TECHNICAL NOTE

Corner Water Consulting

Project Title:	Planning Applications 230312 & 230313 Land Adjacent to Calgary, Dinedor, HR2 6LQ	Job Number:	CWC190
		Date:	11/04/2023
Subject:	Maintenance of Drainage Elements		

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Background

This Technical Note is in support of planning applications 230312 & 230313 and should be read in conjunction with all other information associated with the planning application.

Application 230312 is entitled Application for approval of details reserved by conditions 7 & 8 attached to planning permission P193328/O.

Application 230313 is entitled Application for approval of details reserved by conditions 7 & 8 attached to planning permission 193329/O.

These two applications relate to surface water and foul drainage aspects at a site for the development of 8 houses. This report is an addendum and update to the previous planning submission drainage report entitled “Surface Water Management Plan and Foul Drainage Strategy for Residential Development at Dinedor, Herefordshire” Contract Ref: L0337 dated March 2021 by Hydro-Logic Services. This update is required due to increased climate change allowances plus the need to provide drainage maintenance details.

Figure 1: Site Layout Plan

Figure 2: Aerial View

Source Bing Maps - Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

1.2. Design Update

To update the design the DEFRA Survey Data download webservice was utilised to obtain current LiDAR mapping of the site and the surrounding fields. This data was used to produce a 200mm interval contour plan - see an extract showing the existing ground levels in Figure 3.

It should be noted that the LiDAR values do not correspond accurately with the contours shown on the architectural drawings. The DEFRA LiDAR values have been used in this design update to ensure accuracy.

Figure 3: Existing Ground Levels from LiDAR

Climate change information has been updated by the Government and EA since the previous SWMP report and the DEFRA Climate Change Allowances webpage shows that for Herefordshire the upper end rainfall allowances that are applicable for housing for the 3.3% AEP event are 40% at the 2070s, plus for the 1% AEP event are 45% for the 2070s.

The surface water drainage design has thus been assessed against up to 45% climate change plus 10% Urban Creep as required by the council.

1.3. Surface Water Management Plan

The proposed development is located adjacent to the public highway with the eastern and western boundary adjoining existing properties Hillview and Calgary respectively. The southern site boundary will be adjacent to retained agricultural land.

As high groundwater levels were detected infiltration and soakaways are not appropriate at this location and a design utilising attenuation plus a controlled rate of outflow has been utilised. The maximum outflow rate remains at 2 l/s and the dry basin has been amended to accommodate the additional climate change allowance plus the 10% hard paved area allowance to take urban creep into account.

Complete details of the design approach and the results are included in the drainage report within Appendix 2 which includes design settings, chamber (node) details, sewer (links) details, a complete Pipeline Schedule, plus a complete Manhole Schedule.

The Design Settings *Figure 4* and the Simulation Settings *Figure 5* show that FEH rainfall was utilised and climate change of 40% or 45% was applied – together with 10% creep for the 1 in 100 year event.

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.200
CV	0.750	Preferred Cover Depth (m)	0.500
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Figure 4: Design Settings for Surface Water Drainage

Simulation Settings

Rainfall Methodology	FEH-13	Drain Down Time (mins)	3600
Summer CV	0.750	Additional Storage (m³/ha)	20.0
Winter CV	0.840	Check Discharge Rate(s)	x
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +45% 360 minute (m³)	83

Storm Durations

15	30	60	120	180	240	360	480

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	45	10	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	45
Positively Drained Area (ha)	0.230	Storm Duration (mins)	360
Soil Index	2	Betterment (%)	0
SPR	0.30	PR	0.386
CWI	130.000	Runoff Volume (m³)	83

Node Basin Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	70.125	Product Number	CTL-SHE-0075-2000-0500-2000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	70.230
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	400.0	400.0	0.970	632.9	450.0

Figure 5: Modelling Simulation Settings for Surface Water Drainage

The areas drained to each part of the network has been taken from the approved planning drawings, with the shaded catchment areas shown in Figure 11. The catchment connected to each part of the network is detailed in Figure 6 and totals 2,240m^2. To control the rate of outflow to the ditch a dry basin with a basal area of 400m^2 and 1 in 3 side slopes is proposed. Infiltration into the soil has been ignored which is conservative. To suit the pipework arrangements the basin is 970mm deep and thus has a plan area at ground level of 633m^2.

As shown by the hydraulic modelling this size of basin is more than adequate for this site with a peak water level of 445mm during the 240 minute Winter 1 in 100 year plus 45% Climate Change plus a 10%

Creep allowance design event, see Figure 7 . At this provides a large freeboard the design is also resilient if the climate changes further in the future.

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
2			72.800	1200		-31.183	46.179	0.804
5			72.800	600		-28.445	15.927	1.101
12			72.000	600		6.324	18.802	1.018
9			71.400	1200		32.196	21.266	0.835
Basin			71.200	1200		11.836	-5.996	1.075
8	0.020	4.00	72.000	600		47.253	49.103	0.650
6	0.015	4.00	71.800	600		31.648	67.671	0.700
7	0.083	4.00	71.800	1200		26.720	53.297	0.952
10	0.004	4.00	72.000	600		3.723	54.666	0.700
11	0.013	4.00	72.000	600		6.050	34.681	0.834
1	0.067	4.00	72.800	1200		-32.493	53.962	0.725
4	0.011	4.00	72.800	600		-40.902	33.437	0.725
3	0.011	4.00	72.600	600		-29.107	34.800	0.700
13_OUT			70.800	400	1000	12.166	-27.048	0.900

Figure 6: Design Settings for Surface Water Drainage

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	2	11	72.411	0.415	50.8	0.4693	0.0000	SURCHARGED
15 minute winter	5	11	71.836	0.137	66.5	0.0387	0.0000	OK
15 minute winter	12	10	71.040	0.058	13.9	0.0163	0.0000	OK
15 minute winter	9	11	71.237	0.672	81.8	0.7604	0.0000	FLOOD RISK
240 minute winter	Basin	240	70.570	0.445	31.7	150.7326	0.0000	SURCHARGED
15 minute winter	8	11	71.444	0.094	16.0	0.0889	0.0000	OK
15 minute winter	6	11	71.398	0.298	12.2	0.2231	0.0000	SURCHARGED
15 minute winter	7	11	71.390	0.542	80.7	1.6521	0.0000	SURCHARGED
15 minute winter	10	10	71.345	0.045	3.5	0.0187	0.0000	OK
15 minute winter	11	10	71.254	0.088	13.9	0.0542	0.0000	OK
15 minute winter	1	11	72.525	0.450	54.8	1.4220	0.0000	FLOOD RISK
15 minute summer	4	10	72.130	0.055	9.1	0.0340	0.0000	OK
15 minute winter	3	11	72.257	0.357	58.3	0.2201	0.0000	SURCHARGED
15 minute summer	13_OUT	1	69.900	0.000	2.0	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	2	1.001	3	50.5	1.269	1.064	0.4600	
15 minute winter	5	1.003	Basin	66.9	2.226	0.692	1.4444	
15 minute winter	12	5.002	Basin	13.8	0.688	0.144	0.5857	
15 minute winter	9	3.002	Basin	81.1	2.043	1.371	1.3533	
240 minute winter	Basin	Hydro-Brake®	13_OUT	2.0				180.8
15 minute winter	8	4.000	9	15.6	1.190	0.586	0.4629	
15 minute winter	6	3.000	7	12.6	0.892	0.331	0.4756	
15 minute winter	7	3.001	9	67.9	1.231	0.655	2.2883	
15 minute winter	10	5.000	11	3.5	0.384	0.113	0.1863	
15 minute winter	11	5.001	12	13.9	1.087	0.364	0.2027	
15 minute winter	1	1.000	2	50.8	1.279	0.978	0.3139	
15 minute summer	4	2.000	5	9.1	0.668	0.132	0.3453	
15 minute winter	3	1.002	5	58.5	1.474	1.382	0.7259	

Figure 7: Modelling Results for 100 year plus Climate Change plus Creep

The dry basin will be constructed in accordance with SuDS Manual Chapter 22 with 1 in 3 side slopes, plus the design values detailed in this report. A section through the inlet pipework, basin and outfall is shown in Figure 8.

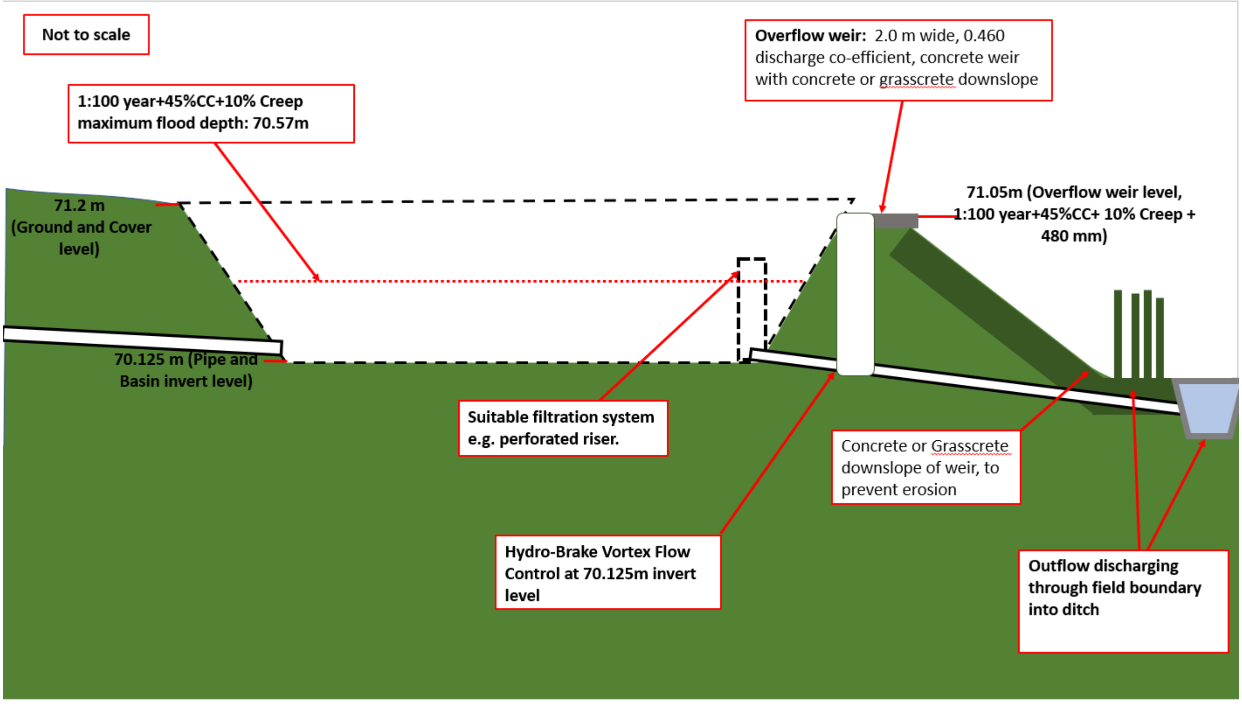

Figure 8: Dry Basin Section

The reed bed location has been determined by ARM and is shown on drawing number RBS 4667/2 Rev A, included in Appendix 1.

1.4. Foul Drainage and Treatment

The foul drainage gravity networks have been designed in Causeway Flow following the methodology within Sewers for Adoption/the Sewerage Sector Guidance by UK Water.

Complete details of the design approach and the results are included in the drainage report within Appendix 3 which includes design settings, chamber (node) details, sewer (links) details, a complete Pipeline Schedule, plus a complete Manhole Schedule. The Foul Design Settings plus details of the chambers (Nodes) and sewers (Links) are shown in Figure 9.

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	1.00
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	2.000
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	0.450
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Dwellings	Cover Level (m)	Manhole Type	Width (mm)	Easting (m)	Northing (m)	Depth (m)
5	1	72.800	Adoptable		-36.394	36.408	1.000
6	1	72.340	Adoptable		-13.426	37.613	0.923
PTP1		72.300	Adoptable		-6.416	37.811	1.050
8		72.200	Adoptable		-2.862	17.561	1.361
10		71.200	Adoptable		7.984	-1.448	1.406
Reed Bed		70.600	Adoptable		19.259	-46.191	1.267
11_OUT		70.300	Headwall	900	13.705	-54.459	1.313
2	2	71.800	Adoptable		30.096	70.006	0.550
3	1	71.800	Adoptable		23.126	55.262	1.329
9		72.000	Adoptable		5.835	11.996	1.934
1	1	72.000	Adoptable		41.521	59.837	0.800
PTP2		71.800	Adoptable		2.676	51.122	1.538

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
3.000	5	6	23.000	1.500	71.800	71.417	0.383	60.0	100
3.001	6	PTP1	7.013	1.500	71.417	71.300	0.117	60.0	100
3.002	PTP1	8	20.560	1.500	71.250	70.839	0.411	50.0	150
3.003	8	9	10.325	1.500	70.839	70.066	0.773	13.4	150
1.004	10	Reed Bed	46.142	1.500	69.794	69.333	0.461	100.0	150
1.005	Reed Bed	11_OUT	9.960	1.500	69.333	68.987	0.346	28.8	150
2.000	2	3	16.308	1.500	71.250	70.521	0.729	22.4	100
1.001	3	PTP2	20.865	1.500	70.471	70.262	0.209	100.0	150
1.002	PTP2	9	39.253	1.500	70.262	70.066	0.196	200.0	150
1.003	9	10	13.615	1.500	70.066	69.794	0.272	50.0	150
1.000	1	3	18.955	1.500	71.200	70.521	0.679	27.9	100

Figure 9: Foul Drainage Design Settings

Primary and secondary treatment of the foul flows will be undertaken utilising two One2Clean biological only sewage package treatment plants by Graf, all in accordance with the General Binding Rules for Small Sewage Discharges, UK best practice, plus the Building Regulations Part H.

The total daily flow for the entire 8 dwellings has been determined as 14 people in the western part of the site creating 1540 l/day, with a further 26 persons in the eastern part of the site generating 2,860 l/day. So the total will be less than 5m^3/day and with the discharge being classed as 'to surface water' there will be no requirement for an EA Discharge Permit as the site is within the requirements of the General Binding Rules.

PIA Prüfinstitut für Abwassertechnik GmbH

PERFORMANCE RESULTS

Otto Graf GmbH
Carl-Zeiss-Str. 2 - 6, 79331 Teningen, Germany

EN 12566-3
Small wastewater treatment systems for up to 50 PT

Small wastewater treatment system one2clean
SBR plant in one two-zone polypropylene tank

Test report PIA2014-216B14.01.e

Nominal organic daily load*	0.27	kg/d	
Nominal hydraulic daily load	0.75	m³/d	
Material	polypropylene		
Treatment efficiency (nominal sequences)		Efficiency	Effluent
	COD	94.2 %	43 mg/l
	BOD_5	98.0 %	7 mg/l
	SS	96.3 %	14 mg/l
	NH_4-N**	98.3 %	0.5 mg/l
	N_{tot}**	87.0 %	7.9 mg/l
	P_{tot}	80.2 %	1.6 mg/l
Electrical consumption	0.63	kWh/d	

*at a test influent of ≥ 300 mg/l BOD_5 (mean)
**determined for temperatures ≥ 12°C in the bioreactor

Performance tested by:

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

This document replaces neither the declaration of performance nor the CE marking.

Notified Body No.: 1739 — Certified according to ISO 9001:2008 — DAkkS Deutsche Akkreditierungsstelle D-PL-17712-01-00

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Elmar Lancé — November 2014

Figure 10: PTP Performance Results

1.5. Drainage Details

Complete and comprehensive design details have been produced for this site.

Reed bed design details are included in the design report, calculations and drawings submitted with the planning application. Appendix 1, includes:

- Reed bed Location drawing, number RBS4667/2 Rev A;
- Reed bed details drawing, number RBS 4667/1 Rev A.

Surface Water design data is included within Section 1.3, plus within Appendix 2, including:

- Compete hydraulic modelling report
- Plan drawings of the surface water networks;
- Long section drawings of both networks at 1 to 100 scale horizontally and 1 to 20 vertically.

Foul drainage design data is included within Section 1.4 , plus within Appendix 3, including:

- Compete hydraulic modelling report
- Plan drawings of the foul networks;
- Long section drawings of both networks at 1 to 100 scale horizontally and 1 to 20 vertically.

The overall site drainage layout plan arrangement is shown in Figure 11, which also repeats the pipework sizes and gradients, plus chamber cover and invert levels - all of which are provided in complete detail within the various Manhole plus Pipeline schedules.

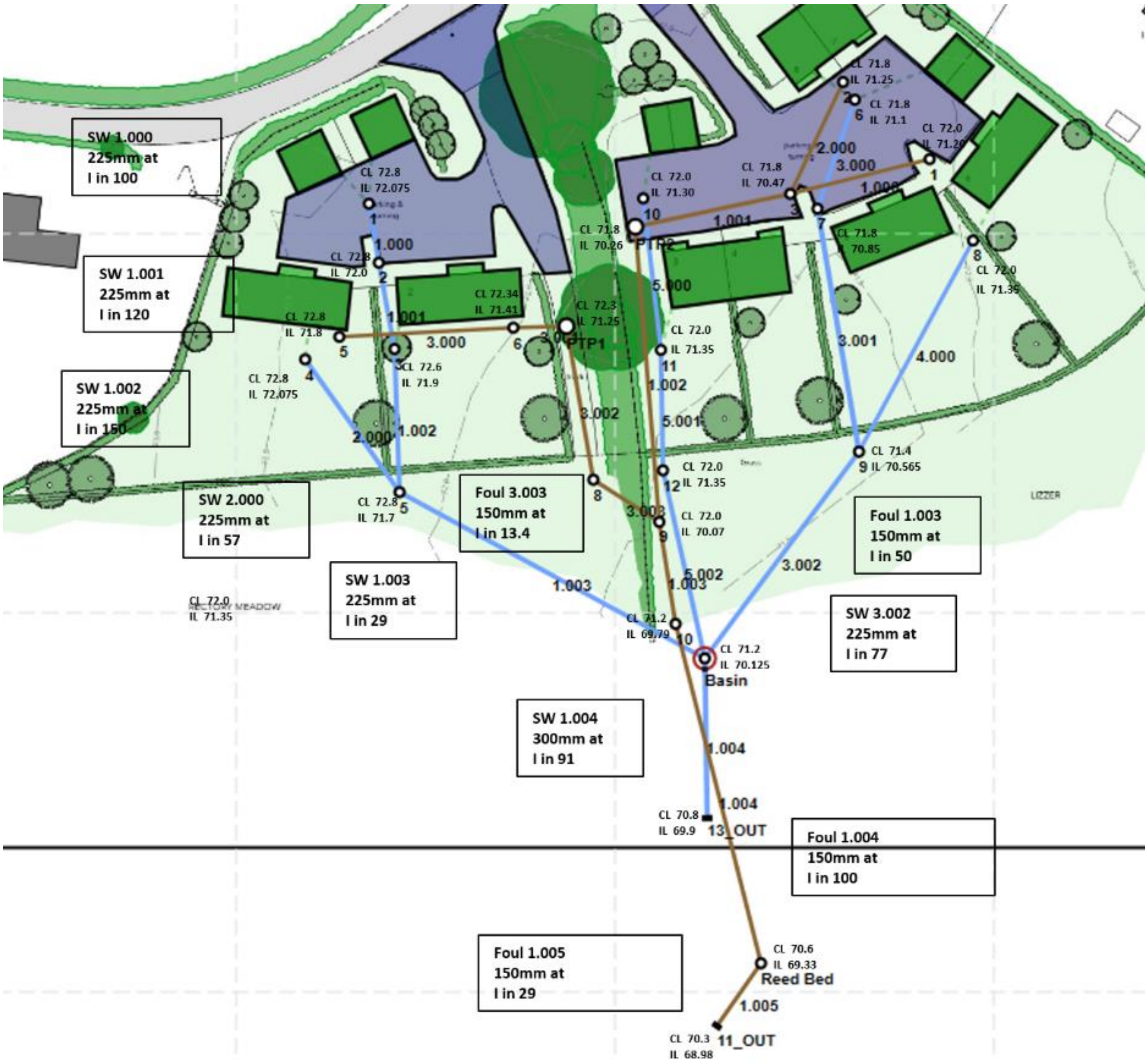

Figure 11: Foul and Storm Drainage Network Modelling

1.6. Maintenance

This section of the report should be read in conjunction with some of the other information submitted as part of the planning application. Namely “Surface Water Management Plan and Foul Drainage Strategy for Residential Development at Dinedor, Herefordshire” Contract Ref: L0337 dated March 2021 by Hydro-Logic Services which details maintenance of SuDS in section 3.5 and of foul drainage in sections 4.2 and 4.3.

The reed bed designers ARM Design Specification, which details maintenance in section 4.3.

Some of the drainage elements and assets will be shared between properties it will be necessary to ensure that all future owners of the dwellings cooperate and ensure that matters are dealt with as required. As such a legal opinion has been undertaken in respect of the form of the arrangement that would be appropriate at this small development. The solicitor has dealt with a number of such sites and has concluded that the following is the most appropriate shared ownership/responsibility arrangement.

“Dudley Cleland will retain all the land to the south of the development boundary line, upon which the reed bed, storage basin and pipework shall be located. Dudley Cleland will be responsible for the maintenance and upkeep of this service media, subject to the plot owners contributing a fair proportion to such maintenance costs.

The pipe work from the development site to the dry basin plus the reed bed will be installed at a suitable depth to ensure the ongoing agricultural use of the land and fencing will be installed around the immediate vicinity of the reed bed and the dry basin.

The plot owners shall be jointly responsible for the maintenance and repair of the package treatment plants and drainage pipes falling within the development site”.

No legal agreement has been drawn up at this time as this would not be appropriate until all planning matters have been concluded.

The owners of the fields surrounding the SuDS dry basin would be responsible for undertaking the management and maintenance of the basin. This requires simple but regular attention as detailed within Figure 12.

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Figure 12: Maintenance of Detention Basins

Foul Operation and Maintenance

The dwelling owners would be responsible for the management and maintenance of the shared foul drainage system serving the properties. The foul maintenance can be undertaken by competent local drainage contractors, who can undertake regular as well as any emergency maintenance.

The package treatment plant is to be a UK certified and approved unit. All foul drainage will be via gravity sewer designed and installed in accordance with the Building Regulations. Suitable tanker access is provided to allow occasional maintenance and is provided by the driveways and parking.

The PTP should be installed and maintained as per manufacturer instructions. It is recommended that a local qualified drainage contractor be employed to undertake regular plus any emergency maintenance.

The council with Balfour Beatty Living Places have prepared a checklist for a PTP. These should be followed in the final design and construction of the foul drainage apparatus.

To ensure the reliable long-term operation of the drainage network there will need to be maintenance arrangements put in place. The council produced a checklist to ensure that the key points are addressed. These key points are considered below (black text) – together with the mechanism by which these are addressed (blue text) which have already been agreed by the council on other multi house development sites.

1. How maintenance and eventual replacement of the package treatment plant will be funded.

   Sinking fund or similar by the dwelling owners.

2. Please clarify which party will retrieve inorganic debris from the package treatment plant when this is discharged down the drains. The inorganic debris will need to be removed in a timely manner to ensure the continued operation of the plant.

   The appointed and certified foul drainage maintenance contractor or contractors, or the dwelling owners.

3. Please clarify who will be responsible for communicating with new residents (e.g. new tenants) to advise them to dispose of inorganic debris using bins.

   The detailed property handover detail pack will include details. Noting that this is not an unusual arrangement and occurs in many properties throughout the county. Appropriate signage will also be located within a property, e.g.

4. Which party will maintain the package treatment plant and which drains will be owned by respective property owners or third party. If a private management company is proposed, then the land on which the package treatment plant is built and the plant itself will need to be owned by all of the property owners. This policy is consistent with our SuDS guidance and will ensure continuity if the management company went into administration.

The dwellings are served by a PTP within the housing area and the responsibility for maintenance lies with the property owners. These owners can be supported by appointing a qualified foul drainage maintenance contractor.

Dudley Cleland will retain all the land to the south of the development boundary line and will ensure maintenance of all elements located in this area.

5. In the event of electrical power failure, the Residual Current Device may isolate the package treatment plant. In this scenario pollution will occur. The RCD would need to be installed in a dry place, please confirm where. Please advise which party will be responsible for switching the package treatment plant on after an electrical power failure.

   For a PTP the RCD will be in the local control panel. Any resetting would be by the appointed and certified foul drainage maintenance contractor or contractors, or the dwelling owners.

6. If a water company operated a remote pumping station, then they would install telemetry so that their maintenance team could respond to pump failure within 3 hours to mitigate the risk of pollution. As there will be multiple users, the residents will not be immediately accountable and so will rely on any management company to resolve a problem. A method will need to be developed to ensure that failure of the package treatment plant will be communicated to those who maintain it.

   Not applicable as there is no pumping.

2. CONCLUSIONS

This Technical Note provides an updated drainage design for the site to take into account any changes made to UK Climate Change Policy or otherwise required by local or national policy since the planning application data plus design detail was prepared.

The design follows the planning approved layout plus adds some additional maintenance details.

APPENDIX 1 – REED BED DRAWINGS

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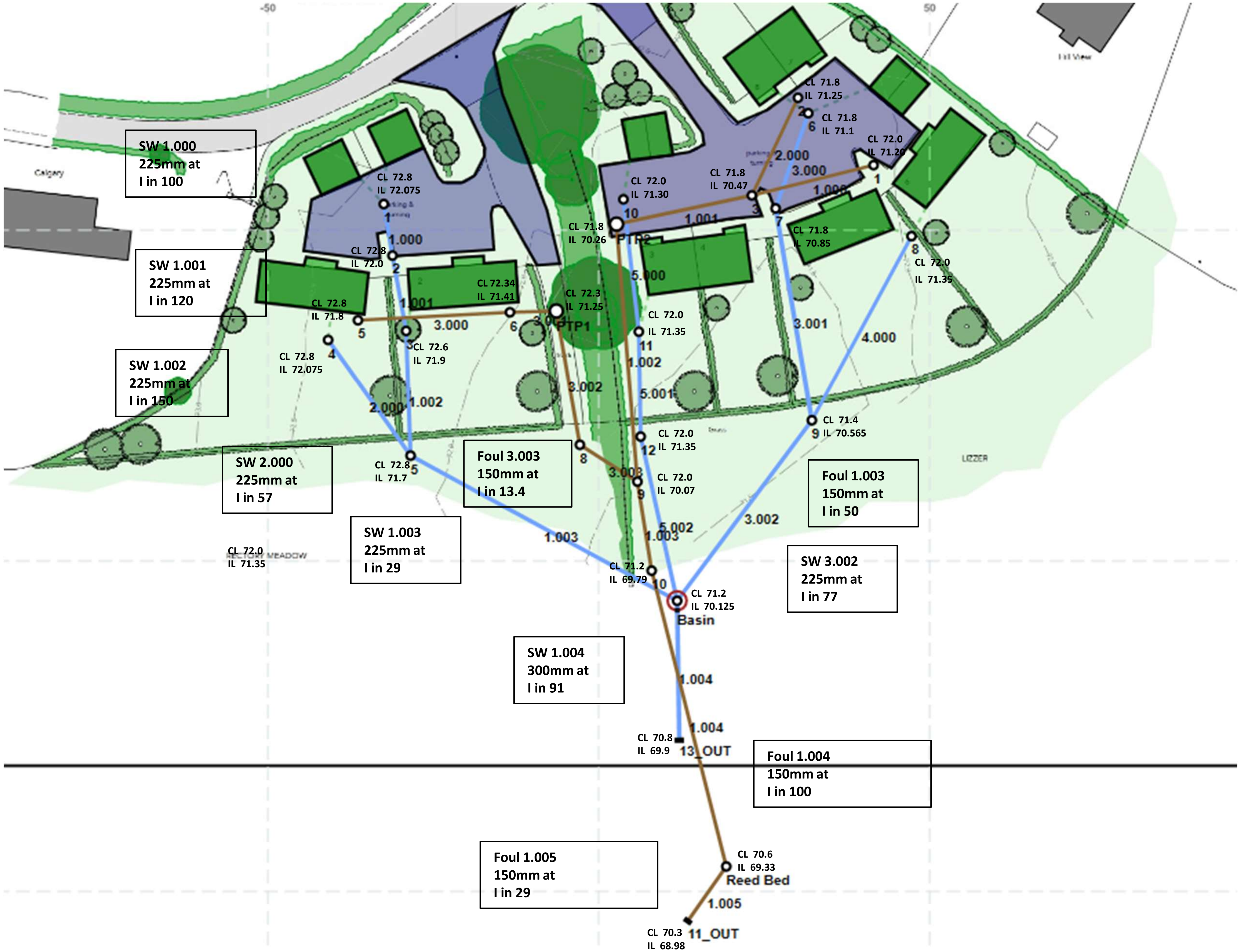
APPENDIX 2 – SURFACE WATER DRAINAGE DESIGN REPORT & DRAWINGS



SW 1.000
225mm at
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SW 1.001
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I in 120
SW 1.002
225mm at
I in 150
SW 2.000
225mm at
I in 57
SW 1.003
225mm at
I in 29
Foul 3.003
150mm at
I in 13.4
SW 1.004
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I in 91
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CL 71.8
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IL 69.9
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CL 70.6
IL 69.33
Reed Bed
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1.000
1.001
1.002
1.003
1.004
1.005
2.000
3.000
3.001
3.002
3.003
4.000
5.000
5.001
5.002

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.200
CV	0.750	Preferred Cover Depth (m)	0.500
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
2			72.800	1200		-31.183	46.179	0.804
5			72.800	600		-28.445	15.927	1.101
12			72.000	600		6.324	18.802	1.018
9			71.400	1200		32.196	21.266	0.835
Basin			71.200	1200		11.836	-5.996	1.075
8	0.020	4.00	72.000	600		47.253	49.103	0.650
6	0.015	4.00	71.800	600		31.648	67.671	0.700
7	0.083	4.00	71.800	1200		26.720	53.297	0.952
10	0.004	4.00	72.000	600		3.723	54.666	0.700
11	0.013	4.00	72.000	600		6.050	34.681	0.834
1	0.067	4.00	72.800	1200		-32.493	53.962	0.725
4	0.011	4.00	72.800	600		-40.902	33.437	0.725
3	0.011	4.00	72.600	600		-29.107	34.800	0.700
13_OUT			70.800	400	1000	12.166	-27.048	0.900

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)
1.001	2	3	11.567	0.600	71.996	71.900	0.096	120.0	225	4.26	176.7
1.003	5	Basin	45.860	0.600	71.699	70.125	1.574	29.1	225	4.87	176.7
5.002	12	Basin	25.403	0.600	70.982	70.125	0.857	29.6	225	4.73	176.7
3.002	9	Basin	34.026	0.600	70.565	70.125	0.440	77.3	225	4.96	176.7
4.000	8	9	31.648	0.600	71.350	70.640	0.710	44.6	150	4.35	176.7
3.000	6	7	15.195	0.600	71.100	70.948	0.152	100.0	200	4.21	176.7
3.001	7	9	32.496	0.600	70.848	70.565	0.283	114.8	300	4.58	176.7
5.000	10	11	20.120	0.600	71.300	71.166	0.134	150.0	200	4.34	176.7
5.001	11	12	15.881	0.600	71.166	71.007	0.159	100.0	200	4.56	176.7

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)
1.001	1.192	47.4	32.0	0.579	0.475	0.067	0.0	136	1.278
1.003	2.433	96.7	42.4	0.876	0.850	0.088	0.0	104	2.355
5.002	2.412	95.9	8.1	0.793	0.850	0.017	0.0	44	1.472
3.002	1.488	59.2	56.2	0.610	0.850	0.117	0.0	175	1.685
4.000	1.511	26.7	9.3	0.500	0.610	0.020	0.0	61	1.379
3.000	1.211	38.1	7.1	0.500	0.652	0.015	0.0	58	0.930
3.001	1.466	103.6	46.8	0.652	0.535	0.098	0.0	142	1.431
5.000	0.987	31.0	2.0	0.500	0.634	0.004	0.0	35	0.561
5.001	1.211	38.1	8.1	0.634	0.793	0.017	0.0	62	0.963

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	7.892	0.600	72.075	71.996	0.079	100.0	225	4.10	176.7
2.000	4	5	21.489	0.600	72.075	71.699	0.376	57.2	225	4.21	176.7
1.002	3	5	18.885	0.600	71.900	71.774	0.126	150.0	225	4.56	176.7
1.004	Basin	13_OUT	20.398	0.600	70.125	69.900	0.225	90.7	300	5.17	173.0

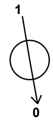
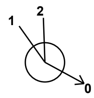
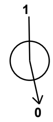
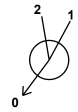
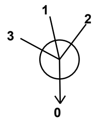
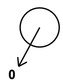
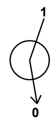
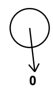
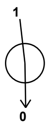
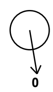
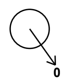
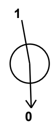
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.307	52.0	32.0	0.500	0.579	0.067	0.0	128	1.373
2.000	1.733	68.9	5.3	0.500	0.876	0.011	0.0	42	1.031
1.002	1.065	42.3	37.1	0.475	0.801	0.077	0.0	164	1.197
1.004	1.652	116.7	104.4	0.775	0.600	0.223	0.0	222	1.858

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)
1.001	11.567	120.0	225	Circular	72.800	71.996	0.579	72.600	71.900	0.475
1.003	45.860	29.1	225	Circular	72.800	71.699	0.876	71.200	70.125	0.850
5.002	25.403	29.6	225	Circular	72.000	70.982	0.793	71.200	70.125	0.850
3.002	34.026	77.3	225	Circular	71.400	70.565	0.610	71.200	70.125	0.850
4.000	31.648	44.6	150	Circular	72.000	71.350	0.500	71.400	70.640	0.610
3.000	15.195	100.0	200	Circular	71.800	71.100	0.500	71.800	70.948	0.652
3.001	32.496	114.8	300	Circular	71.800	70.848	0.652	71.400	70.565	0.535
5.000	20.120	150.0	200	Circular	72.000	71.300	0.500	72.000	71.166	0.634
5.001	15.881	100.0	200	Circular	72.000	71.166	0.634	72.000	71.007	0.793
1.000	7.892	100.0	225	Circular	72.800	72.075	0.500	72.800	71.996	0.579
2.000	21.489	57.2	225	Circular	72.800	72.075	0.500	72.800	71.699	0.876
1.002	18.885	150.0	225	Circular	72.600	71.900	0.475	72.800	71.774	0.801
1.004	20.398	90.7	300	Circular	71.200	70.125	0.775	70.800	69.900	0.600

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.001	2	1200	Manhole	Adoptable	3	600		Manhole	Adoptable
1.003	5	600	Manhole	Adoptable	Basin	1200		Manhole	Adoptable
5.002	12	600	Manhole	Adoptable	Basin	1200		Manhole	Adoptable
3.002	9	1200	Manhole	Adoptable	Basin	1200		Manhole	Adoptable
4.000	8	600	Manhole	Adoptable	9	1200		Manhole	Adoptable
3.000	6	600	Manhole	Adoptable	7	1200		Manhole	Adoptable
3.001	7	1200	Manhole	Adoptable	9	1200		Manhole	Adoptable
5.000	10	600	Manhole	Adoptable	11	600		Manhole	Adoptable
5.001	11	600	Manhole	Adoptable	12	600		Manhole	Adoptable
1.000	1	1200	Manhole	Adoptable	2	1200		Manhole	Adoptable
2.000	4	600	Manhole	Adoptable	5	600		Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	5	600		Manhole	Adoptable
1.004	Basin	1200	Manhole	Adoptable	13_OUT	400	1000	Manhole	Headwall

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections		Link	IL (m)	Dia (mm)
2	-31.183	46.179	72.800	0.804	1200			1	1.000	71.996	225
								0	1.001	71.996	225
5	-28.445	15.927	72.800	1.101	600			1	2.000	71.699	225
								2	1.002	71.774	225
								0	1.003	71.699	225
12	6.324	18.802	72.000	1.018	600			1	5.001	71.007	200
								0	5.002	70.982	225
9	32.196	21.266	71.400	0.835	1200			1	4.000	70.640	150
								2	3.001	70.565	300
								0	3.002	70.565	225
Basin	11.836	-5.996	71.200	1.075	1200			1	5.002	70.125	225
								2	3.002	70.125	225
								3	1.003	70.125	225
								0	1.004	70.125	300
8	47.253	49.103	72.000	0.650	600			0	4.000	71.350	150
6	31.648	67.671	71.800	0.700	600			0	3.000	71.100	200
7	26.720	53.297	71.800	0.952	1200			1	3.000	70.948	200
								0	3.001	70.848	300
10	3.723	54.666	72.000	0.700	600			0	5.000	71.300	200
11	6.050	34.681	72.000	0.834	600			1	5.000	71.166	200
								0	5.001	71.166	200
1	-32.493	53.962	72.800	0.725	1200			0	1.000	72.075	225
4	-40.902	33.437	72.800	0.725	600			0	2.000	72.075	225
3	-29.107	34.800	72.600	0.700	600			1	1.001	71.900	225
								0	1.002	71.900	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)
13_OUT	12.166	-27.048	70.800	0.900	400	1000	1	1.004	69.900	300

Simulation Settings

Rainfall Methodology	FEH-13	Drain Down Time (mins)	3600
Summer CV	0.750	Additional Storage (m³/ha)	20.0
Winter CV	0.840	Check Discharge Rate(s)	x
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +45% 360 minute (m³)	83

Storm Durations

15	30	60	120	180	240	360	480

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	45	10	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	45
Positively Drained Area (ha)	0.230	Storm Duration (mins)	360
Soil Index	2	Betterment (%)	0
SPR	0.30	PR	0.386
CWI	130.000	Runoff Volume (m³)	83

Node Basin Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	70.125	Product Number	CTL-SHE-0075-2000-0500-2000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	70.230
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	400.0	400.0	0.970	632.9	450.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	2	10	72.066	0.070	8.9	0.0788	0.0000	OK
15 minute winter	5	11	71.751	0.052	11.6	0.0148	0.0000	OK
15 minute winter	12	10	71.005	0.023	2.2	0.0066	0.0000	OK
15 minute winter	9	10	70.643	0.078	15.6	0.0879	0.0000	OK
180 minute winter	Basin	140	70.268	0.143	7.9	15.9023	0.0000	OK
15 minute winter	8	10	71.382	0.032	2.6	0.0281	0.0000	OK
15 minute winter	6	10	71.132	0.032	2.0	0.0223	0.0000	OK
15 minute summer	7	10	70.920	0.072	13.0	0.2078	0.0000	OK
15 minute winter	10	10	71.319	0.019	0.6	0.0077	0.0000	OK
15 minute winter	11	10	71.199	0.033	2.3	0.0196	0.0000	OK
15 minute summer	1	10	72.143	0.068	8.9	0.2011	0.0000	OK
15 minute winter	4	10	72.098	0.023	1.5	0.0135	0.0000	OK
15 minute winter	3	10	71.978	0.078	10.3	0.0457	0.0000	OK
15 minute summer	13_OUT	1	69.900	0.000	2.0	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	2	1.001	3	8.9	0.788	0.188	0.1307	
15 minute winter	5	1.003	Basin	11.5	0.864	0.119	0.6397	
15 minute winter	12	5.002	Basin	2.2	0.214	0.023	0.3054	
15 minute winter	9	3.002	Basin	15.3	0.960	0.259	0.5553	
180 minute winter	Basin	Hydro-Brake®	13_OUT	2.0				34.1
15 minute winter	8	4.000	9	2.6	0.954	0.097	0.0855	
15 minute winter	6	3.000	7	2.0	0.638	0.052	0.0475	
15 minute summer	7	3.001	9	13.0	0.951	0.126	0.4459	
15 minute winter	10	5.000	11	0.6	0.244	0.019	0.0498	
15 minute winter	11	5.001	12	2.2	0.658	0.058	0.0536	
15 minute summer	1	1.000	2	8.9	0.870	0.171	0.0807	
15 minute winter	4	2.000	5	1.5	0.459	0.022	0.0970	
15 minute winter	3	1.002	5	10.1	0.861	0.240	0.2228	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	2	10	72.166	0.170	34.8	0.1920	0.0000	OK
15 minute winter	5	10	71.807	0.108	45.7	0.0305	0.0000	OK
15 minute winter	12	10	71.028	0.046	8.8	0.0129	0.0000	OK
15 minute winter	9	10	70.772	0.207	61.9	0.2341	0.0000	OK
240 minute winter	Basin	236	70.439	0.314	20.7	89.2837	0.0000	SURCHARGED
15 minute winter	8	10	71.414	0.064	10.2	0.0567	0.0000	OK
15 minute summer	6	10	71.164	0.064	7.8	0.0450	0.0000	OK
15 minute summer	7	10	71.003	0.155	51.1	0.4457	0.0000	OK
15 minute winter	10	10	71.336	0.036	2.2	0.0145	0.0000	OK
15 minute winter	11	10	71.234	0.068	8.8	0.0398	0.0000	OK
15 minute winter	1	10	72.239	0.164	34.9	0.4883	0.0000	OK
15 minute winter	4	10	72.119	0.044	5.8	0.0258	0.0000	OK
15 minute winter	3	10	72.090	0.190	40.3	0.1118	0.0000	OK
15 minute summer	13_OUT	1	69.900	0.000	2.0	0.0000	0.0000	OK

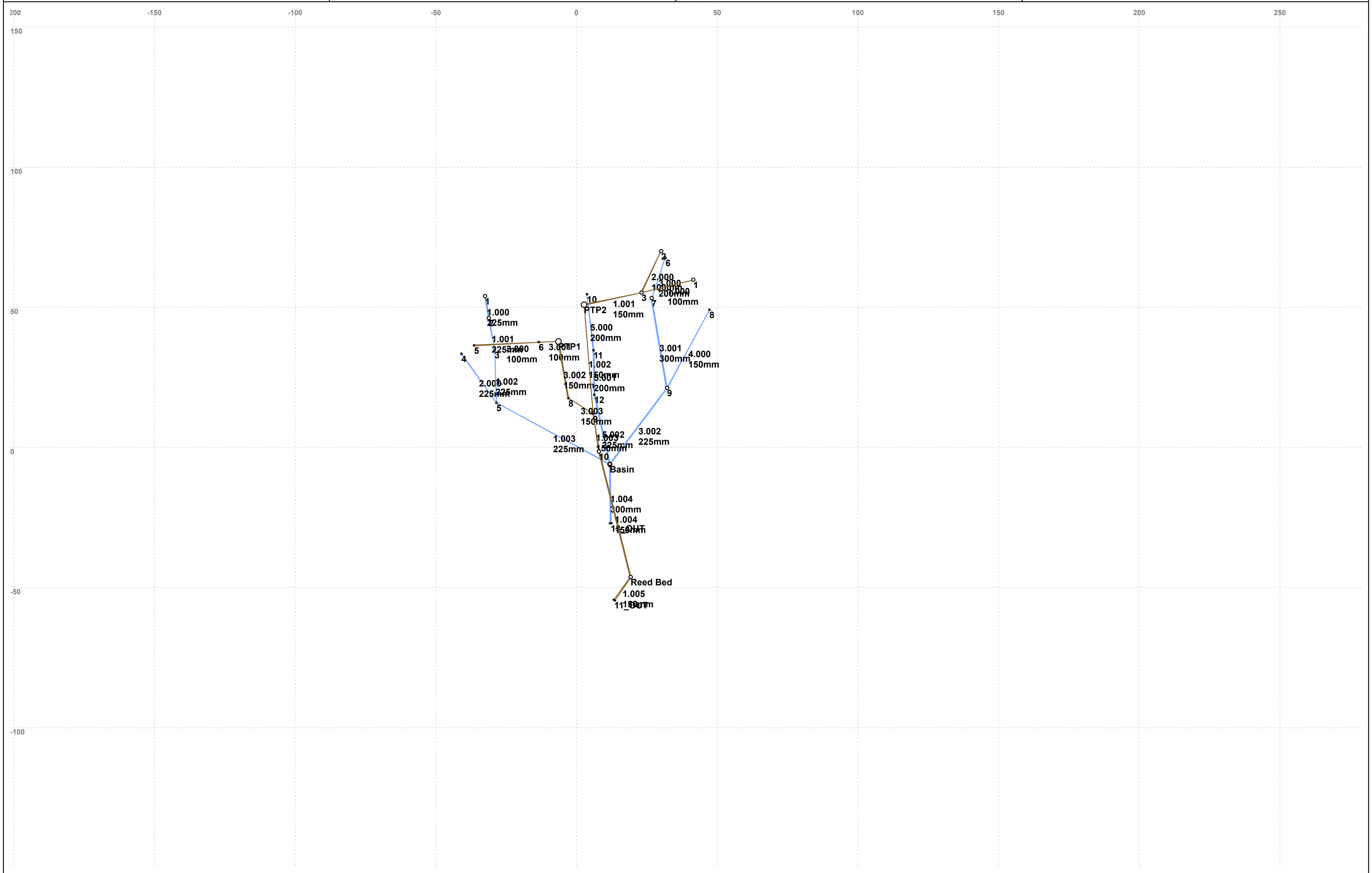
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	2	1.001	3	34.7	1.030	0.732	0.3933	
15 minute winter	5	1.003	Basin	45.2	1.900	0.468	1.1701	
15 minute winter	12	5.002	Basin	8.7	0.529	0.091	0.5166	
15 minute winter	9	3.002	Basin	59.7	1.756	1.010	1.1860	
240 minute winter	Basin	Hydro-Brake®	13_OUT	2.0				118.3
15 minute winter	8	4.000	9	10.2	1.175	0.382	0.3737	
15 minute summer	6	3.000	7	7.8	0.935	0.205	0.1268	
15 minute summer	7	3.001	9	51.7	1.212	0.499	1.4380	
15 minute winter	10	5.000	11	2.2	0.341	0.071	0.1324	
15 minute winter	11	5.001	12	8.8	0.965	0.230	0.1441	
15 minute winter	1	1.000	2	34.8	1.114	0.670	0.2493	
15 minute winter	4	2.000	5	5.8	0.603	0.084	0.2598	
15 minute winter	3	1.002	5	39.9	1.178	0.942	0.6378	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.22%

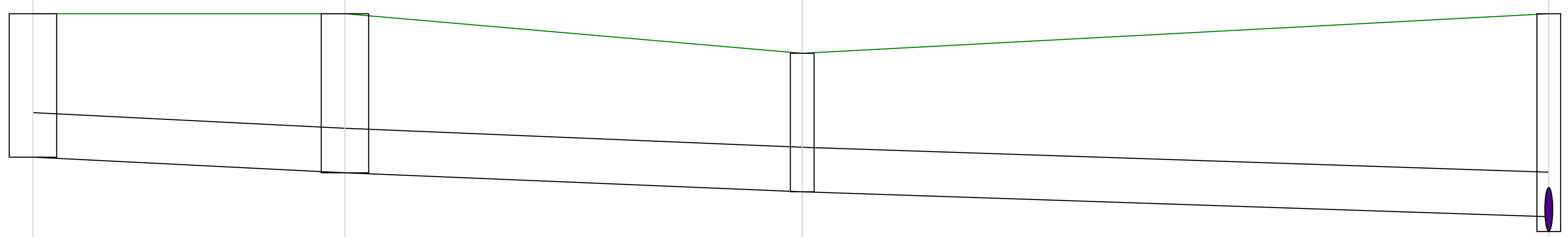
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	2	11	72.411	0.415	50.8	0.4693	0.0000	SURCHARGED
15 minute winter	5	11	71.836	0.137	66.5	0.0387	0.0000	OK
15 minute winter	12	10	71.040	0.058	13.9	0.0163	0.0000	OK
15 minute winter	9	11	71.237	0.672	81.8	0.7604	0.0000	FLOOD RISK
240 minute winter	Basin	240	70.570	0.445	31.7	150.7326	0.0000	SURCHARGED
15 minute winter	8	11	71.444	0.094	16.0	0.0889	0.0000	OK
15 minute winter	6	11	71.398	0.298	12.2	0.2231	0.0000	SURCHARGED
15 minute winter	7	11	71.390	0.542	80.7	1.6521	0.0000	SURCHARGED
15 minute winter	10	10	71.345	0.045	3.5	0.0187	0.0000	OK
15 minute winter	11	10	71.254	0.088	13.9	0.0542	0.0000	OK
15 minute winter	1	11	72.525	0.450	54.8	1.4220	0.0000	FLOOD RISK
15 minute summer	4	10	72.130	0.055	9.1	0.0340	0.0000	OK
15 minute winter	3	11	72.257	0.357	58.3	0.2201	0.0000	SURCHARGED
15 minute summer	13_OUT	1	69.900	0.000	2.0	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	2	1.001	3	50.5	1.269	1.064	0.4600	
15 minute winter	5	1.003	Basin	66.9	2.226	0.692	1.4444	
15 minute winter	12	5.002	Basin	13.8	0.688	0.144	0.5857	
15 minute winter	9	3.002	Basin	81.1	2.043	1.371	1.3533	
240 minute winter	Basin	Hydro-Brake®	13_OUT	2.0				180.8
15 minute winter	8	4.000	9	15.6	1.190	0.586	0.4629	
15 minute winter	6	3.000	7	12.6	0.892	0.331	0.4756	
15 minute winter	7	3.001	9	67.9	1.231	0.655	2.2883	
15 minute winter	10	5.000	11	3.5	0.384	0.113	0.1863	
15 minute winter	11	5.001	12	13.9	1.087	0.364	0.2027	
15 minute winter	1	1.000	2	50.8	1.279	0.978	0.3139	
15 minute summer	4	2.000	5	9.1	0.668	0.132	0.3453	
15 minute winter	3	1.002	5	58.5	1.474	1.382	0.7259	

CAUSEWAY	Corner Water Consulting Ltd	File: CWC190.pfd Network: Storm Network Alan Corner 10/04/2023	Page 1 Dinedor SWMP



CAUSEWAY	Corner Water Consulting Ltd	File: CWC190.pfd Network: Storm Network Alan Corner 10/04/2023	Page 1 Dinedor SWMP



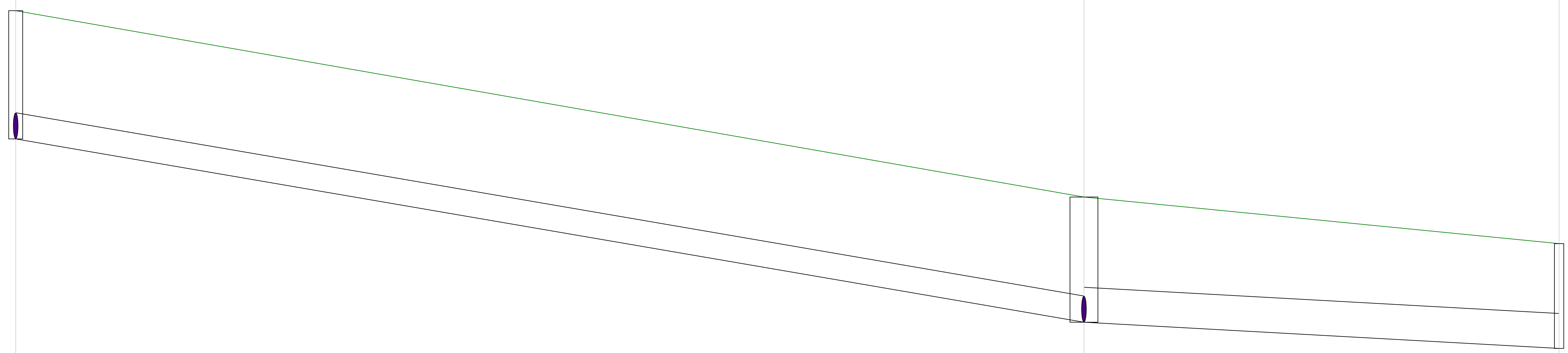
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 67.000

Node Name	1		2		3		5
Link Name		1.000		1.001		1.002	
Section Type		225mm		225mm		225mm	
Slope (1:X)		100.0		120.0		150.0	
Cover Level (m)	72.800		72.800		72.600		72.800
Invert Level (m)	72.075		71.996 71.996		71.900 71.900		71.774
Length (m)		7.892		11.567		18.885	

Node Name	5		Basin		13_OUT



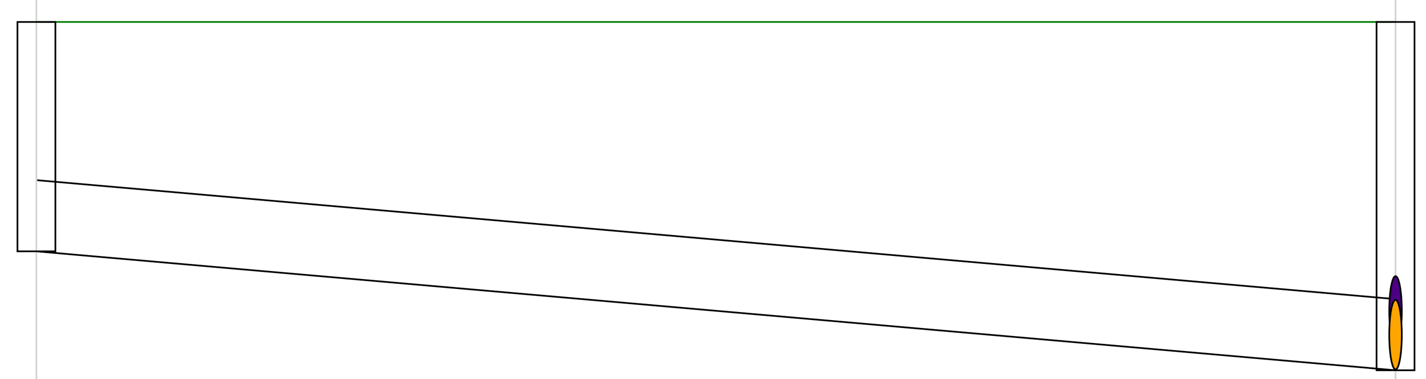
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

	5		Basin		13_OUT
Link Name		1.003		1.004	
Section Type		225mm		300mm	
Slope (1:X)		29.1		90.7	
Cover Level (m)	72.800		71.200		70.800
Invert Level (m)	71.699		70.125 70.125		69.900
Length (m)		45.860		20.398	

Node Name	4	5



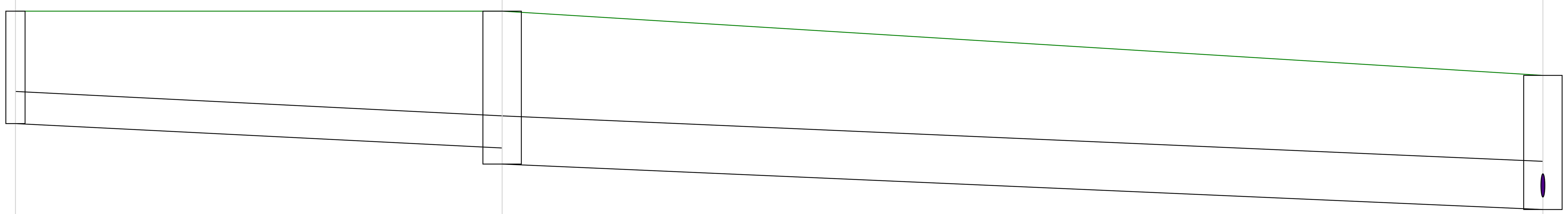
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 67.000

Link Name	2.000	
Section Type	225mm	
Slope (1:X)	57.2	
Cover Level (m)	72.800	72.800
Invert Level (m)	72.075	71.699
Length (m)	21.489	

Node Name	6		7		9



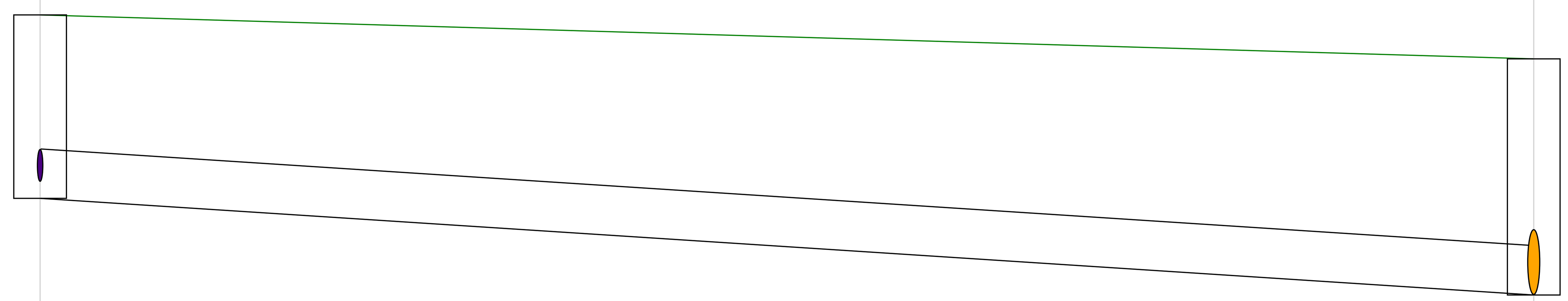
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

	6		7		9
Link Name		3.000		3.001	
Section Type		200mm		300mm	
Slope (1:X)		100.0		114.8	
Cover Level (m)	71.800		71.800		71.400
Invert Level (m)	71.100		70.948 70.848		70.565
Length (m)		15.195		32.496	

Node Name	9		Basin



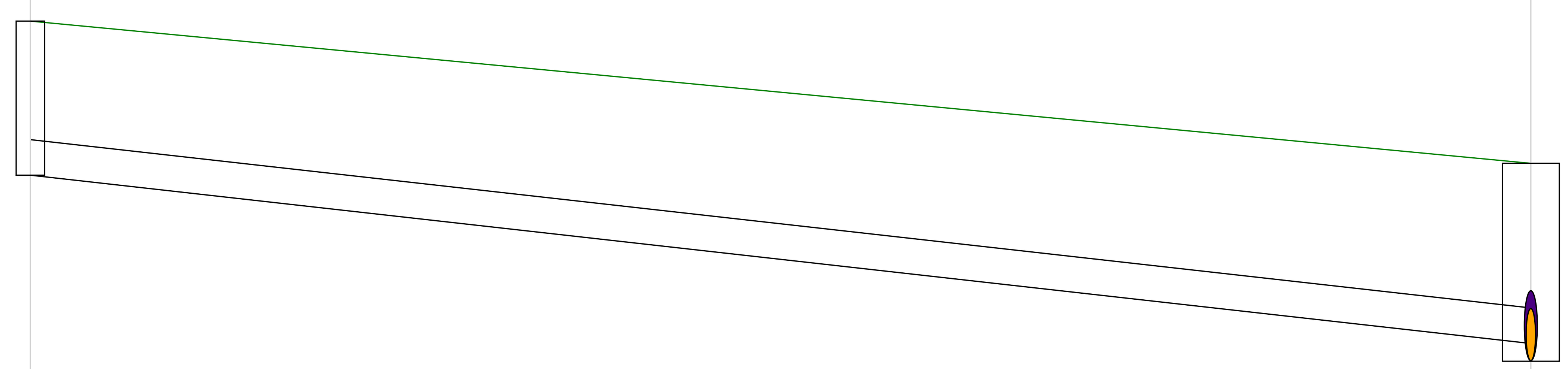
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

	9		Basin
Link Name		3.002	
Section Type		225mm	
Slope (1:X)		77.3	
Cover Level (m)	71.400		71.200
Invert Level (m)	70.565		70.125
Length (m)		34.026	

Node Name	8	9



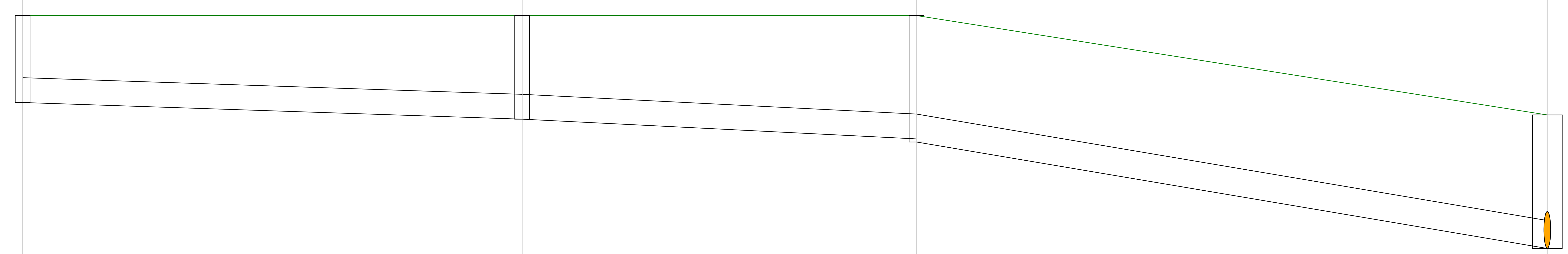
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

Link Name	4.000	
Section Type	150mm	
Slope (1:X)	44.6	
Cover Level (m)	72.000	71.400
Invert Level (m)	71.350	70.640
Length (m)	31.648	

Node Name	10		11		12		Basin



A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

	10		11		12		Basin
Link Name		5.000		5.001		5.002	
Section Type		200mm		200mm		225mm	
Slope (1:X)		150.0		100.0		29.6	
Cover Level (m)	72.000		72.000		72.000		71.200
Invert Level (m)	71.300		71.166 71.166		71.007 70.982		70.125
Length (m)		20.120		15.881		25.403	

APPENDIX 3 – FOUL DRAINAGE DESIGN REPORT & DRAWINGS

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	1.00
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	2.000
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	0.450
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Dwellings	Cover Level (m)	Manhole Type	Width (mm)	Easting (m)	Northing (m)	Depth (m)
5	1	72.800	Adoptable		-36.394	36.408	1.000
6	1	72.340	Adoptable		-13.426	37.613	0.923
PTP1		72.300	Adoptable		-6.416	37.811	1.050
8		72.200	Adoptable		-2.862	17.561	1.361
10		71.200	Adoptable		7.984	-1.448	1.406
Reed Bed		70.600	Adoptable		19.259	-46.191	1.267
11_OUT		70.300	Headwall	900	13.705	-54.459	1.313
2	2	71.800	Adoptable		30.096	70.006	0.550
3	1	71.800	Adoptable		23.126	55.262	1.329
9		72.000	Adoptable		5.835	11.996	1.934
1	1	72.000	Adoptable		41.521	59.837	0.800
PTP2		71.800	Adoptable		2.676	51.122	1.538

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
3.000	5	6	23.000	1.500	71.800	71.417	0.383	60.0	100
3.001	6	PTP1	7.013	1.500	71.417	71.300	0.117	60.0	100
3.002	PTP1	8	20.560	1.500	71.250	70.839	0.411	50.0	150
3.003	8	9	10.325	1.500	70.839	70.066	0.773	13.4	150
1.004	10	Reed Bed	46.142	1.500	69.794	69.333	0.461	100.0	150
1.005	Reed Bed	11_OUT	9.960	1.500	69.333	68.987	0.346	28.8	150
2.000	2	3	16.308	1.500	71.250	70.521	0.729	22.4	100
1.001	3	PTP2	20.865	1.500	70.471	70.262	0.209	100.0	150
1.002	PTP2	9	39.253	1.500	70.262	70.066	0.196	200.0	150
1.003	9	10	13.615	1.500	70.066	69.794	0.272	50.0	150
1.000	1	3	18.955	1.500	71.200	70.521	0.679	27.9	100

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	0.144	0.860	6.8	0.0	0.900	0.823	0.000	1	0.0	0.0	6	0.217
3.001	0.194	0.860	6.8	0.1	0.823	0.900	0.000	2	0.0	0.0	8	0.279
3.002	0.191	1.241	21.9	0.1	0.900	1.211	0.000	2	0.0	0.0	7	0.284
3.003	0.290	2.405	42.5	0.1	1.211	1.784	0.000	2	0.0	0.0	6	0.450
1.004	0.223	0.876	15.5	0.3	1.256	1.117	0.000	6	0.0	0.0	14	0.326
1.005	0.353	1.637	28.9	0.3	1.117	1.163	0.000	6	0.0	0.0	11	0.502
2.000	0.281	1.411	11.1	0.1	0.450	1.179	0.000	2	0.0	0.0	7	0.394
1.001	0.200	0.876	15.5	0.2	1.179	1.388	0.000	4	0.0	0.0	12	0.287
1.002	0.156	0.618	10.9	0.2	1.388	1.784	0.000	4	0.0	0.0	14	0.222
1.003	0.284	1.241	21.9	0.3	1.784	1.256	0.000	6	0.0	0.0	12	0.408
1.000	0.213	1.263	9.9	0.0	0.700	1.179	0.000	1	0.0	0.0	5	0.286

Pipeline Schedule

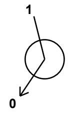
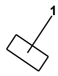
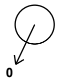
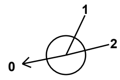
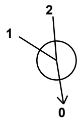
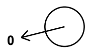
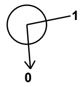
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	23.000	60.0	100	Circular	72.800	71.800	0.900	72.340	71.417	0.823
3.001	7.013	60.0	100	Circular	72.340	71.417	0.823	72.300	71.300	0.900
3.002	20.560	50.0	150	Circular	72.300	71.250	0.900	72.200	70.839	1.211
3.003	10.325	13.4	150	Circular	72.200	70.839	1.211	72.000	70.066	1.784
1.004	46.142	100.0	150	Circular	71.200	69.794	1.256	70.600	69.333	1.117
1.005	9.960	28.8	150	Circular	70.600	69.333	1.117	70.300	68.987	1.163
2.000	16.308	22.4	100	Circular	71.800	71.250	0.450	71.800	70.521	1.179
1.001	20.865	100.0	150	Circular	71.800	70.471	1.179	71.800	70.262	1.388
1.002	39.253	200.0	150	Circular	71.800	70.262	1.388	72.000	70.066	1.784
1.003	13.615	50.0	150	Circular	72.000	70.066	1.784	71.200	69.794	1.256
1.000	18.955	27.9	100	Circular	72.000	71.200	0.700	71.800	70.521	1.179

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
3.000	5	600	Manhole	Adoptable	6	600		Manhole	Adoptable
3.001	6	600	Manhole	Adoptable	PTP1	2000		Manhole	Adoptable
3.002	PTP1	2000	Manhole	Adoptable	8	600		Manhole	Adoptable
3.003	8	600	Manhole	Adoptable	9	600		Manhole	Adoptable
1.004	10	1200	Manhole	Adoptable	Reed Bed	1200		Manhole	Adoptable
1.005	Reed Bed	1200	Manhole	Adoptable	11_OUT	400	900	Manhole	Headwall
2.000	2	1200	Manhole	Adoptable	3	1200		Manhole	Adoptable
1.001	3	1200	Manhole	Adoptable	PTP2	2000		Manhole	Adoptable
1.002	PTP2	2000	Manhole	Adoptable	9	600		Manhole	Adoptable
1.003	9	600	Manhole	Adoptable	10	1200		Manhole	Adoptable
1.000	1	1200	Manhole	Adoptable	3	1200		Manhole	Adoptable

Manhole Schedule

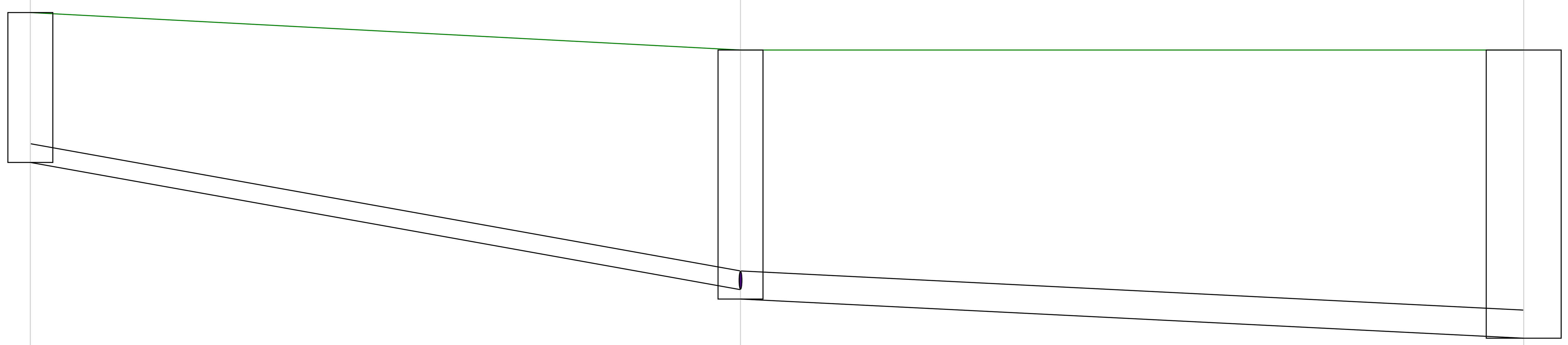
Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)
5	-36.394	36.408	72.800	1.000	600		0	3.000	71.800	100
6	-13.426	37.613	72.340	0.923	600		1	3.000	71.417	100
							0	3.001	71.417	100
PTP1	-6.416	37.811	72.300	1.050	2000		1	3.001	71.300	100
							0	3.002	71.250	150
8	-2.862	17.561	72.200	1.361	600		1	3.002	70.839	150
							0	3.003	70.839	150
10	7.984	-1.448	71.200	1.406	1200		1	1.003	69.794	150
							0	1.004	69.794	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections		Link	IL (m)	Dia (mm)
Reed Bed	19.259	-46.191	70.600	1.267	1200			1	1.004	69.333	150
								0	1.005	69.333	150
11_OUT	13.705	-54.459	70.300	1.313	400	900		1	1.005	68.987	150
2	30.096	70.006	71.800	0.550	1200			0	2.000	71.250	100
3	23.126	55.262	71.800	1.329	1200			1	2.000	70.521	100
								2	1.000	70.521	100
								0	1.001	70.471	150
9	5.835	11.996	72.000	1.934	600			1	3.003	70.066	150
								2	1.002	70.066	150
								0	1.003	70.066	150
1	41.521	59.837	72.000	0.800	1200			0	1.000	71.200	100
PTP2	2.676	51.122	71.800	1.538	2000			1	1.001	70.262	150
								0	1.002	70.262	150


-200
-100
0
100
200
300
100
0
-100
1
1.000
225mm
2
1.001
225mm
5
3
3.000
100mm
6
3.00 PTP1
100mm
4
2.000
225mm
1.002
225mm
5
1.003
225mm
3.002
150mm
8
3.003
150mm
9
10
PTP2
1.001
150mm
3
2
6
2.000
100mm
3.000
200mm
1.000
100mm
1
7
5.000
200mm
11
1.002
150mm
5.001
200mm
12
1.003
150mm
5.002
225mm
10
3.001
300mm
8
4.000
150mm
9
3.002
225mm
Basin
1.004
300mm
1.004
150mm
13_OUT
Reed Bed
1.005
150mm
11_OUT

Node Name	1	3	PTP2



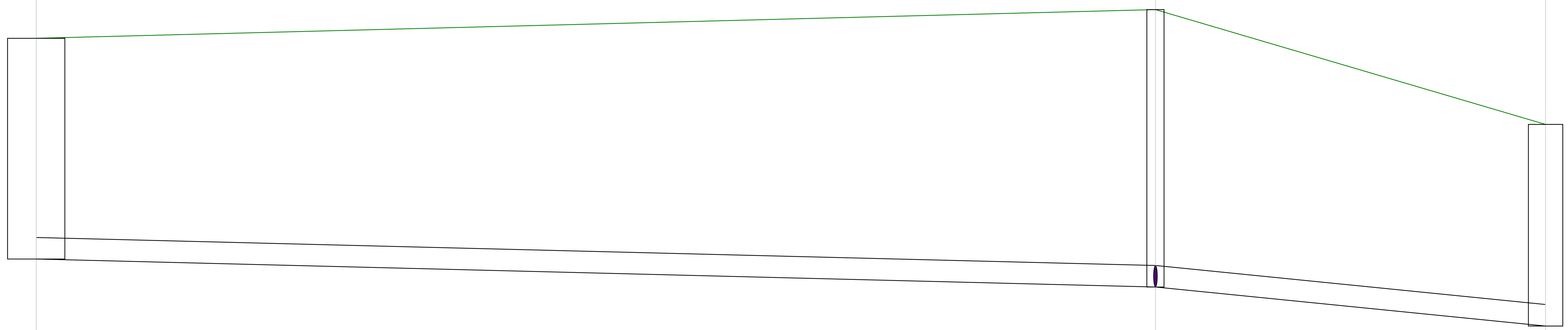
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

Link Name		1.000		1.001	
Section Type		100mm		150mm	
Slope (1:X)		27.9		100.0	
Cover Level (m)	72.000		71.800		71.800
Invert Level (m)	71.200		70.521 70.471		70.262
Length (m)		18.955		20.905	

Node Name: PTP2 — 9 — 10



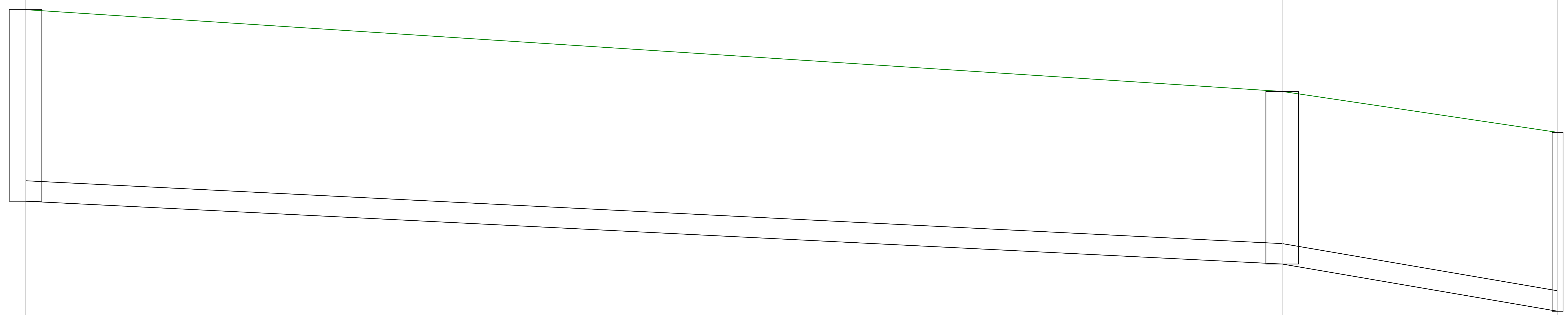
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

	PTP2		9		10
Link Name		1.002		1.003	
Section Type		150mm		150mm	
Slope (1:X)		200.0		50.0	
Cover Level (m)	71.800		72.000		71.200
Invert Level (m)	70.262		70.067 70.067		69.795
Length (m)		39.058		13.615	

Node Name	10		Reed Bed		11_OUT



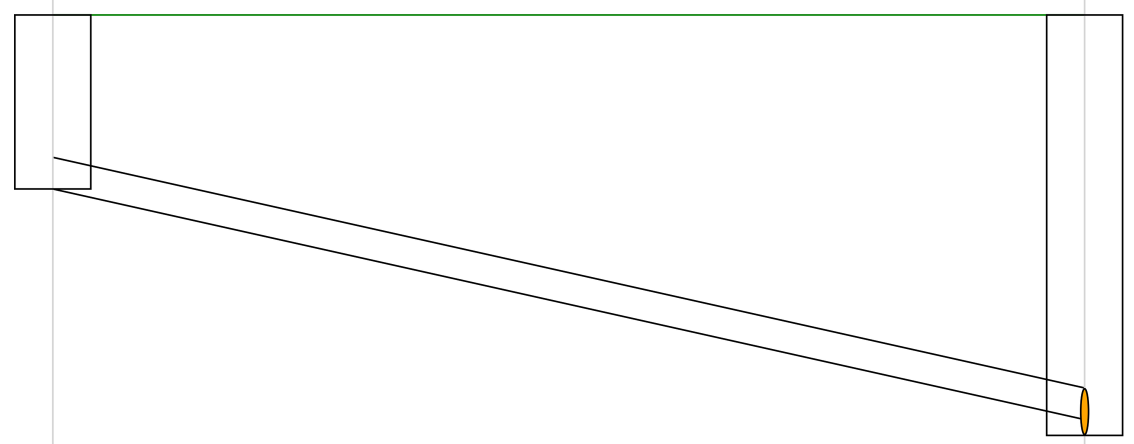
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 65.000

	10		Reed Bed		11_OUT
Link Name		1.004		1.005	
Section Type		150mm		150mm	
Slope (1:X)		100.0		29.2	
Cover Level (m)	71.200		70.600		70.300
Invert Level (m)	69.795		69.334 69.334		68.988
Length (m)		46.142		10.108	

Node Name	2	3



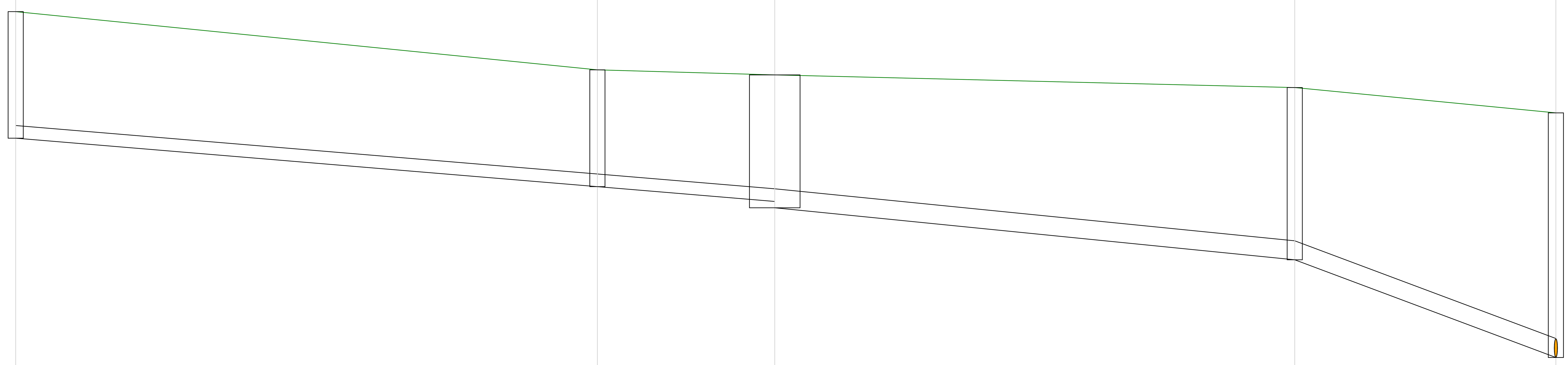
A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

Link Name	2.000	
Section Type	100mm	
Slope (1:X)	22.4	
Cover Level (m)	71.800	71.800
Invert Level (m)	71.250	70.521
Length (m)	16.308	

Node Name	5		6		PTP1		8		9



A1 drawing

Hor Scale 100
Ver Scale 20

Datum (m) 66.000

	5		6		PTP1		8		9
Link Name		3.000		3.001		3.002		3.003	
Section Type		100mm		100mm		150mm		150mm	
Slope (1:X)		60.0		60.0		50.0		13.4	
Cover Level (m)	72.800		72.340		72.300		72.200		72.000
Invert Level (m)	71.800		71.417 71.417		71.300 71.250		70.839 70.839		70.067
Length (m)		23.000		7.013		20.560		10.325	

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