



- Structural Engineering
- Civil Engineering
- Hydrology

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**The Waterside Village – Opulwood
FRA Addendum
Date: 25.04.2023**



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Document History and Status

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Author	I. Casling
Project Number	22006
Project Name	The Waterside Village - Opulwood Developments

1.0 Introduction

Elluc Projects have been commissioned by Opulwood Developments to provide an addendum to the existing Flood Risk Assessment by BEK Enviro Ltd. report Ref: BEK-18439-1-Rev A dated December 2018.

Specifically, the planners for this development site have requested the drainage engineers to check if any updated flood data was used in the design calculations for the drainage design carried out by Elluc.

2.0 Proposed drainage design

The proposed drainage design shown in drawing ELL-22006-OP-L-120 within Appendix A shows a new private surface water and foul drainage system serving the development and combining to a combined drain just before connecting to the public combined sewer in Kay Street.

A hydrobrake flow control is proposed to limit surface water discharge to 5 l/s to 1 in 100 year plus climate change allowance.

The proposed drainage design follows the hierarchy of surface water outfalls, due to the nature of the site and the practicalities of constructing a headwall outfall to the River Irwell a connection to the combined sewer is proposed. A public surface water sewer isn't available near to the site to connect to.

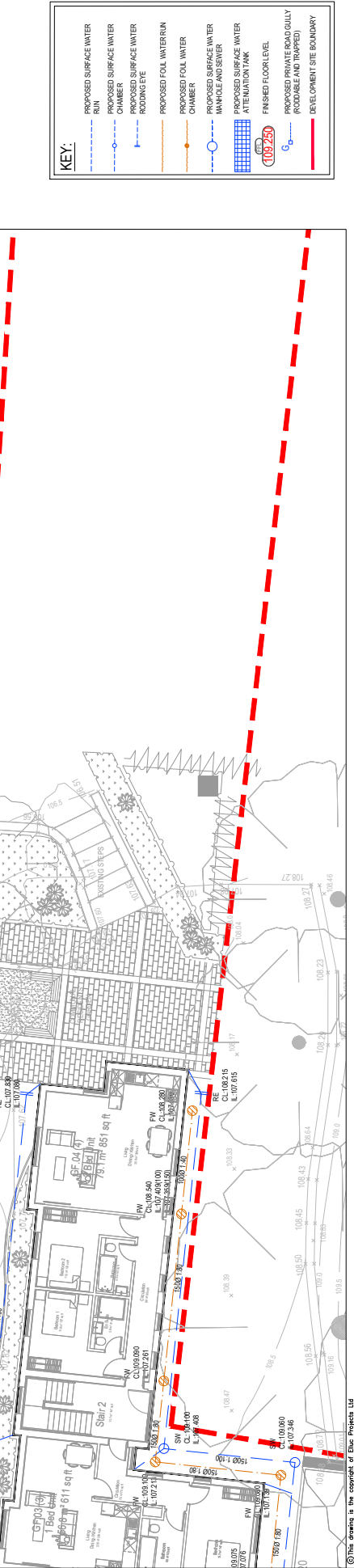
The public combined sewer is approximately 3.5m lower than the proposed surface and foul connections which backdrop into the combined demarcation manhole before leaving site. The risk of backing up of the sewers because of this and no direct connection to the river is considered low. The drainage calculations are provided in Appendix B.

3.0 Summary

The proposed drainage design shown in Appendix A and the calculations in Appendix B demonstrate the site can be drained safely, with regard to flood risk described in the BEK Enviro report. A majority of the flood risk is mitigated by the use of elevated external works and a FFL to the development set in line with the FRA report.

APPENDIX A

- | | | | | |
|--|--|--|-----------|----------|
| A | UPDATED TO SET SNIWER RECORDS
DRAINAGE SURVEY | Date | By | Co |
| No. | Description | | | |
| PRELIMINARY | | | | |
| OPLLWOOD DEVELOPMENTS | | | | |
| 22006 - THE WATERSIDE VILLAGE | | | | |
| PRIVATE DRAINAGE LAYOUT | | | | |
| ELLUC Projects | | | | |
| ELLUC PROJECTS
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www.ellucprojects.co.uk | Cust Ref: | Drawn By |
| Proj No: | Rev: | Date: | Checked: | Mk'd: |
| 2206 | 1 | 19-04-12 | | |
| Drawing Title: | | | | |
| ELL-22006-OP-L-120 | | | | |



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APPENDIX B

[illegible]

ELLUC Projects Ltd

760 Mandarin Court
Warrington
Cheshire

22006 - The Waterside Village
Summerseat

Date 01/03/2022
File 2206 - SW Calculations.SRCX

Designed by IC
Checked by

XP Solutions

Source Control 2017.1

Micro Drainage

Summary of Results for 100 year Return Period (+40%)								
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status	
10080 min Summer	9.261	0.061	0.0	1.8	1.8	4.7	O K	
15 min Winter	9.576	0.376	0.0	5.0	5.0	29.0	O K	
30 min Winter	9.723	0.523	0.0	5.0	5.0	40.2	Flood Risk	
60 min Winter	9.871	0.671	0.0	5.0	5.0	51.6	Flood Risk	
120 min Winter	9.965	0.765	0.0	5.0	5.0	58.9	Flood Risk	
180 min Winter	9.971	0.771	0.0	5.0	5.0	59.4	Flood Risk	
240 min Winter	9.958	0.758	0.0	5.0	5.0	58.3	Flood Risk	
360 min Winter	9.906	0.706	0.0	5.0	5.0	54.3	Flood Risk	
480 min Winter	9.830	0.630	0.0	5.0	5.0	48.5	Flood Risk	
600 min Winter	9.740	0.540	0.0	5.0	5.0	41.6	Flood Risk	
720 min Winter	9.660	0.460	0.0	5.0	5.0	35.4	O K	
960 min Winter	9.525	0.325	0.0	5.0	5.0	25.0	O K	
1440 min Winter	9.368	0.168	0.0	4.7	4.7	12.9	O K	
2160 min Winter	9.307	0.107	0.0	3.8	3.8	8.2	O K	
2880 min Winter	9.289	0.089	0.0	3.1	3.1	6.8	O K	
4320 min Winter	9.272	0.072	0.0	2.3	2.3	5.6	O K	
5760 min Winter	9.264	0.064	0.0	1.9	1.9	4.9	O K	
7200 min Winter	9.258	0.058	0.0	1.6	1.6	4.4	O K	
8640 min Winter	9.254	0.054	0.0	1.4	1.4	4.1	O K	
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
10080 min Summer	1.503		0.0	270.7	5136			
15 min Winter	112.007		0.0	33.5	23			
30 min Winter	79.304		0.0	47.5	36			
60 min Winter	53.779		0.0	64.5	64			
120 min Winter	35.059		0.0	84.2	118			
180 min Winter	26.712		0.0	96.2	150			
240 min Winter	21.907		0.0	105.2	188			
360 min Winter	16.552		0.0	119.2	266			
480 min Winter	13.534		0.0	130.0	342			
600 min Winter	11.563		0.0	138.8	406			
720 min Winter	10.160		0.0	146.4	468			
960 min Winter	8.271		0.0	158.9	586			
1440 min Winter	6.170		0.0	177.8	796			
2160 min Winter	4.586		0.0	198.3	1112			
2880 min Winter	3.713		0.0	214.0	1476			
4320 min Winter	2.763		0.0	238.9	2208			
5760 min Winter	2.243		0.0	258.6	2880			
7200 min Winter	1.909		0.0	275.2	3672			
8640 min Winter	1.676		0.0	289.9	4320			

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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)	19.000	Shortest Storm (mins)	15
Ratio R	0.258	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.143

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.048	4 8	0.048	8 12	0.047

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 9.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	81.0	81.0	0.801	0.0	109.8
0.800	81.0	109.8			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0105-5000-1000-5000
Design Head (m) 1.000
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 105
Invert Level (m) 9.200
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0	Kick-Flo®	0.637	4.1
Flush-Flo™	0.296	5.0	Mean Flow over Head Range	-	4.3

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	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

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