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Maizelands Limited and Arringford Limited
Letchworth Gateway

Letchworth Garden City
Hertfordshire

DRAINAGE STRATEGY

May 2017

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CONTENTS

1.0 Executive Summary
- 1.1 Objective
- 1.2 Proposed Drainage Strategy

2.0 Introduction
- 2.1 Site Location
- 2.2 Scope and Purpose of this Report
- 2.3 Existing Site
- 2.4 Proposed Redevelopment – Letchworth Gateway

3.0 Proposed Drainage Strategy
- 3.1 Design Parameters
- 3.2 Storm Water Sewerage – Outline Proposal

4.0 APPENDICES
- 4.1 Appendix A – Anglian Water Assets
  Sewer Record
- 4.2 Appendix B – Topographical and Services Survey
  Existing Site
- 4.3 Appendix C – Proposed Redevelopment
- 4.4 Appendix D – Proposed Phasing of Redevelopment Works
- 4.5 Appendix E – Proposed Redevelopment SWS
- 4.6 Appendix F – SWS Calculations
  Micro Drainage

1.0 Executive Summary

1.1 Objective

1.1.1 Letchworth Gateway comprises the proposed redevelopment of an existing developed commercial site, currently disused.

1.1.2 The existing site covers an area of 1.68 ha of which, 77% is impermeable consisting of existing roof and paved areas. Consequently, the estimated unrestricted peak flow rate (Q_{BAR}) for rainwater run-off from the existing site is 203 l/s.

The existing storm water sewerage (SWS) discharges via two connections to existing public SWS located in Avenue One and Sixth Avenue.

1.1.3 Redevelopment will consist of four separate developments, wholly contained within the existing site boundary. The proposed developments are to be constructed for specific tenants in a phased sequence as follows:

a) Phase 1 – McDonald's restaurant, drive-thru' and car park including a one-way private link road, between Avenue One (entrance) and Sixth Avenue (exit), which will also serve as the permanent means of access for the subsequent developments.

b) Phase 2 – ALDI superstore and car park.

c) Phase 3 – Travelodge hotel and car park.

d) Phase 4 – Costa Coffee café, drive-thru' and car park.

1.2 Proposed Drainage Strategy

1.2.1 To facilitate phased construction, each development will need to be served by new, separate SWS routed to shared discharge points, located off-site, into the public SWS via the aforementioned link road.

1.2.2 The proposed drainage strategy reflects the findings of the Flood Risk Assessment (FRA) in principle viz., the total discharge rate, for run-off from the whole redevelopment will be controlled and limited to 10 l/s.

1.2.3 In accordance with the National Planning Policy Framework (NPPF), the application of SuDS features to facilitate the required reduction in discharge of run-off from the redevelopment was considered. Application of SuDS, typically soakaways, ponds, swales, was not considered feasible for the following reasons:

a) The site consists of made ground and firm to stiff clay-gravel deposits overlying chalk formation.

The use of soakaways may precipitate dissolution of the underlying chalk. The result of dissolution may cause significant settlement of building foundations and/or failure of paved areas. Such consequences were considered an unacceptable risk.

Any soakaway on the site would need to be founded at depths exceeding 2.5m below ground level. Due to the size of soakaways required, this is not considered an economically viable option for the disposal of rainwater run-off from the site.

b) In terms of groundwater vulnerability, the chalk formation is classified as a 'Principal Aquifer'. The site is located within a Source Protection Zone 1 (SPZ 1) area. A Groundwater and Potable Abstraction Licence is located approximately 40m East of the site and is a historical potable water supply.

The use of soakaways may give rise to filtration of water containing pollutants, e.g., accidental oil spillage from a vehicle, into the underlying aquifer. For this reason, stoned-up soakaways, to capture hydro-carbons, would be required. Stone soakaways, trenches or filtration blankets have circa 30% only, storage capacity within the gross volume of stone used.

c) The proposed redevelopment will occupy approximately 78% of the site comprising roofs and paved areas. The remaining area would be landscaped, predominantly occupying, as existing, areas adjacent to the South and West boundaries of the site. These areas are, and will remain, elevated approximately 1.5 to 3m above average ground levels across the developed area of the site.

   The landscaped areas being at predominantly raised levels, relative to the developed site, precludes (for hydraulic reasons) consideration for surface features such as ponds, basins or swales to provide attenuation.

   Attenuation is to be provided using large diameter pipes and/or cellular storage units located below ground under the paved areas of each development.

1.2.4 The proposed Drainage Strategy may be summarised as follows:

a) Storm water run-off, from the total impermeable (roofs and paved areas) area of the redevelopment, is to be discharged to existing public SWS in Avenue One and Sixth Avenue.

b) The total peak discharge rate (Q_{BAR}) for the redevelopment shall be controlled and limited to 10 l/s, representing a 95% reduction against the estimated peak flow rate for the site, pre-redevelopment.

c) SWS for each of the four developments will include on-site attenuation storage and flow control devices as necessary.

d) The attenuated SWS for each development shall be designed to accommodate 1 in 100yr storm events – up to 600mins – including a 40% allowance for climate change without flooding.

e) More extreme storm events, e.g., for 1 in 200yr return period, were assessed which exceed the design limits proposed. Some minor surface ponding (flooding) – less than $1m^3$ – was estimated. Such volumes would be contained within the site, having no adverse impact on the proposed developments, adjacent commercial/industrial sites or the public highways around the site.

2 Introduction

An existing developed commercial site, off Avenue One, Letchworth, is the subject area, outlined in Fig. 2.1, for proposed redevelopment.

Client Maizelands Limited and Arrington Limited, commissioned Nolan Associates to prepare a Drainage Strategy, pertinent to the proposed brownfield redevelopment (Letchworth Gateway), in support of the current planning application 17/00477/1.

2.1 Site Location

The existing site is located off Avenue One, Letchworth Garden City, Hertfordshire, Ordnance Survey reference:

OS X (Eastings)	523182
OS Y (Northings)	232632
Latitude (WGS84)	N51:58:43 (51.978506)
Longitude (WGS84)	W0:12:29 (-0.207918)
National Grid Ref:	TL 231326 / TL 23182 32632
m_x	-23145
m_y	6762557
Nearest Post Code	SG6 2HU



Fig. 2.1 – Location of the existing site for proposed redevelopment

2.2 Scope and Purpose of this Report

2.2.1 The scope of this report is to outline a drainage strategy, for subsequent development into detailed design for construction, taking due cognisance of the following:

a) The recommendations set down in a Flood Risk Assessment Report (FRA) carried out by WtFR Limited, document ref: WtFR-2017-01-Q07 dated 17.01.2017.

b) Points raised by the Local Lead Flood Authority (LLFA) in their interim recommendation to the Local Planning Authority (LPA) to reject grant of planning permission.

c) The hydrogeology and pertinent observations of a Soils Investigation (SI) Report carried out by GIP Limited, document ref: DNB/23795 dated 20.12.2016.

d) Phased redevelopment of the site.

e) Tenant-specific requirements subject to compatibility, in principle, with the National Planning Policy Framework (NPPF).

2.2.2 The purpose of this report is to;

a) contribute supporting information in connection with the infrastructure aspect of the planning application, necessary to service the proposed redevelopment;

b) demonstrate that the proposed drainage strategy for the redevelopment will not have a detrimental flooding effect on adjacent land or properties, receiving storm water sewerage and will be safe for those working therein from flooding; in accordance with the requirements of the NPPF and;

c) address the points raised by the LLFA in their interim recommendation to the LPA to reject grant of planning application.

2.3 Existing Site

2.3.1 Existing points of access onto the site are located along the North and East boundaries of the site off Sixth Avenue and Avenue One respectively.

2.3.2 The site has a gross area of 1.682 (16,820 m^2) which accommodates a large disused warehouse and car park representing a total impermeable area covering 1.4635 ha of the site. The warehouse occupies approximately 40% of the total impermeable area.

2.3.3 The information available on Anglian Water's sewer records (Appendix A), the topographical and services surveys (Appendix B), whilst incomplete (see 2.3.6 below), is sufficient to demonstrate that the disposal of foul and storm water from the site is by positive sewerage connection into existing foul and storm water public sewers located in Sixth Avenue and Avenue One.

2.3.4 The existing storm water sewerage (SWS) does not feature any attenuation or flow control devices. Discharge of storm water run-off, from the impermeable area into the public sewers, is unrestricted.

Thus, the estimated peak flow from the site (Q_{BAR}) is in the order of:

$$Q_{50} = 2.78 \times 50 \times 1.4635 = 203 \text{ l/s}$$

However, the information available, regarding the existing SWS, is not sufficient to define the proportional split in the discharge of Q_{BAR} between the public SWS in Sixth Avenue and Avenue One.

2.3.5 The equivalent greenfield run-off estimation for the site, as given in the FRA, may be summarized as tabled below:

TABLE 2.1

Greenfield run-off rates	
Q_{BAR}	3.98 l/s
1 in 1 year	3.46 l/s
1 in 30 years	9.75 l/s
1 in 100 years	14.17 l/s

2.3.6 A CCTV sewer survey was carried out on the existing foul and storm water sewerage within the site. The sewers were found to be in variable condition. Frequent instances of root-ball damage, silting and blockages were recorded. This, in turn, inhibited physical tracing of the sewers; hence the incompleteness of the services survey.

Nevertheless, interceptors were located and sewer tracing was sufficient to deduce the likely location of outfalls for discharge off-site into the public sewers, in both Sixth Avenue and Avenue One, as indicatively shown in Fig. 2.2.

There was no evidence to indicate use of soakaways, anywhere on the site, as part of the existing site drainage system.

2.3.7 Geotechnically, the site comprises;

- made ground varying from 0.2m to 2.3m in thickness, but generally circa 1m across most of the site, overlying;
- superficial deposits consisting of predominantly firm to stiff and in parts soft clay together with medium dense sand and in parts gravel overlying:
- New Pit/Holywell Nodular Chalk Formation recorded to 20m in depth at which structureless chalk consisting of silt with flint nodules in parts.

Groundwater was encountered in one trial pit, at 2.4m depth below ground level but elsewhere across the site, the pits and boreholes were dry; indicating the groundwater encountered represents a localised pocket, perched on the underlying superficial clay considered to be practically impermeable.

In terms of groundwater vulnerability, the chalk formation is classified as a 'Principal Aquifer'. The site is located on a Source Protection Zone 1 (SPZ 1). The nearest Groundwater and Potable Abstraction Licence is located 41m to the East of the site and is a historical potable water supply.

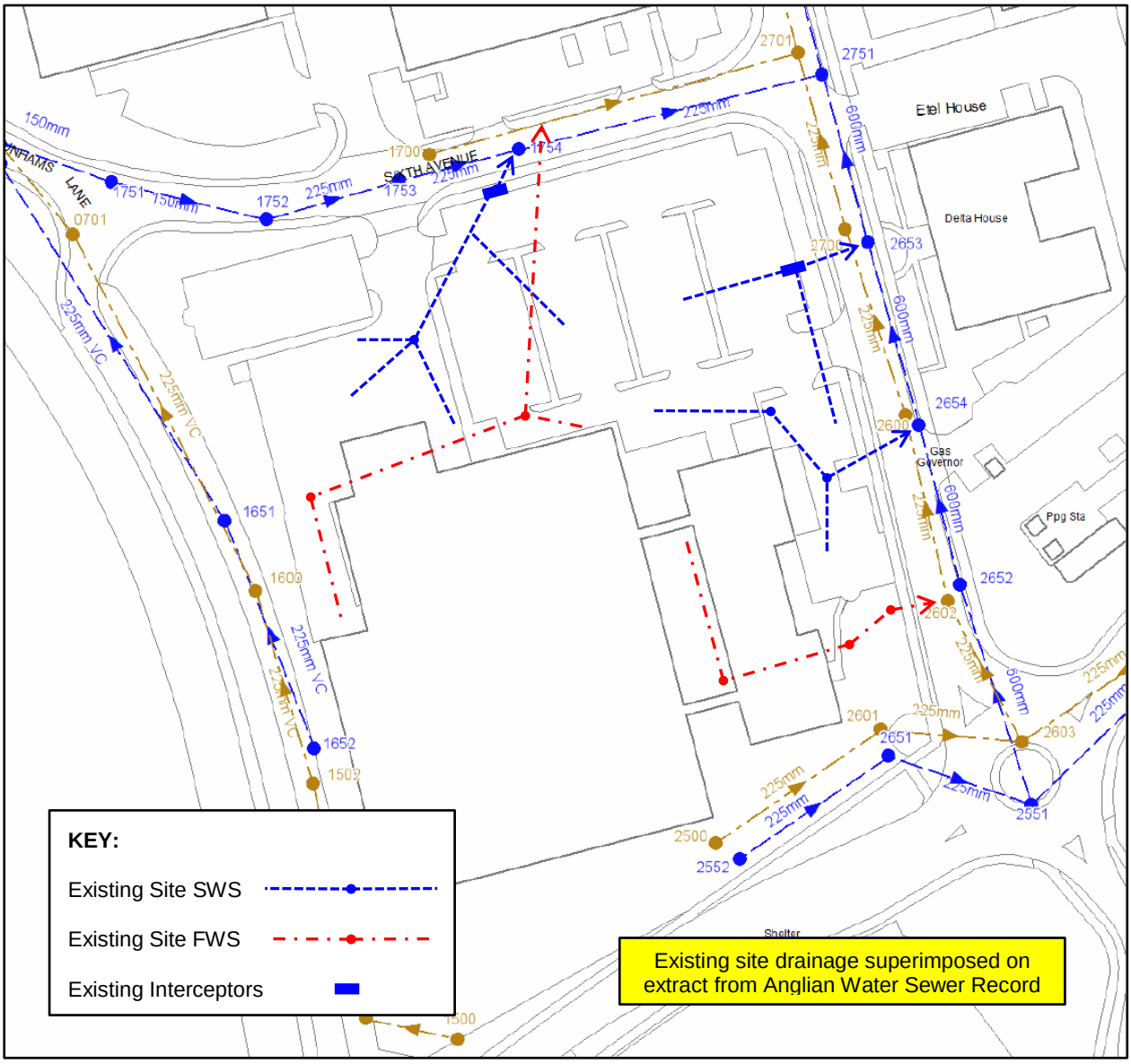


Fig. 2.2 – Locations of existing site drainage outfalls into the public sewers

Note: For detailed information regarding existing site sewerage and utilities, refer to the combined topographical and services survey drawings – Appendix B.

2.4 Proposed Redevelopment – Letchworth Gateway

2.4.1 The proposed redevelopment will consist of four separate developments (Appendix C), for the following prospective tenants:

1. Travelodge hotel with 58 parking bays.
2. McDonald's restaurant and drive-through with 49 parking bays.
3. ALDI supermarket with 92 parking bays.
4. Costa Coffee café and drive-through with 20 parking bays.

2.4.2 Construction of each development is to be phased, sequenced as indicated on the Phasing Plan; Appendix D refers.

Whilst the infrastructure to service each development will also be phased, for operational and practical reasons, Phase 1 will include:

a) McDonald's restaurant and car parking.

b) One-way estate road ultimately required to provide access to all four developments.

c) Foul and storm water drainage and utilities for Phase 1, together with capped spurs for future connection up to the demise boundaries of each of the other three developments.

3.0 Proposed Drainage Strategy

3.1 Design Parameters

3.1.1 The SWS scheme outlined to serve the redevelopment, considers and implements, where required, measures to address the following:

a) Any pre-existing legal, environmental and/or physical conditions relating to the site.

b) Practicable application of SuDS and environmental betterment, in line with current design standards and requirements of the relevant regulatory bodies.

3.1.2 The drainage strategy will be influenced by:

a) The requirement for phased redevelopment of the site.

b) The recommended performance criteria as outlined in the FRA report albeit, modified as proposed below:

i. SWS to be designed to accommodate 1 in 100yr storm events including 40% allowance for climate change.

ii. Fully accommodate 1 in 30yr storm events, with the total discharge of storm water run-off for the whole of the redevelopment limited to 10 l/s, with allowance for contained temporary surface attenuation to accommodate 1 in 100yr storm events and greater.

The topography of the existing site and hence proposed levels are such that surface containment is not practicable. It is proposed that the SWS scheme, including attenuation, is designed to fully accommodate 1 in 100yr storm events together with 40% allowance for climate change.

iii. For physical and practical reasons, attenuated SWS for the McDonald's and Costa Coffee developments will be combined to share a common point of discharge into the public SWS in Sixth Avenue. Similarly, attenuated SWS for the ALDI and Travelodge developments will be combined to share a common point of discharge into the public SWS in Avenue One.

iv. Both points of discharge will be controlled by hydro-brakes limiting the flow rate from each, to 5 l/s. This effectively represents a 95% reduction in the estimated freely discharging peak flow, from the existing site, of 203 l/s (Q_{BAR}).

3.1.3 Application of the SuDS Hierarchy for on-site attenuation.

a) Soakaways

No permeability tests were undertaken or reported in the aforementioned SI. Testing may be undertaken in accordance with BRE 365 to determine the degree of permeability. However, it is not proposed to implement use of soakaways for the following reasons:

i. Size and construction of filtration blankets and/or trenches considered uneconomic due to the depth to potentially permeable chalk below existing ground levels.

ii. The site is designated SPZ 1 overlying a 'Principal Aquifer' with a groundwater and potable water abstraction licence in force. Thus, direct exfiltration to ground, of storm water run-off from roofs and paved areas, is not normally permitted due to risk of contamination.

iii. Filtration via soakaways may precipitate dissolution of the chalk underlying the made ground. This would potentially introduce an unacceptable risk and consequence of destabilising the foundations of proposed buildings and/or trafficked paved areas.

Whilst no dissolution features were encountered during the fieldwork for the SI, the report did include a recommendation to consult Hertfordshire Building Control. Building Control advised as follows, quote: *'We can confirm that we would expect to find chalk in this area. This chalk does not tend to be over gravel, and therefore dissolution features are not prominent in this area. However, we would always advise that the ground-workers are made aware to report any hollows or caves found during excavations'.*

b) Surface attenuation features

Due to the type of developments and intensive usage of the space available, it is not considered feasible to accommodate surface attenuation features such as swales or ponds.

c) Below-ground attenuation storage

It is proposed to utilise large diameter pipes and/or tanked cellular units to provide below-ground attenuation storage. Such features would be suitable for phased construction and negate sterilising areas needed for the proposed developments to function.

For reasons described earlier (3.1.2b ii) the attenuation storage for each development is to be sized to hold the volume of rainwater run-off generated from 1 in 100yr storm events, of up to 10hrs duration including 40% allowance for climate change, without need to provide contained surface storage – e.g. temporary flooding of car parks.

3.2 Storm Water Sewerage – Outline Proposal

3.2.1 The proposed SWS to service each development is outlined on drawing 2016-238-101 T1, refer to Appendix E.

The SWS for the redevelopment as a whole, has been configured to accommodate phased construction.

Rainwater run-off from the existing site is discharged into public SWS in Avenue One and Sixth Avenue. A similar arrangement is proposed for Letchworth Gateway, where the run-off from Phases 1 and 4 will be discharged into the public sewer in Sixth Avenue and run-off from Phases 2 and 3 will be discharged into the public sewer in Avenue One.

Each point of discharge would be restricted to 5 l/s using hydro-brakes. The combined restricted flow rate, 10 l/s, would represent a 95% reduction from the estimated peak flow rate from the existing site.

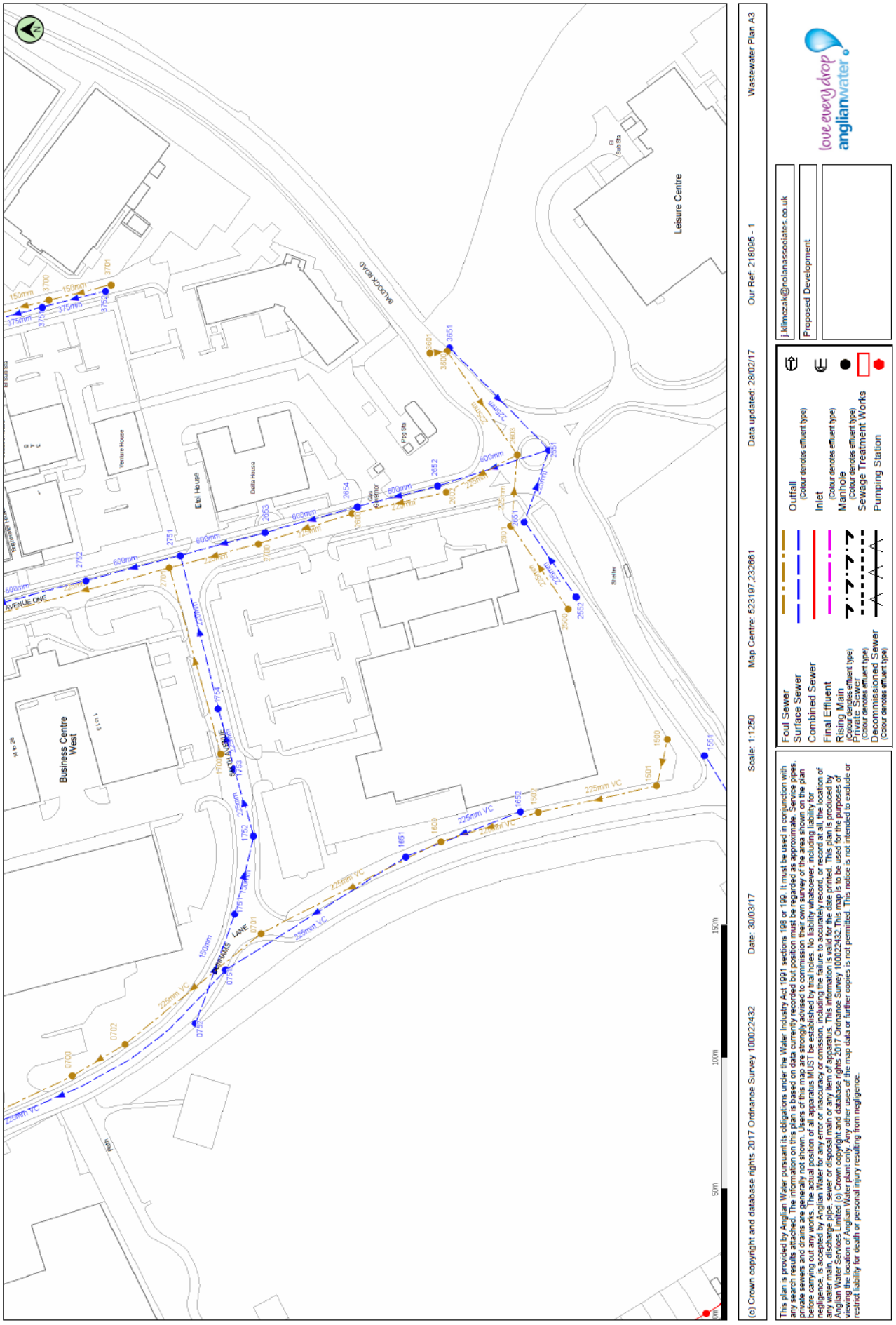
For Micro Drainage calculations supporting the proposed SWS for Letchworth Gateway, refer to Appendix F.

4.0 APPENDICES

4.1 APPENDIX A

Anglian Water Assets

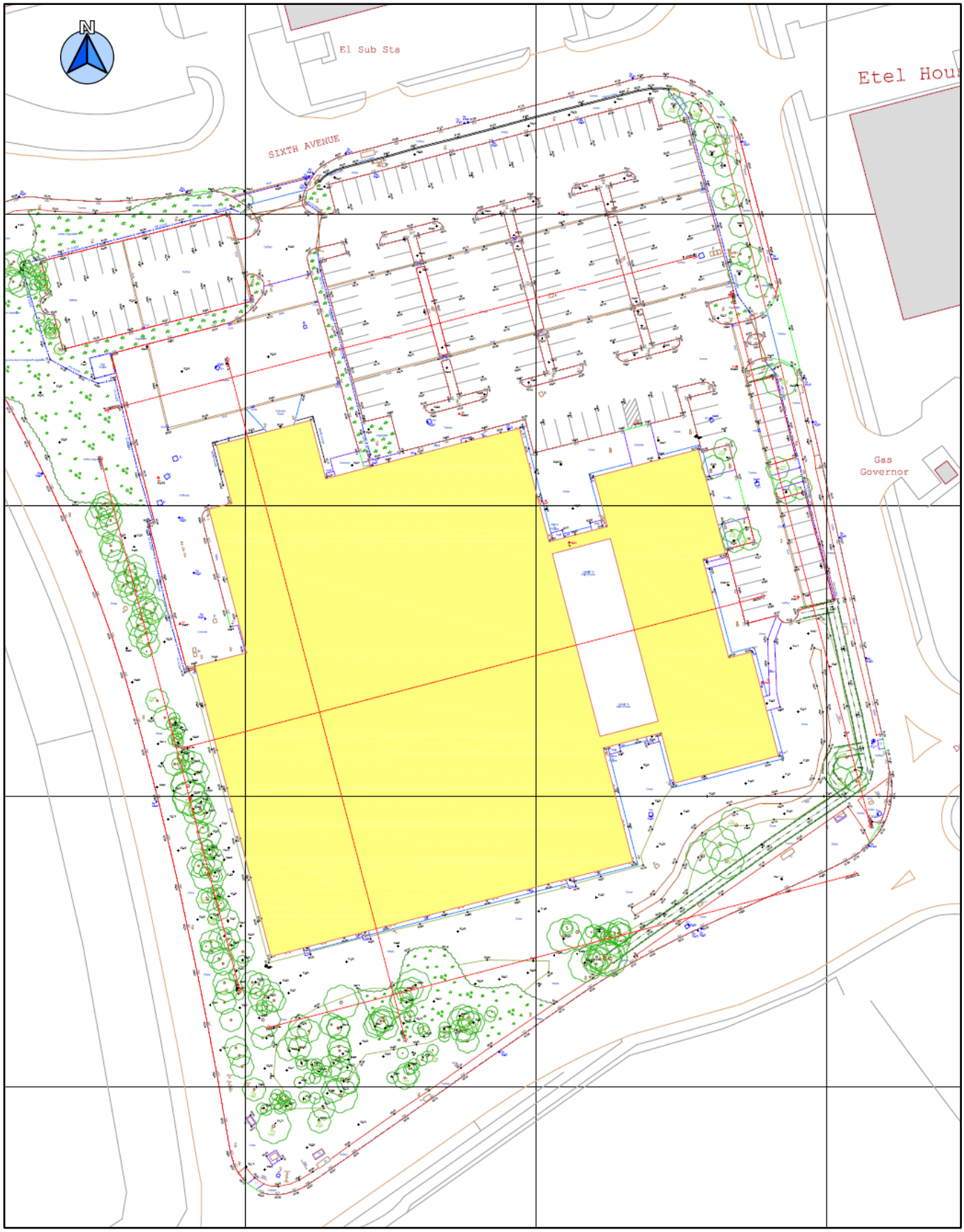
Sewer Record


Leisure Centre
Business Centre West
Venture House
Etel House
Delta House
BALDOCK ROAD
AVENUE ONE
225mm VC
600mm
150mm
(c) Crown copyright and database rights 2017 Ordnance Survey 100022432
Date: 30/03/17
Scale: 1:1250
Map Centre: 523197,232661
Data updated: 28/02/17
Our Ref: 218095 - 1
Wastewater Plan A3
Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main
(Colour denotes effluent type)
Private Sewer
(Colour denotes effluent type)
Decommissioned Sewer
(Colour denotes effluent type)
Outfall
(Colour denotes effluent type)
Inlet
(Colour denotes effluent type)
Manhole
(Colour denotes effluent type)
Sewage Treatment Works
Pumping Station
j.klimczak@nolanassociates.co.uk
Proposed Development
love every drop
anglianwater
This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2017 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

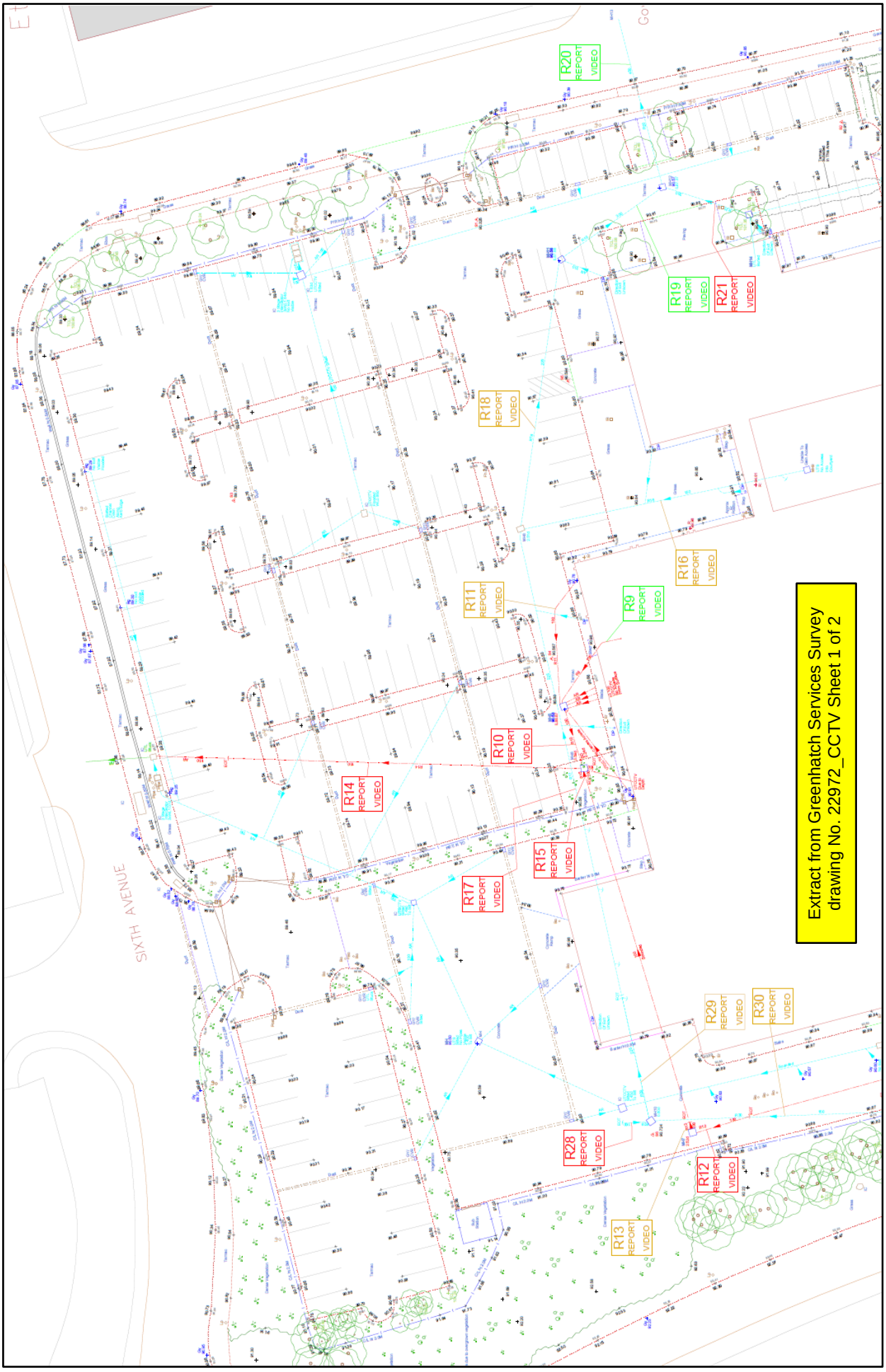
4.2 APPENDIX B

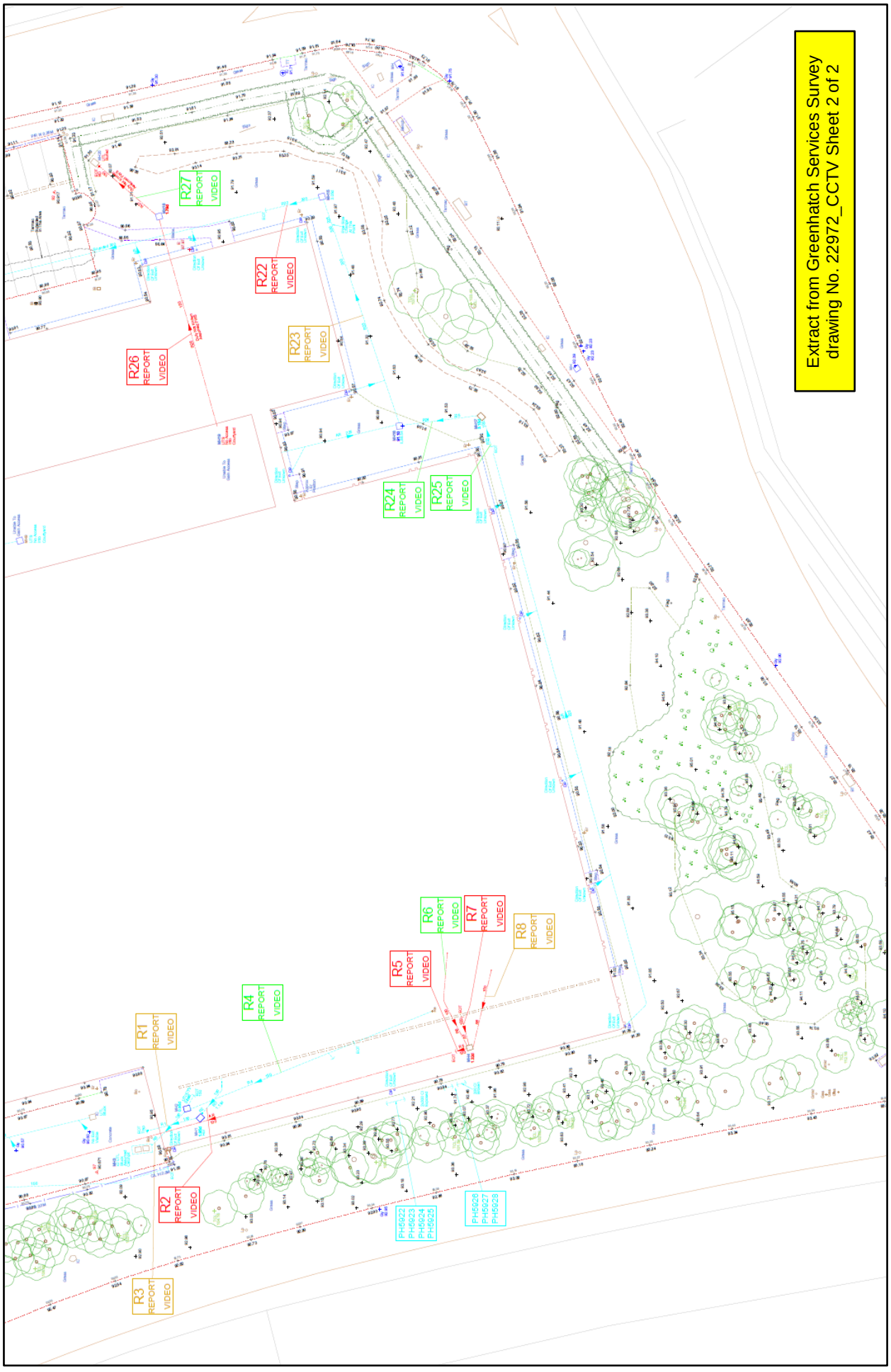
Topographical and Services Survey

Existing Site



Extract from Greenhatch Topographical Survey drawing No. 22972_01_T Rev 0


R20 REPORT VIDEO
R19 REPORT VIDEO
R21 REPORT VIDEO
R18 REPORT VIDEO
R16 REPORT VIDEO
R11 REPORT VIDEO
R9 REPORT VIDEO
R10 REPORT VIDEO
R14 REPORT VIDEO
R15 REPORT VIDEO
R17 REPORT VIDEO
R29 REPORT VIDEO
R30 REPORT VIDEO
R28 REPORT VIDEO
R12 REPORT VIDEO
R13 REPORT VIDEO
SIXTH AVENUE
Extract from Greenhatch Services Survey drawing No. 22972_CCTV Sheet 1 of 2


Extract from Greenhatch Services Survey drawing No. 22972_CCTV Sheet 2 of 2
R27 REPORT VIDEO
R22 REPORT VIDEO
R23 REPORT VIDEO
R26 REPORT VIDEO
R24 REPORT VIDEO
R25 REPORT VIDEO
R6 REPORT VIDEO
R7 REPORT VIDEO
R8 REPORT VIDEO
R5 REPORT VIDEO
R4 REPORT VIDEO
R1 REPORT VIDEO
R2 REPORT VIDEO
R3 REPORT VIDEO
PH5622 PH5623 PH5624 PH5625
PH5626 PH5627 PH5628

4.3 APPENDIX C

Proposed Redevelopment

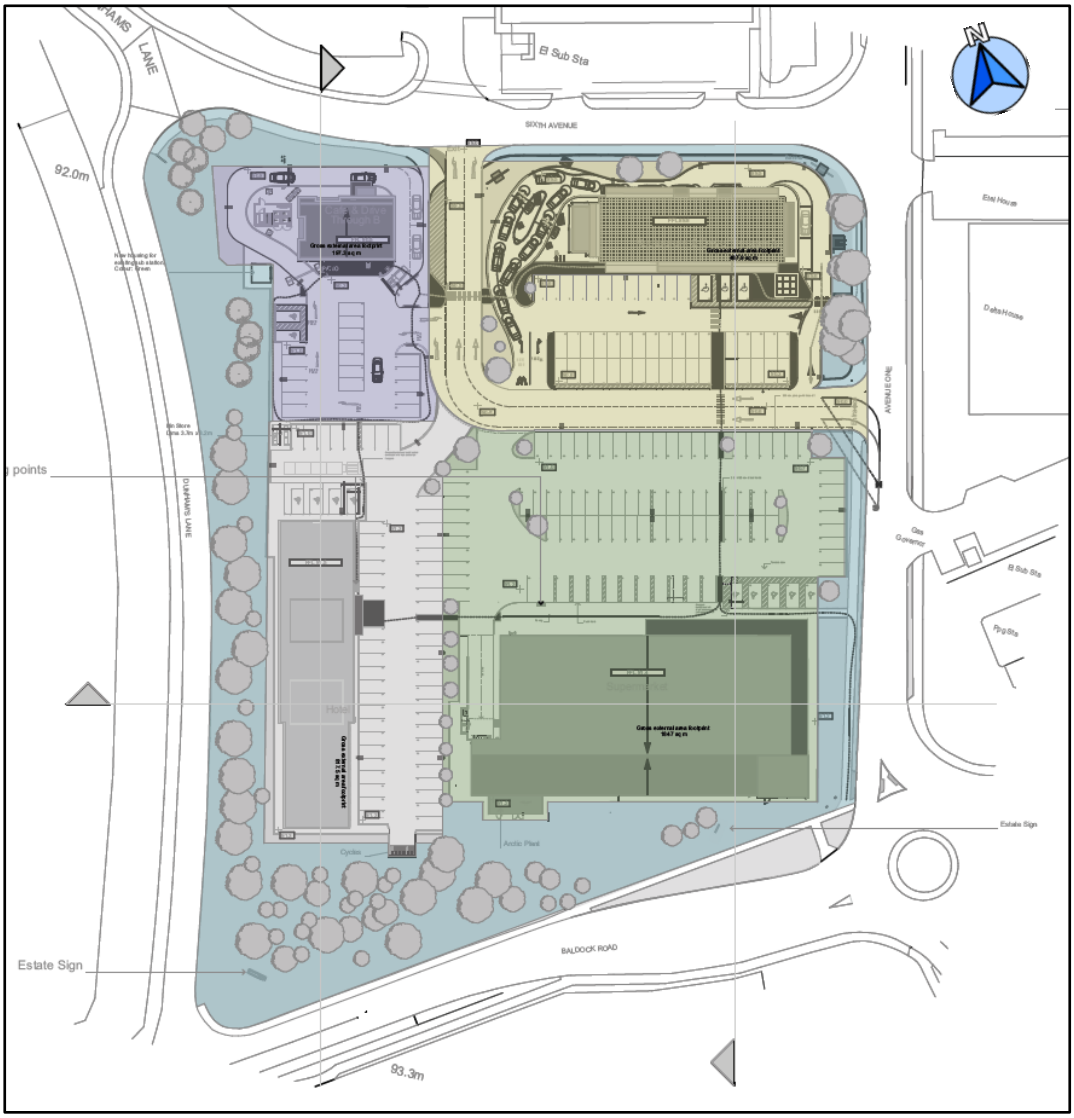


Extract from SHA drawing No. AP(0)002 Rev G

Letchworth Gateway

4.4 APPENDIX D

Proposed Phasing of the Redevelopment



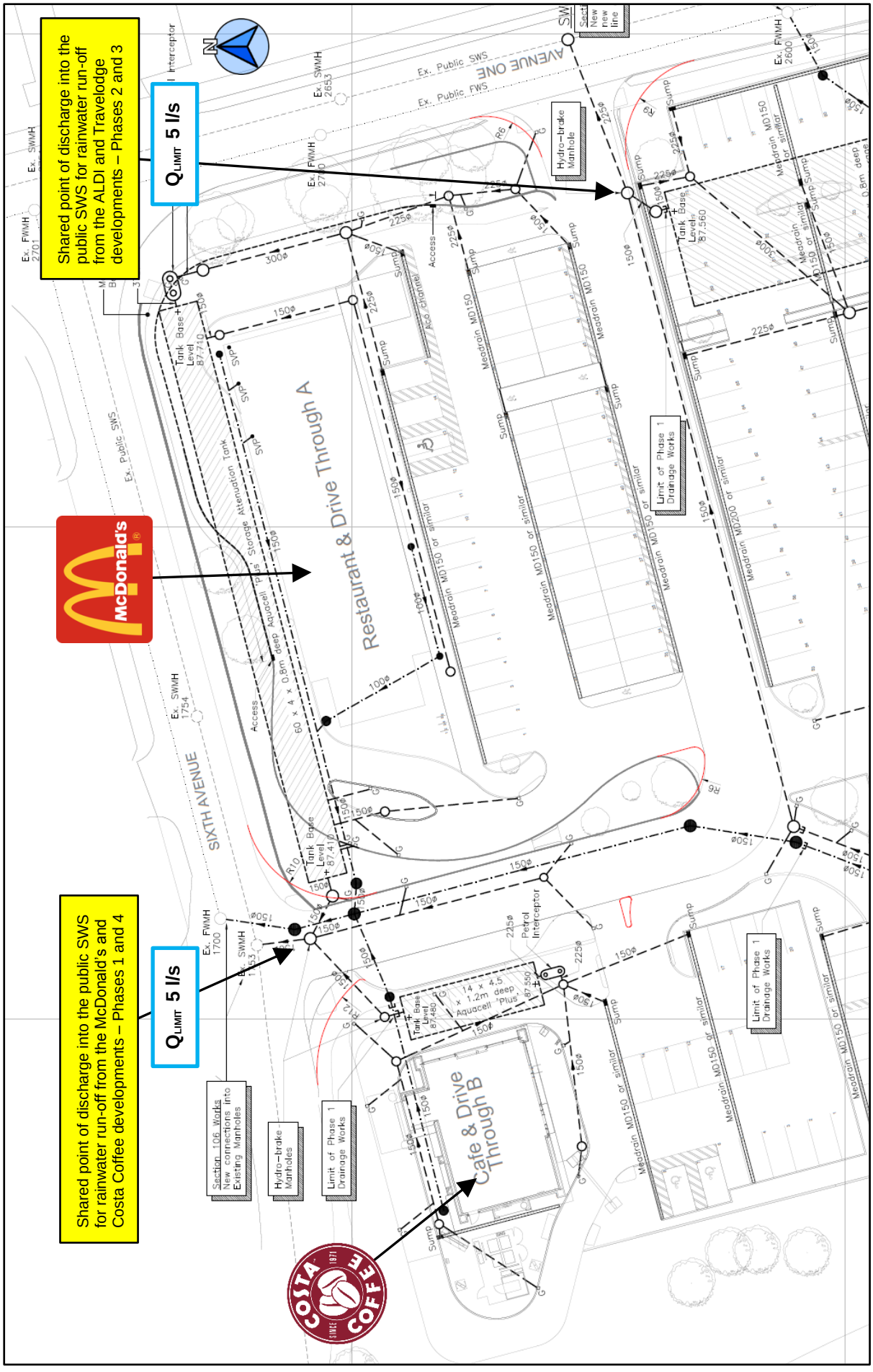
Extract from SHA drawing No. AP(0)027 Rev A

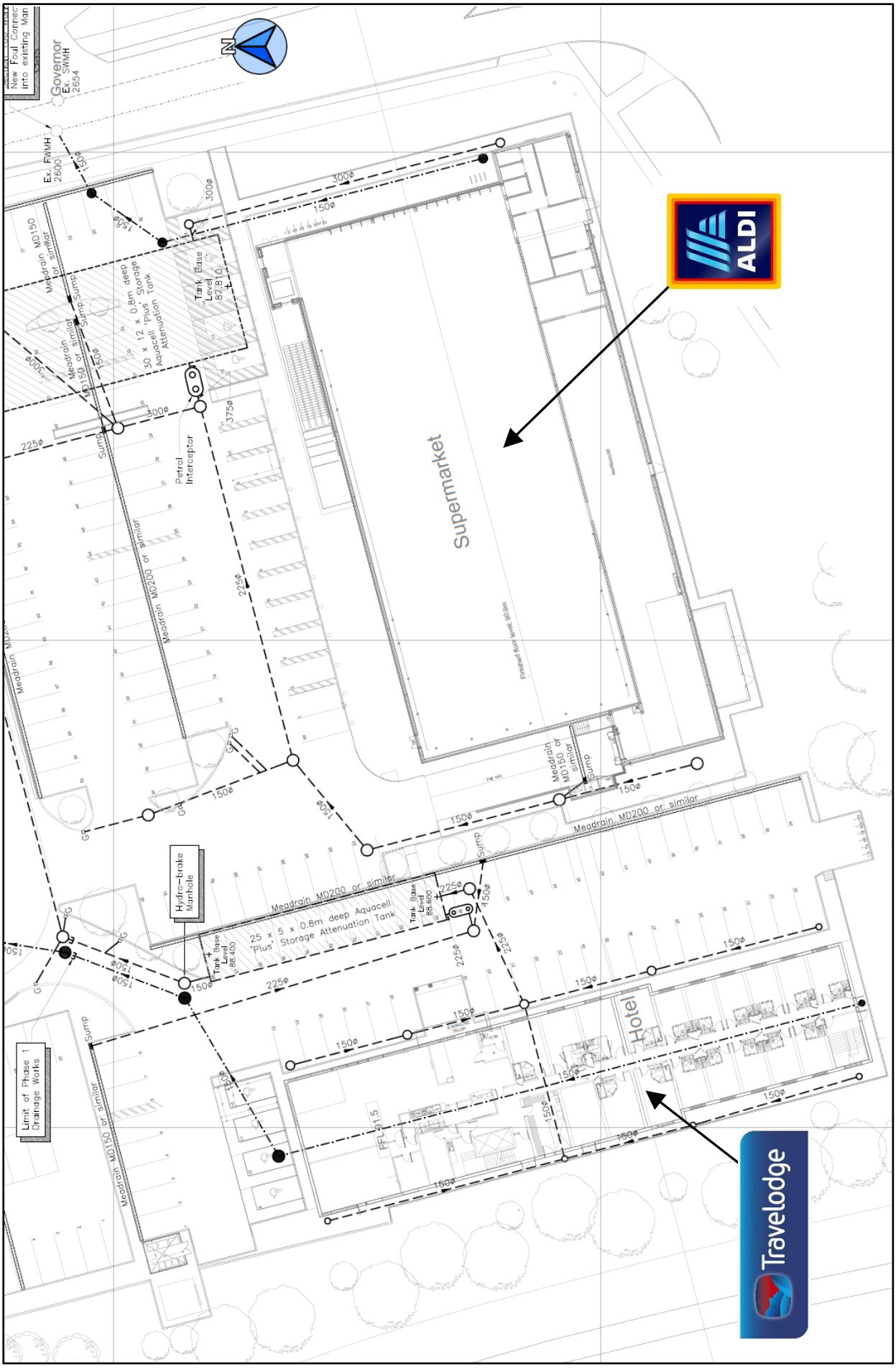
- Phase 1 – McDonald's restaurant and drive-thru'
- Phase 2 – ALDI superstore
- Phase 3 – Travelodge hotel
- Phase 4 – Costa Coffee café and drive-thru'
- Phase 5 – Landscaping to be undertaken during appropriate planting seasons

4.5 APPENDIX E

Proposed Redevelopment SWS

Extracts from Drawing No. 2016-238-101 Rev T1


Shared point of discharge into the public SWS for rainwater run-off from the ALDI and Travelodge developments – Phases 2 and 3
Q_{LIMIT} 5 l/s
Shared point of discharge into the public SWS for rainwater run-off from the McDonald's and Costa Coffee developments – Phases 1 and 4
Q_{LIMIT} 5 l/s
Restaurant & Drive Through A
Cafe & Drive Through B
SIXTH AVENUE
AVENUE ONE
Ex. Public SWS
Ex. Public FWS
Hydro-brake Manhole
Limit of Phase 1 Drainage Works
Section 106 Works New connections into Existing Manholes
Hydro-brake Manholes
Petrol Interceptor
Meadrain MD150 or similar
Meadrain MD200 or similar
Access
Sump


Supermarket
ALDI
Hotel
Travelodge
Governor
Ex. SWMH
2654
Ex. FWMH
2600
Tank Base Level 87.810
30 x 12 x 0.8m deep Aquacell 'Plus' Storage Attenuation Tank
Petrol Interceptor
Meadrain MD200 or similar
Meadrain MD150 or similar
Sump
Hydro-brake Manhole
25 x 5 x 0.8m deep Aquacell 'Plus' Storage Attenuation Tank
Tank Base Level 86.400
Tank Base Level 86.600
Limit of Phase 1 Drainage Works
FFL 91.5

4.6 APPENDIX F

SWS Calculations

Micro Drainage

Calculation Results for 1 in 100yr storm events

Phase 1 and Phase 4 combined SWS – calculation pages 1 to 17

Phase 2 and Phase 3 combined SWS – calculation pages 18 to 33

Nolan Associates Ltd		Page 1
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	
Date 06.05.2017 File M100-15+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.513	4-8	0.021

Total Area Contributing (ha) = 0.534

Total Pipe Volume (m³) = 278.435

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54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-15+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	8.000	0.315	25.4	0.050	3.00	0.0	0.600	o	225
1.001	7.000	0.140	50.0	0.025	0.00	0.0	0.600	o	300
2.000	8.000	0.110	72.7	0.055	3.00	0.0	0.600	o	225
1.002	11.000	0.220	50.0	0.000	0.00	0.0	0.600	o	300
3.000	6.000	0.100	60.0	0.014	3.00	0.0	0.600	o	150
4.000	14.500	0.185	78.4	0.056	3.00	0.0	0.600	o	225
1.003	18.500	0.370	50.0	0.040	0.00	0.0	0.600	o	375
1.004	3.000	0.060	50.0	0.000	0.00	0.0	0.600	o	375
5.000	39.000	0.565	69.0	0.024	3.00	0.0	0.600	o	150
5.001	15.500	0.225	68.9	0.000	0.00	0.0	0.600	o	150
1.005	60.000	0.300	200.0	0.024	0.00	0.0	0.600	[]	-2
6.000	19.000	0.840	22.6	0.038	3.00	0.0	0.600	o	150
1.006	2.000	0.020	100.0	0.000	0.00	0.0	0.600	o	150
1.007	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	150
7.000	25.000	1.000	25.0	0.045	3.00	0.0	0.600	o	150

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	89.440	0.050	0.0	2.61	103.7
1.001	89.050	0.075	0.0	2.23	157.5
2.000	89.110	0.055	0.0	1.54	61.0
1.002	88.910	0.130	0.0	2.23	157.5
3.000	88.850	0.014	0.0	1.30	23.0
4.000	88.950	0.056	0.0	1.48	58.8
1.003	88.615	0.240	0.0	2.57	283.6
1.004	88.195	0.240	0.0	2.57	283.6
5.000	89.150	0.024	0.0	1.21	21.4
5.001	88.585	0.024	0.0	1.21	21.4
1.005	87.710	0.288	0.0	2.82	9019.7
6.000	88.900	0.038	0.0	2.13	37.6
1.006	87.410	0.326	0.0	1.00	17.8
1.007	87.390	0.326	0.0	1.00	17.8
7.000	89.300	0.045	0.0	2.02	35.7

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Nolan Associates Ltd		Page 3
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	
Date 06.05.2017 File M100-15+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
8.000	17.000	0.340	50.0	0.047	3.00	0.0	0.600	o	225
8.001	18.500	0.185	100.0	0.021	0.00	0.0	0.600	o	300
9.000	17.000	0.340	50.0	0.033	3.00	0.0	0.600	o	225
10.000	5.000	0.200	25.0	0.027	3.00	0.0	0.600	o	150
11.000	14.500	0.290	50.0	0.035	3.00	0.0	0.600	o	225
8.002	2.000	0.040	50.0	0.000	0.00	0.0	0.600	o	300
8.003	3.000	0.060	50.0	0.000	0.00	0.0	0.600	o	300
8.004	14.000	0.070	200.0	0.000	0.00	0.0	0.600	[]	-5
8.005	2.000	0.020	100.0	0.000	0.00	0.0	0.600	o	150
8.006	11.000	0.110	100.0	0.000	0.00	0.0	0.600	o	150
1.008	5.500	0.050	110.0	0.000	0.00	0.0	0.600	o	150

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
8.000	89.500	0.047	0.0	1.85	73.7
8.001	89.085	0.068	0.0	1.57	111.1
9.000	89.400	0.033	0.0	1.85	73.7
10.000	89.700	0.027	0.0	2.02	35.7
11.000	89.975	0.035	0.0	1.85	73.7
8.002	88.900	0.163	0.0	2.23	157.5
8.003	88.810	0.163	0.0	2.23	157.5
8.004	87.550	0.163	0.0	3.49	18868.3
8.005	87.470	0.163	0.0	1.00	17.8
8.006	87.450	0.163	0.0	1.00	17.8
1.008	87.340	0.534	0.0	0.96	16.9

Conduit Sections for Storm

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m²)
-2	[]	4000	800	90.0		1.333	3.200
-5	[]	4500	1200	90.0		1.895	5.400

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Nolan Associates Ltd		Page 4
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-15+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008		88.500	87.290	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	40.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	15
Ratio R	0.450		

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Nolan Associates Ltd		Page 5
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-15+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 25, DS/PN: 8.006, Volume (m³): 2.4

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	User Defined
Objective	Minimise upstream storage
Diameter (mm)	105
Invert Level (m)	87.450
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0	Kick-Flo®	0.636	4.0
Flush-Flo™	0.295	4.9	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.800	4.5	2.000	6.9	4.000	9.5	7.000	12.4
0.200	4.8	1.000	5.0	2.200	7.2	4.500	10.1	7.500	12.8
0.300	4.9	1.200	5.4	2.400	7.5	5.000	10.6	8.000	13.2
0.400	4.9	1.400	5.8	2.600	7.8	5.500	11.1	8.500	13.6
0.500	4.7	1.600	6.2	3.000	8.3	6.000	11.5	9.000	14.0
0.600	4.3	1.800	6.5	3.500	8.9	6.500	12.0	9.500	14.4

Hydro-Brake Optimum® Manhole: 26, DS/PN: 1.008, Volume (m³): 2.3

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	User Defined
Objective	Minimise upstream storage
Diameter (mm)	105
Invert Level (m)	87.340
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0	Kick-Flo®	0.636	4.0
Flush-Flo™	0.295	4.9	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.800	4.5	2.000	6.9	4.000	9.5	7.000	12.4
0.200	4.8	1.000	5.0	2.200	7.2	4.500	10.1	7.500	12.8
0.300	4.9	1.200	5.4	2.400	7.5	5.000	10.6	8.000	13.2
0.400	4.9	1.400	5.8	2.600	7.8	5.500	11.1	8.500	13.6
0.500	4.7	1.600	6.2	3.000	8.3	6.000	11.5	9.000	14.0
0.600	4.3	1.800	6.5	3.500	8.9	6.500	12.0	9.500	14.4

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Nolan Associates Ltd		Page 6
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-15+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 15 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.554	-0.111	0.000	0.50	0.0	39.4	OK
1.001	2	89.220	-0.130	0.000	0.59	0.0	55.0	OK
2.000	3	89.283	-0.052	0.000	0.92	0.0	43.1	OK
1.002	4	89.128	-0.082	0.000	0.83	0.0	97.1	OK
3.000	4a	88.942	-0.058	0.000	0.57	0.0	10.9	OK
4.000	5	89.114	-0.061	0.000	0.85	0.0	43.9	OK
1.003	6	88.917	-0.073	0.000	0.76	0.0	178.8	OK
1.004	12	88.694	0.124	0.000	1.66	0.0	178.1	SURCHARGED
5.000	12a	89.264	-0.036	0.000	0.86	0.0	17.9	OK
5.001	12b	88.700	-0.035	0.000	0.92	0.0	18.3	OK
1.005	12c	87.975	-0.535	0.000	0.03	0.0	205.1	OK
6.000	14a	89.008	-0.042	0.000	0.85	0.0	29.8	OK
1.006	14	87.975	0.415	0.000	0.07	0.0	0.7	SURCHARGED
1.007	15	87.977	0.437	0.000	0.01	0.0	0.2	SURCHARGED
7.000	16	89.507	0.057	0.000	1.00	0.0	34.1	SURCHARGED
8.000	17	89.635	-0.090	0.000	0.56	0.0	36.9	OK
8.001	18	89.534	0.149	0.000	0.51	0.0	49.1	SURCHARGED
9.000	19	89.532	-0.093	0.000	0.39	0.0	25.5	OK
10.000	20	89.800	-0.050	0.000	0.76	0.0	21.2	OK
11.000	21	90.079	-0.121	0.000	0.43	0.0	27.5	OK
8.002	22	89.485	0.285	0.000	1.93	0.0	118.1	SURCHARGED
8.003	23	89.256	0.146	0.000	1.92	0.0	117.7	SURCHARGED
8.004	24	88.288	-0.462	0.000	0.01	0.0	114.5	OK
8.005	24a	88.288	0.668	0.000	0.53	0.0	5.7	SURCHARGED
8.006	25	88.283	0.683	0.000	0.31	0.0	4.9	SURCHARGED
1.008	26	88.071	0.581	0.000	0.35	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 7
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-30+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 30 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.538	-0.127	0.000	0.39	0.0	31.2	OK
1.001	2	89.198	-0.152	0.000	0.49	0.0	45.9	OK
2.000	3	89.254	-0.081	0.000	0.73	0.0	34.3	OK
1.002	4	89.093	-0.117	0.000	0.68	0.0	80.1	OK
3.000	4a	88.921	-0.079	0.000	0.46	0.0	8.7	OK
4.000	5	89.086	-0.089	0.000	0.68	0.0	34.9	OK
1.003	6	88.831	-0.159	0.000	0.63	0.0	147.2	OK
1.004	12	88.634	0.064	0.000	1.35	0.0	145.1	SURCHARGED
5.000	12a	89.245	-0.055	0.000	0.71	0.0	14.8	OK
5.001	12b	88.682	-0.053	0.000	0.74	0.0	14.6	OK
1.005	12c	88.091	-0.419	0.000	0.03	0.0	173.0	OK
6.000	14a	88.990	-0.060	0.000	0.67	0.0	23.7	OK
1.006	14	88.091	0.531	0.000	0.11	0.0	1.2	SURCHARGED
1.007	15	88.093	0.553	0.000	0.01	0.0	0.2	SURCHARGED
7.000	16	89.404	-0.046	0.000	0.83	0.0	28.1	OK
8.000	17	89.605	-0.120	0.000	0.45	0.0	29.3	OK
8.001	18	89.391	0.006	0.000	0.42	0.0	40.2	SURCHARGED
9.000	19	89.486	-0.139	0.000	0.31	0.0	20.6	OK
10.000	20	89.784	-0.066	0.000	0.60	0.0	16.8	OK
11.000	21	90.065	-0.135	0.000	0.34	0.0	21.8	OK
8.002	22	89.350	0.150	0.000	1.57	0.0	96.5	SURCHARGED
8.003	23	89.192	0.082	0.000	1.59	0.0	97.5	SURCHARGED
8.004	24	88.436	-0.314	0.000	0.01	0.0	96.1	OK
8.005	24a	88.436	0.816	0.000	0.53	0.0	5.7	SURCHARGED
8.006	25	88.432	0.832	0.000	0.31	0.0	4.9	SURCHARGED
1.008	26	88.106	0.616	0.000	0.35	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 8
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	
Date 06.05.2017 File M100-60+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 60 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.518	-0.147	0.000	0.26	0.0	20.7	OK
1.001	2	89.169	-0.181	0.000	0.33	0.0	30.8	OK
2.000	3	89.221	-0.114	0.000	0.49	0.0	22.7	OK
1.002	4	89.053	-0.157	0.000	0.45	0.0	52.9	OK
3.000	4a	88.906	-0.094	0.000	0.30	0.0	5.8	OK
4.000	5	89.056	-0.119	0.000	0.45	0.0	23.1	OK
1.003	6	88.785	-0.205	0.000	0.42	0.0	97.5	OK
1.004	12	88.480	-0.090	0.000	0.90	0.0	96.0	OK
5.000	12a	89.223	-0.077	0.000	0.47	0.0	9.7	OK
5.001	12b	88.660	-0.075	0.000	0.48	0.0	9.6	OK
1.005	12c	88.205	-0.305	0.000	0.02	0.0	112.5	OK
6.000	14a	88.970	-0.080	0.000	0.45	0.0	15.7	OK
1.006	14	88.205	0.645	0.000	0.14	0.0	1.6	SURCHARGED
1.007	15	88.206	0.666	0.000	0.11	0.0	1.6	SURCHARGED
7.000	16	89.380	-0.070	0.000	0.55	0.0	18.6	OK
8.000	17	89.584	-0.141	0.000	0.30	0.0	19.4	OK
8.001	18	89.247	-0.138	0.000	0.28	0.0	27.2	OK
9.000	19	89.470	-0.155	0.000	0.21	0.0	13.6	OK
10.000	20	89.766	-0.084	0.000	0.40	0.0	11.2	OK
11.000	21	90.047	-0.153	0.000	0.22	0.0	14.5	OK
8.002	22	89.218	0.018	0.000	1.03	0.0	63.2	SURCHARGED
8.003	23	89.110	0.000	0.000	1.03	0.0	63.4	OK
8.004	24	88.528	-0.222	0.000	0.01	0.0	62.3	OK
8.005	24a	88.528	0.908	0.000	0.52	0.0	5.6	SURCHARGED
8.006	25	88.533	0.933	0.000	0.31	0.0	4.9	SURCHARGED
1.008	26	88.215	0.725	0.000	0.35	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 9
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-120+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 120 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.499	-0.166	0.000	0.16	0.0	12.4	OK
1.001	2	89.140	-0.210	0.000	0.20	0.0	18.5	OK
2.000	3	89.192	-0.143	0.000	0.29	0.0	13.6	OK
1.002	4	89.016	-0.194	0.000	0.27	0.0	32.1	OK
3.000	4a	88.893	-0.107	0.000	0.18	0.0	3.5	OK
4.000	5	89.029	-0.146	0.000	0.27	0.0	13.8	OK
1.003	6	88.742	-0.248	0.000	0.25	0.0	59.3	OK
1.004	12	88.394	-0.176	0.000	0.55	0.0	59.3	OK
5.000	12a	89.204	-0.096	0.000	0.29	0.0	5.9	OK
5.001	12b	88.641	-0.094	0.000	0.30	0.0	5.9	OK
1.005	12c	88.322	-0.188	0.000	0.01	0.0	70.7	OK
6.000	14a	88.952	-0.098	0.000	0.27	0.0	9.4	OK
1.006	14	88.322	0.762	0.000	0.44	0.0	4.8	SURCHARGED
1.007	15	88.370	0.830	0.000	0.25	0.0	3.5	SURCHARGED
7.000	16	89.359	-0.091	0.000	0.33	0.0	11.1	OK
8.000	17	89.563	-0.162	0.000	0.18	0.0	11.6	OK
8.001	18	89.169	-0.216	0.000	0.18	0.0	16.8	OK
9.000	19	89.452	-0.173	0.000	0.12	0.0	8.2	OK
10.000	20	89.749	-0.101	0.000	0.24	0.0	6.7	OK
11.000	21	90.029	-0.171	0.000	0.13	0.0	8.7	OK
8.002	22	89.078	-0.122	0.000	0.66	0.0	40.3	OK
8.003	23	88.988	-0.122	0.000	0.66	0.0	40.3	OK
8.004	24	88.556	-0.194	0.000	0.00	0.0	39.6	OK
8.005	24a	88.556	0.936	0.000	0.46	0.0	5.0	SURCHARGED
8.006	25	88.576	0.976	0.000	0.31	0.0	4.9	SURCHARGED
1.008	26	88.400	0.910	0.000	0.36	0.0	5.0	SURCHARGED

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Nolan Associates Ltd		Page 10
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-180+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 180 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.492	-0.173	0.000	0.12	0.0	9.6	OK
1.001	2	89.128	-0.222	0.000	0.15	0.0	14.4	OK
2.000	3	89.182	-0.153	0.000	0.23	0.0	10.6	OK
1.002	4	89.003	-0.207	0.000	0.21	0.0	25.0	OK
3.000	4a	88.887	-0.113	0.000	0.14	0.0	2.7	OK
4.000	5	89.019	-0.156	0.000	0.21	0.0	10.8	OK
1.003	6	88.727	-0.263	0.000	0.20	0.0	46.1	OK
1.004	12	88.381	-0.189	0.000	0.43	0.0	46.1	OK
5.000	12a	89.198	-0.102	0.000	0.22	0.0	4.6	OK
5.001	12b	88.634	-0.101	0.000	0.23	0.0	4.6	OK
1.005	12c	88.381	-0.129	0.000	0.01	0.0	54.8	OK
6.000	14a	88.946	-0.104	0.000	0.21	0.0	7.3	OK
1.006	14	88.381	0.821	0.000	0.53	0.0	5.8	SURCHARGED
1.007	15	88.442	0.902	0.000	0.35	0.0	4.9	SURCHARGED
7.000	16	89.351	-0.099	0.000	0.25	0.0	8.7	OK
8.000	17	89.555	-0.170	0.000	0.14	0.0	9.0	OK
8.001	18	89.158	-0.227	0.000	0.14	0.0	13.1	OK
9.000	19	89.447	-0.178	0.000	0.10	0.0	6.4	OK
10.000	20	89.743	-0.107	0.000	0.19	0.0	5.2	OK
11.000	21	90.023	-0.177	0.000	0.10	0.0	6.7	OK
8.002	22	89.052	-0.148	0.000	0.51	0.0	31.3	OK
8.003	23	88.962	-0.148	0.000	0.51	0.0	31.3	OK
8.004	24	88.577	-0.173	0.000	0.00	0.0	30.8	OK
8.005	24a	88.577	0.957	0.000	0.55	0.0	6.0	SURCHARGED
8.006	25	88.660	1.060	0.000	0.29	0.0	4.6	SURCHARGED
1.008	26	88.493	1.003	0.000	0.37	0.0	5.1	SURCHARGED

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Nolan Associates Ltd		Page 11
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-240+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 240 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.487	-0.178	0.000	0.10	0.0	7.6	OK
1.001	2	89.119	-0.231	0.000	0.12	0.0	11.5	OK
2.000	3	89.174	-0.161	0.000	0.18	0.0	8.4	OK
1.002	4	88.992	-0.218	0.000	0.17	0.0	19.9	OK
3.000	4a	88.883	-0.117	0.000	0.11	0.0	2.1	OK
4.000	5	89.011	-0.164	0.000	0.17	0.0	8.6	OK
1.003	6	88.713	-0.277	0.000	0.16	0.0	36.7	OK
1.004	12	88.416	-0.154	0.000	0.34	0.0	36.7	OK
5.000	12a	89.192	-0.108	0.000	0.18	0.0	3.7	OK
5.001	12b	88.628	-0.107	0.000	0.18	0.0	3.7	OK
1.005	12c	88.415	-0.095	0.000	0.01	0.0	43.7	OK
6.000	14a	88.941	-0.109	0.000	0.16	0.0	5.8	OK
1.006	14	88.415	0.855	0.000	0.51	0.0	5.6	SURCHARGED
1.007	15	88.446	0.906	0.000	0.29	0.0	4.1	SURCHARGED
7.000	16	89.346	-0.104	0.000	0.20	0.0	6.9	OK
8.000	17	89.549	-0.176	0.000	0.11	0.0	7.2	OK
8.001	18	89.151	-0.234	0.000	0.11	0.0	10.4	OK
9.000	19	89.441	-0.184	0.000	0.08	0.0	5.0	OK
10.000	20	89.738	-0.112	0.000	0.15	0.0	4.1	OK
11.000	21	90.018	-0.182	0.000	0.08	0.0	5.3	OK
8.002	22	89.033	-0.167	0.000	0.41	0.0	24.9	OK
8.003	23	88.943	-0.167	0.000	0.41	0.0	24.9	OK
8.004	24	88.508	-0.242	0.000	0.00	0.0	24.5	OK
8.005	24a	88.508	0.888	0.000	0.48	0.0	5.2	SURCHARGED
8.006	25	88.548	0.948	0.000	0.30	0.0	4.8	SURCHARGED
1.008	26	88.458	0.968	0.000	0.37	0.0	5.1	SURCHARGED

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Nolan Associates Ltd		Page 12
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-360+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 360 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.479	-0.186	0.000	0.07	0.0	5.5	OK
1.001	2	89.110	-0.240	0.000	0.09	0.0	8.2	OK
2.000	3	89.163	-0.172	0.000	0.13	0.0	6.0	OK
1.002	4	88.979	-0.231	0.000	0.12	0.0	14.3	OK
3.000	4a	88.878	-0.122	0.000	0.08	0.0	1.5	OK
4.000	5	89.001	-0.174	0.000	0.12	0.0	6.1	OK
1.003	6	88.698	-0.292	0.000	0.11	0.0	26.3	OK
1.004	12	88.359	-0.211	0.000	0.25	0.0	26.3	OK
5.000	12a	89.185	-0.115	0.000	0.13	0.0	2.6	OK
5.001	12b	88.621	-0.114	0.000	0.13	0.0	2.6	OK
1.005	12c	88.358	-0.152	0.000	0.01	0.0	31.4	OK
6.000	14a	88.934	-0.116	0.000	0.12	0.0	4.2	OK
1.006	14	88.358	0.798	0.000	0.66	0.0	7.2	SURCHARGED
1.007	15	88.481	0.941	0.000	0.32	0.0	4.5	SURCHARGED
7.000	16	89.338	-0.112	0.000	0.15	0.0	4.9	OK
8.000	17	89.542	-0.183	0.000	0.08	0.0	5.2	OK
8.001	18	89.140	-0.245	0.000	0.08	0.0	7.5	OK
9.000	19	89.434	-0.191	0.000	0.06	0.0	3.6	OK
10.000	20	89.732	-0.118	0.000	0.11	0.0	3.0	OK
11.000	21	90.010	-0.190	0.000	0.06	0.0	3.8	OK
8.002	22	89.010	-0.190	0.000	0.29	0.0	17.9	OK
8.003	23	88.920	-0.190	0.000	0.29	0.0	17.9	OK
8.004	24	88.543	-0.207	0.000	0.00	0.0	17.6	OK
8.005	24a	88.543	0.923	0.000	0.42	0.0	4.6	SURCHARGED
8.006	25	88.656	1.056	0.000	0.25	0.0	4.0	SURCHARGED
1.008	26	88.551	1.061	0.000	0.36	0.0	5.0	FLOOD RISK

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Nolan Associates Ltd		Page 13
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	
Date 06.05.2017 File M100-480+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 480 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.474	-0.191	0.000	0.05	0.0	4.3	OK
1.001	2	89.102	-0.248	0.000	0.07	0.0	6.5	OK
2.000	3	89.158	-0.177	0.000	0.10	0.0	4.8	OK
1.002	4	88.972	-0.238	0.000	0.10	0.0	11.3	OK
3.000	4a	88.874	-0.126	0.000	0.06	0.0	1.2	OK
4.000	5	88.996	-0.179	0.000	0.09	0.0	4.9	OK
1.003	6	88.690	-0.300	0.000	0.09	0.0	20.8	OK
1.004	12	88.307	-0.263	0.000	0.19	0.0	20.8	OK
5.000	12a	89.182	-0.118	0.000	0.10	0.0	2.1	OK
5.001	12b	88.617	-0.118	0.000	0.11	0.0	2.1	OK
1.005	12c	88.285	-0.225	0.000	0.00	0.0	24.9	OK
6.000	14a	88.931	-0.119	0.000	0.09	0.0	3.3	OK
1.006	14	88.285	0.725	0.000	0.71	0.0	7.7	SURCHARGED
1.007	15	88.597	1.057	0.000	0.42	0.0	5.8	SURCHARGED
7.000	16	89.334	-0.116	0.000	0.11	0.0	3.9	OK
8.000	17	89.536	-0.189	0.000	0.06	0.0	4.1	OK
8.001	18	89.133	-0.252	0.000	0.06	0.0	5.9	OK
9.000	19	89.430	-0.195	0.000	0.04	0.0	2.9	OK
10.000	20	89.729	-0.121	0.000	0.08	0.0	2.3	OK
11.000	21	90.006	-0.194	0.000	0.05	0.0	3.0	OK
8.002	22	88.997	-0.203	0.000	0.23	0.0	14.2	OK
8.003	23	88.907	-0.203	0.000	0.23	0.0	14.2	OK
8.004	24	88.588	-0.162	0.000	0.00	0.0	13.9	OK
8.005	24a	88.588	0.968	0.000	0.40	0.0	4.3	SURCHARGED
8.006	25	88.828	1.228	0.000	0.19	0.0	3.0	SURCHARGED
1.008	26	88.676	1.186	0.000	0.36	0.0	5.1	FLOOD RISK

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Nolan Associates Ltd		Page 14
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-600+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 600 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.471	-0.194	0.000	0.05	0.0	3.6	OK
1.001	2	89.096	-0.254	0.000	0.06	0.0	5.4	OK
2.000	3	89.154	-0.181	0.000	0.09	0.0	4.0	OK
1.002	4	88.966	-0.244	0.000	0.08	0.0	9.4	OK
3.000	4a	88.872	-0.128	0.000	0.05	0.0	1.0	OK
4.000	5	88.992	-0.183	0.000	0.08	0.0	4.1	OK
1.003	6	88.682	-0.308	0.000	0.07	0.0	17.4	OK
1.004	12	88.295	-0.275	0.000	0.16	0.0	17.4	OK
5.000	12a	89.179	-0.121	0.000	0.08	0.0	1.7	OK
5.001	12b	88.615	-0.120	0.000	0.09	0.0	1.7	OK
1.005	12c	88.280	-0.230	0.000	0.00	0.0	20.7	OK
6.000	14a	88.928	-0.122	0.000	0.08	0.0	2.8	OK
1.006	14	88.280	0.720	0.000	0.43	0.0	4.7	SURCHARGED
1.007	15	88.392	0.852	0.000	0.30	0.0	4.2	SURCHARGED
7.000	16	89.331	-0.119	0.000	0.10	0.0	3.3	OK
8.000	17	89.533	-0.192	0.000	0.05	0.0	3.4	OK
8.001	18	89.128	-0.257	0.000	0.05	0.0	4.9	OK
9.000	19	89.428	-0.197	0.000	0.04	0.0	2.4	OK
10.000	20	89.726	-0.124	0.000	0.07	0.0	2.0	OK
11.000	21	90.004	-0.196	0.000	0.04	0.0	2.5	OK
8.002	22	88.989	-0.211	0.000	0.19	0.0	11.8	OK
8.003	23	88.899	-0.211	0.000	0.19	0.0	11.8	OK
8.004	24	88.396	-0.354	0.000	0.00	0.0	11.6	OK
8.005	24a	88.396	0.776	0.000	0.39	0.0	4.2	SURCHARGED
8.006	25	88.453	0.853	0.000	0.23	0.0	3.7	SURCHARGED
1.008	26	88.433	0.943	0.000	0.35	0.0	4.8	SURCHARGED

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Nolan Associates Ltd		Page 15
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-720+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 720 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.469	-0.196	0.000	0.04	0.0	3.1	OK
1.001	2	89.093	-0.257	0.000	0.05	0.0	4.7	OK
2.000	3	89.150	-0.185	0.000	0.07	0.0	3.4	OK
1.002	4	88.961	-0.249	0.000	0.07	0.0	8.1	OK
3.000	4a	88.870	-0.130	0.000	0.05	0.0	0.9	OK
4.000	5	88.988	-0.187	0.000	0.07	0.0	3.5	OK
1.003	6	88.676	-0.314	0.000	0.06	0.0	15.0	OK
1.004	12	88.288	-0.282	0.000	0.14	0.0	15.0	OK
5.000	12a	89.176	-0.124	0.000	0.07	0.0	1.5	OK
5.001	12b	88.612	-0.123	0.000	0.08	0.0	1.5	OK
1.005	12c	88.238	-0.272	0.000	0.00	0.0	17.9	OK
6.000	14a	88.925	-0.125	0.000	0.07	0.0	2.4	OK
1.006	14	88.238	0.678	0.000	0.42	0.0	4.6	SURCHARGED
1.007	15	88.395	0.855	0.000	0.30	0.0	4.2	SURCHARGED
7.000	16	89.329	-0.121	0.000	0.08	0.0	2.8	OK
8.000	17	89.530	-0.195	0.000	0.04	0.0	2.9	OK
8.001	18	89.125	-0.260	0.000	0.04	0.0	4.2	OK
9.000	19	89.426	-0.199	0.000	0.03	0.0	2.1	OK
10.000	20	89.724	-0.126	0.000	0.06	0.0	1.7	OK
11.000	21	90.002	-0.198	0.000	0.03	0.0	2.2	OK
8.002	22	88.981	-0.219	0.000	0.17	0.0	10.2	OK
8.003	23	88.891	-0.219	0.000	0.17	0.0	10.2	OK
8.004	24	88.396	-0.354	0.000	0.00	0.0	10.0	OK
8.005	24a	88.396	0.776	0.000	0.37	0.0	4.0	SURCHARGED
8.006	25	88.503	0.903	0.000	0.19	0.0	3.1	SURCHARGED
1.008	26	88.482	0.992	0.000	0.34	0.0	4.7	SURCHARGED

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Nolan Associates Ltd		Page 16
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-840+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 840 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.467	-0.198	0.000	0.03	0.0	2.7	OK
1.001	2	89.090	-0.260	0.000	0.04	0.0	4.1	OK
2.000	3	89.147	-0.188	0.000	0.06	0.0	3.0	OK
1.002	4	88.958	-0.252	0.000	0.06	0.0	7.1	OK
3.000	4a	88.869	-0.131	0.000	0.04	0.0	0.8	OK
4.000	5	88.985	-0.190	0.000	0.06	0.0	3.1	OK
1.003	6	88.672	-0.318	0.000	0.06	0.0	13.2	OK
1.004	12	88.282	-0.288	0.000	0.12	0.0	13.2	OK
5.000	12a	89.174	-0.126	0.000	0.06	0.0	1.3	OK
5.001	12b	88.610	-0.125	0.000	0.07	0.0	1.3	OK
1.005	12c	88.198	-0.312	0.000	0.00	0.0	15.7	OK
6.000	14a	88.923	-0.127	0.000	0.06	0.0	2.1	OK
1.006	14	88.198	0.638	0.000	0.40	0.0	4.3	SURCHARGED
1.007	15	88.456	0.916	0.000	0.30	0.0	4.2	SURCHARGED
7.000	16	89.326	-0.124	0.000	0.07	0.0	2.5	OK
8.000	17	89.529	-0.196	0.000	0.04	0.0	2.6	OK
8.001	18	89.123	-0.262	0.000	0.04	0.0	3.7	OK
9.000	19	89.425	-0.200	0.000	0.03	0.0	1.8	OK
10.000	20	89.722	-0.128	0.000	0.05	0.0	1.5	OK
11.000	21	90.000	-0.200	0.000	0.03	0.0	1.9	OK
8.002	22	88.976	-0.224	0.000	0.15	0.0	9.0	OK
8.003	23	88.886	-0.224	0.000	0.15	0.0	9.0	OK
8.004	24	88.419	-0.331	0.000	0.00	0.0	8.8	OK
8.005	24a	88.419	0.799	0.000	0.32	0.0	3.4	SURCHARGED
8.006	25	88.551	0.951	0.000	0.17	0.0	2.7	SURCHARGED
1.008	26	88.523	1.033	0.000	0.35	0.0	4.9	FLOOD RISK

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Nolan Associates Ltd		Page 17
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS McDonalds & Costa Coffee 2016-238 Rev A	Micro Drainage
Date 06.05.2017 File M100-960+40% network McD+CC	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 960 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	89.466	-0.199	0.000	0.03	0.0	2.5	OK
1.001	2	89.088	-0.262	0.000	0.04	0.0	3.7	OK
2.000	3	89.145	-0.190	0.000	0.06	0.0	2.7	OK
1.002	4	88.955	-0.255	0.000	0.05	0.0	6.4	OK
3.000	4a	88.868	-0.132	0.000	0.04	0.0	0.7	OK
4.000	5	88.983	-0.192	0.000	0.05	0.0	2.8	OK
1.003	6	88.669	-0.321	0.000	0.05	0.0	11.8	OK
1.004	12	88.278	-0.292	0.000	0.11	0.0	11.8	OK
5.000	12a	89.173	-0.127	0.000	0.06	0.0	1.2	OK
5.001	12b	88.609	-0.126	0.000	0.06	0.0	1.2	OK
1.005	12c	88.171	-0.339	0.000	0.00	0.0	14.1	OK
6.000	14a	88.922	-0.128	0.000	0.05	0.0	1.9	OK
1.006	14	88.172	0.612	0.000	0.40	0.0	4.4	SURCHARGED
1.007	15	88.515	0.975	0.000	0.30	0.0	4.2	SURCHARGED
7.000	16	89.325	-0.125	0.000	0.07	0.0	2.2	OK
8.000	17	89.527	-0.198	0.000	0.04	0.0	2.3	OK
8.001	18	89.121	-0.264	0.000	0.03	0.0	3.3	OK
9.000	19	89.424	-0.201	0.000	0.02	0.0	1.6	OK
10.000	20	89.721	-0.129	0.000	0.05	0.0	1.3	OK
11.000	21	89.999	-0.201	0.000	0.03	0.0	1.7	OK
8.002	22	88.972	-0.228	0.000	0.13	0.0	8.0	OK
8.003	23	88.882	-0.228	0.000	0.13	0.0	8.0	OK
8.004	24	88.430	-0.320	0.000	0.00	0.0	7.9	OK
8.005	24a	88.430	0.810	0.000	0.34	0.0	3.7	SURCHARGED
8.006	25	88.645	1.045	0.000	0.16	0.0	2.6	SURCHARGED
1.008	26	88.597	1.107	0.000	0.35	0.0	4.9	FLOOD RISK

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Nolan Associates Ltd		Page 18
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-15+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Existing Network Details for Storm

* - Indicates pipe has been modified outside of System 1

	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
*	1.000	32.000	0.320	100.0	0.026	4.00	0.600	o	150
*	2.000	25.000	0.250	100.0	0.027	4.00	0.600	o	150
*	1.001	17.000	0.170	100.0	0.000	0.00	0.600	o	150
*	3.000	32.000	0.320	100.0	0.026	4.00	0.600	o	150
*	4.000	25.000	0.250	100.0	0.023	4.00	0.600	o	150
*	1.002	14.000	0.140	100.0	0.000	0.00	0.600	o	225
*	1.003	3.000	0.060	50.0	0.000	0.00	0.600	o	225
*	5.000	41.000	0.125	328.0	0.047	4.00	0.600	o	225
*	6.000	7.000	0.140	50.0	0.109	4.00	0.600	o	225
*	5.001	2.500	0.050	50.0	0.000	0.00	0.600	o	225
*	5.002	2.500	0.050	50.0	0.000	0.00	0.600	o	225
*	1.004	25.000	0.200	125.0	0.000	0.00	0.600	[]	-5
*	1.005	3.000	0.033	90.9	0.000	0.00	0.600	o	150
*	1.006	13.000	0.140	92.9	0.013	0.00	0.600	o	150
*	1.007	66.500	0.707	94.1	0.000	0.00	0.600	o	150

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
*	1.000	1	91.400	90.700	0.550	91.400	90.380	0.870		1200
*	2.000	2	91.400	90.700	0.550	91.400	90.450	0.800		1200
*	1.001	3	91.400	90.380	0.870	91.350	90.210	0.990		1200
*	3.000	4	91.350	90.700	0.500	91.350	90.380	0.820		1200
*	4.000	6	91.350	90.700	0.500	91.350	90.450	0.750		1200
*	1.002	8	91.350	90.135	0.990	91.200	89.995	0.980		1200
*	1.003	9	91.200	89.635	1.340	91.200	89.575	1.400		1200
*	5.000	10	91.050	90.300	0.525	91.200	90.175	0.800		1200
*	6.000	10a	91.375	90.175	0.975	91.200	90.035	0.940		1200
*	5.001	12	91.200	89.725	1.250	91.300	89.675	1.400		1200
*	5.002	14	91.300	89.625	1.450	91.200	89.575	1.400		1200
*	1.004	16	91.200	88.600	1.400	91.200	88.400	1.600		1200
*	1.005	17	91.200	88.400	2.650	91.180	88.367	2.663		1200
*	1.006	18	91.180	88.367	2.663	90.850	88.227	2.473	Hydro-Brake®	1200
*	1.007	19	90.850	88.227	2.473	90.300	87.520	2.630		1200

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Nolan Associates Ltd		Page 19
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-15+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Existing Network Details for Storm

	PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
*	7.000	35.000	0.500	70.0	0.040	4.00	0.600	o	150
*	7.001	12.000	0.200	60.0	0.008	0.00	0.600	o	150
*	7.002	37.500	0.625	60.0	0.030	0.00	0.600	o	225
*	8.000	7.000	0.140	50.0	0.039	4.00	0.600	o	225
*	9.000	5.000	0.170	29.4	0.026	4.00	0.600	o	225
*	8.001	21.000	0.225	93.3	0.000	0.00	0.600	o	300
*	10.000	16.500	0.325	50.8	0.064	4.00	0.600	o	225
*	11.000	14.000	0.280	50.0	0.032	4.00	0.600	o	150
*	12.000	2.000	0.050	40.0	0.079	4.00	0.600	o	225
*	8.002	8.500	0.170	50.0	0.000	0.00	0.600	o	300
*	7.003	2.000	0.100	20.0	0.000	0.00	0.600	o	375
*	7.004	3.000	0.060	50.0	0.000	0.00	0.600	o	375
*	13.000	33.000	0.650	50.8	0.180	4.00	0.600	o	300
*	13.001	2.000	0.100	20.0	0.000	0.00	0.600	o	300
*	7.005	30.000	0.250	120.0	0.000	0.00	0.600	[]	-11

	PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
*	7.000	20	91.300	90.200	0.950	91.100	89.700	1.250		1200
*	7.001	21	91.100	89.700	1.250	90.200	89.500	0.550		1200
*	7.002	22	90.200	89.425	0.550	91.200	88.800	2.175		1200
*	8.000	23	90.440	89.740	0.475	90.590	89.600	0.765		1200
*	9.000	24	90.470	89.770	0.475	90.590	89.600	0.765		1200
*	8.001	25	90.590	89.525	0.765	90.650	89.300	1.050		1200
*	10.000	26	90.600	89.700	0.675	90.650	89.375	1.050		1200
*	11.000	27	90.995	90.170	0.675	90.650	89.890	0.610		1200
*	12.000	27a	90.990	89.990	0.775	90.650	89.940	0.485		1200
*	8.002	28	90.650	89.300	1.050	91.200	89.130	1.770		1200
*	7.003	30	91.200	88.445	2.380	91.200	88.345	2.480		1200
*	7.004	31	91.200	88.295	2.530	91.290	88.235	2.680		1200
*	13.000	32	91.250	90.500	0.450	91.200	89.850	1.050		1200
*	13.001	33	91.200	88.410	2.490	91.290	88.310	2.680		1200
*	7.005	34	91.290	87.810	2.680	90.480	87.560	2.120		1200

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Nolan Associates Ltd		Page 20
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-15+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
* 7.006	5.500	0.040	137.5	0.000	0.00	0.600	o	150
* 1.008	17.000	0.220	77.3	0.000	0.00	0.600	o	225

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
* 7.006	35	90.480	87.560	2.770	90.300	87.520	2.630		1200
* 1.008	36	90.300	87.520	2.555	88.900	87.300	1.375	Hydro-Brake®	1350

Conduit Sections for Storm

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m²)
-5	[]	4500	1200	90.0		1.895	5.400
-11	[]	12000	800	90.0		1.500	9.600

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008		88.900	87.300	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	40.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	15
Ratio R	0.450		

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Nolan Associates Ltd		Page 21
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-15+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 18, DS/PN: 1.006, Volume (m³): 3.2

Unit Reference	MD-SHE-0102-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	User Defined
Objective	Minimise upstream storage
Diameter (mm)	102
Invert Level (m)	88.367
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.740	4.0
Flush-Flo™	0.353	4.9	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	0.800	4.1	2.000	6.3	4.000	8.7	7.000	11.4
0.200	4.7	1.000	4.6	2.200	6.6	4.500	9.2	7.500	11.8
0.300	4.9	1.200	5.0	2.400	6.9	5.000	9.7	8.000	12.1
0.400	4.9	1.400	5.3	2.600	7.1	5.500	10.2	8.500	12.5
0.500	4.8	1.600	5.7	3.000	7.6	6.000	10.6	9.000	12.8
0.600	4.6	1.800	6.0	3.500	8.2	6.500	11.0	9.500	13.2

Hydro-Brake Optimum® Manhole: 36, DS/PN: 1.008, Volume (m³): 5.2

Unit Reference	MD-SHE-0102-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	102
Invert Level (m)	87.520
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.740	4.0
Flush-Flo™	0.353	4.9	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	0.800	4.1	2.000	6.3	4.000	8.7	7.000	11.4
0.200	4.7	1.000	4.6	2.200	6.6	4.500	9.2	7.500	11.8
0.300	4.9	1.200	5.0	2.400	6.9	5.000	9.7	8.000	12.1
0.400	4.9	1.400	5.3	2.600	7.1	5.500	10.2	8.500	12.5
0.500	4.8	1.600	5.7	3.000	7.6	6.000	10.6	9.000	12.8
0.600	4.6	1.800	6.0	3.500	8.2	6.500	11.0	9.500	13.2

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Nolan Associates Ltd		Page 22
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-15+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 15 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	91.151	0.301	0.000	0.88	0.0	14.9	FLOOD RISK
2.000	2	91.122	0.272	0.000	0.94	0.0	15.9	FLOOD RISK
1.001	3	90.933	0.403	0.000	1.71	0.0	28.2	SURCHARGED
3.000	4	90.871	0.021	0.000	1.02	0.0	17.4	SURCHARGED
4.000	6	90.815	-0.035	0.000	0.94	0.0	15.9	OK
1.002	8	90.438	0.078	0.000	1.28	0.0	58.0	SURCHARGED
1.003	9	89.963	0.103	0.000	1.67	0.0	57.5	SURCHARGED
5.000	10	90.795	0.270	0.000	1.04	0.0	28.2	FLOOD RISK
6.000	10a	90.915	0.515	0.000	1.32	0.0	69.5	SURCHARGED
5.001	12	90.661	0.711	0.000	2.95	0.0	93.1	SURCHARGED
5.002	14	90.217	0.367	0.000	2.94	0.0	92.6	SURCHARGED
1.004	16	89.143	-0.657	0.000	0.02	0.0	147.4	OK
1.005	17	89.143	0.593	0.000	0.39	0.0	4.4	SURCHARGED
1.006	18	89.159	0.642	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	88.280	-0.097	0.000	0.27	0.0	4.9	OK
7.000	20	90.768	0.418	0.000	1.20	0.0	24.6	SURCHARGED
7.001	21	90.028	0.178	0.000	1.37	0.0	28.4	SURCHARGED
7.002	22	89.572	-0.078	0.000	0.73	0.0	46.4	OK
8.000	23	89.916	-0.049	0.000	0.49	0.0	25.8	OK
9.000	24	89.900	-0.095	0.000	0.30	0.0	17.3	OK
8.001	25	89.886	0.061	0.000	0.44	0.0	44.7	SURCHARGED
10.000	26	89.989	0.064	0.000	0.66	0.0	42.8	SURCHARGED
11.000	27	90.286	-0.034	0.000	0.96	0.0	22.2	OK
12.000	27a	90.305	0.090	0.000	1.74	0.0	54.8	SURCHARGED
8.002	28	89.841	0.241	0.000	1.53	0.0	158.2	SURCHARGED
7.003	30	89.148	0.328	0.000	1.67	0.0	206.5	SURCHARGED
7.004	31	88.867	0.197	0.000	1.92	0.0	206.2	SURCHARGED
13.000	32	90.717	-0.083	0.000	0.87	0.0	124.7	OK
13.001	33	88.845	0.135	0.000	1.58	0.0	124.8	SURCHARGED
7.005	34	88.071	-0.539	0.000	0.02	0.0	322.3	OK
7.006	35	88.071	0.361	0.000	0.35	0.0	4.4	SURCHARGED
1.008	36	88.070	0.325	0.000	0.09	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 23
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-30+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 30 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.976	0.126	0.000	0.79	0.0	13.5	SURCHARGED
2.000	2	90.949	0.099	0.000	0.85	0.0	14.3	SURCHARGED
1.001	3	90.792	0.262	0.000	1.56	0.0	25.8	SURCHARGED
3.000	4	90.811	-0.039	0.000	0.89	0.0	15.1	OK
4.000	6	90.803	-0.047	0.000	0.79	0.0	13.3	OK
1.002	8	90.392	0.032	0.000	1.14	0.0	51.6	SURCHARGED
1.003	9	89.925	0.065	0.000	1.50	0.0	51.9	SURCHARGED
5.000	10	90.554	0.029	0.000	0.96	0.0	26.0	SURCHARGED
6.000	10a	90.626	0.226	0.000	1.16	0.0	61.3	SURCHARGED
5.001	12	90.450	0.500	0.000	2.56	0.0	80.5	SURCHARGED
5.002	14	90.113	0.263	0.000	2.56	0.0	80.7	SURCHARGED
1.004	16	89.299	-0.501	0.000	0.01	0.0	131.0	OK
1.005	17	89.299	0.749	0.000	0.47	0.0	5.3	SURCHARGED
1.006	18	89.310	0.793	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	88.280	-0.097	0.000	0.27	0.0	4.9	OK
7.000	20	90.526	0.176	0.000	1.06	0.0	21.8	SURCHARGED
7.001	21	89.952	0.102	0.000	1.24	0.0	25.7	SURCHARGED
7.002	22	89.560	-0.090	0.000	0.66	0.0	41.8	OK
8.000	23	89.844	-0.121	0.000	0.43	0.0	22.9	OK
9.000	24	89.849	-0.146	0.000	0.26	0.0	15.3	OK
8.001	25	89.767	-0.058	0.000	0.37	0.0	37.8	OK
10.000	26	89.834	-0.091	0.000	0.58	0.0	37.5	OK
11.000	27	90.274	-0.046	0.000	0.81	0.0	18.8	OK
12.000	27a	90.265	0.050	0.000	1.47	0.0	46.3	SURCHARGED
8.002	28	89.727	0.127	0.000	1.34	0.0	138.8	SURCHARGED
7.003	30	89.016	0.196	0.000	1.44	0.0	178.7	SURCHARGED
7.004	31	88.804	0.134	0.000	1.67	0.0	178.5	SURCHARGED
13.000	32	90.694	-0.106	0.000	0.73	0.0	105.0	OK
13.001	33	88.778	0.068	0.000	1.32	0.0	104.2	SURCHARGED
7.005	34	88.181	-0.429	0.000	0.02	0.0	279.7	OK
7.006	35	88.181	0.471	0.000	0.25	0.0	3.1	SURCHARGED
1.008	36	88.181	0.436	0.000	0.09	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 24
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-60+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 60 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.787	-0.063	0.000	0.61	0.0	10.4	OK
2.000	2	90.790	-0.060	0.000	0.65	0.0	10.9	OK
1.001	3	90.613	0.083	0.000	1.24	0.0	20.5	SURCHARGED
3.000	4	90.787	-0.063	0.000	0.61	0.0	10.4	OK
4.000	6	90.781	-0.069	0.000	0.55	0.0	9.3	OK
1.002	8	90.301	-0.059	0.000	0.87	0.0	39.4	OK
1.003	9	89.871	0.011	0.000	1.15	0.0	39.7	SURCHARGED
5.000	10	90.442	-0.083	0.000	0.68	0.0	18.4	OK
6.000	10a	90.336	-0.064	0.000	0.85	0.0	44.8	OK
5.001	12	90.206	0.256	0.000	1.94	0.0	61.1	SURCHARGED
5.002	14	89.996	0.146	0.000	1.97	0.0	62.0	SURCHARGED
1.004	16	89.418	-0.382	0.000	0.01	0.0	101.1	OK
1.005	17	89.418	0.868	0.000	0.42	0.0	4.8	SURCHARGED
1.006	18	89.422	0.905	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	88.345	-0.032	0.000	0.27	0.0	4.9	OK
7.000	20	90.303	-0.047	0.000	0.78	0.0	16.1	OK
7.001	21	89.817	-0.033	0.000	0.91	0.0	19.0	OK
7.002	22	89.539	-0.111	0.000	0.48	0.0	30.8	OK
8.000	23	89.825	-0.140	0.000	0.30	0.0	16.0	OK
9.000	24	89.835	-0.160	0.000	0.18	0.0	10.7	OK
8.001	25	89.630	-0.195	0.000	0.26	0.0	26.4	OK
10.000	26	89.800	-0.125	0.000	0.41	0.0	26.3	OK
11.000	27	90.252	-0.068	0.000	0.57	0.0	13.1	OK
12.000	27a	90.215	0.000	0.000	1.01	0.0	31.9	OK
8.002	28	89.535	-0.065	0.000	0.92	0.0	95.2	OK
7.003	30	88.828	0.008	0.000	1.01	0.0	124.5	SURCHARGED
7.004	31	88.707	0.037	0.000	1.18	0.0	126.2	SURCHARGED
13.000	32	90.654	-0.146	0.000	0.52	0.0	74.1	OK
13.001	33	88.641	-0.069	0.000	0.92	0.0	73.1	OK
7.005	34	88.297	-0.313	0.000	0.01	0.0	195.3	OK
7.006	35	88.297	0.587	0.000	0.17	0.0	2.1	SURCHARGED
1.008	36	88.299	0.554	0.000	0.09	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 25
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-120+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 120 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.764	-0.086	0.000	0.38	0.0	6.4	OK
2.000	2	90.765	-0.085	0.000	0.40	0.0	6.7	OK
1.001	3	90.481	-0.049	0.000	0.79	0.0	13.1	OK
3.000	4	90.764	-0.086	0.000	0.38	0.0	6.4	OK
4.000	6	90.760	-0.090	0.000	0.34	0.0	5.7	OK
1.002	8	90.255	-0.105	0.000	0.56	0.0	25.2	OK
1.003	9	89.778	-0.082	0.000	0.73	0.0	25.2	OK
5.000	10	90.403	-0.122	0.000	0.43	0.0	11.6	OK
6.000	10a	90.289	-0.111	0.000	0.51	0.0	27.0	OK
5.001	12	89.964	0.014	0.000	1.22	0.0	38.6	SURCHARGED
5.002	14	89.864	0.014	0.000	1.22	0.0	38.6	SURCHARGED
1.004	16	89.469	-0.331	0.000	0.01	0.0	63.1	OK
1.005	17	89.469	0.919	0.000	0.41	0.0	4.6	SURCHARGED
1.006	18	89.388	0.871	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	88.467	0.090	0.000	0.27	0.0	4.9	SURCHARGED
7.000	20	90.273	-0.077	0.000	0.48	0.0	9.9	OK
7.001	21	89.781	-0.069	0.000	0.57	0.0	11.9	OK
7.002	22	89.509	-0.141	0.000	0.30	0.0	19.3	OK
8.000	23	89.805	-0.160	0.000	0.18	0.0	9.6	OK
9.000	24	89.820	-0.175	0.000	0.11	0.0	6.4	OK
8.001	25	89.605	-0.220	0.000	0.16	0.0	16.1	OK
10.000	26	89.775	-0.150	0.000	0.24	0.0	15.8	OK
11.000	27	90.230	-0.090	0.000	0.34	0.0	7.9	OK
12.000	27a	90.118	-0.097	0.000	0.62	0.0	19.5	OK
8.002	28	89.463	-0.137	0.000	0.57	0.0	59.3	OK
7.003	30	88.662	-0.158	0.000	0.64	0.0	78.6	OK
7.004	31	88.534	-0.136	0.000	0.73	0.0	78.6	OK
13.000	32	90.614	-0.186	0.000	0.31	0.0	44.5	OK
13.001	33	88.571	-0.139	0.000	0.56	0.0	44.5	OK
7.005	34	88.418	-0.192	0.000	0.01	0.0	122.7	OK
7.006	35	88.418	0.708	0.000	0.11	0.0	1.4	SURCHARGED
1.008	36	88.419	0.674	0.000	0.09	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 26
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-180+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 180 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.755	-0.095	0.000	0.29	0.0	5.0	OK
2.000	2	90.757	-0.093	0.000	0.31	0.0	5.2	OK
1.001	3	90.465	-0.065	0.000	0.61	0.0	10.1	OK
3.000	4	90.755	-0.095	0.000	0.29	0.0	5.0	OK
4.000	6	90.752	-0.098	0.000	0.26	0.0	4.4	OK
1.002	8	90.238	-0.122	0.000	0.43	0.0	19.4	OK
1.003	9	89.757	-0.103	0.000	0.56	0.0	19.3	OK
5.000	10	90.389	-0.136	0.000	0.33	0.0	9.0	OK
6.000	10a	90.273	-0.127	0.000	0.40	0.0	20.9	OK
5.001	12	89.899	-0.051	0.000	0.94	0.0	29.7	OK
5.002	14	89.799	-0.051	0.000	0.94	0.0	29.6	OK
1.004	16	89.441	-0.359	0.000	0.01	0.0	48.2	OK
1.005	17	89.441	0.891	0.000	0.58	0.0	6.5	SURCHARGED
1.006	18	89.512	0.995	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	88.641	0.264	0.000	0.28	0.0	5.0	SURCHARGED
7.000	20	90.263	-0.087	0.000	0.37	0.0	7.7	OK
7.001	21	89.770	-0.080	0.000	0.44	0.0	9.2	OK
7.002	22	89.499	-0.151	0.000	0.23	0.0	14.9	OK
8.000	23	89.796	-0.169	0.000	0.14	0.0	7.5	OK
9.000	24	89.814	-0.181	0.000	0.09	0.0	5.0	OK
8.001	25	89.595	-0.230	0.000	0.12	0.0	12.4	OK
10.000	26	89.766	-0.159	0.000	0.19	0.0	12.3	OK
11.000	27	90.222	-0.098	0.000	0.27	0.0	6.1	OK
12.000	27a	90.100	-0.115	0.000	0.48	0.0	15.1	OK
8.002	28	89.440	-0.160	0.000	0.44	0.0	45.7	OK
7.003	30	88.631	-0.189	0.000	0.49	0.0	60.3	OK
7.004	31	88.521	-0.149	0.000	0.56	0.0	60.1	OK
13.000	32	90.600	-0.200	0.000	0.24	0.0	34.5	OK
13.001	33	88.548	-0.162	0.000	0.43	0.0	34.4	OK
7.005	34	88.521	-0.089	0.000	0.01	0.0	93.8	OK
7.006	35	88.521	0.811	0.000	0.10	0.0	1.2	SURCHARGED
1.008	36	88.609	0.864	0.000	0.09	0.0	4.9	SURCHARGED

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Nolan Associates Ltd		Page 27
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-240+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 240 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.749	-0.101	0.000	0.23	0.0	4.0	OK
2.000	2	90.750	-0.100	0.000	0.24	0.0	4.1	OK
1.001	3	90.454	-0.076	0.000	0.49	0.0	8.1	OK
3.000	4	90.749	-0.101	0.000	0.23	0.0	4.0	OK
4.000	6	90.746	-0.104	0.000	0.21	0.0	3.5	OK
1.002	8	90.226	-0.134	0.000	0.34	0.0	15.6	OK
1.003	9	89.741	-0.119	0.000	0.45	0.0	15.6	OK
5.000	10	90.378	-0.147	0.000	0.27	0.0	7.2	OK
6.000	10a	90.261	-0.139	0.000	0.32	0.0	16.7	OK
5.001	12	89.872	-0.078	0.000	0.76	0.0	23.8	OK
5.002	14	89.772	-0.078	0.000	0.76	0.0	23.8	OK
1.004	16	89.407	-0.393	0.000	0.00	0.0	39.1	OK
1.005	17	89.407	0.857	0.000	0.42	0.0	4.8	SURCHARGED
1.006	18	89.464	0.947	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	89.120	0.743	0.000	0.27	0.0	4.9	SURCHARGED
7.000	20	90.256	-0.094	0.000	0.30	0.0	6.1	OK
7.001	21	89.761	-0.089	0.000	0.35	0.0	7.3	OK
7.002	22	89.491	-0.159	0.000	0.19	0.0	11.9	OK
8.000	23	89.790	-0.175	0.000	0.11	0.0	6.0	OK
9.000	24	89.808	-0.187	0.000	0.07	0.0	4.0	OK
8.001	25	89.588	-0.237	0.000	0.10	0.0	9.9	OK
10.000	26	89.758	-0.167	0.000	0.15	0.0	9.8	OK
11.000	27	90.217	-0.103	0.000	0.21	0.0	4.9	OK
12.000	27a	90.086	-0.129	0.000	0.38	0.0	12.1	OK
8.002	28	89.423	-0.177	0.000	0.36	0.0	36.7	OK
7.003	30	89.068	0.248	0.000	0.39	0.0	48.6	SURCHARGED
7.004	31	89.068	0.398	0.000	0.45	0.0	48.6	SURCHARGED
13.000	32	90.589	-0.211	0.000	0.19	0.0	27.5	OK
13.001	33	89.068	0.358	0.000	0.35	0.0	27.5	SURCHARGED
7.005	34	89.068	0.458	0.000	0.00	0.0	75.9	SURCHARGED
7.006	35	89.068	1.358	0.000	0.17	0.0	2.1	SURCHARGED
1.008	36	89.069	1.324	0.000	0.11	0.0	5.6	SURCHARGED

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Nolan Associates Ltd		Page 28
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-360+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 360 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.741	-0.109	0.000	0.17	0.0	2.9	OK
2.000	2	90.742	-0.108	0.000	0.18	0.0	3.0	OK
1.001	3	90.441	-0.089	0.000	0.35	0.0	5.8	OK
3.000	4	90.741	-0.109	0.000	0.17	0.0	2.9	OK
4.000	6	90.738	-0.112	0.000	0.15	0.0	2.5	OK
1.002	8	90.210	-0.150	0.000	0.25	0.0	11.2	OK
1.003	9	89.723	-0.137	0.000	0.32	0.0	11.2	OK
5.000	10	90.366	-0.159	0.000	0.19	0.0	5.2	OK
6.000	10a	90.247	-0.153	0.000	0.23	0.0	12.0	OK
5.001	12	89.843	-0.107	0.000	0.54	0.0	17.1	OK
5.002	14	89.743	-0.107	0.000	0.54	0.0	17.1	OK
1.004	16	89.331	-0.469	0.000	0.00	0.0	28.1	OK
1.005	17	89.331	0.781	0.000	0.52	0.0	5.9	SURCHARGED
1.006	18	89.451	0.934	0.000	0.28	0.0	4.8	SURCHARGED
1.007	19	89.504	1.127	0.000	0.27	0.0	4.9	SURCHARGED
7.000	20	90.247	-0.103	0.000	0.21	0.0	4.4	OK
7.001	21	89.751	-0.099	0.000	0.25	0.0	5.3	OK
7.002	22	89.480	-0.170	0.000	0.13	0.0	8.6	OK
8.000	23	89.783	-0.182	0.000	0.08	0.0	4.3	OK
9.000	24	89.802	-0.193	0.000	0.05	0.0	2.9	OK
8.001	25	89.577	-0.248	0.000	0.07	0.0	7.1	OK
10.000	26	89.749	-0.176	0.000	0.11	0.0	7.0	OK
11.000	27	90.209	-0.111	0.000	0.15	0.0	3.5	OK
12.000	27a	90.070	-0.145	0.000	0.28	0.0	8.7	OK
8.002	28	89.418	-0.182	0.000	0.26	0.0	26.3	OK
7.003	30	89.475	0.655	0.000	0.28	0.0	34.9	SURCHARGED
7.004	31	89.473	0.803	0.000	0.33	0.0	34.9	SURCHARGED
13.000	32	90.574	-0.226	0.000	0.14	0.0	19.8	OK
13.001	33	89.485	0.775	0.000	0.25	0.0	19.8	SURCHARGED
7.005	34	89.483	0.873	0.000	0.00	0.0	54.5	SURCHARGED
7.006	35	89.483	1.773	0.000	0.72	0.0	9.0	SURCHARGED
1.008	36	89.700	1.955	0.000	0.11	0.0	6.0	SURCHARGED

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Nolan Associates Ltd		Page 29
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-480+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 480 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.736	-0.114	0.000	0.13	0.0	2.3	OK
2.000	2	90.737	-0.113	0.000	0.14	0.0	2.3	OK
1.001	3	90.434	-0.096	0.000	0.28	0.0	4.6	OK
3.000	4	90.736	-0.114	0.000	0.13	0.0	2.3	OK
4.000	6	90.734	-0.116	0.000	0.12	0.0	2.0	OK
1.002	8	90.202	-0.158	0.000	0.20	0.0	8.9	OK
1.003	9	89.712	-0.148	0.000	0.26	0.0	8.9	OK
5.000	10	90.358	-0.167	0.000	0.15	0.0	4.1	OK
6.000	10a	90.239	-0.161	0.000	0.18	0.0	9.5	OK
5.001	12	89.828	-0.122	0.000	0.43	0.0	13.5	OK
5.002	14	89.728	-0.122	0.000	0.43	0.0	13.5	OK
1.004	16	89.305	-0.495	0.000	0.00	0.0	22.2	OK
1.005	17	89.305	0.755	0.000	0.44	0.0	5.0	SURCHARGED
1.006	18	89.525	1.008	0.000	0.28	0.0	4.8	SURCHARGED
1.007	19	89.098	0.721	0.000	0.28	0.0	5.0	SURCHARGED
7.000	20	90.241	-0.109	0.000	0.17	0.0	3.5	OK
7.001	21	89.745	-0.105	0.000	0.20	0.0	4.2	OK
7.002	22	89.474	-0.176	0.000	0.11	0.0	6.8	OK
8.000	23	89.777	-0.188	0.000	0.06	0.0	3.4	OK
9.000	24	89.798	-0.197	0.000	0.04	0.0	2.3	OK
8.001	25	89.571	-0.254	0.000	0.06	0.0	5.6	OK
10.000	26	89.744	-0.181	0.000	0.09	0.0	5.6	OK
11.000	27	90.204	-0.116	0.000	0.12	0.0	2.8	OK
12.000	27a	90.061	-0.154	0.000	0.22	0.0	6.9	OK
8.002	28	89.391	-0.209	0.000	0.20	0.0	20.8	OK
7.003	30	89.452	0.632	0.000	0.22	0.0	27.6	SURCHARGED
7.004	31	89.462	0.792	0.000	0.26	0.0	27.6	SURCHARGED
13.000	32	90.566	-0.234	0.000	0.11	0.0	15.6	OK
13.001	33	89.504	0.794	0.000	0.20	0.0	15.6	SURCHARGED
7.005	34	89.503	0.893	0.000	0.00	0.0	43.1	SURCHARGED
7.006	35	89.504	1.794	0.000	0.53	0.0	6.6	SURCHARGED
1.008	36	89.509	1.764	0.000	0.11	0.0	5.6	SURCHARGED

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Nolan Associates Ltd		Page 30
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-600+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 600 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.733	-0.117	0.000	0.11	0.0	1.9	OK
2.000	2	90.734	-0.116	0.000	0.12	0.0	2.0	OK
1.001	3	90.429	-0.101	0.000	0.23	0.0	3.8	OK
3.000	4	90.733	-0.117	0.000	0.11	0.0	1.9	OK
4.000	6	90.731	-0.119	0.000	0.10	0.0	1.7	OK
1.002	8	90.195	-0.165	0.000	0.16	0.0	7.4	OK
1.003	9	89.705	-0.155	0.000	0.21	0.0	7.4	OK
5.000	10	90.353	-0.172	0.000	0.13	0.0	3.4	OK
6.000	10a	90.233	-0.167	0.000	0.15	0.0	7.9	OK
5.001	12	89.818	-0.132	0.000	0.36	0.0	11.3	OK
5.002	14	89.718	-0.132	0.000	0.36	0.0	11.3	OK
1.004	16	89.236	-0.564	0.000	0.00	0.0	18.5	OK
1.005	17	89.236	0.686	0.000	0.43	0.0	4.9	SURCHARGED
1.006	18	89.295	0.778	0.000	0.29	0.0	4.9	SURCHARGED
1.007	19	89.278	0.901	0.000	0.27	0.0	4.9	SURCHARGED
7.000	20	90.237	-0.113	0.000	0.14	0.0	2.9	OK
7.001	21	89.741	-0.109	0.000	0.17	0.0	3.5	OK
7.002	22	89.470	-0.180	0.000	0.09	0.0	5.6	OK
8.000	23	89.773	-0.192	0.000	0.05	0.0	2.8	OK
9.000	24	89.796	-0.199	0.000	0.03	0.0	1.9	OK
8.001	25	89.566	-0.259	0.000	0.05	0.0	4.7	OK
10.000	26	89.739	-0.186	0.000	0.07	0.0	4.6	OK
11.000	27	90.202	-0.118	0.000	0.10	0.0	2.3	OK
12.000	27a	90.054	-0.161	0.000	0.18	0.0	5.7	OK
8.002	28	89.382	-0.218	0.000	0.17	0.0	17.4	OK
7.003	30	89.204	0.384	0.000	0.19	0.0	23.0	SURCHARGED
7.004	31	89.204	0.534	0.000	0.21	0.0	23.0	SURCHARGED
13.000	32	90.561	-0.239	0.000	0.09	0.0	13.0	OK
13.001	33	89.215	0.505	0.000	0.16	0.0	13.0	SURCHARGED
7.005	34	89.215	0.605	0.000	0.00	0.0	35.9	SURCHARGED
7.006	35	89.215	1.505	0.000	0.42	0.0	5.3	SURCHARGED
1.008	36	89.303	1.558	0.000	0.11	0.0	5.7	SURCHARGED

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Nolan Associates Ltd		Page 31
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-720+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 720 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.731	-0.119	0.000	0.09	0.0	1.6	OK
2.000	2	90.732	-0.118	0.000	0.10	0.0	1.7	OK
1.001	3	90.425	-0.105	0.000	0.20	0.0	3.3	OK
3.000	4	90.731	-0.119	0.000	0.09	0.0	1.6	OK
4.000	6	90.729	-0.121	0.000	0.08	0.0	1.4	OK
1.002	8	90.191	-0.169	0.000	0.14	0.0	6.4	OK
1.003	9	89.700	-0.160	0.000	0.18	0.0	6.4	OK
5.000	10	90.349	-0.176	0.000	0.11	0.0	2.9	OK
6.000	10a	90.228	-0.172	0.000	0.13	0.0	6.8	OK
5.001	12	89.810	-0.140	0.000	0.31	0.0	9.7	OK
5.002	14	89.710	-0.140	0.000	0.31	0.0	9.7	OK
1.004	16	89.191	-0.609	0.000	0.00	0.0	16.0	OK
1.005	17	89.191	0.641	0.000	0.39	0.0	4.4	SURCHARGED
1.006	18	89.271	0.754	0.000	0.28	0.0	4.8	SURCHARGED
1.007	19	89.199	0.822	0.000	0.27	0.0	4.8	SURCHARGED
7.000	20	90.235	-0.115	0.000	0.12	0.0	2.5	OK
7.001	21	89.738	-0.112	0.000	0.14	0.0	3.0	OK
7.002	22	89.466	-0.184	0.000	0.08	0.0	4.9	OK
8.000	23	89.771	-0.194	0.000	0.05	0.0	2.4	OK
9.000	24	89.795	-0.200	0.000	0.03	0.0	1.6	OK
8.001	25	89.563	-0.262	0.000	0.04	0.0	4.1	OK
10.000	26	89.736	-0.189	0.000	0.06	0.0	4.0	OK
11.000	27	90.199	-0.121	0.000	0.09	0.0	2.0	OK
12.000	27a	90.049	-0.166	0.000	0.16	0.0	4.9	OK
8.002	28	89.376	-0.224	0.000	0.14	0.0	15.0	OK
7.003	30	89.179	0.359	0.000	0.16	0.0	19.8	SURCHARGED
7.004	31	89.185	0.515	0.000	0.18	0.0	19.8	SURCHARGED
13.000	32	90.556	-0.244	0.000	0.08	0.0	11.2	OK
13.001	33	89.206	0.496	0.000	0.14	0.0	11.2	SURCHARGED
7.005	34	89.206	0.596	0.000	0.00	0.0	30.9	SURCHARGED
7.006	35	89.206	1.496	0.000	0.46	0.0	5.7	SURCHARGED
1.008	36	89.319	1.574	0.000	0.11	0.0	5.6	SURCHARGED

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Nolan Associates Ltd		Page 32
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-840+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 840 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.729	-0.121	0.000	0.08	0.0	1.4	OK
2.000	2	90.730	-0.120	0.000	0.09	0.0	1.5	OK
1.001	3	90.422	-0.108	0.000	0.18	0.0	2.9	OK
3.000	4	90.729	-0.121	0.000	0.08	0.0	1.4	OK
4.000	6	90.727	-0.123	0.000	0.07	0.0	1.3	OK
1.002	8	90.187	-0.173	0.000	0.12	0.0	5.6	OK
1.003	9	89.695	-0.165	0.000	0.16	0.0	5.6	OK
5.000	10	90.346	-0.179	0.000	0.10	0.0	2.6	OK
6.000	10a	90.225	-0.175	0.000	0.11	0.0	6.0	OK
5.001	12	89.804	-0.146	0.000	0.27	0.0	8.6	OK
5.002	14	89.704	-0.146	0.000	0.27	0.0	8.6	OK
1.004	16	89.138	-0.662	0.000	0.00	0.0	14.1	OK
1.005	17	89.139	0.589	0.000	0.41	0.0	4.7	SURCHARGED
1.006	18	89.209	0.692	0.000	0.28	0.0	4.7	SURCHARGED
1.007	19	89.097	0.720	0.000	0.26	0.0	4.7	SURCHARGED
7.000	20	90.233	-0.117	0.000	0.11	0.0	2.2	OK
7.001	21	89.735	-0.115	0.000	0.13	0.0	2.6	OK
7.002	22	89.463	-0.187	0.000	0.07	0.0	4.3	OK
8.000	23	89.769	-0.196	0.000	0.04	0.0	2.1	OK
9.000	24	89.794	-0.201	0.000	0.02	0.0	1.4	OK
8.001	25	89.561	-0.264	0.000	0.04	0.0	3.6	OK
10.000	26	89.734	-0.191	0.000	0.05	0.0	3.5	OK
11.000	27	90.197	-0.123	0.000	0.08	0.0	1.8	OK
12.000	27a	90.045	-0.170	0.000	0.14	0.0	4.3	OK
8.002	28	89.371	-0.229	0.000	0.13	0.0	13.2	OK
7.003	30	89.053	0.233	0.000	0.14	0.0	17.5	SURCHARGED
7.004	31	89.052	0.382	0.000	0.16	0.0	17.5	SURCHARGED
13.000	32	90.551	-0.249	0.000	0.07	0.0	9.9	OK
13.001	33	89.061	0.351	0.000	0.12	0.0	9.9	SURCHARGED
7.005	34	89.060	0.450	0.000	0.00	0.0	27.3	SURCHARGED
7.006	35	89.060	1.350	0.000	0.39	0.0	4.9	SURCHARGED
1.008	36	89.153	1.408	0.000	0.10	0.0	5.4	SURCHARGED

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Nolan Associates Ltd		Page 33
54 Hagley Road Birmingham West Midlands B16 8PE	Letchworth Gateway - SWS ALDI & Travelodge 2016-238 Rev A	Micro Drainage
Date 04.04.2017 File M100-960+40% network ALDI+TL	Designed by J A K Checked by	
Causeway	Network 2014.1.1	

Summary of Results for 960 minute 100 year Summer (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	90.727	-0.123	0.000	0.07	0.0	1.3	OK
2.000	2	90.728	-0.122	0.000	0.08	0.0	1.3	OK
1.001	3	90.420	-0.110	0.000	0.16	0.0	2.6	OK
3.000	4	90.727	-0.123	0.000	0.07	0.0	1.3	OK
4.000	6	90.725	-0.125	0.000	0.07	0.0	1.1	OK
1.002	8	90.185	-0.175	0.000	0.11	0.0	5.0	OK
1.003	9	89.692	-0.168	0.000	0.15	0.0	5.0	OK
5.000	10	90.344	-0.181	0.000	0.09	0.0	2.3	OK
6.000	10a	90.223	-0.177	0.000	0.10	0.0	5.4	OK
5.001	12	89.800	-0.150	0.000	0.24	0.0	7.7	OK
5.002	14	89.700	-0.150	0.000	0.24	0.0	7.7	OK
1.004	16	89.137	-0.663	0.000	0.00	0.0	12.6	OK
1.005	17	89.137	0.587	0.000	0.37	0.0	4.2	SURCHARGED
1.006	18	89.176	0.659	0.000	0.28	0.0	4.7	SURCHARGED
1.007	19	88.946	0.569	0.000	0.26	0.0	4.6	SURCHARGED
7.000	20	90.231	-0.119	0.000	0.10	0.0	2.0	OK
7.001	21	89.733	-0.117	0.000	0.11	0.0	2.4	OK
7.002	22	89.461	-0.189	0.000	0.06	0.0	3.8	OK
8.000	23	89.768	-0.197	0.000	0.04	0.0	1.9	OK
9.000	24	89.793	-0.202	0.000	0.02	0.0	1.3	OK
8.001	25	89.560	-0.265	0.000	0.03	0.0	3.2	OK
10.000	26	89.732	-0.193	0.000	0.05	0.0	3.2	OK
11.000	27	90.195	-0.125	0.000	0.07	0.0	1.6	OK
12.000	27a	90.042	-0.173	0.000	0.12	0.0	3.9	OK
8.002	28	89.367	-0.233	0.000	0.11	0.0	11.8	OK
7.003	30	88.917	0.097	0.000	0.13	0.0	15.7	SURCHARGED
7.004	31	88.918	0.248	0.000	0.15	0.0	15.7	SURCHARGED
13.000	32	90.548	-0.252	0.000	0.06	0.0	8.9	OK
13.001	33	88.920	0.210	0.000	0.11	0.0	8.9	SURCHARGED
7.005	34	88.921	0.311	0.000	0.00	0.0	24.4	SURCHARGED
7.006	35	88.921	1.211	0.000	0.37	0.0	4.7	SURCHARGED
1.008	36	88.914	1.169	0.000	0.10	0.0	5.2	SURCHARGED

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