JACKSON
CONSULTING ENGINEERS

Infiltration Testing Report

Project:

Proposed Para 79 House, Land Adj. Tilsons Yard, Gedney Drove End

Client:

Mr Matt Parnel c/o
Swann Edwards Architecture Limited,
Swann Edwards Architecture,
Fen Road, Guyhirn,
Wisbech,
Cambs. PE13 4AA

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Introduction

Jackson consulting engineers have been appointed by Mr Matt Parnell c/o Swann Edwards Architecture, to report on infiltration testing form part of the supporting evidence for the planning submission of the proposed residential development adjacent to the side of Tilsons Yard, Gedney Drove End. The following document is to assist the planners in demonstrating that the development is acceptable in terms of sustainable drainage strategy for the development.

Existing Site

Location

The site lies to the west of Tilsons Yard, which is located to the north of Main Road (B1359), Gedney Drove End, Spalding, Lincolnshire – The approximate post code is PE12 9NE. An aerial location plan, with approximate site boundary is shown in figure 1.

Figure 1 - Site Location

Site Description

The existing site consists of a green field, which is partly laid to grass and partly arable field. As seen on the plan above, there is an existing ditch running within the site. This has been diverted by the client already and now forms the boundary of the proposed development. This ditch is owned by the IDB and will be well maintained.

Site Proposals

The site is being developed to provide 'Paragraph 79' house. The house will be of relatively substantial plan area, but the area of land is of significant size, and most of this is remaining soft landscaped areas.

Site Topography

The site sits deep in the fens and the topography of the land would be described as flat.

Infiltration Testing

The infiltration testing locations were instructed by Jackson Consulting Engineers, whilst the monitoring was undertaken by the client. A combination of BRE 365 and building regulations part H were used in the testing.

Location Plan

A sketch location plan of the trial pit locations is shown in figure 2, indicatively. The descriptions of the trial pits are shown further below.

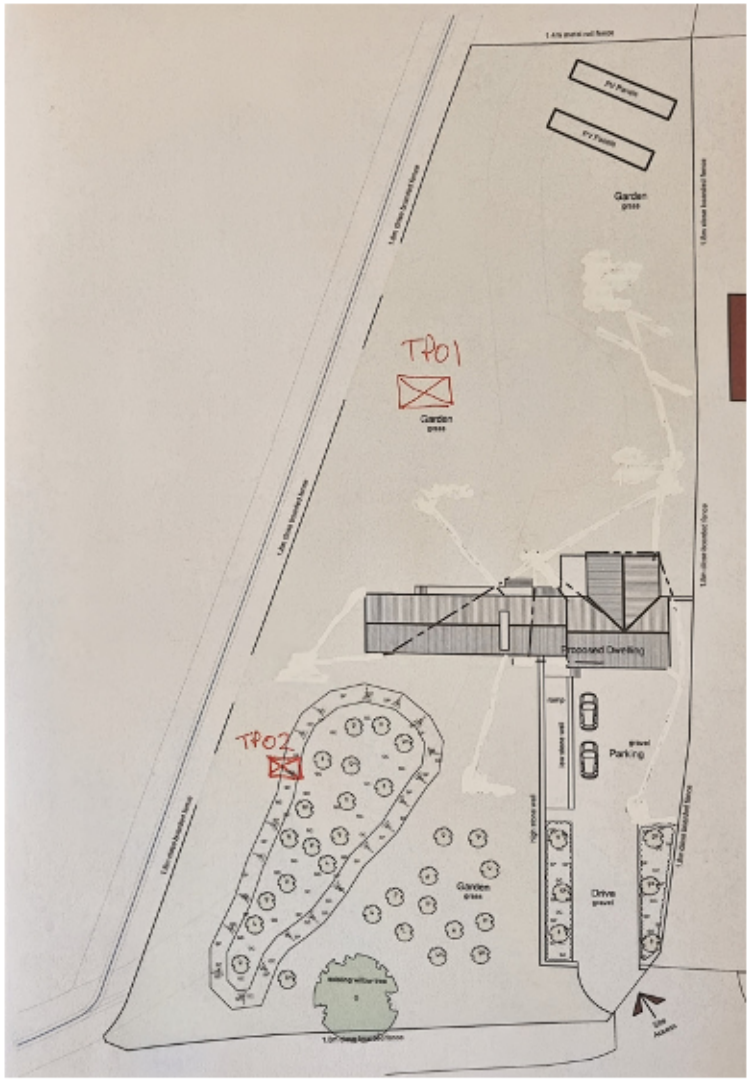


Figure 2 - TP Location Plan

A total of two trial pits were excavated and tested as part of this exercise.

TP01

The first trial pit was dug to a depth of 0.7m with a larger access pit, before a 0.3m cube was excavated in the bottom. The purpose of this test was to determine the VP rate in accordance with building regulations so that the treated foul drainage field can be calculated. A picture of this trial pit is shown below.

The testing has been carried out in accordance with paragraphs 1.34 to 1.38 of Building Regulations part H (H2).

In accordance with part H, a 300mm x 300mm was excavated to 300mm below the anticipated invert level. The excavation was filled, and the time recorded for the water to drop from 75% to 25%, this test was repeated 3 times. The results are shown in the table below.

Test Number	Time taken to drop between 75% and 25%, seconds (minutes)	Time/150 = V_p
1	4800 (80)	32
2	3900 (65)	26
3	4800 (80)	32

For infiltration to be viable for a drainage field the V_p rate should be between 12 and 100. The highest rate of the test is 32, which indicates a relatively good infiltration potential.

The testing results were provided by the developer, and JCE has only converted these figures into the soil infiltration rate, it is assumed that the testing was conducted properly and JCE take no responsibility for inaccurate recording.

TP02

Trial pit 2 was located in the rear garden of the proposed building, at a location approximate to the proposed soakaway. The dimensions of the pit were to 1.50m long x 0.6m wide x 0.8m deep, which represents a shallow house soakaway, the pits were filled with 300mm of water for each test. A picture of the trial pit is shown below.

TP02 was filled a total of 3 times, the results of this testing is shown in the tables below.

Test 1

Duration - Minutes	Depth of Water
0	30cm
10	27cm
29	24cm
41	22.5cm
67	15cm
77	14cm
117	11cm
177	8cm

Test 2

Duration - Minutes	Depth of Water
0	30cm
15	27.5cm
30	25.5cm
90	20cm
115	16cm
180	11.5cm
210	10cm
260	7cm

Test 3

Duration - Minutes	Depth of Water
0	30cm
18	26.5cm
88	21cm
171	16cm
211	13cm
276	10.5cm
337	7.0cm

By using the methodology from BRE 365 the summarised infiltration rate for each test is shown in the table below.

Soil infiltration rate, f, test 1	1.07342E-05	m/s
Soil infiltration rate, f, test 2	7.54148E-06	m/s
Soil infiltration rate, f, test 3	5.40657E-06	m/s

As shown, the infiltration rate decreases for each subsequent test, which is expected and the purpose of each test. For the purpose of the calculation the slowest rate of 5.4x10-6 m/s will be used, with the appropriate factor of safety.

The full set of the infiltration rate calculations can be found in appendix A.

The testing results were provided by the developer, and JCE has only converted these figures into the soil infiltration rate, it is assumed that the testing was conducted properly and JCE take no responsibility for inaccurate recording.

Foul Drainage Field Calculation

Number of occupants

In order to calculate the size of the drainage field, and assessment of the number of people likely to be present in the houses on a consistent basis needs to be taken into consideration. An estimation of this is given below.

Design Standard

The main guidance used in developing this report and the drawings are from Building regulations Part H.

Drainage field Sizes

As set out in section 1.44 of Building Regulations Part H, the equation for the drainage field size is;

$$A_t = p \times V_p \times 0.25$$

Where

A_t = the floor area of the drainage field in m^2

p = the number of people served by the tank

V_p = the percolation value in seconds/mm.

As calculated earlier in the document, the V_p value for the soil is 32. The proposed dwelling has 3 bedrooms, and it would be reasonable to assume that the maximum number of occupants at any given time would be 5 persons. Putting these figures into the above equation gives;

$$A_t = 5 \times 32 \times 0.25$$

$$40 = 5 \times 32 \times 0.25$$

The floor area required for the drainage field for the house is $40m^2$.

Drainage Field Location

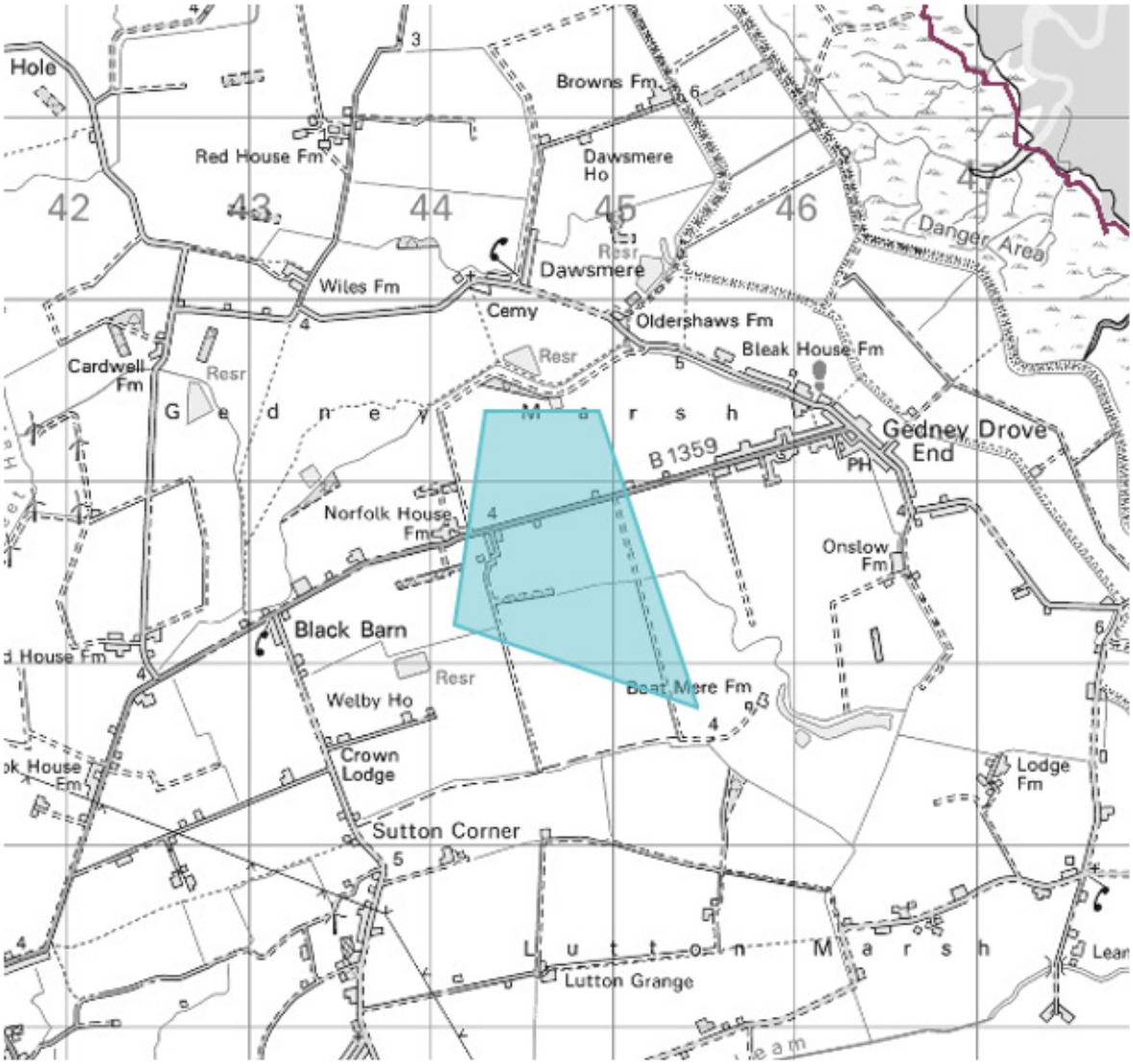
The location of the drainage field should be located in accordance with Building regulations Part H, in particular:

- At least 10m from any watercourse or permeable drain.
- At least 50m from the point of abstraction of any groundwater supply and not in any Zone 1 ground protection zone.
- At least 15m from any building.
- Sufficiently far away from any other drainage fields, drainage mounds or soakaways so that the overall soakage capacity of the ground is not exceeded.
- The disposal area should be downslope of groundwater sources.
- No water supply pipes or underground services other than those required by the disposal system itself should be located within the disposal area.
- No access roads, driveways or paved areas should be located within the disposal area.

The drainage field location and sizes can be shown on JCE drawing: 0131-JCE-00-SI-DR-C-3000 & 3103.

Groundwater

DEFRA's groundwater magic maps have shown that the area (light blue on the extract below) is not within a Source Protection Zone, and therefore is suitable for a drainage field.



The water table is understood to be 1.8m below ground level, the wasterwater treatment plant is to have a pumped outlet to raise the treated discharge to an acceptable level.

Soakaway Sizing

The soakaway sizing is shown on JCE drawing 0131-JCE-00-SI-DR-C-3000 & 3103. To keep the soakaway units as shallow as possible, the soakaways have been split up into 3 different areas, this ensures that the runs entering them are short.

The above sizing is capable of storing all storms up to and including the 1 in 100 year + a 40% allowance for climate change.

The sizing of the soakaway also ensures that all design storms up to an including the 1 in 100 year + 40% climate change event (critical storm), half drains within 24 hours.

The soakaway must be located a minimum of 5m from all building foundations and where possible boundary fences. Where located in soft landscaped areas, with pedestrian access, the minimum cover to the units is to be 300mm.

The Causeway Flow Calculations for the three soakaways can be found in appendix B.

Appendix

Appendix A – BRE 365 Soakaway Calculation

JACKSON CONSULTING ENGINEERS

JCE
Red Lion Quarter,
Red Lion Street,
PE11 1SX

The following calculations are based on the method stipulated in BRE Digest 365 - revision 2016

Project Title:	Land Adj. Tilsons Yard, Gedney Drove End
Project Code:	0131
Drawing Group:	Civil Engineering
Reference:	

Description
the trial pit is located to south west corner of the proposed dwelling, in natural ground.

Details of Pit	
Actual Depth of pit, D	0.8
Effective depth of pit, D_E	0.3
Length of pit, L	1.5
Width of pit, W	0.6
Proportion of pit volume occupied by gravel solid, P_g	0

V_{p75-25}, the effective storgae volume (m^3) of water in the soakage trial pit between 75% and 25% effective storage depth = L x W x 0.5D_E	0.135
a_{s50}, the internal surface area (m^2) of the soakage trial pit up to 50% effective storgae depth and including the base area = (2 x L x 0.5D_E) + (2 x W x 0.5D_E) + (L x W)	1.53
t_{p75-25}, the time (mins) for the water level to fall from 75% to 25% effective storage depth.	See test result below

Test 1	
Duration (mins)	177
Time 75% depth	40
Time 25% depth	177
t_{p75-25}	137

Test 2	
Duration (mins)	260
Time 75% depth	65
Time 25% depth	260
t_{p75-25}	195

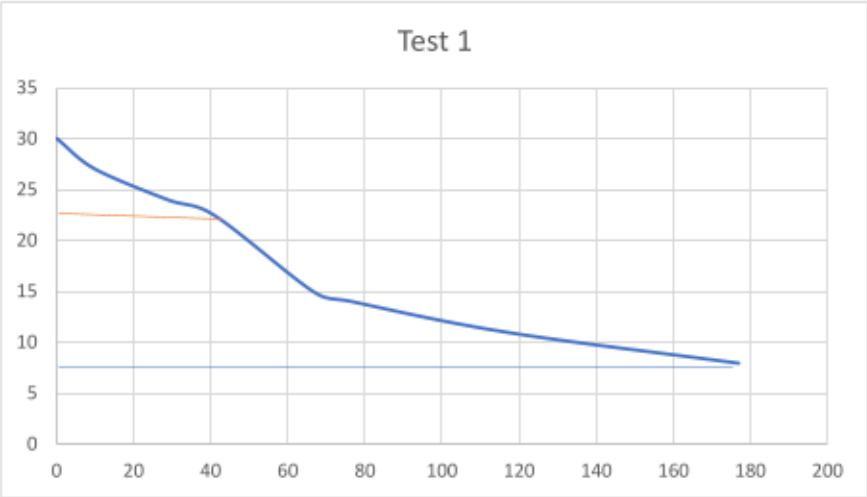
Test 3	
Duration (mins)	337
Time 75% depth	65
Time 25% depth	337
t_{p75-25}	272

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$

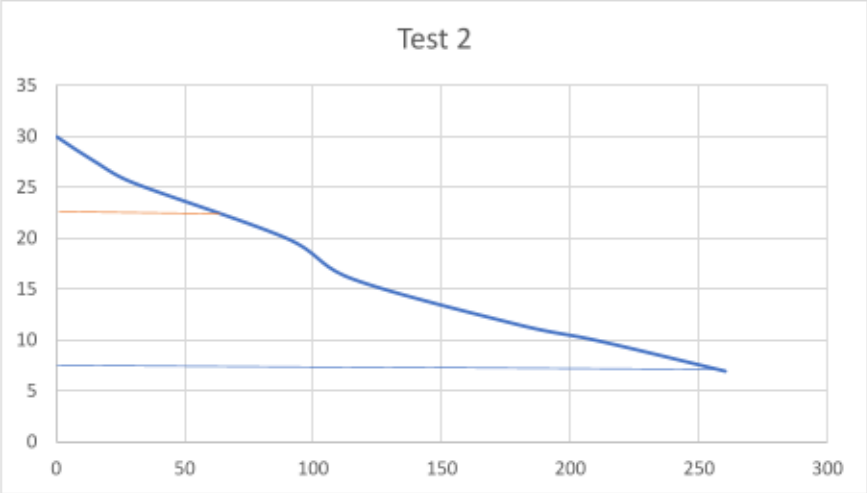
Soil infiltration rate, f, test 1	1.07342E-05	m/s
Soil infiltration rate, f, test 2	7.54148E-06	m/s
Soil infiltration rate, f, test 3	5.40657E-06	m/s

Summary
All tests were terminated at the 75% line. The last result is the slowest result as expected, and this result will be used for deisgn purposes.

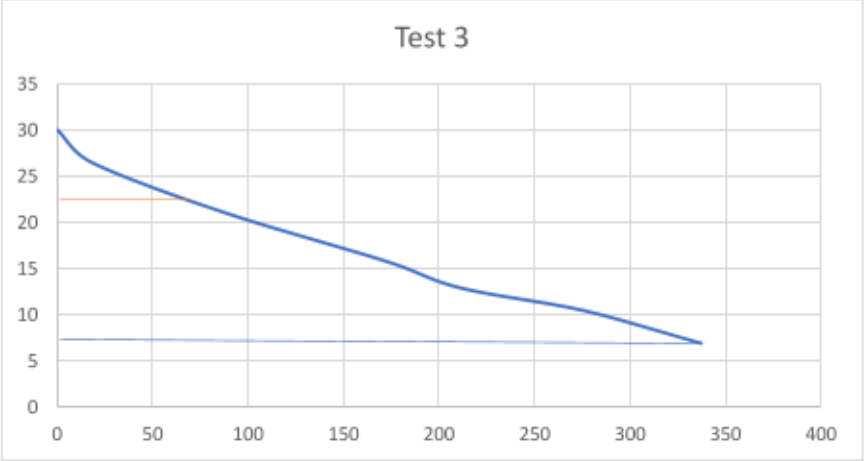
Duration, minutes	Depth of water, cm's
0	30
10	27
29	24
41	22.5
67	15
77	14
117	11
177	8



Duration, minutes	Depth of water, cm's
0	30
15	27.5
30	25.5
90	20
115	16
180	11.5
210	10
260	7



Duration, minutes	Depth of water, cm's
0	30
18	26.5
88	21
171	16
211	13
276	10.5
337	7



Appendix B – Surface Water Soakaway Sizing

Design Settings

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

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S2	0.008	5.00	9.000	500	0.400
Soakaway			9.000	1	0.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S2	Soakaway	2.400	0.600	8.600	8.500	0.100	24.0	100	5.03	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.582	12.4	1.1	0.300	0.400	0.008	0.0	20	0.967

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	2.400	24.0	100	Circular	9.000	8.600	0.300	9.000	8.500	0.400

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S2	500	Manhole	Adoptable	Soakaway	1	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S2	9.000	0.400	500	0	1.000	8.600	100
Soakaway	9.000	0.500	1	1	1.000	8.500	100

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Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

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

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01944	Safety Factor	1.5	Invert Level (m)	8.500
Side Inf Coefficient (m/hr)	0.01944	Porosity	0.95	Time to half empty (mins)	415

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	15.0	15.0	0.400	15.0	21.4	0.401	0.0	21.4

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Results for 1 year Critical Storm Duration. Lowest mass balance: 97.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2	9	8.623	0.023	1.1	0.0046	0.0000	OK
960 minute winter	Soakaway	615	8.567	0.067	0.1	0.9546	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S2	1.000	Soakaway	1.1	1.206	0.090	0.0031
960 minute winter	Soakaway	Infiltration		0.1			

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Results for 30 year Critical Storm Duration. Lowest mass balance: 97.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S2	440	8.675	0.075	0.3	0.0147	0.0000	OK
480 minute winter	Soakaway	440	8.675	0.175	0.6	2.4908	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute winter	S2	1.000	Soakaway	0.6	0.744	0.047	0.0169
480 minute winter	Soakaway	Infiltration		0.1			

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Results for 100 year Critical Storm Duration. Lowest mass balance: 97.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	570	8.736	0.136	0.3	0.0266	0.0000	FLOOD RISK
600 minute winter	Soakaway	570	8.736	0.236	0.6	3.3597	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S2	1.000	Soakaway	0.6	0.677	0.045	0.0188
600 minute winter	Soakaway	Infiltration		0.1			

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	585	8.839	0.239	0.5	0.0468	0.0000	FLOOD RISK
600 minute winter	Soakaway	585	8.839	0.339	0.5	4.8305	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S2	1.000	Soakaway	0.5	0.677	0.039	0.0188
600 minute winter	Soakaway	Infiltration		0.1			

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Design Settings

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

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S2	0.008	5.00	9.000	500	0.470
Soakaway			9.000	1	0.494

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S2	Soakaway	2.400	0.600	8.530	8.506	0.024	100.0	100	5.05	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.769	6.0	1.1	0.370	0.394	0.008	0.0	29	0.579

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	2.400	100.0	100	Circular	9.000	8.530	0.370	9.000	8.506	0.394

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S2	500	Manhole	Adoptable	Soakaway	1	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S2	9.000	0.470	500	0	1.000	8.530	100
Soakaway	9.000	0.494	1	1	1.000	8.506	100

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Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

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

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01944	Safety Factor	1.5	Invert Level (m)	8.506
Side Inf Coefficient (m/hr)	0.01944	Porosity	0.95	Time to half empty (mins)	404

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	15.0	15.0	0.400	15.0	21.4	0.401	0.0	21.4

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Results for 1 year Critical Storm Duration. Lowest mass balance: 96.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	S2	615	8.571	0.041	0.2	0.0080	0.0000	OK
960 minute winter	Soakaway	615	8.571	0.065	0.2	0.9219	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute winter	S2	1.000	Soakaway	0.2	0.467	0.027	0.0100
960 minute winter	Soakaway	Infiltration		0.1			

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S2	440	8.676	0.146	0.3	0.0287	0.0000	SURCHARGED
480 minute winter	Soakaway	440	8.676	0.170	0.3	2.4277	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute winter	S2	1.000	Soakaway	0.3	0.433	0.049	0.0188
480 minute winter	Soakaway	Infiltration		0.1			

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Results for 100 year Critical Storm Duration. Lowest mass balance: 96.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	570	8.738	0.208	0.3	0.0407	0.0000	FLOOD RISK
600 minute winter	Soakaway	570	8.738	0.232	0.3	3.3009	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S2	1.000	Soakaway	0.3	0.467	0.047	0.0188
600 minute winter	Soakaway	Infiltration		0.1			

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	585	8.841	0.311	0.5	0.0609	0.0000	FLOOD RISK
600 minute winter	Soakaway	585	8.841	0.335	0.5	4.7718	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S2	1.000	Soakaway	0.5	0.467	0.078	0.0188
600 minute winter	Soakaway	Infiltration		0.1			

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Design Settings

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

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S2	0.012	5.00	9.000	500	0.480
Soakaway			9.000	1	0.504

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S2	Soakaway	2.400	0.600	8.520	8.496	0.024	100.0	100	5.05	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.769	6.0	1.6	0.380	0.404	0.012	0.0	36	0.653

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	2.400	100.0	100	Circular	9.000	8.520	0.380	9.000	8.496	0.404

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S2	500	Manhole	Adoptable	Soakaway	1	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S2	9.000	0.480	500	0	1.000	8.520	100
Soakaway	9.000	0.504	1	1	1.000	8.496	100

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Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

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

Node Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.01944	Safety Factor	1.5	Invert Level (m)	8.496
Side Inf Coefficient (m/hr)	0.01944	Porosity	0.95	Time to half empty (mins)	423

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	18.0	18.0	0.400	18.0	25.2	0.401	0.0	25.2

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Results for 1 year Critical Storm Duration. Lowest mass balance: 96.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S2	288	8.577	0.057	0.3	0.0112	0.0000	OK
360 minute winter	Soakaway	288	8.577	0.081	0.6	1.3869	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute winter	S2	1.000	Soakaway	0.6	0.442	0.102	0.0137
360 minute winter	Soakaway	Infiltration		0.1			

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Results for 30 year Critical Storm Duration. Lowest mass balance: 96.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	570	8.717	0.197	0.4	0.0385	0.0000	FLOOD RISK
600 minute winter	Soakaway	570	8.717	0.221	0.4	3.7724	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S2	1.000	Soakaway	0.4	0.475	0.063	0.0188
600 minute winter	Soakaway	Infiltration		0.1			

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Results for 100 year Critical Storm Duration. Lowest mass balance: 96.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	S2	585	8.775	0.255	0.5	0.0500	0.0000	FLOOD RISK
600 minute winter	Soakaway	585	8.775	0.279	0.5	4.7721	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
600 minute winter	S2	1.000	Soakaway	0.5	0.475	0.079	0.0188
600 minute winter	Soakaway	Infiltration		0.1			

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S2	472	8.945	0.425	0.8	0.0832	0.0000	FLOOD RISK
480 minute winter	Soakaway	472	8.945	0.449	0.8	6.8486	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
480 minute winter	S2	1.000	Soakaway	0.8	0.442	0.126	0.0188
480 minute winter	Soakaway	Infiltration		0.1			

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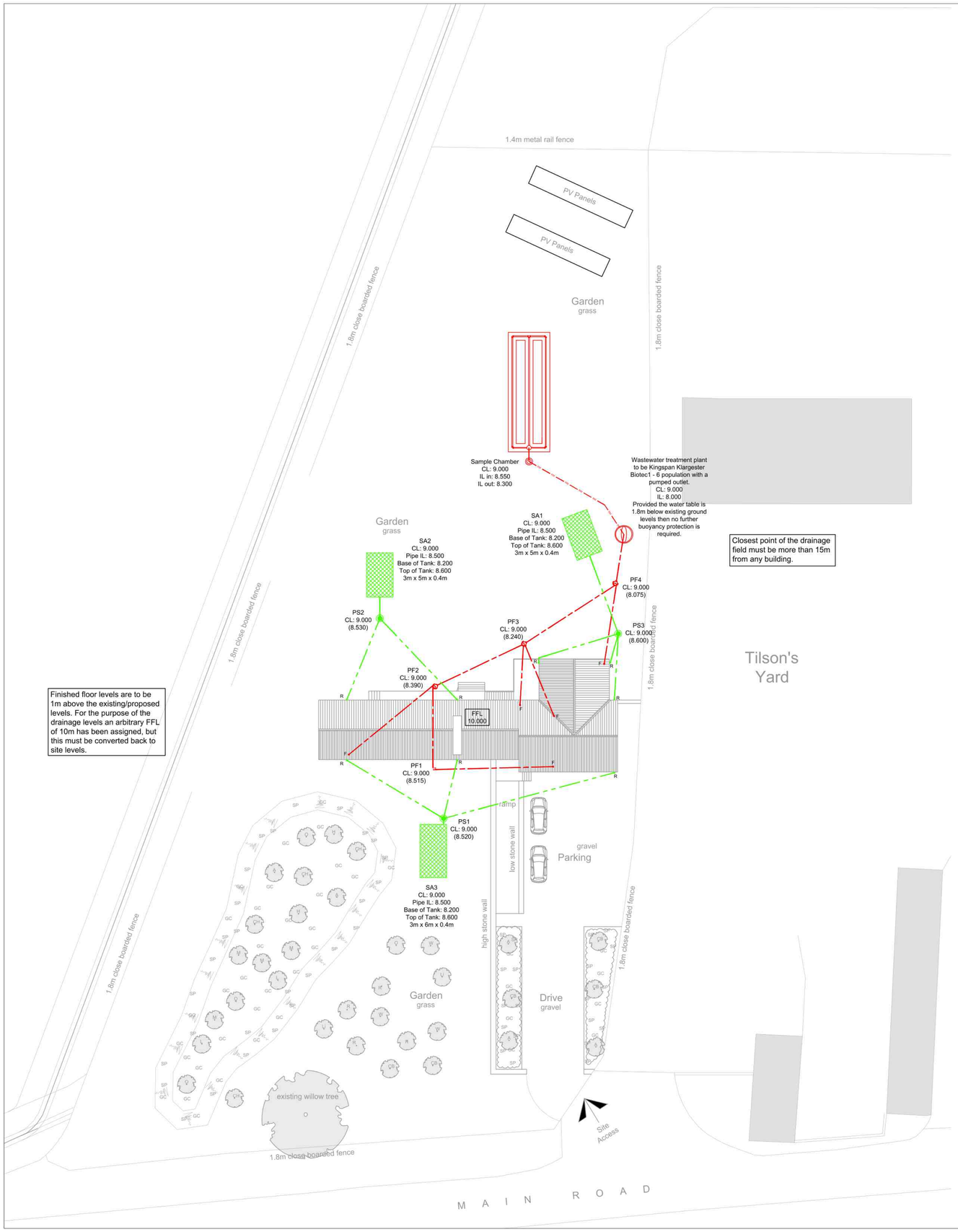

Drainage Key

xxxØ @ 1:xxx →	Private Surface Water Sewer
P.S1.1 CL: XX.XXX (x.xxx)	Private Surface Water PPIC Catchpit Cover Level (invert)
R	Private Surface Rainwater Pipe Location
xxxØ @ 1:xxx ←	Private Foul Water Sewer
	Private Foul Riser Main
F	Private Foul Below Ground Drainage Point (Architect to specify type, SVP, SS, FD, etc.)
P.F1.1 CL: XX.XXX (x.xxx)	Private Foul Water PPIC Cover Level (invert)
P.F1.1 CL: XX.XXX (x.xxx)	Private Foul Water mini PPIC Cover Level (invert)
	Private Foul Water Pumping Station Cover Level (invert)
FFL 22.200	Finished Floor Level Level Proposed — These levels are based on an arbitrary FFL and need to be converted back to site levels.
	Foul drainage field
	Wastewater treatment sample chamber

Building Regulations Part H Drainage Field Notes

All notes must be read and agreed in writing by the local authority before works commence.

Gradient of drainage field pipes should not be steeper than 1:200.

The equations for the drainage field sizes has been calculated as: $A_t = p \times V_p \times 0.25$. this equation is taken from Building Regulations Part H.

The percolation (V_p) value of the soil has been determined to be 32, the testing and results were provided by the developer.

Full details of the drainage calculations can be found in the report: 0131-JCE-00-SI-REP-3000

The developer has confirmed that there is no mains foul sewer in the proximity of the site.

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Drawing must be printed in colour. This text will be red if a coloured drawing.

Notes:

1. All drawings to be read in conjunction with Structural Engineers Drawings.
2. If in doubt - ASK!
3. Any discrepancies are to be reported back to the engineer immediately.
4. This drawing is not to be scaled.
5. All dimensions are in metres unless noted otherwise (pipe diameters are generally shown in millimetres, unless noted otherwise).
6. Drawings marked Preliminary, Information or Tender are for guidance/ approval only, i.e. NOT for Construction.
7. It is likely that existing services will be present within the existing site. Contractor to ensure all necessary precautions have been taken before any excavation takes place.
8. It is the contractors responsibility to locate existing services where they may be affected by proposed works and protect them as necessary and agreed by the utility provider.
9. Drawings to be read in conjunction with all relevant drawings.
10. Setting out to be in accordance with the Architectural plans.
11. All proprietary items to be installed in strict accordance with the manufacturers instructions and recommendations.
12. All works to be carried out in accordance wit the current British Standards, Codes for practice and Building Regulations.
13. Manhole covers are to be D400 in adoptable areas and the main access way, C250 for shared parking areas, B125 for private domestic car parking and A15 for soft landscaped and non-vehicle areas.
14. For private drainage, the pipework does not need concrete pipe protection if the following depths are exceeded:
    - 14.1. For PVC - 0.9m in vehicular areas or 0.6m in soft landscaping.
    - 14.2. For clayware or concrete - 1.2m in vehicular areas or 0.6m in soft landscaping.
15. Pipe materials to be the following;
    - 15.1. Clayware to be Class 120
    - 15.2. Concrete to be Class M
    - 15.3. Thermoplastic to have a nominal ring stiffness of SN4.
16. PPIC's deeper than 1.2m are to be fitted with a non-access cover.
17. Unused PPIC connections are to be installed with caps.
18. Excavations near foundations need to be carefully considered. Refer to building regulations, and consult with the structural engineer where appropriate.
19. Where drainage gradients have been stated, these represent the minimum gradients. Actual gradient between stated inverts might be steeper.
20. No work is to be started until all necessary approvals have been obtained.
21. Drainage has been design to store all storms up to and including the 1 in 100 year + 40% climate change event with no flooding offsite.
22. The junctions from RWP's, SVP's and similar connections into main runs are to be determined on site, and in accordance with building regulations.
23. All RWP's, to be fitted with rodding access.
24. For PPIC's the orientation of the main channel is to generally connect upstream and downstream pipes with stated inverts. Non stated inverts such as RE's, R's and F's to generally connect into side inlets.
25. Drainage generally designed to incorporate a side step in preformed bases down into the main channel invert of of 100mm. Details vary dependant on the preformed base and manufacturer selected.
26. Backdrops might be required to ensure that building drainage above foundations are able to enter the PPIC - refer to details.
27. Unless noted, rain water pipes (R's) and below ground foul drainage pipes (F's) to be 100mmØ . R's to have a minimum fall of 1:100, and F's to have a minimum fall of 1:40, unless a WC is connected when the minimum fall shall be 1:80.
28. All RWP's and below ground foul drainage to be set out from the architects drawings.
29. Where drainage gradients have been stated, these represent the minimum gradients, and can be steeper - subject to a maximum gradient of 1:10.
30. If the contractor is unsure which manhole/PPIC reference is being used for the actual manhole/PPIC, ask!
31. Cover levels are approximate only and must suit the finished external levels.
32. An arbitrary datum for the FFL is being used and this must be converted back to site specific levels.
33. Soakaways must be a minimum of 5m away from building foundations.
34. Soakaway crates are to have a minimum of 300mm cover.
35. Construction is not to commence until all necessary approvals have been received.
36. The water table is considered to be 1.8m below the existing ground levels.

Preliminary
For client approval

Rev	Description	Drn	Ck'd	Date

Client:
Mr Parnell

JACKSON CONSULTING ENGINEERS
JCE
Red Lion Quarter
Red Lion Street,
Spalding,
Lincolnshire
PE11 1SX
Tel: 01775 729259
Email: enquiries@j-ce.co.uk
Web: www.j-ce.co.uk

Project Title:
Proposed Para 79 House,
Land Adjacent Tilsons Yard,
Gedney Drove End

Drawing Title:
Drainage General Arrangement.

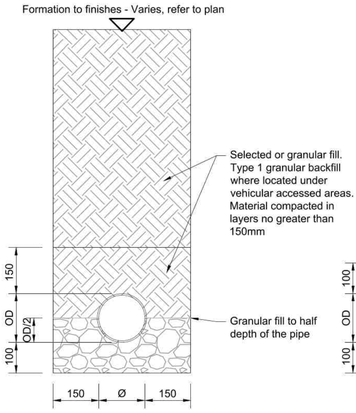
Drawing Status:
Preliminary

Scale: 1:250	Paper size: A1	Date:10/08/2021
Drawn: BJ	Checked: JCE	Approved: JCE

Drawing Number: 0131-JCE-00-SI-DR-C-3000
Rev -

Protection Measure Notes

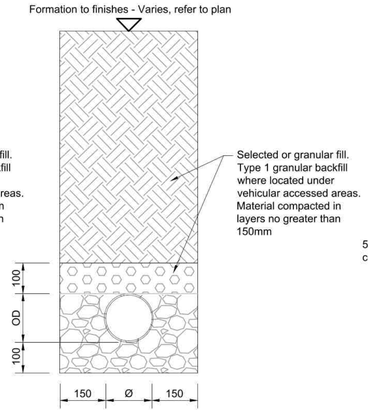
For concrete and clay pipes, where cover to pipe is less than 1.2m in trafficked areas, or 0.6m in soft landscaped areas, then pipe protection of either a concrete slab or concrete pipe surround, to be used as agreed with the building inspector.
For thermoplastic pipes ('flexible'), where cover to pipe is less than 0.9m in trafficked areas, or 0.6m in soft landscaped areas, then pipe protection of either a concrete slab or concrete pipe surround, to be used as agreed with the building inspector.
Material to be in accordance with Building Regulations Part H.
Pipes and cover to be in full accordance with Building Regulations Part H; Tables 8, 9 and 10.



Class B: Bedding Factor 1.9

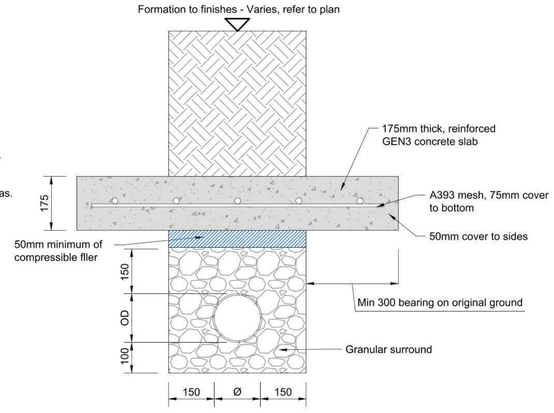
Generally suitable in all soil conditions

(Scale 1:10)



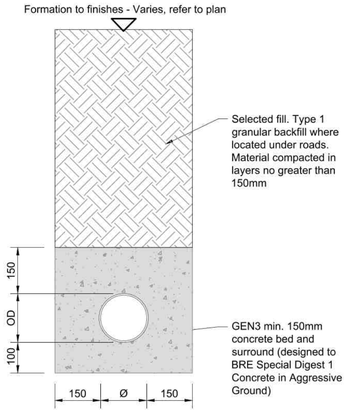
Flexible Pipes

(Scale 1:10)



Concrete Slab Pipe Protection

(Scale 1:10)



Type 'Z' Bedding

(Scale 1:10)

Note:
Type Z pipe surround must be agreed by the building control inspector. Only practical solution for very shallow pipes/start or rodding points, RWP's, etc..

Key

Selected fill: free from stones larger than 40mm, lumps of clay over 100mm, timber, frozen material, vegetable matter.

Granular Material - for rigid pipes the granular material should conform to BS EN 1610 Annex B Table B.15 and should be single size material or graded material from 5mm up to a maximum size of 10mm for 100mm pipes, 14mm for 150mm pipes, 20mm for pipes from 150mm up to 600mm diameter and 40mm for pipes more than 600mm diameter. Compaction fraction maximum 0.3 for class N or B and 0.15 for class F.

Selected fill or granular fill free from stones larger than 40mm.

Note:
1. Provision may be required to prevent groundwater flow in trenches with class B type bedding.

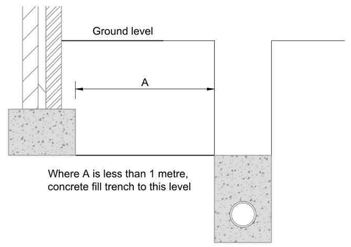
Pipe Bedding Materials

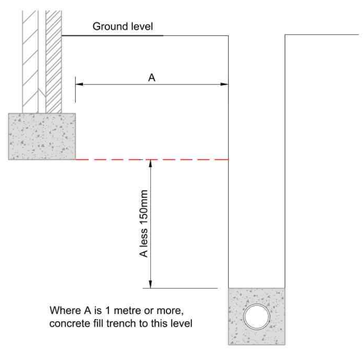
Nominal size of pipe (mm)	Granular material sizes (mm)
	Graded
100	5 to 10
150	5 to 14
225	5 to 20
300	5 to 20
375	5 to 20
450	5 to 20
525	5 to 20
600	5 to 20
600 Over	5 to 40

Where used, type 1 granular backfill material to Department of Transport Specification for Highway Works, clause 803 to be used where pipes are laid below vehicle areas.

Note:

Where pipes have less than the minimum recommended cover stated in the pipe details above, the pipes should, where necessary, be protected from damage by a reinforced concrete cover slab with a flexible filler and at least 75mm of granular material between the top of the pipe and the underside of the flexible filler below the slabs.



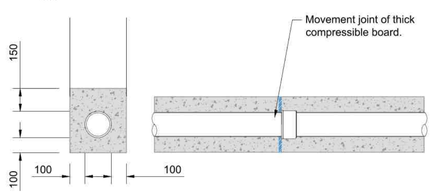


Pipe Runs Near Foundations

(Scale 1:20)

Note:

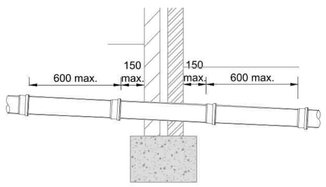
Where it is necessary to backfill the trench with concrete in order to protect nearby foundations movement joints formed with compressible board should be provided at each socket or sleeve joint face



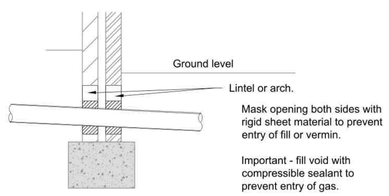
Joints for concrete encased pipes

(Scale 1:20)

Where pipes are required to pass through foundations the structural engineer is to advise on a detail to suit the foundation requirments



A) Short length of pipe bedded in wall, joints formed within 150mm of either wallface. Adjacent rocker pipes of max. length 600mm with flexible joints.



B) Arch or lintel opening to give 50mm space all around the pipe

Pipes Penetrating Walls

(Scale 1:20)

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Drawing must be printed in colour. This text will be red if a coloured drawing.

Notes:

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2. If in doubt - ASK!
3. Any discrepancies are to be reported back to the engineer immediately.
4. This drawing is not to be scaled.
5. All dimensions are in metres unless noted otherwise (pipe diameters are generally shown in milimetres, unless noted otherwise).
6. Drawings marked Preliminary, Information or Tender are for guidance/ approval only, i.e. NOT for Construction.
7. It is likely that existing services will be present within the existing site. Contractor to ensure all necessary precautions have been taken before any excavation takes place.
8. It is the contractors responsibility to locate existing services where they may be affected by proposed works and protect them as necessary and agreed by the utility provider.
9. Drawings to be read in conjunction with all relevant drawings.
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11. All proprietary items to be installed in strict accordance with the manufacturers instructions and recommendations.
12. All works to be carried out in accordance wit the current British Standards, Codes for practice and Building Regulations.
13. Manhole covers are to be D400 in adoptable areas and the main access way, C250 for shared parking areas, B125 for private domestic car parking and A15 for soft landscaped and non-vehicle areas.
14. For private drainage, the pipework does not need concrete pipe protection if the following depths are exceeded:
    14.1. For PVC - 0.9m in vehicular areas or 0.6m in soft landscaping.
    14.2. For clayware or concrete - 1.2m in vehicular areas or 0.6m in soft landscaping.
15. Pipe materials to be the following;
    15.1. Clayware to be Class 120
    15.2. Concrete to be Class M
    15.3. Thermoplastic to have a nominal ring stiffness of SN4.
16. PPIC's deeper than 1.2m are to be fitted with a non-access cover.
17. Unused PPIC connections are to be installed with caps.
18. Excavations near foundations need to be carefully considered. Refer to building regulations, and consult with the structural engineer where appropriate.
19. Where drainage gradients have been stated, these represent the minimum gradients. Actual gradient between stated inverts might be steeper.
20. No work is to be started until all necessary approvals have been obtained.
21. Drainage has been design to store all storms up to and including the 1 in 100 year + 40% climate change event with no flooding offsite.
22. The junctions from RWP's, SVP's and similar connections into main runs are to be determined on site, and in accordance with building regulations.
23. All RWP's, to be fitted with rodding access.
24. For PPIC's the orientation of the main channel is to generally connect upstream and downstream pipes with stated inverts. Non stated inverts such as RE's, R's and F's to generally connect into side inlets.
25. Drainage generally designed to incorporate a side step in preformed bases down into the main channel invert of of 100mm. Details vary dependant on the preformed base and manufacturer selected.
26. Backdrops might be required to ensure that building drainage above foundations are able to enter the PPIC - refer to details.
27. Unless noted, rain water pipes (R's) and below ground foul drainage pipes (F's) to be 100mmØ . R's to have a minimum fall of 1:100, and F's to have a minimum fall of 1:40, unless a WC is connected when the minimum fall shall be 1:80.
28. All RWP's and below ground foul drainage to be set out fromarchotects drawings.
29. Where drainage gradients have been stated, these represent the minimum gradients, and can be steeper - subject to a maximum gradient of 1:10.
30. If the contractor is unsure which manhole/PPIC reference is being used for the actual manhole/PPIC, ask!
31. Cover levels are approximate only and must suit the finished external levels.

Rev	Description	Drn	Ck'd	Date

Client:
Mr Parnell

JACKSON CONSULTING ENGINEERS
JCE
Red Lion Quarter
Red Lion Street,
Spalding,
Lincolnshire
PE11 1SX
Tel: 01775 729259
Email: enquiries@j-ce.co.uk
Web: www.j-ce.co.uk

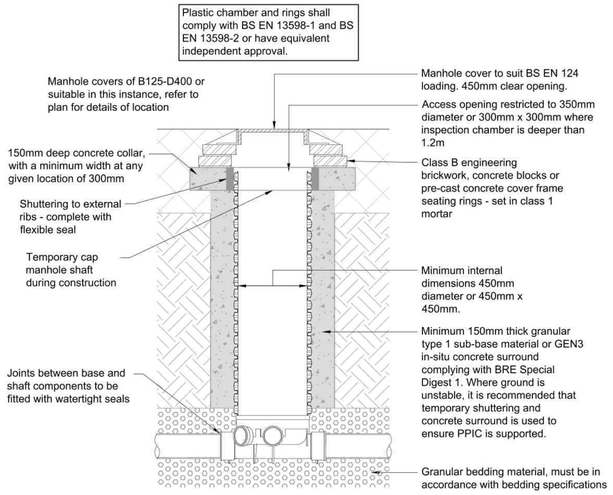
Project Title:
Proposed Para 79 House,
Land Adjacent Tilsons Yard,
Gedney Drove End

Drawing Title:
Drainage Details
Sheet 1 of 4

Drawing Status:
Preliminary

Scale: As Shown	Paper size: A1	Date:10/08/2021
Drawn: BJ	Checked: JCE	Approved: JCE

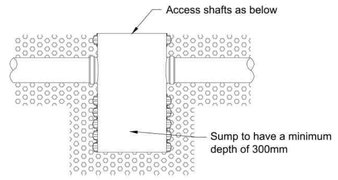
Drawing Number: 0131-JCE-00-SI-DR-C-3100
Rev -



Range 450 IC - Osma/Wavin Chamber

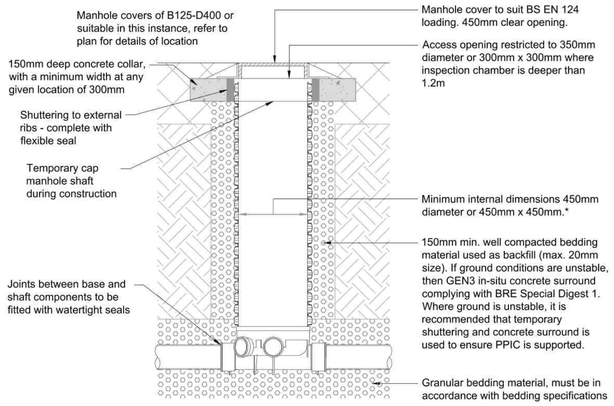
In areas subject to vehicular loading

Maximum depth 3m (over 1.2m deep - non-access cover fitted)
(Scale 1:20)



Alternative PPIC Catchpit Base

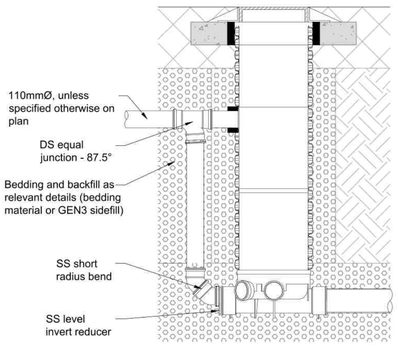
(Scale 1:20)



Range 450 IC - Osma/Wavin Chamber

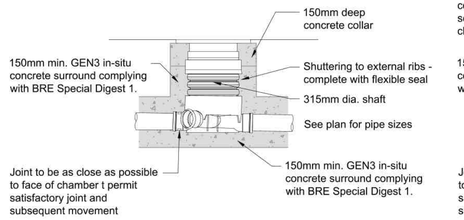
In Pedestrian Only Areas

Maximum depth 3m (over 1.2m deep - non-access cover fitted)
(Scale 1:20)



Typical Backdrop into PPIC

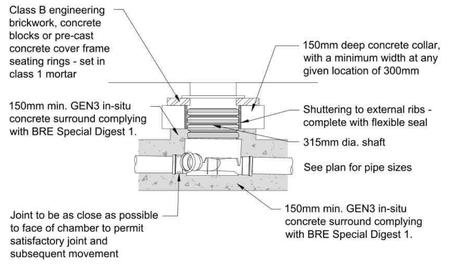
Refer to full PPIC details for correct loadings
(Scale 1:20)



Range 315 - Osma/Wavin Chamber

Maximum depth 0.6m - up to A15 Loading

(Scale 1:20)

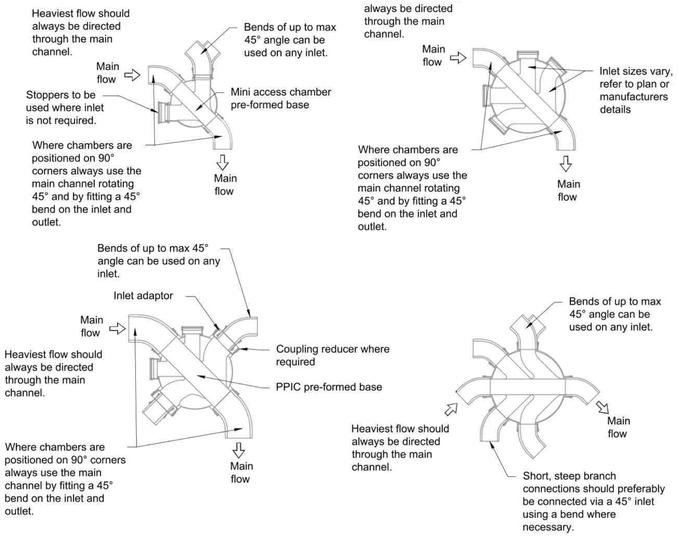


Range 315 - Osma/Wavin Chamber

Maximum depth 0.6m - up to B125 to D400 Loading

(Scale 1:20)

Alternative base layouts are available, please consult the supplier/drainage plan to determine the most suitable base configuration.



PPIC/Mini Access Chamber Layout Arrangement

(Scale 1:20)

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23. All RWP's, to be fitted with rodding access.
24. For PPIC's the orientation of the main channel is to generally connect upstream and downstream pipes with stated inverts. Non stated inverts such as RE's, R's and F's to generally connect into side inlets.
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Rev	Description	Drn	Ck'd	Date

Client:
Mr Parnell

JACKSON CONSULTING ENGINEERS
JCE
Red Lion Quarter
Red Lion Street,
Spalding,
Lincolnshire
PE11 1SX
Tel: 01775 729259
Email: enquiries@j-ce.co.uk
Web: www.j-ce.co.uk

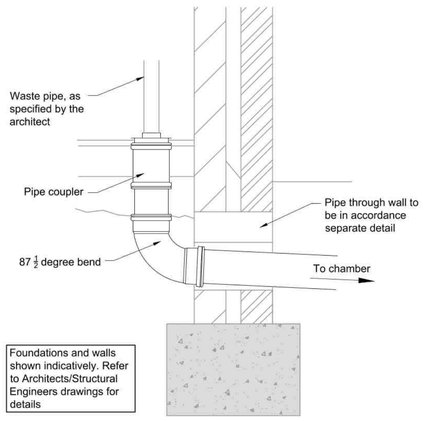
Project Title:
Proposed Para 79 House,
Land Adjacent Tilsons Yard,
Gedney Drove End

Drawing Title:
Drainage Details
Sheet 2 of 4

Drawing Status:
Preliminary

Scale: As Shown	Paper size: A1	Date:10/08/2021
Drawn: BJ	Checked: JCE	Approved: JCE

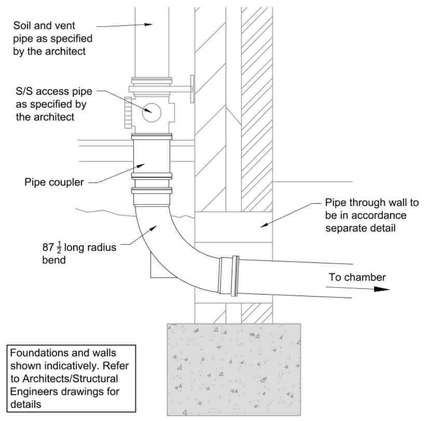
Drawing Number: 0131-JCE-00-SI-DR-C-3101
Rev -



Internal Waste Pipe Connection

Typically based on Wavin/OsmaDrain

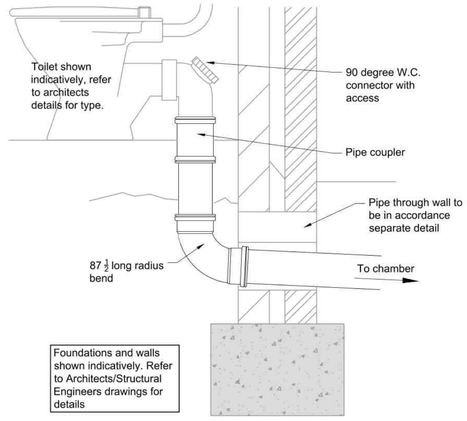
(Scale 1:10)



Soil Vent Pipe to Drain

Typically based on Wavin/OsmaDrain

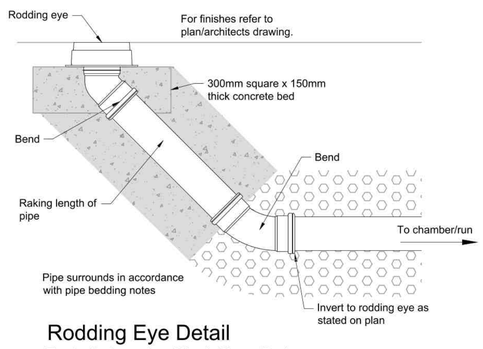
(Scale 1:10)



W.C. Direct to Drain

Typically based on Wavin/OsmaDrain

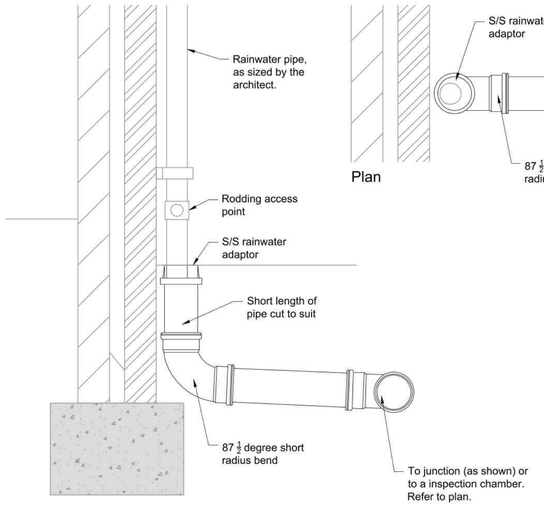
(Scale 1:10)



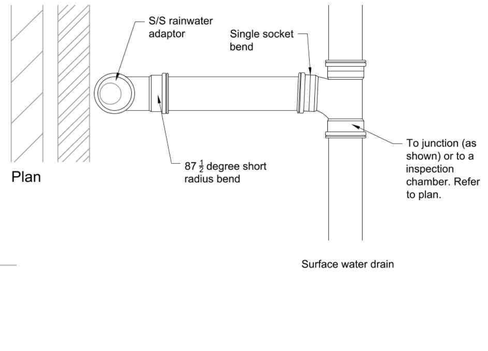
Rodding Eye Detail

Typically based on Wavin/OsmaDrain

(Scale 1:10)



Section



Surface water drain

External Rainwater Pipe Connection

Typically based on Wavin/OsmaDrain

(Scale 1:10)

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JCE
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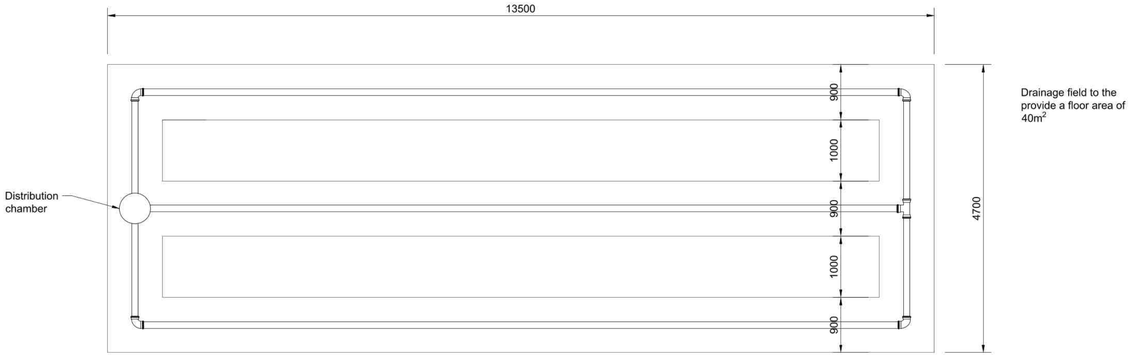
Drawing Title:
Drainage Details
Sheet 3 of 4

Drawing Status:
Preliminary

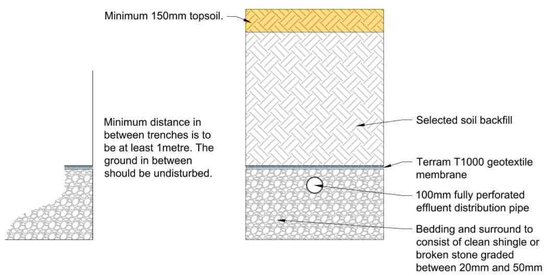
Scale: As Shown	Paper size: A1	Date:10/08/2021
Drawn: BJ	Checked: JCE	Approved: JCE

Drawing Number:
0131-JCE-00-SI-DR-C-3102

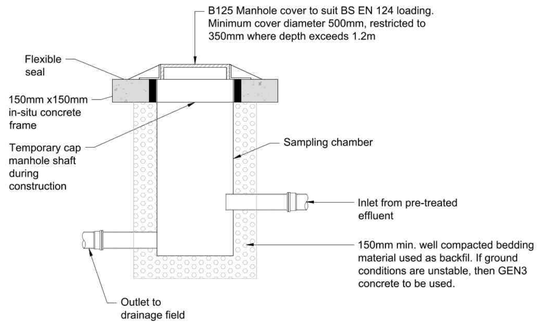
Rev
-



Drainage Field
(Scale 1:50)



Typical Section Through Drainage Field Trench
In Accordance with BS 6297:2007
(Scale 1:20)



Typical Sample Chamber
(Scale 1:20)

Details are to be read in accordance with the details and notes found on 0131-JCE-00-SI-DR-C-3000

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Drawing Number: 0131-JCE-00-SI-DR-C-3103
Rev -