

HAVANT HEALTH AND WELLBEING CAMPUS
DRAINAGE STRATEGY

HAMPSHIRE LIVING SPACE

MARCH 2015



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Contents	Page
1.0 Introduction	3
<i>Commission</i>	3
<i>Scope</i>	3
<i>Information Source</i>	3
<i>Report Structure</i>	3
<i>Development Proposals</i>	4
2.0 Existing Conditions	5
<i>Introduction</i>	5
<i>Site Location</i>	5
<i>Site Description</i>	5
<i>Foul Water Overview</i>	5
<i>Surface Water Overview</i>	6
<i>Attenuation Basin</i>	6
3.0 Foul Water Strategy	8
<i>Introduction</i>	8
<i>Overview</i>	8
<i>Proposed Flow Estimation</i>	8
<i>Foul Water Disposal</i>	9
4.0 Surface Water Strategy	11
<i>Introduction</i>	11
<i>Overview</i>	11
<i>Surface Water Disposal</i>	12
<i>Exceedance</i>	13
5.0 Summary and Conclusion	14
<i>Introduction</i>	14
<i>Summary – Foul Water</i>	14
<i>Summary – Surface Water</i>	14
<i>Conclusion</i>	15
Appendices i	
Appendix 1 – Drawings	ii
Appendix 2 – Southern Water	iii
Appendix 3 – Microdrainage WinDES Outputs	iv



1.0 Introduction

Commission

- 1.1. This report has been prepared by Abley Letchford Partnership Limited, on behalf of Hampshire Living Space/Ashley House Plc, in relation to the proposed development of land on the former Oak Park School, located to the south of Crossland Drive and north of Lavant Drive, Havant PO9 2AW (the Development).
- 1.2. This report provides an overview to the Drainage Strategy (storm and foul) for the Development, and supplements the Flood Risk Assessment (Ref: CRM.1112.005.HY.R.001A dated February 2015) produced by Enzygo Limited.

Scope

- 1.3. This drainage assessment has been undertaken in order to assess existing surface and foul water drainage infrastructure and to examine potential disposal options in relation to the Development.
- 1.4. It aims to take into account all the available information at the time of writing in order to provide appropriate surface and foul water management options.

Information Source

- 1.5. Prior to a site visit in December 2014 to undertake an investigative CCTV survey, and in preparation of this report, a desktop study was carried out using published material and information.
- 1.6. Southern Water Services Limited (SWSL) was approached to provide their current asset location plans. Their Asset Management Plans were also examined.
- 1.7. Discussions were also held within the Consultant Team and Client in order to ensure a coordinated approach to the provision of storm and foul water disposal solutions.

Report Structure

- 1.8. The drainage strategy considers the following aspects:
 - Section 2: Existing Conditions – a description of the existing site, its topography and surrounding drainage provision.
 - Section 3: Foul Water Strategy – measures to drain the Development and provide conveyance to public sewerage systems.
 - Section 4: Surface Water Strategy – measures to drain the Development and provide conveyance to surface water features.
 - Section 5: Summary and Recommendations – a review of the suitability of the Development proposals in the context of on and off site vulnerability.



Development Proposals

- 1.9. The Development is expected to be carried out in one phase, and comprises of a Health and Wellbeing Campus to include a nursing home, extra care and supported living units along with a shared hub which will provide ancillary support facilities as follows:
 - 80 Bed Care Home;
 - 42 x 1 Bed Extra Care Facility Flats;
 - 9 x 2 Bed Extra Care Facility Flats;
 - 30 x 1 Bed Supported Living Flats; and
 - 18 x 2 Bed Supported Living Flats.
- 1.10. Taken together, the proposals will therefore provide a total of 179 units.
- 1.11. Alongside the residential elements of the proposals, there will also be a number of support facilities. These include staff accommodation, kitchen facilities and lounge/dining rooms, some shared bathrooms specifically catered for residents' needs and treatment rooms.
- 1.12. The Hub centre of the site also includes for a cinema, small shop, hairdressers and gym.
- 1.13. A copy of the proposed Site Layout is included within Appendix 1.
- 1.14. This Drainage Strategy offers a corresponding robust solution for the development proposals presented. Alternative solutions may be possible, subject to further design development and consideration.



2.0 Existing Conditions

Introduction

- 2.1. This chapter provides for a description of the existing site, its topography and surrounding drainage provisions.

Site Location

- 2.2. The Site is located approximately 0.5 miles north of Havant town centre, to the south of Crossland Drive and north of Lavant Drive. It sits on the footprint of the former Oak Park Secondary Modern School, Hampshire County Council Education Office and Adult Mental Health Unit – all since demolished.
- 2.3. The Site covers an area of approximately 1.93 hectares, approximately centred on OS grid Reference SU 72025 07125 (472025E, 107125N).
- 2.4. A Site Location Plan is provided in Appendix 1.

Site Description

- 2.5. The Site is a mixture of grassed areas, demolition material and hard standings attributed to its former use, and is bounded on all sides by built development.
- 2.6. The northern, southern and western boundaries are defined by existing roads in the form of Crossland Drive, Lavant Drive and Leigh Road respectively. To the east lies Lavant Stream and Old Copse Road beyond.
- 2.7. The site was found to be relatively level, with a gentle slope, falling from north to south. The eastern boundary falls in a southerly direction from 13.46mAOD to 12.53mAOD over a distance of approximately 200m (1:215 slope). The western boundary of the site falls from 14.11mAOD to 12.61mAOD in a southerly direction over a distance of 90m. (1:60 slope).

Foul Water Overview

- 2.8. Southern Water Services Limited (SWSL) is the local water authority and sewerage undertaker.
- 2.9. The SWSL asset location plan detailing existing public sewers at, and in the vicinity of the site is included in Appendix 2.
- 2.10. Separate public foul gravity sewers are present within the site extents and immediately adjacent in Leigh Road to the east, and Lavant Drive to the south.
- 2.11. Asset plans show a large 675mm diameter public sewer located within the Site's boundary running east to west from Old Copse Road to Leigh Road. A connecting section of disused public sewer is also indicated within the Site's boundary, although this is thought to have been removed previously given the lack of corresponding Ground Penetrating Radar (GPR) data. This is to be investigated further post Planning.



- 2.12. The unknown diameter public sewer (later confirmed as 150mm through surveying) within Lavant Drive runs from east to west, and transfers flows from the adjacent developments to the larger 225mm diameter public sewer running north to south down Leigh Road.
- 2.13. A sporadic private sewer system exists onsite, but due to the staged demolition of the site, full connectivity cannot be established. Connections into the public sewer manholes on Leigh Road and Lavant Drive from the former building uses have been confirmed visually and through the use of GPR. These connections will be re-utilised as part of these redevelopment proposals.

Surface Water Overview

- 2.14. Southern Water Services Limited (SWSL) is the local water authority and sewerage undertaker.
- 2.15. The SWSL asset location plan detailing existing public sewers at, and in the vicinity of, the site is included in Appendix 2.
- 2.16. Separate storm gravity sewers are present within Crossland Drive to the north, and within Lavant Drive to the south.
- 2.17. The short section of unknown diameter public sewer (later confirmed as 225mm through surveying) within Lavant Drive discharges flows into an existing attenuation basin within the south-eastern corner before final discharge into Lavant Stream.
- 2.18. Flows from the attenuation basin to the Lavant Stream are restricted via a 150mm diameter pipe fitted with a non-return valve.
- 2.19. A sporadic private sewer system exists onsite, but due to the staged demolition of the site, full connectivity cannot be established. Some connections into the attenuation basin within the Site from the former building hardstandings have been confirmed visually and through the use of Ground Penetrating Radar (GPR).
- 2.20. Given the lack of other apparent discharge points into Lavant Stream or the public sewer system attributable to any onsite/historic surface water network, it is a reasonable assumption that the Site as a whole utilised the onsite attenuation basin prior to discharging flows into Lavant Stream.

Attenuation Basin

- 2.21. As mentioned above, a surface water attenuation basin is located within the south eastern corner of the Site. It is understood that this feature was constructed in the mid 1990's as part of infrastructure improvements in the local area. On the understanding that these improvements would facilitate future development adjacent to Lavant Drive, it is assumed that this feature was suitably sized to accommodate future flows and surface water discharge
- 2.22. Having reviewed publically available material and survey data, we believe the current drainage arrangement into and out of the attenuation basin is shown in Figure 1 below:



- ## Attenuation Basin Criteria

Base of Basin	10.45m AOD	376m ²
Outfall Level	10.70m AOD	544m ²
Top of Basin	12.00m AOD	858m ²
Estimated Basin Volume to Top of Basin	990m ³	
Contributing Highway Area from Lavant Drive/Lakeside Gardens	1900m ² or 0.19 Hectares	

3.0 Foul Water Strategy

Introduction

- 3.1. This chapter provides details on the foul water drainage strategy, measures to drain the development and conveyance to public sewerage systems.

Overview

- 3.2. Historical records show that over 1000 pupils attended the former Oak Park Secondary Modern School which previously occupied the northern part of the site. Given its location, it is assumed that the majority of its generated flow was directed into the public sewer system within Leigh Road.
- 3.3. A historic rate of approximately 5.6 l/s was agreed in 2013 between Hampshire County Council and Southern Water Services Limited (SWSL) in their Preliminary Drainage Strategy document which accompanied the land sale.
- 3.4. Similarly, historic flows generated from the Education Office adjacent to Lavant Drive to the south, were calculated and agreed to be approximately 2.1 l/s.
- 3.5. A summary of these rate are provided in the table below:

Historic Flows

Previous Use	Directed to	Agreed Peak Flow
Secondary School	Leigh Road	5.6 l/s
Education Office	Lavant Drive	2.1 l/s

Flow Estimation

- 3.6. Proposed Dry Weather Flows (DWF) and corresponding Peak Design Flows for the Development have been calculated in accordance with British Water Code of Practice guidance dated 2013. These are provided in the table below:

Proposed Flows

Unit Type	Flow per use/person/day	No. of units / people	DWF	Peak Flow (3DWF or 6DWF)
Nursing Home	350 l	160 units (inc staff)	0.32 l/s	$0.32 \times 6 = 1.92 \text{ l/s}$
Hub and ancillary uses	100 l	50 people (assumed)	<0.1 l/s	$0.1 \times 3 = 0.3 \text{ l/s}$
Extra Care Flats	150 l	51 unit (2 pop.)	<0.2 l/s	$0.2 \times 6 = 1.2 \text{ l/s}$
Supported Living	150 l	30 unit (2 pop.)	0.1 l/s	$0.1 \times 6 = 0.6 \text{ l/s}$
Support Living (South)	150 l	18 unit (2 pop.)	<0.1 l/s	$0.1 \times 6 = 0.6 \text{ l/s}$
TOTAL PEAK FLOW				4.62 l/s

- 3.7. These rates have been provided to Southern Water Services Limited (SWSL) for verification and confirmation of existing capacity, and a response is awaited. Whilst the rates offered are an approximation, minor variations are not deemed detrimental to the principles of this drainage strategy.
- 3.8. Overall, we anticipate a net reduction in foul flows to the existing public foul sewers in the immediate vicinity.

Foul Water Disposal

- 3.9. The proposed site foul drainage utilises a conventional piped sewerage system to serve the proposed buildings and is designed in accordance with British Standard EN 752, Sewers for Adoption 7th Edition and the requirements of Building Regulations.
- 3.10. As stated within Building Regulations Approved Document H, foul water drainage must be designed as follows:
- ‘(1) An adequate system of drainage shall be provided to carry foul water from appliances within the building to one of the following, listed in order of priority-*
- a) A public sewer, or, where that is not reasonably practicable,*
 - b) A private sewer communicating with a public sewer, or, where that is not reasonably practicable,*
 - c) Either a septic tank which has an appropriate form of secondary treatment or another wastewater treatment system; or, where that is not reasonably practicable,*
 - d) A cesspool.’*
- 3.11. Due to the presence of the existing public sewerage system within Leigh Road and Lavant Drive, compliance with a) or b) is achievable.
- 3.12. One particular way in which a compliant drainage scheme could be provided is shown in Appendix 1. Any scheme is subject to refinement post Planning Approval following development of the design.



- 3.13. Onsite foul sewers serving the proposed buildings would be located adjacent to the building form under paths and soft landscaping, within parking areas or carriageways as indicated on the Drainage Strategy drawing.

4.0 Surface Water Strategy

Introduction

- 4.1. This chapter provides details on the surface water drainage strategy, measures to drain the development and conveyance to surface water features.

Overview

- 4.2. The surface water drainage strategy proposes utilising a number of Sustainable Drainage System techniques (SuDS) to attenuate surface water runoff. The selection of the most appropriate SuDS needs to consider existing constraints, ownership and maintenance issues. To that end, the most suitable SuDS features that could be incorporated into this Site alongside the existing Attenuation Basin are:

- Green Roofs;
- Swales and granular filter strips;
- Rain gardens; and
- Permeable paving.

- 4.3. The use of onsite infiltration features have been embraced within the strategy following successful testing to BRE365 by Enzygo Ltd during December 2014.

- 4.4. Three test pits were dug at appropriate locations within the site:

- SA1 - Located: within northern car park access road, Infiltration Rate: 2.22E^{-3} m/s (medium)
- SA2 - Located: close to the Hub and main site access, Infiltration Rate: 3.67E^{-4} m/s (medium)
- SA3 - Located: at the entrance to the service road, Infiltration Rate: 5.93E^{-5} m/s (medium)

- 4.5. Based on the above, the use of shallow infiltration features within the site are considered to be feasible. Given the location of the proposed infiltration features, the following “worst case” rates have been carried forward within the drainage calculations:

Zone	Infiltration Rate (Pit Designation)
West	5.93E^{-5} m/s or 0.212 m/hour (SA3)
East	3.67E^{-4} m/s or 1.332 m/hour (SA2)

- 4.6. Deeper infiltration features would be limited by natural groundwater levels, which were encountered at depths below 1.9m below existing ground level.

- 4.7. Therefore the surface water drainage strategy developed, utilises a predominately perforated piped sewerage system to drain the buildings and adjacent hard standings, car parking and internal roads. The

system is designed to infiltrate surface water to the ground at or near to its source through the use of granular “spine” surrounding the principal sewers. In turn this gravity based system will pass residual flows to the existing attenuation basin located at the south-eastern corner of the Site.

- 4.8. Attenuation storage will be catered for by using a combination of residual volume within pipes and granular layers below the car park to supplement the existing volume within the attenuation basin.
- 4.9. The system was modelled for a 2 year rainfall event and has been simulated to accommodate no flooding in a 30 year rainfall simulation, in accordance with Building Regulations and Sewers for Adoption 7th Edition. Flows will be attenuated on site via the existing attenuation pond and granular storage layers for all rainfall events up to the 1 in a 100 year storm event plus 30% allowance for climate change. Microdrainage WinDES outputs are included within Appendix 3 for reference.
- 4.10. There is an opportunity to utilise landscaping areas and surrounding green space for additional SUDS features or for overland flows for rainfall events above the 30 year return period. Under Sewers for Adoption 7th Edition, rainfall from such events and the associated pluvial flows are not designed to be catered for within the formal network. A certain level of additional storage capacity will be available within the proposed surface water network, however, levels and falls surrounding the proposed buildings should be designed so that such extreme flows are directed away (but retained onsite) to mitigate potential damage.
- 4.11. The proposed surface water runoff from the Development will be restricted by the existing 150mm diameter outfall pipe from the existing attenuation basin to Lavant Stream. Corresponding discharge rates for storms up to 1 in 100 year plus 30% climate change are as follows:

Return Period	Post-development rate (l/s)
1 in 2	27.8
1 in 30	40.7
1 in 100+30% CC	54.6

- 4.12. The proposed surface water runoff from the Development will be restricted by the existing 150mm diameter outfall pipe from the existing attenuation basin to Lavant Stream. Corresponding discharge rates for storms up to 1 in 100 year plus 30% climate change are as flows.
- 4.13. The critical storm event for the Attenuation Basin has been calculated to be the 120 minute winter storm. This produces a maximum surcharge water level of 11.286m AOD resulting in a 0.714m freeboard.

Surface Water Disposal

- 4.14. Having examined the supporting Flood Risk Assessment by Enzygo, a post-development impermeable area of approximately 1.2 Ha has been utilised.



- 4.15. Assuming infiltration losses to ground at appropriate values, the total attenuation volume for the Development has been calculated to be approximately 570m³ for all storms up to the 1 in 100 year storm event plus 30% climate change.
- 4.16. Any attenuation reductions associated with smaller scale SUDS features such as swales, granular strips and rain gardens have been excluded from the modelling, however the benefits in utilising such features would offer further water quality and visual improvements.
- 4.17. One particular way in which a compliant drainage scheme could be provided is shown in Appendix 1. Any scheme is subject to refinement post Planning Approval following development of the design.
- 4.18. Onsite storm sewers serving the proposed buildings would be located adjacent to the building form under paths and soft landscaping, within parking areas or carriageways as indicated on the Drainage Strategy drawing.
- 4.19. The final discharge point will be the existing attenuation basin, and therein Lavant Stream.

Exceedance

- 4.20. For normal exceedance events, flood waters would generally flow down the internal road system contained by kerbing. Ground levels will then direct overland flow away from buildings. This would not only mitigate flooding of the proposed development but also offers betterment to existing properties, by managing currently uncontrolled pluvial run off.
- 4.21. For clarity, a drainage system can be designed to cater for the 1 in 30 year storm event with the attenuation designed to cater 1 in 100 year storm event plus 30% climate change, as per best practice.

5.0 Summary and Conclusion

Introduction

- 5.1. This chapter summarises the previous chapters and assesses the suitability of the development proposals in the context of on and off site vulnerability and the requirements of NPPF.

Summary – Foul Water

- 5.2. The foul water drainage strategy developed for the Site, utilises a conventional piped sewerage system to serve the proposed buildings. The system is designed to comply with British Standard EN 752, Sewers for Adoption 7th Edition and the requirements of Building Regulations.
- 5.3. Historic and Proposed foul flows have been calculated. These rates have been provided to Southern Water Services Limited (SWSL) for verification and confirmation of existing capacity, and a response is awaited.
- 5.4. Overall, we anticipate a net reduction in foul flows to the existing public foul sewers in the immediate vicinity.
- 5.5. Onsite foul sewer serving the proposed buildings would be located under hard standings, parking areas or carriageways.

Summary – Surface Water

- 5.6. The surface water drainage strategy proposes utilising a number of Sustainable Drainage System techniques (SuDS) to attenuate surface water runoff. Suitable SuDS features have been incorporated into the Site to sit alongside the existing Attenuation Basin.
- 5.7. An assessment has been undertaken on the existing Attenuation Basin together with its current catchment. The existing volume has been calculated to be 990m³.
- 5.8. The surface water drainage strategy utilises a predominately perforated piped sewerage system to drain the buildings and adjacent hard standings, car parking and internal roads. The system is designed to infiltrate surface water to the ground at or near to its source through the use of granular “spine” surrounding the principal sewers. In turn this gravity based system will pass residual flows to the existing attenuation basin located at the south-eastern corner of the Site.
- 5.9. Attenuation storage will be catered for by using a combination of residual volume within pipes and granular layers below the car parks to supplement the existing volume within the attenuation basin.
- 5.10. The system was modelled for a 2 year rainfall event and has been simulated to accommodate no flooding in a 30 year rainfall simulation, in accordance with Building Regulations and Sewers for Adoption 7th Edition. Flows will be attenuated on site for all rainfall events up to the 1 in a 100 year storm event plus 30% allowance for climate change.



- 5.11. Surface water runoff from the Development will be restricted by the existing 150mm diameter outfall pipe from the existing attenuation basin to Lavant Stream using corresponding discharge rates for storms up to 1 in 100 year plus 30% climate change.
- 5.12. Assuming infiltration losses to ground at appropriate values, the total attenuation volume for the Development has been calculated to be approximately 570m³ for all storms up to the 1 in 100 year storm event plus 30% climate change. This volume is provided through a combination of the existing attenuation basin and new onsite features.
- 5.13. Onsite surface water sewers serving the proposed buildings would be located under hard standings, parking areas or carriageways.

Conclusion

- 5.14. It is concluded that this Drainage Strategy demonstrates that the Site satisfies NPPF. Any increase in surface water runoff can be managed through the use of SuDS techniques.
- 5.15. The Drainage Strategy shows one way in which viable surface water and foul disposal solutions can be delivered within the proposed development. Any scheme is subject to refinement post Planning Approval following development of the design.
- 5.16. Any offsite foul sewer network capacity shortfall (if required) would be provided by the Developer and/or Southern Water Services Limited. The extent of upgrades would be established at post planning, once the extent of capacity had been established.



Appendices



Appendix 1 – Drawings

Site Location Plan

Penoyre & Prasad drawing: Site Plan

Drainage Strategy



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Rev	Date	Description	Drawn	Checked

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Client

HAMPSHIRE LIVING SPACE

Project

HAVANT HEALTH AND WELLBEING CAMPUS

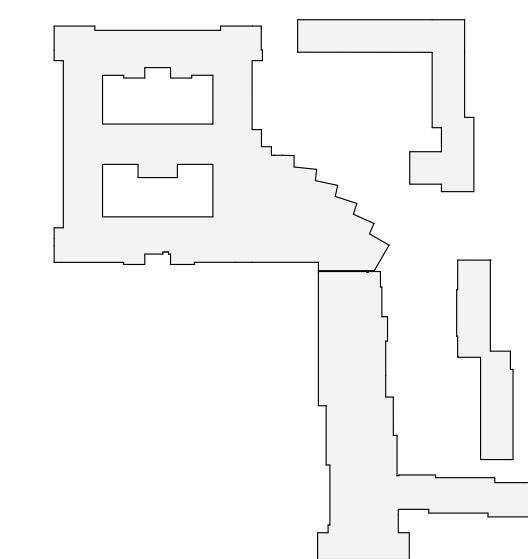
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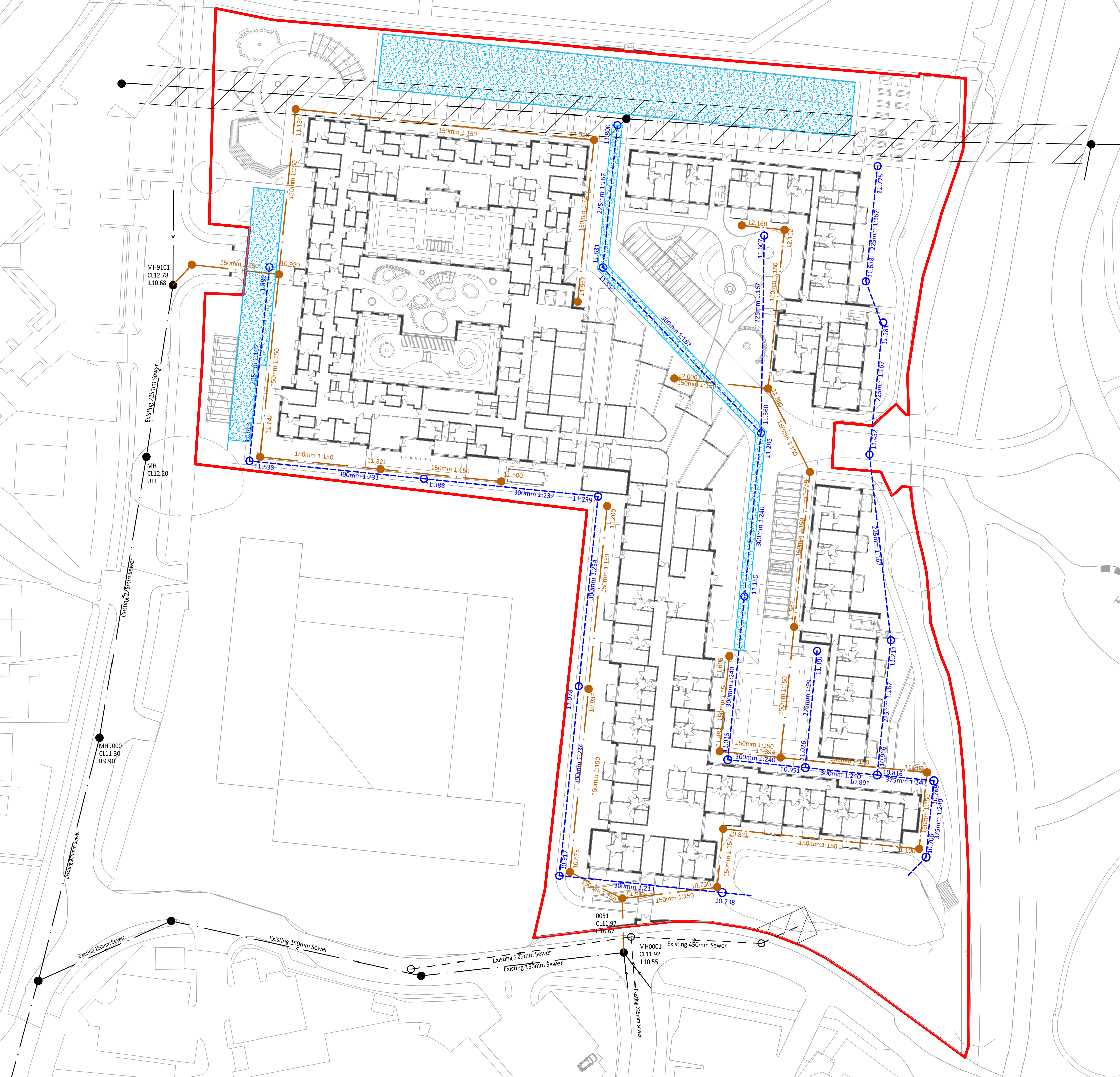
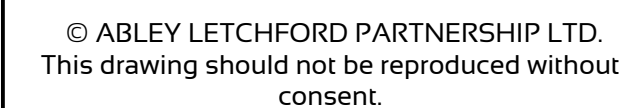
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FOR PLANNING

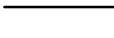
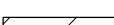
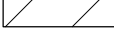
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Drawing No	A048-01		Revision
			P0



B	11/03/15	VW/RS	Planning
A	05/03/15	VW/RS	Information
Rev	Date	Prep/Check	Description



Legend:

-  Existing Storm Water Sewer
 Existing Foul Water Sewer
 Existing Sewer Easement
 11.316 Proposed Storm Water Sewer (IL=invert)
 11.200 Proposed Foul Water Sewer (IL=invert)
 Proposed Porous Paving / Infiltration Trench.



Client

HAMPSHIRE LIVING SPACE

Project
HAVANT HEALTH AND
WELLBEING CAMPUS

Title

DRAINAGE STRATEGY

Status

FOR PLANNING

Scale 1:500 @ A1	Date FEB 2015	Drawn LPA	Checked SL
Drawing No A048-010			Revision P1



Appendix 2 – Southern Water

Asset Location Search

SEWER RECORDS PAGE 1 OF 2

107406



106829

47/1537

O.S. REF.
SU7207SW

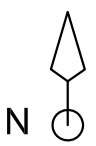
Title: 184654_River Way Off River Way

Drawn by: goswama

Scale: 1:2500

Date: 12/11/2014

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.
The actual positions should be determined on site.
WARNING: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement
Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved
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472483

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0001X	11.97	10.6	150	UNK	CIRC	2105X		10.738	150	VC	CIRC	6001X	12.87	8.85	675	CP	CIRC	800DX			UNK	VC	CIRC
0050X	12.46	10.55	450	UNK	CIRC	2106X		10.12	675	CP	CIRC	6050X	11.83	9.33	375	CP	CIRC	8050X	12.88	11.66	150	VC	CIRC
0051Y	12	10.66	450	UNK	CIRC	2201X	13.5	12.23	225	VC	CIRC	6051X	12		225	UNK	CIRC	8051X	12.65	11.49	150	VC	CIRC
0100X	13.09		675	UNK	CIRC	2202X	13.47	12.35	225	VC	CIRC	6101X			UNK	VC	CIRC	8052X	12.62	11.44	150	VC	CIRC
0200X	13.7	12.45	225	VC	CIRC	2250X	13.35	12	600	CP	CIRC	6102X			UNK	VC	CIRC	8053X	12.59	11.57	150	VC	CIRC
0201X	14.2	12.7	225	VC	CIRC	2251X	13.15	11.79	600	CP	CIRC	6103X			UNK	VC	CIRC	8054X	12.57	11.38	150	VC	CIRC
0202X			225	VC	CIRC	2252X	13.72	12.5	300	VC	CIRC	610DX			UNK	UNK	CIRC	8055X	12.37	11.15	225	VC	CIRC
0203X			UNK	UNK	CIRC	2300X	13.84	12.39	375	CP	CIRC	6150X	13.47	12.7	150	VC	CIRC	8056X	12.37	10.83	225	VC	CIRC
0204X			UNK	UNK	CIRC	2350X	13.85	12.6	600	CP	CIRC	6151X	13.81	13.02	150	VC	CIRC	8057X	12.39	11.02	150	VC	CIRC
0250X	13.48	11.68	675	CP	CIRC	2351X	13.79	12.86	600	CP	CIRC	6200X	14.14	12.69	225	VC	CIRC	8058X	12.49	10.7	225	VC	CIRC
0251X	13.99	11.44	675	CP	CIRC	2800X	12.53	10.15	225	VC	CIRC	6201X			UNK	UNK	CIRC	8100X	12.29		UNK	UNK	CIRC
0252X	13.83	12.73	225	VC	CIRC	2851X	12.59	10.72	675	CP	CIRC	6202X			UNK	UNK	CIRC	8102X	13.77	12.52	225	VC	CIRC
0253X	13.77	11.74	675	CP	CIRC	2852X	12.67	10.87	675	CP	CIRC	6203X			UNK	UNK	CIRC	8103Y	13.77	11.28	225	VC	CIRC
0300X	15.38	12.38	300	CP	CIRC	2900X			225	UNK	CIRC	6204X			UNK	UNK	CIRC	8150X	13.77	12.44	225	VC	CIRC
0301X	15.35	12.15	375	CP	CIRC	2901X	12.62	10.46	225	VC	CIRC	620DX			UNK	UNK	CIRC	8200X	14.53	13.14	225	VC	CIRC
0302X	15.44	12.11	375	CP	CIRC	2902X	12.67	10.65	225	VC	CIRC	6300X	13.98	10.85	450	CP	CIRC	8202X			100	VC	CIRC
0303X			UNK	UNK	CIRC	2950X	12.63	10.97	600	CP	CIRC	6350X	13.73	10.28	525	CP	CIRC	820DX			100	VC	CIRC
0304X			UNK	UNK	CIRC	2951X	12.86	10.8	600	CP	CIRC	6351X	14.39	11.2	450	CP	CIRC	8250X	14.16	11.98	300	VC	CIRC
0305X			UNK	UNK	CIRC	2952X	12.58	11.09	450	CP	CIRC	6850X	11.08	8.44	675	CP	CIRC	8251X	14.57	11.73	300	VC	CIRC
030DX			UNK	UNK	CIRC	3000X	12.5	10.33	225	VC	CIRC	6851X	10.83	8.39	675	CP	CIRC	8252X	15.06	12.91	225	VC	CIRC
0350X	14.5	12.1	675	CP	CIRC	3050X	13		450	CP	CIRC	6950X	11.7	8.95	600	CP	CIRC	8254X	14.7	12.61	225	VC	CIRC
0352X	15.26	13.86	225	VC	CIRC	3100X	14	12.15	225	VC	CIRC	6951X	11.43		600	CP	CIRC	8300Y	15.26	13.51	150	VC	CIRC
0802X	11.672	9.61	225	VC	CIRC	3101Y	13.17	11.26	225	VC	CIRC	6952X	11.26		600	CP	CIRC	8301X	15.43	11.61	450	CP	CIRC
0803X	11.769	9.47	225	VC	CIRC	3101X	13.17	11.26	300	VC	CIRC	6953X	11.231	8.781	600	UNK	CIRC	8350X	15.22	12.04	225	VC	CIRC
0850X	11.65	10.41	375	VC	CIRC	3102X	13.06	11.06	300	VC	CIRC	7000X	11.49	9.79	300	CP	CIRC	8351X	14.99	14.07	150	VC	CIRC
0851X	11.69	10.35	375	VC	CIRC	3103X	13.44	10.33	675	CP	CIRC	7001X	12.82	8.52	675	CP	CIRC	8352X			UNK	UNK	CIRC
0900X	12.076	9.89	225	VC	CIRC	3104X	13.5	10.63	675	CP	CIRC	7002X	11.78	9.36	300	CP	CIRC	8404X	15.33	13.55	150	VC	CIRC
0950X	11.97	10.57	375	VC	CIRC	3105X	12.79	11.19	225	VC	CIRC	7003X	12.2	9.3	300	CP	CIRC	8405X	15.32	13.38	150	VC	CIRC
1050X	12.23	11.14	450	UNK	CIRC	3150X	12.4	11.79	300	VC	CIRC	7004X	12.8	9.3	300	CP	CIRC	8800X	10.19	8.51	225	VC	CIRC
1100X	12.7	9.95	675	CP	CIRC	3151X	13.18	11.92	450	CP	CIRC	7050X	11.43	10.29	300	CP	CIRC	8801X			UNK	UNK	CIRC
1101X	12.6	9.85	675	CP	CIRC	3152X	13.13	11.81	450	CP	CIRC	7051X	11.68	10.03	300	CP	CIRC	8802X			UNK	UNK	CIRC
1102X		11.155	150	VC	CIRC	3153X	12.98	12.13	300	VC	CIRC	7100X	13.59	11.56	225	VC	CIRC	8803X			UNK	UNK	CIRC
1103X		10.997	150	VC	CIRC	3200X	14.32	12.04	225	VC	CIRC	7101X			UNK	VC	CIRC	8804X			UNK	UNK	CIRC
1104X		10.647	150	VC	CIRC	3201X	14.15	11.92	225	VC	CIRC	7102X			UNK	VC	CIRC	8805X			UNK	UNK	CIRC
1105X		9.997	675	CP	CIRC	3202X	13.79	11.82	225	VC	CIRC	7103X			UNK	VC	CIRC	8850X	11.92	10.55	225	CP	CIRC
1200X	13.34	12.4	225	VC	CIRC	3203X	13.71	11.75	225	VC	CIRC	7104X			UNK	VC	CIRC	8851X	12.14	10.75	225	CP	CIRC
1250X	13.29	11.55	600	CP	CIRC	3204X	13.51	11.69	225	VC	CIRC	7150X	13.66	12.71	150	VC	CIRC	8852X	12.27	10.92	150	VC	CIRC
1254X	13.3	12.2	300	CP	CIRC	3205X	13.93	10.98	600	CP	CIRC	7151X	13.87	12.92	150	VC	CIRC	9000X	11.35		225	VC	CIRC
1300X	14.5	14.5	375	CP	CIRC	3206X			225	VC	CIRC	7152X	14.14	13.38	150	VC	CIRC	9001X	12.44	10.34	150	UNK	CIRC
1301X	14.92	12.26	375	CP	CIRC	3250X	13.69	12.62	600	CP	CIRC	7200X	14.98	12.98	225	VC	CIRC	9002X	12.13	9.98	150	UNK	CIRC
1302X	14.99	12.24	375	CP	CIRC	3251X	13.76	12.27	600	CP	CIRC	7201X	14.7	12.6	225	VC	CIRC	9003X	11.098		225	VC	CIRC
1303X	14.8	12.2	225	VC	CIRC	3252X	13.42	12.14	600	CP	CIRC	7202X	14.41	12.17	225	VC	CIRC	9050X	12.07		225	VC	CIRC
1304X	14.09	12.68	225	VC	CIRC	3253X	13.59	12.74	300	VC	CIRC	7251X	14.88	11.43	300	VC	CIRC	9051X	12.25	11.08	300	UNK	CIRC
1305X	14.34	12.9	225	VC	CIRC	3254X	14	13	225	VC	CIRC	7300X	14.4	11.1	450	CP	CIRC	9100X	13.317		675	CP	CIRC
1306X	15.09	12.57	225	VC	CIRC	3300X	14.12	12.49	375	CP	CIRC	7301X	14.52	11.64	225	VC	CIRC	9101X	12.81	10.71	225	VC	CIRC
1307X	14.54	12.76	225	VC	CIRC	3350X	14.55	13.37	225	VC	CIRC	7302X	14.83	11.19	450	CP	CIRC	9102X	12.94	9.34	675	CP	CIRC
1350X	14.8	12.02	675	CP	CIRC	3351X	14.25	13.15	225	VC	CIRC	7350X	14.56	11.72	300	VC	CIRC	9200X	13.96	12.46	225	VC	CIRC
1351X	14.74	11.97	675	CP	CIRC	3452X	14.25	13	600	CP	CIRC	7351X	14.53	10.83	450	CP	CIRC	9202X			UNK	UNK	CIRC
1352X	14.56	11.95	675	CP	CIRC	4300X	14.37	11.26	600	CP	CIRC	7352X	14.92	11.34	300	VC	CIRC	9203X	14.365	10.808	225	VC	CIRC
1354X	15.19	13.85	225	VC	CIRC	4301X	14.55	12.6	375	CP	CIRC	7353X	14.75	12	300	VC	CIRC	9204X	13.8	9.53	675	UNK	CIRC
1800X	11.793	9.93	150	VC	CIRC	4302X	14.54	12.74	225	VC	CIRC	7354X			300	VC	CIRC	9251X	14.24		675	CP	CIRC
1850X	11.68	10.72	225	VC	CIRC	4303X	14.36	12.92	150	VC	CIRC	7800X	11.71	10.69	225	VC	CIRC	9255X	14.92		900	CP	CIRC
1851X	11.81	10.58	225	VC	CIRC	4350X	14.66	13.61	450	CP	CIRC	7801X	11.8	10.4	225	VC	CIRC	9256X	15.03	13.18	225	VC	CIRC
1900X	11.847	10.43	150	VC	CIRC	4351X	14.4	13.13	450	CP	CIRC	7850X	11.73	10.31	300	CP	CIRC	9257X	13.87	11.88	300	VC	CIRC
1901X	11.83	10.2	150	VC	CIRC	4353X	14.12	12.82	600	CP	CIRC	7900X	11.5	9.68	300	CP	CIRC	9300X	14.93	12.03	375	VC	CIRC
1902X	11.597	10.13	225	VC	CIRC	5000X	13.13		675	CP	CIRC	7901X			UNK	UNK	UNK	9301X	14.71	11.9	450	CP	CIRC
1903X	11.968	10.02	225	VC	CIRC	5200X	13.33	12.23	225	VC	CIRC	7950X	11.117	9.742	UNK	UNK	CIRC	9302X	15.02	12.42	225	VC	CIRC
1950X	12.03	11.08	225	VC	CIRC	5250X	13.25		525	CP	CIRC	7951X	11.185	9.665	300	UNK	CIRC	9303X	14.79	12.18	225	VC	CIRC
1951X	11.82	10.88	225	VC	CIRC	5251X	13.94	11.74	525	CP	CIRC	8001X			150	PF	CIRC	9304X			UNK	UNK	CIRC
1952X	11.75	10.77	300	VC	CIRC	5252X	14.34	12.1	225	VC	CIRC	8003X			UNK	VC	CIRC	9305X			UNK	UNK	CIRC
2100X	12.8	10.2	675	CP	CIRC	5301X	12.87	10.52	450	CP	CIRC	8004X			UNK	VC	CIRC	930DX			225	VC	CIRC
2101X		11.302	150	VC	CIRC	5350X	13.14	11.4	300	VC	CIRC	8005X			UNK	VC	CIRC	9350X	14.91	13.28	700	CP	CIRC
2102X		11.232	150	VC	CIRC	5801X	11.196	10.546	UNK	UNK	CIRC	8006X			UNK	VC	CIRC	9351X	14.29	12.04	225	VC	CIRC
2103X		11.122	150	VC	CIRC	5802X	11.107	9.977	150	UNK	CIRC	8007X											



Appendix 3 – Microdrainage WinDES Outputs

Network Details and Simulation Runs

Abley Letchford Partnership Ltd		Page 1
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.100	Minimum Backdrop Height (m)	0.000
Ratio R	0.350	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.000	9.998	0.060	166.6	0.035	5.00	0.0	0.600	o	225	
S1.001	36.020	0.216	167.0	0.165	0.00	0.0	0.600	o	225	
S1.002	34.602	0.150	230.7	0.042	0.00	0.0	0.600	o	300	
S1.003	34.602	0.149	231.8	0.095	0.00	0.0	0.600	o	300	
S1.004	37.658	0.161	234.1	0.056	0.00	0.0	0.600	o	300	
S1.005	37.658	0.161	234.1	0.065	0.00	0.0	0.600	o	300	
S1.006	38.048	0.179	212.6	0.023	0.00	0.0	0.600	o	300	
S1.007	20.464	0.288	71.1	0.024	0.00	0.0	0.600	o	300	
S2.000	28.292	0.169	167.4	0.149	5.00	0.0	0.600	o	225	
S2.001	45.221	0.271	166.9	0.175	0.00	0.0	0.600	o	300	
S3.000	41.066	0.247	166.3	0.054	5.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.16	11.889	0.035	0.0	0.0	0.0	1.01	40.2	4.7
S1.001	50.00	5.76	11.829	0.199	0.0	0.0	0.0	1.01	40.1	27.0
S1.002	50.00	6.32	11.538	0.241	0.0	0.0	0.0	1.03	72.9	32.7
S1.003	50.00	6.88	11.388	0.336	0.0	0.0	0.0	1.03	72.7	45.5
S1.004	50.00	7.49	11.239	0.392	0.0	0.0	0.0	1.02	72.3	53.1
S1.005	50.00	8.11	11.078	0.457	0.0	0.0	0.0	1.02	72.3	61.9
S1.006	50.00	8.70	10.917	0.480	0.0	0.0	0.0	1.07	76.0	65.0
S1.007	50.00	8.88	10.738	0.504	0.0	0.0	0.0	1.87	132.0	68.2
S2.000	50.00	5.47	11.800	0.149	0.0	0.0	0.0	1.01	40.1	20.1
S2.001	50.00	6.09	11.556	0.324	0.0	0.0	0.0	1.21	85.8	43.9
S3.000	50.00	5.68	11.607	0.054	0.0	0.0	0.0	1.01	40.2	7.3

Abley Letchford Partnership Ltd			Page 2
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG		OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX		Designed by SL Checked by LPA	
XP Solutions		Network 2014.1.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S4.000	11.326	0.115	98.5	0.074	5.00	0.0	0.600	o	225	
S2.002	32.444	0.135	240.0	0.099	0.00	0.0	0.600	o	300	
S2.003	32.444	0.135	240.3	0.049	0.00	0.0	0.600	o	300	
S2.004	15.367	0.064	240.0	0.047	0.00	0.0	0.600	o	300	
S5.000	27.314	0.275	99.3	0.041	5.00	0.0	0.600	o	225	
S2.005	14.296	0.060	240.0	0.032	0.00	0.0	0.600	o	300	
S6.000	24.892	0.150	165.9	0.028	5.00	0.0	0.600	o	225	
S6.001	32.302	0.193	167.4	0.033	0.00	0.0	0.600	o	225	
S6.002	36.960	0.221	167.2	0.016	0.00	0.0	0.600	o	225	
S6.003	26.743	0.245	109.2	0.015	0.00	0.0	0.600	o	225	
S2.006	11.275	0.047	240.0	0.013	0.00	0.0	0.600	o	375	
S2.007	15.183	0.063	240.0	0.006	0.00	0.0	0.600	o	375	
S2.008	12.674	0.053	240.0	0.009	0.00	0.0	0.600	o	375	
S2.009	11.058	0.203	54.5	0.017	0.00	0.0	0.600	o	375	
S7.000	43.931	0.263	167.0	0.020	5.00	0.0	0.600	o	225	

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	50.00	5.14	11.475	0.074	0.0	0.0	0.0	1.32	52.4	10.1
S2.002	50.00	5.54	11.285	0.000	65.0	0.0	0.0	1.01	71.4	65.0
S2.003	50.00	5.54	11.150	0.000	65.0	0.0	0.0	1.01	71.4	65.0
S2.004	50.00	5.25	11.015	0.000	65.0	0.0	0.0	1.01	71.4	65.0
S5.000	50.00	5.35	11.301	0.041	0.0	0.0	0.0	1.31	52.2	5.6
S2.005	50.00	5.24	10.951	0.000	65.0	0.0	0.0	1.01	71.4	65.0
S6.000	50.00	5.41	11.775	0.028	0.0	0.0	0.0	1.01	40.2	3.8
S6.001	50.00	5.94	11.625	0.061	0.0	0.0	0.0	1.01	40.1	8.3
S6.002	50.00	6.56	11.432	0.077	0.0	0.0	0.0	1.01	40.1	10.4
S6.003	50.00	6.91	11.211	0.092	0.0	0.0	0.0	1.25	49.7	12.4
S2.006	50.00	7.07	10.816	0.105	65.0	0.0	0.0	1.17	128.7	79.2
S2.007	50.00	7.29	10.769	0.111	65.0	0.0	0.0	1.17	128.7	80.0
S2.008	50.00	7.47	10.706	0.119	65.0	0.0	0.0	1.17	128.7	81.2
S2.009	50.00	7.55	10.653	0.137	65.0	0.0	0.0	2.46	271.6	83.5
S7.000	50.00	5.73	11.038	0.020	0.0	0.0	0.0	1.01	40.1	2.7

Abley Letchford Partnership Ltd		Page 3
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S8.000	10.007	0.060	166.8	0.090	5.00	0.0	0.600	o	225	
S7.001	25.778	0.063	410.0	0.040	0.00	0.0	0.600	o	450	
S7.002	19.726	0.037	533.1	0.040	0.00	0.0	0.600	o	450	
S1.008	5.279	0.066	80.0	0.000	0.00	0.0	0.600	o	150	

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)
S8.000	50.00	5.17	10.835	0.090	0.0	0.0	0.0	1.01	40.1	12.2
S7.001	50.00	6.16	10.550	0.150	0.0	0.0	0.0	1.00	158.7	20.3
S7.002	50.00	6.53	10.487	0.190	0.0	0.0	0.0	0.87	138.9	25.7
S1.008	50.00	5.08	10.450	0.000	19.0	0.0	0.0	1.12	19.9	19.0

Abley Letchford Partnership Ltd										Page 4	
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG					OAK PARK, HAVANT SURFACE WATER DRAINAGE						
Date MAR 15 File STRATEGY V2.MDX					Designed by SL Checked by LPA						
XP Solutions										Network 2014.1.1	
Manhole Schedules for Storm											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	13.200	1.311	Open Manhole	450	S1.000	11.889	225				
S2	13.200	1.371	Open Manhole	1200	S1.001	11.829	225	S1.000	11.829	225	
S3	13.200	1.662	Open Manhole	1200	S1.002	11.538	300	S1.001	11.613	225	
S4	13.100	1.712	Open Manhole	1200	S1.003	11.388	300	S1.002	11.388	300	
S5	12.850	1.611	Open Manhole	1200	S1.004	11.239	300	S1.003	11.239	300	
S6	12.600	1.522	Open Manhole	1200	S1.005	11.078	300	S1.004	11.078	300	
S7	12.400	1.483	Open Manhole	1200	S1.006	10.917	300	S1.005	10.917	300	
S8	12.000	1.262	Open Manhole	1200	S1.007	10.738	300	S1.006	10.738	300	
S9	13.200	1.400	Open Manhole	1200	S2.000	11.800	225				
S10	13.184	1.628	Open Manhole	1200	S2.001	11.556	300	S2.000	11.631	225	
S11	12.900	1.293	Open Manhole	450	S3.000	11.607	225				
S12	12.900	1.425	Open Manhole	450	S4.000	11.475	225				
S13	12.913	1.628	Open Manhole	1200	S2.002	11.285	300	S2.001	11.285	300	
								S3.000	11.360	225	
								S4.000	11.360	225	
S14	12.900	1.750	Open Manhole	1200	S2.003	11.150	300	S2.002	11.150	300	
S15	12.900	1.885	Open Manhole	1200	S2.004	11.015	300	S2.003	11.015	300	
S16	12.800	1.499	Open Manhole	450	S5.000	11.301	225				
S17	12.263	1.312	Open Manhole	1200	S2.005	10.951	300	S2.004	10.951	300	
								S5.000	11.026	225	
S18	12.900	1.125	Open Manhole	450	S6.000	11.775	225				
S19	12.750	1.125	Open Manhole	450	S6.001	11.625	225	S6.000	11.625	225	
S20	12.857	1.425	Open Manhole	450	S6.002	11.432	225	S6.001	11.432	225	
S21	12.800	1.589	Open Manhole	450	S6.003	11.211	225	S6.002	11.211	225	
S22	12.175	1.359	Open Manhole	1350	S2.006	10.816	375	S2.005	10.891	300	
								S6.003	10.966	225	
S23	12.147	1.378	Open Manhole	1350	S2.007	10.769	375	S2.006	10.769	375	
S24	12.109	1.403	Open Manhole	1350	S2.008	10.706	375	S2.007	10.706	375	
S25	12.000	1.347	Open Manhole	1350	S2.009	10.653	375	S2.008	10.653	375	
S26	12.360	1.322	Open Manhole	1200	S7.000	11.038	225				
S27	12.000	1.165	Open Manhole	1200	S8.000	10.835	225				
S28	12.000	1.450	Open Manhole	1350	S7.001	10.550	450	S7.000	10.775	225	
								S8.000	10.775	225	
S29	12.420	1.933	Open Manhole	1350	S7.002	10.487	450	S7.001	10.487	450	
S30	12.000	1.550	Open Manhole	1350	S1.008	10.450	150	S1.007	10.450	300	
								S2.009	10.450	375	
								S7.002	10.450	450	
S	12.000	1.616	Open Manhole	0		OUTFALL		S1.008	10.384	150	
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Abley Letchford Partnership Ltd		Page 5
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

Storage Structures for Storm

Porous Car Park Manhole: S2, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.21240	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	50.0
Max Percolation (l/s)	76.4	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	11.775	Cap Volume Depth (m)	0.000

Porous Car Park Manhole: S9, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	1.33200	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	92.0
Max Percolation (l/s)	255.6	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	12.500	Cap Volume Depth (m)	0.000

Infiltration Trench Manhole: S10, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	1.33200	Trench Width (m)	0.2
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	28.0
Safety Factor	2.0	Slope (1:X)	167.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	11.556	Cap Infiltration Depth (m)	0.000

Infiltration Trench Manhole: S13, DS/PN: S2.002

Infiltration Coefficient Base (m/hr)	1.33200	Trench Width (m)	0.3
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	45.0
Safety Factor	2.0	Slope (1:X)	240.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	11.285	Cap Infiltration Depth (m)	0.000

Infiltration Trench Manhole: S14, DS/PN: S2.003

Infiltration Coefficient Base (m/hr)	1.33200	Trench Width (m)	0.3
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	43.0
Safety Factor	2.0	Slope (1:X)	240.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	11.150	Cap Infiltration Depth (m)	0.000

Tank or Pond Manhole: S30, DS/PN: S1.008

Invert Level (m) 10.450

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	376.7	0.100	376.7	0.200	376.7	0.300	543.6

Abley Letchford Partnership Ltd		Page 6
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

Tank or Pond Manhole: S30, DS/PN: S1.008

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.400	569.8	1.000	727.3	1.600	0.0	2.200	0.0
0.500	596.1	1.100	753.5	1.700	0.0	2.300	0.0
0.600	622.3	1.200	779.8	1.800	0.0	2.400	0.0
0.700	648.6	1.300	806.0	1.900	0.0	2.500	0.0
0.800	674.8	1.400	832.0	2.000	0.0		
0.900	701.1	1.500	858.5	2.100	0.0		

Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Area (m³) 348 Evaporation (mm/day) 1
Depression Storage (mm) 10 Decay Coefficient 0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4 0.006324	32	36 0.001277	64	68 0.000258	96	100 0.000052
4	8 0.005178	36	40 0.001045	68	72 0.000211	100	104 0.000043
8	12 0.004239	40	44 0.000856	72	76 0.000173	104	108 0.000035
12	16 0.003471	44	48 0.000701	76	80 0.000141	108	112 0.000029
16	20 0.002841	48	52 0.000574	80	84 0.000116	112	116 0.000023
20	24 0.002326	52	56 0.000470	84	88 0.000095	116	120 0.000019
24	28 0.001905	56	60 0.000385	88	92 0.000078		
28	32 0.001559	60	64 0.000315	92	96 0.000064		

Time Area Diagram for Green Roof at Pipe Number S4.000 (Storm)

Area (m³) 743 Evaporation (mm/day) 1
Depression Storage (mm) 10 Decay Coefficient 0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4 0.013502	32	36 0.002726	64	68 0.000550	96	100 0.000111
4	8 0.011054	36	40 0.002232	68	72 0.000451	100	104 0.000091
8	12 0.009051	40	44 0.001827	72	76 0.000369	104	108 0.000074
12	16 0.007410	44	48 0.001496	76	80 0.000302	108	112 0.000061
16	20 0.006067	48	52 0.001225	80	84 0.000247	112	116 0.000050
20	24 0.004967	52	56 0.001003	84	88 0.000202	116	120 0.000041
24	28 0.004067	56	60 0.000821	88	92 0.000166		
28	32 0.003329	60	64 0.000672	92	96 0.000136		

Abley Letchford Partnership Ltd		Page 7
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 6
 Number of Online Controls 0 Number of Time/Area Diagrams 2
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.100 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2
 Climate Change (%) 0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	120 Winter	2	0%					
S1.001	30 Winter	2	0%					
S1.002	30 Winter	2	0%					
S1.003	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S1.005	15 Winter	2	0%					
S1.006	15 Winter	2	0%					
S1.007	15 Winter	2	0%					
S2.000	15 Winter	2	0%					
S2.001	15 Winter	2	0%					
S3.000	15 Winter	2	0%					
S4.000	120 Winter	2	0%					
S2.002	15 Winter	2	0%					
S2.003	15 Winter	2	0%					
S2.004	15 Winter	2	0%					
S5.000	15 Winter	2	0%					
S2.005	15 Winter	2	0%					
S6.000	15 Winter	2	0%					
S6.001	15 Winter	2	0%					
S6.002	15 Winter	2	0%					
S6.003	15 Winter	2	0%					
S2.006	15 Winter	2	0%					

Abley Letchford Partnership Ltd		Page 8
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S2.007	15 Winter	2	0%					
S2.008	15 Winter	2	0%					
S2.009	15 Winter	2	0%					
S7.000	15 Winter	2	0%					
S8.000	15 Winter	2	0%					
S7.001	120 Winter	2	0%					
S7.002	120 Winter	2	0%					
S1.008	120 Winter	2	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	11.917	-0.197	0.000	0.04	0.0	1.2	OK
S1.001	S2	11.886	-0.168	0.000	0.14	0.0	5.5	OK
S1.002	S3	11.612	-0.226	0.000	0.13	0.0	9.0	OK
S1.003	S4	11.500	-0.189	0.000	0.29	0.0	19.5	OK
S1.004	S5	11.370	-0.169	0.000	0.39	0.0	26.1	OK
S1.005	S6	11.230	-0.149	0.000	0.50	0.0	33.5	OK
S1.006	S7	11.069	-0.148	0.000	0.51	0.0	35.6	OK
S1.007	S8	10.856	-0.182	0.000	0.33	0.0	37.8	OK
S2.000	S9	11.934	-0.091	0.000	0.61	0.0	22.6	OK
S2.001	S10	11.718	-0.138	0.000	0.54	0.0	43.1	OK
S3.000	S11	11.681	-0.151	0.000	0.23	0.0	8.7	OK
S4.000	S12	11.510	-0.190	0.000	0.06	0.0	2.5	OK
S2.002	S13	11.505	-0.080	0.000	0.87	0.0	56.8	OK
S2.003	S14	11.377	-0.073	0.000	0.87	0.0	57.0	OK
S2.004	S15	11.294	-0.021	0.000	0.94	0.0	56.7	OK
S5.000	S16	11.357	-0.169	0.000	0.14	0.0	6.7	OK
S2.005	S17	11.240	-0.011	0.000	1.00	0.0	59.4	OK
S6.000	S18	11.828	-0.172	0.000	0.12	0.0	4.6	OK
S6.001	S19	11.700	-0.150	0.000	0.24	0.0	9.1	OK
S6.002	S20	11.515	-0.142	0.000	0.29	0.0	10.9	OK
S6.003	S21	11.292	-0.144	0.000	0.28	0.0	12.9	OK
S2.006	S22	11.058	-0.133	0.000	0.74	0.0	72.2	OK
S2.007	S23	11.002	-0.142	0.000	0.70	0.0	72.7	OK
S2.008	S24	10.947	-0.134	0.000	0.73	0.0	73.2	OK
S2.009	S25	10.824	-0.204	0.000	0.42	0.0	74.9	OK
S7.000	S26	11.082	-0.181	0.000	0.09	0.0	3.3	OK
S8.000	S27	10.940	-0.120	0.000	0.44	0.0	14.7	OK
S7.001	S28	10.714	-0.286	0.000	0.06	0.0	8.4	OK
S7.002	S29	10.713	-0.224	0.000	0.10	0.0	9.7	OK
S1.008	S30	10.712	0.112	0.000	1.68	0.0	27.0	SURCHARGED

Abley Letchford Partnership Ltd			Page 1					
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG		OAK PARK, HAVANT SURFACE WATER DRAINAGE						
Date MAR 15 File STRATEGY V2.MDX		Designed by SL Checked by LPA						
XP Solutions		Network 2014.1.1						
<u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								
Simulation Criteria								
Areal Reduction Factor		1.000	Additional Flow - % of Total Flow 0.000					
Hot Start (mins)		0	MADD Factor * 10m³/ha Storage 2.000					
Hot Start Level (mm)		0	Inlet Coefficient 0.800					
Manhole Headloss Coeff (Global)		0.500	Flow per Person per Day (l/per/day) 0.000					
Foul Sewage per hectare (l/s)		0.000						
Number of Input Hydrographs		0	Number of Storage Structures 6					
Number of Online Controls		0	Number of Time/Area Diagrams 2					
Number of Offline Controls		0	Number of Real Time Controls 0					
Synthetic Rainfall Details								
Rainfall Model		FSR	Ratio R 0.350					
Region England and Wales		Cv (Summer)	0.750					
M5-60 (mm)		19.100	Cv (Winter) 0.840					
Margin for Flood Risk Warning (mm)			300.0					
Analysis Timestep		2.5 Second	Increment (Extended)					
DTS Status			ON					
DVD Status			OFF					
Inertia Status			OFF					
Profile(s)								
Duration(s) (mins)		15, 30, 60, 120, 240, 360, 480, 960, 1440	Summer and Winter					
Return Period(s) (years)			30					
Climate Change (%)			0					
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	30	0%					
S1.001	15 Winter	30	0%					
S1.002	15 Winter	30	0%					
S1.003	15 Winter	30	0%					
S1.004	15 Winter	30	0%					
S1.005	15 Winter	30	0%	30/15 Winter				
S1.006	15 Winter	30	0%					
S1.007	120 Winter	30	0%					
S2.000	15 Winter	30	0%	30/15 Summer				
S2.001	15 Winter	30	0%	30/15 Summer				
S3.000	15 Winter	30	0%	30/15 Summer				
S4.000	15 Winter	30	0%	30/15 Summer				
S2.002	15 Winter	30	0%	30/15 Summer				
S2.003	15 Winter	30	0%	30/15 Summer				
S2.004	15 Winter	30	0%	30/15 Summer				
S5.000	15 Winter	30	0%					
S2.005	15 Winter	30	0%	30/15 Summer				
S6.000	15 Winter	30	0%					
S6.001	15 Winter	30	0%					
S6.002	15 Winter	30	0%					
S6.003	15 Winter	30	0%					
S2.006	15 Winter	30	0%	30/15 Summer				
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Abley Letchford Partnership Ltd		Page 2
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S2.007	15 Winter	30	0%	30/15 Summer				
S2.008	15 Winter	30	0%	30/15 Summer				
S2.009	120 Winter	30	0%					
S7.000	15 Winter	30	0%					
S8.000	15 Winter	30	0%					
S7.001	120 Winter	30	0%					
S7.002	120 Winter	30	0%	30/120 Winter				
S1.008	120 Winter	30	0%	30/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	11.952	-0.162	0.000	0.04	0.0	1.3	OK
S1.001	S2	11.952	-0.102	0.000	0.57	0.0	21.4	OK
S1.002	S3	11.678	-0.160	0.000	0.42	0.0	28.4	OK
S1.003	S4	11.600	-0.088	0.000	0.76	0.0	50.9	OK
S1.004	S5	11.523	-0.016	0.000	0.89	0.0	59.7	OK
S1.005	S6	11.394	0.015	0.000	1.07	0.0	71.4	SURCHARGED
S1.006	S7	11.216	-0.001	0.000	1.00	0.0	70.4	OK
S1.007	S8	10.950	-0.089	0.000	0.33	0.0	38.2	OK
S2.000	S9	12.345	0.320	0.000	1.05	0.0	39.1	SURCHARGED
S2.001	S10	12.214	0.358	0.000	0.93	0.0	74.7	SURCHARGED
S3.000	S11	12.093	0.261	0.000	0.41	0.0	15.5	SURCHARGED
S4.000	S12	12.064	0.364	0.000	0.06	0.0	2.6	SURCHARGED
S2.002	S13	12.065	0.480	0.000	1.29	0.0	84.2	SURCHARGED
S2.003	S14	11.859	0.409	0.000	1.30	0.0	85.1	SURCHARGED
S2.004	S15	11.628	0.314	0.000	1.50	0.0	90.1	SURCHARGED
S5.000	S16	11.500	-0.026	0.000	0.26	0.0	12.7	OK
S2.005	S17	11.483	0.232	0.000	1.69	0.0	100.2	SURCHARGED
S6.000	S18	11.849	-0.151	0.000	0.23	0.0	8.6	OK
S6.001	S19	11.740	-0.110	0.000	0.50	0.0	18.9	OK
S6.002	S20	11.562	-0.095	0.000	0.61	0.0	23.2	OK
S6.003	S21	11.359	-0.077	0.000	0.58	0.0	26.9	OK
S2.006	S22	11.310	0.119	0.000	1.26	0.0	122.2	SURCHARGED
S2.007	S23	11.211	0.067	0.000	1.19	0.0	123.3	SURCHARGED
S2.008	S24	11.111	0.030	0.000	1.25	0.0	124.5	SURCHARGED
S2.009	S25	10.948	-0.080	0.000	0.42	0.0	73.9	OK
S7.000	S26	11.099	-0.164	0.000	0.16	0.0	6.2	OK
S8.000	S27	10.995	-0.065	0.000	0.83	0.0	27.8	OK
S7.001	S28	10.940	-0.060	0.000	0.12	0.0	15.5	OK
S7.002	S29	10.939	0.001	0.000	0.18	0.0	17.5	SURCHARGED
S1.008	S30	10.937	0.337	0.000	2.49	0.0	40.1	SURCHARGED

Abley Letchford Partnership Ltd			Page 1					
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG		OAK PARK, HAVANT SURFACE WATER DRAINAGE						
Date MAR 15 File STRATEGY V2.MDX		Designed by SL Checked by LPA						
XP Solutions		Network 2014.1.1						
<u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								
<u>Simulation Criteria</u>								
Areal Reduction Factor		1.000	Additional Flow - % of Total Flow 0.000					
Hot Start (mins)		0	MADD Factor * 10m³/ha Storage 2.000					
Hot Start Level (mm)		0	Inlet Coefficient 0.800					
Manhole Headloss Coeff (Global)		0.500	Flow per Person per Day (l/per/day) 0.000					
Foul Sewage per hectare (l/s)		0.000						
Number of Input Hydrographs		0	Number of Storage Structures 6					
Number of Online Controls		0	Number of Time/Area Diagrams 2					
Number of Offline Controls		0	Number of Real Time Controls 0					
<u>Synthetic Rainfall Details</u>								
Rainfall Model		FSR	Ratio R 0.350					
Region England and Wales		Cv (Summer)	0.750					
M5-60 (mm)		19.100	Cv (Winter) 0.840					
Margin for Flood Risk Warning (mm)			300.0					
Analysis Timestep		2.5 Second Increment (Extended)						
DTS Status		ON						
DVD Status		OFF						
Inertia Status		OFF						
Profile(s)		Summer and Winter						
Duration(s) (mins)		15, 30, 60, 120, 240, 360, 480, 960, 1440						
Return Period(s) (years)		100						
Climate Change (%)		30						
PN	Storm	Return Period	Climate Change	First X Surge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+30%	100/15 Winter				
S1.001	15 Winter	100	+30%	100/15 Summer				
S1.002	15 Winter	100	+30%	100/15 Summer				
S1.003	15 Winter	100	+30%	100/15 Summer				
S1.004	15 Winter	100	+30%	100/15 Summer				
S1.005	15 Winter	100	+30%	100/15 Summer				
S1.006	15 Winter	100	+30%	100/15 Summer				
S1.007	120 Winter	100	+30%	100/30 Summer				
S2.000	15 Winter	100	+30%	100/15 Summer				
S2.001	15 Winter	100	+30%	100/15 Summer				
S3.000	15 Winter	100	+30%	100/15 Summer				
S4.000	15 Winter	100	+30%	100/15 Summer				
S2.002	15 Winter	100	+30%	100/15 Summer				
S2.003	15 Winter	100	+30%	100/15 Summer				
S2.004	15 Winter	100	+30%	100/15 Summer				
S5.000	15 Winter	100	+30%	100/15 Summer				
S2.005	15 Winter	100	+30%	100/15 Summer				
S6.000	15 Winter	100	+30%					
S6.001	15 Winter	100	+30%	100/15 Winter				
S6.002	15 Winter	100	+30%	100/15 Summer				
S6.003	15 Winter	100	+30%	100/15 Summer				
S2.006	15 Winter	100	+30%	100/15 Summer				
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Abley Letchford Partnership Ltd		Page 2
Avebury 2 Elcot Pk Elcot Lane Marlborough SN8 2BG	OAK PARK, HAVANT SURFACE WATER DRAINAGE	
Date MAR 15 File STRATEGY V2.MDX	Designed by SL Checked by LPA	
XP Solutions	Network 2014.1.1	

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

PN	Storm	Return Period	Climate Change	First X Surge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S2.007	15 Winter	100	+30%	100/15 Summer				
S2.008	120 Winter	100	+30%	100/15 Summer				
S2.009	120 Winter	100	+30%	100/15 Winter				
S7.000	120 Winter	100	+30%	100/120 Winter				
S8.000	120 Winter	100	+30%	100/15 Summer				
S7.001	120 Winter	100	+30%	100/30 Summer				
S7.002	120 Winter	100	+30%	100/15 Winter				
S1.008	120 Winter	100	+30%	100/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	12.134	0.020	0.000	0.13	0.0	4.4	SURCHARGED
S1.001	S2	12.134	0.080	0.000	1.08	0.0	40.8	SURCHARGED
S1.002	S3	12.220	0.381	0.000	0.72	0.0	48.2	SURCHARGED
S1.003	S4	12.223	0.534	0.000	0.90	0.0	59.8	SURCHARGED
S1.004	S5	12.138	0.599	0.000	1.18	0.0	78.9	SURCHARGED
S1.005	S6	11.905	0.527	0.000	1.56	0.0	104.4	SURCHARGED
S1.006	S7	11.485	0.268	0.000	1.56	0.0	109.5	SURCHARGED
S1.007	S8	11.295	0.257	0.000	0.58	0.0	66.4	SURCHARGED
S2.000	S9	12.598	0.573	0.000	1.07	0.0	40.0	SURCHARGED
S2.001	S10	12.840	0.984	0.000	1.10	0.0	88.5	SURCHARGED
S3.000	S11	12.892	1.060	0.000	0.59	0.0	22.6	FLOOD RISK
S4.000	S12	12.791	1.091	0.000	0.27	0.0	11.9	FLOOD RISK
S2.002	S13	12.794	1.209	0.000	1.58	0.0	102.9	FLOOD RISK
S2.003	S14	12.571	1.121	0.000	1.57	0.0	102.4	SURCHARGED
S2.004	S15	12.240	0.925	0.000	1.93	0.0	115.9	SURCHARGED
S5.000	S16	12.034	0.508	0.000	0.38	0.0	18.4	SURCHARGED
S2.005	S17	11.995	0.745	0.000	2.36	0.0	140.4	FLOOD RISK
S6.000	S18	11.967	-0.033	0.000	0.39	0.0	14.5	OK
S6.001	S19	11.942	0.092	0.000	0.82	0.0	30.7	SURCHARGED
S6.002	S20	11.878	0.221	0.000	0.85	0.0	32.4	SURCHARGED
S6.003	S21	11.769	0.333	0.000	0.71	0.0	32.6	SURCHARGED
S2.006	S22	11.653	0.462	0.000	1.80	0.0	175.6	SURCHARGED
S2.007	S23	11.448	0.304	0.000	1.72	0.0	177.7	SURCHARGED
S2.008	S24	11.316	0.235	0.000	1.18	0.0	117.8	SURCHARGED
S2.009	S25	11.293	0.265	0.000	0.68	0.0	120.1	SURCHARGED
S7.000	S26	11.284	0.021	0.000	0.09	0.0	3.6	SURCHARGED
S8.000	S27	11.286	0.226	0.000	0.49	0.0	16.3	SURCHARGED
S7.001	S28	11.282	0.282	0.000	0.19	0.0	25.0	SURCHARGED
S7.002	S29	11.280	0.343	0.000	0.31	0.0	30.0	SURCHARGED
S1.008	S30	11.278	0.678	0.000	3.37	0.0	54.3	SURCHARGED