Consulting Civil Engineers

Foul and Surface Water Drainage Report

Firsland Park Estate, Henfield Road, Albourne, West Sussex

Planning Ref: DC/23/2037

For

Firsland Park Estate

Rev - P

Reference C3062

Date 28th October 2024

Revision	Date of Issue	Comments	Prepared By	Checked By
P	28/10/2024	Initial Issue	LH	CS

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1 Introduction

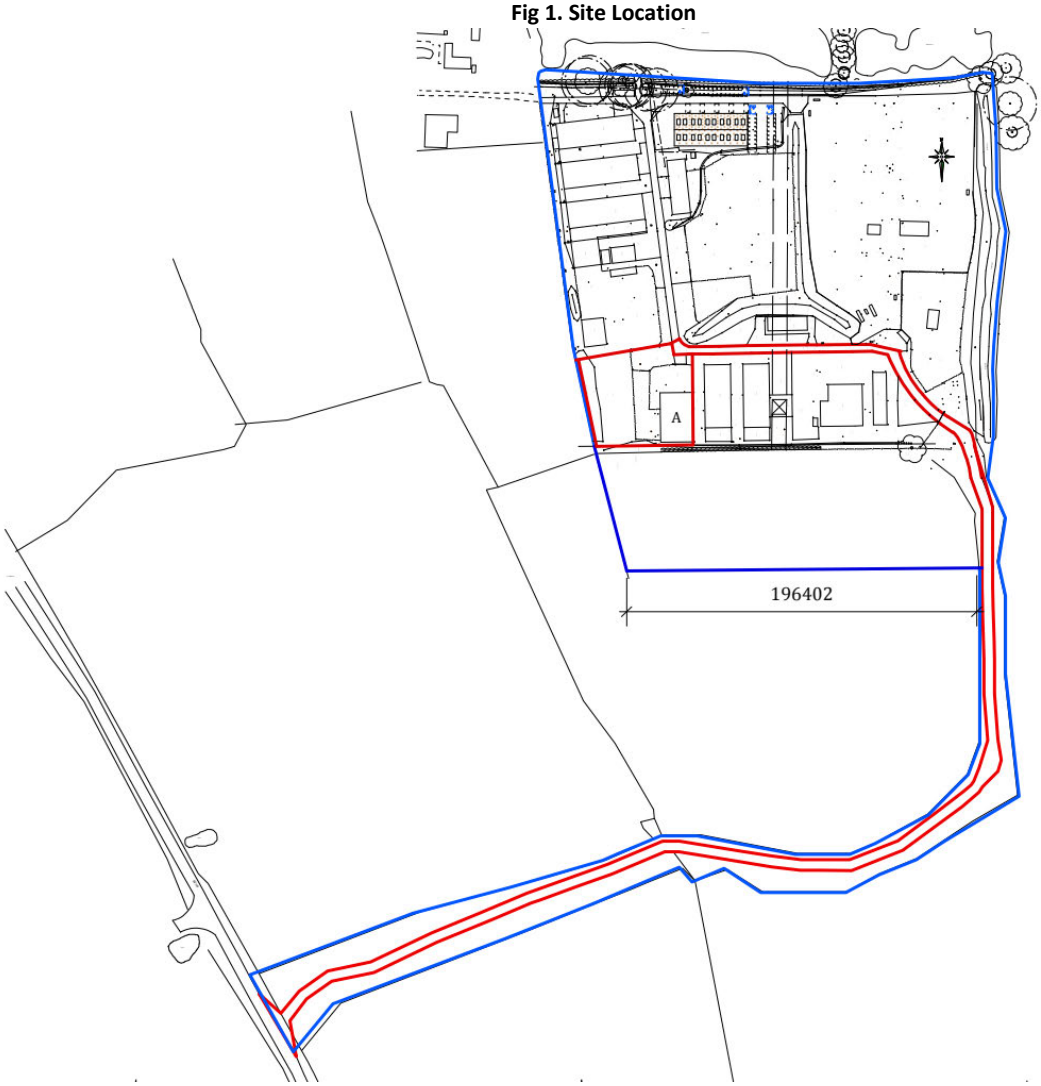
1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Firsland Park Estate in Albourne, West Sussex.

1.1.2 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere in order to clear Condition 3. The condition is in place on Decision Notice from **13th February 2024**, with the planning reference: **DC/23/2037.** The condition requires the following to be included:

- The results of an assessment into the potential for disposing of surface water by means of Sustainable Drainage System (SuDS).
- Details of a management and maintenance plan for the drainage scheme
- The appropriate design standard for the surface water drainage scheme must be the 1 in 100-year return period with a 45% allowance for climate change.

1.1.3 The existing site existing consists of an open parking area as well as a commercial unit. The proposed development will consist of the construction of replacement commercial units along with additional communal parking. The proposed development is located as OS Grid Reference TQ 24589 17881 and has the post code.

Fig 1. Site Location



2 Executive Summary:

2.1.1 The Surface Water will discharge to the stream to the south of the site at a restricted rate of 8.4 l/s. The proposed network will make us of a geocellular tank in order to cater for the 1 in 100year +45% storm. The proposed network will also utilise a new Storm Shark system alongside a filter drain in order to remove any contaminants from the surface water runoff prior to the discharge to the stream.

2.1.2 The Foul water is to be treated on site via a new package treatment plant. The treated effluent runoff is to then be discharged into the existing stream located on the southern boundary of the site. The proposed foul water discharge will not require Environment Agency approval as it adheres to all binding rules.

3 Site Geology

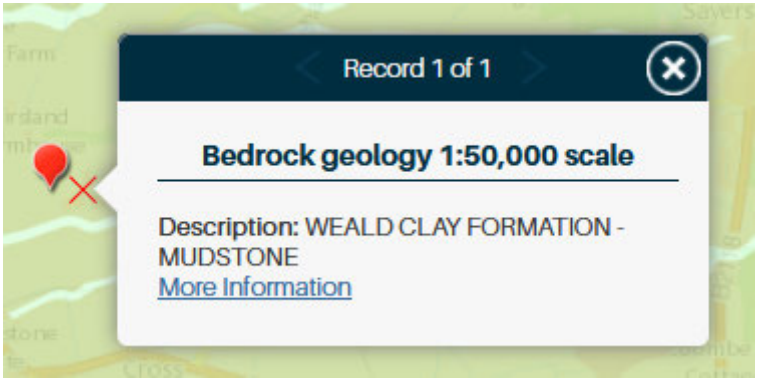
3.1 British Geological Survey information

3.1.1 The British Geological Survey confirms the bedrock geology to be made up of Weald Clay Formation. At the time of writing the British Geological Survey website does not have any recorded information of the Superficial deposits on site.

3.1.2 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.

- Borehole TQ21NW10 (Located approx. 277m northwest of the site within Firsland Farm) – Primarily Clay with some rock and sand at 38mbgl.

Fig 2. British Geological Survey



3.2 Geological Assessment

3.2.1 A soil investigation report was carried out on site by Oakland Site Investigation in June 2024. The investigation consists of the excavation of 6 no. boreholes as well as a soakage test in 2 of the excavated boreholes.

3.2.2 The excavated boreholes confirm that the geology on site matches the British Geological Survey information with it primarily being Clay with a layer of gravel ranging from 0.30 - 0.52mbgl.

3.2.3 The infiltration tests that were undertaken within Boreholes Number 1 and 4 both resulted in a failure with the water level failing to drain at all during the test.

3.2.4 It is noted that no groundwater was encountered during the excavation of the boreholes which were dug to a depth of 3.45 – 5.45 metres. Despite the testing being carried out in June, it is presumed that groundwater will not be a factor in the proposed drainage design and that flotation calculations are not required for the attenuation tank.

4 Existing Drainage

4.1.1 It is not currently known how the existing site discharges all surface water runoff; however, it is presumed to discharge to the existing stream to the south.

5 Proposed Drainage Strategy

5.1 SuDS Hierarchy

5.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Table 1. SuDS Hierarchy

Discharge Destination	
Rainwater Harvesting	Rainwater harvesting is to be undertaken. A 22,000l rainwater harvesting tank is included within the layout.
Discharge to Ground	No – On-site infiltration test failed, and geology does not support infiltration.
Discharge to Watercourse	Yes – surface water to be discharged into existing stream to the south. Brownfield runoff calculations carried out and resulted in an existing discharge rate of 16.8 l/s for the 1 in 2-year storm and a 56.3 l/s discharge rate of the 1 in 100-year storm. Proposed discharge rate to be restricted to 8.4l/s for all storm events, providing a 50% betterment over the existing discharge for the 1 in 2-year storm.
Discharge to Surface Water Sewer	N/A due to above
Discharge to Other Sewer	N/A due to above

5.2 Proposed Hydraulic Calculation Specifications:

Table 2. SuDS Hierarchy

Hydraulic Calculations Settings:	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**1**
CV Winter and Summer	**1**
Additional Storage (m^3 / ha)	**0.0**
Maximum Rainfall (mm/hr)	**75**
Flow Control	**1.607m Head @ 8.4l/s discharge**
Attenuation Tank Design	Base Coefficient (m/hr): **0.00000**
	Side Coefficient (m/hr): **0.00000**
	Factor of Safety: **2**
	Porosity: **95%**
	Time to Half Empty (mins): **212**

5.3 Surface Water Drainage

5.3.1 Based upon the failure of the infiltration tests that were carried out on site, it is proposed that the surface water runoff from the site is to be discharged into an existing stream that flows along the southern border of the site. The existing stream is noted to flow from West to East, under the existing access to Firsland Park Estate and to discharge into a larger stream in the adjacent field to the east.

5.3.2 It is proposed that all runoff from the roof and hard paved areas are to be captured into a positive drainage network before discharging into the stream at a restricted rate of 8.4 l/s. The proposed network will make use of an attenuation tank in order to cater for the 1 in 100-year +45% storm and also a petrol interceptor to intercept any contaminants prior to the discharge to the stream.

Table 3. Existing Runoff Calculations

Greenfield Runoff Calculations				
Storm period	**Existing runoff rate (l/s)**	**Proposed Discharge Rate (l/s)**	**Difference (l/s)**	**Betterment (%)**
2	16.8	8.4	- 8.4	50
10	33.4	8.4	- 23.4	75
30	44.7	8.4	- 34.7	81
100	56.3	8.4	- 46.3	85

5.3.3 Existing discharge rate and Hydraulic calculations have been carried out which can be found at Appendix C.

5.4 Water Quality

5.4.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.

5.4.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.

5.4.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e., the pollution source)
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
- The sensitivity of the receiving environment

5.4.4 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Table 26.1 from SuDS manual. Approaches to Water Quality Risk Management

Table 26.1 Approaches to Water Quality Risk Management			
Design method	**Hazard Characterisation**	**Risk Reduction**	
		For Surface Water	**For Groundwater**
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

5.4.5 As per Table 26.1 Simple Index approach will be used as a design method for this site.

5.4.6 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.

- Other Roofs
- Commercial Yard

5.4.7 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index >=pollution hazard index

5.4.8 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual.

Table 26.2 from SuDS manual. Pollution Hazard Indices for Different Land Use Classifications

Table 26.2 Pollution hazard indices for different land use classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended solids (TSS)**	**Metals**	**Hydro-Carbons**
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (Typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

5.4.9 From Table 26.2 the following information is tabulated in Table 1

Table 3: Pollution hazard index and destination of runoff for the proposed site

Table 3: Pollution Hazard Index and Destination of runoff for the proposed Site					
Land Use	**Destination of Runoff**	**Pollution Hazard Level**	**Total Suspended Solids**	**Metals**	**Hydrocarbons**
Other Roofs	Surface Water	Low	0.3	0.2	0.05
Commercial Yard	Surface water	Medium	0.7	0.6	0.7

5.4.10 The SuDS mitigation index will be obtained from Table 26.4 (for groundwater) of the SuDS manual.

Table 26.4 from SuDS manual. Indicative SuDS Mitigation Indices for discharges to ground waters.

5.4.11 SuDS mitigation index is tabulated in Table 5 as followed.

Table 26.4 Indicative SuDS mitigation indices for discharges to surface waters			
	Mitigation Indices		
Type of SuDS Components	**TSS**	**Metals**	**Hydrocarbons**
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 4: SuDS mitigation index

Table 4 Mitigation Indices						
Runoff Source	**Destination of Runoff**	**Mitigation Index Source**	**Type of SuDS Component**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Other Roofs/Commercial Yard	Surface water	Table 26.3 (for surface waters)	Proprietary Treatment System (Storm Shark)	0.5	0.4	0.45
Other Roofs/Commercial Yard	Surface water	Table 26.3 (for surface waters)	Filter Drain	0.4	0.4	0.4

5.4.12 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

5.5 Foul water drainage

5.5.1 The foul water will discharge into a proposed treatment plant on site. All treated effluent runoff is to be discharged into an existing stream to the south.

5.5.2 The proposed foul water discharge does not require Environment Agency approval as it adheres to the general binding rules for small discharge to surface water. This is because the proposed discharge:

- Is less than $5m^3$ a day
- Utilises a sufficient treatment system
- Is not causing pollution
- Is not within 500 meters of a protected site
- Is not within 50m of any other exempt discharge

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the replacement commercial units along with additional communal parking at Firsland Park Estate in Albourne, West Sussex.

6.1.2 The Surface Water will discharge to the stream to the south of the site at a restricted rate of 8.4 l/s. The proposed network will make us of a geocellular tank in order to cater for the 1 in 100-year +45% storm. The proposed network will also utilise a new Storm Shark system alongside a filter drain in order to remove any contaminants from the surface water runoff prior to the discharge to the stream.

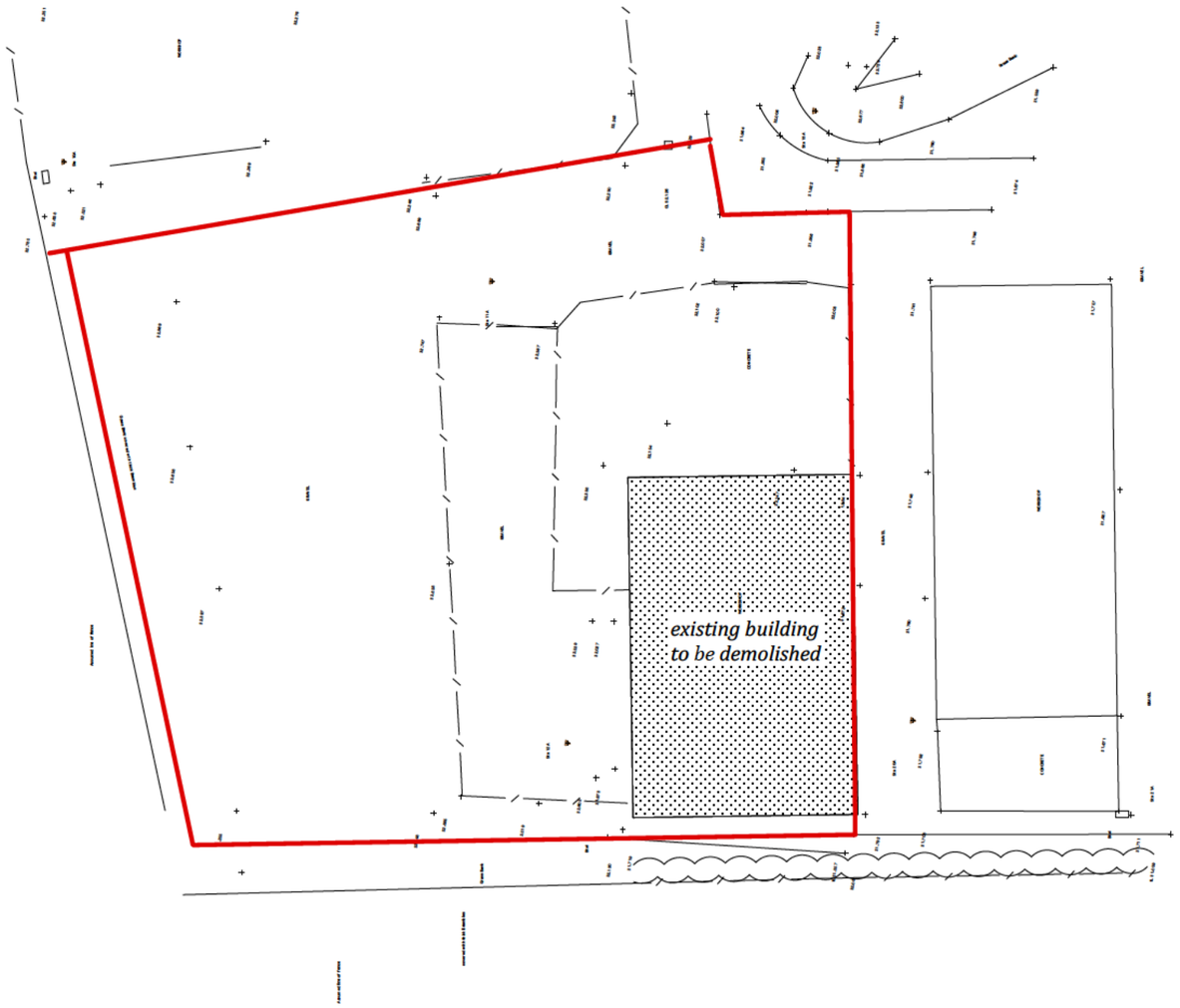
6.1.3 The Foul water is to be treated on site via a new package treatment plant. The treated effluent runoff is to then be discharged into the existing stream located on the southern boundary of the site. The proposed foul water discharge will not require Environment Agency approval as it adheres to all binding rules.

6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

6.1.5 A maintenance schedule has been written up for the drainage network including the SuDS features and can be found within Appendix **E.**

7 Appendices

7.1 Appendix A – Site Plan



EXISTING



PROPOSED

SCALE 1:500

10cm = 250 Metres at scale 1:2500
10cm = 125 Metres at scale 1:1250

10cm = 50 Metres at scale 1:500
10cm = 25 Metres at scale 1:250

10cm = 10/20 Metres at scale 1:100/1:200
10cm = 5 Metres at scale 1:50

The Drawings supporting this application have been produced to be handled and viewed electronically and are best viewed on screen to see fine detail that may not appear on printed versions depending on the type of printer used and the size of print etc, for which Brett Incorporated Ltd accepts no liability.

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Client:	Firsland Park Industrial Estate Ltd	Drg No: 1221.36/02	Date: June 2023
Project:	Replacement commercial units at Firsland Park Industrial Estate	Scales: 1:500 **Original Plan Size A3**	Drawn:Gonzo
Drawing:	Existing and proposed block Plans		

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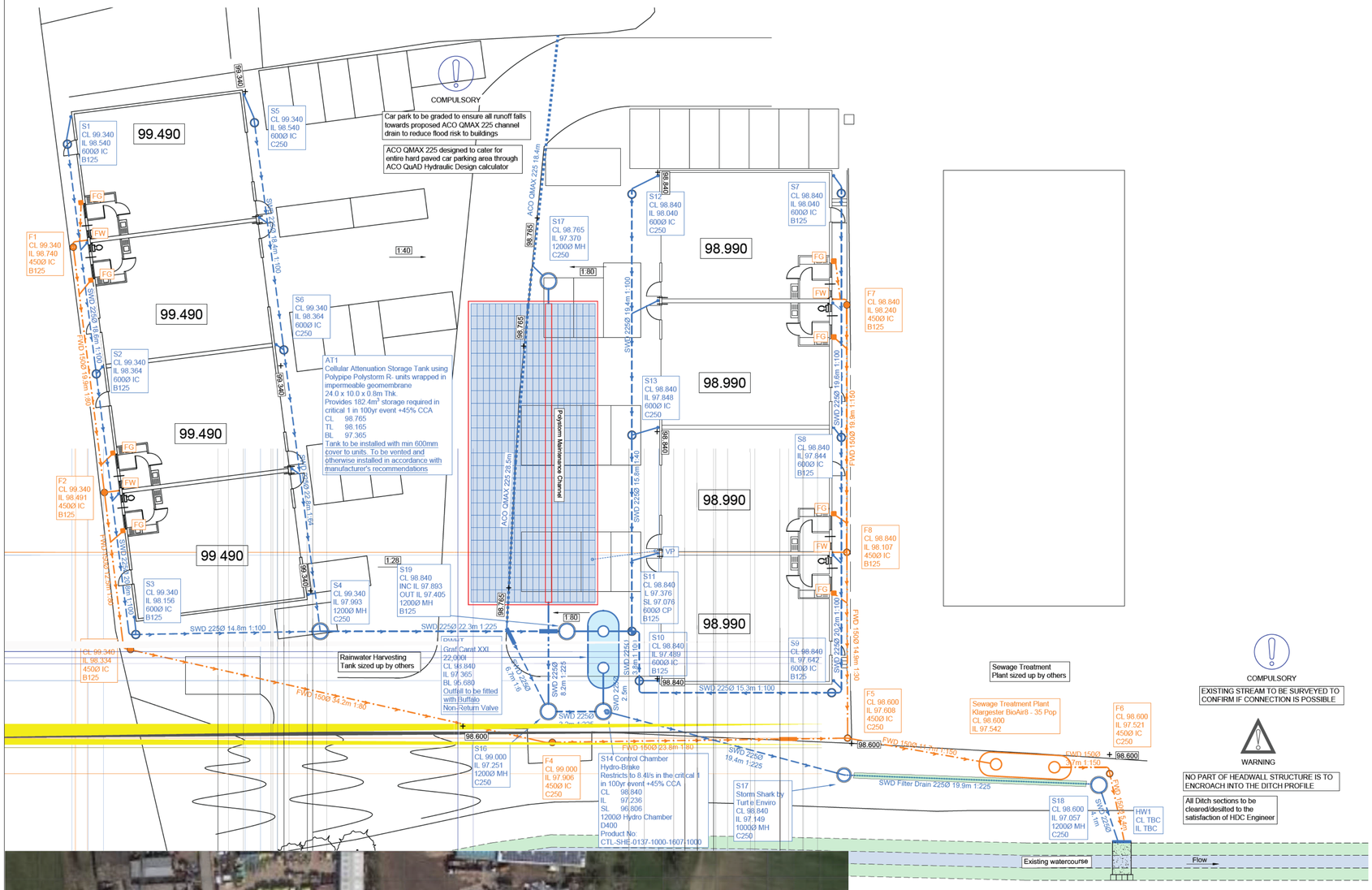
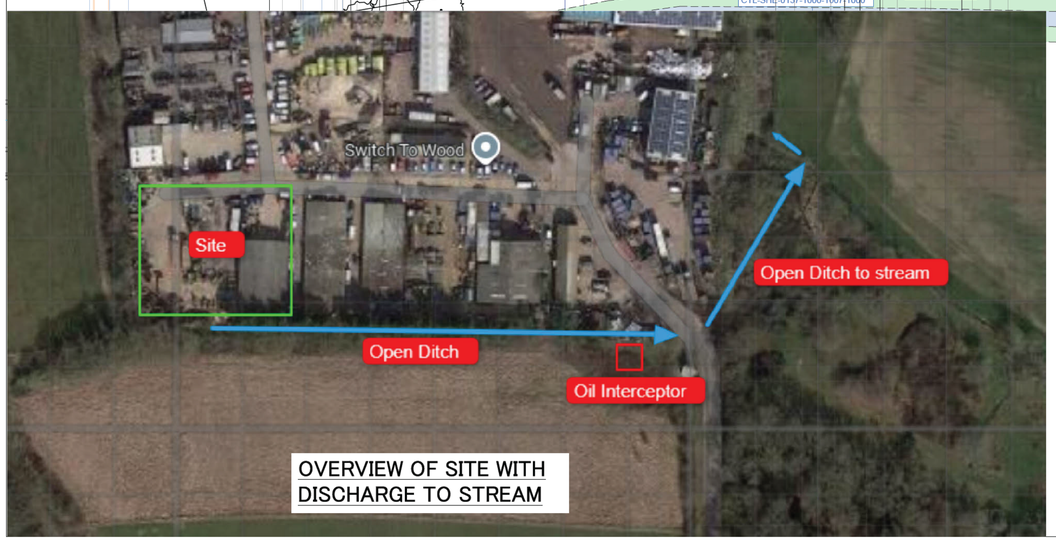
7.2 Appendix B – Drainage Layout

DE I N B E T TO THE APPROVAL OF:
PLANNIN A THORITY
B ILDIN ONTROL

DE I N B E T TO THE CONFIRMATION OF:
EXTERNAL LEVEL DE I N
ORDINARY ATER O R E APPROVAL
LO ATION AND DEPTH OF EXISTING UTILITIES
ROOT PROTE TION AREA





OVERVIEW OF SITE WITH DISCHARGE TO STREAM

DRAINAGE LEGEND

PROPOSED FEATURES

- FWD — Foul Drainage
- SWD — Surface Water Drainage
- Pipe crossing (thickening denotes pipe above)
- CD — Channel drain
- Storm water inspection chamber (600Ø)
- Storm water catchpit chamber (600Ø)
- Storm water manhole (1200Ø)
- Storm water vortex flow control chamber
- FG — Trapped foul gully
- FW — Soil stack (type TBC by architect/m&e engineer)
- Foul water inspection chamber (450Ø)
- 00.000 — Finished floor level
- 100Ø 4.5m 1:100 Z BED — Pipe info - diameter, length, gradient, bedding type

ABBREVIATIONS

MH	- MANHOLE
IC	- INSPECTION CHAMBER
AC	- ACCESS CHAMBER
CP	- CATCHPIT
BC	- BRAKE CHAMBER
RE	- RODDING EYE
IL	- INVERT LEVEL
SL	- SUMP LEVEL
RA	- RESTRICTED ACCESS COVER
CL	- COVER LEVEL
TL	- TOP OF CELLULAR SA
BL	- BASE OF CELLULAR SA
FL	- FORMATION LEVEL

- 18.250 + — Proposed surface level
- 1:62 — Fall in surface and gradient

STANDARD DRAINAGE NOTES

1. DO NOT SCALE FROM THIS DRAWING, REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
2. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
4. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
5. BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
6. ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT, THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
7. COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
8. ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA
9. ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911:PART 1.
10. ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
11. ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
12. ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
13. THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
14. STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
15. IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
16. NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
17. ALL EXISTING MANHOLE COVERS, GULLIES, ETC, ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
18. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT
19. UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION
20. MANHOLE AND CHAMBER COVER GRADES:

- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

Site Specific Notes

1. The proposed scheme consists of the construction of replacement commercial units along with additional communal parking at Firsland Park Estate in Albourne, West Sussex.
2. The British Geological Survey confirms the site geology to be made up of Clay.
3. A site specific soil investigation was carried out by Oakland Site Investigation in June 2024. The excavation of 6 No. boreholes confirmed the geology to be primarily clay with some gravel layers ranging from 0.3 to 0.52 mbgl. No groundwater was encountered during the site investigations with the boreholes ranging from depths of 3.45 - 5.45 mbgl.
4. Infiltration tests were carried out in 2 of the 6 boreholes which both failed with the water level failing to change.
5. The surface water runoff from both roof and hard paved areas are to be captured into a positive drainage network before discharging into the existing stream to the south at a restricted rate of 8.4 l/s.
6. Existing discharge calculations were carried out with the 1 in 2 year storm discharging into the stream at a rate of 16.8l/s. Therefore, the proposed 8.4 l/s discharge is a 50% betterment over the existing site for the 1 in 2 year storm and a 85% betterment for the 1 in 100 year storm.
7. The foul water is to be treated on site by a new package treatment plant with all treated effluent runoff discharging to the stream. No Environment Agency approval is required as the proposed discharge adheres to all binding rules.
8. A maintenance schedule has been carried out and will accompany this drainage layout.

FOR PLANNING ONLY

REV	DATE	DESCRIPTION	BY	CHK	APP
P-	30.10.24	PRELIMINARY ISSUE	LH	CS	CS

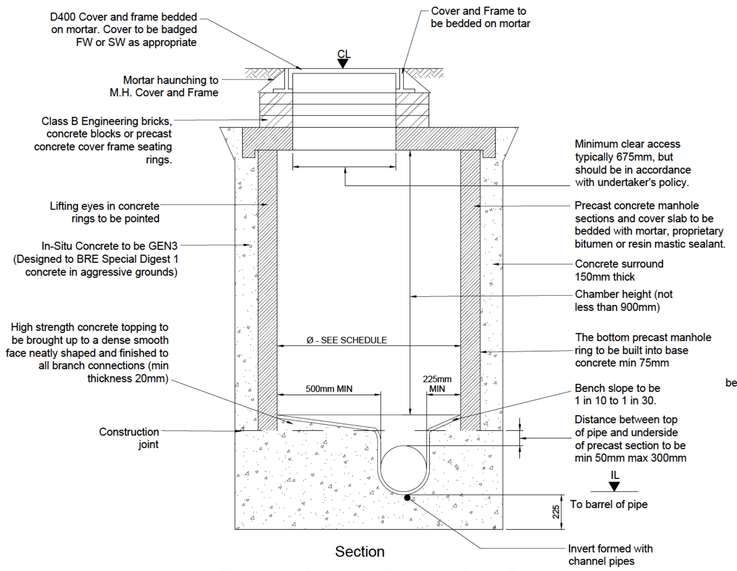
givil
o lig ivilEgineer

CLIENT: FIRSLAND PARK ESTATE
ARCHITECT: GRHAM ASKEW
JOB TITLE: FIRSLAND PARK ESTATE ALBOURNE
DRAWING TITLE: DRAINAGE LAYOUT

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
OCT 2024	1:200

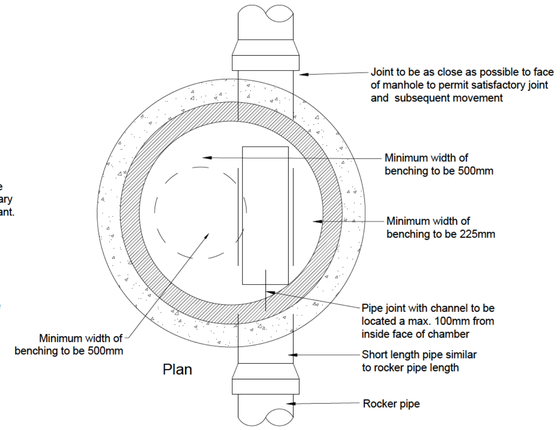
JOB No.	STATUS	DRAWING No.	REV.
C3062	PL	101	PL-



Section

Typical Manhole Detail - Type B

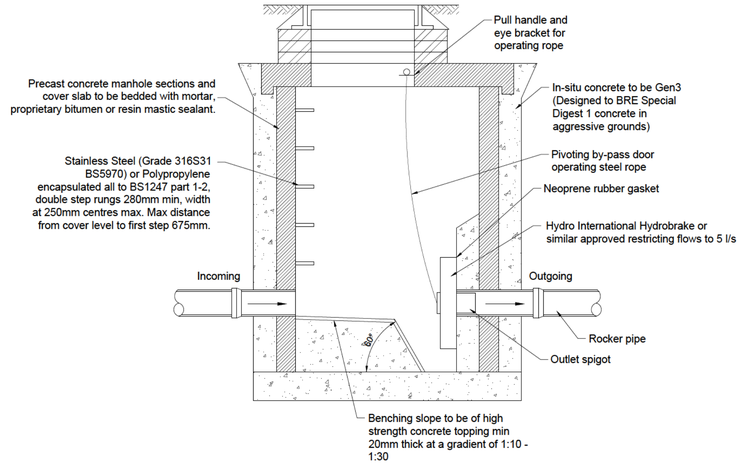
Maximum depth from cover level to soffit of pipe 3.0m



Plan

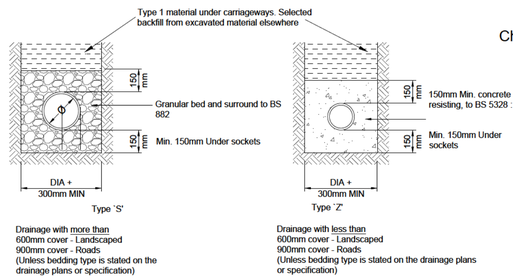
NOMINAL DIAMETER (mm) DN	EFFECTIVE ROCKER PIPE LENGTH (m)
150 - 600	0.6
675 - 750	1.0
OVER 750	1.25

DIAMETER OF LARGEST PIPE IN MANHOLE (mm) DN	INTERNAL DIAMETER OF MANHOLE (mm)
< 375	1200 (1050 WHERE SOFFIT IS 1.35-1.5m)
375 - 450	1350
500 - 700	1500
750 - 900	1800
> 900	CONSULT UNDERTAKER

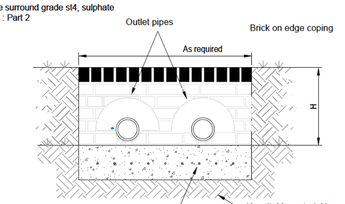


Typical Hydrobrake Manhole detail

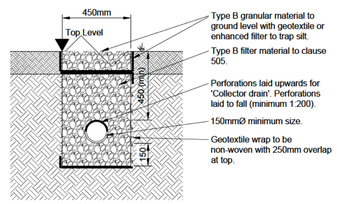
Chamber is to be constructed to flow control manufacturers specific requirements



Pipe bedding details in private Areas

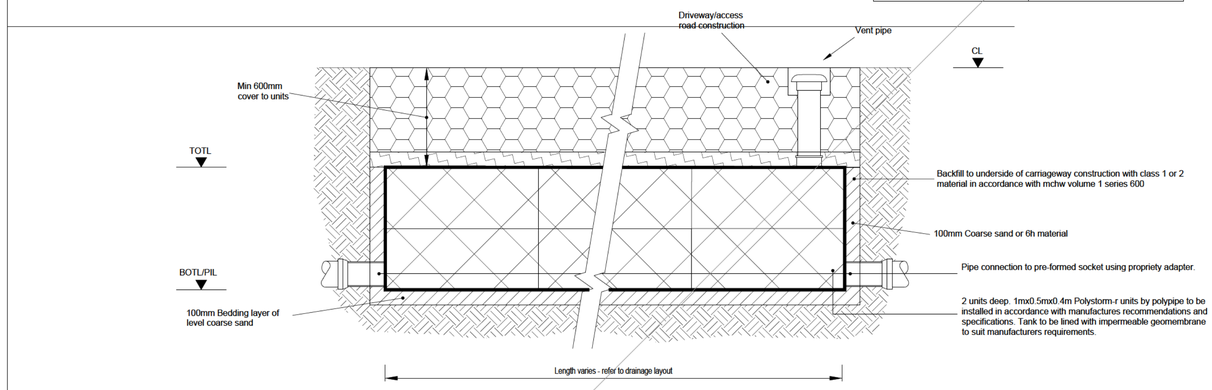


Typical Elevation of headwall Outfall to pond / side of ditch



FILTER DRAIN

(Scale 1:20)

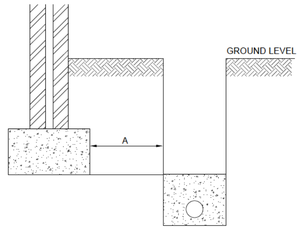


Attenuation tank using polystorm-r geomodular units trafficked areas

0.8m thick

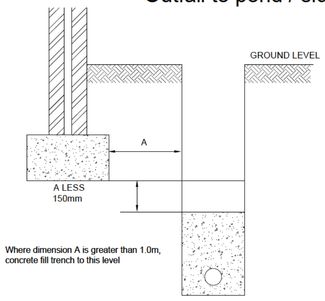
All storage tank drainage works shall be carried out in accordance with the specifications, method statements and recommendations of polypipe

Pipes near buildings

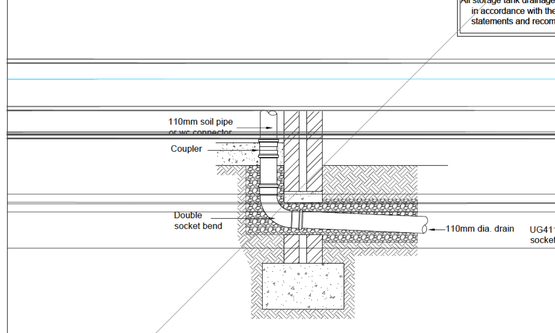


Where dimension A is less than 1.0m, concrete fill trench to level of underside of foundations.

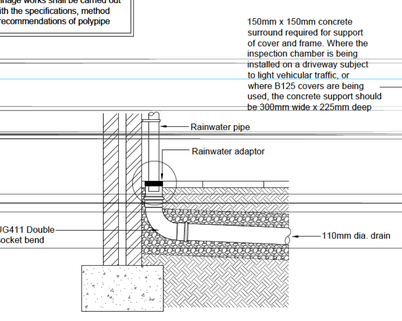
Pipes near buildings



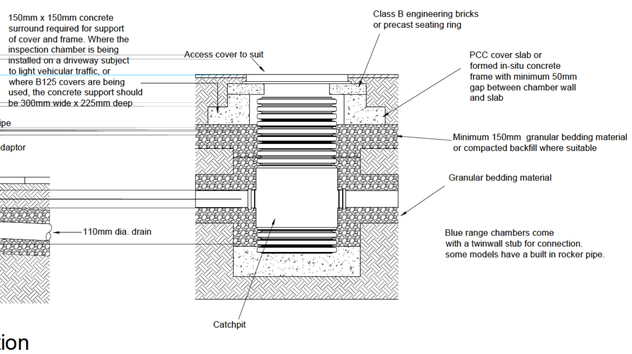
Where dimension A is greater than 1.0m, concrete fill trench to this level



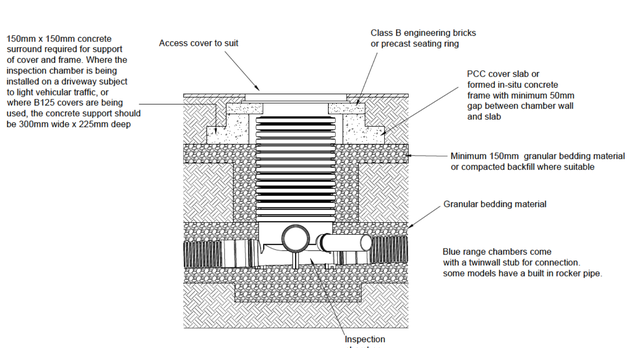
Soil pipe / wc connection



Rainwater pipe connection



450mmØ/600mmØ Turtle Enviro Silt Trap Detail



450mmØ/600mmØ Turtle Enviro Inspection Chamber

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

REV	DATE	DESCRIPTION	BY	CHK	APP
P-	30.10.24	PRELIMINARY ISSUE	LH	CS	CS

FOR PLANNING ONLY

civil engineering

CLIENT: FIRSLAND PARK ESTATE

ARCHITECT: GRHAM ASKEW

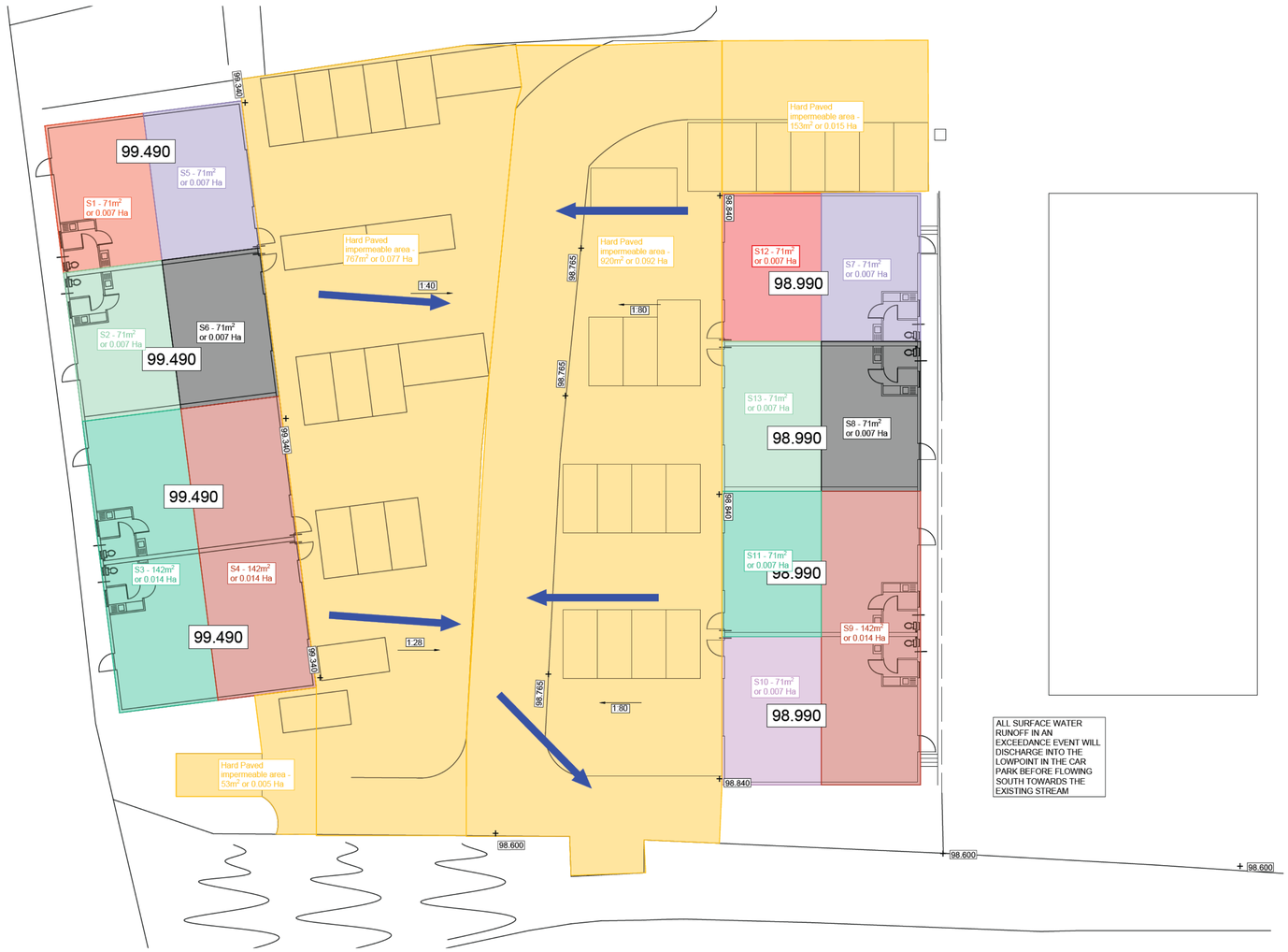
JOB TITLE: FIRSLAND PARK ESTATE ALBOURNE

DRAWING TITLE: CONSTRUCTION DETAILS

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
OCT 2024	1:20

JOB No.	STATUS	DRAWING No.	REV.
C3062	PL	301	PL-



Prefixed to drawing numbers shall signify the following.-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

REV.	DATE	DESCRIPTION	BY	CHK	APP
P-	30.10.24	PRELIMINARY ISSUE	LH	CS	CS

FOR PLANNING ONLY

CLIENT: FIRSLAND PARK ESTATE

ARCHITECT: GRHAM ASKEW

JOB TITLE: FIRSLAND PARK ESTATE ALBOURNE

DRAWING TITLE: IMPERMEABLE AREAS & OVERLAND FLOW ROUTE

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE	SCALE @ A1
OCT 2024	1:200

JOB No.	STATUS	DRAWING No.	REV.
C3062	PL	401	PL-

7.3 Appendix C – Surface Water Calculations and existing discharge calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	20.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	75.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S14	0.301	20.00	98.840	Manhole	Adoptable	1200	1254.615	60.412	1.604
S17			98.600	Manhole	Adoptable	1200	1271.804	57.433	1.449

Links (Input)

Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S14	S17	17.445	97.236	97.151	0.085	205.2	225

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	10 year (l/s)	3.4
Summer CV	1.000	Additional Storage (m³/ha)	0.0	30 year (l/s)	4.6
Winter CV	1.000	Check Discharge Rate(s)	✓	100 year (l/s)	5.9
Analysis Speed	Normal	1 year (l/s)	2.0	Check Discharge Volume	x
Skip Steady State	x	2 year (l/s)	2.1		

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 %)
2	0	0	0
10	0	0	0
30	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.277	Betterment (%)	0
SAAR (mm)	809	QMed	2.1
Host	1	QBar	2.4
BFIHost	0.233	Q 1 year (l/s)	2.0
Region	1	Q 2 year (l/s)	2.1
QBar/QMed conversion factor	1.111	Q 10 year (l/s)	3.4
Growth Factor 1 year	0.85	Q 30 year (l/s)	4.6
Growth Factor 2 year	0.90	Q 100 year (l/s)	5.9
Growth Factor 10 year	1.45		

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Node S14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	97.236	Product Number	CTL-SHE-0126-8400-1604-8400
Design Depth (m)	1.604	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.4	Min Node Diameter (mm)	1200

Node S14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	97.365
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	188

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	240.0	0.0	0.800	240.0	0.0	0.801	0.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	S14	90	97.458	0.222	22.6	21.4689	0.0000	OK
15 minute summer	S17	1	97.151	0.000	7.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	S14	Hydro-Brake®	S17	7.6	56.4

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Results for 10 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	S14	98	97.593	0.357	39.7	52.5166	0.0000	SURCHARGED
15 minute summer	S17	1	97.151	0.000	8.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	S14	Hydro-Brake®	S17	8.3	99.2

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S14	110	97.693	0.457	40.8	75.4546	0.0000	SURCHARGED
15 minute summer	S17	1	97.151	0.000	8.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	S14	Hydro-Brake®	S17	8.4	126.8

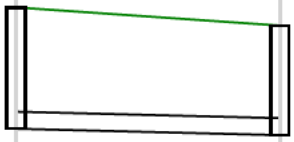
Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.71%

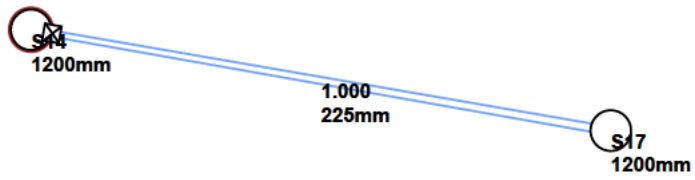
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S14	180	98.140	0.904	57.5	177.8588	0.0000	SURCHARGED
15 minute summer	S17	1	97.151	0.000	8.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	S14	Hydro-Brake®	S17	8.4	191.9

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Node Name		S14	S17
A4 drawing Hor Scale 500 Ver Scale 100 Datum (m) 88.000			
Link Name		1.000	
Section Type		225mm	
Slope (1:X)		205.2	
Cover Level (m)		98.840	98.600
Invert Level (m)		97.236	97.151
Length (m)		17.445	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd



Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	20.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	35.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S14	0.277	20.00	98.840	Manhole	Adoptable	1200	1254.615	60.412	1.425
S15			98.600	Manhole	Adoptable	1200	1271.804	57.433	1.425

Links (Input)

Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S14	S15	17.445	97.415	97.175	0.240	72.7	225

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	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)	240	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 %)
2	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S14	25	97.511	0.096	21.1	0.1089	0.0000	OK
30 minute winter	S15	26	97.266	0.091	21.1	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)
30 minute winter	S14	1.000	S15	21.1	1.355	0.346	0.2717	28.8

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Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S14	25	97.562	0.147	41.3	0.1667	0.0000	OK
30 minute winter	S15	26	97.309	0.134	41.3	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)
30 minute winter	S14	1.000	S15	41.3	1.579	0.677	0.4560	56.3

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S14	25	97.599	0.184	54.2	0.2081	0.0000	OK
30 minute winter	S15	26	97.338	0.163	54.2	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)
30 minute winter	S14	1.000	S15	54.2	1.649	0.888	0.5720	73.9

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Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S14	40	97.775	0.360	69.3	0.4071	0.0000	SURCHARGED
60 minute summer	S15	40	97.384	0.209	69.3	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)
60 minute summer	S14	1.000	S15	69.3	1.742	1.134	0.6824	120.0

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7.4 Appendix D – Borehole Logs

British Geological Survey

BGS ID: 584199 : BGS Reference: TQ21NW10
British National Grid (27700) : 524440,118150

TQ 21 NW 10.

2444. 1815

318/110 **Firsland, Twineham (formerly Furzelands Farm)**

Surface +46. Shaft 20; rest bore. Lining tubes: x 4¼ in to 125 down; x 3 in to 142 down (perforated). R.W.L. +35. Suction -81. Yield 220 g.p.h. (test). *Dando, Apr. 1930.*

Windpump. *Apr. 1940.* Yield c. 180 g.p.h. *June 1947.*

WC ...	...	142	142
Dug well		20	20
Blue clay		36	56
In Weald Clay Brown "		28	84
Mottled "			
2" of rock		15	99
10" of sand			
Blue clay to			142

GEOLOGICAL
JERMYN

O.A.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 584199 : BGS Reference: TQ21NW10
British National Grid (27700) : 524440,118150

TQ 2444 1815

TQ21/27

318/110 Firsland, Twineham (formerly Furzelands Farm)

Surface +46. Shaft 20; rest bore. Lining tubes: x 4½ in to 125 down; x 3 in to 142 down (perforated). R.W.L. +35. Suction -81. Yield 220 g.p.h. (test). *Dando, Apr. 1930.*
Windpump. *Apr. 1940.* Yield c. 180 g.p.h. *June 1947.*

WC	...	142	142

Dug well	20	20
Blue clay	36	56
Brown "	26	84
Mottled "	15	99
2" of rock		
10" of sand		
Blue clay to		142

Contact BGS: ngdc@bgs.ac.uk

TQ21/27
368

WELL BORING at Albourne, Hassocks County Sussex

Geol. map 1 in. map New Series 318 6 in. map

Made by Duke and Ockenden Date 1930

Dug well (old) 20 feet. Bored to 142 feet.

Communicated by D. & O.

Height above Ordnance Datum 46 ft Rest level of water 11 ft.

Yield Tested at 220 g. p. h. with suction at 127 ft.

Quality (with copy of analysis on separate sheet) —

318

110

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.
	Dug well	20	—	20	—
	Blue clay	36	—	56	—
	Brown clay	28	-	84	-
	Mottled clay	15	-	99	-
	Blue clay	26	-	125	-
	2" of rock				
	10" of sand				
	Blue clay to			142	-
	Wealden.				

Lined 4½" tubes to 125 ft.
3" perforated to 142 ft.

Boring at Furzelands Poultry Farm for R. Brown, Esq.
1¾ miles N.W. of Albourne Place.

Mof H notified 10/30 Dy

Albourne Hassocks Sussex
At Furzelands Poultry Farm D&O 1930 April
for R. Brown Esq
OD. 46.00
1¾ miles N.W. of Albourne Place
Strata

Dug Well (old). 20' 0"
Bored to .. . 142' 0
Lined 4½" Tubes to 125' 0"
" 3" perforated to 142' 0"
Water level .. . 11' 0"
Tested at 220 gls per hour with suction at 127' 0"

Blue Clay .. .. 20 - 56
Brown clay - . 56 - 84
Mottled clay - 84 - 99
Blue clay . 99 - 125
2" of Rock
10" of Sand
Blue clay to 142' 0
Wealden

WSB 4/464

J. C. KING, LTD., 42 TO 60, GOSWELL ROAD, LONDON E.C.

Parish of Twineham.

now "Fivsland"
Windmill pump In use
Visited S. Beecham
26-4-40.

Visited & sited on Sussex 38 S.E.W.
O.D. +46 Yield c 180 g.p.h.
Only used for watering cattle.
No further information
JKT
2.6.47.

DATA Bank

GEOLOGICAL SURVEY AND MUSEUM
JERMYN STREET, LONDON S.W. 1

(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 160. O.A.

7.5 Appendix E – Maintenance Schedule

Consulting Civil Engineers

Maintenance Schedule

Firsland Park Estate, Henfield Road, Albourne, West Sussex

Planning Ref: DC/23/2037

For

Firsland Park Estate

Rev - **P**

Reference **C3062**

Date **28th October 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	28/10/2024	Initial Issue	LH	CS

Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW
Tel: 01243 933253 E: mail@cgscivils.co.uk W: www.cgscivils.co.uk

1 Maintenance

1.1 Introduction

1.1.1 During construction, the Contractor will be responsible for maintaining the drainage and SuDS (Sustainable Drainage Systems). Upon handover, the client will take on the responsibility of these duties as laid out in this report.

1.1.2 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

1.2 SuDS at Firsland Park Estate, Albourne

1.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be **Attenuation Tank**

1.2.2 The SuDS features have been designed for easy maintenance and comprise:

- Regular Day-to-Day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS features
- Occasional tasks – checking the SuDS features and removing any silt that builds up in the SuDS feature
- Remedial work – repairing damage where necessary

1.3 SuDS Drainage Maintenance Specification

1.3.1 Attenuation Tank

In order to maintain the functioning of the attenuation tanks, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from per-treatment structures and/or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

1.4 General Drainage Maintenance Specification

1.4.1 Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater downpipes, road gullies and channel drains should be free from obstruction at all times to all free flow through the SuDS
- Inspection Chambers and Rodding Eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	**Frequency**
Inlet Structures **Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.** **Strim vegetation 1m min surround to structures and keep area free from silt and debris**	Monthly
Inspections Chambers and below ground control chambers. **Remove cover and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.** **Undertake inspection after leaf fall in Autumn**	Annually
Occasional Maintenance **Check topsoil levels are 20mm above edges of chambers to avoid mower damage.**	As necessary
Remedial Work **Repair physical damage if necessary**	As required

1.4.2 Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	**Frequency**
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly or as required
Remedial Work **Repair physical damage if necessary**	As required
Monitoring **Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.**	Annually
Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required