

St Patrick's, University of Reading

Sustainable Drainage Systems (Planning Stage Proposals)

Curtins Ref: BR1508/SUDS

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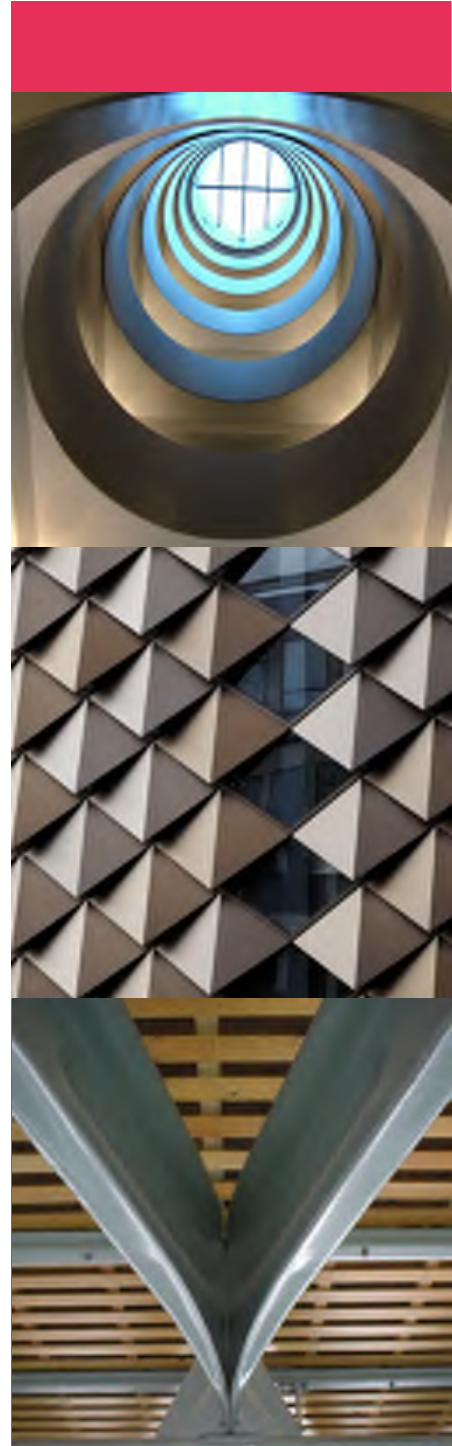
Client Name: UPP

Client Address:

Site Address: St Patrick's Halls, Northcourt Avenue, Reading RG2 7HB

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Rev	Description	Issued by	Checked	Date
Draft PP1	Pre-Planning Consultation Stage	SW	TN	21/10/2015
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00	Revised site layout. Client Review	SW	AH	16/03/2016
01	Planning Issue	SW	AH	26/05/2016
02	Revised Masterplan	TN	SW	03/11/2017
03	Revised Planning Issue	TN	SW	09/11/2017

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Author	Signature	Date
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Reviewed	Signature	Date
Stuart Williamson BEng (Hons) IEng MICE Principle Engineer	<i>S Williamson</i>	09/11/2017

Table of Contents

1.0	Introduction	1
1.1	Project Background	1
2.0	Pre-Planning Liaisons	2
2.1	Thames Water Liaisons	2
2.2	Local Authority Requirements	2
3.0	Existing Site Assessment	3
3.1	Existing Site Drainage	3
3.2	Preliminary Soakaway Testing	3
4.0	Flood Risk Summary	4
4.1	Sources of Flooding	4
4.2	Development Vulnerability Classification	4
4.3	Overall Flood Risk	4
4.4	Climate Change	4
5.0	Preliminary SUDS Assessment	5
5.1	Discharge by Infiltration	5
5.2	Discharge to Watercourses	5
5.3	Discharge to Sewers	5
5.4	Proposed Discharge Rates	6
6.0	Site Specific SUDS Proposals	8
6.1	Selection of SUDS Elements	8
6.2	Detailed Network Designs	9
6.3	Attenuation Storage Estimates	9
7.0	Conclusions	11
7.1	Design Criteria Review	11

Appendices

- Appendix A - Thames Water Correspondence
- Appendix B – Preliminary Infiltration Testing
- Appendix C – Existing Site Assessment
- Appendix D – Proposed SUDS Strategy
- Appendix E – Micro Drainage

1.0 Introduction

1.1 Project Background

Curtins Consulting Limited have been appointed by UPP to develop the drainage proposals for the redevelopment of the University of Reading's St Patricks Halls of Residence, part of the Northcourt Group.

This report presents the final development of the proposals through the pre-planning consultation stage. These proposals are based on the planning stage redevelopment proposals, initial third party liaisons and initial site investigations.

The report demonstrates the liaisons undertaken, the established site specific constraints, the consideration of the implementation of Sustainable Drainage Systems, and the detailed design of the proposed storm drainage solutions.

2.0 Pre-Planning Liaisons

2.1 Thames Water Liaisons

A Pre-development enquiry was made to Thames Water in September 2015 and their letter reply is included in Appendix A. In summary they advised:-

- Sewer Records indicate that there are no public sewers within the site boundary, with separate storm and foul sewers present to the immediate east and west of the site.
- Proposed storm water discharges should be infiltrated or discharged to watercourses. If this is not viable then discharge to public storm sewers will need to be to the satisfaction of the local authorities' stipulation.
- Foul sewer capacity for the increased flows from the redevelopment will be subject to a developer funded Impact Assessment by Thames Water.

Subsequently UPP funded an Impact Assessment by Thames Water. The report on this was released by Thames Water in March 2016 which confirmed that adequate capacity for the development existed. In subsequent e-mails (May 2016) a net increase of up to 726 student rooms was agreed by Thames Water. In November 2017 Thames Water confirmed the 2015 Impact Assessment outcome remained valid and that a net increase for the current scheme of 702 student rooms was acceptable. The relevant correspondence is included in Appendix A.

2.2 Local Authority Requirements

Reading Borough Council published in December 2016 their Planning Applications Validation Information Requirement, which includes Sustainable Drainage System Proposals covering the following:

- Detailed designs for the drainage system including (components, levels, volumes of storage)
- Infiltration tests of the existing ground.
- Design calculations to show that:-
 - the runoff from the site post development is no greater than the existing runoff from the site for a 1 in 100 year, 6 hour rainfall event
 - no flooding occurs anywhere on site for a 1 in 30 year rainfall event
 - no flooding occurs in any building (including basement) or any utility plant susceptible to water during a 1 in 100 year rainfall event.
- Connection details to existing watercourse and drainage networks if infiltration methods are not used together with acceptance of these connections from the relevant approving body (EA, LFA, Canal and River trust, Sewage Undertaker).

3.0 Existing Site Assessment

3.1 Existing Site Drainage

Site topographical and sub-surface utility scan survey has been undertaken across the site. Additionally intrusive drainage investigations have been undertaken (manhole cover lifting and network tracing) to determine the basic drainage networks, their outfall destinations and to confirm critical design data. This information is shown on the drawing in Appendix C.

The existing site has been determined to have five discrete storm water networks, each associated with a development phase of the site. Three of these existing drainage networks drain the vast majority of the site area, discharging into the public storm sewer in Northcourt Avenue. The fourth network serves only a small area of that to be redeveloped along the southern boundary, discharging to the public storm sewer network to the south west via a pond.

Additionally a fifth outfall location adjacent to the North West corner of the site has been identified which currently serves an existing building and its hardstandings. As a result of restriction in level at the other outfalls this fifth outfall will need to be utilised to drain the proposed access road along the northern edge of the proposed development.

3.2 Preliminary Soakaway Testing

As part of preliminary ground investigations soakaway testing was carried out in two trial pits. The results of these are included in Appendix B. Whilst the provided results indicate calculated infiltration rates, inspection of the raw data shows that the pits only slightly emptied, at around 0.25m water level fall in three hours. Thus the results correctly analysed will give much lower infiltration rates than stated. As the stated rates are at best marginal for the use of soakaways then it is apparent that correctly analysed results will indicate that soakaways are not viable. Further testing is therefore not proposed.

4.0 Flood Risk Summary

4.1 Sources of Flooding

A formal Flood Risk Assessment for the site has been undertaken as a separate report (BR1508/FRA by Curtins). Its outcomes are summarised below.

Source	Comment	Risk
Rivers and Seas	EA Flood mapping advises Flood Zone 1	Low
Adopted sewers	TW have not advised any storm water capacity issues	Low
Private drainage	All existing private drainage will be replaced by the redevelopment	Low
Groundwater	Site sub-strata has low permeability	Low
Surface water	Site topography diverts flows around perimeter road system	Low
Artificial sources	Nearby ponds are at lower elevation. No canals. No reservoirs.	Low
	Overall Risk	Low

4.2 Development Vulnerability Classification

The proposed redevelopment is residential. From Table 2 in NPPF classifies this as More Vulnerable.

4.3 Overall Flood Risk

The site's vulnerability is appropriate for a Low overall risk from flooding.

4.4 Climate Change

Given the 40 year design life for the proposed buildings a climate change allowance of 20% will be utilised.

5.0 Preliminary SUDS Assessment

5.1 Discharge by Infiltration

The preliminary testing has indicated that the use of soakaways (ie infiltration by concentrating catchments into significantly smaller infiltration areas) is not viable. However, self-draining constructions (ie with no area concentration) would still be viable.

5.2 Discharge to Watercourses

There are no natural surface channels (streams, ditches, etc) within the site to be redeveloped. There are two ponds to the west of the site, however inspection of these indicates that they are historic water attenuation features specifically associated with building developments adjacent. These ponds have been observed to have positive outfalls that downstream discharge into the public sewer network of Thames Water. Only a small percentage of the redevelopment site currently discharges to these ponds. The southern pond receives run-off from the southern access road (to be retained) and some warden houses (along the site's southern boundary, which will be replaced by new buildings). The northern pond receives run-off from the adjacent Reading Student Village (Benyon Hall) site.

5.3 Discharge to Sewers

The four discrete storm networks serving the existing site, and the additional fifth outfall needed to serve the proposed development in the north, have been assessed by hydraulic modelling. The drawing in Appendix C indicates these networks, their catchment areas and the calculated discharges for various return periods. The Micro Drainage outputs are also included in this Appendix, and the discharges summarised below.

Existing Network	Catchment (approx)	Modelled Rate (for return period)		
		1 Year	30 Year	100 Year
Comment	(Hectares)			
Outfall 1	0.22 ha	16.7 l/s	35.4 l/s	36.8 l/s
Outfall 2	0.37 ha	20.3 l/s	24.7 l/s	25.1 l/s
Outfall 3	0.15 ha	8.4 l/s	10.3 l/s	10.3 l/s
Outfall 4	0.24 ha	26.1 l/s	46.0 l/s	49.8 l/s
Outfall 5	0.14ha	12.2 l/s	20.0 l/s	21.6 l/s

Outfalls 1 to 3 represent the discharges to the public sewer in Northcourt Avenue. These existing networks are relatively shallow and rather flat. Subsequently they have been analysed as likely to regularly surcharge and result in onsite flooding in extreme events.

Outfall 4 represents the system discharging to the southern pond. One leg of this network will be reused to take flows from the redeveloped area and thus additional upstream and downstream elements of this network have been modelled to determine the existing rates that will need to be maintained from the leg to be re-used.

Outfall 5 represents the system discharging to the northern pond. One upstream catchment of this will be extended to serve the new development and so the modelling has determined the existing rates that will need to be maintained at this connection point.

5.4 Proposed Discharge Rates

In accordance with SUDS principles and emerging best practice it is proposed to offer at least a 20% betterment against the existing discharge rates from the site. These are shown in the table below.

Existing Network	20% Betterment Rate (for return period)		
	1 Year	30 Year	100 Year
Outfall 1	13.4 l/s	28.5 l/s	29.4 l/s
Outfall 2	16.2 l/s	19.8 l/s	20.1 l/s
Outfall 3	6.7 l/s	8.2 l/s	8.2 l/s
Outfall 4	20.9 l/s	36.8 l/s	39.8 l/s
Outfall 5	9.8 l/s	16.0 l/s	17.3 l/s

Outfalls 1 to 3 discharge to Northcourt Avenue storm sewer at a combined 100 Year rate of 57.7 l/s. Due to layout and levels considerations it is proposed to only re-use two of the existing connections, those at 1 and 2. These will discharge at a combined 57.7 l/s which will be achieved as 35.0 l/s at Outfall 1 and 22.0 l/s at Outfall 2, ie at 95% and 87% of their modelled rates respectively.

Due to consideration of the large increase in catchment area Outfall 5 will be limited to a practical minimum of 5 l/s so as to better mimic greenfield rates for the increased volume of discharge.

Thus the following proposed discharge rates will be used across the four proposed networks. These represent at least 20% betterment in discharge rates across the whole scheme.

Proposed Network	Proposed Discharge Rate (for return period)		
	1 Year	30 Year	100 Year
Outfall A (ex 1)	15.9 l/s	33.8 l/s	35.0 l/s
Outfall B (ex 2)	17.7 l/s	21.5 l/s	22.0 l/s
(Outfall 3)	0 l/s	0 l/s	0 l/s
Outfall C (ex 4)	20.9 l/s	36.8 l/s	39.8 l/s
Outfall D (ex 5)	5.0 l/s	5.0 l/s	5.0 l/s

6.0 Site Specific SUDS Proposals

6.1 Selection of SUDS Elements

Assessment of the viability of the use of the general SUDS components for use on this specific site is undertaken below.

Description	Comment	Use on site?
Permeable Pavements	Generally suitable across the site where levels and geometry allow. Will provide water attenuation and quality benefits.	New internal access roads and paths
Green Roofs	Proposed buildings will be of multi-storey lightweight frame construction. Weight of green roofs will make them cost prohibitive.	No
Rainwater Harvesting	High room density of new buildings plus term time related occupancy will make RWH use inefficient and thus cost prohibitive.	No
Water Butts	Inappropriate for student residential sites.	No
Soakaways	Infiltration capacity of site sub-strata insufficient for concentrated infiltration techniques. Space limitation issues due to retention of existing trees.	No
Infiltration Basins	Infiltration capacity of site sub-strata insufficient for concentrated infiltration techniques. Space limitation issues due to retention of existing trees.	No
French Drains	Will provide water attenuation and quality benefits.	Adjacent to paths, under new access roads
Bioretention Areas	The relatively flat nature of the site and retention of existing trees will limit the suitable locations	Considered, but not included.
Swales	The relatively flat nature of the site and retention of existing trees will limit the suitable locations	Considered, but not included.
Filter Strips	Retention of existing trees will limit the suitable locations	No

Sand Filters	Not suitable due to high cost over relative effectiveness	No
Attenuation Basins	Insufficient site space due to retention of existing trees	No
Storm Water Wetlands	Insufficient site space due to retention of existing trees	No
Detention Basins	Insufficient site space due to retention of existing trees	No
Cellular Storage Systems	Generally storm water drainage will not be sufficiently deep to accommodate.	Limited use.
Oversized Pipes	Generally storm water drainage will not be sufficiently deep to accommodate.	Limited use.

6.2 Detailed Network Designs

The proposed site area has been divided into four sub-catchments and each associated with one of the existing outfalls around the site. Where the local hydraulics of each region have allowed attenuation storage has been provided in the form of voided sub-base construction below proposed hardstandings, linked by carrier/filter drainage pipe connections. The use of cellular storage has been limited to locations where space and/or hydraulics necessitate.

The retention of Pearson's Court will also include the retention of the below ground drainage in its current state. A CCTV survey will be undertaken to confirm the condition of the drainage and remedial work undertaken where required but the hydraulic response of the network cannot be changed. Therefore attenuation will be provided at the junction between the existing and the proposed networks to accommodate the flow from Pearson's Court such that the existing behaviour of the network will not be adversely affected by the design proposals. These drainage proposals are shown on the drawing in Appendix D.

6.3 Attenuation Storage Estimates

Given that there are three existing outfalls to Northcourt Avenue the proposed redevelopment will combine these into two outfalls, at the aggregated rate of the three existing discharge rates. Thus the proposed site will have four outfalls (see below table for details).

Using the proposed discharge rates (see section 5.4) for the 100 year return period plus 20% allowance for climate change the following storage volume estimates have been determined:-

Network	Proposed Discharge Rate (100 year)	Proposed Catchment Area (Ha)	Modelled Storage Volume
Outfall A (Northcourt Avenue)	35.0 l/s	0.51	104m ³
Outfall B (Northcourt Avenue)	22.0 l/s	0.50	131m ³
Outfall C (existing pond SW)	39.8 l/s	0.56	186m ³
Outfall D (existing pond NW)	5 l/s	0.25	69m ³

7.0 Conclusions

7.1 Design Criteria Review

The following list summarises how the appropriate design criteria applicable to the site's storm water drainage system has been achieved within the proposed final design:

Detailed designs for the drainage system including (components, levels, volumes of storage)

The proposed SUDS Strategy is included in Appendix D.

Hydraulic modelling of the proposed drainage networks has been carried out using Micro Drainage software and can be found in Appendix E.

Infiltration tests of the existing ground

Initial testing indicate that the site has limited infiltration capacity. The use of soakaway is thus not viable.

The runoff from the site post development is no greater than the existing runoff from the site for a 1 in 100 year, 6 hour rainfall event

The redevelopment proposals for the site inherently increased the site's storm water catchment area above that of the existing. The lack of infiltration capacity of the site's sub-strata will thus result in an increase in the volume of run-off from the site across all rainfall events. However, flow control and attenuation storage volumes will be implemented to ensure that the existing discharge rates (per return period, and including the 1 in 100 year, 6 hour event) are not exceeded, with the increased volume element of each network discharged at rates no greater than the existing run-off rates, through the use of flow controls.

No flooding occurs anywhere on site for a 1 in 30 year rainfall event

For the new development this will be achieved through the provision of sufficient attenuation storage across the site. Pearson's Court is retained within the development proposals and therefore whilst measures will be put in place to not cause a detriment to the hydraulic behaviour of the network as this is a retained element there may be a limitation on achieving this element.

No flooding occurs in any building (including basement) or any utility plant susceptible to water during a 1 in 100 year rainfall event.

For the new development this will be achieved through the provision of sufficient attenuation storage across the site. Pearson's Court is retained within the development proposals and therefore whilst measures will be put in place to not cause a detriment to the hydraulic behaviour of the network as this is a retained element there may be a limitation on achieving this element.

Connection details to existing watercourse and drainage networks if infiltration methods are not used together with acceptance of these connections from the relevant approving body (EA, LFA, Canal and River trust, Sewage undertaker)

This will be achieved through liaison with Thames Water (which has already commenced) and the submission of S106 Applications. However, Thames Water have advised that they will be led by the requirements of the LLFA as determined during the planning application stage for storm water discharge criteria.

Appendix

Appendix A - Thames Water Correspondence

Curtins Consulting		
INITIAL	ATTN	INFO
PM	SLW	PM
		RP
		TA
20 SEP 2015		
JOB No.		SECTION

Mr S Williamson

Curtins Consulting
Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ

Developer Services

Your ref
Our ref 50077382 /DS4002549
Name Siva Sivarajan
Phone 0800 009 3921
E-Mail developer_services@thameswater.co.uk

25 September 2015

Re: Reading University 20 Northcourt Avenue Reading RG2 7HB

Dear Mr Williamson

I write in relation to the above site and further to your Pre-Development Enquiry application and supporting documentation.

Further to receiving your application we have consulted with our Asset Planners for the area and they have responded with their comments regarding the capacity of the public foul sewer network adjacent to the proposed site to accommodate foul flows from the development as detailed in your application.

They have concerns regarding the sewerage network capacity in this area and its ability to support the foul discharge demand anticipated from this development. It will therefore be necessary for us to undertake a detailed investigation into the impact of the development by means **of a developer funded impact study**. This will determine whether capacity does exist in the sewerage network or what upgrades to the existing foul sewer network are required before the site can be connected to it.

Surface water discharges should ideally go to soakaways / infiltration basins / watercourses (if any present in area). If it can be illustrated that none of the above are feasible then surface water discharges should be stored on site and attenuated to the public sewer, to the satisfaction of the local authority stipulation. To this end you have to liaise with the local authority and discuss their criteria regarding surface water discharges in that area.

At no account should the surface water flows be discharged to the TW foul sewer network.

If you wish to proceed with an impact study to determine available capacity & what upgrades to the existing network are required before the site can be connected to it., firstly we would require a cheque made payable to Thames Water Utilities Ltd for £400 + VAT which our Modelling Group need in order **to scope what is required as part of the impact study**. This will enable them to create a **quote for the impact study itself which I will then forward to you**.

Thames Water Utilities Ltd,
Clearwater Court, Vastern
Road, Reading RG1 8BD
T 0118 3 738744
f www.thames-water.com

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading, Berks. RG1 8BD

Send the cheque with a covering letter quoting the reference numbers given on this letter.

Please note that the views expressed by Thames Water in this letter are in response to this pre development enquiry at this time and do not represent our final views on any future planning applications made in relation to this site.

We reserve the right to change our position in relation to any such planning applications.

If you have any further queries then please do not hesitate to contact me.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "Siva Sivaraajan", with a long, sweeping horizontal line extending to the right.

Siva Sivaraajan
Senior Adoptions Engineer (TW)

Developer Services-Adoptions Team
Thames Water Utilities Ltd
Clearwater Court
Vastern Road
Reading, RG1 8DB

Stuart Williamson

From: Siva Sivarajan <Siva.Sivarajan@thameswater.co.uk>
Sent: 09 November 2017 15:14
To: Stuart Williamson
Cc: Toby Nicks; Ross Pomery
Subject: RE: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Follow Up Flag: Follow up
Flag Status: Completed

Categories: Needs to be reviewed

Dear Sir,

I refer to the email chain below; I gather that the number of rooms now stands at 702 (which is less than 726 which was accepted before); I confirm that Thames water will accept 702 rooms ;

Regds,

Siva Sivarajan

Developer Services- Senior Adoptions Engineer

Office:0203 577 7752

siva.sivarajan@thameswater.co.uk

Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB



From: Stuart Williamson [mailto:Stuart.Williamson@curtins.com]
Sent: 08 November 2017 17:15
To: Siva Sivarajan
Cc: Toby Nicks; Ross Pomery
Subject: RE: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Hello Siva,

Further to our e-mail chain below from last year, due to a Listed Building issue on the site there has been quite a delay in the progress of this project. A solution now has been determined and a new scheme proposal will shortly go for planning application.

We thus need to update with yourselves regarding foul water capacity (as previously discussed below). In summary TW have required my client to fund an Impact Assessment which was undertaken by TW. As per your e-mail below a previous net increase in student rooms of 726 was advised as acceptable. The new scheme however is slightly less being only 702.

Can you please confirm that 702 rooms is acceptable?

Regards

Stuart Williamson Principal Engineer

Curtins

T. 0117 302 7560 | stuart.williamson@curtins.com

From: Siva Sivarajan [<mailto:Siva.Sivarajan@thameswater.co.uk>]

Sent: 31 May 2016 10:00

To: Stuart Williamson <Stuart.Williamson@curtins.com>

Subject: RE: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Dear Sir,

The very small increase you have indicated below will not alter the conclusion of the report already submitted to you from Thameswater Developer Services. This is to be expected as the increase is very insignificant in relation to what was agreed before.

Regds,

Siva Sivarajan
Sewer Adoptions Engineer
Strategic Partnering

Planning for and enabling growth

Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB

Siva.sivarajan@thameswater.co.uk

0800 009 3921



From: Stuart Williamson [<mailto:Stuart.Williamson@curtins.com>]

Sent: 27 May 2016 16:48

To: Siva Sivarajan

Subject: RE: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Hello Siva,

Just to inform you on progress with this scheme.

There has been a delay in submitting for planning due to a local residence action group filing for listed building status on some of the buildings to be demolished on the site. This has recently been turned down so the scheme will shortly be submitted for planning. During the delay period some refinement of the building internal layouts has occurred which has resulted in a small increase in the number of proposed units. The net increase on the site now stands at 726 (ie 6 more than previously advised – see below). My client has requested that I seek your confirmation that this small increase will not impact the outcome of the Impact Study.

Regards

Stuart Williamson Principal Engineer

Curtins

T. 0117 302 7560 | stuart.williamson@curtins.com

From: Siva Sivarajan [<mailto:Siva.Sivarajan@thameswater.co.uk>]

Sent: 07 March 2016 11:11

To: Stuart Williamson <Stuart.Williamson@curtins.com>

Subject: RE: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Stuart,

Hope you are well;

I have reviewed the contents of your below email re: the minor changes to your project; the increase is approximately 10%; I have reviewed this and can confirm that the outcome of the Impact Study will not alter. ie the Conclusion that was in the report that I sent remains the same;

Regds,

Siva Sivarajan

Sewer Adoptions Engineer

Strategic Partnering

Planning for and enabling growth

Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB

Siva.sivarajan@thameswater.co.uk

0800 009 3921



From: Stuart Williamson [<mailto:Stuart.Williamson@curtins.com>]

Sent: 04 March 2016 16:09

To: Siva Sivarajan

Subject: RE: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Hello Siva,

Thank you for forwarding the final report, the findings of which were good news for my client.

Over the past couple of months the St Patricks project has been caught up in some planning iterations that have significantly altered the massing of the buildings across the site. The plan layout of the site remains effectively the same but building heights have changed. A side effect of this is that an increase in the total

number of rooms has been possible. Also, some existing buildings originally anticipated to be replaced will now not be. The combined effect of these is that the net increase in student rooms from the redevelopment has increased from 650 to 720. Please can you advise if this alters the outcome of your Impact Study?

Regards

Stuart Williamson Principal Engineer

Curtins

T. 0117 302 7560 | stuart.williamson@curtins.com

From: Siva Sivarajan [<mailto:Siva.Sivarajan@thameswater.co.uk>]

Sent: 01 March 2016 09:35

To: Stuart Williamson <Stuart.Williamson@curtins.com>

Subject: FW: X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report

Dear Mr Williamson,

I have attached the Impact Study report produced by our Asset Planning/ Modelling team herewith ; You will be happy to know that they have concluded that there is no upgrade work required,

Any queries please come back to me,

Regds,

Siva Sivarajan
Sewer Adoptions Engineer
Strategic Partnering

Planning for and enabling growth
Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB
Siva.sivarajan@thameswater.co.uk
0800 009 3921



Hi Siva,

X4503-1097-SMG1959-Reading University, 20 Northcourt Avenue, Reading – Final external report



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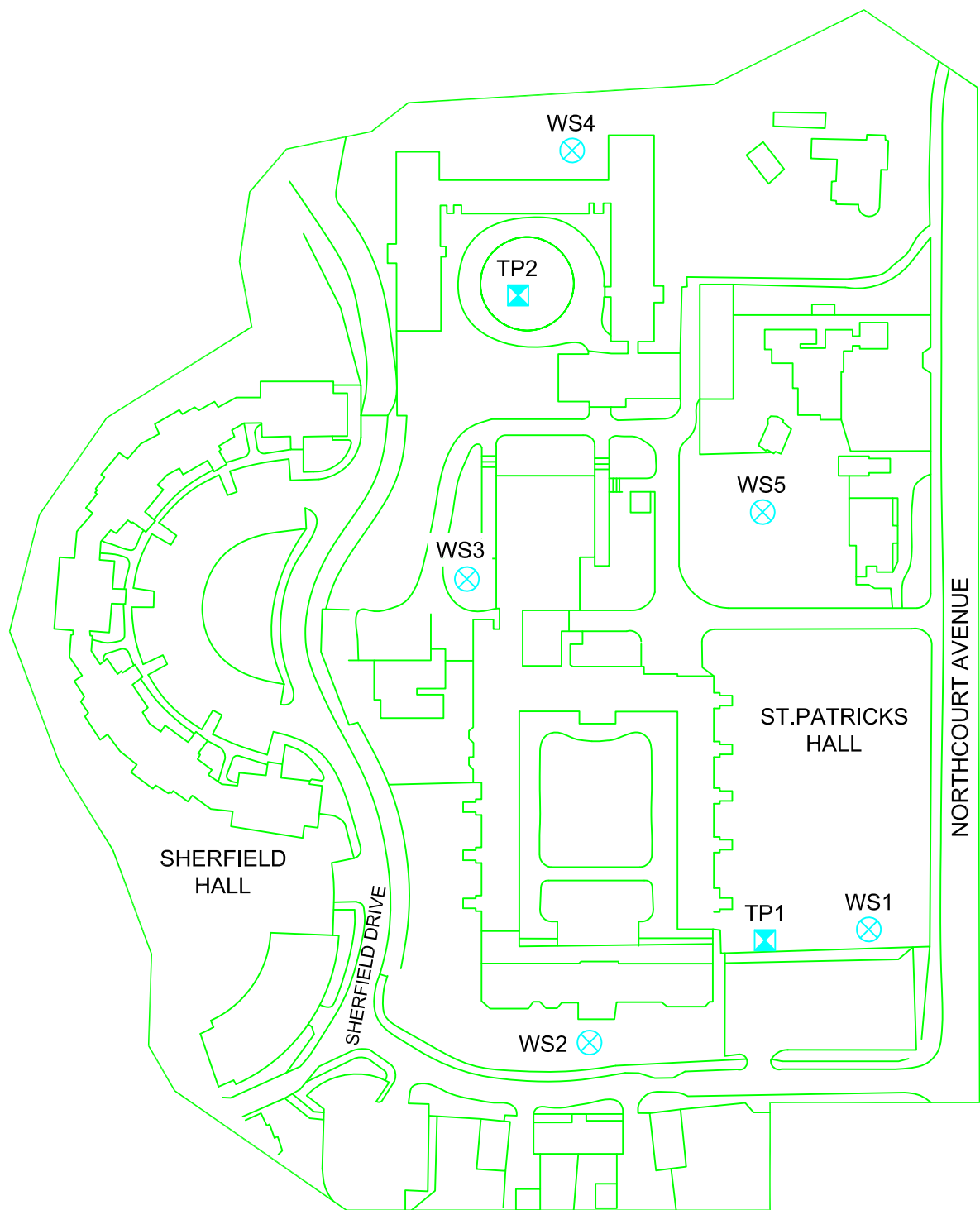
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Appendix

Appendix B – Preliminary Infiltration Testing



Scale : N.T.S.

Drawn By : P.L.E.

Job No: 52393

Fig: A1.1

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007
BRE Digest 365, Figure 2, Page 5

Client:	Curtins				
Site:	St Patricks Hall, Reading University, Northcourt Avenue, RG2 7HB				
Job No:	52393	Test No:	TP1		
Date	04/09/2015				
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (mm)		Size of Soakaway	Length (m) =	0.96
0	370			Width (m) =	0.47
0.5	374			Depth (m) =	1.85
1	376				
1.5	380	Depth to water at start of test = 370mm			
2	389	Depth to water at end of test = 562mm			
2.5	390	Depth to water at 75% level = 418mm			
3	390	Depth to water at 50% level = 466mm			
5	391	Depth to water at 25% level = 514mm			
10	409				
20	420	Base area of pit (m ²) = 0.451			
30	446	Eff area of loss 75 - 25% (m ²) = 0.726			
45	458	Volume outflow 75 - 25% (m ³) = 0.043			
60	467				
90	488	From the graph: tp 75 (min) = 18 tp 25 (min) = 140			
120	504				
180	536				
240	562				
		Soil infiltration rate, f, (m/s) =		8.15E-06	normal test
		Tested by:	FA	Date:	04/09/2015
		Checked by:	EM	Date:	10/09/2015

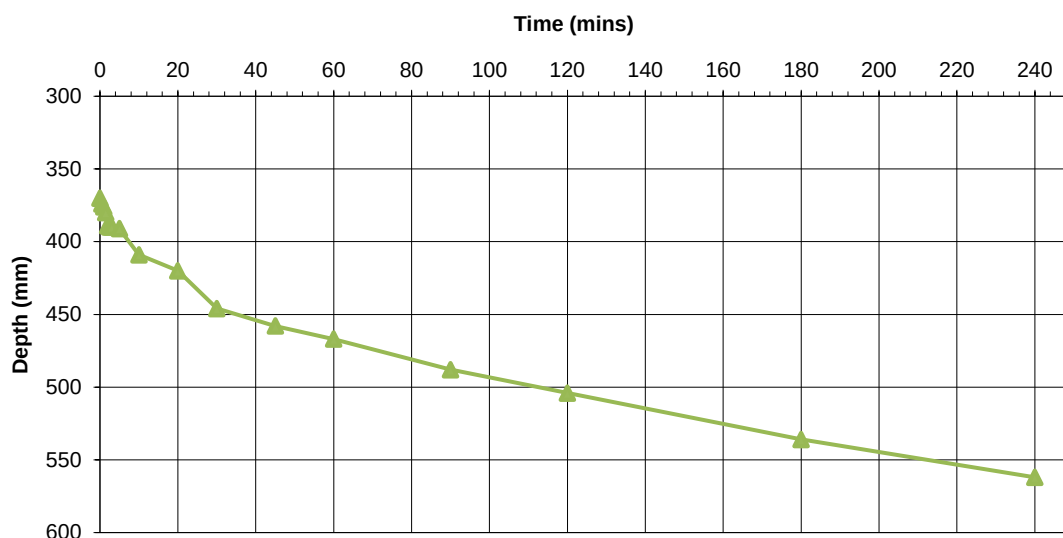


Figure A2.8

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007
BRE Digest 365, Figure 2, Page 5

Client:	Curtins				
Site:	St Patricks Hall, Reading University, Northcourt Avenue, RG2 7HB				
Job No:	52393	Test No:	TP2		
Date	04.09.2015				
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (mm)		Size of Soakaway	Length (m) =	1.78
0	432			Width (m) =	0.53
0.5	436			Depth (m) =	1.78
1	439				
1.5	442	Depth to water at start of test = 432mm			
2	446	Depth to water at end of test = 611mm			
2.5	447	Depth to water at 75% level = 477mm			
3	448	Depth to water at 50% level = 522mm			
5	450	Depth to water at 25% level = 566mm			
10	462				
20	475	Base area of pit (m ²) = 0.943			
30	487	Eff area of loss 75 - 25% (m ²) = 1.357			
45	506	Volume outflow 75 - 25% (m ³) = 0.084			
60	525				
90	552				
120	576				
180	611				
		Soil infiltration rate, f, (m/s) =		1.26E-05	normal test
		Tested by:	FA	Date:	04/09/2015
		Checked by:	EM	Date:	10/09/2015

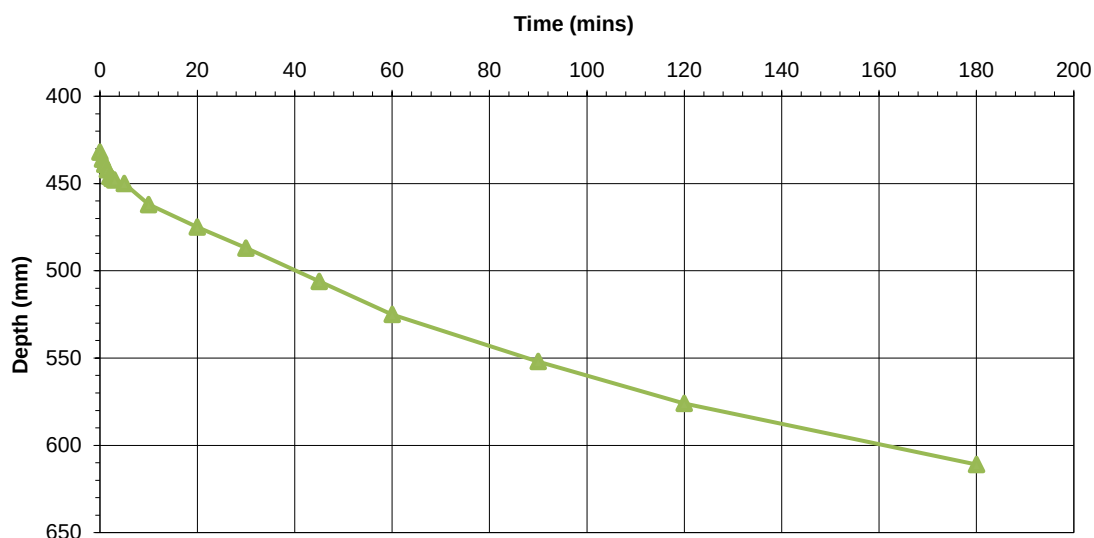


Figure A2.9