.269	0.0	1812	4320 min Summer	0.974	0.0	2596	5760 min Summer	0.807	0.0	3352	7200 min Summer	0.698	0.0	4104	8640 min Summer	0.619	0.0	4832	10080 min Summer	0.560	0.0	5456	15 min Winter	51.534	0.0	19
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Odyssey Markides				Page 2	
Tuscany House		18-344			
White Hart Lane		Ford Lane, Yapton			
Basingstoke RG21 4AF		Highway Swale			
Date 15/01/2020		Designed by SG			
File 18-344 HIGHWAY SWALE (1...		Checked by			
XP Solutions		Source Control 2018.1			
<p style="text-align: center;"><u>Summary of Results for 10 year Return Period</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	3.690	0.890	1.7	80.1	O K
60 min Winter	3.902	1.102	1.9	99.2	O K
120 min Winter	4.152	1.352	1.9	121.7	O K
180 min Winter	4.312	1.512	1.9	136.1	O K
240 min Winter	4.428	1.628	1.9	146.5	O K
360 min Winter	4.589	1.789	1.9	161.0	O K
480 min Winter	4.696	1.896	1.9	170.6	O K
600 min Winter	4.770	1.970	1.9	177.3	O K
720 min Winter	4.822	2.022	1.9	181.9	O K
960 min Winter	4.776	1.976	1.9	177.8	O K
1440 min Winter	4.693	1.893	1.9	170.3	O K
2160 min Winter	4.533	1.733	1.9	156.0	O K
2880 min Winter	4.365	1.565	1.9	140.8	O K
4320 min Winter	4.190	1.390	1.9	125.1	O K
5760 min Winter	4.011	1.211	1.9	109.0	O K
7200 min Winter	3.860	1.060	1.9	95.4	O K
8640 min Winter	3.766	0.966	1.9	86.9	O K
10080 min Winter	3.699	0.899	1.7	80.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	32.474	0.0	33		
60 min Winter	20.463	0.0	62		
120 min Winter	12.894	0.0	120		
180 min Winter	9.842	0.0	178		
240 min Winter	8.125	0.0	238		
360 min Winter	6.202	0.0	352		
480 min Winter	5.120	0.0	466		
600 min Winter	4.413	0.0	576		
720 min Winter	3.908	0.0	684		
960 min Winter	3.095	0.0	808		
1440 min Winter	2.227	0.0	1082		
2160 min Winter	1.603	0.0	1532		
2880 min Winter	1.269	0.0	1960		
4320 min Winter	0.974	0.0	2768		
5760 min Winter	0.807	0.0	3520		
7200 min Winter	0.698	0.0	4184		
8640 min Winter	0.619	0.0	4920		
10080 min Winter	0.560	0.0	5648		
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Odyssey Markides		Page 3
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Swale	
Date 15/01/2020 File 18-344 HIGHWAY SWALE (1...	Designed by SG Checked by	
XP Solutions Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 7.500

Dry Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Length (m)	200.0
Infiltration Coefficient Side (m/hr)	0.00000	Trench Infiltration Side (m/hr)	0.03456
Safety Factor	2.0	Trench Porosity	0.30
Porosity	1.00	Side Slope (1:X)	4.0
Invert Level (m)	2.800	Slope (1:X)	0.0
Trench Height (m)	4.000	Cap Volume Depth (m)	4.450
Trench Width (m)	1.5	Cap Infiltration Depth (m)	1.000

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<p><u>Summary of Results for 100 year Return Period (+40%)</u></p> <p>Half Drain Time : 2284 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>4.812</td><td>2.012</td><td>1.9</td><td>181.1</td><td>O K</td></tr><tr><td>30 min Summer</td><td>5.224</td><td>2.424</td><td>1.9</td><td>218.2</td><td>O K</td></tr><tr><td>60 min Summer</td><td>5.711</td><td>2.911</td><td>1.9</td><td>262.0</td><td>O K</td></tr><tr><td>120 min Summer</td><td>6.277</td><td>3.477</td><td>1.9</td><td>312.9</td><td>O K</td></tr><tr><td>180 min Summer</td><td>6.642</td><td>3.842</td><td>1.9</td><td>345.7</td><td>O K</td></tr><tr><td>240 min Summer</td><td>6.831</td><td>4.031</td><td>1.9</td><td>370.1</td><td>O K</td></tr><tr><td>360 min Summer</td><td>6.915</td><td>4.115</td><td>1.9</td><td>405.3</td><td>O K</td></tr><tr><td>480 min Summer</td><td>6.963</td><td>4.163</td><td>1.9</td><td>430.3</td><td>O K</td></tr><tr><td>600 min Summer</td><td>6.995</td><td>4.195</td><td>1.9</td><td>449.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>7.019</td><td>4.219</td><td>1.9</td><td>463.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>7.016</td><td>4.216</td><td>1.9</td><td>462.2</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>6.995</td><td>4.195</td><td>1.9</td><td>448.8</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>6.947</td><td>4.147</td><td>1.9</td><td>421.6</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>6.901</td><td>4.101</td><td>1.9</td><td>398.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>6.885</td><td>4.085</td><td>1.9</td><td>391.5</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>6.854</td><td>4.054</td><td>1.9</td><td>378.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>6.811</td><td>4.011</td><td>1.9</td><td>363.3</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>6.655</td><td>3.855</td><td>1.9</td><td>347.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>6.469</td><td>3.669</td><td>1.9</td><td>330.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>5.054</td><td>2.254</td><td>1.9</td><td>202.9</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>162.161</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>98.106</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>59.354</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>35.909</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>26.763</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>21.725</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>16.191</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>13.143</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>11.180</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>9.796</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>7.627</td><td>0.0</td><td>962</td></tr><tr><td>1440 min Summer</td><td>5.360</td><td>0.0</td><td>1440</td></tr><tr><td>2160 min Summer</td><td>3.767</td><td>0.0</td><td>1820</td></tr><tr><td>2880 min Summer</td><td>2.933</td><td>0.0</td><td>2164</td></tr><tr><td>4320 min Summer</td><td>2.197</td><td>0.0</td><td>2980</td></tr><tr><td>5760 min Summer</td><td>1.790</td><td>0.0</td><td>3808</td></tr><tr><td>7200 min Summer</td><td>1.527</td><td>0.0</td><td>4616</td></tr><tr><td>8640 min Summer</td><td>1.341</td><td>0.0</td><td>5448</td></tr><tr><td>10080 min Summer</td><td>1.202</td><td>0.0</td><td>6256</td></tr><tr><td>15 min Winter</td><td>162.161</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	4.812	2.012	1.9	181.1	O K	30 min Summer	5.224	2.424	1.9	218.2	O K	60 min Summer	5.711	2.911	1.9	262.0	O K	120 min Summer	6.277	3.477	1.9	312.9	O K	180 min Summer	6.642	3.842	1.9	345.7	O K	240 min Summer	6.831	4.031	1.9	370.1	O K	360 min Summer	6.915	4.115	1.9	405.3	O K	480 min Summer	6.963	4.163	1.9	430.3	O K	600 min Summer	6.995	4.195	1.9	449.1	O K	720 min Summer	7.019	4.219	1.9	463.8	O K	960 min Summer	7.016	4.216	1.9	462.2	O K	1440 min Summer	6.995	4.195	1.9	448.8	O K	2160 min Summer	6.947	4.147	1.9	421.6	O K	2880 min Summer	6.901	4.101	1.9	398.6	O K	4320 min Summer	6.885	4.085	1.9	391.5	O K	5760 min Summer	6.854	4.054	1.9	378.5	O K	7200 min Summer	6.811	4.011	1.9	363.3	O K	8640 min Summer	6.655	3.855	1.9	347.0	O K	10080 min Summer	6.469	3.669	1.9	330.2	O K	15 min Winter	5.054	2.254	1.9	202.9	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	162.161	0.0	19	30 min Summer	98.106	0.0	34	60 min Summer	59.354	0.0	64	120 min Summer	35.909	0.0	124	180 min Summer	26.763	0.0	184	240 min Summer	21.725	0.0	244	360 min Summer	16.191	0.0	362	480 min Summer	13.143	0.0	482	600 min Summer	11.180	0.0	602	720 min Summer	9.796	0.0	722	960 min Summer	7.627	0.0	962	1440 min Summer	5.360	0.0	1440	2160 min Summer	3.767	0.0	1820	2880 min Summer	2.933	0.0	2164	4320 min Summer	2.197	0.0	2980	5760 min Summer	1.790	0.0	3808	7200 min Summer	1.527	0.0	4616	8640 min Summer	1.341	0.0	5448	10080 min Summer	1.202	0.0	6256	15 min Winter	162.161	0.0	19
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Odyssey Markides				Page 2	
Tuscany House		18-344			
White Hart Lane		Ford Lane, Yapton			
Basingstoke RG21 4AF		Highway Swale			
Date 15/01/2020		Designed by SG			
File 18-344 HIGHWAY SWALE (1...		Checked by			
XP Solutions		Source Control 2018.1			
<p><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	5.517	2.717	1.9	244.6	O K
60 min Winter	6.065	3.265	1.9	293.9	O K
120 min Winter	6.705	3.905	1.9	351.5	O K
180 min Winter	6.879	4.079	1.9	388.8	O K
240 min Winter	6.938	4.138	1.9	416.6	O K
360 min Winter	7.008	4.208	1.9	457.2	O K
480 min Winter	7.052	4.252	1.9	486.3	O K
600 min Winter	7.083	4.283	1.9	508.6	O K
720 min Winter	7.106	4.306	1.9	526.3	O K
960 min Winter	7.106	4.306	1.9	527.0	O K
1440 min Winter	7.094	4.294	1.9	517.2	O K
2160 min Winter	7.057	4.257	1.9	489.6	O K
2880 min Winter	7.010	4.210	1.9	458.5	O K
4320 min Winter	6.991	4.191	1.9	446.3	O K
5760 min Winter	6.953	4.153	1.9	424.6	O K
7200 min Winter	6.902	4.102	1.9	398.9	O K
8640 min Winter	6.835	4.035	1.9	371.5	O K
10080 min Winter	6.620	3.820	1.9	343.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	98.106	0.0	34		
60 min Winter	59.354	0.0	64		
120 min Winter	35.909	0.0	122		
180 min Winter	26.763	0.0	182		
240 min Winter	21.725	0.0	240		
360 min Winter	16.191	0.0	358		
480 min Winter	13.143	0.0	476		
600 min Winter	11.180	0.0	594		
720 min Winter	9.796	0.0	710		
960 min Winter	7.627	0.0	942		
1440 min Winter	5.360	0.0	1398		
2160 min Winter	3.767	0.0	2036		
2880 min Winter	2.933	0.0	2332		
4320 min Winter	2.197	0.0	3240		
5760 min Winter	1.790	0.0	4152		
7200 min Winter	1.527	0.0	5048		
8640 min Winter	1.341	0.0	5960		
10080 min Winter	1.202	0.0	6760		
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Odyssey Markides		Page 3
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Highway Swale	
Date 15/01/2020 File 18-344 HIGHWAY SWALE (1...	Designed by SG Checked by	
XP Solutions Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 7.500

Dry Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Length (m)	200.0
Infiltration Coefficient Side (m/hr)	0.00000	Trench Infiltration Side (m/hr)	0.03456
Safety Factor	2.0	Trench Porosity	0.30
Porosity	1.00	Side Slope (1:X)	4.0
Invert Level (m)	2.800	Slope (1:X)	0.0
Trench Height (m)	4.000	Cap Volume Depth (m)	4.450
Trench Width (m)	1.5	Cap Infiltration Depth (m)	1.000

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Odyssey Markides				Page 1																																																																																																																																																																																																																			
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Summer</td><td>6.349</td><td>0.949</td><td>6.6</td><td>207.4</td><td>O K</td></tr><tr><td>600 min Summer</td><td>6.331</td><td>0.931</td><td>6.6</td><td>203.3</td><td>O K</td></tr><tr><td>720 min Summer</td><td>6.311</td><td>0.911</td><td>6.6</td><td>199.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>6.211</td><td>0.811</td><td>6.6</td><td>177.2</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>6.040</td><td>0.640</td><td>6.6</td><td>139.9</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>5.832</td><td>0.432</td><td>6.6</td><td>94.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>5.673</td><td>0.273</td><td>6.6</td><td>59.7</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>5.521</td><td>0.121</td><td>6.6</td><td>26.4</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>5.454</td><td>0.054</td><td>6.6</td><td>11.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>5.444</td><td>0.044</td><td>5.8</td><td>9.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>5.439</td><td>0.039</td><td>5.1</td><td>8.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>5.435</td><td>0.035</td><td>4.6</td><td>7.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>6.094</td><td>0.694</td><td>6.6</td><td>151.6</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>162.161</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>98.106</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>59.354</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>35.909</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>26.763</td><td>0.0</td><td>180</td></tr><tr><td>240 min Summer</td><td>21.725</td><td>0.0</td><td>240</td></tr><tr><td>360 min Summer</td><td>16.191</td><td>0.0</td><td>302</td></tr><tr><td>480 min Summer</td><td>13.143</td><td>0.0</td><td>364</td></tr><tr><td>600 min Summer</td><td>11.180</td><td>0.0</td><td>430</td></tr><tr><td>720 min Summer</td><td>9.796</td><td>0.0</td><td>500</td></tr><tr><td>960 min Summer</td><td>7.627</td><td>0.0</td><td>634</td></tr><tr><td>1440 min Summer</td><td>5.360</td><td>0.0</td><td>896</td></tr><tr><td>2160 min Summer</td><td>3.767</td><td>0.0</td><td>1276</td></tr><tr><td>2880 min Summer</td><td>2.933</td><td>0.0</td><td>1616</td></tr><tr><td>4320 min Summer</td><td>2.197</td><td>0.0</td><td>2292</td></tr><tr><td>5760 min Summer</td><td>1.790</td><td>0.0</td><td>2936</td></tr><tr><td>7200 min Summer</td><td>1.527</td><td>0.0</td><td>3672</td></tr><tr><td>8640 min Summer</td><td>1.341</td><td>0.0</td><td>4368</td></tr><tr><td>10080 min Summer</td><td>1.202</td><td>0.0</td><td>5072</td></tr><tr><td>15 min Winter</td><td>162.161</td><td>0.0</td><td>18</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	6.016	0.616	6.6	134.6	O K	30 min Summer	6.127	0.727	6.6	158.9	O K	60 min Summer	6.241	0.841	6.6	183.8	O K	120 min Summer	6.340	0.940	6.6	205.3	O K	180 min Summer	6.375	0.975	6.6	212.9	O K	240 min Summer	6.381	0.981	6.6	214.4	O K	360 min Summer	6.367	0.967	6.6	211.4	O K	480 min Summer	6.349	0.949	6.6	207.4	O K	600 min Summer	6.331	0.931	6.6	203.3	O K	720 min Summer	6.311	0.911	6.6	199.0	O K	960 min Summer	6.211	0.811	6.6	177.2	O K	1440 min Summer	6.040	0.640	6.6	139.9	O K	2160 min Summer	5.832	0.432	6.6	94.3	O K	2880 min Summer	5.673	0.273	6.6	59.7	O K	4320 min Summer	5.521	0.121	6.6	26.4	O K	5760 min Summer	5.454	0.054	6.6	11.7	O K	7200 min Summer	5.444	0.044	5.8	9.6	O K	8640 min Summer	5.439	0.039	5.1	8.4	O K	10080 min Summer	5.435	0.035	4.6	7.5	O K	15 min Winter	6.094	0.694	6.6	151.6	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	162.161	0.0	18	30 min Summer	98.106	0.0	33	60 min Summer	59.354	0.0	62	120 min Summer	35.909	0.0	122	180 min Summer	26.763	0.0	180	240 min Summer	21.725	0.0	240	360 min Summer	16.191	0.0	302	480 min Summer	13.143	0.0	364	600 min Summer	11.180	0.0	430	720 min Summer	9.796	0.0	500	960 min Summer	7.627	0.0	634	1440 min Summer	5.360	0.0	896	2160 min Summer	3.767	0.0	1276	2880 min Summer	2.933	0.0	1616	4320 min Summer	2.197	0.0	2292	5760 min Summer	1.790	0.0	2936	7200 min Summer	1.527	0.0	3672	8640 min Summer	1.341	0.0	4368	10080 min Summer	1.202	0.0	5072	15 min Winter	162.161	0.0	18
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
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30 min Summer	6.127	0.727	6.6	158.9	O K																																																																																																																																																																																																																		
60 min Summer	6.241	0.841	6.6	183.8	O K																																																																																																																																																																																																																		
120 min Summer	6.340	0.940	6.6	205.3	O K																																																																																																																																																																																																																		
180 min Summer	6.375	0.975	6.6	212.9	O K																																																																																																																																																																																																																		
240 min Summer	6.381	0.981	6.6	214.4	O K																																																																																																																																																																																																																		
360 min Summer	6.367	0.967	6.6	211.4	O K																																																																																																																																																																																																																		
480 min Summer	6.349	0.949	6.6	207.4	O K																																																																																																																																																																																																																		
600 min Summer	6.331	0.931	6.6	203.3	O K																																																																																																																																																																																																																		
720 min Summer	6.311	0.911	6.6	199.0	O K																																																																																																																																																																																																																		
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60 min Summer	59.354	0.0	62																																																																																																																																																																																																																				
120 min Summer	35.909	0.0	122																																																																																																																																																																																																																				
180 min Summer	26.763	0.0	180																																																																																																																																																																																																																				
240 min Summer	21.725	0.0	240																																																																																																																																																																																																																				
360 min Summer	16.191	0.0	302																																																																																																																																																																																																																				
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Odyssey Markides				Page 2	
Tuscany House		18-344			
White Hart Lane		Ford Lane, Yapton			
Basingstoke RG21 4AF		Cellular Soakaway 1			
Date 15/01/2020		Designed by NA			
File 18-344 TANK 1.SRCX		Checked by			
XP Solutions		Source Control 2018.1			
<p><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	6.222	0.822	6.6	179.5	O K
60 min Winter	6.356	0.956	6.6	208.9	O K
120 min Winter	6.480	1.080	6.6	236.0	O K
180 min Winter	6.533	1.133	6.6	247.6	O K
240 min Winter	6.554	1.154	6.6	252.1	O K
360 min Winter	6.548	1.148	6.6	250.8	O K
480 min Winter	6.517	1.117	6.6	244.0	O K
600 min Winter	6.490	1.090	6.6	238.2	O K
720 min Winter	6.459	1.059	6.6	231.4	O K
960 min Winter	6.318	0.918	6.6	200.7	O K
1440 min Winter	6.067	0.667	6.6	145.8	O K
2160 min Winter	5.763	0.363	6.6	79.3	O K
2880 min Winter	5.550	0.150	6.6	32.8	O K
4320 min Winter	5.446	0.046	6.0	9.9	O K
5760 min Winter	5.437	0.037	4.9	8.1	O K
7200 min Winter	5.432	0.032	4.2	6.9	O K
8640 min Winter	5.428	0.028	3.7	6.1	O K
10080 min Winter	5.425	0.025	3.3	5.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	98.106	0.0	33		
60 min Winter	59.354	0.0	62		
120 min Winter	35.909	0.0	120		
180 min Winter	26.763	0.0	176		
240 min Winter	21.725	0.0	232		
360 min Winter	16.191	0.0	340		
480 min Winter	13.143	0.0	392		
600 min Winter	11.180	0.0	464		
720 min Winter	9.796	0.0	542		
960 min Winter	7.627	0.0	692		
1440 min Winter	5.360	0.0	968		
2160 min Winter	3.767	0.0	1344		
2880 min Winter	2.933	0.0	1648		
4320 min Winter	2.197	0.0	2184		
5760 min Winter	1.790	0.0	2888		
7200 min Winter	1.527	0.0	3576		
8640 min Winter	1.341	0.0	4408		
10080 min Winter	1.202	0.0	5136		
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Odyssey Markides		Page 3
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Cellular Soakaway 1	
Date 15/01/2020 File 18-344 TANK 1.SRCX	Designed by NA Checked by	
XP Solutions Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 7.800

Cellular Storage Structure

Invert Level (m) 5.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.20628 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	230.0	230.0	1.201	0.0	302.8
1.200	230.0	302.8			

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Odyssey Markides		Page 1
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Cellular Soakaway	
Date 15/01/2020 File 18-344 Tank 2 Catchment...	Designed by NA Checked by	
XP Solutions Source Control 2018.1		

Cascade Summary of Results for 18-344 Tank 2.SRCX

Upstream Structures	Outflow To	Overflow To
18-344 Permeable (Tank 2).SRCX	(None)	(None)

Half Drain Time : 306 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	3.041	0.421	4.7	61.9	O K
30 min Summer	3.136	0.516	4.7	76.0	O K
60 min Summer	3.248	0.628	4.7	92.5	O K
120 min Summer	3.379	0.759	4.7	111.8	O K
180 min Summer	3.463	0.843	4.7	124.1	O K
240 min Summer	3.523	0.903	4.7	132.9	O K
360 min Summer	3.601	0.981	4.7	144.4	O K
480 min Summer	3.607	0.987	4.7	145.3	O K
600 min Summer	3.594	0.974	4.7	143.4	O K
720 min Summer	3.579	0.959	4.7	141.2	O K
960 min Summer	3.483	0.863	4.7	127.0	O K
1440 min Summer	3.304	0.684	4.7	100.7	O K
2160 min Summer	3.082	0.462	4.7	68.1	O K
2880 min Summer	2.913	0.293	4.7	43.1	O K
4320 min Summer	2.748	0.128	4.7	18.9	O K
5760 min Summer	2.674	0.054	4.7	8.0	O K
7200 min Summer	2.664	0.044	4.2	6.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	162.161	0.0	124
30 min Summer	98.106	0.0	153
60 min Summer	59.354	0.0	192
120 min Summer	35.909	0.0	244
180 min Summer	26.763	0.0	282
240 min Summer	21.725	0.0	318
360 min Summer	16.191	0.0	384
480 min Summer	13.143	0.0	454
600 min Summer	11.180	0.0	504
720 min Summer	9.796	0.0	560
960 min Summer	7.627	0.0	668
1440 min Summer	5.360	0.0	924
2160 min Summer	3.767	0.0	1300
2880 min Summer	2.933	0.0	1648
4320 min Summer	2.197	0.0	2324
5760 min Summer	1.790	0.0	2952
7200 min Summer	1.527	0.0	3656

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Odyssey Markides				Page 2	
Tuscany House		18-344			
White Hart Lane		Ford Lane, Yapton			
Basingstoke RG21 4AF		Cellular Soakaway			
Date 15/01/2020		Designed by NA			
File 18-344 Tank 2 Catchment...		Checked by			
XP Solutions		Source Control 2018.1			
<u>Cascade Summary of Results for 18-344 Tank 2.SRCX</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	2.659	0.039	3.7	5.7	O K
10080 min Summer	2.655	0.035	3.3	5.1	O K
15 min Winter	3.095	0.475	4.7	70.0	O K
30 min Winter	3.199	0.579	4.7	85.3	O K
60 min Winter	3.325	0.705	4.7	103.8	O K
120 min Winter	3.475	0.855	4.7	125.8	O K
180 min Winter	3.569	0.949	4.7	139.8	O K
240 min Winter	3.646	1.026	4.7	151.1	O K
360 min Winter	3.755	1.135	4.7	167.1	O K
480 min Winter	3.800	1.180	4.7	173.8	O K
600 min Winter	3.775	1.155	4.7	170.1	O K
720 min Winter	3.749	1.129	4.7	166.3	O K
960 min Winter	3.604	0.984	4.7	144.9	O K
1440 min Winter	3.338	0.718	4.7	105.7	O K
2160 min Winter	3.012	0.392	4.7	57.7	O K
2880 min Winter	2.783	0.163	4.7	24.0	O K
4320 min Winter	2.666	0.046	4.3	6.7	O K
5760 min Winter	2.657	0.037	3.5	5.5	O K
7200 min Winter	2.652	0.032	3.0	4.7	O K
8640 min Winter	2.648	0.028	2.7	4.1	O K
10080 min Winter	2.645	0.025	2.4	3.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
8640 min Summer	1.341	0.0	4376		
10080 min Summer	1.202	0.0	5088		
15 min Winter	162.161	0.0	138		
30 min Winter	98.106	0.0	172		
60 min Winter	59.354	0.0	214		
120 min Winter	35.909	0.0	268		
180 min Winter	26.763	0.0	310		
240 min Winter	21.725	0.0	344		
360 min Winter	16.191	0.0	402		
480 min Winter	13.143	0.0	474		
600 min Winter	11.180	0.0	530		
720 min Winter	9.796	0.0	582		
960 min Winter	7.627	0.0	718		
1440 min Winter	5.360	0.0	996		
2160 min Winter	3.767	0.0	1368		
2880 min Winter	2.933	0.0	1680		
4320 min Winter	2.197	0.0	2208		
5760 min Winter	1.790	0.0	2936		
7200 min Winter	1.527	0.0	3664		
8640 min Winter	1.341	0.0	4416		
10080 min Winter	1.202	0.0	5024		
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Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Cellular Soakaway	
Date 15/01/2020 File 18-344 Tank 2 Catchment...	Designed by NA Checked by	
XP Solutions Source Control 2018.1		

Cascade Model Details for 18-344 Tank 2.SRCX

Storage is Online Cover Level (m) 8.000

Cellular Storage Structure

Invert Level (m) 2.620 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.20628 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	155.0	165.0	1.201	0.0	226.7
1.200	155.0	226.7			

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Odyssey Markides				Page 1																																																																																																																																																																																																																			
Tuscany House		18-344																																																																																																																																																																																																																					
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<p><u>Summary of Results for 100 year Return Period (+40%)</u></p> <p>Half Drain Time : 587 minutes.</p> <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>4.723</td><td>0.923</td><td>8.3</td><td>267.7</td><td>O K</td></tr><tr><td>30 min Summer</td><td>4.899</td><td>1.099</td><td>8.3</td><td>318.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>5.091</td><td>1.291</td><td>8.3</td><td>374.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>5.286</td><td>1.486</td><td>8.3</td><td>431.0</td><td>O K</td></tr><tr><td>180 min Summer</td><td>5.387</td><td>1.587</td><td>8.3</td><td>460.2</td><td>O K</td></tr><tr><td>240 min Summer</td><td>5.444</td><td>1.644</td><td>8.3</td><td>476.7</td><td>O K</td></tr><tr><td>360 min Summer</td><td>5.489</td><td>1.689</td><td>8.3</td><td>489.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>5.484</td><td>1.684</td><td>8.3</td><td>488.4</td><td>O K</td></tr><tr><td>600 min Summer</td><td>5.466</td><td>1.666</td><td>8.3</td><td>483.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>5.448</td><td>1.648</td><td>8.3</td><td>477.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>5.316</td><td>1.516</td><td>8.3</td><td>439.7</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>5.112</td><td>1.312</td><td>8.3</td><td>380.4</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>4.857</td><td>1.057</td><td>8.3</td><td>306.7</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>4.639</td><td>0.839</td><td>8.3</td><td>243.3</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>4.395</td><td>0.595</td><td>8.3</td><td>172.4</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>4.194</td><td>0.394</td><td>8.3</td><td>114.2</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>4.042</td><td>0.242</td><td>8.3</td><td>70.3</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>3.935</td><td>0.135</td><td>8.3</td><td>39.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>3.873</td><td>0.073</td><td>8.3</td><td>21.3</td><td>O K</td></tr><tr><td>15 min Winter</td><td>4.837</td><td>1.037</td><td>8.3</td><td>300.8</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>162.161</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>98.106</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>59.354</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>35.909</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>26.763</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>21.725</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>16.191</td><td>0.0</td><td>360</td></tr><tr><td>480 min Summer</td><td>13.143</td><td>0.0</td><td>468</td></tr><tr><td>600 min Summer</td><td>11.180</td><td>0.0</td><td>518</td></tr><tr><td>720 min Summer</td><td>9.796</td><td>0.0</td><td>584</td></tr><tr><td>960 min Summer</td><td>7.627</td><td>0.0</td><td>702</td></tr><tr><td>1440 min Summer</td><td>5.360</td><td>0.0</td><td>966</td></tr><tr><td>2160 min Summer</td><td>3.767</td><td>0.0</td><td>1364</td></tr><tr><td>2880 min Summer</td><td>2.933</td><td>0.0</td><td>1756</td></tr><tr><td>4320 min Summer</td><td>2.197</td><td>0.0</td><td>2508</td></tr><tr><td>5760 min Summer</td><td>1.790</td><td>0.0</td><td>3224</td></tr><tr><td>7200 min Summer</td><td>1.527</td><td>0.0</td><td>3888</td></tr><tr><td>8640 min Summer</td><td>1.341</td><td>0.0</td><td>4576</td></tr><tr><td>10080 min Summer</td><td>1.202</td><td>0.0</td><td>5152</td></tr><tr><td>15 min Winter</td><td>162.161</td><td>0.0</td><td>19</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	4.723	0.923	8.3	267.7	O K	30 min Summer	4.899	1.099	8.3	318.7	O K	60 min Summer	5.091	1.291	8.3	374.5	O K	120 min Summer	5.286	1.486	8.3	431.0	O K	180 min Summer	5.387	1.587	8.3	460.2	O K	240 min Summer	5.444	1.644	8.3	476.7	O K	360 min Summer	5.489	1.689	8.3	489.8	O K	480 min Summer	5.484	1.684	8.3	488.4	O K	600 min Summer	5.466	1.666	8.3	483.2	O K	720 min Summer	5.448	1.648	8.3	477.8	O K	960 min Summer	5.316	1.516	8.3	439.7	O K	1440 min Summer	5.112	1.312	8.3	380.4	O K	2160 min Summer	4.857	1.057	8.3	306.7	O K	2880 min Summer	4.639	0.839	8.3	243.3	O K	4320 min Summer	4.395	0.595	8.3	172.4	O K	5760 min Summer	4.194	0.394	8.3	114.2	O K	7200 min Summer	4.042	0.242	8.3	70.3	O K	8640 min Summer	3.935	0.135	8.3	39.3	O K	10080 min Summer	3.873	0.073	8.3	21.3	O K	15 min Winter	4.837	1.037	8.3	300.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	162.161	0.0	19	30 min Summer	98.106	0.0	33	60 min Summer	59.354	0.0	64	120 min Summer	35.909	0.0	122	180 min Summer	26.763	0.0	182	240 min Summer	21.725	0.0	242	360 min Summer	16.191	0.0	360	480 min Summer	13.143	0.0	468	600 min Summer	11.180	0.0	518	720 min Summer	9.796	0.0	584	960 min Summer	7.627	0.0	702	1440 min Summer	5.360	0.0	966	2160 min Summer	3.767	0.0	1364	2880 min Summer	2.933	0.0	1756	4320 min Summer	2.197	0.0	2508	5760 min Summer	1.790	0.0	3224	7200 min Summer	1.527	0.0	3888	8640 min Summer	1.341	0.0	4576	10080 min Summer	1.202	0.0	5152	15 min Winter	162.161	0.0	19
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Odyssey Markides				Page 2	
Tuscany House		18-344			
White Hart Lane		Ford Lane, Yapton			
Basingstoke RG21 4AF		Basin			
Date 15/01/2020 11:49		Designed by SG			
File 18-344 BASIN.SRCX		Checked by			
XP Solutions		Source Control 2018.1			
<p><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	5.038	1.238	8.3	359.0	O K
60 min Winter	5.261	1.461	8.3	423.7	O K
120 min Winter	5.493	1.693	8.3	491.0	O K
180 min Winter	5.620	1.820	8.3	527.8	O K
240 min Winter	5.698	1.898	8.3	550.5	O K
360 min Winter	5.777	1.977	8.3	573.5	O K
480 min Winter	5.800	2.000	8.3	580.0	O K
600 min Winter	5.790	1.990	8.3	577.1	O K
720 min Winter	5.761	1.961	8.3	568.6	O K
960 min Winter	5.585	1.785	8.3	517.5	O K
1440 min Winter	5.307	1.507	8.3	436.9	O K
2160 min Winter	4.934	1.134	8.3	328.9	O K
2880 min Winter	4.612	0.812	8.3	235.4	O K
4320 min Winter	4.234	0.434	8.3	125.9	O K
5760 min Winter	3.963	0.163	8.3	47.3	O K
7200 min Winter	3.849	0.049	8.2	14.2	O K
8640 min Winter	3.843	0.043	7.2	12.5	O K
10080 min Winter	3.839	0.039	6.4	11.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	98.106	0.0	33		
60 min Winter	59.354	0.0	62		
120 min Winter	35.909	0.0	120		
180 min Winter	26.763	0.0	178		
240 min Winter	21.725	0.0	236		
360 min Winter	16.191	0.0	352		
480 min Winter	13.143	0.0	462		
600 min Winter	11.180	0.0	572		
720 min Winter	9.796	0.0	672		
960 min Winter	7.627	0.0	752		
1440 min Winter	5.360	0.0	1052		
2160 min Winter	3.767	0.0	1472		
2880 min Winter	2.933	0.0	1872		
4320 min Winter	2.197	0.0	2596		
5760 min Winter	1.790	0.0	3232		
7200 min Winter	1.527	0.0	3600		
8640 min Winter	1.341	0.0	4352		
10080 min Winter	1.202	0.0	4992		
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Odyssey Markides		Page 3
Tuscany House White Hart Lane Basingstoke RG21 4AF	18-344 Ford Lane, Yapton Basin	
Date 15/01/2020 11:49 File 18-344 BASIN.SRCX	Designed by SG Checked by	
XP Solutions Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 7.300

Cellular Storage Structure

Invert Level (m) 3.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.20628 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	290.0	290.0	2.101	0.0	477.2
2.100	290.0	477.2			

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