Flood Risk Assesment – Land at Spring Lane

Radford Semele,
Warwickshire,
CV31 1XD

INTRODUCTION

The project comprises the proposed development of a 3.51 ha of existing agricultural land, to provide up to 65 residential units.

This assessment is based on the assumption that the site will be submitted for outline planning permission.

INDEX

THE DEVELOPMENT

Site Location & Description

The site is located to the west of Spring Lane approximately 400 m southwest of Radford Semele Village centre, Warwickshire. The National Grid Reference for the site is SP 342 642. The site boundaries are formed by residential properties to the north of the site and a recreation ground to the east across Spring Lane. To the southeast there are more residential properties and to the south and west the site is surrounded by agricultural land. The River Learn is approximately 868 m to the north of the site.

Site Levels

A topographical survey has been carried out. The area slopes gently down to the southwest from around 71m AOD to 68m AOD over the length of the site, the lowest point being in the south western corner of the site. The topography is relatively uniform, with just the southwest corner falling away more steeply. Beyond the hedge that marks the western boundary of the site, land levels continue to fall gently and then more steeply towards the Whitnash Brook, which flows in its valley approximately 0.5km from the site at approximately 53.0m AOD

It is proposed that post development site levels will remain broadly the same as existing.

Site Layout

The proposed site layout is appended.

FLOOD RISK

National Planning Policy Framework

The National Planning Policy Framework Technical Guidance sets out the principles for assessing the suitability of sites for development, in relation to flood risk, as part of the planning process. A risk-based approach is adopted through a strategic approach with regard to site selection and a methodology for managing flood "pathways" and reducing the adverse consequences of flooding.

Initially a "Sequential Test" is applied to the allocation of land suitable for development. Following this, an "Exception Test" is applied where it must be demonstrated that the development provides wider sustainability benefits to the community outweighing flood risk.

Sequential Test

Tables 1 and 2 of The National Planning Policy Framework Technical Guidance provide details of vulnerability classifications for particular types of development in relation to flood risk zones. Housing is classed as "More Vulnerable" in Table 2.

Table 3 indicates that "More Vulnerable" development is compatible with Flood Zones 1 and 2, compatible with Zone 3a if the Exception Test can be satisfied and incompatible with Zone 3b (functional floodplain).

It is therefore to be concluded that the proposed development is appropriate to this site and that application of the Sequential Test has been adequately demonstrated.

Climate Change

An issue emphasised in The National Planning Policy Framework Technical Guidance is the requirement to take account of potential climate change effects. The National Planning Policy Framework Technical Guidance recommends that a 30% increase in peak rainfall intensity is taken into account for design horizons up to and including 2055-2085.

Environment Agency Flood Map

The Environment Agency (EA) flood zone map shows all of the proposed developed area of the site to lie within Zone 1 (Low Risk).

Strategic Flood Risk Assessment

A Level 1 Strategic Flood Risk Assessment (SFRA) has been carried out by Mouchel on behalf of Warwick District Council in April 2013. This shows the site to lie outside any flood zone with no history of recorded flooding.

Potential Sources of Flooding

The EA and SFRA maps are intended for general guidance on flood risk and it is also necessary to consider other local factors.

Overland Flow

The site is bounded by Spring Lane to the East and by existing residential development to the North in Slade Meadow & Chapman Close. The likelihood of any significant overland flow is slight.

To the South and west is existing open arable land that slopes away from the proposed development site, falling gently at first and then more steeply towards the Whitnash Brook Valley.

Sewerage

The site may be at risk of flooding resulting from surcharging of the local storm drainage system to the North of the site in Spring Lane. However, these sewers are owned and maintained by Severn Trent Water and there are no abnormal flood risks associated with these systems.

There is also public storm sewer system on the western boundary of the site. Should this sytem ever flood, overland flows will be away from the proposed development site due to the natural topography.

A focussed internet search was undertaken to identify any significant flooding events within the vicinity of the site and there has been no incidence of any issues since these sewers were constructed.

Residual Flood Risk

The site is not considered to be at significant risk from flooding.

The principal flood risk for consideration is to others, which should not be increased (reduced if possible) as a result of developing the site. Hence the disposal of surface water is also a consideration of this FRA. This is discussed in more detail in the Drainage Strategy section of this report.

Flood Mitigation Measures

Buildings

Levels across the site will be laid out to provide an opportunity for any flood water to flow away from buildings.

Access and Egress

Provided that site roads, parking and walkways are not constructed significantly below current site levels, with a consequential risk of localised flooding, it is anticipated that there will be no difficulty in maintaining safe access and egress to and from the buildings, or the site in general, even during extreme weather conditions.

DRAINAGE STRATEGY

Current National Planning Policy guidance is for the disposal of surface water to be dealt with in a sustainable way and to be such that volumes and peak flows should aim to be reduced from the rates prior to development.

Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H 2002. Disposal via SUDS methods should be considered as the first option. Disposal to the public sewer should be considered only when SUDS methods and disposal to the watercourse are shown to be unsuitable.

GROUND CONDITIONS

Geology

A ground investigation desk study appraisal was undertaken by Crossfield Consulting Limited in January 2014.

The 1:50,000 scale solid and drift geology map of Warwick (Sheet 184) and associated digital data, published by the British Geological Survey, indicates the site to be underlain by superficial deposits of the Wolston Sand and Gravel (Glacial Deposits).
The underlying solid geology comprises predominantly mudstones of the Mercia Mudstone Group.

Potential for Soakaway drainage

Crossfield Consulting Limited report soakaway drainage might be feasible, provided that the Wolston Sand and Gravel strata are of adequate permeability and neither clay strata nor groundwater occur at shallow depths. Alternatives to soakaways should however be considered in case clays or shallow groundwater are present. Percolation tests could be carried out to confirm the suitability prior to a full planning assessment.

Severn Trent Water Consultation

A sewer record map has been received from Severn Trent Water. The map shows there is a 150 mm dia. public storm sewer running along Spring Lane which then passes along Hamilton Road and down the Western Boundary of the site (increasing in size to 375mm diameter) before discharging to a small watercourse. This watercourse ultimately discharges into the Whitnash Brook.

The nearest public foul water sewers are in Hamilton Road & Spring Lane and both are of 150mm dia.

It is assumed that there are also formerly private sewers serving the existing dwellings in Slade Meadow & Chapman Close which are now public following the PDaS sewer transfers of October 2011.

The most suitable location for a new foul sewer discharge point for the site is one of the existing adopted foul sewer manholes in Hamilton Road.

A Section 106 connection licence would be required from Severn Trent for the proposed new foul connection, and Severn Trent have confirmed that there is capacity within this sewer to accept the foul flows generated by the proposed development.

The Severn Trent consultation also indicates that, should soakways not prove to be viable, a surface water connection to the 375mm storm sewer on the western boundary of the site would be acceptable provided flows are attenuated to the greenfield run off rate.

Existing surface run off from the site generally appears to drain into the watercourse to the South of the site, which the 375mm sewer currently discharges into and therefore a discharge into this sewer would be desirable.

Sustainable Drainage Systems (SUDS)

It is recognised that the use of sustainable drainage systems, or SUDS, is desirable on new development sites.

SUDS methods include water infiltration systems such as soakaways, basins and filter strips, together with swales, pervious pavements, detention basins, ponds and other wetland solutions. The various methods are considered in detail in The SUDS Manual (CIRIA C697).

The recommendation of Crossfield Consulting is that soakaways are possibly a viable solution for this site, however other SUDS methods will be considered in case this is not possible. In addition highways to be adopted by the local authority under a Section 38 Agreement must drain into a public sewer system.

Proposals for Surface Water Disposal

It is proposed that the developed site will drain into to the existing public sewer within the site and ultimately in the watercourse to the south as per the existing site. The discharge rate to the sewer will be based on the existing greenfield runoff from the site.
The Institute of Hydrology Report 124 (IoH124) Flood Estimation for Small Catchments (1994) has been used to determine peak greenfield runoff rates. The flow rate was calculated by using the 'Source Control' suite within the computer software package WinDes (Microdrainage) and catchment specific rainfall parameters derived from the Flood Estimation Handbook.

The existing site area is 3.5 hectares of which 100% is currently permeable.
The proposed site has an impermeable area of approximately 1.24 hectares.
This a worst case scenario, with the potential for the area needing to be drained able to be reduced should soakaways prove viable.

Based on the IoH124 calculations, the proposed discharge rate for the impermeable area of the site post development is as shown in below for the respective rainfall return period:

Q 1 YEAR = 4 l/s

(The EN/DEFRA document "Preliminary Rainfall Runoff Management for Developments" (2012) recommends that discharges from new developments cannot be set lower than 5 ls to protect against the risk of blockage and so this will be used in all calculations.)

Q 30 YEARS = 9.4 l/s

Q 100 YEARS = 12.3 l/s

If the discharge from the proposed development is limited to the existing greenfield runoff of 12.3 l/s or less, for the critical 1 in 100 year + 30% climate change event, this results in a storage requirement of just over 579 m^3, taking the infiltration as 0.0m/hr (worst case, Soakaways not viable) .

This 579m^3 of storage can be provided by a number of swales in the approximate positions indicated on the proposed drainage drawing in the appendix, along with oversized drainage pipes located under the swales.

This storage requirement has been calculated under various storm conditions to ensure no above ground flooding occurs using the Micro Drainage Win Des Source Control Module. Details of the results are contained within the appendix.

It is proposed that the pipe network is adopted by Severn Trent Water under a Section 104 agreement and will therefore by subject to design under the current Sewers for Adoption Criteria.

Proposals for Foul Disposal

As mentioned previously, a Section 106 connection licence would be obtained from Severn Trent for the proposed new foul connection in Hamilton Road.

As for the surface water drainage system, it is proposed that Severn Trent Water adopt the foul network under a Section 104 agreement.

CONCLUSIONS

1. **The areas proposed for development within the site boundary are not at risk of flooding.**

2. **Soakaways may viable on this site and any infiltration that can be shown will result in a reduction in the volume of storage to be provided by the swale features. However there is suffieceint scope on site to meet the worst case storage requirements.**

3. **Surface water disposal will be to the existing Severn Trent Sewer along the western boundary of the site.**

4. **The permitted discharge rate to this sewer will be limited to that of the existing discharge run off for the impermeable area of the site.**

5. **Containment of the 1 in 100 year plus 30% allowance for climate change event can be incorporated into the drainage design at the time of a full planning submission.**

6. **The level of risk and safeguards available are considered appropriate to this class of development.**

7. **Foul Water disposal will be via the existing adopted Severn Trent manhole at the in Hamilton Road.**

Darren Avern BEng (Hons)

Senior Operations Engineer

A C Lloyd Group Of Companies

March 2014

APPENDICES

- **Appendix A - Location plan**
- **Appendix B - Site Topographical Survey**
- **Appendix C - Flood maps**
  Extract from Environment Agency flood zone map
- **Appendix D – Severn Trent Consultation Letter**
- **Appendix E - Proposed Site layout Plan**
- **Appendix F – Outline Site Storm Drainage Layout**
- **Appendix G – Micro Drainage Win Des Printouts**

APPENDIX A

The scaling of this drawing cannot be assured

Revision	Date	Initial

Legend

Site Boundary - 3.30Ha

Radford Semele

Dismantled Railway
Track
Sinks
Issues
Track
Radford Hall
PW
Vic
CHURCH END
CHURCH LANE
68m
Play Area
KINGSHURST
63m
PH
SOUTHAM ROAD
OFF CHURCH LANE
THE GREENWOLDES
CHANCE FIELDS
HALLFIELDS
School
Track
SCHOOL LANE
73m
THE GARDENS
EMELE CLOSE
86m
HAMILTON ROAD
HATHERELL ROAD
OVERTON CLOSE
SLADE MEADOW
SPRING LANE
Recreation Ground
77m
LAYCOCK ROAD
LEWIS ROAD
PO
Track
LYTHALL CLOSE
Path
GODFREY CLOSE
THORNLEY CLOSE
ST NICHOLAS ROAD
PW
Path
WILLIAMS RD
VALLEY ROAD
66m
THE VALLEY
Valley Farm
Path
Leigh Foss
Tinker's Close
68m
Track
Track
Hill Farm
Track
Drain
Path
Barn Farm
Path
MARLBOROUGH DRIVE
DANESBURY CRES
STANTON
OTTERS REST
WAY

N

20 50 100 200 400m
0

Project
LAND AT RADFORD SEMELE

Drawing Title
SITE LOCATION PLAN

Date	Scale	Drawn by
10.07.08	1:5000@A3	M.D./TPS
Project No	**Drawing No**	**Revision**
16974	01	B

C:\Documents And Settings\tom.smith\My Documents\16974 -01B- Site Location Plan.dwg - A3

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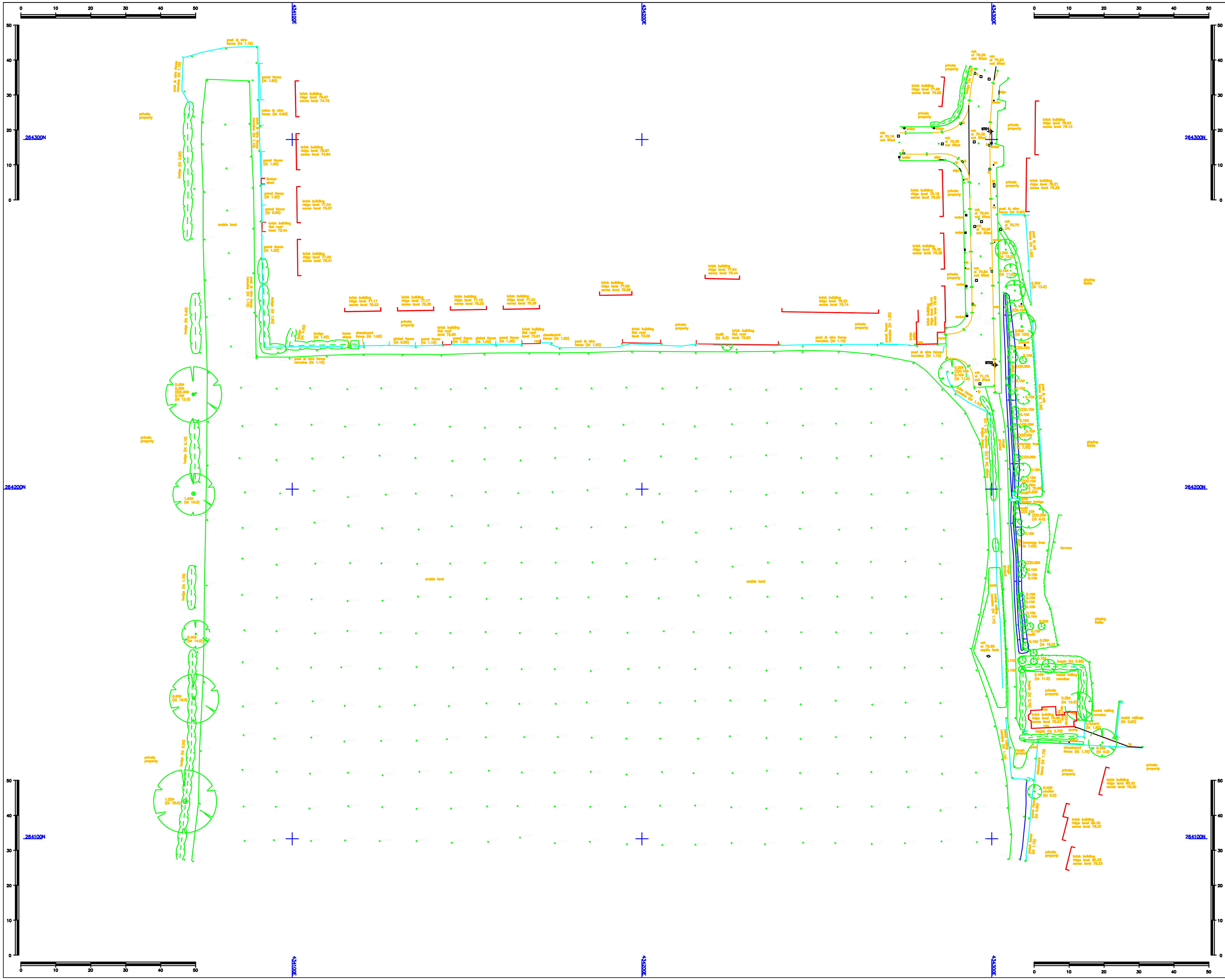
APPENDIX B



NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

GRID COORDINATES ARE ORDNANCE SURVEY NATIONAL GRID DERIVED FROM GPS TRANSFORMATION. GPS COORDINATES AND LEVELS SET AT ST02 (NO SCALE FACTOR APPLIED)

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:500

SERVICE COVERS INDICATED WHERE VISIBLE. PIPE INVERTS / DETAILS SURVEYED FROM SURFACE INSPECTION ONLY. GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

SERVICE COVERS LOCATED UNDER PARKED VEHICLES/MOBILE STRUCTURES MAYBE OMITTED.

BURIED SERVICE COVERS WILL NOT BE INDICATED.

THIS DRAWING HAS BEEN PLOTTED IN 3D AND THEREFORE PRESENTATION HAS BEEN COMPROMISED.

TOPOGRAPHICAL SURVEY KEY :-
(WHERE APPLICABLE)

mh - manhole
ic - inspection cover
cl - cover level
il - invert level
dp - depth
toc - top of cap
tot - top of tank
top - top of pipe
UTL - unable to lift
wfc - water filled chamber
mkr - marker
fh - fire hydrant
g - gully
sv - stop valve
sc - stop cock
catv - cable television
wm - water meter
bt - telecom
s - storm
f - foul
re - rodding eye
er - earthing rod
elec - electric
fs - fire switch
g/run - gully run
d/chan - drainage channel
wp - waste pipe
svp - soil vent pipe
wo - wash out

vp - vent pipe
rs - road sign
lp - lamp post
tp - telecom pole
ep - electric pole
ts - traffic signal light
sl - spot light
c/box - control box
boll - bollard
ill - illuminated
cr - cable riser
ht - height
u/s - underside
f/bed - flower bed
c/b fence - closeboard fence
sec fence - security fence
ret wall - retaining wall
p & r fence - post & rail fence
s/birch - silver birch
h/chestnut - horse chestnut
h/thorn - hawthorn
con - conifer
sap - sapling
TBM - temporary bench mark
OSBM - ordnance survey bench mark
fl - floor level
tl - threshold level
sp - soil pipe
rwp - rain water pipe
av - air valve

SURVEY CONTROL :-

STATION	EASTINGS	NORTHINGS	LEVEL	STATION	EASTINGS	NORTHINGS	LEVEL
ST01	434299.592	264302.309	70.398				
ST02	434300.900	264235.477	71.183				

BUILDING SURVEY KEY :-
(WHERE APPLICABLE)

TBM - temporary bench mark
ffl - finished floor level
tl - threshold level
fh - floor to head height
sh - sill to head height
fs - floor to sill height
u/s - underside height
ah - arch head height
sp - arch springing point height
(1.23) - room height
rad - radiator
htr - heater
t/rail - heated towel rail
hwt - hot water tank
wc - toilet
wb - wash basin
shr - shower
bdt - bidet
ur - urinal
hd - hand dryer
wp - waste pipe
vp - vent pipe
rwp - rain water pipe
wf - water fountain
g - gully
rl - roof light
sus.c - suspended ceiling

elec - electricity
e/mtr - electricity meter
g/mtr - gas meter
fhr - fire hose reel
bt - telecommunications point
ss - single electricity socket
ds - double electricity socket
ls - light switch
cp - cooker point
db - fuse box
lf - light fitting
fl - fluorescent light fitting
ber - intruder alarm sensor
fsr - fire alarm sensor
ab - alarm box
wm - water meter
wtr - water
ic - inspection chamber
mh - manhole cover
cl - cover level
il - invert level
ø - pipe diameter
f/b - floorboard
conc - concrete
bk - brick
q/tiles - quarry tiles
f/p - fire place

UTILITY SURVEY KEY :-
(WHERE APPLICABLE)

ELECTRIC CABLE
WATER PIPE
FOUL SEWER
STORM SEWER
COMBINED SEWER
DUCTS
CABLE TELEVISION
DATA CABLE
TELECOM CABLE
GAS PIPE
FUEL PIPE
UNIDENTIFIED SERVICE
OTHER

NORTH

ABBREVIATIONS :-

mh - manhole cover
ic - inspection chamber
cl - cover level
il - invert level
bd - back drop
eot - end of trace
utl - unable to lift
uts - unable to survey
a/r - assumed route
nl/ts - not located trench scar
tfr - taken from records
utt - unable to trace
utr - unable to rod

DISCLAIMER :-

Electromagnetic techniques have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm service identification, positions and particularly depths, where these are critical. The completeness of the underground services information cannot be guaranteed.

This method of survey does not differentiate between live and dead services, and as such all services should be treated as live. This drawing may not include the location of all public services that may cross the site, therefore the relevant service drawings should be obtained from the appropriate utility company and used in conjunction with this drawing.

Private service pipes and cables in highways are not shown, but there presence should be anticipated.

Additional below ground structures or obstructions not shown on this drawing may be present. Reference should be made to historical plans and as-built drawings. Excavations in the vicinity of services should be carried out with due diligence ref: HSG47 document avoiding dangers from underground services

Pipe diameters noted in mm

MIDLAND SURVEY LTD

HEAD OFFICE
Cromwell House, Westfield Road, Southam, Warwickshire, CV47 0JH.
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Client A C LLOYD (BUILDERS) LIMITED

Project RADFORD SEMELE

Title TOPOGRAPHICAL SURVEY

Date FEBRUARY 2014

Scale 1:500@A1

Dwg No 19276/1

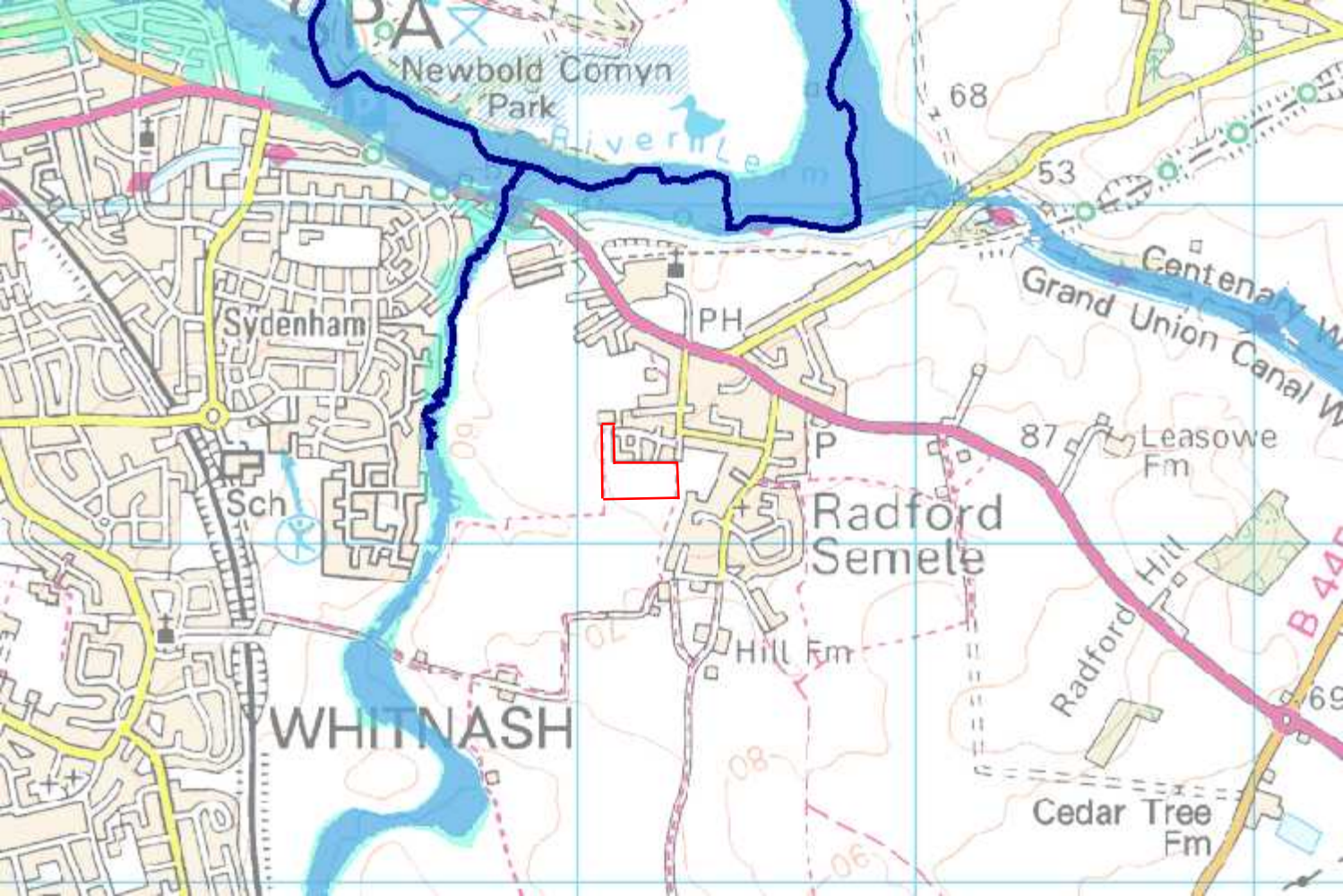
Surveyor S.J.M

Checked P.G

Revisions

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

APPENDIX C


Newbold Comyn Park
River Leam
68
53
Centenary W
Grand Union Canal W
Sydenham
PH
P
87
Leasowe Fm
Sch
Radford Semele
Hill Fm
Radford Hill
B445
69
WHITNASH
Cedar Tree Fm

APPENDIX D

A C Lloyd Homes Ltd.
Nicholls House
Tachbrook Park
Warwick
CV34 6TT

F.A.O: Mr Darren Avern

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

Tel: 0116 234 3834
Fax: 0116 234 3035

www.stwater.co.uk
net.dev.east@severntrent.co.uk

Contact: Keith Baker
Direct line: 0116 234 3786
Mobile no: 07889

Your ref:
Our ref: WT29595 / 8135056

13th March 2014

Dear Sirs,

Land off Spring Lane, Radford Semele, Warwickshire
Proposed 63 dwellings (434274, 264219)

I refer to your recent Development Enquiry Request in respect of the above site. Please find a copy of the sewer records and 'Additional Guidance Notes' enclosed for your information.

Sewer Crossing

A short length of 375mm dia surface water sewers crosses the site in the north west. This sewer requires a 10m easement strip.

Foul Water Drainage

A gravity foul discharge from 63 properties is under 1 l/sec and can be accommodated in the public foul sewers in Hamilton Road and Spring Lane.

The public sewers in Spring Lane are fairly shallow being between approximately 1.3m and 1.6m deep. Some of the sewers in Hamilton Road are slightly deeper at around 1.7m – 3.0m deep. A gravity discharge should be feasible to drain the whole site, as most of it is on the 70m contour or slightly higher.

Any pumped discharge would require sewer modelling due to some sewer flooding downstream, which would not be exacerbated by a gravity flow, but is likely to be by pumped flows.

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical and no watercourse is available as an alternative, the use of sewerage should be considered. In addition, other sustainable drainage methods should also be explored before a discharge to the public sewerage system is considered.

If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or submitting a statement from the SI consultant (extract or a supplementary letter).

Subject to the above, a discharge into the 375mm dia public surface water sewer would be limited to a green field run-off rate of 5 l/sec/ha.

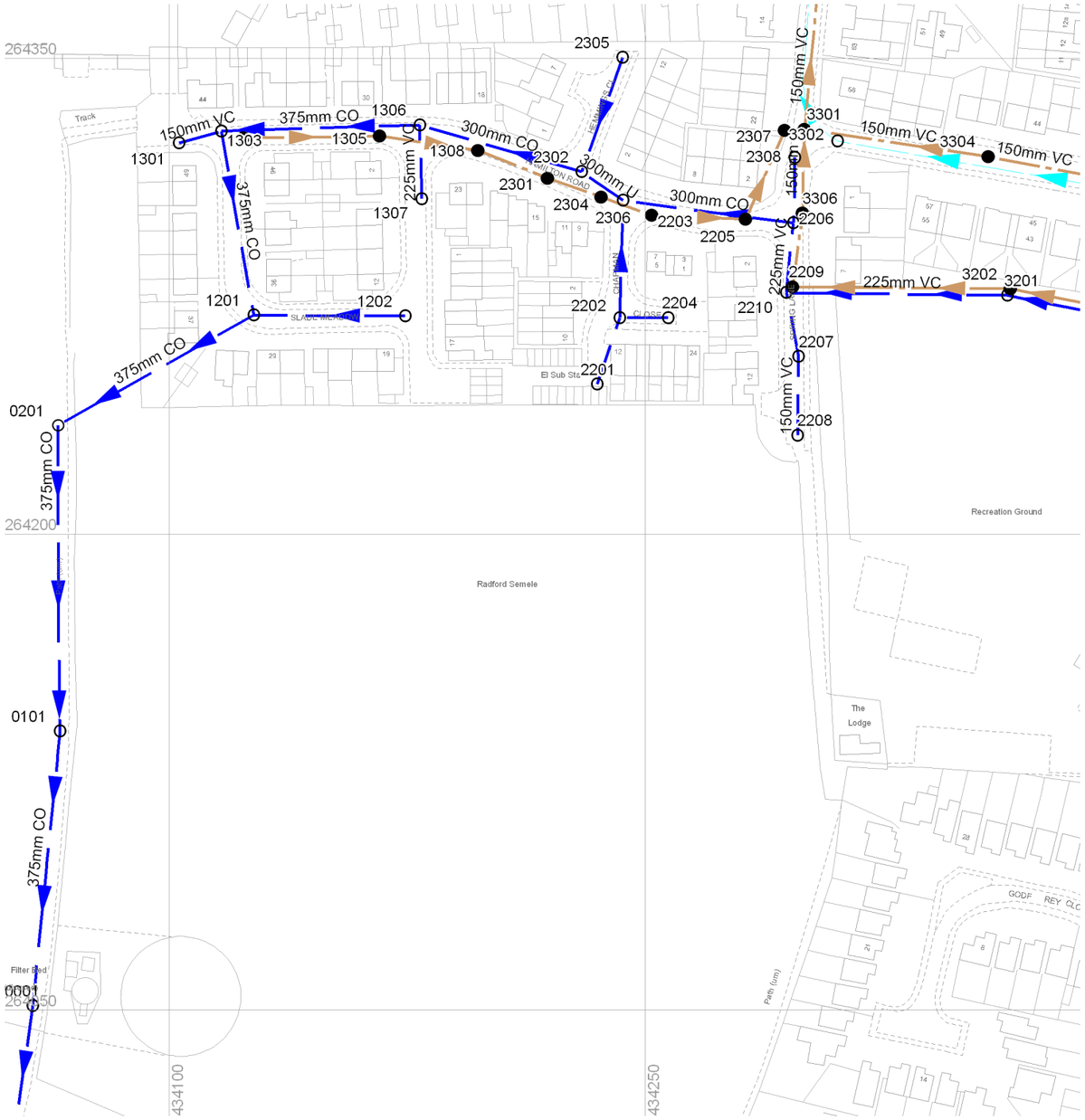
Any flows generated by the site in excess of the permitted discharge rate will have to be attenuated within the development site.

For any new connection(s) into the public sewer network **or the reuse of an existing sewer connection(s)**, you will need to apply under Section 106 Water Industry Act 1991 as amended by the Water Act 2003. Our New Connections Team currently processes Section 106 applications, please contact them on 0800 707 6600 for an application pack and guidance notes (or visit www.stwater.co.uk). For the avoidance of doubt, it is suggested that you quote the reference number above. Applications to make such connections should be made separately from any application for adoption of the related sewers under Section 104 Water Industry Act 1991 as amended by the Water Act 2003.

I must inform you that this evaluation is only valid for 6 months from the date of this letter. Please quote the reference number above, in all future correspondence.

Yours faithfully,

WF Walton
Asset Protection Manager - East
Waste Water



Sewer Node / Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP34640001	63.08	60.42	59.17	S	CO	C	375	nil	54.98	nill
SP34640101	nil	nil	61.90	S	CO	C	375	nil	0.00	nill
SP34640201	nil	nil	nil	S	CO	C	375	nil	0.00	nill
SP34641201	69.80	67.10	nil	S	CO	C	375	nil	0.00	nill
SP34641202	70.04	68.54	68.08	S	VC	C	225	nil	104.45	nill
SP34641301	69.47	67.81	67.72	S	VC	C	150	nil	139.80	nill
SP34641302	69.60	68.73	68.46	F	VC	C	150	nil	159.26	nill
SP34641303	69.52	67.48	67.10	S	CO	C	375	nil	142.90	nill
SP34641305	69.68	68.44	68.04	F	VC	C	150	nil	78.87	nill
SP34641306	69.71	67.80	67.50	S	CO	C	375	nil	201.71	nill
SP34641307	69.84	68.20	67.93	S	VC	C	225	nil	84.85	nill
SP34641308	69.78	68.04	67.86	F	VC	C	150	nil	133.61	nill
SP34642201	70.44	69.14	68.80	S	VC	C	150	nil	63.71	nill
SP34642202	70.42	68.80	68.25	S	VC	C	225	nil	67.29	nill
SP34642203	nil	nil	67.26	F	VC	C	150	nil	0.00	nill
SP34642204	70.28	68.94	68.80	S	VC	C	150	nil	107.14	nill
SP34642205	70.32	67.24	nil	F	VC	C	150	nil	0.00	nill
SP34642206	70.44	68.61	68.25	S	CO	C	300	nil	148.50	nill
SP34642207	70.86	69.16	68.95	S	VC	C	150	nil	97.14	nill
SP34642208	71.18	69.74	69.16	S	VC	C	150	nil	43.10	nill
SP34642209	70.68	69.26	68.81	F	VC	C	150	nil	51.96	nill
SP34642210	70.70	68.94	68.61	S	VC	C	225	nil	66.94	nill
SP34642301	69.88	67.84	67.73	F	VC	C	150	nil	150.25	nill
SP34642302	69.98	68.06	67.81	S	CO	C	300	nil	213.48	nill
SP34642304	70.00	67.72	nil	F	VC	C	150	nil	0.00	nill
SP34642305	69.52	68.62	68.20	S	VC	C	150	nil	89.02	nill
SP34642306	70.11	68.23	68.08	S	U	C	300	nil	98.81	nill
SP34642307	70.30	nil	67.10	F	nil	nil	nil	nil	0.00	nill
SP34642308	70.26	68.98	68.61	S	VC	C	150	nil	52.68	nill
SP34643201	71.68	69.90	68.93	S	VC	C	225	nil	71.16	nill
SP34643202	71.63	70.35	69.29	F	VC	C	150	nil	64.08	nill
SP34643301	70.16	66.97	66.25	F	VC	C	150	nil	100.47	nill
SP34643302	70.24	nil	nil	nil	nil	nil	nil	nil	0.00	nill
SP34643304	70.45	69.28	68.80	F	VC	C	150	nil	120.23	nill
SP34643306	70.33	68.81	68.55	F	nil	C	150	nil	100.08	nill

- Abandoned Gravity Sewer
- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Private Surface Water Gravity Sewer
- Public Combined Gravity Sewer
- Public Foul Gravity Sewer
- Public Surface Water Gravity Sewer
- Trunk Combined Gravity Sewer
- Trunk Foul Use Gravity Sewer
- Trunk Surface Water Gravity Sewer
- Combined Use Pressurised Sewer
- Foul Use Pressurised Sewer
- Surface Water Pressurised Sewer
- Highway Drain
- Combined Lateral Drain (SS)
- Foul Lateral Drain (SS)
- Surface Water Lateral Drain (SS)

All Private Sewers are shown in magenta
All section 104 sewers are shown in green
All Sewers that have been transferred to Severn Trent Water after the 1st October 2011, but have not been surveyed and confirmed by Severn Trent Water are shown in orange

- Culverted Watercourse
- Cable, Earthing
- Cable Junction
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other
- Housing, Building
- Housing, Kiosk
- Disposal Site
- Sewage Treatment Works
- Housing, Other
- Pipe Support Structure
- Sewage Pumping Facility
- Sewer Facility Connection Inlet / Outlet

- Blind Shaft
- Combined Use Manhole
- Flushing Chamber
- Foul Use Manhole
- Grease Trap
- Head Node
- Hydrobrake
- Lamphole
- Outfall
- Overflow
- Penstock
- Petrol Interceptor

- Sewer Chemical Injection Point
- Sewer Junction
- Sewerage Air Valve
- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Pre-1937 Properties

TABULAR KEY

Sewer pipe data refers to downstream sewer pipe.

A. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.

B.

C. Gradient is stated a 1 in...

MATERIALS

- - NONE
- AC - ASBESTOS CEMENT
- BR - BRICK
- CC - CONCRETE BOX CULVERT
- CI - CAST IRON
- CO - CONCRETE
- CSB - CONCRETE SEGMENTS (BOLTED)
- CSU - CONCRETE SEGMENTS (UNBOLTED)
- DI - DUCTILE IRON
- GRC - GLASS REINFORCED CONCRETE
- GRP - GLASS REINFORCED PLASTIC
- MAC - MASONRY IN REGULAR COURSES
- MAR - MASONRY RANDOMLY COURSED
- PE - POLYETHLENE
- PF - PITCH
- PP - POLYPROPYLENE
- PSC - PLASTIC STEEL COMPOSITE
- PVC - POLYVINYL CHLORIDE
- RPM - REINFORCED PLASTIC MATRIX
- SI - SPUN (GREY) IRON
- ST - STEEL
- U - UNKNOWN
- VC - VITRIFIED CLAY
- XXX - OTHER

SHAPE

- C - CIRCULAR
- E - EGG SHAPED
- O - OTHER
- R - RECTANGLE
- S - SQUARE
- T - TRAPEZOIDAL
- U - UNKNOWN

PURPOSE

- C - COMBINED
- E - FINAL EFFLUENT
- F - FOUL
- L - SLUDGE
- S - SURFACE WATER

CATEGORIES

N / W / E / S

- W - WEIR
- C - CASCADE
- DB - DAMBOARD
- SE - SIDE ENTRY
- FV - FLAP VALVE
- BD - BACK DROP
- S - SIPHON
- HD - HIGHWAY DRAIN
- S104 - SECTION 104

SEVERN TRENT WATER

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (Tabular)

O/S Map scale:	1:1750	This map is centred upon: O / S Grid reference:	
Date of issue:	13.03.14	x :	434217
Sheet No.	1 of 1	y :	264191

APPENDIX E

KEY

- Existing tree to be retained
- Existing tree to be removed
- Existing group of trees to be retained
- Existing hedgerow remnants
- Proposed ornamental screen hedging
- Proposed ornamental low hedging
- Proposed tree planting & conifers
- Proposed native hedging
- Proposed native woodland planting with ground flora
- Proposed shrubs
- Proposed wild-flower meadows
- Proposed lawn
- Existing contours at 0.5m centres
- Proposed contours
- Proposed SUDS swales
- Site boundary

REVISION

B: Swales added JFB 13-03-14
A: Wildflower areas removed from central area JFB 07-03-14

FOR PLANNING ONLY

CLIENT

A.C.LLOYD

JB Landscape Associates
25 Victoria Street, Warwick CV34 4JT 01926 498350

PROJECT

PROPOSED HOUSING AT SPRING LANE, RADFORD SEMELE

DRAWING

PRELIMINARY LANDSCAPE PROPOSALS

DRAWN JB	CHECKED	APPROVED JB
TRACED	SCALE 1:500@A1	DATE 20-03-12

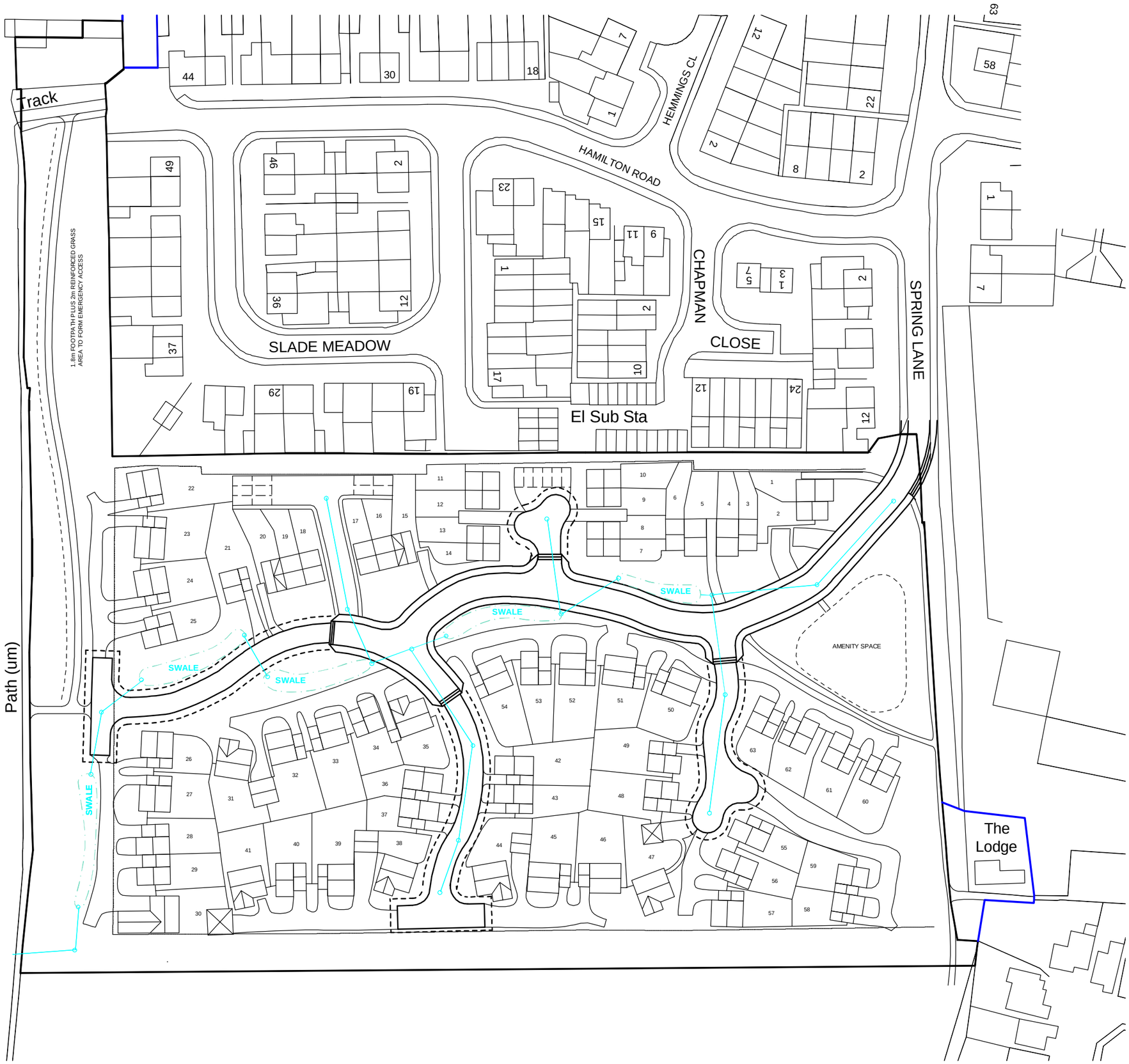
DRAWING No 2046-PL004 REV B

DRAWING BASE
The landscape drawing is based upon C+W Architects drawing 13967-0103G, with reference to the Midland Survey Ltd drawing 19276/1.

APPENDIX F

Figured dimensions only to be taken from this drawing. DO NOT SCALE.
All contractors must visit the site and be responsible for checking all setting out dimensions and notifying the architect of any discrepancies prior to any manufacture or construction work.

NOTES:



A.C.LLOYD

REVISION	DATE	NOTES	CHK

FOR INFORMATION

Client
AC LLOYD

Project
RADFORD SEMELE

Drawing Title
OUTLINE DRAINAGE LAYOUT PLAN

Drawn	Checked	Paper Size	Scale	Date
DA	RAC	A3	1:1000	MAR 2014

Project No.	Drawing No.	Revision
	RS200	

APPENDIX G

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.240	Urban	0.000
SAAR (mm)	624	Region Number	Region 4

Results l/s

QBAR Rural	4.8
QBAR Urban	4.8
Q100 years	12.2
Q1 year	4.0
Q30 years	9.3
Q100 years	12.2

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 418 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	100.616	0.616	0.0	11.7	11.7	264.3	O K
30 min Summer	100.715	0.715	0.0	11.7	11.7	343.1	Flood Risk
60 min Summer	100.800	0.800	0.0	11.7	11.7	417.0	Flood Risk
120 min Summer	100.863	0.863	0.0	11.9	11.9	475.2	Flood Risk
180 min Summer	100.882	0.882	0.0	12.0	12.0	493.6	Flood Risk
240 min Summer	100.883	0.883	0.0	12.0	12.0	495.0	Flood Risk
360 min Summer	100.862	0.862	0.0	11.9	11.9	474.1	Flood Risk
480 min Summer	100.841	0.841	0.0	11.7	11.7	454.5	Flood Risk
600 min Summer	100.823	0.823	0.0	11.7	11.7	438.1	Flood Risk
720 min Summer	100.807	0.807	0.0	11.7	11.7	423.4	Flood Risk
960 min Summer	100.776	0.776	0.0	11.7	11.7	395.4	Flood Risk
1440 min Summer	100.714	0.714	0.0	11.7	11.7	341.6	Flood Risk
2160 min Summer	100.619	0.619	0.0	11.7	11.7	266.5	O K
2880 min Summer	100.525	0.525	0.0	11.7	11.7	199.7	O K
4320 min Summer	100.352	0.352	0.0	11.7	11.7	95.6	O K
5760 min Summer	100.212	0.212	0.0	11.4	11.4	33.0	O K
7200 min Summer	100.072	0.072	0.0	11.4	11.4	3.4	O K
8640 min Summer	100.000	0.000	0.0	10.2	10.2	0.0	O K
10080 min Summer	100.000	0.000	0.0	9.0	9.0	0.0	O K
15 min Winter	100.660	0.660	0.0	11.7	11.7	298.3	O K
30 min Winter	100.768	0.768	0.0	11.7	11.7	388.2	Flood Risk
60 min Winter	100.861	0.861	0.0	11.9	11.9	473.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.269	0.0	281.9	26
30 min Summer	79.695	0.0	370.6	40
60 min Summer	49.937	0.0	464.2	68
120 min Summer	30.267	0.0	562.9	126
180 min Summer	22.297	0.0	622.0	184
240 min Summer	17.851	0.0	664.0	242
360 min Summer	12.957	0.0	723.0	342
480 min Summer	10.330	0.0	768.6	398
600 min Summer	8.659	0.0	805.2	460
720 min Summer	7.492	0.0	836.2	524
960 min Summer	5.959	0.0	886.7	662
1440 min Summer	4.309	0.0	961.7	930
2160 min Summer	3.110	0.0	1041.3	1328
2880 min Summer	2.466	0.0	1100.7	1708
4320 min Summer	1.775	0.0	1188.6	2420
5760 min Summer	1.405	0.0	1254.0	3064
7200 min Summer	1.171	0.0	1306.4	3680
8640 min Summer	1.008	0.0	1350.4	0
10080 min Summer	0.889	0.0	1388.4	0
15 min Winter	121.269	0.0	315.8	26
30 min Winter	79.695	0.0	415.1	40
60 min Winter	49.937	0.0	520.1	68

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	100.933	0.933	0.0	12.3	12.3	544.3	Flood Risk
180 min Winter	100.958	0.958	0.0	12.5	12.5	570.5	Flood Risk
240 min Winter	100.965	0.965	0.0	12.5	12.5	577.5	Flood Risk
360 min Winter	100.953	0.953	0.0	12.5	12.5	565.1	Flood Risk
480 min Winter	100.929	0.929	0.0	12.3	12.3	540.8	Flood Risk
600 min Winter	100.904	0.904	0.0	12.1	12.1	515.7	Flood Risk
720 min Winter	100.886	0.886	0.0	12.0	12.0	497.3	Flood Risk
960 min Winter	100.846	0.846	0.0	11.8	11.8	459.5	Flood Risk
1440 min Winter	100.758	0.758	0.0	11.7	11.7	379.8	Flood Risk
2160 min Winter	100.616	0.616	0.0	11.7	11.7	264.5	O K
2880 min Winter	100.471	0.471	0.0	11.7	11.7	164.9	O K
4320 min Winter	100.197	0.197	0.0	11.4	11.4	28.2	O K
5760 min Winter	100.000	0.000	0.0	10.3	10.3	0.0	O K
7200 min Winter	100.000	0.000	0.0	8.6	8.6	0.0	O K
8640 min Winter	100.000	0.000	0.0	7.4	7.4	0.0	O K
10080 min Winter	100.000	0.000	0.0	6.5	6.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	30.267	0.0	630.4	124
180 min Winter	22.297	0.0	696.7	182
240 min Winter	17.851	0.0	743.7	238
360 min Winter	12.957	0.0	809.8	348
480 min Winter	10.330	0.0	860.8	450
600 min Winter	8.659	0.0	901.9	484
720 min Winter	7.492	0.0	936.5	560
960 min Winter	5.959	0.0	993.1	714
1440 min Winter	4.309	0.0	1077.1	1016
2160 min Winter	3.110	0.0	1166.3	1432
2880 min Winter	2.466	0.0	1232.8	1796
4320 min Winter	1.775	0.0	1331.2	2424
5760 min Winter	1.405	0.0	1404.4	0
7200 min Winter	1.171	0.0	1463.2	0
8640 min Winter	1.008	0.0	1512.4	0
10080 min Winter	0.889	0.0	1555.0	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 1.240

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	From:	To:	(ha)
0	4	0.413	4	8	0.413		12	0.413

Model Details

Storage is Offline Dividing Weir Level (m) 100.800
Cover Level (m) 101.000

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	140.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	100.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	2.5		

Hydro-Brake® Outflow Control

Design Head (m) 0.900 Hydro-Brake® Type Md4 Invert Level (m) 100.000
Design Flow (l/s) 12.3 Diameter (mm) 128

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	14.0	3.000	22.1	7.000	33.8
0.200	10.2	1.400	15.1	3.500	23.9	7.500	35.0
0.300	11.5	1.600	16.1	4.000	25.5	8.000	36.1
0.400	10.0	1.800	17.1	4.500	27.1	8.500	37.2
0.500	9.7	2.000	18.1	5.000	28.5	9.000	38.3
0.600	10.1	2.200	18.9	5.500	29.9	9.500	39.4
0.800	11.4	2.400	19.8	6.000	31.3		
1.000	12.8	2.600	20.6	6.500	32.6		