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Our ref: SE2621-ISS-XX-00-TN-C-3100

Hertfordshire County Council

Address: Farnham and Robertson House,
Six Hills Way,
Stevenage, SG1 2ST

29th June 2026

Dear LLFA Team,

RE: TECHNICAL NOTE Surface Water Drainage Design

In Compliance with Planning Condition: 6 (SuDS) Application: 21/01882/FP

Development: Land East Rhee Spring and Orwell View, Royston Road, Baldock, Hertfordshire

Prepared by: Iesis Civils

1. Introduction

This Technical Note has been prepared in response to comments received from Hertfordshire County Council in its role as Lead Local Flood Authority (LLFA).

A previous Technical Note (Ref. RR-ISS-XX-XX-TN-C-3000) was submitted in March 2026. This document addresses the remaining outstanding comments following the meeting with the LLFA on 19 June 2026.

A site location plan is provided in **Appendix A**.

2. Existing Watercourse

The existing watercourse runs broadly parallel to the eastern site boundary at an offset of approximately 10 m. The channel is typically 2.0 m wide and approximately 0.3 m deep.

The watercourse has been inspected on several occasions and has consistently been observed to be dry.



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For context the watercourse is illustrated on the below figure, by means of the blue line running north to south. The site has been approximated shown as the red line;



3. Proposed Watercourse

The proposed development requires the watercourse to be realigned closer to the eastern site boundary to facilitate appropriately sized rear gardens to the proposed dwellings.

The revised alignment will meander within a 4.0 m corridor located inside a wider 7.0 m easement between the proposed rear garden fences and the eastern site boundary. This arrangement retains a continuous 3.0 m maintenance strip adjacent to the watercourse.

The proposed channel will maintain the existing dimensions of approximately 2.0 m width and 0.3 m depth, thereby avoiding the need for steeper side slopes and minimising health and safety risks.

The realigned channel will reconnect to the existing watercourse at both the northern and southern extents of the site.

The proposed alignment will provide a slightly greater cross-sectional area than the existing channel and is therefore expected to provide equal or greater hydraulic capacity. Accordingly, this assessment has modelled the existing watercourse geometry, representing a conservative assessment of the proposed development.

4. Catchment Assessment

Whilst the topographical survey extends only to the site boundary, the existing watercourse continues beyond the southern extent of the surveyed area. Consequently, Ordnance Survey mapping has been used to establish the continuation of the watercourse alignment and surrounding topography. The 70 m AOD contour intersects the apparent head of the watercourse, providing confidence that the adopted levels are sufficiently representative for this assessment.

The contributing catchment has been determined using the review sketches included within **Appendix B**.

A description of each sketch has been included below;

Sketch 1

Sketch 1 reviews the wider catchment over an area of approximately 3 km² and identifies the principal overland flow routes draining towards the development site.

The A505, located immediately south of the site, is situated within a cutting. It is understood that runoff from land to the south is intercepted and positively drained as part of the highway drainage infrastructure. Consequently, land south of the A505 has been excluded from the contributing catchment.

Sketch 2

Sketch 2 reviews the local catchment over an area of approximately 1 km² and identifies the overall contributing catchment draining to the watercourse.

Sketch 3

Sketch 3 refines the catchment over an area of approximately 0.5 km² and identifies two principal contributing drainage areas:

- runoff entering the head of the watercourse from land immediately south of the site; and
- runoff entering the watercourse along its eastern alignment.

Review of the topographical survey confirms that the development site generally falls towards the north-east. Accordingly, the existing site has been included within the contributing catchment.

Sketch 4

Sketch 4 illustrates the existing watercourse divided into a series of hydraulic nodes used within the hydraulic model. These nodes define the individual catchment inflows applied within the hydraulic analysis undertaken using Causeway Flow.

5. Hydraulic Modelling

The catchment assessment identified a total contributing greenfield catchment of **18.45 ha**.

Greenfield runoff rates have been derived from the approved Flood Risk Assessment (Appendix G).

Q1	QBAR _{rural}	x	0.87	=	2.05 l/s/ha
Q30	QBAR _{rural}	x	2.45	=	5.77 l/s/ha
Q100	QBAR _{rural}	x	3.56	=	8.39 l/s/ha

Applying the approved runoff rates to the revised contributing catchment gives the following inflows:

- QBAR (1 year): 38.82 l/s
- Q30: 106.46 l/s
- Q100: 154.80 l/s

To replicate these inflows within the hydraulic model, equivalent impermeable areas have been introduced. This approach marginally overestimates runoff across each design event and therefore represents a conservative assessment.

The hydraulic calculations are included within **Appendix C**.

6. Hydraulic Results

Node 6, located at the north-east corner of the site, consistently records the highest water level throughout the model and therefore represents the critical assessment location.

The predicted water depths are:

- 1 in 2 year event – 143 mm
- 1 in 30 year event – 221 mm
- 1 in 100 year event – 250 mm
- 1 in 100 year event plus 40% climate change – 291 mm (67.191 mAOD)

The minimum channel depth throughout the existing watercourse is approximately 300 mm, increasing to approximately 350 mm through sections of the site. The adopted 300 mm depth therefore represents a conservative assumption.

The modelling demonstrates that the predicted water level remains below the top of the existing watercourse for all assessed events, including the 1 in 100 year event plus 40% climate change allowance.

The lowest proposed Finished Floor Level (FFL) is located adjacent to Node 6 at **67.930 mAOD**, providing approximately **739mm** of freeboard above the maximum predicted water level.

7. Proposed Watercourse Performance

As discussed in Section 3, the proposed realignment marginally increases the channel cross-sectional area compared with the existing watercourse. Consequently, the proposed channel is expected to provide equal or greater hydraulic capacity, resulting in water levels that will be no higher than those predicted within this assessment.

Furthermore, this assessment assumes that the existing site contributes directly to the watercourse. Following development, runoff from the site will be managed through the approved SuDS network before controlled discharge. As such, the hydraulic assessment represents a conservative worst-case scenario.

8. Conclusion

This Technical Note demonstrates that:

- the contributing catchment has been reviewed and defined using topographical survey information supported by Ordnance Survey mapping;
- hydraulic modelling has been undertaken using conservative assumptions based on the existing watercourse geometry;
- the existing watercourse has sufficient capacity to contain the 1 in 100 year rainfall event including a 40% allowance for climate change;
- the proposed realignment will provide hydraulic performance that is at least equivalent to, and likely better than, the existing channel;
- the minimum proposed Finished Floor Level remains approximately 739mm above the maximum predicted water level; and
- the proposed development satisfies the outstanding hydraulic concerns raised by the LLFA regarding the proposed watercourse diversion.

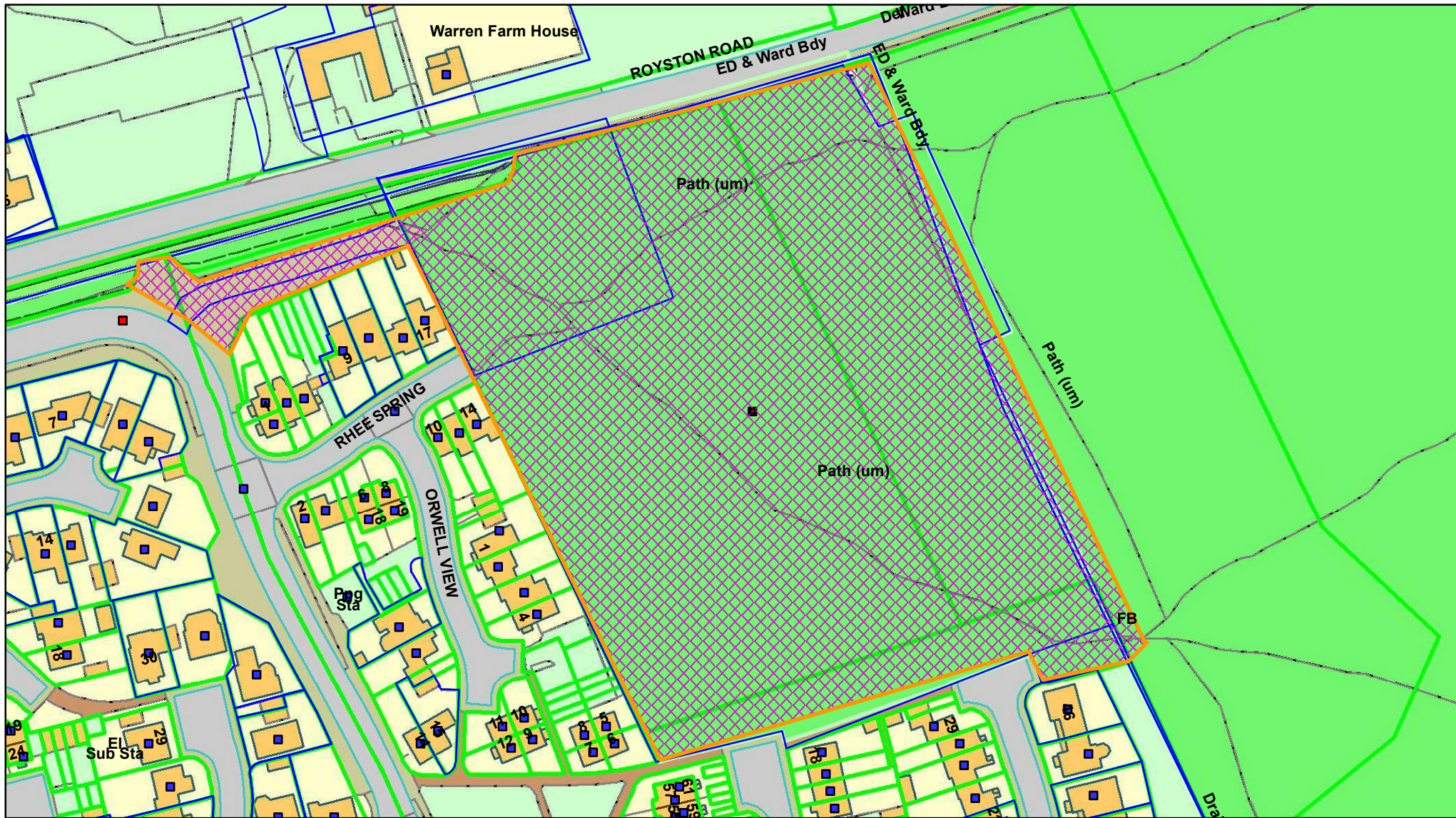


Gareth Wilby
BSc (Hons) FIHE MCIHT AMICE
Director

APPENDIX A – LOCATION PLAN

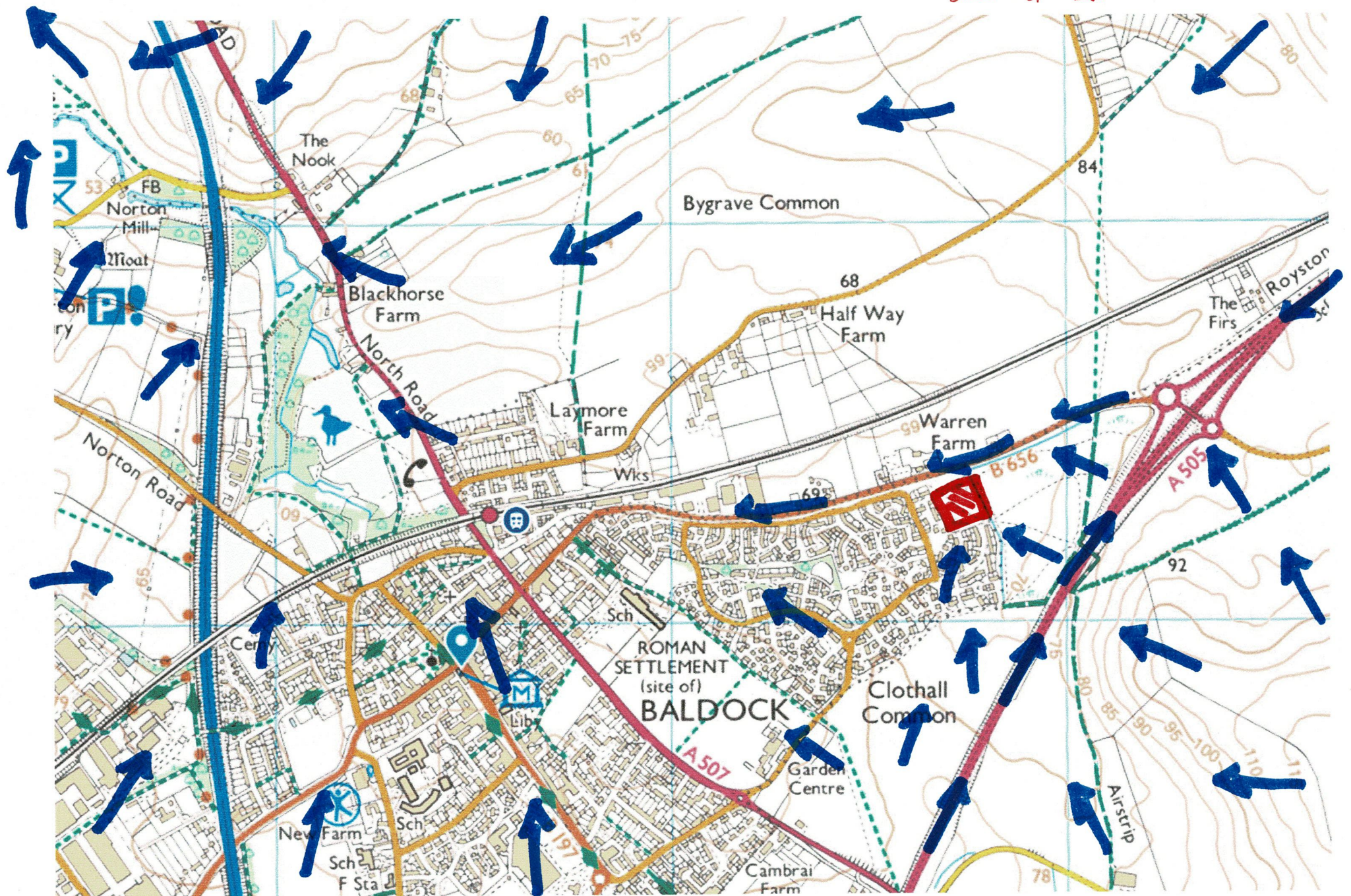
NORTH HERTFORDSHIRE DISTRICT COUNCIL

21/01882/FP Land East Rhee Spring and Orwell View, Royston Road, Baldock, Hertfordshire

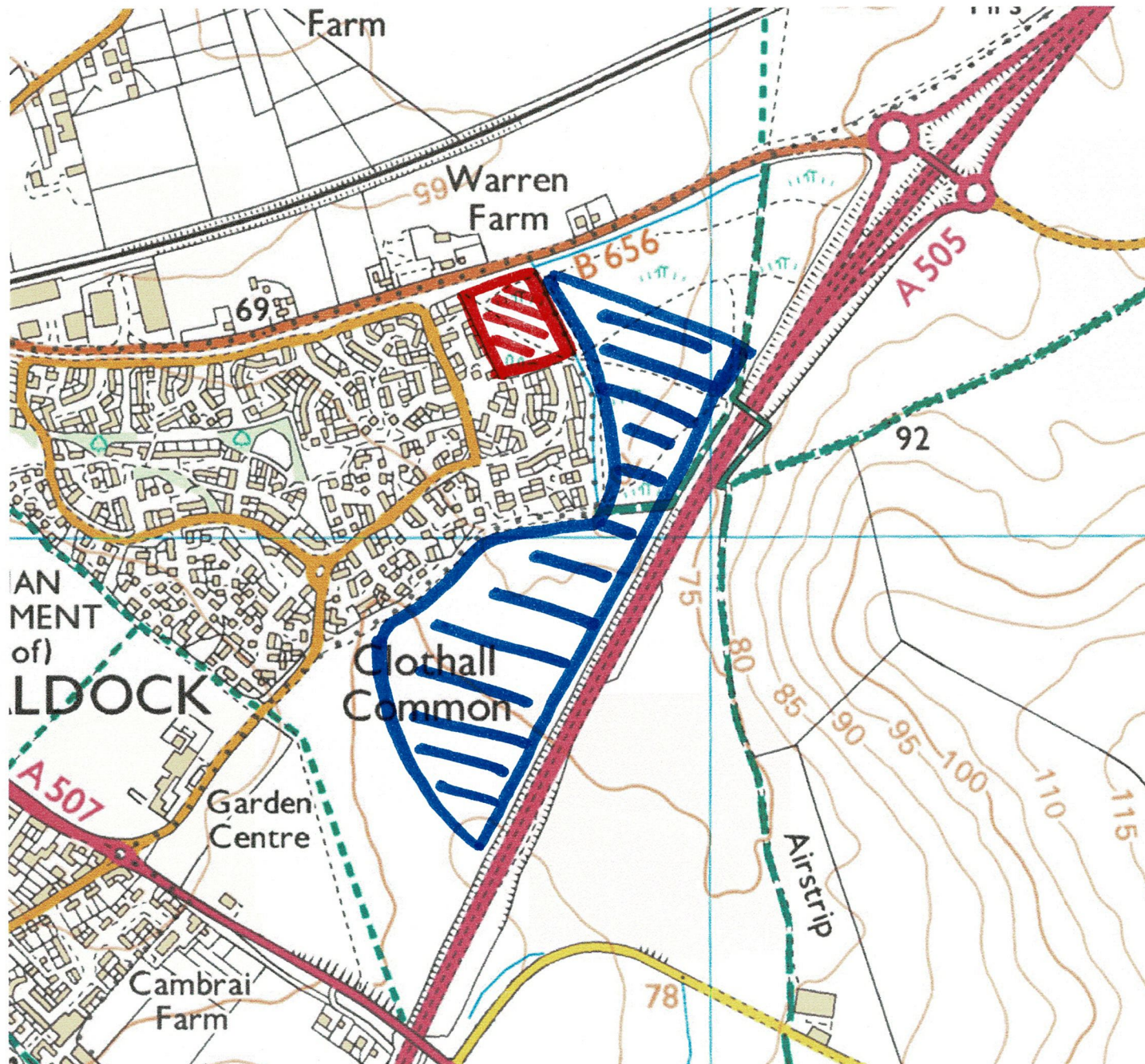


APPENDIX B – CATCHMENT PLAN SKETCHES 1-4

* GJW CATCHMENT
SKETCH 1



~~GT.W~~ CATCHMENT SKETCH 2



KEY;



- Site Area
= 17,500m²
/ 1.75 ha.



Off Site
+ Catchment
to Watercourse.

AREA 167,000m²
/ 16.70 ha.

∴ Total = 18.45 ha

* G.T.W. CATCHMENT
SKETCH 3



KEY:



Catchment #3
- Site Area
= 1.75 ha

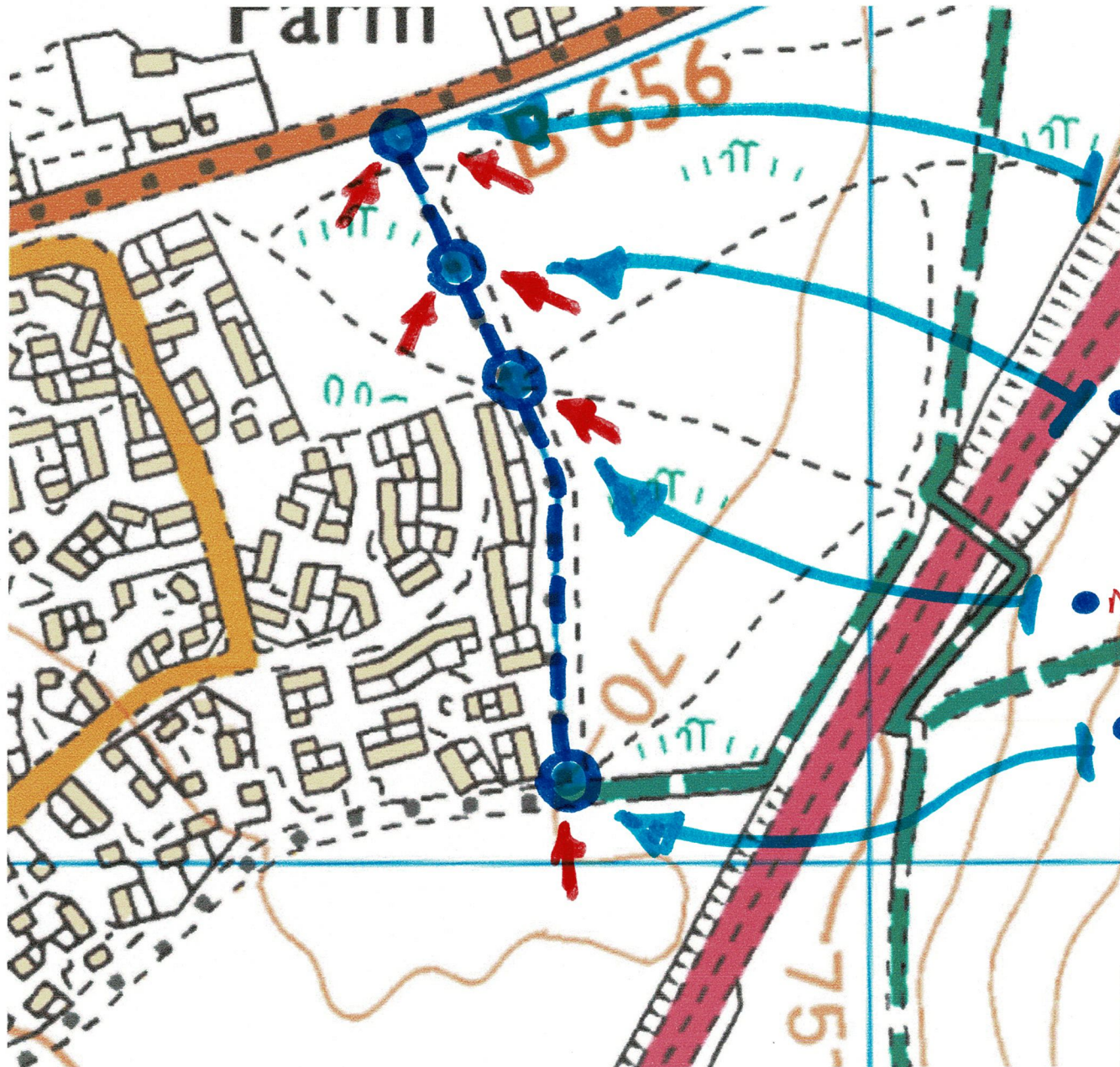


+ Catchment #1
= 5.5 ha



+ Catchment #2
= 11.2 ha

~~#~~ G.J.W. CATCHMENT SKETCH 4



● NODE 6
CATCHMENT # 1A = 1.85ha
+ 3A = 1.0ha
= 2.85ha

● NODE 5
CATCHMENT # 1B = 1.85ha
+ 3B = 0.75ha
= 2.60ha

● NODE 4
CATCHMENT # 1C = 1.80ha

● NODE 1
CATCHMENT # 3 = 11.20ha

∴ TOTAL = 18.45ha

APPENDIX C – SURFACE WATER CALCULATIONS

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	10.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.480	14.00	70.000	600	525838.718	234036.369	0.300
2			69.618	600	525836.643	234117.994	0.300
3			69.240	600	525832.771	234196.842	0.300
4	0.080	12.00	68.952	600	525810.805	234248.920	0.300
5	0.120	10.00	68.073	600	525779.926	234313.613	0.300
6	0.120	8.00	67.523	600	525752.838	234373.775	0.623
7			67.500	600	525748.565	234383.013	0.650

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	1	2	81.651	0.030	69.700	69.318	0.382	213.7	300	16.02	50.0
1.001	2	3	78.943	0.030	69.318	68.940	0.378	208.8	300	17.95	50.0
1.002	3	4	56.521	0.030	68.940	68.652	0.288	196.3	300	19.29	50.0
1.003	4	5	71.685	0.030	68.652	67.773	0.879	81.6	300	20.38	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	0.674	232.5	65.1	0.000	0.000	0.480	0.0	173	0.488
1.001	0.682	235.2	65.1	0.000	0.000	0.480	0.0	173	0.493
1.002	0.703	242.6	65.1	0.000	0.000	0.480	0.0	170	0.503
1.003	1.091	376.3	75.9	0.000	0.000	0.560	0.0	150	0.727

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)
1.004	5	6	65.979	0.030	67.773	67.223	0.550	120.0	300	21.61	50.0
1.005	6	7	10.178	0.030	66.900	66.850	0.050	203.6	300	21.85	50.0

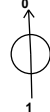
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.004	0.899	310.3	92.2	0.000	0.000	0.680	0.0	178	0.662
1.005	0.690	238.2	108.4	0.323	0.350	0.800	0.0	214	0.566

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	81.651	213.7	300	Swale	70.000	69.700	0.000	69.618	69.318	0.000
1.001	78.943	208.8	300	Swale	69.618	69.318	0.000	69.240	68.940	0.000
1.002	56.521	196.3	300	Swale	69.240	68.940	0.000	68.952	68.652	0.000
1.003	71.685	81.6	300	Swale	68.952	68.652	0.000	68.073	67.773	0.000
1.004	65.979	120.0	300	Swale	68.073	67.773	0.000	67.523	67.223	0.000
1.005	10.178	203.6	300	Swale	67.523	66.900	0.323	67.500	66.850	0.350

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	600	Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	4	600	Manhole	Adoptable
1.003	4	600	Manhole	Adoptable	5	600	Manhole	Adoptable
1.004	5	600	Manhole	Adoptable	6	600	Manhole	Adoptable
1.005	6	600	Manhole	Adoptable	7	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	525838.718	234036.369	70.000	0.300	600		0	1.000	69.700	300
2	525836.643	234117.994	69.618	0.300	600		1	1.000	69.318	300
3	525832.771	234196.842	69.240	0.300	600		0	1.001	69.318	300
4	525810.805	234248.920	68.952	0.300	600		1	1.001	68.940	300
5	525779.926	234313.613	68.073	0.300	600		0	1.002	68.940	300
6	525752.838	234373.775	67.523	0.623	600		1	1.002	68.652	300
7	525748.565	234383.013	67.500	0.650	600		0	1.003	68.652	300
							1	1.003	67.773	300
							0	1.004	67.773	300
							1	1.004	67.223	300
							0	1.005	66.900	300
							1	1.005	66.850	300

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	100 year 360 minute (m³)
Summer CV	0.750	Skip Steady State	✓	Check Discharge Rate(s)	✓	
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	✓	

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Soil Index	1	Growth Factor 30 year	1.95	Q 1 year (l/s)
Greenfield Method	IH124	SPR	0.10	Growth Factor 100 year	2.48	Q 30 year (l/s)
Positively Drained Area (ha)		Region	1	Betterment (%)	0	Q 100 year (l/s)
SAAR (mm)		Growth Factor 1 year	0.85	QBar		

Pre-development Discharge Volume

Site Makeup	Greenfield	Soil Index	1	Return Period (years)	100	Betterment (%)	0
Greenfield Method	FSR/FEH	SPR	0.10	Climate Change (%)	0	PR	
Positively Drained Area (ha)		CWI		Storm Duration (mins)	360	Runoff Volume (m³)	

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	14	69.850	0.150	35.9	4.8301	0.0000	OK
15 minute winter	2	18	69.475	0.157	42.5	0.0445	0.0000	OK
15 minute winter	3	22	69.093	0.153	43.7	0.0434	0.0000	OK
30 minute winter	4	31	68.762	0.110	40.7	0.6153	0.0000	OK
30 minute winter	5	33	67.906	0.133	41.2	1.1025	0.0000	OK
30 minute winter	6	33	67.043	0.143	38.9	0.5900	0.0000	OK
30 minute winter	7	33	66.944	0.094	38.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	42.5	0.437	0.183	8.2418	
15 minute winter	2	1.001	3	43.7	0.447	0.186	7.8777	
15 minute winter	3	1.002	4	36.7	0.455	0.151	4.6605	
30 minute winter	4	1.003	5	38.7	0.541	0.103	5.3068	
30 minute winter	5	1.004	6	37.7	0.568	0.122	4.4639	
30 minute winter	6	1.005	7	38.9	0.543	0.163	0.7475	64.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	69.917	0.217	89.6	6.9956	0.0000	OK
15 minute winter	2	15	69.546	0.228	99.2	0.0645	0.0000	OK
15 minute winter	3	19	69.165	0.225	107.3	0.0636	0.0000	OK
30 minute winter	4	27	68.823	0.171	105.0	0.9593	0.0000	OK
30 minute winter	5	29	67.981	0.208	117.4	1.7188	0.0000	OK
30 minute winter	6	28	67.121	0.221	115.8	0.9137	0.0000	OK
30 minute winter	7	29	67.011	0.161	115.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	99.2	0.542	0.427	15.8621	
15 minute winter	2	1.001	3	107.3	0.566	0.456	15.3855	
15 minute winter	3	1.002	4	97.3	0.592	0.401	9.4562	
30 minute winter	4	1.003	5	102.1	0.676	0.271	11.0990	
30 minute winter	5	1.004	6	108.6	0.750	0.350	9.6863	
30 minute winter	6	1.005	7	115.7	0.735	0.486	1.6293	162.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.92%

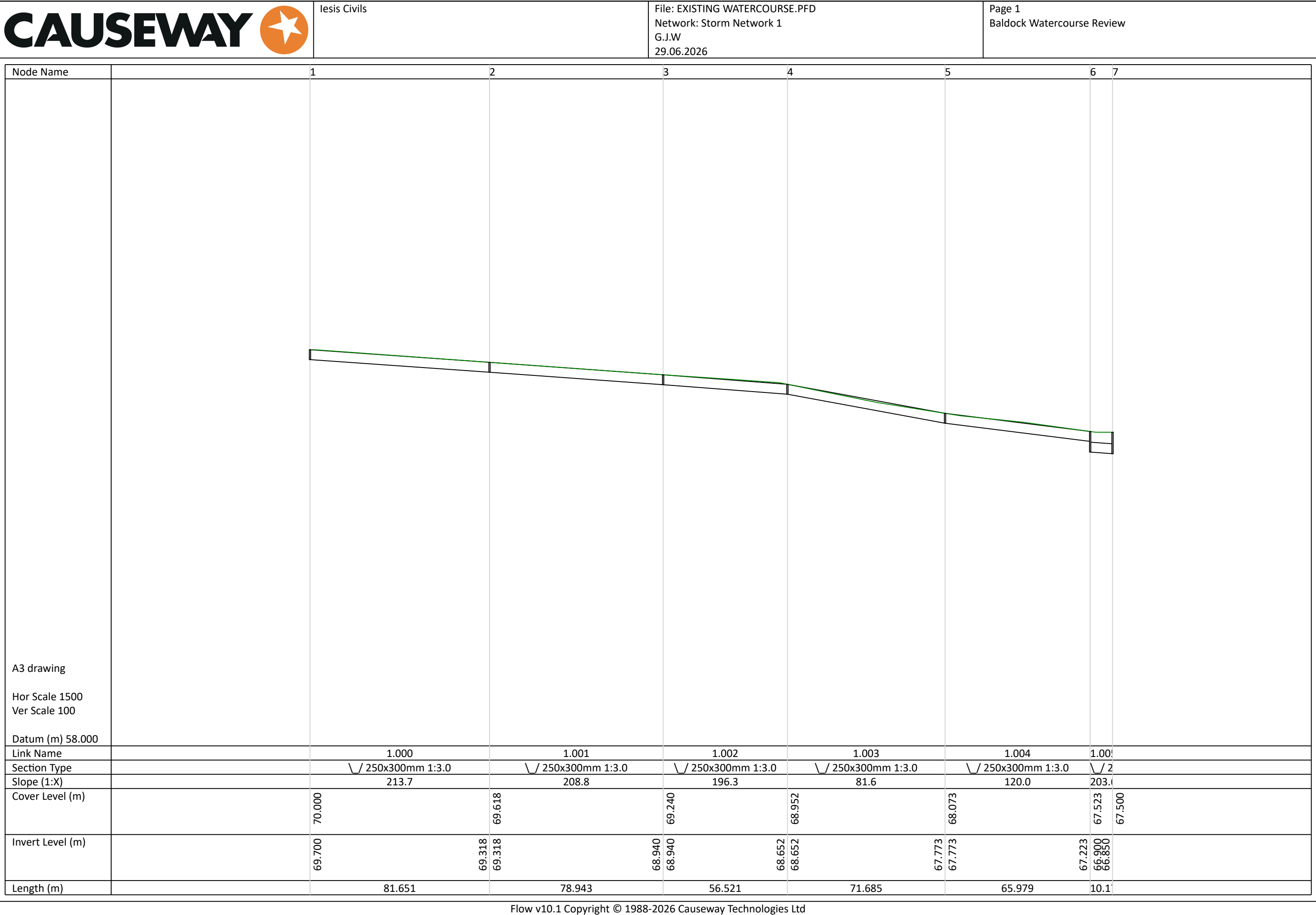
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	69.938	0.238	115.8	7.6766	0.0000	OK
15 minute winter	2	15	69.568	0.250	125.0	0.0709	0.0000	OK
15 minute winter	3	18	69.188	0.248	134.3	0.0701	0.0000	OK
15 minute winter	4	20	68.845	0.193	140.4	1.0814	0.0000	OK
30 minute winter	5	28	68.007	0.234	155.5	1.9361	0.0000	OK
30 minute winter	6	26	67.150	0.250	158.1	1.0334	0.0000	OK
30 minute winter	7	26	67.037	0.187	157.4	0.0000	0.0000	OK

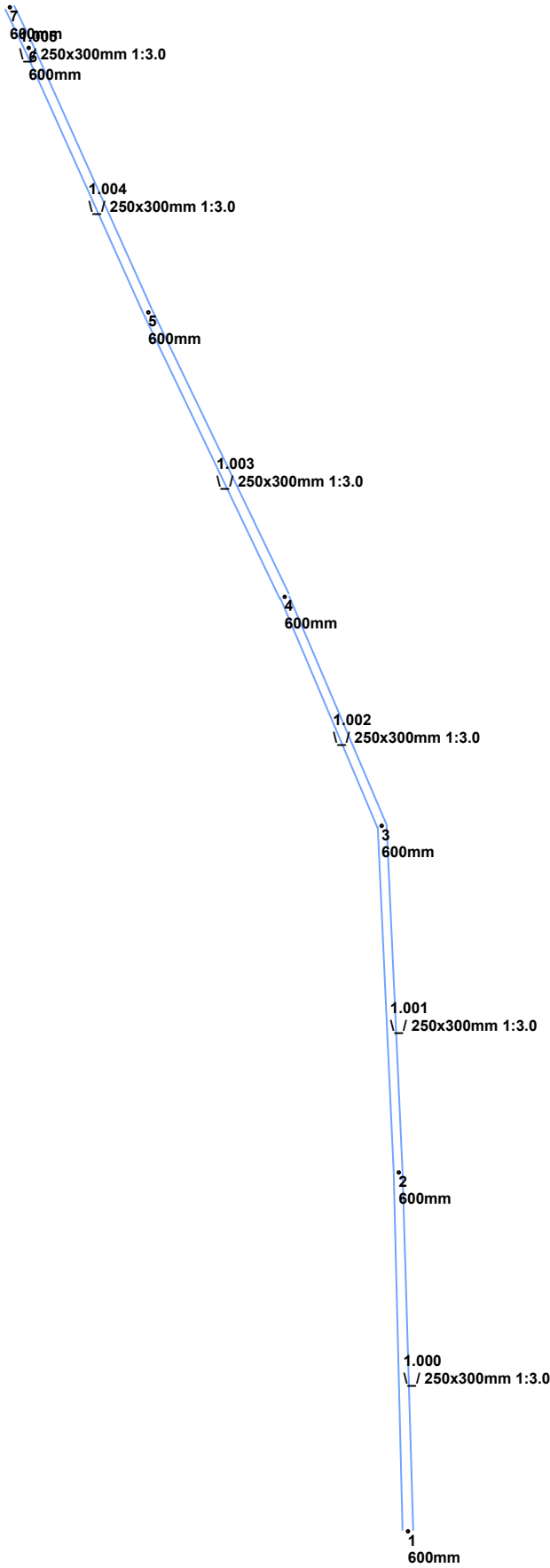
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	125.0	0.574	0.538	18.7257	
15 minute winter	2	1.001	3	134.3	0.601	0.571	18.3051	
15 minute winter	3	1.002	4	124.8	0.631	0.515	11.3659	
15 minute winter	4	1.003	5	134.0	0.751	0.356	13.0392	
30 minute winter	5	1.004	6	145.2	0.807	0.468	12.0167	
30 minute winter	6	1.005	7	157.4	0.797	0.661	2.0406	212.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.92%

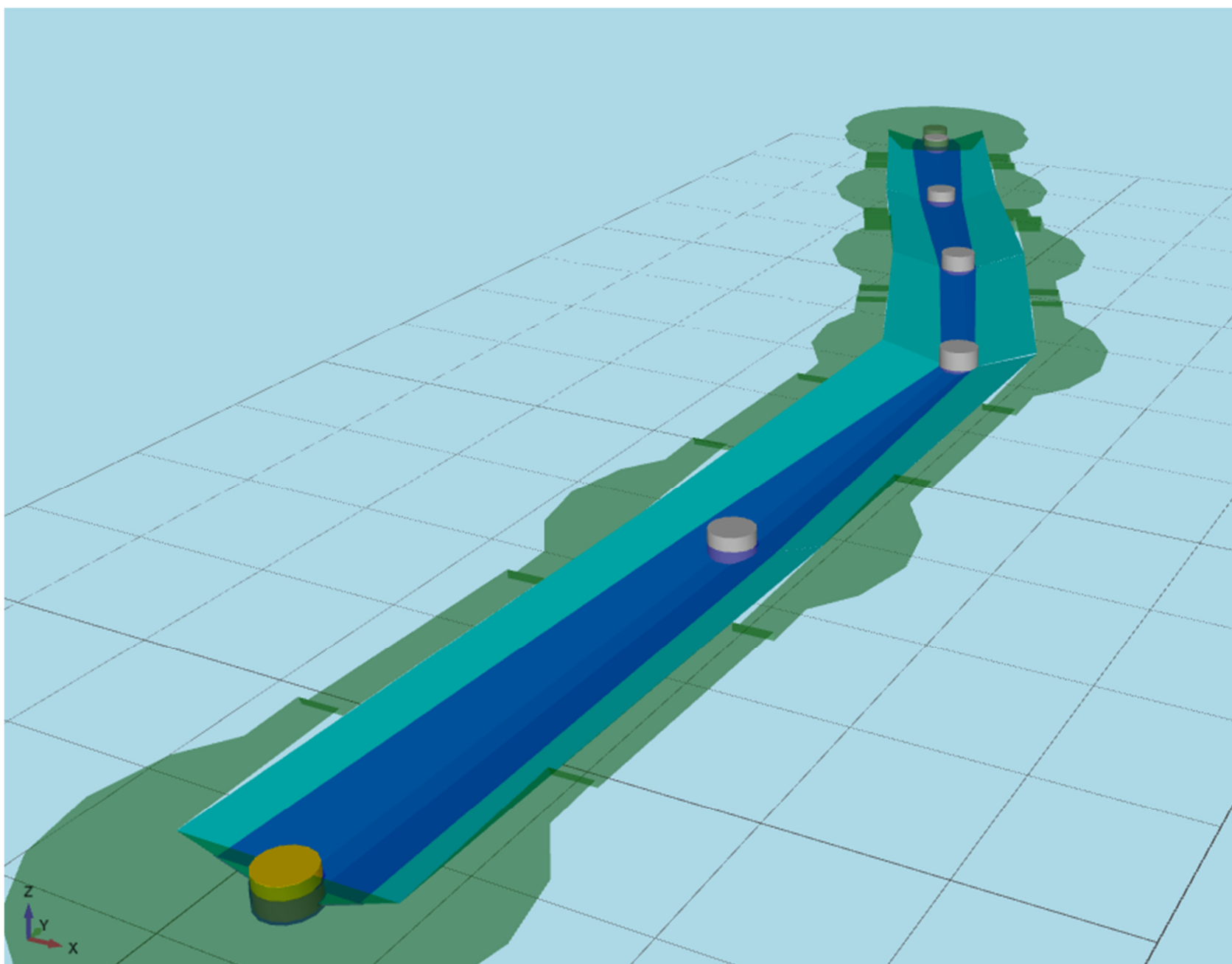
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	69.967	0.267	162.1	8.6087	0.0000	OK
15 minute winter	2	14	69.599	0.281	164.3	0.0795	0.0000	OK
15 minute winter	3	17	69.220	0.280	182.5	0.0793	0.0000	OK
15 minute winter	4	19	68.876	0.224	196.0	1.2586	0.0000	OK
30 minute winter	5	27	68.043	0.270	218.5	2.2351	0.0000	OK
30 minute winter	6	25	67.191	0.291	232.1	1.2041	0.0000	OK
30 minute winter	7	25	67.073	0.223	231.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	164.3	0.617	0.707	23.2608	
15 minute winter	2	1.001	3	182.5	0.649	0.776	22.8438	
15 minute winter	3	1.002	4	171.3	0.685	0.706	14.3770	
15 minute winter	4	1.003	5	189.7	0.805	0.504	17.0897	
30 minute winter	5	1.004	6	206.9	0.883	0.667	15.6292	
30 minute winter	6	1.005	7	231.7	0.881	0.973	2.7118	298.2





APPENDIX D – 3D PLAN OF THE EXISTING WATERCOURSE



END OF NOTE