Furners Lane, Henfield

Drainage Strategy Report

Project No: AC23068

File Name: AC23068-ABS-XX-XX-RP-C-5800

Revision: P06

April 2025

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Version Record

Rev: P03

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Created By	Martin Howell	MEng (Hons)	[redacted]	24/09/24
Checked By	Matthew Woods	BEng (Hons)		24/09/24
Approved By	Matthew Woods	BEng (Hons)		24/09/24

Revision	**Details**	**Created By**	**Checked By**	**Date**
P01	First Issue	MH	MRW	13/09/24
P02	Site plan updated	MH	MH	20/09/24
P03	Rainwater harvesting added	MH	MRW	24/09/24
P04	SI Information added, calcs updated	MH	MH	23/01/25
P05	Southern Water letter added.	MH	MH	27/02/25
P06	Site plan updated	AS	MH	23/04/25

Contents

1. Introduction

ABSTRUCT Consulting have been appointed by Elivia Homes Eastern to prepare a surface and foul water drainage strategy to support a planning application for a new development of 29 dwellings.

1.1. Site Address / Location

Furners Lane, Henfield, West Sussex, BN5 9HS

Ordnance Survey Grid TQ 217 161

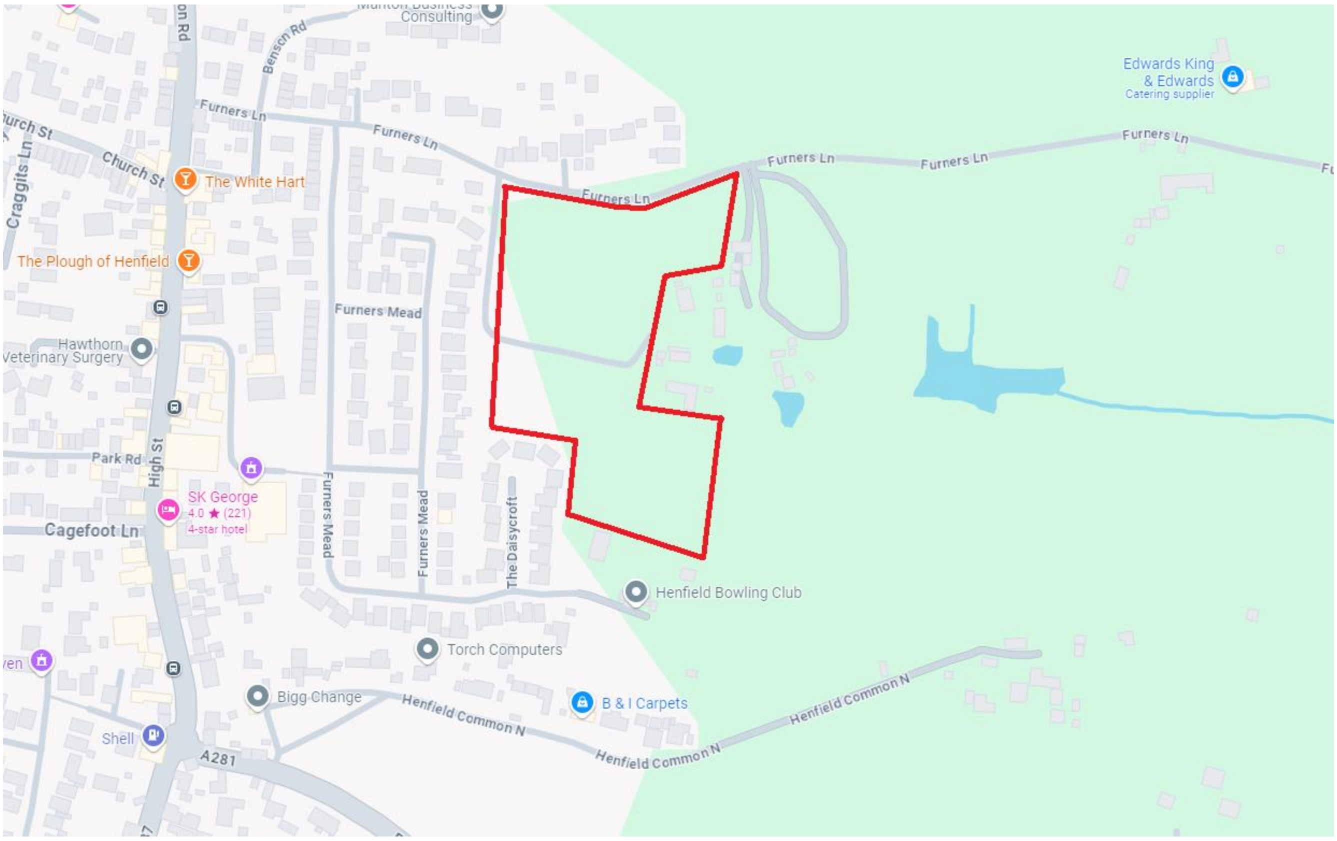

Figure 1 – Site Location Plan

1.2. Description of Site

1.2.1. Site

The site extends to 2.90ha and is located within the administrative boundary of Horsham District Council. The site comprises a greenfield with a track running through it which serves several dwellings on the eastern side of the site.

1.2.2. Surrounding Area

The site is immediately south of Furners Lane

To the west is the village of Henfield, whilst to the south is Henfield Bowling Club. There are further fields and small areas of woodland to the north and east.

1.2.3. Access

The site is accessed via an existing track, accessed off Furners Lane (public highway), beyond the existing track access Furners Lane changes to private. The existing access onto the development will be upgraded and formalised into a junction whilst the development is built out.

1.3. Description of Development

The development will comprise 29 dwellings along with associated access roads, parking areas, driveways, and landscaping. A proposed site layout can be found in Appendix A.

2. Existing Foul Water Drainage

Being a greenfield site there is no existing foul drainage on site. This is supported by the topographic survey found in Appendix B which shows no drainage onsite. There is a foul chamber within Furners Lane to the northwest of the site.

The Southern Water sewer records (found in Appendix C) shows that this is a public sewer.

3. Proposed Foul Drainage

A new private foul drainage system will be developed to discharge all foul water to the Southern Water public sewer manhole identified to the northwest of the site entrance.

All foul drainage is proposed to discharge under gravity via the new foul drainage system.

All new foul drainage will be designed and constructed in accordance with Approved Document Part H of the Building Regulations. A layout showing the drainage strategy can be found in Appendix D.

Southern Water have been consulted and have confirmed that they have adequate capacity for the foul flows at the proposed connection point. A letter confirming this can be found in Appendix G.

4. Existing Surface Water Drainage

Being a greenfield site there is no existing surface water drainage on site, however there will be greenfield runoff due to the impermeable nature of the soils beneath the site.

5. SUDS Assessment

Sustainable Urban Drainage Systems (SUDS) is the philosophy of trying to replicate, as closely as possible, the natural drainage from a site before development.

There are a number of SUDS features that should be considered for any development and these are set out in a hierarchy. These are summarised along with their suitability for the site in Table 2 below.

The British Geological Survey mapping for the area shows that the site is underlain by the Lower Greensand Group – Sandstone, silty. This, combined with the on site evidence of poor drainage through the upper layers of the soils shows that infiltration features would not be suitable for this site.

Further to this, infiltration testing was undertaken on site which recorded no infiltration potential. The results of this can be found in Appendix F.

SUDS Feature	Site Specific Notes	Proposed Use
1) Store Rainwater for Later Use		
Rainwater Harvesting	The site has a requirement to consider water neutrality. Rainwater harvesting will assist with this.	Proposed for use.
2) Use Infiltration Techniques		
Green Roofs	Sloped roofs generally offer poor results with green roofs.	Not proposed for use.
Soakaways	Site underlain by unsuitable soils.	Not proposed for use.
Permeable Paving	Site underlain by unsuitable soils. However, a tanked (lined) permeable paving system, discharging to the main drainage system would be possible and provides water quality improvement.	Proposed for use as a tanked system discharging to the sewer for water quality benefits.
3) Attenuate Rainwater in Ponds / Open Features for Gradual Release		
Swales / Detention Basins / Ponds	There are large open areas suitable for the use of these features.	Swales and a pond are proposed for use on site.
4) Attenuate Rainwater in Tanks for Gradual Release		
Reduced Discharge and Storage	Infiltration is expected to be very poor, offering no practical infiltration solution. Therefore, , surface water will be discharged to a local sewer. A combination of below ground attenuation tanks, tanked (lined) permeable paving, and a pond will be used to temporarily store the surface water prior to discharge.	Proposed for use.

Table 2 – SUDS Features Summary

6. Proposed Surface Water Drainage

Pre development, the site is classified as a greenfield site and therefore West Sussex's requirements for surface water drainage is to manage and control discharge rates to QBar, Greenfield runoff rates for the developed area.

Surface water runoff will be collected via a mix of tanked (lined) permeable paving, road gullies, swales, and gutters and rainwater downpipes. Surface water from the roofs will be collected and stored for reuse via rainwater harvesting units.

The remaining surface water will be conveyed via a new gravity surface water drainage network to a combined pond and below ground tank storage system located to the northeastern corner of the site.

Due to the topography of the site the surface water held in the pond / below ground attenuation tank will need to be pumped to a surface water sewer located further along Furners Lane to the west of the new site entrance.

The final, offsite flow rate will be restricted through the use of a surface water pump. Vortex flow controls will be utilised within the development in key areas (parking courts) to help control and manage the surface water run-off / discharge into the wider site drainage network.

A layout showing the drainage strategy can be found in Appendix D.

The above changes are summarised in table 3 below, and calculations supporting this summary can be found in Appendix E.

Return Period	Developed Area Greenfield Runoff Rate (ls^{-1})	Post Development Runoff Rate (ls^{-1})
1:2 year	1.7	2.0
QBar	1.9	2.0
1:30 year	3.7	2.0
1:100 year	4.7	2.0

Table 3 – Pre / Post Development Offsite Flow Rate Comparison

Temporary storage will be provided within a combination of a below ground attenuation tank and a pond to balance the volumes prior to discharge to the offsite sewer network up to and including the 1:100 year event with a 45% allowance for climate change which is in accordance with the Environment Agencies recent changes (May 2022), to how Climate Change Allowance is assessed and incorporated within developments.

The tank will be sufficient to store all storms up to and including the 1:30 year event, with the pond providing additional storage for the 1:100 year event.

Using the Environment Agencies Climate Change Allowances web page the 1% annual exceedance rainfall event for the 2070's Epoch * (upper end allowance) is 45%.

** Environment Agency guidelines state:-*

Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125. Design life of building is 100 years, therefore the 2070s number has been used.

Causeway Flow Calculations supporting the above strategy can be found in Appendix E.

In the event of surface water drainage system exceedance / failure, surface water will discharge over ground towards the north and west, as per the existing condition.

Southern Water have been consulted and have confirmed that they have adequate capacity for up to 3l/s of surface flows at the proposed connection point, therefore they have capacity for the 2l/s required. A letter confirming this can be found in Appendix G.

It is therefore shown that post development offsite surface water flows will be suitably managed and controlled in accordance with West Sussex Councils requirements.

7. Water Quality, Ecology, and Amenity

As demonstrated in Figure 2 below the site is not within any Source Protection Zones.

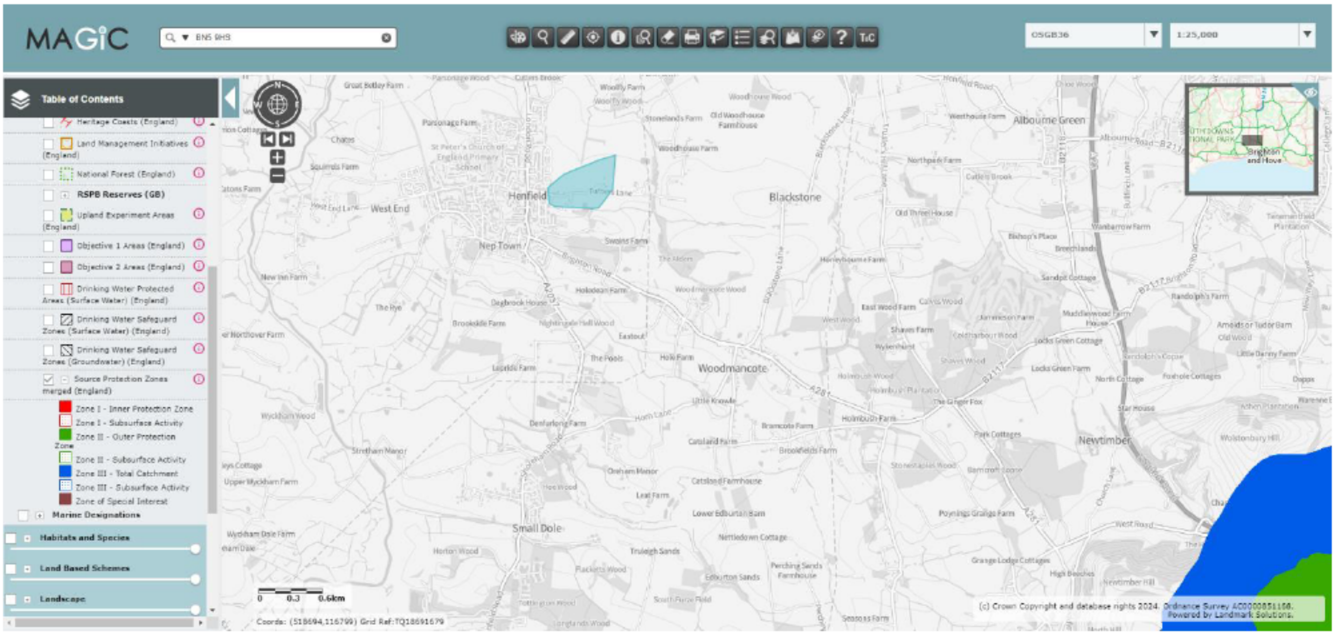

Figure 2 – Magic Map Showing Source Protection Zone

Surface water should be treated prior to discharge to the public sewer. Table 4.3 from CIRIA C753 (The SuDS Manual, 2015) sets out water quality management requirements for discharging surface water.

For Residential Roofs, removal of gross solids only is considered appropriate.

For Residential Parking, and Streets, a Simple Index Approach is considered appropriate. Therefore the site can be assessed using the simple index approach.

Table 26.2 of CIRIA C753 sets out the Hazard Indices for the areas of the site as identified in the previous paragraph. These need to be equalled or better by the Mitigation Indices of the SUDS components proposed to satisfy the requirements of the Simple Index Approach.

Table 4 below sets out the hazard indices.

Land Use	Total Suspended Solids	Metals	Hydrocarbons
Individual Driveways and low traffic roads	0.3	0.2	0.05

Table 4 – Pollution Hazard Indices

Table 26.3 of CIRIA C753 sets out the Mitigation Indices for various common SUDS features.

The surface water from the site will pass through various SUDS features, all of which will provide sufficient cleansing to the surface water.

Table 5 below compares the mitigation indices in the various treatment types to the pollution hazard indices and demonstrates compliance.

Land Use	SUDS Component	Total Suspended Solids	Metals	Hydrocarbons
Individual Driveways and low traffic roads.		0.3	0.2	0.05
	Pond	0.7	0.7	0.5
	Permeable Pavement	0.7	0.6	0.7
	Swale	0.5	0.6	0.6

Table 5 – Pollution Hazard Indices and Mitigation Indices

It can therefore be seen that the Mitigation Indices equal or better the Hazard Indices as required by the Simple Index Approach.

As well as providing water quality benefits the Swales and pond will also provide Ecology and Amenity benefits and will help soften the boundary with the housing to the southeast.

8. Adoption

It is not proposed to offer the new below ground surface and foul water drainage systems for Adoption.

9. Drainage Maintenance

The surface water drainage system serving the development will be managed and maintained by the residents own appointed management and maintenance team once the development has been officially handed over.

The pipework within the site will be designed to be self-cleansing in accordance with Part H of the Building Regulations and as such should have no specific maintenance requirements other than general clearance of silts and debris as and when required.

The use of manholes and inspection chambers will allow future access to maintain the system.

Standard typical maintenance associated with any property will be required for the roof water, typically consisting of ensuring that the system is clear of any leaves or other debris. This should be carried out as required.

Table 6 sets out the various elements of the drainage system and suggested maintenance requirements.

Drainage Element	Inspection Requirements	Maintenance Requirements	Inspection Schedule
Gutters & Rainwater Downpipes	Visual inspection to check for blockages.	Clear and blockages / debris found.	Yearly
Pipework	Designed to be self-cleansing, only required if flooding issue occurs, then by specialist CCTV company.	As recommended by specialist CCTV survey company.	When required.
Catchpits / Hydrobrake Chambers	Visual inspection for silt / debris.	Clear silt / debris.	Initially after 3 months, then every 6 months.
Permeable Paving	Visual check for debris and weeds.	Remove debris and weeds with powered brush to sweep the surface.	Initially after 3 months, then every 6 months.
Attenuation Tanks	CCTV survey to check distributor pipe is clear of debris, visual inspection of surface to check for deformation indicating an issue with the tank below.	Clear silt / debris. Excavation and replacement if required.	Yearly
Swales and Pond	Check for litter, debris, and weeds. Check grass length. Check for areas of poor vegetation growth.	Clear litter, debris, and weeds. Mow grass. Reseed areas to assist with growth.	Initially after 3 months, then every 6 months. Monthly during growing season.
Pump	As required by the manufacturer	As required by the manufacturer	Yearly
Below ground drainage system MUST only be worked on / entered by suitably trained and qualified people using appropriate Health and Safety equipment			

Table 6 – SUDS Maintenance Summary

10. Construction Phase Drainage System

Once appointed, the main contractor as part of their overall responsibilities will prepare the necessary documentation and methodology regarding how they intend to manage the surface water run-off during the main construction works.

11. Conclusions

The site is currently a greenfield site. There is a public foul water sewer network to the northwest of the site entrance in Furners Lane. A public surface water sewer network is also located to the northwest of the site entrance in Furners Lane.

The new development will comprise 29 new dwellings, alongside associated access roads, parking area, and driveways.

The proposed development will discharge foul water to the Southern Water public foul sewer to the northwest of the site in Furners Lane, via a new connection.

Surface water will be discharged to a surface water sewer identified to the northwest of the site along Furners Lane. Surface water flow rates will be restricted to the Greenfield Runoff QBar rate in accordance with the requirements of West Sussex County Council’s surface water drainage requirements. Surface water will be temporarily stored on site through the use of a combined below ground attenuation tank and pond prior to discharge. This will be sized for the 1:100 year event with a 45% allowance for climate change.

All surface water runoff shall also be treated prior to discharge to the sewer to help prevent contaminated surface water from leaving the site.

Appendix A – Proposed Site Layout

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

Designers Hazard Register

1. Conflict between construction work and Furners Lane highway.
2. Sloping site could cause subsidence when strip foundations are dug.
3. Construction works on an existing highway to create site access.
4. Close proximity to existing dwellings on Furners Mead and The Daisycroft.
5. Existing mature trees on site that are to be retained, full arboriculturalist recommended protection measures to be implemented.
6. Overhead cables to be buried as part of the works.

Rev	Date	Revision Details	Dr	Ch
P10	20.03.25	Revised visitor parking and pedestrian path.	NK	TW
P9	20.02.25	Accessible visitor parking spaces hatched	NK	TW
P8	04.02.25	Revised landscaping	NK	TW
P7	17.01.25	Revised landscaping	NK	TW
P6	16.01.25	Revised visitor parking	NK	TW
P5	03.01.25	Issued to Planning	LP	TW
P4	23.12.24	Issued to Planning	LP	TW
P3	18.12.24	Amended to clients comments	LP	TW
P2	12.12.24	Amended to clients comments	LP	TW
P1	27.09.24	Planning Submission	NK	TW

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Sussex: 64 - 68 Brighton Road, Worthing
West Sussex, BN11 2EN
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Bristol: Westworks, Beacon Tower
Colston Street, Bristol, BS1 4XE
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www.ecearchitecture.com

Client's Name
Elivia Homes

Job Title
Land West of Backsettown,
Furners Lane, Henfield

Drawing Title
Proposed Site Plan:
Presentation

Scale
1:500 @ A1 / 1:1000 @ A3

metres 10 20 30 40 50

Drawn	Checked	Date
AK	KE	17.09.24

Job No	Drawing No	Rev
7227	PL-04	P10

Status
APPROVAL

CAD Plot date: 20/03/2025 - 16:22:07 7227m henfield site plan.dwg

N

SITE PLAN

Accommodation Schedule

Affordable Rented Dwellings [10no. - 34,5%] ●

2no.	1-Bedroom M4(3) Flats	AFF Type 1	Block	607sqft
2no.	2-Bedroom Flats	AFF Type 2	Block	716sqft
2no.	2-Bedroom Houses	AFF Type 3	Terraced	874sqft
4no.	3-Bedroom Houses	AFF Type 4	Terraced	1003sqft

Open Market Dwellings [19no. - 65.5%]

2no.	3-Bedroom Chalet Bungalows	New House Type A	Detached	1526sqft
2no.	2-Bedroom Chalet Bungalows	New House Type B	Detached	1261sqft
2no.	3-Bedroom Chalet Bungalows	New House Type C	Semi-D	1295sqft
3no.	3-Bedroom Chalet Bungalows	Birtley	Detached	1238sqft
3no.	4-Bedroom Houses	Ashcombe II	Detached	1427sqft
5no.	4-Bedroom Houses	Barnham	Detached	1605sqft
2no.	4-Bedroom w/ Study Houses	Goring	Detached	1854sqft

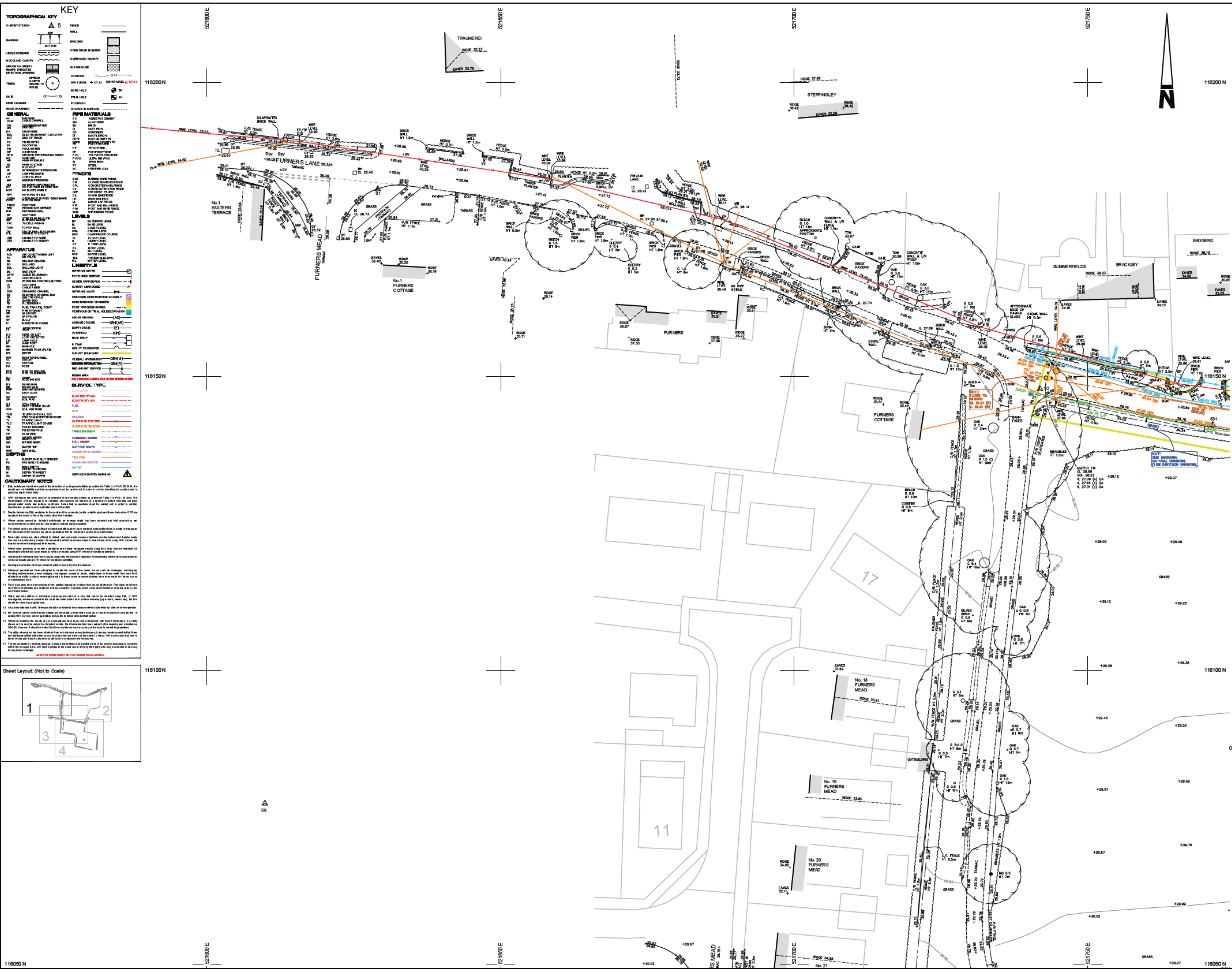
Total; 29 Dwellings

Parking

Allocated Spaces:	55 spaces
Visitor Parking:	19 spaces
Private Garages	15 (Garages to Plot 26 & 23 to be included in allocated spaces)

Total Parking Spaces: 74 spaces

Appendix B – Topographic and Utility Survey



Notes :

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99978 APPLIED.
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.
3. THIS SURVEY SHOULD ALWAYS BE READ IN CONJUNCTION WITH THE DESKTOP UTILITY REPORT, THAT WAS CARRIED OUT AS A PREREQUISITE TO THIS DETECTION SURVEY.
4. BACKGROUND INFORMATION (SHOWN GREY) PROVIDED BY THE CLIENT.

Coordinate Table

Station	Description	Easting	Northing	Level
S1	ROAD NAIL	521629.085	116181.868	26.633
S2	ROAD NAIL	521682.736	116176.876	28.082
S3	ROAD NAIL	521741.829	116147.849	28.712
S31	ROAD NAIL	521771.278	116141.770	28.815
S32	ROAD NAIL	521845.803	116136.759	27.762
S33	ROAD NAIL	521902.803	116162.273	27.368
S4	PEG	521775.036	116083.947	29.641
S5	PEG	521775.547	116004.393	30.514
S51	PEG	521826.232	115955.317	30.432
S6	ROAD NAIL	521730.851	116039.591	30.274
S61	PEG	521827.959	116018.801	29.417
S7	ROAD NAIL	521680.337	116044.756	30.272
S8	ROAD NAIL	521609.859	116077.368	28.910

Equipment Information

Equipment	Manufacturer	Model	Serial Number	MKS REF	Date of Calibration
EML Tx Transmitter	SPX Radiodetection	RD8100	[illegible]	RD16	27/05/2021
EML Rx Receiver	SPX Radiodetection	RD8100	[illegible]	RD16	27/05/2021
GPR	IDS Georadar	Opera	[illegible]	GPR7	29/03/2022

DETECTION SURVEY REPORT

GENERAL

This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

DESKTOP UTILITY REPORT

Prior to the survey commencing record information was gathered and compiled in a separate desktop utility report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey less than 90 days old in accordance with the requirements of the PAS 128:2014. For a full list of the providers searched, records received and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY

DRAINAGE

Drainage was lifted with pipe sizes and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. All connections from gullies, external rainwater pipes and external soil stacks have been proven wherever possible into manholes and sewer runs by radio sonde location and/or GPR. Where a saddle connection is present the position is assumed only until proven to QB2 or above. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as QB4. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A. Supplied information from our client suggests some drainage to be present in the field. These utilities do not feature in the Thames Water records and therefore have limited information regarding these.

WATER

Water utilities have been located using GPR with depths recorded to the crown of the pipe. Undetected routes have been added from the supplied record information. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

GAS

Gas utilities have been located using GPR with depths recorded to the crown of the pipe. Undetected routes have been added from the supplied record information. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

ELECTRICITY

Electricity utilities have been located using GPR and EML methods with depths recorded electronically and to the crown of the duct. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

TELECOM

Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

CATV

There were no CATV utilities detected on site which matches with the supplied record information.

UNKNOWNS

Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas. Unknown anomalies located using EML or GPR techniques with electronically derived depths recorded where possible. Recommend trial excavations to confirm identity position and depths in critical areas.

SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
QB4	A utility is expected to exist but cannot be detected - (AR), (R), (M)	Undefined
QB3, QB3P	Horizontal location only using one geophysical technique. No depth information - ND.	+/- 500mm Horizontal Undefined Vertical
QB2, QB2P	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
QB1 QB1P	Horizontal and vertical location only using two geophysical techniques.	+/- 150mm or +/- 15% of depth whichever is greater
QA	Service verified from open excavation, inside an inspection chamber / draw pit, or at the point the service enters / exits the ground.	+/- 50mm Horizontal +/- 25mm Vertical

Desktop Utility Records

Utility Type	Provider Details	Date Acquired
Drainage	Southern Water	08/03/2022
Water	Southern Water	08/03/2022
Gas	SGN	08/03/2022
Electricity	UK Power Networks	09/03/2022
Telecom	Openreach	08/03/2022
CATV	Virgin Media	08/03/2022
Tunnels & Pipelines	Linesearchbeforeudig	09/03/2022

Revision	Description	Surv. by	Check. by	App. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

Topographical and PAS 128:2014 Utility Survey

MILLWOOD

Furners Lane
Henfield
West Sussex

Scale:	Sheet Size:	Sheet Number:	Date:
1:200	A0	1	March 2022

Project Number:	Rev:	Surveyed by:	Checked by:	Approved by:
31022	-	JL/LW	AJ/TW	CP/NF

mksurveys

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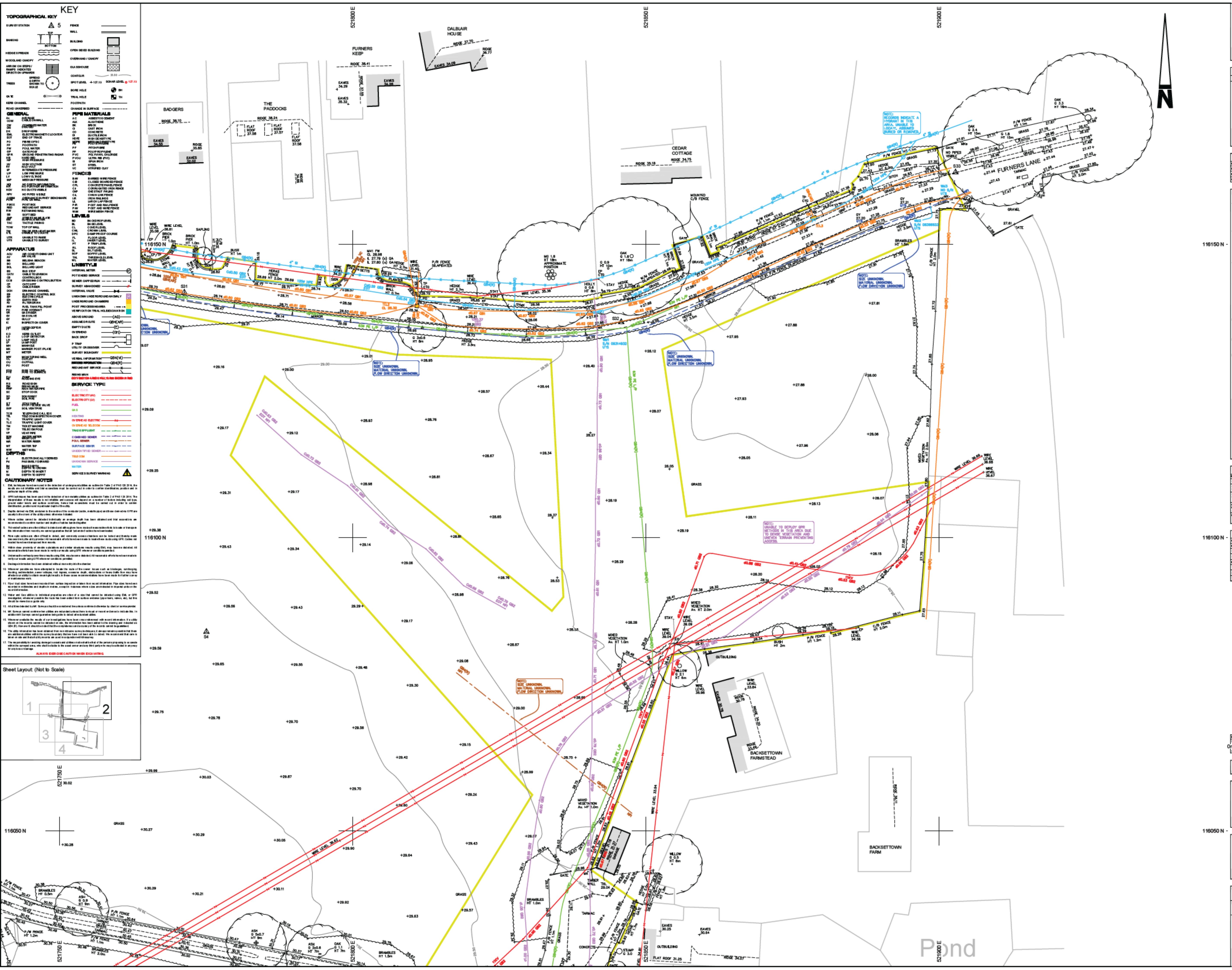

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GPR	IDS Georadar	Opera	6061A	GPR7	29/03/2022

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Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

CATV

There were no CATV utilities detected on site which matches with the supplied record information.

UNKNOWNS

Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas. Unknown anomalies located using EML or GPR techniques with electronically derived depths recorded where possible. Recommend trial excavations to confirm identity position and depths in critical areas.

SEE CAUTIONARY NOTES WITHIN THE UTILITY KEY

PAS 128:2014 Quality Level Guide

Quality Level	Description	Accuracy
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Desktop Utility Records

Utility Type	Provider Details	Date Acquired
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Water	Southern Water	08/03/2022
Gas	SGN	08/03/2022
Electricity	UK Power Networks	09/03/2022
Telecom	Openreach	08/03/2022
CATV	Virgin Media	08/03/2022
Tunnels & Pipelines	Linesearchbeforeudig	03/03/2022

Revision	Description	Surv. by	Check by	Appr. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

Topographical and PAS 128:2014 Utility Survey

MILLWOOD

Furners Lane
Henfield
West Sussex

Scale:	Sheet Size:	Sheet Number:	Date:
1:200	A0	2	March 2022

Project Number:	Rev:	Surveyed by:	Checked by:	Approved by:
31022	-	JL/LW	AJ/TW	CP/NF

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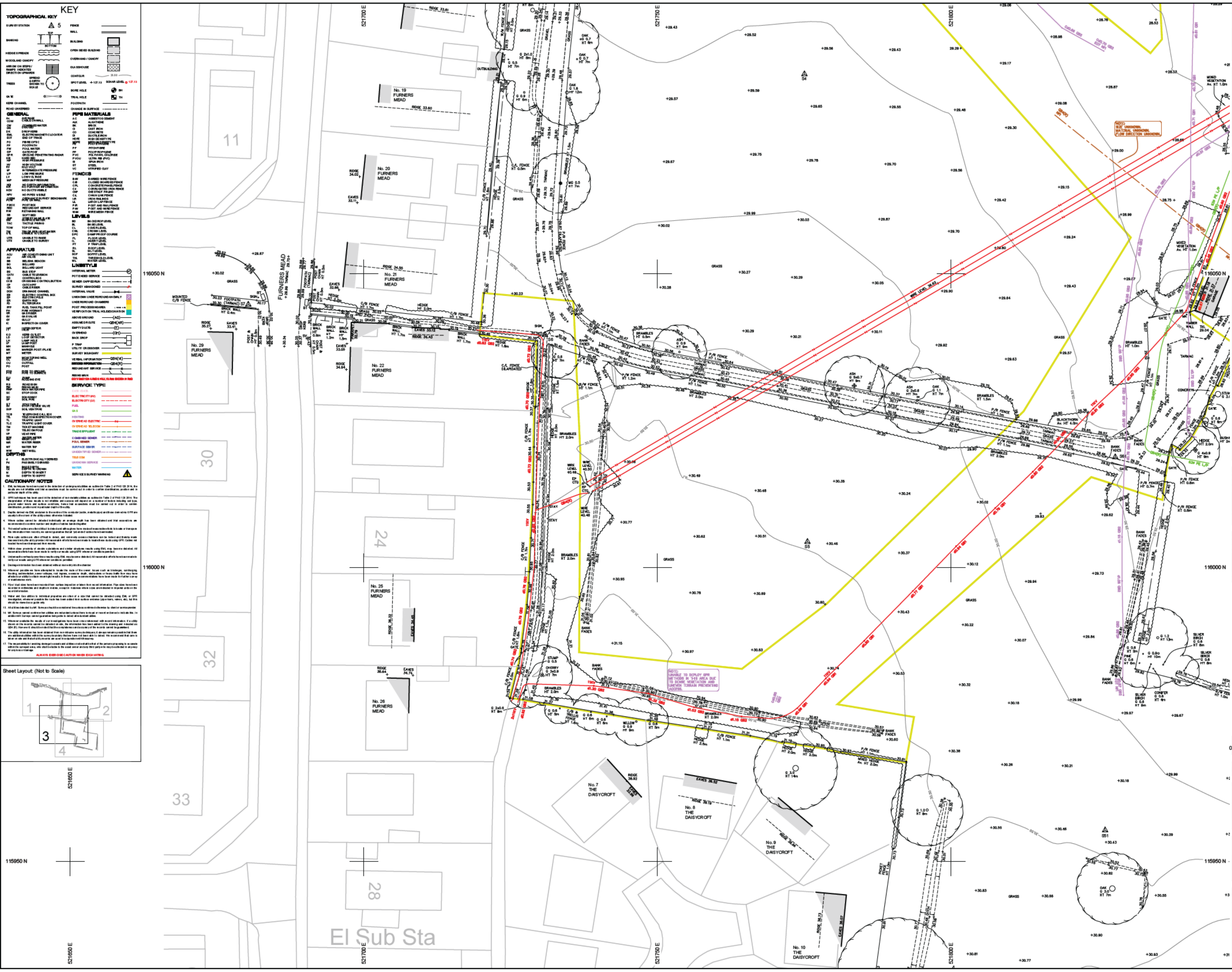

Notes :

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GNSS NETWORK. LOCAL SCALE FACTOR 0.99978 APPLIED.
2. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.
3. THIS SURVEY SHOULD ALWAYS BE READ IN CONJUNCTION WITH THE DESKTOP UTILITY REPORT, THAT WAS CARRIED OUT AS A PREREQUISITE TO THIS DETECTION SURVEY.
4. BACKGROUND INFORMATION (SHOWN GREY) PROVIDED BY THE CLIENT.

Coordinate Table

Station	Description	Easting	Northing	Level
S1	ROAD NAIL	521629.085	116181.868	26.633
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S31	ROAD NAIL	521771.278	116141.770	28.815
S32	ROAD NAIL	521845.803	116136.759	27.762
S33	ROAD NAIL	521902.803	116162.273	27.368
S4	PEG	521775.036	116083.947	29.641
S5	PEG	521775.547	116004.393	30.514
S51	PEG	521826.232	115955.317	30.432
S6	ROAD NAIL	521730.851	116039.591	30.274
S61	PEG	521827.959	116018.801	29.417
S7	ROAD NAIL	521680.337	116044.756	30.272
S8	ROAD NAIL	521609.859	116077.368	28.910

Equipment Information

Equipment	Manufacturer	Model	Serial Number	MKS REF	Date of Calibration
EML Tx Transmitter	SPX Radiodetection	RD8100	10656	RD16	27/05/2021
EML Rx Receiver	SPX Radiodetection	RD8100	2707	RD16	27/05/2021
GPR	IDS Georadar	Opera	8051A	GPR7	29/03/2022

DETECTION SURVEY REPORT

GENERAL

This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

DESKTOP UTILITY REPORT

Prior to the survey commencing record information was gathered and compiled in a separate desktop utility report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey less than 90 days old in accordance with the requirements of the PAS 128:2014. For a full list of the providers searched, records received and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY

DRAINAGE

Drainage was lifted with pipe sizes and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. All connections from gullies, external rainwater pipes and external soil stacks have been proven wherever possible into manholes and sewer runs by radio sonde location and/or GPR. Where a saddle connection is present the position is assumed only until proven to QB2 or above. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as QB4. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A. Supplied information from our client suggests some drainage to be present in the field. These utilities do not feature in the Thames Water records and therefore have limited information regarding these.

WATER

Water utilities have been located using GPR with depths recorded to the crown of the pipe. Undetected routes have been added from the supplied record information. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

GAS

Gas utilities have been located using GPR with depths recorded to the crown of the pipe. Undetected routes have been added from the supplied record information. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

ELECTRICITY

Electricity utilities have been located using GPR and EML methods with depths recorded electronically and to the crown of the duct. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

TELECOM

Telecom ducts have been traced with depths recorded. Due to laws protecting British Telecom apparatus all ducts have been located using remote detection techniques only and compared with record information. Chamber sizes have been recorded using GPR techniques wherever possible. For further information regarding BT apparatus please contact Openreach directly.

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There were no CATV utilities detected on site which matches with the supplied record information.

UNKNOWNS

Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets with depths (i.e. not linking two or more depth readings). This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification surveys (PAS 128:2014 survey type A) are carried out to identify these targets in critical areas. Unknown anomalies located using EML or GPR techniques with electronically derived depths recorded where possible. Recommend trial excavations to confirm identity position and depths in critical areas.

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Head Office: Milton Keynes t: 01908 555561 e: mail@mksurveys.co.uk

KEY

TOPOGRAPHICAL KEY

SURVEY STATION	△ 5	FENCE	
BANKING	TOP / BOTTOM	WALL	
HEDGE SPREADS		BUILDING	▨
WOODLAND CANOPY		OPEN SIDED BUILDING	▨
ARROW ON STEPS / RAMPS INDICATES DIRECTION UPWARDS		OVERHANG / CANOPY	▨
TREES	SPREAD & GIRTH SHOWN TO SCALE	GLASSHOUSE	▨
GATE		CONTOUR	30.00
KERB CHANNEL		SPOT LEVEL	+ 127.13
ROAD UNKERBED		SONAR LEVEL	● 127.13
		BORE HOLE	BH
		TRIAL HOLE	TH
		FOOTPATH	
		CHANGE IN SURFACE	

GENERAL

Av.	AVERAGE
COW	CABLE ON WALL
CW	COMBINED WATER
DIS	DISUSED
DK	DROP KERB
EML	ELECTROMAGNETIC LOCATOR
EOT	END OF TRACE
FO	FIBRE OPTIC
FP	FOOTPATH
FW	FOUL WATER
GP	GATE POST
GPR	GROUND PENETRATING RADAR
HB	HARD BED
HP	HIGH PRESSURE
HV	HIGH VOLTAGE
KV	KILO VOLT
IP	INTERMEDIATE PRESSURE
L/P	LOW PRESSURE
LV	LOW VOLTAGE
MP	MEDIUM PRESSURE
NDI	NO DEPTH INFORMATION
NFI	NO FURTHER INFORMATION
NDV	NO DUCTS VISIBLE
NPV	NO PIPES VISIBLE
OSBM	ORDNANCE SURVEY BENCHMARK
POW	PIPE ON WALL
P.BOX	POST BOX
RED	REDUNDANT SERVICE
RW	RETAINING WALL
SB	SOFT BED
SNP	STREET NAME PLATE
SW	SURFACE WATER
TAC	TACTILE PAVING
TOW	TOP OF WALL
TW	TRADE EFFLUENT WATER
U/L	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTS	UNABLE TO SURVEY

APPARATUS

ACU	AIR CONDITIONING UNIT
AV	AIR VALVE
BB	BELISHA BEACON
BO	BOLLARD
BOL	BOLLARD LIGHT
BS	BUS STOP
CATV	CABLE TELEVISION
CB	CONTROL BOX
CCB	CROSSING CONTROL BUTTON
CP	CATCHPIT
CR	CABLE RISER
DCH	DRAINAGE CHANNEL
EB	ELECTRIC CONTROL BOX
EP	ELECTRIC POLE
ER	EARTH ROD
FD	FILTER DRAIN
FFP	FUEL TANK FILL POINT
FH	FIRE HYDRANT
GR	GAS RISER
GV	GAS VALVE
GY	GULLY
IC	INSPECTION COVER
INT	INTERCEPTOR
IV	INLET
KO	KERB OUTLET
LD	LOOP DETECTOR
LH	LAMP HOLE
LP	LAMP POST
MH	MANHOLE
MK	MARKER POST / PLATE
MT	METER
MW	MONITORING WELL
OL	OUTLET
OU	OUTFALL
PO	POST
PTG	PIPE TO GROUND
PTS	PIPE TO SURFACE
PU	PUMP
RE	RODDING EYE
RS	ROAD SIGN
RM	RISING MAIN
RWP	RAIN WATER PIPE
SC	STOP COCK
SO	SOAKAWAY
SP	SOIL PIPE
ST	STAY CABLE
SV	STOP / SLUICE VALVE
SVP	SOIL VENT PIPE
TCB	TELEPHONE CALL BOX
TIL	TELECOM INSPECTION COVER
TL	TRAFFIC LIGHT
TLC	TRAFFIC LIGHT COVER
TM	TICKET MACHINE
TP	TELECOM POLE
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
WR	WATER RISER
WT	WATER TAP
WW	WET WELL

DEPTHS

E	ELECTRONICALLY DERIVED
Pd	PASSIVELY DERIVED
BK	BASE DEPTH
Cd	DEPTH TO CROWN
Id	DEPTH TO INVERT
Sd	DEPTH TO SOFFIT

PIPE MATERIALS

AC	ASBESTOS CEMENT
ALK	ALKATHENE
BK	BRICK
CI	CAST IRON
CO	CONCRETE
DI	DUCTILE IRON
HDPE	HIGH DENSITY PE
MDPE	MEDIUM DENSITY PE
PE	POLYETHYLENE
PF	PITCH FIBRE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
PVCU	ULTRA RIB (PVC)
SI	SPUN IRON
ST	STEEL
VC	VITRIFIED CLAY

FENCES

B/W	BARBED WIRE FENCE
C/B	CLOSED BOARDED FENCE
CPL	CONCRETE PANEL FENCE
CI	CORRUGATED IRON FENCE
CHP	CHESTNUT PALING
C/L	CHAIN LINK FENCE
I/R	IRON RAILINGS
LL	LARCH LAP FENCE
P/R	POST AND RAIL FENCE
P/W	POST AND WIRE FENCE
W/M	WIRE MESH FENCE

LEVELS

BD	BACKDROP LEVEL
BL	BASE LEVEL
CL	COVER LEVEL
CWL	CROWN LEVEL
DPC	DAMP PROOF COURSE
FL	FLOOR LEVEL
IL	INVERT LEVEL
PT	P TRAP LEVEL
RL	ROOF LEVEL
SL	SILT LEVEL
SOF	SOFFIT LEVEL
THL	THRESHOLD LEVEL
WL	WATER LEVEL

LINESTYLE

INTERNAL METER	
POT ENDED SERVICE	
SEWER CAPPED RUN	
SURVEY ABANDONED	
INTERNAL VALVE	
UNKNOWN UNDERGROUND ANOMALY	🟪
UNDERGROUND CHAMBERS	🟧
POST PROCESSING AREA	🟨
VERIFICATION TRIAL HOLE/EXCAVATION	🟦
ABOVE GROUND	(AG)
ASSUMED ROUTE	QB4(AR)
EMPTY DUCTS	(E)
OVERHEAD	(OH)
BACK DROP	
P TRAP	
UTILITY CROSSOVER	
SURVEY BOUNDARY	🟨
VERBAL INFORMATION	QB4(V)
RECORD INFORMATION	QB4(R)
REDUNDANT SERVICE	
RISING MAIN	

CCTV INSPECTION & RODDING RESULTS ARE SHOWN IN RED

SERVICE TYPE

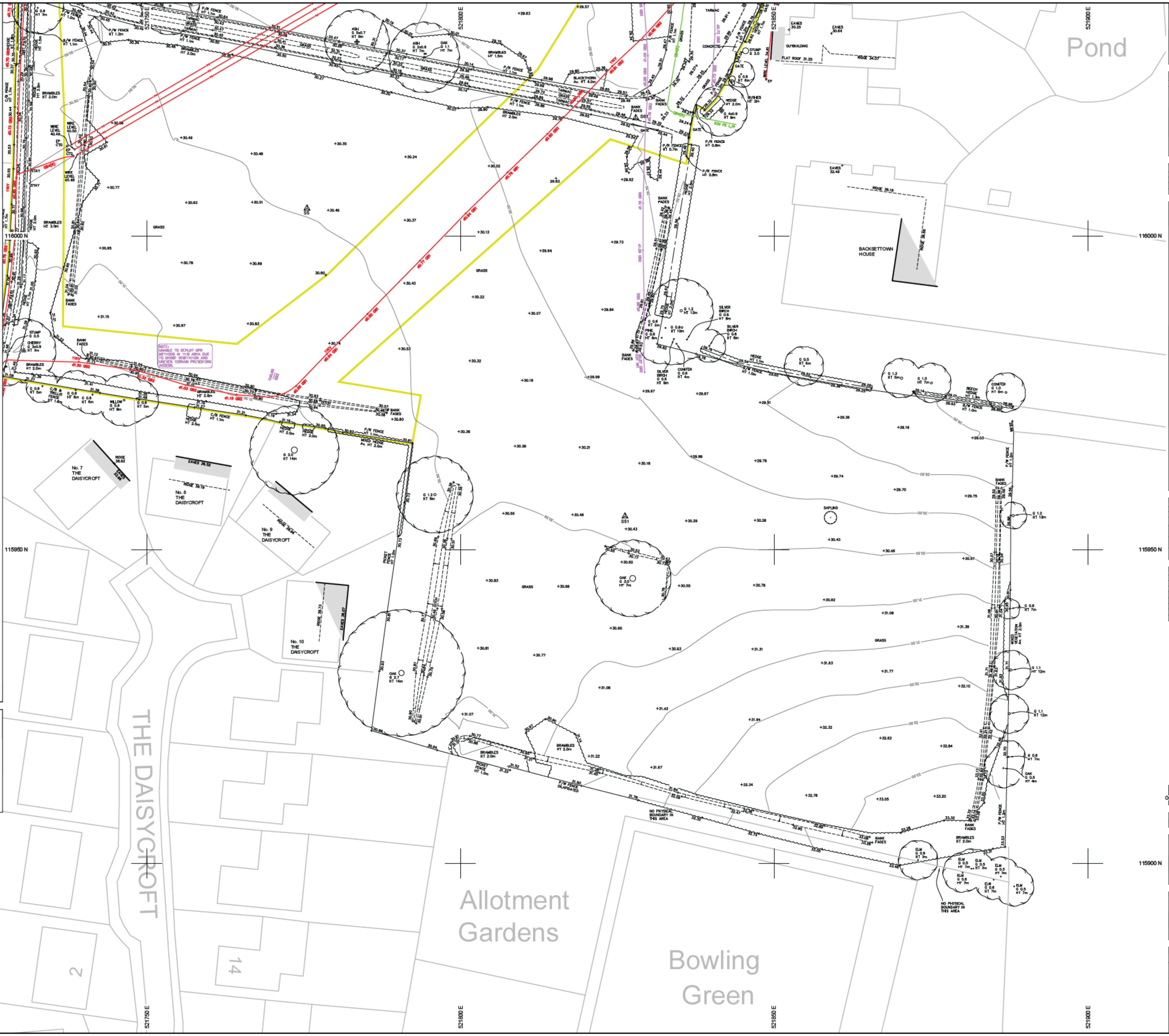
- CATV / DATA
- ELECTRICITY (HV)
- ELECTRICITY (LV)
- FUEL
- GAS
- HEATING
- OVERHEAD ELECTRIC
- OVERHEAD TELECOM
- TRADE EFFLUENT
- COMBINED SEWER
- FOUL SEWER
- SURFACE SEWER
- UNIDENTIFIED SEWER
- TELECOM
- UNKNOWN SERVICE
- WATER
- SERVICES SURVEY WARNING ⚠

CAUTIONARY NOTES

1. EML techniques have been used in the detection of underground utilities as outlined in Table 2 of PAS 128 2014, the results are not infallible and trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
2. GPR techniques has been used in the detection of non-metallic utilities as outlined in Table 2 of PAS 128 2014. The interpretation of these results is not infallible and success will depend on a number of factors including soil type, ground water levels and surface conditions, hence trial excavations must be carried out in order to confirm identification, position and in particular depth of the utility.
3. Depths derived via EML are taken to the centre of the conductor (cable, metallic pipe) and those derived via GPR are usually to the crown of the utility unless otherwise indicated.
4. Where cables cannot be detected individually an average depth has been obtained and trial excavations are recommended to confirm number and depths of cables banded together.
5. 'Pot-ended' cables are often difficult to detect and although we have made all reasonable efforts to locate or transpose this information from records, we cannot guarantee that all 'pot-ended' cables have been located.
6. Fibre optic cables are often difficult to detect, and commonly access chambers can be locked and thereby made inaccessible by the utility provider. All reasonable efforts have been made to locate these ducts using GPR. Cables not located have been transposed from records.
7. Within close proximity of electric substations and similar structures results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
8. Underneath overhead power lines results using EML may become distorted. All reasonable efforts have been made to verify our results using GPR wherever conditions permitted.
9. Drainage information has been obtained without man entry into the chamber.
10. Wherever possible we have attempted to locate the route of the sewer. Issues such as blockages, surcharging, flooding, sedimentation, sewer collapse, root ingress, excessive depth, obstructions or heavy traffic flow may have affected our ability to obtain meaningful results. In these cases recommendations have been made for further survey or maintenance work.
11. Pipe / duct sizes have been recorded from surface inspection or taken from record information. Pipe sizes have been recorded in millimetres and depths in metres, except in instances where sizes are indicated in imperial units on the record information.
12. Water and Gas utilities to individual properties are often of a size that cannot be detected using EML or GPR investigation, wherever possible the route has been added from surface evidence (pipe risers, valves, etc), but this should be viewed as a guide only.
13. All utilities detected by MK Surveys should be considered live unless confirmed otherwise by client or service provider.
14. MK Surveys cannot confirm when utilities are redundant unless there is visual or record evidence to indicate this. In addition MK Surveys cannot guarantee being able to detect all redundant utilities.
15. Wherever available the results of our investigations have been cross referenced with record information. If a utility shown on the records cannot be detected on site, the information has been added to the drawing and indicated as QB4 (R). However it should be noted that the completeness and accuracy of the records cannot be guaranteed.
16. The utility information has been obtained from non-intrusive survey techniques; it always remains possible that there are additional utilities within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all utility records are used in conjunction with this survey.
17. The responsibility for avoiding damage to assets and utilities on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING.

Sheet Layout: (Not to Scale)



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GPR	IDS Georadar	Opera	8051A	GPR7	29/03/2022

DETECTION SURVEY REPORT

GENERAL

This survey was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). After a pre-survey consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2014. The survey boundary has been shown on the drawing; please see linestyle section of the key for reference.

DESKTOP UTILITY REPORT

Prior to the survey commencing record information was gathered and compiled in a separate desktop utility report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey less than 90 days old in accordance with the requirements of the PAS 128:2014. For a full list of the providers searched, records received and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY

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Water utilities have been located using GPR with depths recorded to the crown of the pipe. Undetected routes have been added from the supplied record information. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

GAS

Gas utilities have been located using GPR with depths recorded to the crown of the pipe. Undetected routes have been added from the supplied record information. Trial excavations are recommended to confirm location and depth of pipes in critical areas.

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N

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0m 2 4 6 8 10 12 14 16 18 20 22

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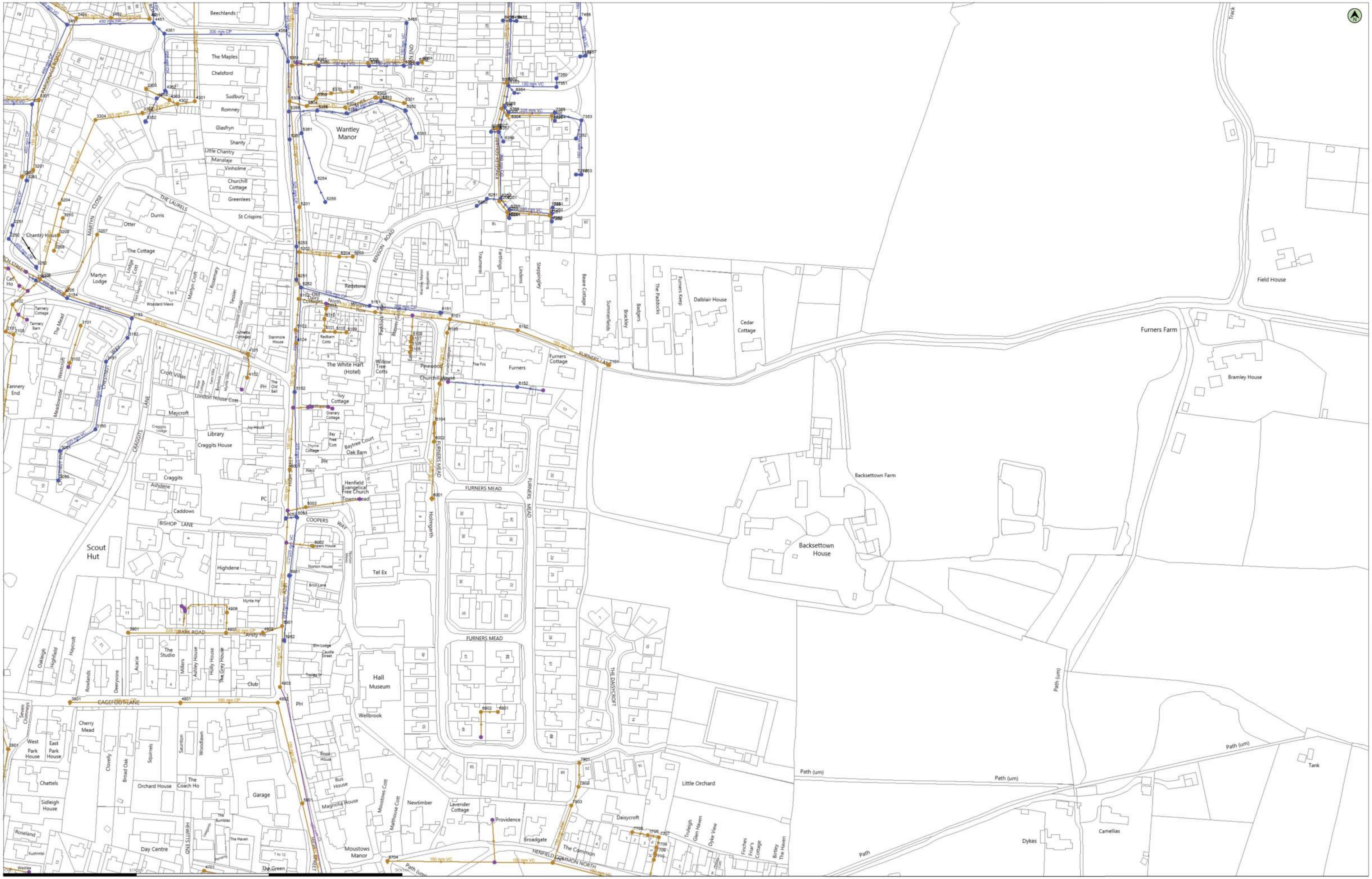
Head Office: Milton Keynes t: 01908 565561 e: mail@mksurveys.co.uk

Appendix C – Southern Water Sewer Records



(c) Crown copyright and database rights 2022 Ordnance Survey 100031673 | Date: 08/02/22 | Scale: 1:1250 | Map Centre: 521804,116094 | Data updated: 17/01/22 | Our Ref: 776904 - 3 | Wastewater Plan A1

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

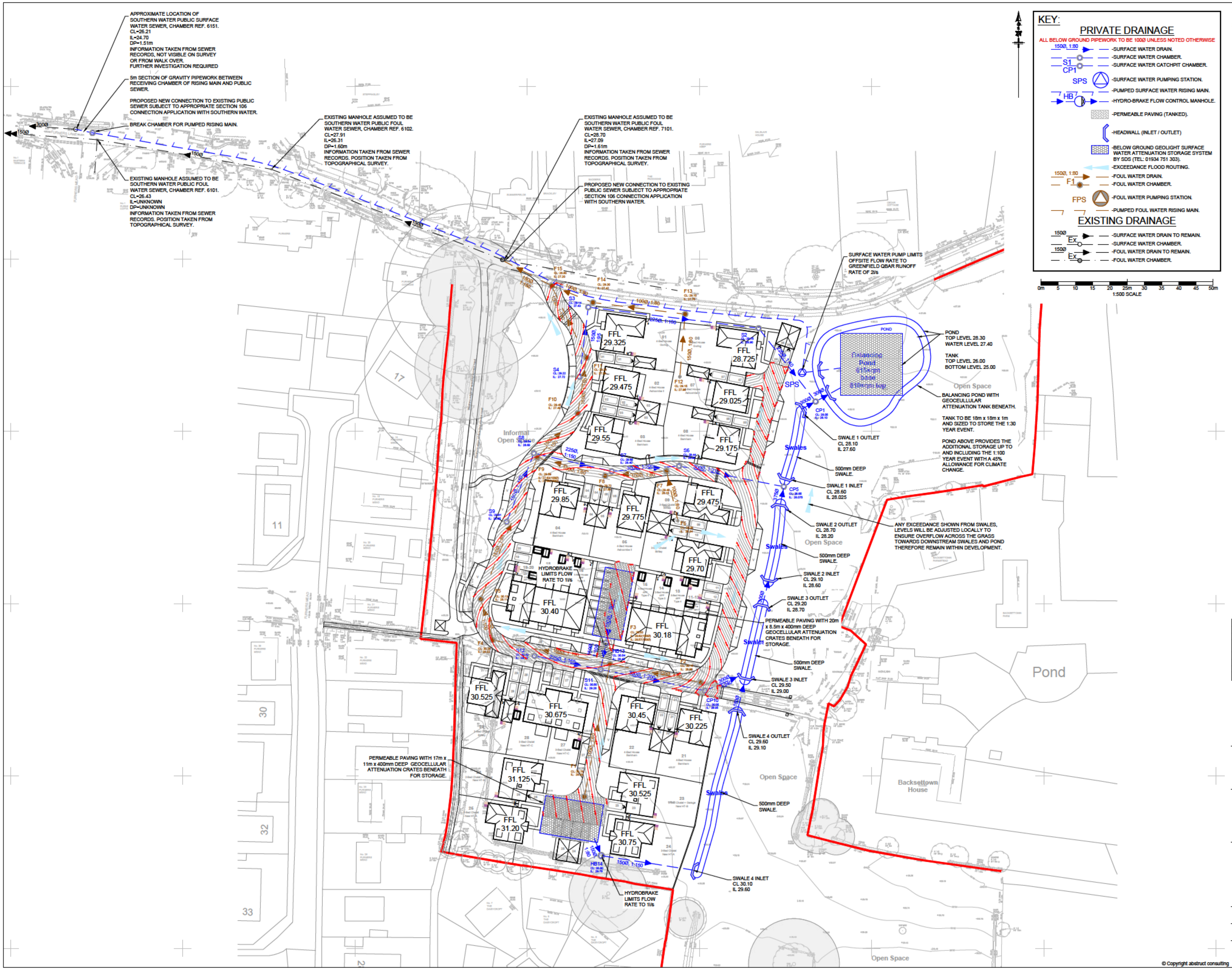
Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Foul Outfall
Surface Water Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Separation Chamber Dummy Manhole or Surface Water Soakaway

rachel.dyson@mksurveys.co.uk

31022

WATER for LIFE
from Southern Water

Appendix D – Drainage Strategy Drawing



1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND SPECIFICATIONS.

FOR INFORMATION ONLY

Rev	Drwn	Chkd	D.M.Y	Revision notes
P06	AS	MH	23.04.25	UPDATED TO SUIT NEW SITE LAYOUT.
P05	MH	MH	27.02.25	PUMP FLOW RATE NOTE AMENDED.
P04	MH	MH	23.01.25	SITE PLAN UPDATED TO LATEST.
P03	MH	MRW	18.11.24	ADDITIONAL INFO ADDED TO SUDS FEATURES.
P02	MH	MRW	20.09.24	SITE PLAN UPDATED TO LATEST.
P01	MH	MRW	13.09.24	PRELIMINARY ISSUE

Revisions

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Drawing Title
DRAINAGE STRATEGY LAYOUT

Status FOR INFORMATION

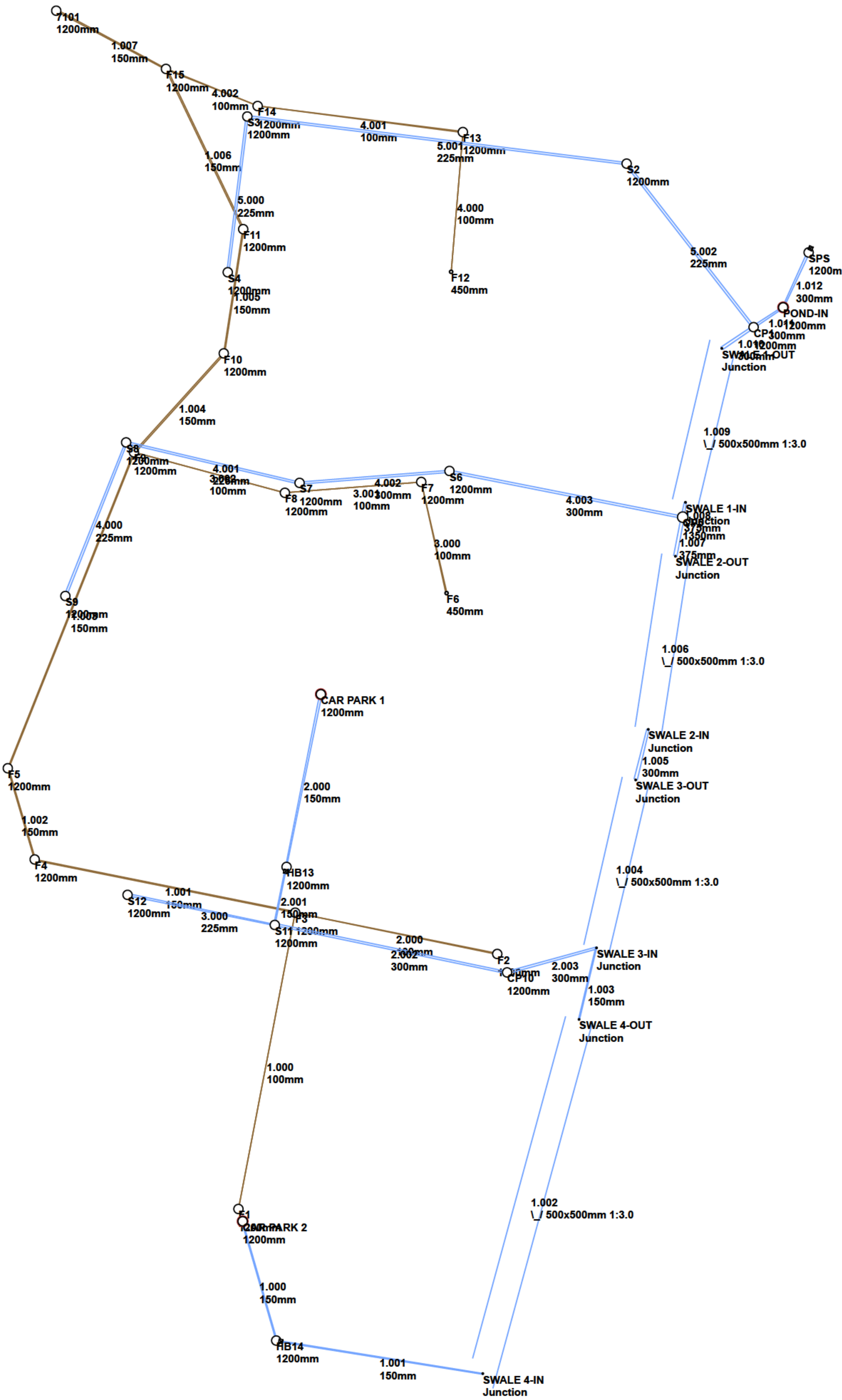
Scale 1 : 500 @A1 Proj. No. AC23068

Drawing Ref. AC23068-ABS-XX-ZZ-DR-C-5100
Revision P06

THIS DRAWING MUST BE READ AS A COLOUR PRINT

DWG FILE: AC23068-ABS-XX-ZZ-DR-C-5100-P06.dwg

Appendix E – Surface Water Drainage Calculations


7101
1200mm
1.007
150mm
F15
1200mm
4.002
100mm
F14
S3 1200mm
1200mm
4.001
100mm
F13
5.001 1200mm
225mm
S2
1200mm
1.006
150mm
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F11
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F12
450mm
5.002
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S4
1200mm
1.005
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SPS
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1.012
300mm
POND-IN
1.011 1200mm
CP1 300mm
1.010 1200mm
SWALE 1-OUT 300mm
Junction
F10
1200mm
1.004
150mm
1.009
_/ 500x500mm 1:3.0
S8
1200mm
F9
1200mm
4.001
3.002 225mm
100mm
S7
F8 1200mm
1200mm
4.002
3.001 300mm
100mm
F7
1200mm
S6
1200mm
4.003
300mm
SWALE 1-IN
1.008 Junction
S5 375mm
1350mm
1.007
375mm
SWALE 2-OUT
Junction
4.000
225mm
3.000
100mm
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1200mm
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150mm
F6
450mm
1.006
_/ 500x500mm 1:3.0
CAR PARK 1
1200mm
SWALE 2-IN
Junction
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300mm
SWALE 3-OUT
Junction
F5
1200mm
2.000
150mm
1.002
150mm
1.004
_/ 500x500mm 1:3.0
F4
1200mm
HB13
1200mm
S12
1200mm
1.001
150mm
3.000
225mm
2.001
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F3
S11 1200mm
1200mm
2.000
100mm
2.002
300mm
F2
150mm
CP10
1200mm
2.003
300mm
SWALE 3-IN
Junction
1.003
150mm
SWALE 4-OUT
Junction
1.000
100mm
1.002
_/ 500x500mm 1:3.0
F1
CAR PARK 2
1200mm
1200mm
1.000
150mm
HB14
1200mm
1.001
150mm
SWALE 4-IN
Junction

Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	x
Return Period (years)	2	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
CAR PARK 2	0.073	5.00	30.700	1200	521767.150	115992.379	0.800
HB14			30.800	1200	521771.524	115976.874	1.020
SWALE 4-IN			30.100		521798.450	115972.578	0.500
SWALE 4-OUT			29.600		521810.994	116018.628	0.500
CAR PARK 1	0.072	5.00	30.200	1200	521777.341	116060.905	0.600
HB13			30.540	1200	521772.872	116038.455	1.110
S12	0.035	5.00	30.430	1200	521752.149	116034.821	1.030
S11	0.052	5.00	30.500	1200	521771.339	116030.910	1.300
CP10	0.040	5.00	30.050	1200	521801.619	116024.738	1.000
SWALE 3-IN			29.500		521813.275	116027.931	0.500
SWALE 3-OUT			29.200		521818.374	116049.764	0.500
SWALE 2-IN			29.100		521820.015	116056.335	0.500
SWALE 2-OUT			28.700		521823.552	116078.845	0.500
S9	0.023	5.00	29.810	1200	521744.044	116073.681	0.960
S8	0.030	5.00	29.540	1200	521751.963	116093.650	0.910
S7	0.030	5.00	29.680	1200	521774.568	116088.386	1.280
S6	0.026	5.00	29.440	1200	521794.103	116089.937	1.140
CP5			28.650	1350	521824.503	116083.936	0.575
SWALE 1-IN			28.600		521824.863	116085.860	0.575
SWALE 1-OUT			28.100		521829.602	116105.867	0.500
S4	0.050	5.00	29.220	1200	521765.209	116115.773	1.500
S3	0.036	5.00	29.140	1200	521767.756	116136.025	1.710
S2	0.025	5.00	28.750	1200	521817.196	116129.896	1.850
CP1			28.050	1200	521833.746	116108.634	1.950
POND-IN			28.300	1200	521837.596	116111.205	3.300
SPS			28.300	1200	521840.918	116118.346	3.333

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
1.000	CAR PARK 2	HB14	16.110	0.600	29.900	29.780	0.120	134.3	150	5.31	50.0	
1.001	HB14	SWALE 4-IN	27.267	0.600	29.780	29.600	0.180	151.5	150	5.87	50.0	1.0
1.002	SWALE 4-IN	SWALE 4-OUT	47.728	0.240	29.600	29.100	0.500	95.5	500	10.30	39.2	
1.003	SWALE 4-OUT	SWALE 3-IN	9.579	0.600	29.100	29.000	0.100	95.8	150	10.46	38.9	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.865	15.3	13.2	0.650	0.870	0.073	0.0	108	0.971
1.001	0.814	14.4	1.0	0.870	0.350	0.073	0.0	27	0.465
1.002	0.179	179.5	10.3	0.000	0.000	0.073	0.0	134	0.086
1.003	1.027	18.1	10.3	0.350	0.350	0.073	0.0	81	1.057

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
2.000	CAR PARK 1	HB13	22.890	0.600	29.600	29.430	0.170	134.6	150	5.44	50.0	
2.001	HB13	S11	7.699	0.600	29.430	29.350	0.080	96.2	150	5.57	50.0	1.0
3.000	S12	S11	19.584	0.600	29.400	29.275	0.125	156.7	225	5.31	50.0	
2.002	S11	CP10	30.903	0.600	29.200	29.050	0.150	206.0	300	6.04	50.0	
2.003	CP10	SWALE 3-IN	12.085	0.600	29.050	29.000	0.050	241.7	300	6.24	50.0	
1.004	SWALE 3-IN	SWALE 3-OUT	22.421	0.240	29.000	28.700	0.300	74.7	500	12.30	35.6	
1.005	SWALE 3-OUT	SWALE 2-IN	6.773	0.600	28.700	28.600	0.100	67.7	300	12.36	35.5	
1.006	SWALE 2-IN	SWALE 2-OUT	22.786	0.240	28.600	28.200	0.400	57.0	500	13.99	33.1	
1.007	SWALE 2-OUT	CP5	5.179	0.600	28.200	28.075	0.125	41.4	375	14.02	33.0	
4.000	S9	S8	21.482	0.600	28.850	28.630	0.220	97.6	225	5.27	50.0	
4.001	S8	S7	23.210	0.600	28.630	28.475	0.155	149.7	225	5.63	50.0	
4.002	S7	S6	19.596	0.600	28.400	28.300	0.100	196.0	300	5.93	50.0	
4.003	S6	CP5	30.987	0.600	28.300	28.150	0.150	206.6	300	6.40	49.8	
1.008	CP5	SWALE 1-IN	1.957	0.600	28.075	28.025	0.050	39.1	375	14.03	33.0	
1.009	SWALE 1-IN	SWALE 1-OUT	20.561	0.240	28.025	27.600	0.425	48.4	500	15.39	31.3	
1.010	SWALE 1-OUT	CP1	4.983	0.600	27.600	26.100	1.500	3.3	300	15.40	31.3	
5.000	S4	S3	20.412	0.600	27.720	27.430	0.290	70.4	225	5.22	50.0	
5.001	S3	S2	49.818	0.600	27.430	26.900	0.530	94.0	225	5.83	50.0	
5.002	S2	CP1	26.944	0.600	26.900	26.175	0.725	37.2	225	6.04	50.0	
1.011	CP1	POND-IN	4.630	0.600	26.100	26.000	0.100	46.3	300	15.44	31.3	
1.012	POND-IN	SPS	7.876	0.600	25.000	24.967	0.033	238.7	300	15.56	31.1	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	0.864	15.3	13.0	0.450	0.960	0.072	0.0	106	0.968
2.001	1.024	18.1	1.0	0.960	1.000	0.072	0.0	24	0.546
3.000	1.042	41.4	6.3	0.805	1.000	0.035	0.0	59	0.758
2.002	1.091	77.1	28.7	1.000	0.700	0.159	0.0	127	1.014
2.003	1.007	71.2	36.0	0.700	0.200	0.199	0.0	151	1.009
1.004	0.203	202.9	39.2	0.000	0.000	0.305	0.0	241	0.133
1.005	1.913	135.2	39.1	0.200	0.200	0.305	0.0	110	1.661
1.006	0.232	232.4	41.2	0.000	0.000	0.345	0.0	231	0.149
1.007	2.822	311.6	41.2	0.125	0.200	0.345	0.0	91	1.978
4.000	1.323	52.6	4.2	0.735	0.685	0.023	0.0	43	0.796
4.001	1.066	42.4	9.6	0.685	0.980	0.053	0.0	73	0.865
4.002	1.119	79.1	15.0	0.980	0.840	0.083	0.0	88	0.867
4.003	1.090	77.0	19.6	0.840	0.200	0.109	0.0	103	0.915
1.008	2.903	320.6	54.1	0.200	0.200	0.454	0.0	104	2.182
1.009	0.252	252.1	55.1	0.075	0.000	0.487	0.0	254	0.171
1.010	8.683	613.8	55.1	0.200	1.650	0.487	0.0	60	5.444
5.000	1.561	62.0	9.0	1.275	1.485	0.050	0.0	58	1.118
5.001	1.349	53.6	15.5	1.485	1.625	0.086	0.0	83	1.174
5.002	2.152	85.6	20.1	1.625	1.650	0.111	0.0	74	1.770
1.011	2.316	163.7	67.5	1.650	2.000	0.598	0.0	134	2.207
1.012	1.013	71.6	67.2	3.000	3.033	0.598	0.0	232	1.146

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	7200	Check Discharge Rate(s)	✓	100 year (l/s)	4.7
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m^3/ha)	0.0	2 year (l/s)	1.7	Check Discharge Volume	✓
Summer CV	1.000	Skip Steady State	x	Starting Level (m)		30 year (l/s)	3.7	100 year 360 minute (m^3)	218

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	2160	2880	4320

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	10	0	30	40	10	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Host	1	Growth Factor 2 year	0.90	QMed	1.7	Q 100 year (l/s)	4.7
Greenfield Method	FEH	BFIHost	0.610	Growth Factor 30 year	1.95	QBar	1.9		
Positively Drained Area (ha)	0.593	Region	1	Growth Factor 100 year	2.48	Q 2 year (l/s)	1.7		
SAAR (mm)	808	QBar/QMed conversion factor	1.111	Betterment (%)	0	Q 30 year (l/s)	3.7		

Pre-development Discharge Volume

Site Makeup	Greenfield	Positively Drained Area (ha)	0.593	SPR	0.47	Return Period (years)	100	Storm Duration (mins)	360	PR	0.511
Greenfield Method	FSR/FEH	Soil Index	4	CWI	121.185	Climate Change (%)	0	Betterment (%)	0	Runoff Volume (m³)	218

Node HB14 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.520	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0053-1000-0520-1000		
Invert Level (m)	29.780	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075		

Node HB13 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.590	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0052-1000-0590-1000		
Invert Level (m)	29.430	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075		

Node SPS Online Pump Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	24.967	Switch on depth (m)	0.001	Switch off depth (m)	0.000

Depth (m)	Flow (l/s)
0.001	2.000

Node CAR PARK 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	29.600	Time to half empty (mins)	744

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	170.0	0.0	0.400	170.0	0.0	0.401	0.0	0.0

Node CAR PARK 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	29.900	Time to half empty (mins)	568

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	187.0	0.0	0.400	187.0	0.0	0.401	0.0	0.0

Node POND-IN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	1.00	Invert Level (m)	27.400	Time to half empty (mins)	1800

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	609.0	0.0	0.600	782.0	0.0	0.900	875.0	97.9

Node POND-IN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	25.000	Time to half empty (mins)	1380

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	324.0	0.0	1.000	324.0	0.0	1.001	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year +10% A 15 minute summer	74.577	21.103	30 year +40% CC +10% A 15 minute summer	402.742	113.962	100 year +45% CC +10% A 15 minute summer	524.835	148.510
1 year +10% A 15 minute winter	52.335	21.103	30 year +40% CC +10% A 15 minute winter	282.626	113.962	100 year +45% CC +10% A 15 minute winter	368.306	148.510
1 year +10% A 30 minute summer	48.062	13.600	30 year +40% CC +10% A 30 minute summer	268.014	75.839	100 year +45% CC +10% A 30 minute summer	351.721	99.525
1 year +10% A 30 minute winter	33.728	13.600	30 year +40% CC +10% A 30 minute winter	188.080	75.839	100 year +45% CC +10% A 30 minute winter	246.821	99.525
1 year +10% A 60 minute summer	32.829	8.676	30 year +40% CC +10% A 60 minute summer	182.524	48.236	100 year +45% CC +10% A 60 minute summer	241.537	63.831
1 year +10% A 60 minute winter	21.811	8.676	30 year +40% CC +10% A 60 minute winter	121.264	48.236	100 year +45% CC +10% A 60 minute winter	160.472	63.831
1 year +10% A 120 minute summer	25.547	6.751	30 year +40% CC +10% A 120 minute summer	114.033	30.136	100 year +45% CC +10% A 120 minute summer	147.891	39.083
1 year +10% A 120 minute winter	16.973	6.751	30 year +40% CC +10% A 120 minute winter	75.761	30.136	100 year +45% CC +10% A 120 minute winter	98.255	39.083
1 year +10% A 180 minute summer	21.565	5.549	30 year +40% CC +10% A 180 minute summer	87.860	22.609	100 year +45% CC +10% A 180 minute summer	113.182	29.126
1 year +10% A 180 minute winter	14.018	5.549	30 year +40% CC +10% A 180 minute winter	57.111	22.609	100 year +45% CC +10% A 180 minute winter	73.571	29.126
1 year +10% A 240 minute summer	17.928	4.738	30 year +40% CC +10% A 240 minute summer	69.345	18.326	100 year +45% CC +10% A 240 minute summer	89.160	23.562
1 year +10% A 240 minute winter	11.911	4.738	30 year +40% CC +10% A 240 minute winter	46.071	18.326	100 year +45% CC +10% A 240 minute winter	59.236	23.562
1 year +10% A 360 minute summer	14.347	3.692	30 year +40% CC +10% A 360 minute summer	52.431	13.492	100 year +45% CC +10% A 360 minute summer	67.561	17.386
1 year +10% A 360 minute winter	9.326	3.692	30 year +40% CC +10% A 360 minute winter	34.082	13.492	100 year +45% CC +10% A 360 minute winter	43.916	17.386
1 year +10% A 480 minute summer	11.511	3.042	30 year +40% CC +10% A 480 minute summer	40.794	10.781	100 year +45% CC +10% A 480 minute summer	52.811	13.957
1 year +10% A 480 minute winter	7.648	3.042	30 year +40% CC +10% A 480 minute winter	27.103	10.781	100 year +45% CC +10% A 480 minute winter	35.087	13.957
1 year +10% A 600 minute summer	9.517	2.603	30 year +40% CC +10% A 600 minute summer	33.024	9.033	100 year +45% CC +10% A 600 minute summer	42.923	11.741
1 year +10% A 600 minute winter	6.502	2.603	30 year +40% CC +10% A 600 minute winter	22.564	9.033	100 year +45% CC +10% A 600 minute winter	29.328	11.741
1 year +10% A 720 minute summer	8.528	2.286	30 year +40% CC +10% A 720 minute summer	29.124	7.806	100 year +45% CC +10% A 720 minute summer	37.974	10.177
1 year +10% A 720 minute winter	5.731	2.286	30 year +40% CC +10% A 720 minute winter	19.573	7.806	100 year +45% CC +10% A 720 minute winter	25.521	10.177
1 year +10% A 960 minute summer	7.051	1.857	30 year +40% CC +10% A 960 minute summer	23.498	6.187	100 year +45% CC +10% A 960 minute summer	30.750	8.097
1 year +10% A 960 minute winter	4.671	1.857	30 year +40% CC +10% A 960 minute winter	15.565	6.187	100 year +45% CC +10% A 960 minute winter	20.369	8.097
1 year +10% A 1440 minute summer	5.158	1.382	30 year +40% CC +10% A 1440 minute summer	16.588	4.446	100 year +45% CC +10% A 1440 minute summer	21.768	5.834
1 year +10% A 1440 minute winter	3.466	1.382	30 year +40% CC +10% A 1440 minute winter	11.148	4.446	100 year +45% CC +10% A 1440 minute winter	14.629	5.834
1 year +10% A 2160 minute summer	3.762	1.040	30 year +40% CC +10% A 2160 minute summer	11.612	3.209	100 year +45% CC +10% A 2160 minute summer	15.200	4.201
1 year +10% A 2160 minute winter	2.592	1.040	30 year +40% CC +10% A 2160 minute winter	8.001	3.209	100 year +45% CC +10% A 2160 minute winter	10.473	4.201
1 year +10% A 2880 minute summer	3.203	0.859	30 year +40% CC +10% A 2880 minute summer	9.566	2.564	100 year +45% CC +10% A 2880 minute summer	12.460	3.339
1 year +10% A 2880 minute winter	2.153	0.859	30 year +40% CC +10% A 2880 minute winter	6.429	2.564	100 year +45% CC +10% A 2880 minute winter	8.374	3.339
1 year +10% A 4320 minute summer	2.570	0.672	30 year +40% CC +10% A 4320 minute summer	7.268	1.900	100 year +45% CC +10% A 4320 minute summer	9.337	2.441
1 year +10% A 4320 minute winter	1.692	0.672	30 year +40% CC +10% A 4320 minute winter	4.787	1.900	100 year +45% CC +10% A 4320 minute winter	6.149	2.441

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	CAR PARK 2	232	29.949	0.049	3.2	8.7619	0.0000	OK
360 minute summer	HB14	232	29.949	0.169	1.3	0.1907	0.0000	SURCHARGED
120 minute winter	SWALE 4-IN	102	29.651	0.051	1.0	0.0000	0.0000	OK
15 minute summer	SWALE 4-OUT	13	29.137	0.037	2.8	0.0000	0.0000	OK
240 minute summer	CAR PARK 1	160	29.650	0.050	3.9	8.1833	0.0000	OK
240 minute summer	HB13	160	29.650	0.220	1.7	0.2484	0.0000	SURCHARGED
15 minute summer	S12	10	29.452	0.052	4.7	0.0585	0.0000	OK
15 minute summer	S11	10	29.277	0.077	11.6	0.0871	0.0000	OK
15 minute summer	CP10	11	29.157	0.107	16.8	0.1215	0.0000	OK
15 minute summer	SWALE 3-IN	12	29.142	0.142	16.4	0.0000	0.0000	OK
15 minute summer	1.004:50%	13	29.042	0.192	17.1	0.0000	0.0000	OK
15 minute summer	SWALE 3-OUT	13	28.766	0.066	14.6	0.0000	0.0000	OK
15 minute summer	SWALE 2-IN	14	28.737	0.137	14.5	0.0000	0.0000	OK
30 minute summer	1.006:50%	23	28.593	0.193	16.0	0.0000	0.0000	OK
30 minute summer	SWALE 2-OUT	23	28.258	0.058	15.1	0.0000	0.0000	OK
15 minute summer	S9	10	28.887	0.037	3.1	0.0413	0.0000	OK
15 minute summer	S8	11	28.693	0.063	7.0	0.0707	0.0000	OK
15 minute summer	S7	11	28.476	0.076	10.7	0.0861	0.0000	OK
15 minute summer	S6	11	28.388	0.088	14.1	0.0998	0.0000	OK
30 minute summer	CP5	21	28.187	0.112	23.3	0.1596	0.0000	OK
30 minute summer	SWALE 1-IN	21	28.194	0.169	23.1	0.0000	0.0000	OK
120 minute summer	1.009:50%	70	28.051	0.239	22.6	2.6534	0.0000	OK
120 minute summer	SWALE 1-OUT	72	27.638	0.038	21.4	0.0000	0.0000	OK
15 minute summer	S4	10	27.769	0.049	6.7	0.0560	0.0000	OK
15 minute summer	S3	10	27.502	0.072	11.4	0.0813	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	CAR PARK 2	1.000	HB14	1.3	0.214	0.085	0.1820	
360 minute summer	HB14	Hydro-Brake®	SWALE 4-IN	1.0				
120 minute winter	SWALE 4-IN	1.002	SWALE 4-OUT	1.0	0.043	0.006	1.1265	
15 minute summer	SWALE 4-OUT	1.003	SWALE 3-IN	-2.8	-0.291	-0.153	0.0968	
240 minute summer	CAR PARK 1	2.000	HB13	1.7	0.220	0.113	0.2608	
240 minute summer	HB13	Hydro-Brake®	S11	1.0				
15 minute summer	S12	3.000	S11	4.6	0.684	0.111	0.1318	
15 minute summer	S11	2.002	CP10	11.4	0.634	0.147	0.5704	
15 minute summer	CP10	2.003	SWALE 3-IN	16.4	0.615	0.231	0.3332	
15 minute summer	SWALE 3-IN	1.004	1.004:50%	13.1	0.090	0.065	1.8553	
15 minute summer	SWALE 3-IN	1.004	SWALE 3-OUT	14.6	0.128	0.072	1.4119	
15 minute summer	SWALE 3-OUT	1.005	SWALE 2-IN	14.5	0.892	0.107	0.1443	
15 minute summer	SWALE 2-IN	1.006	1.006:50%	14.0	0.091	0.060	1.8320	
15 minute summer	SWALE 2-IN	1.006	SWALE 2-OUT	14.1	0.135	0.061	1.3452	
30 minute summer	SWALE 2-OUT	1.007	CP5	15.1	1.007	0.048	0.0972	
15 minute summer	S9	4.000	S8	3.0	0.475	0.058	0.1404	
15 minute summer	S8	4.001	S7	6.9	0.780	0.162	0.2046	
15 minute summer	S7	4.002	S6	10.8	0.693	0.136	0.3067	
15 minute summer	S6	4.003	CP5	13.9	0.823	0.180	0.5223	
30 minute summer	CP5	1.008	SWALE 1-IN	23.1	0.792	0.072	0.0739	
30 minute summer	SWALE 1-IN	1.009	1.009:50%	23.1	0.115	0.092	2.2919	
30 minute summer	SWALE 1-IN	1.009	SWALE 1-OUT	21.0	0.168	0.083	1.5906	
120 minute summer	SWALE 1-OUT	1.010	CP1	21.4	1.852	0.035	0.0621	
15 minute summer	S4	5.000	S3	6.6	0.771	0.107	0.1771	
15 minute summer	S3	5.001	S2	11.3	1.122	0.210	0.5023	

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	S2	11	26.964	0.064	14.5	0.0725	0.0000	OK
120 minute summer	CP1	68	26.198	0.098	27.7	0.1105	0.0000	OK
960 minute summer	POND-IN	765	25.388	0.388	11.6	119.7810	0.0000	SURCHARGED
960 minute summer	SPS	765	25.388	0.421	4.8	0.4758	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	S2	5.002	CP1	14.5	1.588	0.170	0.2461	
120 minute summer	CP1	1.011	POND-IN	27.7	1.555	0.169	0.0826	
960 minute summer	POND-IN	1.012	SPS	4.8	0.706	0.067	0.5546	
960 minute summer	SPS	Pump		2.0				200.0

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	CAR PARK 2	352	30.169	0.269	7.6	48.0623	0.0000	SURCHARGED
360 minute winter	HB14	352	30.168	0.388	1.3	0.4392	0.0000	SURCHARGED
4320 minute summer	SWALE 4-IN	2100	29.651	0.051	1.0	0.0000	0.0000	OK
30 minute summer	SWALE 4-OUT	21	29.310	0.210	13.0	0.0000	0.0000	FLOOD RISK
360 minute winter	CAR PARK 1	352	29.887	0.287	7.5	46.7429	0.0000	SURCHARGED
360 minute winter	HB13	352	29.887	0.457	1.4	0.5166	0.0000	SURCHARGED
15 minute summer	S12	11	29.568	0.168	25.3	0.1899	0.0000	OK
15 minute summer	S11	11	29.535	0.335	64.1	0.3794	0.0000	SURCHARGED
15 minute summer	CP10	11	29.420	0.370	87.9	0.4188	0.0000	SURCHARGED
15 minute summer	SWALE 3-IN	12	29.322	0.322	87.7	0.0000	0.0000	OK
15 minute summer	1.004:50%	12	29.229	0.379	93.6	0.0000	0.0000	OK
15 minute summer	SWALE 3-OUT	13	28.946	0.246	93.9	0.0000	0.0000	OK
15 minute summer	SWALE 2-IN	13	28.930	0.330	89.7	0.0000	0.0000	OK
15 minute summer	1.006:50%	12	28.774	0.374	108.8	0.0000	0.0000	OK
30 minute summer	SWALE 2-OUT	21	28.498	0.298	107.4	0.0000	0.0000	OK
15 minute summer	S9	10	28.936	0.086	16.6	0.0971	0.0000	OK
15 minute summer	S8	11	28.806	0.176	38.2	0.1987	0.0000	OK
15 minute summer	S7	11	28.630	0.230	58.7	0.2601	0.0000	OK
15 minute summer	S6	12	28.596	0.296	76.3	0.3350	0.0000	OK
30 minute summer	CP5	21	28.489	0.414	161.7	0.5917	0.0000	FLOOD RISK
30 minute summer	SWALE 1-IN	21	28.450	0.425	161.5	0.0000	0.0000	OK
30 minute summer	1.009:50%	22	28.353	0.541	174.7	14.0102	0.0000	PONDING
2160 minute winter	SWALE 1-OUT	2100	27.717	0.117	16.7	0.0000	0.0000	OK
15 minute summer	S4	11	27.853	0.133	36.2	0.1505	0.0000	OK
15 minute summer	S3	11	27.761	0.331	62.0	0.3743	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	CAR PARK 2	1.000	HB14	1.3	0.211	0.085	0.2836	
360 minute winter	HB14	Hydro-Brake®	SWALE 4-IN	1.0				
4320 minute summer	SWALE 4-IN	1.002	SWALE 4-OUT	1.0	0.043	0.006	1.1261	
30 minute summer	SWALE 4-OUT	1.003	SWALE 3-IN	-12.7	-0.724	-0.702	0.1686	
360 minute winter	CAR PARK 1	2.000	HB13	1.4	0.212	0.090	0.4030	
360 minute winter	HB13	Hydro-Brake®	S11	1.0				
15 minute summer	S12	3.000	S11	25.5	0.956	0.616	0.7006	
15 minute summer	S11	2.002	CP10	60.3	0.857	0.782	2.1762	
15 minute summer	CP10	2.003	SWALE 3-IN	87.7	1.245	1.232	0.8510	
15 minute summer	SWALE 3-IN	1.004	1.004:50%	71.0	0.130	0.350	6.1263	
15 minute summer	SWALE 3-IN	1.004	SWALE 3-OUT	93.9	0.216	0.463	5.1280	
15 minute summer	SWALE 3-OUT	1.005	SWALE 2-IN	89.7	1.305	0.664	0.4478	
15 minute summer	SWALE 2-IN	1.006	1.006:50%	89.6	0.164	0.386	6.2239	
15 minute summer	SWALE 2-IN	1.006	SWALE 2-OUT	108.1	0.220	0.465	5.7736	
30 minute summer	SWALE 2-OUT	1.007	CP5	106.8	1.058	0.343	0.5287	
15 minute summer	S9	4.000	S8	16.5	0.706	0.313	0.5060	
15 minute summer	S8	4.001	S7	37.4	1.171	0.883	0.7409	
15 minute summer	S7	4.002	S6	58.1	0.976	0.734	1.2542	
15 minute summer	S6	4.003	CP5	73.2	1.180	0.950	2.1796	
30 minute summer	CP5	1.008	SWALE 1-IN	161.5	1.464	0.504	0.2159	
30 minute summer	SWALE 1-IN	1.009	1.009:50%	158.8	0.182	0.630	9.7466	
30 minute summer	SWALE 1-IN	1.009	SWALE 1-OUT	155.7	0.334	0.617	6.2640	
2160 minute winter	SWALE 1-OUT	1.010	CP1	20.1	1.552	0.033	0.2386	
15 minute summer	S4	5.000	S3	36.0	1.115	0.580	0.6553	
15 minute summer	S3	5.001	S2	58.5	1.561	1.090	1.8899	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	S2	2100	27.715	0.815	2.7	0.9218	0.0000	SURCHARGED
2160 minute winter	CP1	2100	27.716	1.616	20.1	1.8273	0.0000	SURCHARGED
2160 minute winter	POND-IN	2100	27.714	2.714	21.2	516.5735	0.0000	SURCHARGED
2160 minute winter	SPS	2100	27.714	2.747	2.2	3.1065	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	S2	5.002	CP1	2.7	0.978	0.032	1.0716	
2160 minute winter	CP1	1.011	POND-IN	21.2	1.293	0.130	0.3260	
2160 minute winter	POND-IN	1.012	SPS	2.2	0.646	0.031	0.5546	
2160 minute winter	SPS	Pump		2.0				751.9

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
480 minute winter	CAR PARK 2	464	30.267	0.367	7.8	65.5322	0.0000	SURCHARGED
480 minute winter	HB14	464	30.266	0.486	1.2	0.5496	0.0000	SURCHARGED
4320 minute winter	SWALE 4-IN	2040	29.651	0.051	1.0	0.0000	0.0000	OK
30 minute summer	SWALE 4-OUT	21	29.344	0.244	14.3	0.0000	0.0000	FLOOD RISK
480 minute winter	CAR PARK 1	464	29.992	0.392	7.7	63.7450	0.0000	FLOOD RISK
480 minute winter	HB13	464	29.991	0.561	1.2	0.6346	0.0000	SURCHARGED
15 minute summer	S12	11	29.825	0.425	33.0	0.4804	0.0000	SURCHARGED
15 minute summer	S11	11	29.732	0.532	80.5	0.6012	0.0000	SURCHARGED
15 minute summer	CP10	11	29.539	0.489	116.7	0.5536	0.0000	SURCHARGED
15 minute summer	SWALE 3-IN	11	29.372	0.372	115.7	0.0000	0.0000	OK
15 minute summer	1.004:50%	11	29.269	0.419	127.5	0.0000	0.0000	OK
15 minute summer	SWALE 3-OUT	12	29.058	0.358	128.0	0.0000	0.0000	FLOOD RISK
15 minute summer	SWALE 2-IN	13	28.975	0.375	122.0	0.0000	0.0000	OK
15 minute summer	1.006:50%	13	28.805	0.405	146.9	0.0000	0.0000	OK
15 minute summer	SWALE 2-OUT	13	28.620	0.420	142.4	0.0000	0.0000	FLOOD RISK
15 minute summer	S9	11	29.109	0.259	21.7	0.2934	0.0000	SURCHARGED
15 minute summer	S8	11	29.070	0.440	47.1	0.4976	0.0000	SURCHARGED
15 minute summer	S7	12	28.878	0.478	70.3	0.5403	0.0000	SURCHARGED
15 minute summer	S6	12	28.786	0.486	91.1	0.5498	0.0000	SURCHARGED
15 minute summer	CP5	13	28.570	0.495	213.8	0.7078	0.0000	FLOOD RISK
15 minute summer	SWALE 1-IN	13	28.499	0.474	214.0	0.0000	0.0000	OK
30 minute summer	1.009:50%	24	28.369	0.556	234.2	30.5417	0.0000	PONDING
2880 minute winter	SWALE 1-OUT	2880	27.986	0.386	27.3	0.0000	0.0000	FLOOD RISK
15 minute summer	S4	12	28.739	1.019	47.1	1.1520	0.0000	SURCHARGED
15 minute summer	S3	12	28.599	1.169	72.5	1.3224	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
480 minute winter	CAR PARK 2	1.000	HB14	1.2	0.213	0.077	0.2836	
480 minute winter	HB14	Hydro-Brake®	SWALE 4-IN	1.0				
4320 minute winter	SWALE 4-IN	1.002	SWALE 4-OUT	1.0	0.043	0.006	1.1261	
30 minute summer	SWALE 4-OUT	1.003	SWALE 3-IN	-14.0	-0.795	-0.772	0.1686	
480 minute winter	CAR PARK 1	2.000	HB13	1.2	0.219	0.079	0.4030	
480 minute winter	HB13	Hydro-Brake®	S11	1.0				
15 minute summer	S12	3.000	S11	32.1	0.973	0.774	0.7789	
15 minute summer	S11	2.002	CP10	79.1	1.123	1.025	2.1762	
15 minute summer	CP10	2.003	SWALE 3-IN	115.7	1.644	1.627	0.8510	
15 minute summer	SWALE 3-IN	1.004	1.004:50%	97.8	0.147	0.482	7.4965	
15 minute summer	SWALE 3-IN	1.004	SWALE 3-OUT	128.0	0.227	0.631	7.1186	
15 minute summer	SWALE 3-OUT	1.005	SWALE 2-IN	122.0	1.733	0.903	0.4770	
15 minute summer	SWALE 2-IN	1.006	1.006:50%	120.0	0.184	0.516	7.4290	
15 minute summer	SWALE 2-IN	1.006	SWALE 2-OUT	142.4	0.218	0.613	8.1591	
15 minute summer	SWALE 2-OUT	1.007	CP5	144.6	1.311	0.464	0.5712	
15 minute summer	S9	4.000	S8	20.1	0.735	0.383	0.8544	
15 minute summer	S8	4.001	S7	43.0	1.177	1.014	0.9231	
15 minute summer	S7	4.002	S6	67.7	0.995	0.855	1.3799	
15 minute summer	S6	4.003	CP5	89.7	1.273	1.164	2.1821	
15 minute summer	CP5	1.008	SWALE 1-IN	214.0	1.940	0.667	0.2159	
15 minute summer	SWALE 1-IN	1.009	1.009:50%	214.9	0.207	0.852	10.7242	
15 minute summer	SWALE 1-IN	1.009	SWALE 1-OUT	157.4	0.337	0.624	6.2673	
2880 minute winter	SWALE 1-OUT	1.010	CP1	-17.2	1.547	-0.028	0.3509	
15 minute summer	S4	5.000	S3	39.8	1.149	0.642	0.8118	
15 minute summer	S3	5.001	S2	67.2	1.689	1.253	1.9813	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
2880 minute winter	S2	2880	27.986	1.086	5.0	1.2285	0.0000	SURCHARGED
2880 minute winter	CP1	2880	27.986	1.886	17.5	2.1333	0.0000	FLOOD RISK
2880 minute winter	POND-IN	2880	27.986	2.986	13.2	718.1658	0.0000	SURCHARGED
2880 minute winter	SPS	2880	27.986	3.019	2.4	3.4147	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
2880 minute winter	S2	5.002	CP1	2.7	0.978	0.032	1.0716	
2880 minute winter	CP1	1.011	POND-IN	-15.5	1.291	-0.095	0.3260	
2880 minute winter	POND-IN	1.012	SPS	2.4	0.715	0.034	0.5546	
2880 minute winter	SPS	Pump		2.0				1044.6

Water Quality

					Pollution hazard indices			Pollution mitigation indices			Cumulative pollution hazard indices		
Area (ha)	Intended Land Use	Entering via Node or Link	Name	SuDS Component	TSS	Metals	Hydrocarbons	TSS	Metals	Hydrocarbons	TSS	Metals	Hydrocarbons
		Link	1.002	Swale				0.5	0.6	0.6			
		Link	1.004	Swale				0.25	0.3	0.3			
		Link	1.006	Swale				0.25	0.3	0.3			
		Link	1.009	Swale				0.25	0.3	0.3			
		Node	SPS										
											Sufficient	Sufficient	Sufficient

Appendix F – Infiltration Testing Results

31th May 2022

Our ref: GE20688/JG01/220531

Sue Fulton
Millwood Designer Homes Limited
6 Alexander Grove,
Kings Hill,
West Malling,
Kent,
ME19 4XR

By email only

Dear Sue

RE: Furners Lane, Henfield – Preliminary Information

Further to our recent field works and subject to the results of the ongoing laboratory testing, we write to confirm our preliminary assessments with respect to the ground conditions and the proposed redevelopment:

Scope of works

The investigation was undertaken on 12th May 2022 and comprised:

- 2No. machine excavated trial pits to depths of up to 2.60m bgl (TP01 to TP02).

Figure 1 presents the exploratory hole locations.

The exploratory hole locations were positioned across the paddocks and were situated in areas that had been cleared of vegetation by the ecologists.

Site Description

The site was composed of two paddocks located to the south for Furners Lane, the paddocks are accessed along a track running along the west of the northern field. The fields were currently in pasture.

Ground Conditions

According to the British Geological Survey the ground conditions are likely to comprise the Folkestone Formation. During the investigation a thin mantle of Topsoil was encountered, overlying the Folkestone Formation. A summary of the ground conditions is provided below:

Top (m bgl)	Base (m bgl)	Geology	Positions
0	0.40-0.70	TOPSOIL: Light brown silty SAND with matted rootlets.	All
0.40-0.70	>2.60	FOLKESTONE FORMATION: Light grey with orangish brown mottling sandy CLAY becoming clayey SAND. Sand was fine.	All

The draft exploratory hole logs are appended.

No significant organoleptic evidence of contamination was noted during the intrusive investigation. However, samples have been recovered from the exploratory holes and submitted for laboratory analysis for a suite of commonly occurring contaminants including pesticides. The test results and assessment thereof will be presented within the final report.

Groundwater

Perched groundwater was encountered at 2.5m bgl in TP01.

It should be noted that changes in groundwater and perched water levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed within appropriate response zones.

Soakage Testing

Two full scale BRE Digest 365 tests were carried out, preliminary results are recorded below,

Location	Depth of Pit (m bgl)	Fall in head (m)	Total time (mins)	Calculated infiltration rate (m/s)	Remarks
TP01	2.60	0.20	180	-	Insufficient fall over time to calculate rate.
TP02	2.50	0.26	250	-	Insufficient fall over time to calculate rate.

It was inappropriate to extrapolate the test data, given the limited fall in head. Based on the results it is considered unlikely that conventional shallow soakaways will work effectively on the site.

Excavations

Both shallow and deeper dry excavations within the cohesive soils are likely to remain stable in the short to medium term. However, any excavation that intersects perched water bodies may become unstable in the short term and may require pumping from sumps and shuttering to maintain stability.

Appropriate Health and Safety precautions should be adopted where man entry into excavations is required. However, groundworks should be designed in such a manner to avoid man entry into excavations.

Foundations

Based on the ground and groundwater conditions encountered during the intrusive works, it is considered that conventional foundations may be appropriate for a low-rise development. The clay horizons of the Folkestone Formation are likely to be classified as ranging between medium and high volume change potential as defined by NHBC Standards, Chapter 4.2. The more granular horizons of the Folkstone Formation are likely to range between low and medium volume change potential. However, these assessments will be confirmed by the ongoing geotechnical classification tests. Minimum foundation depths of at 1.50m bgl are likely to be applicable within the more granular horizons, outside of the zone of influence of any current, recently removed or proposed trees. Foundations within shrinkable soils within the zone of moisture demand of existing, proposed or recently removed trees will require deepening and potentially heave protection measures included.

Furthermore, foundations which span the clay and sand horizons of the Folkestone Formation should be nominally reinforced to account for differential settlement.
Where the depth of foundations require deepening beyond 2.50m bgl on account of trees, the use of a piled foundation solution on site may be more appropriate.

A preliminary net allowable bearing pressure of 125kPa is considered suitable for traditional trench foundations up to 1.50m in width taken down through any disturbed, desiccated or loose materials to bear upon the granular deposits of the Folkstone Formation.

Given the presence of shrinkable soils on site, floor slabs should be fully suspended.

Closure

We trust we have interpreted your request correctly and provide sufficient information for your current requirements.

It should be noted that the comments provided herein are for preliminary purposes only and could change following receipt and review of geotechnical laboratory testing. As such, detailed design should not be undertaken based on the preliminary findings.

If you have any questions or queries in relation the preliminary information provided at this stage, please do not hesitate to contact the undersigned.

Yours sincerely
For and on Behalf of Geo-Environmental

[redacted]

James Gooding, BSc (Hons), MSc, FGS, AMIEnvSc
Senior Consulting Engineer

Enc. Figure 1 - Exploratory hole plan
Preliminary exploratory hole logs

ace consultancy engineering business environment
CL:AIRE CONTAMINATED LAND: APPLICATIONS IN REAL ENVIRONMENTS
AGS Association of Geotechnical & Geoenvironmental Specialists
smas worksafe consultant as recognised by SSIP SAFETY SCHEMES IN PROCUREMENT
CHAS CONTRACTORS HEALTH & SAFETY ASSESSMENT SCHEME Accredited Contractor www.chas.gov.uk
constructionline
UVDB Verify Verified
Link-up Registered
iema Institute of Environmental Management & Assessment
CQMS Safety Scheme
THE ENVIRONMENTAL INDUSTRIES COMMISSION

Project:	Furners Lane, Henfield			**Title**	Exploratory Hole Plan
Client:	Millwood Designer Homes Ltd			**Geo-Environmental Services Ltd** **Unit 7 Danworth Farm, Cuckfield Road** **Hurstpierpoint, West Sussex BN6 9GL** **+44(0)1273 832972 www.gesl.net**	Geo-Environmental
Ref No:	GE20688	**Revision:**	0		
Drawn:	JG	**Date:**			
Figure:	1	**Scale:**	NTS		

Geo-Environmental

Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL
www.gesl.net

Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

Project Name: Furners Green	Project No. GE20688	Co-ords: 521791.19 - 116077.21 Level:	Date 12/05/2022
Location: Henfield		Dimensions (m): 2.45 × 0.58 Depth 2.60	Scale 1:25
Client: MDH			Logged JG

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES				▨	Light brown silty SAND. Matted rootlets to 0.5m bgl. TOPSOIL
				0.40		▤	Firm light grey mottled orange brown sandy CLAY. Sand is fine. FOLKESTONE FORMATION
	0.50	D					
	0.60	ES					
	1.00	D					
	1.50	D		1.50		▤	Light grey mottled orange brown clayey SAND with pockets of clay. FOLKESTONE FORMATION
	2.00	D					
				2.30		▤	Grey with occasional orange brown mottling very clayey SAND. Sand is fine. FOLKESTONE FORMATION
	2.50	D					*Perched groundwater was encountered at 2.5m bgl.*
				2.60			End of Pit at 2.60m

Water Strike - Details

Depth Water	Depth Water Value

Remarks

Stability Sides Stable

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Hurstpierpoint
BN6 9GL
www.gesl.net

Trial Pit Log

TrialPit No	TP02
Sheet 1 of 1	

Project Name: Furners Green	Project No. GE20688	Co-ords: 521779.60 - 115997.76 Level:	Date 12/05/2022
Location: Henfield		Dimensions (m): 2.73 × 0.63	Scale 1:25
Client: MDH		Depth 2.50	Logged JG

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES				▨	Light brown silty SAND. Matted rootlets to 0.05m bgl. TOPSOIL
	0.20	ES					
	0.50	D					
				0.70		▨	Firm orange brown mottled light grey sandy CLAY becoming at 1.5 clayey SAND with clay pockets. Sand is fine FOLKESTONE FORMATION
	1.00	D					
	1.50	D					
	2.00	D					
	2.50	D		2.50			End of Pit at 2.50m

Water Strike - Details	
Depth Water	Depth Water Value

Remarks

Stability: Sides Stable

Appendix G – Southern Water Sewer Capacity Check Response

from Southern Water

[redacted]
The Dovecote
Salters Heath Business Centre
Cold Arbor Road
Sevenoaks
Kent
TN13 2BL

Your ref
18253

Our ref
DSA000039341

Date
26 February 2025

Contact
Tel 0330 303 0119

Dear [redacted],

Level 1 Capacity Check Enquiry: Furner's Lane, Henfield, West Sussex, BN5 9HX.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

The enquiry has been reassessed to determine the capacity available for 0.26 l/s at manhole reference TQ21167101.

There is currently adequate capacity in the local sewerage network to accommodate a foul flow of 0.26 l/s for the above development at manhole reference TQ21167101. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system unless agreed by the Lead Local Flood Authority in consultation with Southern Water, after the hierarchy Part H3 of Building Regulations has been complied with.

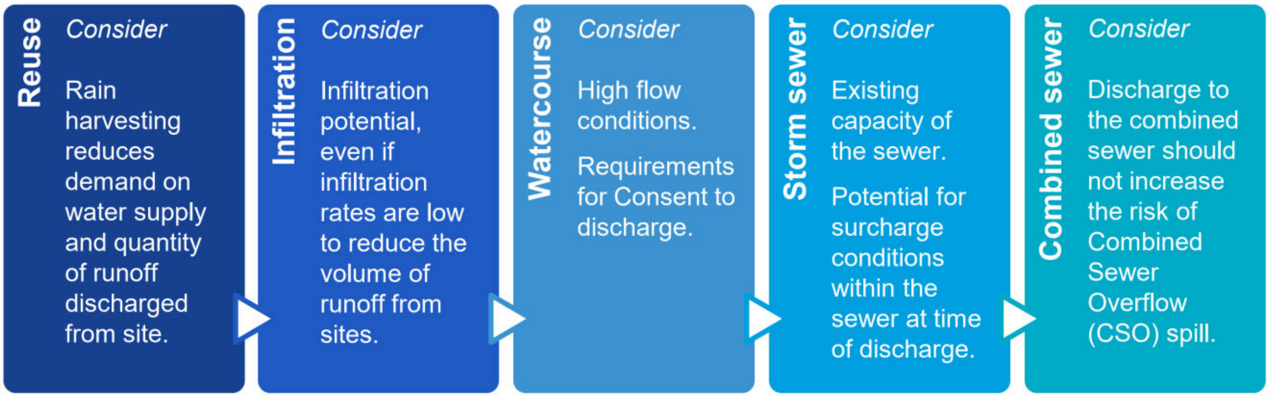
Surface Water

The enquiry has been reassessed to determine the capacity available for 3.2 l/s (pumped) at manhole reference TQ21166151.

There is currently adequate capacity in the local surface water/foul sewerage network to accommodate a surface water flow of 3.0 l/s for the above development at manhole reference TQ21166151.

This assessment has been undertaken using a theoretical check that shows capacity from all upstream properties for 46.0l/s.

Although capacity in the surface water network has been identified, in all situations where surface water is being considered for discharge to our network, we require the below hierarchy for surface water to be followed which is reflected in part H3 of the Building Regulations. Whilst reuse does not strictly form part of this hierarchy, Southern Water would encourage the consideration of reuse for new developments.



Reuse
Consider
Rain harvesting reduces demand on water supply and quantity of runoff discharged from site.

Infiltration
Consider
Infiltration potential, even if infiltration rates are low to reduce the volume of runoff from sites.

Watercourse
Consider
High flow conditions.
Requirements for Consent to discharge.

Storm sewer
Consider
Existing capacity of the sewer.
Potential for surcharge conditions within the sewer at time of discharge.

Combined sewer
Consider
Discharge to the combined sewer should not increase the risk of Combined Sewer Overflow (CSO) spill.

Guidance on Building Regulations is here: gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h

We would welcome the opportunity to engage with you on the design for disposal of surface water, with a particular focus on the potential for incorporating Sustainable Drainage Systems (SuDS), for this development at the earliest opportunity and we recommend that civil engineers and landscape architects work together and with Southern Water.

Where a surface water connection to the foul or combined sewer is being considered, this should be agreed by the Lead Local Flood Authority, in consultation with Southern Water.

It should be noted that although the above assessment indicates that there is capacity available for your proposed surface water flows the LLFA (Local Lead Flood Authority) may impose/request that a lower flow is discharged to the public surface water sewer.

If the excess surface water flows are to be attenuated on site, it could have a significant effect on any proposed Sewer Adoption (S104) Agreements. Any attenuation proposals should be agreed before any works are implemented on site. Where capacity is limited/restricted, agreement should be sought if you are to include any highway drainage within your proposals as Southern Water is not obligated to accept highway flows.

Connecting to our network

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal Sewer Connection (S106) application is required to be completed and approved by Southern Water Services. To make an application visit: developerservices.southernwater.co.uk

The results quoted above are only valid for 12 months from the date of issue of this letter.

Please get in touch via the Get Connected customer dashboard if you have any queries.

Yours sincerely,

Future Growth Planning Team
Developer Services

southernwater.co.uk/developing-building/planning-your-development