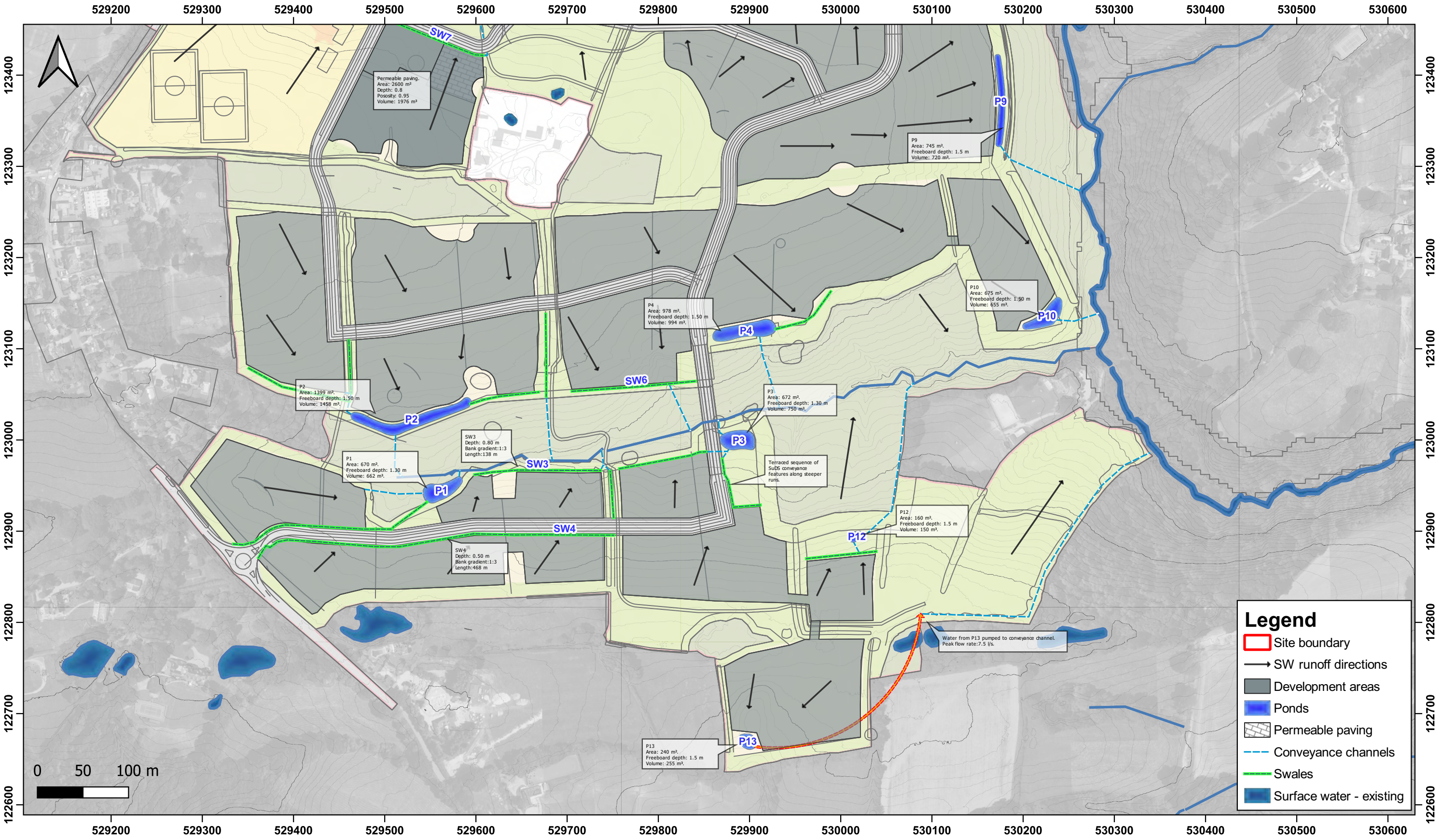


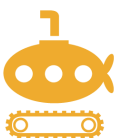


Outline drainage layout and relevant design information - south.

Date	2023	Drawn	HJK
Scale	1:4000	Checked	JEM
Original	A3	Revision	1
File reference Projects\2266 - Ansty\GIS			



Appendix H: Drainage calculations



Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	10.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Depth (m)
P10	1.879	30.00	42.000	Manhole	1500	1.500
P4	1.736	30.00	54.950	Manhole	1500	1.500
P3	1.432	30.00	46.770	Manhole	1500	1.300
P12	0.333	30.00	57.400	Manhole	1200	1.500
P13	1.077	30.00	56.930	Manhole	1200	1.500
P2	3.416	30.00	57.300	Junction		1.500
P1	1.689	30.00	52.500	Junction		1.300
P7	0.340	30.00	51.950	Manhole	1200	1.000
P6	3.000	30.00	49.150	Manhole	1800	1.300
P8A	1.000	30.00	49.750	Manhole	1500	0.400
P11	0.564	30.00	59.900	Manhole	1800	0.700
P5	0.884	30.00	52.150	Manhole	1200	1.300
P9	1.994	30.00	49.350	Manhole	1500	1.500
SW3	0.453	30.00	50.350	Junction		0.800
SW4	0.316	30.00	55.200	Junction		0.500
SW6	0.881	30.00	52.650	Junction		1.000
SW7	0.000	30.00	67.680	Junction		0.800
SW5	0.444	30.00	58.150	Junction		0.900
SW1	1.221	30.00	51.500	Junction		1.200
SW2	0.408	30.00	53.650	Junction		0.500
Perm1	2.442	10.00	69.150	Junction		0.800
P8	0.000	30.00	47.750	Junction		1.000
SW8	0.848	30.00	53.400	Junction		0.800

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Drain Down Time (mins)	240	Check Discharge Rate(s)	x
Summer CV	0.750	Skip Steady State	x	Additional Storage (m³/ha)	99.0	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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node P2 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	55.800	Product Number	CTL-SHE-0248-3530-1500-3530
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	35.3	Min Node Diameter (mm)	1800

Node P1 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	51.200	Product Number	CTL-SHE-0184-1770-1300-1770
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	17.7	Min Node Diameter (mm)	1500

Node P3 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	45.470	Product Number	CTL-SHE-0164-1380-1300-1380
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	13.8	Min Node Diameter (mm)	1500

Node P4 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	53.450	Product Number	CTL-SHE-0187-1890-1500-1890
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	18.9	Min Node Diameter (mm)	1500

Node P12 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	55.900	Product Number	CTL-SHE-0073-2800-1500-2800
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.8	Min Node Diameter (mm)	1200

Node P13 Offline Pump Control

Flap Valve	x	Invert Level (m)	55.430	Design Flow (l/s)	7.5	Switch off depth (m)	0.000
Loop to Node		Design Depth (m)	1.500	Switch on depth (m)	0.050		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.050	7.500	1.500	7.500

Node P10 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	40.500	Product Number	CTL-SHE-0163-1410-1500-1410
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	14.1	Min Node Diameter (mm)	1500

Node P9 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	47.850	Product Number	CTL-SHE-0158-1330-1500-1330
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	13.3	Min Node Diameter (mm)	1500

Node P5 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	50.850	Product Number	CTL-SHE-0134-8900-1300-8900
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.9	Min Node Diameter (mm)	1200

Node P11 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	59.200	Product Number	CTL-SHE-0236-2880-0700-2880
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	28.8	Min Node Diameter (mm)	1500

Node P6 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	47.850	Product Number	CTL-SHE-0222-2690-1300-2690
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	26.9	Min Node Diameter (mm)	1800

Node P8A Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	49.350	Product Number	CTL-SHE-0182-1500-0400-1500
Design Depth (m)	0.400	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.0	Min Node Diameter (mm)	1200

Node P7 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	50.950	Product Number	CTL-SHE-0104-4900-1000-4900
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.9	Min Node Diameter (mm)	1200

Node SW1 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	50.300	Product Number	CTL-SHE-0106-5400-1200-5400
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.4	Min Node Diameter (mm)	1200

Node SW2 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node	P5	Sump Available	✓
Invert Level (m)	53.150	Product Number	CTL-SHE-0205-2000-0500-2000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	20.0	Min Node Diameter (mm)	1200

Node SW3 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	49.550	Product Number	CTL-SHE-0091-3400-0800-3400
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	3.4	Min Node Diameter (mm)	1200

Node SW4 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	54.500	Product Number	CTL-SHE-0117-5700-0700-5700
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.7	Min Node Diameter (mm)	1200

Node SW5 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	57.250	Product Number	CTL-SHE-0088-3300-0900-3300
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.3	Min Node Diameter (mm)	1200

Node SW6 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	51.650	Product Number	CTL-SHE-0123-6900-1000-6900
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.9	Min Node Diameter (mm)	1200

Node SW7 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	66.880	Product Number	CTL-SHE-0148-9900-0800-9900
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	9.9	Min Node Diameter (mm)	1200

Node P13 Offline Pump Control

Flap Valve	x	Loop to Node	Invert Level (m)	55.430	Switch on depth (m)	0.100	Switch off depth (m)	0.050
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Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	12.000	1.500	12.000

Node Perm1 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node	SW7	Sump Available	✓
Invert Level (m)	65.350	Product Number	CTL-SHE-0149-1000-0800-1000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	10.0	Min Node Diameter (mm)	1200

Node P8 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	46.750	Product Number	CTL-SHE-0175-1500-1000-1500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.0	Min Node Diameter (mm)	1200

Node SW8 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node	P8	Sump Available	✓
Invert Level (m)	52.600	Product Number	CTL-SHE-0177-1500-0800-1500
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.0	Min Node Diameter (mm)	1200

Node P7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	30.0	0.0	1.000	248.3	0.0

Node P6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	300.0	0.0	1.300	1316.0	0.0

Node P8A Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	600.0	0.0	0.400	2242.0	0.0

Node P11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	59.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	87

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	50.0	0.0	0.700	539.4	0.0

Node P5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.850
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)
0.000	200.0	0.0	1.300	786.3	0.0

Node P9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.850
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)
0.000	215.0	0.0	1.500	745.0	0.0

Node P10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	40.500
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)
0.000	200.0	0.0	1.500	675.0	0.0

Node P4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.450
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)
0.000	350.0	0.0	1.500	977.5	0.0

Node P3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	45.470
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)
0.000	250.0	0.0	1.300	750.0	0.0

Node P12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	55.900
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)
0.000	40.0	0.0	1.500	160.0	0.0

Node P13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	55.430
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	215

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	100.0	0.0	1.500	240.0	0.0

Node P2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	55.800
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)
0.000	550.0	0.0	1.500	1399.0	0.0

Node P1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	51.200
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)
0.000	250.0	0.0	1.300	670.0	0.0

Node SW3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.550
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)
0.000	41.5	0.0	0.800	705.1	0.0

Node SW4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	54.700
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)
0.000	140.0	0.0	0.500	1544.0	0.0

Node SW6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	51.650
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)
0.000	38.6	0.0	1.000	854.4	0.0

Node SW7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	66.880
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)
0.000	32.6	0.0	0.800	554.0	0.0

Node SW5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	57.250
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)
0.000	32.6	0.0	0.900	628.0	0.0

Node SW1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.300
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)
0.000	38.6	0.0	1.200	965.9	0.0

Node SW2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.150
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	113

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	79.8	0.0	0.500	239.0	0.0

Node Perm1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Width (m)	26.000	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	68.350	Length (m)	100.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	1000.0		

Node P8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	46.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	50.0	0.0	1.000	187.0	0.0

Node SW8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	52.600
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)
0.000	27.9	0.0	0.800	474.3	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	P10	264	41.023	0.523	59.7	213.7037	0.0000	OK
360 minute summer	P4	248	53.789	0.339	55.2	182.1501	0.0000	OK
360 minute summer	P3	248	45.826	0.356	45.5	153.0420	0.0000	OK
360 minute summer	P12	264	56.349	0.449	10.6	36.3767	0.0000	OK
120 minute summer	P13	98	55.776	0.346	49.0	65.2174	0.0000	OK
360 minute summer	P2	248	56.215	0.415	108.5	370.3067	0.0000	OK
240 minute summer	P1	180	51.590	0.390	64.5	172.0934	0.0000	OK
180 minute summer	P7	136	51.227	0.277	14.1	26.3433	0.0000	OK
360 minute summer	P6	256	48.310	0.460	95.3	326.5264	0.0000	OK
480 minute summer	P8A	320	49.474	0.124	27.6	136.5517	0.0000	OK
120 minute summer	P11	90	59.363	0.163	25.7	30.8719	0.0000	OK
360 minute summer	P5	280	51.256	0.406	37.7	146.0860	0.0000	OK
360 minute summer	P9	264	48.389	0.539	63.4	238.8786	0.0000	OK

US Node	DS Node	Outflow (l/s)	Discharge Vol (m³)
P10		14.1	361.4
P4		18.6	335.2
P3		13.8	277.9
P12		2.4	65.7
P13		7.5	67.7
P13		12.0	77.2
P2		35.2	651.0
P1		17.7	283.4
P7		4.9	53.6
P6		26.9	581.0
P8A		9.1	173.8
P11		17.8	74.6
P5		8.9	236.0
P9		13.3	366.8

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	SW3	264	49.801	0.251	14.4	50.5739	0.0000	OK
120 minute summer	SW4	98	54.752	0.052	14.4	14.3107	0.0000	OK
360 minute summer	SW6	256	52.000	0.350	28.0	94.0924	0.0000	OK
1440 minute summer	SW7	1380	67.459	0.579	12.5	128.2135	0.0000	OK
360 minute summer	SW5	264	57.531	0.281	14.1	48.9438	0.0000	OK
480 minute summer	SW1	368	50.796	0.496	33.7	164.1424	0.0000	OK
120 minute summer	SW2	90	53.289	0.139	18.6	25.3549	0.0000	OK
360 minute summer	Perm1	280	68.490	0.140	84.1	265.1216	0.0000	OK
240 minute summer	P8	216	46.959	0.209	15.0	13.4608	0.0000	OK
180 minute summer	SW8	132	52.884	0.284	35.2	60.3131	0.0000	OK

US Node	DS Node	Outflow (l/s)	Discharge Vol (m³)
SW3		3.4	88.3
SW4		5.7	42.7
SW6		6.9	175.1
SW7		9.9	744.1
SW5		3.3	87.2
SW1		5.4	193.2
SW2	P5	12.1	52.9
Perm1	SW7	12.7	415.1
P8		14.5	148.7
SW8	P8	15.0	133.5

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 98.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	P10	368	41.983	1.483	168.6	831.2435	0.0000	OK
360 minute summer	P4	360	54.493	1.043	155.8	713.5935	0.0000	OK
360 minute summer	P3	360	46.534	1.064	128.5	601.9406	0.0000	OK
360 minute summer	P12	368	57.174	1.274	29.9	145.3968	0.0000	OK
120 minute summer	P13	126	56.867	1.437	160.1	343.7094	0.0000	OK
360 minute summer	P2	360	57.060	1.260	306.6	1425.8590	0.0000	OK
240 minute summer	P1	248	52.397	1.197	190.2	684.3325	0.0000	OK
180 minute summer	P7	188	51.755	0.805	43.2	122.8562	0.0000	OK
360 minute summer	P6	360	49.097	1.247	269.2	1270.0010	0.0000	OK
360 minute summer	P8A	280	49.629	0.279	89.7	397.5923	0.0000	OK
60 minute summer	P11	65	59.645	0.445	90.8	127.9098	0.0000	OK
480 minute summer	P5	488	51.974	1.124	86.9	586.9649	0.0000	OK
360 minute summer	P9	368	49.339	1.489	178.9	910.5358	0.0000	OK

US Node	DS Node	Outflow (l/s)	Discharge Vol (m³)
P10		14.1	437.2
P4		18.9	514.3
P3		13.8	388.5
P12		2.6	81.1
P13		7.5	153.4
P13		12.0	236.9
P2		35.3	968.6
P1		17.7	416.0
P7		4.9	99.8
P6		26.9	806.6
P8A		15.0	400.4
P11		28.8	201.9
P5		8.9	309.8
P9		13.3	414.8

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 98.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	SW3	368	50.142	0.592	40.7	202.9296	0.0000	OK
120 minute summer	SW4	128	54.900	0.200	47.0	97.1477	0.0000	OK
360 minute summer	SW6	368	52.480	0.830	79.1	385.6537	0.0000	OK
1440 minute summer	SW7	1680	67.674	0.794	12.8	231.5457	0.0000	OK
360 minute summer	SW5	368	57.912	0.662	39.8	198.7424	0.0000	OK
600 minute summer	SW1	615	51.402	1.102	80.8	623.0525	0.0000	OK
120 minute summer	SW2	102	53.576	0.426	60.6	97.3487	0.0000	OK
480 minute summer	Perm1	480	68.805	0.455	198.9	1136.7640	0.0000	OK
1440 minute summer	P8	1110	46.975	0.225	15.0	14.6954	0.0000	OK
180 minute summer	SW8	176	53.397	0.797	107.8	283.1712	0.0000	OK

US Node	DS Node	Outflow (l/s)	Discharge Vol (m³)
SW3		3.4	97.7
SW4		5.7	115.0
SW6		6.9	206.6
SW7		9.9	903.3
SW5		3.3	95.4
SW1		5.4	238.8
SW2	P5	20.0	176.5
Perm1	SW7	13.4	546.0
P8		14.6	673.4
SW8	P8	15.0	322.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	P10	288	42.000	1.500	184.0	844.9215	295.4211	FLOOD
360 minute summer	P4	368	54.762	1.312	200.5	971.7193	0.0000	OK
360 minute summer	P3	304	46.770	1.300	165.4	794.0647	21.5507	FLOOD
480 minute summer	P12	344	57.400	1.500	32.6	184.6635	12.8609	FLOOD
180 minute summer	P13	120	56.930	1.500	177.6	363.3195	127.2401	FLOOD
360 minute summer	P2	264	57.300	1.500	394.4	1799.9340	153.9550	FLOOD
480 minute summer	P1	296	52.500	1.300	165.4	765.2112	165.2444	FLOOD
240 minute summer	P7	244	51.933	0.983	49.4	169.0647	0.0000	OK
360 minute summer	P6	224	49.150	1.300	346.4	1350.7080	417.9648	FLOOD
360 minute summer	P8A	320	49.697	0.347	115.5	540.9721	0.0000	OK
60 minute summer	P11	69	59.772	0.572	121.6	190.0008	0.0000	OK
480 minute summer	P5	384	52.150	1.300	106.6	730.0813	69.1342	FLOOD
480 minute summer	P9	288	49.350	1.500	195.3	920.0565	333.6547	FLOOD

US Node	DS Node	Outflow (l/s)	Discharge Vol (m³)
P10		14.1	540.5
P4		18.9	549.4
P3		13.8	428.2
P12		2.8	104.4
P13		7.5	179.1
P13		12.0	277.9
P2		35.3	994.8
P1		17.7	654.8
P7		4.9	122.9
P6		26.9	843.7
P8A		15.0	409.3
P11		28.8	270.3
P5		8.9	333.9
P9		13.3	512.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	SW3	488	50.257	0.707	44.4	276.5230	0.0000	OK
180 minute summer	SW4	188	54.952	0.252	52.1	140.1515	0.0000	OK
480 minute summer	SW6	488	52.640	0.990	86.3	524.7142	0.0000	OK
1440 minute summer	SW7	1380	67.680	0.800	13.1	234.6400	45.2290	FLOOD
480 minute summer	SW5	488	58.041	0.791	43.5	271.3720	0.0000	OK
1440 minute summer	SW1	870	51.500	1.200	55.3	723.5796	141.4326	FLOOD
60 minute summer	SW2	56	53.650	0.500	88.0	120.0920	19.6479	FLOOD
720 minute summer	Perm1	720	68.964	0.614	185.2	1579.9680	0.0000	OK
360 minute summer	P8	376	46.985	0.235	15.0	15.5018	0.0000	OK
180 minute summer	SW8	120	53.400	0.800	139.8	284.8320	101.6123	FLOOD

US Node	DS Node	Outflow (l/s)	Discharge Vol (m³)
SW3		3.4	126.0
SW4		5.7	130.7
SW6		6.9	267.0
SW7		9.9	929.6
SW5		3.3	122.9
SW1		5.4	494.2
SW2	P5	20.0	174.6
Perm1	SW7	13.7	728.3
P8		14.7	449.5
SW8	P8	15.0	329.2

Appendix B2: Land Quality Desk Study

Ansty Garden Community: Land Quality Desk Study

A REPORT FOR FAIRFAX ACQUISITIONS LTD
APRIL 2023
P21367_R2_Rev1



Document Control

Title

Ansty Garden Community: Land Quality Desk Study

Client

Fairfax Acquisitions Ltd.
Buncton Barn,
Buncton Lane,
Bolney,
West Sussex,
RH17 5RE



Reference

P21367_R2_Rev1

Status

Final

Document Control

Document Reference	Issue Date	Comments	Written by	Approved by
P21367_R2	April 2023	Final	RLW	JEM
P21367_R2_Rev1	October 2023	Updated to development terminology	RLW	JEM

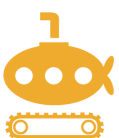
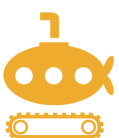


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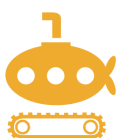
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Drawings

Drawing P21367_R2_D01	Site location plan
Drawing P21367_R2_D02	Site feature plan

Appendices

Appendix A: Report Conditions
Appendix B: Drawings provided by client
Appendix C: Photos
Appendix D: Envirocheck Report
Appendix E: Ciria C552 Risk Assessment Methodology



1 Introduction

1.1 INSTRUCTION

Yellow Sub Geo Ltd (Yellow Sub) was instructed by Fairfax Acquisitions Ltd (the Client) to provide a Phase 1 land quality focussed preliminary risk assessment (Desk Study) for Ansty Farm, Haywards Heath (the Site). Instruction to proceed in accordance with Yellow Sub proposal (Ref: P21367_P1) was confirmed by email dated 19th July 2022.

1.2 BRIEF

The brief was to provide a land quality desk study to support the proposed residential development through the Environmental Impact Assessment (EIA) and planning process.

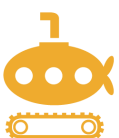
1.3 SCOPE

This report presents records of desk study research, which is in-turn used to develop a conceptual site model and inform a preliminary environmental risk assessment.

The report identifies key potential land quality risks and uncertainties associated with the ground conditions which may require further assessment and/ or risk management in due course via suitable condition(s) linked to the future planning consent.

1.4 LIMITATIONS

This report is written strictly for the benefit of the Client and bound by the conditions presented in Appendix A.



2 Desk Study

The following section collates and presents available information pertinent to the Site and its local environs.

2.1 SITE LOCATION

The Site is located to the east of Ansty Village in the District of Mid Sussex. A Site location plan is presented as drawing P21367_R1_D01. The Site address is as follows:

Ansty Farm,
Haywards Heath,
West Sussex,
RH17 5AG

The National Grid Reference (NGR) for the approximate centre of the Site is TQ 29653 23438. The Site covers a total area of c. 99 ha.

2.2 PROPOSED DEVELOPMENT

The proposed development is currently envisaged to comprise up to 1,450 homes (including 30% affordable housing), up to 90 residential care (C2 units), a primary school, new SEND school, sports facilities including all weather hockey pitches and tennis centre, allotments, retail, community and employment uses together with ancillary and associated development including new and enhanced pedestrian/cycle routes, open spaces, and landscaping. Drawings provided by the Client are included in Appendix B.

2.3 CONSULTATIONS

As part of the desk study, consultation requests were made to West Sussex County Council (WSCC), Mid-Sussex District Council (MSDC) and the Environment Agency (EA). WSCC responded in relation to mineral consultation zones which are covered in more detail in the Preliminary Mineral Assessment for the Site (ref: P21367_R3, April 2023).

2.4 SITE WALKOVER

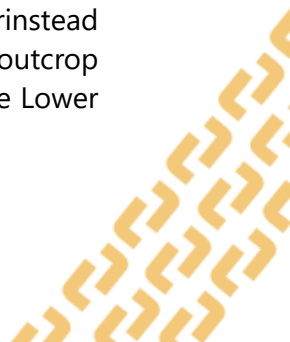
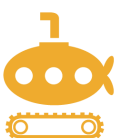
A Site walkover was undertaken on the 3rd January 2023. Selected photographs are presented in Appendix C. The Site comprised a series of agricultural fields comprising pastoral and grazing land bisected by access tracks and public footpaths. The fields were noted to be saturated with ground conditions very soft in nature. Several areas of ponded water comprising suspected historic quarries/ borrow pits were noted in the northern and southern sections of Site, these were typically overgrown with thick vegetation. Site access was possible for the north of the Site via a gated track off the A272. Southern access was possible off the A272 in Ansty village down a paved farm track.

The Site comprises a series of hill and valley systems with valley areas typically afforested and with watercourses flowing along their base. Further vegetated areas were noted along field boundaries and in the south-east of the Site.

2.5 GEOLOGY

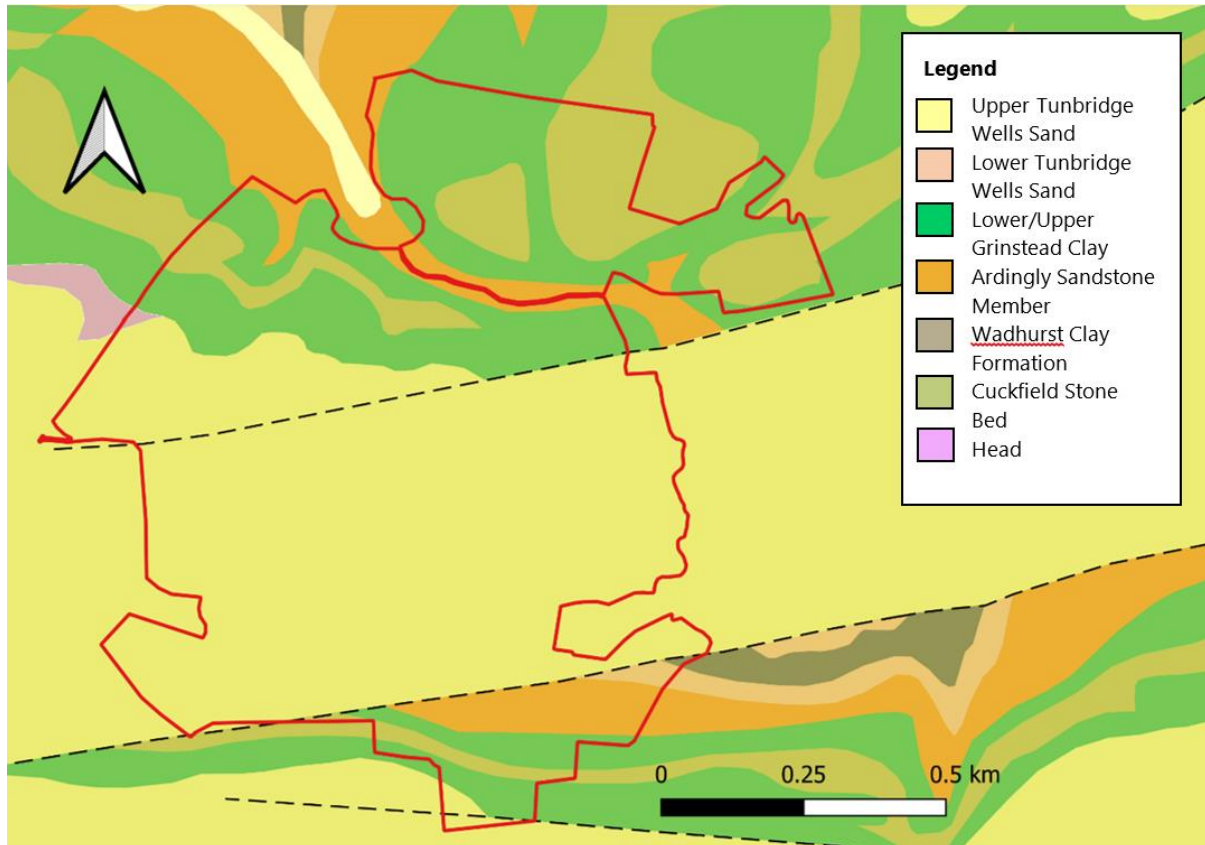
2.5.1 Published Geology

The majority of the Site is underlain by the Upper Tunbridge Wells Sand. The Lower Grinstead Clay, Cuckfield Stone Bed, Upper Grinstead Clay and Ardingly Sandstone Member also outcrop in both the north and south of the Site. In the south of the Site small outcrops of the Lower



Tunbridge Wells Sand and Wadhurst Clay Formation are also present. There is a small outcrop of superficial Head Deposits in the northwest of the Site, otherwise no superficial deposits are mapped. The Site is bisected by three faults, two of which trend NEE-SWW and one NWW-SEE. Figure 2-1 depicts the geology at the Site.

Figure 2-1 Published BGS Geology



2.5.2 Mineral consultation zone

Parts of the Site are located within the WSCC Mineral Safeguarding Area (MSA) for building stone resources, which comprises the Ardingly Sandstone Member and Cuckfield Stone Bed. There is also a MSA associated with the Wadhurst Clay Formation, however only a small area extends onto the Site in the far southeast.



2.5.3 BGS Boreholes

Nearby historical borehole logs within the BGS database are summarised in Table 2-1.

Table 2-1 Strata encountered in nearby historical boreholes logs

Borehole ref.	Strata	Maximum depth (m bgl)
TQ32SW9 (0.1km north)	Topsoil (dark grey-brown, clayey, very sandy silt with occasional gravel, pockets of silty sand and rootlets)	0.5
	Compact, dark orange-brown with light orange-brown patches silty fine SAND with some pockets and layers of weak friable poorly cemented sandstone and occasional pockets and layers of sandy silty CLAY (highly weathered bedrock)	1.3
	Firm to stiff becoming stiff with depth fissured light orange-brown with grey patches silty CLAY with occasional ironstone concretions	3.4
	Very weak to weak blue-grey moderately weathered silty MUDSTONE with some pockets of very stiff silty clay	4.2
	Moderately strong dark grey slightly to moderately weathered highly calcareous MUDSTONE with occasional pockets and layers of silty clay.	4.7
TQ32SE23 (0.1km north)	Dark brown, slightly clayey, very sandy SILT with roots	0.55
	Firm, friable light yellow-brown with light grey patches, slightly sandy, silty CLAY with occasional sandstone gravel and calcareous nodules.	1.7
	Very dense, yellow-brown, silty. fine sand with occasional gravel sized fragments of very weak poorly cemented silty sand and pockets of silty clay (highly weathered bedrock)	2.1
	Very weak poorly cemented yellow brown moderately weathered silty fine SANDSTONE with pockets and layers of very dense silty sand	8
TQ32SW22 (0.3km east)	Yellow Clay	1.8
	Brown Clay	4.6
	Dark shell and clay	14.6

2.6 HYDROGEOLOGY

The Upper and Lower Tunbridge Wells Sand, Ardingly Sandstone Member and Cuckfield Stone Bed beneath the Site are all classified by the EA as Secondary A aquifers. These are layers of rock or drift deposits that have high intergranular and/ or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. The Upper Grinstead Clay and Wadhurst Clay Formation are classed by the EA as unproductive strata. Where superficial Head Deposits are present these are classified as a Secondary (undifferentiated) aquifer. These are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. They have only a minor value.

Groundwater vulnerability is classed as high.

2.7 HYDROLOGY

2.7.1 Surface water

The Site lies within the catchment of the Rivers Adur and Teville. The Site and surrounding area is covered by a network of small inland rivers. The north of the Site is bisected by a small river flowing between Highbridge Mill Cottages and Mackerells farm cottage. This is associated with several small tributaries, one flowing southwards from the A272 and another from the northeast corner of the Site. The watercourse then flows along the eastern Site boundary where it is joined at Furnace Woods by another tributary, which crosses the south of the Site through Ridden's Wood.

There are also at least nine small ponds located across the Site with a further nineteen additional ponds within 50m of the Site boundary.

2.7.2 Flooding

EA mapping indicates the majority of the Site is located within Flood Zone 1, at low risk of flooding from rivers or sea. However, a small area in the north of the Site and along the eastern Site boundary, associated with the watercourse, is in Flood Zone 2/3 (extreme flooding from rivers or sea without defences).

2.7.3 Groundwater Flooding

According to the BGS, there is limited potential for groundwater flooding to occur across the Site.

2.8 SITE HISTORY

A review of historical Ordnance Survey (OS) mapping of the Site has been undertaken. The historical mapping is provided in Appendix D. The salient observations are summarised in Table 2-2.

Table 2-2 Site history

Epoch	Details	Development consideration
1874 to 1879 (1:2,500 & 1:10,560)	The Site and surrounding area is predominantly agricultural. On Site is Mackrell's Farm and Ansty Farm, there are also several small ponds across the Site. Ansty village is located to the west of the Site and Highbridge Mill and mill pond is adjacent to the north eastern boundary of the Site. There are numerous ponds surrounding the Site, the largest being at Cuckfield Park 250m north of Site. There also numerous wells within 100m of the Site. A sand pit is recorded approximately 150m north of the Site, near Highbridge Mill. Areas at Cow Bottom and west of Freizeland Wood, both adjacent to the east of the Site and at the south of the Site near Riddens Farm, also appear to have been worked.	None.
1897 to 1899 (1:2,500 & 1:10,560)	A further small pond is recorded at Ansty Farm. Off Site, a sewage farm with associated tanks is now shown bordering the northeast of the Site. Old sand pits are shown 60m northeast of Site, next to the Sewage Farm and 400m east of the Site along Copyhold Lane. Old quarries are now labelled at Highbridge Mill (50m north of Site), Riddens Farm (at south west boundary of Site) and at Freizeland Wood.	Potential contamination associated with migration from off Site sources including the sewage

Epoch	Details	Development consideration
		treatment works and old sand pits.
1910 to 1913 (1:2,500 & 1:10,560)	No significant changes on Site. The area northeast of the Site is now labelled as a golf course. The sand pit on Copyhold Lane is no longer shown. Addition of an unknown tank 30m west of Site within Ansty village.	None.
1937 to 1938 (1:2,500)	Addition of a footpath across the Site towards Ansty Farm, no other significant changes on Site. Off Site, a series of filter beds are now present at the sewage farm. Ansty village has expanded westwards to include several new buildings. And several new houses have been built along Copyhold Lane to the east of the Site. There is now a cricket ground and pavilion 150m north of the Site.	None.
1938 to 1952 (Aerial photograph & 1:10,560)	No significant changes on Site. Off Site, Ansty continues to expand.	None.
1955 to 1958 (1:2,500 & 1:10,000)	The pond at Mackrell's Farm is no longer shown. Off Site, the golf course is no longer present. There is now a Cricket ground at the west of the Site, north of Ansty. Ansty has expanded further westwards and southwards to include more housing. New housing has also been built southwest of the Site by Marlpit Ponds.	Potential contamination associated with migration from off Site sources including infilled pits/ ponds.
1960 to 1979 (1:1,250 & 1:2,500 & 1:10,000)	Ansty Farm at the centre of Site is now labelled the Old Place and Grain Loft and a pond has been filled in. Off Site, continued expansion of Ansty, including construction of The Lizard, Birch Tree and Whitton Lodge and Ansty Social Club. There is also now a timber yard at Ansty, 300m west of the Site.	Potential for contamination associated with infilled pond.
1984 (1:2,500)	No significant changes on Site. Off Site, addition of an electricity substation 300m east of the Site along Copyhold Lane. Additional filter beds are shown at the sewage treatment works.	None.
1989 (1:2,500)	No significant changes on Site. Construction of the A272 along the northern Site boundary. Addition of new buildings at Lodge Farm and Crabtree Cottage 300m east of the Site	None.
1992 to 1994 (1:1,120, 1:2,500 & 1:10,000)	Construction of a roundabout next to the northwest corner of the Site and widening of the road at High Bridge. Cricket Ground at Ansty is now labelled as a recreation ground. Construction of several new small buildings at Birch Trees Farm at the western edge of the Site, by Ansty.	None.
1999 to 2000 (1:10,000 & Aerial photograph)	Addition of a swimming pool at Old Place in the centre of the Site. Addition of a small building at Mackrell's Farm 40m east of the Site. Expansion of Ansty Farm 400m west of the Site and infilling of pond previously there.	Potential contamination associated with migration from off Site sources including infilled pits/ ponds.

Epoch	Details	Development consideration
2003 to 2016 (1:10,000)	No significant changes on Site. Addition of housing along the southwestern boundary of the Site at Ansty Place and Harvest Hill Cottages	None.
2021 to 2022 (1:10,000 & Aerial photograph)	Old Place and Grain loft at the centre of the Site is now labelled The Barn House. Construction of new housing at Ansty. There is also now a depot in Ansty 350m west of the Site. The Mill Pond at Highbridge Mill appears to have been redeveloped with three small buildings surrounding a possibly smaller pond. Construction of new buildings at Laines Farm 120m north of Site.	None.

2.8.1 Other data sources

Additional online data sources including Google Earth, Britain from Above and National Library of Scotland maps, were reviewed but no additional relevant information was identified.

2.9 ENVIRONMENTAL DATABASE SEARCH

An Envirocheck report was purchased as part of the desk study assessment. The full database report is provided in Appendix D. A summary of the database records is provided in Table 2-3 below with reference to entries within 250m of the Site, unless considered to be relevant at greater distances.

Table 2-3 Environmental database records

Distance (m)/ direction	Land use / permitted activity / authorisation	Development consideration
On Site to 168m (NE, NW, N, W, SE)	28No. Discharge Consents. 10No. Non water company (private) sewage discharges-final/treated effluent and 18No. Discharge consents for waste water treatment works/ sewage treatment works at Newbury Lane, Cuckfield, 2no. which are active currently.	Potential baseline impacts to surface and groundwater quality from the discharge of treated effluent.
On Site to 25m (SE)	1No. local authority recorded landfill is present Site in the northwest corner. However, the details of this are noted to be related to the Cuckfield bypass therefore it is not known if this is on Site or off site along the A272. 1No. landfill site is recorded adjacent to the southern boundary at West Riddens Farm. No further details were provided.	Potential contaminants from unknown Made Ground both on and off Site.
6 to 84 (SE, SW, S, N, NW)	3No. areas of potentially infilled land (non-water) dated 1992-1994	Potential contaminants from unknown Made Ground.
On Site to 202 (E, S, SE, N, NE)	17No. BGS recorded mineral sites. Of these, 5No. are on Site including Laines Farm Pits, Highbridge Mill Pit, Ansty Farm Pit, Hamshalls Pits and Mackrell's Farm Pits. All have ceased operation and are opencast pits in the Ardingly Sandstone Member or Cuckfield Stone Bed.	Potential contaminants from unknown Made Ground if pits are infilled.

Distance (m)/ direction	Land use / permitted activity / authorisation	Development consideration
18 to 158 (NW)	10No. Contemporary trade directory entries, 2 of which are active today, a car dealers and a petrol filling station.	None.

2.10 GEO-HAZARDS

The Envirocheck report provided in Appendix D also includes information from the BGS regarding potential geo-hazards on or near the Site. These potential geo-hazards are summarised in Table 2-4 below.

Table 2-4 Summary of geo-hazards

Ground Stability Hazards	The following potential ground stability hazards have been identified by the BGS on-Site:	
	<i>Collapsible ground</i>	Very Low
	<i>Compressible ground</i>	No Hazard
	<i>Ground dissolution</i>	No Hazard
	<i>Landslide ground</i>	Moderate
	<i>Running sand</i>	Very Low
	<i>Shrinking or swelling clay</i>	Low
Radon	The property is in a lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Basic radon protection measures are therefore likely to be required in the construction of new houses.	



2.11 ENVIRONMENTAL DESIGNATIONS

Online mapping (Defra) indicates there are multiple environmental designations nearby to the Site and in the surrounding local area, a summary of these designations is provided in Table 2-5 below.

Table 2-5 Environmental designation within proximity of the Site

Designation	Location	Information
Ancient Woodland	On Site	Biddens Wood, Furnace Wood, Highbridge Mill, Highbridge Mill Shaw, Mackrells Shaw and Pook Ryde Shaw - may be impacted by the proposed development.
Area of Outstanding Natural Beauty (AONB)	8m North	High Weald – may be impacted by the proposed development.
Nitrate Vulnerable Zone (NVZ)	On Site	Adur East (Sakeham) NVZ - not considered to have potential implications on the proposed development.

2.12 PRELIMINARY UXO RISK ASSESSMENT

Zetica produce online mapping relating to potential risks associated with discovering unexploded ordnance (UXO). Based on this mapping, the Site is indicated to be at a Low Risk from all forms of Unexploded Ordnance. Therefore, it is considered that the risk of encountering UXO is unlikely.

3 Preliminary conceptual Site model and risk assessment

The following section draws together the findings of the desk study to develop a preliminary conceptual site model. The relationship of identified sources, viable pathways and identified environmental receptors is considered and used as a technical basis to inform a qualitative assessment of risk to human health and the wider environment posed by the proposed ground conditions and the proposed redevelopment of the Site.

3.1 SOURCES

The key identified potential contaminant sources are summarised as follows and covered within the risk assessment table in Section 3.4.

3.1.1 On-site source potential

- **Current Agricultural Site use:** Potential sources of contamination associated with the current site use include the use of herbicides and pesticides.
- **Infilled quarries:** Potential contamination may be associated with the unknown Made Ground if the former quarries have been infilled.
- **Historical landfill:** Potential contamination, leachate, impacted groundwater and ground gases associated with the possible landfill located in the northwest of the Site.

3.1.2 Off-site source potential

- **Sewage treatment works:** to the north of the Site.
- **Historical landfill/ infilled pits:** Potential contamination, leachate, impacted groundwater and ground gases associated with the landfill located 25m south of the Site.

3.2 PATHWAYS

For the purposes of this risk assessment, it is assumed that the relevant pathways comprise:

- Direct contact with sub-surface materials (dermal soil/ leachate contact, soil ingestion and dust ingestion/ inhalation);
- Leaching of contaminants to groundwater;
- Migration of dissolved phase contamination in groundwater;
- Preferential flow through the drainage system; and,
- Migration of gas and/ or vapours through preferential pathways and/ or permeable sub-surface materials.

3.2.1 Construction-phase pathways

In addition to the above, during the redevelopment of the Site it will be necessary to cause a period of exposure of bare earth. This in turn will allow for increased infiltration during rainfall events, and therefore an increased potential for leaching and throughflow of potential sub-surface contaminants.

3.3 RECEPTORS

The key identified potential environmental receptors are summarised as follows and covered within the risk assessment table in Section 3.4 below.

3.3.1 Human health

- Demolition, construction and maintenance workers (short term acute risks);
- Off-Site residential and commercial occupants; and,
- Future Site occupants (predominantly residential).

3.3.2 Environmental

- Secondary A Aquifers;
- Streams and ponds across and adjacent to the Site ;
- On Site designated Area of Outstanding natural beauty; and,
- On Site areas of Ancient Woodland.

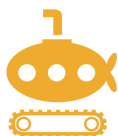
3.4 PRELIMINARY RISK ASSESSMENT

A summary of the potential contaminant linkages associated with the Site is presented in Table 3-1, alongside an assessment of the risks posed by each linkage. The contaminant linkages have been assessed using the risk assessment methodology described in CIRIA C552 (2001). As such, risk is considered to be a function of both the probability (likelihood) of contamination occurring at the study site and also the potential severity (consequence) of the environmental impacts associated with any such contamination. The classification system used to define contaminant probability, consequence and risk is described in Appendix E.

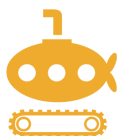


Table 3-1 Pollutant linkage assessment

Sources	Pathways	Receptors	Consequence	Probability	Risk	Risk management / remediation
Potential contamination from infilled quarries.	Direct human contact exposure pathways (dermal, ingestion, inhalation)	Future Site users (Residential) Off-Site residential and commercial occupants	Medium	Low likelihood	Moderate /low	Potential sources of contamination on and in the vicinity of the Site are typically discrete including small historical quarries and a sewage treatment works. Therefore, in reality the potential risks to future Site occupants and off Site users is likely to be low . However, a suitable targeted site investigation is required to understand the ground conditions on Site and contamination status of the underlying soils and groundwater, particularly in the areas of infilled ground. If required, this should result in a suitable risk management strategy to ensure that occupants of the proposed development are not impacted.
Historical Landfills Contaminants from Agricultural use (herbicides and pesticides)		Construction workers	Mild	Low likelihood	Low	Risk to construction works can be adequately managed by standard precautions and health and safety procedures commensurate with working on brownfield sites.
Contaminants from off Site sewage treatment works	Ingress into potable supply pipes	Future Site users (Residential) Off-Site residential and commercial occupants	Medium	Low likelihood	Moderate /low	The potential presence of made ground infilling former quarries and historical landfill may include potential organic contaminants which may impact buried potable pipes. Subject to the findings of the above site investigation and location of potable supply pipes delivered as part of the proposed development, barrier pipe may be required should areas of Made Ground be crossed.



Sources	Pathways	Receptors	Consequence	Probability	Risk	Risk management / remediation
	Migration of gases and/or vapours through permeable subsurface materials and/or preferential pathways	Future Site users (Residential) Off-Site residential and commercial occupants	Medium	Low likelihood	Moderate /low	The historic pits and landfill recorded may have been infilled with materials which could act as a potential source of ground gas and vapour. However, these sources are typically small and discrete. Therefore, in reality the potential risks to future Site occupants and off Site users is likely to be low. It is recommended that this should be investigated further as part of the above targeted site investigation and, if required, suitable gas protection measures installed within the proposed dwellings.
	Leaching and/or water mobile constituents passing through permeable sub-surface soils and/or shallow preferential pathways	Secondary (A) Aquifer and Principal Aquifer Streams and ponds across Site	Medium	Low likelihood	Moderate /low	The historic pits and landfill recorded may have been infilled with materials which could act as a potential source of leachate. However, these sources are typically small and discrete. Therefore, in reality the potential risks to the wider environment is likely to be low. In addition, the off-Site sewage works is considered to be the most likely source of local diffuse groundwater pollution. It is recommended that the presence and depth of groundwater at the Site should be investigated further as part of the above targeted site investigation. This should include consideration of off-Site sources including the sewage treatment works.



4 Conclusions and next steps

4.1 CONCLUSIONS

The Site has undergone limited development since the earliest OS maps and has remained agricultural. Small parts of the Site and the surrounding area have historically been subject to the small scale extraction of building stone from the Ardingly Sandstone Member and Cuckfield Stone Bed. There are 6No. recorded historical quarries across the Site, which may have been infilled by unknown materials however, many were noted during the walkover to remain as, possibly partial, depressions. 1No. recorded landfill Site is present in the north-western corner of the Site and a further 1No. located approximately 25m south of the Site, which may be associated with historic quarries. The landfill located on Site is listed as being associated with the Cuckfield bypass (A272) and as such may not actually be located on the Site itself. In addition, the sewage treatment works located adjacent to the northern boundary is likely to be locally impacting surface and ground water quality albeit the discharge will be covered by an Environmental Permit.

Based on this, potential sources of contamination include: potential materials infilling quarries, historical landfill sites, herbicides and pesticides from current agricultural Site use and diffuse pollution from the sewage treatment works.

Based on the findings of the desk study and the proposed residential led development an assessment of land quality has been undertaken in accordance with current guidance and best practice. On this basis, the potential risk to **human health** is considered to be **MODERATE/ LOW**.

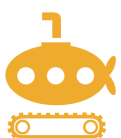
The potential risk to the **wider environment** is assessed to be **MODERATE/ LOW** on the basis that it is underlain by Secondary A Aquifers and surface water features are located across the Site.

Whilst the above risk assessment indicates an overall moderate/ low risk, it is important to note that many of the sources are both historical but also discrete/ isolated with the vast majority of the Site likely to result in a **LOW** potential risk to future Site users and the wider environment.

4.2 NEXT STEPS

The preliminary conceptual site model and desk based preliminary risk assessment presented herein is considered sufficient to support the proposed planning application. However, following granting of planning permission, a suitably scoped and targeted site investigation should be undertaken to understand the ground, groundwater and ground gas regime across the Site and to test the preliminary conceptual site model. Such an investigation will also provide the opportunity to characterise the ground for the purposes of geotechnical characterisation for foundation design and may also support the design of infiltration drainage.

Given the Site's history, it is important that any site investigation is proportionate and targeted to the features of interest and potential sources of contamination.



Drawings

