CODA Planning

Proposed Residential Development
Grove Street
Barnsley

Drainage Assessment

Prepared by EWE Associates Ltd
Draft Rev0 April 2019

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CLIENT DETAILS

CODA Planning
Sheffield

CONTRACT

This report describes work commissioned by CODA Planning following written instruction dated 2nd April 2019. CODA Planning representative for the contract was Mr Mark Boyd. Lea Favill of EWE Associates Ltd carried out the work.

Date: 26th April 2019

Prepared by: …… ……. Lea Favill
Director

REVISION HISTORY

Draft Report Rev0 issued 26th April 2019
- 1No copy issued to Mr Mark Boyd (CODA Planning)

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1. INTRODUCTION

Terms of Reference

This report was commissioned by CODA Planning to consider the surface water and foul water systems for the proposed residential development off Grove Street, Barnsley.

The proposal involves the construction of 32 residential dwellings and private car parking. The drainage issues are being considered as part of the planning conditions.

Approach to the Assessment

For the purposes of this study, the following have been considered: -

- Site level information and proposed finished levels of the building and external works.
- Existing infiltration characteristics of subsoils.
- Onsite constriction.
- Options available to developer.
- NPPF guidelines with regards to the control of runoff.
- PPG3 pollution prevention guidelines.
- Flood risk to adjacent land users.

Design Constraints

For the purposes of this study, the following constraints have been applied: -

- The design is based on the proposed layout provided by the client's representative. At this stage no modifications to the layout are proposed.
- The proposal is for 32 residential dwellings as such any SUDs features or attenuation structures within private land will be maintained by the individual owner.
- The individual driveways will eb constructed using permeable paving within private land will be maintained by the individual owner.
- SUDs features are to be recommended where practically possible.
- Site investigation works have been undertaken within the site by RAB Consultants. The tests provided robust results ranging from 0.0.35m/hr and 0.094m/hr. The worst case of 0.035m/hr (35mm/hr) has been adopted for this drainage design. The extract from the report is provided at Appendix A.

- It is assumed that the minimum design standard is 1 in 100 years plus climate change (40%).
- Due to the existing development to the east of the site that no on site above ground flooding will be acceptable up to and including 1 in 100 years plus climate change (40%) storm.

2. DESIGN OF PROPOSED SURFACE WATER DRAINAGE SYSTEM

Catchment Area

The catchment area was calculated from proposed layout drawing provide by Flynn Architecture Ltd (2256/104 dated April 2015). The total impermeable area to be drained has been estimated at 2227m² (0.2227 hectares). This includes 1564m² of roofed area and 663m² of private drives.

Drainage Strategy

The proposed drainage strategy is as follows and is illustrated on the drainage layout drawing provided at Appendix B of this report.

- Roof drainage from induvial Plots 1 to 32. Lined soakaways 2.4m diameter varying between 2 and 3m deep depending on topography.
- Private driveways. Permeable paving system to be constructed within driveways with porous paving/blocks above.

Adoption & Maintenance

It is considered that the lined soakaways within private gardens will be maintained by individual owners.

It is considered that the permeable paving systems within private driveways will be maintained by individual owners.

Existing Drainage

The site was previously the school with a considered roofed and paved area. There are surface water and combined sewers located within the adjacent highways.

There is an existing 225mm diameter surface water located within Grove Street and Grasmere Road adjacent to the site. The Yorkshire Water sewer plan is provided at Appendix E of this report.

Proposed Drainage Strategy – Roof Drainage

The percolation testing provided an estimate of 0.035m/hr. See Appendix C for details of calculations.

The roof drainage from each plot will be directed to a lined soakaway. The lined soakaway has been designed based on a maximum impermeable area of 135m² (0.014 ha). The soakaways are designed to a 1 in 100 year plus climate change (40%) standard.

The drainage strategy is provided at Appendix C of this report.

Proposed Drainage Strategy – Discharge to permeable paving

The driveway drainage from each plot will be directed to a permeable paving system. The subbase will consist of 30% voided subbase and will be 0.15m thick with the permeable paving system constructed above.

Each driveway will be at least 18m² which will require a sub base depth of 0.15m deep. The voided sub base will provide the required storage upto and including the 1 in 100 year plus climate change (40%) rainfall event. The calculation sheet is provided at Appendix D of this report.

3. DESIGN OF PROPOSED FOUL WATER DRAINAGE SYSTEM

Existing Drainage

There is an existing 225mm diameter combined connection from the site located within the south east corner within Grasmere Road. The combined sewer is approximately 2.5m deep in line with the site. The Yorkshire Water sewer plan is provided at Appendix E of this report.

Proposed Foul Drainage – Discharge to combined sewer

It is proposed that the whole of the site discharges to the existing combined manhole located at the south east corner of the site. The manhole is approximately 2.5m deep and therefore the whole of the site can gravitate to this point.

The foul drainage will be located within the rear gardens and therefore will remain private.

The foul drainage drawing is provided at Appendix F of this report.

Appendix A: - Percolation Test Results

- Cross sections including design levels

5.0 Infiltration testing results

Infiltration tests were undertaken (in line with Building Regulations H2 1.34) at the two locations within the site boundary (see Figure 2 below).

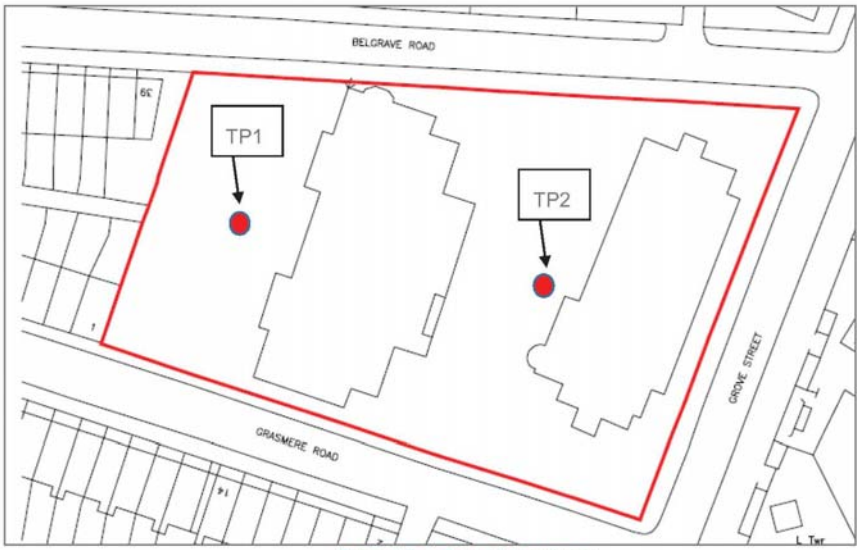


Figure 2 – Trial pit locations

The pits were dug to a 1 m depth with a 0.3 m x 0.3 m hole dug in the base (see Figure 3). The test was performed on 08.07.2015. The day was wet and the days preceding the test included heavy downpours. The holes were pre-wetted the day before, and no water was evident at the time of carrying out the tests.



Figure 3 – Trial pit photographs

The results of the testing were:

- Trial Pit 1 – test 1 - Infiltration rates of 0.046 m / hr
- Trial Pit 1 – test 2 - Infiltration rates of 0.035 m / hr
- Trial Pit 2 – test 1 - Infiltration rates of 0.094 m / hr
- Trial Pit 2 – test 1 - Infiltration rates of 0.075 m / hr

The 'Quick Storage Estimate' tool in the Source Control module of WinDes 2015.1 has been used to estimate required storage volumes on site as a result of the proposed development. The BRE Digest 365 guidance says to use the lowest infiltration rate measured at the trail pits. An infiltration coefficient of 0.035 m / hr has been used to represent the lowest infiltration rate of the two infiltration tests carried out.

Table 3: Windes 2015:1 Quick Storage Estimate components

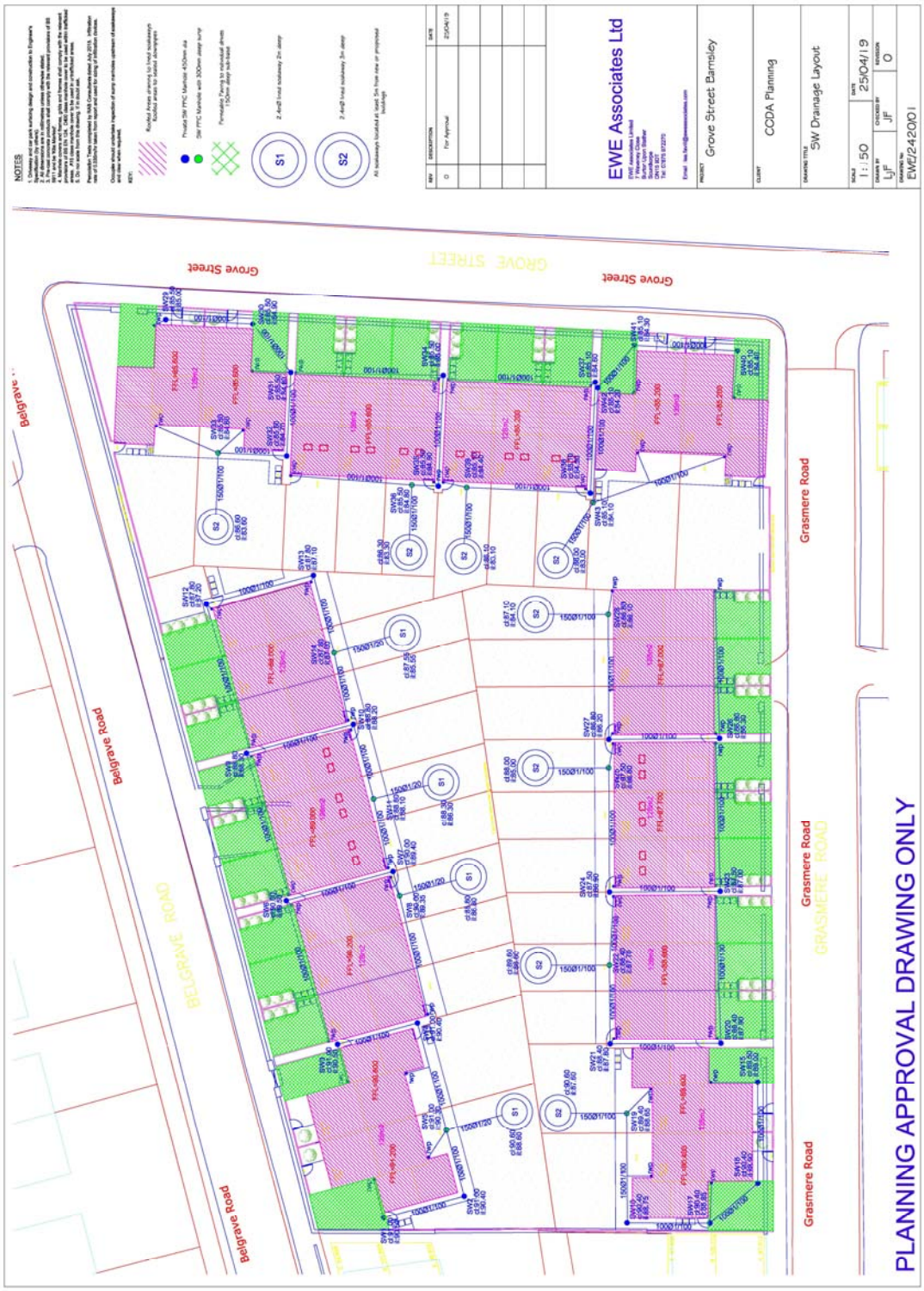
Inflow	Rainfall data
Region	England and Wales
M5-60 (mm)	18.500 mm
Ration R	0.376
Storms	Summer and winter
Cv	Summer: 0.750 Winter: 0.840
Impermeable area	0.21 ha
Maximum allowable discharge (l/s)	0 (assume 100% infiltration)
Infiltration coefficient (m/hr)	0.035
Safety factor	2

The 'Quick Storage Estimate' tool confirmed that infiltration techniques are feasible on the site and that the following storage volumes are required to manage a range of rainfall events.

Table 4: Storage volumes

Rainfall event	Storage volume
1 in 10 year	28 m^3 – 81 m^3
1 in 30 year	36 m^3 – 100 m^3
1 in 100 year	47 m^3 – 125 m^3
1 in 100 year & 30% climate change	61 m^3 – 162 m^3

Appendix B: - Surface Water Drainage Drawing EWE2420.01



Appendix C: - Roof Drainage Soakaway Calculation Sheets

EWE Associates Ltd		Page 1
Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 26/04/2019 09:50	Designed By Windows7	
File 100yr+CC40% lined...	Checked By	
Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 579 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	89.094	0.594	0.1	4.2	O K
30 min Summer	89.202	0.702	0.1	5.0	O K
60 min Summer	89.322	0.822	0.1	5.8	O K
120 min Summer	89.444	0.944	0.1	6.7	O K
180 min Summer	89.509	1.009	0.1	7.1	O K
240 min Summer	89.546	1.046	0.1	7.4	O K
360 min Summer	89.580	1.080	0.1	7.6	O K
480 min Summer	89.588	1.088	0.1	7.7	O K
600 min Summer	89.591	1.091	0.1	7.7	O K
720 min Summer	89.590	1.090	0.1	7.7	O K
960 min Summer	89.597	1.097	0.1	7.7	O K
1440 min Summer	89.584	1.084	0.1	7.7	O K
2160 min Summer	89.545	1.045	0.1	7.4	O K
2880 min Summer	89.500	1.000	0.1	7.1	O K
4320 min Summer	89.312	0.812	0.1	5.7	O K
5760 min Summer	89.165	0.665	0.1	4.7	O K
7200 min Summer	89.048	0.548	0.1	3.9	O K
8640 min Summer	88.951	0.451	0.1	3.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	162.744	19
30 min Summer	97.441	34
60 min Summer	58.342	64
120 min Summer	34.931	122
180 min Summer	25.877	182
240 min Summer	20.915	242
360 min Summer	15.493	360
480 min Summer	12.522	422
600 min Summer	10.616	484
720 min Summer	9.276	550
960 min Summer	7.600	682
1440 min Summer	5.738	966
2160 min Summer	4.332	1384
2880 min Summer	3.549	1788
4320 min Summer	2.487	2592
5760 min Summer	1.933	3344
7200 min Summer	1.589	4104
8640 min Summer	1.354	4840

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Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	88.870	0.370	0.1	2.6	O K
15 min Winter	89.166	0.666	0.1	4.7	O K
30 min Winter	89.289	0.789	0.1	5.6	O K
60 min Winter	89.425	0.925	0.1	6.5	O K
120 min Winter	89.567	1.067	0.1	7.5	O K
180 min Winter	89.644	1.144	0.1	8.1	O K
240 min Winter	89.691	1.191	0.1	8.4	O K
360 min Winter	89.739	1.239	0.1	8.7	Flood Risk
480 min Winter	89.754	1.254	0.2	8.8	Flood Risk
600 min Winter	89.753	1.253	0.2	8.8	Flood Risk
720 min Winter	89.751	1.251	0.2	8.8	Flood Risk
960 min Winter	89.757	1.257	0.2	8.9	Flood Risk
1440 min Winter	89.730	1.230	0.1	8.7	Flood Risk
2160 min Winter	89.655	1.155	0.1	8.1	O K
2880 min Winter	89.576	1.076	0.1	7.6	O K
4320 min Winter	89.321	0.821	0.1	5.8	O K
5760 min Winter	89.129	0.629	0.1	4.4	O K
7200 min Winter	88.979	0.479	0.1	3.4	O K
8640 min Winter	88.859	0.359	0.1	2.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	1.183	5552
15 min Winter	162.744	19
30 min Winter	97.441	33
60 min Winter	58.342	62
120 min Winter	34.931	120
180 min Winter	25.877	178
240 min Winter	20.915	236
360 min Winter	15.493	348
480 min Winter	12.522	454
600 min Winter	10.616	548
720 min Winter	9.276	572
960 min Winter	7.600	724
1440 min Winter	5.738	1038
2160 min Winter	4.332	1488
2880 min Winter	3.549	1928
4320 min Winter	2.487	2728
5760 min Winter	1.933	3520
7200 min Winter	1.589	4320
8640 min Winter	1.354	5024

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Date 26/04/2019 09:50 File 100yr+CC40% lined...	Designed By Windows7 Checked By	
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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	88.762	0.262	0.1	1.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	1.183	5752

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	435100 406150 SE 35100 06150
C (1km)	-0.025
D1 (1km)	0.375
D2 (1km)	0.422
D3 (1km)	0.238
E (1km)	0.298
F (1km)	2.359
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time / Area Diagram

Total Area (ha) 0.014

Time (mins)	Area (ha)
0-4	0.014

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Micro Drainage	Source Control W.12.4	

Model Details

Storage is Online Cover Level (m) 90.000

Lined Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.03500	Ring Diameter (m)	2.40
Infiltration Coefficient Side (m/hr)	0.03500	Pit Multiplier	1.5
Safety Factor	2.0	Number Required	1
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	88.500	Cap Infiltration Depth (m)	0.000

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Appendix D: - Driveway Permeable Paving Calculation Sheets

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Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 63 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	85.327	0.077	0.1	0.5	Flood Risk
30 min Summer	85.339	0.089	0.1	0.5	Flood Risk
60 min Summer	85.347	0.097	0.1	0.6	Flood Risk
120 min Summer	85.351	0.101	0.1	0.6	Flood Risk
180 min Summer	85.350	0.100	0.1	0.6	Flood Risk
240 min Summer	85.347	0.097	0.1	0.6	Flood Risk
360 min Summer	85.337	0.087	0.1	0.5	Flood Risk
480 min Summer	85.327	0.077	0.1	0.5	Flood Risk
600 min Summer	85.318	0.068	0.1	0.4	Flood Risk
720 min Summer	85.310	0.060	0.1	0.4	Flood Risk
960 min Summer	85.300	0.050	0.1	0.3	Flood Risk
1440 min Summer	85.291	0.041	0.1	0.2	Flood Risk
2160 min Summer	85.283	0.033	0.1	0.2	Flood Risk
2880 min Summer	85.278	0.028	0.1	0.2	Flood Risk
4320 min Summer	85.270	0.020	0.0	0.1	Flood Risk
5760 min Summer	85.266	0.016	0.0	0.1	Flood Risk
7200 min Summer	85.263	0.013	0.0	0.1	Flood Risk
8640 min Summer	85.261	0.011	0.0	0.1	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	162.744	17
30 min Summer	97.441	31
60 min Summer	58.342	54
120 min Summer	34.931	86
180 min Summer	25.877	120
240 min Summer	20.915	154
360 min Summer	15.493	220
480 min Summer	12.522	284
600 min Summer	10.616	344
720 min Summer	9.276	400
960 min Summer	7.600	512
1440 min Summer	5.738	752
2160 min Summer	4.332	1116
2880 min Summer	3.549	1472
4320 min Summer	2.487	2204
5760 min Summer	1.933	2936
7200 min Summer	1.589	3672
8640 min Summer	1.354	4384

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Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	85.260	0.010	0.0	0.1	Flood Risk
15 min Winter	85.339	0.089	0.1	0.5	Flood Risk
30 min Winter	85.353	0.103	0.1	0.6	Flood Risk
60 min Winter	85.363	0.113	0.1	0.7	Flood Risk
120 min Winter	85.365	0.115	0.1	0.7	Flood Risk
180 min Winter	85.361	0.111	0.1	0.7	Flood Risk
240 min Winter	85.354	0.104	0.1	0.6	Flood Risk
360 min Winter	85.338	0.088	0.1	0.5	Flood Risk
480 min Winter	85.322	0.072	0.1	0.4	Flood Risk
600 min Winter	85.309	0.059	0.1	0.3	Flood Risk
720 min Winter	85.300	0.050	0.1	0.3	Flood Risk
960 min Winter	85.293	0.043	0.1	0.3	Flood Risk
1440 min Winter	85.283	0.033	0.1	0.2	Flood Risk
2160 min Winter	85.276	0.026	0.0	0.2	Flood Risk
2880 min Winter	85.271	0.021	0.0	0.1	Flood Risk
4320 min Winter	85.265	0.015	0.0	0.1	Flood Risk
5760 min Winter	85.262	0.012	0.0	0.1	Flood Risk
7200 min Winter	85.259	0.009	0.0	0.1	Flood Risk
8640 min Winter	85.258	0.008	0.0	0.0	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	1.183	5056
15 min Winter	162.744	17
30 min Winter	97.441	31
60 min Winter	58.342	58
120 min Winter	34.931	94
180 min Winter	25.877	130
240 min Winter	20.915	168
360 min Winter	15.493	236
480 min Winter	12.522	298
600 min Winter	10.616	354
720 min Winter	9.276	404
960 min Winter	7.600	520
1440 min Winter	5.738	764
2160 min Winter	4.332	1120
2880 min Winter	3.549	1468
4320 min Winter	2.487	2204
5760 min Winter	1.933	2992
7200 min Winter	1.589	3680
8640 min Winter	1.354	4464

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Micro Drainage	Source Control W.12.4	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
10080 min Winter	85.257	0.007	0.0	0.0	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	1.183	5216

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Micro Drainage	Source Control W.12.4	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	435100 406150 SE 35100 06150
C (1km)	-0.025
D1 (1km)	0.375
D2 (1km)	0.422
D3 (1km)	0.238
E (1km)	0.298
F (1km)	2.359
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time / Area Diagram

Total Area (ha) 0.002

Time (mins)	Area (ha)
0-4	0.002

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		
Date 26/04/2019 09:51 File Porous paving 20m...	Designed By Windows7 Checked By	
Micro Drainage	Source Control W.12.4	

Model Details

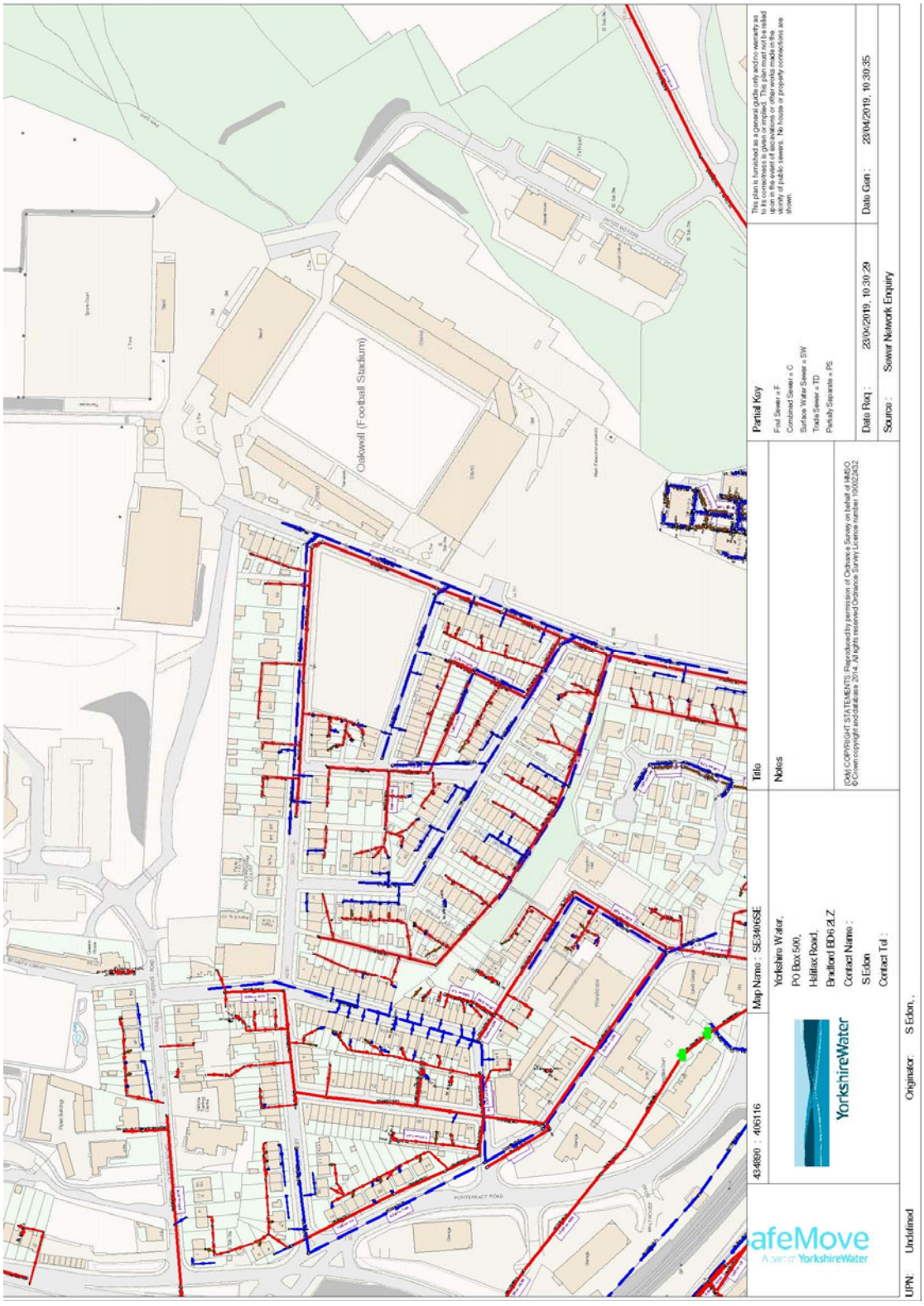
Storage is Online Cover Level (m) 85.400

Porous Car Park Structure

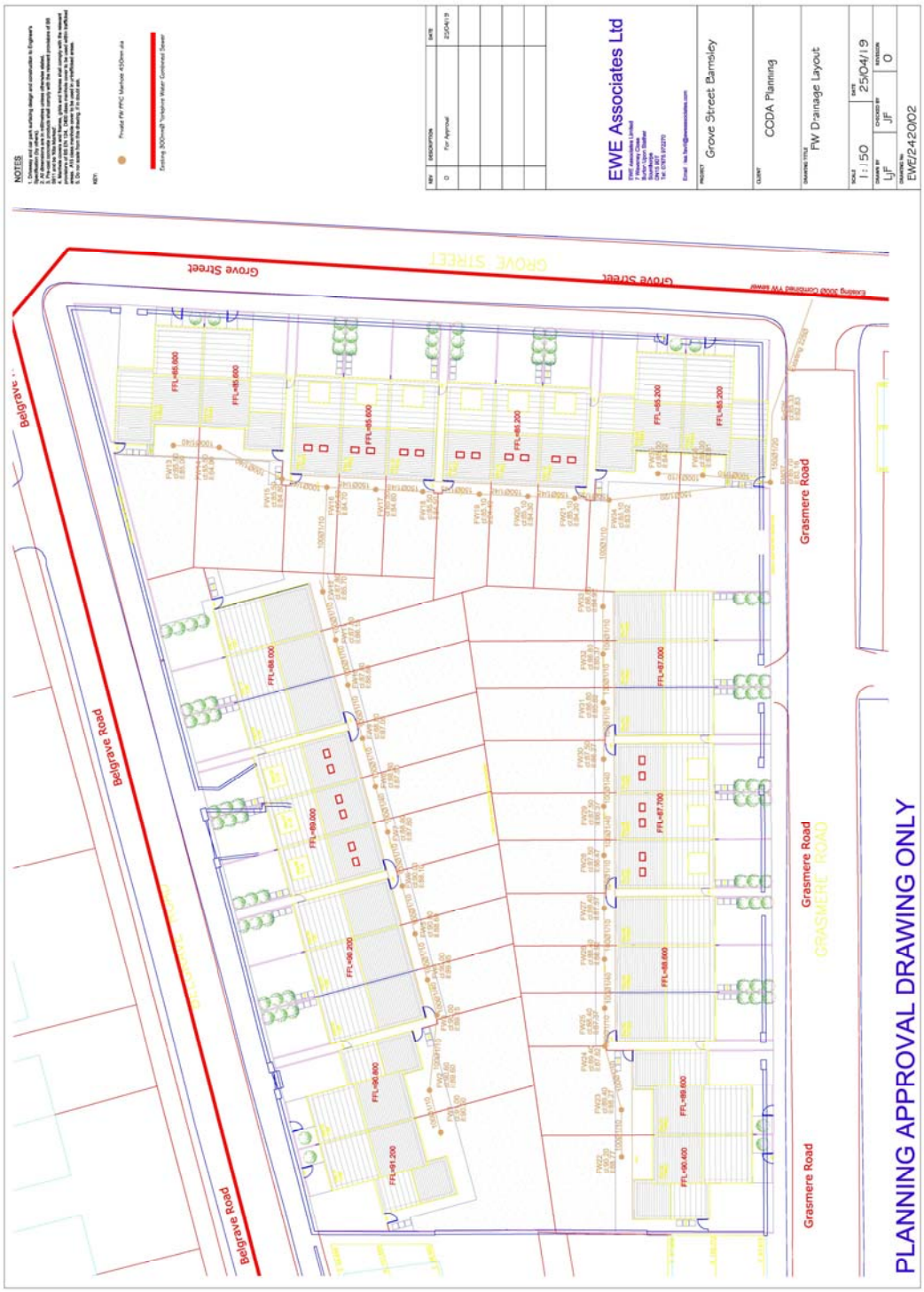
Infiltration Coefficient Base (m/hr)	0.03500	Width (m)	3.2
Membrane Percolation (mm/hr)	1000	Length (m)	6.2
Max Percolation (l/s)	5.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	85.250	Cap Volume Depth (m)	0.000

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Appendix E: - Yorkshire Water Sewer Plan



Appendix F: - Foul Water Drainage Drawing EWE2420.02



Appendix G: - Drainage Detail Drawing EWE2420.03

