gta Civils & Transport

Flood Risk Assessment

Lake Lane, Barnham, Bognor Regis PO22 0AJ

Client

Property Sphere Development Limited
2 St Joseph's Abbey
Greyfriars Lane
Storrington
West Sussex RH20 4GJ
Ref: 12188
Date: February 2024

Consulting Engineers

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Schedule of Appendices

Issue	Issue date	Compiled	Checked
Preliminary Issue	19 December 2023	JP	MR
First Issue	23 February 2024	JP / JR	MR
Second Issue	4 March 2024	JR	MR
Third Issue	19 April 2024	JR	MR
Fourth Issue	15 January 2025	JP	MR

1 Introduction

1.1 GTA Civils Ltd. was appointed by Property Sphere Development Limited to provide a Flood Risk Assessment (FRA) report in relation to the proposed development on land to the north of Lake Lane, Barnham, Bognor Regis PO22 0AJ. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.2 GTA Civils & Transport Limited was appointed by the client to provide a Flood Risk Assessment (FRA) as required by the Environment Agency and Arun District Council in order to achieve Planning Approval at said property.

1.3 This report will take the form of a formal Flood Risk Assessment in accordance with the 2024 National Planning Policy Framework (NPPF) and the current Planning Practice Guidance (PPG).

1.4 This report should be read in conjunction with the Drainage Impact Assessment, prepared by GTA C&T, dated January 2025.

1.5 The Fourth Issue of this report has been prepared following comments from and discussions with the LLFA engineers. A CCTV survey was undertaken of the surface water sewer that runs from the NW corner (downstream end) of the site under the garden of the neighbour's property.

2 Existing Site and Current Flood Conditions

2.1 The application site lies north of Lake Lane in Barnham, which is administered by Arun District Council (ADC). It comprises approximately 0.5ha of vacant land, accessed from Lake Lane between St. Annes Cottage and Lynton. A site location map and aerial view are shown in Appendix A.

2.2 Hydrology: the site lies approximately 5km north of the English Channel. The River Arun flows north-south passing the site approximately 3.5km to the east, before depositing into the English Channel at Littlehampton. A ditch runs parallel to the site's east and north boundaries to flow west-northwest away from the site. It is assumed that this ditch connects to the Barnham Rife which flows from north to south through the town. Ponds are located approximately 50m north, 85m east and a third 150m east of the site.

2.3 Topography: a topographic survey was commissioned – refer to Appendix C. The direction of fall is broadly south to north, with levels ranging between 10.20m AOD on the access in the south and 8.62m AOD close to the northwest corner.

2.4 Geology: The BGS's online geology map shows the soil type is London Clay Formation (clay, silt and sand), with River Terrace Deposits (sand, silt and clay) overlying.

2.5 Soil soakage testing was carried out on site in accordance with BRE Digest 365. The water level rose during the test – and, given the obvious cohesive nature of the soil, this was deemed 'a fail' (nil result). The test report, including photographs of the pit and site conditions, is shown in Appendix D.

2.6 The greenfield runoff rate for the positively drained post-development catchment area (0.209ha) was calculated using the ICP SuDS application in Micro Drainage. The rates for the 4 main storm return periods have been tabulated as follows:

Event	Catchment Area: 0.182ha (l/s)
QBAR	1.2
1 in 1 yr	1.0
1 in 30 yrs	2.8
1 in 100 yrs	3.9

2.7 Public sewers: Southern Water's sewer records are shown in Appendix C. A 175mmØ foul sewer flows east-west under Lake Lane. The site's Lake Lane access lies between manhole references 8601 and 9602. There are no surface water sewers in this area.

2.8 A CCTV survey was carried out following comments from the LLFA – refer to the CCTV Survey in

Appendix C. The neighbour did not give the drainage surveyor permission to enter the property to finish the survey. A large trash screen covers the culverted section under this garden. Paul Cann, the LLFA engineer, agreed that no more could be done to confirm the condition of this culverted section - refer to the correspondence in Appendix H.

2.9 Fluvial flooding: the Environment Agency's (EA) Rivers and Seas flood map in Appendix B shows the site lying in Flood Zone 1 (FZ1 – Low Risk). Inland sites located in FZ1 have an Annual Exceedance Probability (AEP) of less than 1 in 1000 years (<0.1%) of flooding from rivers or watercourses.

2.10 Surface water flooding: can occur when excess rainwater does not infiltrate into the ground, or is not intercepted by urban drainage systems, and instead flows across the surface. The EA's online 'Surface Water Depth - Low Risk Scenario' (1 in 1000 years) Flood Map in Appendix B shows areas in the northwest is liable to surface water flooding. The EA's 'Surface Water Velocity - Low Risk Scenario' (1 in 1000 years) Flood Map in Appendix B shows this flood pattern originates within the site. (The pattern on the east boundary is contained within the ditch.)

2.11 Climate Change: the EA provides guidance on the level of climate change to apply for developments. This is on a catchment basis, with this site falling in the Arun and Western Streams Management Catchment. The matrix provided is relevant only for sites in FZ2 and FZ3, however. Parts of the site are affected by surface water flooding in the 1000yrs event, which is usually accepted as equivalent to the 100yrs + climate change scenario where there is no bespoke modelling available, such as here.

2.12 Artificial sources: flooding from reservoirs, canals and docks. The EA's Reservoirs Flood Map in Appendix B shows the site is not liable to flood from a nearby reservoir failing. There are no docks or canals nearby.

2.13 Groundwater Flooding: The EA's Groundwater Vulnerability Zone (GVZ) and Groundwater Protection Zones (GWPZ) mapping shows the site to be overlying a 'Medium-Low' GWVZ and outside of all recorded GWPZ's (see Appendix B). Groundwater flooding can occur when groundwater rises up from the underlying aquifer to flood subsurface infrastructure or to emerge at the ground surface.

2.14 Historical Flooding: the EA's historical flood maps in Appendix B shows the site has not been affected by flooding in the past.

2.15 The Lidsey Surface Water Management Plan (SWMP) published by West Sussex County Council (WSCC) in 2014 identifies Local Flood Risk Zones (LFRZ) for further analysis. The north half of the site at Barnham Lane is within LFRZ_007 (Park Road, Barnham). The flood map for the LFRZ is in Appendix B and identifies historical flooding from surface water due to capacity/unmaintained ditches, including a poor arrangement of a trash screen. Both WSCC and ADC were to address these maintenance issues

as detailed within the list of actions under Chapter 11 of the SWMP. Historical flooding due to groundwater is noted due to a spring behind properties to the east side of Park Road. Flooding from foul sewers has occurred along Park Road.

2.16 In conclusion, the flood risk profile of this site is Low: although there is a surface water flood pattern, because this originates within the site, all precipitation will be intercepted by the development's SuDS system and routed off site sustainably. Surface water flooding identified local to the site within the Lidsey SWMP is mitigated by regular maintenance.

3 Proposed Development & The Sequential Test

3.1 The proposed scheme is to build seven new detached dwellings plus amenity landscaping and access. Refer to the proposed site layout drawing in Appendix E.

3.2 As concluded in section 2.13 above, the site's flood risk profile is Low. No mitigation is needed or proposed.

3.3 Vulnerability and the Sequential Test: the Sequential and Exception Tests are policy mechanisms created to discourage 'vulnerable use' developments in FZ2 and FZ3. This process 'steers' higher vulnerability uses to sites in lower flood-risk zones (eg FZ1.) The vulnerability classification of any new development should be considered. All vulnerabilities are 'appropriate development' in FZ1 – **Low Risk**.

4 Proposed SuDS and Foul Drainage Strategy

4.1 As set out in Section 2.5 above, the soil's high clay content results in a nil soakage rate - so infiltration features are unfeasible here.

4.2 Various sustainable drainage systems were considered to store the excess storm water and mitigate runoff pollution:

- Porous Pavings: porous pavings were deemed to be of limited benefit due to low soil soakage rate and the need for anti-buoyancy measures, if lined.
- Green roofs: not practical for this development due to the proposed steep pitches of the roofs.
- Ponds/swales: 1No pond is included in this strategy. This is a long shallow dry pond which can be considered as a swale.
- Rainwater harvesting: water butts are to be installed on rainwater downpipes to reduce the volumes of runoff discharged off the site. The use of rainwater harvesting tanks on a residential development where each householder would be required to maintain their own tank is not generally considered good practice or commercially viable.
- Filter drain: is proposed to one side along one section of the road.

4.3 A drainage strategy layout is shown in Appendix E. The network will be routed to the ditch on the north boundary, via an attenuation pond and SDS cellular attenuation tank.

4.4 The offsite flow rate will be restricted to a total of **1.2l/s**, ie the Qbar rate as set out in section 2.6 above.

4.5 The SDS tank and attenuation pond/swale have been sized to hold the volume in the critical '100 years plus 45% CC' storm event. The drainage calculation sheets in Appendix F show that the total storage volume of 176.3m^3 (102.6m^3 in tank + 73.7m^3 in pond) is sufficient for the design storm event. Causeway Flow has been used (in simulation mode) as this uses FEH22 hydrological data.

4.6 Flotation risk: The site levels have been raised such that the base level of all storage features will be no lower than the lowest current level. As this site has no history of groundwater flooding, it is contended that there is very low risk of the tank or pond needing anti-flotation measures. It is contended that any outstanding issue can be resolved by a carefully worded planning condition.

4.7 The combination of treatment on the pond (UV action), granular fill (filtration) in the SDS tank's base and the filter drain to one section of the road provide a total mitigation that exceeds the pollution indices for such a residential development.

4.8 Exceedance flows: exceedance in the event of the control manhole overtopping will flow into the watercourse to the north - away from buildings. Overland flow arrows are shown on the drainage strategy layout – from all parts of the network, these reflecting flows in an extreme storm.

4.9 Ordinary Watercourse Consent will be applied for from the Lead Local Flood Authority in due course – this being needed for the new outfall headwall.

4.10 Maintenance of the SuDS system will be the overall responsibility of the Applicant. A draft Drainage Maintenance Plan is shown in Appendix G. This sets out how the various components will be inspected and maintained – in line with Industry Standards as per CIRIA's SuDS Manual C753. The responsibility of maintenance, repair, renewal and replacement of the surface water drainage system will be conferred on to the property owners with all costs shared on an equal basis. These arrangements will be administered in the Transfer Document **TP1** of each property at the point of sale with the same responsibilities transferring with each property to the successors in title.

4.11 Phasing of Construction Works: a 4m wide buffer zone shall be set up between the construction footprint: no storage of materials shall be allowed within this buffer. The network shall be formed upstream, with outfall and control manholes in place first. The pavings shall be built last and the roofs' drainage connected to the network only at the end. In this way there shall be minimal impact on the watercourse. The drainage network will be flushed of construction silts into a silt bag prior to first operation. Silt fences / straw bales will be set up (plus dust screens when needed) to protect the watercourse during the works. A Construction Surface Water Management Plan shall be prepared during the next stage.

4.12 Foul drainage: it is proposed to discharge the development's foul water into the existing 175mm dia sewer under Lake Lane – refer to the Drainage Strategy Layout in Appendix D. Because of the adverse gradient, a pumping station will be needed to convey the flows from the dwellings towards the north end. The pumped rising mains will terminate at a break manhole close to the sewer where a new manhole is needed. Southern Water will accept only a gravity discharge into the public sewer.

4.13 Permission to discharge into the sewer – by means of a Section 106 application – will be required from Southern Water as the owner of the public sewerage network.

5 Summary & Conclusion

5.1 The application site has a 'Low' Risk flood risk profile.

5.2 On-site BRE 365 soil soakage testing confirms that there is no soakage potential.

5.3 The development's surface water will be routed to the watercourse on the north boundary.

5.4 The offsite runoff rate will be restricted to the Qbar rate of 1.2l/s.

5.5 An attenuation pond/swale and SDS tank have been sized to hold the volume in the critical '100 years plus 45% CC' storm event. The total storage volume provided on the scheme is 176.3m^3.

5.6 This development will not increase the flood risk, either on this site or to neighbouring properties, and so complies fully with the 2024 NPPF and current PPG.

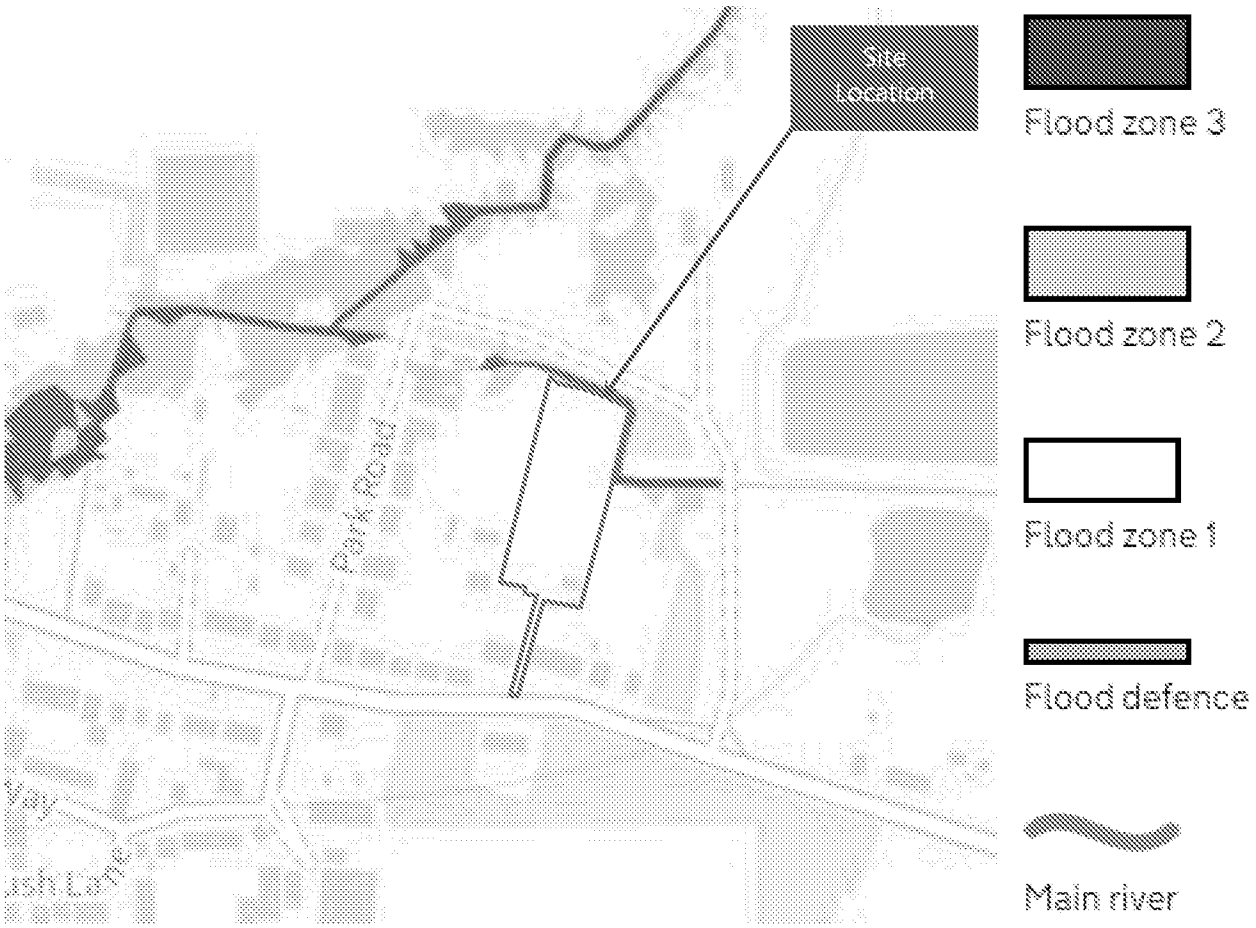
- End of Report -

Appendix A

Site Location Map & Aerial Photo

Appendix B

Flood Maps – Environment Agency and WSCC



EA's Online Flood Map for Planning (Rivers and Seas)

The site is located in Flood Zone 1 (FZ1)

EA's Online Surface Water Flood Depth Map in a 'Low Risk Scenario'
(1 in 1000 years storm event)

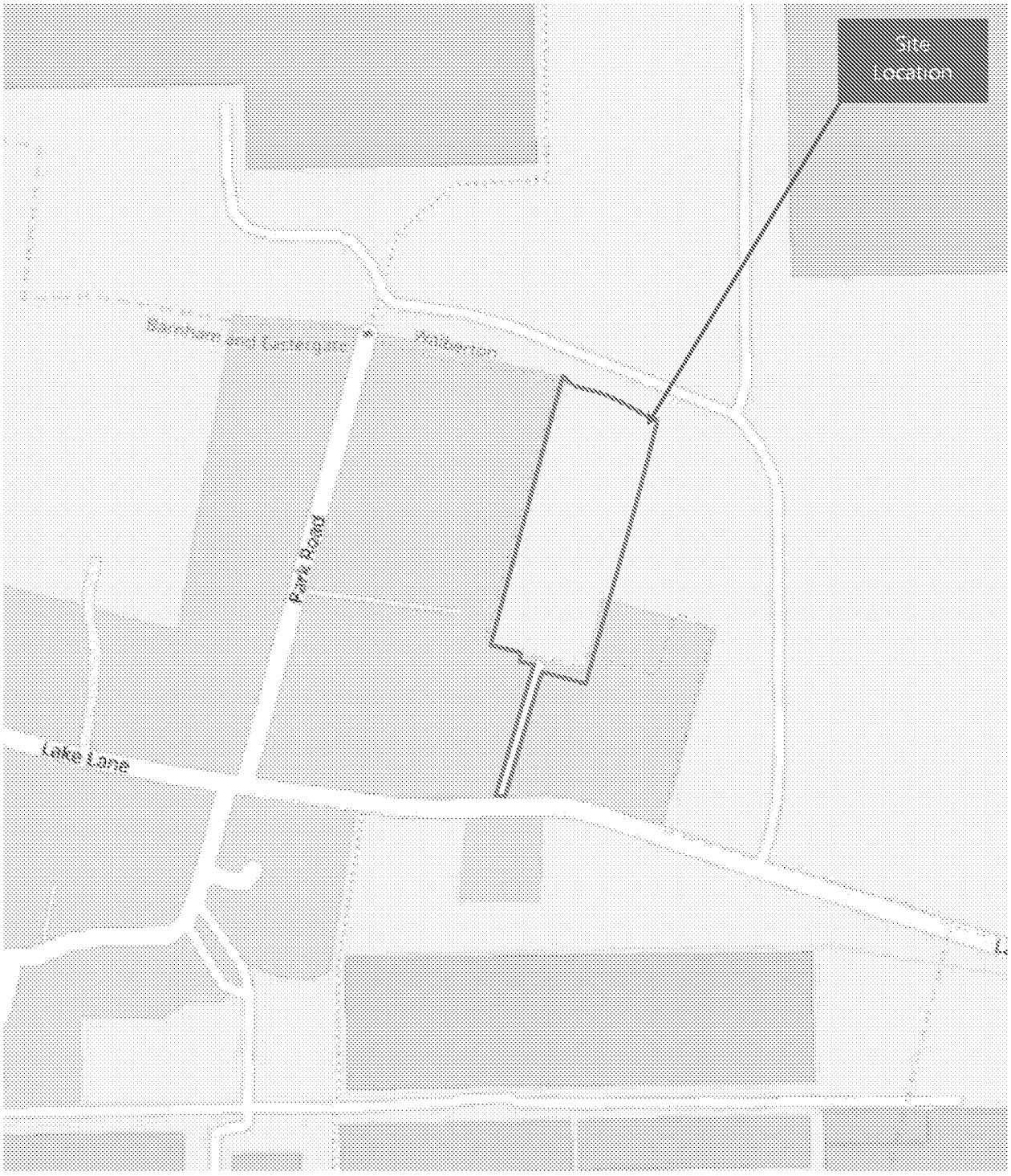
Areas in the northwest and on the eastern boundary are liable to surface water flooding up to 300mm

EA's Online Surface Water Flood Velocity Map in a 'Low Risk Scenario'
(1 in 1000 years storm event)

The surface water flooding originates within the site

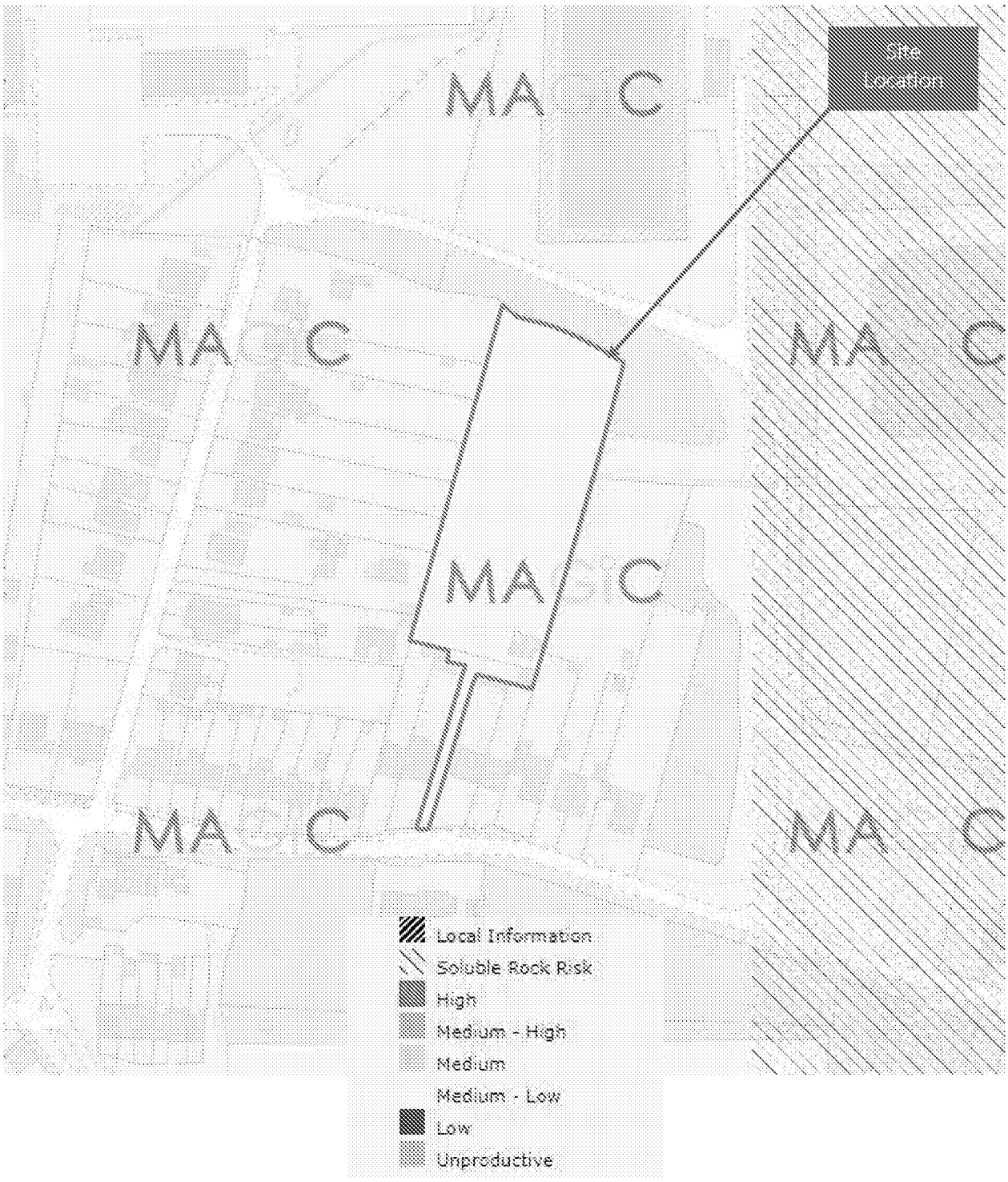
EA's Online Risk of Flooding from Reservoirs' Map

The site is not liable to flood from this source



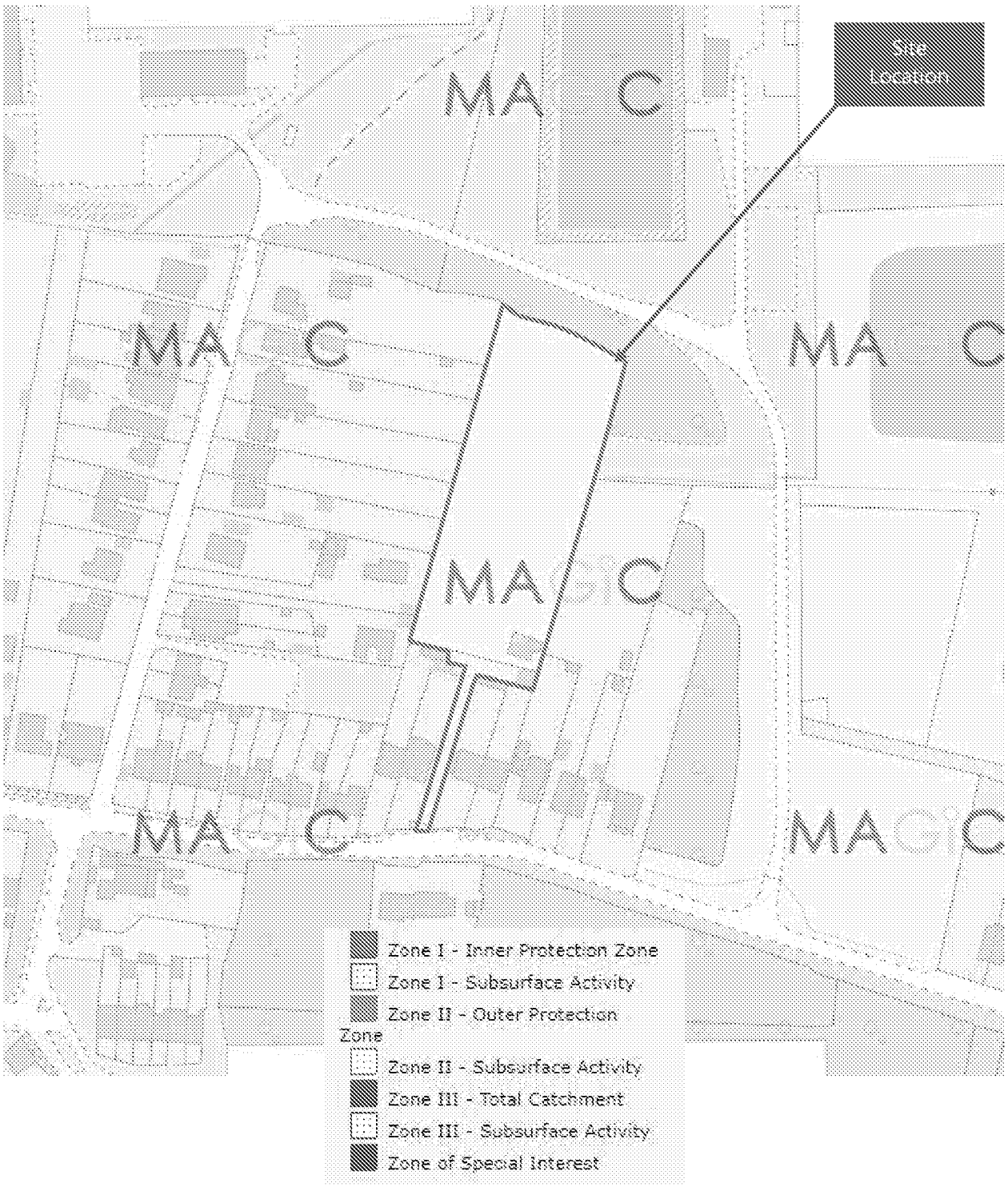
Environment Agency's Online Historic(al) Flood Map

The site has not been affected by flooding in the past



Environment Agency's Groundwater Vulnerability Zone Map

The site overlies a 'Medium - Low' Groundwater Vulnerability Zone



Environment Agency's Online Groundwater Source Protection Zones Map

The site lies outside of all recorded Groundwater Protection Zones

LFRZ_007 - Park Road, Barnham

Figure 7.15 - Flood Risk LFRZ_007 (1 in 100 year storm event)

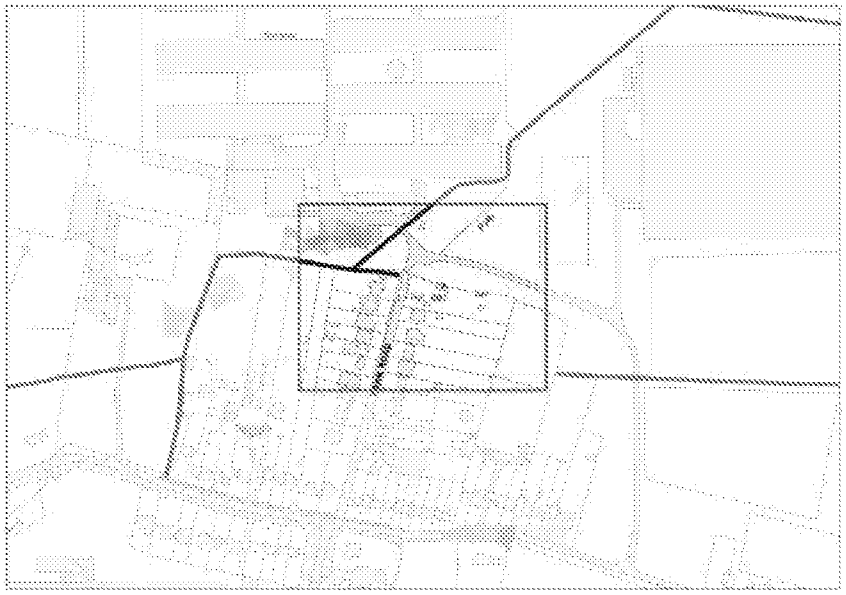


Figure 7.16 - Flood Hazard LFRZ_007 (1 in 100 year storm event)

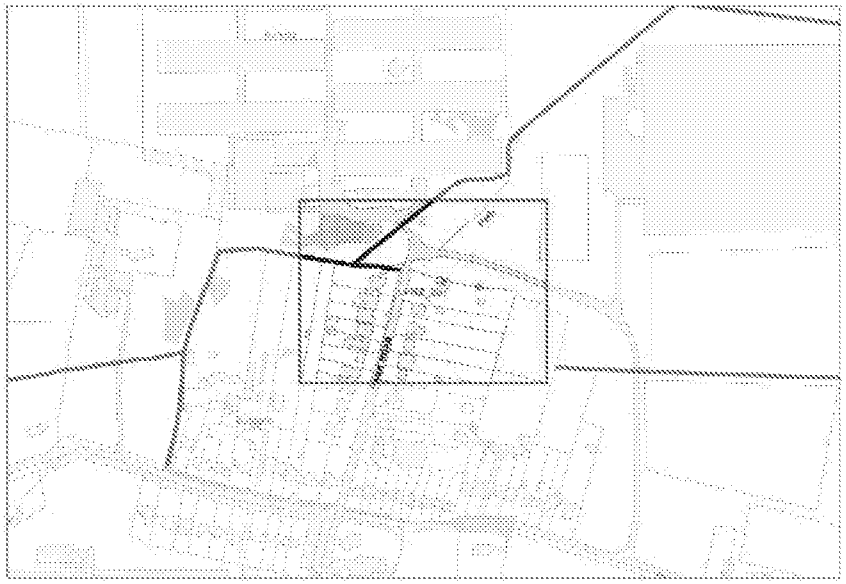


Table 7-14 - Predicted Residential and Commercial Property Flood Impact LFRZ_007

Rainfall Return Period	Predicted number of properties at risk of flooding	
	Residential	Commercial
1 in 30 Year	0	0
1 in 100 Year	0	0
1 in 100 Year + (Climate Change (2080's)	0	0

Table 7-15 - Summary of local flood risk within the LFRZ_007

Flood Risk Source			
Pluvial Flood Risk	Fluvial Flood Risk	Ground Water Flood Risk	Public Sewer Flood Risk
Medium	Low	Medium	Medium
Flood Mechanism			
SWS have reported incidents of sewer flooding in the area. ADC confirmed overflowing foul sewers due to infiltration/inundation/surface water connections. Surface water flooding due to capacity/unmaintained ditch network and ground water flooding due to spring behind properties on east side of Park Road. Ditch on northern boundary of Kilkenny has a trash screen. This is a poor arrangement and is considered to warrant improvement. This arrangement results in ditch backing up and overflowing. An assumed overflow from reservoir to N/E of Park Road is reported to flow continuously. It is understood that there is no surface water collection/storage by nursery at end of Park Road.			
Flood Risk Receptors			
Flooding in fields to the rear of properties.			
Flood Hazard			
No specific flood hazard is predicted for 1% annual chance storm event (1 in 100 year return period)			
Validation			
SWS have reported a single incident of hydraulic overload and flooding from the foul sewer system in the last 10 years, ADC confirmed overflowing foul sewers due to infiltration/inundation/surface water connections. Flooding to the east of the LFRZ has been identified to the EA due to exceedance from the main river.			

LFRZ_007 – Park Road, Barnham

Preferred Interventions: Asset management, reduce surface water and infiltration entering public foul sewers.

Table 10-9 - LFRZ_007 Options

Option Ref.	Option Category (Source / Pathway / Receptor / Other)	Option	Potential	Considered	Economic	Environmental	Objectiveness	Social	Technical	Total Score	Summary of scheme / General discussion
2	**Do minimum**	Do minimum - continue current maintenance	Yes	Yes	2	2	0	2	1	7	
7	Source	Rainwater Harvesting	Yes	Yes	2	2	1	2	2	9	Installation of water butts.
12	Source	Sealing of manhole covers and protecting gullies	Yes	Yes	1	2	2	2	1	8	Reduce surface water inflow.
13	Source	Sealing Sewers (Reduce ground water / rainfall induced infiltration)	Yes	Yes	1	2	2	2	0	7	Reduce ground water inflows.
27	Receptor	Planning policies to influence development (Development Control, SUDS Strategy, Blue Development Corridors, and New Development).	Yes	Yes	2	2	2	2	1	9	Ensure suitable development controls are placed on new developments in this LFRZ to reduce flood risk.
29	Strategy	Further Study / Investigations	Yes	Yes	1	1	1	1	1	5	Investigate current surface water drainage from local nurseries. Investigate the screen arrangement in the ditch on northern boundary of Kilkenny in order to evaluate performance. Investigation the surface water disposal from the greenhouses to assess if improvements can be made to reduce peak flows entering main river. This may reduce flood risk at Meadow Farm. Also consider the affect of the attenuation ponds further in the EA River Modelling Study.

Appendix C

Topographic Survey, Sewer Records & CCTV Survey

SURVEY STATIONS			
Name	Easting	Northing	Height
1STN	496904.831	104740.898	9.754
2STN	496892.325	104679.861	9.855
3STN	496903.214	104732.720	9.785

SURVEY GRID:

All information is to Ordnance Survey National Grid, computed using Leica Smartnet RTK Network

SURVEY DATUM:

All Levels are Orthometric Heights Related To OSGM15 Datum.

NOTES:

- Surveyed boundaries may not be legal boundaries.
- Dimensions should not be scaled. All information contained in the drawing should be checked and verified on site prior to any fabrication/construction.
- All utilities have been identified to the best of the surveyors knowledge but cannot be guaranteed. Due to non entry of inspection chambers all pipe sizes should be checked and verified before any works commence.
- Services such as Inspection Chambers and Water Meters etc may be obscured by parked cars or debris.

Topo Key

STREET FURNITURE
BB Bollard Balloon
BL Basement Light
Bin Litter Bin
BO Bollard
BS BusStop
CPO Concrete Post
EQ Electric Equipment
ET Electric Point
FB Flower Bed
FHM Fire Hydrant Marker
FL Flood Light
FP Flag Pole
FPO Fence Post
GB Grit Bin/Box
GB Grit Box
GMK Gas Marker Post
GPO Gate Post
IRO Illuminating Bollard
LH Lamp Hook
LP Lamp Post
MBO Marker Post
MK Marker
MPO Metal Post
NP Name Plate
PB Post Box
PM Parking Meter
RPO Reflector Post
SB Sign Blade
SI Sign
STN Survey Station
TP Water Tap
TCB Telephone Cell Box
TL Traffic Light
TLCB Traffic Light Control Box
TP Telegraph Post
TPO Timber Post

PIPES & CABLES
DBC Directly Buried Cable
FWP Foul Water Pipe
FWPP Foul Water Pipe
GP Gas Pipe
RWP Rain Water Pipe
SP Steond Pipe
SVP Soil Vent Pipe
UTT Unable to Trace
VP Vent Pipe
WP Waste Pipe

LEVELS & DEPTHS
A Approximate
BD Back Drop Depth
BDL Back Drop Level
CD Chamber Depth
DHL Door Head Level
DSL Door Sill Level
DPC Damp Proof Course
FCL Finished Floor Level
FFL First Floor Level
ICL Cover Level
ID Invert Depth
IL Invert Level
OD Outlet Depth
OL Outlet Level
PWL Parapet Wall Level
RL Ridge Level
SD Sump Depth
SFD Soffit Depth
SFL Soffit Level
SL Sump Level
TL Sump Level
EBL Structure Slab Level
TFL Top of Fenced Level
THL Threshold Level
TTL Top of Tree Level
TWL Top of Wall Level
WD Water Depth
WL Water Level
WHL Window Head Level
WSL Window Sill Level

FENCES & WALLS
BW Block Wall
CBW Brick Wall
BRTW Brick Retaining Wall
BRW Brick Wall
BWF Barbed Wire Fence
CBF Close Board Fence
CF Corrugated Iron Fence
CLF Chain Link Fence
CPF Chestnut Paling Fence
CRW Concrete Retaining Wall
CW Concrete Wall
CWF Chicken Wire Fence
DI Dilapidated
HH Hedge
IW Ironwork Fence
LF Lattice Fence
MF Miscellaneous Fence
MRF Metal Railing Fence
OBF Open Board Fence
PCF Post & Chain Fence
PF Post Fence
PRF Post & Rail Fence
PWF Post & Wire Fence
RTW Retaining Wall
STW Stone Wall
SRTW Stone Retaining Wall
WMF Wire Mesh Fence

INSPECTION CHAMBERS
AC Access Cover
BH Borehole
CDC Concrete Drainage Channel
EIC Electric Inspection Cover
ER Earth Rod
FH Fire Hydrant
FWIC Foul Water Inspection Cover
GIC Gas Inspection Cover
GM Gas Meter
GV Gas Valve
GY Gully
IC Inspection Cover
KI Kerb Inlet
MHP Manhole Hydraulic Power
MDC Metal Drainage Channel
MW Monitoring Well
NI No Further Information
RE Rodding Eye
SGIC Scarcia Gurt Inspection Cover
SV Stop Valve
SWCP Surface Catch Pit
SWIC Storm Water Inspection Cover
TCIC Traffic Control Inspection Cover
TIC Telecom Inspection Cover
UIC Unidentified Inspectional Cover
UTR Unable to Raise
WIC Water Inspection Cover
WM Water Meter
WMO Water Meter Out
WSV Water Stop Valve

SURFACES
GPav Block Paving
Grass Grass
CPav Crazy Paving
CPS Concrete Paving Slabs
FB Flower&Shrub Border
KPC Kidney Flint Cobbles
SPS Stone Paving Slabs
Tarm Tarmac
Timber Timber
TPav Tactile Paving
TS Trench Scar

MEASUREMENTS
d Depth(m)
ø Diameter (mm)
Ext.ø External Diameter (mm)
H Object Height (m)

Trees

Tree canopies an heights shown as indicative only. Tree species identified to the best of the Surveyors knowledge. If tree species are important than the services of an Arborist should be employed. Individual tree canopies are shown in a separate layer, called TREES which is turned off for presentation purposes.

Tree Notation: Trunk/Canopy/Height

Symbology

- Single Gate
- Double Gate
- Banking
- Step Up
- Ø Diameter shown in mm
- Survey Station

Linetypes

- Telecom Overhead
- Power Overhead
- Foul Water
- Surface Water
- Unknown Water
- Unknown Services
- Change of Surface
- Drop Kerb
- Fence
- Hedge
- Kerb
- Building Face
- Overhead Feature
- Trench Scar
- Tree Canopy
- Bushes/Village/Overgrowth
- Tree Canopy Cabels

5 0 5 10 15 20 25

Scale Bar 1:200

ARUN DISTRICT COUNCIL Ver1725PL

SURVEY GRID:

All information is to Ordnance Survey National Grid, computed using Leica Smartnet RTK Network

SURVEY DATUM:

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- Services such as Inspection Chambers and Water Meters etc may be obscured by parked cars or debris.

Topo Key

STREET FURNITURE

BB	Belisha Beacon
BL	Basement Light
Bin	Litter Bin
BO	Bollard
BS	BusStop
CPO	Concrete Post
EC	Electric Cupboard
EP	Electric Pole
FB	FlowerBed
FHM	Fire Hydrant Marker
FL	Flood Light
FP	Flag Pole
FPO	Fence Post
JB	Junction Box
GB	GritBox
GMK	Gas Marker Post
GPO	GatePost
IBO	Illuminating Bollard
LH	Lamp Hole
LP	Lamp Post
LPO	Lockable Post
MK	Marker
MPO	Metal Post
NP	Name Plate
PB	Post Box
PM	Parking Meter
RPO	Reflector Post
RS	Road Sign
SI	Sign
STN	Survey Station
Tap	WaterTap
TCB	Telephone Call Box
TL	Traffic Light
TLCB	Traffic Light Control Box
TP	Telegraph Post
TPO	Timber Post

PIPES & CABLES

DBC	Directly Buried Cable
DP	Down Pipe
FWP	Foul Water Pipe
GP	Gas Pipe
RWP	Rain Water Pipe
SP	Stand Pipe
SVP	Soil Vent Pipe
UTT	Unable to Trace
VP	Vent Pipe
WP	Waste Pipe

LEVELS & DEPTHS

A	Approximate
BD	Back DropDepth
BDL	Back DropLevel
CD	Chamber Depth
DHL	Door Head Level
DSL	Door Sill Level
DPC	Damp Proof Course
EL	Eaves Level
FFL	Finished Floor Level
FRL	Flat Roof Level
ICL	Cover Level
ID	Invert Depth
IL	Invert Level
OD	Outlet Depth
OL	Outlet Level
PWL	Parapet Wall Level
RL	Ridge Level
SD	Sump Depth
SFD	Soffit Depth
SFL	Soffit Level
SiltL	Silt Level
SL	Sump Level
SSL	Structural Slab Level
TFL	Top of Fence Level
THL	Threshold Level
TTL	Top of Tree Level
TWL	Top of Wall Level
USL	Underside Level
WL	Water Level
WHL	Window Head Level
WSL	Window Sill Level

FENCES & WALLS

BW	Block Wall
BRP	Brick Pier
BRTW	Brick Retaining Wall
BRW	Brick Wall
BWF	Barbed Wire Fence
CBF	Close Board Fence
CIF	Corrugated Iron Fence
CLF	Chain Link Fence
CPF	Chestnut Pailing Fence
CRW	Concrete Retaining Wall
CW	ConcreteWall
CWF	Chicken Wire Fence
Dil	Dilapidated
HR	Handrail
IWF	Interwoven Fence
LF	Lattice Fence
MF	Miscellaneous Fence
MRF	Metal Railing Fence
OBF	Open Board Fence
PCF	Post & Chain Fence
PNF	Panel Fence
PRF	Post & Rail Fence
PWF	Post & Wire Fence
RTW	Retaining Wall
STW	Stone Wall
SRTW	Stone Retaining Wall
WMF	Wire Mesh Fence

INSPECTION CHAMBERS

AC	Access Cover
BH	Borehole
CDC	Concrete Drainage Channel
EIC	Electric Inspection Cover
ER	Earth Rod
FH	Fire Hydrant
FWIC	Foul Water Inspection Cover
GIC	Gas Inspection Cover
GM	Gas Meter
GV	Gas Valve
G	Gully
IC	Inspection Cover
KI	Kerb Inlet
LHP	London Hydraulic Power
MDC	Metal Drainage Channel
MW	Monitoring Well
NFI	No Further Information
RE	Rodding Eye
SDIC	Service Duct Inspection Cover
SV	Stop Valve
SWCP	Storm Water Catch Pit
SWIC	Storm Water Inspection Cover
TCIC	Traffic Control Inspection Cover
TIC	Telecom Inspection Cover
UIC	Unidentified Inspectional Cover
UTR	Unable to Raise
WIC	Water Inspection Cover
WM	Water Meter
WWO	Water Wash Out
WSV	Water Stop Valve

SURFACES

BPav	Brick Paving
Conc	Concrete
CPav	Crazy Paving
CPS	Concrete Paving Slabs
FB	Flowe\Shrub Border
KFC	Kidney Flint Cobbles
SPS	Stone Paving Slabs
T	Tiles
Tmac	Tarmac
TPav	Tactile Paving
TS	Trench Scar

MEASUREMENTS

d	Depth(m)
Ø	Diameter (mm)
Ext.Ø	External Diameter (mm)
H	Object Height (m)

Trees

Tree canopies an heights shown as indicative only. Tree species identified to the best of the Surveyors knowledge. If tree species are important than the services of an Arborist should be employed. Individual tree canopies are shown in a separate layer, called TREES which is turned off for presentation purposes.

Tree Notation: Trunk/Canopy/Height

Symbology

- Single Gate
- Double Gate
- Banking
- Step Up
- Ø Diameter shown in mm
- Survey Station

Linetypes

- Telecom Overhead
- Power Overhead
- Foul Water
- Surface Water
- Combined Water
- Unknown Services
- Change of Surface
- Drop Kerb
- Fence
- Wall
- Kerb
- Building Face
- Overhead Feature
- Trench Scar
- Tree Canopy
- Bushes\Foliage\Overgrowth
- Tree Canopy Extents

Scale: 1:1250

Date: 23/03/23

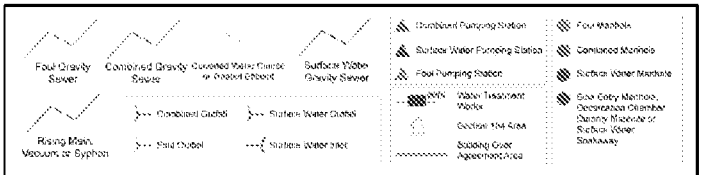
Wastewater Plan A4

Data updated: 27/02/23

Map Centre: 496912,104760

Our Ref: 1119401 - 2

Powered by digdat



utility.reports@technicsgroup.com

GRS13477

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

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

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
8601	F	9.78	7.49	
8701	F	8.79	6.98	
8702	F	9.89	9.88	
8704	F	0.00	0.00	
8705	F	0.00	0.00	
8706	F	0.00	0.00	
8707	F	0.00	0.00	
8801	F	8.11	7.26	
9601	F	10.21	0.00	
9602	F	9.43	0.00	

Project

Project Name:	Park Rd Culvert - Barnham
Project Description:	Culvert Survey
Project Status:	Complete
Project Date:	18/08/2024
Inspection Standard:	MSCC5 Sewers & Drainage GB (SRM5 Scoring)

EYES ON DRAINAGE

CCTV-Trace-Plot-Map-Repair

Table of Contents

Project Name	Project Number	Project Date
Park Rd Culvert - Barnham		18/08/2024

Eyes On Drainage Services Ltd
Bines Green, Horsham
[redacted]

Project Information

Project Name	Project Number	Project Date
Park Rd Culvert - Barnham		18/08/2024

Client

Company: Folkes Architects
Department: The Old Forge
Street: 6 Church St
Town or City: Storrington
County: West sussex
Post Code: RH20 4LA

Site

Description: North of Lake Lane
Department: Kilkenny
Street: Park Rd
Town or City: Barnham
County: West Sussex
Post Code: PO22 0AJ

Contractor

Company: Eyes On Drainage Services Ltd
Contact: Jay Young
Department: Merrion House
Street: Bines Green
Town or City: Horsham
County: West Sussex
Post Code: RH13 8EH
Phone: 01403 710971
Mobile: 077111 84951
Email: info@eyesondrainage.co.uk

EYES ON DRAINAGE

Eyes On Drainage Services Ltd
Bines Green, Horsham
[redacted]

Project Information

Project Name	Project Number	Project Date
Park Rd Culvert - Barnham		18/08/2024

Project Drawing, Page 'Park Rd Culvert - Barnham'

Scoring Summary

Project Name	Project Number	Project Date
Park Rd Culvert - Barnham		18/08/2024

Structural Defects

Section	PLR	Grade	Description
All inspected pipes are in an acceptable structural condition (< grade 3).			

Service / Operational Condition

Section	PLR	Grade	Description
All inspected pipes are in an acceptable service condition (< grade 3).			

Abandoned Surveys

Section	PLR	Description
All inspections complete, none are abandoned.		

Information

These scoring summaries are based on the SRM grading from the WRc.

EYES ON DRAINAGE

Eyes On Drainage Services Ltd
Bines Green, Horsham
[redacted]

Section Profile

Project Name	Project Number	Project Date
Park Rd Culvert - Barnham		18/08/2024

Circular, 450 mm

Item No.	Upstream Node	Downstream Node	Date	Road	Material	Total Length	Inspected Length
1	HW1	HW2	18/08/2024	Park Rd	Concrete	55.00 m	55.00 m

Total: 1 Inspection x Circular 450 mm, 0 mm = 55.00 m Total Length and 55.00 m Inspected Length

Total: 1 Inspection = 55.00 m Total Length and 55.00 m Inspected Length

Section Summary

Project Name	Project Number	Project Date
Park Rd Culvert - Barnham		18/08/2024

Number of sections	1
Total length of sections	55.00 m
Total length of inspected sections	55.00 m
Total length of not inspected sections	0.00 m
Number of abandoned inspections	0
Number of section inspection photos	4
Number of section inspection videos	0
Number of section inspection scans	0
Number of section inclination measurements	0

PLR:	HW1X	**Upstream Node:**	HW1
Inspection Direction:	Downstream	**Downstream Node:**	HW2
Inspected Length:	55.00 m	**Dia/Height:**	450 mm
Total Length:	55.00 m	**Material:**	Concrete

No.	m+	Code	Observation
1	0.00	OF	Start node, outfall, reference: HW1, Located within private grounds
2	0.00	WL	Water level, 0% of the vertical dimension
3	0.00	WL	Water level, 70% of the vertical dimension
4	55.00	OFF	Finish node, outfall, reference: HW2, Unable to carry out full CCTV survey due to permissions.

EYES ON DRAINAGE

Eyes On Drainage Services Ltd
Bines Green, Horsham
[redacted]

Section Inspection - 18/08/2024 - HW1X

Item No.	Insp. No.	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	18/08/24	7:51	Not Specified	No Rain Or Snow	No	HW1X

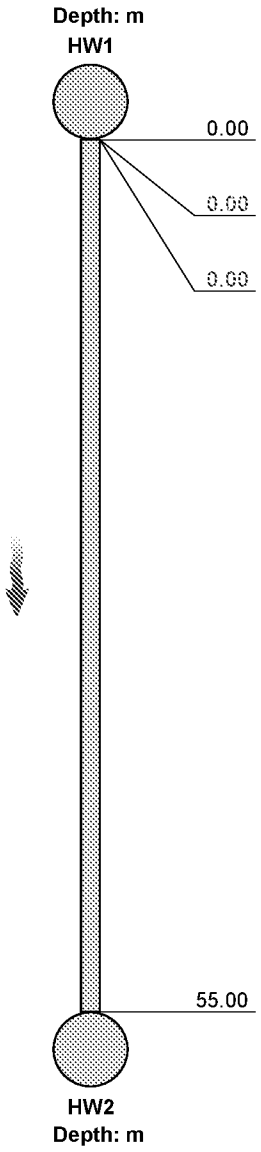
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
JY	BV21 CDX	Not Specified	Not Specified	Watercourse	Not Specified

Town or Village:	Barnham	**Inspection Direction:**	Downstream	**Upstream Node:**	HW1
Road:	Park Rd	**Inspected Length:**	55.00 m	**Upstream Pipe Depth:**	
Location:	Gardens (private)	**Total Length:**	55.00 m	**Downstream Node:**	HW2
Surface Type:	Various	**Joint Length:**		**Downstream Pipe Depth:**	

Use:	Culverted watercourse	**Pipe Shape:**	Circular
Type of Pipe:	Gravity drain/sewer	**Dia/Height:**	450 mm
Flow Control:	No flow control	**Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:477

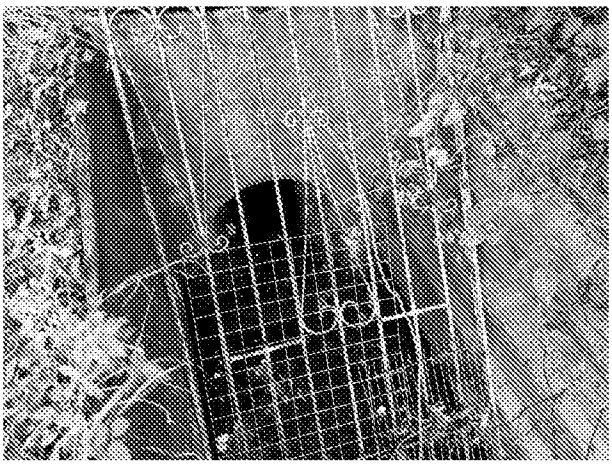


Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	OF	Start node, outfall, reference: HW1: Located within private grounds		1, 2	
0.00	WL	Water level, 0% of the vertical dimension			
0.00	WL	Water level, 70% of the vertical dimension	00:00:01		
55.00	OFF	Finish node, outfall, reference: HW2: Unable to carry out full CCTV survey due to permissions.		3, 4	

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Pictures - 18/08/2024 - HW1X

Item No.	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
1	Downstream	HW1X		



1, 0.00 m
Start node, outfall, reference: HW1, Located within private grounds

2, 0.00 m
Start node, outfall, reference: HW1, Located within private grounds

3, 55.00 m
Finish node, outfall, reference: HW2, Unable to carry out full CCTV survey due to permissions.

4, 55.00 m
Finish node, outfall, reference: HW2, Unable to carry out full CCTV survey due to permissions.

Disclaimer

Although every effort has been made to produce a thorough and precise report, Eyes On Drainage Services Ltd cannot be held liable for any descrepencies or omissions.
Furthermore Eyes On Drainage Services Ltd cannot be held responsible for any actions taken based on the information supplied within this report.

Appendix D

BRE Digest 365 Soil Soakage Test Report

From: John Baxter <[redacted]
Sent: Tuesday, November 21, 2023 22:10
To: Info - Folkes Architects <[redacted] John Pakenham <[redacted]
Subject: Re: 12188: Lake Lane, Barnham

Dear Mark, John,

Findings from Filtration test carried out at Lake Lane in Barnham below

DATE 20th November 2023

Pit size 300mm x 800mm x 1000mm deep

Location - can be determined by photos of work sent to Mark Folkes (about 12 meters Infront of gate entrance to field

Virgin ground which visually appeared to be clay/ sand appeared 250mm down. Sample has been taken and is on site in a bag (depth 1000mm) if needed.

Test start time 10.42am - Hole filled with water 100mm below marker stick suspended above

0 mins - 100mm
5 mins - 100mm
10 mins - 100mm
15 mins - 100mm
20 mins - 100mm
25 mins - 100mm
30 mins - 100mm
35 mins - 100mm
40 mins- 97mm
45 mins - 97 mm
50 mins - 97mm
55 mins - 97mm
60 mins - 97mm
75 mins - 95mm
120 mins - 90mm

The gap between the stick and water level actually *decreased* slightly as the pit slowly filled up with water. From the discussion I had with John on completion of the work, I believe this is a fail.

I trust this is what you need.

Regards

John

[The soil type is clearly cohesive]

Appendix E

Proposed Scheme Drawings including Drainage Strategy Layout

NOTES

- DO NOT SCALE OFF THIS DRAWING EXCEPT FOR PLANNING PURPOSES
- CHECK ALL DIMENSIONS ON SITE BEFORE ANY WORK IS COMMENCED
- ALL GOODS MATERIALS AND WORKMANSHIP MUST CONFORM WITH CURRENT BUILDING REGULATIONS, BRITISH STANDARDS AND CODES OF PRACTICE
- COPYRIGHT OF THIS DRAWING IS RETAINED BY THE ARCHITECT AND IT MUST NOT BE REPRODUCED WITHOUT WRITTEN CONSENT

Site Plan 1:500 @ A1

REV	DATE	BY	AMENDMENT
C	16.10.24	BH	Plots 6 & 7 Layout Amendments
B	20.08.24	BH	Plot 7 Layout Revision
A	23.04.24	BH	Revised Parking Layout & Dims Added

folkes architects

CLIENT
Property Sphere

JOB TITLE
Land to the North of
Lake Lane
Barnham
Bognor Regis
PO22 0AJ

DRAWING TITLE
Site Plan
As Proposed

DRAWING STATUS
PLANNING
NOT FOR CONSTRUCTION USE UNLESS STATED AS 'CONSTRUCTION'

DATE	SCALE	DRAWN BY	CHECKED BY
FEB 24	1:200 @ A1	BH	MF

JOB NO.	DRAWING NO.	REVISION
22071	2.02	/

GENERAL NOTES

1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations , record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.

2. Prior to commencement of works the contractor shall provide co-ordinated and dimensioned installation drawings and calculations and allow 10 working days for gta's checking procedure prior to proceeding with those works or the ordering of materials.

3. Tender or billing drawings shall not be used for construction or the ordering of materials.

4. Do not scale. All dimensions and levels to be site confirmed.

5. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements

6. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.

7. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

KEY

- Existing foul water drain
- Surface water drain
- Land drain
- Foul drain
- Foul rising main
- Filter drain
- ExFSMH — Existing foul sewer manhole
- FMH — Foul manhole
- SCP — Surface water catchpit manhole
- FIC — Foul inspection chamber
- SIC — Surface water inspection chamber
- PPCP — Surface water catchpit inspection chamber
- RG — Road gully
- Cellular Storage
- Overland flow route for exceedance events

ABBREVIATIONS

BL	BASE LEVEL
CL	COVER LEVEL
ExFSMH	EXISTING FOUL SEWER MANHOLE
FIC	FOUL INSPECTION CHAMBER
FFL	FINISHED FLOOR LEVEL
FMH	FOUL MANHOLE
FWD	FOUL DRAIN
IL	INVERT LEVEL
LLFA	LEAD LOCAL FLOOD AUTHORITY
MH	MANHOLE
PN	PIPE NUMBER
PPCP	PLASTIC CATCHPIT
RG	ROAD GULLY
SIC	SURFACE WATER INSPECTION CHAMBER
SL	SUMP LEVEL
SWD	SURFACE WATER DRAIN
TL	TOP LEVEL

DESIGN NOTES

1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 45%.

2. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.

3. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.

4. CONTRACTOR TO ALLOW FOR NEW FOUL WATER SEWER CONNECTION INTO PUBLIC SEWER.

DESIGN ADDITIONS TO REDUCE IMPACTS ON THE LIDSEY WASTE WATER CATCHMENT

1. WATER BUTTS TO BE INSTALLED ON RAINWATER DOWNPIPES.

2. USE OF JOINT SEALANT OR MASS CONCRETE CHAMBER SURROUNDS TO PREVENT INFILTRATION.

3. USE OF BOLT DOWN SEALED CHAMBER COVERS TO PREVENT SURFACE WATER INUNDATION.

Rev	Amendments	Date	Dsn	Chk
P4	Updated to latest site layout. Ditch shown with easement. Land drainage shown	20.09.24	JR	MR
P3	NOTES ON WATER BUTTS AND SEALED SEWERS ADDED.	04.03.24	JR	MR
P2	REVISED TO LATEST SITE PLAN. DISCHARGE POINT TO DITCH CHANGED.	23.02.24	JR	MR
P1	INITIAL ISSUE	15.12.23	AE	MR

Status: PRELIMINARY

Client: PROPERTY SPHERE LTD

Architect: FOLKES ARCHITECTS

Project: LAKE LANE BARNHAM

Title: DRAINAGE STRATEGY

Date: DECEMBER 2023 | Scale @ A0: 1:200

Clients Ref. | Project Ref.: 12188

gta Civils & Transport
Maple House, 192-198 London Road,
Burgess Hill, West Sussex, RH15 9RD
Tel.01444 871444 Web: www.gtaciwils.co.uk

Drawing Number: 12188-1101 | Rev.: P4

GENERAL NOTES

1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations , record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.

2. Prior to commencement of works the contractor shall provide co-ordinated and dimensioned installation drawings and calculations and allow 10 working days for gta's checking procedure prior to proceeding with those works or the ordering of materials.

3. Tender or billing drawings shall not be used for construction or the ordering of materials.

4. Do not scale. All dimensions and levels to be site confirmed.

5. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements

6. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.

7. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

KEY

94.82m² - 2.000
UC 10%

Catchment area with pipe reference
UC = Urban Creep

N

Kilkenny
Holmwood
Pipits
Clanwilliam
Daylesford
arsden
ds
The
Drive
Ridgeway
awne
ottages
10
Pipkins
St Annes
Lynton
South
View
Laurels
Smallfield
Harvest
Cottage
Trevone
Cox's
Farm
LAKE LANE

Plot 7
Plot 6
Plot 5
Plot 4
Plot 3
Plot 1
Plot 2

23.94m² - 3.000
95.36m² - 3.000
UC 10%
27.14m² - 3.000
95.36m² - 3.000
UC 10%
37.29m² - 1.007
172.10m² - 1.006
104.12m² - 1.008
95.36m² - 1.006
UC 10%
54.58m² - 1.005
95.32m² - 1.004
UC 10%
114.58m² - 1.005
133.28m² - 1.004
82.41m² - 1.004
94.82m² - 2.000
UC 10%
22.69m² - 1.003
89.34m² - 1.003
22.99m² - 1.003
21.35m² - 1.003
160.93m² - 1.003
UC 10%
114.69m² - 1.003
UC 10%
118.58m² - 1.002
126.07m² - 1.001
136.09m² - 1.000

P3	Updated to latest site layout and UC added	20.09.24	JR	MR
P2	REVISED TO LATEST DRAINAGE NETWORK	23.02.24	JR	MR
P1	INITIAL ISSUE	14.12.23	AE	JR
Rev	Amendments	Date	Dsn	Chk

Status: PRELIMINARY

Client: PROPERTY SPHERE LTD

Architect: FOLKES ARCHITECTS

Project: LAKE LANE
BARNHAM

Title: CATCHMENT PLAN

Date	Scale @ A0
DECEMBER 2023	1:200
Clients Ref.	Project Ref.
	12188

gta Civils & Transport
Maple House, 192-198 London Road,
Burgess Hill, West Sussex, RH15 9RD
Tel.01444 871444 Web: www.gtacivils.co.uk

Drawing Number	Rev.
12188-1102	P3

Appendix F

Drainage Calculation Sheets

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.209	Urban	0.000
SAAR (mm)	900	Region Number	Region 7

Results l/s

QBAR Rural	1.2
QBAR Urban	1.2
Q100 years	3.9
Q1 year	1.0
Q30 years	2.8
Q100 years	3.9

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Inverts
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.014	5.00	10.170	1 STANDARD	600	57.634	494.565	1.280
2	0.013	5.00	10.268	1 STANDARD	600	87.764	494.565	1.578
3	0.015	5.00	9.978	1 STANDARD	600	117.604	494.565	1.488
4	0.047	5.00	9.630	1 STANDARD	600	138.204	494.565	1.275
5	0.011	5.00	9.262	1 STANDARD	600	158.044	500.115	0.812
6	0.021	5.00	9.334	1 STANDARD	600	158.044	494.565	1.111
7	0.026	5.00	9.135	1 STANDARD	600	159.044	494.565	0.935
8	0.026	5.00	9.231	1 STANDARD	600	186.944	523.145	0.748
9	0.036	5.00	9.239	1 STANDARD	600	186.944	494.565	1.200
10			8.785	1 STANDARD	600	196.338	494.565	0.800
11			8.785	1 STANDARD	1200	198.426	494.565	0.815
11_OUT			8.730	1 STANDARD		202.176	494.565	0.785

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.816	14.4	1.9	1.130	1.428	0.014	0.0
1.001	0.820	14.5	3.7	1.428	1.338	0.027	0.0
1.002	0.811	14.3	5.7	1.338	1.125	0.042	0.0
1.003	1.064	42.3	11.9	1.050	0.886	0.089	0.0
2.000	1.567	12.3	1.5	0.712	1.011	0.011	0.0
1.004	1.989	79.1	16.1	0.886	0.710	0.121	0.0
1.005	0.990	39.4	19.0	0.710	0.975	0.147	0.0
3.000	1.255	22.2	3.5	0.598	1.050	0.026	0.0
1.006	0.988	39.3	26.7	0.975	0.575	0.209	0.0
1.007	1.106	44.0	26.7	0.575	0.590	0.209	0.0
1.008	0.818	14.5	26.5	0.665	0.635	0.209	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	30.130	150.7	150	1 STANDARD	10.170	8.890	1.130	10.268	8.690	1.428
1.001	29.840	149.2	150	1 STANDARD	10.268	8.690	1.428	9.978	8.490	1.338
1.002	20.600	152.6	150	1 STANDARD	9.978	8.490	1.338	9.630	8.355	1.125
1.003	19.840	150.3	225	1 STANDARD	9.630	8.355	1.050	9.334	8.223	0.886
2.000	5.550	24.4	100	1 STANDARD	9.262	8.450	0.712	9.334	8.223	1.011
1.004	1.000	43.5	225	1 STANDARD	9.334	8.223	0.886	9.135	8.200	0.710
1.005	27.900	173.3	225	1 STANDARD	9.135	8.200	0.710	9.239	8.039	0.975
3.000	28.580	64.4	150	1 STANDARD	9.231	8.483	0.598	9.239	8.039	1.050
1.006	9.394	174.0	225	1 STANDARD	9.239	8.039	0.975	8.785	7.985	0.575
1.007	2.088	139.2	225	1 STANDARD	8.785	7.985	0.575	8.785	7.970	0.590
1.008	3.750	150.0	150	1 STANDARD	8.785	7.970	0.665	8.730	7.945	0.635

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	1 STANDARD	2	600	Manhole	1 STANDARD
1.001	2	600	Manhole	1 STANDARD	3	600	Manhole	1 STANDARD
1.002	3	600	Manhole	1 STANDARD	4	600	Manhole	1 STANDARD
1.003	4	600	Manhole	1 STANDARD	6	600	Manhole	1 STANDARD
2.000	5	600	Manhole	1 STANDARD	6	600	Manhole	1 STANDARD
1.004	6	600	Manhole	1 STANDARD	7	600	Manhole	1 STANDARD
1.005	7	600	Manhole	1 STANDARD	9	600	Manhole	1 STANDARD
3.000	8	600	Manhole	1 STANDARD	9	600	Manhole	1 STANDARD
1.006	9	600	Manhole	1 STANDARD	10	600	Manhole	1 STANDARD
1.007	10	600	Manhole	1 STANDARD	11	1200	Manhole	1 STANDARD
1.008	11	1200	Manhole	1 STANDARD	11_OUT		Manhole	1 STANDARD

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	60	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	8640
30	120	240	480	720	1440	2880	5760	10080

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	45	0	0

Node 11 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	7.970	Product Number	CTL-SHE-0055-1200-0730-1200
Design Depth (m)	0.730	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.2	Min Node Diameter (mm)	1200

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	216.0	0.0	0.700	0.0	0.0	1.400	0.0	0.0	2.100	0.0	0.0
0.100	216.0	0.0	0.800	0.0	0.0	1.500	0.0	0.0	2.200	0.0	0.0
0.200	216.0	0.0	0.900	0.0	0.0	1.600	0.0	0.0	2.300	0.0	0.0
0.300	216.0	0.0	1.000	0.0	0.0	1.700	0.0	0.0	2.400	0.0	0.0
0.400	216.0	0.0	1.100	0.0	0.0	1.800	0.0	0.0	2.500	0.0	0.0
0.500	216.0	0.0	1.200	0.0	0.0	1.900	0.0	0.0			
0.501	0.0	0.0	1.300	0.0	0.0	2.000	0.0	0.0			

Node 11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.985
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	34.0	0.0	0.800	167.0	0.0	0.801	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.932	0.042	2.6	0.0120	0.0000	OK
15 minute summer	2	11	8.750	0.060	5.0	0.0169	0.0000	OK
15 minute summer	3	11	8.567	0.077	7.6	0.0219	0.0000	OK
15 minute summer	4	9	8.487	0.132	16.0	0.0373	0.0000	OK
15 minute summer	5	10	8.478	0.028	2.1	0.0079	0.0000	OK
15 minute winter	6	8	8.463	0.240	23.2	0.0678	0.0000	SURCHARGED
360 minute summer	7	296	8.289	0.089	7.0	19.1516	0.0000	OK
15 minute summer	8	10	8.531	0.048	4.9	0.0135	0.0000	OK
360 minute summer	9	296	8.288	0.249	7.8	0.0706	0.0000	SURCHARGED
360 minute summer	10	296	8.288	0.303	7.3	0.0859	0.0000	SURCHARGED
360 minute summer	11	296	8.288	0.318	7.2	18.3404	0.0000	SURCHARGED
60 minute summer	11_OUT	62	7.974	0.029	1.2	0.0000	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)
15 minute summer	1	1.000	2	2.5	0.491	0.176	0.1600	
15 minute summer	2	1.001	3	4.9	0.628	0.337	0.2344	
15 minute summer	3	1.002	4	7.5	0.710	0.525	0.2448	
15 minute summer	4	1.003	6	16.2	0.841	0.382	0.6340	
15 minute summer	5	2.000	6	2.1	0.362	0.169	0.0267	
15 minute winter	6	1.004	7	24.0	1.851	0.303	0.0201	
360 minute summer	7	1.005	9	5.2	0.384	0.132	0.7570	
15 minute summer	8	3.000	9	4.8	0.625	0.218	0.2315	
360 minute summer	9	1.006	10	7.3	0.320	0.187	0.3736	
360 minute summer	10	1.007	11	7.2	0.259	0.165	0.0830	
360 minute summer	11	1.008	11_OUT	1.2	0.481	0.083	0.0094	22.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.960	0.070	6.6	0.0199	0.0000	OK
15 minute summer	2	12	8.900	0.210	12.6	0.0594	0.0000	SURCHARGED
15 minute summer	3	11	8.762	0.272	17.3	0.0768	0.0000	SURCHARGED
15 minute summer	4	10	8.545	0.190	38.0	0.0539	0.0000	OK
15 minute winter	5	7	8.520	0.070	4.9	0.0199	0.0000	OK
15 minute winter	6	7	8.505	0.282	50.0	0.0799	0.0000	SURCHARGED
480 minute summer	7	480	8.456	0.256	11.0	55.3198	0.0000	SURCHARGED
15 minute summer	8	10	8.562	0.079	12.3	0.0224	0.0000	OK
480 minute summer	9	480	8.456	0.417	7.2	0.1179	0.0000	SURCHARGED
480 minute summer	10	480	8.456	0.471	6.9	0.1332	0.0000	SURCHARGED
480 minute summer	11	480	8.456	0.486	6.9	34.9763	0.0000	SURCHARGED
240 minute summer	11_OUT	112	7.974	0.029	1.2	0.0000	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)
15 minute summer	1	1.000	2	6.5	0.616	0.450	0.3856	
15 minute summer	2	1.001	3	11.4	0.703	0.789	0.5253	
15 minute summer	3	1.002	4	17.3	0.983	1.207	0.3627	
15 minute summer	4	1.003	6	37.9	1.097	0.897	0.7326	
15 minute winter	5	2.000	6	4.9	0.740	0.394	0.0380	
15 minute winter	6	1.004	7	50.3	2.267	0.636	0.0221	
480 minute summer	7	1.005	9	4.2	0.354	0.106	1.1096	
15 minute summer	8	3.000	9	12.2	0.794	0.549	0.3863	
480 minute summer	9	1.006	10	6.9	0.364	0.176	0.3736	
480 minute summer	10	1.007	11	6.9	0.314	0.156	0.0830	
480 minute summer	11	1.008	11_OUT	1.2	0.481	0.083	0.0094	29.8

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	9.921	1.031	12.0	0.2918	0.0000	FLOOD RISK
15 minute summer	2	12	9.831	1.141	18.7	0.3229	0.0000	SURCHARGED
15 minute summer	3	12	9.492	1.002	27.8	0.2835	0.0000	SURCHARGED
15 minute summer	4	11	8.928	0.573	64.3	0.1622	0.0000	SURCHARGED
600 minute winter	5	585	8.750	0.300	0.8	0.0848	0.0000	SURCHARGED
600 minute winter	6	585	8.750	0.527	9.0	0.1490	0.0000	SURCHARGED
600 minute winter	7	585	8.749	0.549	10.9	108.2635	0.0000	SURCHARGED
15 minute summer	8	11	8.803	0.320	22.3	0.0907	0.0000	SURCHARGED
600 minute winter	9	585	8.749	0.710	6.2	0.2010	0.0000	SURCHARGED
600 minute winter	10	585	8.749	0.764	6.1	0.2163	0.0000	FLOOD RISK
600 minute winter	11	585	8.749	0.779	6.1	75.4208	0.0000	FLOOD RISK
600 minute winter	11_OUT	585	7.974	0.029	1.2	0.0000	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)
15 minute summer	1	1.000	2	9.4	0.608	0.653	0.5304	
15 minute summer	2	1.001	3	18.5	1.051	1.276	0.5253	
15 minute summer	3	1.002	4	28.5	1.618	1.988	0.3627	
15 minute summer	4	1.003	6	64.2	1.615	1.518	0.7891	
600 minute winter	5	2.000	6	0.8	0.203	0.065	0.0434	
600 minute winter	6	1.004	7	8.9	0.996	0.112	0.0398	
600 minute winter	7	1.005	9	3.4	0.382	0.086	1.1096	
15 minute summer	8	3.000	9	21.1	1.197	0.950	0.5031	
600 minute winter	9	1.006	10	6.1	0.386	0.156	0.3736	
600 minute winter	10	1.007	11	6.1	0.308	0.138	0.0830	
600 minute winter	11	1.008	11_OUT	1.2	0.483	0.084	0.0094	40.5

Appendix G

Draft Drainage Maintenance Plan

Maintenance Responsibilities

It is the overarching responsibility of each **site owner** to ensure the Drainage Infrastructure is maintained in accordance with this Maintenance Plan.

The responsibility of maintenance, repair, renewal and replacement of the surface water drainage system will be conferred on to the property owners with all costs shared on an equal basis. These arrangements will be administered in the Transfer Document TP1 of each property at the point of sale with the same responsibilities transferring with each property to the successors in title.

Contamination or Dilution of Spillage

The Environment Agency would prefer all spillages on any highway to be contained to prevent any downstream contamination. However, this cannot always be achieved, depending on the nature of the spillage. In all circumstances involving the spillage of substances on the highway it is important that the Environment Agency are notified as soon as possible so that they can provide advice and take appropriate action.

Prompt action following a spillage can prevent or reduce its effects, whilst inappropriate action may cause or worsen the pollution effects. In the design of the drainage on this site, a number of measures have been put in place to prevent any pollution entering the groundwater such as Green roofs and permeable paving. The permeable paving sub-base is lined with a geotextile fabric.

In the event of a spillage on site it is the responsibility of the freeholders to clear up any spillage before it enters the drainage system. The primary method of dealing with any spillage of Hydrocarbons should be to use sand to soak up the leak and prevent any Hydrocarbons entering the drainage system. Once sand has been contaminated it should not be washed into the drainage system but disposed of by a Licensed Contractor.

Environment Agency – Emergency Contact Number

In the event of a spillage the Environment Agency should be contacted to notify the event and seek advice. The Environment Agency's Incident Hotline is **0800 80 70 60** (Freephone 24hrs).

Health and Safety

All those responsible for and involved in the maintenance of the site drainage systems should be safety-conscious and comply with the relevant health and safety legislation. This includes:

- The Health and Safety at Work etc Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Workplace (Health, Safety and Welfare) Regulations 1992

Each freeholder is responsible for suitable risk assessment and management to ensure safe working conditions and practices. Measures to protect potential visitors also need to be considered.

Specialist contractors used should work to industry guidelines and be able to demonstrate safe working practices.

Employers have a duty to employees to inform them about the risks of their work environment and to decrease the risk as far as reasonably practicable. Appropriate personal protective equipment (PPE) should be provided and policies implemented based on risk assessment.

Operatives should be trained for working near water. Risks of contaminated water should be considered. Checking for open cuts and using nitrile gloves, waterproof plasters etc is advised.

Entry of pipes, chambers, tanks and culverts should be avoided wherever possible. Work should be carried out from the surface using appropriate equipment. In the event that entry cannot be avoided to perform a critical task, the required safety training, protection measures and precautions must be implemented prior to entry. Lone working should never be attempted.

For further information refer to Section 36 of The SuDS Manual (CIRIA C753).

Drains, Manholes, Gullies, Silt Catchpits

Regular inspection/maintenance is required to ensure the effective long-term operation of private drains, manholes, gullies & silt pits.

Check hydrobrake orifice is clear and retention tank door is closed. Check function of retention tank door and oil if necessary.

Operation and maintenance requirements for drains, gullies and silt pits are described in the following table:

Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Six-monthly
	Debris removal from gullies & silt pits, channel drains (where may cause risks to performance).	Weekly
	Lift and inspect receiving manholes to check for any blockages. **Particular attention should be given to the control manhole containing the flow control device**	Six-monthly
Remedial Actions	Repair any damaged gully gratings or manhole covers	As required
	Replace / fix any loose channel drain covers	As required
Monitoring	Carry out full CCTV survey to confirm ongoing integrity of all drains. Inspect all gullies and silt pits & drainage channels during the survey	10-yearly intervals

Inspection of manholes and removal of silt from silt catchpits should be undertaken by a specialist contractor.

SDS Infiltration Tank

Recommended design life: Geolight has a service design life in excess of 50 years.

Exact timing of decommission should be identified via the ongoing maintenance and inspection regime. Once replacement need is identified, the complete tank will be removed and replaced depending on the new requirements. The decommissioned tank should be recycled as per manufacturer's guidelines.

The technologies and framework implemented now to design and build these assets could change significantly during the design life of the product. The decommissioning strategy should therefore be reviewed appropriately over time.

Inspection Frequency and Maintenance Requirements: as per table below

Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action. Remove sediment from pre-treatment structures and/ or internal forebays	Monthly for 3 months then annually Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents. Reconstruct soakaway and/or replace or clean granular layers and infiltration blanket, if performance deteriorates or failure occurs	As required As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed. Survey inside of tank for sediment build-up and remove if necessary.	Annually Every 5 years or as required

To be inspected & checked for blockage **6 monthly** and jetted/cleared if necessary.

A CCTV Drainage Survey of the perforated pipe should be carried out every **5 Years** and any blockage/silt build up should be jet washed or removed.

Pond/swale

Inspection Frequency and Maintenance Requirements: as per table below:

Schedule	Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants.	Monthly at start, then as required.
	Inspect inlets, outlets & overflows for blockages and clear if required	Monthly
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record where water is ponding for > 48 hours	Monthly, or when required
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Water Butts

The householders will need to be made aware that the purpose of the water butts is principally to reduce flood risk.

For this reason, the water butts should be regularly emptied to allow for attenuation of roof runoff.

Appendix G

LLFA Correspondence

From: Paul Cann <Paul.Cann@arun.gov.uk>
Sent: 01 October 2024 12:36
To: Martin Roberts <[redacted]
Cc: Info - Folkes Architects [redacted]; Sarah Burrow <Sarah.Burrow@arun.gov.uk>; John Pakenham <jp[redacted]eson <[redacted]Property Sphere Limited <a[redacted]
Subject: RE: Land to the North of Lake Lane Barnham PO22 0AJ - WA/20/24/PL

Hi Martin

The difficulties in respect to the culvert have been noted. If significant issues become apparent in the future then there is the enforcement option, as you are aware. Provided you restrict your flows to QBAR (as required), then it is difficult to ask you to undertake works to this third party asset, so we will respond to any future planning application along those lines.

Please note that works may be required to the perimeter open ditch for which your client is likely to have 50/50 responsibility with the landowner on the other side. An inspection will be required of this ditch and any works agreed.

Regards

Paul Cann
Principal Drainage Engineer, Coastal Engineers and Flood Prevention

T: 01903 737819
E: paul.cann@arun.gov.uk

Arun District Council, Civic Centre, Maltravers Rd
Littlehampton, West Sussex, BN17 5LF
www.arun.gov.uk

From: Martin Roberts
Sent: 19 August 2024 15:07
To: 'Paul Cann' <Paul.Cann@arun.gov.uk>; Sarah Burrow <Sarah.Burrow@arun.gov.uk>
Cc: Info - Folkes Architects <[redacted]n Pakenham <[redacted]uk>; Susan Leeson <[redacted]; Property Sphere Limited[redacted]
Subject: RE: Land to the North of Lake Lane Barnham PO22 0AJ - WA/20/24/PL

Dear Paul/Sarah,

Jay from Eyes on Drainage attended site last Thursday to survey the culverted wastercourse and the results area attached.
The owner of Kilkenny unfortunately refused access to the culvert so he only managed to carry out a visual survey as attached which confirms the connectivity. The owner was quite obstructive and seems to believe he will have some sort of ransom over the adjacent landowner - so it might be worth writing to him to remind him of his riparian responsibilities? Strangely he did show Jay a contraption he used for keeping the culvert clear!

Please can you confirm if the attached will be acceptable to prove connectivity? As you know, the proposed development will not be increasing flows to the watercourse as it will be discharging at greenfield rates, so there should be no change to the current situation.

Kind Regards,

Martin Roberts
Managing Director
I.Eng ACIWEM MCIHT

52th Anniversary gta Civils & Transport

Consulting Engineers
[redacted]

From: Sarah Burrow <Sarah.Burrow@arun.gov.uk>
Sent: 25 October 2024 09:46
To: Martin Roberts <M[redacted]
Cc: Info - Folkes Architects <[redacted]>; Susan Leeson <S[redacted]uk>; John Pakenham <jp[redacted]Limited <[redacted]rg>; Paul Cann <Paul.Cann@arun.gov.uk>
Subject: RE: Lake Lane, Barnham

Hi Martin,

I stand by my previous comments on the consultation for WA/20/24/PL as follows:

"Water levels were recorded to rise during the single infiltration test that was completed in November 2023 on site. This accords with our mapping which notes springs in the area. Infiltration is not considered to be viable as a means of surface water disposal, which we do not dispute.

No groundwater monitoring has been supplied to support this application, however, we would accept a design based upon peak groundwater at ground level. If the applicant wishes to design the surface water drainage for a lower peak groundwater level, then this must be evidenced with winter groundwater monitoring.

Due to the expected design challenges associated with installing drainage infrastructure below peak groundwater levels, we need to see that the effects of buoyancy have been accounted for in the design."

Please feel free to include this communication in your appendices when a new application is made. I assume you have a copy of our latest design checklist? If not it is available at www.arun.gov.uk/surfacewater or I can email a copy.

Kind regards

Sarah Burrow
Flood Risk and Drainage Engineer, Coastal Engineers and Flood Prevention

T: 01903 737815
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Littlehampton, West Sussex, BN17 5LF
www.arun.gov.uk

From: Martin Roberts <[redacted]
Sent: 24 October 2024 10:56
To: Sarah Burrow <Sarah.Burrow@arun.gov.uk>
Cc: Info - Folkes Architects <[redacted]Susan Leeson <[redacted]ohn Pakenham <[redacted]Property Sphere Limited [redacted]Paul Cann <Paul.Cann@arun.gov.uk>
Subject: Lake Lane, Barnham

Sarah,

I've just left you a VM.

Further to the recent letter you sent to developers regarding GW monitoring, we were checking the need for it on this site. The client is about to make a fresh planning application and previous comments from you didn't ask for a full GW monitoring period and we have shown in the attached taking the GW level as the lowest point of the site there will be no flotation in the storage devices. Therefore we don't believe it would be necessary on this site.

Please can you confirm?

Kind Regards,

Martin Roberts
Managing Director
I.Eng ACIWEM MCIHT

52nd Anniversary gta Civils & Transport

Consulting Engineers
[redacted]

Engineers Comments Regarding Surface Water Drainage

Application Reference:	WA/20/24/PL	**Reviewer Reference:**	ADC/SB
Planning Officer:	Simon Davis	**Date of Review:**	01/05/2024
Site Name:	Land to the North of Lake Lane Barnham PO22 0AJ		
Application Description:	Demolition of stable block and erection of 7 No. dwelling houses comprising 2 No. three-bedroom detached bungalows & 5 No. four-bedroom two storey detached houses together with associated car parking and landscaping. This application is a Departure from the Development Plan, falls partly in both Barnham and Walberton Parishes, is in CIL Zone 3, and is liable for CIL as new dwellings.		
Assessment Number:	1 of 1		

Policy and Guidance Information

Arun District Council Surface Water Drainage Guidance - https://www.arun.gov.uk/surfacewater

WSCC Policy for the Management of Surface Water- https://www.westsussex.gov.uk/media/12230/ws_ilfa_policy_for_management_of_surface_water.pdf

Land Drainage Consent - https://www.arun.gov.uk/land-drainage-consent/

Arun District Council surface water pre-commencement conditions - https://www.arun.gov.uk/planning-pre-commencement-conditions

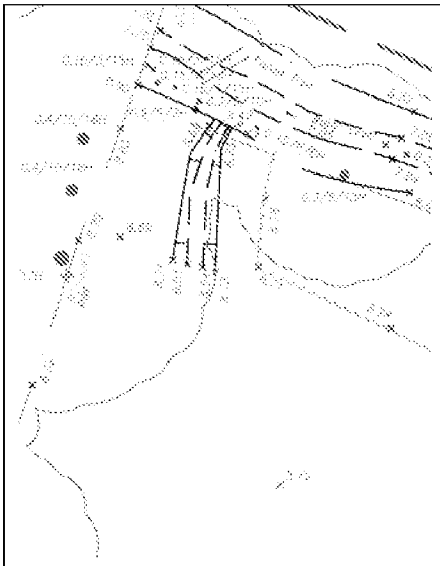
Response	**Objection**

Comments

I object to this application. Insufficient information relating to surface water drainage and the existing on site and boundary watercourses has been provided to evidence that the proposed layout will not increase flood risk on site or elsewhere.

I have attached mapping to this consultation which illustrates the expected location of the north and western watercourses. The western watercourse is located east of the boundary.

This is incorrect. There is no evidence of a watercourse on the survey and on site other than a small branch here:



This is also reflected by the surface water flood risk mapping which is referenced in the flood risk assessment. However, it is not clearly shown on the topographic survey.

This is just a local depression in the ground. The SW flood map shows this as isolated and not a watercourse. The new site drainage will supersede this.

We have now shown, as discussed in the on line meeting with ADC a system of land drains under plot 6 and 7 gardens to ensure any water emerging will be picked up and taken separately to the ditch, as it is now.

Arun land drainage byelaws approved by the Secretary of State for Environment Food & Rural Affairs on 30 September 2004 state that:

"[9] No obstructions within 3m of the edge of the watercourse

No person without the previous consent of the Council shall erect any building or structure, whether temporary or permanent, or plant any tree, shrub, willow or other similar growth within 3 metres of the landward toe of the bank where there is an embankment or wall or within 3 metres of the top of the batter where there is no embankment or wall, or where the watercourse is enclosed within 3 metres of the enclosing structure."

The applicant has not accurately shown the existing watercourses and their necessary easements on the proposed site layouts or drainage strategy. Plot 7 and it's rear boundary with plot 5 appear to be proposed over the watercourse.

We have shown, as demonstrated in the meeting that we have surveyed all the watercourses on the site and they are currently shown on the topographical survey and we have made clearer on the proposed drainage layout. These only run along the east and northern boundaries. A CCTV survey of the culvert was attempted by the adjacent landowner refused entry. A report is appended with photos of the entry screen and confirmation of where the culvert is located.

There is a former Arun IDB watercourse shown on the mapping, the location and existence of this watercourse (through the site) needs to be verified.

Water levels were recorded to rise during the single infiltration test that was completed in November 2023 on site. This accords with our mapping which notes springs in the area. Infiltration is not considered to be viable as a means of surface water disposal, which we do not dispute.

No groundwater monitoring has been supplied to support this application, however, we would accept a design based upon peak groundwater at ground level. If the applicant wishes to design the surface water drainage for a lower peak groundwater level, then this must be evidenced with winter groundwater monitoring.

Due to the expected design challenges associated with installing drainage infrastructure below peak groundwater levels, we need to see that the effects of buoyancy have been accounted for in the design. The proposed attenuation tank is set 2m below ground level and the base of the basin 1.515m below the nearest road level. If features need to be made shallower due to the risk of buoyancy, then their plan areas may increase which will affect the proposed layout.

The proposed attenuation tank is set at an IL of 8.20m AOD. The existing ground level in this area is 8.76-9.04m AOD. Therefore the tank invert is only 560mm below the lowest ground level in that area. (the proposed ground levels are slightly higher at 9.3 so provide additional cover) We have prepared buoyancy calculations to prove the tank and pond will work with an anticipated GW level at the lowest point on the site.

As infiltration is not viable, the applicant proposes to discharge surface water from the site to the northern boundary watercourse. Investigations into this watercourse must be presented to support the application to ensure that it can receive the proposed flow and volume generated by the development. The trash screen at downstream at Kilkenny is identified within the Lidsey Surface Water Management Plan as a poor arrangement which results in the ditch backing up (towards the application site) and overflowing. Flooding is noted in the fields to the rear of the properties, it is unclear which fields, but this may include the application site.

Land drainage consent will be required for the proposed connection to the watercourse network.

The calculations also require some modification, the impact of which may result in an increase in storage volume required.

- CV values must be set to 1 for both design and simulation settings, on both winter and summer storms. CV values have been updated to 1 showing no flooding.
- Connection type is expected to be level soffits unless a clear justification for level inverts is provided. . All drainage is level soffit.
- No climate change allowance has been applied to the 3.33%AEP event, however, if the 1% AEP design event does not flood this is acceptable. We have shown the 3.33% with climate change on the new calcs.
- It is unclear if urban creep has been applied to the impermeable roof areas. The addition of urban creep will increase the volume of storage required. Urban creep has been applied and is shown on the revised catchment layout

Overcoming our objection

As this is not a holding objection or a request for further information, I am not listing requested conditions. If you are minded to approve this application, please reconsult me for a list of suggested conditions to ensure that the development is adequately drained and does not increase flood risk elsewhere.

The imposition of conditions at this stage rather than overcoming my objection could result in a circumstance where the condition cannot be discharged. In the event of attaching a condition that cannot be discharged, permission may be invalid.

If the planning officer is minded to allow the applicant additional time to submit further documents to support this application, then the following evidence may overcome our objection. Please do not submit further documents without prior discussion with the planning officer as to whether it will be possible for these to be assessed or influence their determination.

1. Updated site plans and layout accurately showing watercourse locations and their 3m easements as described above.
   Watercourse locations clearly shown with the 3m easment

2. Evidence of how the risk of buoyancy and groundwater ingress has been accounted for in the design.
   We have carried out pond and tank buoyancy calculations which are attached. This is based on a highest groundwater level of 8.6m, which is the ground level in the area of the apparent spring as a worst case. This shows the tank has enough material under the road to counteract the buoyancy. The pond requires a 400mm deep ballast under 150mm topsoil over the liner to counteract the buoyancy uplift. The detailed design of this could be conditioned at post planning.
3. Evidence of the condition of the pro watercourse and identification of any remedial works that are required to ensure that it can receive the proposed flow and volume from this proposed development without increasing flood risk.
   The downstream watercourse has been surveyed on site. The owner of Kilkenny refuses to let our client CCTV the culvert. However, it was noted on site that the culvert is free flowing and the owner has a regular maintenance regime, even a special tool he uses for maintaining the culvert. As we are proposing a reduction in flows in all events other then up to QBar, the proposed development can only improve the current situation.

We would then expect the final design to be further developed via condition following planning permission being granted.

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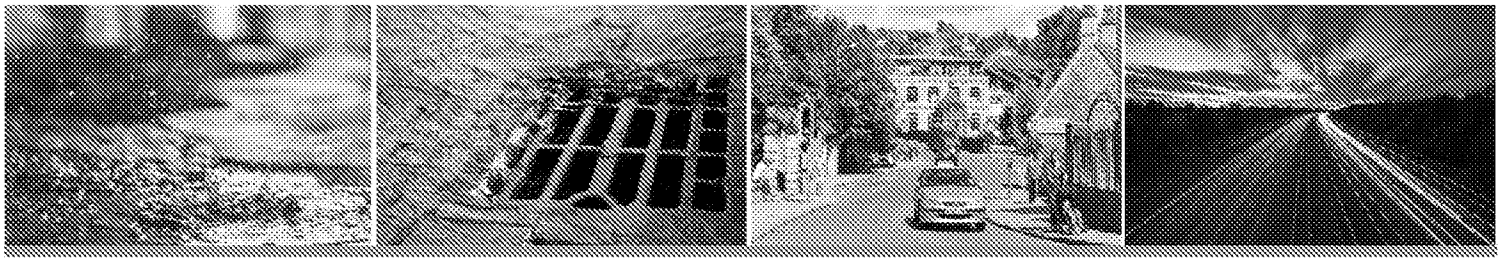

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