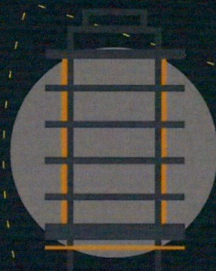


# Clonburriss T2

## Clarification of Further Information

CLB-T2-ZZZ-SW-DTM-RP-DBFL-CE-0005

INFRASTRUCTURE



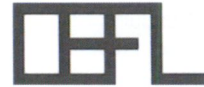
October 2023



DBFL CONSULTING ENGINEERS







Project Title:	<b>Clonburris T2</b>		
Document Title:	<b>Clarification of Further Information</b>		
File Ref:	<b>CLB-T2-ZZZ-SW-DTM-RP-DBFL-CE-0005</b>		
Status:	<b>P3 - Planning</b>	Rev:	<b>0</b>
	<b>S - Issued</b>		

Rev.	Date	Description	Prepared	Reviewed	Approved
1	04/10/2023	Clarification of Further Information	Dieter Bester	John Carr	John Carr

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Updated Drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-5005 includes a plan and section drawing of the attenuation feature complete with all water levels. A schematic extract is presented below in Figure 1

As described in response to Item 1.1, Proposed Storage volume significantly exceeds minimum calculated volume. Updated Drainage calculations (see Appendix A) have calculated a minimum required storage volume of 1478m<sup>3</sup> would be required which would correspond to a water level of 58.683. The storage actually proposed is 2180m<sup>3</sup> with a design TWL of 59.0m

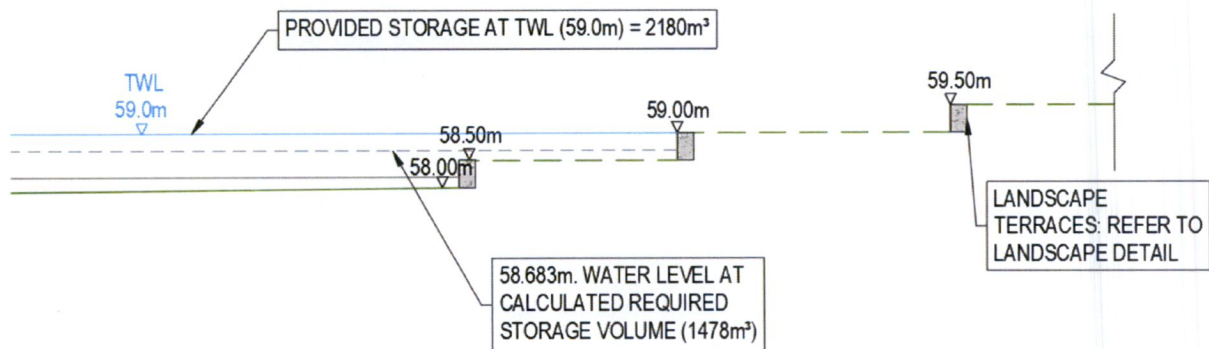


Figure 1: Water levels for Provided Storage and Required Storage. Extract from drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-5005

Note the lowest building floor level within the subject development is 59.600m AOD and the floor level of the adjacent T1 development west of the proposed attenuation pond is 59.900m AOD, providing sufficient freeboard over and above the proposed top of water level 59.0 for the attenuation pond.

### Item No. 1.3

The applicant is requested to submit a revised report to show surface water attenuation calculations for proposed development. The applicant is requested to submit the area in m<sup>2</sup> of hard standing, buildings, roads, green roofs if any, permeable paving, grass and their respective run off coefficients.

The applicant is requested to clarify what attenuation is provided in m<sup>3</sup> and what is required in m<sup>3</sup> for proposed development.





The applicant is requested to clarify what areas are residential that can be attenuated in the general Clonburris Attenuation plan and what areas are schools, and commercial areas that require on site attenuation. Show how surface water attenuation relates to Surface Water Management Plan for Clonburris 2020. Attenuation should be by means of SuDS.

### **DBFL Response**

Please refer to drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-1002 as issued for Planning, which shows the area of hard standing, buildings, roads, green roofs, permeable paving, grass and their respective run off coefficients. This is unchanged since previous submissions.

As per responses above/below the total attenuation provided is 2180m<sup>3</sup> and the total volume required from calculations is 1478m<sup>3</sup>. Please refer also to Appendix A and updated drawings provided with this CFI response.

The proposed drainage strategy is fully aligned with Surface Water Management Plan for Clonburris. As set out in the masterplan, only areas identified as Urban Cores or Education sites require onsite attenuation, all other areas can drain directly to the regional attenuation. As required by the SWMP Catchment plan, the urban centre (CUC3) portion of the site is attenuated locally within the development. The proposed catchment area for the urban core is indicated as Catchment 1 on drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-1002.

All attenuation for Catchment 1 of the proposed development is within the open attenuation pond, which is considered a high quality SuDS feature providing all four pillars of SuDS. It provides Amenity and Biodiversity value in addition to managing water Quality and Quantity. In addition SuDS tree pits are provided throughout the site.



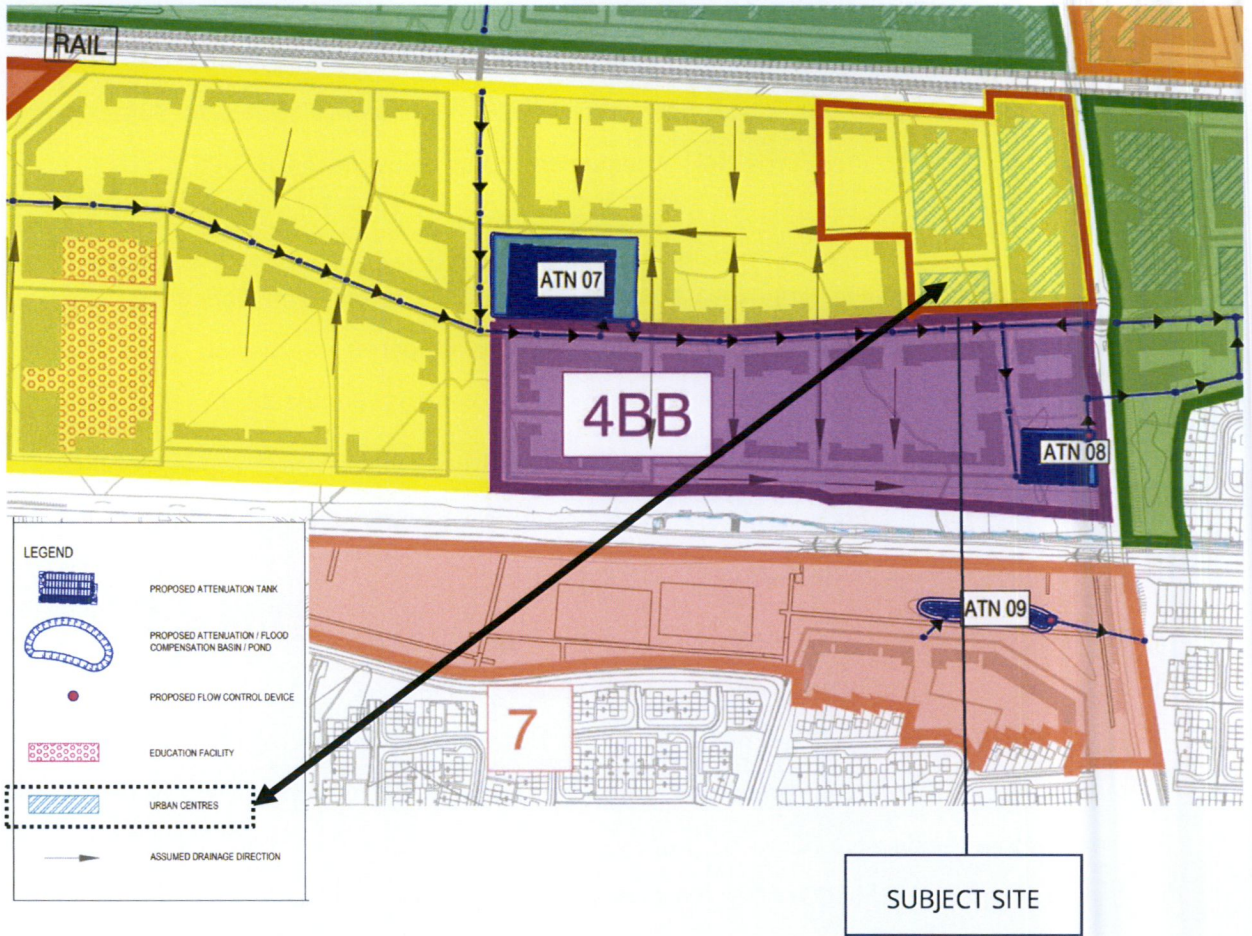


Figure 2 – Extract from Clonburris Surface Water Masterplan Catchment Drawing indicating areas requiring onsite attenuation. Note only a portion of subject site classified as urban centre



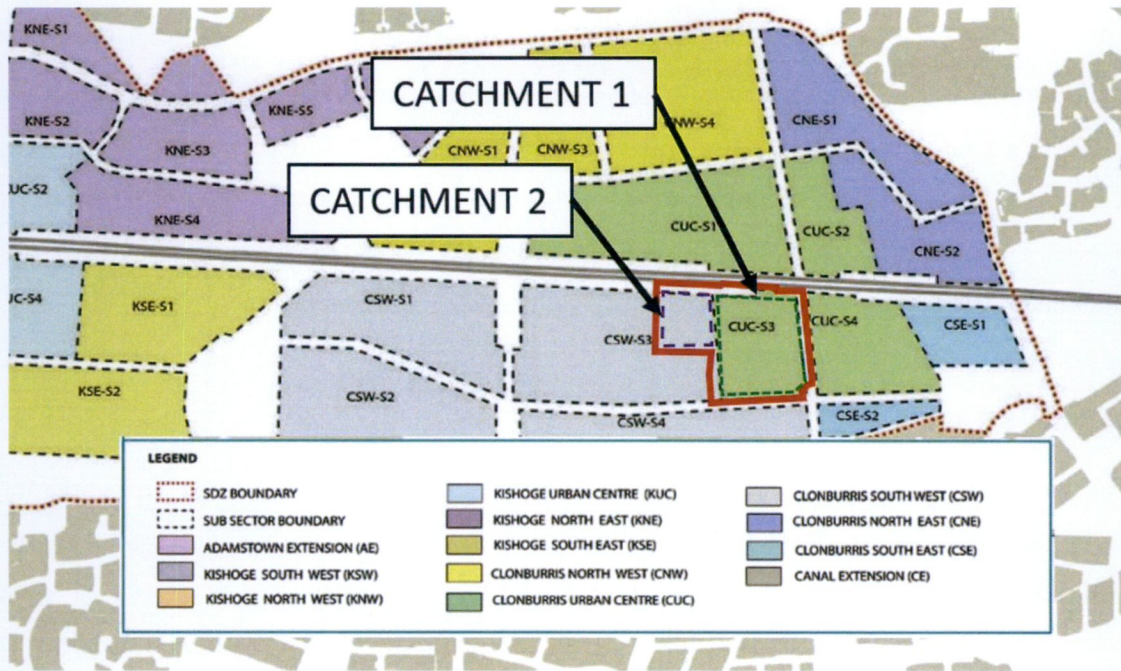


Figure 3 - Clonburris SDZ Figure 2.1.4 | Development Areas and Sub Sectors Map

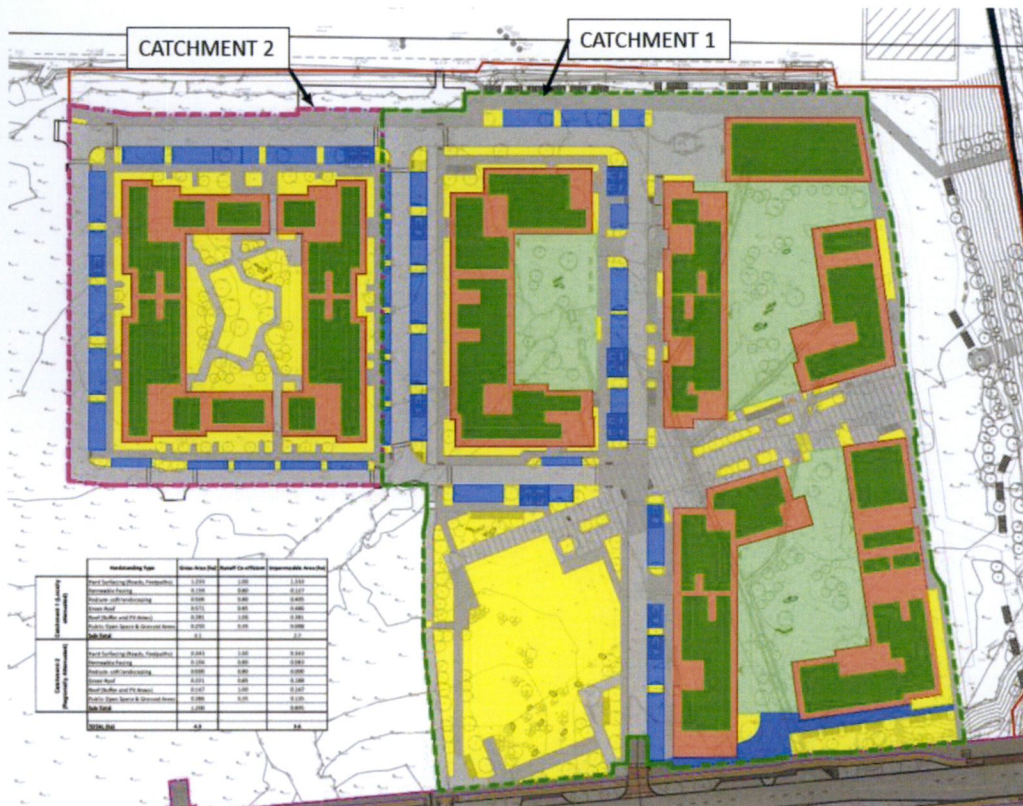


Figure 4 - Drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-1002 Proposed Surface Water Catchments





#### **Item no. 1.4**

The maximum allowable outflow calculations (Appendix B, Infrastructure Design Report) for catchment 1 have used the total area of the site (4.3ha), instead of the area of catchment 1 (3.1ha). Catchment 2 flows directly to a further attenuation area downstream. Catchment 1 maximum allowable outflow should be 9.6 l/s. This will have a direct effect on the flow control values for the attenuation pond. Provide a report to clarify surface water calculations, and revised drawings accordingly.

#### **DBFL Response**

The surface water network calculations have been revised as suggested, using a 3.1ha area for Catchment 1 and a pre-development flow rate of 3.1l/s/ha as per the Clonburris SWMP. This equates to a 9.6l/s controlled outflow rate as used in the revised surface water network calculations attached as Appendix A. See the extract from the surface water network calculations showing the 9.6l/s controlled discharge rate in Figure 5.





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Ormond House Upper Ormond Quay Dublin 7, Ireland	Clonburris T2 Surface Water Calculations						
Date 27/09/2023 09:38 File 210124 Surface Water Ne...	Designed by DC Bester Checked by JPC						
Innovyze		Network 2020.1					
<u>Online Controls for SW_1</u>							
<u>Hydro-Brake® Optimum Manhole: SM7, DS/FN: S1.006, Volume (m³): 35.2</u>							
Unit Reference	MD-SHE-0134-9600-1600-9600						
Design Head (m)	1.600						
Design Flow (l/s)	9.6						
Flush-Flow™	Calculated						
Objective	Minimise upstream storage						
Application	Surface						
Sump Available	Yes						
Diameter (mm)	134						
Invert Level (m)	57.400						
Minimum Outlet Pipe Diameter (mm)	150						
Suggested Manhole Diameter (mm)	1200						
<b>Control Points</b>	<b>Head (m)</b>	<b>Flow (l/s)</b>					
Design Point (Calculated)	1.600	9.6					
Flush-Flow™	0.460	9.6					
Kick-Flow®	0.904	7.6					
Mean Flow over Head Range	-	8.4					
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							
<b>Depth (m)</b>	<b>Flow (l/s)</b>	<b>Depth (m)</b>	<b>Flow (l/s)</b>	<b>Depth (m)</b>	<b>Flow (l/s)</b>	<b>Depth (m)</b>	<b>Flow (l/s)</b>
0.100	4.8	1.200	8.4	3.000	12.9	7.000	19.4
0.200	6.5	1.400	9.6	3.500	13.9	7.500	20.6
0.300	9.3	1.600	9.6	4.000	14.8	8.000	20.6
0.400	9.5	1.800	10.1	4.500	15.7	8.500	21.3
0.500	9.6	2.000	10.7	5.000	16.5	9.000	21.8
0.600	9.5	2.200	11.2	5.500	17.2	9.500	22.4
0.800	9.0	2.400	11.6	6.000	18.0		
1.000	7.7	2.600	12.1	6.500	18.7		
<b>CONTROLLED OUTFLOW RATE FROM THE ATTENUATION POND (USING QBAR 3.1l/s/ha) FOR THE 3.1ha CATCHMENT 1 AS PER DRAWING CLB-1B-94-SW-DTM-DR-DBFL-CE-1002 ISSUED FOR PLANNING.</b>							

Figure 5 - Extract from the surface water network calculations (Attached as appendix A)





### **Item no. 1.5**

It is not clear how surface water is getting to tree pits given the proximity of gullies to tree pits. Gullies should not intercept surface before tree pits.

#### **DBFL Response**

The general drainage layout and gully locations for the proposed development have been revised as per the enclosed drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-1001. Several gullies have now been removed in order to maximise the surface water runoff from the roads which is to be diverted to tree pits and other SuDS features.

The tree pit details have also been revised to better align with the recently issued "Sustainable Drainage Explanatory Design & Evaluation Guide 2022". See enclosed drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-5003 for the revised tree pit details. Note the significant amount of "Type 2" tree pits on the enclosed drainage layout, which allows surface water runoff from the roads to discharge directly to tree pit/bioretention surface and infiltrate.

It is also noted that in Type 1 tree pits gullies do intercept water initially however they direct discharge to tree pit structure for infiltration and plant uptake with only a high level overflow to the surface water network. Refer to details provided on drawing CLB-1B-94-SW-DTM-DR-DBFL-CE-5003.

While drainage to tree pits has been prioritised is noted that there are extremely low infiltration rates on site and certain low points that are not adjacent to SuDS features so a suitable overflow gully provision will inevitably be required

### **Item no. 1.6**

Prior to submission of revised drawings contact Water Services and Public Realm to discuss surface water system and SuDS.

#### **DBFL Response**

DBFL held a meeting on 27/09/2023 in SDCC offices with Brian Harkin (Water Services Dept) and Laurence Colleran (Parks Dept) to discuss the Clarification of Further Information items in this report.





## **Item no. 2**

The drainage design does not appear to allow for the infiltration of surface water through the SuDs measures included, before hard engineering drainage solutions such as gullies intercept, which makes the SuDs features non-operational, undermines sustainable drainage of the site and makes the SuDs features utilised somewhat obsolete. Tree pits are required to attenuate water, treat the water, provide amenity value and provide habitats to improve biodiversity. The required tree pits are present but the system only functions when water is directed into the tree pits. The positioning of gullies close to tree pits is diverting water away from the tree pits and into a conventional piped system contrary to SDCC policies on Sustainable drainage. A thorough review of the surface water drainage design is required. The applicant is requested demonstrate that drainage on site utilises sustainable drainage techniques and avoids underground pipes. Please contact Public Realm and Water and Drainage prior to submission of this clarification.

### **DBFL Response**


[Please see response to Item 1.5](#)





## Appendix A : Surface Water Network Calculations



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Ormond House Upper Ormond Quay Dublin 7, Ireland	Clonburriss T2 Surface Water Calculations	
Date 27/09/2023 09:38 File 210124 Surface Water Ne...	Designed by DC Bester Checked by JPC	
Innovyze	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW\_1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	20
Ratio R	0.277	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for SW\_1




Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.038	4-8	2.445	8-12	0.118

Total Area Contributing (ha) = 3.600

Total Pipe Volume (m³) = 153.687

Network Design Table for SW\_1


« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	46.012	0.161	285.8	0.174	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	44.624	0.161	277.2	0.174	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.000	38.566	0.193	199.8	0.050	4.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.83	58.200	0.174	0.0	0.0	4.7	0.92	65.4	28.3
S1.001	50.00	5.52	58.039	0.348	0.0	0.0	9.4	1.08	119.7	56.5
S2.000	50.00	4.58	58.072	0.050	0.0	0.0	1.4	1.11	78.4	8.1



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Innovyze	Network 2020.1	


Network Design Table for SW\_1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.002	6.340	0.023	275.7	0.174	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.000	31.867	0.159	200.4	0.174	4.00	0.0	0.600	o	300	Pipe/Conduit	
S3.001	54.380	0.272	199.9	0.174	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.003	48.791	0.175	278.8	0.174	0.00	0.0	0.600	o	600	Pipe/Conduit	
S4.000	25.995	0.130	200.0	0.174	4.00	0.0	0.600	o	450	Pipe/Conduit	
S1.004	23.381	0.081	288.7	0.174	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	39.249	0.200	196.2	0.438	0.00	0.0	0.600	o	1000	Pipe/Conduit	
S5.000	45.984	0.137	335.6	0.100	4.00	0.0	0.600	o	300	Pipe/Conduit	
S5.001	48.481	0.137	353.9	0.100	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.002	45.153	0.144	313.6	0.100	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.003	6.958	0.021	331.3	0.270	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.004	11.765	0.035	336.1	0.250	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.005	20.769	0.062	335.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.006	17.409	0.052	334.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.007	4.395	0.013	338.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.006	19.629	0.142	138.2	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	










Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.002	50.00	5.59	57.879	0.572	0.0	0.0	15.5	1.46	413.3	92.9
S3.000	50.00	4.48	58.344	0.174	0.0	0.0	4.7	1.11	78.2	28.3
S3.001	50.00	5.19	58.128	0.348	0.0	0.0	9.4	1.28	141.1	56.5
S1.003	50.00	6.15	57.856	1.094	0.0	0.0	29.6	1.45	411.0	177.8
S4.000	50.00	4.30	57.811	0.174	0.0	0.0	4.7	1.43	228.1	28.3
S1.004	50.00	6.42	57.681	1.442	0.0	0.0	39.1	1.43	403.8	234.3
S1.005	50.00	6.69	57.600	1.880	0.0	0.0	50.9	2.38	1872.1	305.5
S5.000	50.00	4.90	58.000	0.100	0.0	0.0	2.7	0.85	60.3	16.2
S5.001	50.00	5.74	57.863	0.200	0.0	0.0	5.4	0.96	105.7	32.5
S5.002	50.00	6.40	57.726	0.300	0.0	0.0	8.1	1.14	181.7	48.7
S5.003	50.00	6.51	57.582	0.570	0.0	0.0	15.4	1.11	176.7	92.6
S5.004	50.00	6.68	57.561	0.820	0.0	0.0	22.2	1.10	175.5	133.2
S5.005	50.00	7.00	57.526	0.820	0.0	0.0	22.2	1.11	175.8	133.2
S5.006	50.00	7.26	57.464	0.820	0.0	0.0	22.2	1.11	175.8	133.2
S5.007	50.00	7.33	57.412	0.820	0.0	0.0	22.2	1.10	175.0	133.2
S1.006	50.00	7.50	57.400	2.700	0.0	0.0	73.1	1.90	412.0«	438.7



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Innovyze	Network 2020.1	


Network Design Table for SW\_1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.007	18.585	0.136	136.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.008	14.809	0.095	155.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.009	66.708	0.148	450.7	0.150	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.010	31.537	0.097	325.1	0.150	0.00	0.0	0.600	o	525	Pipe/Conduit	
S6.000	58.353	0.397	147.0	0.150	4.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	7.450	0.051	146.1	0.150	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.002	54.179	0.368	147.2	0.150	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.003	45.849	0.309	148.4	0.150	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.011	15.282	0.034	449.5	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.007	50.00	7.66	57.258	2.700	0.0	0.0	73.1	1.91	414.4<	438.7
S1.008	50.00	7.80	57.122	2.700	0.0	0.0	73.1	1.79	387.8<	438.7
S1.009	50.00	8.86	57.028	2.850	0.0	0.0	77.2	1.05	227.0<	463.1
S1.010	50.00	9.28	56.880	3.000	0.0	0.0	81.2	1.24	267.7<	487.5
S6.000	50.00	4.75	57.906	0.150	0.0	0.0	4.1	1.29	91.5	24.4
S6.001	50.00	4.85	57.510	0.300	0.0	0.0	8.1	1.30	91.8	48.7
S6.002	50.00	5.54	57.460	0.450	0.0	0.0	12.2	1.29	91.4	73.1
S6.003	50.00	6.00	57.092	0.600	0.0	0.0	16.2	1.67	265.1	97.5
S1.011	50.00	9.53	56.783	3.600	0.0	0.0	97.5	1.05	227.3<	585.0



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Ormond House Upper Ormond Quay Dublin 7, Ireland	Clonburris T2 Surface Water Calculations	
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Innovyze	Network 2020.1	

PIPELINE SCHEDULES for SW\_1


Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	SM2	59.668	58.200	1.168	Open Manhole	1200
S1.001	o	375	SM2	59.759	58.039	1.345	Open Manhole	1200
S2.000	o	300	SM3	59.707	58.072	1.335	Open Manhole	1200
S1.002	o	600	SM3	59.517	57.879	1.038	Open Manhole	1500
S3.000	o	300	SM9	59.600	58.344	0.956	Open Manhole	1200
S3.001	o	375	SM10	59.600	58.128	1.097	Open Manhole	1200
S1.003	o	600	SM4	59.485	57.856	1.029	Open Manhole	1500
S4.000	o	450	SM12	59.020	57.811	0.759	Open Manhole	1200
S1.004	o	600	SM5	59.503	57.681	1.222	Open Manhole	1500
S1.005	o	1000	SM6	59.458	57.600	0.858	Open Manhole	1900
S5.000	o	300	SM11	59.660	58.000	1.360	Open Manhole	1200
S5.001	o	375	SM12	59.240	57.863	1.002	Open Manhole	1200
S5.002	o	450	SM13	58.966	57.726	0.790	Open Manhole	1200
S5.003	o	450	SM14	59.512	57.582	1.480	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	46.012	285.8	SM2	59.759	58.039	1.420	Open Manhole	1200
S1.001	44.624	277.2	SM3	59.517	57.878	1.264	Open Manhole	1500
S2.000	38.566	199.8	SM3	59.517	57.879	1.338	Open Manhole	1500
S1.002	6.340	275.7	SM4	59.485	57.856	1.029	Open Manhole	1500
S3.000	31.867	200.4	SM10	59.600	58.185	1.115	Open Manhole	1200
S3.001	54.380	199.9	SM4	59.485	57.856	1.254	Open Manhole	1500
S1.003	48.791	278.8	SM5	59.503	57.681	1.222	Open Manhole	1500
S4.000	25.995	200.0	SM5	59.503	57.681	1.372	Open Manhole	1500
S1.004	23.381	288.7	SM6	59.458	57.600	1.258	Open Manhole	1900
S1.005	39.249	196.2	SM7	59.316	57.400	0.916	Open Manhole	1900
S5.000	45.984	335.6	SM12	59.240	57.863	1.077	Open Manhole	1200
S5.001	48.481	353.9	SM13	58.966	57.726	0.865	Open Manhole	1200
S5.002	45.153	313.6	SM14	59.512	57.582	1.480	Open Manhole	1200
S5.003	6.958	331.3	SM15	59.556	57.561	1.545	Open Manhole	1200



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PIPELINE SCHEDULES for SW\_1


Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.004	o	450	SM15	59.556	57.561	1.545	Open Manhole	1200
S5.005	o	450	SM16	59.618	57.526	1.642	Open Manhole	1200
S5.006	o	450	SM17	59.477	57.464	1.563	Open Manhole	1200
S5.007	o	450	SM18	59.269	57.412	1.407	Open Manhole	1200
S1.006	o	525	SM7	59.316	57.400	1.391	Open Manhole	1900
S1.007	o	525	SM8	59.397	57.258	1.614	Open Manhole	1500
S1.008	o	525	SM9	59.560	57.122	1.913	Open Manhole	1500
S1.009	o	525	SM10	58.788	57.028	1.235	Open Manhole	1500
S1.010	o	525	SM23	59.240	56.880	1.835	Open Manhole	1500
S6.000	o	300	SM24	59.191	57.906	0.985	Open Manhole	1200
S6.001	o	300	SM25	59.214	57.510	1.404	Open Manhole	1200
S6.002	o	300	SM26	59.500	57.460	1.740	Open Manhole	1200
S6.003	o	450	SM27	59.463	57.092	1.921	Open Manhole	1200
S1.011	o	525	SM24	59.130	56.783	1.822	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.004	11.765	336.1	SM16	59.618	57.526	1.642	Open Manhole	1200
S5.005	20.769	335.0	SM17	59.477	57.464	1.563	Open Manhole	1200
S5.006	17.409	334.8	SM18	59.269	57.412	1.407	Open Manhole	1200
S5.007	4.395	338.1	SM7	59.316	57.399	1.467	Open Manhole	1900
S1.006	19.629	138.2	SM8	59.397	57.258	1.614	Open Manhole	1500
S1.007	18.585	136.7	SM9	59.560	57.122	1.913	Open Manhole	1500
S1.008	14.809	155.9	SM10	58.788	57.027	1.236	Open Manhole	1500
S1.009	66.708	450.7	SM23	59.240	56.880	1.835	Open Manhole	1500
S1.010	31.537	325.1	SM24	59.130	56.783	1.822	Open Manhole	1500
S6.000	58.353	147.0	SM25	59.214	57.509	1.405	Open Manhole	1200
S6.001	7.450	146.1	SM26	59.500	57.459	1.741	Open Manhole	1200
S6.002	54.179	147.2	SM27	59.463	57.092	2.071	Open Manhole	1200
S6.003	45.849	148.4	SM24	59.130	56.783	1.897	Open Manhole	1500
S1.011	15.282	449.5	SM	59.265	56.749	1.991	Open Manhole	0



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Area Summary for SW\_1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.174	0.174	0.174
1.001	-	-	100	0.174	0.174	0.174
2.000	-	-	100	0.050	0.050	0.050
1.002	-	-	100	0.174	0.174	0.174
3.000	-	-	100	0.174	0.174	0.174
3.001	-	-	100	0.174	0.174	0.174
1.003	-	-	100	0.174	0.174	0.174
4.000	-	-	100	0.174	0.174	0.174
1.004	-	-	100	0.174	0.174	0.174
1.005	-	-	100	0.438	0.438	0.438
5.000	-	-	100	0.100	0.100	0.100
5.001	-	-	100	0.100	0.100	0.100
5.002	-	-	100	0.100	0.100	0.100
5.003	-	-	100	0.270	0.270	0.270
5.004	-	-	100	0.250	0.250	0.250
5.005	-	-	100	0.000	0.000	0.000
5.006	-	-	100	0.000	0.000	0.000
5.007	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.150	0.150	0.150
1.010	-	-	100	0.150	0.150	0.150
6.000	-	-	100	0.150	0.150	0.150
6.001	-	-	100	0.150	0.150	0.150
6.002	-	-	100	0.150	0.150	0.150
6.003	-	-	100	0.150	0.150	0.150
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				3.600	3.600	3.600

Free Flowing Outfall Details for SW\_1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.011	SM	59.265	56.749	0.000	0	0



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Simulation Criteria for SW\_1


Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.277		



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Online Controls for SW\_1

Hydro-Brake® Optimum Manhole: SM7, DS/PN: S1.006, Volume (m³): 35.2

Unit Reference MD-SHE-0134-9600-1600-9600  
 Design Head (m) 1.600  
 Design Flow (l/s) **9.6**  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Application Surface  
 Sump Available Yes  
 Diameter (mm) 134  
 Invert Level (m) 57.400  
 Minimum Outlet Pipe Diameter (mm) 150  
 Suggested Manhole Diameter (mm) 1200


Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	9.6
Flush-Flo™	0.469	9.6
Kick-Flo®	0.984	7.6
Mean Flow over Head Range	-	8.4

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	4.8	1.200	8.4	3.000	12.9	7.000	19.4
0.200	8.5	1.400	9.0	3.500	13.9	7.500	20.0
0.300	9.3	1.600	9.6	4.000	14.8	8.000	20.6
0.400	9.5	1.800	10.1	4.500	15.7	8.500	21.3
0.500	9.6	2.000	10.7	5.000	16.5	9.000	21.8
0.600	9.5	2.200	11.2	5.500	17.2	9.500	22.4
0.800	9.0	2.400	11.6	6.000	18.0		
1.000	7.7	2.600	12.1	6.500	18.7		

**CONTROLLED OUTFLOW RATE FROM THE ATTENUATION POND (USING QBAR 3.1l/s/ha) FOR THE 3.1ha CATCHMENT 1 AS PER DRAWING CLB-1B-94-SW-DTM-DR-DBFL-CE-1002 ISSUED FOR PLANNING.**



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Storage Structures for SW\_1


Tank or Pond Manhole: SM7, DS/PN: S1.006

Invert Level (m) 57.400

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	350.0	0.600	1400.0	1.100	1400.0	1.600	2290.0
0.350	350.0	0.601	1400.0	1.101	2290.0	1.601	0.0

**TOTAL ATTENUATION  
VOLUME OF 2180m3  
PROVIDED**



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Summary of Critical Results by Maximum Level (Rank 1) for SW\_1

Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0    MADD Factor \* 10m<sup>3</sup>/ha Storage 2.000  
Hot Start Level (mm) 0    Inlet Coefficient 0.800  
Manhole Headloss Coeff (Global) 0.500    Flow per Person per Day (l/per/day) 0.000  
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0    Number of Storage Structures 1  
Number of Online Controls 1    Number of Time/Area Diagrams 0  
Number of Offline Controls 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR    Ratio R 0.303  
Region Scotland and Ireland Cv (Summer) 0.750  
M5-60 (mm)    17.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0    DVD Status ON  
Analysis Timestep    Fine Inertia Status ON  
DTS Status    OFF

Profile(s)    Summer and Winter  
Duration(s) (mins)    15, 30, 60, 120, 180, 240, 360, 720, 1440,  
2880, 7200, 10080  
Return Period(s) (years)    30, 100  
Climate Change (%)    20, 20

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )
S1.000	SM2	15 minute 100 year Winter I+20%	15	59.668	59.074	0.574	0.000
S1.001	SM2	15 minute 100 year Winter I+20%	15	59.759	58.898	0.484	0.000
S2.000	SM3	720 minute 100 year Winter I+20%	720	59.707	58.728	0.356	0.000
S1.002	SM3	720 minute 100 year Winter I+20%	720	59.517	58.726	0.247	0.000
S3.000	SM9	15 minute 100 year Winter I+20%	15	59.600	59.042	0.398	0.000
S3.001	SM10	15 minute 100 year Winter I+20%	15	59.600	58.916	0.413	0.000
S1.003	SM4	720 minute 100 year Winter I+20%	720	59.485	58.724	0.268	0.000
S4.000	SM12	1440 minute 100 year Winter I+20%	1440	59.020	58.684	0.423	0.000
S1.004	SM5	1440 minute 100 year Winter I+20%	1440	59.503	58.684	0.403	0.000
S1.005	SM6	1440 minute 100 year Winter I+20%	1440	59.458	58.683	0.083	0.000
S5.000	SM11	15 minute 100 year Winter I+20%	15	59.660	59.088	0.788	0.000
S5.001	SM12	15 minute 100 year Winter I+20%	15	59.240	59.029	0.791	0.000
S5.002	SM13	15 minute 100 year Winter I+20%	15	58.966	58.962	0.786	0.000
S5.003	SM14	15 minute 100 year Winter I+20%	15	59.512	58.869	0.837	0.000
S5.004	SM15	15 minute 100 year Winter I+20%	15	59.556	58.762	0.751	0.000
S5.005	SM16	1440 minute 100 year Winter I+20%	1440	59.618	58.685	0.709	0.000
S5.006	SM17	1440 minute 100 year Winter I+20%	1440	59.477	58.684	0.770	0.000
S5.007	SM18	1440 minute 100 year Winter I+20%	1440	59.269	58.683	0.821	0.000
S1.006	SM7	1440 minute 100 year Winter I+20%	1440	59.316	58.683	0.758	0.000
S1.007	SM8	15 minute 100 year Winter I+20%	15	59.397	57.499	-0.284	0.000
S1.008	SM9	15 minute 100 year Winter I+20%	15	59.560	57.496	-0.151	0.000




Summary of Critical Results by Maximum Level (Rank 1) for SW\_1

PN	US/MH Name	Flow / Overflow Cap.	Maximum (l/s)	Pipe Maximum Flow (l/s)	Vol (m³)	Status
S1.000	SM2	1.04	0.983	63.6		SURCHARGED
S1.001	SM2	1.14	4.133	124.8		SURCHARGED
S2.000	SM3	0.03	0.736	2.0		SURCHARGED
S1.002	SM3	0.10	8.900	23.1		SURCHARGED
S3.000	SM9	0.90	0.784	64.1		SURCHARGED
S3.001	SM10	0.95	3.053	124.6		SURCHARGED
S1.003	SM4	0.12	8.751	44.2		SURCHARGED
S4.000	SM12	0.02	0.981	4.2		SURCHARGED
S1.004	SM5	0.11	19.054	33.9		SURCHARGED
S1.005	SM6	0.04	9.185	44.0		SURCHARGED
S5.000	SM11	0.55	1.225	31.3		SURCHARGED
S5.001	SM12	0.63	4.478	61.3		FLOOD RISK
S5.002	SM13	0.56	6.615	91.3		FLOOD RISK
S5.003	SM14	1.70	8.441	179.6		SURCHARGED
S5.004	SM15	2.25	2.268	270.0		SURCHARGED
S5.005	SM16	0.14	2.986	19.5		SURCHARGED
S5.006	SM17	0.14	4.487	19.4		SURCHARGED
S5.007	SM18	0.17	4.010	19.4		SURCHARGED
S1.006	SM7	0.03	1477.891	9.6		SURCHARGED
S1.007	SM8	0.05	1.494	13.8		OK
S1.008	SM9	0.08	2.839	20.7		OK

**REQUIRED ATTENUATION VOLUME WITHIN THE ATTENUATION POND FOR THE 1:100 AEP STORM**



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Summary of Critical Results by Maximum Level (Rank 1) for SW\_1

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )
S1.009	SM10	15 minute 100 year Winter I+20%	15	58.788	57.492	-0.061	0.000
S1.010	SM23	15 minute 100 year Winter I+20%	15	59.240	57.410	0.005	0.000
S6.000	SM24	15 minute 100 year Winter I+20%	15	59.191	59.028	0.822	0.000
S6.001	SM25	15 minute 100 year Winter I+20%	15	59.214	58.894	1.084	0.000
S6.002	SM26	15 minute 100 year Winter I+20%	15	59.500	58.733	0.973	0.000
S6.003	SM27	15 minute 100 year Winter I+20%	15	59.463	57.594	0.052	0.000
S1.011	SM24	15 minute 100 year Winter I+20%	15	59.130	57.383	0.075	0.000

PN	US/MH Name	Flow / Overflow Cap.	Maximum Vol (m <sup>3</sup> )	Pipe Flow (l/s)	Status
S1.009	SM10	0.21	3.182	44.0	OK
S1.010	SM23	0.39	13.531	88.2	SURCHARGED
S6.000	SM24	0.56	1.263	49.0	FLOOD RISK
S6.001	SM25	1.62	5.600	99.5	SURCHARGED
S6.002	SM26	1.72	1.877	149.2	SURCHARGED
S6.003	SM27	0.81	3.857	192.9	SURCHARGED
S1.011	SM24	2.01	14.061	277.0	SURCHARGED









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