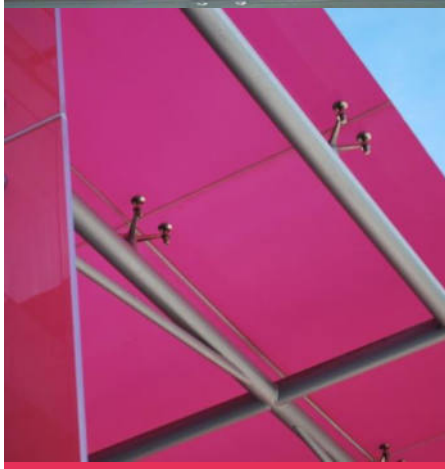


Turing House School

Nursery Car Park - Drainage Strategy Addendum

Curtins Ref: FS0316-CUR-00-XX-RP-D-002

Revision: V03

Issue Date: 07 August 2020

Client Name: Bowmer and Kirkland Ltd

Client Address: High Edge Court, Heage, Belper, Derbyshire, DE56 2BW

Site Address: Hospital Bridge Road, Twickenham, TW2 6LH

Curtins
56 The Ropewalk,
Nottingham, NG1 5DW
Tel: 0115 941 5551
www.curtins.com

Rev	Description	Issued by	Checked	Date
V01	First Issue	RV	ID	14.05.20
V02	Planning Issue	ID	ID	19.05.20
V03	Planning Issue	ID	ID	07.08.20

Author	Signature	Date
Ricardo Vendone **Student Engineer**		14.05.20

Reviewed	Signature	Date
Ivayla Dimitrov MSc **Senior Engineer**		14.05.20

Authorised	Signature	Date
Ivayla Dimitrov MSc **Senior Engineer**		14.05.20

Table of contents

Figures

1.0 Introduction

1.1 Project Background

1.1.1 Curtins has been appointed by Bowmer & Kirkland (B&K) to provide an addendum to the Drainage Strategy of the proposed Turing House School development on Hospital Bridge Road, Twickenham, TW2 6LH. This will be used in support of the full FRA & Drainage Strategy previously provided for the development planning application.

1.1.2 Proposals contained in, or forming part of, this report represent the updated design intent following the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the contents of this document, an approval shall be obtained from the relevant authority in advance of commencing such works.

1.1.3 Where the proposed works to which this report refers to are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-evaluate the findings and conclusions by undertaking appropriate further considerations at no cost to Curtins.

1.2 Proposed Development

1.2.1 It is understood that the proposal includes the construction of new buildings, associated landscaping, car park and sports pitches.

1.2.2 The updated drainage catchment for the site includes the redevelopment of 0.039ha existing car parking area (comprising 16 spaces with permeable paving) and approximately 2.24 ha of sports pitches.

1.2.3 The surface water drainage from site is proposed to discharge to the public surface water sewers at the average annual greenfield run-off rate, Qbar, calculated for the total contributing area of 4.75ha. This has resulted in a proposed discharge rate of 7.3l/s.

1.2.4 The net impermeable area that will be accommodated within a new surface water drainage system is estimated to be 1.557 ha.

1.2.5 The proposed site layout is included in **Appendix A.**

2.0 Existing Site Details

2.1 History and Current Use

2.1.1 The site is located in Whitton, south-west London, land off Hospital Bridge Road. A site location plan is provided in *Figure 2.1-1*. The site currently comprises of a large open field and a small area which is thought to be used for storage by the adjacent garden centre and nursery.

2.1.2 The approximate Ordnance Survey (OS) grid reference is 513521, 173666 (TQ1352173666).

2.1.3 A topographical survey was completed in June 2017, the topographical survey confirms that the site is relatively flat with levels ranging between approximately 20m AOD - 18.7m AOD falling towards the north-east boundary. There is an artificial bund along the eastern boundary with a maximum level of approximately 22.7m AOD.

2.1.4 A copy of the topographical survey is included in **Appendix B**.

2.1.5 The total area of the site is estimated to be approximately 6.5ha, with a developable area of approximately 4.75ha.

Figure 2.1-1 Site Location (source OS Open Data)

3.0 Drainage Strategy

3.1 National Planning Policy Framework Requirements

3.1.1 The NPPF requires that the proposed development will not flood and will not increase flood risk elsewhere. This includes surface water runoff generated by the development. Runoff generated by the development must be naturally drained within the site if possible, or captured and attenuated by a suitable drainage system. This system will require sufficient storage capacity to prevent it surcharging during extreme rainfall events, potentially flooding adjacent areas.

3.1.2 NPPF requires that sustainable drainage systems (SuDS) should be provided in new developments, unless it is demonstrated that they are inappropriate (for example, development related to mineral extraction). The Planning Practice Guidance notes that SuDS are designed to control surface water runoff close to source and mimic natural drainage as much as possible. SuDS provide opportunities to:

- Mitigate the causes and impacts of surface water flooding;
- Treat urban surface water runoff at source, by removing pollutants; and,
- Combine water management with additional benefits for amenity, recreation and biodiversity.

3.1.3 General national guidance for the design of the surface water drainage systems include the following:

- National Planning Policy Framework (NPPF)
- Non-Statutory Technical Standards for Sustainable Drainage Systems, DEFRA, March 2015
- Written Ministerial Statement regarding Sustainable Drainage (HCWS161)
- The SUDS Manual – C753, CIRIA Industry Best Practice Guidance
- Flood Risk Planning Practice Guidance
- Building Regulations Part H

3.2 Drainage Hierarchy

3.2.1 The NPPF stipulates the drainage hierarchy as follows:

- Discharge into the ground;
- Discharge to a surface water body;
- Discharge to a surface water sewer;
- Discharge to a combined sewer.

3.3 Discharge into the ground (Infiltration)

3.3.1 A Phase II GI has been undertaken including 3 no. infiltration tests. At two locations the infiltration rate was too poor to complete the tests. At the third location the test was completed, however the calculated infiltration rate was relatively poor ($6.9x10^{-6}$ m/s).

3.3.2 Based on the above, soakaways are deemed unviable for the scheme. The test results are included in **Appendix C** of this report.

3.4 Discharge to a surface water body

3.4.1 The nearest watercourse to the site is an ordinary watercourse east of Hospital Bridge Road. The distance to the river and the fact that a connecting sewer would have to cross the public highway and 3rd party land mean that discharging to a watercourse is not viable.

3.5 Discharge into a surface water public sewer

3.5.1 The nearest public surface water sewer, shown on the Thames Water records, lie within Hospital Bridge Road. With the closest manhole (the head of the run) being approximately 35m south east of the proposed site access.

3.5.2 Based on the above, a connection to the public surface water sewer is deemed to be the most viable method of discharge.

3.5.3 Due to level differences, surface water flows will be pumped from the development into the public sewer. In the pre-development enquiry response from Thames Water they have confirmed that this approach is acceptable.

3.5.4 As the proposed connection is to the existing public sewer it will be subject to a Section 106 Agreement with Thames Water.

3.6 Discharge into a combined sewer

3.6.1 There are no public combined sewers in the immediate vicinity of the site.

3.7 Surface Water Drainage Calculations

3.7.1 The total area of the site is estimated to be approximately 6.5ha, with a developable area of approximately 4.75ha. The post development impermeable area used for the calculations will be approximately 1.557ha including 20% run-off from the grassed sports pitches. The 4.75ha of developable area will be used for the greenfield runoff calculations.

3.7.2 The Qbar has been calculated as 1.53l/s/ha using the HR Wallingford's Greenfield Runoff Estimation Toolkit. The proposed contributing area of total 4.75ha has been calculated to generate greenfield discharge rate of 7.3l/s. The calculation sheet is included within **Appendix D**.

3.7.3 The total impermeable area on site is approximately 1.557ha. The MicroDrainage Network Module has been used to establish the overall attenuation volume required for the 100 years plus 40% climate change event. This has been calculated to be approximately 1,241m^3 and is to be accommodated in two interconnected underground attenuation tanks, permeable MUGA, rain gardens and permeable car park spaces.

3.7.4 The total proposed impermeable area for the new nursery car park is 0.038ha. The drainage proposal for the car park is to accommodate lined permeable block paving car parking spaces with attenuation sub-base and orifice plate flow controls to control the run-off. The nursery car park drainage is to be connected to the proposed main attenuation tank on site and ultimately discharge to the public sewers.

3.7.5 A summary of the calculations for the 1 year, 30 years, and 100 years plus 40% climate chance scenarios are included in **Appendix E**.

3.7.6 An underground drainage system, with two attenuation tanks, has been proposed for the site, connecting (via a pump) to the existing public surface water sewer within Hospital Bridge Road. The design also incorporates subgrade attenuation beneath the parking areas, rain gardens and filter drains which will provide additional attenuation and treatment to surface water runoff.

3.7.7 Separate systems for the foul water drainage and the surface water drainage are proposed. The strategy proposes to control the runoff to the above greenfield discharge rate via vortex flow control chambers downstream of the underground tanks.

3.7.8 A pre-developer's enquiry was submitted to Thames Water to confirm the existing capacity in the public surface water sewers and they confirmed that there is sufficient capacity to accommodate the proposed 7.3l/s discharge from site. The response to the pre-development enquiry can be found in **Appendix F.**

3.7.9 The surface water drainage layout for the site and proposed nursery car park is included in **Appendix G**.

3.8 Surface Water Management Train

3.8.1 The principles of the SuDS management train are to replicate the natural catchment drainage process as much as possible. This concept is core to the successful design and implementation of a SuDS scheme, where drainage techniques are used in series to incrementally reduce pollution, flow rates and volumes. The SuDS scheme should be integrated into the landscape proposals, to enhance amenity and biodiversity, whilst protecting and/or enhancing water quality.

3.8.2 SuDS features should be designed in accordance with CIRIA C753 SuDS Manual 2015'.

3.8.3 Source control should be the first recourse of any pollutant management, followed by conveyance measures and finally site control. Using the simple index approach contained within the SuDS Manual, Table 26.2, the car parking area would be classified as having a medium pollutant hazard level. The associated pollution hazard indices are Total Suspended Solids (TSS) of 0.7, Metals of 0.6 and Hydrocarbons of 0.7.

3.8.4 Any new car parking area should have permeable paving and sub-base. Permeable paving would provide 0.7, 0.6 and 0.7 mitigation respectively, and so thus covering the main source of pollution, parked cars (see figures below – taken from the SuDS Manual). These ratings apply to both surface water and groundwater receptors and will offer a significant improvement to water quality of the runoff from these areas.

3.8.5 Runoff from the building perimeter footpath will be subject to pedestrian use, with very occasional maintenance vehicles, and as such contain negligible to low levels of pollution.

3.8.6 Catch-pit manholes have been proposed upstream of the underground tanks for silt collection.

Figure 6.8-1: Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS Manual 2015)

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 3.8-2 Indicative SuDS Mitigation Indices (Table 26.3 the CIRIA SuDS Manual 2015)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[4]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

4.0 Addendum

- It is acknowledged that the submission drawings and report detail attenuation for both the application site and nursery site. However, the latter does not have a consent for such works and is unrelated to this application for the purpose of discharging conditions.
- For the purpose of discharging condition NS10, revised calculations are identified below, relating to the application site only.
- The updated drainage catchment for the application site includes approximately 2.24ha of sports pitches.
- The surface water drainage from the application site is proposed to discharge to the public surface water sewers at the average annual greenfield run-off rate, Qbar, calculated for the total contributing area of 4.711ha, resulting in a proposed discharge rate of 7.2l/s.
- The net impermeable area that will be accommodated within the surface water drainage system for the application site only is estimated to be 1.520ha.
- The overall attenuation volume for the application site only which is required for the 100 years plus 40% CC has been calculated to be approximately 1,220m^3.

5.0 Appendices

Appendix A **Proposed Site Layout**

Appendix B **Topographical Survey**

Appendix C **Infiltration Tests Results**

Appendix D **Greenfield Runoff Rate Calculations**

Appendix E **MicroDrainage Network Calculations**

Appendix F **Pre-Development Enquiry Response**

Appendix G **Surface Water Drainage Layouts**

Appendix A Proposed Site Layout

Notes

1. Drawing not to be scaled for construction or setting out purposes'.
2. To be read in conjunction with Project Risk Register REF: XXX
3. To be read in conjunction with all other Landscape Architect"s drawings

KEY

- **A** Entrance Plaza
- **B** Car Parking
  45no. Total Spaces
  3 Disabled Bays
  10 Active Electric Charging Points
  10 Passive Electric Charging Points
  Deliveries / Coach Bay
- **C** New Site Entrance
- **D** Deliveries and Maintenance Gate
- **E** Habitat Area
  Planting species designed to encourage insect and bird habitats and enhance the ecological corridor
- **F** Pedestrian Boulevard
- **G** Hard Informal Social Area
- **H** 6th Form External Social Space
- **I** External Canopy
- **J** Cycle Parking
  136no. Pupil Spaces
  10no. Visitor Spaces
  10no. Staff Spaces
- **K** 3 Court MUGA
- **L** Playing/Sports Field
  A Space design to maximise the amount of sports played by the school. The North/South orientation results in 3no. pitches
- **M** Boundary Fence
  a 2.4m boundary fence with hedge planting to provide screening
- **N** Grassland & Habitat Creation
  Area seeded with species rich grass and planting with trees to create habitat zones and habitat creation
- **O** Habitat Corridor
  The existing avenue of trees retained and grassland managed to reinforce the habitat corridor, providing habitat corridor between the rail line, cemetary and retained fallow land
- **P** Pupil Access
  Propsoed pupil access from Heathfield Recreation Ground. A low lit self bind gravel path weaving through the habitat area to the school.

ID	RISK	MITIGATION	Date Mitigated

RESIDUAL PROJECT RISKS

DATE	SUITABILITY	REV	DESCRIPTION OF REVISION	DRAWN BY	APPROVED BY
13.11.18	S2	P02	Highways entrance and adjacent area updated	HT	LA

REVISIONS

SUITABILITY
S2 - For Planning

ares LANDSCAPE ARCHITECTS

Ares Landscape Architects LTD
Gatecrasher
51 Eyre Lane
Sheffield
S1 4RB

t: 0114 276 2000
e: hello@ares.eu.com
w: ares.eu.com

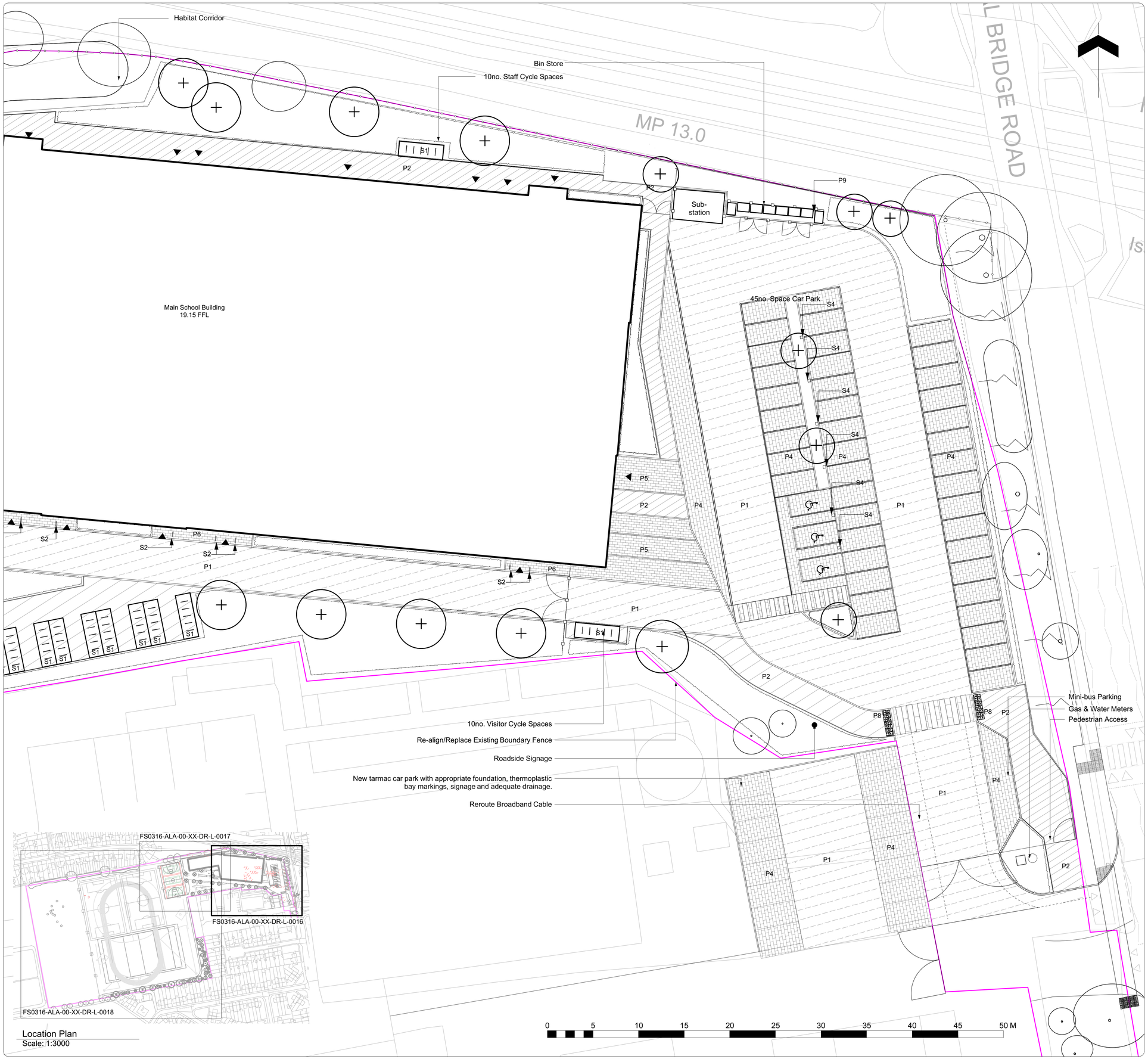
CLIENT :
Bowmer and Kirkland

PROJECT TITLE :
Turing House School

DRAWING TITLE :
Illustrative Masterplan

DRAWING SCALE :	DRAWN BY :	DRAWN DATE :
1:1000	EC	02.03.2018
PAPER SIZE :	APPROVED BY :	
A1	LA	

DRAWING NUMBER : **EFATH-ALA-00-XX-DR-L-0003** SUITABILITY : **S2** REVISION : **P02**



Location Plan
Scale: 1:3000

KEY

Extent of Works

Soft Landscape

Refer to FS0316-ALA-00-XX-DR-L-0014 Planting Strategy for planting detail

- Existing tree retained. Refer to FS0316-ALA-00-XX-DR-L-0009 Tree Retention and Removal Plan for details
- Existing tree to be removed
- Proposed tree
- Proposed Grass Seed
- Proposed Acid Grassland
- Proposed Planting

Hard Landscape

P1 Bitumous macadam (vehicular)
Refer to engineer's specification.

P2 Bitumous macadam (pedestrian)
Refer to engineer's specification.

P3 Bitumous macadam (MUGA)
Refer to engineer's specification.

P4 Permeable Block Paving (vehicular)
Manufacturer: Marshalls or similar.
Product: Priora or similar.
Size: 240L x 160W x 60D mm.
Colour/Finish: Graphitem, light or dark.
Bond: 90 degree herringbone.
Q24/110B

P5 Permeable Block Paving (pedestrian)
Colour: Mix A
Manufacturer: Marshalls or similar.
Product: Priora or similar.
Size: 240L x 160W x 60D mm.
Colour/Finish: Graphitem, light or dark.
Bond: Running.
Q24/110A

P6 Permeable Block Paving (pedestrian)
Colour: Mix B
Manufacturer: Marshalls or similar.
Product: Priora or similar.
Size: 240L x 160W x 60D mm.
Colour/Finish: Graphitem, light or dark.
Bond: Running.
Q24/110A

P7 Self Binding Gravel
Manufacturer: DCM Surfaces.
Product: Self Binding Gravel.
Size: 50-100D mm.
Colour/Finish: Gold.
Q23/110A

P8 Hazard Warning Paving Type: Blister, Precast
Manufacturer: Marshalls or similar.
Product: Contractor's choice.
Size: 400L x 400W mm.
Colour/Finish: Grey.
Q25/320

P9 Concrete Surface To Cycle Parking and Bin Store
Refer to engineer's specification.

Furniture

S1 Cycle Shelter & Hoops
1no. Shelter
5no. Hoops
Shelter
Manufacturer: Broxap or similar.
Product: New Sheffield Cycle Shelter.
Size: 4100L x 2140W x 2150H mm
Materials: Steel frame, plastics and composite panel.
Method of Fixing: Base plates bolted to concrete base.
B91/340
Hoops
Manufacturer: Kensington Systems Ltd. or similar.
Product: Elk Ervine Traditional style Sheffield type Stand.
Size: 700W x 1100H mm.
Materials: Stainless steel.
Method of Fixing: Root fixed. Ref ELK90009.
Q50/210C

S2 Door Protection Hoops
Manufacturer: Kensington Systems Ltd. or similar.
Product: Elk Door Restrainer ELK90068.
Size: 1020mm Above Ground x 500mm wide. (300mm below ground)
Materials: Steel.
Method of Fixing: Rooted in concrete base. 300mm below ground.
Q50/210D

S3 Concrete Bench without Back Rest
Manufacturer: Artform Urban or similar.
Product: Loop Line.
Colour: Grey.
Size: Refer to Ares detail drawings.
Q50/220E

S4 Electric Charging Point

S5 Table Tennis (Legacy Equipment)

S6 Dining Table (Legacy Equiptment)

Fencing

Refer to EFATH-ALA-00-XX-DR-L-0005 Fencing General Arrangement for fencing details.

- Existing Fencing
- Proposed Fencing & Gates

Notes

1. Do not scale from this drawing
2. Residual risks to be read in conjunction with Ares Landscape Architects risk register - XXX
3. Specification and details of build ups to paving, kerbs, edges and structures to be advised by Civil Engineers.
4. To be read in conjunction with Civil Engineers's NBS documents.
5. The contractor is to check all levels and dimensions before construction. Any discrepancies are to be brought to the attention of Ares Landscape Architects before commencing on site.
6. All sub bases and concrete specification to Engineer's details.

ID	RISK	MITIGATION	Date Mitigated

RESIDUAL PROJECT RISKS

DATE	REV	DESCRIPTION OF REVISION	DRAWN BY	APPROVED BY
05/02/2020	P05	Block paving added to nursery car park	LA	
25/10/2019	P04	Issued for review and comments.	TB	LA
18/10/2019	P03	Site coordination changes.	LA	-

REVISIONS

SUITABILITY
S3 - CONTRACTORS PROPOSALS

ares LANDSCAPE ARCHITECTS
Ares Landscape Architects LTD
Gatecrasher,
51 Eyre Lane
Sheffield
S1 4RB
t: 0114 276 2000
e: hello@ares.eu.com
w: ares.eu.com

CLIENT :
Bowmer + Kirkland

PROJECT TITLE :
Turning House School

DRAWING TITLE :
Landscape General Arrangement 1 of 3

DRAWING SCALE :	DRAWN BY :	DRAWN DATE :
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Appendix B Topographical Survey

Notes © 2017 RPS Group

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2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

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 ST03 (NO SCALE FACTOR APPLIED)

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:200

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.

TOPOGRAPHICAL SURVEY/UTILITY KEY :–

(ht) – height
ø – diameter
● – pea trap
a/g – above ground
a/r – assumed route
av – air valve
bb – belisha beacon
bd – back drop
bl – bed level
boll – bollard
bos – bottom of shaft
bt – telecom
c/b fence – closeboard fence
c/box – control box
catv – cable television
cl – cover level
con – conifer
cr – cable riser
cws – combined water sewer
d/chan – drainage channel
ejb – electric junction box
elec – electric
eot – end of trace
ep – electric pole
er – earth rod
f/bed – flower bed
fh – fire hydrant
fl – floor level
fs – fire switch
fws – foul water sewer
g – gully
g/run – gully run
gr – gas riser
h/chestnut – horse chestnut
h/thorn – hawthorn
ic – inspection cover
il – invert level
ill – illuminated
int – interceptor
lp – lamp post
mh – manhole cover
mkr – marker
o/h – over head
ol – off let
osa – off survey area
OSBM – ordnance survey bench mark
p & r fence – post & rail fence
pd – pit depth
pr – pipe riser
ptg – pipe to ground
pts – pipe to surface
re – rodding eye
ret wall – retaining wall
rs – road sign
rwp – rain water pipe
s/birch – silver birch
s/p – safety paving
sap – sapling
sec fence – security fence
sfc – soil filled chamber
sl – spot light
sp – soil pipe
st – stop tap
sv – stop valve
svp – soil vent pipe
sws – storm water sewer
TBM – temporary bench mark
tfr – taken from records
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
tp – telecom pole
ts – traffic signal
t/s – trench scar
u/s – underside
utl – unable to lift
utr – unable to rod
uts – unable to survey
utt – unable to trace
vp – vent pipe
wfc – water filled chamber
wl – water level
wm – water meter
wp – waste pipe
wr – water riser

SURVEY CONTROL :–

STATION	EASTINGS	NORTHINGS	LEVEL
ST01	513586.844	173601.307	19.932
ST02	513549.224	173595.177	19.262
ST03	513563.722	173621.003	19.539
ST04	513485.419	173646.001	19.181
ST05	513553.693	173672.464	18.991
ST06	513426.840	173672.286	18.993
ST07	513366.021	173664.497	19.070
ST08	513424.612	173693.123	18.877
ST09	513266.310	173631.436	19.291
ST10	513166.485	173620.547	19.410

SHEET LAYOUT :–

JKK9139_01
JKK9139_02
JKK9139_03
JKK9139_04
JKK9139_05

UTILITY SURVEY KEY :–

HATCHED AREA
BOREHOLE
CPT
TRIAL PIT
HAND PIT
WINDOW SAMPLE

ELECTRIC CABLE
W — W WATER PIPE
FOUL SEWER
STORM SEWER
COMBINED SEWER
D — D DUCTS
TV — TV CABLE TELEVISION
COM — COM DATA CABLE
TELECOM CABLE
G — G GAS PIPE
U — U UNIDENTIFIED SERVICE
OTHER
CCTV — CCTV CCTV
TL — TL TRAFFIC LIGHT
O — O OFFSET FILL
V — V VENT
F — F FUEL PIPE
GL — GL GAUGE LINES
P — P PIPE
AR — AR ASSUMED ROUTE
TFR — TFR TAKEN FROM RECORDS

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

Please note that factors such as ground conditions, proximity of other utilities, material and method of construction have an influence on the quality of the data collected on site.

TSA Standards – "Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate."

UTILITY NOTES

MAINS GAS,ELEC AND WATER ENTER TIMBER BUILDING AT THE REAR, OF SURVEY AREA.
2X ANOMALIES LOCATED IN ENTRANCE ROAD AND CAR PARK AREA WITH GPR.
1X METALLIC SERVICE TRACED ACROSS THE FIELD. POSSIBLE GAS OR WATER.
UNABLE TO TRACE CUT CABLE RISER IN FIELD.
ANOMALIES ALSO LOCATED WITHIN FIELD AREA WITH GPR, POSSIBLE VOIDS OR PROMINENT GROUND CHANGE.
UNABLE TO TRACE GAS VIA GAS VALVES WITHIN PAVEMENT.

Rev	Description	By	Ckd	Date
A	ORIGINAL DRAWING ISSUE	MSL	AHP	29.06.17

RPS
Noble House, Capital Drive, Linford Wood,
Milton Keynes, MK14 6QP
T: 01908 669 898 E: rpsmks@rpsgroup.com F: 01908 302 625

Client TURNER & TOWNSEND

Project TURING HOUSE SCHOOL, HOSPITAL BRIDGE ROAD, HOUNSLOW, TW2 6LH

Title TOPOGRAPHICAL & UTILITY SURVEY

Status	Scale	Date Created
FINAL	1:200 @A0	29.06.17
Project Leader	**Drawn By**	**Checked by**
NB	MSL	AHP

Document Number	Revision	Suitability
JKK9319 - 03	A	

Project Number — Originator - Zone - Level - Type - Role - Drawing Number

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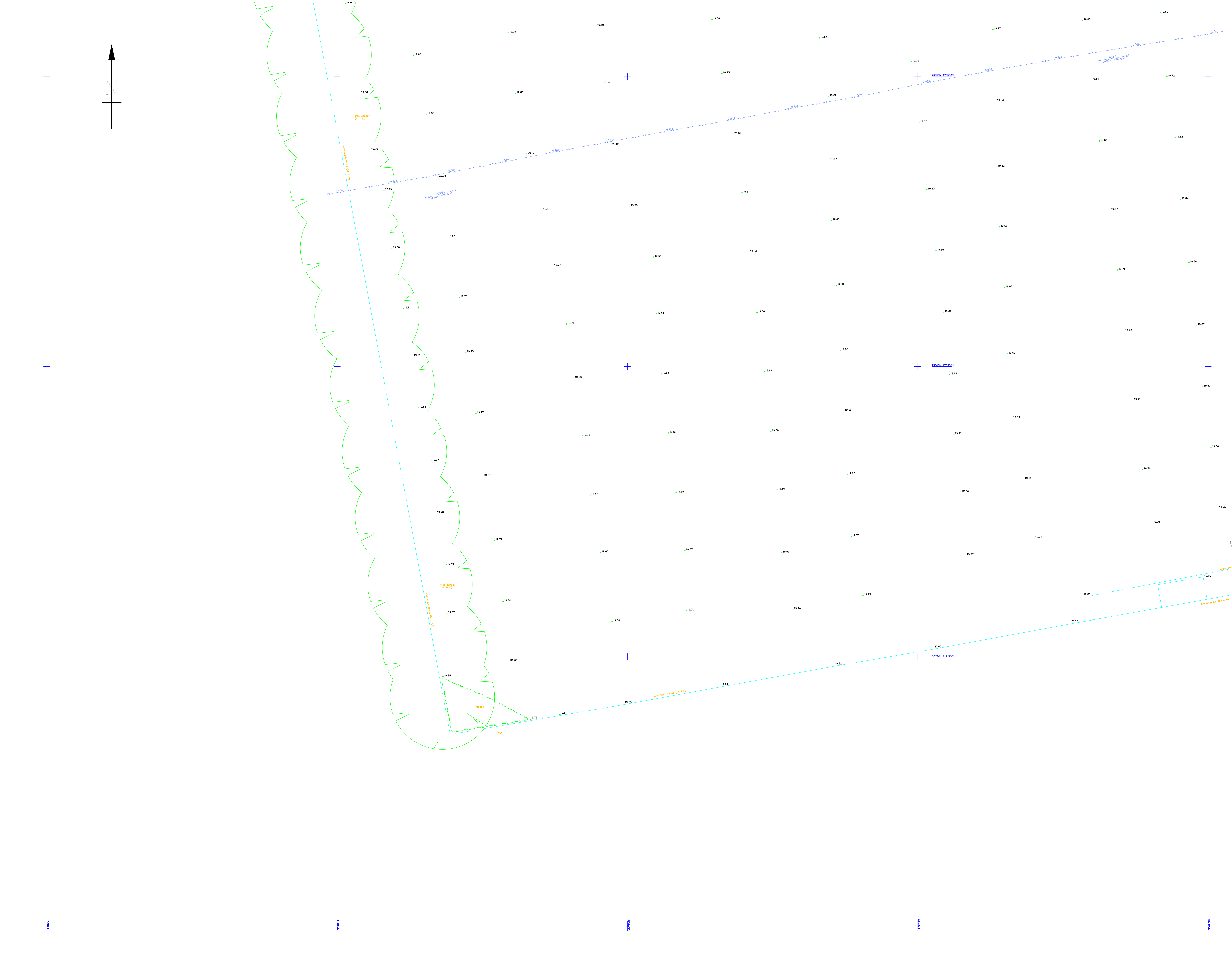

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SHEET LAYOUT :-

JKK9139_02
JKK9139_03
JKK9139_01
JKK9139_05
JKK9139_04

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CPT
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STORM SEWER
COMBINED SEWER
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TV CABLE TELEVISION
COM DATA CABLE
: TELECOM CABLE
G GAS PIPE
U UNIDENTIFIED SERVICE
OTHER
CCTV CCTV
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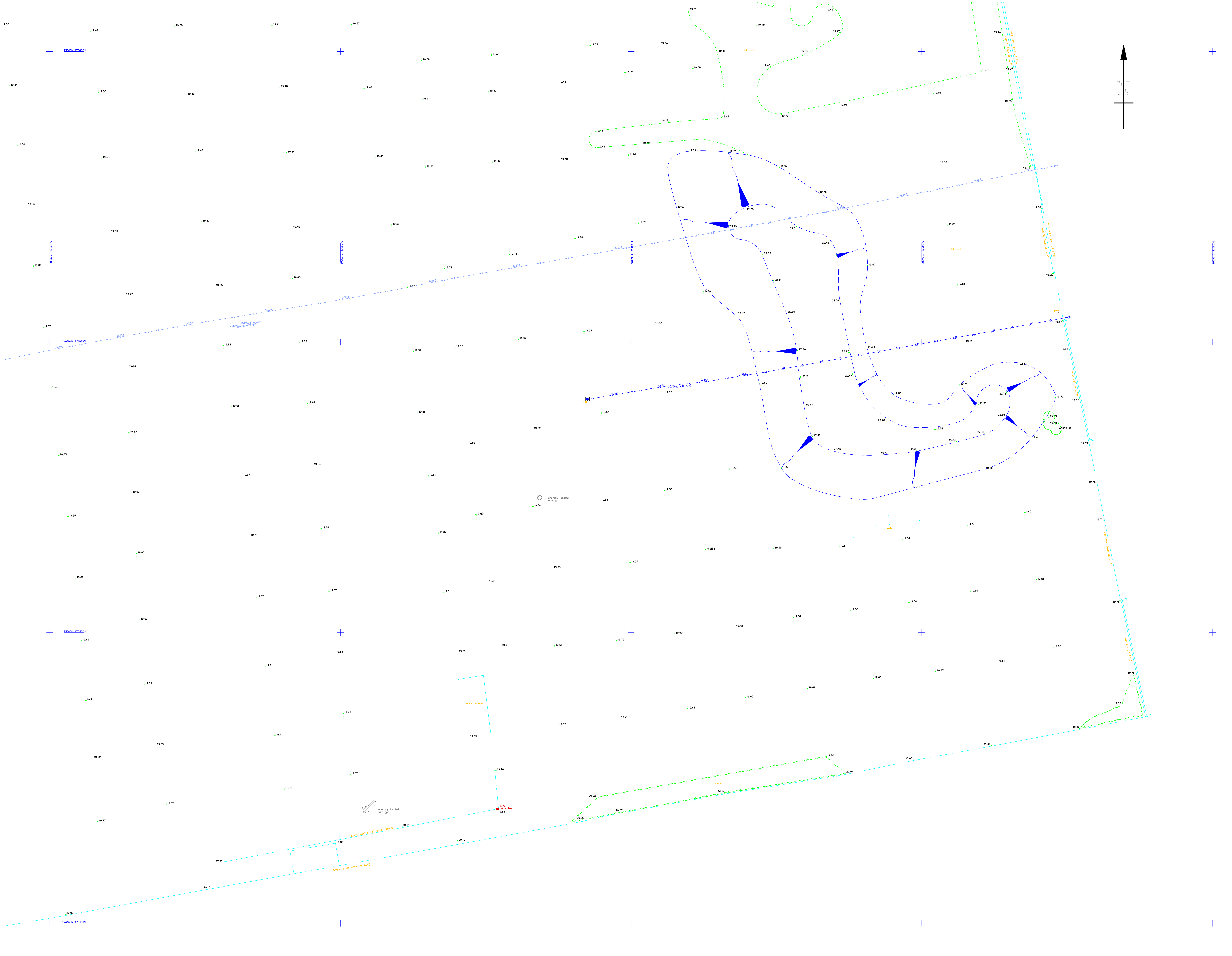

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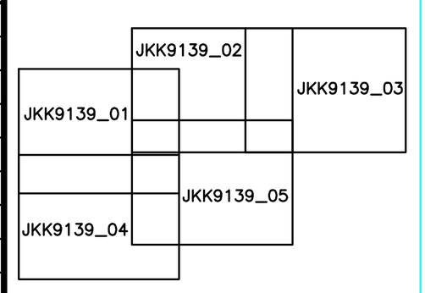

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FINAL	1:200 @A0	29.06.17
Project Leader	**Drawn By**	**Checked by**
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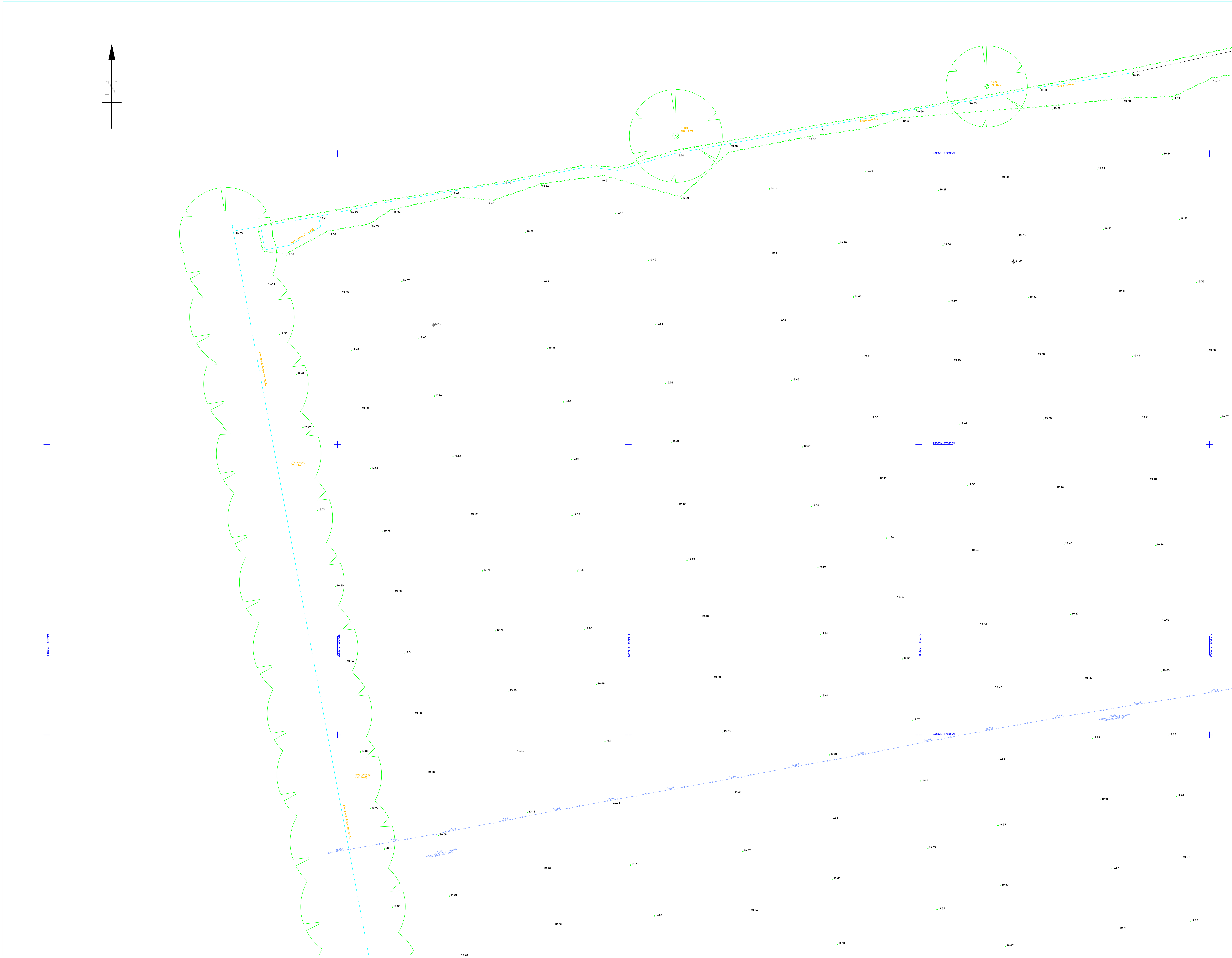
Document Number	Revision	Suitability
JKK9319 - 05	A	
Project Number / Originator - Zone - Level - Type - Role - Drawing Number		



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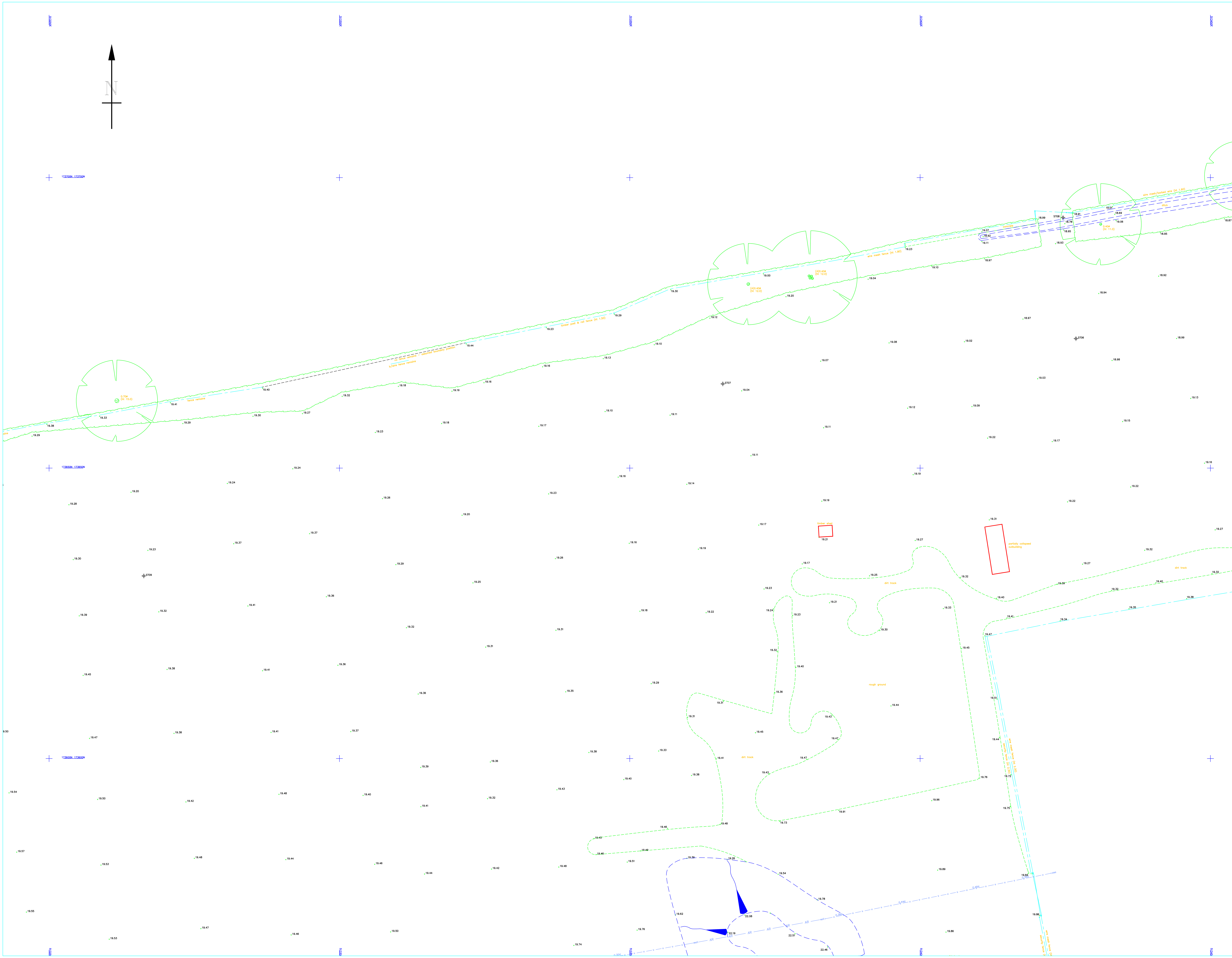

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pr – pipe riser
ptg – pipe to ground
pts – pipe to surface
re – rodding eye
ret wall – retaining wall
rs – road sign
rwp – rain water pipe
s/birch – silver birch
s/p – safety paving
sap – sapling
sec fence – security fence
sfc – soil filled chamber
sl – spot light
sp – soil pipe
st – stop tap
sv – stop valve
svp – soil vent pipe
sws – storm water sewer
TBM – temporary bench mark
tfr – taken from records
tl – threshold level
toc – top of cap
top – top of pipe
tot – top of tank
tp – telecom pole
ts – traffic signal
t/s – trench scar
u/s – underside
utl – unable to lift
utr – unable to rod
uts – unable to survey
utt – unable to trace
vp – vent pipe
wfc – water filled chamber
wl – water level
wm – water meter
wp – waste pipe
wr – water riser

SURVEY CONTROL :–

STATION	EASTINGS	NORTHINGS	LEVEL
ST01	513586.844	173601.307	19.932
ST02	513549.224	173595.177	19.262
ST03	513563.722	173621.003	19.539
ST04	513485.419	173646.001	19.181
ST05	513553.693	173672.464	18.991
ST06	513426.840	173672.286	18.993
ST07	513366.021	173664.497	19.070
ST08	513424.612	173693.123	18.877
ST09	513266.310	173631.436	19.291
ST10	513166.485	173620.547	19.410

SHEET LAYOUT :–

JKK9139_01
JKK9139_02
JKK9139_03
JKK9139_04
JKK9139_05

UTILITY SURVEY KEY :–

HATCHED AREA
BOREHOLE
CPT
TRIAL PIT
HAND PIT
WINDOW SAMPLE

ELECTRIC CABLE
W — WATER PIPE
FOUL SEWER
STORM SEWER
COMBINED SEWER
D — DUCTS
TV — CABLE TELEVISION
COM — DATA CABLE
TELECOM CABLE
G — GAS PIPE
U — UNIDENTIFIED SERVICE
OTHER
CCTV — CCTV
TL — TRAFFIC LIGHT
O — OFFSET FILL
V — VENT
F — FUEL PIPE
GL — GAUGE LINES
P — PIPE
AR — ASSUMED ROUTE
TFR — TAKEN FROM RECORDS

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

Please note that factors such as ground conditions, proximity of other utilities, material and method of construction have an influence on the quality of the data collected on site.

TSA Standards – "Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate."

UTILITY NOTES

MAINS GAS,ELEC AND WATER ENTER TIMBER BUILDING AT THE REAR, OF SURVEY AREA.
2X ANOMALIES LOCATED IN ENTRANCE ROAD AND CAR PARK AREA WITH GPR.
1X METALLIC SERVICE TRACED ACROSS THE FIELD. POSSIBLE GAS OR WATER.
UNABLE TO TRACE CUT CABLE RISER IN FIELD.
ANOMALIES ALSO LOCATED WITHIN FIELD AREA WITH GPR, POSSIBLE VOIDS OR PROMINENT GROUND CHANGE.
UNABLE TO TRACE GAS VIA GAS VALVES WITHIN PAVEMENT.

Rev	Description	By	Ckd	Date
A	ORIGINAL DRAWING ISSUE	MSL	AHP	29.06.17

Noble House, Capital Drive, Linford Wood,
Milton Keynes, MK14 6QP
T: 01908 669 898 E: rpsmks@rpsgroup.com F: 01908 302 625

Client TURNER & TOWNSEND

Project TURING HOUSE SCHOOL, HOSPITAL BRIDGE ROAD, HOUNSLOW, TW2 6LH

Title TOPOGRAPHICAL & UTILITY SURVEY

Status	Scale	Date Created
FINAL	1:200 @A0	29.06.17
Project Leader	**Drawn By**	**Checked by**
NB	MSL	AHP

Document Number	Revision	Suitability
JKK9319 - 02	A	

Project Number | Originator - Zone - Level - Type - Role - Drawing Number

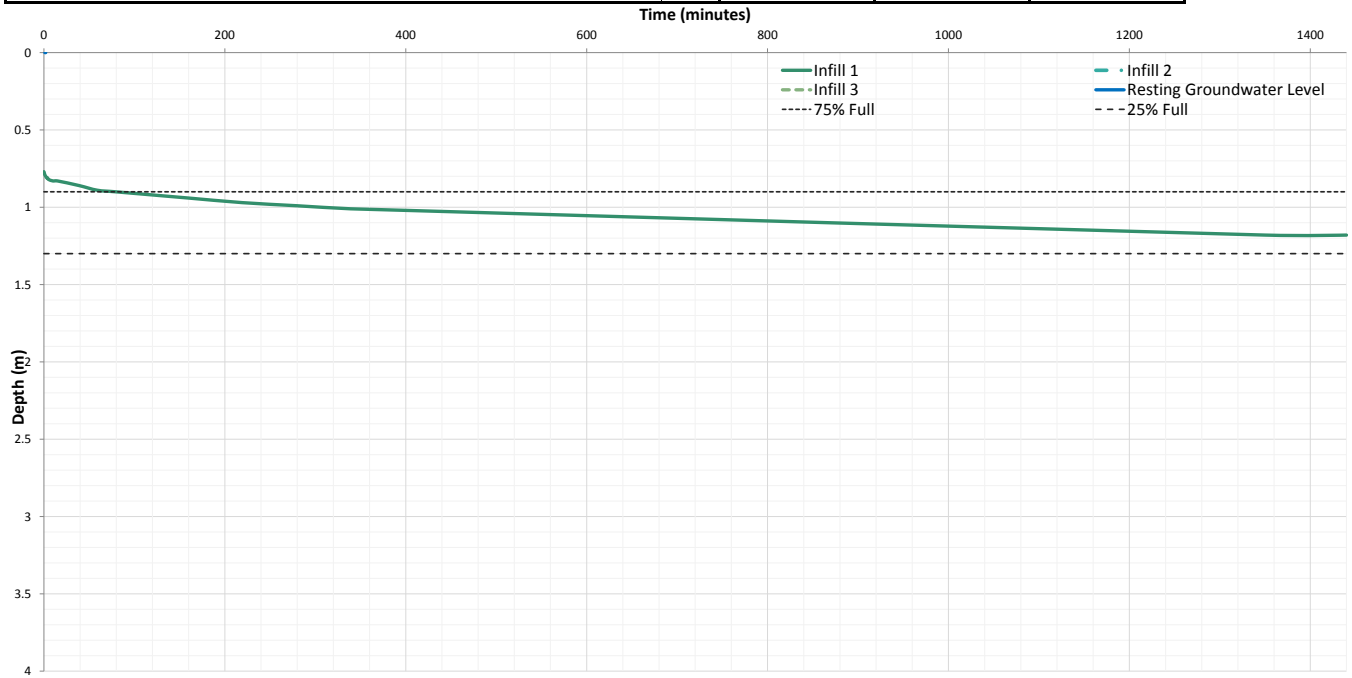
rpsgroup.com/uk

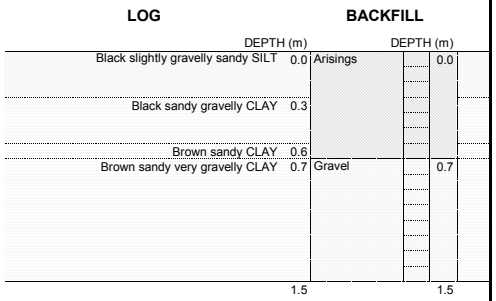
Appendix C Infiltration Test Results

	units	Infill 1	Infill 2	Infill 3
Length	m		2.00	
Width	m		0.60	
Depth	m		1.50	
Gravel type			20mm single size	
Voids ratio			0.40	
Resting groundwater level at time of testing	m		Dry	
Depth of first reading	m	0.77	0.00	0.00
Depth of final reading	m	1.18	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	0.87	0.00	0.00
Depth at 25% full/effective depth	m	1.08	0.00	0.00
Time at 75% full/effective depth	mins	47.33	#N/A	#N/A
Time at 25% full/effective depth	mins	740.77	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.10	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m^2	2.27	1.20	1.20
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	693.43	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate	
Failed Test	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





deltasimons

TITLE: Soakaway Test Results
Turing House
Bowmer and Kirkland

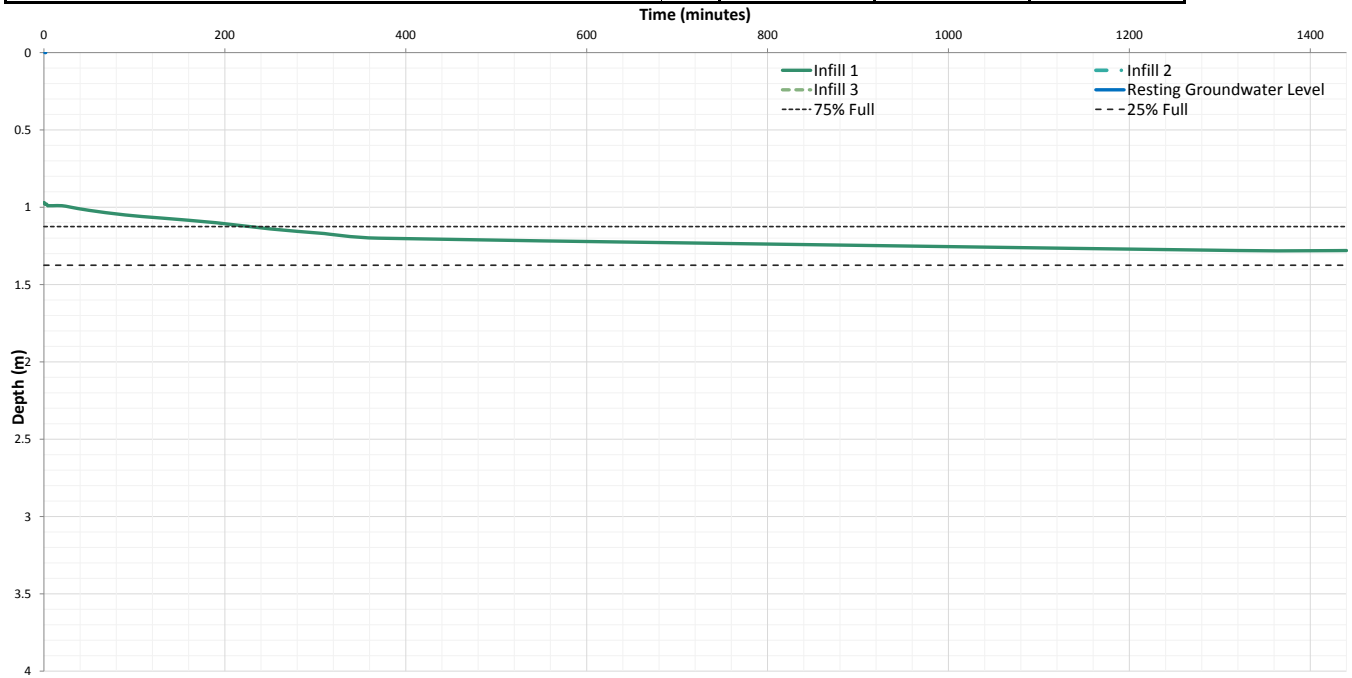
In accordance with BRE Digest 365 (2016)

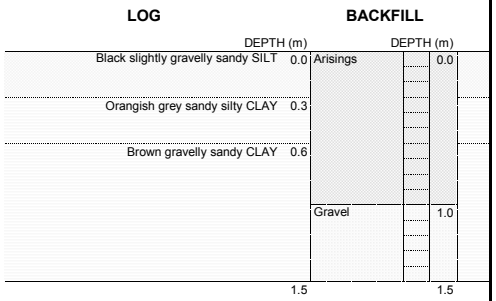
DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 18-0170.01
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA103
DATE: 20/03/2017		

	units	Infill 1	Infill 2	Infill 3
Length	m		2.00	
Width	m		0.60	
Depth	m		1.50	
Gravel type			20mm single size	
Voids ratio			0.40	
Resting groundwater level at time of testing	m		Dry	
Depth of first reading	m	0.97	0.00	0.00
Depth of final reading	m	1.28	0.00	0.00
Did soakage test reach 25% of maximum fill depth?		No	No	No
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	1.05	0.00	0.00
Depth at 25% full/effective depth	m	1.20	0.00	0.00
Time at 75% full/effective depth	mins	86.67	#N/A	#N/A
Time at 25% full/effective depth	mins	399.69	#N/A	#N/A
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.07	0.00	0.00
Mean surface area for outflow (50% full/effective depth)	m^2	2.01	1.20	1.20
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	313.02	#N/A	#N/A
Soil infiltration rate, f =	m/s	Failed Test	Failed Test	Failed Test
or	m/s	Failed Test	Failed Test	Failed Test

Recommended soil infiltration rate	
Failed Test	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





deltasimons

TITLE: Soakaway Test Results
Turing House
Bowmer and Kirkland

In accordance with BRE Digest 365 (2016)

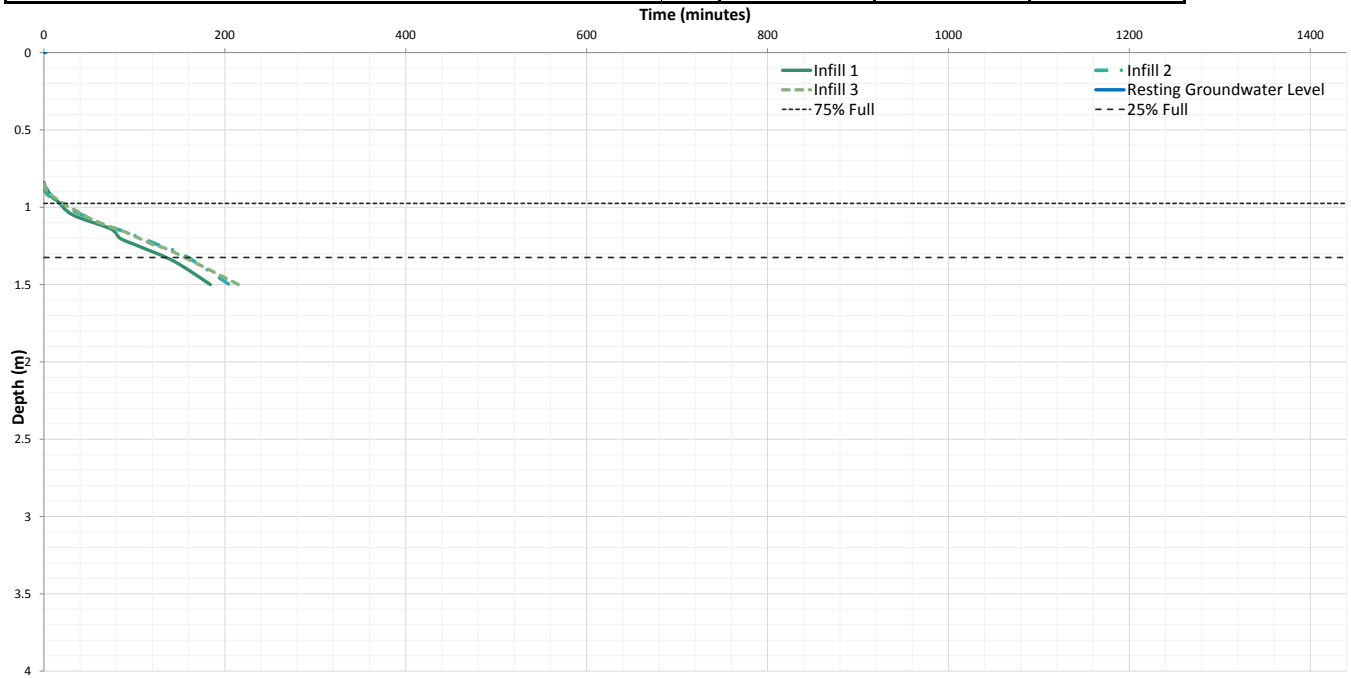
DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 18-0170.01	
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA102	
DATE: 20/03/2017			

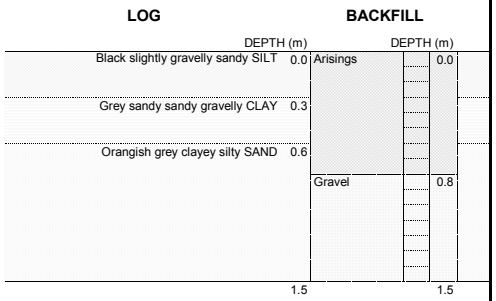
	units	Infill 1	Infill 2	Infill 3
Length	m		2.00	
Width	m		0.60	
Depth	m		1.50	
Gravel type			20mm single size	
Voids ratio			0.40	
Resting groundwater level at time of testing	m		Dry	
Depth of first reading	m	0.84	0.88	0.85
Depth of final reading	m	1.50	1.50	1.50
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		Yes	Yes	Yes
Depth at 75% full/effective depth	m	1.01	1.04	1.01
Depth at 25% full/effective depth	m	1.34	1.35	1.34
Time at 75% full/effective depth	mins	23.50	36.88	32.50
Time at 25% full/effective depth	mins	138.00	164.21	159.60
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.16	0.15	0.16
Mean surface area for outflow (50% full/effective depth)	m^2	2.92	2.81	2.89
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	114.50	127.34	127.10
Soil infiltration rate, f =	m/s	0.00000791	0.00000693	0.00000708
or	m/s	7.9E-06	6.9E-06	7.1E-06

Recommended soil infiltration rate

6.9E-06	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





deltasimons

TITLE: Soakaway Test Results
Turing House
Bowmer and Kirkland

In accordance with BRE Digest 365 (2016)

DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 18-0170.01	
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA101	
DATE: 20/03/2017			

Appendix D Greenfield Run-Off Rate Calculations

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	
Site name:	
Site location:	

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	51.45006° N
Longitude:	0.36935° W

Reference:	
Date:	2019-09-02 14:40

Methodology	IH124

Site characteristics

Total site area (ha)	4.75

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	600	600
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	7.23	7.23
1 in 1 year (l/s)	6.14	6.14
1 in 30 years (l/s)	16.62	16.62
1 in 100 years (l/s)	23.06	23.06

Appendix E MicroDrainage Network Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.403	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.650	4-8	0.866	8-12	0.003

Total Area Contributing (ha) = 1.519

Total Pipe Volume (m³) = 39.091

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	3.600	0.293	12.3	0.206	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	13.668	0.280	48.8	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	49.800	0.332	150.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	1.741	0.012	145.1	0.440	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	31.852	0.228	139.7	0.040	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	14.506	0.104	139.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.01	17.841	0.206	0.0	0.0	0.0	4.51	318.7	27.9
1.001	50.00	5.17	17.629	0.219	0.0	0.0	0.0	1.44	25.5«	29.7
2.000	50.00	6.01	17.694	0.000	0.0	0.0	0.0	0.82	14.5	0.0
2.001	50.00	6.05	17.362	0.440	0.0	0.0	0.0	0.83	14.7«	59.6
1.002	48.01	6.68	17.335	0.699	0.0	0.0	0.0	0.85	15.0«	90.9
1.003	47.03	6.96	17.108	0.699	0.0	0.0	0.0	0.85	15.0«	90.9

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	18.726	0.165	113.5	0.017	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	10.798	0.133	81.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.002	40.400	0.476	84.9	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	13.623	0.222	61.4	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	13.611	0.093	146.4	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	3.704	0.063	58.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	13.105	0.199	65.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	50.00	5.33	18.030	0.017	0.0	0.0	0.0	0.94	16.7	2.3
3.001	50.00	5.49	17.946	0.017	0.0	0.0	0.0	1.12	19.7	2.3
3.002	50.00	5.97	17.746	0.042	0.0	0.0	0.0	1.42	56.5	5.7
4.000	50.00	5.18	18.227	0.000	0.0	0.0	0.0	1.29	22.7	0.0
5.000	50.00	5.27	18.155	0.000	0.0	0.0	0.0	0.83	14.6	0.0
5.001	50.00	5.32	18.062	0.000	0.0	0.0	0.0	1.31	23.2	0.0
4.001	50.00	5.50	18.000	0.000	0.0	0.0	0.0	1.24	21.9	0.0

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
6.000	4.970	0.214	23.2	0.029	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	10.059	0.456	22.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	19.601	0.335	58.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
7.001	10.805	0.346	31.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.003	16.483	0.333	49.5	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
6.000	50.00	5.04	18.000	0.029	0.0	0.0	0.0	2.10	37.1	3.9
4.002	50.00	5.57	17.776	0.029	0.0	0.0	0.0	2.15	38.1	3.9
7.000	50.00	5.25	18.000	0.000	0.0	0.0	0.0	1.32	23.3	0.0
7.001	50.00	5.35	17.665	0.000	0.0	0.0	0.0	1.81	32.0	0.0
3.003	50.00	6.11	17.245	0.109	0.0	0.0	0.0	1.86	74.1	14.7

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.004	15.764	0.092	171.3	0.053	0.00	0.0	0.600	o	375	Pipe/Conduit	
8.000	24.025	0.411	58.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
8.001	5.353	0.092	58.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	48.879	0.092	531.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.000	35.349	0.153	231.0	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
9.001	5.290	0.153	34.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
9.002	39.057	0.250	156.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.004	46.40	7.15	16.756	0.861	0.0	0.0	0.0	1.38	152.6	108.1
8.000	50.00	5.30	18.000	0.000	0.0	0.0	0.0	1.32	23.3	0.0
8.001	50.00	5.37	17.589	0.000	0.0	0.0	0.0	1.32	23.3	0.0
1.005	43.24	8.20	16.589	0.861	0.0	0.0	0.0	0.78	86.1«	108.1
9.000	50.00	5.90	18.500	0.028	0.0	0.0	0.0	0.66	11.6	3.8
9.001	50.00	5.95	18.347	0.028	0.0	0.0	0.0	1.72	30.4	3.8
9.002	47.71	6.76	18.195	0.028	0.0	0.0	0.0	0.80	14.2	3.8

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Date 07/08/2020 09:54 | Designed by dimitrov_i
File FS0316-CUR-00-00-M3-C-9200-V10_SW_NETWORK... | Checked by
Innovyze | Network 2018.1.1

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
9.003	2.946	1.147	2.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	19.837	0.109	182.0	0.094	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.007	17.823	0.064	278.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
10.000	12.185	0.192	63.5	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
10.001	34.692	0.154	225.0	0.037	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.002	10.654	0.047	225.0	0.036	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.003	14.037	0.075	187.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.004	1.346	0.021	64.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.003	47.69	6.77	17.945	0.028	0.0	0.0	0.0	6.34	112.0	3.8
1.006	42.57	8.44	16.573	0.983	0.0	0.0	0.0	1.34	148.0	113.3
1.007	41.84	8.72	16.464	0.983	0.0	0.0	0.0	1.08	119.4	113.3
10.000	50.00	5.12	18.355	0.000	0.0	0.0	0.0	1.64	65.4	0.0
10.001	50.00	5.79	18.163	0.037	0.0	0.0	0.0	0.87	34.5	5.0
10.002	50.00	5.99	18.009	0.073	0.0	0.0	0.0	0.87	34.5	9.9
10.003	49.61	6.24	17.948	0.073	0.0	0.0	0.0	0.95	37.9	9.9
10.004	49.57	6.25	17.796	0.073	0.0	0.0	0.0	1.97	139.0	9.9

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
10.005	59.827	0.322	185.9	0.027	0.00	0.0	0.600	o	300	Pipe/Conduit	
10.006	7.145	0.041	173.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
10.007	14.226	0.079	181.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
10.008	39.489	0.238	165.7	0.127	0.00	0.0	0.600	o	300	Pipe/Conduit	
11.000	40.628	0.229	177.4	0.043	5.00	0.0	0.600	o	150	Pipe/Conduit	
11.001	30.063	0.175	171.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
12.000	30.553	0.209	146.2	0.111	5.00	0.0	0.600	o	225	Pipe/Conduit	
12.001	8.071	0.177	45.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.005	46.50	7.12	17.756	0.100	0.0	0.0	0.0	1.15	81.3	12.6
10.006	46.17	7.22	17.423	0.100	0.0	0.0	0.0	1.19	84.2	12.6
10.007	45.52	7.42	17.371	0.100	0.0	0.0	0.0	1.16	82.3	12.6
10.008	43.90	7.96	17.295	0.227	0.0	0.0	0.0	1.22	86.1	27.0
11.000	50.00	5.90	17.950	0.043	0.0	0.0	0.0	0.75	13.3	5.8
11.001	48.43	6.56	17.721	0.043	0.0	0.0	0.0	0.76	13.5	5.8
12.000	50.00	5.47	17.950	0.111	0.0	0.0	0.0	1.08	42.9	15.0
12.001	50.00	5.54	17.741	0.111	0.0	0.0	0.0	1.94	77.2	15.0

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
13.000	31.863	0.234	136.2	0.047	5.00	0.0	0.600	o	150	Pipe/Conduit	
13.001	6.231	0.076	82.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
12.002	2.728	0.083	32.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
14.000	11.038	0.074	149.2	0.017	5.00	0.0	0.600	o	150	Pipe/Conduit	
14.001	28.039	0.454	61.8	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
12.003	8.018	0.100	80.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
13.000	50.00	5.62	17.950	0.047	0.0	0.0	0.0	0.86	15.2	6.4
13.001	50.00	5.71	17.716	0.047	0.0	0.0	0.0	1.11	19.6	6.4
12.002	50.00	5.73	17.564	0.158	0.0	0.0	0.0	2.29	91.1	21.4
14.000	50.00	5.22	18.098	0.017	0.0	0.0	0.0	0.82	14.5	2.3
14.001	50.00	5.59	18.024	0.037	0.0	0.0	0.0	1.28	22.7	5.0
12.003	50.00	5.82	17.481	0.195	0.0	0.0	0.0	1.46	58.1	26.4

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
15.000	29.842	0.510	58.5	0.072	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	5.461	0.050	109.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.009	18.504	0.162	114.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
15.000	50.00	5.38	17.500	0.072	0.0	0.0	0.0	1.32	23.3	9.8
1.008	41.71	8.77	16.400	1.519	0.0	0.0	0.0	1.73	191.4	171.6
1.009	41.27	8.95	16.350	1.519	0.0	0.0	0.0	1.69	187.2	171.6

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	SW01	19.300	17.841	1.159	Open Manhole	1200
1.001	o	150	SW02A	19.308	17.629	1.529	Open Manhole	600
2.000	o	150	SW09	19.300	17.694	1.456	Open Manhole	450
2.001	o	150	SW10	19.300	17.362	1.788	Open Manhole	600
1.002	o	150	SW02B	19.276	17.335	1.791	Open Manhole	600
1.003	o	150	SW03	19.166	17.108	1.908	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	3.600	12.3	SW02A	19.308	17.548	1.460	Open Manhole	600
1.001	13.668	48.8	SW02B	19.276	17.348	1.778	Open Manhole	600
2.000	49.800	150.0	SW10	19.300	17.362	1.788	Open Manhole	600
2.001	1.741	145.1	SW02B	19.276	17.350	1.776	Open Manhole	600
1.002	31.852	139.7	SW03	19.166	17.107	1.909	Open Manhole	1200
1.003	14.506	139.5	SW04	19.125	17.004	1.971	Open Manhole	1350

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
3.000	o	150	SW11	19.050	18.030	0.870	Open Manhole	600
3.001	o	150	8	19.040	17.946	0.944	Open Manhole	1050
3.002	o	225	SW12	19.350	17.746	1.379	Open Manhole	600
4.000	o	150	10	19.020	18.227	0.643	Open Manhole	1050
5.000	o	150	11	19.020	18.155	0.715	Open Manhole	1050
5.001	o	150	12	19.020	18.062	0.808	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
3.000	18.726	113.5	8	19.040	17.865	1.025	Open Manhole	1050
3.001	10.798	81.3	SW12	19.350	17.813	1.387	Open Manhole	600
3.002	40.400	84.9	SW13	19.100	17.270	1.605	Open Manhole	1200
4.000	13.623	61.4	SW14	19.098	18.005	0.943	Open Manhole	450
5.000	13.611	146.4	12	19.020	18.062	0.808	Open Manhole	1050
5.001	3.704	58.8	SW14	19.098	17.999	0.949	Open Manhole	450

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.001	o	150	SW14	19.098	18.000	0.948	Open Manhole	450
6.000	o	150	14	19.100	18.000	0.950	Open Manhole	1050
4.002	o	150	SW15	19.066	17.776	1.140	Open Manhole	1200
7.000	o	150	15	19.050	18.000	0.900	Open Manhole	1050
7.001	o	150	16	19.050	17.665	1.235	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.001	13.105	65.9	SW15	19.066	17.801	1.115	Open Manhole	1200
6.000	4.970	23.2	SW15	19.066	17.786	1.130	Open Manhole	1200
4.002	10.059	22.1	SW13	19.100	17.320	1.630	Open Manhole	1200
7.000	19.601	58.5	16	19.050	17.665	1.235	Open Manhole	1050
7.001	10.805	31.2	SW13	19.100	17.319	1.631	Open Manhole	1200

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
3.003	o	225	SW13	19.100	17.245	1.630	Open Manhole	1200
1.004	o	375	SW04	19.125	16.756	1.994	Open Manhole	1350
8.000	o	150	20	19.050	18.000	0.900	Open Manhole	1050
8.001	o	150	21	19.050	17.589	1.311	Open Manhole	1050
1.005	o	375	20	19.100	16.589	2.136	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
3.003	16.483	49.5	SW04	19.125	16.912	1.988	Open Manhole	1350
1.004	15.764	171.3	20	19.100	16.664	2.061	Open Manhole	1350
8.000	24.025	58.5	21	19.050	17.589	1.311	Open Manhole	1050
8.001	5.353	58.2	20	19.100	17.497	1.453	Open Manhole	1350
1.005	48.879	531.3	SW05	19.100	16.497	2.228	Open Manhole	1350

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.000	o	150	SW16	19.130	18.500	0.480	Open Manhole	450
9.001	o	150	20	19.000	18.347	0.503	Open Manhole	1050
9.002	o	150	SW17	19.060	18.195	0.715	Open Manhole	600
9.003	o	150	SW18	19.050	17.945	0.955	Open Manhole	600
1.006	o	375	SW05	19.100	16.573	2.152	Open Manhole	1350
1.007	o	375	SW06	19.060	16.464	2.221	Open Manhole	1350
10.000	o	225	SW19	19.100	18.355	0.520	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.000	35.349	231.0	20	19.000	18.347	0.503	Open Manhole	1050
9.001	5.290	34.6	SW17	19.060	18.194	0.716	Open Manhole	600
9.002	39.057	156.2	SW18	19.050	17.945	0.955	Open Manhole	600
9.003	2.946	2.6	SW05	19.100	16.798	2.152	Open Manhole	1350
1.006	19.837	182.0	SW06	19.060	16.464	2.221	Open Manhole	1350
1.007	17.823	278.5	TANK	18.941	16.400	2.166	Open Manhole	1350
10.000	12.185	63.5	19	19.100	18.163	0.712	Open Manhole	1050

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
10.001	o	225	19	19.100	18.163	0.712	Open Manhole	1050
10.002	o	225	20	19.100	18.009	0.866	Open Manhole	1050
10.003	o	225	SW20	19.100	17.948	0.927	Open Manhole	600
10.004	o	300	SW21	19.100	17.796	1.004	Open Manhole	600
10.005	o	300	SW22	19.100	17.756	1.044	Open Manhole	600
10.006	o	300	SW24	19.100	17.423	1.377	Open Manhole	600
10.007	o	300	SW25	19.100	17.371	1.429	Open Manhole	600
10.008	o	300	SW26	19.100	17.295	1.505	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
10.001	34.692	225.0	20	19.100	18.009	0.866	Open Manhole	1050
10.002	10.654	225.0	SW20	19.100	17.961	0.914	Open Manhole	600
10.003	14.037	187.2	SW21	19.100	17.873	1.002	Open Manhole	600
10.004	1.346	64.1	SW22	19.100	17.775	1.025	Open Manhole	600
10.005	59.827	185.9	SW24	19.100	17.435	1.365	Open Manhole	600
10.006	7.145	173.2	SW25	19.100	17.382	1.418	Open Manhole	600
10.007	14.226	181.2	SW26	19.100	17.292	1.508	Open Manhole	1200
10.008	39.489	165.7	TANK	18.941	17.057	1.585	Open Manhole	1350

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
11.000	o	150	SW33	19.300	17.950	1.200	Open Manhole	450
11.001	o	150	SW34	19.110	17.721	1.239	Open Manhole	450
12.000	o	225	SW27	18.849	17.950	0.674	Open Manhole	600
12.001	o	225	SW28	18.857	17.741	0.891	Open Manhole	600
13.000	o	150	SW31	18.840	17.950	0.740	Open Manhole	600
13.001	o	150	SW32	18.861	17.716	0.995	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
11.000	40.628	177.4	SW34	19.110	17.721	1.239	Open Manhole	450
11.001	30.063	171.8	TANK	18.941	17.546	1.245	Open Manhole	1350
12.000	30.553	146.2	SW28	18.857	17.741	0.891	Open Manhole	600
12.001	8.071	45.6	SW29	19.175	17.564	1.386	Open Manhole	1200
13.000	31.863	136.2	SW32	18.861	17.716	0.995	Open Manhole	1200
13.001	6.231	82.0	SW29	19.175	17.640	1.385	Open Manhole	1200

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
12.002	o	225	SW29	19.175	17.564	1.386	Open Manhole	1200
14.000	o	150	SW35	19.380	18.098	1.132	Open Manhole	600
14.001	o	150	SW36	19.320	18.024	1.146	Open Manhole	600
12.003	o	225	SW30	19.175	17.481	1.469	Open Manhole	1200
15.000	o	150	53	19.000	17.500	1.350	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
12.002	2.728	32.9	SW30	19.175	17.481	1.469	Open Manhole	1200
14.000	11.038	149.2	SW36	19.320	18.024	1.146	Open Manhole	600
14.001	28.039	61.8	SW30	19.175	17.570	1.455	Open Manhole	1200
12.003	8.018	80.2	TANK	18.941	17.381	1.335	Open Manhole	1350
15.000	29.842	58.5	TANK	18.941	16.990	1.801	Open Manhole	1350

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.008	o	375	TANK	18.941	16.400	2.166	Open Manhole	1350
1.009	o	375	SW07	19.126	16.350	2.401	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.008	5.461	109.2	SW07	19.126	16.350	2.401	Open Manhole	1350
1.009	18.504	114.2	SW08	19.569	16.188	3.006	Open Manhole	1350

Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.206	0.206	0.206
1.001	User	-	100	0.013	0.013	0.013
2.000	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.440	0.440	0.440
1.002	User	-	100	0.040	0.040	0.040
1.003	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.017	0.017	0.017
3.001	-	-	100	0.000	0.000	0.000
3.002	User	-	100	0.025	0.025	0.025
4.000	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.000	0.000	0.000
5.001	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.029	0.029	0.029
4.002	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
7.001	-	-	100	0.000	0.000	0.000
3.003	User	-	100	0.039	0.039	0.039
1.004	User	-	100	0.011	0.011	0.011
	User	-	100	0.013	0.013	0.024
	User	-	100	0.029	0.029	0.053
8.000	-	-	100	0.000	0.000	0.000
8.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.010	0.010	0.010
	User	-	100	0.018	0.018	0.028
9.001	-	-	100	0.000	0.000	0.000

Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
9.002	-	-	100	0.000	0.000	0.000
9.003	-	-	100	0.000	0.000	0.000
1.006	User	-	100	0.094	0.094	0.094
1.007	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.000	0.000	0.000
10.001	User	-	100	0.037	0.037	0.037
10.002	User	-	100	0.036	0.036	0.036
10.003	-	-	100	0.000	0.000	0.000
10.004	-	-	100	0.000	0.000	0.000
10.005	User	-	100	0.027	0.027	0.027
10.006	-	-	100	0.000	0.000	0.000
10.007	-	-	100	0.000	0.000	0.000
10.008	User	-	100	0.127	0.127	0.127
11.000	User	-	100	0.043	0.043	0.043
11.001	-	-	100	0.000	0.000	0.000
12.000	User	-	100	0.111	0.111	0.111
12.001	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.047	0.047	0.047
13.001	-	-	100	0.000	0.000	0.000
12.002	-	-	100	0.000	0.000	0.000
14.000	User	-	100	0.017	0.017	0.017
14.001	User	-	100	0.020	0.020	0.020
12.003	-	-	100	0.000	0.000	0.000
15.000	User	-	100	0.072	0.072	0.072
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total

Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
				1.519	1.519	1.519

Network Classifications for Surface Network 1

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	SW01	300	1.159	1.460	Unclassified	1200	0	1.159	Unclassified
1.001	SW02A	150	1.529	1.778	Unclassified	600	0	1.529	Unclassified
2.000	SW09	150	1.456	1.788	Unclassified	450	0	1.456	Unclassified
2.001	SW10	150	1.776	1.788	Unclassified	600	0	1.788	Unclassified
1.002	SW02B	150	1.791	1.909	Unclassified	600	0	1.791	Unclassified
1.003	SW03	150	1.908	1.971	Unclassified	1200	0	1.908	Unclassified
3.000	SW11	150	0.870	1.025	Unclassified	600	0	0.870	Unclassified
3.001	8	150	0.944	1.387	Unclassified	1050	0	0.944	Unclassified
3.002	SW12	225	1.379	1.605	Unclassified	600	0	1.379	Unclassified
4.000	10	150	0.643	0.943	Unclassified	1050	0	0.643	Unclassified
5.000	11	150	0.715	0.808	Unclassified	1050	0	0.715	Unclassified
5.001	12	150	0.808	0.949	Unclassified	1050	0	0.808	Unclassified
4.001	SW14	150	0.948	1.115	Unclassified	450	0	0.948	Unclassified
6.000	14	150	0.950	1.130	Unclassified	1050	0	0.950	Unclassified
4.002	SW15	150	1.140	1.630	Unclassified	1200	0	1.140	Unclassified
7.000	15	150	0.900	1.235	Unclassified	1050	0	0.900	Unclassified
7.001	16	150	1.235	1.631	Unclassified	1050	0	1.235	Unclassified
3.003	SW13	225	1.630	1.988	Unclassified	1200	0	1.630	Unclassified
1.004	SW04	375	1.994	2.061	Unclassified	1350	0	1.994	Unclassified
8.000	20	150	0.900	1.311	Unclassified	1050	0	0.900	Unclassified
8.001	21	150	1.311	1.453	Unclassified	1050	0	1.311	Unclassified
1.005	20	375	2.136	2.228	Unclassified	1350	0	2.136	Unclassified
9.000	SW16	150	0.480	0.503	Unclassified	450	0	0.480	Unclassified
9.001	20	150	0.503	0.716	Unclassified	1050	0	0.503	Unclassified
9.002	SW17	150	0.715	0.955	Unclassified	600	0	0.715	Unclassified

Network Classifications for Surface Network 1

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
9.003	SW18	150	0.955	2.152	Unclassified	600	0	0.955	Unclassified
1.006	SW05	375	2.152	2.221	Unclassified	1350	0	2.152	Unclassified
1.007	SW06	375	2.166	2.221	Unclassified	1350	0	2.221	Unclassified
10.000	SW19	225	0.520	0.712	Unclassified	450	0	0.520	Unclassified
10.001	19	225	0.712	0.866	Unclassified	1050	0	0.712	Unclassified
10.002	20	225	0.866	0.914	Unclassified	1050	0	0.866	Unclassified
10.003	SW20	225	0.927	1.002	Unclassified	600	0	0.927	Unclassified
10.004	SW21	300	1.004	1.025	Unclassified	600	0	1.004	Unclassified
10.005	SW22	300	1.044	1.365	Unclassified	600	0	1.044	Unclassified
10.006	SW24	300	1.377	1.418	Unclassified	600	0	1.377	Unclassified
10.007	SW25	300	1.429	1.508	Unclassified	600	0	1.429	Unclassified
10.008	SW26	300	1.505	1.585	Unclassified	1200	0	1.505	Unclassified
11.000	SW33	150	1.200	1.239	Unclassified	450	0	1.200	Unclassified
11.001	SW34	150	1.239	1.245	Unclassified	450	0	1.239	Unclassified
12.000	SW27	225	0.674	0.891	Unclassified	600	0	0.674	Unclassified
12.001	SW28	225	0.891	1.386	Unclassified	600	0	0.891	Unclassified
13.000	SW31	150	0.740	0.995	Unclassified	600	0	0.740	Unclassified
13.001	SW32	150	0.995	1.385	Unclassified	1200	0	0.995	Unclassified
12.002	SW29	225	1.386	1.469	Unclassified	1200	0	1.386	Unclassified
14.000	SW35	150	1.132	1.146	Unclassified	600	0	1.132	Unclassified
14.001	SW36	150	1.146	1.455	Unclassified	600	0	1.146	Unclassified
12.003	SW30	225	1.335	1.469	Unclassified	1200	0	1.469	Unclassified
15.000	53	150	1.350	1.801	Unclassified	1050	0	1.350	Unclassified
1.008	TANK	375	2.166	2.401	Unclassified	1350	0	2.166	Unclassified
1.009	SW07	375	2.401	3.006	Unclassified	1350	0	2.401	Unclassified

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	SW08	19.569	16.188	0.000	1350	0

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	9	Number of Storage Structures	9	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Return Period (years)	1	Ratio R	0.403	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Surface Network 1

Orifice Manhole: SW02A, DS/PN: 1.001, Volume (m³): 0.7

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 17.629

Hydro-Brake® Optimum Manhole: SW10, DS/PN: 2.001, Volume (m³): 1.4

Unit Reference	MD-SHE-0061-1800-1200-1800	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	61
Design Flow (l/s)	1.8	Invert Level (m)	17.362
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.8	Kick-Flo®	0.542	1.3
Flush-Flo™	0.265	1.5	Mean Flow over Head Range	-	1.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	0.500	1.4	1.200	1.8	2.000	2.3	3.000	2.7	5.000	3.5
0.200	1.5	0.600	1.3	1.400	1.9	2.200	2.4	3.500	2.9	5.500	3.6
0.300	1.5	0.800	1.5	1.600	2.0	2.400	2.5	4.000	3.1	6.000	3.8
0.400	1.5	1.000	1.7	1.800	2.2	2.600	2.6	4.500	3.3	6.500	3.9

Hydro-Brake® Optimum Manhole: SW10, DS/PN: 2.001, Volume (m³): 1.4

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
7.000	4.1	7.500	4.2	8.000	4.3	8.500	4.4	9.000	4.6	9.500	4.7

Orifice Manhole: 12, DS/PN: 5.001, Volume (m³): 1.1

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 18.062

Orifice Manhole: 16, DS/PN: 7.001, Volume (m³): 1.5

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 17.665

Orifice Manhole: 21, DS/PN: 8.001, Volume (m³): 1.7

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 17.589

Orifice Manhole: SW34, DS/PN: 11.001, Volume (m³): 0.9

Diameter (m) 0.080 Discharge Coefficient 0.600 Invert Level (m) 17.721

Orifice Manhole: SW28, DS/PN: 12.001, Volume (m³): 1.5

Diameter (m) 0.130 Discharge Coefficient 0.600 Invert Level (m) 17.741

Orifice Manhole: SW32, DS/PN: 13.001, Volume (m³): 1.8

Diameter (m) 0.070 Discharge Coefficient 0.600 Invert Level (m) 17.716

Hydro-Brake® Optimum Manhole: TANK, DS/PN: 1.008, Volume (m³): 9.4

Unit Reference	MD-SHE-0122-7200-1200-7200	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	122
Design Flow (l/s)	7.2	Invert Level (m)	16.400
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	7.2	Kick-Flo®	0.755	5.8
Flush-Flo™	0.350	7.2	Mean Flow over Head Range	-	6.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.4	0.600	6.8	1.600	8.2	2.600	10.4	5.000	14.1	7.500	17.2
0.200	6.8	0.800	6.0	1.800	8.7	3.000	11.1	5.500	14.8	8.000	17.7
0.300	7.2	1.000	6.6	2.000	9.1	3.500	11.9	6.000	15.4	8.500	18.2
0.400	7.2	1.200	7.2	2.200	9.6	4.000	12.7	6.500	16.0	9.000	18.7
0.500	7.0	1.400	7.7	2.400	10.0	4.500	13.4	7.000	16.6	9.500	19.2

Storage Structures for Surface Network 1

Porous Car Park Manhole: SW02A, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	18.950	Depression Storage (mm)	5
Max Percolation (l/s)	557.6	Width (m)	36.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	55.0	Membrane Depth (mm)	0

Cellular Storage Manhole: SW10, DS/PN: 2.001

Invert Level (m)	17.362	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	290.0	0.0	1.200	290.0	0.0	1.201	0.0	0.0

Porous Car Park Manhole: 12, DS/PN: 5.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	60.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	18.061	Depression Storage (mm)	5
Max Percolation (l/s)	23.5	Width (m)	6.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	13.0	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: 16, DS/PN: 7.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	16.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	17.665	Depression Storage (mm)	5
Max Percolation (l/s)	42.2	Width (m)	7.6	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	20.0	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: 21, DS/PN: 8.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	70.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	17.589	Depression Storage (mm)	5
Max Percolation (l/s)	26.9	Width (m)	5.7	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	17.0	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SW34, DS/PN: 11.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	151.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	18.900	Depression Storage (mm)	5
Max Percolation (l/s)	54.7	Width (m)	4.8	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	41.0	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SW28, DS/PN: 12.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	17.741	Depression Storage (mm)	5
Max Percolation (l/s)	43.3	Width (m)	4.8	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	32.5	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: SW32, DS/PN: 13.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	17.716	Depression Storage (mm)	5
Max Percolation (l/s)	48.0	Width (m)	4.8	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	36.0	Cap Volume Depth (m)	0.350

Cellular Storage Manhole: TANK, DS/PN: 1.008

Invert Level (m)	16.400	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	560.0	0.0	1.200	560.0	0.0	1.201	0.0	0.0

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Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Total Volume (m³)
1.000	SW01	1.650	1.650
1.001	SW02A	0.475	0.475
2.000	SW09	0.255	0.255
2.001	SW10	0.548	0.548
1.002	SW02B	0.549	0.549
1.003	SW03	2.327	2.327
3.000	SW11	0.288	0.288
3.001	8	0.948	0.948
3.002	SW12	0.454	0.454
4.000	10	0.687	0.687
5.000	11	0.749	0.749
5.001	12	0.830	0.830
4.001	SW14	0.175	0.175
6.000	14	0.952	0.952
4.002	SW15	1.459	1.459
7.000	15	0.909	0.909
7.001	16	1.199	1.199
3.003	SW13	2.098	2.098
1.004	SW04	3.391	3.391
8.000	20	0.909	0.909
8.001	21	1.265	1.265
1.005	20	3.594	3.594
9.000	SW16	0.100	0.100
9.001	20	0.565	0.565
9.002	SW17	0.245	0.245

Volume Summary (Static)

Pipe Number	USMH Name	Manhole Volume (m³)	Total Volume (m³)
9.003	SW18	0.312	0.312
1.006	SW05	3.617	3.617
1.007	SW06	3.716	3.716
10.000	SW19	0.118	0.118
10.001	19	0.811	0.811
10.002	20	0.945	0.945
10.003	SW20	0.326	0.326
10.004	SW21	0.369	0.369
10.005	SW22	0.380	0.380
10.006	SW24	0.474	0.474
10.007	SW25	0.489	0.489
10.008	SW26	2.042	2.042
11.000	SW33	0.215	0.215
11.001	SW34	0.221	0.221
12.000	SW27	0.254	0.254
12.001	SW28	0.316	0.316
13.000	SW31	0.252	0.252
13.001	SW32	1.295	1.295
12.002	SW29	1.822	1.822
14.000	SW35	0.362	0.362
14.001	SW36	0.366	0.366
12.003	SW30	1.915	1.915
15.000	53	1.299	1.299
1.008	TANK	3.638	3.638
1.009	SW07	3.973	3.973
Total		56.148	56.148

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Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Total Volume (m³)
1.000	SW01	1.650	1.650
1.001	SW02A	0.475	0.475
2.000	SW09	0.255	0.255
2.001	SW10	0.548	0.548
1.002	SW02B	0.549	0.549
1.003	SW03	2.327	2.327
3.000	SW11	0.288	0.288
3.001	8	0.948	0.948
3.002	SW12	0.454	0.454
4.000	10	0.687	0.687
5.000	11	0.749	0.749
5.001	12	0.830	0.830
4.001	SW14	0.175	0.175
6.000	14	0.952	0.952
4.002	SW15	1.459	1.459
7.000	15	0.909	0.909
7.001	16	1.199	1.199
3.003	SW13	2.098	2.098
1.004	SW04	3.391	3.391
8.000	20	0.909	0.909
8.001	21	1.265	1.265
1.005	20	3.594	3.594
9.000	SW16	0.100	0.100
9.001	20	0.565	0.565
9.002	SW17	0.245	0.245

Volume Summary (Static)

Pipe Number	USMH Name	Manhole Volume (m³)	Total Volume (m³)
9.003	SW18	0.312	0.312
1.006	SW05	3.617	3.617
1.007	SW06	3.716	3.716
10.000	SW19	0.118	0.118
10.001	19	0.811	0.811
10.002	20	0.945	0.945
10.003	SW20	0.326	0.326
10.004	SW21	0.369	0.369
10.005	SW22	0.380	0.380
10.006	SW24	0.474	0.474
10.007	SW25	0.489	0.489
10.008	SW26	2.042	2.042
11.000	SW33	0.215	0.215
11.001	SW34	0.221	0.221
12.000	SW27	0.254	0.254
12.001	SW28	0.316	0.316
13.000	SW31	0.252	0.252
13.001	SW32	1.295	1.295
12.002	SW29	1.822	1.822
14.000	SW35	0.362	0.362
14.001	SW36	0.366	0.366
12.003	SW30	1.915	1.915
15.000	53	1.299	1.299
1.008	TANK	3.638	3.638
1.009	SW07	3.973	3.973
Total		56.148	56.148

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

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

Number of Input Hydrographs 0 | Number of Offline Controls 0 | Number of Time/Area Diagrams 0
Number of Online Controls 9 | Number of Storage Structures 9 | Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model | FSR M5-60 (mm) 20.000 | Cv (Summer) 0.750
Region England and Wales | Ratio R 0.404 | Cv (Winter) 0.840

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

Profile(s): Summer and Winter
Duration(s) (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years): 1, 30, 100
Climate Change (%): 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	SW01	180 Winter	1	+0%	1/15 Summer	100/15 Winter			19.017	0.876	0.000	0.05		7.1
1.001	SW02A	180 Winter	1	+0%	1/15 Summer				19.017	1.238	0.000	0.09		2.2

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.000	SW01	FLOOD RISK	1
1.001	SW02A	FLOOD RISK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
2.000	SW09	360 Winter	1	+0%	30/180 Winter				17.694	-0.150	0.000	0.00		0.0
2.001	SW10	600 Winter	1	+0%	1/60 Winter				17.583	0.071	0.000	0.14		1.5
1.002	SW02B	15 Winter	1	+0%	30/15 Summer				17.408	-0.077	0.000	0.47		6.7
1.003	SW03	15 Winter	1	+0%	30/15 Summer				17.182	-0.076	0.000	0.49		6.7
3.000	SW11	15 Winter	1	+0%					18.069	-0.111	0.000	0.15		2.3
3.001	8	15 Winter	1	+0%					17.982	-0.114	0.000	0.13		2.3
3.002	SW12	15 Winter	1	+0%					17.793	-0.178	0.000	0.10		5.2
4.000	10	360 Winter	1	+0%					18.227	-0.150	0.000	0.00		0.0
5.000	11	360 Winter	1	+0%					18.155	-0.150	0.000	0.00		0.0
5.001	12	360 Winter	1	+0%					18.061	-0.151	0.000	0.00		0.0
4.001	SW14	360 Winter	1	+0%					17.999	-0.151	0.000	0.00		0.0
6.000	14	15 Winter	1	+0%					18.037	-0.113	0.000	0.14		4.0
4.002	SW15	15 Winter	1	+0%					17.810	-0.116	0.000	0.12		3.9
7.000	15	360 Winter	1	+0%					18.000	-0.150	0.000	0.00		0.0
7.001	16	360 Winter	1	+0%					17.665	-0.150	0.000	0.00		0.0
3.003	SW13	15 Winter	1	+0%	100/15 Summer				17.315	-0.155	0.000	0.21		13.7
1.004	SW04	15 Winter	1	+0%	100/15 Summer				16.875	-0.256	0.000	0.22		26.4
8.000	20	360 Winter	1	+0%					18.000	-0.150	0.000	0.00		0.0
8.001	21	360 Winter	1	+0%					17.589	-0.150	0.000	0.00		0.0
1.005	20	15 Winter	1	+0%	30/480 Winter				16.761	-0.203	0.000	0.31		24.9
9.000	SW16	15 Winter	1	+0%	100/15 Summer				18.562	-0.088	0.000	0.34		3.8
9.001	20	15 Winter	1	+0%					18.386	-0.111	0.000	0.16		3.8
9.002	SW17	15 Winter	1	+0%	100/15 Summer				18.249	-0.096	0.000	0.27		3.7
9.003	SW18	15 Winter	1	+0%					17.968	-0.127	0.000	0.05		3.7
1.006	SW05	15 Winter	1	+0%	30/480 Winter				16.715	-0.233	0.000	0.30		37.8

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
2.000	SW09	OK	
2.001	SW10	SURCHARGED	
1.002	SW02B	OK	
1.003	SW03	OK	
3.000	SW11	OK	
3.001	8	OK	
3.002	SW12	OK	
4.000	10	OK	
5.000	11	OK	
5.001	12	OK	
4.001	SW14	OK	
6.000	14	OK	
4.002	SW15	OK	
7.000	15	OK	
7.001	16	OK	
3.003	SW13	OK	
1.004	SW04	OK	
8.000	20	OK	
8.001	21	OK	
1.005	20	OK	
9.000	SW16	OK	
9.001	20	OK	
9.002	SW17	OK	
9.003	SW18	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.006	SW05	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.007	SW06	600 Winter	1	+0%	30/120 Winter				16.638	-0.201	0.000	0.08		8.1
10.000	SW19	360 Winter	1	+0%					18.355	-0.225	0.000	0.00		0.0
10.001	19	15 Winter	1	+0%	100/15 Summer				18.218	-0.170	0.000	0.13		4.3
10.002	20	15 Winter	1	+0%	100/15 Summer				18.092	-0.142	0.000	0.29		8.5
10.003	SW20	15 Winter	1	+0%	100/15 Summer				18.025	-0.148	0.000	0.26		8.5
10.004	SW21	15 Winter	1	+0%	100/15 Summer				17.873	-0.224	0.000	0.15		8.5
10.005	SW22	15 Winter	1	+0%	100/15 Summer				17.834	-0.223	0.000	0.15		11.2
10.006	SW24	15 Winter	1	+0%	100/15 Summer				17.509	-0.214	0.000	0.18		11.1
10.007	SW25	15 Winter	1	+0%	100/15 Summer				17.453	-0.218	0.000	0.16		11.2
10.008	SW26	15 Winter	1	+0%	100/15 Summer				17.410	-0.185	0.000	0.31		24.6
11.000	SW33	15 Winter	1	+0%	30/15 Summer	100/15 Summer			18.022	-0.078	0.000	0.45		5.7
11.001	SW34	15 Winter	1	+0%	1/15 Summer				17.902	0.031	0.000	0.39		5.0
12.000	SW27	15 Winter	1	+0%	100/15 Summer				18.047	-0.128	0.000	0.38		15.2
12.001	SW28	30 Winter	1	+0%	30/15 Winter	100/15 Winter			17.864	-0.102	0.000	0.11		6.6
13.000	SW31	15 Winter	1	+0%	30/15 Summer				18.021	-0.079	0.000	0.44		6.5
13.001	SW32	30 Winter	1	+0%	30/30 Winter				17.796	-0.070	0.000	0.11		1.9
12.002	SW29	30 Winter	1	+0%	100/30 Winter				17.633	-0.156	0.000	0.21		8.5
14.000	SW35	15 Winter	1	+0%	100/15 Winter				18.141	-0.107	0.000	0.18		2.3
14.001	SW36	15 Winter	1	+0%	100/15 Summer				18.071	-0.103	0.000	0.22		4.7
12.003	SW30	30 Winter	1	+0%					17.556	-0.150	0.000	0.25		11.0
15.000	53	15 Winter	1	+0%	30/15 Summer				17.571	-0.079	0.000	0.45		9.9
1.008	TANK	600 Winter	1	+0%	30/60 Winter				16.635	-0.140	0.000	0.06		6.9
1.009	SW07	600 Winter	1	+0%					16.401	-0.324	0.000	0.04		6.9

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.007	SW06	OK	
10.000	SW19	OK	
10.001	19	OK	
10.002	20	OK	
10.003	SW20	OK	
10.004	SW21	OK	
10.005	SW22	OK	
10.006	SW24	OK	
10.007	SW25	OK	
10.008	SW26	OK	
11.000	SW33	OK	4
11.001	SW34	SURCHARGED	
12.000	SW27	OK	
12.001	SW28	OK	
13.000	SW31	OK	
13.001	SW32	OK	
12.002	SW29	OK	
14.000	SW35	OK	
14.001	SW36	OK	
12.003	SW30	OK	
15.000	53	OK	
1.008	TANK	OK	
1.009	SW07	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 9 Number of Storage Structures 9 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.404 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	SW01	30 Winter	30	+0%	1/15 Summer	100/15 Winter			19.212	1.071	0.000	0.40		54.6
1.001	SW02A	180 Winter	30	+0%	1/15 Summer				19.082	1.304	0.000	0.10		2.3

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.000	SW01	FLOOD RISK	1
1.001	SW02A	FLOOD RISK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
2.000	SW09	720 Winter	30	+0%	30/180 Winter				17.929	0.085	0.000	0.00		0.0
2.001	SW10	720 Winter	30	+0%	1/60 Winter				17.929	0.417	0.000	0.14		1.5
1.002	SW02B	15 Winter	30	+0%	30/15 Summer				17.537	0.052	0.000	1.08		15.6
1.003	SW03	15 Winter	30	+0%	30/15 Summer				17.271	0.013	0.000	1.09		15.1
3.000	SW11	15 Winter	30	+0%					18.093	-0.087	0.000	0.36		5.7
3.001	8	15 Winter	30	+0%					18.005	-0.091	0.000	0.32		5.7
3.002	SW12	15 Winter	30	+0%					17.826	-0.145	0.000	0.27		14.3
4.000	10	360 Winter	30	+0%					18.227	-0.150	0.000	0.00		0.0
5.000	11	360 Winter	30	+0%					18.155	-0.150	0.000	0.00		0.0
5.001	12	360 Winter	30	+0%					18.061	-0.151	0.000	0.00		0.0
4.001	SW14	360 Winter	30	+0%					17.999	-0.151	0.000	0.00		0.0
6.000	14	15 Winter	30	+0%					18.060	-0.090	0.000	0.34		9.8
4.002	SW15	15 Winter	30	+0%					17.831	-0.095	0.000	0.29		9.7
7.000	15	360 Winter	30	+0%					18.000	-0.150	0.000	0.00		0.0
7.001	16	360 Winter	30	+0%					17.665	-0.150	0.000	0.00		0.0
3.003	SW13	15 Winter	30	+0%	100/15 Summer				17.369	-0.101	0.000	0.57		37.7
1.004	SW04	600 Winter	30	+0%	100/15 Summer				16.971	-0.160	0.000	0.09		10.1
8.000	20	360 Winter	30	+0%					18.000	-0.150	0.000	0.00		0.0
8.001	21	360 Winter	30	+0%					17.589	-0.150	0.000	0.00		0.0
1.005	20	600 Winter	30	+0%	30/480 Winter				16.968	0.004	0.000	0.13		10.0
9.000	SW16	15 Winter	30	+0%	100/15 Summer				18.608	-0.042	0.000	0.84		9.4
9.001	20	15 Winter	30	+0%					18.411	-0.086	0.000	0.38		9.4
9.002	SW17	15 Winter	30	+0%	100/15 Summer				18.286	-0.059	0.000	0.66		9.1
9.003	SW18	15 Winter	30	+0%					17.981	-0.114	0.000	0.14		9.1
1.006	SW05	600 Winter	30	+0%	30/480 Winter				16.964	0.016	0.000	0.11		13.0

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
2.000	SW09	SURCHARGED	
2.001	SW10	SURCHARGED	
1.002	SW02B	SURCHARGED	
1.003	SW03	SURCHARGED	
3.000	SW11	OK	
3.001	8	OK	
3.002	SW12	OK	
4.000	10	OK	
5.000	11	OK	
5.001	12	OK	
4.001	SW14	OK	
6.000	14	OK	
4.002	SW15	OK	
7.000	15	OK	
7.001	16	OK	
3.003	SW13	OK	
1.004	SW04	OK	
8.000	20	OK	
8.001	21	OK	
1.005	20	SURCHARGED	
9.000	SW16	OK	
9.001	20	OK	
9.002	SW17	OK	
9.003	SW18	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.006	SW05	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.007	SW06	600 Winter	30	+0%	30/120 Winter				16.961	0.122	0.000	0.13		12.7
10.000	SW19	360 Winter	30	+0%					18.355	-0.225	0.000	0.00		0.0
10.001	19	15 Winter	30	+0%	100/15 Summer				18.264	-0.124	0.000	0.41		13.2
10.002	20	15 Winter	30	+0%	100/15 Summer				18.176	-0.058	0.000	0.88		25.6
10.003	SW20	15 Winter	30	+0%	100/15 Summer				18.098	-0.075	0.000	0.78		25.7
10.004	SW21	15 Winter	30	+0%	100/15 Summer				17.936	-0.160	0.000	0.44		25.6
10.005	SW22	15 Winter	30	+0%	100/15 Summer				17.896	-0.160	0.000	0.42		32.6
10.006	SW24	15 Winter	30	+0%	100/15 Summer				17.579	-0.144	0.000	0.54		32.8
10.007	SW25	15 Winter	30	+0%	100/15 Summer				17.548	-0.123	0.000	0.48		33.1
10.008	SW26	15 Winter	30	+0%	100/15 Summer				17.518	-0.077	0.000	0.88		70.6
11.000	SW33	15 Winter	30	+0%	30/15 Summer	100/15 Summer			18.671	0.571	0.000	0.89		11.4
11.001	SW34	15 Winter	30	+0%	1/15 Summer				18.489	0.618	0.000	0.88		11.4
12.000	SW27	15 Winter	30	+0%	100/15 Summer				18.124	-0.051	0.000	0.93		37.2
12.001	SW28	30 Winter	30	+0%	30/15 Winter	100/15 Winter			17.990	0.024	0.000	0.25		15.1
13.000	SW31	15 Winter	30	+0%	30/15 Summer				18.137	0.037	0.000	1.07		15.6
13.001	SW32	30 Winter	30	+0%	30/30 Winter				17.869	0.003	0.000	0.21		3.5
12.002	SW29	30 Winter	30	+0%	100/30 Winter				17.671	-0.118	0.000	0.46		18.6
14.000	SW35	15 Winter	30	+0%	100/15 Winter				18.168	-0.080	0.000	0.44		5.7
14.001	SW36	15 Winter	30	+0%	100/15 Summer				18.108	-0.066	0.000	0.60		12.9
12.003	SW30	15 Winter	30	+0%					17.606	-0.100	0.000	0.59		26.3
15.000	53	15 Winter	30	+0%	30/15 Summer				17.709	0.059	0.000	1.06		23.7
1.008	TANK	600 Winter	30	+0%	30/60 Winter				16.958	0.183	0.000	0.07		7.2
1.009	SW07	1440 Winter	30	+0%					16.401	-0.324	0.000	0.05		7.2

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.007	SW06	SURCHARGED	
10.000	SW19	OK	
10.001	19	OK	
10.002	20	OK	
10.003	SW20	OK	
10.004	SW21	OK	
10.005	SW22	OK	
10.006	SW24	OK	
10.007	SW25	OK	
10.008	SW26	OK	
11.000	SW33	SURCHARGED	4
11.001	SW34	SURCHARGED	
12.000	SW27	OK	
12.001	SW28	SURCHARGED	
13.000	SW31	SURCHARGED	
13.001	SW32	SURCHARGED	
12.002	SW29	OK	
14.000	SW35	OK	
14.001	SW36	OK	
12.003	SW30	OK	
15.000	53	SURCHARGED	
1.008	TANK	SURCHARGED	
1.009	SW07	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 9 Number of Storage Structures 9 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.404 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	SW01	15 Winter	100	+40%	1/15 Summer	100/15 Winter			19.300	1.159	0.072	0.92		125.1
1.001	SW02A	180 Winter	100	+40%	1/15 Summer				19.177	1.398	0.000	0.10		2.3

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.000	SW01	FLOOD	1
1.001	SW02A	FLOOD RISK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
2.000	SW09	960 Winter	100	+40%	30/180 Winter				18.502	0.658	0.000	0.00		0.0
2.001	SW10	960 Winter	100	+40%	1/60 Winter				18.502	0.990	0.000	0.15		1.6
1.002	SW02B	15 Winter	100	+40%	30/15 Summer				18.218	0.732	0.000	1.64		23.7
1.003	SW03	15 Winter	100	+40%	30/15 Summer				17.667	0.409	0.000	1.63		22.6
3.000	SW11	15 Winter	100	+40%					18.121	-0.059	0.000	0.66		10.3
3.001	8	15 Winter	100	+40%					18.029	-0.066	0.000	0.59		10.4
3.002	SW12	15 Winter	100	+40%					17.859	-0.112	0.000	0.49		26.0
4.000	10	360 Winter	100	+40%					18.227	-0.150	0.000	0.00		0.0
5.000	11	360 Winter	100	+40%					18.155	-0.150	0.000	0.00		0.0
5.001	12	360 Winter	100	+40%					18.061	-0.151	0.000	0.00		0.0
4.001	SW14	360 Winter	100	+40%					17.999	-0.151	0.000	0.00		0.0
6.000	14	15 Winter	100	+40%					18.086	-0.064	0.000	0.61		17.8
4.002	SW15	15 Winter	100	+40%					17.854	-0.072	0.000	0.52		17.6
7.000	15	360 Winter	100	+40%					18.000	-0.150	0.000	0.00		0.0
7.001	16	15 Winter	100	+40%					17.666	-0.149	0.000	0.00		0.0
3.003	SW13	15 Winter	100	+40%	100/15 Summer				17.676	0.206	0.000	0.92		60.2
1.004	SW04	960 Winter	100	+40%	100/15 Summer				17.555	0.424	0.000	0.10		11.4
8.000	20	360 Winter	100	+40%					18.000	-0.150	0.000	0.00		0.0
8.001	21	360 Winter	100	+40%					17.589	-0.150	0.000	0.00		0.0
1.005	20	960 Winter	100	+40%	30/480 Winter				17.552	0.588	0.000	0.14		11.1
9.000	SW16	15 Winter	100	+40%	100/15 Summer				18.847	0.197	0.000	1.47		16.4
9.001	20	15 Winter	100	+40%					18.470	-0.027	0.000	0.63		15.5
9.002	SW17	15 Winter	100	+40%	100/15 Summer				18.409	0.064	0.000	1.12		15.3
9.003	SW18	15 Winter	100	+40%					17.994	-0.101	0.000	0.23		15.4
1.006	SW05	960 Winter	100	+40%	30/480 Winter				17.548	0.600	0.000	0.13		15.7

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
2.000	SW09	SURCHARGED	
2.001	SW10	SURCHARGED	
1.002	SW02B	SURCHARGED	
1.003	SW03	SURCHARGED	
3.000	SW11	OK	
3.001	8	OK	
3.002	SW12	OK	
4.000	10	OK	
5.000	11	OK	
5.001	12	OK	
4.001	SW14	OK	
6.000	14	OK	
4.002	SW15	OK	
7.000	15	OK	
7.001	16	OK	
3.003	SW13	SURCHARGED	
1.004	SW04	SURCHARGED	
8.000	20	OK	
8.001	21	OK	
1.005	20	SURCHARGED	
9.000	SW16	FLOOD RISK	
9.001	20	OK	
9.002	SW17	SURCHARGED	
9.003	SW18	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.006	SW05	SURCHARGED	

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.
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Date 07/08/2020 09:54 | Designed by dimitrov_i
File FS0316-CUR-00-00-M3-C-9200-V10_SW_NETWORK... | Checked by
Innovyze | Network 2018.1.1

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.007	SW06	960 Winter	100	+40%	30/120 Winter				17.545	0.706	0.000	0.16		15.6
10.000	SW19	15 Winter	100	+40%					18.416	-0.164	0.000	0.00		0.1
10.001	19	15 Winter	100	+40%	100/15 Summer				18.428	0.040	0.000	0.66		21.5
10.002	20	15 Winter	100	+40%	100/15 Summer				18.392	0.159	0.000	1.44		41.9
10.003	SW20	15 Winter	100	+40%	100/15 Summer				18.313	0.140	0.000	1.25		41.2
10.004	SW21	15 Winter	100	+40%	100/15 Summer				18.224	0.128	0.000	0.65		37.6
10.005	SW22	15 Winter	100	+40%	100/15 Summer				18.151	0.095	0.000	0.65		50.3
10.006	SW24	15 Winter	100	+40%	100/15 Summer				17.994	0.272	0.000	0.92		56.4
10.007	SW25	15 Winter	100	+40%	100/15 Summer				17.913	0.242	0.000	0.82		56.5
10.008	SW26	15 Winter	100	+40%	100/15 Summer				17.807	0.212	0.000	1.34		107.1
11.000	SW33	15 Winter	100	+40%	30/15 Summer	100/15 Summer			19.301	1.201	1.486	1.26		16.2
11.001	SW34	15 Winter	100	+40%	1/15 Summer				18.983	1.112	0.000	1.09		14.1
12.000	SW27	30 Winter	100	+40%	100/15 Summer				18.812	0.637	0.000	1.27		50.9
12.001	SW28	30 Winter	100	+40%	30/15 Winter	100/15 Winter			18.740	0.774	0.000	0.54		31.9
13.000	SW31	15 Winter	100	+40%	30/15 Summer				18.699	0.599	0.000	1.84		26.9
13.001	SW32	60 Winter	100	+40%	30/30 Winter				17.989	0.123	0.000	0.30		5.0
12.002	SW29	30 Winter	100	+40%	100/30 Winter				17.799	0.010	0.000	0.88		35.6
14.000	SW35	15 Winter	100	+40%	100/15 Winter				18.259	0.011	0.000	0.79		10.3
14.001	SW36	15 Winter	100	+40%	100/15 Summer				18.214	0.040	0.000	1.04		22.5
12.003	SW30	30 Winter	100	+40%					17.695	-0.011	0.000	1.00		44.6
15.000	53	15 Winter	100	+40%	30/15 Summer				18.719	1.069	0.000	1.75		39.1
1.008	TANK	960 Winter	100	+40%	30/60 Winter				17.542	0.767	0.000	0.07		7.2
1.009	SW07	2160 Summer	100	+40%					16.401	-0.324	0.000	0.05		7.2

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Status	Level Exceeded
1.007	SW06	SURCHARGED	
10.000	SW19	OK	
10.001	19	SURCHARGED	
10.002	20	SURCHARGED	
10.003	SW20	SURCHARGED	
10.004	SW21	SURCHARGED	
10.005	SW22	SURCHARGED	
10.006	SW24	SURCHARGED	
10.007	SW25	SURCHARGED	
10.008	SW26	SURCHARGED	
11.000	SW33	FLOOD	4
11.001	SW34	FLOOD RISK	
12.000	SW27	FLOOD RISK	
12.001	SW28	FLOOD RISK	
13.000	SW31	FLOOD RISK	
13.001	SW32	SURCHARGED	
12.002	SW29	SURCHARGED	
14.000	SW35	SURCHARGED	
14.001	SW36	SURCHARGED	
12.003	SW30	OK	
15.000	53	FLOOD RISK	
1.008	TANK	SURCHARGED	
1.009	SW07	OK	

Appendix F Pre-Development Enquiry Response

MS A Smolen
56 The Ropewalk
Nottingham
NG1 5DW

Our ref: DS6047140

0800 009 3921
Monday to Friday, 8am to 5pm

24th April 2018

Pre-planning enquiry: Capacity check

Dear Ms Smolen

Thank you for providing information on your development at Turing Hse School Hospital Bridge rd TW2 6LH dated Apr' 18.

Foul

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity to serve your foul discharges from your development.

Surface Water
In considering your surface water needs, we support the use of sustainable drainage on development sites.

The surface water drainage strategy should follow policy 5.13 of the London Plan. Typically greenfield run off rates of 5l/s/ha should be aimed for using the drainage hierarchy. The hierarchy lists the preference for surface water disposal as follows; Store Rainwater for later use > Use infiltration techniques, such as porous surfaces in non-clay areas > Attenuate rainwater in ponds or open water features for gradual release > Discharge rainwater direct to a watercourse > Discharge rainwater direct to a surface water sewer/drain > Discharge rainwater to the combined sewer.
Please refer to the attached document titled ''Planning your wastewater'' attached to this letter, specifically to notes relating to surface water. Also I would advise you to liaise with the LA and discuss their criteria regarding surface water discharges in that area and adhere to their stipulation. If you adhere to LA stipulation then TW will be able to accommodate that agreed discharge.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient sewerage capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me.

Yours sincerely

Siva Sivarajan

Developer Services- Wastewater Adoptions Engineer
Office:0203 577 7752 Mobile: 07747842608
siva.sivarajan@thameswater.co.uk

Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB
Find us online at developers.thameswater.co.uk

TW internal ref: DTS57768

Planning your wastewater

We've put together some information on sewerage to help you plan your new development.

How long does it take to get consent to connect to a sewer?

If you're applying for consent to connect to a sewer under Section 106 of the Water Industry Act 1991, you'll need to give us 21 days' notice.

I think I'll need to connect to a trunk sewer – is that possible?

Connecting directly to trunk sewers can be complex and dangerous, and we won't permit this at all in London. If you're considering a trunk sewer as a point of connection, please contact us as soon as possible to discuss.

How do I handle trade effluent and groundwater discharges?

You mustn't discharge non-domestic waste to our sewers without a valid trade effluent consent - doing this is an offence under Section 109(1) of the Water Industry Act 1991. You can call our trade effluent team on 0203 577 9200 to get help with trade effluent consents and ground water discharge permits.

Where can I discharge surface water?

The Lead Local Flood Authority, or if you are in a London Borough, 'The London Plan', advises that your development should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. You should aim to achieve greenfield run-off rates and ensure you manage surface water run-off as close to its source as possible in line with the following drainage hierarchy:

1. Store rainwater for later use.
2. Use infiltration techniques, such as porous surfaces in non-clay areas.
3. Attenuate rainwater in ponds or open water features for gradual release.
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. Discharge rainwater direct to a watercourse.
6. Discharge rainwater to a surface water sewer or drain.
7. Discharge rainwater to a combined sewer.

Please note that if you're discharging surface water anywhere other than to a public sewer – such as to a watercourse – you'll need approval from the relevant authority, for example the Environment Agency, the local authority or the Canals and Rivers Trust.

If you don't follow the surface water hierarchy you may not be granted planning permission, and Thames Water may seek to put conditions on the planning application.

There's no right of discharge of highway drainage into the public sewerage system, and we'd need to agree this with the relevant highway authority under Section 115 of the Water Industry Act 1991. You can contact us to discuss this further.

What can I do about redundant sewers and rising mains on my site?

On brownfield sites where existing sewers or rising mains need to be made redundant or diverted, the developer will need to fund the work, as set out in Section 185 of the Water Industry Act. If there's no practical way of making a diversion, we'll apply the standoff distances in Sewers for Adoption 7th edition to assess the width of easement required.

Appendix G Surface Water Drainage Layouts

GRASSED FILTER DRAIN WITH PERFORATED PIPE 300mm Ø

GRASSED FILTER DRAIN WITH PERFORATED PIPE 300mm Ø

SW32
CL: 19.100
IL: 17.423
600mm Ø PPIC

300mm@1:173

SW33
CL: 19.100
IL: 17.371
600mm Ø PPIC

300mm@1:181

SW51
CL: 19.050
IL: 17.600
450mm Ø PPIC
CATCHPIT

RWP

HEAVY DUTY CELLULAR ATTENUATION TANK 1
REQUIRED STORAGE: 660m³
TOT=17.600m
BOT=16,400m
CL: 18.740m MIN
DIMENSIONS: 580m² x 1.2m

SW38
CL: 18.840
IL: 17.950
600mm Ø PPIC

G3 TREES SEE DESIGN NOTE 2

SW39
CL: 18.840
IL: 17.950
450mm Ø PPIC

SW37
CL: 19.030
IL: 17.721
600mm Ø PPIC
0.08m ORIFICE PLATE
CATCHPIT

150mm Ø

300mm

SDP

SW34
CL: 19.100
IL: 17.295
1200mm Ø PCC
CATCHPIT
VENTILATED COVER

MATCH LINE

SW35
CL: 19.100
IL: 17.500
1200mm Ø PCC
CATCHPIT
VENTILATED COVER

SW55
CL: 19.100
IL: 17.500
1200mm Ø PCC
VENTILATED COVER

ATTENUATION SUB-BASE
MIN.DEPTH: 0.35m
EFFECTIVE STORAGE: 16.3m³
PERFORATED PIPE 150mm Ø

ATTENUATION SUB-BASE
MIN.DEPTH: 0.35m
EFFECTIVE STORAGE: 14.8m³
PERFORATED PIPE 225mm Ø

ATTENUATION SUB-BASE
MIN.DEPTH: 0.35m
EFFECTIVE STORAGE: 5m³
PERFORATED PIPE 150mm Ø

1M

SW52
CL: 19.126
IL: 16.400
1200mm Ø PCC
VORTEX FLOW CONTROL CHAMBER
DESIGN FLOW: 7.3l/s
DESIGN HEAD 1.2m
MIN SUMP DEPTH 380mm
HYDRO-INTERNATIONAL FLOW CONTROL REFERENCE
MD-SHE-0123-7300-1200-7300 (OR SIMILAR APPROVED)

SW19
CL: 19.100
IL: 16.510
1350mm Ø PCC
BACKDROP

375mm@1:256

375mm@1:221

SW40
CL: 18.910
IL: 17.741
600mm Ø PPIC
0.13m ORIFICE PLATE
CATCHPIT

SW43
CL: 19.175
IL: 17.481
1200mm Ø PCC
CATCHPIT

SW23
CL: 19.060
IL: 18.195
450mm Ø PPIC

150mm@1:135

GRASSED FILTER DRAIN WITH PERFORATED PIPE 150mm Ø

Track

SW24
CL: 19.050
IL: 17.945
450mm Ø PPIC

SW20
CL: 19.060
IL: 16.420
1350mm Ø PCC
CATCHPIT

SW41
CL: 18.830
IL: 17.717
600mm Ø PPIC
0.07m ORIFICE PLATE
CATCHPIT

225mm@1:57

150mm

225mm

SW36
CL: 19.160
IL: 17.950
450mm Ø PPIC

SW22
CL: 19.00
IL: 18.347
450mm Ø PPIC

NOMINAL ROUTE OF POWER SUPPLY FOR PUMP STATION (TBC)

150mm@1:28

150mm@1:114

SW42
CL: 19.120
IL: 17.564
600mm Ø PPIC

SW08
CL: 19.569
IL: 16.184
PUMP CHAMBER (TO BE DESIGNED BY A SPECIALIST)

150mm@1:135

150mm@1:53

SW46
CL: 19.320
IL: 17.852
450mm Ø PPIC

SW48
CL: 19.166
IL: 17.892
600mm Ø PPIC
0.02m ORIFICE PLATE
CATCHPIT

INDICATIVE PUMP CONTROL KIOSK

RISING MAIN

SW45
CL: 19.415
IL: 17.948
600mm Ø PPIC
0.02m ORIFICE PLATE
CATCHPIT

PERFORATED PIPE 150mm Ø ATTENUATION VOLUME 8.2m³

PERFORATED PIPE 150mm Ø ATTENUATION VOLUME 8.2m³

SW53
CL: 20.06
IL: 18.713
450mm Ø PPIC

SW50
CL: 19.320
IL: 18.024
600mm Ø PPIC

150mm@1:49

150mm@1:164

SITE ENTRANCE DESIGN SUBJECT TO A S278 AGREEMENT. SECTION 278 AGREEMENT TO BE OBTAINED BY OTHERS.

SW44
CL: 19.315
IL: 18.265
450mm Ø PPIC

SW47
CL: 19.320
IL: 18.200
450mm Ø PPIC

SW49
CL: 19.380
IL: 18.098
450mm Ø PPIC

SW54
CL: 20.000
IL: 18.651
450mm Ø PPIC

DRAINAGE THROUGH TREE ROOT PROTECTION AREA SUBJECT TO APPROVAL BY AN ARBORICULTURIST.

PROPOSED POINT OF CONNECTION TO THE EXISTING PUBLIC THAMES WATER SURFACE WATER SEWER VIA MH REF.5508. CONNECTION SUBJECT TO S106 APPLICATION.
CL: 19.64
IL: 18.43
LEVELS INFORMATION HAS BEEN TAKEN FROM THAMES WATER SEWER MAPS. EXISTING PUBLIC SEWER LEVELS TO BE CONFIRMED VIA ADDITIONAL SURVEYS.

150mm@1:150

225 Ø

1C

1,2 &3C

ROAD

Holbridge

N

DRAFT

DESIGN IN ABEYANCE AND NOT SUITABLE FOR CONSTRUCTION
AWAITING SIPHONIC DRAINAGE LOCATIONS, FLOWS AND PIPE SIZES, S106 AGREEMENT AND THAMES WATER SEWERS INVERT LEVELS AND LOCATIONS INFORMATION

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

TO BE READ IN CONJUNCTION WITH THE DRAWINGS:

- FS0316-CUR-ZZ-00-DR-C-9200_SURFACE WATER DRAINAGE LAYOUT KEY PLAN
- FS0316-CUR-ZZ-00-DR-C-9203_SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2
- FS0316-CUR-ZZ-00-DR-C-9201_FOUL WATER DRAINAGE LAYOUT

KEY

- PROPOSED SURFACE WATER DRAIN
- RWP — PROPOSED SURFACE RAIN WATER PIPE
- SDP — PROPOSED SURFACE WATER SIPHONIC DRAIN PIPE
- G — PROPOSED SURFACE WATER GULLY
- PROPOSED LINEAR DRAINAGE CHANNEL (LDC) WITH A SUMP UNIT AT OUTFALL
- PROPOSED GATIC (OR EQUIVALENT) DRAINAGE CHANNEL WITH A SUMP UNIT AT OUTFALL
- PROPOSED FILTER DRAIN
- PROPOSED ATTENUATION SUB-BASE WITH PERFORATED PIPE
- PROPOSED SURFACE WATER ATTENUATION TANK
- POWER SUPPLY FOR PUMP STATIONS (TBC)
- EXISTING PUBLIC SURFACE WATER SEWER
- PROPOSED DISHED CHANNEL (CD2)
- PUMP CHAMBER (DESIGN BY OTHERS)
- PROPOSED RAIN GARDEN

DESIGN NOTES:

1. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM.
2. G3 TREES HAVE BEEN ASSUMED TO BE REMOVED - SUBJECT TO NETWORK RAIL APPROVAL. TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
3. DESIGN BASED ON LANDSCAPE ARCHITECT LAYOUT ALA456L001M, RECEIVED ON 10.01.20. ANY CHANGES TO THE PROPOSED LAYOUT AND LEVELS MAY AFFECT THE FINAL DRAINAGE DESIGN.
4. SIPHONIC DRAIN PIPES LOCATIONS BASED ON DRAWINGS FS0316-STL-01-00-DR-A-1160/1161 ISSUED BY STRIDE TREGLOWN ON 04.02.20.. AWAITING FURTHER PIPE SIZES AND FLOW RATES INFORMATION FROM THE SIPHONIC DESIGNERS.
5. ALL MANHOLES/INSPECTION CHAMBERS WITHIN TRAFFICKED HARD STANDING AREAS TO HAVE HEAVY DUTY COVERS (D400 GRADE).
6. CONNECTION TO THE EXISTING SURFACE WATER PUBLIC SEWER SUBJECT TO SECTION 106 AGREEMENT WITH THAMES WATER. APPLICATION TO BE SUBMITTED THE BY CONTRACTOR.
7. DISCHARGE RATE BASED ON GREENFIELD RUNOFF RATES.
8. ATTENUATION VOLUME BASED ON 100 YEARS +40%CC STORM EVENT.
9. SURFACE WATER PUMPING STATION INDICATIVE ONLY. PUMP TO BE DESIGNED BY A SPECIALIST.

Rev:	Description:	Date:	By:	Chkd:
P11	IL OF SW19 AND SW20 REVISED	18.05.20	ID	ID
P10	REVISED TO NEW SIPHONIC LOCATIONS. SW55 ADDED. DRAFT CONSTRUCTION	25.02.20	ID	ID
P09	DRAFT CONSTRUCTION	30.01.20	ID	AS
P08	REVISED TO PLANNING COMMENTS.	03.04.19	ID	BB
P07	PUMP NOTE REVISED.CP ISSUE	14.02.19	ID	AW
P06	CONTRACTOR'S PROPOSAL	22.01.19	BB	AW
P05	CONTRACTOR'S PROPOSAL	22.01.19	JW	BB
P04	Revised to latest LA layout. Attenuation revised. Planning	22.11.18	ID	RJ
P03	PLANNING ISSUE	01.08.18	RJ	AW
P02	REVISED AS PER ITT CLARIFICATIONS	01.05.18	AS	AW
P01	ISSUED FOR ITT	17.04.18	AS	AW

curtins
56 The Ropewalk, Nottingham NG1 5DW
0115 941 5551
nottingham@curtins.com
www.curtins.com
Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer
Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Status: DRAFT CONSTRUCTION

Project: TURING HOUSE SCHOOL

Drg Title: SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 2

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	06.04.18	AS	AS	AW
Scale: 1:200				

Project No: | Originator: | Zone: | Level: | Type: | Discipline: | Category / Number: | Rev:

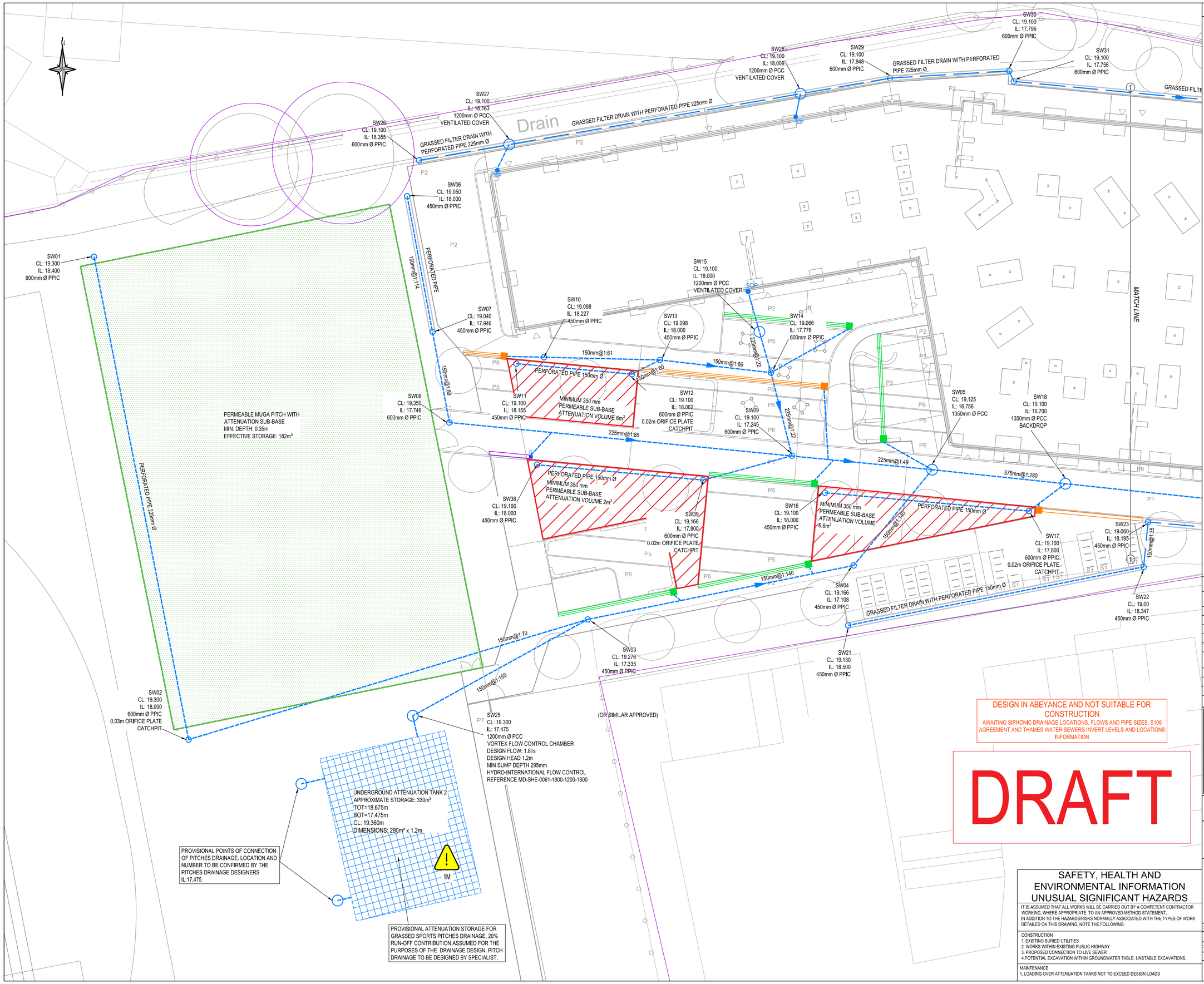
FS0316 - CUR - ZZ - 00 - DR - C - 9202 - P11

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION UNUSUAL SIGNIFICANT HAZARDS

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION
1. EXISTING BURIED UTILITIES
2. WORKS WITHIN EXISTING PUBLIC HIGHWAY
3. PROPOSED CONNECTION TO LIVE SEWER
4.POTENTIAL EXCAVATION WITHIN GROUNDWATER TABLE. UNSTABLE EXCAVATIONS.

MAINTENANCE
1. LOADING OVER ATTENUATION TANKS NOT TO EXCEED DESIGN LOADS



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4. FOR GENERAL NOTES REFER TO DRAWING.

TO BE READ IN CONJUNCTION WITH THE DRAWINGS:

- FS0316-CUR-ZZ-00-DR-C-9200_SURFACE WATER DRAINAGE LAYOUT KEY PLAN
- FS0316-CUR-ZZ-00-DR-C-9202_SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 2
- FS0316-CUR-ZZ-00-DR-C-9201_FOUL WATER DRAINAGE LAYOUT

KEY

- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE RAIN WATER PIPE
- PROPOSED SURFACE WATER SIPHONIC DRAIN PIPE
- PROPOSED SURFACE WATER GULLY
- PROPOSED LINEAR DRAINAGE CHANNEL (LDC) WITH A SUMP UNIT AT OUTFALL
- PROPOSED GATIC (OR EQUIVALENT) DRAINAGE CHANNEL WITH A SUMP UNIT AT OUTFALL
- PROPOSED FILTER DRAIN
- PROPOSED ATTENUATION SUB-BASE WITH PERFORATED PIPE
- PROPOSED SURFACE WATER ATTENUATION TANK
- POWER SUPPLY FOR PUMP STATIONS (TBC)
- EXISTING PUBLIC SURFACE WATER SEWER
- PROPOSED DISHED CHANNEL (CD2)
- PUMP CHAMBER (DESIGN BY OTHERS)
- PROPOSED RAIN GARDEN

DESIGN NOTES:

1. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM.
2. G3 TREES HAVE BEEN ASSUMED TO BE REMOVED - SUBJECT TO NETWORK RAIL APPROVAL. TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT.
3. DESIGN BASED ON LANDSCAPE ARCHITECT LAYOUT ALA456L001M, RECEIVED ON 10.01.20. ANY CHANGES TO THE PROPOSED LAYOUT AND LEVELS MAY AFFECT THE FINAL DRAINAGE DESIGN.
4. SIPHONIC DRAIN PIPES LOCATIONS BASED ON DRAWINGS FS0316-STL-01-00-DR-A-1160/1161 ISSUED BY STRIDE TREGLOWN ON 04.02.20.. AWAITING FURTHER PIPE SIZES AND FLOW RATES INFORMATION FROM THE SIPHONIC DESIGNERS.
5. ALL MANHOLES/INSPECTION CHAMBERS WITHIN TRAFFICKED HARD STANDING AREAS TO HAVE HEAVY DUTY COVERS (D400 GRADE).
6. CONNECTION TO THE EXISTING SURFACE WATER PUBLIC SEWER SUBJECT TO SECTION 106 AGREEMENT WITH THAMES WATER. APPLICATION TO BE SUBMITTED THE BY CONTRACTOR.
7. DISCHARGE RATE BASED ON GREENFIELD RUNOFF RATES.
8. ATTENUATION VOLUME BASED ON 100 YEARS +40%CC STORM EVENT.
9. SURFACE WATER PUMPING STATION INDICATIVE ONLY. PUMP TO BE DESIGNED BY A SPECIALIST.

Rev:	Description:	Date:	By:	Chkd:
P11	REVISED TO SHOW RAIN GARDENS	19.05.20	ID	ID
P10	REVISED TO NEW SIPHONIC LOCATIONS. SW55 ADDED. DRAFT CONSTRUCTION	25.02.20	ID	ID
P09	DRAFT CONSTRUCTION	30.01.20	ID	AS
P08	REVISED TO PLANNING COMMENTS.	03.04.19	ID	BB
P07	GULLY RECONNECTED. CP ISSUE	14.02.19	ID	AW
P06	CONTRACTOR'S PROPOSAL	22.01.19	BB	AW
P05	CONTRACTOR'S PROPOSAL	22.01.19	JW	BB
P04	Revised to new layout. Attenuation volume amended. Planning issue.	22.11.18	ID	RJ
P03	PLANNING ISSUE	01.08.18	RJ	AW
P02	REVISED AS PER ITT CLARIFICATIONS	01.05.18	AS	AW
P01	ISSUED FOR ITT	17.04.18	AS	AW

DESIGN IN ABEYANCE AND NOT SUITABLE FOR CONSTRUCTION

AWAITING SIPHONIC DRAINAGE LOCATIONS, FLOWS AND PIPE SIZES, S106 AGREEMENT AND THAMES WATER SEWERS INVERT LEVELS AND LOCATIONS INFORMATION

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION UNUSUAL SIGNIFICANT HAZARDS

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION
1. EXISTING BURIED UTILITIES
2. WORKS WITHIN EXISTING PUBLIC HIGHWAY
3. PROPOSED CONNECTION TO LIVE SEWER
4. POTENTIAL EXCAVATION WITHIN GROUNDWATER TABLE. UNSTABLE EXCAVATIONS.

MAINTENANCE
1. LOADING OVER ATTENUATION TANKS NOT TO EXCEED DESIGN LOADS

curtins
56 The Ropewalk, Nottingham NG1 5DW
0115 941 5551
nottingham@curtins.com
www.curtins.com
Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer
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Status: DRAFT CONSTRUCTION

Project: TURING HOUSE SCHOOL

Drg Title: SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	06.04.18	AS	AS	AW
Scale: 1:200				

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
FS0316	CUR	ZZ	00	DR	C	9203	-P11

Our Locations

Birmingham
2 The Wharf
Bridge Street
Birmingham
B1 2JS
T. 0121 643 4694
birmingham@curtins.com

Bristol
Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ
T. 0117 302 7560
bristol@curtins.com

Cambridge
50 Cambridge Place
Cambridge
CB2 1NS
T. 01223 631 799
cambridge@curtins.com

Cardiff
3 Cwrt-y-Parc
Earlswood Road
Cardiff
CF14 5GH
T. 029 2068 0900
cardiff@curtins.com

Douglas
Varley House
29-31 Duke Street
Douglas
Isle of Man
IM1 2AZ
T. 01624 624 585
douglas@curtins.com

Dublin
39 Fitzwilliam Square
Dublin 2
Ireland
T. 00353 1 507 9447
dublin@curtins.com

Edinburgh
1a Belford Road
Edinburgh
EH4 3BL
T. 0131 225 2175
edinburgh@curtins.com

Glasgow
Queens House
29 St Vincent Place
Glasgow
G1 2DT
T. 0141 319 8777
glasgow@curtins.com

Kendal
28 Lowther Street
Kendal
Cumbria
LA9 4DH
T. 01539 724 823
kendal@curtins.com

Leeds
Rose Wharf
Ground Floor
Leeds
L29 8EE
T. 0113 274 8509
leeds@curtins.com

Liverpool
Curtin House
Columbus Quay
Riverside Drive
Liverpool
L3 4DB
T. 0151 726 2000
liverpool@curtins.com

London
40 Compton Street
London
EC1V 0BD
T. 020 7324 2240
london@curtins.com

Manchester
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG
T. 0161 236 2394
manchester@curtins.com

Nottingham
56 The Ropewalk
Nottingham
NG1 5DW
T. 0115 941 5551
nottingham@curtins.com

Curtins Consulting Ltd registered in England and Wales No: 2054159
Registered office: 61-55 Tithebarn Street, Liverpool, L2 2SB