



Drainage Addendum

Site: Land Adjacent to the Bull Inn, Bethersden

Client: Esquire Developments Ltd

Prepared by: DHA Environment
Eclipse House
Eclipse Park
Sittingbourne Road
Maidstone ME14 3EN

Date: November 2024

1.1 Introduction

- 1.1.1 This Drainage Technical Note (TN) has been produced in response to the latest response from Kent County Council (LLFA) dated 21st October 2024 in relation to Outline Planning Application Reference: PA/2024/1442 concerning a proposed residential development of 40 units on Land Adjacent to the Bull Inn, Bethersden.

1.2 Responses to KCC comments

- 1.2.1 KCC's full response is contained in **Appendix A** and can be summarised with response to each point as follows: -

"Basin

We note that there is to be no permanent water level within this feature and that it is intended to fully empty after each rainfall event.

The basin invert is 1.1m below the anticipated 1 in 100 year plus climate change (CC) river flood level of 28.4m (from mapping). If there is a permeable stratum giving hydraulic connectivity between the basin and the river, the basin will fill during river flood events and provide no attenuation volume for runoff from the site."

- 1.2.2 The EA do not hold any flood level data for the watercourse bounding the site. The flood map has been overlaid onto the drawing and has been taken to be at a level of 28.4m AOD.
- 1.2.3 The base of the basin has now been located at a level of 28.4m AOD which is at the interpolated 1 in 1000-year flood line (Flood Zone 2). There will therefore be no ingress of flood water into the basin. A cross section has been prepared to show this relationship.
-

"The top water level from hydraulic modelling for the 1 in 100 year plus CC rainfall event is 28.483m AOD. This compares with a stated crest level of 28.500m, offering only 17mm freeboard. The minimum acceptable freeboard for this stage of design is 300mm, in line with C759 SuDS Manual. In addition, we note that the basin volume continues up to an elevation of 28.700m within the hydraulic model, so there is some inconsistency between reporting and calculations."

- 1.2.4 There is now a 365mm freeboard in the basin.

"Should there be an intention to build up levels on the low side of the basin to create a bund, this must sit fully outside of Flood Zone 2 as per EA comments, to avoid the need for flood storage compensation"

- 1.2.5 The pond and any bunding sits entirely outside Flood zone 2 so no flood compensation works are required.

Calculations

"We note that reporting states that a 10% allowance for creep has been included but cannot see this within calculations. The area used for calculation of allowable discharge rate (based on greenfield at 4 l/s/ha) has now reduced to 1.4 ha, but is still not equivalent to the area drained into the surface water network of 0.8ha. Areas not draining to the surface water system in the post-development case will continue to generate flows at greenfield rates to the river and should therefore not be used in developing an allowable discharge rate from the basin. Please refer to our previous letter for more on this subject."

- 1.2.6 The total impermeable contributing area of 0.8 ha is shown on drawing 32891-D-01 Rev P3. The greenfield runoff rate has been calculated to be 3.2l/s ($0.8 \times 4 = 3.2\text{l/s}$). Both the area of 0.8 ha and the runoff rate of 3.2l/s have been included in the revised calculations.

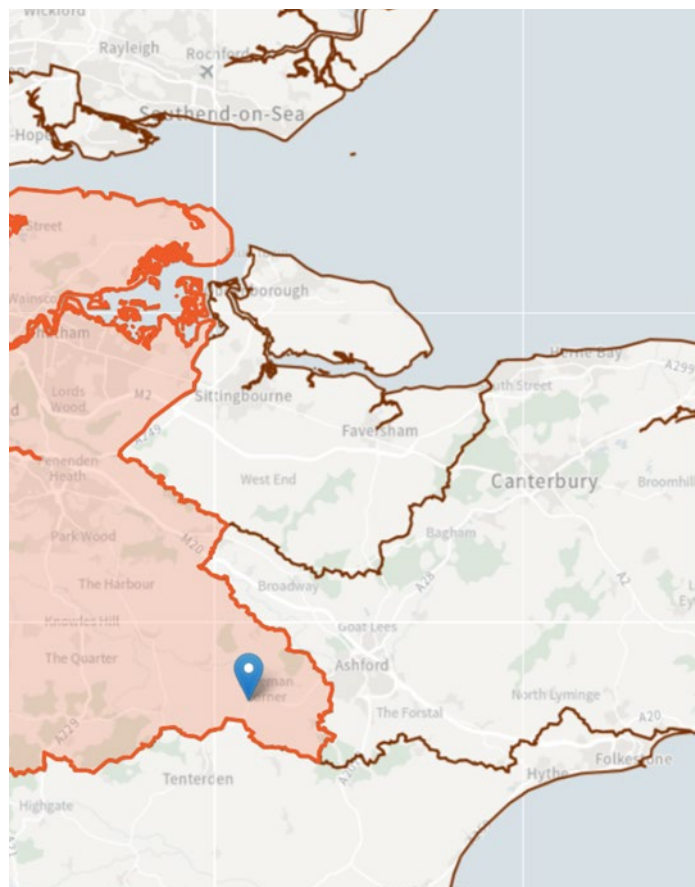
"Storm durations up to 1440mins have been run within modelling, and this 1440 min storm is identified as critical for the basin. This may infer that longer durations are, in fact, critical, but have not been run. Please can future submissions ensure that durations of 2 days or longer are analysed, ensuring that the longest duration run is not identified as critical for any part of the network."

- 1.2.7 Storm durations between 15minutes and 10080 mins for both the winter and summer rainfall events. These show the critical duration to be the 1440-minute duration event.

"As of the 10th of May 2022, the Environment Agency's climate change allowances have been updated. As part of this update, revisions have been made to the 'Peak Rainfall Intensity Allowances' that are used in applying climate change percentages to new drainage schemes. The LLFA would now seek the 'upper end' allowance is designed for both the 30 (3.3%) and 100 (1%) year storm scenarios."

- 1.2.8 Calculations were previously run for the worst-case rainfall event which is the 1 in 100 + 45% allowance for climate change in accordance with the EA guidance.

- 1.2.9 For completeness the 1 in 30 year + 35% allowance for climate change event have also been run and are provided in Appendix B.



Medway Management Catchment peak rainfall allowances ⓧ

3.3% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	35%
2070s	20%	35%

1% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	45%
2070s	20%	40%

APPENDIX

A



KCC Response



Benazir Kachchhi
Ashford Borough Council
Civic Centre
Tannery Lane
Ashford
Kent
TN23 1PL

Flood and Water Management
Invicta House
Maidstone
Kent
ME14 1XX

Website: www.kent.gov.uk/flooding
Email: suds@kent.gov.uk
Tel: 03000 41 41 41
Our Ref: ABC/2024/101689
Date: 21 October 2024

Application No: PA/2024/1442

Location: Land Adjacent to the Bull Inn, Bethersden

Proposal: Outline planning permission (with all matters reserved except access) for the erection of up to 40 dwellings including access from Bull Lane, parking, landscaping, open space and associated infrastructure and earthworks.

Thank you for your consultation on the above referenced planning application.

Kent County Council as Lead Local Flood Authority have reviewed the drainage addendum by DHA dated Sep 2024 and have the following comments:

Basin

We note that there is to be no permanent water level within this feature and that it is intended to fully empty after each rainfall event.

- The basin invert is 1.1m below the anticipated 1 in 100 year plus climate change (CC) river flood level of 28.4m (from mapping). If there is a permeable stratum giving hydraulic connectivity between the basin and the river, the basin will fill during river flood events and provide no attenuation volume for runoff from the site.
- The top water level from hydraulic modelling for the 1 in 100 year plus CC rainfall event is 28.483m AOD. This compares with a stated crest level of 28.500m, offering only 17mm freeboard. The minimum acceptable freeboard for this stage of design is 300mm, in line with C759 SuDS Manual. In addition, we note that the basin volume continues up to an elevation of 28.700m within the hydraulic model, so there is some inconsistency between reporting and calculations.
- Should there be an intention to build up levels on the low side of the basin to create a bund, this must sit fully outside of Flood Zone 2 as per EA comments, to avoid the need for flood storage compensation.

Calculations

- We note that reporting states that a 10% allowance for creep has been included but cannot see this within calculations.
- The area used for calculation of allowable discharge rate (based on greenfield at 4 l/s/ha) has now reduced to 1.4 ha, but is still not equivalent to the area drained into the surface water network of 0.8ha. Areas not draining to the surface water system in the post-development case will continue to generate flows at greenfield rates to

the river and should therefore not be used in developing an allowable discharge rate from the basin. Please refer to our previous letter for more on this subject.

- Storm durations up to 1440mins have been run within modelling, and this 1440 min storm is identified as critical for the basin. This may infer that longer durations are, in fact, critical, but have not been run. Please can future submissions ensure that durations of 2 days or longer are analysed, ensuring that the longest duration run is not identified as critical for any part of the network.
- As of the 10th of May 2022, the Environment Agency's climate change allowances have been updated. As part of this update, revisions have been made to the 'Peak Rainfall Intensity Allowances' that are used in applying climate change percentages to new drainage schemes.

The LLFA would now seek the 'upper end' allowance is designed for both the 30 (3.3%) and 100 (1%) year storm scenarios. The latest information on the allowances and map can be found at the following link:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Due to the spatial pressures exerted by the river flood zones combined with basin size and level, we would recommend an objection is put in place until such time as the above comments have been addressed.

This response has been provided using the best knowledge and information submitted as part of the planning application at the time of responding and is reliant on the accuracy of that information.

Yours faithfully,

Cathy Bishop

Flood Risk Officer

Flood and Water Management

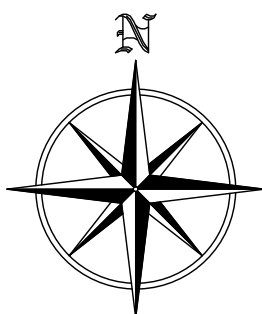
APPENDIX B



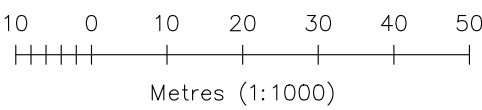
Proposed Drainage Design



NOTES



INDICATIVE ONLY



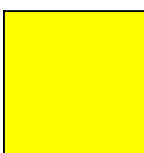
PROPOSED SITE BOUNDARY

DEVELOPMENT BOUNDARY

EXTENT OF FLOOD ZONE 2



PROPOSED HARDSTANDING
4,354m²



PROPOSED ROOFS
3,626m²

TOTAL IMPERMEABLE AREA
7,980m² (INCLUDING 10% ALLOWANCE
FRO URBAN CREEP)

100m

P3	KCC COMMENTS INCORPORATED	18.09.24	CS
P2	UPDATED RED LINE	09.07.24	CS
P1	FIRST ISSUE	24.06.24	CS
REV	AMENDMENTS	DATE	CHK

Client
ESQUIRE DEVELOPMENTS LTD

Project
LAND ADJACENT TO BULL INN, BULL LANE,
BETHERSDEN

Title
CONTRIBUTING AREAS PLAN

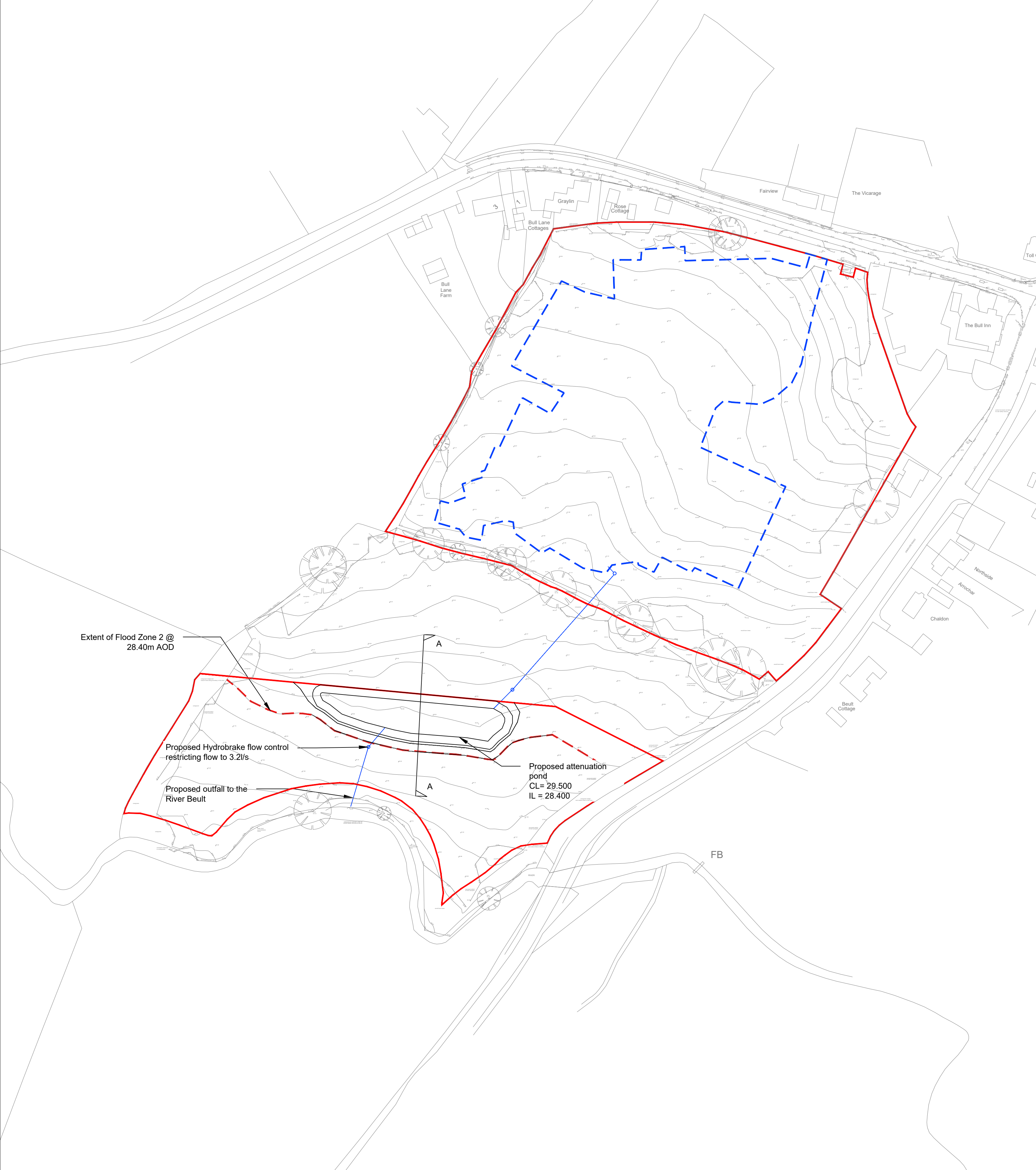
Drwg	Rev	Scale	Date
32891-D-01	P3	1:1000@A1	24.06.24



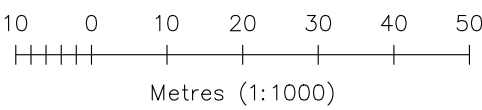
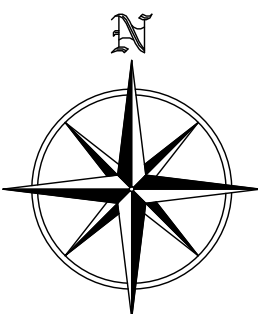
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CAD Reference:

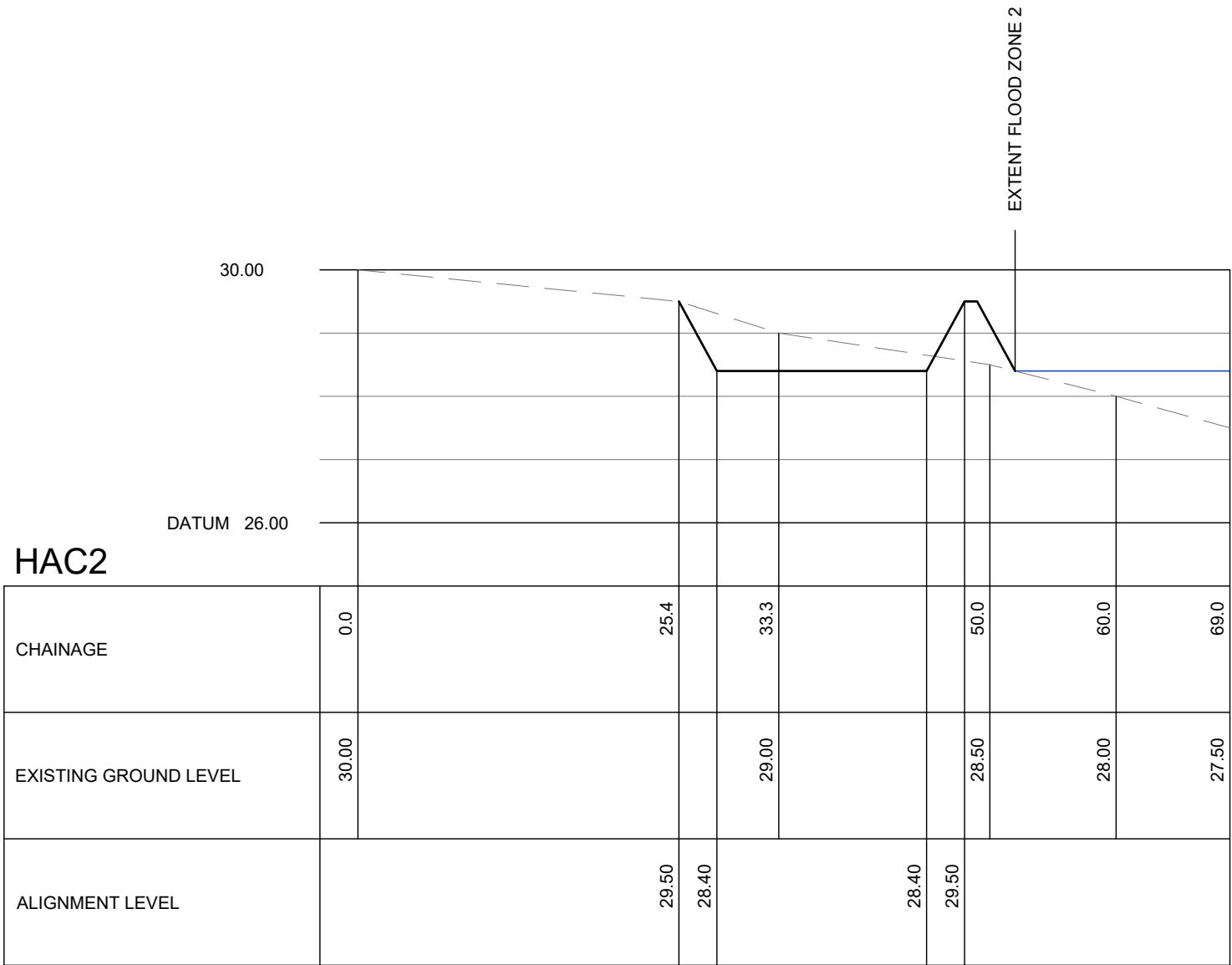
A1



NOTES



- PROPOSED SITE BOUNDARY
- DEVELOPMENT BOUNDARY
- EXTENT OF FLOOD ZONE 2



SECTION A-A - THROUGH POND - 1:500 H - 1:100 V

P4	KCC COMMENTS INCORPORATED	05.11.24	CS
P3	KCC COMMENTS INCORPORATED	18.09.24	CS
P2	UPDATED RED LINE	09.07.24	CS
P1	FIRST ISSUE	24.06.24	CS
REV	AMENDMENTS	DATE	CHK

Client
ESQUIRE DEVELOPMENTS LTD

Project
LAND ADJACENT TO BULL INN, BULL LANE, BETHERSDEN

Title
PROPOSED DRAINAGE PLAN

Drwg	Rev	Scale	Date
32891-D-02	P4	1:1000@A1	124.06.24



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CAD Reference:
A1

DHA Transport Ltd					Page 1	
Eclipse House Eclipse Park Sittingbourne Road Maidstone ME14 3EN			Bethersden			
Date 05/11/2024 19:33			Designed by Chris			
File pond 2.SRCX			Checked by			
Causeway			Source Control 2019.1			
Summary of Results for 100 year Return Period (+45%)						
Storm Event			Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³) Status
15 min Summer			28.692	0.292	3.2	286.2 O K
30 min Summer			28.771	0.371	3.2	370.4 O K
60 min Summer			28.843	0.443	3.2	450.7 O K
120 min Summer			28.906	0.506	3.2	523.4 O K
180 min Summer			28.942	0.542	3.2	565.7 O K
240 min Summer			28.967	0.567	3.2	594.6 O K
360 min Summer			28.998	0.598	3.2	632.7 O K
480 min Summer			29.018	0.618	3.2	656.7 O K
600 min Summer			29.031	0.631	3.2	672.6 O K
720 min Summer			29.040	0.640	3.2	683.3 O K
960 min Summer			29.049	0.649	3.2	694.5 O K
1440 min Summer			29.048	0.648	3.2	693.4 O K
2160 min Summer			29.025	0.625	3.2	665.0 O K
2880 min Summer			29.001	0.601	3.2	635.9 O K
4320 min Summer			28.956	0.556	3.2	581.9 O K
5760 min Summer			28.915	0.515	3.2	533.0 O K
7200 min Summer			28.876	0.476	3.2	487.8 O K
8640 min Summer			28.839	0.439	3.2	445.9 O K
10080 min Summer			28.804	0.404	3.2	407.1 O K
15 min Winter			28.725	0.325	3.2	320.7 O K
30 min Winter			28.811	0.411	3.2	415.1 O K
Storm Event			Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer			192.260	0.0	234.6	19
30 min Summer			124.873	0.0	264.3	34
60 min Summer			76.528	0.0	430.8	64
120 min Summer			45.025	0.0	492.8	124
180 min Summer			32.838	0.0	517.1	184
240 min Summer			26.190	0.0	523.4	244
360 min Summer			18.990	0.0	521.6	362
480 min Summer			15.094	0.0	515.4	482
600 min Summer			12.621	0.0	508.1	602
720 min Summer			10.899	0.0	500.7	722
960 min Summer			8.640	0.0	486.5	962
1440 min Summer			6.218	0.0	462.1	1440
2160 min Summer			4.466	0.0	921.8	1884
2880 min Summer			3.528	0.0	934.1	2220
4320 min Summer			2.529	0.0	882.7	2980
5760 min Summer			1.999	0.0	1145.5	3752
7200 min Summer			1.666	0.0	1192.3	4544
8640 min Summer			1.436	0.0	1231.3	5360
10080 min Summer			1.266	0.0	1262.4	6144
15 min Winter			192.260	0.0	251.6	19
30 min Winter			124.873	0.0	269.6	34
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DHA Transport Ltd				Page 2																																																																																																													
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Eclipse House Eclipse Park Sittingbourne Road Maidstone ME14 3EN		
Date 05/11/2024 19:33 File pond 2.SRCX		
Causeway		
Bethersden		Designed by Chris
		Checked by
		Source Control 2019.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.800

Time (mins)	Area
From:	To: (ha)
0	4 0.800

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Model Details

Storage is Online Cover Level (m) 29.500

Tank or Pond Structure

Invert Level (m) 28.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	908.0	1.100	1506.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-3200-1100-3200
Design Head (m)	1.100
Design Flow (l/s)	3.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	28.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	3.2
Flush-Flo™	0.335	3.2
Kick-Flo®	0.688	2.6
Mean Flow over Head Range	-	2.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	3.3	3.000	5.1	7.000	7.6
0.200	3.1	1.400	3.6	3.500	5.5	7.500	7.8
0.300	3.2	1.600	3.8	4.000	5.8	8.000	8.1
0.400	3.2	1.800	4.0	4.500	6.2	8.500	8.3
0.500	3.1	2.000	4.2	5.000	6.5	9.000	8.6
0.600	2.9	2.200	4.4	5.500	6.8	9.500	8.8
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.3		

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Causeway			Source Control 2019.1				
Summary of Results for 30 year Return Period (+35%)							
Storm Event			Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer			28.612	0.212	3.1	203.0	O K
30 min Summer			28.668	0.268	3.2	261.2	O K
60 min Summer			28.723	0.323	3.2	318.2	O K
120 min Summer			28.772	0.372	3.2	371.9	O K
180 min Summer			28.800	0.400	3.2	402.7	O K
240 min Summer			28.819	0.419	3.2	423.6	O K
360 min Summer			28.843	0.443	3.2	450.2	O K
480 min Summer			28.856	0.456	3.2	466.0	O K
600 min Summer			28.865	0.465	3.2	475.4	O K
720 min Summer			28.869	0.469	3.2	480.8	O K
960 min Summer			28.872	0.472	3.2	483.7	O K
1440 min Summer			28.865	0.465	3.2	475.6	O K
2160 min Summer			28.850	0.450	3.2	459.0	O K
2880 min Summer			28.833	0.433	3.2	439.9	O K
4320 min Summer			28.797	0.397	3.2	399.5	O K
5760 min Summer			28.762	0.362	3.2	361.1	O K
7200 min Summer			28.729	0.329	3.2	325.6	O K
8640 min Summer			28.699	0.299	3.2	293.3	O K
10080 min Summer			28.672	0.272	3.2	264.5	O K
15 min Winter			28.636	0.236	3.1	227.5	O K
30 min Winter			28.699	0.299	3.2	292.9	O K
Storm Event			Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer			136.673	0.0	173.8	19	
30 min Summer			88.388	0.0	219.5	34	
60 min Summer			54.347	0.0	309.2	64	
120 min Summer			32.316	0.0	366.6	124	
180 min Summer			23.710	0.0	401.6	182	
240 min Summer			18.995	0.0	426.5	242	
360 min Summer			13.865	0.0	460.1	362	
480 min Summer			11.076	0.0	480.5	482	
600 min Summer			9.299	0.0	491.6	602	
720 min Summer			8.058	0.0	495.8	722	
960 min Summer			6.423	0.0	492.4	960	
1440 min Summer			4.662	0.0	474.0	1226	
2160 min Summer			3.379	0.0	714.8	1596	
2880 min Summer			2.687	0.0	754.3	1988	
4320 min Summer			1.945	0.0	799.2	2808	
5760 min Summer			1.547	0.0	886.3	3584	
7200 min Summer			1.296	0.0	927.2	4392	
8640 min Summer			1.121	0.0	960.8	5112	
10080 min Summer			0.992	0.0	987.4	5856	
15 min Winter			136.673	0.0	193.7	19	
30 min Winter			88.388	0.0	238.9	33	
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Eclipse House Sittingbourne Road Maidstone ME14 3EN	Bethersden	
Date 05/11/2024 19:34 File pond 2.SRCX	Designed by Chris Checked by	
Causeway Source Control 2019.1		

DHA Transport Ltd		Page 4
Eclipse House Eclipse Park Sittingbourne Road Maidstone ME14 3EN	Bethersden	
Date 05/11/2024 19:34	Designed by Chris	
File pond 2.SRCX	Checked by	
Causeway		Source Control 2019.1

Model Details

Storage is Online Cover Level (m) 29.500

Tank or Pond Structure

Invert Level (m) 28.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	908.0	1.100	1506.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-3200-1100-3200
Design Head (m)	1.100
Design Flow (l/s)	3.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	28.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	3.2
Flush-Flo™	0.335	3.2
Kick-Flo®	0.688	2.6
Mean Flow over Head Range	-	2.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	3.3	3.000	5.1	7.000	7.6
0.200	3.1	1.400	3.6	3.500	5.5	7.500	7.8
0.300	3.2	1.600	3.8	4.000	5.8	8.000	8.1
0.400	3.2	1.800	4.0	4.500	6.2	8.500	8.3
0.500	3.1	2.000	4.2	5.000	6.5	9.000	8.6
0.600	2.9	2.200	4.4	5.500	6.8	9.500	8.8
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.3		

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