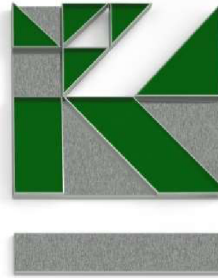


vkhp-consulting
civil and structural



DRAINAGE STRATEGY REPORT

PROPOSED DEVELOPMENT AT

HEVERCOURT, GOODWOOD CRESCENT,

GRAVESEND, DA12 5EY

VKHP CONSULTING LTD

The Forge
Little Mount Sion
Tunbridge Wells
Kent
TN1 1YS

Tel: 01892 521841
Fax: 01892 533149
E-mail: tw@vkhp.co.uk



DOCUMENT CONTROL SHEET

Document Title: Surface Water Drainage Strategy

Document No: 531921

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ISSUE	ISSUE NOTE	DATE
-	Issued for comments	26 th January 2022
A	Initial Issue	22 nd February 2022
B	Sections 5.0, 6.0 & 7.0 added	27 th March 2023

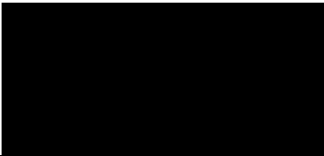
Author:	Andrew Bird Principle Civil Engineer GMICE	
Approved:		



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APPENDICES

Appendix A:	Site Location Plan & Development Proposal
Appendix B:	Existing Drainage Assets
Appendix C:	Site Geology
Appendix D:	Surface Water Drainage Layout
Appendix E:	Flow Calculations & Surface Water Storage Requirements

1.00 Introduction

- 1.01 vkhp consulting limited has been instructed to prepare a Drainage Strategy Report to accompany and support a Planning Application for a proposed residential redevelopment at Hevercourt, Goodwood Crescent, Gravesend, DA12 5EY. The proposed site is shown on the location plan provided in Appendix A.
- 1.02 The site is rectangular on plan and is centred at National Grid Reference 565261, 171032 and occupies an approximate area of 0.55 hectares. The existing site is a residential care home, and the proposed development is an extension to the existing buildings.
- 1.03 Surface water run-off from the new development will be collected and addressed by means of sustainable urban drainage systems (SuDS), with these SuDS compliant facilities to be installed prior to the buildings being fully operational.
- 1.04 The site is suited to the North of Cheltenham Close and at an elevation of approximately 63m AOD.
- 1.05 The Environmental Agency maps indicate that the proposed development is located within Flood Zone 1 and low risk of surface water flooding, therefore there is no recognised risk of flooding to the site. Furthermore, as the proposed development is less than one hectare, there is no requirement for a Flood Risk Assessment to support the Planning Application.

2.00 Existing Drainage

- 2.01 There is an existing foul and surface water drainage system on-site serving the existing buildings and hardstanding areas, Foul water connects into a public sewer located in Cheltenham Close which is own and maintained by Southern Water. Surface water discharges into soakaways.
- 2.02 A Section 106 Agreement (Application to Connect to a Public Sewer) will be submitted to Southern Water prior to the connection of any foul water sewers.
- 2.03 Plans showing existing drainage assets in the area can be found in Appendix B.

3.00 Site Geology

- 3.01 A desktop study using the Geology of Britain web site, has indicated that Lewes Nodular Chalk Formation underlies the site. A plan showing the Bedrock Geology can be seen in Appendix C.
- 3.02 Infiltration Test have been carried out to BRE 365 which indicate that infiltration rates are 10.8×10^{-6} m/s.

4.00 Development Drainage Proposals

- 4.01 For the consideration of the surface water drainage generated by this proposed development, the principal factor is the impermeable roofs area, access and external parking areas. The development will be sited over 2 of the existing soakaways and surface water entering these will need to be diverted into the new system.
- 4.02 The impermeable roof area is intended to be drained with conventional roof guttering and downpipes, directed into an underground surface water drainage system via 100mm and 150mm diameter pipes at a gradient not less than a 1:100 to ensure self-cleansing velocities. To reduce the risk of contaminants

and silt entering into an attenuation tank, all water will pass through silt traps or catch pits.

- 4.03 A new attenuation tank is proposed and will be designed to receive all of the run-offs from roofs, access and parking areas from the proposed development and to infiltrate into the underlying soil.
- 4.04 For a proposed development which consists of 547 square metres of existing roof areas and 805 square metres of new roof area 337 square metres of new parking area, we have calculated the storage volume of 112m², based on an infiltration rate of 10.8×10^{-6} m/s.
- 4.05 Calculations attached in Appendix E demonstrate that for any rainfall duration of 1/100 year event + 40% climate change (starting with 30 minutes and finishing with a 24-hour storm) the attenuation tank size provides adequate storage.
- 4.06 Exceedance routes indicate that flows will generally remain on site, with eventual flows discharging into the road.

5.00 Maintenance of Attenuation Tank

- 5.01 To ensure the long-term effectiveness of a soakaway asset, the sediment that accumulates within the SUDS system must periodically be removed to prevent it from entering the chamber and slowing the infiltration of the system. The frequency of this maintenance operation will vary depending on the density of the site, vegetation, design of the drainage system, other permeable areas and if the site is pre or post construction.
- 5.02 All maintenance operations are to be carried out in accordance with the manufacturer's recommendations by the appointed management company.
- 5.03 The ongoing maintenance activities for this system are tabulated below in Table 1.

Table 1 – Tank Maintenance Activities – By Residents and Management Company

Maintenance Activity	Remedial Action	Inspection Frequency	
Inspect Catch-pits & Chambers	Clear any sediment or detritus found in the chamber/s. If sediment has built up within the pipe network, this should be cleared with rodding equipment or professional jetting techniques.	Pre-completion	Monthly
		Post completion – up to 1 year	Quarterly
		On-going	Annually

6.0 Maintenance of other surface water elements

- 6.1 To ensure the long-term effectiveness of the surface water system, ongoing maintenance to the following elements will need to be conducted by the management company.

Table 3 – Surface Water Maintenance Activities – Management Company

Maintenance Activity	Remedial Action	Inspection Frequency	
Drainage channels & Gullies	As per Table 1	As per Table 1	
		Pre-completion	Monthly
		Post-completion – up to 1 year	Quarterly

7.0 Protection during Construction Phase

- 7.01 During construction, surface water will continue to discharge as per the existing site. It is recommended that the access road is regularly cleaned during the demolition and construction phases.
- 7.02 The attenuation tank should be installed after foundation works have been completed. To prevent silt from construction material from entering the attenuation tank it is recommended that straw bales are placed in the silt traps prior to the tank and in the silt trap prior to the outfall. These should be replaced, and any resultant silt removed on a regular basis.



7.03 The following measures will be employed on-site during construction:

- Stockpiles of materials to be located away from site drainage system. Protective coverings will help prevent runoff stripping the stockpile
- Plant and wheel washing are to take place in designated locations
- The use of oils and hydrocarbons on construction sites create an inherent risk of leakages and spillages, which could potentially lead to pollution incidents. Measures are to be taken to prevent oil and hydrocarbons becoming entrained in surface runoff, such as:
 - i) Appropriate maintenance of machinery and plant
 - ii) Drip trays
 - iii) Regular checking of machinery and plant for oil leaks
 - iv) Correct storage facilities
 - v) Checking for signs of wear and tear on tanks
 - vi) Care with specific procedures when refuelling
 - vii) Designating areas for refuelling
 - viii) Emergence spill kit located near a refuelling area
 - ix) Regular emptying of bunds
 - x) Tanks located in secure areas to stop vandalism



APPENDIX A

SITE LOCATION PLAN & DEVELOPMENT PROPOSAL



Havercourt Care Home

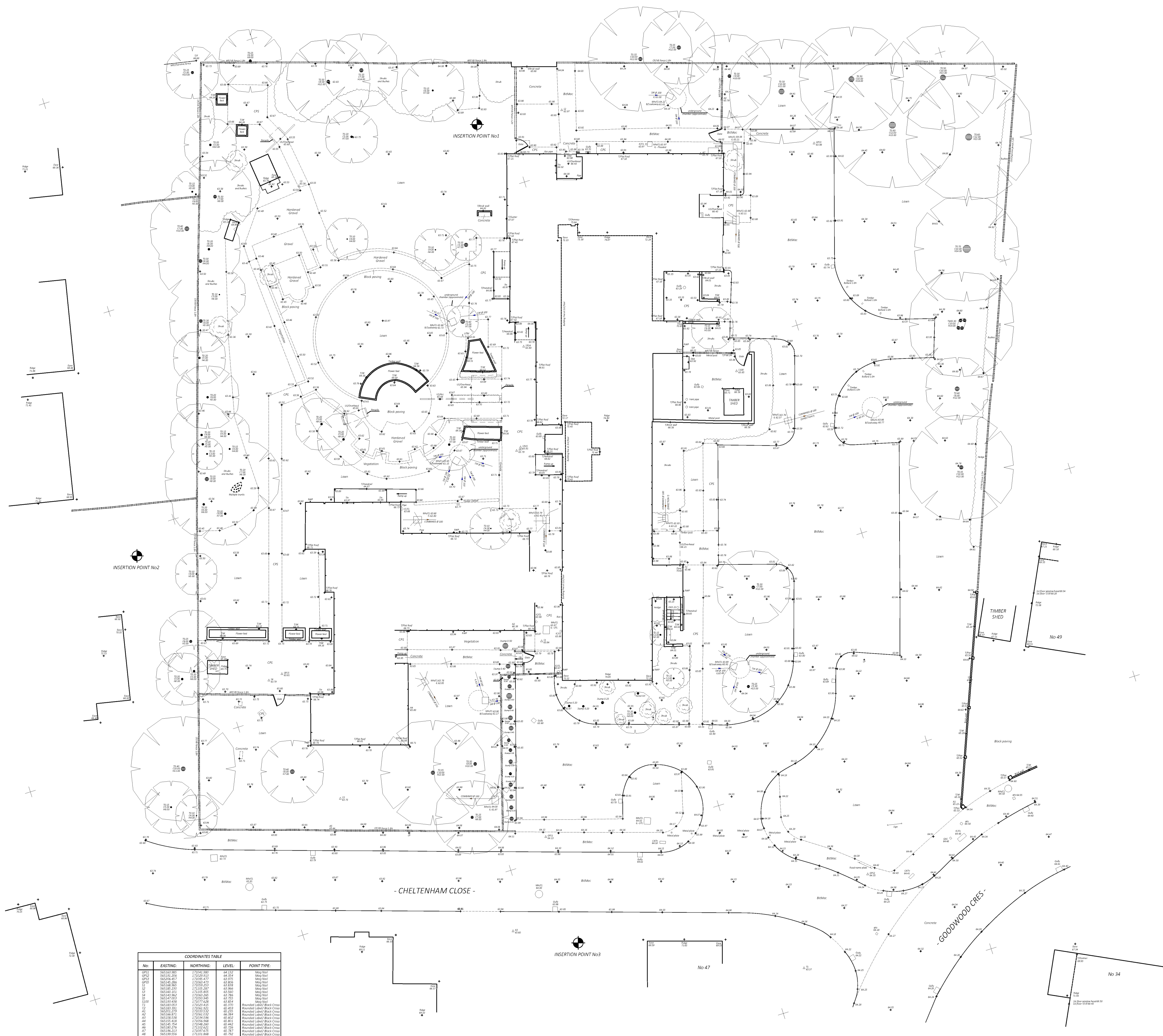
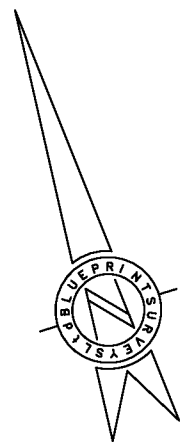
Cheltenham Ct

Cheltenham Ct

Cheltenham Ct

Goodwood Cres

Goodwood Cres



COORDINATES TABLE				
No.	EASTING	NORTHING	LEVEL	POINT TYPE
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Site Legend:

AB Air Brick
ACU Air Conditioning Unit
ASP Artificial Stone Paving
BT British Telecom
CL Cover Level
DYL Double Yellow Line
EL Electricity
FAI Fresh Air Inlet
FB Flower Bed
FH Fire Hydrant
G Gully

GV Gas Valve
IC Inspection Cover
IL Invert level
LP Lamp Post
MKR Marker (Service)
MP Metal Post
OH Overhead
OST Oil Storage Tank
PB Post Box
PL Pavement Light
RE Rodding Eye
RS Road Sign
SNP Street Name Plate

SYL Single Yellow Line
TCB Telephone Call Box
TP Telegraph Pole
TW Top of Wall
TF Top of Fence
UTL Unable To Lift
VP Vent Pipe
WV Water Valve
CP/ Concrete Post
WP/ Wooden Post
CB/ Close Boarded Fence
IW Interwoven Panel
VB Vertical Board

Building Legend:

CA Centre of Arch
CH Ceiling Height
CWT Cold Water Tank
DH Door Head
ESP Electricity Switch Panel
F Frame Height
GDH Glazed Door Height
GRL Glazed Roof Light
HWT Hot Water Tank
RSD Roller Shutter Door

RWP Rain Water Pipe
SA Spring of Arch
SCH Suspended Ceiling Height
SD Sliding Door
SP Soil Pipe
SVP Soil and Vent Pipe
USB Underside of Beam
WP Waste Pipe
WST Water Storage Tank

Levels:

Level data has been obtained with Kinematic GPS corrections via the Ordnance Survey's network, OS Net.
<http://www.ordnancesurvey.co.uk/oswebsite/gps/commercialservices/faq.html>

Project: Hevercourt, Goodwood Crescent, Gravesend, DA12 5EY

Drawing: Site Plan

Scale: 1:200 @ A1

Date: November 2015

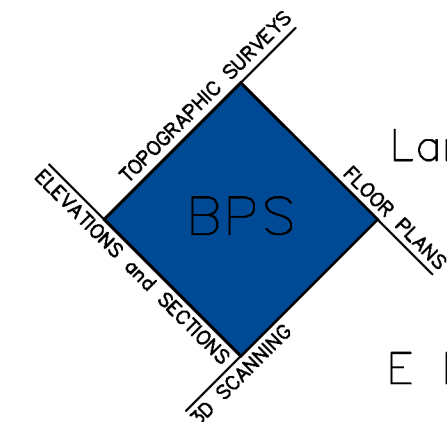
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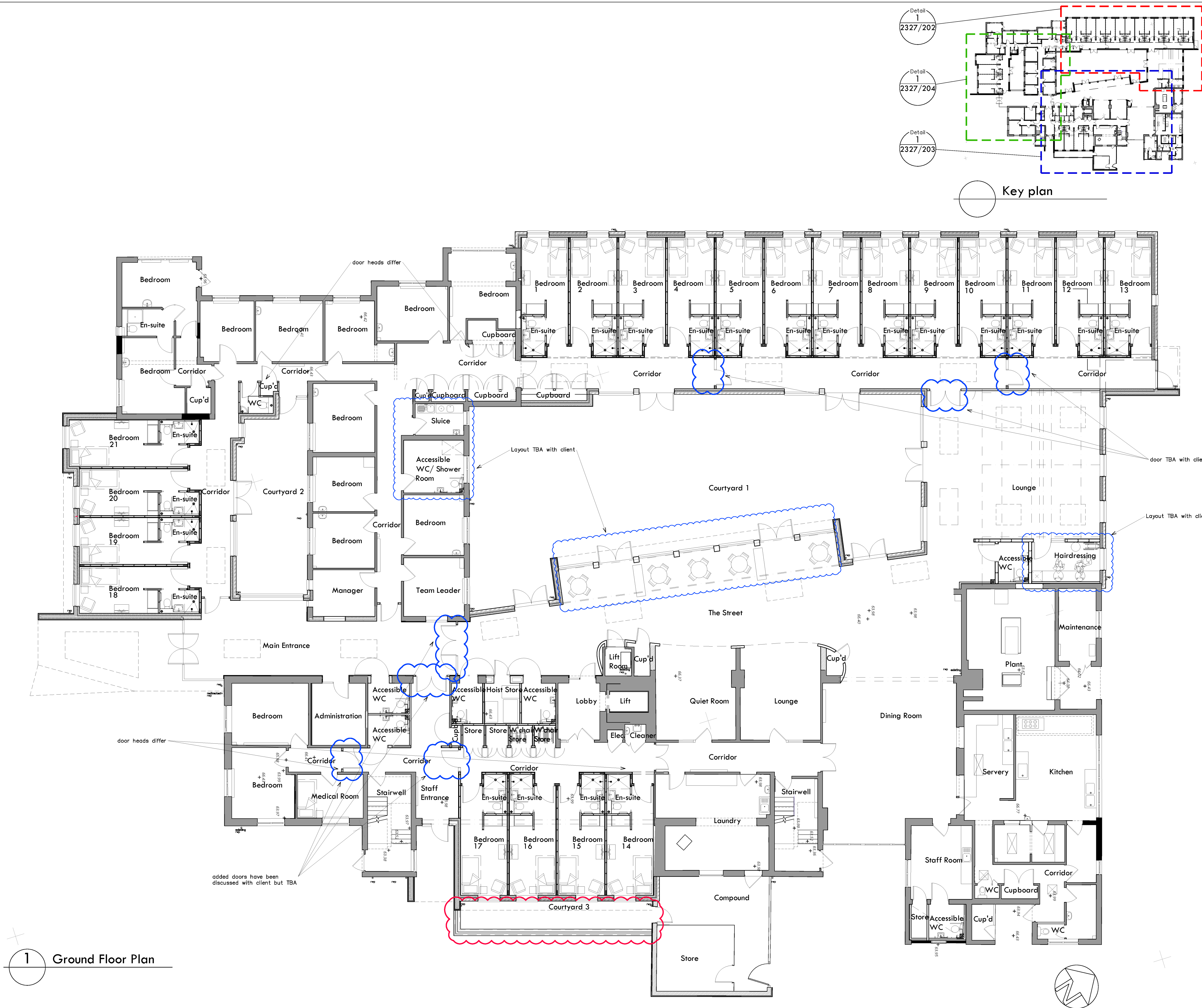
Blueprint Surveys Ltd

Land and Measured Building Surveys

Tel: 020 8339 6125

E Mail: admin@blueprintsurveys.co.uk





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 - These drawings are to be read in conjunction with all other Architects, Consultants and Specialist sub-contractors drawings.
 - All structural timber to be pre-treated strength graded to Structural Engineer's details and to be stamped KID (kiln dried).
 - All external s/w to be pre-treated with preservative.
 - All dimensions and levels to be checked on site prior to construction and the manufacture of steelwork and architectural ironmongery, stonework and any other purpose made items.
 - All materials, products etc. to be installed, applied etc. in accordance with the manufacturer's written instructions.
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 - 9.6. The responsibility of the design is by others. The design intent drawing/ specification sets out what the third party design is to achieve.

Key

- denotes structures to be retained
- denotes construction to match existing
- denotes vertical stack bonded brickwork

Where new openings are formed install new lintel/ beam over to engineer's details, not indicated for clarity.

- + 10.00 denotes existing level
- 10.0000 denotes new level
- ToS denotes Top of Scribed
- denotes column to engineer's details
- denotes beam to engineer's details
- denotes drain point
- denotes dimension to suit site conditions
- denotes new floor to be level with existing

CLIENT
Mr & Mrs Gilmour

PROJECT
**Hevercourt Residential Home
Goodwood Crescent
Gravesend
Kent
DA12 5EY**

SHEET
Ground Floor Plan

Rosewood House, High Street,
Hadlow, Tonbridge, Kent TN11 0EF
t: 01732 850995
e: design@mka-architects.co.uk
w: www.mka-architects.co.uk



SCALE AT A1
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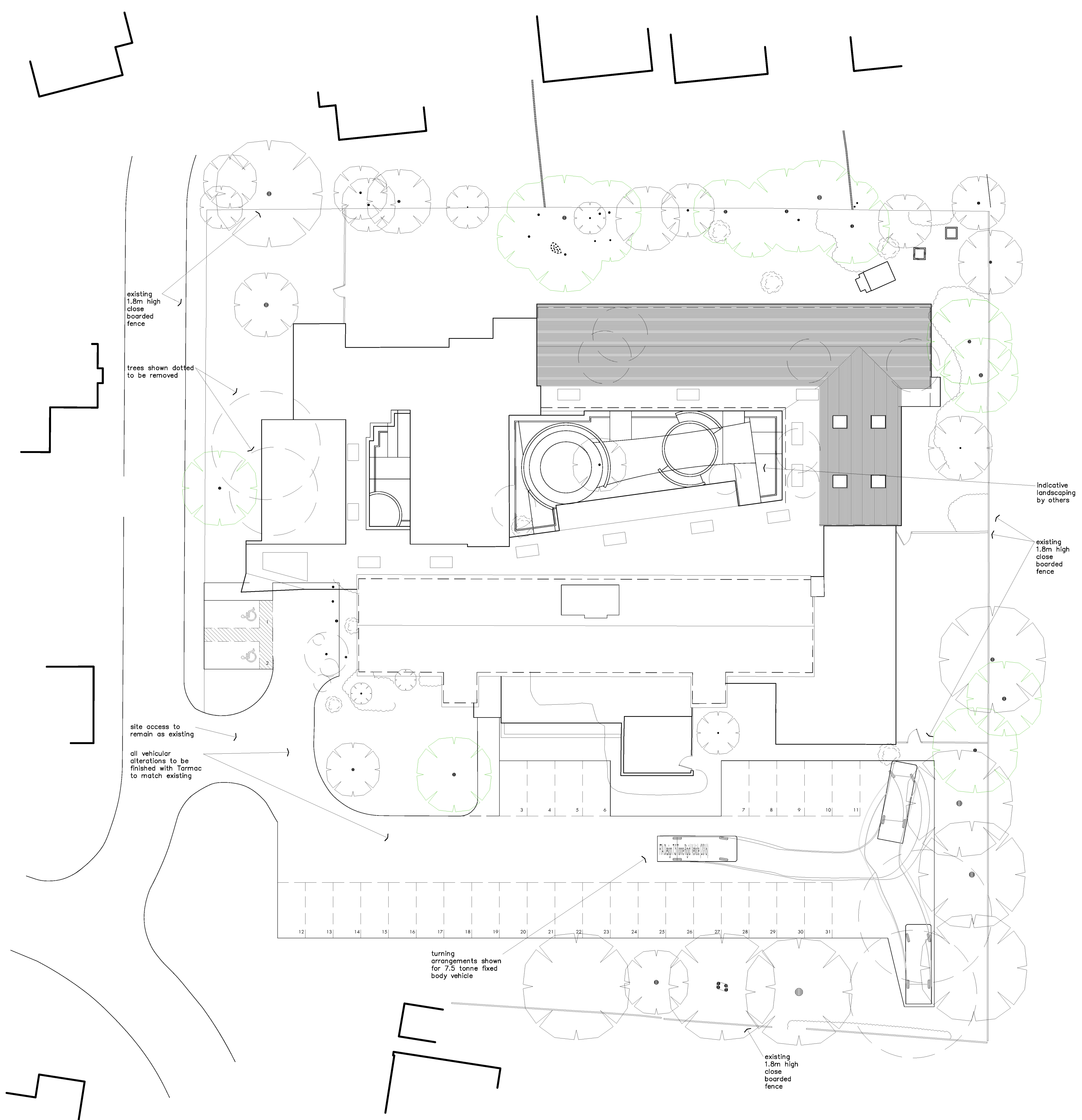
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DRAWING STATUS
PRELIMINARY

JOB NUMBER
2327

DRAWING NUMBER
201

REVISION
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 6. All external s/w to be pre-treated with preservative.
 7. All dimensions and levels to be checked on site prior to construction and the manufacture of steelwork and architectural ironmongery, stonework and any other purpose made items.
 8. All materials, products etc. to be installed, applied etc. in accordance with the manufacturer's written instructions.
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9.5. All technical means to achieve the intent of the design is the responsibility of the appointed specialist.
9.6. The responsibility of the design is by others. The design intent drawing/ specification sets out what the third party design is to achieve.

CLIENT

Mr & Mrs Gilmour

PROJECT

Hevercourt Residential Home
Goodwood Crescent
Gravesend
Kent
DA12 5EY

SHEET

Proposed Site
Plan

Rosewood House, High Street,
Hadlow, Tonbridge, Kent TN11 0EF
t: 01732 850995
e: design@mka-architects.co.uk
w: www.mka-architects.co.uk



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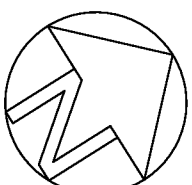
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PRELIMINARY

JOB NUMBER DRAWING NUMBER REVISION

2327 / 04 / -

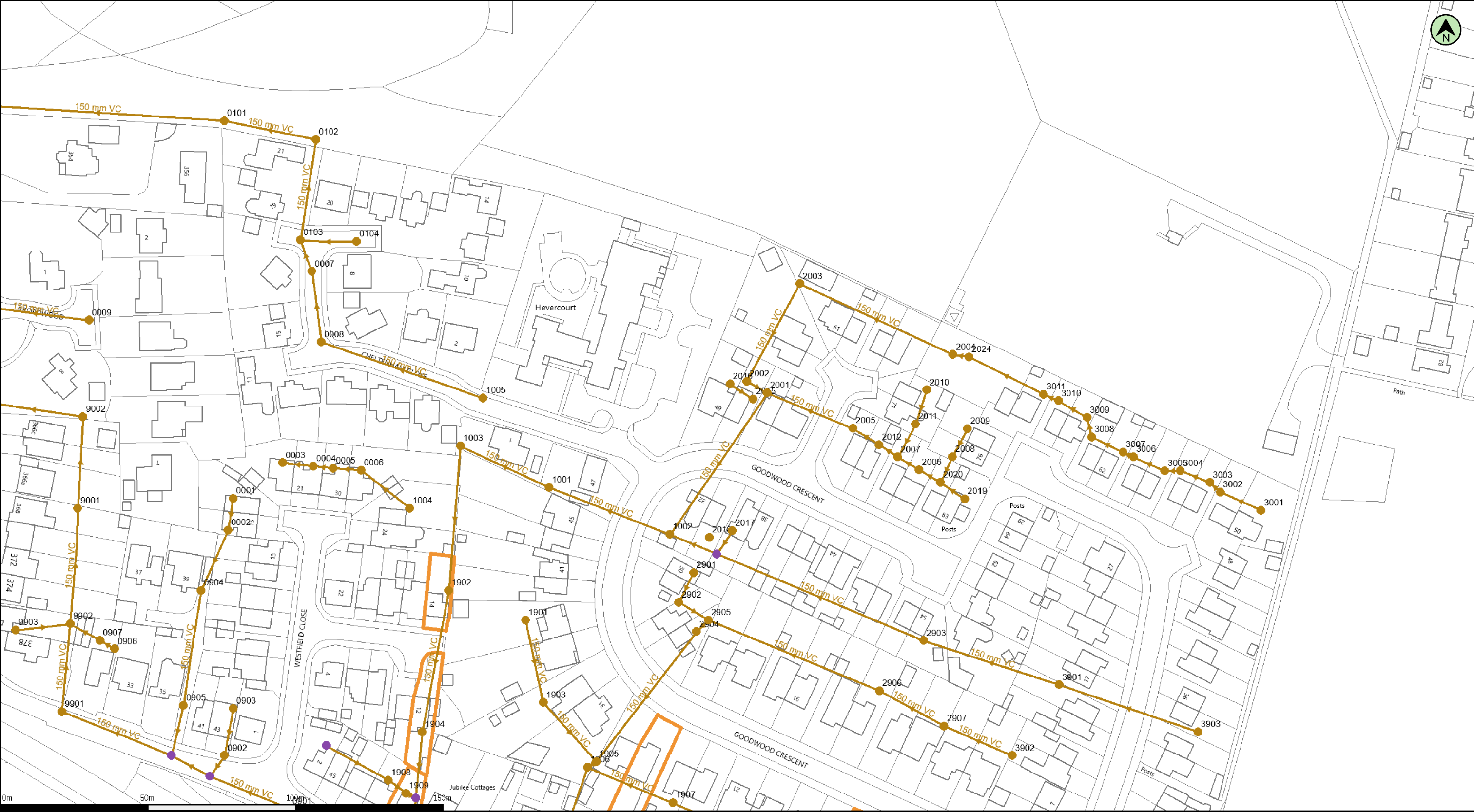


scale in metres
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APPENDIX B

EXISTING DRAINAGE ASSETS



(c) Crown copyright and database rights 2021 Ordnance Survey 100031673 Date: 17/11/21 Scale: 1:1250 Map Centre: 565221,171047 Data updated: 20/10/21 Our Ref: 705034 - 1 Wastewater Plan A3

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 2021 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.

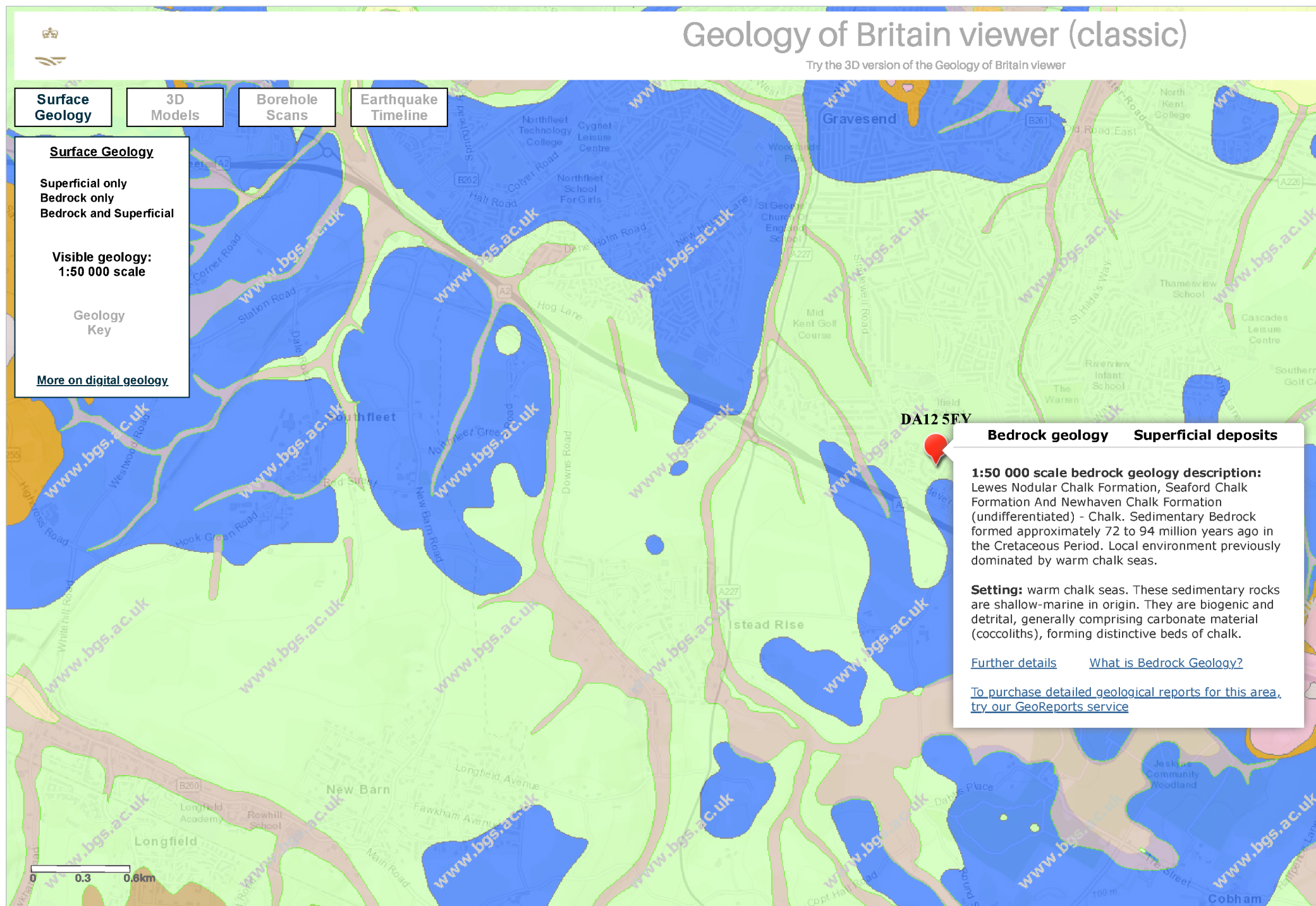
andrew@vkhp.co.uk
539121 Hevercourt





APPENDIX C

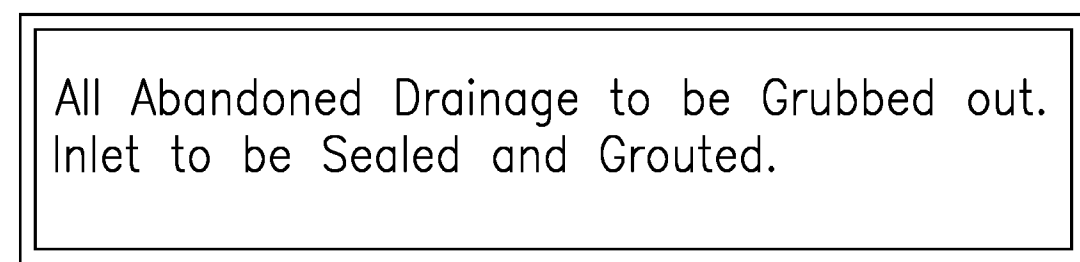
SITE GEOLOGY





APPENDIX D

SURFACE WATER DRAINAGE LAYOUT



- | | | | |
|----------------------|----------------|------------|-----|
| Drn By
<i>ADB</i> | Chk By | DRG NO | REV |
| Date
Jan 22 | Scale
1:200 | 539121-100 | C |



APPENDIX E

FLOW CALCULATIONS AND SURFACE WATER STORAGE REQUIREMENTS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.057	5.00	63.900	450	0.900
S2	0.057	5.00	63.900	450	0.900
ATT	0.054	5.00	63.900	450	1.225
END	0.000	5.00	63.900	10	1.235

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)
1.000	S1	ATT	25.000	0.600	63.000	62.750	0.250	100.0	150	5.41	50.0
1.001	ATT	END	1.000	0.600	62.675	62.665	0.010	100.0	225	5.43	50.0
2.000	S2	ATT	25.000	0.600	63.000	62.750	0.250	100.0	150	5.41	50.0

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	1.005	17.8	7.7	0.750	1.000	0.057	0.0	69	0.972
1.001	1.307	52.0	22.8	1.000	1.010	0.168	0.0	104	1.265
2.000	1.005	17.8	7.7	0.750	1.000	0.057	0.0	69	0.972

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

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

Node END Online Pump Control

Flap Valve	x	Design Depth (m)	1.000	Switch off depth (m)	0.900
Replaces Downstream Link	✓	Design Flow (l/s)	0.1		
Invert Level (m)	62.665	Switch on depth (m)	1.000		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.000	3.000	0.000

Node ATT Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.03800	Safety Factor	2.0	Invert Level (m)	61.150
Side Inf Coefficient (m/hr)	0.03800	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	70.0	75.0	1.600	70.0	302.0	1.601	0.0	302.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	11	63.872	0.872	35.7	1.2441	0.0000	FLOOD RISK
15 minute winter	S2	11	63.872	0.872	35.7	1.2441	0.0000	FLOOD RISK
480 minute winter	ATT	464	62.643	-0.032	11.5	104.5416	0.0000	OK
15 minute summer	END	1	62.665	0.000	0.0	0.0000	0.0000	OK
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	ATT	33.2	1.884	1.868	0.4357	
15 minute winter	S2	2.000	ATT	33.2	1.884	1.868	0.4357	
15 minute summer	ATT	1.001	END	0.0	0.000	0.000	0.0000	
480 minute winter	ATT	Infiltration		1.5				
15 minute summer	END	Pump		0.0				0.0