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Executive Summary

The proposed development is for the construction of 147 residential dwellings on greenfield land to the north of Havant Road and to the west of Selangor Avenue in Emsworth, Hampshire.

The site is shown on the Environment Agency flood risk maps as being within Flood Zone 1 (low risk of flooding from rivers and seas). The site is in excess of 1 hectare in area and therefore a Flood Risk Assessment is required to support the Planning Application in accordance with National Planning Policy Framework and Environment Agency guidance.

Havant Borough Council requires that Sustainable Drainage Systems [SuDS] be considered in all new developments and as a minimum there should be no nett increase in surface water runoff. This report covers both flood risk and sustainable drainage.

All sources of flood risk have been assessed including tidal, fluvial, artificial drainage, overland, infrastructure failure and groundwater. The conclusion of the assessment is that all risks are considered as low, providing that necessary mitigation measures for surface water drainage are undertaken. The pre-existing low risk of surface water flooding is mitigated through incorporation of a Sustainable Drainage System which will store the volume of a 100 year return period storm plus allowance for climatic change; the surface water drainage system will ensure no increase in flood risk to adjacent or downstream sites. An allowance for 10% increase in drained area due to 'Urban Creep' has been incorporated.

Proposals include the raising of road levels and finished floor levels in areas of potential high groundwater which mitigates any pre-existing risk to the site.

The previous flooding problems experienced by the residential area to the east of the site are primarily due to the flow in the Nore Farm Stream exceeding the capacity of the piped section of the watercourse. This is not caused by the development site and has been addressed by the Environment Agency Nore Farm Flood Alleviation Scheme. The proposed development does not represent an increase in flood risk to neighbouring land and the storage provided within permeable pavements and soakaways will reduce runoff.

Foul drainage from the development shall connect to an adoptable onsite foul water pumping station located at the southern boundary of the site which will connect via rising main to the nearby Public Foul Sewer located beneath Havant Road.

The sustainable surface water drainage system stores large return period storms and mimics the existing drainage condition of infiltration to ground and greenfield run off utilising a series of permeable paving areas in the northern part of the site and a below ground storage tank in the southern part of the site. Water quality of runoff is achieved through use of filter drains and the naturally high pollutant retention shallow subsoil layers in addition to permeable paving where infiltration is utilised to ensure adequate treatment of surface water before infiltration to ground or conveyance to sewer and watercourse.

The surface water drainage system will be privately owner shared infrastructure maintained by a Management Company along with the private roads and shared open space and landscaping.

This Flood Risk Assessment concludes that the proposed development is not at significant risk of flooding and will not increase the risk of flooding to others. It is in accordance with all local and national drainage and flood risk policy.

Contents

1.	Introduction.....	1
1.1	Reason for Report and Planning Context	1
1.2	Scope of Report	1
1.3	Site Location.....	1
1.4	Existing Site and Surrounding Area	2
1.5	Hydrogeology and Existing Drainage.....	3
1.6	Proposed Development.....	6
1.7	Policy and Information Review	7
2.	Flood Risk Identification	8
2.1	Historical Instances	8
2.2	Flood Defences and Alleviation Works	9
2.3	Tidal and Fluvial	10
2.4	Surface Water Flooding and Overland Flow	11
2.5	Infrastructure Failure	14
2.6	Groundwater.....	14
2.7	Drainage.....	15
3.	Flood Risk Summary	17
3.1	Analysis	17
3.2	Mitigation	17
4.	Sequential and Exception Tests.....	18
4.1	Sequential Test	18
4.2	Exception Test.....	18
5.	Drainage Strategy	19
5.1	Foul Water Drainage	19
5.2	Surface Water Drainage.....	19
5.3	Ownership and Maintenance of the Drainage System.....	24
5.4	Risks Associated with Below Ground Drainage System.....	25
6.	Conclusion.....	27
7.	Appendices.....	28

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1. Introduction

1.1 Reason for Report and Planning Context

The development site is located within an area of low flood risk and the site area exceeds one hectare. In accordance with the National Planning Policy Framework [NPPF] and Planning Practice Guidance a Flood Risk Assessment is required to support the Planning Application.

The development proposal is classified as C3 Residential Dwellings in terms of Planning Use Classes.

In lieu of setting out National Standards on SuDS and implementing SuDS Approval Bodies, on 18 December 2014 the Central Government Department for Food and Rural Affairs directed Planning Authorities to 'ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate.' This is to be applied to all major applications (10 dwellings or more or equivalent non-residential development) from 6 April 2015. No additional national planning guidance on sustainable drainage in amplification of the NPPF has yet been adopted at a National level.

The Havant Borough Core Strategy Policy CS15 'Flood and Coastal Erosion Risk' states that priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage.

The proposed development is a major planning application and as such a sustainable drainage system is required. This Flood Risk Assessment assesses flood risk and sets out the sustainable drainage strategy.

1.2 Scope of Report

This report has been written to meet the requirements of a site-specific flood risk assessment in accordance with the National Planning Policy Framework (NPPF) and includes the following:

- An appraisal of the availability and adequacy of existing information on flood risk.
- An appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere.
- An appraisal of the scope of possible measures to reduce the flood risk to acceptable levels.
- The foul and surface water drainage strategy.

The report is a desk based study and considers all forms of flood risk.

1.3 Site Location

The site is located within the town of Emsworth in Hampshire. The postcode of the development is PO10 7LG and centred at National Grid reference SU734062.

The site is located north of Havant Road and is adjacent to the A27 which forms the northwest boundary of the site. Selangor Avenue borders the site to the east and a West Coastway rail line borders the site to the north.

The site is approximately 1.2km to the north of the Emsworth Channel which runs into the English Channel.

A map highlighting the location of the site is shown in Figure 1.

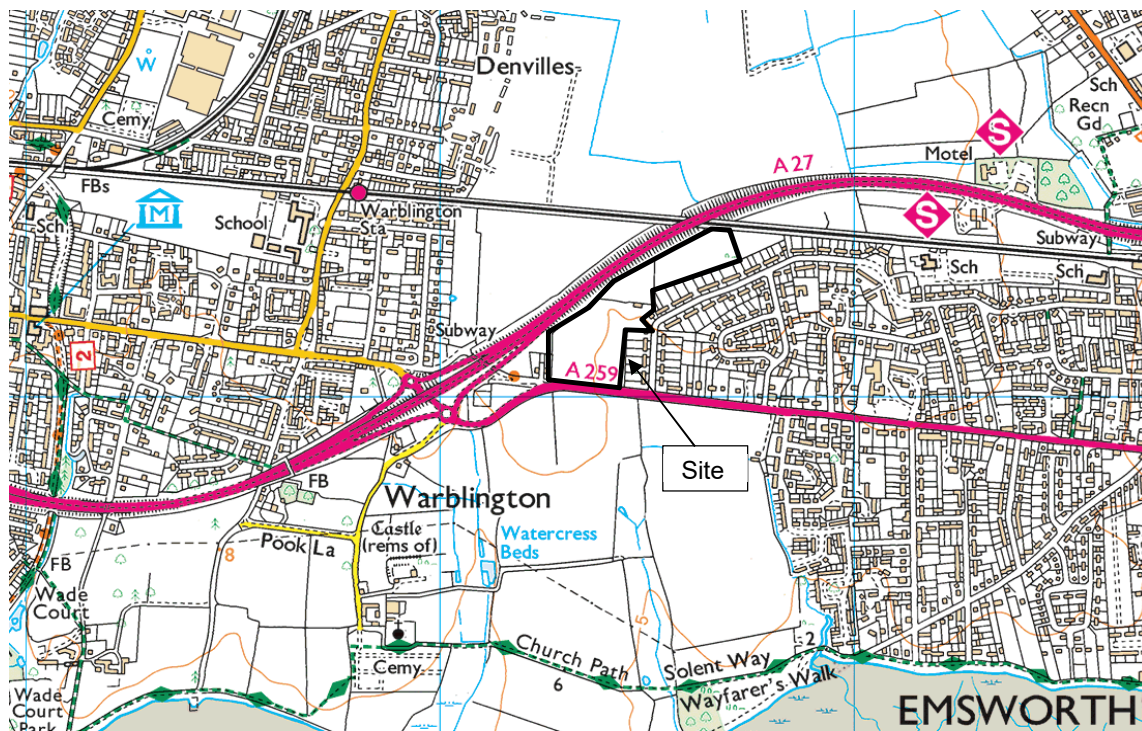


Figure 1 Site Location

1.4 Existing Site and Surrounding Area

The site is irregular in shape and consists of greenfield land approximately 63,000m² (6.3ha) in area. The site is currently undeveloped pasture land and there are no existing structures or paved areas. There are residential properties forming the eastern boundary of the site. There is a line of trees along the northwest boundary of the site shielding the neighbouring properties from the A27. Beyond the highways at the north and south boundaries of the site is open farmland.

Access to the site is through a gated entrance along Selangor Avenue. There is currently no access to the site from Havant Road to the south. A former footway crossing and gated access has been removed and full height kerbs replaced as part of the footway cycleway improvement.

The northern half of the site is relatively level. The southern half of the site falls towards the east and south with a low point adjacent to the south-eastern corner. The northern and south-western parts of the site are at approximately 10.5-11m AOD. The south-eastern part of the site is located at approximately 9.5-10m AOD. The gradient from west to east in the southern part of the site is approximately 1/120. The gradient from northwest to southeast in the northern part of the site is approximately 1/485. The gradient across the full length of the site from southwest to northeast is approximately 1/765. Gradient variation across the site is shown in Appendix 1 at the rear of this report.

There are no identifiable watercourses within the site boundary. The site does not share a boundary with the Nore Farm Stream adjacent to the north-eastern boundary. There is a drainage ditch adjacent to the north-western boundary within Highway Land under the control of Highways England which captures runoff from the highway and discharges to the east into the Nore Farm Stream.

The proposed development site does not currently discharge surface water into the Nore Farm Stream other than potentially via topsoil seepage from the very northern corner which is adjacent to the existing culvert beneath the railway line. This part of the site is outside the developable area.

The existing site is shown in the aerial photograph in Figure 2 below. Photographs of the site are shown in Appendix 2 at the rear of this report.



Figure 2 Existing Site

1.5 Hydrogeology and Existing Drainage

From the British Geological Survey, the local superficial geology on the site consists primarily of River Terrace Deposits (alluvium of sand, silt and clay) with a small area of clayey gravel in the south-eastern corner of the site. The bedrock geology across the entirety of the site is London Clay formation (clay, silt and sand). Borehole records undertaken on site indicate that alluvium on site consists of a 200mm – 400mm layer of topsoil underlain by sandy clay. The southern half of the site is further underlain by sand; the northern half has layers of gravel interspersed by silt and sand strata.

Groundwater flows through the sand and gravel layers and is typically 1.9m (average recorded) below existing ground level. Groundwater monitoring has been undertaken over several years. The most shallow recorded groundwater level on the site is 0.48m below existing ground level; this was recorded in February 2013 (winter high groundwater level) in the southern area of the site, at the same time ground water levels were considerably less shallow in the northern part of the site (1.48m bgl and 1.76m bgl). At all other times the most shallow readings are more than 1 metre below ground level and typical 1.5m – 3m below ground level. Groundwater levels vary across the site but in general the southern half of the site has recorded groundwater levels approximately 0.5m – 1m higher than the northern half of the site. A summary of the site investigation data is shown in Appendix 3 at the rear of this report.

Soakage tests were undertaken across the site in July 2016. A series of shallow and deep percolation tests were taken across the site to gather results for both the shallow sand-clay strata and the deeper gravel-clay strata. The results of these tests indicate that soakage rates for the shallow sand-clay strata range from 1.4e-6m/s to 9.2e-6m/s and rates for the gravel-clay strata range from 2.5e-6m/s to 1.7e-4m/s. An overview of the recorded soakage rates is shown in Appendix 3 at the rear of this report.

The existing site is undeveloped and has no positive foul or surface water drainage. Rainwater currently drains to ground through the shallow sandy clay layer and discharges through the groundwater in the sand and gravel layers with any remaining surface water run-off discharging overland following local topography.

The Nore Farm Stream watercourse passes to the east of the site as a piped watercourse and through surface water sewers. The catchment to the north of the A27 is conveyed via a series of drainage ditches and open watercourses across farmland and through culverts which runs beneath the A27 and West Coastway Railway Line adjacent to the north-eastern boundary of the proposed development site. The watercourse then passes beneath Nore Farm Avenue southwards as a piped watercourse before outflowing to an open watercourse close to Barn Close to the southeast of the site.

There is a 225mm diameter public foul water sewer beneath Selangor Avenue flowing southwards which discharges into the 225mm diameter public foul water sewer flowing eastwards beneath Havant Road, approximately 3.5m deep. There is an existing 150mm diameter highway drain beneath Selangor Avenue flowing southwards, approximately 1m deep. This drain discharges into the 450mm diameter sewer / culvert beneath Havant Road approximately 1.5m deep, where it drains via an ordinary watercourse approximately 50m to the east of the site which flows southwards and outfalls to the Emsworth Channel. There is currently no connection to this watercourse or the upstream sewers and drains from the proposed development site but there is a 350mm diameter surface water pipe beneath Havant Road which serves both Highway drainage and surface water from multiple private properties to the west of the site. The closest public surface water sewer is located west of the site along Havant Road close to the junction with the A27. There is an existing 700mm diameter surface water sewer crossing Havant Road flowing southwards, approximately 4m deep.

The existing public sewer layout is shown in Figures 3 and 4 below.

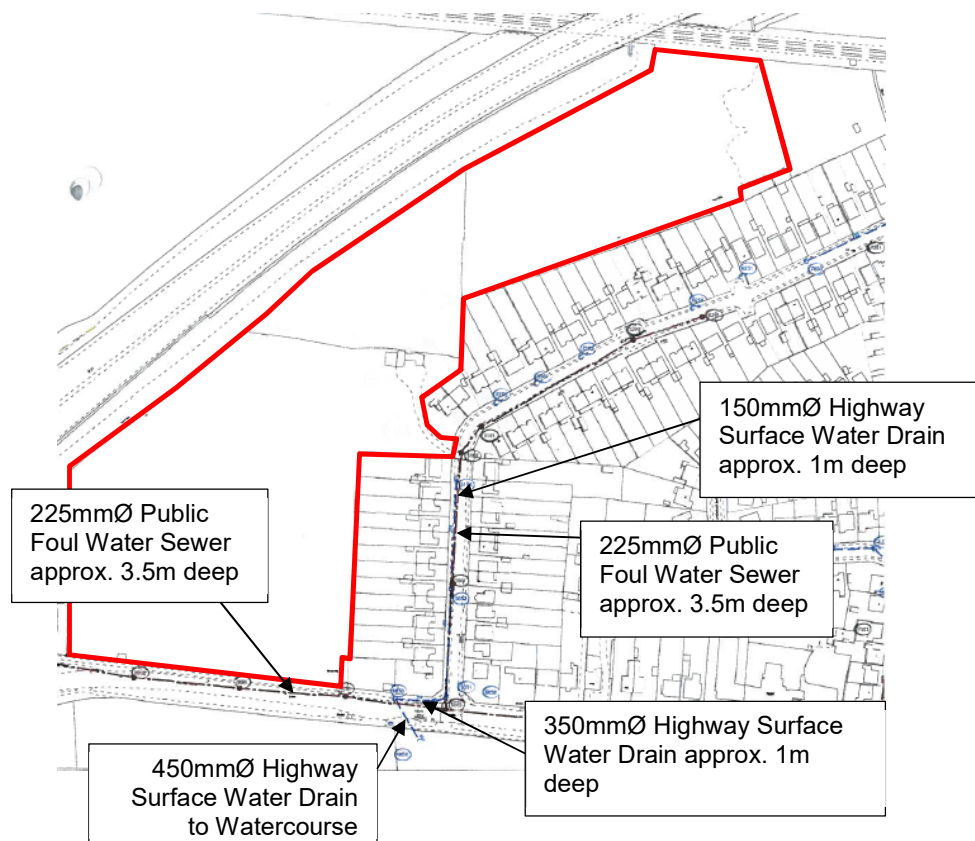


Figure 3 Extract of Public Sewer Records, adjacent to site

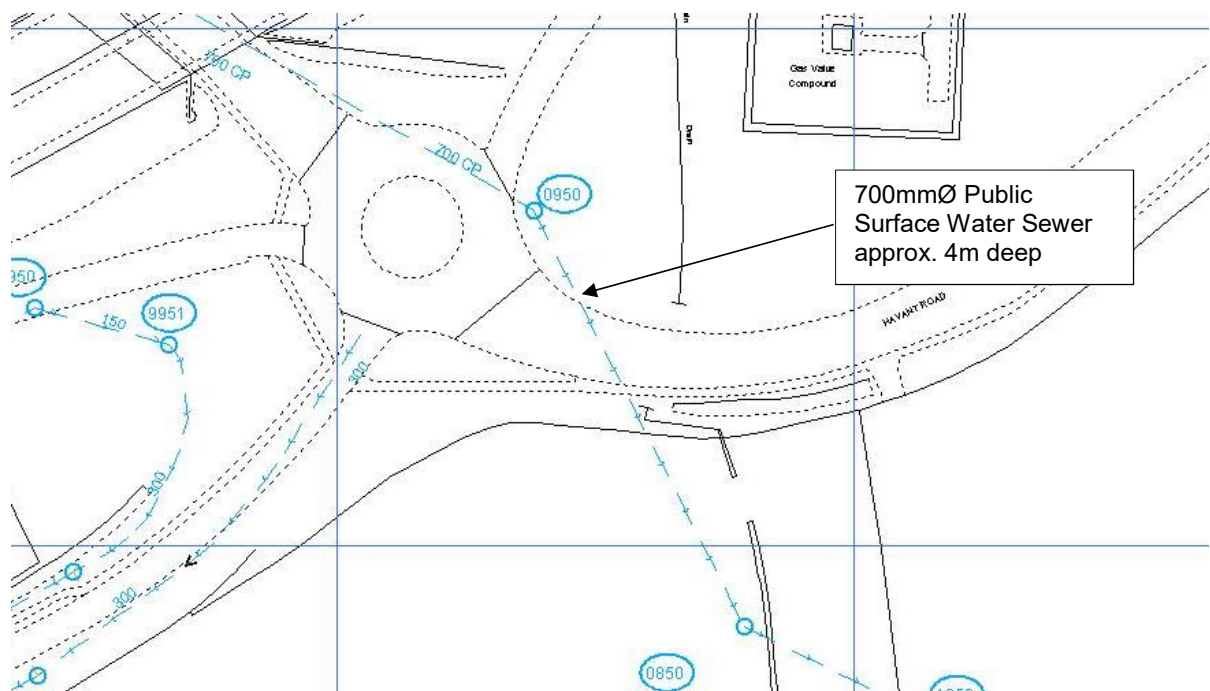


Figure 4 Extract of Public Sewer Records, west of site

1.6 Proposed Development

It is proposed to construct 147 residential dwellings on the site with associated parking, streets, driveways, gardens and landscaping.

The site will be accessed from a new highway access from Havant Road, with the existing access to the site via Selangor Avenue providing additional pedestrian access.

The impermeable positively drained areas of the site are the house roof areas, access roads and pavements, shared car parking areas and private driveways. The approximate impermeable areas are as follows:

Roof areas of the houses (including covered garages)	7,815m ²
Paved Surfaces - Parking areas and access roads and footpaths	16,364m ²
Total impermeable / paved area:	24,179m²

The Architect's proposed site layout is shown in Figure 5 below.



Figure 5 Architect's Site Layout

1.7 Policy and Information Review

The following documents have been reviewed as part of this flood risk assessment:

- National Planning Policy Framework and Planning Practice Guidelines
- Central Government Written Statement to Parliament on Sustainable Drainage Systems, 18 December 2014
- Update from Environment Agency on Flood Risk Assessments: Climate Change Allowances, 19 February 2016
- Havant Borough Core Strategy, March 2011
- Havant Borough Local Plan (Allocations), July 2014
- Havant Borough Local Plan Housing Statement, December 2016
- Partnership for Urban South Hampshire [PUSH] Strategic Flood Risk Assessment, December 2007
- Emsworth Flood Risk Strategy Review, October 2015
- North Solent Shoreline Management Plan, December 2010
- HCC Surface Water and Sustainable Drainage Guidance for Developers

A summary of these policy documents in relation to the site is shown in Appendix 5 at the rear of this report.

2. Flood Risk Identification

2.1 Historical Instances

2.1.1 Reported instances of flooding in the press

From a search through various news sites on the internet, the following instances of flooding around the site and within the larger area of Emsworth have been identified in the past 10 years:

March 2008: Flooding in Emsworth. Emsworth Quay flooded at high water, A259 flooded.

November 2010: Flooding event affected 21 properties in Bridge Road and Selangor Avenue. The properties on Bridge Road were affected by water overflowing from the West Brook and the properties on Selangor Avenue were affected by overflow from the Nore Farm Stream.

June 2012: Properties in Selangor Avenue flooded.

December 2012: Properties in Selangor Avenue flooded.

December 2013: Flooding in Emsworth. Properties in Selangor Avenue flooded / close to flooding. Flooding along Havant Road.

January 2014: Flooding in Emsworth. Queen St flooded.

The Nore Farm Stream has had a large influence on instances of flooding in the surrounding area around the site, as the piped watercourse system has placed a restriction on the flow from the open watercourse upstream to the north of the A27 and Railway Line.

2.1.2 Instances of flooding identified by Local Authorities

Several Hampshire local councils have produced a PUSH [Partnership for Urban South Hampshire] SFRA. The SFRA does not identify the site as in or bordering a flood zone. It does identify instances of surface water sewer flooding in Nore Crescent and hence if the surface water drainage system were to connect to this drainage system its capacity would have to be checked with Southern Water.

Previous Emsworth Flood Risk Strategy Reviews from Havant Borough Council identifies Selangor Avenue (adjacent to the site) as having previous reported flooding incidents, from a combination of fluvial and tidal influences. The latest Review identifies that the Environment Agency is leading the Nore Farm Stream Flood Alleviation Scheme (also referred to as the Emsworth Flood Alleviation Scheme), positioned to the north of the site and intended to help reduce flooding from the river. The Environment Agency were consulted in February 2016 and advised that this alleviation scheme has been completed.

Figure 6 below presents an excerpt from the Emsworth Flood Risk Strategy Review highlighting the locations of proposed alleviation schemes in the surrounding area.

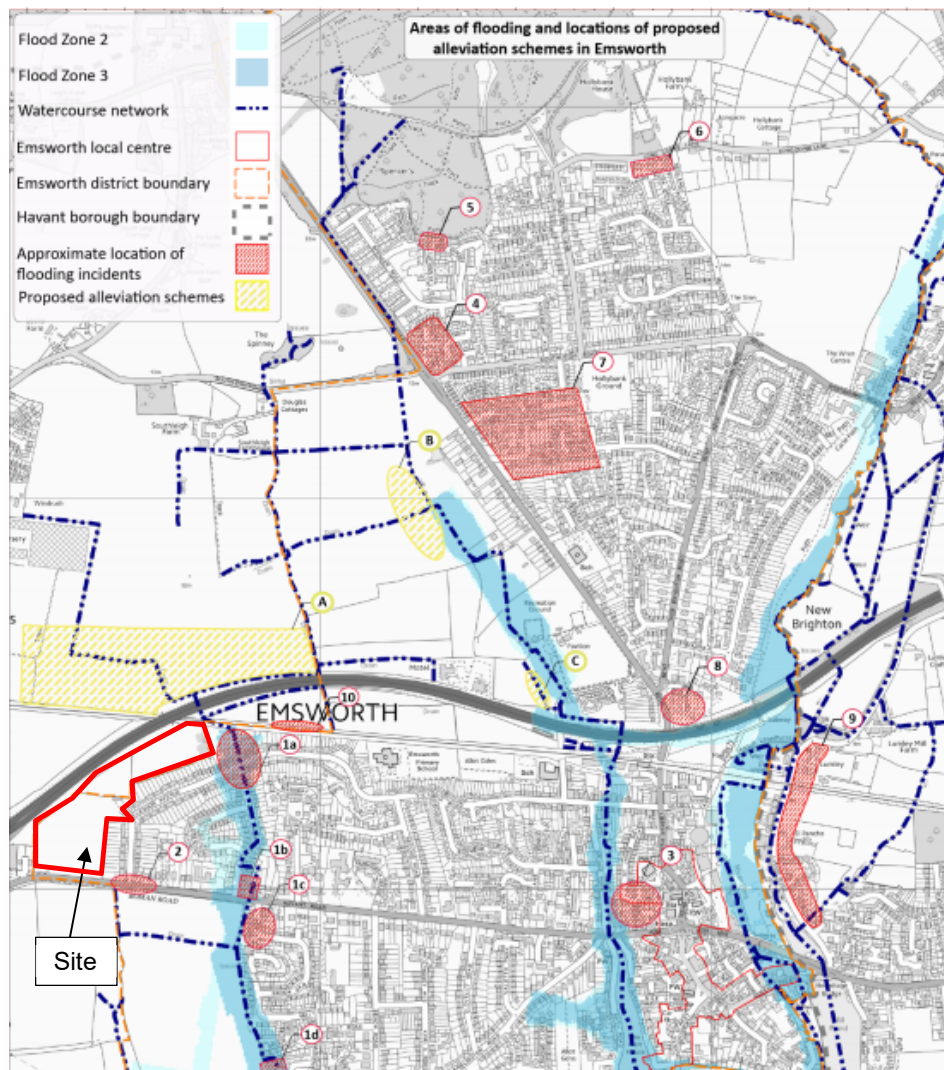


Figure 6 Location of proposed alleviation schemes

2.2 Flood Defences and Alleviation Works

The completion of the Nore Farm Stream Flood Alleviation Scheme in February 2016 has increased the standard of protection against flooding for the dwellings along Selangor Avenue, reducing the risk of flooding from 20% annual probability (1 in 5 year) to 1.4% annual probability (1 in 70 year) plus climate change.

The scheme has created a Flood Water Storage Area within nearby arable land to the north of the A27. The size of the culvert that runs beneath the A27 has been reduced to prevent large volumes of fast-flowing water passing through.

The Nore Farm flood alleviation scheme will significantly reduce the flood risk to the affected area to the east of the site.

2.3 Tidal and Fluvial

The northernmost and southwestern parts of the site are located approximately 11m AOD. The south-eastern part of the site is allocated at approximately 9.5m AOD. There is a slight dip in the centre of the site to approximately 10m AOD.

The Environment Agency were contacted in February 2016 to provide flood risk information for the site and this information (covering flooding risks from tidal and fluvial sources and surface water) is included in Appendix 6 at the rear of this report. Where relevant excerpts of maps provided by the EA are included in the subsequent sections of this report.

The site is not within a flood warning zone.

With reference to the Environment Agency's detailed flood risk modelling the site is located within Flood Zone 1 and therefore has a low probability of flooding from tidal or fluvial sources. The north-eastern part of the site borders an area lying in Flood Zone 3 (indicating a 0.1% annual probability of flooding) and a main river line. As mentioned in Section 2.2 above the flood alleviation scheme to the north of the proposed site will reduce flood risk to this area. The EA have advised that the Nore Farm Stream alleviation project has been completed and that the standard of protection for properties south of the A27 is 1 in 70 years plus climate change; the Flood Maps have not yet been updated following the completion of this scheme.

The extent of tidal and fluvial flooding risk is shown in Figure 7 below.



Figure 7 Environment Agency - Flood Map (Rivers and Sea) (contains Environment Agency information © Environment Agency and database right)

The site is outside of the flood risk zones and the risk from rivers and seas is low.

Assessment of Impact: LOW

Assessment of Probability: LOW

2.4 Surface Water Flooding and Overland Flow

The Environment Agency have mapped the areas that could flood from surface water and overland flow. The map is based on hydraulic modelling following topography and natural flow path ignoring manmade obstructions. The extent of the flood risk around the site is shown in Figure 8 below.

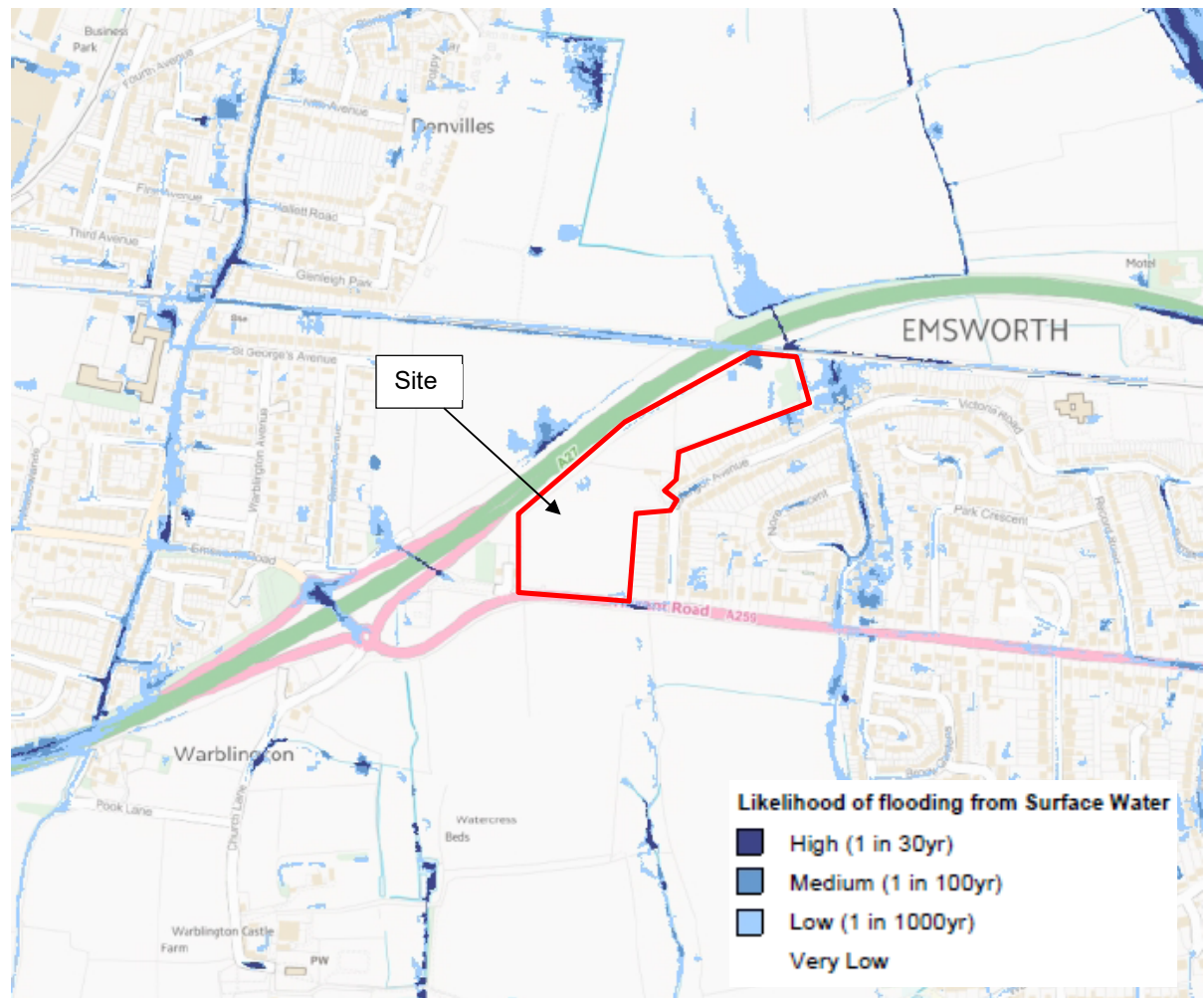


Figure 8 Environment Agency Surface Water Extent map (contains Environment Agency information © Environment Agency and database right)

These maps do not take flood defences and alleviation schemes into account, so the Nore Farm Flood Alleviation Scheme is not taken into account in this flood mapping. Areas of flood risk to the northeast of the site in the area of the Nore Farm Stream are alleviated by the completed flood alleviation scheme.

Detailed surface water maps received from the Environment Agency indicate that very little of the site is highlighted as at risk of flooding from surface water. The north-eastern boundary lies adjacent to a watercourse (i.e. the Nore Farm Stream) – most risk areas correspond to a low flood risk of below 0.1% annual chance (1 in 1000 year return period) of surface water flooding.

There is a small area of medium flood risk of 1% (1 in 100 year return period) chance of flooding. Within the context of the proposed development the risk areas located in the north-east of the site will be situated in land which is to remain undeveloped open space and hence will not affect the proposed properties. Areas of risk away from the north-eastern boundary will be addressed within the proposed site surface water strategy.

Based on the modelling prediction the Environment Agency have estimated the potential depth and rate of flow for the areas at risk from surface water and overland flow.

The depth and velocity are shown in Figures 9 and 10 below.

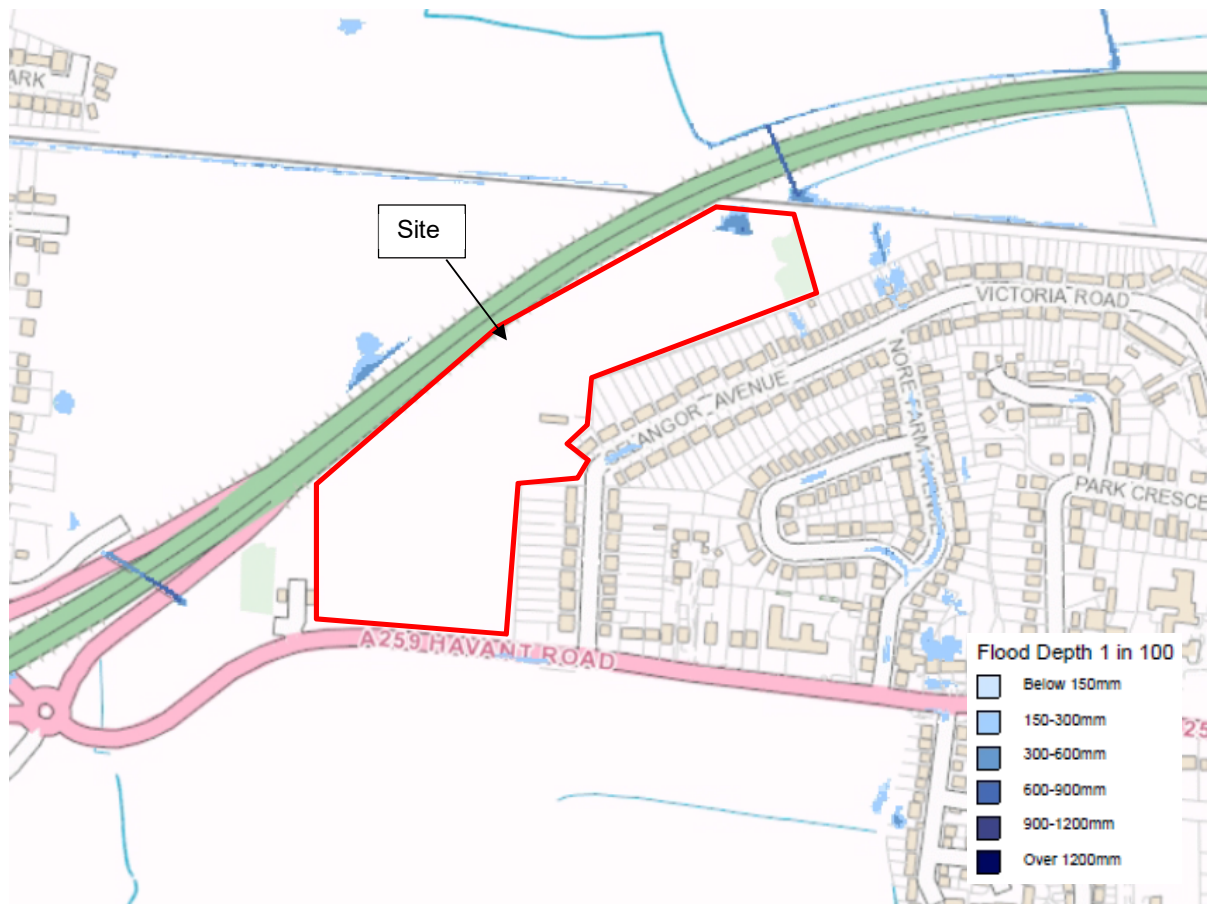


Figure 9 Environment Agency Surface Water Depth map for 1 in 100 year flood event (contains Environment Agency information © Environment Agency and database right)

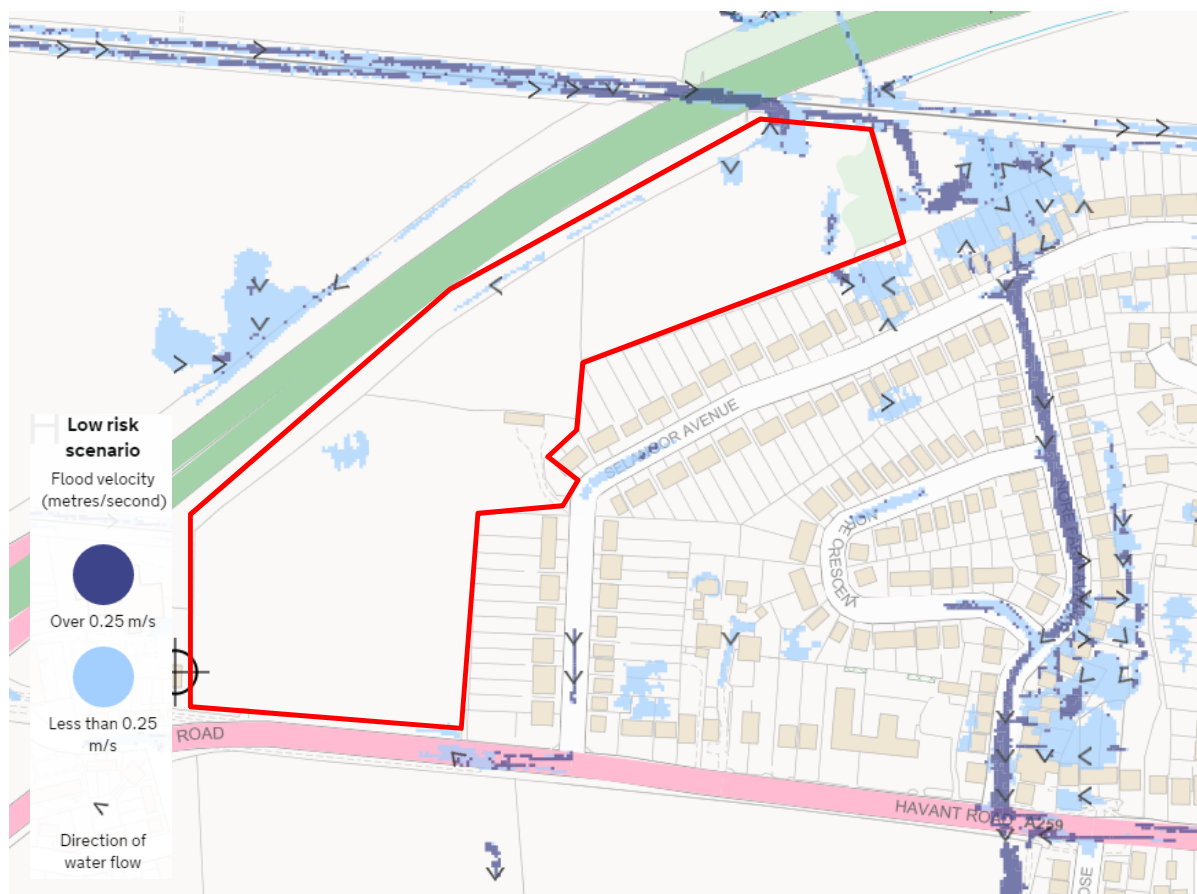


Figure 10 Environment Agency Surface Water Velocity Estimate

Without the effects of any flood alleviation works the potential depth of surface water for the low risk classification (1 in 100 year flood event) is less than 600mm and the velocity is less than 0.25m/s (i.e. ponding, not flowing). If flooding should occur by this mechanism it could result in damage to property if the flow entered homes but would not represent a danger to safety. Once the site is developed the drainage system and setting of floor levels above street or garden level would remove the risk of surface water flooding. The small area to the north of the site which is subject to ponding is to be left as greenfield land on the proposed site plan and will not affect any of the proposed developments.

Taking into consideration the proposed development of the site and the existing flood alleviation scheme against the flood risk plans the risk of flooding from surface water or overland flows is low.

Assessment of Impact: LOW

Assessment of Probability: LOW

2.5 Infrastructure Failure

The Environment Agency have mapped the areas that could flood in the event of a failure of large reservoirs (greater than 25,000m³ in volume). There are no smaller reservoirs or other above ground bodies of water which could affect the site.

The risk of flooding from infrastructure failure is low.

Assessment of Impact: LOW

Assessment of Probability: LOW

2.6 Groundwater

The Hampshire Groundwater Management Plan does not attribute flooding in the Havant area as attributable to groundwater.

The PUSH SFRA identifies the site as in an area of low bedrock permeability and does not highlight any historic instances of groundwater flooding.

Groundwater flooding does not occur historically at this site. Extensive ground water monitoring has been undertaken onsite which shows a worst case of approximately 0.5m below ground level in the lower southern part of the site.

There is a risk that prolonged winter storms could potentially raise groundwater levels close to the existing ground level; there is no groundwater modelling available which would aid to predict the potential movements of groundwater in large storm events. In the event of such a storm occurring the watercourse located to the south of the site would release groundwater pressure and provide an outlet for groundwater flow. Should groundwater levels rise significantly to cause flooding the flow would be directed in the first instance to this watercourse, rather than occur via spring action through the clay strata on site; it is likely that should the site be affected by groundwater flooding the flood depths on the site would be shallow.

The PUSH SFRA shows the site lying within an area of low bedrock permeability. Any rise in groundwater could lead to greater overland flows should the water level reach the surface, which could in turn lead to flooding of nearby drainage systems where the surface water flow is directed. This situation is particularly applicable to the Nore Farm Stream culvert, which carries a large overland flow from the field to the north of the site.

The alleviation works on the Nore Farm Stream together with a proposed levels strategy which raises floor levels in the lower south-eastern part of the site and where ground water monitoring has shown potential for shallow ground water will address the potential for ground water flood risk.

In consideration of the above there is a low risk of impact to the proposed development from groundwater flooding however there is a medium risk of probability that groundwater flooding may occur within the site. Subsequently the overall risk of groundwater flooding to the is medium following the precautionary principle.

Assessment of Impact: LOW

Assessment of Probability: MEDIUM

2.7 Drainage

2.7.1 Existing Drainage

The PUSH SFRA has identified instances of previous surface water sewer flooding caused by incapacity of drainage infrastructure, shown in Figure 11.

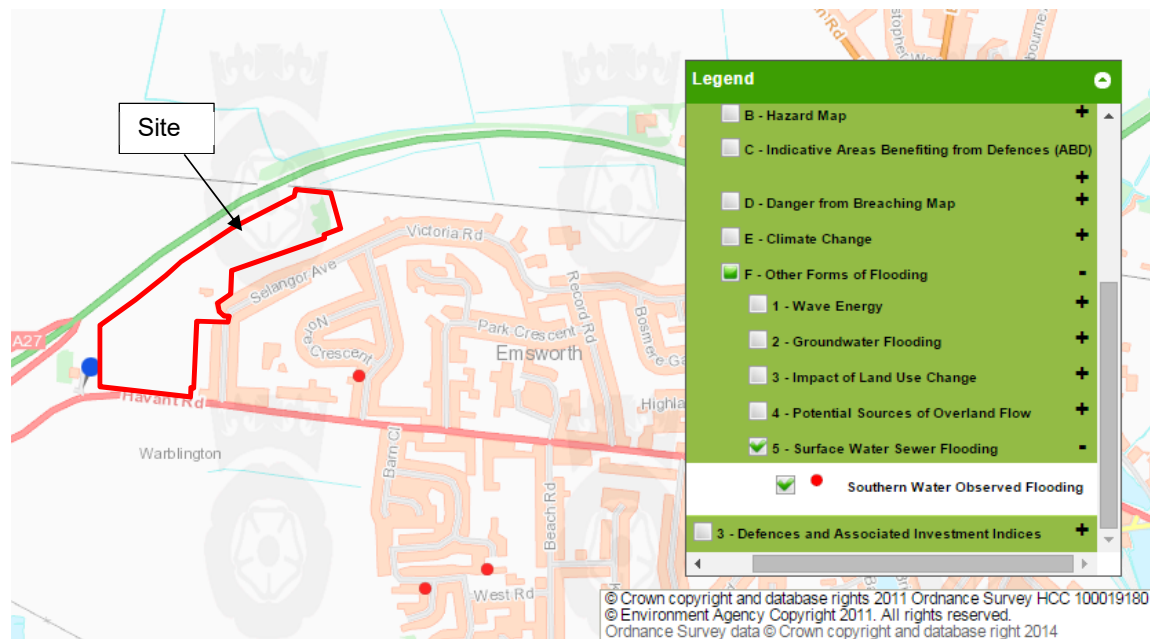


Figure 11 Extract from PUSH SFRA for Surface Water Sewer Flooding

There are no previously recorded instances within the immediate vicinity of the site. Flooding from existing sewers to the south and east of the site would not affect the development due to levels and flow paths. There are no existing sewers which, if flooding occurred, would flow into the site.

We are aware from Local Residents previous issues with foul water flooding have affected the local area and is it therefore important that the capacity of the existing foul sewerage network is satisfactorily established and an appropriate point of discharge for the new foul drainage from the development be established. Discussions have been held with Southern Water and flow monitoring of their network was undertaken to better assess the capacity of the existing drainage system and identify any specific problems which could potentially be solved by the Applicant. A foul sewerage improvement funded by the Applicant will provide a nett benefit to the existing public sewer system. The risk to the development remains low.

The risk of flooding to the site from existing drainage infrastructure is low.

Assessment of Impact: LOW

Assessment of Probability: LOW

2.7.2 Proposed Drainage

In accordance with Havant Borough Council's requirements for sustainable drainage systems for all new developments, priority should be given to incorporating a sustainable drainage system to manage surface water drainage. This will ensure the drainage system will accommodate any rainfall events up to and including a 1 in 100 year return period storm with 40% increase in storm intensity to allow for the predicted effects of climate change over the design life of the development in accordance with current guidance. The detailed design will allow for exceedance without flooding property.

Foul water drainage will be designed to meet Adoptable and British Standards where appropriate and will be subject to Building Regulations Approval. There is low risk of flooding within the site from proposed foul water drainage.

Foul water discharge from the development will discharge to the public foul sewer network at a point of discharge which is confirmed by the Statutory Sewerage Undertaker (Southern Water) as being acceptable be accommodated within their network. The existing network is over capacity under storm conditions and a local improvement can be undertaken to offset the new foul flows as a developer contribution. In this way, the development can be accommodated on the existing network at nil detriment or nett improvement in terms of risk of downstream foul flooding.

The sustainable drainage strategy, details of the design of the sustainable drainage system and water quality control measures are set out in Section 5 of this report.

Once the sustainable drainage system is installed the risk of flooding from surface water and rainfall both at the development and to adjacent and downstream land is low.

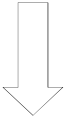
Assessment of Impact: LOW

Assessment of Probability: LOW

3. Flood Risk Summary

3.1 Analysis

A summary of the flood risks identified in Section 2 prior to mitigation are shown in the table below.

RISK ASSESSMENT MATRIX				
	Impact			
Probability of Event		Low	Medium	High
	Low	A, B, C, E		
	Medium	D		
	High			

Key:

A: Tidal & Fluvial – (Section 2.3)

B: Surface Water / Overland Flow – (Section 2.4)

C: Infrastructure Failure – (Section 2.5)

D: Groundwater – (Section 2.6)

E: Artificial Drainage – (Section 2.7)

3.2 Mitigation

3.2.1 Groundwater

Groundwater monitoring indicates that groundwater across the site has in recent years risen as high as to be within 500mm of the existing ground levels in the southern part of the site. Although the risk of groundwater flooding is considered low in terms of impact to the proposed development, as a precaution road levels and finished floor levels of the proposed developments situated in areas with high groundwater levels (less than 1m below ground level during winter months) are proposed to be raised to mitigate against any potential rise in groundwater. Following this mitigation measure the risk of groundwater flooding to buildings is removed.

3.2.2 Surface Water / Overland Flow

The risk of flooding from that shown by previous modelling is greatly reduced following completion of the Emsworth / Nore Farm Flood Alleviation Scheme. Any remaining flood risk to the site will be removed by the alteration in proposed levels and the proposed surface water drainage system will also ensure no increase in flood risk from surface water run-off to adjacent sites.

4. Sequential and Exception Tests

4.1 Sequential Test

The development of the site introduces residential dwelling (C3) land use. In accordance with Table 2 of the National Planning Policy Framework the development's vulnerability classification is 'more vulnerable' for residential use.

The development is located within 'Flood Risk Zone 1'.

In accordance with the NPPF Technical Guidance Tables 2 and 3 shown in Appendix 6, attached at the rear of this report, the development is appropriate in this location and the Sequential Test is passed.

4.2 Exception Test

The Sequential Test is passed and the development is acceptable in this location in flood risk planning terms, therefore the Exception Test is not required.

5. Drainage Strategy

5.1 Foul Water Drainage

There is no existing foul water discharge or drainage infrastructure on site.

The peak domestic foul flow from the site is calculated as 6.80 litres per second in accordance with the approximation of 4,000 litres per household per day within Sewers for Adoption which incorporates a six times peaking factor.

Foul water drainage from the proposed development will be drained to an adoptable foul water pumping station situated at the southern boundary of the site adjacent to the highway access. The pumping station will connect into the existing foul drainage network in Havant Road via a rising main and onsite gravity sewer.

A section of the site can drain by gravity to the existing sewer in Havant Road and will be drained directly by gravity where possible and not through the pumping station. The pump drained pipework could incorporate a high-level gravity overflow into the gravity drained pipework but this is not usually necessary as the Sewerage Undertaker would promptly maintain any pump failure as part of the public sewer network.

Southern Water has undertaken a desk study of the impact that the additional foul sewerage flows from the proposed development will have on the existing public sewer network. This initial study indicates that there is an increased risk of flooding unless any required network reinforcement is provided by Southern Water.

Southern Water and the Developer will work together in order to review if the delivery of our network reinforcement aligns with the proposed occupation of the development, as it will take time to design and deliver any such reinforcement.

Any such network reinforcement will be part funded through the New Infrastructure Charge with the remainder funded through Southern Water's Capital Works programme.

Occupation of the development is to be phased and implemented to align with the delivery by Southern Water of any sewerage network reinforcement required to ensure that adequate waste water network capacity is available to adequately drain the development.

The onsite Foul Water Drainage Strategy and Preliminary Design is shown on drawings CLXX(52)2001 and 2002 which are attached in Appendix 8 at the rear of this report.

5.2 Surface Water Drainage

There is no positive drainage on the pastureland which currently drains partially to ground and partially via run off to surrounding land to the south and east. At times of heavy rain where the natural attenuation within the top soil is exceeded the resulting runoff is a concern to neighbouring properties in Selangor Road and ponding can occur in the southeast corner of the site which is the lowest point within the site boundary.

The proposed development will add areas of building roof and paved hard-standing to the site increasing the impermeable area which will require positive drainage. This will be achieved in the northern part of the site by storing rainwater within soakaways and permeable paving where it lands and allowing it to soak into

shallow subsoil. This will reduce the existing runoff to surrounding land providing a benefit to local area in terms of sustainable drainage.

The southern area of the site where monitoring shows a greater range of groundwater levels could drain to ground as percolation tests confirm but a clear metre vertical distance is not possible from the base of permeable pavements and the Lead Local Flood Authority has clarified their position that this is a firm requirement they will not support a drainage strategy based upon infiltration in this part of the site or the central area (Zones A and B on Drainage Strategy Plans) and instead will accept storage and conveyance downstream via pumping. The southern and central parts of the site will therefore be served by a storage tank to provide attenuation storage for the design storm and restricted outflow at a greenfield runoff rate.

Southern Water have confirmed that there is a surface water sewer in Havant Road to the east of the site, at the junction of Havant Road and the A27, which can accept the flows from the site. Southern Water have confirmed that they will accept surface water flow from the site, not greater than 12.3 l/s, to be connected at manhole reference SU73050950. Copies of the correspondence can be found in Appendix 9 at the rear of this report.

At this stage specific details of the connection are not known but it is anticipated that surface water pumping will be required to achieve conveyance to the outfall which is a viable solution..

The onsite Surface Water Drainage Strategy and Preliminary Design is shown on drawings CLXX(52)2001 and 2002 together with Indicative Drainage Details shown on drawing CLXX(52)2003 all attached in Appendix 8 at the rear of this report.

5.2.1 Greenfield Run-Off Rate

The existing greenfield run off rates are calculated for the existing site area and compared with the post development remaining green field area not captured by the drainage system.

The existing and proposed greenfield runoff rates are calculated for a 50ha site using the IH 124 Method and factored down by area to represent the proposed development site area. The runoff rates from this method are shown in Table 1 below.

Table 1 Existing and Post Development Greenfield Runoff Rates to IH 124

Storm Return Period	Existing Flow Rate (Litres per second) Whole Site	Existing Flow Rate (Litres per second) Area of Site Drained by Conveyance	Post-Dev Flow Rate (Litres per second) Restricted Outflow	Post-Dev Flow Rate (Litres per second) Undrained Landscaping
QBAR	21.4	12.3	12.3	4.9
1 Year	18.2	10.4	12.3	4.2
2 Years	18.9	10.8	12.3	4.3
5 Years	27.4	15.7	12.3	6.3
10 Years	34.7	19.9	12.3	7.9
20 Years	42.9	24.6	12.3	9.8
50 Years	56.2	32.1	12.3	12.8
100 Years	68.4	39.1	12.3	15.6

The full site area of 6.3ha has been used for the whole site greenfield runoff calculation. The QBAR Flow Rate for the site is 21.4 litres per second. The part of the site to be drained by conveyance rather than infiltration is 3.6ha which pro rata produces a QBAR Flow Rate of 12.3 litres per second. This provides the restriction for the piped outflow. The full greenfield calculation output can be found in Appendix 7.

Post-development the area of undrained greenfield land remaining on site which would produce runoff is approximately 1.44ha comprised of the undeveloped north-eastern corner of the site plus a strip of land following the line of the gas main easement which will drain as the existing situation. The remainder of the site will be drained either via infiltration or conveyance.

The resultant reduction in overall run off from the site from the existing greenfield situation is 1.7 litre per second (18.2 - 12.3 - 4.2) for the 1 year return period storm and 40.5 litres per second (68.4 - 12.3 - 15.6) for the 100 year return period (1% annual probability) storm.

This represents a reduced flow of rainwater which will run off of the site to the surrounding area than the undeveloped greenfield rate. This is a nett reduction of flood risk to the site and surrounding area by virtue of storage onsite of rainwater would otherwise create run off.

5.2.2 Runoff Control and Storage

Onsite drainage systems will be designed to accommodate storm events up to and including the 100 year return period storm (1% annual probability) with an increase of intensity of 40% (the Design Storm) to allow for future climate change in accordance with sustainable drainage principles and the latest Environment Agency guidance.

All impermeable areas have been factored by a 10% increase as an allowance for potential future urban creep as required by the Lead Local Flood Authority, Hampshire County Council.

Southern and Central Parts of Site (Zone A and B shown on drainage plans)

Surface water currently dissipates primarily by infiltration to the ground and by runoff to neighbouring land.

The southern part of the site typically does not experience high ground water. However, one reading was recorded in February 2013 at 0.48m below existing ground level which indicates shallow ground water is possible when a ground water event occurs. The highest recorded groundwater level in the central part of the site is 1.13m below existing ground level.

The Lead Local Flood Authority specifically requires drainage by conveyance (nil infiltration) for these areas of the site based on the precautionary principle (unknown future scenario) to remove the risk of a high ground water event coinciding with the design storm and potentially impeding the ability of the subsoil to accept drainage by infiltration.

Surface water drainage in the southern part of the site will be collected pipes, kerb drainage and permeable pavements, tanked with impermeable membranes, and conveyed by piped carrier drain to a tubular below ground storage tank adjacent to the site entrance. The outflow will be controlled by pump rate.

The volume of the tubular attenuation tanks is 990 cubic metres. Network calculations confirm this volume along with the upstream pipework can accommodate the Design Storm without any surface flooding based upon a constant pump outflow rate of 12.3 litres per second. The integral pumps will be a duty standby rotation such that any pump failure would have a backup pump always ready.

A maintenance agreement with a pump maintenance provided can ensure pumps are services regularly and replaced or repaired promptly. A high-level gravity overflow at the top water level will prevent flooding in the event of power failure.

Storage and Network calculations to the Flood Estimation Handbook (FEH) Rainfall Profile for the design storm have been undertaken on the basis of a fixed restricted outflow set by pump rate. These calculations are included in Appendix 7 at the rear of this report. Drainage Strategy Plans are attached in Appendix 8.

Northern Part of Site (Zone C shown on drainage plans)

The northern part of the site does not experience shallow ground water even when a ground water event has shown shallow readings in the southern part of the site. Surface water currently drains primarily by infiltration to ground and by runoff to neighbouring land.

To replicate the existing drainage for the undeveloped site as close as possible whilst reducing runoff, infiltration methods are proposed designed to accommodate the surface water runoff from the impermeable areas being introduced to the site and ensure that this runoff is contained within the site boundary. The remaining soft standing in the proposed development layout shall drain in this way as the existing situation.

Streets and driveways will be designed as permeable surfaces with storage accommodated within the pavement construction which will drain into the shallow subsoil which will be sized to allow sufficient storage to accommodate the roof water drainage from adjacent buildings. All calculations incorporate a 10% increase in impermeable area and a factor of safety of 2 applied to the measured infiltration rate.

Infiltration calculations to the Flood Estimation Handbook (FEH) Rainfall Profile for the design storm have been undertaken for individual porous paving and trench soakaways. These calculations are included in Appendix 7 at the rear of this report. Drainage Strategy Plans are attached in Appendix 8.

Land drainage trenches will be installed where necessary in areas of open space where the detailed levels design indicates areas where surface water ponding could occur. This would simply provide a pathway through the low permeability soils for landscaping runoff and would not form a basin feature or be visible from the surface.

5.2.3 Mitigation for Potential High Groundwater

The northern part of the site does not experience shallow ground water and a metre of vertical depth is provided between base of permeable pavement removing the risk of groundwater interference or any sort.

The permeable pavements and filter drains in the southern part of the site will be lined and the base level set above highest recorded ground water level to prevent any potential ground water seepage into the drainage system. Pipes and chambers together with the below ground tubular storage will be a sealed positive drainage system as will the foul drainage system.

5.2.4 Design for Exceedance

The storage tank has a top water level minimum 200mm below the lowest upstream cover level and a high-level overflow by gravity which would drain any additional exceedance flow prior to any flooding occurring due to lack of available storage during a storm which exceeds the Design Storm.

Typically, exceedance routes follow road carriageways and re-enter the drainage system or overtop kerbs at the edges of the site adjacent to landscaping areas. This would only be after a significant additional volume of water above that included in calculations was retained onsite.

All permeable pavements are set lower than building floor levels and exceedance to the design storm would be retained within the kerb height before following an overland flow path which would direct the flow either along an impermeable carriageway or into landscaping and open space.

5.2.5 Pollution Control

As a Sustainable Drainage System pollution control has been considered in accordance with recommendations and guidance with the CIRIA SUDS Manual C753.

The Simple Index Approach has been used to determine whether the proposed water quality measures are sufficient for the site. This approach uses indices to indicate the level of pollution from particular land uses, ranging from 0 (no pollution hazard for contaminant type) to 1 (high pollution hazard for contaminant type).

As set out within the SUDS Manual C753 the pollution hazard indices relevant to the site are as follows:

Table 2 – Pollution Hazard Indices by Land Use

Land Use	Pollution Hazard Level	Pollution Hazard Indices ^a
Residential Roofs	Very Low	TSS = 0.2, Metals = 0.2, HCs = 0.05
Individual property driveways, residential car parks and low traffic roads	Low	TSS = 0.5, Metals = 0.4, HCs = 0.4
Notes: a TSS = Total Suspended Solids, HCs = Hydrocarbons		

In accordance with Table 4.3 of the SUDS Manual the application of the Simple Index Approach is not required for residential roofs as the pollution hazard level is very low and the runoff is considered to be clean water suitable for discharge directly to the environment without treatment.

Low traffic residential streets, car parks and driveways represents a Low Pollution Hazard which can be mitigated with standard mitigation elements which are set out in the Pollution Mitigation Index within the SUDS Manual.

The drainage features provided on site will have a total pollution mitigation index that equals or exceeds the pollution hazard index. This is summarised in the table below.

Table 3 – SUDS Mitigation Indices

SUDS Component	Indicative SUDS Mitigation Indices ^a (discharging to groundwater or surface water)
Permeable Paving - draining to tanks Permeable pavement including sand and geotextile layers.	TSS = 0.7, Metals = 0.6, HCs = 0.7
Permeable paving - draining to ground Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential of at least 300 mm in depth.	TSS = 0.7, Metals = 0.6, HCs = 0.7
Impermeable Road - draining to tanks via filter drains^b	TSS = 0.4, Metals = 0.4, HCs = 0.4
Impermeable Road - draining to ground via crates Filter drain followed by constructed permeable pavement including geotextile base layer and a soil with good contaminant attenuation potential of at least 300 mm in depth	TSS = 0.7, Metals = 0.6, HCs = 0.7
<u>Notes:</u> a TSS = Total Suspended Solids, HCs = Hydrocarbons b Catch pits will be incorporated into the network to provide additional protection against silts etc.	

The above SUDS features provide adequate mitigation to the pollution hazard and are acceptable solutions for water quality treatment of surface water prior to discharge to ground and to a watercourse.

5.3 Ownership and Maintenance of the Drainage System

The construction and maintenance of the drainage system, and access roads will remain private (not be offered for adoption by Hampshire County Council Highway Authority) and will be the responsibility of the freehold owners of the residential properties through a Management Company financed by a maintenance charge. The surface water attenuation tank and integral pumps will also remain private under the same maintenance mechanism.

Foul Drainage will be offered for adoption by the Statutory Sewerage Undertaker (Southern Water) where appropriate and will be designed and specified to adoptable standard. Private drainage will be maintained by the Management Company.

A permanent record of the inspections will be kept by the management company recording previous issues and work carried out to help inform of future potential issues.

Table 4 below sets out the proposed schedule of maintenance for non-adopted infrastructure for the below ground drainage system which should be adhered to in order to ensure the system is kept free flowing and therefore reduce the risk of localised flooding due to blockages.

Table 4 – Drainage System Maintenance Requirements

Drainage Item	Maintenance Required	Frequency	Owner / Responsibility
Gullies and Linear Drains	Inspect and clean/remove silt. Inspect silt traps.	Annually	Maintenance Company
Manholes (foul and surface)	Inspection and cleaning	Inspect bi-annually and after major storm event (excess of 50 year storm). Clean annually. Inspect integrity of manholes every 5 years and after major storm event.	Maintenance Company
Permeable Paving	Inspection and cleaning of silt	Every 5 years	Maintenance Company
Drain Runs	Cleaning/Jetting CCTV Survey	Every 5 years Every 10 years	Maintenance Company

5.4 Risks Associated with Below Ground Drainage System

A risk assessment will be produced by the designer at detailed design stage and provided to the Principle Designer and Main Contractor in accordance with the requirements of the Construction Design and Management Regulations 2015.

The risks associated with the design of the proposed drainage solution identified at preliminary design stage are set out in Table 5 below.

Table 5 Preliminary Drainage Design Risk Assessment

Risk	Persons at Risk	Consideration of Risk and Mitigation Method	Residual Risk
Works in vicinity of existing high pressure gas main.	Construction personnel	Location of Gas Main to be marked on site and fenced off from physical works.	Minor works in close vicinity of gas main to be carefully planned and monitored.
Deep excavations in ground water	Construction personnel	Surface water system deep manholes avoided where possible by strategy. Tubular storage tank to be constructed using cofferdam and dewatering. Foul water system to be designed to be as shallow as possible.	Manholes and drain runs close to the pumping station may exceed 4m deep and involve deep excavation in groundwater. Contractor to produce Risk and Method Statements.
Confined spaces within drainage system (manholes)	Maintenance personnel	Maintenance to be carried out from the surface by way of jetting and rodding.	Required entry to system – must only be carried out by personnel who are confined spaces trained. Gas monitoring equipment to be used with appropriate breathing apparatus.

All risks are controllable and can be reduced to an acceptable level by an experienced and competent Contractor. A full Designer's Risk Assessment will be produced at Technical Design Stage.

6. Conclusion

The site is within Flood Zone 1 at low risk of flooding from tidal or fluvial sources. The development is in accordance with the Sequential Approach to flood risk as set out within the National Planning Policy Framework and is acceptable in this location in flood risk planning terms.

The Nore Farm Flood Relief Scheme has mitigated the surface water / land drainage flood risk from the Nore Farm Stream which drains land to the north of the A27.

The proposed development is at low risk of flooding from tidal/fluvial sources, overland flow, infrastructure or drainage failure. Any potential risk of groundwater flooding due to the shallow winter ground water levels will be fully mitigated through the proposed levels design which will raise finished floor levels within the southern part of the site above existing ground levels.

Foul water from the new properties will be discharged via pumping station and connection to the existing public sewer beneath the A259 Havant Road.

Surface water runoff will be controlled as part of a sustainable drainage system. Surface water from the impermeable areas will drain to ground via permeable paving and soakaways in the northern part of the site where the potential for shallow groundwater levels is low. The southern and central parts of the site will be conveyed via permeable paving and pipes to attenuation storage and a restricted outflow to the public sewer at the junction of Havant Road and the A27 to the east of the site.

The drainage system will incorporate storage designed to accommodate large return period storm events up to and including the 1 in 100-year return period storm including allowance for 40% climate change. The sustainable drainage (SUDS) system components are designed to meet water quality requirements for draining to ground and to an open watercourse in accordance with guidance within the CIRIA SUDS Manual. Run-off from landscaped areas will be drained to ground via land drained trenches where the detailed levels design indicates surface water ponding could occur.

The proposed drainage solution reduces offsite surface water run-off overall by storing water within the system for gradual release. Once these measures are installed the development represents a reduction in flood risk to the surrounding area and is in accordance with flood risk and sustainable drainage policy.

7. Appendices

Appendix 1

Existing Gradient Variation across Site

Appendix 2

Site photographs

Appendix 3

Site Investigation Summary

Appendix 4

Environment Agency Product 4 Flood Risk Information

Appendix 5

Flood Risk Planning Policy Review

Appendix 6

Sequential and Exception Test Tables

Appendix 7

Greenfield Runoff and SuDS Storage Calculations

Appendix 8

Drainage Strategy Plans

Appendix 9

Southern Water Correspondence

Appendix 1 - Existing Gradient Variation across Site



Appendix 2 - Current Site Photographs

Current entrance to the site (looking towards Selangor Road):

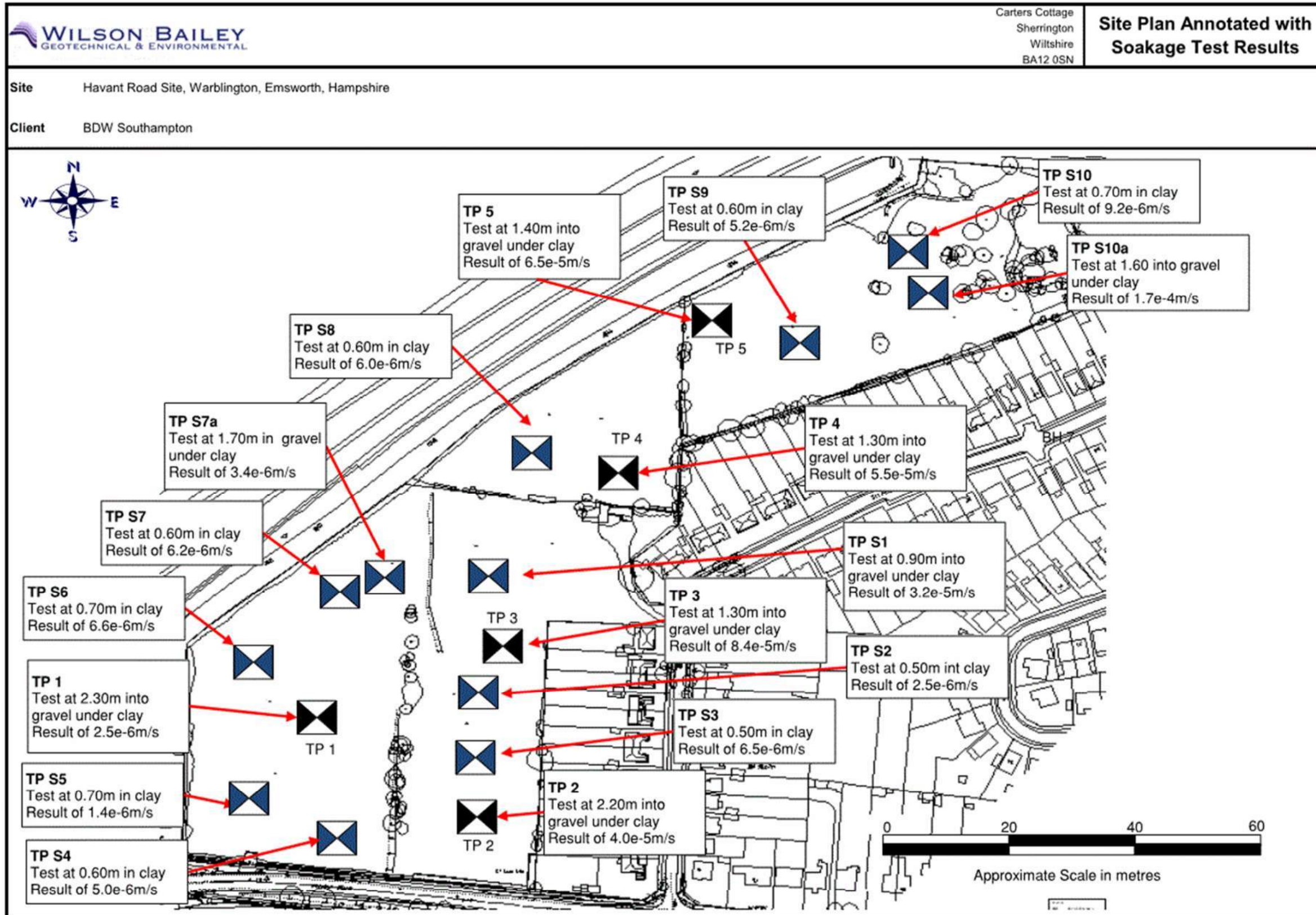


Full site view looking northwest from current site entrance:

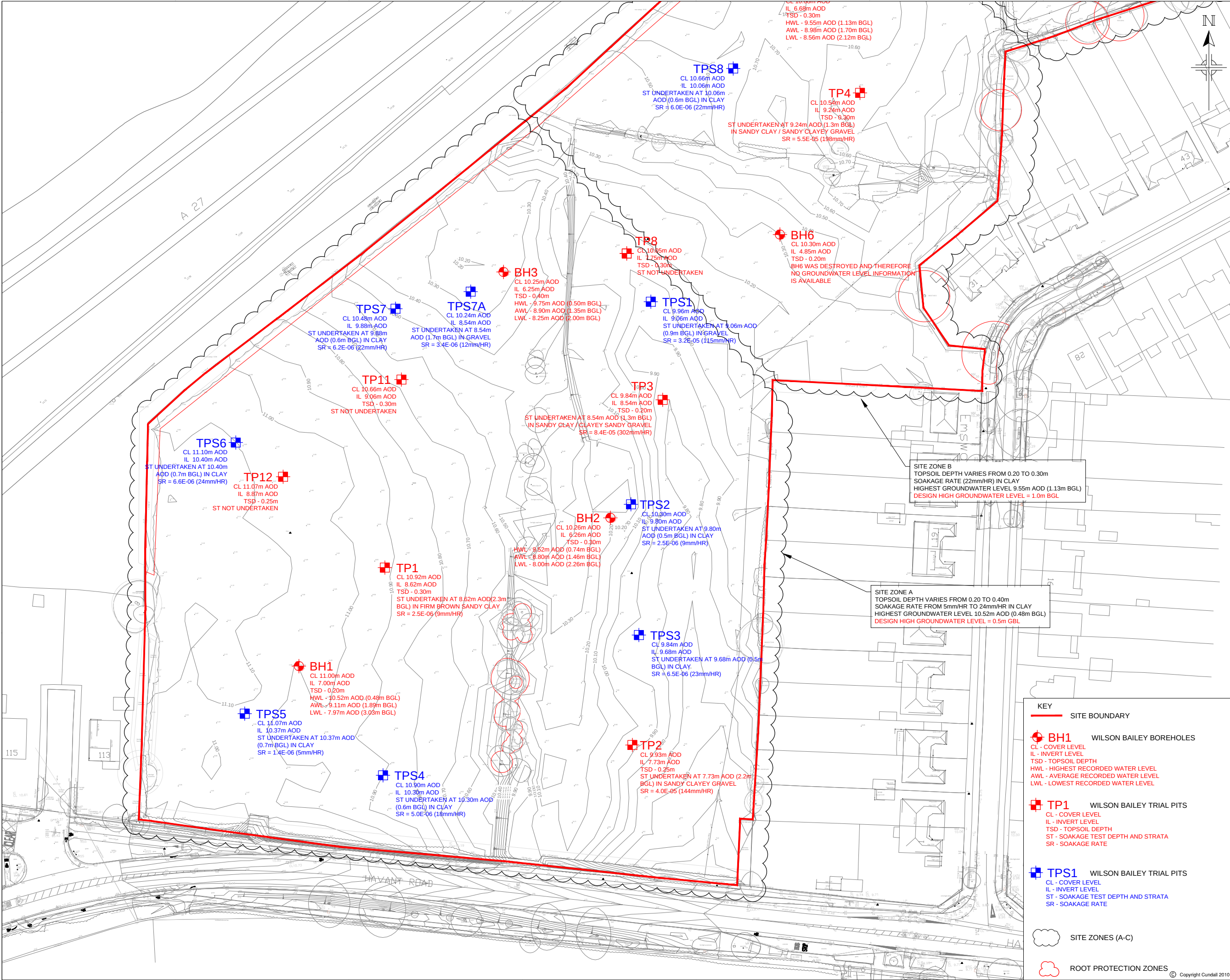


Appendix 3 – Site Investigation Information

- Soakage Test Results Summary
- CLXX(11)8001 Site Investigation Review Sheet 1 of 2
- CLXX(11)8002 Site Investigation Review Sheet 2 of 2



J11145 Site Plan (2)



1012052

A1

Based on:
Architects Drg No.
Structural Drg No.
Survey Drg No.
Other Drg No.

Rev
Rev
Rev
Rev

DO NOT SCALE FROM THIS DRAWING

Notes

1. LEVEL AND LOCATION OF ALL TRIAL PITS IS INDICATIVE AS THEY WERE NOT SURVEYED

SHEET 2 OF 2

SHEET 1 OF 2

P1	19/05/2017	PLANNING RESUBMISSION	SJ	AMF	AMF
Issue	Date	Description	By	Chkd	Verfd

Project

LAND AT HAVANT ROAD, EMSWORTH

Client

BDW SOUTHAMPTON

Architect

SIMON COOPER ASSOCIATES

Title

SITE INVESTIGATION REVIEW
SHEET 1 OF 2

Drawing No.	CLXX(11)8001	Drawing Status	PLANNING
Job No.	1012052	Scale	1:500 @A1
Originator	SJ	Checked	AMF
		Verified	AMF
		Issue	P1

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KEY

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SITE BOUNDARY

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BH1

WILSON BAILEY BOREHOLES
CL - COVER LEVEL
IL - INVERT LEVEL
TSD - TOPSOIL DEPTH
HWL - HIGHEST RECORDED WATER LEVEL
AWL - AVERAGE RECORDED WATER LEVEL
LWL - LOWEST RECORDED WATER LEVEL

+

TP1

WILSON BAILEY TRIAL PITS
CL - COVER LEVEL
IL - INVERT LEVEL
TSD - TOPSOIL DEPTH
ST - SOAKAGE TEST DEPTH AND STRATA
SR - SOAKAGE RATE

+

TPS1

WILSON BAILEY TRIAL PITS
CL - COVER LEVEL
IL - INVERT LEVEL
ST - SOAKAGE TEST DEPTH AND STRATA
SR - SOAKAGE RATE

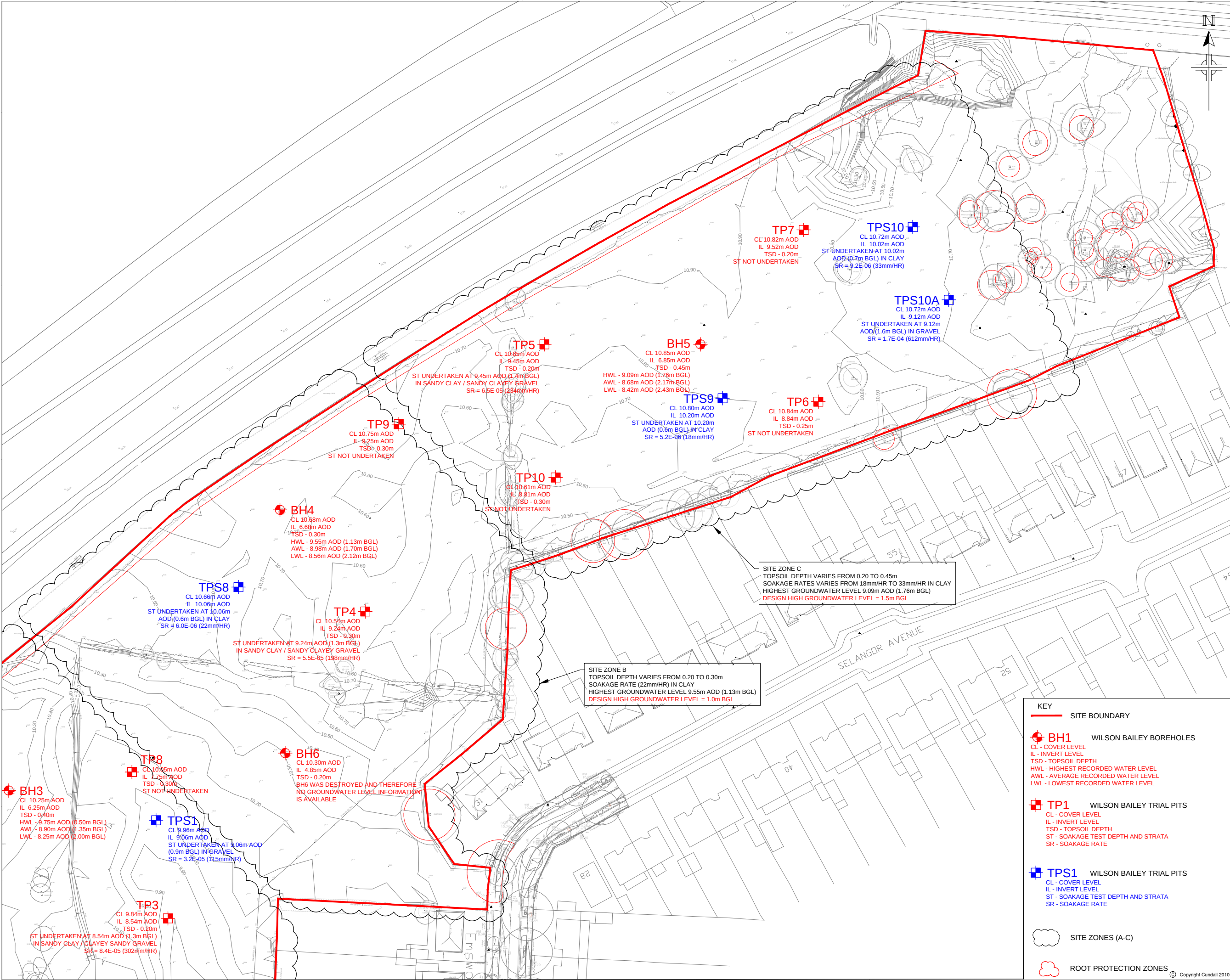
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SITE ZONES (A-C)

☁

ROOT PROTECTION ZONES

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1012052

A1

Based on:
Architects Drg No.
Structural Drg No.
Survey Drg No.
Other Drg No.

Rev
Rev
Rev
Rev

DO NOT SCALE FROM THIS DRAWING

Notes

1. LEVEL AND LOCATION OF ALL TRIAL PITS IS INDICATIVE AS THEY WERE NOT SURVEYED

SHEET 2 OF 2

SHEET 1 OF 2

P1	19/05/2017	PLANNING RESUBMISSION	SJ	AMF	AMF
Issue	Date	Description	By	Chkd	Verfd

Project

LAND AT HAVANT ROAD, EMSWORTH

Client

BDW SOUTHAMPTON

Architect

SIMON COOPER ASSOCIATES

Title

SITE INVESTIGATION REVIEW
SHEET 2 OF 2

Drawing No.	CLXX(11)8002	Drawing Status	PLANNING
Job No.	1012052	Scale	1:500 @A1
Originator	SJ	Checked	AMF
Verified	AMF	Issue	P1

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KEY

SITE BOUNDARY

BH1

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TP1

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TPS1

WILSON BAILEY TRIAL PITS

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IL - INVERT LEVEL
ST - SOAKAGE TEST DEPTH AND STRATA
SR - SOAKAGE RATE

SITE ZONES (A-C)

ROOT PROTECTION ZONES

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Appendix 4 – Environment Agency Product 4 Flood Risk Information

- Flood Map for Planning (Rivers and Seas)
- Risk of Flooding from Surface Water
- Surface Water Depths - 1 in 30
- Surface Water Depths - 1 in 100
- Surface Water Depths - 1 in 1000

Flood Map for Planning (Rivers and Sea) Centered on Havant Road - Created 03 February 2016



Scale 1: 10,001



Flood Map for Planning (Rivers & Sea)

- Flood Map - Defences
- Area Benefitting from Flood Defences
- Flood Map - Flood Storage Area
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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Risk of flooding from Surface Water



Scale 1: 10,001



Likelihood of flooding from Surface Water

- High (1 in 30yr)
- Medium (1 in 100yr)
- Low (1 in 1000yr)
- Very Low

Likelihood of flooding from Surface Water

- High:** Greater than or equal to 1 in 30 (3.3%) chance in any given year
- Medium:** Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year
- Low:** Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
- Very Low:** Less than 1 in 1,000 (0.1%) chance in any given year

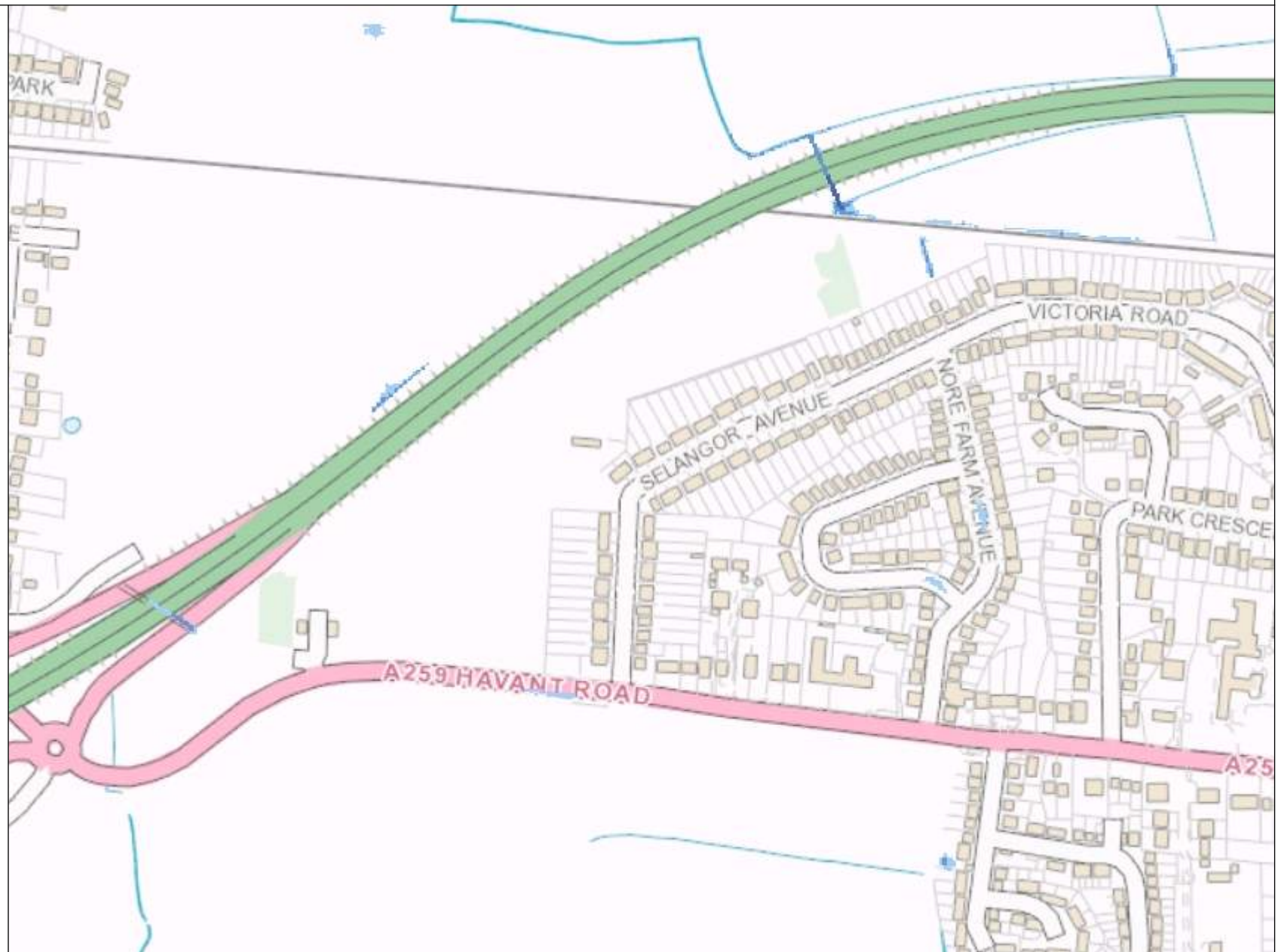
This information is shown on the Risk of Flooding from Surface Water map on our website.

Surface Water Depths Centered on Havant Road - Created 03 February 2016

Legend

Flood Depth 1 in 30

- Below 150mm
- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- Over 1200mm



0 50 100 150
Metres



Surface Water Depths Centered on Havant Road - Created 03 February 2016

Legend

Flood Depth 1 in 100

- Below 150mm
- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- Over 1200mm



0 50 100 150
Metres



Surface Water Depths Centered on Havant Road - Created 03 February 2016

Legend

Flood Depth 1 in 1000

- Below 150mm
- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- Over 1200mm



0 50 100 150
Metres



Appendix 5 – Flood Risk and Drainage Policy Review

National Planning Policy Framework

The Government's national policy on Development and Flood Risk is covered by the National Planning Policy Framework March 2012 and its associated Technical Guidance. The principal aim of the NPPF for flood risk is:

"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

The Technical Guidance to the NPPF March 2012 sets out the sequential approach to development and flood risk and the responsibilities of key stakeholders in assessing flood risk. With regard to the sequential approach it states:

"The overall aim should be to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, local planning authorities allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses (see table 2) and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (see table 3). Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required."

The tables relating to flood risk vulnerability classification and flood zone compatibility are included in Appendix 6 below.

Central Government Written Statement to Parliament on Sustainable Drainage Systems, 18 December 2014

In absence of implementation of Section 3 of the Flood and Water Management Act 2010 relating to National Standards, Approving Bodies and Mandatory Adoption for sustainable drainage the Secretary of State for Communities and Local Government has instructed Local Planning Authorities to ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate and that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

The new guidance took effect on 6 April 2015 and include all major development as defined by Article 2(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010).

Update from Environment Agency on Flood Risk Assessments: Climate Change Allowances, 19 February 2016

The Environment Agency issued an update on previous climate change allowances to support the National Planning Policy Framework, effective from 19th February 2016. The updated guidance includes an increase in peak rainfall intensity allowance to 40% to account for climate change for small and urban catchments.

Havant Borough Core Strategy, March 2011

The Havant Borough Core Strategy is part of the borough's Local Development Framework [HBLDF] and sets an overall policy framework for all other local development documents. The Core Strategy was adopted on 1st March 2011 and as part of the HBLDF will guide the development of the borough until 2026.

Section 1.06 states: “[The Core Strategy] contains strategic policies and some detailed development management policies against which individual planning applications will be assessed. When considering planning applications the council will consider all the policies contained in the Core Strategy that are relevant to the proposal.”

Policy CS15 Flood and Coastal Erosion Risk states:

“Development in areas at risk of flooding now and in the future as identified on the latest Environment Agency flood risk maps and Strategic Flood Risk Assessment climate change maps will only be permitted where:

- 1. It meets the sequential and exception test (where required) in relation to PPS25.*
- 2. The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.*
- 3. A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 4. The scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site.*
- 5. Appropriate flood warning and evacuation plans are in place.*
- 6. New site drainage systems are designed taking account of events which exceed the normal design standard.*

All development will be required to ensure that there is no net increase in surface water run off. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDs are provided arrangements must be put in place for their whole life management and maintenance.

The council will work with partners to implement the Coastal Policy Zones in the North Solent Shoreline Management Plan to ensure that development avoids areas at risk from coastal erosion and coastal flooding and that areas required to offset coastal squeeze and prevent habitat fragmentation, to allow species to adapt to climate change, are identified and protected from development.”

Havant Borough Local Plan (Allocations), July 2014

The Allocations Plan was adopted on 23rd July 2014 and as part of the HBLDF will guide the development of the borough until 2026.

Policy DM25 states: *“Planning permission will be granted for developments within the Emsworth urban area boundary that can demonstrate how post development runoff has been reduced by the greatest percentage rates and volumes that are possible in the context of cost, technical feasibility and viability.”*

Havant Borough Local Plan Housing Statement, December 2016

Yet to be adopted, the Housing Statement identifies the requirement for new housing within Havant Borough. The proposed site is listed (reference ‘UW02b’), and as such is subject to the remainder of the policies listed in the Adopted Local Plan and Guiding Principles listed within the Housing Statement.

PUSH Strategic Flood Risk Assessment, December 2007

The Strategic Flood Risk Assessment was produced for the Partnership for Urban South Hampshire.

Section 4.2.1 states: *"Output Package 1 [of the SFRA] is intended to assist in the application of the Sequential test, by providing information to guide decisions on location of future development in relation to areas of flood risk and, more specifically, the Flood Zones."*

The above package has been consulted in this Flood Risk Assessment.

Hampshire Local Flood Risk Management Strategy, July 2013

The Local Flood Risk Management Strategy (LFRMS) was produced to aid in the understanding and management of flood risk across the county.

The LFRMS identifies Emsworth and Selangor Avenue as subjects of previous instances of flooding.

Hampshire Groundwater Management Plan, October 2013

The Groundwater Management Plan establishes the risk of groundwater flooding throughout Hampshire.

Havant has previously been identified (in the LFRMS) as being at risk of groundwater flooding, however previous causes of flooding in the borough have not been attributable to groundwater therefore it is not addressed within this Plan.

Emsworth Flood Risk Strategy Review, October 2015

The area surrounding the site is identified as being affected by flooding.

Section 1.2 states: *"Emsworth is one of the Borough's few urban areas to suffer from flooding. The settlement is located on the coast and includes the Nore Farm Stream, the West Brook and the River Ems. Over recent years, extreme weather and high tides have resulted in a high frequency of flood events, which have affected local residents and businesses and caused considerable damage to properties. These flood events were caused by a combination of fluvial and tidal influences and principally affected Selangor Avenue, Victoria Road, North Street and Bridge Road in Emsworth."*

Policy DM25 from the Local Plan (allocations) is applicable to all new developments within Emsworth.

The proposed alleviation schemes for Emsworth are mentioned and the Nore Farm Stream Flood Alleviation Scheme is highlighted – this has been taken into account in this Flood Risk Assessment.

North Solent Coastline Management Plan, December 2010

The North Solent Coastline Management Plan was completed on 16th December 2010 and assesses risks associated with coastal flooding and shoreline evolution at a large scale.

The site has no specific mention in the policy statement maps.

Appendix 6 – NPPF Technical Guidance Tables 2 & 3

Table 2: Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 3: Flood Risk Vulnerability and Flood Risk Zone ‘Compatibility’

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Key:

✓ Development is appropriate

X Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

Appendix 7 – Greenfield Runoff and SuDS Storage Calculations

- Greenfield Runoff to IH 124
- SuDS Component Sizing Summary and Micro Drainage Reports
 - Car Park Permeable Paving Areas
 - Road Permeable Paving
 - Road Soakaways
- Conveyance Drainage Network Model

CUNDALL	JOB NUMBER / FILE:		CALCULATION NUMBER:		DRAWING REFERENCE:	
	1012052		CAL-CL001			
JOB TITLE:	REV	CALCULATION BY:	DATE	CHECKED BY	VERIFIED BY:	
Land at Havant Road, Emsworth	0	LK	05/05/16	AMF	AMF	
CALCULATION:	1	LK	21/04/17	AMF	AMF	
	2					
Greenfield Runoff						

CALCULATIONS:

Surface water storage requirement

Existing site	Total site area (m ²)	63000	
Hard standing	Area (m ²)	Soft standing	Area (m ²)
No hard standing on existing site		Greenfield land	63000
			63000

Existing Greenfield Run-off

Based on site size of 63000m², IH124 Method selected.

The screenshot displays the 'Rural Runoff Calculator' window. The 'IH 124' method is selected. The 'IH 124 Input' section contains the following fields: Return Period (Years) set to 1, Area (ha) set to 50,000, SAAR (mm) set to 700, Soil set to 0.400, and Growth Curve set to (None). The 'Partly Urbanised Catchment (QBAR)' section shows Urban set to 0.000 and Region set to Region 7. The 'Results' section shows QBAR rural (l/s) as 170.1 and QBAR urban (l/s) as 170.1. A table titled 'Return Period Flood' lists values for various regions (1-9) across different return periods (1, 2, 5, 10 years). The bottom of the window has 'OK', 'Cancel', and 'Help' buttons, and a note: 'Enter Return Period between 1 and 1000'.

Region	QBAR (l/s)	Q (1yrs) (l/s)	Q (2 yrs) (l/s)	Q (5 yrs) (l/s)	Q (10 yrs) (l/s)
Region 1	170.1	144.6	144.6	154.6	204.1
Region 2	170.1	148.0	148.0	155.5	200.7
Region 3	170.1	146.3	146.3	160.5	212.6
Region 4	170.1	141.2	141.2	152.5	209.2
Region 5	170.1	148.0	148.0	152.0	219.4
Region 6/Region 7	170.1	144.6	144.6	149.9	217.7
Region 8	170.1	132.7	132.7	150.3	209.2
Region 9	170.1	149.7	149.7	158.0	205.8

CUNDALL	JOB NUMBER / FILE:		CALCULATION NUMBER:		DRAWING REFERENCE:	
	1012052		CAL-CL001			
JOB TITLE:	REV	CALCULATION BY:	DATE	CHECKED BY	VERIFIED BY:	
Land at Havant Road, Emsworth	0	LK	05/05/16	AMF	AMF	
CALCULATION:	1	LK	21/04/17	AMF	AMF	
	2					
Greenfield Runoff						

CALCULATIONS:

REF

OUTPUT

IH124 Method is used for areas of 50ha, therefore values factored down for site area:

Storm Return Period	(l/s)
QBAR	21.4
1 Year	18.2
2 Years	18.9
5 Years	27.4
10 Years	34.7
20 Years	42.9
50 Years	56.2
100 Years	68.4

For all soft-standing area for a 1 in 1 year event, Q1 = 18.2 l/s, Qbar = 21.4 l/s

Greenfield runoff rate = 18.2 l/s (1 in 1 year event)

Greenfield runoff for drainage areas A & B only (C to infiltrate to ground)

Approx. area of site within drainage areas A & B: 36033 m² = 3.6 ha

Approx. area of site kept as free-draining soft landscaping: 14389 m² = 1.44 ha

CUNDALL	JOB NUMBER / FILE:		CALCULATION NUMBER:		DRAWING REFERENCE:
	1012052		CAL-CL001		
JOB TITLE:	REV	CALCULATION BY:	DATE	CHECKED BY	VERIFIED BY:
Land at Havant Road, Emsworth	0	LK	05/05/16	AMF	AMF
CALCULATION:	1	LK	21/04/17	AMF	AMF
	2				
Greenfield Runoff					

CALCULATIONS:				
REF				OUTPUT
	Storm Return Period	Flow Rate for Areas A & B (l/s)	Flow Rate for soft landscaping (l/s)	
	QBAR	12.3	4.9	
	1 Year	10.4	4.2	
	2 Years	10.8	4.3	
	5 Years	15.7	6.3	
	10 Years	19.9	7.9	
	20 Years	24.6	9.8	
	50 Years	32.1	12.8	
	100 Years	39.1	15.6	
	Greenfield runoff rate for areas A&B only = 12.3 l/s (QBAR)			

CUNDALL	JOB NUMBER / FILE:		CALCULATION NUMBER:		DRAWING REFERENCE:	
	1012052		-		CLXX(52)2001 & 2002	
JOB TITLE: Land at Havant Road, Emsworth	REV	CALCULATION BY:	DATE	CHECKED BY	VERIFIED BY:	
	0	AC	01/03/17	AMF	AMF	
CALCULATION: Soakaway Design Summary	1	LK	16/05/17	AMF	AMF	
	2	LK	04/12/17	SP	SP	

CALCULATIONS:

SOAKAWAY REFERENCE	TYPE	TRIAL PIT REF	INFILTRATION RATE (m/s)	DRAINED AREA (m ²) + 10% URBAN CREEP	SIZE - PLAN AREA (m ²)	STORAGE DEPTH (mm)	TOTAL DEPTH (mm)
Car Park A	Permeable Paving	TP S9	5.20E-06	198	100	370	500
Car Park B	Permeable Paving	TP S9	5.20E-06	347	170	370	500
Car Park C	Permeable Paving	TP S9	5.20E-06	453	211	370	500
Car Park D	Permeable Paving	TP S10	9.20E-06	664	225	370	500
Car Park E	Permeable Paving	TP S10	9.20E-06	407	176	370	500
Permeable Road 1	Permeable Paving & Permavoid	TP S9	5.20E-06	858	358	370	500
Permeable Road 2	Permeable Paving & Permavoid	TP S9	5.20E-06	1885	797	370	500
Road Soakaway 1	Permavoid	TP S9	5.20E-06	869	190	350	500
Road Soakaway 2	Permavoid	TP S9	5.20E-06	597	118	350	500
Road Soakaway 3	Permavoid	TP S10	9.20E-06	350	64	350	500

Cundall, Johnston & Partners		Page 1
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed Surface Water Drainage.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Maximum Rainfall (mm/hr)	0
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)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.000
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Proposed Surface Water Drainage.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	6.605	0.134	49.3	0.026	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	8.175	0.036	227.1	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	6.614	0.174	38.0	0.018	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	27.402	0.091	301.1	0.025	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	8.451	0.026	325.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	20.208	0.051	396.2	0.032	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	15.589	0.104	150.0	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	7.243	0.048	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	11.703	0.029	403.6	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)	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	0.00	5.08	9.665	0.026	0.0	0.0	0.0	1.44	25.4	0.0
S1.001	0.00	5.23	9.256	0.054	0.0	0.0	0.0	0.86	34.3	0.0
S2.000	0.00	5.07	9.500	0.018	0.0	0.0	0.0	1.64	28.9	0.0
S1.002	0.00	5.74	9.145	0.097	0.0	0.0	0.0	0.90	63.7	0.0
S1.003	0.00	5.88	8.979	0.097	0.0	0.0	0.0	1.00	110.4	0.0
S1.004	0.00	6.21	8.878	0.129	0.0	0.0	0.0	1.02	161.5	0.0
S3.000	0.00	5.32	9.450	0.050	0.0	0.0	0.0	0.82	14.5	0.0
S3.001	0.00	5.47	9.346	0.050	0.0	0.0	0.0	0.82	14.5	0.0
S1.005	0.00	6.41	8.827	0.179	0.0	0.0	0.0	1.01	160.0	0.0

Cundall, Johnston & Partners		Page 2
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34 File Drainage Zones A & B Surface Wa...	Designed by s.johnston Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Network Design Table for Proposed Surface Water Drainage.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	5.907	0.159	37.2	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	22.310	0.056	398.4	0.025	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.000	52.228	0.174	300.0	0.082	5.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	30.872	0.103	299.7	0.047	5.00	0.0	0.600	o	300	Pipe/Conduit	
S5.001	64.862	0.216	300.3	0.102	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.002	8.229	0.027	304.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	35.551	0.089	399.4	0.028	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	25.648	0.171	150.0	0.030	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.000	14.938	0.100	150.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	7.745	0.052	150.0	0.050	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	16.572	0.041	404.2	0.028	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.009	12.879	0.032	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S9.000	11.921	0.040	300.0	0.093	5.00	0.0	0.600	o	300	Pipe/Conduit	
S9.001	5.175	0.023	225.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.010	29.276	0.073	401.0	0.030	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.000	7.166	0.118	60.7	0.090	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	0.00	5.06	9.488	0.025	0.0	0.0	0.0	1.66	29.3	0.0
S1.006	0.00	6.78	8.798	0.229	0.0	0.0	0.0	1.01	161.0	0.0
S5.000	0.00	5.96	9.200	0.082	0.0	0.0	0.0	0.90	63.8	0.0
S6.000	0.00	5.57	9.200	0.047	0.0	0.0	0.0	0.90	63.8	0.0
S5.001	0.00	7.16	9.026	0.231	0.0	0.0	0.0	0.90	63.8	0.0
S5.002	0.00	7.32	8.810	0.231	0.0	0.0	0.0	0.90	63.3	0.0
S1.007	0.00	7.90	8.633	0.488	0.0	0.0	0.0	1.01	160.8	0.0
S7.000	0.00	5.52	9.459	0.030	0.0	0.0	0.0	0.82	14.5	0.0
S8.000	0.00	5.30	9.284	0.014	0.0	0.0	0.0	0.82	14.5	0.0
S7.001	0.00	5.68	9.184	0.094	0.0	0.0	0.0	0.82	14.5	0.0
S1.008	0.00	8.18	8.544	0.610	0.0	0.0	0.0	1.01	159.8	0.0
S1.009	0.00	8.39	8.503	0.610	0.0	0.0	0.0	1.01	160.7	0.0
S9.000	0.00	5.22	9.250	0.093	0.0	0.0	0.0	0.90	63.8	0.0
S9.001	0.00	5.30	9.210	0.093	0.0	0.0	0.0	1.04	73.8	0.0
S1.010	0.00	8.87	8.471	0.733	0.0	0.0	0.0	1.01	160.5	0.0
S10.000	0.00	5.09	9.440	0.090	0.0	0.0	0.0	1.29	22.8	0.0

Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Network Design Table for Proposed Surface Water Drainage.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.011	8.575	0.021	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S11.000	8.174	0.125	65.4	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.012	17.101	0.043	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.000	4.466	0.015	297.7	0.050	5.00	0.0	0.600	o	300	Pipe/Conduit	
S12.001	6.770	0.023	300.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.013	15.872	0.040	396.8	0.034	0.00	0.0	0.600	o	450	Pipe/Conduit	
S13.000	18.120	0.060	300.0	0.055	5.00	0.0	0.600	o	300	Pipe/Conduit	
S13.001	7.364	0.130	56.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.014	7.697	0.019	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.015	13.038	0.033	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S14.000	7.351	0.165	44.6	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
S14.001	4.809	0.047	103.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.016	17.713	0.044	402.6	0.067	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.017	8.189	0.020	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S15.000	7.072	0.205	34.5	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.018	11.111	0.028	400.0	0.000	0.00	0.0	0.600	o	600	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)
S1.011	0.00	9.01	8.398	0.823	0.0	0.0	0.0	1.01	160.7	0.0
S11.000	0.00	5.11	9.451	0.008	0.0	0.0	0.0	1.25	22.0	0.0
S1.012	0.00	9.30	8.376	0.831	0.0	0.0	0.0	1.01	160.7	0.0
S12.000	0.00	5.08	9.350	0.050	0.0	0.0	0.0	0.91	64.0	0.0
S12.001	0.00	5.21	9.335	0.050	0.0	0.0	0.0	0.90	63.8	0.0
S1.013	0.00	9.56	8.334	0.915	0.0	0.0	0.0	1.01	161.3	0.0
S13.000	0.00	5.33	9.300	0.055	0.0	0.0	0.0	0.90	63.8	0.0
S13.001	0.00	5.39	9.240	0.055	0.0	0.0	0.0	2.09	148.0	0.0
S1.014	0.00	9.68	8.294	0.970	0.0	0.0	0.0	1.01	160.7	0.0
S1.015	0.00	9.90	8.274	0.970	0.0	0.0	0.0	1.01	160.7	0.0
S14.000	0.00	5.08	9.366	0.009	0.0	0.0	0.0	1.51	26.7	0.0
S14.001	0.00	5.16	9.201	0.009	0.0	0.0	0.0	0.99	17.5	0.0
S1.016	0.00	10.14	8.092	1.046	0.0	0.0	0.0	1.21	341.4	0.0
S1.017	0.00	10.26	8.048	1.046	0.0	0.0	0.0	1.21	342.5	0.0
S15.000	0.00	5.07	9.350	0.010	0.0	0.0	0.0	1.72	30.4	0.0
S1.018	0.00	10.41	8.027	1.056	0.0	0.0	0.0	1.21	342.5	0.0

Cundall, Johnston & Partners		Page 4
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34 File Drainage Zones A & B Surface Wa...	Designed by s.johnston Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Network Design Table for Proposed Surface Water Drainage.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S16.000	7.039	0.166	42.4	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.019	15.581	0.039	399.5	0.030	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.000	27.345	0.091	300.0	0.040	5.00	0.0	0.600	o	300	Pipe/Conduit	
S18.000	6.880	0.067	102.7	0.037	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.001	14.574	0.049	300.0	0.012	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	6.921	0.067	103.3	0.036	5.00	0.0	0.600	o	150	Pipe/Conduit	
S17.002	23.173	0.077	300.0	0.033	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.003	13.192	0.044	299.8	0.010	0.00	0.0	0.600	o	300	Pipe/Conduit	
S20.000	31.338	0.104	300.0	0.050	5.00	0.0	0.600	o	300	Pipe/Conduit	
S20.001	14.157	0.047	300.0	0.014	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.004	34.178	0.114	299.8	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.005	45.542	0.152	299.6	0.098	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.006	8.691	0.029	300.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.020	15.710	0.039	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S21.000	43.926	0.146	300.9	0.079	5.00	0.0	0.600	o	300	Pipe/Conduit	
S22.000	23.581	0.079	298.5	0.043	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S16.000	0.00	5.08	9.500	0.000	0.0	0.0	0.0	1.55	27.4	0.0
S1.019	0.00	10.62	7.999	1.086	0.0	0.0	0.0	1.21	342.7	0.0
S17.000	0.00	5.50	9.370	0.040	0.0	0.0	0.0	0.90	63.8	0.0
S18.000	0.00	5.12	9.600	0.037	0.0	0.0	0.0	0.99	17.5	0.0
S17.001	0.00	5.77	9.279	0.089	0.0	0.0	0.0	0.90	63.8	0.0
S19.000	0.00	5.12	9.666	0.036	0.0	0.0	0.0	0.99	17.5	0.0
S17.002	0.00	6.20	9.230	0.158	0.0	0.0	0.0	0.90	63.8	0.0
S17.003	0.00	6.45	9.153	0.168	0.0	0.0	0.0	0.90	63.8	0.0
S20.000	0.00	5.58	10.000	0.050	0.0	0.0	0.0	0.90	63.8	0.0
S20.001	0.00	5.84	9.896	0.064	0.0	0.0	0.0	0.90	63.8	0.0
S17.004	0.00	7.08	9.109	0.270	0.0	0.0	0.0	0.90	63.8	0.0
S17.005	0.00	7.92	8.995	0.368	0.0	0.0	0.0	0.90	63.8	0.0
S17.006	0.00	8.08	8.843	0.368	0.0	0.0	0.0	0.90	63.8	0.0
S1.020	0.00	10.84	7.960	1.454	0.0	0.0	0.0	1.21	342.5	0.0
S21.000	0.00	5.81	9.090	0.079	0.0	0.0	0.0	0.90	63.7	0.0
S22.000	0.00	5.43	9.090	0.043	0.0	0.0	0.0	0.90	64.0	0.0

Cundall, Johnston & Partners		Page 5
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34 File Drainage Zones A & B Surface Wa...	Designed by s.johnston Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Network Design Table for Proposed Surface Water Drainage.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S21.001	48.975	0.163	300.5	0.066	0.00	0.0	0.600	o	300	Pipe/Conduit	
S23.000	5.807	0.039	150.0	0.048	5.00	0.0	0.600	o	150	Pipe/Conduit	
S21.002	16.134	0.157	102.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S24.000	7.676	0.183	41.9	0.170	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.021	9.115	0.023	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S25.000	6.727	0.182	37.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.022	26.459	0.066	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.023	20.279	0.051	397.6	0.028	0.00	0.0	0.600	o	600	Pipe/Conduit	
S26.000	8.141	0.020	407.1	0.043	5.00	0.0	0.600	o	600	Pipe/Conduit	
S26.001	14.640	0.037	400.0	0.150	0.00	0.0	0.600	o	600	Pipe/Conduit	
S26.002	15.784	0.039	400.0	0.029	0.00	0.0	0.600	o	600	Pipe/Conduit	
S26.003	9.953	0.025	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.024	15.384	0.038	404.8	0.057	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.025	6.646	0.017	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S27.000	28.933	0.096	301.4	0.059	5.00	0.0	0.600	o	300	Pipe/Conduit	
S27.001	9.035	0.030	301.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S28.000	14.229	0.108	131.8	0.160	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S21.001	0.00	6.72	8.944	0.188	0.0	0.0	0.0	0.90	63.7	0.0
S23.000	0.00	5.12	9.285	0.048	0.0	0.0	0.0	0.82	14.5	0.0
S21.002	0.00	6.89	8.781	0.236	0.0	0.0	0.0	1.55	109.6	0.0
S24.000	0.00	5.05	9.476	0.170	0.0	0.0	0.0	2.43	172.1	0.0
S1.021	0.00	10.97	7.921	1.860	0.0	0.0	0.0	1.21	342.5	0.0
S25.000	0.00	5.07	9.591	0.010	0.0	0.0	0.0	1.66	29.3	0.0
S1.022	0.00	11.33	7.898	1.870	0.0	0.0	0.0	1.21	342.5	0.0
S1.023	0.00	11.61	7.832	1.898	0.0	0.0	0.0	1.22	343.5	0.0
S26.000	0.00	5.11	8.596	0.043	0.0	0.0	0.0	1.20	339.5	0.0
S26.001	0.00	5.31	8.576	0.193	0.0	0.0	0.0	1.21	342.5	0.0
S26.002	0.00	5.53	8.539	0.222	0.0	0.0	0.0	1.21	342.5	0.0
S26.003	0.00	5.67	8.500	0.222	0.0	0.0	0.0	1.21	342.5	0.0
S1.024	0.00	11.82	7.781	2.177	0.0	0.0	0.0	1.20	340.4	0.0
S1.025	0.00	11.91	7.743	2.177	0.0	0.0	0.0	1.21	342.5	0.0
S27.000	0.00	5.54	9.900	0.059	0.0	0.0	0.0	0.90	63.6	0.0
S27.001	0.00	5.70	9.804	0.059	0.0	0.0	0.0	0.90	63.7	0.0
S28.000	0.00	5.17	9.750	0.160	0.0	0.0	0.0	1.37	96.7	0.0

Cundall, Johnston & Partners		Page 6
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Network Design Table for Proposed Surface Water Drainage.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S27.002	19.316	0.064	300.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S29.000	5.149	0.104	49.5	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit	
S27.003	8.198	0.027	303.6	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
S27.004	13.201	0.044	300.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.026	11.294	0.028	400.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.027	5.184	0.013	398.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.028	9.913	0.025	396.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S27.002	0.00	6.06	9.642	0.219	0.0	0.0	0.0	0.90	63.8	0.0
S29.000	0.00	5.06	9.700	0.027	0.0	0.0	0.0	1.43	25.3	0.0
S27.003	0.00	6.21	9.446	0.284	0.0	0.0	0.0	0.90	63.4	0.0
S27.004	0.00	6.46	9.419	0.284	0.0	0.0	0.0	0.90	63.8	0.0
S1.026	0.00	12.07	7.727	2.461	0.0	0.0	0.0	1.21	342.5	0.0
S1.027	0.00	12.24	7.698	2.461	0.0	0.0	0.0	0.50	8.8	0.0
S1.028	0.00	12.57	7.685	2.461	0.0	0.0	0.0	0.50	8.8	0.0

Cundall, Johnston & Partners				Page 7			
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG				1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B			
Date 01/12/2017 14:34				Designed by s.johnston			
File Drainage Zones A & B Surface Wa...				Checked by AJWC			
Micro Drainage				Network 2017.1.2			



Manhole Schedules for Proposed Surface Water Drainage.SWS

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)
S100	10.815	1.150	Open Manhole	1200	S1.000	9.665	150				
S101	10.681	1.425	Open Manhole	1200	S1.001	9.256	225	S1.000	9.531	150	200
S200	10.850	1.350	Open Manhole	1200	S2.000	9.500	150				
S102	10.676	1.531	Open Manhole	1200	S1.002	9.145	300	S1.001	9.220	225	
								S2.000	9.326	150	31
S103	10.647	1.668	Open Manhole	1800	S1.003	8.979	375	S1.002	9.054	300	
S104	10.682	1.804	Open Manhole	1800	S1.004	8.878	450	S1.003	8.953	375	
S300	10.800	1.350	Open Manhole	1200	S3.000	9.450	150				
S301	10.800	1.454	Open Manhole	1200	S3.001	9.346	150	S3.000	9.346	150	
S105	10.680	1.853	Open Manhole	1800	S1.005	8.827	450	S1.004	8.827	450	
								S3.001	9.298	150	171
S400	10.838	1.350	Open Manhole	1200	S4.000	9.488	150				
S106	10.679	1.881	Open Manhole	1800	S1.006	8.798	450	S1.005	8.798	450	
								S4.000	9.329	150	231
S500	10.700	1.500	Open Manhole	1200	S5.000	9.200	300				
S600	10.700	1.500	Open Manhole	1200	S6.000	9.200	300				
S501	10.700	1.674	Open Manhole	1200	S5.001	9.026	300	S5.000	9.026	300	
								S6.000	9.097	300	71
S502	10.837	2.027	Open Manhole	1200	S5.002	8.810	300	S5.001	8.810	300	
S107	10.700	2.067	Open Manhole	1800	S1.007	8.633	450	S1.006	8.742	450	109
								S5.002	8.783	300	
S700	10.809	1.350	Open Manhole	1200	S7.000	9.459	150				
S800	10.784	1.500	Open Manhole	1200	S8.000	9.284	150				
S701	10.808	1.624	Open Manhole	1200	S7.001	9.184	150	S7.000	9.288	150	104
								S8.000	9.184	150	
S108	10.688	2.144	Open Manhole	1800	S1.008	8.544	450	S1.007	8.544	450	
								S7.001	9.133	150	289
S109	10.688	2.185	Open Manhole	1800	S1.009	8.503	450	S1.008	8.503	450	
S900	10.750	1.500	Open Manhole	1200	S9.000	9.250	300				
S901	10.750	1.540	Open Manhole	1200	S9.001	9.210	300	S9.000	9.210	300	
S110	10.688	2.217	Open Manhole	1800	S1.010	8.471	450	S1.009	8.471	450	
								S9.001	9.187	300	567
S1000	10.794	1.354	Open Manhole	1200	S10.000	9.440	150				
S111	10.672	2.274	Open Manhole	1800	S1.011	8.398	450	S1.010	8.398	450	
								S10.000	9.322	150	624
S1100	10.801	1.350	Open Manhole	1200	S11.000	9.451	150				
S112	10.676	2.300	Open Manhole	1800	S1.012	8.376	450	S1.011	8.376	450	
								S11.000	9.326	150	650
S1200	10.850	1.500	Open Manhole	1200	S12.000	9.350	300				
S1201	10.850	1.515	Open Manhole	1200	S12.001	9.335	300	S12.000	9.335	300	
S113	10.710	2.376	Open Manhole	1800	S1.013	8.334	450	S1.012	8.334	450	
								S12.001	9.312	300	829
S1300	10.800	1.500	Open Manhole	1200	S13.000	9.300	300				
S1301	10.800	1.560	Open Manhole	1200	S13.001	9.240	300	S13.000	9.240	300	
S114	10.670	2.376	Open Manhole	1800	S1.014	8.294	450	S1.013	8.294	450	
								S13.001	9.110	300	666

Cundall, Johnston & Partners		Page 8
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage		Network 2017.1.2

Manhole Schedules for Proposed Surface Water Drainage.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S115	10.625	2.351	Open Manhole	1800	S1.015	8.274	450	S1.014	8.274	450	
S1400	10.716	1.350	Open Manhole	1200	S14.000	9.366	150				
S1401	10.551	1.350	Open Manhole	1200	S14.001	9.201	150	S14.000	9.201	150	
S116	10.500	2.408	Open Manhole	1800	S1.016	8.092	600	S1.015	8.242	450	
								S14.001	9.154	150	613
S117	10.450	2.402	Open Manhole	1800	S1.017	8.048	600	S1.016	8.048	600	
S1500	10.700	1.350	Open Manhole	1200	S15.000	9.350	150				
S118	10.495	2.468	Open Manhole	1800	S1.018	8.027	600	S1.017	8.027	600	
								S15.000	9.145	150	668
S1600	10.850	1.350	Open Manhole	1200	S16.000	9.500	150				
S119	10.584	2.585	Open Manhole	1800	S1.019	7.999	600	S1.018	7.999	600	
								S16.000	9.334	150	885
S1700	10.870	1.500	Open Manhole	1200	S17.000	9.370	300				
S1800	10.950	1.350	Open Manhole	1200	S18.000	9.600	150				
S1701	10.999	1.720	Open Manhole	1200	S17.001	9.279	300	S17.000	9.279	300	
								S18.000	9.533	150	104
S1900	11.016	1.350	Open Manhole	1200	S19.000	9.666	150				
S1702	11.069	1.839	Open Manhole	1200	S17.002	9.230	300	S17.001	9.230	300	
								S19.000	9.599	150	219
S1703	11.203	2.050	Open Manhole	1200	S17.003	9.153	300	S17.002	9.153	300	
S2000	11.500	1.500	Open Manhole	1200	S20.000	10.000	300				
S2001	11.441	1.545	Open Manhole	1200	S20.001	9.896	300	S20.000	9.896	300	
S1704	11.318	2.209	Open Manhole	1200	S17.004	9.109	300	S17.003	9.109	300	
								S20.001	9.848	300	739
S1705	11.185	2.190	Open Manhole	1200	S17.005	8.995	300	S17.004	8.995	300	
S1706	10.925	2.082	Open Manhole	1200	S17.006	8.843	300	S17.005	8.843	300	
S120	10.708	2.748	Open Manhole	1800	S1.020	7.960	600	S1.019	7.960	600	
								S17.006	8.814	300	554
S2100	10.590	1.500	Open Manhole	1200	S21.000	9.090	300				
S2200	10.590	1.500	Open Manhole	1200	S22.000	9.090	300				
S2101	10.590	1.646	Open Manhole	1200	S21.001	8.944	300	S21.000	8.944	300	
								S22.000	9.011	300	67
S2300	10.635	1.350	Open Manhole	1200	S23.000	9.285	150				
S2102	10.590	1.809	Open Manhole	1200	S21.002	8.781	300	S21.001	8.781	300	
								S23.000	9.246	150	315
S2400	10.976	1.500	Open Manhole	1200	S24.000	9.476	300				
S121	10.793	2.872	Open Manhole	1800	S1.021	7.921	600	S1.020	7.921	600	
								S21.002	8.624	300	403
								S24.000	9.293	300	1072
S2500	10.941	1.350	Open Manhole	1200	S25.000	9.591	150				
S122	10.759	2.861	Open Manhole	1800	S1.022	7.898	600	S1.021	7.898	600	
								S25.000	9.409	150	1061
S123	10.547	2.715	Open Manhole	1800	S1.023	7.832	600	S1.022	7.832	600	
S2600	10.396	1.800	Open Manhole	1800	S26.000	8.596	600				
S2601	10.587	2.011	Open Manhole	1800	S26.001	8.576	600	S26.000	8.576	600	
S2602	10.611	2.072	Open Manhole	1800	S26.002	8.539	600	S26.001	8.539	600	

Manhole Schedules for Proposed Surface Water Drainage.SWS

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)
S2603	10.462	1.962	Open Manhole	1800	S26.003	8.500	600	S26.002	8.500	600	
S124	10.382	2.601	Open Manhole	1800	S1.024	7.781	600	S1.023	7.781	600	
								S26.003	8.475	600	694
S125	10.885	3.142	Open Manhole		S1.025	7.743	600	S1.024	7.743	600	
S2700	11.400	1.500	Open Manhole	1200	S27.000	9.900	300				
S2701	11.400	1.596	Open Manhole	1200	S27.001	9.804	300	S27.000	9.804	300	
S2800	11.250	1.500	Open Manhole	1200	S28.000	9.750	300				
S2702	11.225	1.583	Open Manhole	1200	S27.002	9.642	300	S27.001	9.774	300	132
								S28.000	9.642	300	
S2900	11.050	1.350	Open Manhole	1200	S29.000	9.700	150				
S2703	10.930	1.484	Open Manhole		S27.003	9.446	300	S27.002	9.578	300	132
								S29.000	9.596	150	
S2704	10.902	1.483	Junction		S27.004	9.419	300	S27.003	9.419	300	
S126	10.982	3.255	Junction		S1.026	7.727	600	S1.025	7.727	600	
								S27.004	9.375	300	1348
S127	10.982	3.284	Junction	0	S1.027	7.698	150	S1.026	7.698	600	
S128	10.982	3.297	Open Manhole	1200	S1.028	7.685	150	S1.027	7.685	150	
S	10.982	3.322	Open Manhole	0		OUTFALL		S1.028	7.660	150	

Cundall, Johnston & Partners		Page 10
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage		Network 2017.1.2

PIPELINE SCHEDULES for Proposed Surface Water Drainage.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S100	10.815	9.665	1.000	Open Manhole	1200
S1.001	o	225	S101	10.681	9.256	1.200	Open Manhole	1200
S2.000	o	150	S200	10.850	9.500	1.200	Open Manhole	1200
S1.002	o	300	S102	10.676	9.145	1.231	Open Manhole	1200
S1.003	o	375	S103	10.647	8.979	1.293	Open Manhole	1800
S1.004	o	450	S104	10.682	8.878	1.354	Open Manhole	1800
S3.000	o	150	S300	10.800	9.450	1.200	Open Manhole	1200
S3.001	o	150	S301	10.800	9.346	1.304	Open Manhole	1200
S1.005	o	450	S105	10.680	8.827	1.403	Open Manhole	1800
S4.000	o	150	S400	10.838	9.488	1.200	Open Manhole	1200
S1.006	o	450	S106	10.679	8.798	1.431	Open Manhole	1800
S5.000	o	300	S500	10.700	9.200	1.200	Open Manhole	1200
S6.000	o	300	S600	10.700	9.200	1.200	Open Manhole	1200
S5.001	o	300	S501	10.700	9.026	1.374	Open Manhole	1200
S5.002	o	300	S502	10.837	8.810	1.727	Open Manhole	1200
S1.007	o	450	S107	10.700	8.633	1.617	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	6.605	49.3	S101	10.681	9.531	1.000	Open Manhole	1200
S1.001	8.175	227.1	S102	10.676	9.220	1.231	Open Manhole	1200
S2.000	6.614	38.0	S102	10.676	9.326	1.200	Open Manhole	1200
S1.002	27.402	301.1	S103	10.647	9.054	1.293	Open Manhole	1800
S1.003	8.451	325.0	S104	10.682	8.953	1.354	Open Manhole	1800
S1.004	20.208	396.2	S105	10.680	8.827	1.403	Open Manhole	1800
S3.000	15.589	150.0	S301	10.800	9.346	1.304	Open Manhole	1200
S3.001	7.243	150.0	S105	10.680	9.298	1.232	Open Manhole	1800
S1.005	11.703	403.6	S106	10.679	8.798	1.431	Open Manhole	1800
S4.000	5.907	37.2	S106	10.679	9.329	1.200	Open Manhole	1800
S1.006	22.310	398.4	S107	10.700	8.742	1.508	Open Manhole	1800
S5.000	52.228	300.0	S501	10.700	9.026	1.374	Open Manhole	1200
S6.000	30.872	299.7	S501	10.700	9.097	1.303	Open Manhole	1200
S5.001	64.862	300.3	S502	10.837	8.810	1.727	Open Manhole	1200
S5.002	8.229	304.8	S107	10.700	8.783	1.617	Open Manhole	1800
S1.007	35.551	399.4	S108	10.688	8.544	1.694	Open Manhole	1800

Cundall, Johnston & Partners		Page 11
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

PIPELINE SCHEDULES for Proposed Surface Water Drainage.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	o	150	S700	10.809	9.459	1.200	Open Manhole	1200
S8.000	o	150	S800	10.784	9.284	1.350	Open Manhole	1200
S7.001	o	150	S701	10.808	9.184	1.474	Open Manhole	1200
S1.008	o	450	S108	10.688	8.544	1.694	Open Manhole	1800
S1.009	o	450	S109	10.688	8.503	1.735	Open Manhole	1800
S9.000	o	300	S900	10.750	9.250	1.200	Open Manhole	1200
S9.001	o	300	S901	10.750	9.210	1.240	Open Manhole	1200
S1.010	o	450	S110	10.688	8.471	1.767	Open Manhole	1800
S10.000	o	150	S1000	10.794	9.440	1.204	Open Manhole	1200
S1.011	o	450	S111	10.672	8.398	1.824	Open Manhole	1800
S11.000	o	150	S1100	10.801	9.451	1.200	Open Manhole	1200
S1.012	o	450	S112	10.676	8.376	1.850	Open Manhole	1800
S12.000	o	300	S1200	10.850	9.350	1.200	Open Manhole	1200
S12.001	o	300	S1201	10.850	9.335	1.215	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	25.648	150.0	S701	10.808	9.288	1.370	Open Manhole	1200
S8.000	14.938	150.0	S701	10.808	9.184	1.474	Open Manhole	1200
S7.001	7.745	150.0	S108	10.688	9.133	1.405	Open Manhole	1800
S1.008	16.572	404.2	S109	10.688	8.503	1.735	Open Manhole	1800
S1.009	12.879	400.0	S110	10.688	8.471	1.767	Open Manhole	1800
S9.000	11.921	300.0	S901	10.750	9.210	1.240	Open Manhole	1200
S9.001	5.175	225.0	S110	10.688	9.187	1.201	Open Manhole	1800
S1.010	29.276	401.0	S111	10.672	8.398	1.824	Open Manhole	1800
S10.000	7.166	60.7	S111	10.672	9.322	1.200	Open Manhole	1800
S1.011	8.575	400.0	S112	10.676	8.376	1.850	Open Manhole	1800
S11.000	8.174	65.4	S112	10.676	9.326	1.200	Open Manhole	1800
S1.012	17.101	400.0	S113	10.710	8.334	1.926	Open Manhole	1800
S12.000	4.466	297.7	S1201	10.850	9.335	1.215	Open Manhole	1200
S12.001	6.770	300.0	S113	10.710	9.312	1.098	Open Manhole	1800

Cundall, Johnston & Partners		Page 12
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

PIPELINE SCHEDULES for Proposed Surface Water Drainage.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.013	o	450	S113	10.710	8.334	1.926	Open Manhole	1800
S13.000	o	300	S1300	10.800	9.300	1.200	Open Manhole	1200
S13.001	o	300	S1301	10.800	9.240	1.260	Open Manhole	1200
S1.014	o	450	S114	10.670	8.294	1.926	Open Manhole	1800
S1.015	o	450	S115	10.625	8.274	1.901	Open Manhole	1800
S14.000	o	150	S1400	10.716	9.366	1.200	Open Manhole	1200
S14.001	o	150	S1401	10.551	9.201	1.200	Open Manhole	1200
S1.016	o	600	S116	10.500	8.092	1.808	Open Manhole	1800
S1.017	o	600	S117	10.450	8.048	1.802	Open Manhole	1800
S15.000	o	150	S1500	10.700	9.350	1.200	Open Manhole	1200
S1.018	o	600	S118	10.495	8.027	1.868	Open Manhole	1800
S16.000	o	150	S1600	10.850	9.500	1.200	Open Manhole	1200
S1.019	o	600	S119	10.584	7.999	1.985	Open Manhole	1800
S17.000	o	300	S1700	10.870	9.370	1.200	Open Manhole	1200
S18.000	o	150	S1800	10.950	9.600	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.013	15.872	396.8	S114	10.670	8.294	1.926	Open Manhole	1800
S13.000	18.120	300.0	S1301	10.800	9.240	1.260	Open Manhole	1200
S13.001	7.364	56.6	S114	10.670	9.110	1.260	Open Manhole	1800
S1.014	7.697	400.0	S115	10.625	8.274	1.901	Open Manhole	1800
S1.015	13.038	400.0	S116	10.500	8.242	1.808	Open Manhole	1800
S14.000	7.351	44.6	S1401	10.551	9.201	1.200	Open Manhole	1200
S14.001	4.809	103.0	S116	10.500	9.154	1.196	Open Manhole	1800
S1.016	17.713	402.6	S117	10.450	8.048	1.802	Open Manhole	1800
S1.017	8.189	400.0	S118	10.495	8.027	1.868	Open Manhole	1800
S15.000	7.072	34.5	S118	10.495	9.145	1.200	Open Manhole	1800
S1.018	11.111	400.0	S119	10.584	7.999	1.985	Open Manhole	1800
S16.000	7.039	42.4	S119	10.584	9.334	1.100	Open Manhole	1800
S1.019	15.581	399.5	S120	10.708	7.960	2.148	Open Manhole	1800
S17.000	27.345	300.0	S1701	10.999	9.279	1.420	Open Manhole	1200
S18.000	6.880	102.7	S1701	10.999	9.533	1.316	Open Manhole	1200

Cundall, Johnston & Partners		Page 13
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

PIPELINE SCHEDULES for Proposed Surface Water Drainage.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.001	o	300	S1701	10.999	9.279	1.420	Open Manhole	1200
S19.000	o	150	S1900	11.016	9.666	1.200	Open Manhole	1200
S17.002	o	300	S1702	11.069	9.230	1.539	Open Manhole	1200
S17.003	o	300	S1703	11.203	9.153	1.750	Open Manhole	1200
S20.000	o	300	S2000	11.500	10.000	1.200	Open Manhole	1200
S20.001	o	300	S2001	11.441	9.896	1.245	Open Manhole	1200
S17.004	o	300	S1704	11.318	9.109	1.909	Open Manhole	1200
S17.005	o	300	S1705	11.185	8.995	1.890	Open Manhole	1200
S17.006	o	300	S1706	10.925	8.843	1.782	Open Manhole	1200
S1.020	o	600	S120	10.708	7.960	2.148	Open Manhole	1800
S21.000	o	300	S2100	10.590	9.090	1.200	Open Manhole	1200
S22.000	o	300	S2200	10.590	9.090	1.200	Open Manhole	1200
S21.001	o	300	S2101	10.590	8.944	1.346	Open Manhole	1200
S23.000	o	150	S2300	10.635	9.285	1.200	Open Manhole	1200
S21.002	o	300	S2102	10.590	8.781	1.509	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.001	14.574	300.0	S1702	11.069	9.230	1.539	Open Manhole	1200
S19.000	6.921	103.3	S1702	11.069	9.599	1.320	Open Manhole	1200
S17.002	23.173	300.0	S1703	11.203	9.153	1.750	Open Manhole	1200
S17.003	13.192	299.8	S1704	11.318	9.109	1.909	Open Manhole	1200
S20.000	31.338	300.0	S2001	11.441	9.896	1.245	Open Manhole	1200
S20.001	14.157	300.0	S1704	11.318	9.848	1.170	Open Manhole	1200
S17.004	34.178	299.8	S1705	11.185	8.995	1.890	Open Manhole	1200
S17.005	45.542	299.6	S1706	10.925	8.843	1.782	Open Manhole	1200
S17.006	8.691	300.0	S120	10.708	8.814	1.594	Open Manhole	1800
S1.020	15.710	400.0	S121	10.793	7.921	2.272	Open Manhole	1800
S21.000	43.926	300.9	S2101	10.590	8.944	1.346	Open Manhole	1200
S22.000	23.581	298.5	S2101	10.590	9.011	1.279	Open Manhole	1200
S21.001	48.975	300.5	S2102	10.590	8.781	1.509	Open Manhole	1200
S23.000	5.807	150.0	S2102	10.590	9.246	1.194	Open Manhole	1200
S21.002	16.134	102.8	S121	10.793	8.624	1.869	Open Manhole	1800

Cundall, Johnston & Partners		Page 14
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

PIPELINE SCHEDULES for Proposed Surface Water Drainage.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S24.000	o	300	S2400	10.976	9.476	1.200	Open Manhole	1200
S1.021	o	600	S121	10.793	7.921	2.272	Open Manhole	1800
S25.000	o	150	S2500	10.941	9.591	1.200	Open Manhole	1200
S1.022	o	600	S122	10.759	7.898	2.261	Open Manhole	1800
S1.023	o	600	S123	10.547	7.832	2.115	Open Manhole	1800
S26.000	o	600	S2600	10.396	8.596	1.200	Open Manhole	1800
S26.001	o	600	S2601	10.587	8.576	1.411	Open Manhole	1800
S26.002	o	600	S2602	10.611	8.539	1.472	Open Manhole	1800
S26.003	o	600	S2603	10.462	8.500	1.362	Open Manhole	1800
S1.024	o	600	S124	10.382	7.781	2.001	Open Manhole	1800
S1.025	o	600	S125	10.885	7.743	2.542	Open Manhole	1800
S27.000	o	300	S2700	11.400	9.900	1.200	Open Manhole	1200
S27.001	o	300	S2701	11.400	9.804	1.296	Open Manhole	1200
S28.000	o	300	S2800	11.250	9.750	1.200	Open Manhole	1200
S27.002	o	300	S2702	11.225	9.642	1.283	Open Manhole	1200
S29.000	o	150	S2900	11.050	9.700	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S24.000	7.676	41.9	S121	10.793	9.293	1.200	Open Manhole	1800
S1.021	9.115	400.0	S122	10.759	7.898	2.261	Open Manhole	1800
S25.000	6.727	37.0	S122	10.759	9.409	1.200	Open Manhole	1800
S1.022	26.459	400.0	S123	10.547	7.832	2.115	Open Manhole	1800
S1.023	20.279	397.6	S124	10.382	7.781	2.001	Open Manhole	1800
S26.000	8.141	407.1	S2601	10.587	8.576	1.411	Open Manhole	1800
S26.001	14.640	400.0	S2602	10.611	8.539	1.472	Open Manhole	1800
S26.002	15.784	400.0	S2603	10.462	8.500	1.362	Open Manhole	1800
S26.003	9.953	400.0	S124	10.382	8.475	1.307	Open Manhole	1800
S1.024	15.384	404.8	S125	10.885	7.743	2.542	Open Manhole	1800
S1.025	6.646	400.0	S126	10.982	7.727	2.655	Junction	
S27.000	28.933	301.4	S2701	11.400	9.804	1.296	Open Manhole	1200
S27.001	9.035	301.2	S2702	11.225	9.774	1.151	Open Manhole	1200
S28.000	14.229	131.8	S2702	11.225	9.642	1.283	Open Manhole	1200
S27.002	19.316	300.0	S2703	10.930	9.578	1.052	Open Manhole	1200
S29.000	5.149	49.5	S2703	10.930	9.596	1.184	Open Manhole	1200

Cundall, Johnston & Partners		Page 15
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

PIPELINE SCHEDULES for Proposed Surface Water Drainage.SWS

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S27.003	o	300	S2703	10.930	9.446	1.184	Open Manhole	1200
S27.004	o	300	S2704	10.902	9.419	1.183	Junction	
S1.026	o	600	S126	10.982	7.727	2.655	Junction	
S1.027	o	150	S127	10.982	7.698	3.134	Junction	
S1.028	o	150	S128	10.982	7.685	3.147	Open Manhole	1200

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S27.003	8.198	303.6	S2704	10.902	9.419	1.183	Junction	
S27.004	13.201	300.0	S126	10.982	9.375	1.307	Junction	
S1.026	11.294	400.0	S127	10.982	7.698	2.684	Junction	
S1.027	5.184	398.8	S128	10.982	7.685	3.147	Open Manhole	1200
S1.028	9.913	396.5	S	10.982	7.660	3.172	Open Manhole	0

Cundall, Johnston & Partners		Page 16
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Area Summary for Proposed Surface Water Drainage.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.026	0.026	0.026
1.001	-	-	100	0.028	0.028	0.028
2.000	-	-	100	0.018	0.018	0.018
1.002	-	-	100	0.025	0.025	0.025
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.032	0.032	0.032
3.000	-	-	100	0.050	0.050	0.050
3.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.025	0.025	0.025
1.006	-	-	100	0.025	0.025	0.025
5.000	-	-	100	0.082	0.082	0.082
6.000	-	-	100	0.047	0.047	0.047
5.001	-	-	100	0.102	0.102	0.102
5.002	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.028	0.028	0.028
7.000	-	-	100	0.030	0.030	0.030
8.000	-	-	100	0.014	0.014	0.014
7.001	-	-	100	0.050	0.050	0.050
1.008	-	-	100	0.028	0.028	0.028
1.009	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.093	0.093	0.093
9.001	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.030	0.030	0.030
10.000	-	-	100	0.090	0.090	0.090
1.011	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.008	0.008	0.008
1.012	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.050	0.050	0.050
12.001	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.034	0.034	0.034
13.000	-	-	100	0.055	0.055	0.055
13.001	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.000	0.000	0.000
1.015	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.009	0.009	0.009
14.001	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.067	0.067	0.067
1.017	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.010	0.010	0.010
1.018	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.030	0.030	0.030
17.000	-	-	100	0.040	0.040	0.040
18.000	-	-	100	0.037	0.037	0.037
17.001	-	-	100	0.012	0.012	0.012
19.000	-	-	100	0.036	0.036	0.036
17.002	-	-	100	0.033	0.033	0.033
17.003	-	-	100	0.010	0.010	0.010
20.000	-	-	100	0.050	0.050	0.050
20.001	-	-	100	0.014	0.014	0.014
17.004	-	-	100	0.038	0.038	0.038
17.005	-	-	100	0.098	0.098	0.098
17.006	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
21.000	-	-	100	0.079	0.079	0.079
22.000	-	-	100	0.043	0.043	0.043
21.001	-	-	100	0.066	0.066	0.066
23.000	-	-	100	0.048	0.048	0.048
21.002	-	-	100	0.000	0.000	0.000
24.000	-	-	100	0.170	0.170	0.170
1.021	-	-	100	0.000	0.000	0.000

Cundall, Johnston & Partners		Page 17
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
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Area Summary for Proposed Surface Water Drainage.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
25.000	-	-	100	0.010	0.010	0.010
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.028	0.028	0.028
26.000	-	-	100	0.043	0.043	0.043
26.001	-	-	100	0.150	0.150	0.150
26.002	-	-	100	0.029	0.029	0.029
26.003	-	-	100	0.000	0.000	0.000
1.024	-	-	100	0.057	0.057	0.057
1.025	-	-	100	0.000	0.000	0.000
27.000	-	-	100	0.059	0.059	0.059
27.001	-	-	100	0.000	0.000	0.000
28.000	-	-	100	0.160	0.160	0.160
27.002	-	-	100	0.000	0.000	0.000
29.000	-	-	100	0.027	0.027	0.027
27.003	-	-	100	0.038	0.038	0.038
27.004	-	-	100	0.000	0.000	0.000
1.026	-	-	100	0.000	0.000	0.000
1.027	-	-	100	0.000	0.000	0.000
1.028	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.461	2.461	2.461

Free Flowing Outfall Details for Proposed Surface Water Drainage.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
S1.028	S	10.982	7.660	0.000	0	0

Simulation Criteria for Proposed Surface Water Drainage.SWS

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 Offline Controls	0
Number of Online Controls	12	Number of Storage Structures	36
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	2	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location GB 473800 105650 SU 73800 05650		Cv (Winter)	0.840
Data Type	Catchment Storm Duration (mins)		30

Online Controls for Proposed Surface Water Drainage.SWS

Orifice Manhole: S301, DS/PN: S3.001, Volume (m³): 1.9

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.346

Orifice Manhole: S701, DS/PN: S7.001, Volume (m³): 2.5

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.184

Orifice Manhole: S901, DS/PN: S9.001, Volume (m³): 2.5

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.210

Orifice Manhole: S1201, DS/PN: S12.001, Volume (m³): 1.9

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.335

Orifice Manhole: S1301, DS/PN: S13.001, Volume (m³): 3.0

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.240

Orifice Manhole: S1701, DS/PN: S17.001, Volume (m³): 3.9

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.279

Orifice Manhole: S1702, DS/PN: S17.002, Volume (m³): 3.1

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.230

Orifice Manhole: S1703, DS/PN: S17.003, Volume (m³): 3.9

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.153

Orifice Manhole: S1704, DS/PN: S17.004, Volume (m³): 4.3

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 9.109

Orifice Manhole: S1705, DS/PN: S17.005, Volume (m³): 4.8

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 8.995

Orifice Manhole: S1706, DS/PN: S17.006, Volume (m³): 5.5

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 8.843

Pump Manhole: S127, DS/PN: S1.027, Volume (m³): 3.2

Invert Level (m) 7.698

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	12.3000	0.700	12.3000	1.300	12.3000	1.900	12.3000	2.500	12.3000
0.200	12.3000	0.800	12.3000	1.400	12.3000	2.000	12.3000	2.600	12.3000
0.300	12.3000	0.900	12.3000	1.500	12.3000	2.100	12.3000	2.700	12.3000
0.400	12.3000	1.000	12.3000	1.600	12.3000	2.200	12.3000	2.800	12.3000
0.500	12.3000	1.100	12.3000	1.700	12.3000	2.300	12.3000	2.900	12.3000
0.600	12.3000	1.200	12.3000	1.800	12.3000	2.400	12.3000	3.000	12.3000

Cundall, Johnston & Partners		Page 19
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
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Storage Structures for Proposed Surface Water Drainage.SWS

Porous Car Park Manhole: S100, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.1
Membrane Percolation (mm/hr)	1000	Length (m)	16.2
Max Percolation (l/s)	27.5	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.335	Membrane Depth (mm)	130

Porous Car Park Manhole: S200, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.5
Membrane Percolation (mm/hr)	1000	Length (m)	13.9
Max Percolation (l/s)	13.5	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.370	Membrane Depth (mm)	130

Porous Car Park Manhole: S301, DS/PN: S3.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	23.0
Membrane Percolation (mm/hr)	1000	Length (m)	15.2
Max Percolation (l/s)	97.1	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.420	Membrane Depth (mm)	130

Porous Car Park Manhole: S400, DS/PN: S4.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	14.9
Max Percolation (l/s)	24.8	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.358	Membrane Depth (mm)	130

Complex Manhole: S501, DS/PN: S5.001

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	52.5
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	0.995
Invert Level (m)	9.225	Cap Infiltration Depth (m)	0.000

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	30.8
Safety Factor	2.0	Slope (1:X)	308.0
Porosity	0.30	Cap Volume Depth (m)	0.920
Invert Level (m)	9.300	Cap Infiltration Depth (m)	0.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	73.6
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

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Porous Car Park

Porosity	0.30	Slope (1:X)	100000.0
Invert Level (m)	10.220	Depression Storage (mm)	5
Width (m)	8.6	Evaporation (mm/day)	3
Length (m)	30.8	Membrane Depth (mm)	130

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.2
Membrane Percolation (mm/hr)	1000	Length (m)	52.5
Max Percolation (l/s)	105.0	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.220	Membrane Depth (mm)	130

Complex Manhole: S502, DS/PN: S5.002

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	64.9
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.348
Invert Level (m)	9.009	Cap Infiltration Depth (m)	0.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	64.9
Max Percolation (l/s)	86.5	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.357	Membrane Depth (mm)	130

Complex Manhole: S701, DS/PN: S7.001

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	25.6
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.104
Invert Level (m)	9.224	Cap Infiltration Depth (m)	0.000

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	14.9
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.094
Invert Level (m)	9.234	Cap Infiltration Depth (m)	0.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Invert Level (m)	10.328
Membrane Percolation (mm/hr)	1000	Width (m)	3.4
Max Percolation (l/s)	14.1	Length (m)	14.9
Safety Factor	2.0	Slope (1:X)	100000.0
Porosity	0.30	Depression Storage (mm)	5

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1012052 - WARBLINGTON MEADOWS
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Porous Car Park

Evaporation (mm/day) 3 Membrane Depth (mm) 130

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.7
Membrane Percolation (mm/hr)	1000	Length (m)	27.6
Max Percolation (l/s)	59.0	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.328	Membrane Depth (mm)	130

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.9
Membrane Percolation (mm/hr)	1000	Length (m)	25.6
Max Percolation (l/s)	27.7	Slope (1:X)	100000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.328	Membrane Depth (mm)	130

Porous Car Park Manhole: S901, DS/PN: S9.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.7
Membrane Percolation (mm/hr)	1000	Length (m)	21.7
Max Percolation (l/s)	136.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.270	Membrane Depth (mm)	130

Porous Car Park Manhole: S1000, DS/PN: S10.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.6
Membrane Percolation (mm/hr)	1000	Length (m)	12.3
Max Percolation (l/s)	12.3	Slope (1:X)	123.5
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.315	Membrane Depth (mm)	130

Porous Car Park Manhole: S1100, DS/PN: S11.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.4
Max Percolation (l/s)	14.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.321	Membrane Depth (mm)	130

Porous Car Park Manhole: S1201, DS/PN: S12.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.8
Membrane Percolation (mm/hr)	1000	Length (m)	24.9
Max Percolation (l/s)	60.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.370	Membrane Depth (mm)	130

Porous Car Park Manhole: S1301, DS/PN: S13.001

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0
Membrane Percolation (mm/hr)	1000	Porosity	0.30
Max Percolation (l/s)	66.2	Invert Level (m)	10.320

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1012052 - WARBLINGTON MEADOWS
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Porous Car Park Manhole: S1301, DS/PN: S13.001

Width (m) 8.8 Depression Storage (mm) 5
Length (m) 27.1 Evaporation (mm/day) 3
Slope (1:X) 0.0 Membrane Depth (mm) 130

Porous Car Park Manhole: S1400, DS/PN: S14.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 3.5
Membrane Percolation (mm/hr) 1000 Length (m) 11.5
Max Percolation (l/s) 11.2 Slope (1:X) 230.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 10.236 Membrane Depth (mm) 130

Porous Car Park Manhole: S1500, DS/PN: S15.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 3.2
Membrane Percolation (mm/hr) 1000 Length (m) 13.6
Max Percolation (l/s) 12.1 Slope (1:X) 272.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 10.220 Membrane Depth (mm) 130

Porous Car Park Manhole: S1600, DS/PN: S16.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 12.3
Membrane Percolation (mm/hr) 1000 Length (m) 6.3
Max Percolation (l/s) 21.5 Slope (1:X) 126.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 10.370 Membrane Depth (mm) 130

Porous Car Park Manhole: S1700, DS/PN: S17.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 11.2
Membrane Percolation (mm/hr) 1000 Length (m) 27.3
Max Percolation (l/s) 84.9 Slope (1:X) 227.5
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 10.390 Membrane Depth (mm) 130

Porous Car Park Manhole: S1800, DS/PN: S18.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 4.3
Membrane Percolation (mm/hr) 1000 Length (m) 20.1
Max Percolation (l/s) 24.0 Slope (1:X) 402.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 10.470 Membrane Depth (mm) 130

Complex Manhole: S1701, DS/PN: S17.001

Infiltration Trench

Infiltration Coefficient Base (m/hr) 0.00000 Trench Width (m) 0.6
Infiltration Coefficient Side (m/hr) 0.00000 Trench Length (m) 27.3
Safety Factor 2.0 Slope (1:X) 300.0
Porosity 0.30 Cap Volume Depth (m) 1.111
Invert Level (m) 9.279 Cap Infiltration Depth (m) 0.000

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1012052 - WARBLINGTON MEADOWS
DRAINAGE ZONES A & B



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Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.8
Membrane Percolation (mm/hr)	1000	Length (m)	14.6
Max Percolation (l/s)	23.5	Slope (1:X)	184.8
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.510	Membrane Depth (mm)	130

Porous Car Park Manhole: S1900, DS/PN: S19.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.8
Membrane Percolation (mm/hr)	1000	Length (m)	14.6
Max Percolation (l/s)	35.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.536	Membrane Depth (mm)	130

Complex Manhole: S1702, DS/PN: S17.002

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	14.6
Safety Factor	2.0	Slope (1:X)	298.0
Porosity	0.30	Cap Volume Depth (m)	1.280
Invert Level (m)	9.230	Cap Infiltration Depth (m)	0.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.2
Max Percolation (l/s)	45.1	Slope (1:X)	173.1
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.589	Membrane Depth (mm)	0

Complex Manhole: S1703, DS/PN: S17.003

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.6
Membrane Percolation (mm/hr)	1000	Length (m)	13.2
Max Percolation (l/s)	20.5	Slope (1:X)	114.8
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.153	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	23.2
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.436
Invert Level (m)	7.583	Cap Infiltration Depth (m)	0.000

Complex Manhole: S2001, DS/PN: S20.001

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1012052 - WARBLINGTON MEADOWS
DRAINAGE ZONES A & B



Date 01/12/2017 14:34

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File Drainage Zones A & B Surface Wa...

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Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.1
Membrane Percolation (mm/hr)	1000	Length (m)	31.3
Max Percolation (l/s)	87.8	Slope (1:X)	530.5
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.896	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	31.3
Safety Factor	2.0	Slope (1:X)	301.0
Porosity	0.30	Cap Volume Depth (m)	1.065
Invert Level (m)	8.831	Cap Infiltration Depth (m)	0.000

Complex Manhole: S1704, DS/PN: S17.004

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	13.2
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.614
Invert Level (m)	9.109	Cap Infiltration Depth (m)	0.000

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	14.2
Safety Factor	2.0	Slope (1:X)	302.1
Porosity	0.30	Cap Volume Depth (m)	1.469
Invert Level (m)	9.849	Cap Infiltration Depth (m)	0.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.4
Membrane Percolation (mm/hr)	1000	Length (m)	14.2
Max Percolation (l/s)	29.2	Slope (1:X)	115.4
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.838	Membrane Depth (mm)	130

Complex Manhole: S1705, DS/PN: S17.005

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.7
Membrane Percolation (mm/hr)	1000	Length (m)	34.2
Max Percolation (l/s)	54.2	Slope (1:X)	257.1
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.705	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30
Infiltration Coefficient Side (m/hr)	0.00000	Invert Level (m)	8.995
Safety Factor	2.0	Trench Width (m)	0.6

19 - 21 Silvermills Court
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1012052 - WARBLINGTON MEADOWS
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Infiltration Trench

Trench Length (m) 34.2 Cap Volume Depth (m) 1.710
Slope (1:X) 300.0 Cap Infiltration Depth (m) 0.000

Complex Manhole: S1706, DS/PN: S17.006

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.3
Membrane Percolation (mm/hr)	1000	Length (m)	45.5
Max Percolation (l/s)	130.2	Slope (1:X)	175.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.445	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	45.5
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.602
Invert Level (m)	8.843	Cap Infiltration Depth (m)	0.000

Complex Manhole: S2101, DS/PN: S21.001

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.5
Membrane Percolation (mm/hr)	1000	Length (m)	23.6
Max Percolation (l/s)	55.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.944	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	43.9
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.166
Invert Level (m)	8.944	Cap Infiltration Depth (m)	0.000

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	23.6
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.579
Invert Level (m)	9.011	Cap Infiltration Depth (m)	0.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.8
Membrane Percolation (mm/hr)	1000	Length (m)	43.9
Max Percolation (l/s)	95.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.110	Membrane Depth (mm)	130

19 - 21 Silvermills Court
Henderson Place Lane
Edinburgh EH3 5DG

1012052 - WARBLINGTON MEADOWS
DRAINAGE ZONES A & B



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Porous Car Park Manhole: S2300, DS/PN: S23.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.7
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	67.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.155	Membrane Depth (mm)	130

Complex Manhole: S2102, DS/PN: S21.002

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.6
Membrane Percolation (mm/hr)	1000	Length (m)	49.0
Max Percolation (l/s)	89.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.110	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	49.0
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	1.329
Invert Level (m)	8.781	Cap Infiltration Depth (m)	0.000

Porous Car Park Manhole: S2400, DS/PN: S24.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	11.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.496	Membrane Depth (mm)	130

Porous Car Park Manhole: S2500, DS/PN: S25.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	11.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.461	Membrane Depth (mm)	130

Porous Car Park Manhole: S2600, DS/PN: S26.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.3
Membrane Percolation (mm/hr)	1000	Length (m)	17.8
Max Percolation (l/s)	46.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.916	Membrane Depth (mm)	130

Porous Car Park Manhole: S2602, DS/PN: S26.002

Infiltration Coefficient Base (m/hr)	0.00000	Invert Level (m)	10.131
Membrane Percolation (mm/hr)	1000	Width (m)	5.0
Max Percolation (l/s)	6.9	Length (m)	5.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.30	Depression Storage (mm)	5

Porous Car Park Manhole: S2602, DS/PN: S26.002

Evaporation (mm/day) 3 Membrane Depth (mm) 130

Complex Manhole: S2701, DS/PN: S27.001

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	28.9
Max Percolation (l/s)	80.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.920	Membrane Depth (mm)	130

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.6
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	28.9
Safety Factor	2.0	Slope (1:X)	300.0
Porosity	0.30	Cap Volume Depth (m)	0.716
Invert Level (m)	9.804	Cap Infiltration Depth (m)	0.000

Porous Car Park Manhole: S2800, DS/PN: S28.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.1
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	16.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.770	Membrane Depth (mm)	130

Porous Car Park Manhole: S2900, DS/PN: S29.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.7
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	20.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.570	Membrane Depth (mm)	130

Cellular Storage Manhole: S127, DS/PN: S1.027

Invert Level (m)	7.807	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.93
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	450.0	0.0	2.200	450.0	0.0	2.201	0.0	0.0

Cundall, Johnston & Partners		Page 28
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	S100	1.301	0.096	10.376	11.772
S1.001	S101	1.612	0.277	0.000	1.889
S2.000	S200	1.527	0.096	5.108	6.731
S1.002	S102	1.732	1.831	0.000	3.562
S1.003	S103	4.245	0.735	0.000	4.979
S1.004	S104	4.591	2.928	0.000	7.518
S3.000	S300	1.527	0.254	0.000	1.781
S3.001	S301	1.644	0.101	26.220	27.966
S1.005	S105	4.715	1.575	0.000	6.290
S4.000	S400	1.527	0.078	9.387	10.992
S1.006	S106	4.787	3.262	0.000	8.049
S5.000	S500	1.696	3.607	0.000	5.303
S6.000	S600	1.696	2.097	0.000	3.794
S5.001	S501	1.893	4.500	82.006	88.399
S5.002	S502	2.293	0.476	46.847	49.615
S1.007	S107	5.260	5.368	0.000	10.628
S7.000	S700	1.527	0.432	0.000	1.959
S8.000	S800	1.696	0.243	0.000	1.939
S7.001	S701	1.836	0.110	46.138	48.085
S1.008	S108	5.456	2.349	0.000	7.805
S1.009	S109	5.560	1.762	0.000	7.322
S9.000	S900	1.696	0.758	0.000	2.454
S9.001	S901	1.741	0.260	51.722	53.723
S1.010	S110	5.642	4.370	0.000	10.012
S10.000	S1000	1.531	0.100	4.636	6.268
S1.011	S111	5.787	1.078	0.000	6.865
S11.000	S1100	1.527	0.118	5.460	7.105
S1.012	S112	5.852	2.434	0.000	8.286
S12.000	S1200	1.696	0.231	0.000	1.927
S12.001	S1201	1.713	0.373	23.008	25.094
S1.013	S113	6.047	2.238	0.000	8.285
S13.000	S1300	1.696	1.196	0.000	2.892
S13.001	S1301	1.765	0.415	25.040	27.220
S1.014	S114	6.047	0.938	0.000	6.985
S1.015	S115	5.982	1.787	0.000	7.769
S14.000	S1400	1.527	0.109	4.226	5.862
S14.001	S1401	1.527	0.058	0.000	1.586
S1.016	S116	6.128	4.499	0.000	10.628
S1.017	S117	6.113	1.806	0.000	7.920
S15.000	S1500	1.527	0.098	4.570	6.195
S1.018	S118	6.280	2.633	0.000	8.912
S16.000	S1600	1.527	0.098	8.136	9.761
S1.019	S119	6.577	3.896	0.000	10.473
S17.000	S1700	1.696	1.848	32.105	35.649
S18.000	S1800	1.527	0.100	9.075	10.702
S17.001	S1701	1.945	0.945	14.579	17.470
S19.000	S1900	1.527	0.101	13.490	15.118
S17.002	S1702	2.080	1.553	23.485	27.117
S17.003	S1703	2.318	0.848	48.575	51.741
S20.000	S2000	1.696	2.130	0.000	3.827
S20.001	S2001	1.748	0.916	140.197	142.861
S17.004	S1704	2.498	2.331	18.563	23.392
S17.005	S1705	2.477	3.134	30.993	36.605
S17.006	S1706	2.355	0.508	57.759	60.622
S1.020	S120	6.992	3.933	0.000	10.925
S21.000	S2100	1.696	3.020	0.000	4.717
S22.000	S2200	1.696	1.582	0.000	3.278
S21.001	S2101	1.862	3.377	142.941	148.180
S23.000	S2300	1.527	0.081	25.463	27.071

Cundall, Johnston & Partners		Page 29
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

Volume Summary (Static)

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S21.002	S2102	2.046	1.034	45.679	48.759
S24.000	S2400	1.696	0.437	4.158	6.291
S1.021	S121	7.308	2.068	0.000	9.376
S25.000	S2500	1.527	0.092	4.158	5.777
S1.022	S122	7.279	6.972	0.000	14.252
S1.023	S123	6.908	5.225	0.000	12.133
S26.000	S2600	4.580	1.793	17.382	23.755
S26.001	S2601	5.117	3.630	0.000	8.748
S26.002	S2602	5.272	3.954	2.625	11.850
S26.003	S2603	4.993	2.305	0.000	7.298
S1.024	S124	6.618	3.841	0.000	10.459
S1.025	S125	7.995	1.625	0.000	9.619
S27.000	S2700	1.696	1.960	0.000	3.657
S27.001	S2701	1.805	0.554	34.070	36.428
S28.000	S2800	1.696	0.921	6.405	9.022
S27.002	S2702	1.790	1.281	0.000	3.071
S29.000	S2900	1.527	0.070	7.738	9.335
S27.003	S2703	1.678	0.537	0.000	2.215
S27.004	S2704	0.000	0.933	0.000	0.933
S1.026	S126	0.000	3.193	0.000	3.193
S1.027	S127	0.000	0.081	920.840	920.921
S1.028	S128	3.728	0.165	0.000	3.893
Total		248.955	130.749	1953.161	2332.864

Cundall, Johnston & Partners		Page 30
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface
Water Drainage.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 12 Number of Storage Structures 36 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 473800 105650 SU 73800 05650 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 20, 40

									Water	Surcharged	Flooded
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)
S1.000	S100	15 Winter	2	+0%	100/15 Winter				9.710	-0.105	0.000
S1.001	S101	15 Winter	2	+0%	100/15 Summer				9.339	-0.142	0.000
S2.000	S200	15 Winter	2	+0%	100/15 Summer				9.534	-0.116	0.000
S1.002	S102	15 Winter	2	+0%	30/360 Winter				9.247	-0.198	0.000
S1.003	S103	15 Winter	2	+0%	30/15 Winter				9.089	-0.265	0.000
S1.004	S104	15 Winter	2	+0%	30/30 Winter				9.013	-0.315	0.000
S3.000	S300	15 Winter	2	+0%	30/15 Summer				9.553	-0.047	0.000
S3.001	S301	15 Winter	2	+0%	2/15 Summer				9.520	0.024	0.000
S1.005	S105	15 Winter	2	+0%	30/15 Winter				8.981	-0.296	0.000
S4.000	S400	15 Winter	2	+0%	100/15 Summer				9.529	-0.109	0.000
S1.006	S106	15 Winter	2	+0%	30/15 Winter				8.945	-0.303	0.000
S5.000	S500	15 Winter	2	+0%	30/15 Winter				9.296	-0.204	0.000
S6.000	S600	15 Winter	2	+0%	100/15 Summer				9.272	-0.228	0.000
S5.001	S501	15 Winter	2	+0%	30/15 Summer				9.178	-0.148	0.000
S5.002	S502	15 Winter	2	+0%	30/15 Summer				8.976	-0.134	0.000
S1.007	S107	15 Winter	2	+0%	30/15 Summer				8.868	-0.215	0.000
S7.000	S700	15 Winter	2	+0%	30/15 Summer				9.521	-0.088	0.000
S8.000	S800	30 Winter	2	+0%	30/15 Summer				9.387	-0.047	0.000
S7.001	S701	30 Winter	2	+0%	2/15 Summer				9.382	0.047	0.000
S1.008	S108	15 Winter	2	+0%	30/15 Summer				8.821	-0.173	0.000
S1.009	S109	15 Winter	2	+0%	30/15 Summer				8.787	-0.166	0.000
S9.000	S900	15 Winter	2	+0%	2/15 Winter				9.566	0.016	0.000
S9.001	S901	15 Winter	2	+0%	2/15 Summer				9.557	0.046	0.000
S1.010	S110	30 Winter	2	+0%	30/15 Summer				8.758	-0.163	0.000
S10.000	S1000	15 Winter	2	+0%	30/15 Summer				9.538	-0.052	0.000
S1.011	S111	240 Winter	2	+0%	30/15 Summer				8.728	-0.120	0.000
S11.000	S1100	15 Winter	2	+0%	100/15 Winter				9.477	-0.124	0.000
S1.012	S112	240 Winter	2	+0%	30/15 Summer				8.725	-0.101	0.000
S12.000	S1200	15 Winter	2	+0%	30/15 Summer				9.513	-0.137	0.000
S12.001	S1201	15 Winter	2	+0%	30/15 Summer				9.511	-0.124	0.000

Cundall, Johnston & Partners		Page 31
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface
Water Drainage.SWS

PN	US/MH Name	Flow / Cap.	Overflow (1/s)	Pipe	Status	Level Exceeded
				Flow (1/s)		
S1.000	S100	0.20		4.2	OK	
S1.001	S101	0.29		8.0	OK	
S2.000	S200	0.12		2.9	OK	
S1.002	S102	0.25		14.3	OK	
S1.003	S103	0.19		14.2	OK	
S1.004	S104	0.14		18.0	OK	
S3.000	S300	0.57		7.6	OK	
S3.001	S301	0.59		7.3	SURCHARGED	
S1.005	S105	0.25		24.9	OK	
S4.000	S400	0.17		4.0	OK	
S1.006	S106	0.23		30.6	OK	
S5.000	S500	0.21		12.6	OK	
S6.000	S600	0.13		7.5	OK	
S5.001	S501	0.47		28.6	OK	
S5.002	S502	0.60		28.1	OK	
S1.007	S107	0.40		56.9	OK	
S7.000	S700	0.35		4.8	OK	
S8.000	S800	0.12		1.6	OK	
S7.001	S701	0.64		8.0	SURCHARGED	
S1.008	S108	0.57		64.1	OK	
S1.009	S109	0.61		63.2	OK	
S9.000	S900	0.25		12.6	SURCHARGED	
S9.001	S901	0.23		11.2	SURCHARGED	
S1.010	S110	0.51		69.6	OK	
S10.000	S1000	0.74		14.5	OK	
S1.011	S111	0.32		30.1	OK	
S11.000	S1100	0.07		1.3	OK	
S1.012	S112	0.26		30.4	OK	
S12.000	S1200	0.16		7.5	OK	
S12.001	S1201	0.16		7.3	OK	

Cundall, Johnston & Partners		Page 32
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface
Water Drainage.SWS

											Water	Surcharged	Flooded	
US/MH		Storm	Return	Climate	First (X)		First (Y)		First (Z)		Overflow	Level	Depth	Volume
PN	Name				Period	Change	Surcharge		Flood		Overflow		Act.	(m)
S1.013	S113	240	Winter	2	+0%	30/15	Summer				8.717	-0.067	0.000	
S13.000	S1300	15	Winter	2	+0%	30/15	Summer				9.422	-0.178	0.000	
S13.001	S1301	15	Winter	2	+0%	30/15	Summer				9.413	-0.127	0.000	
S1.014	S114	240	Winter	2	+0%	30/15	Summer				8.704	-0.039	0.000	
S1.015	S115	240	Winter	2	+0%	30/15	Summer				8.695	-0.029	0.000	
S14.000	S1400	15	Winter	2	+0%	100/60	Winter				9.391	-0.125	0.000	
S14.001	S1401	15	Winter	2	+0%	30/240	Winter				9.234	-0.117	0.000	
S1.016	S116	240	Winter	2	+0%	30/15	Summer				8.677	-0.014	0.000	
S1.017	S117	240	Winter	2	+0%	30/15	Summer				8.643	-0.005	0.000	
S15.000	S1500	15	Winter	2	+0%	100/60	Winter				9.374	-0.126	0.000	
S1.018	S118	240	Winter	2	+0%	30/15	Summer				8.624	-0.003	0.000	
S16.000	S1600	360	Winter	2	+0%	100/120	Winter				9.500	-0.150	0.000	
S1.019	S119	240	Winter	2	+0%	30/15	Summer				8.597	-0.002	0.000	
S17.000	S1700	120	Winter	2	+0%	30/15	Summer				9.636	-0.034	0.000	
S18.000	S1800	15	Winter	2	+0%	30/15	Summer				9.666	-0.084	0.000	
S17.001	S1701	120	Winter	2	+0%	2/30	Winter				9.634	0.055	0.000	
S19.000	S1900	15	Winter	2	+0%	30/15	Summer				9.732	-0.084	0.000	
S17.002	S1702	120	Winter	2	+0%	2/30	Winter				9.588	0.057	0.000	
S17.003	S1703	120	Winter	2	+0%	2/60	Winter				9.518	0.065	0.000	
S20.000	S2000	15	Winter	2	+0%	100/120	Winter				10.074	-0.226	0.000	
S20.001	S2001	30	Winter	2	+0%	100/60	Summer				9.945	-0.251	0.000	
S17.004	S1704	120	Winter	2	+0%	2/15	Winter				9.450	0.041	0.000	
S17.005	S1705	120	Winter	2	+0%	2/30	Winter				9.319	0.024	0.000	
S17.006	S1706	180	Winter	2	+0%	30/15	Summer				9.074	-0.069	0.000	
S1.020	S120	600	Winter	2	+0%	30/15	Summer				8.560	0.000	0.000	
S21.000	S2100	15	Winter	2	+0%	30/360	Winter				9.184	-0.206	0.000	
S22.000	S2200	15	Winter	2	+0%	30/360	Winter				9.160	-0.230	0.000	
S21.001	S2101	30	Winter	2	+0%	30/180	Winter				9.045	-0.199	0.000	
S23.000	S2300	15	Winter	2	+0%	30/15	Summer				9.374	-0.061	0.000	
S21.002	S2102	30	Winter	2	+0%	30/120	Summer				8.869	-0.212	0.000	
S24.000	S2400	15	Winter	2	+0%	100/180	Winter				9.579	-0.197	0.000	
S1.021	S121	120	Winter	2	+0%	30/15	Summer				8.521	0.000	0.000	
S25.000	S2500	15	Winter	2	+0%	100/120	Winter				9.616	-0.125	0.000	
S1.022	S122	360	Winter	2	+0%	30/15	Summer				8.498	0.000	0.000	
S1.023	S123	360	Winter	2	+0%	2/120	Winter				8.467	0.035	0.000	
S26.000	S2600	15	Winter	2	+0%	30/120	Winter				8.734	-0.462	0.000	
S26.001	S2601	15	Winter	2	+0%	30/120	Winter				8.731	-0.445	0.000	
S26.002	S2602	15	Winter	2	+0%	30/120	Winter				8.697	-0.442	0.000	
S26.003	S2603	15	Winter	2	+0%	30/120	Winter				8.658	-0.442	0.000	
S1.024	S124	360	Winter	2	+0%	2/180	Winter				8.465	0.084	0.000	
S1.025	S125	360	Winter	2	+0%	2/180	Winter				8.463	0.120	0.000	
S27.000	S2700	15	Winter	2	+0%	100/15	Summer				9.982	-0.218	0.000	
S27.001	S2701	15	Winter	2	+0%	100/15	Summer				9.892	-0.212	0.000	
S28.000	S2800	15	Winter	2	+0%	30/15	Summer				9.868	-0.182	0.000	
S27.002	S2702	15	Winter	2	+0%	30/15	Summer				9.814	-0.128	0.000	
S29.000	S2900	15	Winter	2	+0%	30/15	Summer				9.747	-0.103	0.000	
S27.003	S2703	15	Winter	2	+0%	30/15	Summer				9.672	-0.074	0.000	
S27.004	S2704	15	Winter	2	+0%						9.606	-0.113	0.000	
S1.026	S126	360	Winter	2	+0%	2/120	Winter				8.462	0.135	0.000	
S1.027	S127	360	Winter	2	+0%	2/15	Summer				8.461	0.612	0.000	
S1.028	S128	15	Winter	2	+0%	2/15	Summer				7.876	0.040	0.000	

US/MH		Pipe Flow / Overflow		Status	Level Exceeded
PN	Name	Cap.	(l/s)		
S1.013	S113	0.30	33.4	OK	
S13.000	S1300	0.15	8.4	OK	

Cundall, Johnston & Partners		Page 33
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface
Water Drainage.SWS

		Pipe		Level	
PN	US/MH Name	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status	Exceeded
S13.001	S1301	0.08	7.3	OK	
S1.014	S114	0.38	35.4	OK	
S1.015	S115	0.34	35.4	OK	
S14.000	S1400	0.06	1.5	OK	
S14.001	S1401	0.11	1.5	OK	
S1.016	S116	0.16	38.0	OK	
S1.017	S117	0.21	37.6	OK	
S15.000	S1500	0.06	1.6	OK	
S1.018	S118	0.20	37.7	OK	
S16.000	S1600	0.00	0.0	OK	
S1.019	S119	0.18	38.3	OK	
S17.000	S1700	0.04	2.1	OK	
S18.000	S1800	0.40	6.0	OK	
S17.001	S1701	0.07	3.9	SURCHARGED	
S19.000	S1900	0.39	5.8	OK	
S17.002	S1702	0.13	7.2	SURCHARGED	
S17.003	S1703	0.09	4.9	SURCHARGED	
S20.000	S2000	0.14	8.0	OK	
S20.001	S2001	0.06	3.4	OK	
S17.004	S1704	0.13	7.7	SURCHARGED	
S17.005	S1705	0.16	9.4	SURCHARGED	
S17.006	S1706	0.18	8.9	OK	
S1.020	S120	0.11	24.1	OK	
S21.000	S2100	0.21	12.4	OK	
S22.000	S2200	0.12	6.9	OK	
S21.001	S2101	0.24	14.5	OK	
S23.000	S2300	0.64	7.7	OK	
S21.002	S2102	0.19	17.6	OK	
S24.000	S2400	0.26	27.4	OK	
S1.021	S121	0.47	84.9	OK	
S25.000	S2500	0.06	1.6	OK	
S1.022	S122	0.16	43.2	OK	
S1.023	S123	0.16	42.0	SURCHARGED	
S26.000	S2600	0.04	6.5	OK	
S26.001	S2601	0.13	26.4	OK	
S26.002	S2602	0.14	29.4	OK	
S26.003	S2603	0.16	29.2	OK	
S1.024	S124	0.23	48.3	SURCHARGED	
S1.025	S125	0.24	47.2	SURCHARGED	
S27.000	S2700	0.16	9.4	OK	
S27.001	S2701	0.19	9.1	OK	
S28.000	S2800	0.32	25.8	OK	
S27.002	S2702	0.62	34.2	OK	
S29.000	S2900	0.22	4.4	OK	
S27.003	S2703	0.91	42.9	OK	
S27.004	S2704	0.70	43.2	OK*	
S1.026	S126	0.18	54.6	SURCHARGED*	
S1.027	S127	1.13	12.3	SURCHARGED*	
S1.028	S128	1.74	12.4	SURCHARGED	

Cundall, Johnston & Partners		Page 34
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 12 Number of Storage Structures 36 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 473800 105650 SU 73800 05650 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 20, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S100	15 Winter	30	+20%	100/15 Winter				9.741	-0.074	0.000
S1.001	S101	480 Winter	30	+20%	100/15 Summer				9.473	-0.008	0.000
S2.000	S200	15 Winter	30	+20%	100/15 Summer				9.557	-0.093	0.000
S1.002	S102	480 Winter	30	+20%	30/360 Winter				9.473	0.028	0.000
S1.003	S103	480 Winter	30	+20%	30/15 Winter				9.472	0.118	0.000
S1.004	S104	480 Winter	30	+20%	30/30 Winter				9.472	0.144	0.000
S3.000	S300	15 Winter	30	+20%	30/15 Summer				10.193	0.593	0.000
S3.001	S301	15 Winter	30	+20%	2/15 Summer				10.047	0.551	0.000
S1.005	S105	480 Winter	30	+20%	30/15 Winter				9.472	0.195	0.000
S4.000	S400	15 Winter	30	+20%	100/15 Summer				9.557	-0.081	0.000
S1.006	S106	480 Winter	30	+20%	30/15 Winter				9.472	0.224	0.000
S5.000	S500	15 Winter	30	+20%	30/15 Winter				9.503	0.003	0.000
S6.000	S600	480 Winter	30	+20%	100/15 Summer				9.474	-0.026	0.000
S5.001	S501	480 Winter	30	+20%	30/15 Summer				9.474	0.148	0.000
S5.002	S502	480 Winter	30	+20%	30/15 Summer				9.472	0.362	0.000
S1.007	S107	480 Winter	30	+20%	30/15 Summer				9.471	0.388	0.000
S7.000	S700	30 Winter	30	+20%	30/15 Summer				9.986	0.377	0.000
S8.000	S800	30 Winter	30	+20%	30/15 Summer				9.966	0.532	0.000
S7.001	S701	30 Winter	30	+20%	2/15 Summer				9.955	0.621	0.000
S1.008	S108	480 Winter	30	+20%	30/15 Summer				9.470	0.476	0.000
S1.009	S109	480 Winter	30	+20%	30/15 Summer				9.468	0.516	0.000
S9.000	S900	15 Winter	30	+20%	2/15 Winter				10.367	0.817	0.000
S9.001	S901	15 Winter	30	+20%	2/15 Summer				10.285	0.775	0.000
S1.010	S110	480 Winter	30	+20%	30/15 Summer				9.467	0.547	0.000
S10.000	S1000	15 Winter	30	+20%	30/15 Summer				9.887	0.297	0.000
S1.011	S111	480 Winter	30	+20%	30/15 Summer				9.465	0.618	0.000
S11.000	S1100	15 Winter	30	+20%	100/15 Winter				9.493	-0.108	0.000
S1.012	S112	480 Winter	30	+20%	30/15 Summer				9.464	0.638	0.000
S12.000	S1200	15 Winter	30	+20%	30/15 Summer				10.021	0.371	0.000
S12.001	S1201	15 Winter	30	+20%	30/15 Summer				10.015	0.380	0.000

Cundall, Johnston & Partners		Page 35
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

PN	US/MH Name	Flow / Cap.	Overflow (1/s)	Pipe Flow (1/s)	Status	Level Exceeded
S1.000	S100	0.51		10.9	OK	
S1.001	S101	0.09		2.6	OK	
S2.000	S200	0.31		7.5	OK	
S1.002	S102	0.08		4.6	SURCHARGED	
S1.003	S103	0.06		4.6	SURCHARGED	
S1.004	S104	0.05		6.1	SURCHARGED	
S3.000	S300	1.21		16.2	SURCHARGED	
S3.001	S301	1.26		15.6	SURCHARGED	
S1.005	S105	0.08		8.4	SURCHARGED	
S4.000	S400	0.43		10.5	OK	
S1.006	S106	0.08		10.7	SURCHARGED	
S5.000	S500	0.52		31.1	SURCHARGED	
S6.000	S600	0.04		2.2	OK	
S5.001	S501	0.18		10.9	SURCHARGED	
S5.002	S502	0.23		10.8	SURCHARGED	
S1.007	S107	0.16		22.8	SURCHARGED	
S7.000	S700	0.54		7.5	SURCHARGED	
S8.000	S800	0.21		2.8	SURCHARGED	
S7.001	S701	1.28		16.0	SURCHARGED	
S1.008	S108	0.25		28.6	SURCHARGED	
S1.009	S109	0.28		28.6	SURCHARGED	
S9.000	S900	0.74		38.2	SURCHARGED	
S9.001	S901	0.43		21.1	SURCHARGED	
S1.010	S110	0.25		34.4	SURCHARGED	
S10.000	S1000	1.87		36.7	SURCHARGED	
S1.011	S111	0.41		38.6	SURCHARGED	
S11.000	S1100	0.17		3.3	OK	
S1.012	S112	0.33		38.9	SURCHARGED	
S12.000	S1200	0.37		17.4	SURCHARGED	
S12.001	S1201	0.36		16.5	SURCHARGED	

Cundall, Johnston & Partners		Page 36
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

		US/MH		Return Period	Climate Change	First (X)		First (Y)		First (Z)		Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
PN	Name	Storm				Surcharge		Flood		Overflow			(m)	(m)	(m³)
S1.013	S113	480 Winter		30	+20%	30/15 Summer							9.463	0.679	0.000
S13.000	S1300	15 Winter		30	+20%	30/15 Summer							9.966	0.366	0.000
S13.001	S1301	15 Winter		30	+20%	30/15 Summer							9.948	0.408	0.000
S1.014	S114	480 Winter		30	+20%	30/15 Summer							9.461	0.717	0.000
S1.015	S115	480 Winter		30	+20%	30/15 Summer							9.460	0.735	0.000
S14.000	S1400	480 Winter		30	+20%	100/60 Winter							9.458	-0.058	0.000
S14.001	S1401	480 Winter		30	+20%	30/240 Winter							9.458	0.107	0.000
S1.016	S116	480 Winter		30	+20%	30/15 Summer							9.458	0.766	0.000
S1.017	S117	480 Winter		30	+20%	30/15 Summer							9.457	0.809	0.000
S15.000	S1500	480 Winter		30	+20%	100/60 Winter							9.456	-0.044	0.000
S1.018	S118	480 Winter		30	+20%	30/15 Summer							9.456	0.829	0.000
S16.000	S1600	360 Winter		30	+20%	100/120 Winter							9.500	-0.150	0.000
S1.019	S119	480 Winter		30	+20%	30/15 Summer							9.455	0.856	0.000
S17.000	S1700	60 Winter		30	+20%	30/15 Summer							10.489	0.819	0.000
S18.000	S1800	60 Winter		30	+20%	30/15 Summer							10.493	0.743	0.000
S17.001	S1701	60 Winter		30	+20%	2/30 Winter							10.486	0.907	0.000
S19.000	S1900	60 Winter		30	+20%	30/15 Summer							10.428	0.612	0.000
S17.002	S1702	60 Winter		30	+20%	2/30 Winter							10.416	0.886	0.000
S17.003	S1703	60 Winter		30	+20%	2/60 Winter							10.215	0.762	0.000
S20.000	S2000	15 Winter		30	+20%	100/120 Winter							10.125	-0.175	0.000
S20.001	S2001	120 Winter		30	+20%	100/60 Summer							10.065	-0.131	0.000
S17.004	S1704	120 Winter		30	+20%	2/15 Winter							10.064	0.655	0.000
S17.005	S1705	30 Winter		30	+20%	2/30 Winter							9.995	0.700	0.000
S17.006	S1706	240 Winter		30	+20%	30/15 Summer							9.579	0.436	0.000
S1.020	S120	480 Winter		30	+20%	30/15 Summer							9.454	0.894	0.000
S21.000	S2100	480 Winter		30	+20%	30/360 Winter							9.455	0.065	0.000
S22.000	S2200	480 Winter		30	+20%	30/360 Winter							9.455	0.065	0.000
S21.001	S2101	480 Winter		30	+20%	30/180 Winter							9.455	0.211	0.000
S23.000	S2300	15 Winter		30	+20%	30/15 Summer							9.502	0.067	0.000
S21.002	S2102	480 Winter		30	+20%	30/120 Summer							9.454	0.373	0.000
S24.000	S2400	15 Winter		30	+20%	100/180 Winter							9.657	-0.119	0.000
S1.021	S121	480 Winter		30	+20%	30/15 Summer							9.453	0.932	0.000
S25.000	S2500	15 Winter		30	+20%	100/120 Winter							9.632	-0.109	0.000
S1.022	S122	480 Winter		30	+20%	30/15 Summer							9.451	0.953	0.000
S1.023	S123	480 Winter		30	+20%	2/120 Winter							9.449	1.017	0.000
S26.000	S2600	480 Winter		30	+20%	30/120 Winter							9.447	0.251	0.000
S26.001	S2601	480 Winter		30	+20%	30/120 Winter							9.447	0.271	0.000
S26.002	S2602	480 Winter		30	+20%	30/120 Winter							9.447	0.308	0.000
S26.003	S2603	480 Winter		30	+20%	30/120 Winter							9.447	0.347	0.000
S1.024	S124	480 Winter		30	+20%	2/180 Winter							9.447	1.066	0.000
S1.025	S125	480 Winter		30	+20%	2/180 Winter							9.445	1.102	0.000
S27.000	S2700	15 Winter		30	+20%	100/15 Summer							10.132	-0.068	0.000
S27.001	S2701	15 Winter		30	+20%	100/15 Summer							10.099	-0.005	0.000
S28.000	S2800	15 Winter		30	+20%	30/15 Summer							10.177	0.127	0.000
S27.002	S2702	15 Winter		30	+20%	30/15 Summer							10.072	0.130	0.000
S29.000	S2900	15 Winter		30	+20%	30/15 Summer							9.983	0.133	0.000
S27.003	S2703	15 Winter		30	+20%	30/15 Summer							9.960	0.214	0.000
S27.004	S2704	15 Winter		30	+20%								9.719	0.000	0.000
S1.026	S126	480 Winter		30	+20%	2/120 Winter							9.444	1.117	0.000
S1.027	S127	480 Winter		30	+20%	2/15 Summer							9.443	1.595	0.000
S1.028	S128	15 Winter		30	+20%	2/15 Summer							7.874	0.039	0.000

		Pipe		Flow (l/s)	Status	Level Exceeded
PN	US/MH Name	Flow / Cap.	Overflow (l/s)			
S1.013	S113	0.38		42.8	SURCHARGED	
S13.000	S1300	0.32		17.7	SURCHARGED	

Cundall, Johnston & Partners		Page 37
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

		US/MH Flow / Overflow		Pipe Flow	Level	
PN	Name	Cap.	(l/s)	(l/s)	Status	Exceeded
S13.001	S1301	0.19		16.8	SURCHARGED	
S1.014	S114	0.48		45.2	SURCHARGED	
S1.015	S115	0.44		45.1	SURCHARGED	
S14.000	S1400	0.02		0.4	OK	
S14.001	S1401	0.03		0.4	SURCHARGED	
S1.016	S116	0.21		48.3	SURCHARGED	
S1.017	S117	0.27		47.4	SURCHARGED	
S15.000	S1500	0.02		0.5	OK	
S1.018	S118	0.25		47.3	SURCHARGED	
S16.000	S1600	0.00		0.0	OK	
S1.019	S119	0.22		47.8	SURCHARGED	
S17.000	S1700	0.11		6.4	SURCHARGED	
S18.000	S1800	0.43		6.4	SURCHARGED	
S17.001	S1701	0.13		6.7	SURCHARGED	
S19.000	S1900	0.41		6.1	SURCHARGED	
S17.002	S1702	0.25		14.2	SURCHARGED	
S17.003	S1703	0.15		8.1	SURCHARGED	
S20.000	S2000	0.35		20.5	OK	
S20.001	S2001	0.13		7.1	OK	
S17.004	S1704	0.18		10.4	SURCHARGED	
S17.005	S1705	0.32		18.9	SURCHARGED	
S17.006	S1706	0.27		13.0	SURCHARGED	
S1.020	S120	0.27		57.4	SURCHARGED	
S21.000	S2100	0.06		3.7	SURCHARGED	
S22.000	S2200	0.04		2.0	SURCHARGED	
S21.001	S2101	0.15		8.9	SURCHARGED	
S23.000	S2300	1.66		19.9	SURCHARGED	
S21.002	S2102	0.12		11.1	SURCHARGED	
S24.000	S2400	0.66		71.2	OK	
S1.021	S121	0.42		75.9	SURCHARGED	
S25.000	S2500	0.17		4.2	OK	
S1.022	S122	0.28		75.8	SURCHARGED	
S1.023	S123	0.29		76.6	SURCHARGED	
S26.000	S2600	0.01		2.0	SURCHARGED	
S26.001	S2601	0.04		9.1	SURCHARGED	
S26.002	S2602	0.05		10.5	SURCHARGED	
S26.003	S2603	0.06		10.4	SURCHARGED	
S1.024	S124	0.42		87.4	SURCHARGED	
S1.025	S125	0.44		86.9	SURCHARGED	
S27.000	S2700	0.40		23.2	OK	
S27.001	S2701	0.63		30.8	OK	
S28.000	S2800	0.77		62.3	SURCHARGED	
S27.002	S2702	1.32		73.1	SURCHARGED	
S29.000	S2900	0.51		10.3	SURCHARGED	
S27.003	S2703	2.01		94.9	SURCHARGED	
S27.004	S2704	1.55		95.2	SURCHARGED*	
S1.026	S126	0.34		100.1	SURCHARGED*	
S1.027	S127	1.13		12.3	SURCHARGED*	
S1.028	S128	1.75		12.4	SURCHARGED	

Cundall, Johnston & Partners		Page 38
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 12 Number of Storage Structures 36 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 473800 105650 SU 73800 05650 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 20, 40

PN	US/MH		Return Period	Climate Change	First (X)		First (Y)	First (Z)	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm			Surcharge	Flood				(m)	(m)	(m³)
S1.000	S100	600 Winter	100	+40%	100/15 Winter					10.234	0.419	0.000
S1.001	S101	600 Winter	100	+40%	100/15 Summer					10.233	0.752	0.000
S2.000	S200	600 Winter	100	+40%	100/15 Summer					10.233	0.583	0.000
S1.002	S102	600 Winter	100	+40%	30/360 Winter					10.233	0.788	0.000
S1.003	S103	600 Winter	100	+40%	30/15 Winter					10.234	0.880	0.000
S1.004	S104	600 Winter	100	+40%	30/30 Winter					10.234	0.906	0.000
S3.000	S300	15 Winter	100	+40%	30/15 Summer					10.768	1.168	0.000
S3.001	S301	15 Winter	100	+40%	2/15 Summer					10.430	0.934	0.000
S1.005	S105	600 Winter	100	+40%	30/15 Winter					10.234	0.957	0.000
S4.000	S400	600 Winter	100	+40%	100/15 Summer					10.235	0.597	0.000
S1.006	S106	600 Winter	100	+40%	30/15 Winter					10.234	0.986	0.000
S5.000	S500	600 Winter	100	+40%	30/15 Winter					10.226	0.726	0.000
S6.000	S600	600 Winter	100	+40%	100/15 Summer					10.226	0.726	0.000
S5.001	S501	600 Winter	100	+40%	30/15 Summer					10.226	0.900	0.000
S5.002	S502	600 Winter	100	+40%	30/15 Summer					10.236	1.126	0.000
S1.007	S107	600 Winter	100	+40%	30/15 Summer					10.234	1.151	0.000
S7.000	S700	15 Winter	100	+40%	30/15 Summer					10.476	0.867	0.000
S8.000	S800	30 Winter	100	+40%	30/15 Summer					10.373	0.939	0.000
S7.001	S701	30 Winter	100	+40%	2/15 Summer					10.362	1.028	0.000
S1.008	S108	600 Winter	100	+40%	30/15 Summer					10.239	1.245	0.000
S1.009	S109	600 Winter	100	+40%	30/15 Summer					10.238	1.285	0.000
S9.000	S900	30 Winter	100	+40%	2/15 Winter					10.398	0.848	0.000
S9.001	S901	30 Winter	100	+40%	2/15 Summer					10.336	0.826	0.000
S1.010	S110	600 Winter	100	+40%	30/15 Summer					10.237	1.316	0.000
S10.000	S1000	15 Winter	100	+40%	30/15 Summer					10.319	0.729	0.000
S1.011	S111	600 Winter	100	+40%	30/15 Summer					10.235	1.387	0.000
S11.000	S1100	600 Winter	100	+40%	100/15 Winter					10.236	0.635	0.000
S1.012	S112	600 Winter	100	+40%	30/15 Summer					10.234	1.408	0.000
S12.000	S1200	15 Winter	100	+40%	30/15 Summer					10.444	0.794	0.000
S12.001	S1201	15 Winter	100	+40%	30/15 Summer					10.382	0.747	0.000

Cundall, Johnston & Partners		Page 39
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage	Network 2017.1.2	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

PN	US/MH Name	Flow / Cap.	Overflow (1/s)	Pipe Flow (1/s)	Status	Level Exceeded
S1.000	S100	0.07		1.5	SURCHARGED	
S1.001	S101	0.11		3.0	SURCHARGED	
S2.000	S200	0.04		1.0	SURCHARGED	
S1.002	S102	0.09		5.4	SURCHARGED	
S1.003	S103	0.07		5.2	SURCHARGED	
S1.004	S104	0.05		7.0	SURCHARGED	
S3.000	S300	1.80		24.1	FLOOD RISK	
S3.001	S301	1.51		18.7	SURCHARGED	
S1.005	S105	0.10		9.6	SURCHARGED	
S4.000	S400	0.06		1.4	SURCHARGED	
S1.006	S106	0.09		12.3	SURCHARGED	
S5.000	S500	0.08		4.6	SURCHARGED	
S6.000	S600	0.04		2.6	SURCHARGED	
S5.001	S501	0.20		12.3	SURCHARGED	
S5.002	S502	0.26		12.1	SURCHARGED	
S1.007	S107	0.18		25.7	SURCHARGED	
S7.000	S700	0.90		12.4	SURCHARGED	
S8.000	S800	0.38		5.1	SURCHARGED	
S7.001	S701	1.37		17.2	SURCHARGED	
S1.008	S108	0.27		31.0	SURCHARGED	
S1.009	S109	0.30		30.5	SURCHARGED	
S9.000	S900	0.88		45.2	SURCHARGED	
S9.001	S901	0.42		21.0	SURCHARGED	
S1.010	S110	0.26		36.4	SURCHARGED	
S10.000	S1000	2.66		52.1	SURCHARGED	
S1.011	S111	0.43		40.4	SURCHARGED	
S11.000	S1100	0.06		1.2	SURCHARGED	
S1.012	S112	0.34		40.1	SURCHARGED	
S12.000	S1200	0.56		26.5	SURCHARGED	
S12.001	S1201	0.45		20.6	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

									Water	Surcharged	Flooded	
US/MH		Storm	Return	Climate	First (X)		First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name				Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)
S1.013	S113	600 Winter	100	+40%	30/15 Summer					10.234	1.450	0.000
S13.000	S1300	15 Winter	100	+40%	30/15 Summer					10.402	0.802	0.000
S13.001	S1301	15 Winter	100	+40%	30/15 Summer					10.333	0.793	0.000
S1.014	S114	600 Winter	100	+40%	30/15 Summer					10.233	1.490	0.000
S1.015	S115	600 Winter	100	+40%	30/15 Summer					10.233	1.509	0.000
S14.000	S1400	600 Winter	100	+40%	100/60 Winter					10.228	0.712	0.000
S14.001	S1401	600 Winter	100	+40%	30/240 Winter					10.227	0.876	0.000
S1.016	S116	600 Winter	100	+40%	30/15 Summer					10.232	1.540	0.000
S1.017	S117	600 Winter	100	+40%	30/15 Summer					10.232	1.584	0.000
S15.000	S1500	600 Winter	100	+40%	100/60 Winter					10.231	0.731	0.000
S1.018	S118	600 Winter	100	+40%	30/15 Summer					10.231	1.604	0.000
S16.000	S1600	600 Winter	100	+40%	100/120 Winter					10.233	0.583	0.000
S1.019	S119	600 Winter	100	+40%	30/15 Summer					10.231	1.632	0.000
S17.000	S1700	60 Winter	100	+40%	30/15 Summer					10.626	0.956	0.000
S18.000	S1800	60 Winter	100	+40%	30/15 Summer					10.629	0.879	0.000
S17.001	S1701	60 Winter	100	+40%	2/30 Winter					10.624	1.045	0.000
S19.000	S1900	60 Winter	100	+40%	30/15 Summer					10.602	0.786	0.000
S17.002	S1702	60 Winter	100	+40%	2/30 Winter					10.590	1.059	0.000
S17.003	S1703	120 Winter	100	+40%	2/60 Winter					10.435	0.982	0.000
S20.000	S2000	180 Winter	100	+40%	100/120 Winter					10.338	0.038	0.000
S20.001	S2001	180 Winter	100	+40%	100/60 Summer					10.337	0.141	0.000
S17.004	S1704	180 Winter	100	+40%	2/15 Winter					10.336	0.927	0.000
S17.005	S1705	15 Winter	100	+40%	2/30 Winter					10.475	1.180	0.000
S17.006	S1706	480 Winter	100	+40%	30/15 Summer					10.238	1.095	0.000
S1.020	S120	600 Winter	100	+40%	30/15 Summer					10.231	1.670	0.000
S21.000	S2100	600 Winter	100	+40%	30/360 Winter					10.202	0.812	0.000
S22.000	S2200	600 Winter	100	+40%	30/360 Winter					10.202	0.812	0.000
S21.001	S2101	600 Winter	100	+40%	30/180 Winter					10.202	0.958	0.000
S23.000	S2300	600 Winter	100	+40%	30/15 Summer					10.201	0.766	0.000
S21.002	S2102	600 Winter	100	+40%	30/120 Summer					10.204	1.123	0.000
S24.000	S2400	600 Winter	100	+40%	100/180 Winter					10.235	0.459	0.000
S1.021	S121	600 Winter	100	+40%	30/15 Summer					10.231	1.710	0.000
S25.000	S2500	600 Winter	100	+40%	100/120 Winter					10.238	0.497	0.000
S1.022	S122	600 Winter	100	+40%	30/15 Summer					10.235	1.737	0.000
S1.023	S123	600 Winter	100	+40%	2/120 Winter					10.238	1.806	0.000
S26.000	S2600	600 Winter	100	+40%	30/120 Winter					10.211	1.015	0.000
S26.001	S2601	600 Winter	100	+40%	30/120 Winter					10.214	1.038	0.000
S26.002	S2602	600 Winter	100	+40%	30/120 Winter					10.229	1.089	0.000
S26.003	S2603	600 Winter	100	+40%	30/120 Winter					10.234	1.135	0.000
S1.024	S124	600 Winter	100	+40%	2/180 Winter					10.237	1.856	0.000
S1.025	S125	600 Winter	100	+40%	2/180 Winter					10.236	1.893	0.000
S27.000	S2700	15 Winter	100	+40%	100/15 Summer					10.619	0.419	0.000
S27.001	S2701	15 Winter	100	+40%	100/15 Summer					10.541	0.437	0.000
S28.000	S2800	15 Winter	100	+40%	30/15 Summer					10.615	0.565	0.000
S27.002	S2702	15 Winter	100	+40%	30/15 Summer					10.487	0.545	0.000
S29.000	S2900	15 Winter	100	+40%	30/15 Summer					10.303	0.453	0.000
S27.003	S2703	15 Winter	100	+40%	30/15 Summer					10.255	0.509	0.000
S27.004	S2704	15 Winter	100	+40%						9.719	0.000	0.000
S1.026	S126	960 Winter	100	+40%	2/120 Winter					9.675	1.348	0.000
S1.027	S127	600 Winter	100	+40%	2/15 Summer					10.008	2.160	0.000
S1.028	S128	15 Summer	100	+40%	2/15 Summer					7.878	0.042	0.000

US/MH		Pipe Flow / Overflow		Pipe Flow (l/s)	Status	Level Exceeded
PN	Name	Cap.	(l/s)			
S1.013	S113	0.39		44.1	SURCHARGED	
S13.000	S1300	0.51		28.2	SURCHARGED	

Cundall, Johnston & Partners		Page 41
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONES A & B	
Date 01/12/2017 14:34	Designed by s.johnston	
File Drainage Zones A & B Surface Wa...	Checked by AJWC	
Micro Drainage		Network 2017.1.2

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed Surface Water Drainage.SWS

		US/MH Flow / Overflow		Pipe Flow	Level	
PN	Name	Cap.	(l/s)	(l/s)	Status	Exceeded
S13.001	S1301	0.23		20.8	SURCHARGED	
S1.014	S114	0.50		46.5	SURCHARGED	
S1.015	S115	0.44		45.9	SURCHARGED	
S14.000	S1400	0.07		1.6	SURCHARGED	
S14.001	S1401	0.19		2.6	SURCHARGED	
S1.016	S116	0.21		49.2	SURCHARGED	
S1.017	S117	0.28		48.8	SURCHARGED	
S15.000	S1500	0.07		1.9	SURCHARGED	
S1.018	S118	0.25		48.8	SURCHARGED	
S16.000	S1600	0.07		1.5	SURCHARGED	
S1.019	S119	0.23		49.7	SURCHARGED	
S17.000	S1700	0.14		7.9	SURCHARGED	
S18.000	S1800	0.51		7.5	SURCHARGED	
S17.001	S1701	0.12		6.3	SURCHARGED	
S19.000	S1900	0.62		9.2	SURCHARGED	
S17.002	S1702	0.29		16.5	SURCHARGED	
S17.003	S1703	0.15		8.1	SURCHARGED	
S20.000	S2000	0.12		7.2	SURCHARGED	
S20.001	S2001	0.12		6.4	SURCHARGED	
S17.004	S1704	0.13		7.9	SURCHARGED	
S17.005	S1705	0.39		23.4	SURCHARGED	
S17.006	S1706	0.25		12.1	SURCHARGED	
S1.020	S120	0.27		59.5	SURCHARGED	
S21.000	S2100	0.07		4.4	SURCHARGED	
S22.000	S2200	0.04		2.4	SURCHARGED	
S21.001	S2101	0.17		10.0	SURCHARGED	
S23.000	S2300	0.24		2.9	SURCHARGED	
S21.002	S2102	0.18		17.0	SURCHARGED	
S24.000	S2400	0.09		9.6	SURCHARGED	
S1.021	S121	0.43		77.9	SURCHARGED	
S25.000	S2500	0.11		2.8	SURCHARGED	
S1.022	S122	0.29		77.9	SURCHARGED	
S1.023	S123	0.30		78.6	SURCHARGED	
S26.000	S2600	0.18		30.3	SURCHARGED	
S26.001	S2601	0.14		28.7	SURCHARGED	
S26.002	S2602	0.10		20.6	SURCHARGED	
S26.003	S2603	0.09		16.9	SURCHARGED	
S1.024	S124	0.41		85.3	FLOOD RISK	
S1.025	S125	0.43		84.8	SURCHARGED	
S27.000	S2700	0.52		29.8	SURCHARGED	
S27.001	S2701	0.76		37.2	SURCHARGED	
S28.000	S2800	1.09		87.5	SURCHARGED	
S27.002	S2702	1.90		105.0	SURCHARGED	
S29.000	S2900	0.68		13.7	SURCHARGED	
S27.003	S2703	2.85		134.9	SURCHARGED	
S27.004	S2704	2.19		134.7	SURCHARGED*	
S1.026	S126	0.24		71.9	SURCHARGED*	
S1.027	S127	1.13		12.3	SURCHARGED*	
S1.028	S128	1.79		12.7	SURCHARGED	

Cundall, Johnston & Partners		Page 1
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK A	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

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

Half Drain Time : 325 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.155	0.155	0.3	4.7	0 K
30 min Summer	0.207	0.207	0.3	6.2	Flood Risk
60 min Summer	0.257	0.257	0.3	7.7	Flood Risk
120 min Summer	0.282	0.282	0.3	8.5	Flood Risk
180 min Summer	0.290	0.290	0.3	8.7	Flood Risk
240 min Summer	0.291	0.291	0.3	8.7	Flood Risk
360 min Summer	0.284	0.284	0.3	8.5	Flood Risk
480 min Summer	0.275	0.275	0.3	8.2	Flood Risk
600 min Summer	0.265	0.265	0.3	8.0	Flood Risk
720 min Summer	0.255	0.255	0.3	7.6	Flood Risk
960 min Summer	0.234	0.234	0.3	7.0	Flood Risk
1440 min Summer	0.195	0.195	0.3	5.9	0 K
2160 min Summer	0.147	0.147	0.3	4.4	0 K
2880 min Summer	0.110	0.110	0.3	3.3	0 K
4320 min Summer	0.065	0.065	0.3	1.9	0 K
5760 min Summer	0.048	0.048	0.3	1.4	0 K
7200 min Summer	0.042	0.042	0.2	1.3	0 K
8640 min Summer	0.038	0.038	0.2	1.2	0 K
10080 min Summer	0.035	0.035	0.2	1.1	0 K
15 min Winter	0.176	0.176	0.3	5.3	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	137.200	0.0	18
30 min Summer	91.280	0.0	33
60 min Summer	58.100	0.0	62
120 min Summer	33.950	0.0	122
180 min Summer	24.762	0.0	180
240 min Summer	19.775	0.0	240
360 min Summer	14.373	0.0	296
480 min Summer	11.428	0.0	358
600 min Summer	9.554	0.0	422
720 min Summer	8.248	0.0	490
960 min Summer	6.538	0.0	626
1440 min Summer	4.702	0.0	894
2160 min Summer	3.393	0.0	1272
2880 min Summer	2.707	0.0	1616
4320 min Summer	1.993	0.0	2292
5760 min Summer	1.625	0.0	2944
7200 min Summer	1.405	0.0	3672
8640 min Summer	1.258	0.0	4408
10080 min Summer	1.155	0.0	5144
15 min Winter	137.200	0.0	18

Cundall, Johnston & Partners		Page 2
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK A	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.234	0.234	0.3	7.0	Flood Risk
60 min Winter	0.291	0.291	0.3	8.7	Flood Risk
120 min Winter	0.322	0.322	0.3	9.7	Flood Risk
180 min Winter	0.334	0.334	0.3	10.0	Flood Risk
240 min Winter	0.337	0.337	0.3	10.1	Flood Risk
360 min Winter	0.330	0.330	0.3	9.9	Flood Risk
480 min Winter	0.317	0.317	0.3	9.5	Flood Risk
600 min Winter	0.304	0.304	0.3	9.1	Flood Risk
720 min Winter	0.290	0.290	0.3	8.7	Flood Risk
960 min Winter	0.260	0.260	0.3	7.8	Flood Risk
1440 min Winter	0.201	0.201	0.3	6.0	Flood Risk
2160 min Winter	0.128	0.128	0.3	3.8	0 K
2880 min Winter	0.077	0.077	0.3	2.3	0 K
4320 min Winter	0.044	0.044	0.2	1.3	0 K
5760 min Winter	0.036	0.036	0.2	1.1	0 K
7200 min Winter	0.031	0.031	0.2	0.9	0 K
8640 min Winter	0.028	0.028	0.1	0.8	0 K
10080 min Winter	0.026	0.026	0.1	0.8	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	91.280	0.0	33
60 min Winter	58.100	0.0	62
120 min Winter	33.950	0.0	120
180 min Winter	24.762	0.0	176
240 min Winter	19.775	0.0	232
360 min Winter	14.373	0.0	338
480 min Winter	11.428	0.0	384
600 min Winter	9.554	0.0	458
720 min Winter	8.248	0.0	534
960 min Winter	6.538	0.0	684
1440 min Winter	4.702	0.0	964
2160 min Winter	3.393	0.0	1340
2880 min Winter	2.707	0.0	1668
4320 min Winter	1.993	0.0	2244
5760 min Winter	1.625	0.0	2944
7200 min Winter	1.405	0.0	3680
8640 min Winter	1.258	0.0	4408
10080 min Winter	1.155	0.0	5144

Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK A	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

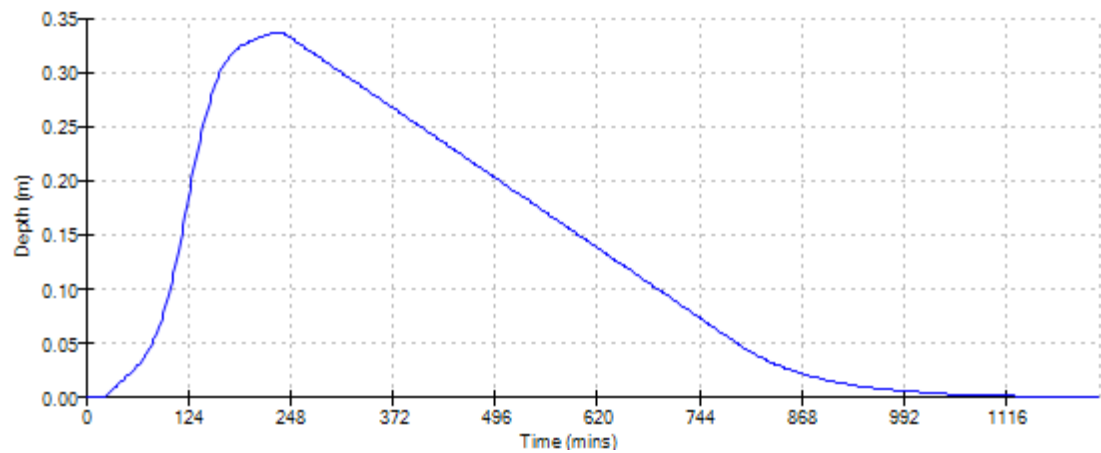
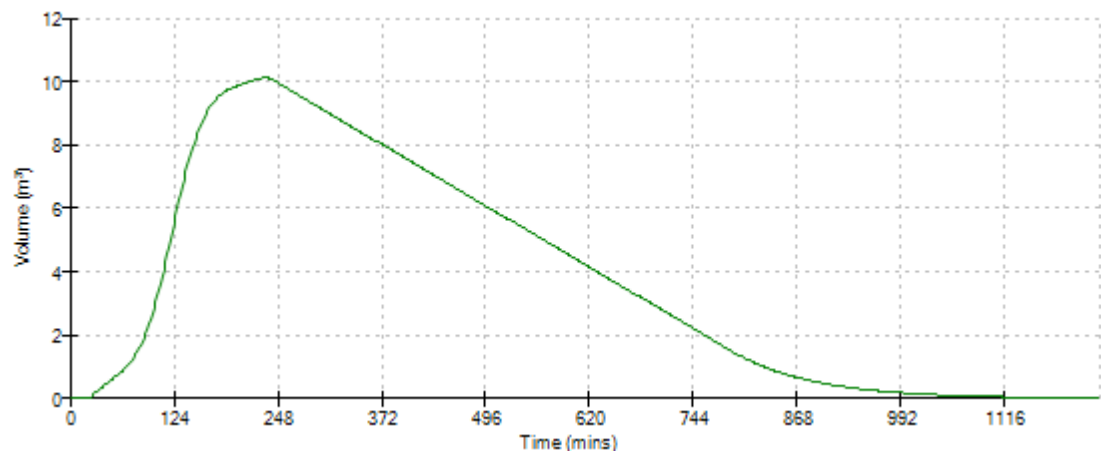
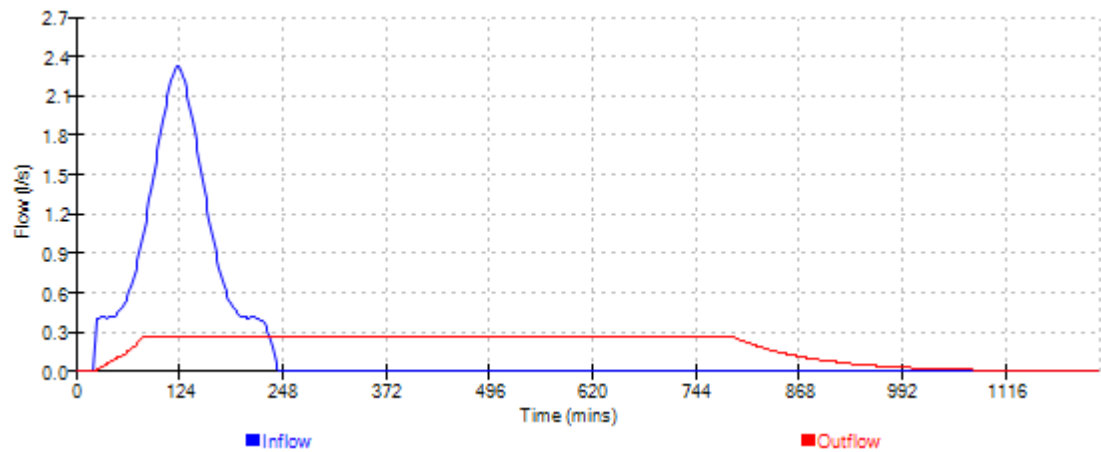
Total Area (ha) 0.020

Time (mins)	Area
From:	To: (ha)
0	4 0.020

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Cundall, Johnston & Partners		Page 4																								
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK A																									
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File Drainage Zone C - Car P...	Checked by																									
Micro Drainage		Source Control 2017.1.2																								
<u>Model Details</u> Storage is Online Cover Level (m) 0.500 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01872</td> <td>Width (m)</td> <td>20.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>5.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>27.8</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>3</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>1</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Membrane Depth (m)</td> <td>130</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	20.0	Membrane Percolation (mm/hr)	1000	Length (m)	5.0	Max Percolation (l/s)	27.8	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	3	Porosity	0.30	Evaporation (mm/day)	1	Invert Level (m)	0.000	Membrane Depth (m)	130
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Event: 240 min Winter



Cundall, Johnston & Partners					Page 1																																																																																																																																																																																																																			
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Summary of Results for 100 year Return Period (+40%) Half Drain Time : 338 minutes. <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>0.160</td><td>0.160</td><td>0.4</td><td>8.2</td><td>0 K</td></tr><tr><td>30 min Summer</td><td>0.213</td><td>0.213</td><td>0.4</td><td>10.9</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.265</td><td>0.265</td><td>0.4</td><td>13.5</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.292</td><td>0.292</td><td>0.4</td><td>14.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.301</td><td>0.301</td><td>0.4</td><td>15.3</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.301</td><td>0.301</td><td>0.4</td><td>15.4</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.295</td><td>0.295</td><td>0.4</td><td>15.0</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.285</td><td>0.285</td><td>0.4</td><td>14.6</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.276</td><td>0.276</td><td>0.4</td><td>14.1</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.265</td><td>0.265</td><td>0.4</td><td>13.5</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.244</td><td>0.244</td><td>0.4</td><td>12.5</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.205</td><td>0.205</td><td>0.4</td><td>10.5</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.155</td><td>0.155</td><td>0.4</td><td>7.9</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>0.117</td><td>0.117</td><td>0.4</td><td>6.0</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>0.069</td><td>0.069</td><td>0.4</td><td>3.5</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>0.049</td><td>0.049</td><td>0.4</td><td>2.5</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>0.044</td><td>0.044</td><td>0.4</td><td>2.2</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>0.039</td><td>0.039</td><td>0.3</td><td>2.0</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>0.036</td><td>0.036</td><td>0.3</td><td>1.9</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>0.181</td><td>0.181</td><td>0.4</td><td>9.2</td><td>0 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>137.200</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>91.280</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>58.100</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>33.950</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>24.762</td><td>0.0</td><td>180</td></tr><tr><td>240 min Summer</td><td>19.775</td><td>0.0</td><td>240</td></tr><tr><td>360 min Summer</td><td>14.373</td><td>0.0</td><td>302</td></tr><tr><td>480 min Summer</td><td>11.428</td><td>0.0</td><td>362</td></tr><tr><td>600 min Summer</td><td>9.554</td><td>0.0</td><td>426</td></tr><tr><td>720 min Summer</td><td>8.248</td><td>0.0</td><td>492</td></tr><tr><td>960 min Summer</td><td>6.538</td><td>0.0</td><td>626</td></tr><tr><td>1440 min Summer</td><td>4.702</td><td>0.0</td><td>894</td></tr><tr><td>2160 min Summer</td><td>3.393</td><td>0.0</td><td>1276</td></tr><tr><td>2880 min Summer</td><td>2.707</td><td>0.0</td><td>1640</td></tr><tr><td>4320 min Summer</td><td>1.993</td><td>0.0</td><td>2292</td></tr><tr><td>5760 min Summer</td><td>1.625</td><td>0.0</td><td>2944</td></tr><tr><td>7200 min Summer</td><td>1.405</td><td>0.0</td><td>3672</td></tr><tr><td>8640 min Summer</td><td>1.258</td><td>0.0</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.155</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>137.200</td><td>0.0</td><td>18</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.160	0.160	0.4	8.2	0 K	30 min Summer	0.213	0.213	0.4	10.9	Flood Risk	60 min Summer	0.265	0.265	0.4	13.5	Flood Risk	120 min Summer	0.292	0.292	0.4	14.9	Flood Risk	180 min Summer	0.301	0.301	0.4	15.3	Flood Risk	240 min Summer	0.301	0.301	0.4	15.4	Flood Risk	360 min Summer	0.295	0.295	0.4	15.0	Flood Risk	480 min Summer	0.285	0.285	0.4	14.6	Flood Risk	600 min Summer	0.276	0.276	0.4	14.1	Flood Risk	720 min Summer	0.265	0.265	0.4	13.5	Flood Risk	960 min Summer	0.244	0.244	0.4	12.5	Flood Risk	1440 min Summer	0.205	0.205	0.4	10.5	Flood Risk	2160 min Summer	0.155	0.155	0.4	7.9	0 K	2880 min Summer	0.117	0.117	0.4	6.0	0 K	4320 min Summer	0.069	0.069	0.4	3.5	0 K	5760 min Summer	0.049	0.049	0.4	2.5	0 K	7200 min Summer	0.044	0.044	0.4	2.2	0 K	8640 min Summer	0.039	0.039	0.3	2.0	0 K	10080 min Summer	0.036	0.036	0.3	1.9	0 K	15 min Winter	0.181	0.181	0.4	9.2	0 K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	137.200	0.0	18	30 min 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Cundall, Johnston & Partners					Page 2	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG		1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK B				
Date 01/12/2017		Designed by LK				
File Drainage Zone C - Car P...		Checked by				
Micro Drainage		Source Control 2017.1.2				
Summary of Results for 100 year Return Period (+40%)						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
30 min Winter	0.241	0.241	0.4	12.3	Flood Risk	
60 min Winter	0.301	0.301	0.4	15.3	Flood Risk	
120 min Winter	0.333	0.333	0.4	17.0	Flood Risk	
180 min Winter	0.346	0.346	0.4	17.6	Flood Risk	
240 min Winter	0.349	0.349	0.4	17.8	Flood Risk	
360 min Winter	0.343	0.343	0.4	17.5	Flood Risk	
480 min Winter	0.330	0.330	0.4	16.8	Flood Risk	
600 min Winter	0.317	0.317	0.4	16.2	Flood Risk	
720 min Winter	0.302	0.302	0.4	15.4	Flood Risk	
960 min Winter	0.272	0.272	0.4	13.9	Flood Risk	
1440 min Winter	0.213	0.213	0.4	10.9	Flood Risk	
2160 min Winter	0.138	0.138	0.4	7.1	0 K	
2880 min Winter	0.084	0.084	0.4	4.3	0 K	
4320 min Winter	0.045	0.045	0.4	2.3	0 K	
5760 min Winter	0.037	0.037	0.3	1.9	0 K	
7200 min Winter	0.032	0.032	0.3	1.6	0 K	
8640 min Winter	0.029	0.029	0.3	1.5	0 K	
10080 min Winter	0.027	0.027	0.2	1.4	0 K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
30 min Winter	91.280	0.0	33			
60 min Winter	58.100	0.0	62			
120 min Winter	33.950	0.0	120			
180 min Winter	24.762	0.0	178			
240 min Winter	19.775	0.0	234			
360 min Winter	14.373	0.0	340			
480 min Winter	11.428	0.0	386			
600 min Winter	9.554	0.0	460			
720 min Winter	8.248	0.0	536			
960 min Winter	6.538	0.0	684			
1440 min Winter	4.702	0.0	966			
2160 min Winter	3.393	0.0	1344			
2880 min Winter	2.707	0.0	1672			
4320 min Winter	1.993	0.0	2248			
5760 min Winter	1.625	0.0	2944			
7200 min Winter	1.405	0.0	3680			
8640 min Winter	1.258	0.0	4408			
10080 min Winter	1.155	0.0	5040			
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Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK B	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

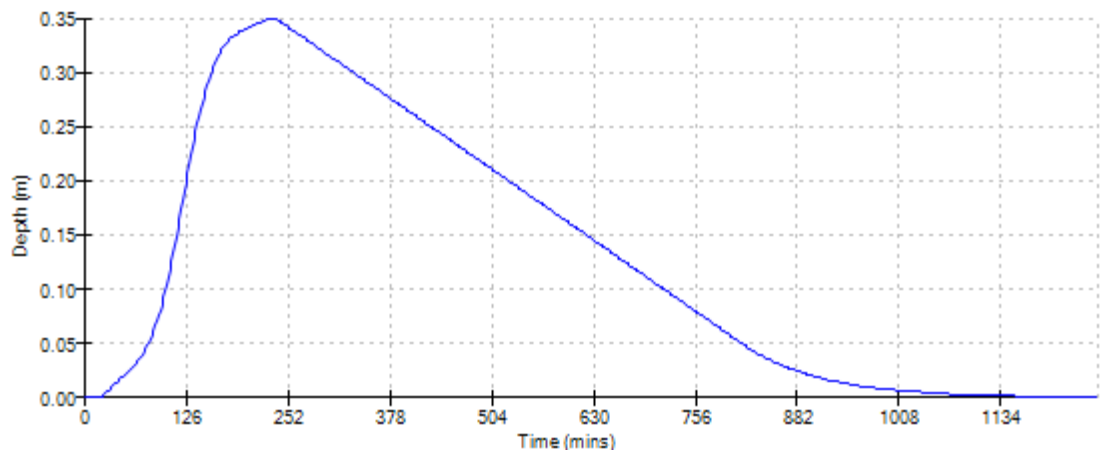
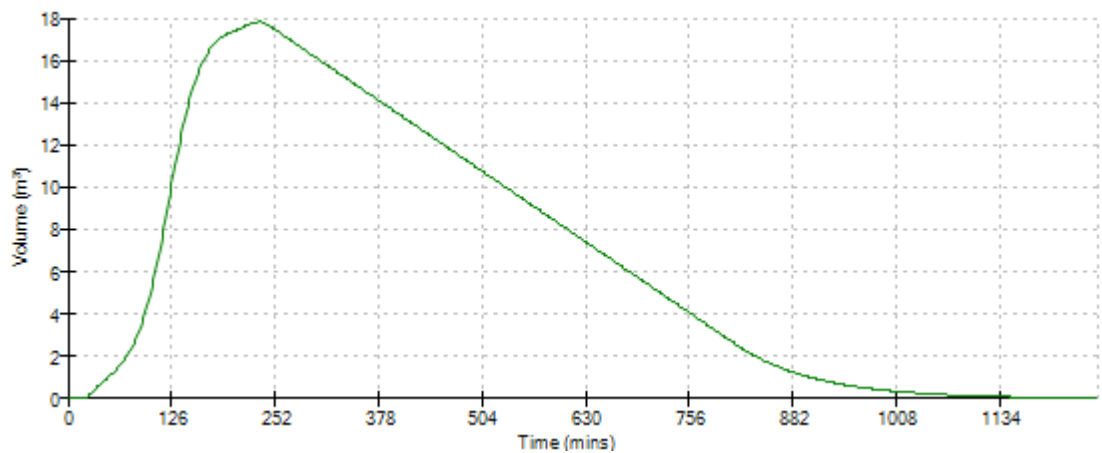
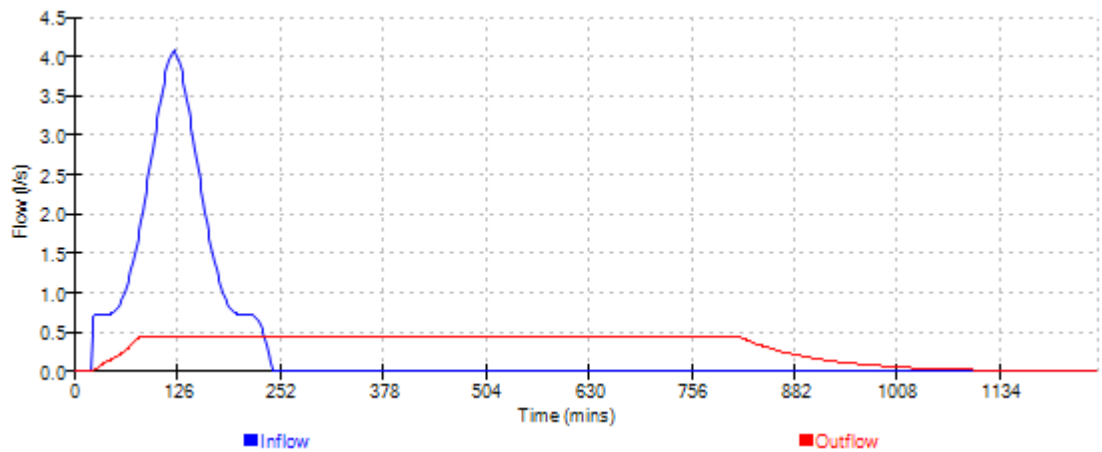
Total Area (ha) 0.035

Time (mins)	Area
From:	To: (ha)
0	4 0.035

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Cundall, Johnston & Partners		Page 4																								
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK B																									
Date 01/12/2017	Designed by LK																									
File Drainage Zone C - Car P...	Checked by																									
Micro Drainage		Source Control 2017.1.2																								
<u>Model Details</u> Storage is Online Cover Level (m) 0.500 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01872</td> <td>Width (m)</td> <td>27.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>6.3</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>47.3</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>3</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>1</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Membrane Depth (m)</td> <td>130</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	27.0	Membrane Percolation (mm/hr)	1000	Length (m)	6.3	Max Percolation (l/s)	47.3	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	3	Porosity	0.30	Evaporation (mm/day)	1	Invert Level (m)	0.000	Membrane Depth (m)	130
Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	27.0																							
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Invert Level (m)	0.000	Membrane Depth (m)	130																							
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Event: 240 min Winter



Cundall, Johnston & Partners					Page 1																																																																																																																																																																																																																			
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Summary of Results for 100 year Return Period (+40%) Half Drain Time : 353 minutes. <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>0.166</td><td>0.166</td><td>0.6</td><td>10.5</td><td>0 K</td></tr><tr><td>30 min Summer</td><td>0.221</td><td>0.221</td><td>0.6</td><td>14.0</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.275</td><td>0.275</td><td>0.6</td><td>17.5</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.303</td><td>0.303</td><td>0.6</td><td>19.2</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.313</td><td>0.313</td><td>0.6</td><td>19.9</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.314</td><td>0.314</td><td>0.6</td><td>19.9</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.307</td><td>0.307</td><td>0.6</td><td>19.5</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.298</td><td>0.298</td><td>0.6</td><td>18.9</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.288</td><td>0.288</td><td>0.6</td><td>18.3</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.278</td><td>0.278</td><td>0.6</td><td>17.6</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.257</td><td>0.257</td><td>0.6</td><td>16.3</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.217</td><td>0.217</td><td>0.6</td><td>13.8</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.166</td><td>0.166</td><td>0.6</td><td>10.5</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>0.127</td><td>0.127</td><td>0.6</td><td>8.0</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>0.075</td><td>0.075</td><td>0.6</td><td>4.8</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>0.051</td><td>0.051</td><td>0.6</td><td>3.3</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>0.045</td><td>0.045</td><td>0.5</td><td>2.9</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>0.041</td><td>0.041</td><td>0.4</td><td>2.6</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>0.038</td><td>0.038</td><td>0.4</td><td>2.4</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>0.188</td><td>0.188</td><td>0.6</td><td>11.9</td><td>0 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>137.200</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>91.280</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>58.100</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>33.950</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>24.762</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>19.775</td><td>0.0</td><td>240</td></tr><tr><td>360 min Summer</td><td>14.373</td><td>0.0</td><td>306</td></tr><tr><td>480 min Summer</td><td>11.428</td><td>0.0</td><td>366</td></tr><tr><td>600 min Summer</td><td>9.554</td><td>0.0</td><td>430</td></tr><tr><td>720 min Summer</td><td>8.248</td><td>0.0</td><td>496</td></tr><tr><td>960 min Summer</td><td>6.538</td><td>0.0</td><td>634</td></tr><tr><td>1440 min Summer</td><td>4.702</td><td>0.0</td><td>896</td></tr><tr><td>2160 min Summer</td><td>3.393</td><td>0.0</td><td>1280</td></tr><tr><td>2880 min Summer</td><td>2.707</td><td>0.0</td><td>1644</td></tr><tr><td>4320 min Summer</td><td>1.993</td><td>0.0</td><td>2332</td></tr><tr><td>5760 min Summer</td><td>1.625</td><td>0.0</td><td>2944</td></tr><tr><td>7200 min Summer</td><td>1.405</td><td>0.0</td><td>3672</td></tr><tr><td>8640 min Summer</td><td>1.258</td><td>0.0</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.155</td><td>0.0</td><td>5136</td></tr><tr><td>15 min Winter</td><td>137.200</td><td>0.0</td><td>18</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.166	0.166	0.6	10.5	0 K	30 min Summer	0.221	0.221	0.6	14.0	Flood Risk	60 min Summer	0.275	0.275	0.6	17.5	Flood Risk	120 min Summer	0.303	0.303	0.6	19.2	Flood Risk	180 min Summer	0.313	0.313	0.6	19.9	Flood Risk	240 min Summer	0.314	0.314	0.6	19.9	Flood Risk	360 min Summer	0.307	0.307	0.6	19.5	Flood Risk	480 min Summer	0.298	0.298	0.6	18.9	Flood Risk	600 min Summer	0.288	0.288	0.6	18.3	Flood Risk	720 min Summer	0.278	0.278	0.6	17.6	Flood Risk	960 min Summer	0.257	0.257	0.6	16.3	Flood Risk	1440 min Summer	0.217	0.217	0.6	13.8	Flood Risk	2160 min Summer	0.166	0.166	0.6	10.5	0 K	2880 min Summer	0.127	0.127	0.6	8.0	0 K	4320 min Summer	0.075	0.075	0.6	4.8	0 K	5760 min Summer	0.051	0.051	0.6	3.3	0 K	7200 min Summer	0.045	0.045	0.5	2.9	0 K	8640 min Summer	0.041	0.041	0.4	2.6	0 K	10080 min Summer	0.038	0.038	0.4	2.4	0 K	15 min Winter	0.188	0.188	0.6	11.9	0 K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	137.200	0.0	18	30 min Summer	91.280	0.0	33	60 min Summer	58.100	0.0	62	120 min Summer	33.950	0.0	122	180 min Summer	24.762	0.0	182	240 min Summer	19.775	0.0	240	360 min Summer	14.373	0.0	306	480 min Summer	11.428	0.0	366	600 min Summer	9.554	0.0	430	720 min Summer	8.248	0.0	496	960 min Summer	6.538	0.0	634	1440 min Summer	4.702	0.0	896	2160 min Summer	3.393	0.0	1280	2880 min Summer	2.707	0.0	1644	4320 min Summer	1.993	0.0	2332	5760 min Summer	1.625	0.0	2944	7200 min Summer	1.405	0.0	3672	8640 min Summer	1.258	0.0	4408	10080 min Summer	1.155	0.0	5136	15 min Winter	137.200	0.0	18
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Cundall, Johnston & Partners		Page 2
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK C	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

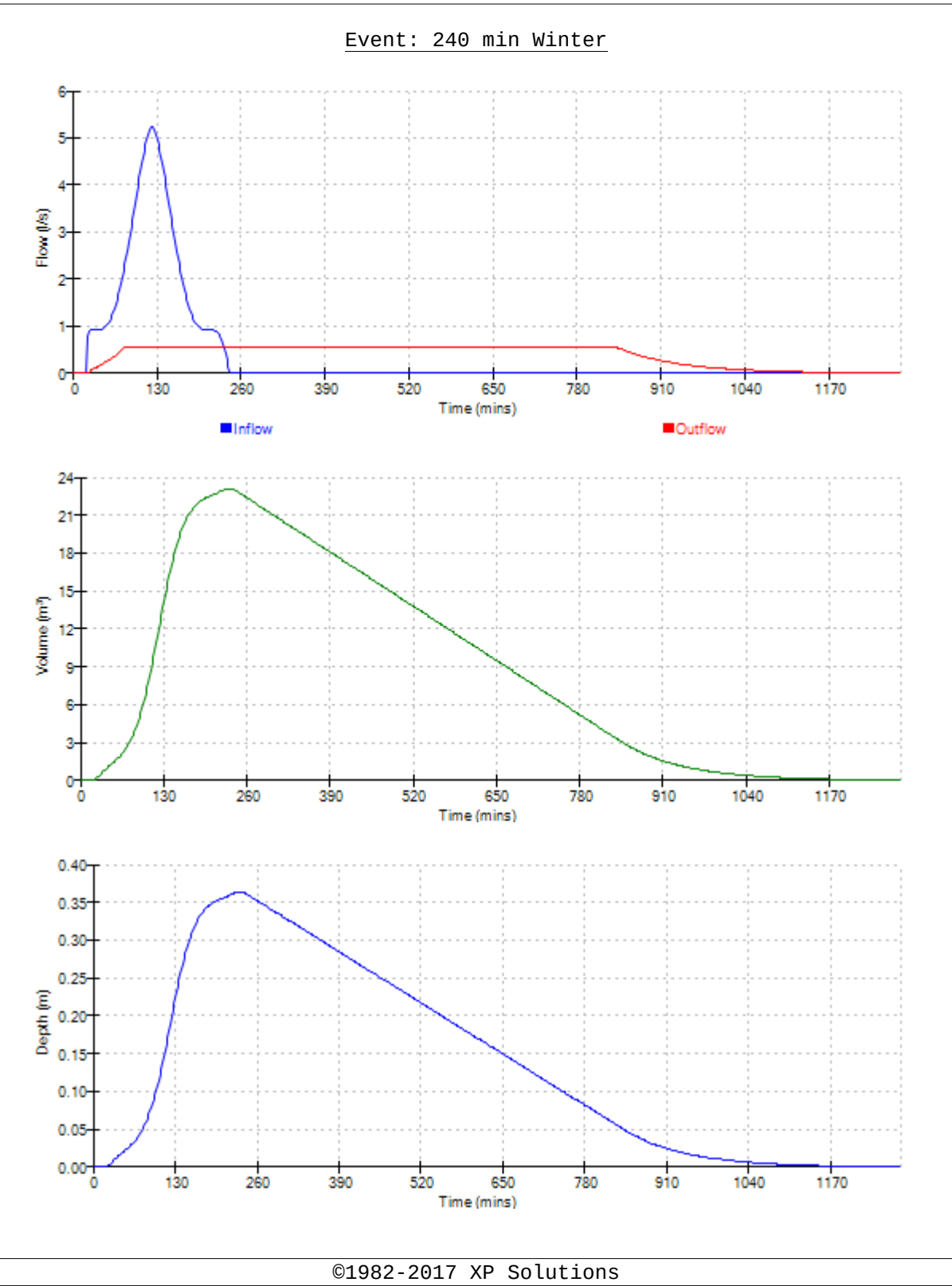
Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.249	0.249	0.6	15.8	Flood Risk
60 min Winter	0.312	0.312	0.6	19.8	Flood Risk
120 min Winter	0.346	0.346	0.6	22.0	Flood Risk
180 min Winter	0.359	0.359	0.6	22.8	Flood Risk
240 min Winter	0.364	0.364	0.6	23.1	Flood Risk
360 min Winter	0.358	0.358	0.6	22.8	Flood Risk
480 min Winter	0.345	0.345	0.6	21.9	Flood Risk
600 min Winter	0.332	0.332	0.6	21.1	Flood Risk
720 min Winter	0.317	0.317	0.6	20.2	Flood Risk
960 min Winter	0.287	0.287	0.6	18.2	Flood Risk
1440 min Winter	0.227	0.227	0.6	14.4	Flood Risk
2160 min Winter	0.151	0.151	0.6	9.6	0 K
2880 min Winter	0.094	0.094	0.6	6.0	0 K
4320 min Winter	0.047	0.047	0.5	3.0	0 K
5760 min Winter	0.039	0.039	0.4	2.4	0 K
7200 min Winter	0.033	0.033	0.4	2.1	0 K
8640 min Winter	0.030	0.030	0.3	1.9	0 K
10080 min Winter	0.028	0.028	0.3	1.7	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	91.280	0.0	33
60 min Winter	58.100	0.0	62
120 min Winter	33.950	0.0	120
180 min Winter	24.762	0.0	178
240 min Winter	19.775	0.0	234
360 min Winter	14.373	0.0	342
480 min Winter	11.428	0.0	392
600 min Winter	9.554	0.0	464
720 min Winter	8.248	0.0	540
960 min Winter	6.538	0.0	692
1440 min Winter	4.702	0.0	970
2160 min Winter	3.393	0.0	1360
2880 min Winter	2.707	0.0	1700
4320 min Winter	1.993	0.0	2248
5760 min Winter	1.625	0.0	2984
7200 min Winter	1.405	0.0	3680
8640 min Winter	1.258	0.0	4408
10080 min Winter	1.155	0.0	5080

Cundall, Johnston & Partners		Page 3																																	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK C																																		
Date 01/12/2017	Designed by LK																																		
File Drainage Zone C - Car P...	Checked by																																		
Micro Drainage		Source Control 2017.1.2																																	
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 473800 105650 SU 73800 05650</td> </tr> <tr> <td>Data Type</td> <td>Catchment</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.045 <table> <thead> <tr> <th colspan="2">Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>0.045</td> </tr> </tbody> </table>			Rainfall Model	FEH	Return Period (years)	100	FEH Rainfall Version	2013	Site Location	GB 473800 105650 SU 73800 05650	Data Type	Catchment	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	0.750	Cv (Winter)	0.840	Shortest Storm (mins)	15	Longest Storm (mins)	10080	Climate Change %	+40	Time (mins)		Area	From:	To:	(ha)	0	4	0.045
Rainfall Model	FEH																																		
Return Period (years)	100																																		
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0	4	0.045																																	
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Cundall, Johnston & Partners		Page 4																								
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK C																									
Date 01/12/2017	Designed by LK																									
File Drainage Zone C - Car P...	Checked by																									
Micro Drainage		Source Control 2017.1.2																								
<u>Model Details</u> Storage is Online Cover Level (m) 0.500 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01872</td> <td>Width (m)</td> <td>18.9</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>11.2</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>58.8</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>3</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>1</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Membrane Depth (m)</td> <td>130</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	18.9	Membrane Percolation (mm/hr)	1000	Length (m)	11.2	Max Percolation (l/s)	58.8	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	3	Porosity	0.30	Evaporation (mm/day)	1	Invert Level (m)	0.000	Membrane Depth (m)	130
Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	18.9																							
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Invert Level (m)	0.000	Membrane Depth (m)	130																							
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Cundall, Johnston & Partners					Page 1	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK D			
Date 01/12/2017			Designed by LK			
File Drainage Zone C - Car P...			Checked by			
Micro Drainage			Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)						
Half Drain Time : 263 minutes.						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
15 min Summer	0.183	0.183	1.0	15.5	0 K	
30 min Summer	0.238	0.238	1.0	20.5	Flood Risk	
60 min Summer	0.289	0.289	1.0	25.2	Flood Risk	
120 min Summer	0.311	0.311	1.0	27.1	Flood Risk	
180 min Summer	0.314	0.314	1.0	27.4	Flood Risk	
240 min Summer	0.309	0.309	1.0	27.0	Flood Risk	
360 min Summer	0.299	0.299	1.0	26.0	Flood Risk	
480 min Summer	0.286	0.286	1.0	24.8	Flood Risk	
600 min Summer	0.272	0.272	1.0	23.6	Flood Risk	
720 min Summer	0.258	0.258	1.0	22.4	Flood Risk	
960 min Summer	0.232	0.232	1.0	20.0	Flood Risk	
1440 min Summer	0.185	0.185	1.0	15.7	0 K	
2160 min Summer	0.128	0.128	1.0	10.7	0 K	
2880 min Summer	0.087	0.087	1.0	7.2	0 K	
4320 min Summer	0.050	0.050	1.0	4.1	0 K	
5760 min Summer	0.041	0.041	0.8	3.4	0 K	
7200 min Summer	0.036	0.036	0.7	3.0	0 K	
8640 min Summer	0.032	0.032	0.7	2.7	0 K	
10080 min Summer	0.030	0.030	0.6	2.5	0 K	
15 min Winter	0.206	0.206	1.0	17.6	Flood Risk	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
15 min Summer	137.200	0.0	18			
30 min Summer	91.280	0.0	33			
60 min Summer	58.100	0.0	62			
120 min Summer	33.950	0.0	122			
180 min Summer	24.762	0.0	180			
240 min Summer	19.775	0.0	214			
360 min Summer	14.373	0.0	274			
480 min Summer	11.428	0.0	338			
600 min Summer	9.554	0.0	406			
720 min Summer	8.248	0.0	472			
960 min Summer	6.538	0.0	608			
1440 min Summer	4.702	0.0	866			
2160 min Summer	3.393	0.0	1232			
2880 min Summer	2.707	0.0	1560			
4320 min Summer	1.993	0.0	2204			
5760 min Summer	1.625	0.0	2936			
7200 min Summer	1.405	0.0	3672			
8640 min Summer	1.258	0.0	4408			
10080 min Summer	1.155	0.0	5136			
15 min Winter	137.200	0.0	18			
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Cundall, Johnston & Partners		Page 2
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK D	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.267	0.267	1.0	23.1	Flood Risk
60 min Winter	0.327	0.327	1.0	28.6	Flood Risk
120 min Winter	0.355	0.355	1.0	31.1	Flood Risk
180 min Winter	0.362	0.362	1.0	31.7	Flood Risk
240 min Winter	0.359	0.359	1.0	31.5	Flood Risk
360 min Winter	0.344	0.344	1.0	30.1	Flood Risk
480 min Winter	0.326	0.326	1.0	28.5	Flood Risk
600 min Winter	0.307	0.307	1.0	26.8	Flood Risk
720 min Winter	0.287	0.287	1.0	25.0	Flood Risk
960 min Winter	0.248	0.248	1.0	21.4	Flood Risk
1440 min Winter	0.177	0.177	1.0	14.9	0 K
2160 min Winter	0.092	0.092	1.0	7.7	0 K
2880 min Winter	0.050	0.050	1.0	4.2	0 K
4320 min Winter	0.037	0.037	0.8	3.1	0 K
5760 min Winter	0.030	0.030	0.6	2.5	0 K
7200 min Winter	0.026	0.026	0.5	2.2	0 K
8640 min Winter	0.024	0.024	0.5	2.0	0 K
10080 min Winter	0.022	0.022	0.4	1.8	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	91.280	0.0	33
60 min Winter	58.100	0.0	62
120 min Winter	33.950	0.0	118
180 min Winter	24.762	0.0	176
240 min Winter	19.775	0.0	230
360 min Winter	14.373	0.0	294
480 min Winter	11.428	0.0	366
600 min Winter	9.554	0.0	442
720 min Winter	8.248	0.0	518
960 min Winter	6.538	0.0	662
1440 min Winter	4.702	0.0	924
2160 min Winter	3.393	0.0	1260
2880 min Winter	2.707	0.0	1500
4320 min Winter	1.993	0.0	2208
5760 min Winter	1.625	0.0	2944
7200 min Winter	1.405	0.0	3680
8640 min Winter	1.258	0.0	4328
10080 min Winter	1.155	0.0	5032

Cundall, Johnston & Partners		Page 4
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK D	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

Model Details

Storage is Online Cover Level (m) 0.500

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.03312	Width (m)	14.1
Membrane Percolation (mm/hr)	1000	Length (m)	14.1
Max Percolation (l/s)	55.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	3
Porosity	0.30	Evaporation (mm/day)	1
Invert Level (m)	0.000	Membrane Depth (m)	130

Cellular Storage

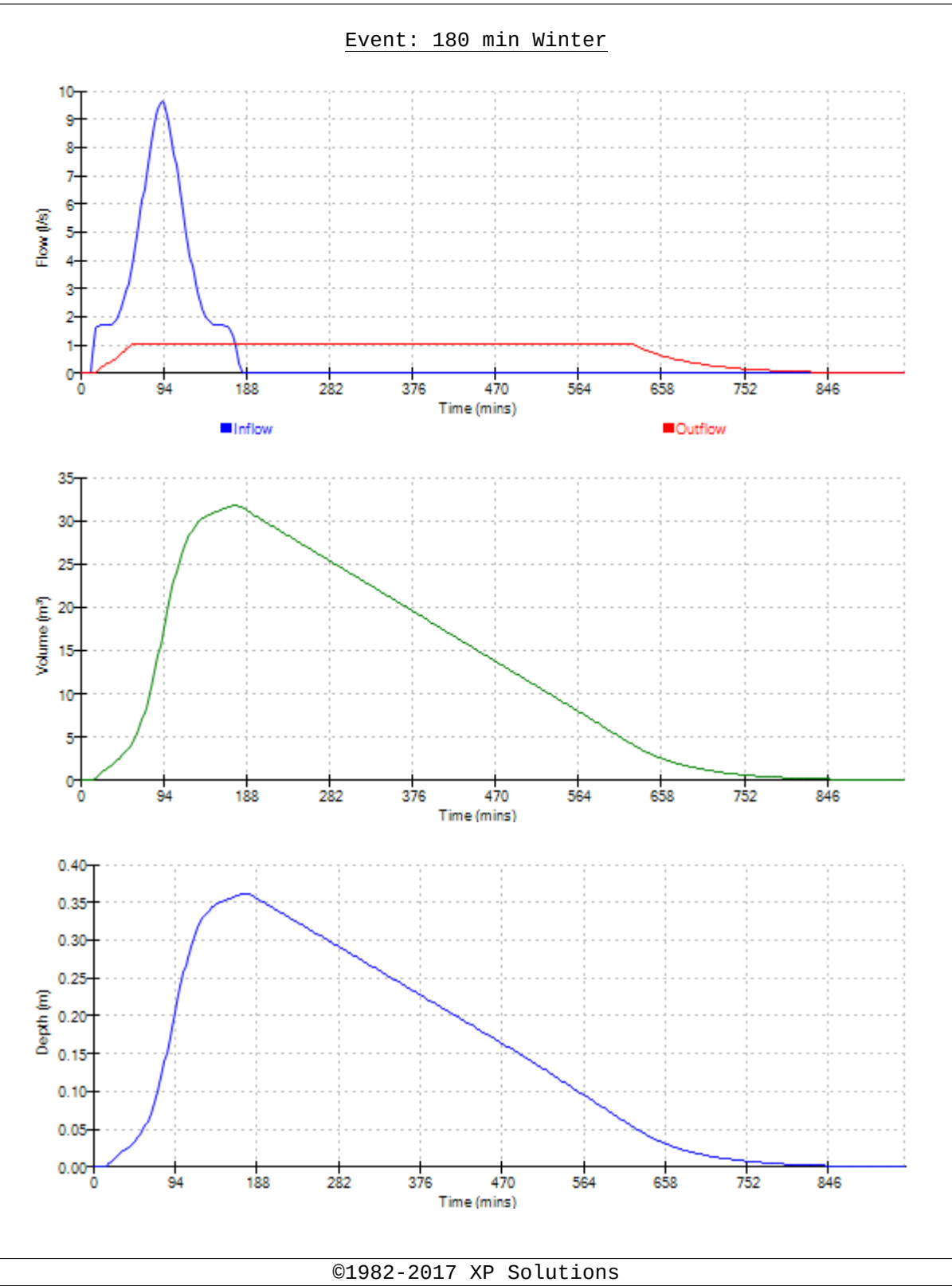
Invert Level (m)	0.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.03312	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	25.0	25.0	0.150	25.0	25.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	3
Porosity	0.30	Evaporation (mm/day)	1
Invert Level (m)	0.150	Membrane Depth (m)	130

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19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK E																																																																																																																																																																																																																					
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Micro Drainage			Source Control 2017.1.2																																																																																																																																																																																																																					
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 200 minutes. <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>0.179</td><td>0.179</td><td>0.8</td><td>9.4</td><td>0 K</td></tr><tr><td>30 min Summer</td><td>0.235</td><td>0.235</td><td>0.8</td><td>12.4</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.286</td><td>0.286</td><td>0.8</td><td>15.1</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.301</td><td>0.301</td><td>0.8</td><td>15.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.298</td><td>0.298</td><td>0.8</td><td>15.7</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.292</td><td>0.292</td><td>0.8</td><td>15.4</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.276</td><td>0.276</td><td>0.8</td><td>14.6</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.259</td><td>0.259</td><td>0.8</td><td>13.7</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.241</td><td>0.241</td><td>0.8</td><td>12.7</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.224</td><td>0.224</td><td>0.8</td><td>11.8</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.192</td><td>0.192</td><td>0.8</td><td>10.1</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>0.137</td><td>0.137</td><td>0.8</td><td>7.2</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>0.081</td><td>0.081</td><td>0.8</td><td>4.3</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>0.053</td><td>0.053</td><td>0.8</td><td>2.8</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>0.040</td><td>0.040</td><td>0.6</td><td>2.1</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>0.033</td><td>0.033</td><td>0.5</td><td>1.7</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>0.029</td><td>0.029</td><td>0.5</td><td>1.5</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>0.026</td><td>0.026</td><td>0.4</td><td>1.4</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>0.024</td><td>0.024</td><td>0.4</td><td>1.2</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>0.202</td><td>0.202</td><td>0.8</td><td>10.7</td><td>Flood Risk</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>137.200</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>91.280</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>58.100</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>33.950</td><td>0.0</td><td>120</td></tr><tr><td>180 min Summer</td><td>24.762</td><td>0.0</td><td>160</td></tr><tr><td>240 min Summer</td><td>19.775</td><td>0.0</td><td>190</td></tr><tr><td>360 min Summer</td><td>14.373</td><td>0.0</td><td>254</td></tr><tr><td>480 min Summer</td><td>11.428</td><td>0.0</td><td>322</td></tr><tr><td>600 min Summer</td><td>9.554</td><td>0.0</td><td>388</td></tr><tr><td>720 min Summer</td><td>8.248</td><td>0.0</td><td>456</td></tr><tr><td>960 min Summer</td><td>6.538</td><td>0.0</td><td>588</td></tr><tr><td>1440 min Summer</td><td>4.702</td><td>0.0</td><td>836</td></tr><tr><td>2160 min Summer</td><td>3.393</td><td>0.0</td><td>1172</td></tr><tr><td>2880 min Summer</td><td>2.707</td><td>0.0</td><td>1496</td></tr><tr><td>4320 min Summer</td><td>1.993</td><td>0.0</td><td>2204</td></tr><tr><td>5760 min Summer</td><td>1.625</td><td>0.0</td><td>2936</td></tr><tr><td>7200 min Summer</td><td>1.405</td><td>0.0</td><td>3672</td></tr><tr><td>8640 min Summer</td><td>1.258</td><td>0.0</td><td>4400</td></tr><tr><td>10080 min Summer</td><td>1.155</td><td>0.0</td><td>5136</td></tr><tr><td>15 min Winter</td><td>137.200</td><td>0.0</td><td>18</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.179	0.179	0.8	9.4	0 K	30 min Summer	0.235	0.235	0.8	12.4	Flood Risk	60 min Summer	0.286	0.286	0.8	15.1	Flood Risk	120 min Summer	0.301	0.301	0.8	15.9	Flood Risk	180 min Summer	0.298	0.298	0.8	15.7	Flood Risk	240 min Summer	0.292	0.292	0.8	15.4	Flood Risk	360 min Summer	0.276	0.276	0.8	14.6	Flood Risk	480 min Summer	0.259	0.259	0.8	13.7	Flood Risk	600 min Summer	0.241	0.241	0.8	12.7	Flood Risk	720 min Summer	0.224	0.224	0.8	11.8	Flood Risk	960 min Summer	0.192	0.192	0.8	10.1	0 K	1440 min Summer	0.137	0.137	0.8	7.2	0 K	2160 min Summer	0.081	0.081	0.8	4.3	0 K	2880 min Summer	0.053	0.053	0.8	2.8	0 K	4320 min Summer	0.040	0.040	0.6	2.1	0 K	5760 min Summer	0.033	0.033	0.5	1.7	0 K	7200 min Summer	0.029	0.029	0.5	1.5	0 K	8640 min Summer	0.026	0.026	0.4	1.4	0 K	10080 min Summer	0.024	0.024	0.4	1.2	0 K	15 min Winter	0.202	0.202	0.8	10.7	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	137.200	0.0	18	30 min Summer	91.280	0.0	33	60 min Summer	58.100	0.0	62	120 min Summer	33.950	0.0	120	180 min Summer	24.762	0.0	160	240 min Summer	19.775	0.0	190	360 min Summer	14.373	0.0	254	480 min Summer	11.428	0.0	322	600 min Summer	9.554	0.0	388	720 min Summer	8.248	0.0	456	960 min Summer	6.538	0.0	588	1440 min Summer	4.702	0.0	836	2160 min Summer	3.393	0.0	1172	2880 min Summer	2.707	0.0	1496	4320 min Summer	1.993	0.0	2204	5760 min Summer	1.625	0.0	2936	7200 min Summer	1.405	0.0	3672	8640 min Summer	1.258	0.0	4400	10080 min Summer	1.155	0.0	5136	15 min Winter	137.200	0.0	18
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																			
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60 min Summer	0.286	0.286	0.8	15.1	Flood Risk																																																																																																																																																																																																																			
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120 min Summer	33.950	0.0	120																																																																																																																																																																																																																					
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Cundall, Johnston & Partners		Page 2
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK E	
Date 04/12/2017 10:18 File Drainage Zone C - Car P...	Designed by 01/12/17 Checked by	
Micro Drainage	Source Control 2017.1.2	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.266	0.266	0.8	14.1	Flood Risk
60 min Winter	0.326	0.326	0.8	17.2	Flood Risk
120 min Winter	0.348	0.348	0.8	18.4	Flood Risk
180 min Winter	0.347	0.347	0.8	18.3	Flood Risk
240 min Winter	0.338	0.338	0.8	17.8	Flood Risk
360 min Winter	0.317	0.317	0.8	16.8	Flood Risk
480 min Winter	0.292	0.292	0.8	15.4	Flood Risk
600 min Winter	0.266	0.266	0.8	14.1	Flood Risk
720 min Winter	0.240	0.240	0.8	12.7	Flood Risk
960 min Winter	0.191	0.191	0.8	10.1	0 K
1440 min Winter	0.111	0.111	0.8	5.8	0 K
2160 min Winter	0.049	0.049	0.8	2.6	0 K
2880 min Winter	0.040	0.040	0.6	2.1	0 K
4320 min Winter	0.029	0.029	0.5	1.6	0 K
5760 min Winter	0.024	0.024	0.4	1.3	0 K
7200 min Winter	0.021	0.021	0.3	1.1	0 K
8640 min Winter	0.019	0.019	0.3	1.0	0 K
10080 min Winter	0.017	0.017	0.3	0.9	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	91.280	0.0	32
60 min Winter	58.100	0.0	62
120 min Winter	33.950	0.0	118
180 min Winter	24.762	0.0	172
240 min Winter	19.775	0.0	222
360 min Winter	14.373	0.0	276
480 min Winter	11.428	0.0	350
600 min Winter	9.554	0.0	424
720 min Winter	8.248	0.0	496
960 min Winter	6.538	0.0	628
1440 min Winter	4.702	0.0	866
2160 min Winter	3.393	0.0	1128
2880 min Winter	2.707	0.0	1496
4320 min Winter	1.993	0.0	2208
5760 min Winter	1.625	0.0	2912
7200 min Winter	1.405	0.0	3672
8640 min Winter	1.258	0.0	4296
10080 min Winter	1.155	0.0	4984

Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK E	
Date 04/12/2017 10:18	Designed by 01/12/17	
File Drainage Zone C - Car P...	Checked by	
Micro Drainage		Source Control 2017.1.2

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

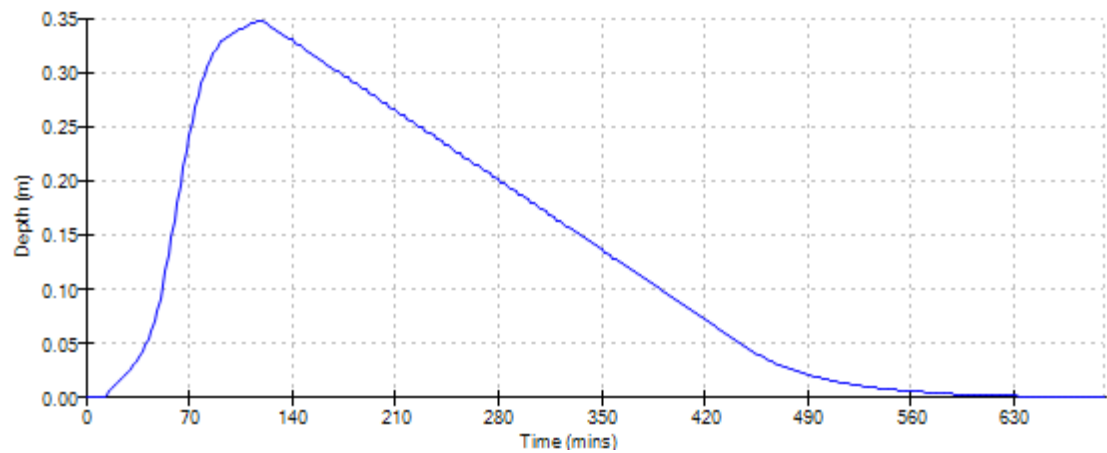
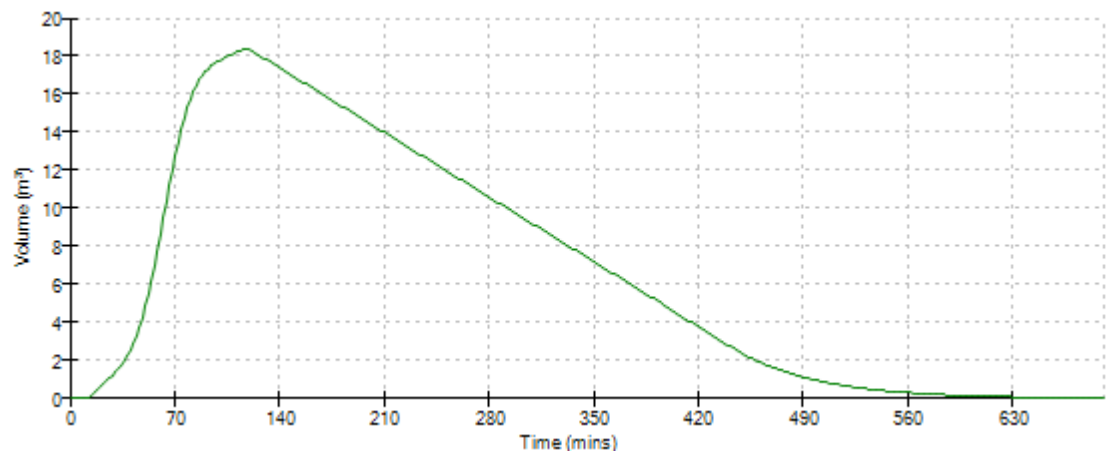
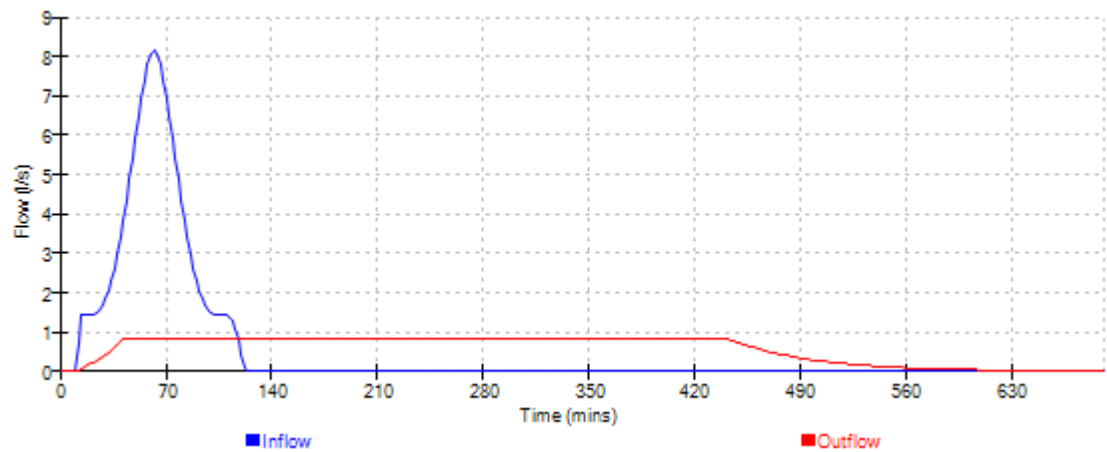
Total Area (ha) 0.041

Time (mins)	Area
From:	To: (ha)

0	4 0.041
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Cundall, Johnston & Partners		Page 4																								
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C CAR PARK E																									
Date 04/12/2017 10:18 File Drainage Zone C - Car P...	Designed by 01/12/17 Checked by																									
Micro Drainage Source Control 2017.1.2																										
<u>Model Details</u> Storage is Online Cover Level (m) 0.500 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.03312</td> <td>Width (m)</td> <td>11.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>16.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>48.9</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>3</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>1</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Membrane Depth (m)</td> <td>130</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.03312	Width (m)	11.0	Membrane Percolation (mm/hr)	1000	Length (m)	16.0	Max Percolation (l/s)	48.9	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	3	Porosity	0.30	Evaporation (mm/day)	1	Invert Level (m)	0.000	Membrane Depth (m)	130
Infiltration Coefficient Base (m/hr)	0.03312	Width (m)	11.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	16.0																							
Max Percolation (l/s)	48.9	Slope (1:X)	0.0																							
Safety Factor	2.0	Depression Storage (mm)	3																							
Porosity	0.30	Evaporation (mm/day)	1																							
Invert Level (m)	0.000	Membrane Depth (m)	130																							
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Event: 120 min Winter



Cundall, Johnston & Partners					Page 1	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 1			
Date 04/12/2017 10:19			Designed by 01/12/17			
File Drainage Zone C - Perme...			Checked by			
Micro Drainage			Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)						
Half Drain Time : 412 minutes.						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
15 min Summer	0.154	0.154	0.9	20.4	0 K	
30 min Summer	0.201	0.201	0.9	27.1	Flood Risk	
60 min Summer	0.248	0.248	0.9	33.8	Flood Risk	
120 min Summer	0.275	0.275	0.9	37.6	Flood Risk	
180 min Summer	0.285	0.285	0.9	39.1	Flood Risk	
240 min Summer	0.289	0.289	0.9	39.6	Flood Risk	
360 min Summer	0.285	0.285	0.9	39.1	Flood Risk	
480 min Summer	0.279	0.279	0.9	38.2	Flood Risk	
600 min Summer	0.271	0.271	0.9	37.1	Flood Risk	
720 min Summer	0.264	0.264	0.9	36.0	Flood Risk	
960 min Summer	0.248	0.248	0.9	33.7	Flood Risk	
1440 min Summer	0.217	0.217	0.9	29.3	Flood Risk	
2160 min Summer	0.176	0.176	0.9	23.5	0 K	
2880 min Summer	0.143	0.143	0.9	18.8	0 K	
4320 min Summer	0.092	0.092	0.9	12.2	0 K	
5760 min Summer	0.063	0.063	0.9	8.3	0 K	
7200 min Summer	0.050	0.050	0.9	6.6	0 K	
8640 min Summer	0.046	0.046	0.9	6.0	0 K	
10080 min Summer	0.042	0.042	0.8	5.6	0 K	
15 min Winter	0.173	0.173	0.9	23.0	0 K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
15 min Summer	137.200	0.0	19			
30 min Summer	91.280	0.0	33			
60 min Summer	58.100	0.0	62			
120 min Summer	33.950	0.0	122			
180 min Summer	24.762	0.0	182			
240 min Summer	19.775	0.0	240			
360 min Summer	14.373	0.0	330			
480 min Summer	11.428	0.0	386			
600 min Summer	9.554	0.0	446			
720 min Summer	8.248	0.0	512			
960 min Summer	6.538	0.0	646			
1440 min Summer	4.702	0.0	912			
2160 min Summer	3.393	0.0	1300			
2880 min Summer	2.707	0.0	1676			
4320 min Summer	1.993	0.0	2380			
5760 min Summer	1.625	0.0	3056			
7200 min Summer	1.405	0.0	3680			
8640 min Summer	1.258	0.0	4408			
10080 min Summer	1.155	0.0	5144			
15 min Winter	137.200	0.0	18			
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Cundall, Johnston & Partners					Page 2
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG		1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 1			
Date 04/12/2017 10:19 File Drainage Zone C - Perme...		Designed by 01/12/17 Checked by			
Micro Drainage		Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.226	0.226	0.9	30.6	Flood Risk
60 min Winter	0.280	0.280	0.9	38.3	Flood Risk
120 min Winter	0.311	0.311	0.9	42.8	Flood Risk
180 min Winter	0.325	0.325	0.9	44.8	Flood Risk
240 min Winter	0.331	0.331	0.9	45.6	Flood Risk
360 min Winter	0.331	0.331	0.9	45.6	Flood Risk
480 min Winter	0.322	0.322	0.9	44.3	Flood Risk
600 min Winter	0.311	0.311	0.9	42.8	Flood Risk
720 min Winter	0.301	0.301	0.9	41.4	Flood Risk
960 min Winter	0.279	0.279	0.9	38.2	Flood Risk
1440 min Winter	0.233	0.233	0.9	31.6	Flood Risk
2160 min Winter	0.172	0.172	0.9	22.9	0 K
2880 min Winter	0.121	0.121	0.9	15.9	0 K
4320 min Winter	0.056	0.056	0.9	7.3	0 K
5760 min Winter	0.043	0.043	0.8	5.7	0 K
7200 min Winter	0.038	0.038	0.7	5.0	0 K
8640 min Winter	0.034	0.034	0.6	4.4	0 K
10080 min Winter	0.031	0.031	0.6	4.1	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	91.280	0.0	33		
60 min Winter	58.100	0.0	62		
120 min Winter	33.950	0.0	120		
180 min Winter	24.762	0.0	178		
240 min Winter	19.775	0.0	234		
360 min Winter	14.373	0.0	346		
480 min Winter	11.428	0.0	448		
600 min Winter	9.554	0.0	480		
720 min Winter	8.248	0.0	554		
960 min Winter	6.538	0.0	704		
1440 min Winter	4.702	0.0	996		
2160 min Winter	3.393	0.0	1404		
2880 min Winter	2.707	0.0	1760		
4320 min Winter	1.993	0.0	2336		
5760 min Winter	1.625	0.0	2992		
7200 min Winter	1.405	0.0	3680		
8640 min Winter	1.258	0.0	4416		
10080 min Winter	1.155	0.0	5136		
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Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 1	
Date 04/12/2017 10:19	Designed by 01/12/17	
File Drainage Zone C - Perme...	Checked by	
Micro Drainage	Source Control 2017.1.2	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.086

Time (mins)	Area
From:	To: (ha)

0	4 0.086
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Cundall, Johnston & Partners		Page 4
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 1	
Date 04/12/2017 10:19 File Drainage Zone C - Perme...	Designed by 01/12/17 Checked by	
Micro Drainage Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 0.500

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	17.9
Membrane Percolation (mm/hr)	1000	Length (m)	17.9
Max Percolation (l/s)	89.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	3
Porosity	0.30	Evaporation (mm/day)	1
Invert Level (m)	0.000	Membrane Depth (m)	130

Cellular Storage

Invert Level (m)	0.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.01872	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

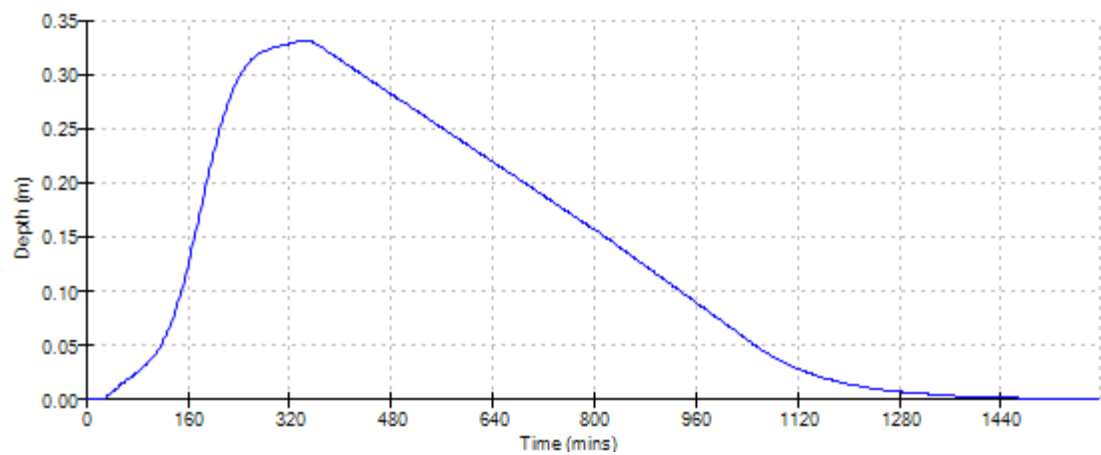
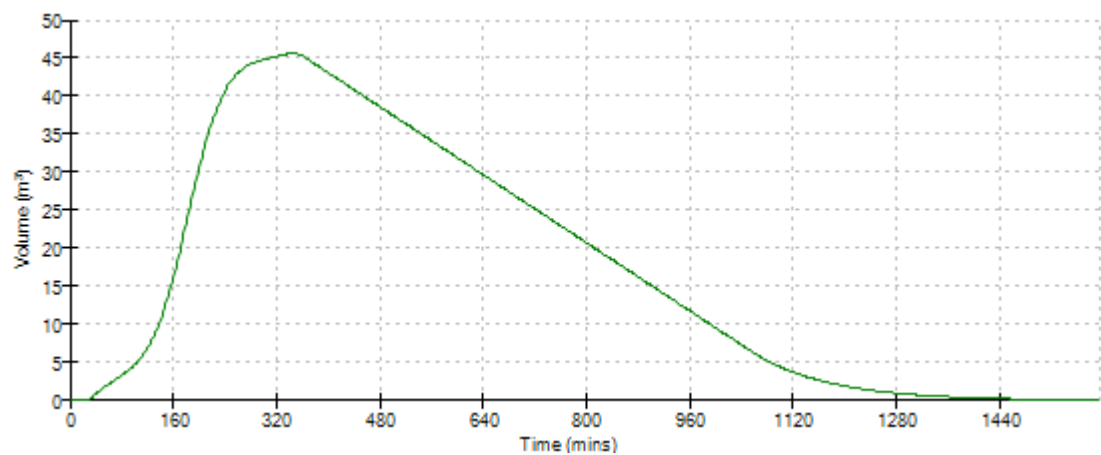
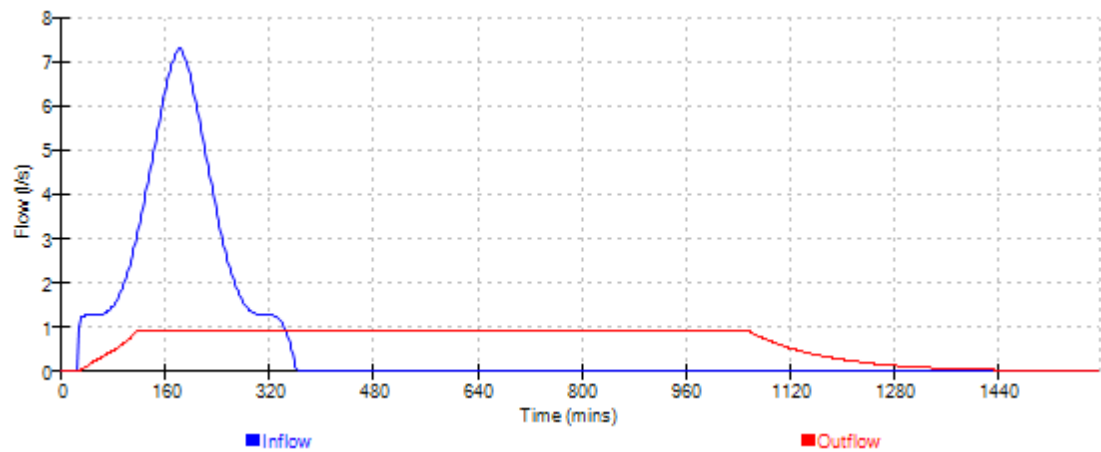
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	37.5	37.5	0.150	37.5	37.5

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.1
Membrane Percolation (mm/hr)	1000	Length (m)	6.1
Max Percolation (l/s)	10.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	3
Porosity	0.30	Evaporation (mm/day)	1
Invert Level (m)	0.150	Membrane Depth (m)	130

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Event: 360 min Winter



Cundall, Johnston & Partners					Page 1
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG		1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 2			
Date 01/12/2017 File Drainage Zone C - Perme...		Designed by LK Checked by			
Micro Drainage		Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)					
Half Drain Time : 407 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.168	0.168	2.1	44.7	0 K
30 min Summer	0.221	0.221	2.1	59.4	Flood Risk
60 min Summer	0.274	0.274	2.1	74.2	Flood Risk
120 min Summer	0.304	0.304	2.1	82.3	Flood Risk
180 min Summer	0.315	0.315	2.1	85.5	Flood Risk
240 min Summer	0.319	0.319	2.1	86.5	Flood Risk
360 min Summer	0.314	0.314	2.1	85.2	Flood Risk
480 min Summer	0.306	0.306	2.1	83.0	Flood Risk
600 min Summer	0.297	0.297	2.1	80.5	Flood Risk
720 min Summer	0.288	0.288	2.1	78.0	Flood Risk
960 min Summer	0.270	0.270	2.1	72.9	Flood Risk
1440 min Summer	0.234	0.234	2.1	63.0	Flood Risk
2160 min Summer	0.188	0.188	2.1	50.2	0 K
2880 min Summer	0.150	0.150	2.1	39.8	0 K
4320 min Summer	0.095	0.095	2.1	25.1	0 K
5760 min Summer	0.063	0.063	2.1	16.7	0 K
7200 min Summer	0.050	0.050	2.1	13.2	0 K
8640 min Summer	0.045	0.045	1.9	12.0	0 K
10080 min Summer	0.042	0.042	1.7	11.1	0 K
15 min Winter	0.189	0.189	2.1	50.5	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	137.200	0.0	19		
30 min Summer	91.280	0.0	33		
60 min Summer	58.100	0.0	62		
120 min Summer	33.950	0.0	122		
180 min Summer	24.762	0.0	182		
240 min Summer	19.775	0.0	240		
360 min Summer	14.373	0.0	328		
480 min Summer	11.428	0.0	384		
600 min Summer	9.554	0.0	446		
720 min Summer	8.248	0.0	508		
960 min Summer	6.538	0.0	646		
1440 min Summer	4.702	0.0	910		
2160 min Summer	3.393	0.0	1300		
2880 min Summer	2.707	0.0	1672		
4320 min Summer	1.993	0.0	2376		
5760 min Summer	1.625	0.0	3048		
7200 min Summer	1.405	0.0	3680		
8640 min Summer	1.258	0.0	4408		
10080 min Summer	1.155	0.0	5144		
15 min Winter	137.200	0.0	18		
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Cundall, Johnston & Partners				Page 2	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG		1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 2			
Date 01/12/2017		Designed by LK			
File Drainage Zone C - Perme...		Checked by			
Micro Drainage		Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.249	0.249	2.1	67.1	Flood Risk
60 min Winter	0.310	0.310	2.1	84.0	Flood Risk
120 min Winter	0.345	0.345	2.1	93.7	Flood Risk
180 min Winter	0.360	0.360	2.1	98.0	Flood Risk
240 min Winter	0.366	0.366	2.1	99.7	Flood Risk
360 min Winter	0.365	0.365	2.1	99.5	Flood Risk
480 min Winter	0.355	0.355	2.1	96.5	Flood Risk
600 min Winter	0.342	0.342	2.1	93.1	Flood Risk
720 min Winter	0.331	0.331	2.1	89.8	Flood Risk
960 min Winter	0.305	0.305	2.1	82.6	Flood Risk
1440 min Winter	0.251	0.251	2.1	67.9	Flood Risk
2160 min Winter	0.181	0.181	2.1	48.4	0 K
2880 min Winter	0.124	0.124	2.1	32.9	0 K
4320 min Winter	0.055	0.055	2.1	14.5	0 K
5760 min Winter	0.043	0.043	1.8	11.4	0 K
7200 min Winter	0.037	0.037	1.5	9.8	0 K
8640 min Winter	0.033	0.033	1.4	8.9	0 K
10080 min Winter	0.031	0.031	1.3	8.1	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	91.280	0.0	33		
60 min Winter	58.100	0.0	62		
120 min Winter	33.950	0.0	120		
180 min Winter	24.762	0.0	178		
240 min Winter	19.775	0.0	234		
360 min Winter	14.373	0.0	346		
480 min Winter	11.428	0.0	446		
600 min Winter	9.554	0.0	476		
720 min Winter	8.248	0.0	552		
960 min Winter	6.538	0.0	704		
1440 min Winter	4.702	0.0	996		
2160 min Winter	3.393	0.0	1388		
2880 min Winter	2.707	0.0	1756		
4320 min Winter	1.993	0.0	2332		
5760 min Winter	1.625	0.0	2992		
7200 min Winter	1.405	0.0	3680		
8640 min Winter	1.258	0.0	4416		
10080 min Winter	1.155	0.0	5144		
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Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 2	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Perme...	Checked by	
Micro Drainage		Source Control 2017.1.2

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.189

Time (mins)	Area
From:	To: (ha)
0	4 0.189

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Cundall, Johnston & Partners		Page 4
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C PERMEABLE ROAD 2	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Perme...	Checked by	
Micro Drainage		Source Control 2017.1.2

Model Details

Storage is Online Cover Level (m) 0.500

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.01872	Width (m)	157.7
Membrane Percolation (mm/hr)	1000	Length (m)	4.8
Max Percolation (l/s)	210.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	3
Porosity	0.30	Evaporation (mm/day)	1
Invert Level (m)	0.000	Membrane Depth (m)	130

Cellular Storage

Invert Level (m)	0.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.01872	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

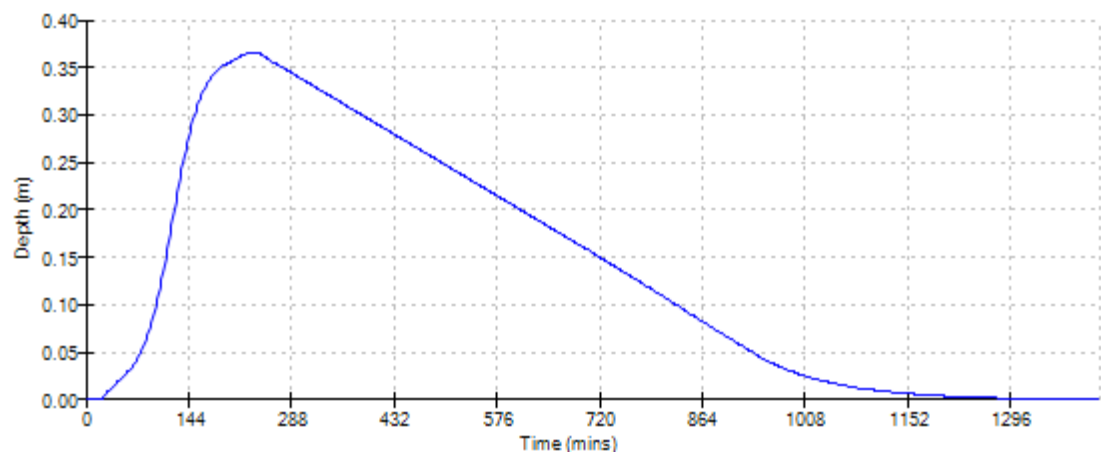
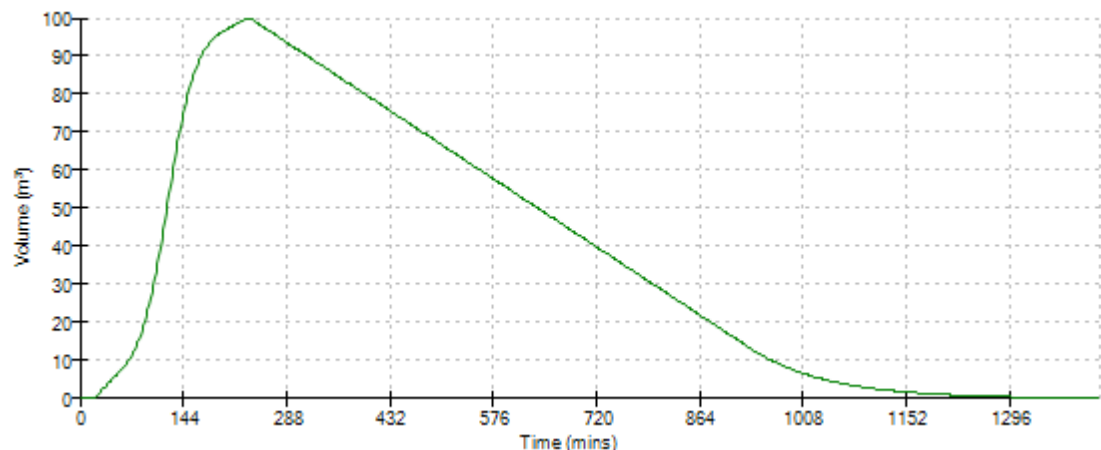
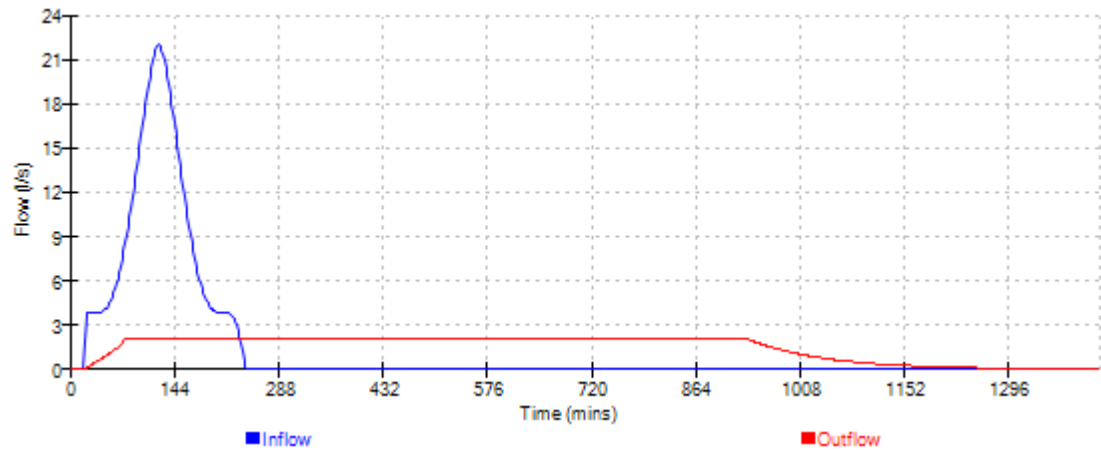
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	40.0	40.0	0.150	40.0	40.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.3
Membrane Percolation (mm/hr)	1000	Length (m)	6.3
Max Percolation (l/s)	11.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	3
Porosity	0.30	Evaporation (mm/day)	1
Invert Level (m)	0.150	Membrane Depth (m)	130

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Event: 240 min Winter



Cundall, Johnston & Partners					Page 1	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 1			
Date 01/12/2017			Designed by LK			
File Drainage Zone C - Road ...			Checked by			
Micro Drainage			Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)						
Half Drain Time : 941 minutes.						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
15 min Summer	0.122	0.122	0.5	22.0	0 K	
30 min Summer	0.161	0.161	0.5	29.1	0 K	
60 min Summer	0.202	0.202	0.5	36.5	Flood Risk	
120 min Summer	0.230	0.230	0.5	41.5	Flood Risk	
180 min Summer	0.246	0.246	0.5	44.3	Flood Risk	
240 min Summer	0.255	0.255	0.5	46.0	Flood Risk	
360 min Summer	0.265	0.265	0.5	47.9	Flood Risk	
480 min Summer	0.268	0.268	0.5	48.4	Flood Risk	
600 min Summer	0.268	0.268	0.5	48.3	Flood Risk	
720 min Summer	0.265	0.265	0.5	47.8	Flood Risk	
960 min Summer	0.258	0.258	0.5	46.6	Flood Risk	
1440 min Summer	0.244	0.244	0.5	44.0	Flood Risk	
2160 min Summer	0.224	0.224	0.5	40.5	Flood Risk	
2880 min Summer	0.207	0.207	0.5	37.4	Flood Risk	
4320 min Summer	0.178	0.178	0.5	32.1	0 K	
5760 min Summer	0.155	0.155	0.5	28.0	0 K	
7200 min Summer	0.137	0.137	0.5	24.8	0 K	
8640 min Summer	0.123	0.123	0.5	22.2	0 K	
10080 min Summer	0.112	0.112	0.5	20.2	0 K	
15 min Winter	0.137	0.137	0.5	24.7	0 K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
15 min Summer	137.200	0.0	19			
30 min Summer	91.280	0.0	34			
60 min Summer	58.100	0.0	64			
120 min Summer	33.950	0.0	124			
180 min Summer	24.762	0.0	182			
240 min Summer	19.775	0.0	242			
360 min Summer	14.373	0.0	362			
480 min Summer	11.428	0.0	482			
600 min Summer	9.554	0.0	600			
720 min Summer	8.248	0.0	704			
960 min Summer	6.538	0.0	808			
1440 min Summer	4.702	0.0	1050			
2160 min Summer	3.393	0.0	1452			
2880 min Summer	2.707	0.0	1848			
4320 min Summer	1.993	0.0	2640			
5760 min Summer	1.625	0.0	3456			
7200 min Summer	1.405	0.0	4184			
8640 min Summer	1.258	0.0	4928			
10080 min Summer	1.155	0.0	5648			
15 min Winter	137.200	0.0	19			
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Cundall, Johnston & Partners				Page 2	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG		1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 1			
Date 01/12/2017		Designed by LK			
File Drainage Zone C - Road ...		Checked by			
Micro Drainage		Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.181	0.181	0.5	32.6	0 K
60 min Winter	0.227	0.227	0.5	41.0	Flood Risk
120 min Winter	0.259	0.259	0.5	46.8	Flood Risk
180 min Winter	0.277	0.277	0.5	50.1	Flood Risk
240 min Winter	0.289	0.289	0.5	52.2	Flood Risk
360 min Winter	0.302	0.302	0.5	54.5	Flood Risk
480 min Winter	0.308	0.308	0.5	55.5	Flood Risk
600 min Winter	0.309	0.309	0.5	55.7	Flood Risk
720 min Winter	0.307	0.307	0.5	55.5	Flood Risk
960 min Winter	0.300	0.300	0.5	54.2	Flood Risk
1440 min Winter	0.281	0.281	0.5	50.7	Flood Risk
2160 min Winter	0.254	0.254	0.5	45.8	Flood Risk
2880 min Winter	0.228	0.228	0.5	41.1	Flood Risk
4320 min Winter	0.182	0.182	0.5	32.8	0 K
5760 min Winter	0.145	0.145	0.5	26.1	0 K
7200 min Winter	0.116	0.116	0.5	20.9	0 K
8640 min Winter	0.093	0.093	0.5	16.8	0 K
10080 min Winter	0.075	0.075	0.5	13.6	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	91.280	0.0	33		
60 min Winter	58.100	0.0	62		
120 min Winter	33.950	0.0	122		
180 min Winter	24.762	0.0	180		
240 min Winter	19.775	0.0	238		
360 min Winter	14.373	0.0	354		
480 min Winter	11.428	0.0	470		
600 min Winter	9.554	0.0	584		
720 min Winter	8.248	0.0	694		
960 min Winter	6.538	0.0	906		
1440 min Winter	4.702	0.0	1126		
2160 min Winter	3.393	0.0	1580		
2880 min Winter	2.707	0.0	2020		
4320 min Winter	1.993	0.0	2856		
5760 min Winter	1.625	0.0	3640		
7200 min Winter	1.405	0.0	4392		
8640 min Winter	1.258	0.0	5104		
10080 min Winter	1.155	0.0	5752		
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Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 1	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Road ...	Checked by	
Micro Drainage		Source Control 2017.1.2

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

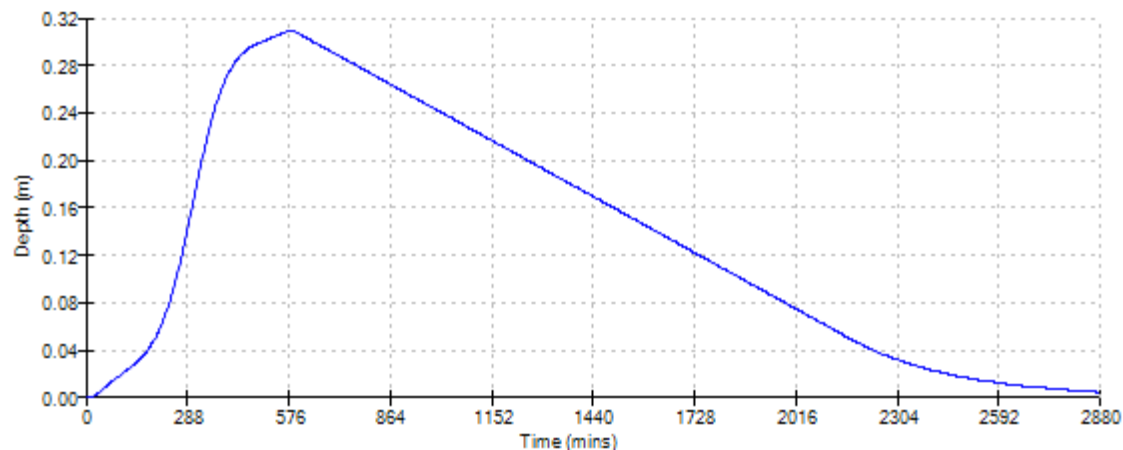
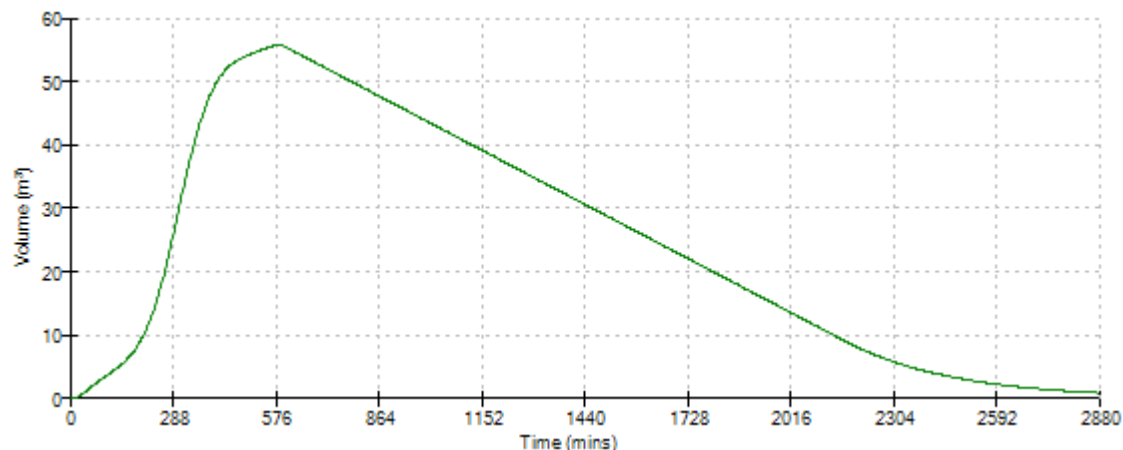
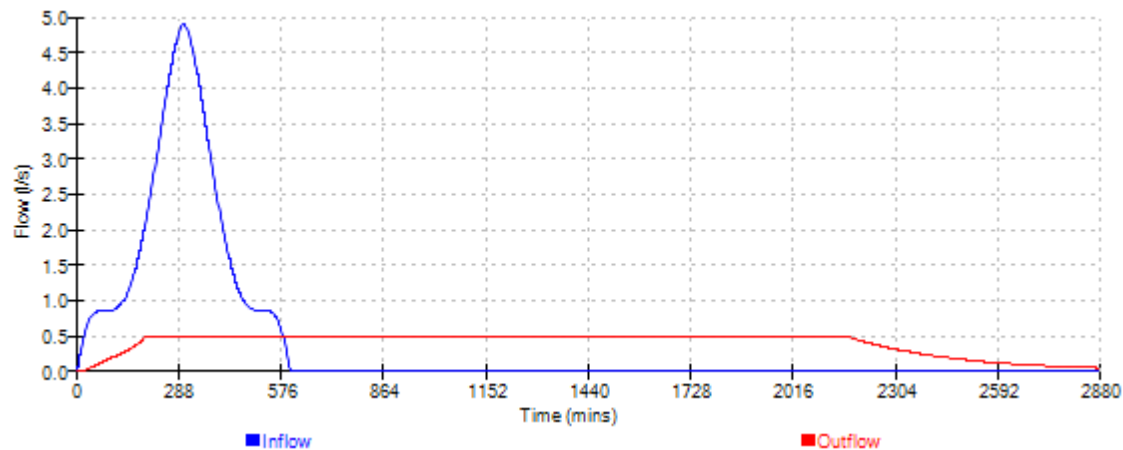
Total Area (ha) 0.087

Time (mins)	Area
From:	To: (ha)
0	4 0.087

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19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 1																			
Date 01/12/2017	Designed by LK																			
File Drainage Zone C - Road ...	Checked by																			
Micro Drainage		Source Control 2017.1.2																		
<u>Model Details</u> Storage is Online Cover Level (m) 0.500 <u>Cellular Storage Structure</u> Invert Level (m) 0.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.01872 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>190.0</td> <td>190.0</td> <td>0.351</td> <td>0.0</td> <td>190.0</td> </tr> <tr> <td>0.350</td> <td>190.0</td> <td>190.0</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	190.0	190.0	0.351	0.0	190.0	0.350	190.0	190.0			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	190.0	190.0	0.351	0.0	190.0															
0.350	190.0	190.0																		
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Event: 600 min Winter



Cundall, Johnston & Partners					Page 1																																																																																																																																																																																																																			
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 2																																																																																																																																																																																																																					
Date 01/12/2017			Designed by LK																																																																																																																																																																																																																					
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Micro Drainage			Source Control 2017.1.2																																																																																																																																																																																																																					
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 972 minutes. <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>0.136</td><td>0.136</td><td>0.3</td><td>15.2</td><td>0 K</td></tr><tr><td>30 min Summer</td><td>0.179</td><td>0.179</td><td>0.3</td><td>20.1</td><td>0 K</td></tr><tr><td>60 min Summer</td><td>0.225</td><td>0.225</td><td>0.3</td><td>25.2</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.256</td><td>0.256</td><td>0.3</td><td>28.7</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.273</td><td>0.273</td><td>0.3</td><td>30.6</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.284</td><td>0.284</td><td>0.3</td><td>31.8</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.295</td><td>0.295</td><td>0.3</td><td>33.1</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.299</td><td>0.299</td><td>0.3</td><td>33.5</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.299</td><td>0.299</td><td>0.3</td><td>33.5</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.296</td><td>0.296</td><td>0.3</td><td>33.1</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.288</td><td>0.288</td><td>0.3</td><td>32.3</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.273</td><td>0.273</td><td>0.3</td><td>30.7</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.253</td><td>0.253</td><td>0.3</td><td>28.3</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.235</td><td>0.235</td><td>0.3</td><td>26.3</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.205</td><td>0.205</td><td>0.3</td><td>23.0</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.181</td><td>0.181</td><td>0.3</td><td>20.3</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>0.163</td><td>0.163</td><td>0.3</td><td>18.2</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>0.148</td><td>0.148</td><td>0.3</td><td>16.6</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>0.136</td><td>0.136</td><td>0.3</td><td>15.2</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>0.152</td><td>0.152</td><td>0.3</td><td>17.0</td><td>0 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>137.200</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>91.280</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>58.100</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>33.950</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>24.762</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>19.775</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>14.373</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.428</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>9.554</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>8.248</td><td>0.0</td><td>712</td></tr><tr><td>960 min Summer</td><td>6.538</td><td>0.0</td><td>808</td></tr><tr><td>1440 min Summer</td><td>4.702</td><td>0.0</td><td>1052</td></tr><tr><td>2160 min Summer</td><td>3.393</td><td>0.0</td><td>1452</td></tr><tr><td>2880 min Summer</td><td>2.707</td><td>0.0</td><td>1872</td></tr><tr><td>4320 min Summer</td><td>1.993</td><td>0.0</td><td>2680</td></tr><tr><td>5760 min Summer</td><td>1.625</td><td>0.0</td><td>3456</td></tr><tr><td>7200 min Summer</td><td>1.405</td><td>0.0</td><td>4248</td></tr><tr><td>8640 min Summer</td><td>1.258</td><td>0.0</td><td>5008</td></tr><tr><td>10080 min Summer</td><td>1.155</td><td>0.0</td><td>5744</td></tr><tr><td>15 min Winter</td><td>137.200</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	0.136	0.136	0.3	15.2	0 K	30 min Summer	0.179	0.179	0.3	20.1	0 K	60 min Summer	0.225	0.225	0.3	25.2	Flood Risk	120 min Summer	0.256	0.256	0.3	28.7	Flood Risk	180 min Summer	0.273	0.273	0.3	30.6	Flood Risk	240 min Summer	0.284	0.284	0.3	31.8	Flood Risk	360 min Summer	0.295	0.295	0.3	33.1	Flood Risk	480 min Summer	0.299	0.299	0.3	33.5	Flood Risk	600 min Summer	0.299	0.299	0.3	33.5	Flood Risk	720 min Summer	0.296	0.296	0.3	33.1	Flood Risk	960 min Summer	0.288	0.288	0.3	32.3	Flood Risk	1440 min Summer	0.273	0.273	0.3	30.7	Flood Risk	2160 min Summer	0.253	0.253	0.3	28.3	Flood Risk	2880 min Summer	0.235	0.235	0.3	26.3	Flood Risk	4320 min Summer	0.205	0.205	0.3	23.0	Flood Risk	5760 min Summer	0.181	0.181	0.3	20.3	0 K	7200 min Summer	0.163	0.163	0.3	18.2	0 K	8640 min Summer	0.148	0.148	0.3	16.6	0 K	10080 min Summer	0.136	0.136	0.3	15.2	0 K	15 min Winter	0.152	0.152	0.3	17.0	0 K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	137.200	0.0	19	30 min Summer	91.280	0.0	34	60 min Summer	58.100	0.0	64	120 min Summer	33.950	0.0	124	180 min Summer	24.762	0.0	182	240 min Summer	19.775	0.0	242	360 min Summer	14.373	0.0	362	480 min Summer	11.428	0.0	482	600 min Summer	9.554	0.0	600	720 min Summer	8.248	0.0	712	960 min Summer	6.538	0.0	808	1440 min Summer	4.702	0.0	1052	2160 min Summer	3.393	0.0	1452	2880 min Summer	2.707	0.0	1872	4320 min Summer	1.993	0.0	2680	5760 min Summer	1.625	0.0	3456	7200 min Summer	1.405	0.0	4248	8640 min Summer	1.258	0.0	5008	10080 min Summer	1.155	0.0	5744	15 min Winter	137.200	0.0	19
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Cundall, Johnston & Partners					Page 2	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 2			
Date 01/12/2017			Designed by LK			
File Drainage Zone C - Road ...			Checked by			
Micro Drainage			Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
30 min Winter	0.201	0.201	0.3	22.5	Flood Risk	
60 min Winter	0.253	0.253	0.3	28.3	Flood Risk	
120 min Winter	0.288	0.288	0.3	32.3	Flood Risk	
180 min Winter	0.309	0.309	0.3	34.6	Flood Risk	
240 min Winter	0.322	0.322	0.3	36.0	Flood Risk	
360 min Winter	0.336	0.336	0.3	37.7	Flood Risk	
480 min Winter	0.342	0.342	0.3	38.4	Flood Risk	
600 min Winter	0.344	0.344	0.3	38.5	Flood Risk	
720 min Winter	0.342	0.342	0.3	38.4	Flood Risk	
960 min Winter	0.335	0.335	0.3	37.5	Flood Risk	
1440 min Winter	0.315	0.315	0.3	35.3	Flood Risk	
2160 min Winter	0.287	0.287	0.3	32.1	Flood Risk	
2880 min Winter	0.260	0.260	0.3	29.1	Flood Risk	
4320 min Winter	0.213	0.213	0.3	23.8	Flood Risk	
5760 min Winter	0.174	0.174	0.3	19.5	0 K	
7200 min Winter	0.144	0.144	0.3	16.1	0 K	
8640 min Winter	0.120	0.120	0.3	13.4	0 K	
10080 min Winter	0.100	0.100	0.3	11.2	0 K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
30 min Winter	91.280	0.0	33			
60 min Winter	58.100	0.0	62			
120 min Winter	33.950	0.0	122			
180 min Winter	24.762	0.0	180			
240 min Winter	19.775	0.0	238			
360 min Winter	14.373	0.0	354			
480 min Winter	11.428	0.0	470			
600 min Winter	9.554	0.0	582			
720 min Winter	8.248	0.0	694			
960 min Winter	6.538	0.0	904			
1440 min Winter	4.702	0.0	1126			
2160 min Winter	3.393	0.0	1580			
2880 min Winter	2.707	0.0	2020			
4320 min Winter	1.993	0.0	2892			
5760 min Winter	1.625	0.0	3688			
7200 min Winter	1.405	0.0	4464			
8640 min Winter	1.258	0.0	5192			
10080 min Winter	1.155	0.0	5944			
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Cundall, Johnston & Partners		Page 3
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 2	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Road ...	Checked by	
Micro Drainage		Source Control 2017.1.2

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 473800 105650 SU 73800 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.060

Time (mins)	Area
From:	To: (ha)
0	4 0.060

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19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 2	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Road ...	Checked by	
Micro Drainage		Source Control 2017.1.2

Model Details

Storage is Online Cover Level (m) 0.500

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0

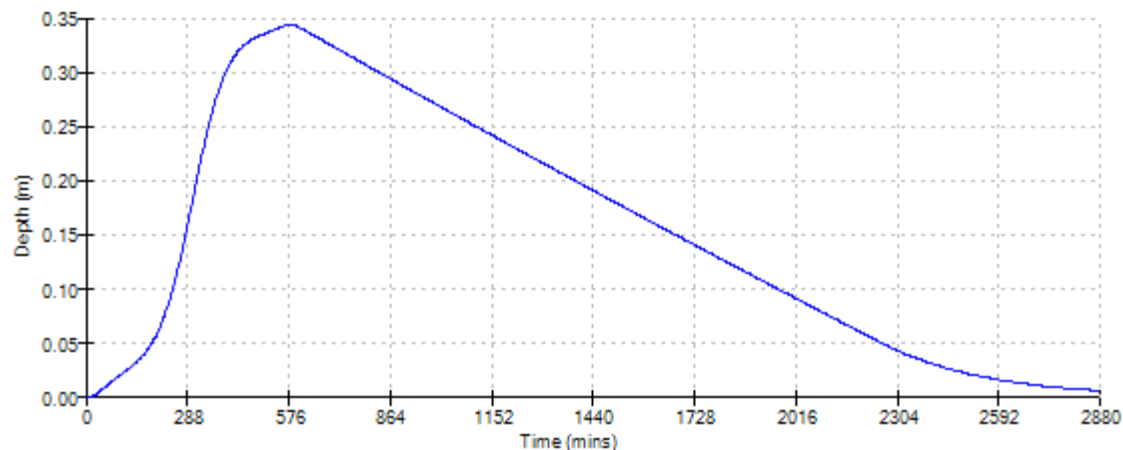
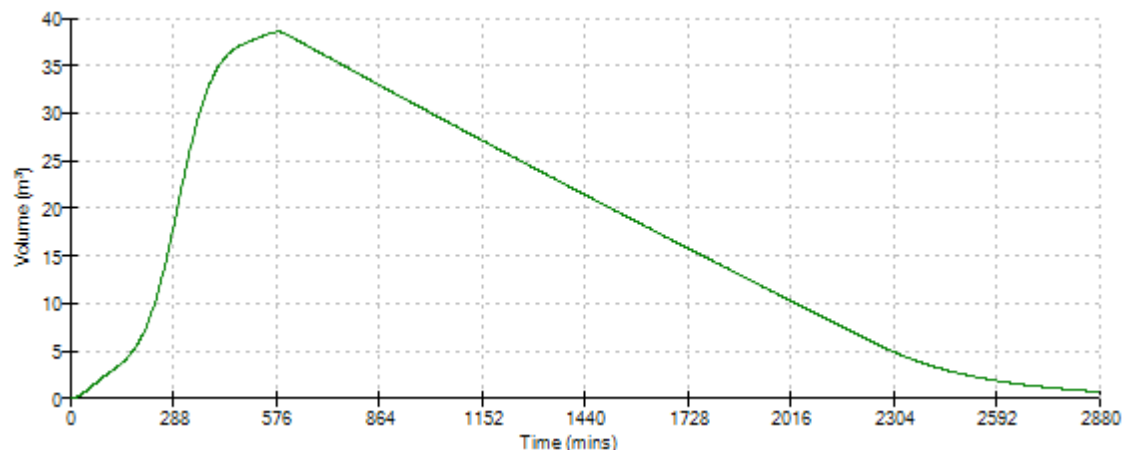
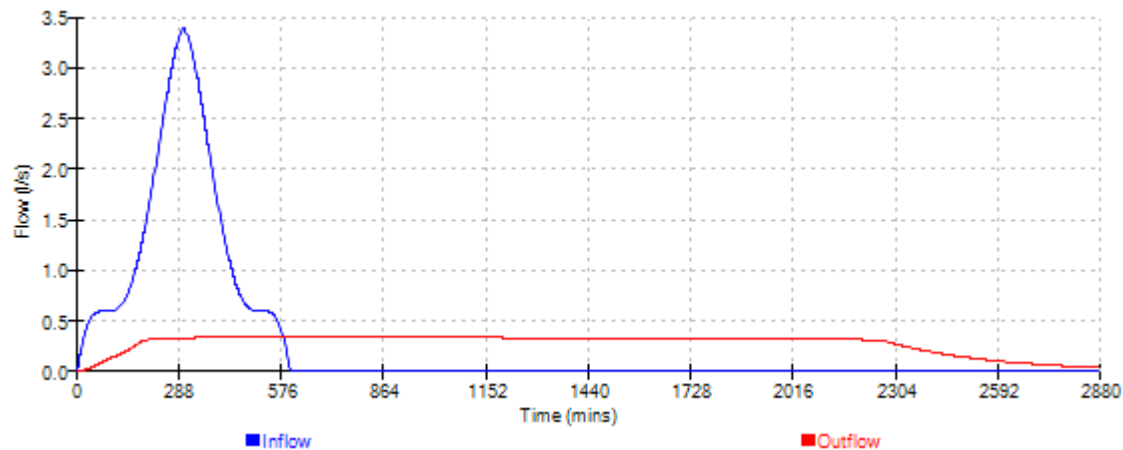
Infiltration Coefficient Base (m/hr) 0.01872 Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.01872

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	118.0	118.0	0.351	0.0	133.2
0.350	118.0	133.2			

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Event: 600 min Winter



Cundall, Johnston & Partners				Page 1	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG		1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 3			
Date 01/12/2017		Designed by LK			
File Drainage Zone C - Road ...		Checked by			
Micro Drainage		Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)					
Half Drain Time : 579 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.144	0.144	0.3	8.8	0 K
30 min Summer	0.190	0.190	0.3	11.6	0 K
60 min Summer	0.237	0.237	0.3	14.4	Flood Risk
120 min Summer	0.265	0.265	0.3	16.1	Flood Risk
180 min Summer	0.279	0.279	0.3	17.0	Flood Risk
240 min Summer	0.286	0.286	0.3	17.4	Flood Risk
360 min Summer	0.289	0.289	0.3	17.6	Flood Risk
480 min Summer	0.284	0.284	0.3	17.3	Flood Risk
600 min Summer	0.278	0.278	0.3	16.9	Flood Risk
720 min Summer	0.272	0.272	0.3	16.6	Flood Risk
960 min Summer	0.260	0.260	0.3	15.8	Flood Risk
1440 min Summer	0.236	0.236	0.3	14.3	Flood Risk
2160 min Summer	0.203	0.203	0.3	12.3	Flood Risk
2880 min Summer	0.175	0.175	0.3	10.6	0 K
4320 min Summer	0.131	0.131	0.3	8.0	0 K
5760 min Summer	0.099	0.099	0.3	6.0	0 K
7200 min Summer	0.078	0.078	0.3	4.8	0 K
8640 min Summer	0.064	0.064	0.3	3.9	0 K
10080 min Summer	0.055	0.055	0.3	3.3	0 K
15 min Winter	0.162	0.162	0.3	9.9	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	137.200	0.0	19		
30 min Summer	91.280	0.0	33		
60 min Summer	58.100	0.0	64		
120 min Summer	33.950	0.0	122		
180 min Summer	24.762	0.0	182		
240 min Summer	19.775	0.0	242		
360 min Summer	14.373	0.0	360		
480 min Summer	11.428	0.0	450		
600 min Summer	9.554	0.0	500		
720 min Summer	8.248	0.0	562		
960 min Summer	6.538	0.0	684		
1440 min Summer	4.702	0.0	954		
2160 min Summer	3.393	0.0	1360		
2880 min Summer	2.707	0.0	1756		
4320 min Summer	1.993	0.0	2504		
5760 min Summer	1.625	0.0	3224		
7200 min Summer	1.405	0.0	3888		
8640 min Summer	1.258	0.0	4576		
10080 min Summer	1.155	0.0	5240		
15 min Winter	137.200	0.0	19		
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Cundall, Johnston & Partners					Page 2	
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG			1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 3			
Date 01/12/2017			Designed by LK			
File Drainage Zone C - Road ...			Checked by			
Micro Drainage			Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)						
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	
30 min Winter	0.214	0.214	0.3	13.0	Flood Risk	
60 min Winter	0.267	0.267	0.3	16.2	Flood Risk	
120 min Winter	0.300	0.300	0.3	18.3	Flood Risk	
180 min Winter	0.317	0.317	0.3	19.3	Flood Risk	
240 min Winter	0.326	0.326	0.3	19.8	Flood Risk	
360 min Winter	0.333	0.333	0.3	20.3	Flood Risk	
480 min Winter	0.331	0.331	0.3	20.1	Flood Risk	
600 min Winter	0.324	0.324	0.3	19.7	Flood Risk	
720 min Winter	0.315	0.315	0.3	19.2	Flood Risk	
960 min Winter	0.299	0.299	0.3	18.2	Flood Risk	
1440 min Winter	0.265	0.265	0.3	16.1	Flood Risk	
2160 min Winter	0.216	0.216	0.3	13.1	Flood Risk	
2880 min Winter	0.173	0.173	0.3	10.5	0 K	
4320 min Winter	0.106	0.106	0.3	6.4	0 K	
5760 min Winter	0.064	0.064	0.3	3.9	0 K	
7200 min Winter	0.048	0.048	0.3	2.9	0 K	
8640 min Winter	0.043	0.043	0.3	2.6	0 K	
10080 min Winter	0.040	0.040	0.2	2.4	0 K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)			
30 min Winter	91.280	0.0	33			
60 min Winter	58.100	0.0	62			
120 min Winter	33.950	0.0	120			
180 min Winter	24.762	0.0	178			
240 min Winter	19.775	0.0	236			
360 min Winter	14.373	0.0	350			
480 min Winter	11.428	0.0	460			
600 min Winter	9.554	0.0	566			
720 min Winter	8.248	0.0	656			
960 min Winter	6.538	0.0	742			
1440 min Winter	4.702	0.0	1040			
2160 min Winter	3.393	0.0	1472			
2880 min Winter	2.707	0.0	1876			
4320 min Winter	1.993	0.0	2596			
5760 min Winter	1.625	0.0	3224			
7200 min Winter	1.405	0.0	3744			
8640 min Winter	1.258	0.0	4496			
10080 min Winter	1.155	0.0	5176			
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Cundall, Johnston & Partners		Page 4
19 - 21 Silvermills Court Henderson Place Lane Edinburgh EH3 5DG	1012052 - WARBLINGTON MEADOWS DRAINAGE ZONE C ROAD SOAKAWAY 3	
Date 01/12/2017	Designed by LK	
File Drainage Zone C - Road ...	Checked by	
Micro Drainage		Source Control 2017.1.2

Model Details

Storage is Online Cover Level (m) 0.500

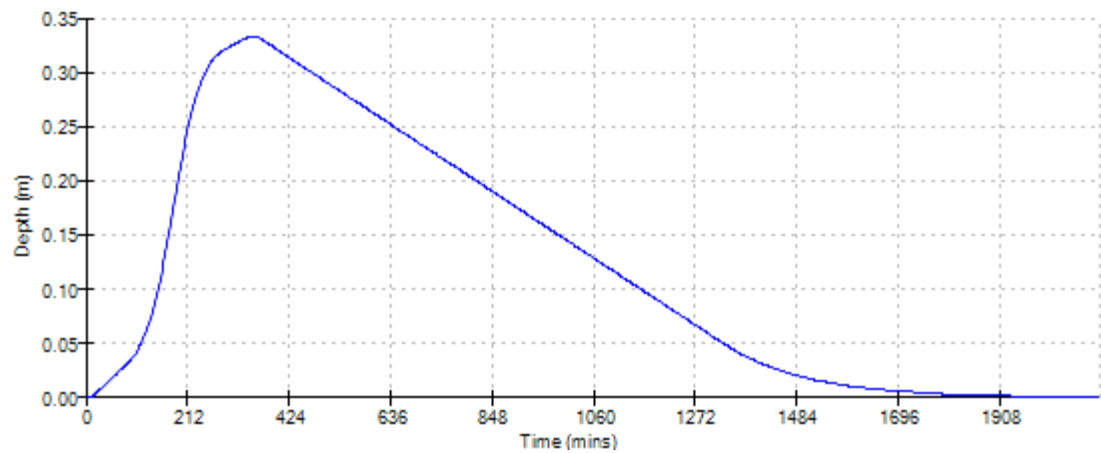
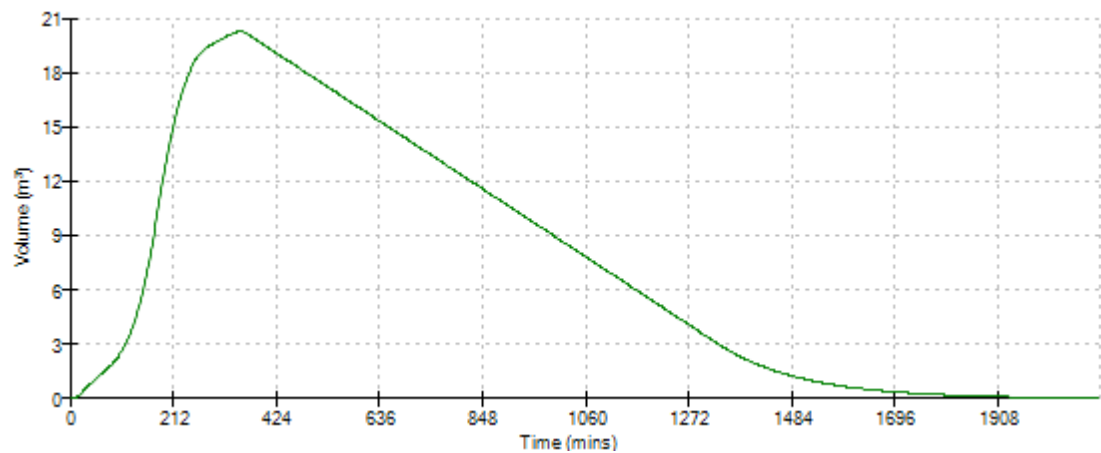
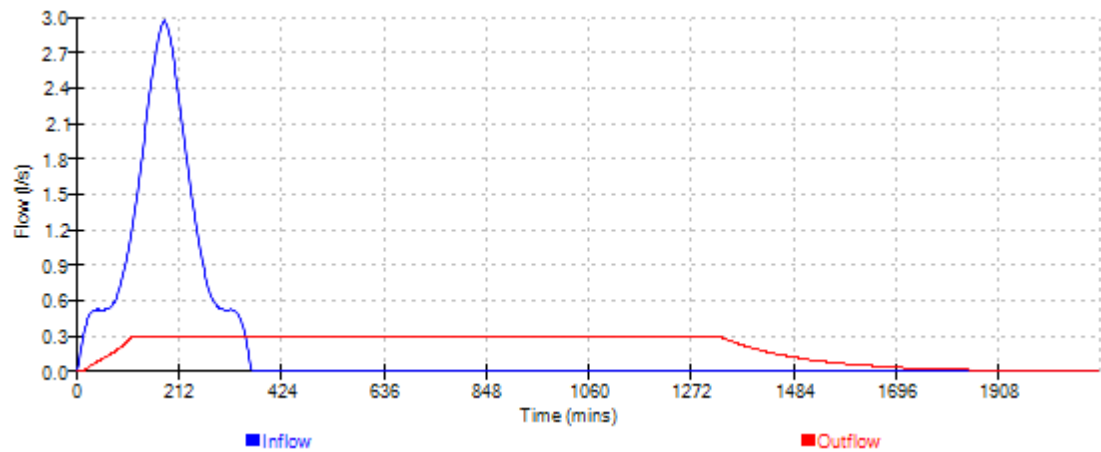
Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03312 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03312

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	64.0	64.0	0.351	0.0	64.0
0.350	64.0	64.0			

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Event: 360 min Winter

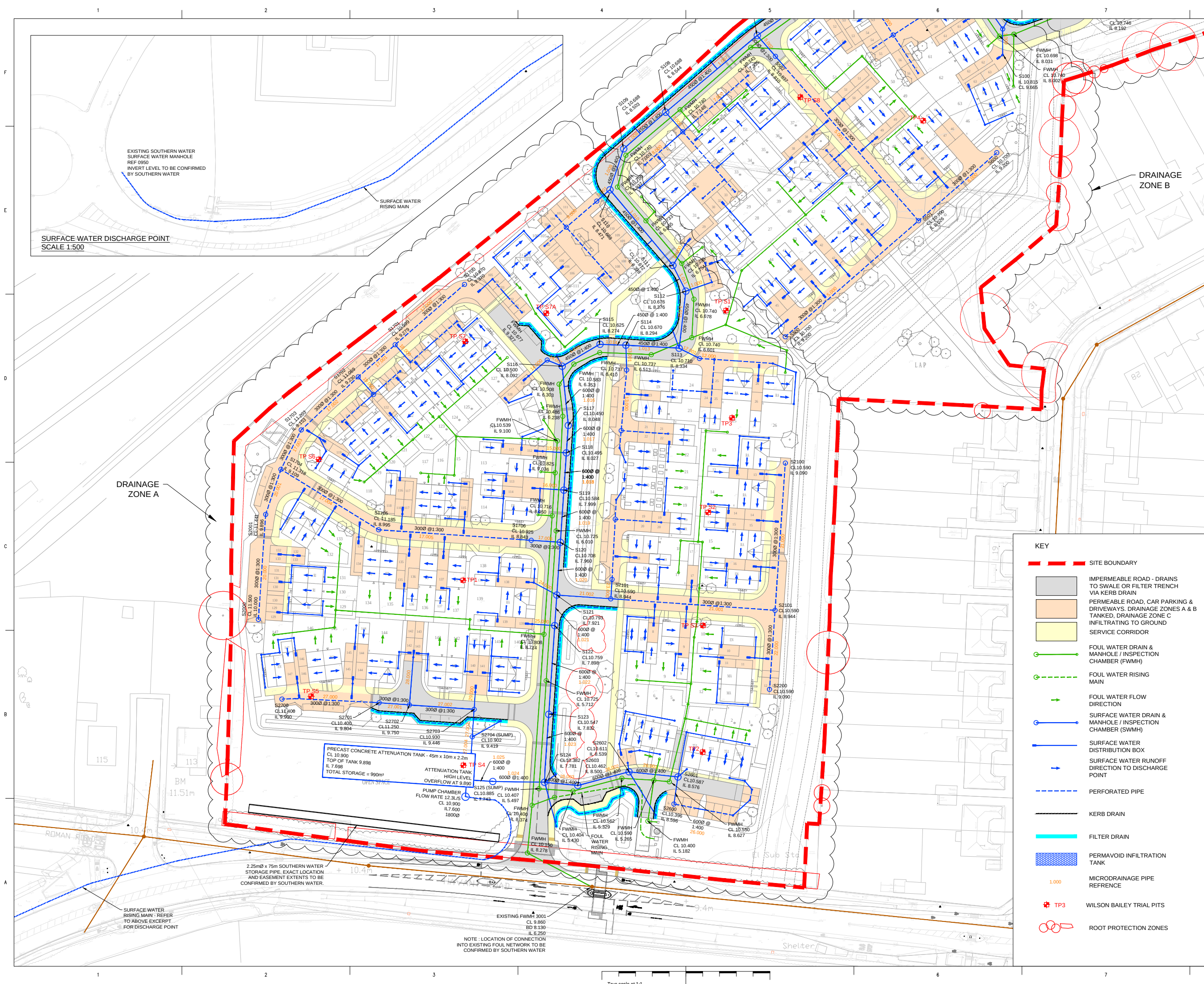
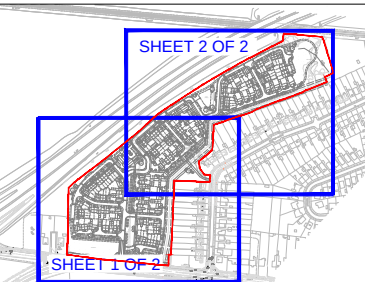


Appendix 8 – Drainage Strategy Plans

- CLXX(52)2001 Drainage Strategy Plan Sheet 1 of 2
- CLXX(52)2002 Drainage Strategy Plan Sheet 2 of 2
- CLXX(52)2003 Drainage Strategy Indicative Details

Based on:	Rev
Architects Dwg No.	Rev
Structural Dwg No.	Rev
Survey Dwg No.	Rev
Other Dwg No.	Rev
Other Dwg No.	Rev

- Notes
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND ENGINEERING SERVICES DRAWINGS, SPECIFICATIONS, SCHEDULES AND PROJECT SPECIFIC DOCUMENTS.
 - ALL DIMENSIONS IN mm UNLESS OTHERWISE STATED.
 - DO NOT SCALE FROM THIS DRAWING.
 - REFER TO DRAWING CLXX(90)9001 FOR GENERAL CIVIL ENGINEERING NOTES.



KEY	
	SITE BOUNDARY
	IMPERMEABLE ROAD - DRAINS TO SWALE OR FILTER TRENCH VIA KERB DRAIN
	PERMEABLE ROAD, CAR PARKING & DRIVEWAYS, DRAINAGE ZONES A & B TANKED, DRAINAGE ZONE C INFILTRATING TO GROUND
	SERVICE CORRIDOR
	FOUL WATER DRAIN & MANHOLE / INSPECTION CHAMBER (FWMH)
	FOUL WATER RISING MAIN
	FOUL WATER FLOW DIRECTION
	SURFACE WATER DRAIN & MANHOLE / INSPECTION CHAMBER (SWMH)
	SURFACE WATER DISTRIBUTION BOX
	SURFACE WATER RUNOFF DIRECTION TO DISCHARGE POINT
	PERFORATED PIPE
	KERB DRAIN
	FILTER DRAIN
	PERMAVOID INFILTRATION TANK
	MICRODRAINAGE PIPE REFERENCE
	TP3
	ROOT PROTECTION ZONES

P4	04/12/17	REVISED LAYOUT - PLANNING RESUBMISSION	SJ	SP	SP
P3	19/05/17	PLANNING RESUBMISSION	SJ	AMF	AMF
P2	01/03/17	REVISED TO SUIT SCHEME ALTERATION	SJ	AMF	AMF
P1	21/07/17	ISSUED FOR PLANNING	SJ	AMF	AMF
-	14/07/16	ISSUED FOR COMMENT	SJ	AMF	AMF
Issue	Date	Description	By	Chkd	Verld

Project
HAVANT ROAD, EMSWORTH

Client
BARRATT HOMES

Architect
COOPER BAILLIE

Title
DRAINAGE LAYOUT
SHEET 1 OF 2

Drawing No.
CLXX(52)2001

Drawing Status
S2 - ISSUED FOR INFORMATION

Job No.
1012052

Scale
1:500 @ A1

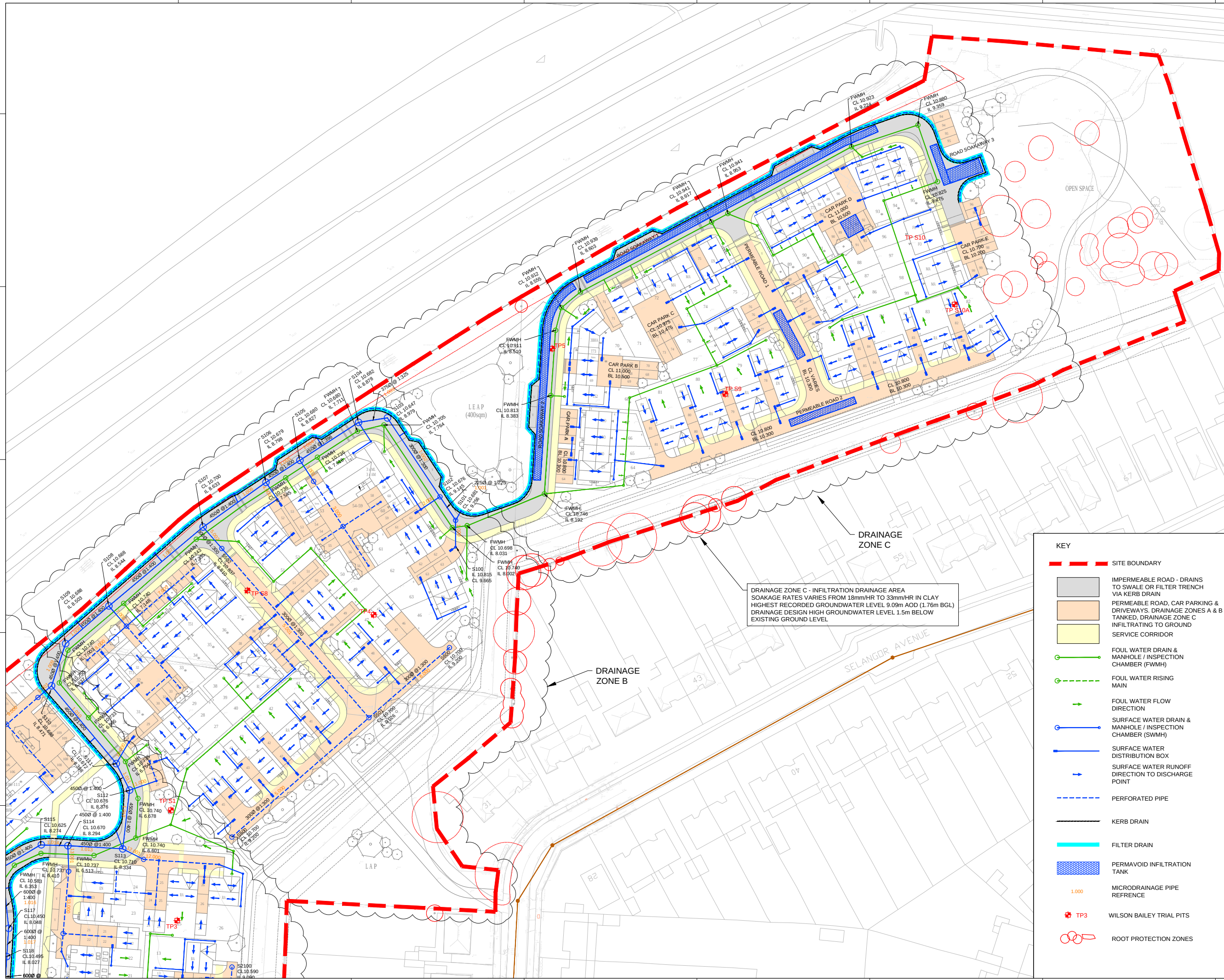
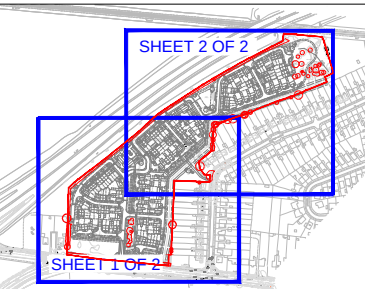
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Website: www.cundall.com

Based on:	Rev
Architects Dwg No.	Rev
Structural Dwg No.	Rev
Survey Dwg No.	Rev
Other Dwg No.	Rev
Other Dwg No.	Rev

- Notes
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND ENGINEERING SERVICES DRAWINGS, SPECIFICATIONS, SCHEDULES AND PROJECT SPECIFIC DOCUMENTS.
 - ALL DIMENSIONS IN mm UNLESS OTHERWISE STATED.
 - DO NOT SCALE FROM THIS DRAWING.
 - REFER TO DRAWING CLXX(90)9001 FOR GENERAL CIVIL ENGINEERING NOTES.



- KEY
- SITE BOUNDARY
 - IMPERMEABLE ROAD - DRAINS TO SWALE OR FILTER TRENCH VIA KERB DRAIN
 - PERMEABLE ROAD, CAR PARKING & DRIVEWAYS, DRAINAGE ZONES A & B TANKED, DRAINAGE ZONE C INFILTRATING TO GROUND SERVICE CORRIDOR
 - FOUL WATER DRAIN & MANHOLE / INSPECTION CHAMBER (FWMH)
 - FOUL WATER RISING MAIN
 - FOUL WATER FLOW DIRECTION
 - SURFACE WATER DRAIN & MANHOLE / INSPECTION CHAMBER (SWMH)
 - SURFACE WATER DISTRIBUTION BOX
 - SURFACE WATER RUNOFF DIRECTION TO DISCHARGE POINT
 - PERFORATED PIPE
 - KERB DRAIN
 - FILTER DRAIN
 - PERMAVOID INFILTRATION TANK
 - MICRODRAINAGE PIPE REFERENCE
 - TP3 WILSON BAILEY TRIAL PITS
 - ROOT PROTECTION ZONES

DRAINAGE ZONE C - INFILTRATION DRAINAGE AREA
SOAKAGE RATES VARIES FROM 18mm/HR TO 33mm/HR IN CLAY
HIGHEST RECORDED GROUNDWATER LEVEL 9.09m AOD (1.76m BGL)
DRAINAGE DESIGN HIGH GROUNDWATER LEVEL 1.5m BELOW EXISTING GROUND LEVEL

DRAINAGE ZONE B

DRAINAGE ZONE C

P4	04/12/17	REVISED LAYOUT - PLANNING RESUBMISSION	SJ	SP	SP
P3	19/05/17	PLANNING RESUBMISSION	SJ	AMF	AMF
P2	01/03/17	REVISED TO SUIT SCHEME ALTERATION	SJ	AMF	AMF
P1	21/07/17	ISSUED FOR PLANNING	SJ	AMF	AMF
-	14/07/16	ISSUED FOR COMMENT	SJ	AMF	AMF
Issue	Date	Description	By	Chkd	Verfd

Project
HAVANT ROAD, EMSWORTH

Client
BARRATT HOMES
Architect
COOPER BAILLIE

Title
DRAINAGE LAYOUT
SHEET 2 OF 2

Drawing No.
CLXX(52)2002
Drawing Status
S2 - ISSUED FOR INFORMATION

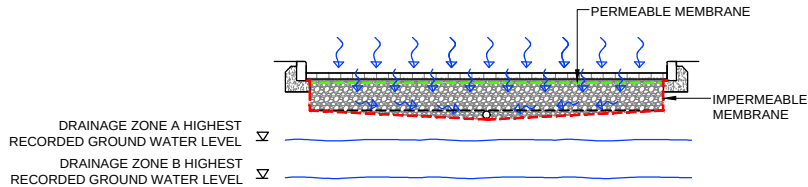
Job No.
1012052
Scale
1:500 @ A1

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Website: www.cundall.com

Based on:		Rev
Architects Dwg No.		Rev
Structural Dwg No.		Rev
Survey Dwg No.		Rev
Other Dwg No.		Rev

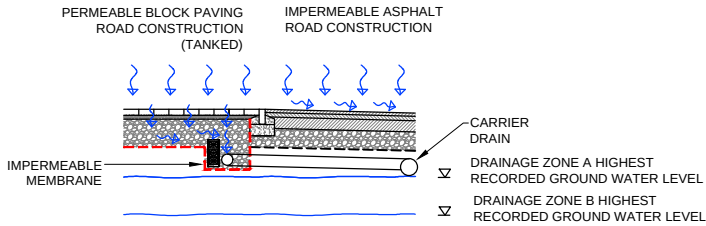
DO NOT SCALE FROM THIS DRAWING

- Notes
1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND ENGINEERING SERVICES DRAWINGS, SPECIFICATIONS, SCHEDULES AND PROJECT SPECIFIC DOCUMENTS.
 2. ALL PLANT AND EQUIPMENT IS TO BE INSTALLED TO MANUFACTURER'S RECOMMENDATIONS, ALLOWING FULL ACCESS FOR COMMISSIONING, MAINTENANCE AND REMOVAL/REPLACEMENT.
 3. ALL DIMENSIONS IN mm UNLESS OTHERWISE STATED.
 4. DO NOT SCALE FROM THIS DRAWING.



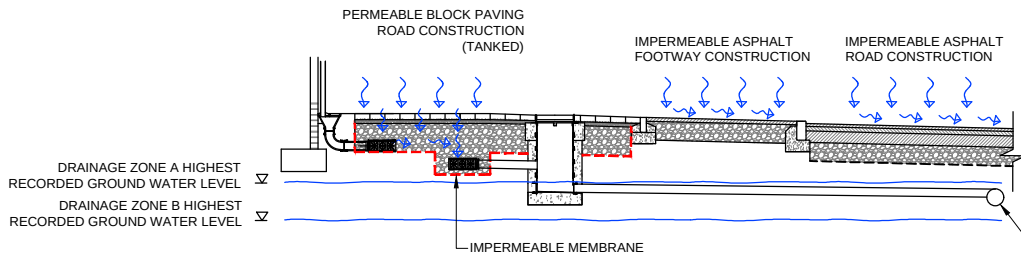
DRAINAGE ZONES A & B PERMEABLE ROAD WITH PERFORATED COLLECTOR PIPE (TANKED)

SCALE 1:50



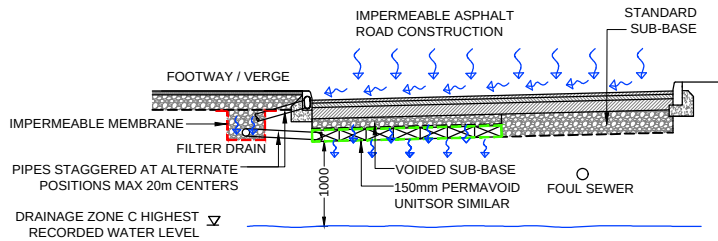
DRAINAGE ZONE A & B PERMEABLE ROAD TO CARRIER DRAIN (TANKED)

SCALE 1:50



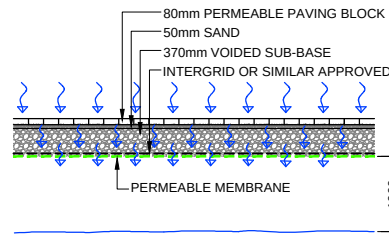
DRAINAGE ZONE A & B PERMEABLE DRIVEWAY TO CARRIER DRAIN (TANKED)

SCALE 1:50



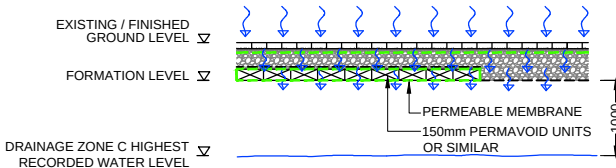
SITE ZONE C IMPERMEABLE ROAD WITH PERMAVOID (INFILTRATING)

SCALE 1:50



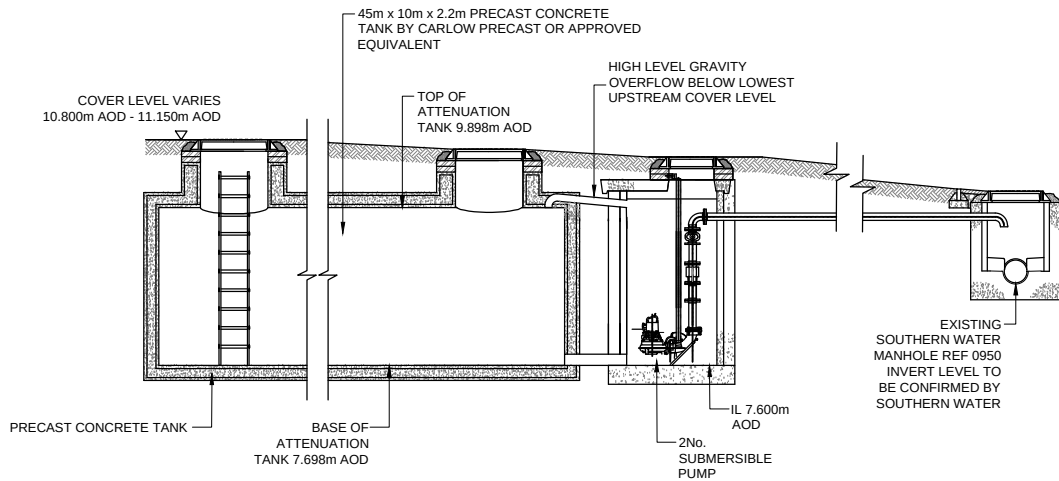
SITE ZONE C PERMEABLE PAVING IN ROADS, DRIVEWAYS & CAR PARKING AREAS (INFILTRATING)

SCALE 1:50



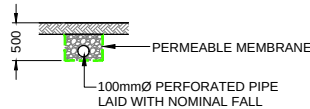
SITE ZONE C PERMEABLE PAVING / PERMAVOID IN ROADS & CAR PARKING AREAS (INFILTRATING)

SCALE 1:50



PUMPED ATTENUATION & PUMP CHAMBER SCHEMATIC

SCALE 1:50



SITE ZONE C SURFACE WATER FILTER DRAIN FROM RWP TO PERMEABLE PAVING IN ROADS, DRIVEWAYS & CAR PARKING AREAS (INFILTRATING)

SCALE 1:50

P2	04/12/17	REVISED LAYOUT - PLANNING RESUBMISSION	SJ	SP	SP
P1	19/05/2017	PLANNING RESUBMISSION	SJ	AMF	AMF
Issue	Date	Description	By	Chkd	Verfd

Project
LAND AT HAVANT ROAD, EMSWORTH

Client
BDW SOUTHAMPTON

Architect
SIMON COOPER ASSOCIATES

Title
DRAINAGE STRATEGY INDICATIVE DETAILS

Drawing No.	CLXX(52)2003	Drawing Status	S2 - ISSUED FOR INFORMATION
Job No.	1012052	Scale	1:50 @ A1
Originator	SJ	Checked	AMF
Verified	AMF	Issue	P2

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Appendix 9 – Southern Water Correspondence



BDW Southampton
Tollbar House
Tollbar Way
Hedge End
Southampton
Hampshire
SO30 2UH

Developer Services
Southern Water
Sparrowgrove House
Sparrowgrove
Otterbourne
Hampshire
SO21 2SW

Tel: **0330 303 0119**

Email: **developerservices@southernwater.co.uk**

Your Ref: _____

Our Ref:
CC/003364

Date:
26 July 2017

F.A.O: Mr. Kenneth,

**Site: Warblington Meadows MH0950, Land Adjacent To Havant Road, Warblington,
Hampshire, PO10 7LR.**

Dear Sirs,

Further to our recent meeting on the 26th July 2017 regarding the above development site.

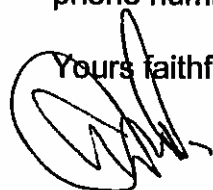
Southern Water will accept a surface water flow no greater of 12.3 l/s to be connected at manhole reference SU73050950.

Please note that if the excess surface water flows are to be attenuated on site, it could have a significant effect on any proposed Section 104 Agreements. Any attenuation proposals should be agreed before any works are implemented on site. Where capacity is limited/restricted, agreement should be sought if you are to include any highway drainage within your proposals as Southern Water is not obligated to accept highway flows.

Section 98 of the Water Industry Act 1991 provides a legal mechanism through which the appropriate infrastructure can be requested (by the developer) and provided to drain a specific location.

Southern Water will still accept Fresh Water Level 2 capacity assessment applications. Before any connections are made to foul and surface sewerage network, an application form needs to be completed and approved by Southern Water Services.

Should you require any further information, please contact us at the above mentioned phone number or address.

Yours faithfully


Stuart Ward
Developer Services

Please note: -

The information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Bradley Slingo
Barratt Homes
Tollbar House
Tollbar Way
Hedge End
Southampton
SO30 2UH

Date
4 March 2019
Contact
Tel 0330 303 0119

Dear Bradley,

PROPOSED DEVELOPMENT AT SAXON CORNER, EMSWORTH

Southern Water has undertaken a desk study of the impact that the additional foul sewerage flows from the proposed development will have on the existing public sewer network. This initial study indicates that there is an increased risk of flooding unless any required network reinforcement is provided by Southern Water.

Southern Water and the Developer will need to work together in order to review if the delivery of our network reinforcement aligns with the proposed occupation of the development, as it will take time to design and deliver any such reinforcement.

As discussed we have your first occupation dates, along with build rates.

The S98 application in this instance is no longer relevant. Any such network reinforcement will be part funded through the New Infrastructure Charge with the remainder funded through Southern Water's Capital Works programme.

Please see link below to Southern Water's published document;
<https://www.southernwater.co.uk/media/2282/ds-charging-arrangements-19-20.pdf>

Occupation of the development is to be phased and implemented to align with the delivery by Southern Water of any sewerage network reinforcement required to ensure that adequate waste water network capacity is available to adequately drain the development.

As discussed at our meeting last week, it may be possible for some initial dwellings to connect pending network reinforcement. Southern Water will review and advise on this following

consideration of the development program and the extent of network reinforcement required. Southern Water are currently carrying out detailed network modelling as part of this review which may require existing flows to be monitored. This will enable us to establish the extent of works required (if any) and to design such works in the most economic manner to satisfy the needs of existing and future customers.

Our assessment of the timescales needed to deliver network reinforcement will consider an allowance for the following:

- Initial feasibility, detail modelling and preliminary estimates.
- Flow monitoring (If required)
- Detail design, including land negotiations.
- Construction.

The overall time required depends on the complexity of any scheme needed to provide network reinforcement. Southern Water will seek however to limit the timescales to a maximum of 24 months from a firm commitment by the developer to commence construction on site and provided that Planning approval has been granted.

Please let me know if you have any questions.

Kind regards

Samantha Jenkins