

Brewery Road Apartments, Stillorgan, Co.
Dublin

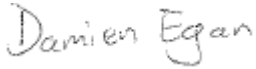
Stormwater Audit Stage 1

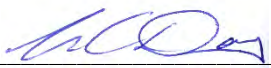
August 2019

Document Control

Document Number: 192-206-SWA-S1

Revision	Description	Date	Prepared	Checked	Approved
PL0	First Issue	09/08/2019	D. Egan	M-C. Daly	L. Brennan
PL1	Audit Response Received	19/08/2019	D. Egan	M-C. Daly	L. Brennan

Report by:  Date: 09^h August 2019
Damien Egan
Engineer (BEng (Hons) MIEI)
PUNCH Consulting Engineers

Checked by:  Date: 09th August 2019
Marie-Claire Daly
Senior Engineer (BEng (Hons) HDSDA CEng MIEI)
PUNCH Consulting Engineers

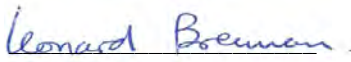
Approved by:  Date: 09th August 2019
Leonard Brennan
Technical Director (BE Dip Hy&Geo Eng PGDipHSC CEng MIEI)
PUNCH Consulting Engineers

Table of Contents

Document Control	i
Table of Contents.....	ii
1.0 Introduction	1
1.1 Purpose of Report	1
1.2 Site Details	1
1.3 Report Details.....	1
2.0 Stage 1 Audit Findings.....	2
2.1 Roads and Carparks	2
2.1.1 Proposed Permeable Paving System.....	2
2.1.2 Bypass Interceptors - Specification	2
2.1.3 Roadways	2
2.1.4 Sump Manholes.....	2
2.1.5 Aco Channels	2
2.1.6 Drainage Areas	2
2.1.7 Drainage Strategy	2
2.1.8 Tree Pits	3
2.1.9 Service Clash	3
2.1.10 Water Table	3
2.1.11 Hydro-Brake	3
2.1.12 Green Roof Extents	3
2.1.13 Attenuation Tank Details.....	3
2.1.14 Attenuation Tank Maintenance Access	4
2.2 Buildings/Residential Units	4
2.2.1 Rainwater Harvesting Tanks	4
Appendix A Drawings and Documents Examined by the Auditor	A-I
Appendix B Site Layout with Stage 1 Audit Findings Highlighted	B-I
Appendix C Storm Water Audit Feedback Form.....	C-I
Appendix D Revised Drawings and Documents Examined by the Auditor.....	D-II

1.0 Introduction

1.1 Purpose of Report

This report presents a Stage 1 Stormwater Audit carried out for a proposed residential development at the Grange, Brewery Road, Stillorgan, Co. Dublin. The proposed development comprises 287 no. residential units and a new creche to accommodate 23 staff and 115 children. The development will include a double basement.

Waterman Moylan has been appointed by Kennedy Wilson, KW PRS ICAV acting for and on behalf of its sub-fund KW PRS Fund 10 I to provide Engineering Services, which includes design of the surface water network and associated sustainable drainage systems (SuDS) proposed.

PUNCH Consulting Engineers has been appointed by Kennedy Wilson, KW PRS ICAV to carry out an independent Stage 1 Stormwater Audit on the proposal in line with Dún Laoghaire-Rathdown County Council requirements.

1.2 Site Details

The site is in Stillorgan, Co. Dublin. It is bounded to the north by Brewery Road, to the east by Stillorgan Road, to the southwest by the Leopardstown Tennis Club and to the southeast by existing residential developments.

The total site area is approximately 1.8 hectares and is currently 50% hardstanding. The site falls from south east to northwest ranging in level from 74.00m in the south east to 66.00m in the northwest. The Grange Marketing Suite and the now redundant site set up for the neighbouring development currently occupy the site. There are also a number of well-established trees and foliage on site occupying an area of approximately 257m².

1.3 Report Details

This Stormwater Audit was carried out by Damien Egan, Marie-Claire Daly and Leonard Brennan between the dates of August 6th and August 9th 2019.

This Stage 1 Audit has been carried out in accordance with the Dún Laoghaire-Rathdown County Council (DLRCC) Stormwater Audit Procedure Rev 0 January 2012. The auditor has examined only those issues within the design relating to surface water drainage implications of the scheme and has therefore not examined or verified the compliance of the design to any other criteria.

Appendix A contains copies of drawings and documents examined by the auditor. The drawings in Site Layout with Stage 1 Audit Findings Highlighted correspond to the Stage 1 Audit findings outlined in Section 2.0 of this report. Appendix C contains the Surface Water Audit Feedback form.

All the findings outlined in Section 2.0 of this report are considered by the auditor to require action in order to improve the stormwater credentials of the scheme.

Appendix D contains the revised documents and drawings submitted with the Audit Feedback Form and were examined by the auditor.

2.0 Stage 1 Audit Findings

The following section should be read in tandem with the drawings included in Appendix B.

2.1 Roads and Carparks

2.1.1 Proposed Permeable Paving System

Problem: It is not clear on drawing P205 where some of the permeable paving (primarily to the north of the site) is discharging to.

Recommendation: Please clarify where the permeable paving located adjacent to the proposed buildings and on the proposed terraces is discharging to.

2.1.2 Bypass Interceptors - Specification

Problem: Bypass Interceptor details provided only refer to the basement interceptor.

Recommendation: Please confirm if the Petrol interceptor to the North of Block N is to be the same as the Interceptor being provided in the basement. If not, please provide details of the Petrol Interceptor to be provided at this location.

2.1.3 Roadways

Problem: There is potential to reduce the surface water runoff and to improve runoff quality from the paths by incorporating SuDS measures.

Recommendation: Consider using a permeable paving material or porous asphalt or consider connecting all proposed roads to a SuDS measure such as infiltration trench or the proposed swales as a means to further reduce the quantity and improve the quality of surface water runoff from the site.

2.1.4 Sump Manholes

Problem: Silt entering the system and entering the attenuation tank has the potential to cause blockages.

Recommendation: Consider making SMH12 a silt trap manhole similar to SMH13.

2.1.5 Aco Channels

Problem: It is unclear where some of the proposed Aco Channels are discharging to.

Recommendation: Provide details of the above. Consider discharging to a SuDS system such as tree pits or swales.

2.1.6 Drainage Areas

Problem: SUDS attenuation Strategy drawing has several areas where it is not shown where they drain to.

Recommendation: Confirm whether these areas are to be attenuated and if so where.

2.1.7 Drainage Strategy

Problem: Unclear where drainage (noted as BD on drawing number P201) is discharging.

Recommendation: Clarify drainage discharge location

2.1.8 Tree Pits

Problem: Unclear if the noted areas are tree pits or not.

Recommendation: Confirm if these areas are tree pits or some other feature.

2.1.9 Service Clash

Problem: Swale Location clashes with existing foul sewer

Recommendation: Consider Re-shaping/Re-locating swale to avoid clash.

2.1.10 Water Table

Problem: No mention was made of groundwater in the documentation supplied, the designer should ensure the formation level of permeable paving that is not proposed over the basement structure is 1000mm above the highest ground water level.

Recommendation: Consider further site investigation during detailed design stage to ensure the ground water level is not less than 1000mm below the formation level of the permeable carpark build-up.

2.1.11 Hydro-Brake

Problem: Hydrobrake details (orifice size, make and model) not submitted

Recommendation: It is also noted that the orifice size of the Hydro-Brake required is 53 mm, which is not considered practical for maintenance. We do not recommend use of a flow control device with an orifice below 75mm diameter. If a larger diameter is not achievable, please confirm what procedure will occur to prevent flooding in the case of a blockage. Consider installing a sediment reduction/removal device (such as a Downstream Defender or equivalent) upstream of the Hydro-Brake.

Problem: Hydrobrake details submitted differ between drawings and Engineering Report. Engineering Report states total discharge of 5.65 l/s, drawings call off both flow controls as 2 l/s each.

Recommendation: Please Clarify the discharge of the 2 no. hydrobrake being provided.

2.1.12 Green Roof Extents

Problem: Mechanical plant (including solar panels) does not appear to have been accounted for in the green roof layout. This may reduce the green roof area proposed at tender stage.

Recommendation: Consider the effect mechanical plant will have on the green roof extents to give an accurate estimation of the true green roof extents that can be installed.

2.1.13 Attenuation Tank Details

Problem: details of attenuation tank outside Block N not submitted.

Recommendation: Submit details of same

2.1.14 Attenuation Tank Maintenance Access

Problem: The attenuation tank is located within the basement.

Recommendation: Confirm access for maintenance is achievable, particularly where a pumping appliance may be required to remove water or silt build-up from the tank.

2.2 Buildings/Residential Units

2.2.1 Rainwater Harvesting Tanks

Problem: There is potential to install a rainwater harvesting facilities for the proposed units. The rainwater collected can be used for toilet flushing within the new units.

Recommendation: Consider incorporating rainwater harvesting tanks.

Appendix A Drawings and Documents Examined by the Auditor


Waterman Moylan		Page 1
Marine House Clanwilliam Place Dublin 2 Ireland		18-093 Brewery Road Apartments Grange Development
Date 29/07/2019 09:16 File Stormwater network for ...		Designed by LRG Checked by EC
Micro Drainage		Network 2019.1















Manhole Schedules for Storm


MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	72.250	1.000	Open Manhole	1200	S2.000	71.250	225				
S2	72.250	1.090	Open Manhole	1200	S2.001	71.160	225	S2.000	71.160	225	
S3	72.250	1.241	Open Manhole	1200	S2.002	71.009	225	S2.001	71.009	225	
S4	72.250	1.417	Open Manhole	1200	S2.003	70.833	225	S2.002	70.833	225	
S5	72.250	6.770	Open Manhole	1200	S2.004	65.480	225	S2.003	70.809	225	5329
S6	72.250	6.770	Open Manhole	1200	S3.000	65.480	225				
S7	66.500	1.104	Open Manhole	1200	S2.005	65.396	225	S2.004	65.396	225	
								S3.000	65.428	225	32
S8	66.450	1.151	Open Manhole	1200	S2.006	65.299	225	S2.005	65.299	225	
S9	66.450	0.800	Open Manhole	1200	S4.000	65.650	225				
S10	72.250	6.770	Open Manhole	1200	S5.000	65.480	225				
S11	66.450	1.067	Open Manhole	1200	S5.001	65.383	225	S5.000	65.383	225	
S12	66.450	1.128	Open Manhole	1200	S4.001	65.322	225	S4.000	65.610	225	288
								S5.001	65.322	225	
S13	66.450	1.900	Open Manhole	1200	S2.007	64.550	300	S2.006	65.191	225	566
								S4.001	65.157	225	532
S14	66.450	1.952	Open Manhole	1200	S2.008	64.498	300	S2.007	64.498	300	
S15	66.000	1.000	Open Manhole	1200	S6.000	65.000	225				
S16	66.000	2.061	Open Manhole	1200	S2.009	63.939	300	S2.008	64.372	300	433
								S6.000	64.014	225	
S	66.230	2.394	Open Manhole	0		OUTFALL		S2.009	63.836	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	720433.718	727166.977	720433.718	727166.977	Required	
S2	720422.335	727174.159	720422.335	727174.159	Required	
S3	720434.595	727193.249	720434.595	727193.249	Required	
S4	720416.815	727212.697	720416.815	727212.697	Required	
S5	720414.114	727215.220	720414.114	727215.220	Required	

Waterman Moylan		Page 2
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 Brewery Road Apartments Grange Development	
Date 29/07/2019 09:16 File Stormwater network for ...	Designed by LRG Checked by EC	
Micro Drainage	Network 2019.1	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S6	720417.893	727219.115	720417.893	727219.115	Required	
S7	720418.754	727226.901	720418.754	727226.901	Required	
S8	720404.584	727230.354	720404.584	727230.354	Required	
S9	720371.876	727198.374	720371.876	727198.374	Required	
S10	720396.857	727198.022	720396.857	727198.022	Required	
S11	720382.417	727196.132	720382.417	727196.132	Required	
S12	720376.037	727202.606	720376.037	727202.606	Required	
S13	720393.044	727219.019	720393.044	727219.019	Required	
S14	720387.619	727224.565	720387.619	727224.565	Required	
S15	720394.679	727251.123	720394.679	727251.123	Required	
S16	720374.028	727237.642	720374.028	727237.642	Required	
S	720370.569	727239.893			No Entry	

Waterman Moylan		Page 3
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 Brewery Road Apartments Grange Development	
Date 29/07/2019 09:16 File Stormwater network for ...	Designed by LRG Checked by EC	
Micro Drainage	Network 2019.1	


PIPELINE SCHEDULES for Storm

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)
S2.000	o	225	S1	72.250	71.250	0.775	Open Manhole	1200
S2.001	o	225	S2	72.250	71.160	0.865	Open Manhole	1200
S2.002	o	225	S3	72.250	71.009	1.016	Open Manhole	1200
S2.003	o	225	S4	72.250	70.833	1.192	Open Manhole	1200
S2.004	o	225	S5	72.250	65.480	6.545	Open Manhole	1200
S3.000	o	225	S6	72.250	65.480	6.545	Open Manhole	1200
S2.005	o	225	S7	66.500	65.396	0.879	Open Manhole	1200
S2.006	o	225	S8	66.450	65.299	0.926	Open Manhole	1200
S4.000	o	225	S9	66.450	65.650	0.575	Open Manhole	1200
S5.000	o	225	S10	72.250	65.480	6.545	Open Manhole	1200
S5.001	o	225	S11	66.450	65.383	0.842	Open Manhole	1200
S4.001	o	225	S12	66.450	65.322	0.903	Open Manhole	1200
S2.007	o	300	S13	66.450	64.550	1.600	Open Manhole	1200
S2.008	o	300	S14	66.450	64.498	1.652	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)
S2.000	13.459	150.0	S2	72.250	71.160	0.865	Open Manhole	1200
S2.001	22.688	150.0	S3	72.250	71.009	1.016	Open Manhole	1200
S2.002	26.350	150.0	S4	72.250	70.833	1.192	Open Manhole	1200
S2.003	3.696	150.0	S5	72.250	70.809	1.216	Open Manhole	1200
S2.004	12.569	149.6	S7	66.500	65.396	0.879	Open Manhole	1200
S3.000	7.834	150.0	S7	66.500	65.428	0.847	Open Manhole	1200
S2.005	14.585	150.0	S8	66.450	65.299	0.926	Open Manhole	1200
S2.006	16.175	150.0	S13	66.450	65.191	1.034	Open Manhole	1200
S4.000	5.935	148.4	S12	66.450	65.610	0.615	Open Manhole	1200
S5.000	14.564	150.1	S11	66.450	65.383	0.842	Open Manhole	1200
S5.001	9.089	150.0	S12	66.450	65.322	0.903	Open Manhole	1200
S4.001	23.635	142.8	S13	66.450	65.157	1.068	Open Manhole	1200
S2.007	7.758	149.2	S14	66.450	64.498	1.652	Open Manhole	1200
S2.008	18.860	149.7	S16	66.000	64.372	1.328	Open Manhole	1200

Waterman Moylan		Page 4
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 Brewery Road Apartments Grange Development	
Date 29/07/2019 09:16 File Stormwater network for ...	Designed by LRG Checked by EC	
Micro Drainage	Network 2019.1	

PIPELINE SCHEDULES for Storm

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)
S6.000	o	225	S15	66.000	65.000	0.775	Open Manhole	1200
S2.009	o	300	S16	66.000	63.939	1.761	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)
S6.000	24.662	25.0	S16	66.000	64.014	1.761	Open Manhole	1200
S2.009	4.127	40.1	S	66.230	63.836	2.094	Open Manhole	0

Marine House
 Clanwilliam Place
 Dublin 2 Ireland

18-093 Brewery Road Apartments
 Grange Development



Date 29/07/2019 09:16
 File Stormwater network for ...


Designed by LRG
 Checked by EC

Micro Drainage

Network 2019.1

Setting Out Information - True Coordinates (Storm)


PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S2.000	S1	1200		720433.718	727166.977	720433.718	727166.977	
S2.001	S2	1200		720422.335	727174.159	720422.335	727174.159	
S2.002	S3	1200		720434.595	727193.249	720434.595	727193.249	
S2.003	S4	1200		720416.815	727212.697	720416.815	727212.697	
S2.004	S5	1200		720414.114	727215.220	720414.114	727215.220	
S3.000	S6	1200		720417.893	727219.115	720417.893	727219.115	
S2.005	S7	1200		720418.754	727226.901	720418.754	727226.901	
S2.006	S8	1200		720404.584	727230.354	720404.584	727230.354	
S4.000	S9	1200		720371.876	727198.374	720371.876	727198.374	
S5.000	S10	1200		720396.857	727198.022	720396.857	727198.022	
S5.001	S11	1200		720382.417	727196.132	720382.417	727196.132	
S4.001	S12	1200		720376.037	727202.606	720376.037	727202.606	
S2.007	S13	1200		720393.044	727219.019	720393.044	727219.019	
S2.008	S14	1200		720387.619	727224.565	720387.619	727224.565	
S6.000	S15	1200		720394.679	727251.123	720394.679	727251.123	
S2.009	S16	1200		720374.028	727237.642	720374.028	727237.642	

Waterman Moylan		Page 6
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 Brewery Road Apartments Grange Development	
Date 29/07/2019 09:16 File Stormwater network for ...	Designed by LRG Checked by EC	
Micro Drainage	Network 2019.1	

Setting Out Information - True Coordinates (Storm)


PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S2.009	S	0		720370.569	727239.893	



Waterman Moylan		Page 7
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 Brewery Road Apartments Grange Development	
Date 29/07/2019 09:16 File Stormwater network for ...	Designed by LRG Checked by EC	
Micro Drainage	Network 2019.1	

Area Summary for Storm


Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	User	-	100	0.051	0.051	0.051
2.001	User	-	100	0.033	0.033	0.033
2.002	User	-	100	0.054	0.054	0.054
2.003	User	-	100	0.023	0.023	0.023
2.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
2.005	User	-	100	0.061	0.061	0.061
2.006	User	-	100	0.049	0.049	0.049
	User	-	100	0.018	0.018	0.067
4.000	User	-	100	0.046	0.046	0.046
5.000	User	-	100	0.027	0.027	0.027
5.001	User	-	100	0.097	0.097	0.097
4.001	-	-	100	0.000	0.000	0.000
2.007	User	-	100	0.052	0.052	0.052
	User	-	100	0.030	0.030	0.082
2.008	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.024	0.024	0.024
2.009	User	-	100	0.025	0.025	0.025
	User	-	100	0.037	0.037	0.062
				Total	Total	Total
				0.627	0.627	0.627

Waterman Moylan		Page 1
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 The Grange	
Date 25/03/2019 File Cascade N 1.CASX	Designed by E Caulwell Checked by	
Micro Drainage		Source Control 2018.1.1

Cascade Summary of Results for Main Complex 1.SRCX

	Upstream	Outflow To	Overflow To			
	Structures					
	Swale 4 1.SRCX	(None)	(None)			
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status	
15 min Summer	64.426	0.326	1.5	130.6	O K	
30 min Summer	64.543	0.443	1.5	177.2	O K	
60 min Summer	64.662	0.562	1.5	224.6	O K	
120 min Summer	64.790	0.690	1.5	275.9	O K	
180 min Summer	64.868	0.768	1.6	307.2	O K	
240 min Summer	64.924	0.824	1.6	329.7	O K	
360 min Summer	65.003	0.903	1.7	361.3	O K	
480 min Summer	65.057	0.957	1.7	382.9	O K	
600 min Summer	65.097	0.997	1.7	398.6	O K	
720 min Summer	65.126	1.026	1.8	410.4	O K	
960 min Summer	65.166	1.066	1.8	426.4	O K	
1440 min Summer	65.201	1.101	1.8	440.2	O K	
2160 min Summer	65.197	1.097	1.8	439.0	O K	
2880 min Summer	65.179	1.079	1.8	431.6	O K	
4320 min Summer	65.148	1.048	1.8	419.3	O K	
5760 min Summer	65.118	1.018	1.8	407.3	O K	
7200 min Summer	65.086	0.986	1.7	394.5	O K	
8640 min Summer	65.053	0.953	1.7	381.2	O K	


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	94.889	0.0	124.0	38
30 min Summer	64.406	0.0	115.6	53
60 min Summer	41.084	0.0	231.5	82
120 min Summer	25.560	0.0	240.0	140
180 min Summer	19.213	0.0	242.0	198
240 min Summer	15.655	0.0	245.3	258
360 min Summer	11.703	0.0	254.4	374
480 min Summer	9.509	0.0	262.3	492
600 min Summer	8.090	0.0	268.1	610
720 min Summer	7.087	0.0	272.5	728
960 min Summer	5.749	0.0	278.6	966
1440 min Summer	4.281	0.0	284.2	1442
2160 min Summer	3.185	0.0	532.7	1980
2880 min Summer	2.580	0.0	540.9	2340
4320 min Summer	1.915	0.0	532.6	3120
5760 min Summer	1.549	0.0	838.5	3936
7200 min Summer	1.314	0.0	889.1	4776
8640 min Summer	1.148	0.0	926.7	5624

Waterman Moylan		Page 2
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 The Grange	
Date 25/03/2019 File Cascade N 1.CASX	Designed by E Caulwell Checked by	
Micro Drainage		Source Control 2018.1.1

Cascade Summary of Results for Main Complex 1.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	65.019	0.919	1.7	367.6	O K
15 min Winter	64.467	0.367	1.5	146.7	O K
30 min Winter	64.598	0.498	1.5	199.0	O K
60 min Winter	64.731	0.631	1.5	252.5	O K
120 min Winter	64.877	0.777	1.6	310.6	O K
180 min Winter	64.966	0.866	1.7	346.4	O K
240 min Winter	65.031	0.931	1.7	372.4	O K
360 min Winter	65.123	1.023	1.8	409.3	O K
480 min Winter	65.187	1.087	1.8	434.9	O K
600 min Winter	65.235	1.135	1.8	454.0	O K
720 min Winter	65.272	1.172	1.9	468.7	O K
960 min Winter	65.324	1.224	1.9	489.5	O K
1440 min Winter	65.378	1.278	1.9	511.1	O K
2160 min Winter	65.396	1.296	1.9	518.6	O K
2880 min Winter	65.379	1.279	1.9	511.5	O K
4320 min Winter	65.328	1.228	1.9	491.2	O K
5760 min Winter	65.283	1.183	1.9	473.1	O K
7200 min Winter	65.232	1.132	1.8	452.9	O K
8640 min Winter	65.179	1.079	1.8	431.5	O K
10080 min Winter	65.124	1.024	1.8	409.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.024	0.0	882.9	6456
15 min Winter	94.889	0.0	120.5	38
30 min Winter	64.406	0.0	113.9	52
60 min Winter	41.084	0.0	239.8	80
120 min Winter	25.560	0.0	242.0	138
180 min Winter	19.213	0.0	247.5	196
240 min Winter	15.655	0.0	254.9	254
360 min Winter	11.703	0.0	266.8	368
480 min Winter	9.509	0.0	274.8	484
600 min Winter	8.090	0.0	280.5	600
720 min Winter	7.087	0.0	284.8	716
960 min Winter	5.749	0.0	290.5	948
1440 min Winter	4.281	0.0	294.6	1402
2160 min Winter	3.185	0.0	559.2	2060
2880 min Winter	2.580	0.0	566.9	2656
4320 min Winter	1.915	0.0	560.9	3328
5760 min Winter	1.549	0.0	939.7	4264
7200 min Winter	1.314	0.0	995.7	5192
8640 min Winter	1.148	0.0	975.5	6064
10080 min Winter	1.024	0.0	944.1	6968

Marine House Clanwilliam Place Dublin 2 Ireland	18-093 The Grange	
---	----------------------	---

Date 25/03/2019 File Cascade N 1.CASX	Designed by E Caulwell Checked by	
--	--------------------------------------	--

Micro Drainage	Source Control 2018.1.1
----------------	-------------------------

Cascade Rainfall Details for Main Complex 1.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.500	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram


Total Area (ha) 0.752

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.188	8	12 0.094	16	20 0.094
4	8 0.188	12	16 0.094	20	24 0.094

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area (ha)
From:	To:
0	4 0.000

Waterman Moylan		Page 4
Marine House Clanwilliam Place Dublin 2 Ireland	18-093 The Grange	
Date 25/03/2019 File Cascade N 1.CASX	Designed by E Caulwell Checked by	
Micro Drainage		Source Control 2018.1.1

Cascade Model Details for Main Complex 1.SRCX

Storage is Online Cover Level (m) 66.000

Tank or Pond Structure

Invert Level (m) 64.100

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	400.0	1.100	400.0	3.400	0.0	4.600	0.0
0.200	400.0	1.200	400.0	3.600	0.0	4.800	0.0
0.400	400.0	1.300	400.0	3.800	0.0	5.000	0.0
0.600	400.0	1.301	0.0	4.000	0.0		
0.800	400.0	3.000	0.0	4.200	0.0		
1.000	400.0	3.200	0.0	4.400	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0060-2000-1600-2000
Design Head (m) 1.600
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 60
Invert Level (m) 63.900
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	2.0
Flush-Flo™	0.263	1.5
Kick-Flo®	0.536	1.2
Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.8	3.000	2.7	7.000	4.0
0.200	1.5	1.400	1.9	3.500	2.9	7.500	4.1
0.300	1.5	1.600	2.0	4.000	3.0	8.000	4.2
0.400	1.5	1.800	2.1	4.500	3.2	8.500	4.3
0.500	1.3	2.000	2.2	5.000	3.4	9.000	4.4
0.600	1.3	2.200	2.3	5.500	3.5	9.500	4.6
0.800	1.5	2.400	2.4	6.000	3.7		
1.000	1.6	2.600	2.5	6.500	3.8		



Waterman Moylan
Engineering Consultants

Engineering Assessment Report

Proposed Residential Development Site at Brewery Road,
Stillorgan

July 2019

Waterman Moylan Consulting Engineers Limited

Block S, EastPoint Business Park, Alfie Byrne Road, Dublin 3
www.watermangroup.com



Client Name: KW PRS ICAV acting for an on behalf of its sub-fund KW PRS Fund 10
Document Reference: 18-093r.002
Project Number: 18-093

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
No. 1	April 2019	E. Caulwell	J Gibbons	J Gibbons

Comments

Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Content

- 1. **Introduction** 1
- 2. **Site Description** 2
 - 2.1 Site Location 2
 - 2.2 Existing Development 2
 - 2.3 Proposed Development 3
- 3. **Foul Water Drainage** 4
 - 3.1 Receiving Environment 4
 - 3.2 Network Design 5
- 4. **Surface Water Drainage** 6
 - 4.1 Introduction 6
 - 4.2 Site Characteristics 6
 - 4.3 Greenfield run-off rates 7
 - 4.4 SUDS Assessment 7
 - 4.5 Proposed Surface Water Strategy 10
 - 4.6 Interception Storage 10
- 5. **SUDS Maintenance** 13
- 6. **Benefits to the Surrounding Existing Drainage Network** 16
- 7. **Water Supply** 17
 - 7.1 Water Supply – General 17
- 8. **Transport** 18
 - 8.1 Introduction 18
 - 8.2 Site Access 18
 - 8.3 Car Parking 18
 - 8.4 Cycle Parking 19

Appendices

- A. Greenfield Calculations
- B. Attenuation Calculations – Supporting Map
- C. Attenuation Calculations – 1 in 100 Year Events
- D. Attenuation Calculations – 1 in 30 Year Events
- E. Attenuation Calculations – 1 in 1 Year Events

1. Introduction

Waterman Moylan have been appointed by KW PRS ICAV acting for an on behalf of its sub-fund KW PRS Fund 10 to provide Engineering services on the development of the lands to the north of The Grange Development on Stillorgan Road (N11) Co. Dublin. This report has been prepared as part of a pre-planning submission to Dun Laoghaire-Rathdown County Council, for the proposed development of 287 No. residential units and a new Crèche to accommodate 23 staff and 115 children at The Grange, Brewery Road, Stillorgan.

This report describes the criteria used to design the storm water discharge, disposal of foul water, water supply and vehicular access to the developed site.

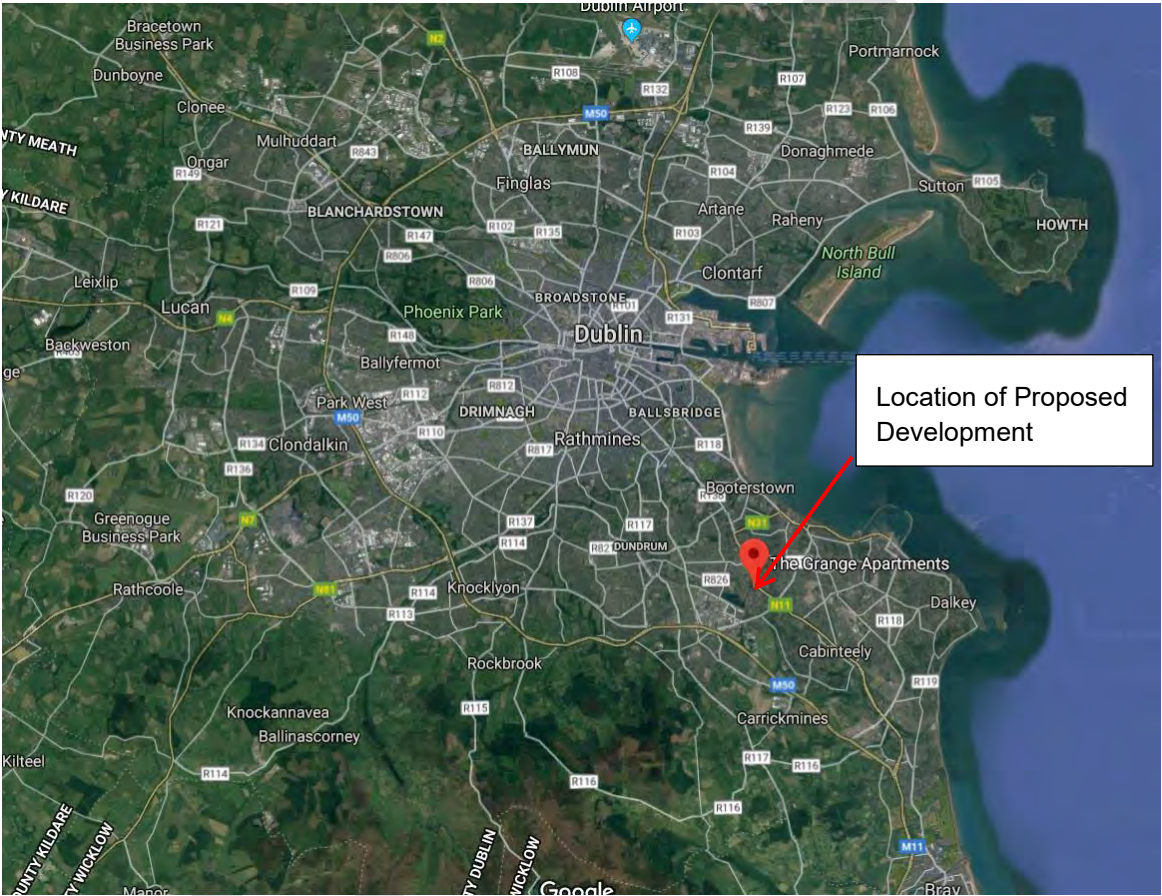
DRAFT

2. Site Description

2.1 Site Location

The site is in Stillorgan, Co.Dublin. It is bounded to the north by Brewery Road, to the east by Stillorgan Road, to the southwest by the Leopardstown Tennis Club and to the southeast by existing residential developments. The proposed development is approximately 2.5km from the coastline at Blackrock and 440m north of Mulchanstown Reservoir. Refer to Figure 1 for the location of the proposed development.

Figure 1: Site Location (image taken from Google Earth)



2.2 Existing Development

The total site area is approximately 1.8 hectares and is currently 50% hardstanding. The site falls from south east to northwest ranging in level from 74.00m in the south east to 66.00m in the northwest. The Grange Marketing Suite and the now redundant site set up for the neighbouring development currently occupy the site. There are also a number of well-established trees and foliage on site occupying an area of approximately 257m².

2.3 Proposed Development

It is proposed to construct 287 No. residential units with the associated tenant amenities over a double level basement carpark. The proposals also include the construction of a new Crèche to accommodate 23 staff and 115 children on site. The developer will construct all associated infrastructure to service the development including a network of foul water and surface water drains, watermain and a realigned access road and footpaths.

The existing road levels around the site range from 66.01m – 74.00m OD. The ground floor of the proposed building steps across the site to mimic the existing levels on site as much as reasonably practicable. The lowest Ground Floor level is in the basement/ground floor level immediately adjacent to Brewery Road and is at a level of 66.00m OD.

The site's main vehicular access will be provided from Brewery Road. The existing access onto Brewery Road will be modified to improve the junction layout and forward visibility. The majority of the carparking onsite will be accessed from a ramp off the main site access road. There is a total of 84 No. parking spaces at basement level and 8 surface level parking spaces, 560 No. bicycle parking spaces and 7 No. Motorcycle Spaces provided. Pedestrian access will be provided along the building elevation facing onto Brewery Road and from the footway provided on both sides of the vehicular entrance road. Pedestrian access will also be provided to basement level via a pedestrian access ramp next to the vehicular access.

3. Foul Water Drainage

3.1 Receiving Environment

There is an existing 225mm diameter foul sewer Brewery Road to the northwest of the subject site which drains the residential properties on this road. There is also an existing private foul sewer within the site which serves The Grange development to the south of the proposed development.

The proposed development can drain all foul drainage on site to the existing on-site private drainage system, which eventually drains to the public foul sewer, or directly to the public foul sewer in Brewery Road by gravity.

A Pre-Connection Enquiry form was submitted to Irish Water on 09th of September 2018 which outlined the foul water discharge proposal. A response was received on 31st January 2019 stating that a connection to the foul water sewer is feasible without an upgrade meaning the existing network has sufficient capacity to drain the proposed development.

The proposed development will consist of 287 residential units and a new Crèche to accommodate 23 staff and 115 children. Based on Irish Waters Code of Practice, the peak foul flow from the proposed development will be as follows:

Table 1: Calculation of proposed Foul Water Flow

Description	No. of Units	Flow l/h/day	Population per Unit	Infiltration Factor	Total Discharge (l/d)
Residential Units	287	150	2.7	1.1	127,858.5
Crèche	1	50	138	1.1	7,590
Totals					135,448.5 l/d

Calculation of Proposed Peak Foul Flow

Total Daily Discharge (from Table 1.) 135,449 l/d

Dry Weather Flow (DWF) 1.57 l/s

Peak Foul Flow (=6 x DWF) 9.41 l/s

Waterman Moylan Drawing No's 18-093-P200, P201 and P202 illustrate the proposed layout for the foul water sewer outfall for the subject site. The proposed foul water outfall from the development is a 225mm diameter pipe laid at a minimum gradient of 1:200, giving a minimum capacity of 32 l/s. Therefore, the proposed outfall has adequate capacity to cater for the flows from the development

3.2 Network Design

Drains will generally consist of Ductile Iron pipework fixed to the underside of the ground floor slab. Drains in other areas will be PE to Irish Water specification or concrete socket and spigot pipes (to IS 6).

Drains will be laid to comply with the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Foul water sewers will consist of uPVC or concrete socket and spigot pipes (to IS 6) and will be laid strictly in accordance with Irish Waters code of practice for Wastewater Infrastructure and Dun-Laoghaire Rathdown County Council requirements for taking in charge.

All manholes will be constructed in block work or cast in-situ concrete. Construction details for the proposed drainage systems are included in the accompanying pre-planning submission drawings.

DRAFT

4. Surface Water Drainage

4.1 Introduction

The existing site drains surface water, unrestricted, to the surface water sewer in Brewery Road. It is proposed that the development will attenuate the surface water on site before discharging it, at a restricted rate, via two outfalls, to the same surface water public sewer.

The existing run-off rate was estimated for the 1 in 1, 1 in 30 and 1 in 100 year return periods using the modified rational method:

$Q = 2.78 \times A \times i$ (where A is the catchment area in Hectares and i is the rainfall intensity in mm/hr as estimated for the 60min storm from WinDes using Met Eireann Data.)

$A = 8794\text{m}^2 = 0.879\text{ha}$ (as measured from topographical survey)

i – 1 year return period = 12.163mm/h

30 year return period = 26.39mm/h

100 year return period = 34.237mm/h

Table 2: Existing Run-off Rates

Rainfall Event	Existing development run-off (l/sec)
Q1	$2.78 \times 0.879 \times 12.163 = 29.72$
Q30	$2.78 \times 0.879 \times 26.39 = 64.49$
Q100	$2.78 \times 0.879 \times 34.237 = 83.66$

4.2 Site Characteristics

The following parameters have been used in greenfield run-off rate calculations which can be seen in Appendix A.

Table 3: Surface Water Catchment Details

	Catchment
Site Area (Catchment) *1 – Ha	1.80
SAAR - mm*2	835
SOIL Index*3	0.37
Climate Change	20%

*1 – The total site area within the application red line boundary.

*2 – From MetEireann data.

*3 – The soil type map of Ireland indicated Soil Type 1 however the SI would suggest this is not correct for this site and soil conditions are more in line with those expected for Soil Type 3. Therefore 0.37 is used as the Soil Index.

4.3 Greenfield run-off rates

The local authority requirements are that post-development run-off rates are limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 “Flood Estimation for Small Catchments”, using the UK SUDS Website, however, the Site Investigation suggest a Soil Type 3 and therefore, a Soil Index of 0.37 was used. The Site Investigation borehole logs can be found in Appendix A. The Greenfield run-off for the whole site is 5.65 l/s.

The greenfield run-off rate (Q_{bar}) of 5.65 l/s is based on Soil Type 3 in line with the Site Investigation (SI) results. The SI indicated that the site is underlain by an overburden, generally of made ground or cobbles and Granite Rock is present at a depth of between 0.8m and 2.6m below ground level.

In addition, there is a natural average slope of c. 1:30 across the site which will increase the rate of run-off from site, even in its greenfield state.

It is proposed to limit the discharge from site to 5.65 l/s as agreed with Johanne Codd of DLRCC split across two outfalls by providing a Sustainable Drainage System (SUDS). A Hydrobreak will be installed on both outfalls. This will greatly reduce the run-off from site when compared to the existing run-off as calculated in 4.1 above, reducing the impact of the development on the surrounding environment and reducing the risk of the public surface water sewer surcharging during high storm events.

4.4 SUDS Assessment

In accordance with the Dun-Laoghaire Rathdown County Council, Greater Dublin Strategic Drainage Study (GDSDS) guidelines and CIRIA documents, surface water run-off should be managed as close to its source as possible, with the re-use of rainwater within the building prioritised. Sustainable Urban Drainage systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping run-off of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water run-off.

The following drainage hierarchy was used to determine the most suitable and sustainable SUDS strategy. This is in accordance with the GDSDS initiative that all new developments will conform to Best Management Practices for urban storm water drainage.

1. The use of green roofs;
2. Store rainwater for later use;
3. Use infiltration techniques, such as porous surfaces in non-clay areas;
4. Attenuate rainwater in ponds or open water features for gradual release;
5. Attenuate rainwater by storing in tanks or sealed water features for gradual release;
6. Discharge rainwater direct to a watercourse;
7. Discharge rainwater to a surface water sewer/drain;
8. Discharge rainwater to the combined sewer.

Green Roofs

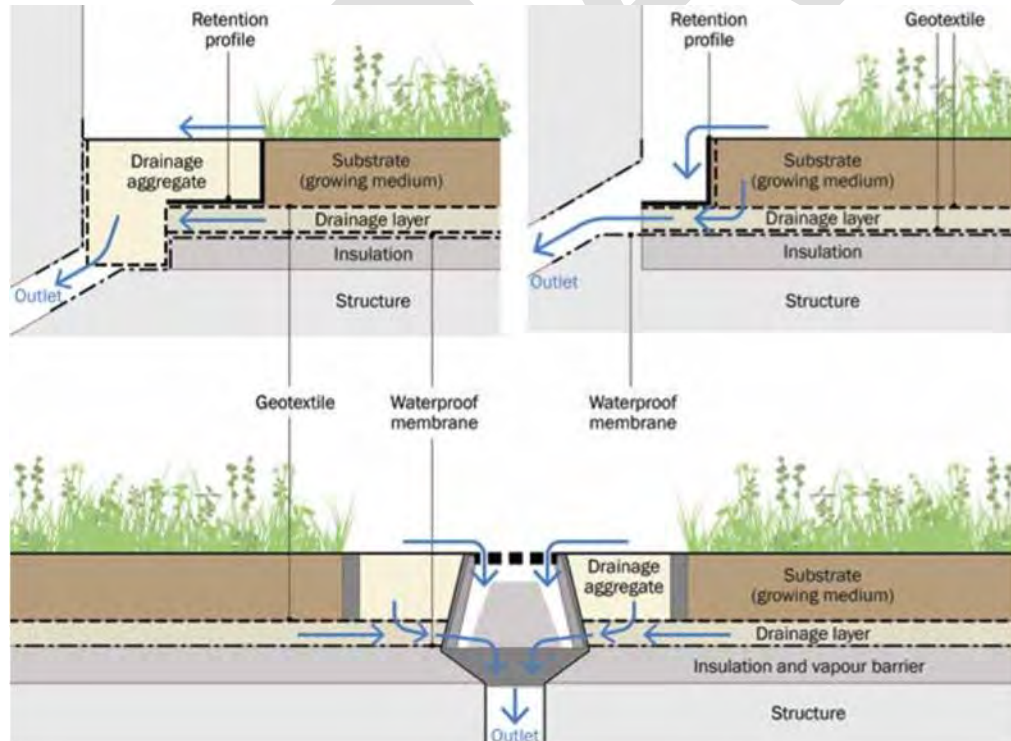
Green Roofs have been considered and incorporated into the development proposals in accordance with Appendix 16 of DLRCC County Development Plan. The locations of the green roofs are illustrated on the accompanying Waterman Moylan SUDS Drawing 18-093-P205. The total roof and podium area on site is 5447.2m² and the area of green roof provided is 3828m² providing a 70% coverage in green roof. This is in excess of the minimum requirement of 60% outlined in section 3.1 of DLRCC Green Roof guidance document.

As well as providing ecological benefits, green roofs contribute the following positive effects to surface water drainage design:

- The retention of water, through storage in the growing medium and evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network.
- Due to the time for water to infiltrate and permeate the substrate, there is also a reduction in peak rates of run-off, helping to reduce the risk of flooding.
- They improve water quality through the filtration of pollutants during the process of water infiltration. This provides treatment in line with CIRIA SUDS Manual management train.

Although green roof space can reduce peak flow rates in the small storm events and aid in reducing the volume of run-off from the site, they operate as conventional roofs in higher storm events. Therefore, green roofs cannot be considered in the surface water drainage run-off calculations for the development. As stated in CIRIA C697 *“although green roofs absorb most of the rainfall that they receive during ordinary events, there is still the need to discharge excess water to the building’s drainage system. This is because their hydraulic performance during extreme events tends to be fairly similar to standard roofs.”*

Figure 2: Example Details of outlets from a green roof (CIRIA C697)



Rainwater storage for later use

Rainwater harvesting is often considered the most sustainable solution as it will reduce the total volume of water draining to the outfall as well as reducing the water demand for the proposed buildings. It must be assumed, however, that any water harvesting tanks are full prior to a storm event, and therefore cannot be considered as providing any rainwater attenuation.

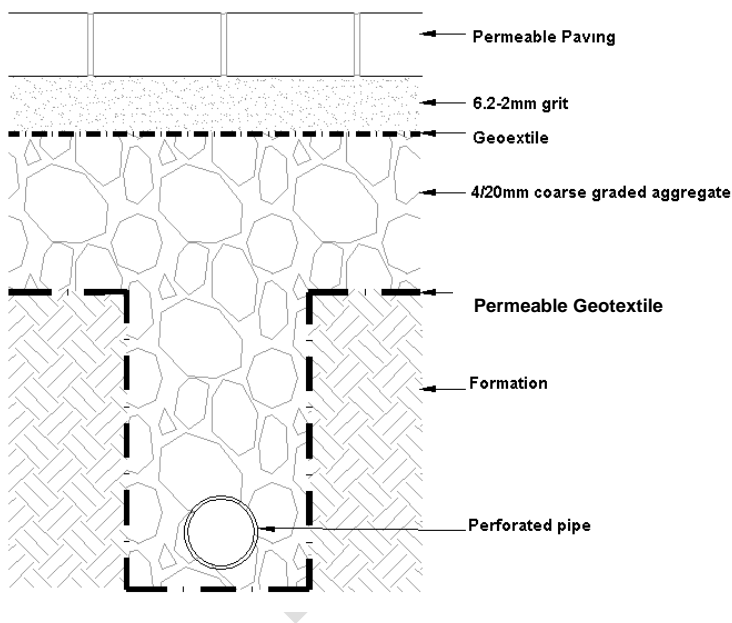
Drainage to ground and attenuation in open features

As the site is underlain by Granite which is impermeable, infiltration techniques cannot be utilised on site. However it is proposed to use the both the treatment and storage properties of swales on site to improve the quality and reduce the volume of water to be discharged into the public surface water sewer.

In addition, permeable paving will be used both on the podium levels and for the Crèche carpark to provide interception treatment to surface water run-off. Permeable pavements are very effective at removing a wide range of pollutants from surface water runoff as they are either retained on the pavement surface or flushed into the granular subbase where they become trapped and are degraded over time.

In the carparking area, instead of infiltrating, the permeable paving sub-base will be used for attenuation purposes. It will include a perforated pipe to convey surface water via a swale next to the access road to the attenuation tank on front of Block N. The permeable paving build-up detail which will be used for the Crèche carpark is shown below in Figure 3.

Figure 3: Proposed residential area permeable paving build-up



Attenuate rainwater

It is proposed to provide attenuation in a concrete tank below the basement carpark for the apartment blocks to the north east of the access road and a portion of the access road and pavement. A modular attenuation tank will be provided to the south west of the access road on front of Block N to serve the Crèche, the realigned access road and block N. A sketch outlining the areas discharging to each SUDS

feature accompanies the attenuation calculations provided in Appendix C. In addition, Waterman Moylan Drainage Drawings 18-093-P200, P201 and P202 outline the proposals in greater detail.

4.5 Proposed Surface Water Strategy

There is an existing surface water sewer located on Brewery Road. It is proposed that the surface water run-off from the development will drain via gravity to this sewer. As described in section 4.3, run-off will be restricted to 5.65 l/s greatly reducing the run-off rate from site. It will be necessary to treat and then store excess storm water within the site. This will be achieved by using a Sustainable drainage network of Green Roofs, Swales and Permeable Paving all discharging the treated water to underground storage tanks. Surface water run-off will be restricted by two separate hydrobrakes, which equate to a total outfall rate for the proposed development of 5.65 l/s. The storm water system will be designed to cater for the 1 in 100-year storm plus a 20% allowance for climate change.

The proposed sustainable urban drainage system will:

- Treat runoff and remove pollutants to improve quality,
- Restrict outflow and to control quantity and
- Increase amenity value.

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid out to minimise the risk of inadvertent connection of waste pipes to the surface water system.

The calculations for the storage design are included in Appendix C. These indicate that for a return period of 100 years plus a 20% allowance for climate change, a storage volume of 520m³ is required in the concert tank within the basement carpark and a storage volume of 149m³ is required to the western section of the site.

The surface water drainage design including the attenuation will cater for this development only. It is considered that any potential future development can be self-contained with its own attenuation and outfall to the existing public sewer on Brewery Road.

4.6 Interception Storage

Interception storage is defined in the SUDS Manual as *“the capture and retention on site of the first 5mm of the majority of rainfall events”*. In accordance with the table 24.6 of the SUDS Manual CIRIA C753 the following guidelines have been used in calculating the area of the site benefiting from interception storage;

Table 4: Interception Mechanisms (Table 24.6 The SUDS Manual)

Systems	Interception methods assumed compliant for zero runoff from the first 5mm of rainfall for 80% of events during the summer and 50% in winter.
Green Roofs	All surfaces that have green roofs
Permeable Paving	<p>All permeable pavements, whether lined or not, can be assumed to comply, provided there is no extra area drained to the permeable pavement.</p> <p>Where the pavement also drains an adjacent impermeable area, compliance can be assumed for all soil types where the pavement is unlined, as long as the extra paved area is no greater than the permeable pavement area</p>
Filter strips/Swales	Roads drained by filters strips/swales, where the longitudinal gradient of the vegetated area is less than 1:100, are suitable for Interception delivery for impermeable surface areas up to 5 times the base of the vegetated surface area receiving the runoff. Components steeper than 1 in 100 cannot be deemed to provide Interception unless additional effective Interception design can be demonstrated.

As described in section 4.4 and 4.5 the proposed development will provide, Green Roofs, Permeable Paving and Swales. In order to calculate the percentage area of site benefiting from each form of interception storage the site areas are described in Table 3 below and demonstrated on Waterman Moylan drawing 18-093-P205;

Table 5: Interception Storage Provided

Area	Total Hard standing Area	Interception mechanism	Interception Area	Percentage Benefiting
Block H	1576.1 m ²	Green Roof	1142 m ²	80.97 %
		Terrace area draining to gravel filter strip.	137 m ²	
Block J	1619 m ²	Green Roof	1278 m ²	90.3 %
		Terrace area draining to gravel filter strip.	212 m ²	
Block M	1383 m ²	Green Roof	980 m ²	77.78 %
		Terrace area draining to gravel filter strip.	233 m ²	
Block N	537 m ²	Green Roof	428 m ²	83.95 %
		Terrace area draining to gravel filter strip.	23m ²	
Creche	332.1 m ²	Terrace area draining to gravel filter strip.	223m ²	67 %
Hard Standing	547 m ²	Swale	526m ²	96.2 %
Total	5994.2m²		5182m²	82.7%

The existing access road is being realigned as part of the proposed development and a number of swales and raingarden type tree pits will be installed along the length of the new access road to greatly improve the interception storage on this part of the site. In addition, the rainfall from this road will be attenuated as part of the development further reducing the impact of the site on the surrounding drainage network.

Within the basement carpark area, any rainwater entering the system as a result of snow melt or raindrops from cars will pass through a petrol interceptor providing treatment.

5. SUDS Maintenance

For the SUDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, drain manholes (including catch pits) and attenuation tanks will ensure adequate performance. The recommended program is outlined in the tables below.

Table 6: Concrete Attenuation Tank Maintenance Schedule

SUDS Element	Maintenance		
Attenuation Tanks	Maintenance Issues	Failure of components, blockage from debris	
	Maintenance Period	Maintenance Task	Frequency
	Regular	Inspect and identify any elements that are not operating correctly. If required, take remedial action.	Monthly for three months, then annually
		Remove sediment/debris from catchment surface that may lead to blockage of structures.	Monthly or as required
		Remove sediment/debris from catch pits/gullies and control structures.	Annually, after severe storms or as required
	Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe storms
		Survey inside of tank for sediment build-up and remove if necessary	Every five years or as required

Table 7: Permeable Paving Maintenance Schedule

SUDS Element	Maintenance		
Permeable Paving	Maintenance period	Maintenance Task	Frequency
	Regular	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or as required, based on site specific observations of clogging or manufacturer's recommendations.
	Occasional	Removal of weeds	As required
	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required
	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually

Table 8: Green Roof Maintenance Schedule

SUDS Element	Maintenance			
Green Roof	Maintenance Issues	Vegetation becoming either overgrown or dying		
	Maintenance Period	Maintenance Task	Frequency	
	Regular	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability		Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment source		Annually and after severe storms
		Inspect drain inlets to ensure unrestricted run-off from the drainage layer to conveyance or roof drain system.		Annually and after severe storms
		Inspect underside of roof for evidence of leakage.		Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.		Six monthly and annually or as required
		During establishment (i.e. year one), replace dead plants as required.		Monthly
		Post-establishment, replace dead plants as required (where >5% of coverage)		Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage		Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds		Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.		Six monthly or as required
	Remedial Work	If erosion channels are evident, these should be established with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled		As required
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate		As required

Table 9: Swale Maintenance Schedule

	Maintenance period	Maintenance Task	Frequency
Swale	Regular	Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required
		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 infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if soil is exposed over 10% or more of the swale treatment area
	Remedial actions	Repair erosion or other damage by re-turfing or re-seeding	As required
		Re-level uneven surfaces and reinstate design levels	As required
		Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

6. Benefits to the Surrounding Existing Drainage Network

It is important to note the very significant benefit the proposed development will have on the existing drainage network. The site currently discharges both foul and surface water, unrestricted to the public foul and surface water sewers respectively. The proposed development will significantly reduce the surface water run-off to the public sewer as demonstrated in Table 10 below. The introduction of the SUDS measures outlined earlier will also improve the quality of the discharge.

Table 10: Surface Water Run-off Rates

Rainfall Event	Existing run-off (l/sec)	Proposed run-off (l/sec)	Difference (%)
Q1	29.72l/s	1.3 + 1.5 = 2.8l/s	- 90.5%
Q30	64.49l/s	1.6 + 1.6 = 3.2l/s	- 95.04%
Q100	83.66l/s	2 + 2 = 4l/s	- 95.22%

7. Water Supply

7.1 Water Supply – General

There is an existing watermain on Brewery Road to the north of the subject site however a Pre-Connection Enquiry form was submitted to Irish Water on 09th of September 2018 which outlined our proposals for the provision of water supply and the response stated that a new connection from the 200mm MOPVC main on Stillorgan Road approximately 140m from the site will be needed to serve the development.

Table 11: Total Water Demand

Description	No. of Units	Flow l/h/day	Population per Unit	Total Discharge (l/d)
Residential Units	287	150	2.7	116,235
Crèche	1	50	138	6,900
Total				123,135 l/d

The total water requirement from the public supply, for the development, is estimated at 123 m³/day.

Waterman Moylan Drawing No's 18-093-P100 shows the proposed indicative water supply layout for the subject site.

It is noted from the Irish Water record drawings that there appears to be a large diameter (1200mm) watermain passing under the existing building in the south west corner of the site. We are currently engaging with Irish water to establish the exact location of this watermain and to agree how best to deal with it in the context of the proposed development.

8. Transport

8.1 Introduction

A site-specific Transport and Traffic Assessment (TTA) has been carried out by Waterman Moylan has also been submitted as part of this application.

8.2 Site Access

The site will be accessed via the existing access road to The Grange off of Brewery Road. It is proposed to re-configure the alignment of this access road as part of the landscaping proposals. The site access from Brewery Road is located in a 50 km/h zone. A 2.4m x 49m sightline, which is in compliance with the requirements of the Department of Transport 'Design Manual for Urban Roads and Streets' recommendation for a road of design speed of 50 km/h, is currently provided at the access road junction onto Brewery Road. No development works will infringe upon this existing sightline provision.

8.3 Car Parking

Section 8.2.4.5 of the Dun Laoghaire Rathdown County Council Development Plan 2016 – 2022 consider the car parking requirements for various types of development. Specifically, Tables 8.2.3 set out the car parking standards for residential developments.

Based on these standards, Table 8 below details the maximum car parking spaces permitted for the proposed development.

Table 12: Car Parking Required and Provided.

Land Use	Units/ Staff Members	DLRCC Car Parking Standards	Maximum Parking Permitted	Parking Provided
Residential/Studio	19	1 space per 1-bed unit	19	
Residential/1 Bed	125	1 space per 1-bed unit	125	92
Residential/2 Bed	143	1.5 space per 2-bed unit	215	
Crèche	23	1 space per 1 staff member	23	8
TOTAL	287 units 23 staff		382	100

In addition, 8 visitor/go-car spaces will be provided at surface level. As shown in Table 8 above, the development will provide 92 No. car parking spaces for the proposed 287 No. apartments. This equates to 0.32 car parking spaces for every apartment. The total car parking spaces provided is approximately 26% of the corresponding DLRCC maximum car parking provision of 382 spaces for the residential development and 35% of the Crèche spaces. Justification for the reduced parking provision and the parking management strategy is set out in Waterman Moylan Report "Parking Strategy and Mobility Management Plan" which accompanies this application.

8.4 Cycle Parking

Section 4.1 of the 'Standard for Cycle Parking and Associated Cycling Facilities for New Developments – Dun Laoghaire-Rathdown County Council 2018' sets out the cycle parking requirements as follows:

Table 13: Total cycle parking spaces required (DLRCC)

	Units	Short stay parking required	Long stay parking required	Total parking required
Apartments	287	58	287	345
Crèche	23 staff 115 children	12	5	17
Total		70	290	362

The Design Standards for New Apartments, who set out a requirement of 1 long stay space per bedroom and 1 visitor space for every two units, have also been reviewed with regards to cycle parking requirements and are set out in table 11 below.

Table 14: Total cycle parking spaces required (National Standards)

Land Use	Units		Long stay parking required	Short stay parking required
Residential/Studio	19	1 space per 1-bed unit	19	10
Residential/1 Bed	125	1 space per 1-bed unit	125	63
Residential/2 Bed	143	2 spaces per 2-bed unit	286	96
TOTAL	287 units		430	169

As the National standards are more onerous than the DLRCC standards for apartments the total number of bike parking spaces provided are in line with the National Standards. It can be seen from Table 13 and Table 14 that the total bicycle parking required for the full development is 345 spaces for the apartments and 17 spaces Crèche, totalling 362 spaces. As shown in table 15 a total of 580 spaces will be provided. This is in excess of the DLRCC cycle standards which will encourage travel by bike.

Dun Laoghaire Rathdown County Council (DLRCC) have launched the first county-wide, station-less, bike-sharing scheme in Ireland. The scheme called the Bleeperbike begun a six-month pilot in November 2018 and it is planned to expand the scheme across DLRCC. 39 cycle parking spaces will be provided at ground level to accommodate visitors and those using the Bleeperbike scheme. The cycle parking will be provided as outlined in Table 15 overleaf.

Table 15: Total cycle parking spaces provided.

	Level -1	Surface	Total
Apartments	518		518
Crèche		20	20
Surface level visitor spaces		42	42
Total	518	62	580

DRAFT

APPENDICES

DRAFT

A. Greenfield Calculations

DRAFT

B. Attenuation Calculations – Supporting Map

DRAFT

C. Attenuation Calculations – 1 in 100 Year Events

DRAFT

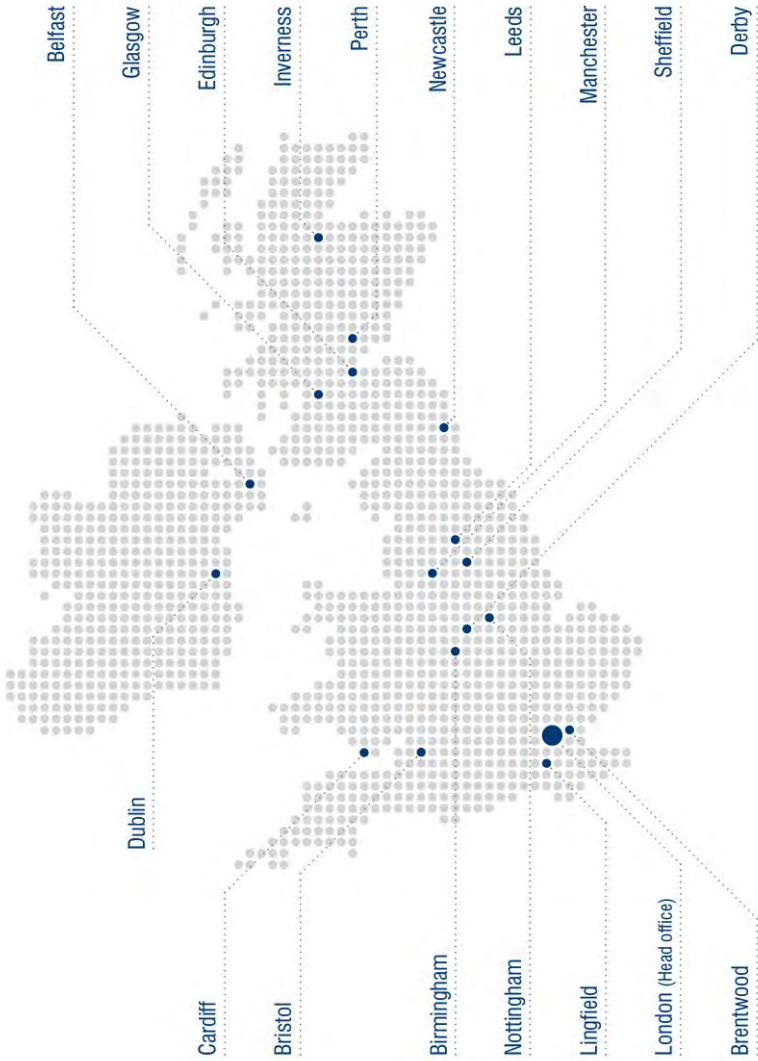
D. Attenuation Calculations – 1 in 30 Year Events

DRAFT

E. Attenuation Calculations – 1 in 1 Year Events

DRAFT

UK and Ireland Office Locations

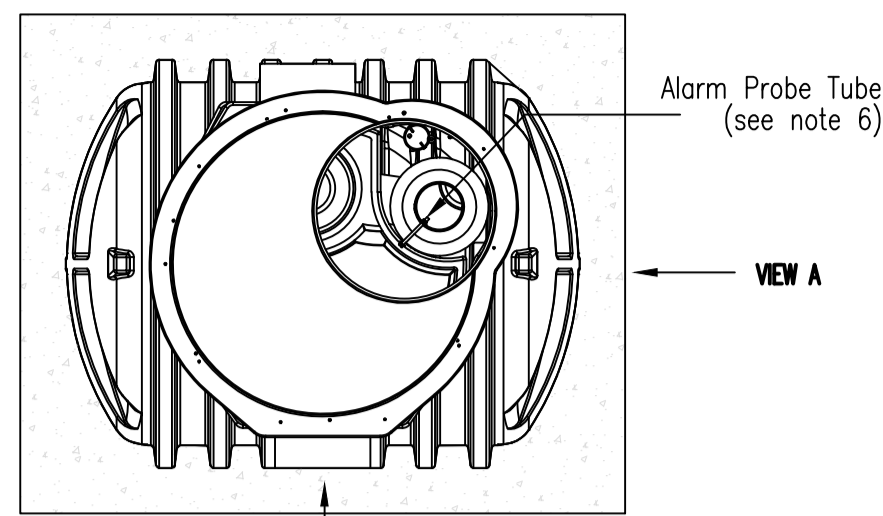


DRAFT

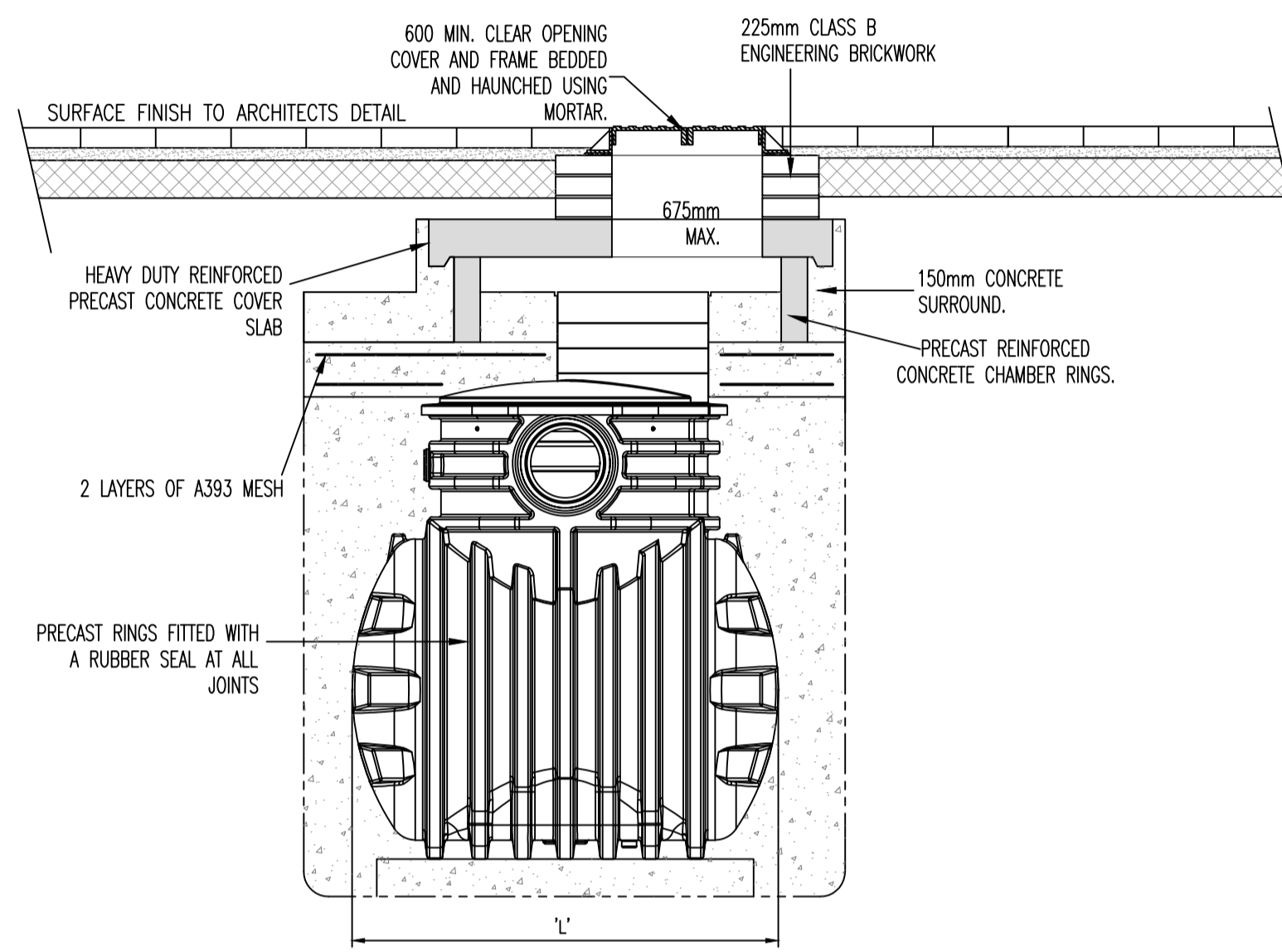
NOTES:

1. INLET/OUTLET PIPES ARE PLAIN PIPE STANDARD EN 858 STATES MINIMUM CONNECTION SIZES, UNITS ORDERED WITH DIFFERENT SIZED CONNECTIONS ARE NOT FULLY COMPLIANT WITH THE STANDARD.
2. EXTENSION NECKS FOR DEEPER INVERTS CAN BE PROVIDED. THESE CAN BE CUT IN 200 MM SECTIONS. MAX 2.0M INVERT RECOMMENDED. PLEASE ASK OUR SALES DEPARTMENT FOR FURTHER DETAILS.
3. ALL UNITS REQUIRE APPROPRIATE COVER AND FRAME TO SUIT APPLIED LOADINGS.
4. THIS DRAWING SHOULD BE USED FOR DIMENSIONAL INFORMATION ONLY. IT IS ESSENTIAL THAT THIS DRAWING IS READ IN CONJUNCTION WITH THE INSTALLATION GUIDELINES FROM THE SUPPLIER. 76 MM TUBE (INTERNAL) IS SUPPLIED TO HOUSE AN OIL ALARM PROBE.
5. WET SITE CONDITIONS - CONCRETE BACKFILL DRY SITE CONDITIONS - PEA SHINGLE BACKFILL.
6. A Ø 76 MM TUBE (INTERNAL) IS SUPPLIED TO HOUSE AN OIL ALARM PROBE.

Outlet Size 'B'	Inlet Size 'A'	Fall across unit	Approx Empty Weight (kgs)	Dim L (mm)	Nominal Flow	Unit Ref No
Ø225 mm	Ø225 mm	100	180	1700	3 L/s	NSBP003

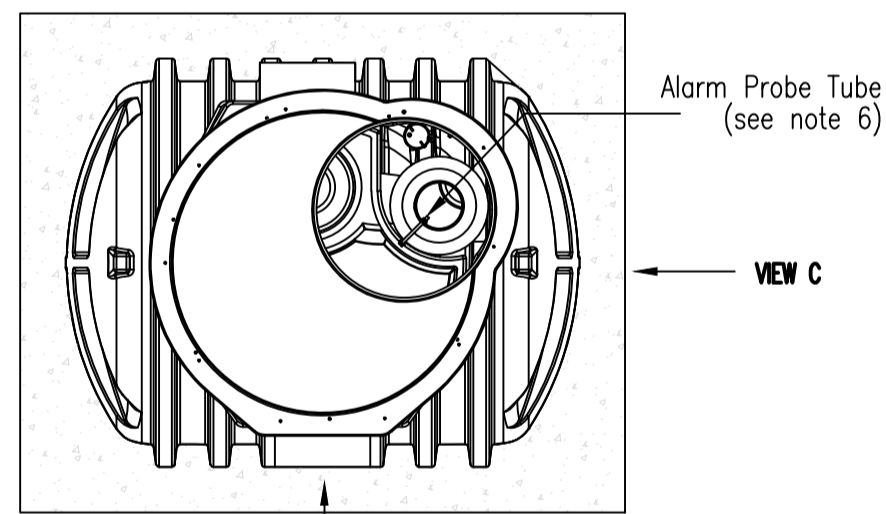


PLAN VIEW
SCALE 1:25

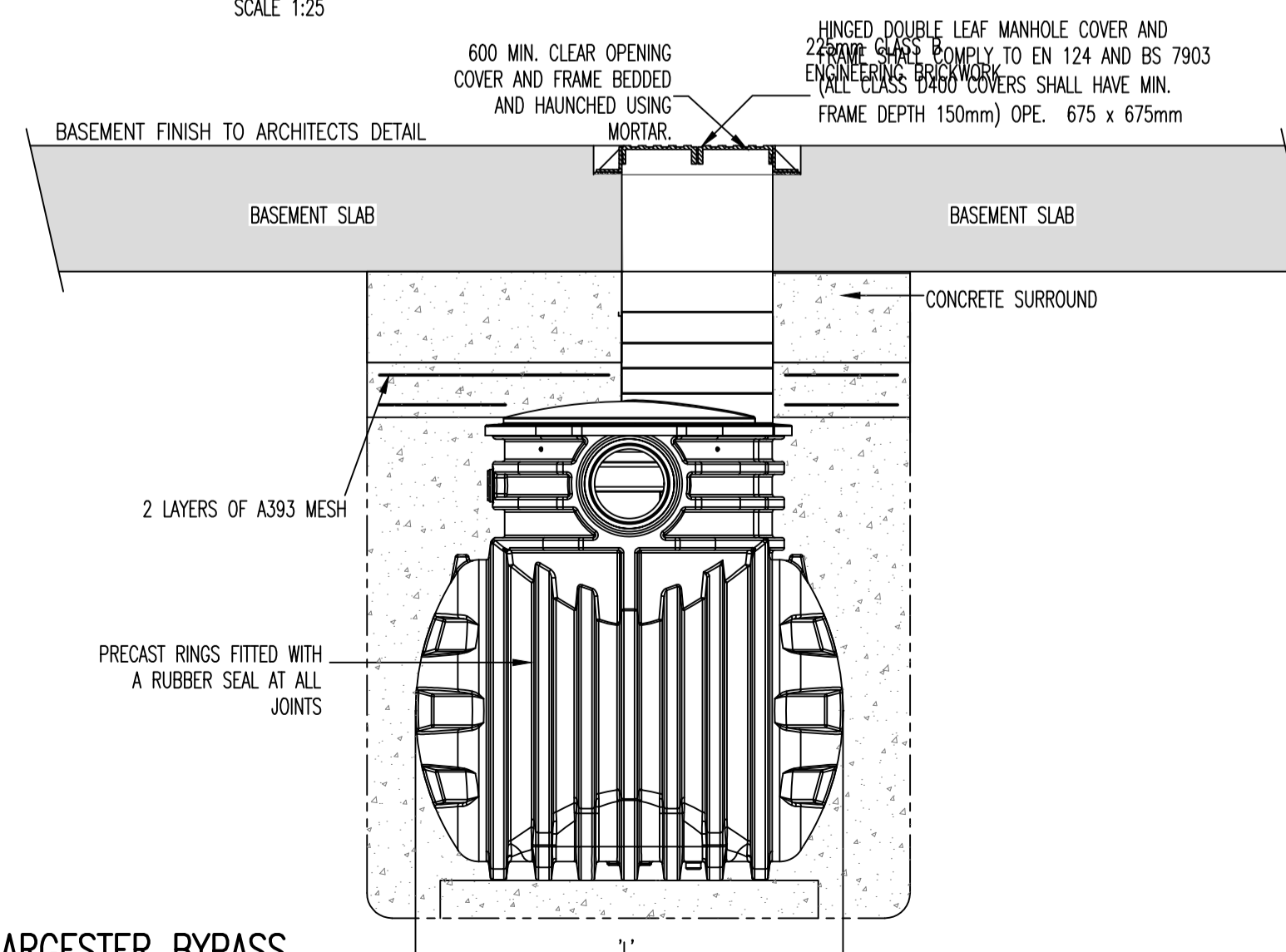


SECTION A-A
SCALE 1:25

Outlet Size 'B'	Inlet Size 'A'	Fall across unit	Approx Empty Weight (kgs)	Dim L (mm)	Nominal Flow	Unit Ref No
Ø225 mm	Ø225 mm	100	180	1700	3 L/s	NSBP003



PLAN VIEW
SCALE 1:25

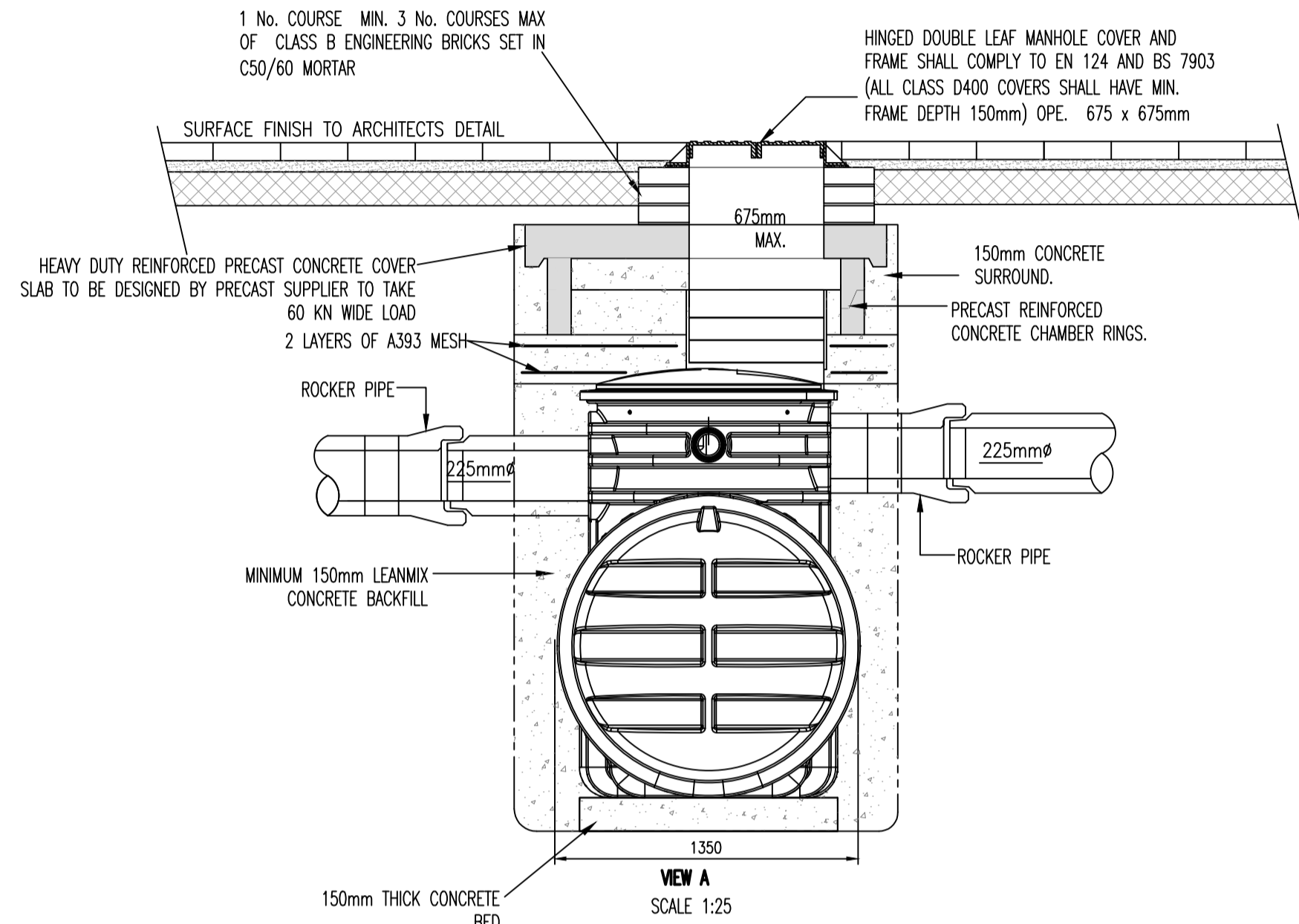


SECTION B-B
SCALE 1:25

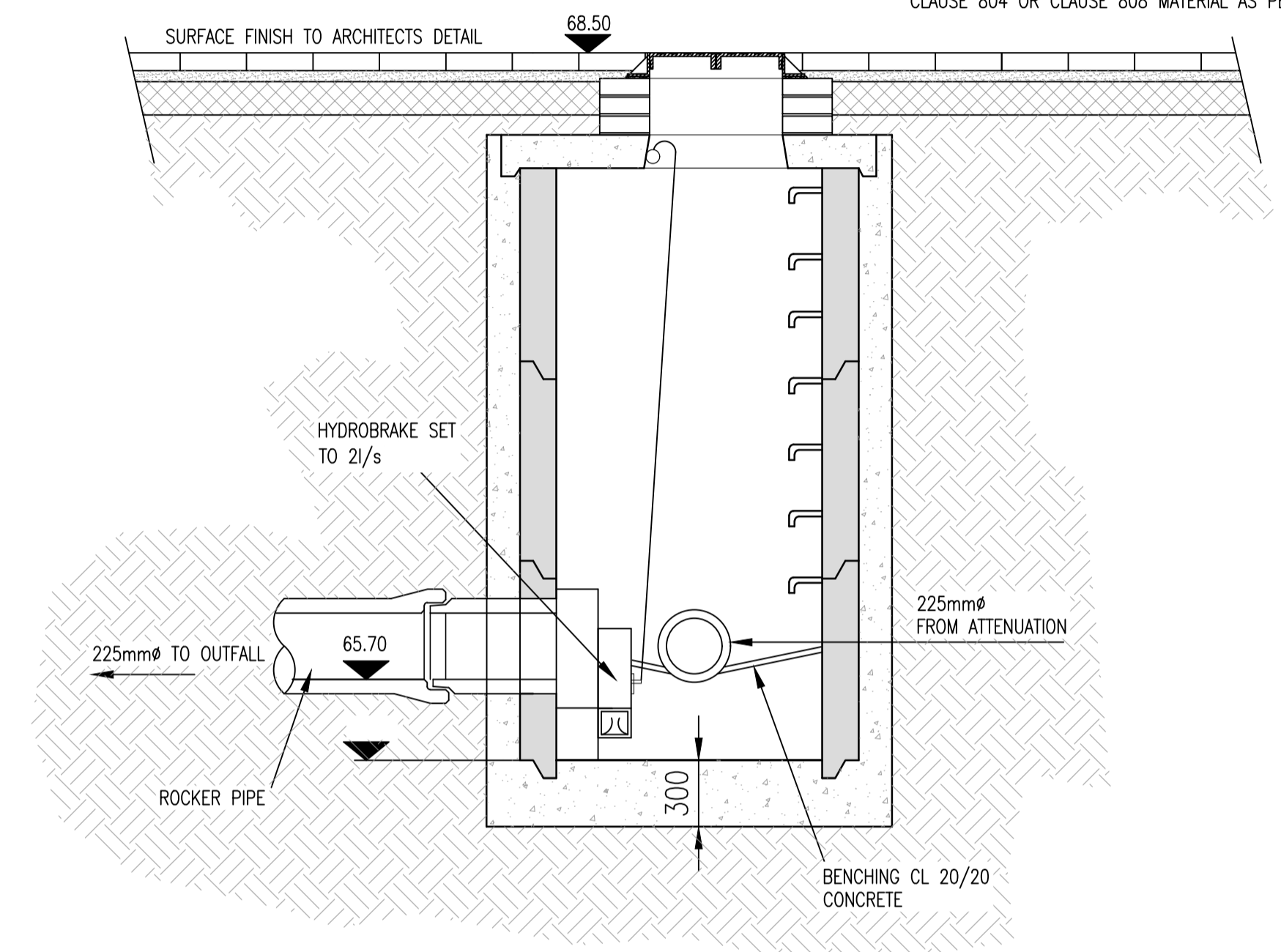
DETAILS OF PROPOSED NSBP003 KLARGESTER BYPASS
PETROL INTERCEPTOR IN BASEMENT SLAB

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AN INSPECTION CHAMBER SHOULD BE LOCATED AT OR WITHIN 1m OF THE PROPERTY BOUNDARY AT THE UPSTREAM END OF EACH SERVICE CONNECTION ON THE PRIVATE SIDE OF THE CURTLAGE, IF PRACTICABLE. CONSULT WITH IRISH WATER ON ALTERNATIVE LOCATIONS.
3. ANY PIPE AND ASSOCIATED ACCESS UPSTREAM OF THE POINT OF CONNECTION TO A PUBLIC SEWER IS A PRIVATE DRAIN AND SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS.
4. ACCESS POINTS SHOULD BE LOCATED SO THAT THEY ARE ACCESSIBLE AND APPARENT TO THE MAINTAINER AT ALL TIMES FOR USE. THEY SHOULD AVOID REAR GARDENS OR ENCLOSED LOCATIONS AND THEY SHOULD NEVER BE OVERLAIN WITH SURFACE DRESSING, TOPSOIL, ETC.
5. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
6. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
7. PROPRIETARY PREFABRICATED CHAMBER UNITS MAY ALSO BE USED, SUBJECT TO APPROVAL FROM IRISH WATER.
8. CHAMBERS SHALL BE SURROUNDED BY A MINIMUM OF 150mm COMPACTED CLAUSE 804 OR CLAUSE 808 MATERIAL AS PER STD-WW-07.

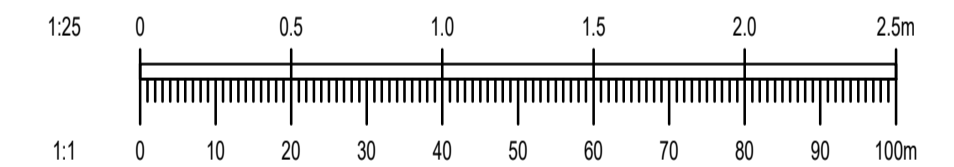


SECTION A-A
SCALE 1:25



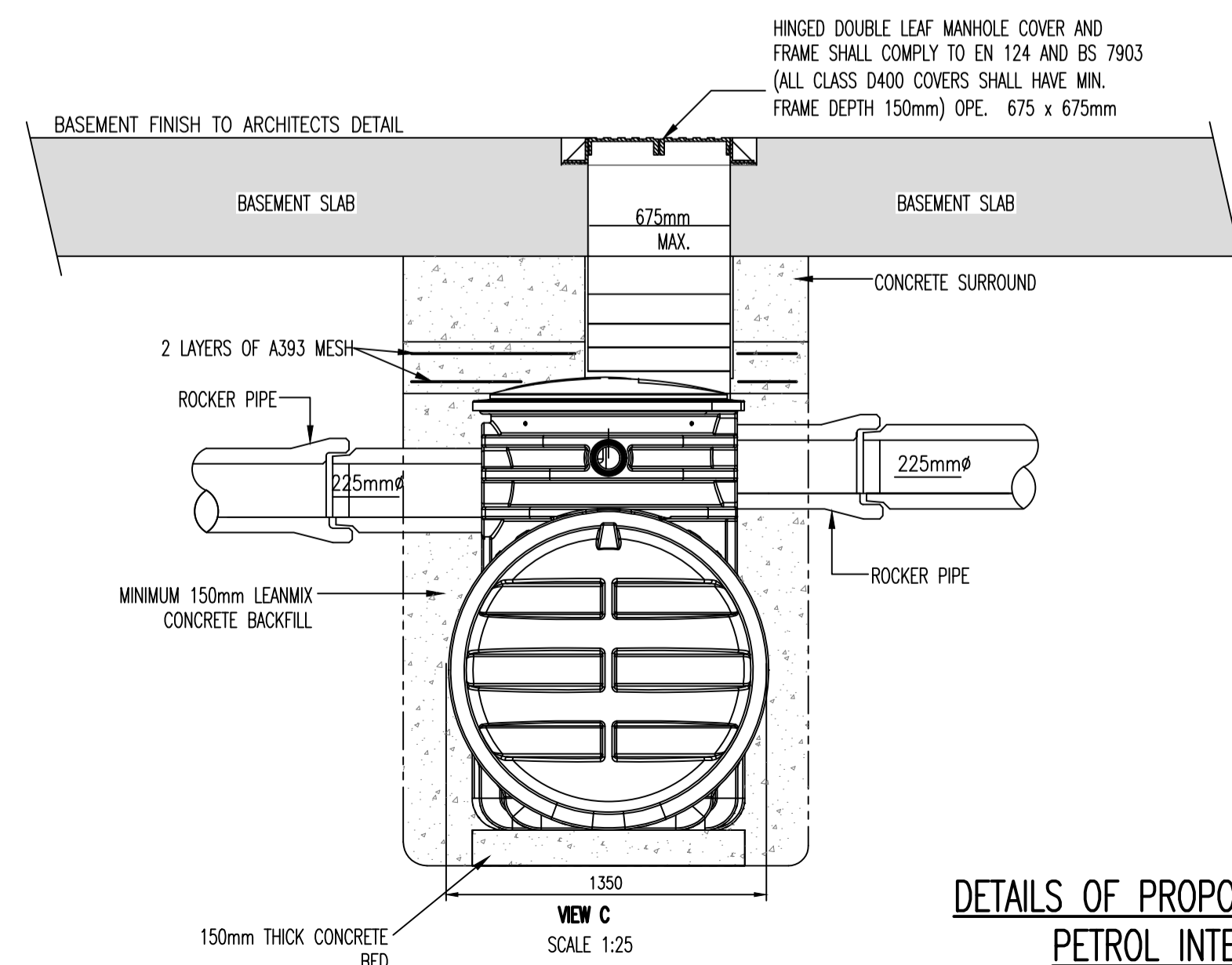
PROPOSED HYDROBRAKE MANHOLE SMH8
SCALE 1:25

NOTE: FOR FURTHER DETAILS ON MANHOLE CONSTRUCTION PLEASE REFER TO DRAWING P230 FOR DETAILS



NOTES:

1. INLET/OUTLET PIPES ARE PLAIN PIPE STANDARD EN 858 STATES MINIMUM CONNECTION SIZES, UNITS ORDERED WITH DIFFERENT SIZED CONNECTIONS ARE NOT FULLY COMPLIANT WITH THE STANDARD.
2. EXTENSION NECKS FOR DEEPER INVERTS CAN BE PROVIDED. THESE CAN BE CUT IN 200 MM SECTIONS. MAX 2.0M INVERT RECOMMENDED. PLEASE ASK OUR SALES DEPARTMENT FOR FURTHER DETAILS.
3. ALL UNITS REQUIRE APPROPRIATE COVER AND FRAME TO SUIT APPLIED LOADINGS.
4. THIS DRAWING SHOULD BE USED FOR DIMENSIONAL INFORMATION ONLY. IT IS ESSENTIAL THAT THIS DRAWING IS READ IN CONJUNCTION WITH THE INSTALLATION GUIDELINES FROM THE SUPPLIER. 76 MM TUBE (INTERNAL) IS SUPPLIED TO HOUSE AN OIL ALARM PROBE.
5. WET SITE CONDITIONS - CONCRETE BACKFILL DRY SITE CONDITIONS - PEA SHINGLE BACKFILL.
6. A Ø 76 MM TUBE (INTERNAL) IS SUPPLIED TO HOUSE AN OIL ALARM PROBE.



SECTION C-C
SCALE 1:25

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants

BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 K7W7 IRELAND
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

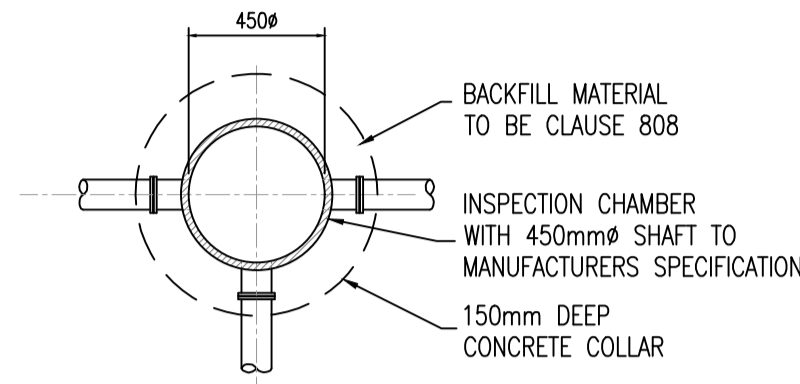
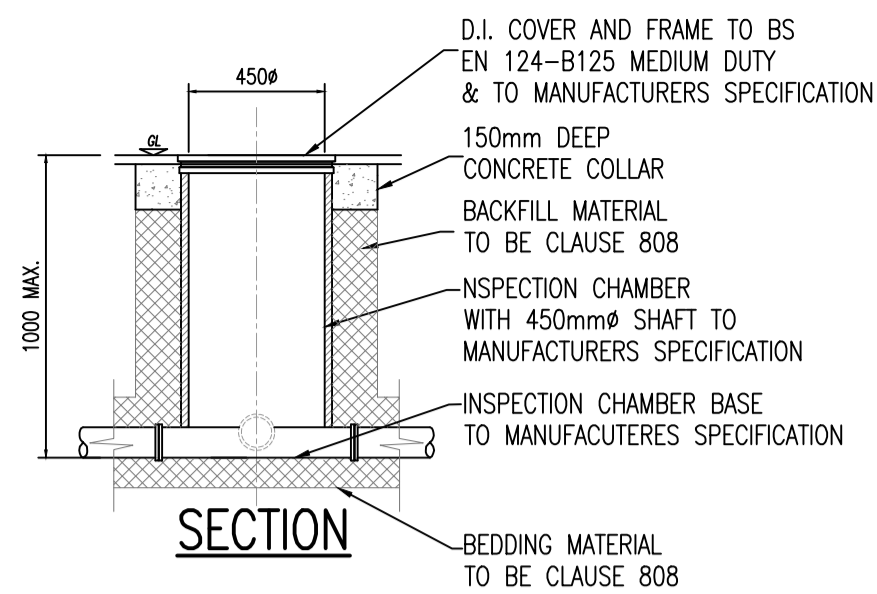
CLIENT **KW PRS ICAY ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**

ARCHITECT **O'MAHONY PIKE ARCHITECTS**

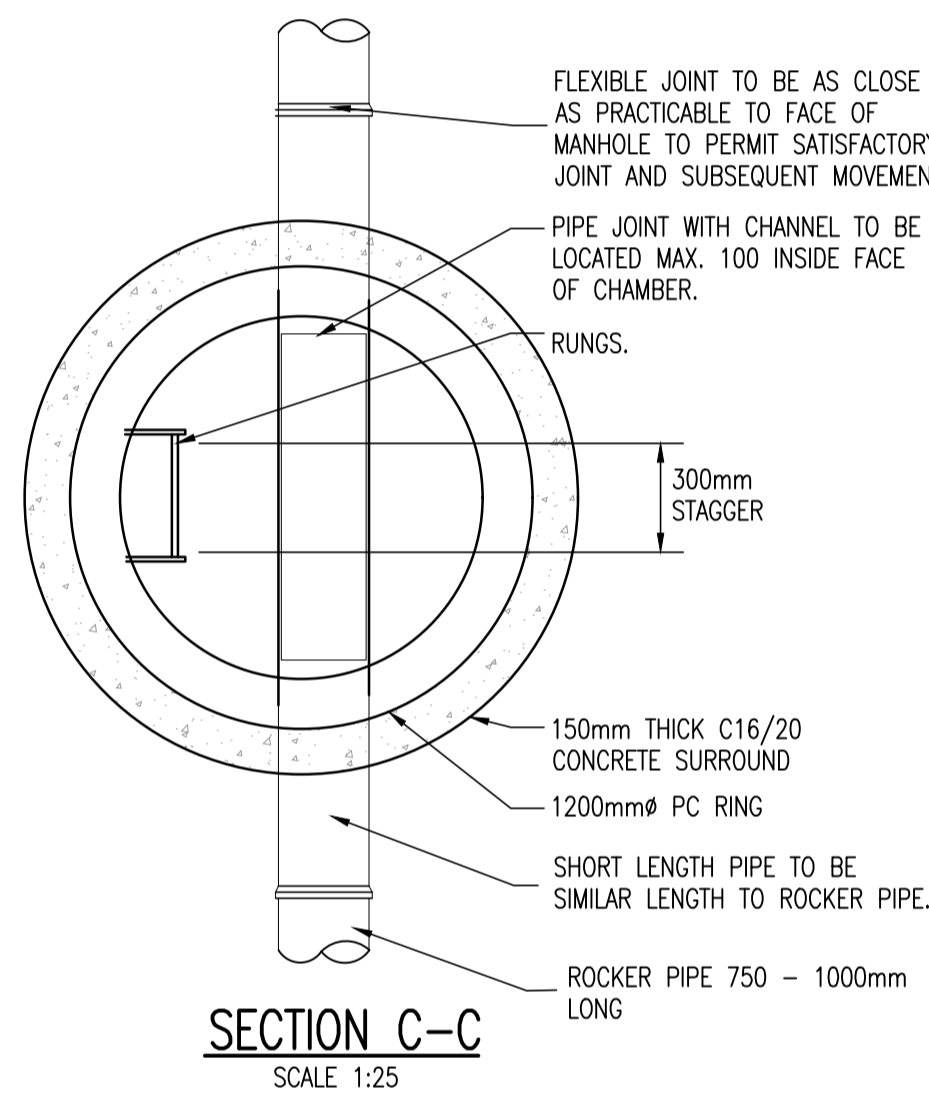
PROJECT **BREWERY ROAD APARTMENTS,
GRANGE DEVELOPMENTS,
BLACKROCK,
CO. DUBLIN**

TITLE **PROPOSED PETROL INTERCEPTOR AND
HYDROBRAKE MANHOLE DETAILS**

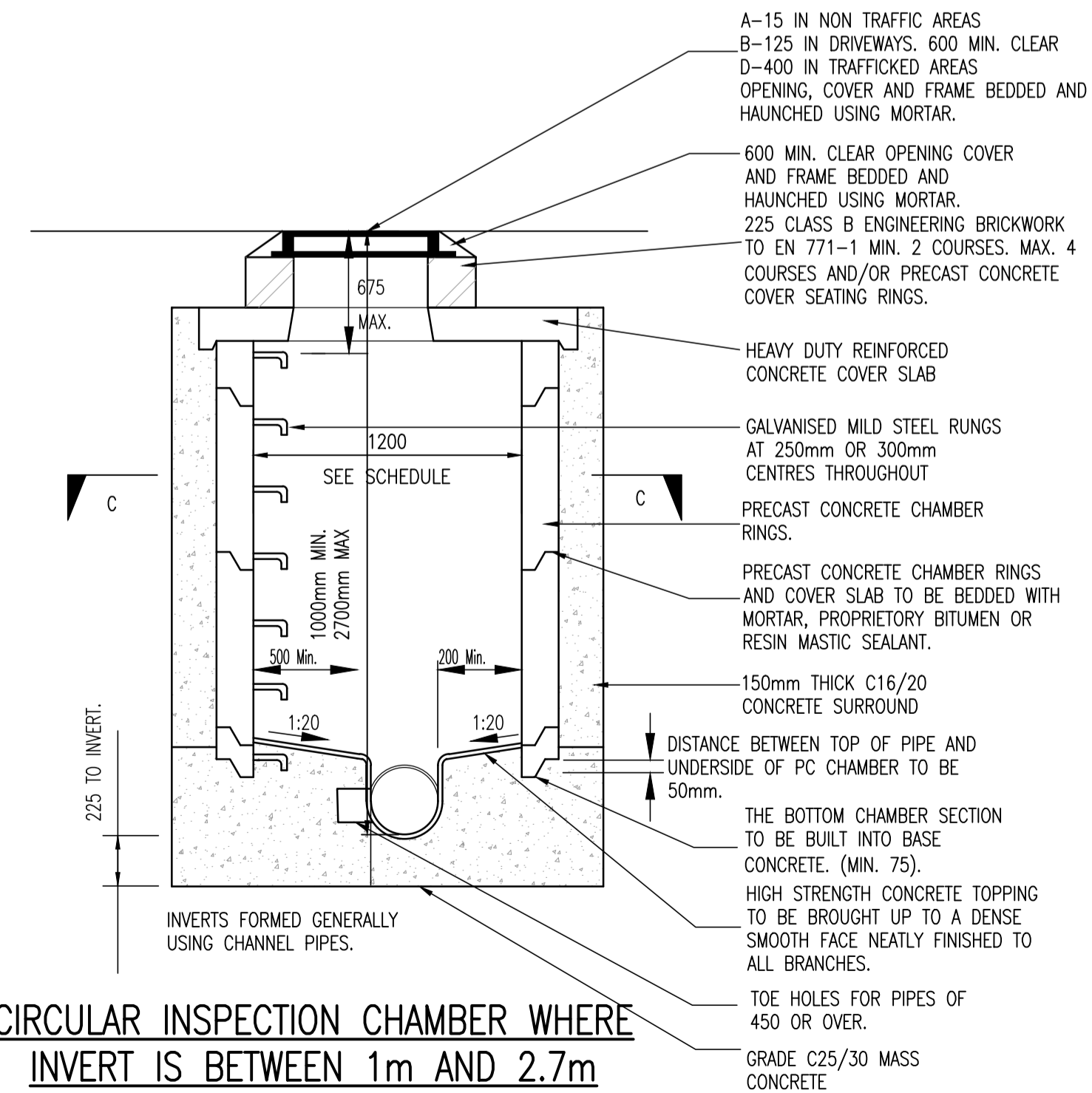
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	MI	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	18-093	P240	



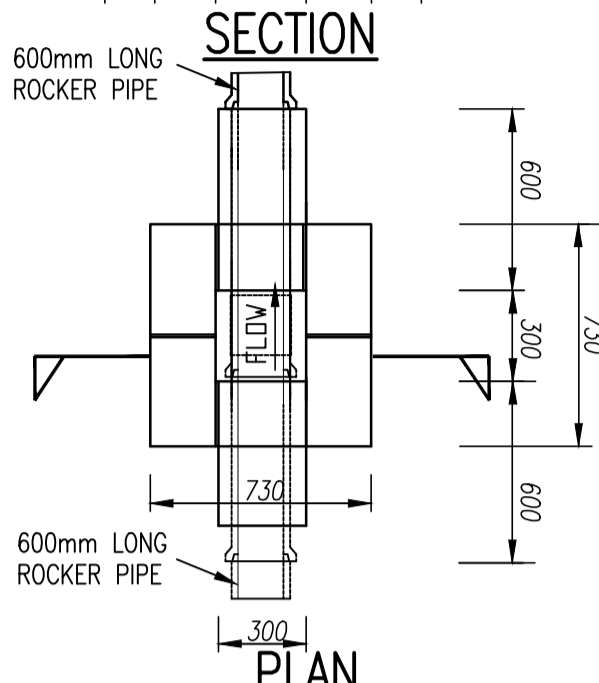
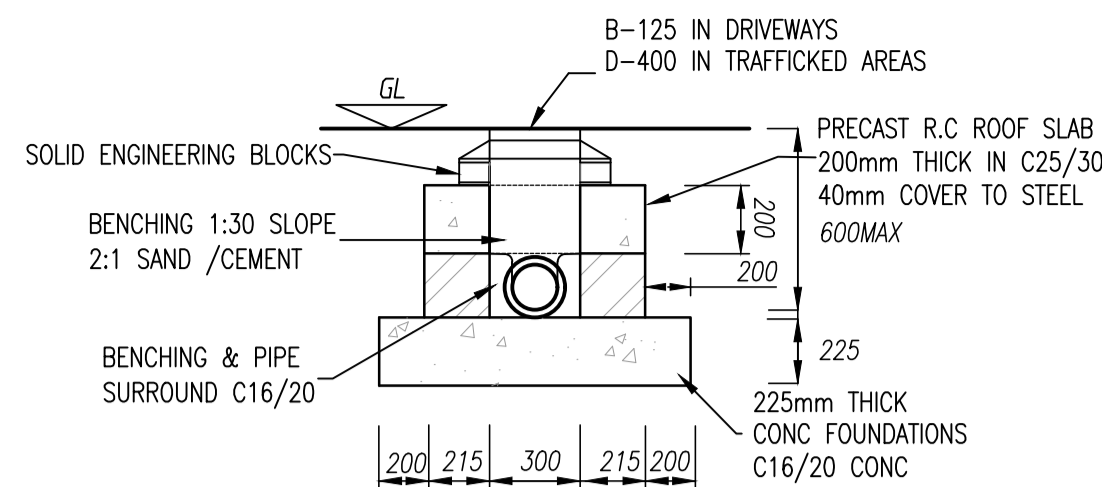
CIRCULAR INSPECTION CHAMBER WHERE INVERT IS 1m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9
SCALE 1:25



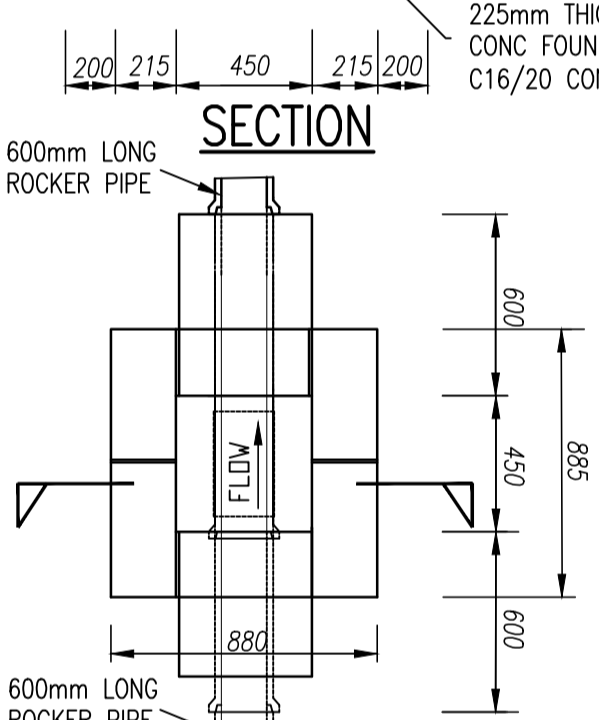
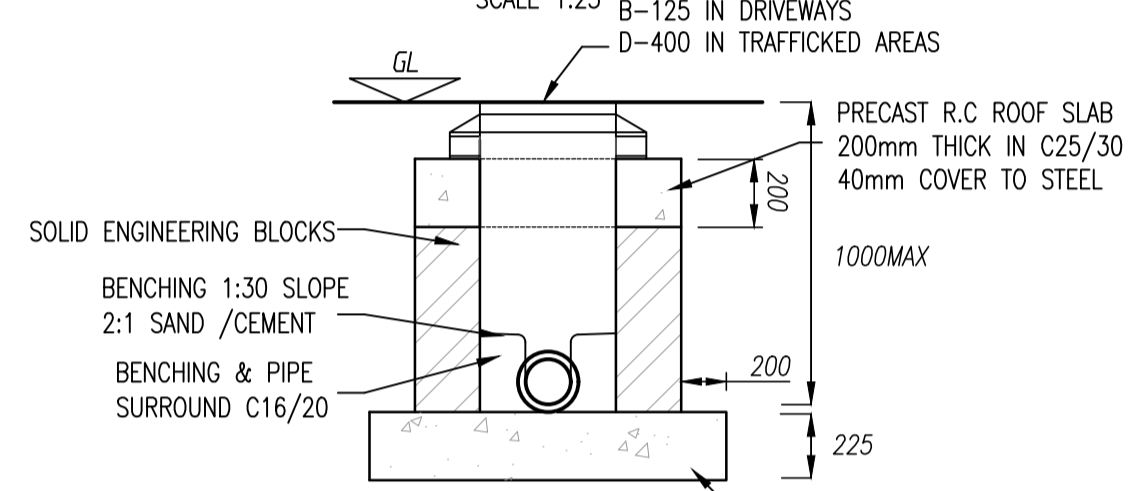
SECTION C-C
SCALE 1:25



CIRCULAR INSPECTION CHAMBER WHERE INVERT IS BETWEEN 1m AND 2.7m BUILDING REGULATIONS TGD SECTION H TABLE 9
SCALE 1:25



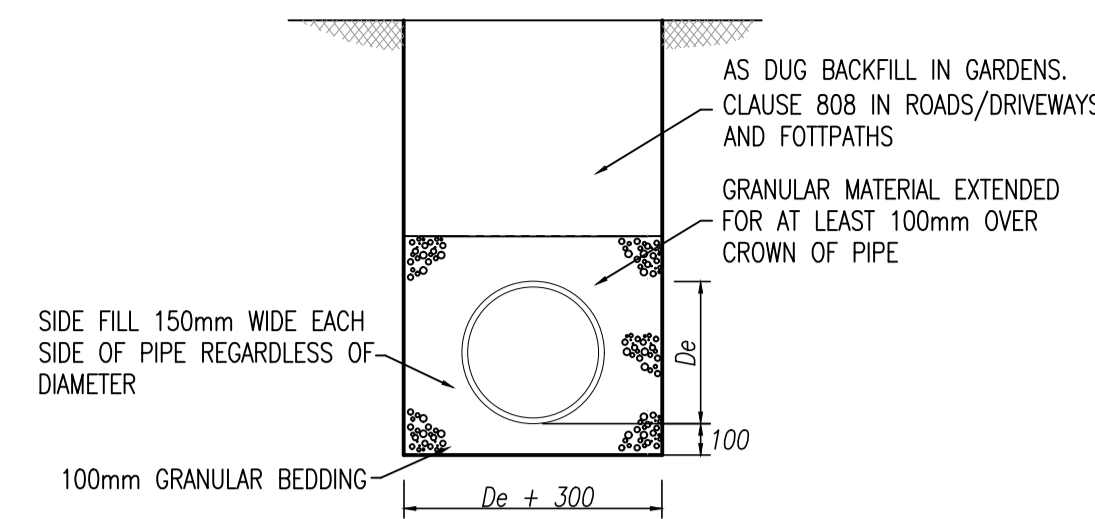
INSPECTION CHAMBER WHERE INVERT IS 0.6m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9
SCALE 1:25



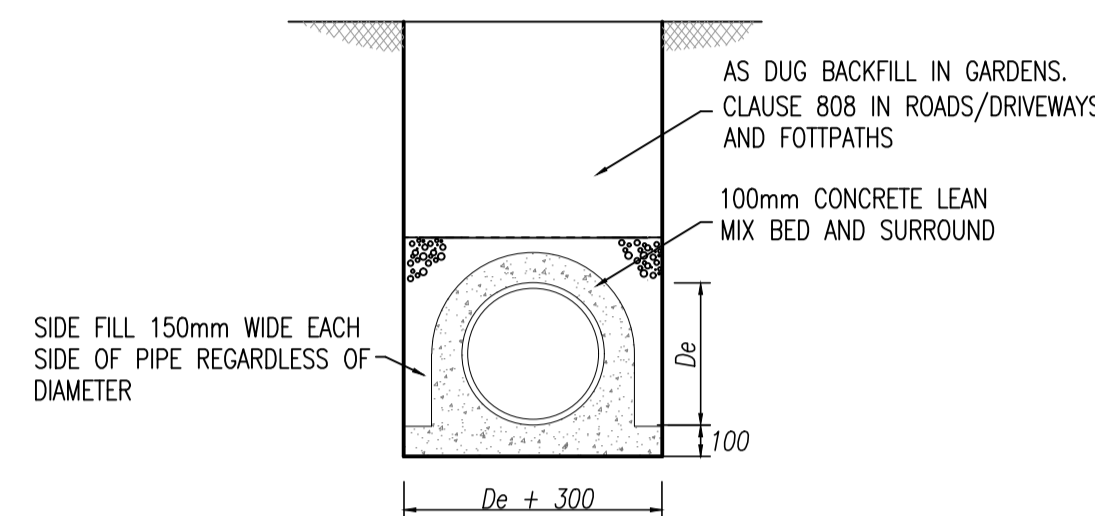
INSPECTION CHAMBER WHERE INVERT IS 1m OR LESS BUILDING REGULATIONS TGD SECTION H TABLE 9
SCALE 1:25

TABLE 9 Minimum dimensions for access fitting and chambers					
Type	Depth to (m)	Internal Sizes		Cover Sizes	
		length x width (mm x mm)	Circular (mm)	length x width (mm x mm)	Circular (mm)
Rodding eye					
Access Fitting					
small	0.6 or less	150 x 100	150	150 x 100	150
large		300 x 100	-	300 x 100	-
Inspection Chamber	0.6 or less	300 x 300	190*	300 x 300	190*
	1.0 or less	450 x 450	450	450 x 450	450**
Manhole	1.5 or less	1200 x 750	1000	600 x 600	600
	over 1.5	1200 x 750	1200	600 x 600	600
	over 2.7	1200 x 840	1200	600 x 600	600
Shaft	over 2.7	900 x 840	900	600 x 600	600

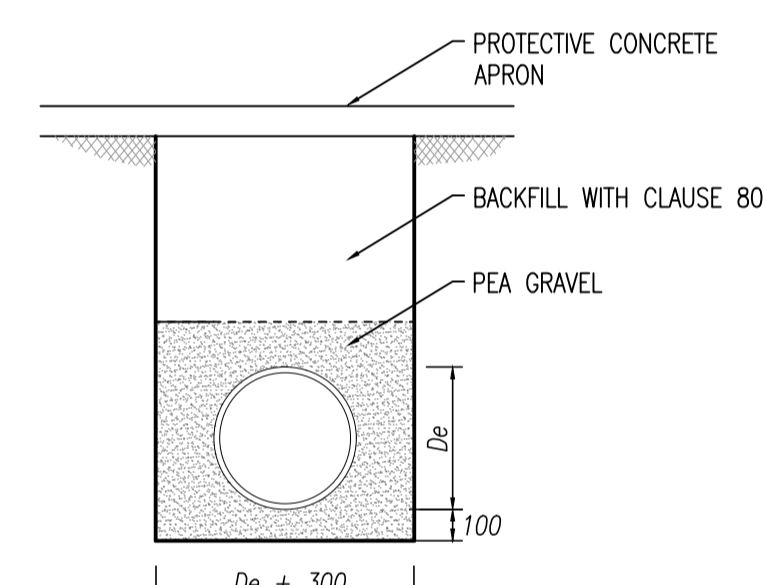
Note:
* For clayware or plastics may be reduced to 430mm in order to provide support for cover and frame
** Drains up to 150mm



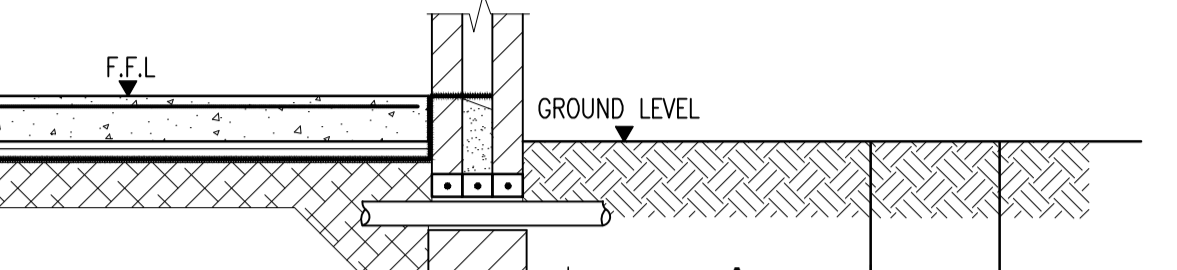
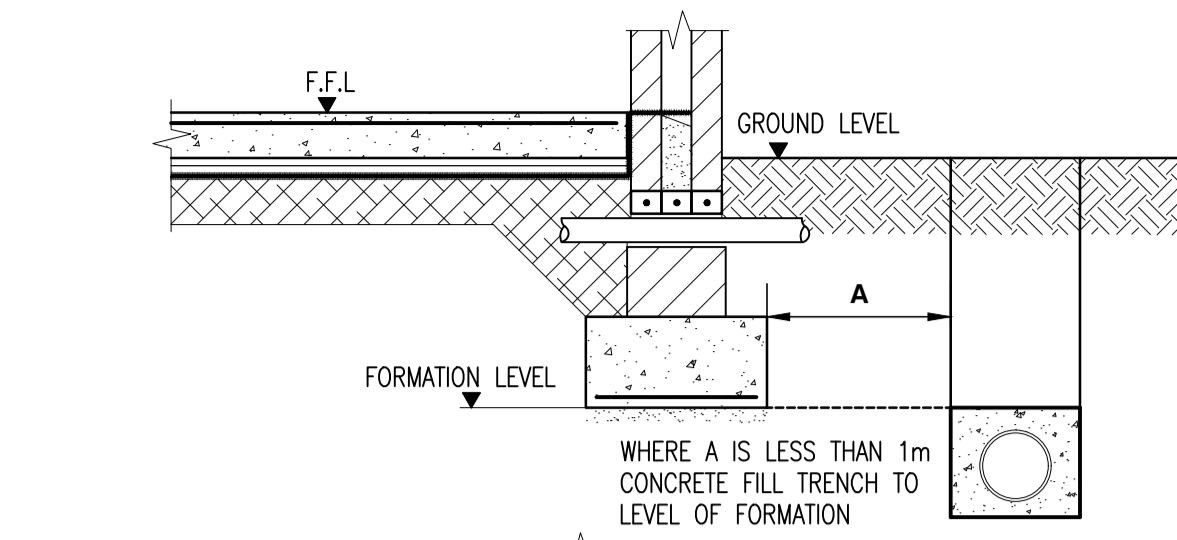
PIPES BEDDED IN GRANULAR MATERIAL COVER > 0.9m IN ROADS COVER > 0.6m IN GARDENS
SCALE 1:25



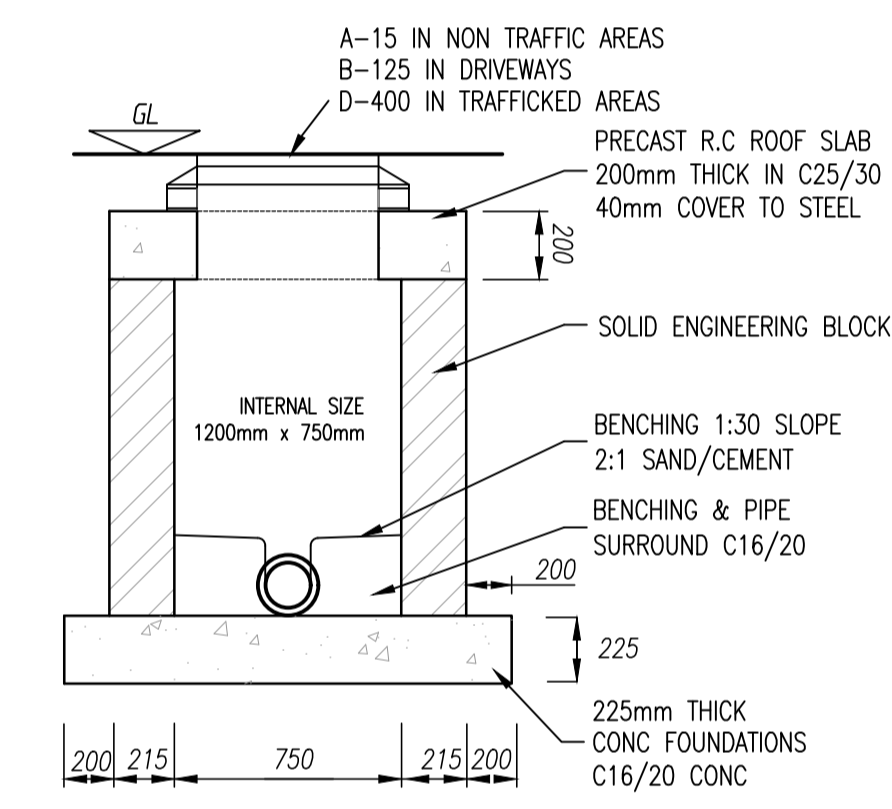
PIPES BEDDED IN GRANULAR MATERIAL COVER < 0.9m IN ROADS COVER < 0.6m IN GARDENS
SCALE 1:25



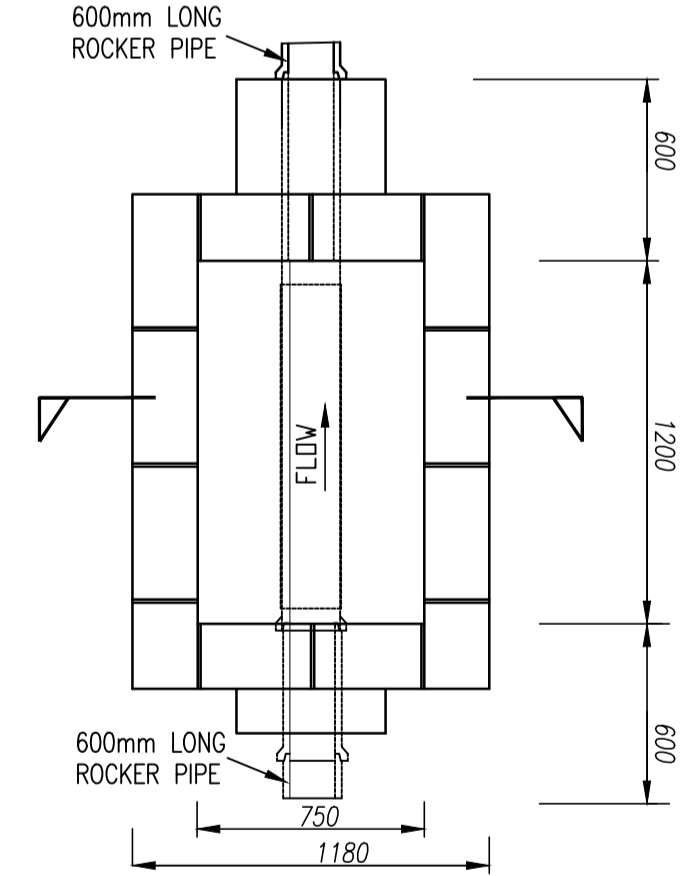
PIPES BEDDING ALTERNATIVE DETAIL COVER < 0.9m IN ROADS COVER < 0.6m IN GARDENS
SCALE 1:25



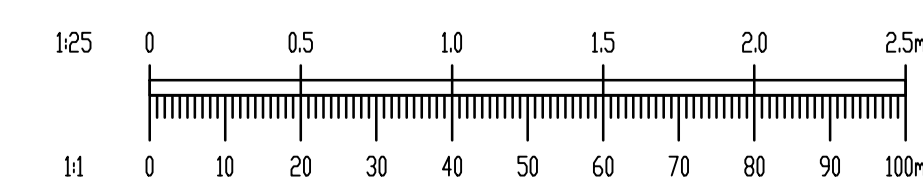
TYPICAL DETAIL WHERE PIPE RUNS NEAR BUILDINGS
SCALE 1:25



SECTION



INSPECTION CHAMBER DEPTH TO INVERT IS BETWEEN 1m AND 2.7m BUILDING REGULATIONS TGD SECTION H TABLE 9
SCALE 1:25



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
 - ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE BUILDING REGULATIONS 2010 SECTION H "DRAINAGE AND WASTE WATER DISPOSAL" AND WITH LOCAL AUTHORITY REQUIREMENTS.
 - ANY ALTERNATIVE DETAILS PROPOSED BY THE CONTRACTOR SHALL BE SUBMITTED TO THE ENGINEER AT LEAST 2 WEEKS PRIOR TO THE CONSTRUCTION OF THE DRAIN.
 - MINIMUM SPACING OF ACCESS POINTS TO BE IN ACCORDANCE WITH BUILDING REGULATIONS TECHNICAL GUIDANCE DOCUMENT SECTION 4 TABLE 10.
 - DETAILS OF MATERIALS FOR CONSTRUCTION REFER TO BUILDING REGULATIONS TECHNICAL GUIDANCE DOCUMENT SECTION 4 TABLE 11.
 - BACKFILL OF ALL INSPECTION CHAMBERS TO BE 808 BACKFILL IN 200mm LAYERS.
 - INSTALLATION OF PLASTIC PIPES AND FITTINGS, GULLIES, A/S ETC TO BE STRICTLY IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

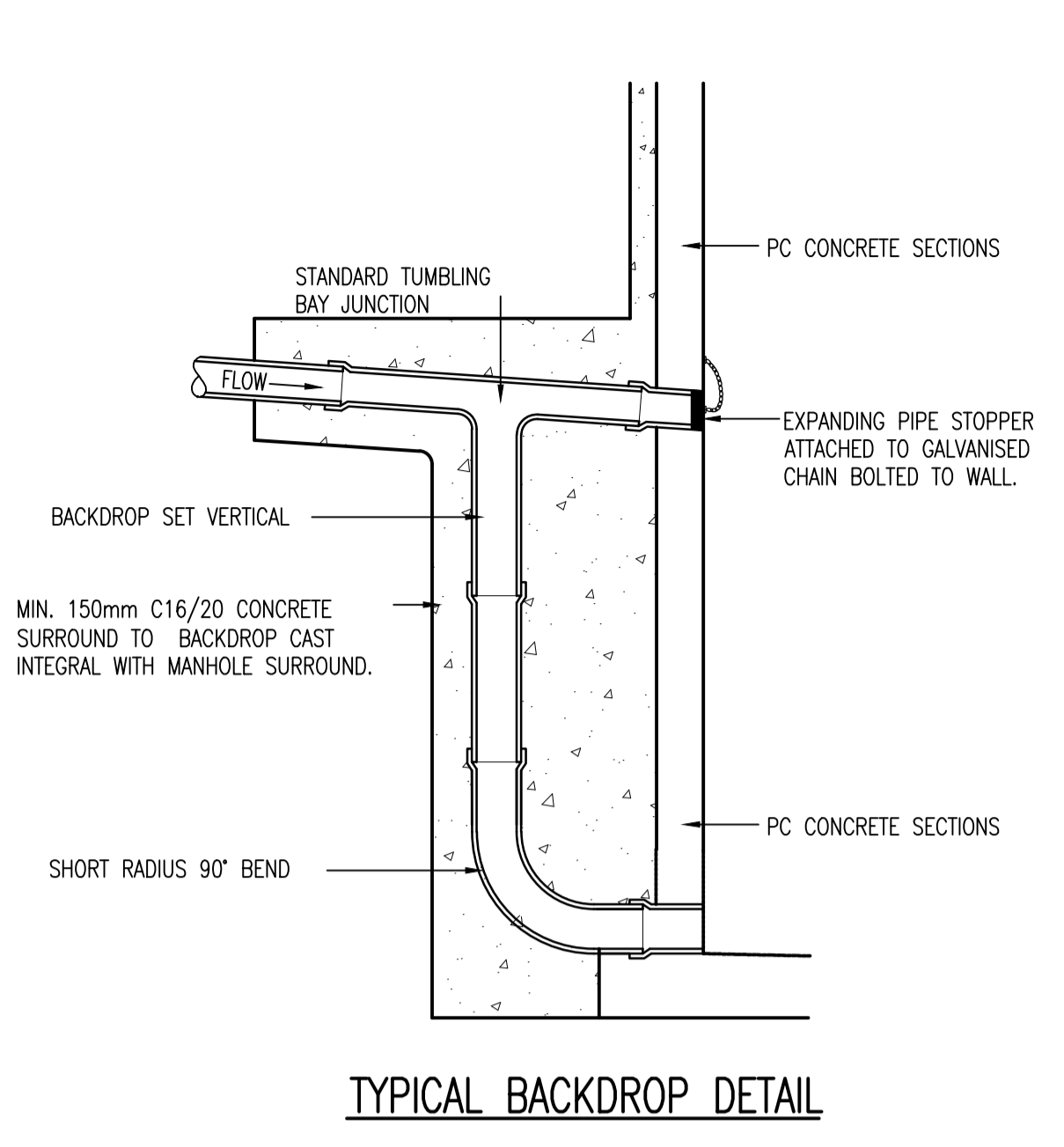
Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICVA ACTING FOR AN ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN**

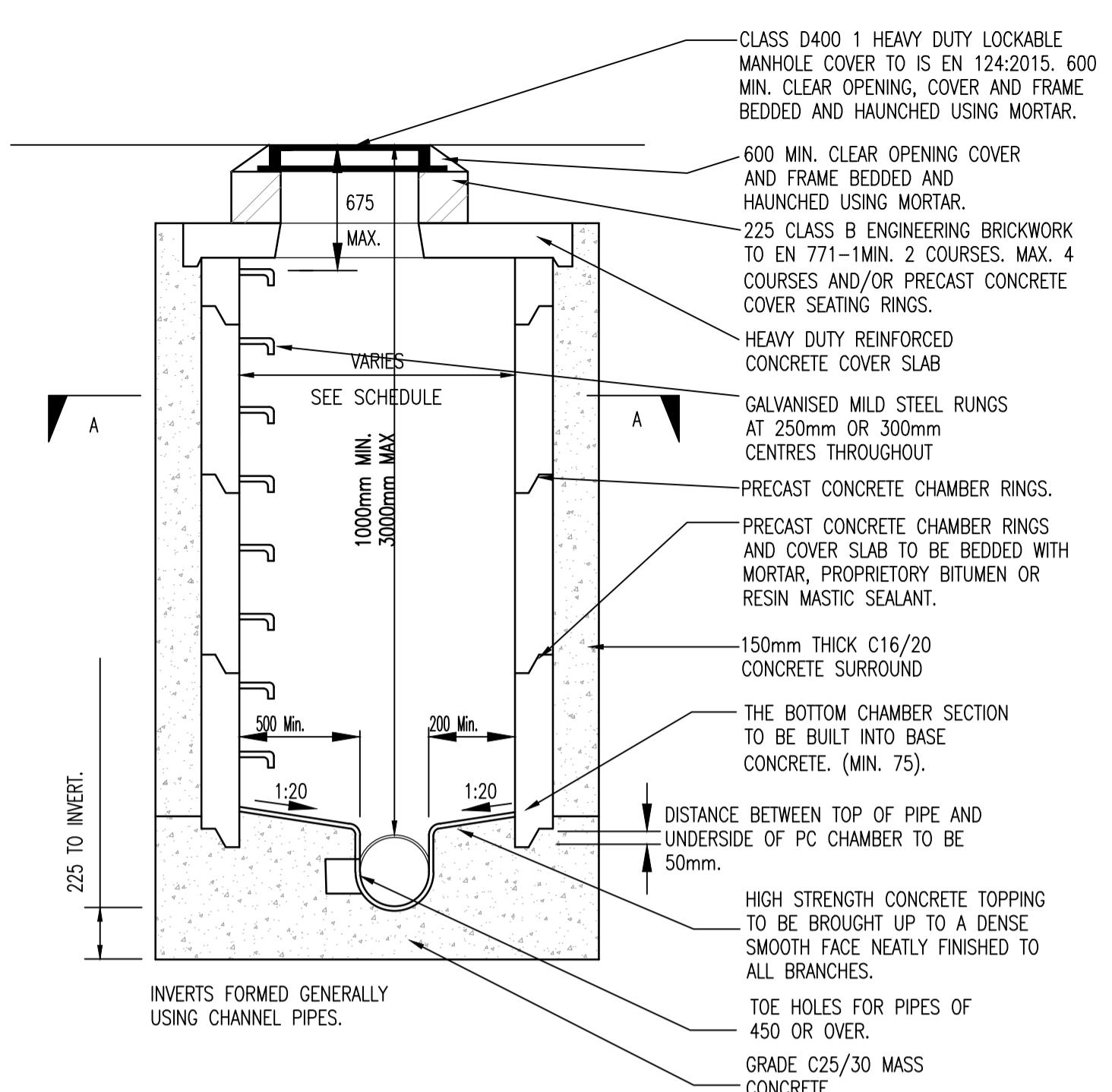
TITLE **PRIVATE SURFACE WATER DRAINAGE DETAILS**

DRAWN	DESIGNED	APPROVED	DATE
C.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN @A1	18-093	P231	



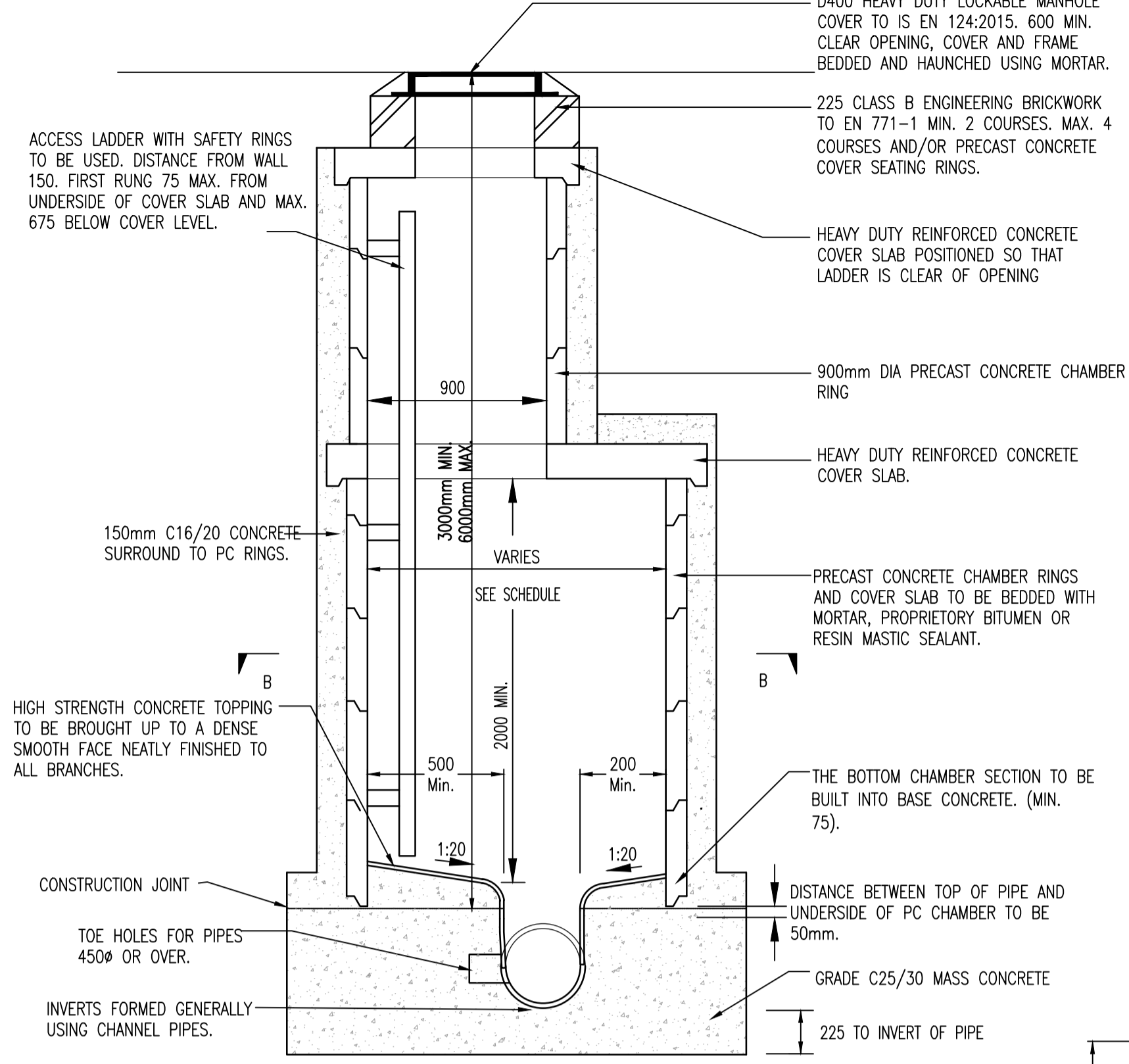
TYPICAL BACKDROP DETAIL

INLET DIA. (mm)	DROP DIA. (mm)
225	300
300	375
375	375
450	450
525	450
600	450
750	600
900	600



PRECAST CONCRETE RING MANHOLE DETAIL TYPE J (GSDS)

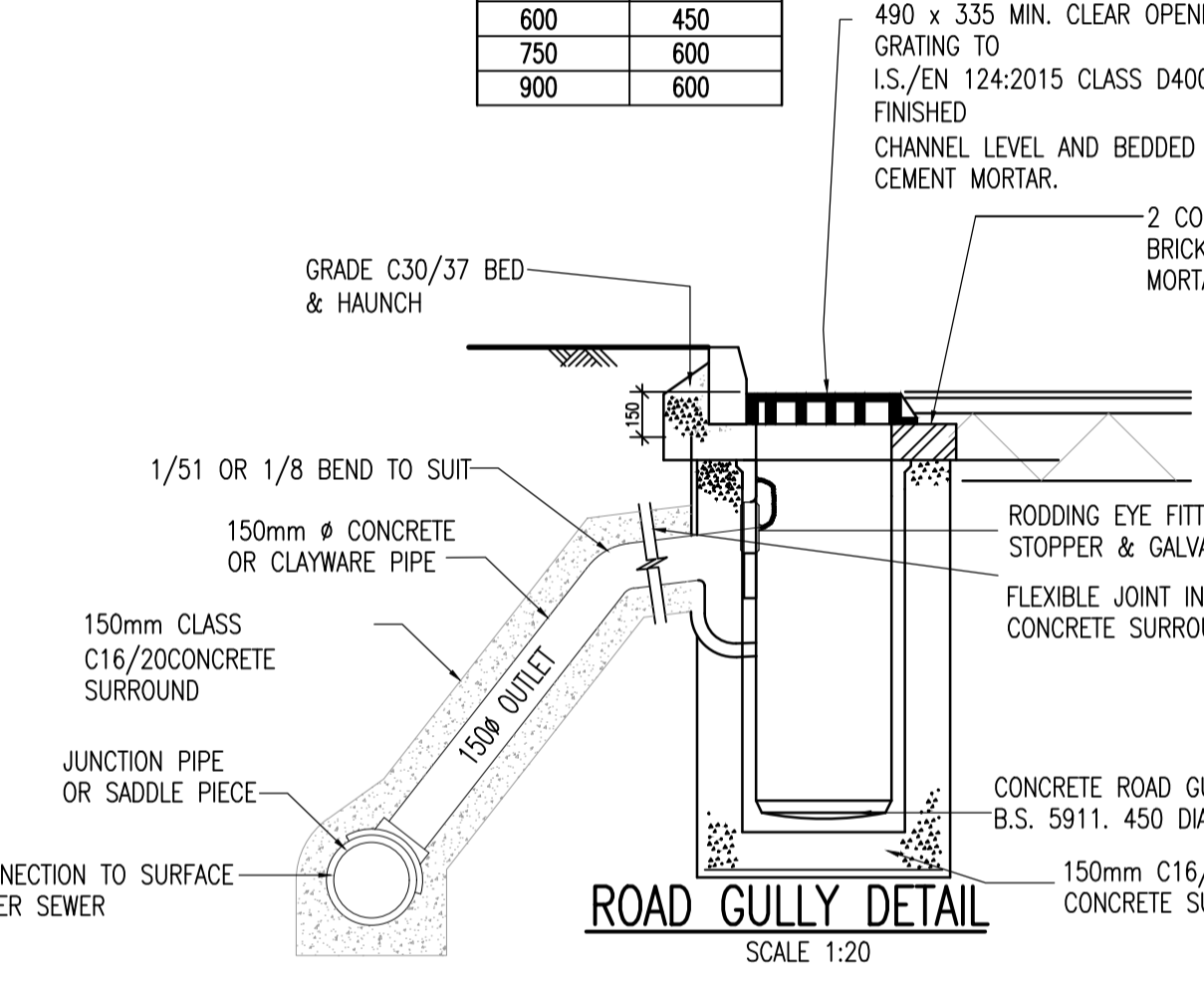
SCALE 1:25



PRECAST CONCRETE RING MANHOLE TYPE K

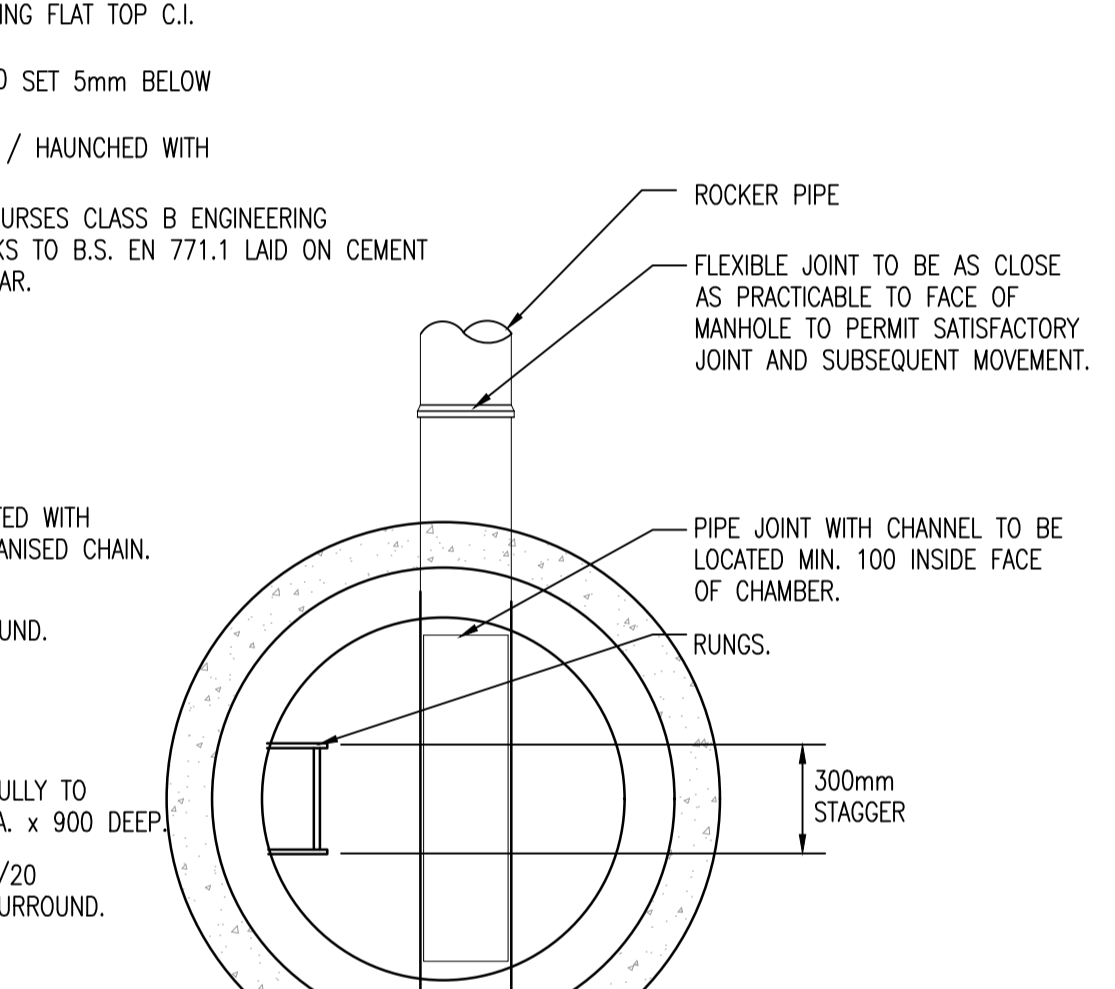
SCALE 1:25

- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
 - TYPE A GRANULAR FILL SHALL CONSIST OF WASHED PEA GRAVEL. ALL MATERIAL SHALL PASS A 19mm B.S. SIEVE TEST AND SHALL BE RETAINED BY A 4.75mm B.S. SIEVE TEST.
 - SELECTED FILL SHALL BE FREE FROM STONES GREATER THAN 25mm IN SIZE, BUILDERS RUBBLE, VEGETABLE MATTER AND LUMPS OF CLAY GREATER THAN 75mm IN SIZE AND SHALL BE COMPACTED IN 150mm LAYERS.
 - IN OPEN SPACES BACKFILL SHALL CONSIST OF SUITABLE SELECTED EXCAVATED MATERIAL. UNDER PAVED AREAS BACKFILL SHALL CONSIST OF SUITABLE APPROVED GRANULAR FILL. GENERAL BACKFILL SHALL BE COMPACTED IN LAYERS NOT EXCEEDING 300mm THICK.
 - CONCRETE BED AND SURROUND SHALL BE USED ON ALL PIPES WHERE COVER TO THE SOFFIT OF THE PIPE IS LESS THAN 1.2m IN ROADS, FOOTPATHS AND GRASS MARGINS AND 0.9m IN OPEN SPACES AND FIELDS.
 - ALL CONCRETE FOR PIPE BEDDING, HAUNCHING AND SURROUNDS SHALL BE GRADE 20N/20.
 - ALL MANHOLES SHALL BE WATERTIGHT TO THE SATISFACTION OF THE ENGINEER.
 - FORMWORK TO REINFORCED CONCRETE AND MASS CONCRETE SHALL BE CLASS F2.
 - CLASS U2 FINISH TO THE TOP OF SLABS. REINFORCEMENT TO SLABS TO ENGINEERS DETAILS.
 - 200mm THICK CL. 30/20 MASS CONCRETE FOUNDATIONS. 225 THICK PRECAST R.C. ROOF SLAB IN CL. 30/20 CONCRETE. COVER TO STEEL TO BE 40mm.
 - TOE HOLES TO BE PROVIDED IN BENCHING OF SEWERS GREATER THAN 450mm DIAMETER FOR ACCESS TO INVERT. SAFETY CHAIN SHALL BE 10MM NOMINAL SIZE GRADE M(H) NON CALIBRATED CHAIN, TYPE 1, COMPLYING WITH BS4942 PART 2.
 - WHEN DEPTH OF MANHOLES TO INVERT IS GREATER THAN 3.5m, LADDERS SHALL BE USED INSTEAD OF RUNGS. FIXED LADDERS SHOULD MEET THE DIMENSIONAL REQUIREMENTS OF BS4211 EXCEPT THAT STRINGERS SHOULD NOT BE LESS THAN 65 x 20mm IN SECTION AND RUNGS 25mm IN DIAMETER.
 - LADDER STRINGERS SHOULD BE ADEQUATELY SUPPORTED FROM THE JOINT AND SUBSEQUENT MOVEMENT MANHOLE WALL AT INTERVALS OF NOT MORE THAN 3.0m STRINGERS SHOULD BE BOLTED TO CLEATS TO FACILITATE RENEWAL.
 - TOE HOLES TO BE PROVIDED IN BENCHING OF SEWER GREATER THAN 450mm FOR ACCESS TO INVERT.
 - ALL LADDERS, RUNGS, HANDRAILS, SAFETY CHAIN, ETC. SHALL BE HOT DIPPED GALVANISED TO BS729.
 - ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF DUN LAOGHAIRE COUNTY COUNCIL.



ROAD GULLY DETAIL

SCALE 1:20

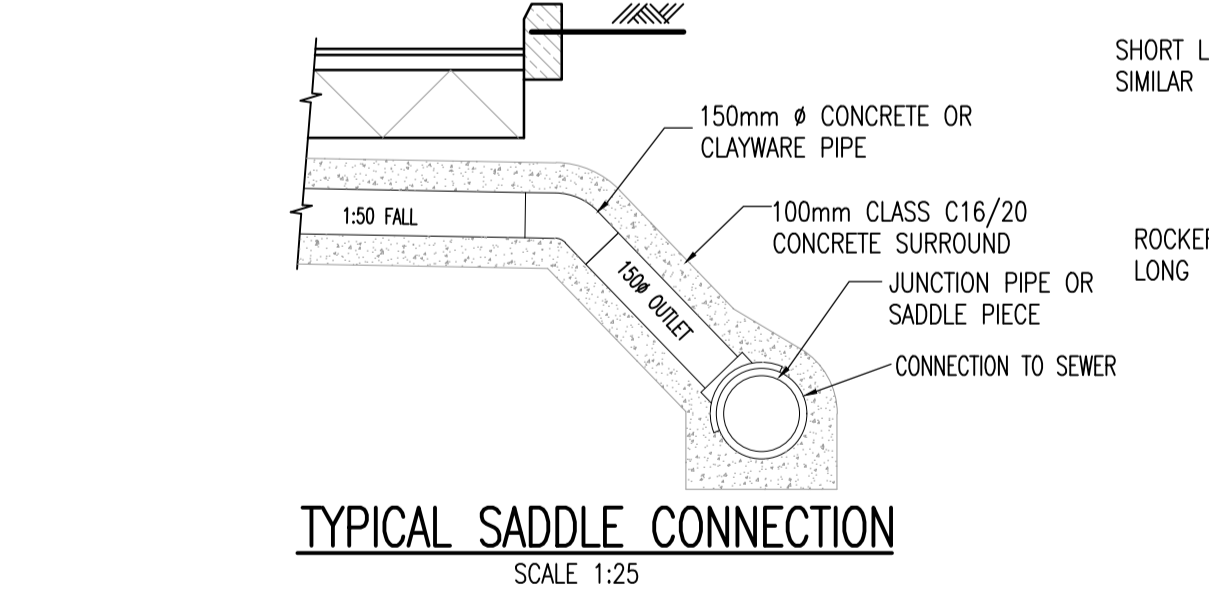


SECTION A-A

SCALE 1:25

PIPE DIAMETER	ROCKER PIPE LENGTH
150 - 450	0.5 - 0.75
451 - 750	0.75 - 1.0
750 >	SEEK GUIDANCE

DIAMETER OF LARGEST PIPE IN MANHOLE	PRECAST CONCRETE RING SIZE
LESS THAN 375mm	1200mm DIA
375mm TO 450mm	1350mm DIA
450mm TO 700mm	1500mm DIA
700mm TO 900mm	1800mm DIA
900mm TO 1200mm	2100mm DIA
1200mm AND ABOVE	2400mm DIA

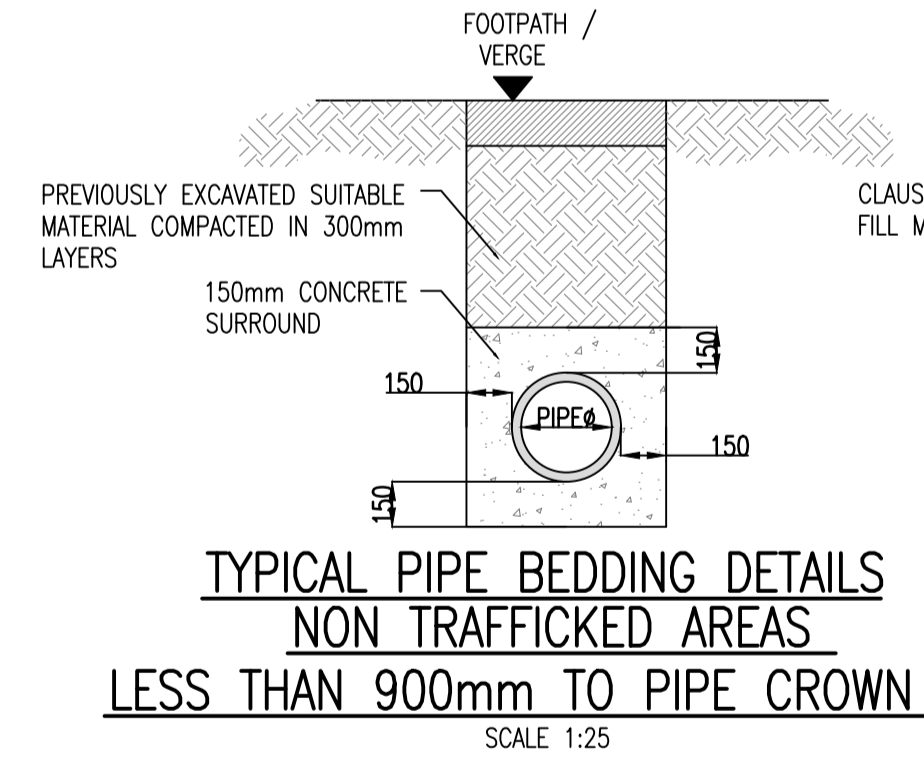


TYPICAL SADDLE CONNECTION

SCALE 1:25

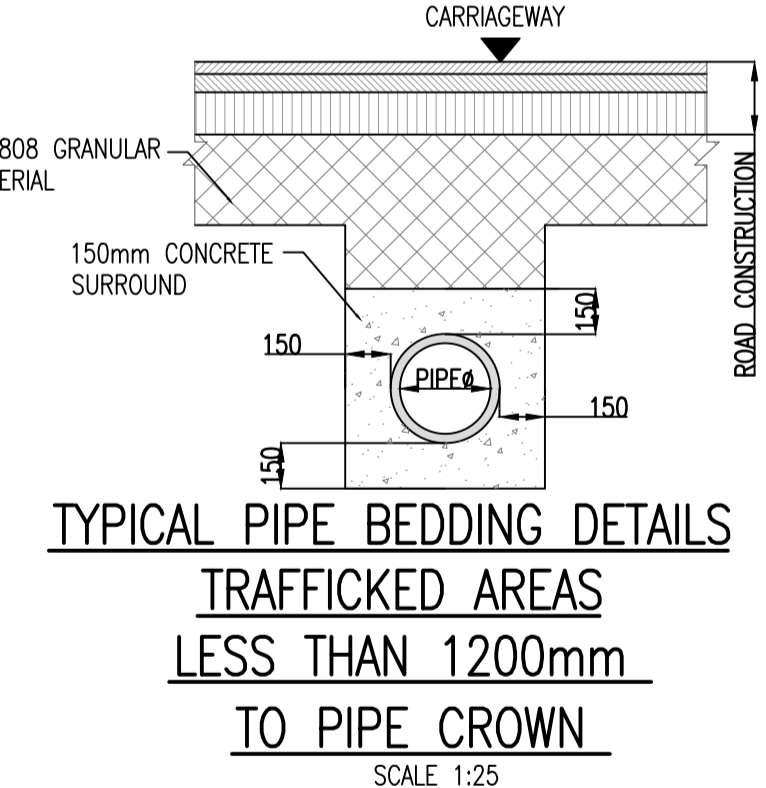
NORMAL INTERNAL DIAMETER	MINIMUM TRENCH WIDTH mm	MAXIMUM TRENCH WIDTH mm
100	450	650
150	500	700
225	600	800
300	700	900
375	950	1150
450	1050	1250
525	1150	1350
600	1250	1450
675	1350	1550
750	1400	1600
825	1500	1700
900	1950	2150
1050	2100	2300
1200	2300	2500
ABOVE 1200	PIPE DIAMETER PLUS 800mm	OUTSIDE DIAMETER PLUS 1000mm

MAXIMUM AND MINIMUM TRENCH WIDTHS



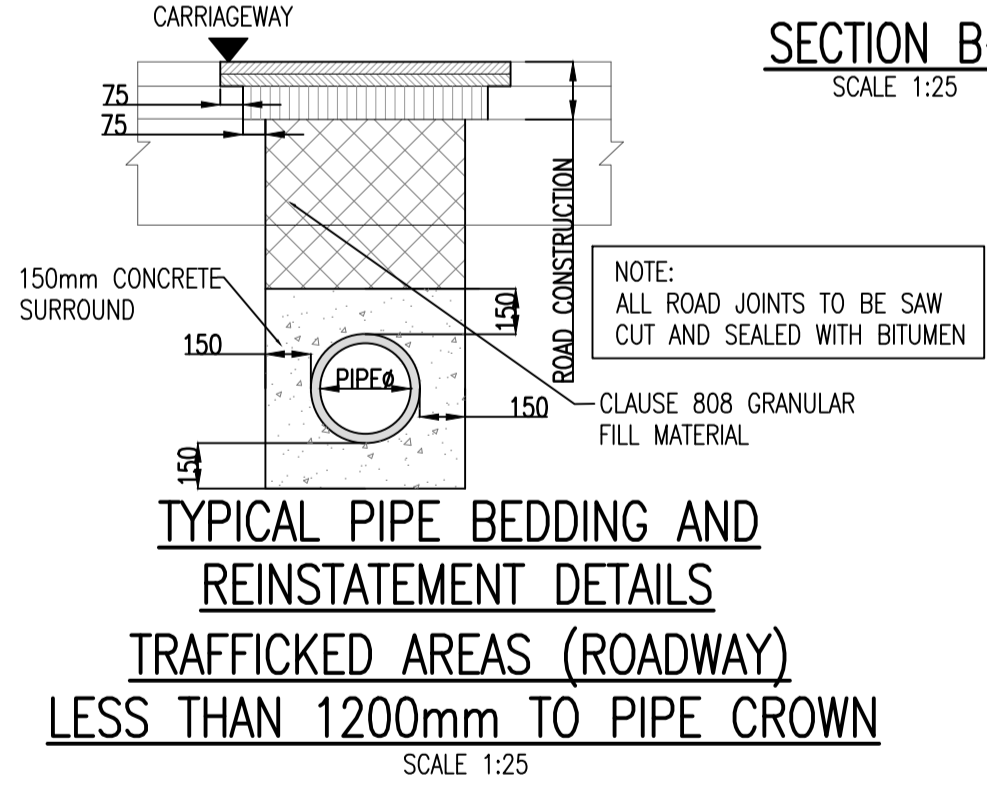
TYPICAL PIPE BEDDING DETAILS NON TRAFFICKED AREAS LESS THAN 900mm TO PIPE CROWN

SCALE 1:25



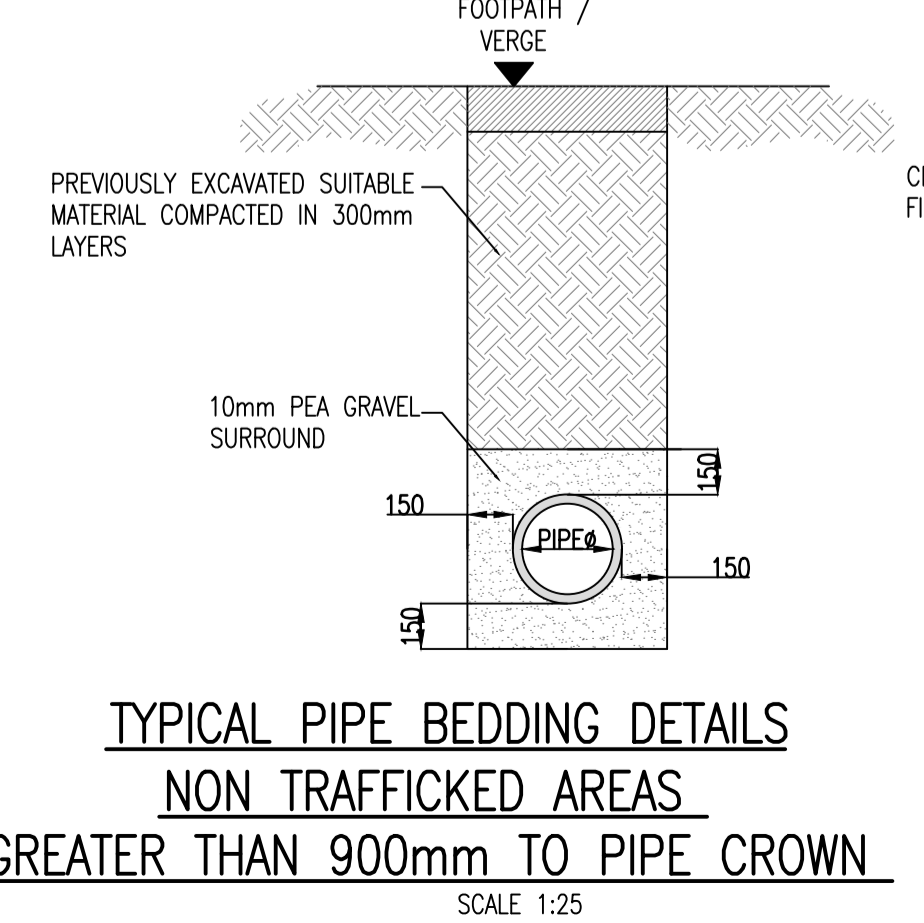
TYPICAL PIPE BEDDING DETAILS TRAFFICKED AREAS LESS THAN 1200mm TO PIPE CROWN

SCALE 1:25



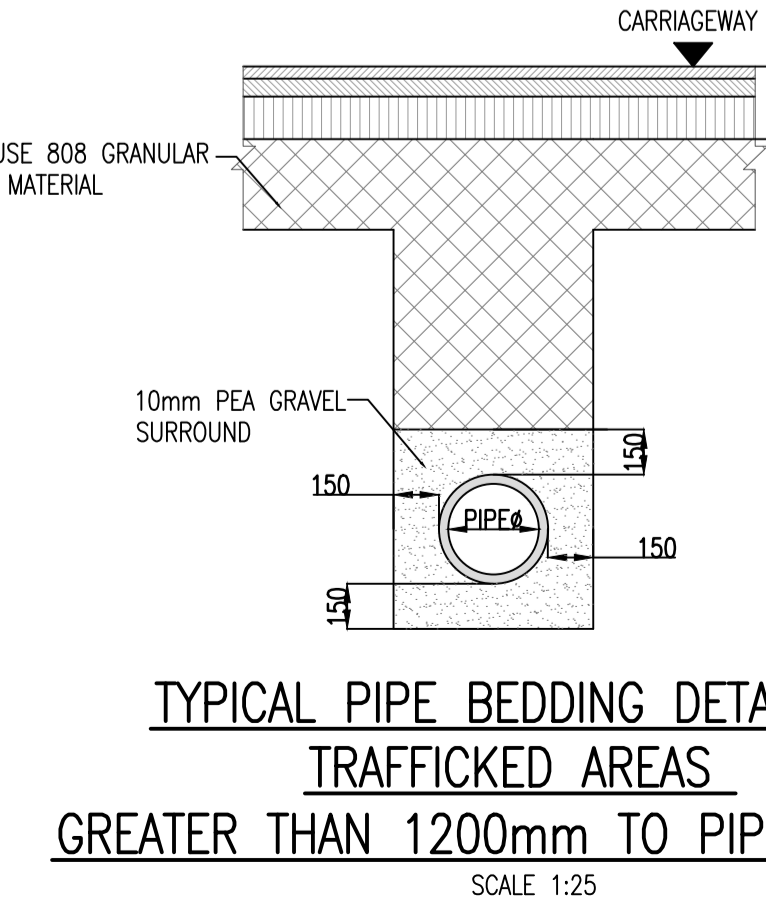
TYPICAL PIPE BEDDING AND REINSTATEMENT DETAILS TRAFFICKED AREAS (ROADWAY) LESS THAN 1200mm TO PIPE CROWN

SCALE 1:25



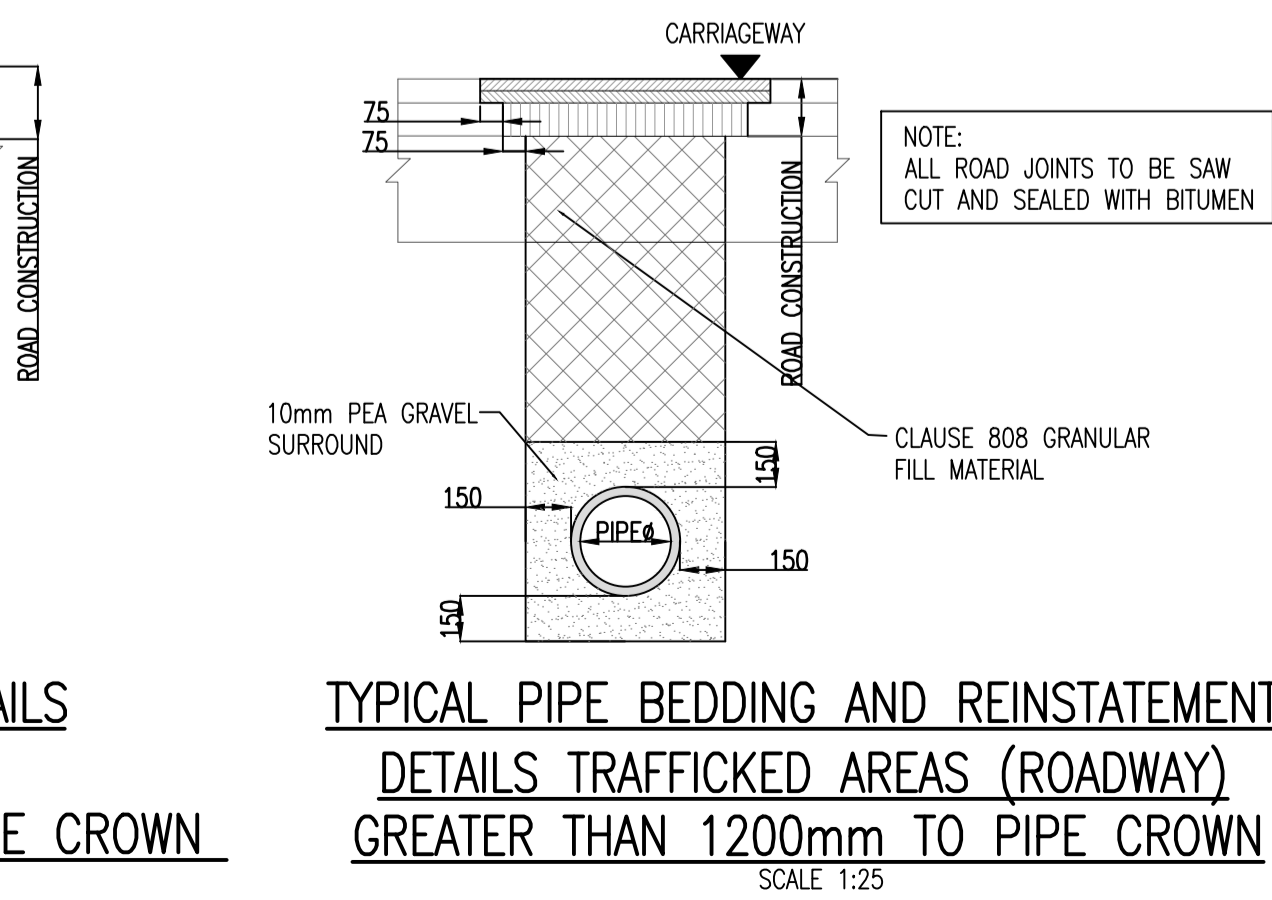
TYPICAL PIPE BEDDING DETAILS NON TRAFFICKED AREAS GREATER THAN 900mm TO PIPE CROWN

SCALE 1:25



TYPICAL PIPE BEDDING DETAILS TRAFFICKED AREAS GREATER THAN 1200mm TO PIPE CROWN

SCALE 1:25



TYPICAL PIPE BEDDING AND REINSTATEMENT DETAILS TRAFFICKED AREAS (ROADWAY) GREATER THAN 1200mm TO PIPE CROWN

SCALE 1:25

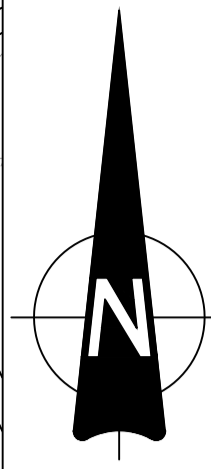
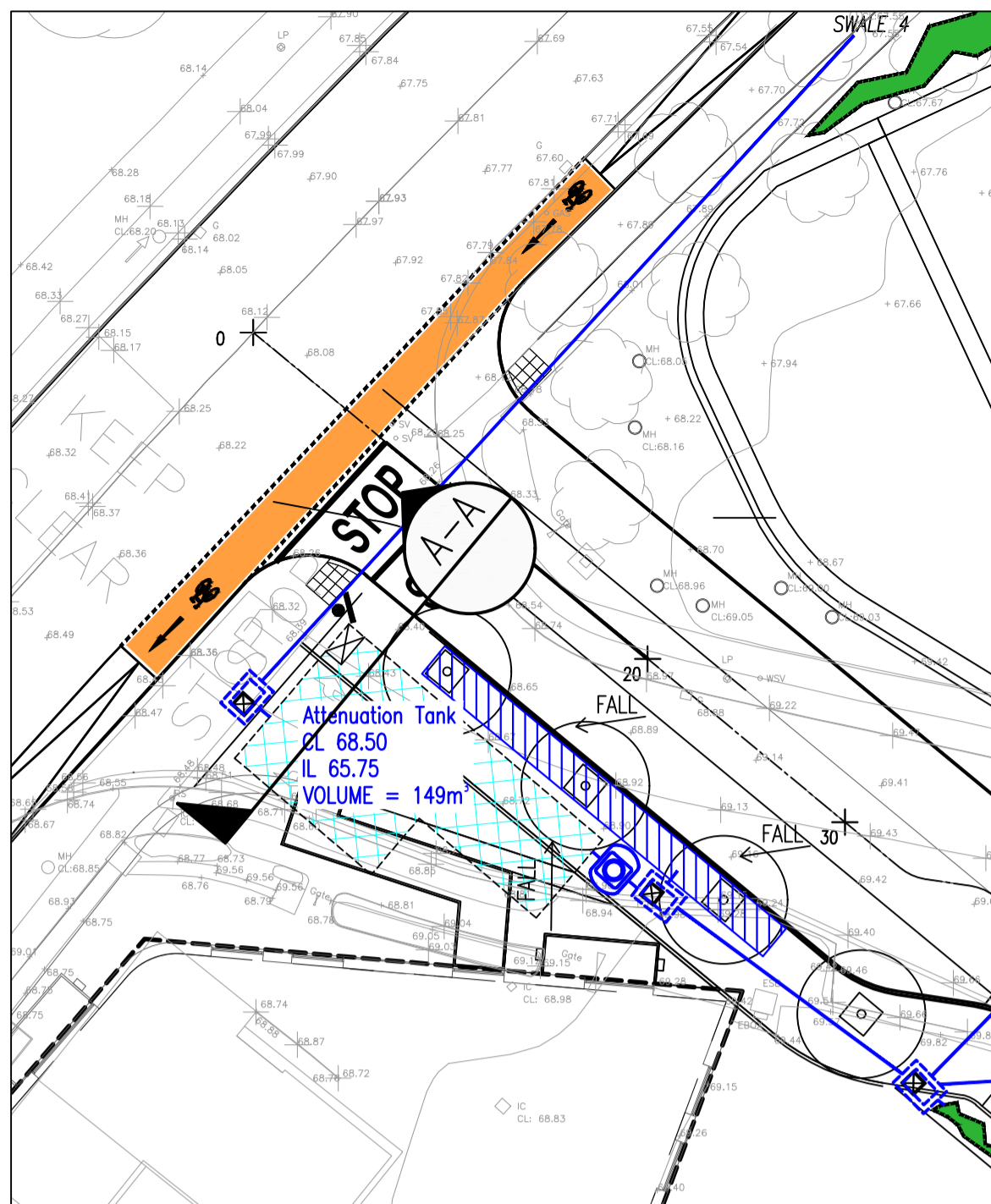
REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

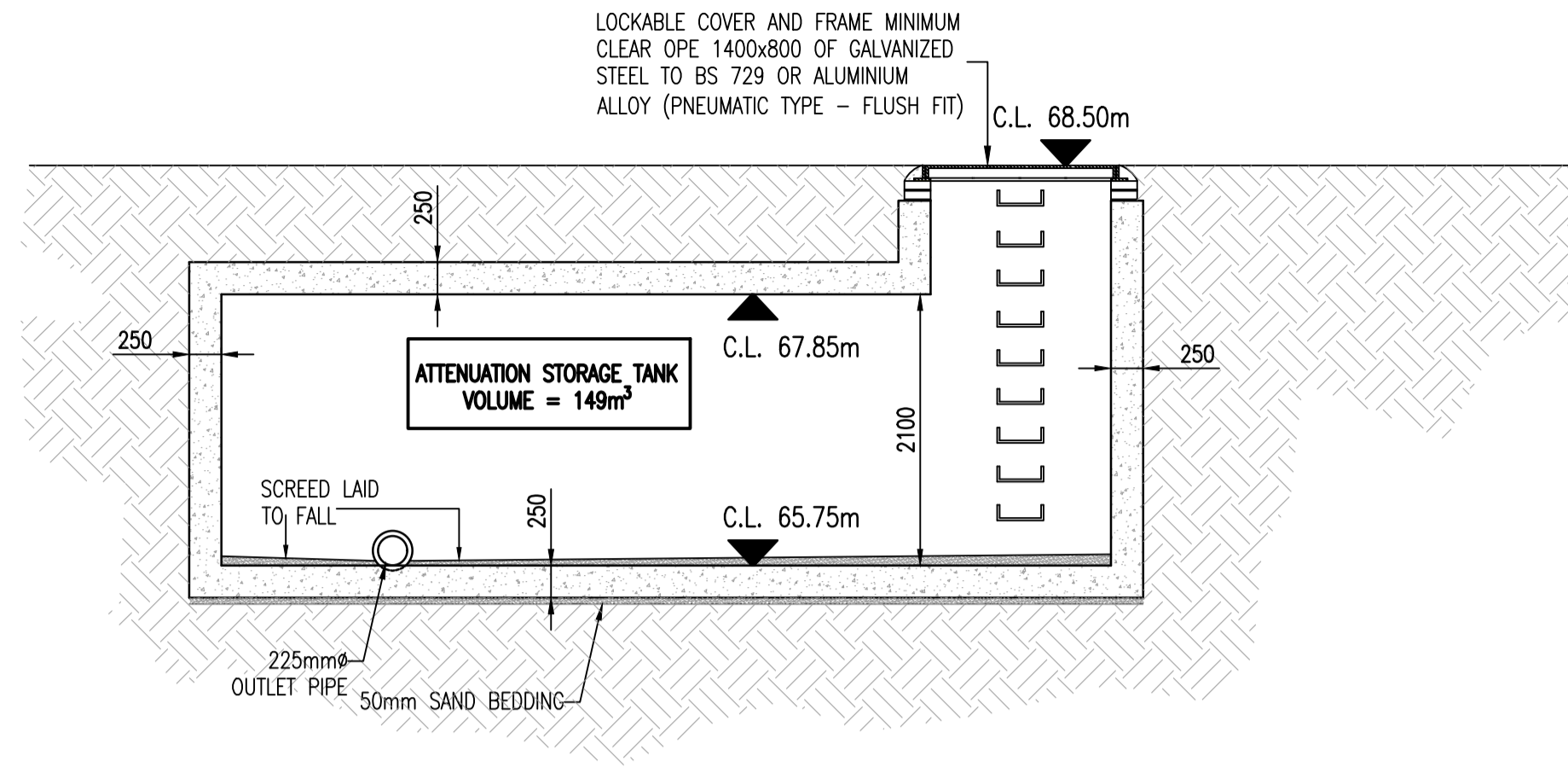
Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICVA ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**
PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN**

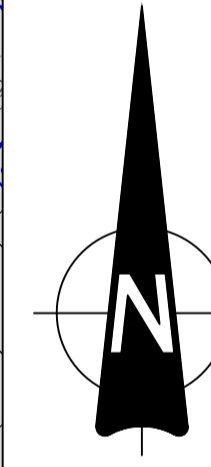
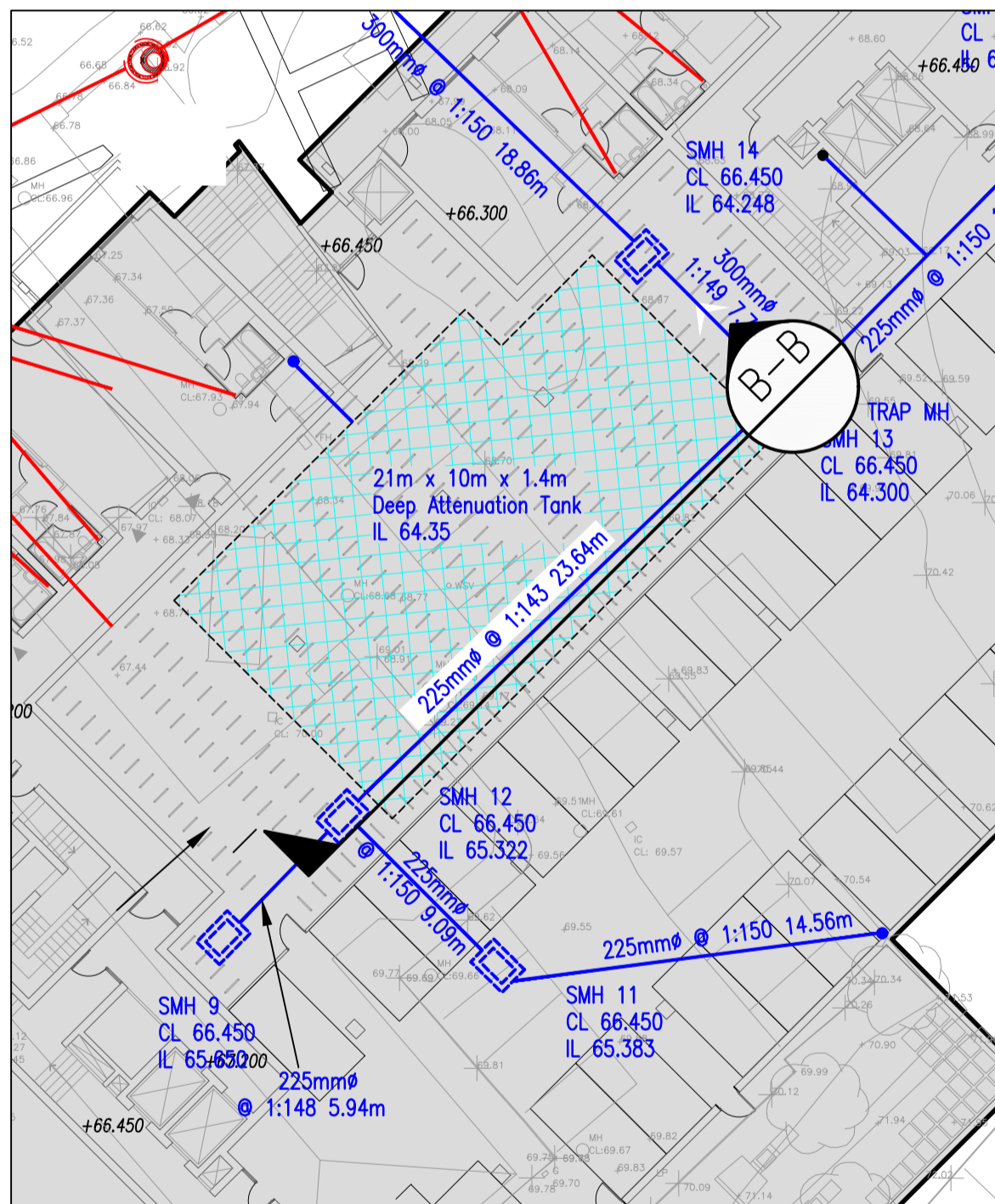
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
AS SHOWN	0A1	18-093	P230



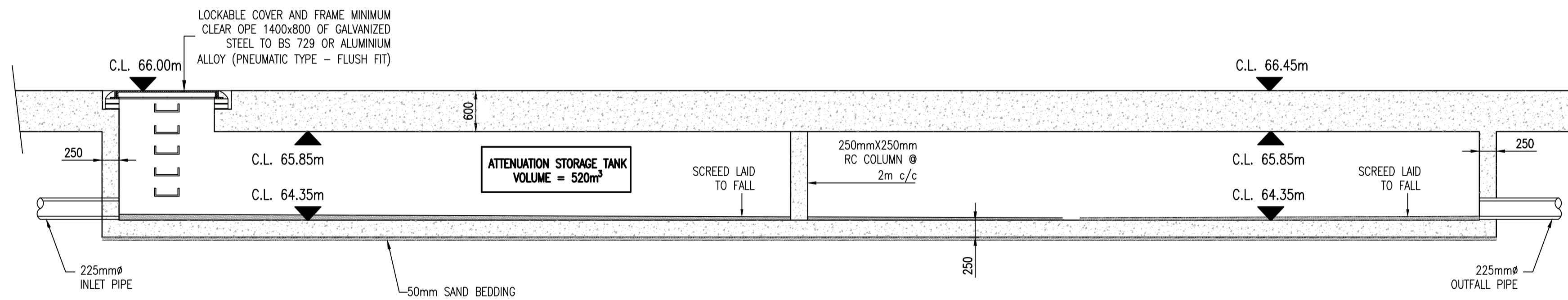
PLAN VIEW – ATTENUATION TANK 1 AT LEVEL 01
SCALE 1:250 @A1



SECTION A-A
THROUGH ATTENUATION STORAGE TANK
SCALE 1:50



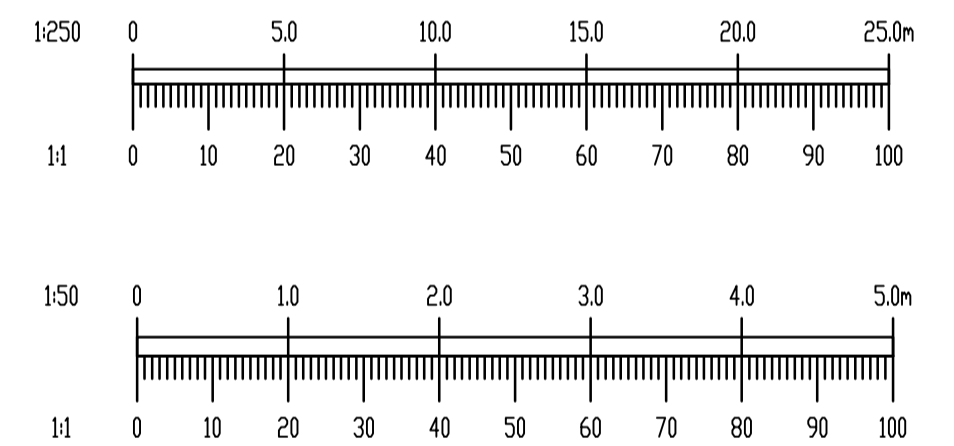
PLAN VIEW – ATTENUATION TANK 2 AT LEVEL 00
SCALE 1:250 @A1



SECTION B-B
THROUGH ATTENUATION STORAGE TANK
SCALE 1:50

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

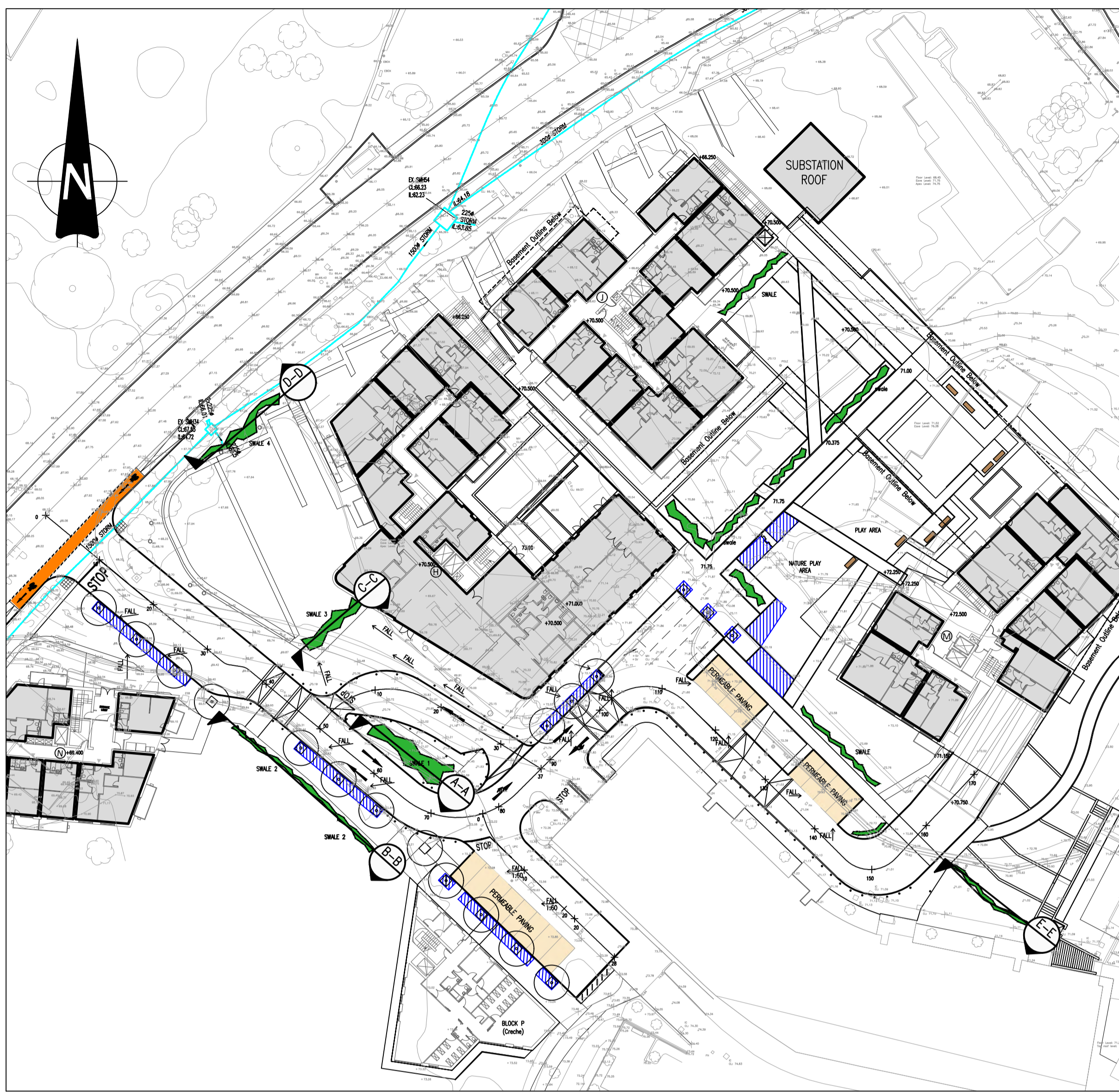
Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICAV ACTING FOR AND ON
BEHALF OF ITS SUB-FUND KW PRS FUND 10**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

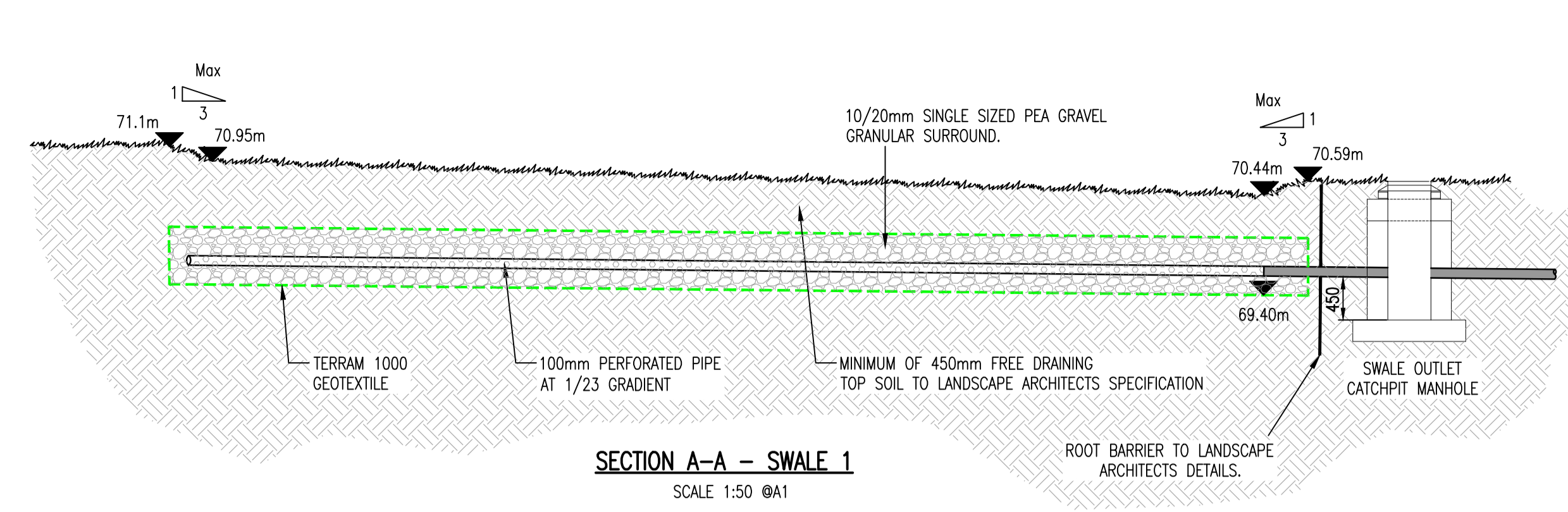
PROJECT **BREWERY ROAD APARTMENTS,
GRANGE DEVELOPMENT,
BLACKROCK,
CO. DUBLIN.**

TITLE **ATTENUATION DETAILS**

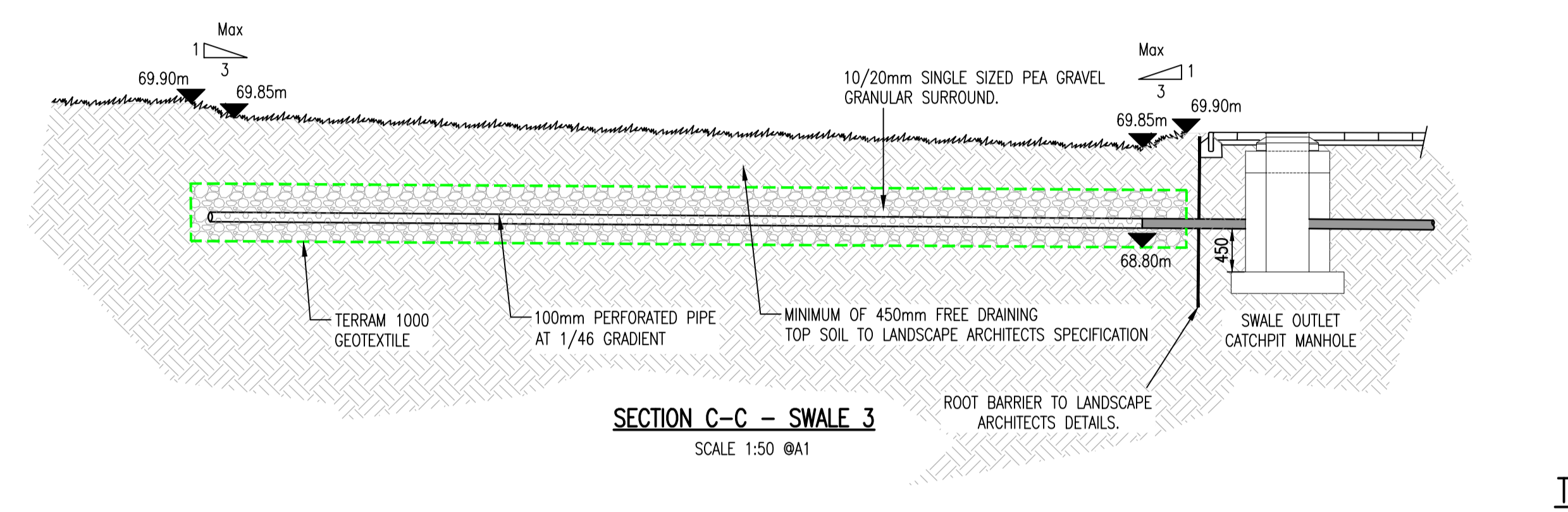
DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:250 @A1	JOB NO. 18-093	DRG. NO. P211	REVISION



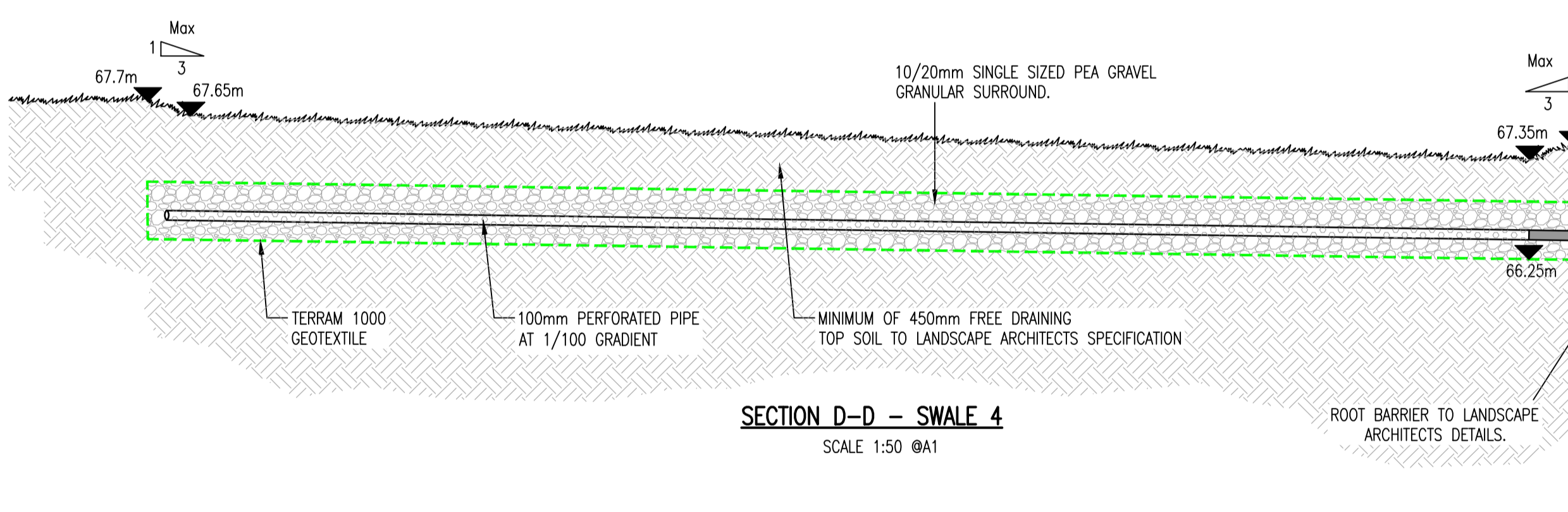
PLAN VIEW – PROPOSED SWALE LOCATIONS



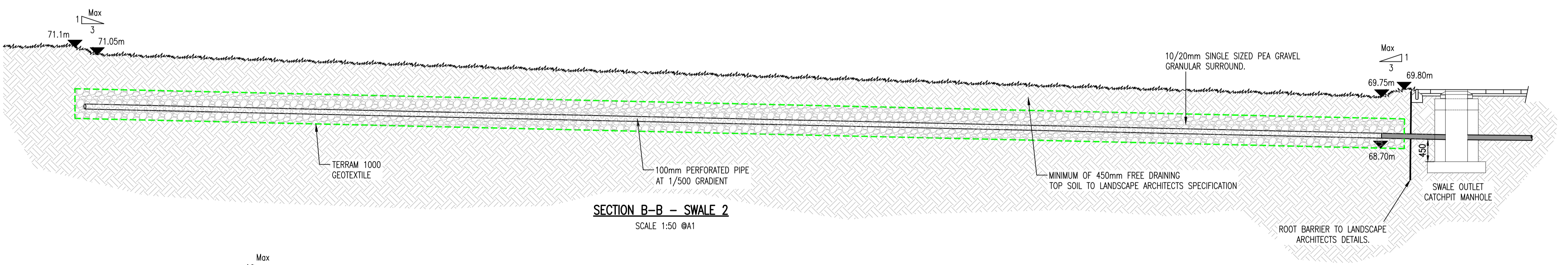
SECTION A-A – SWALE 1
SCALE 1:50 @A1



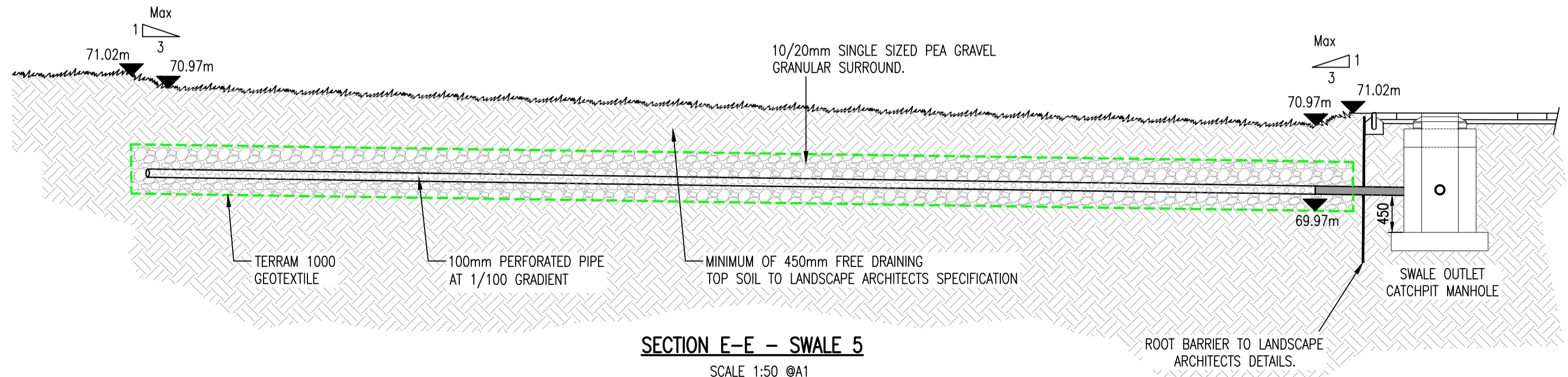
SECTION C-C – SWALE 3
SCALE 1:50 @A1



SECTION D-D – SWALE 4
SCALE 1:50 @A1

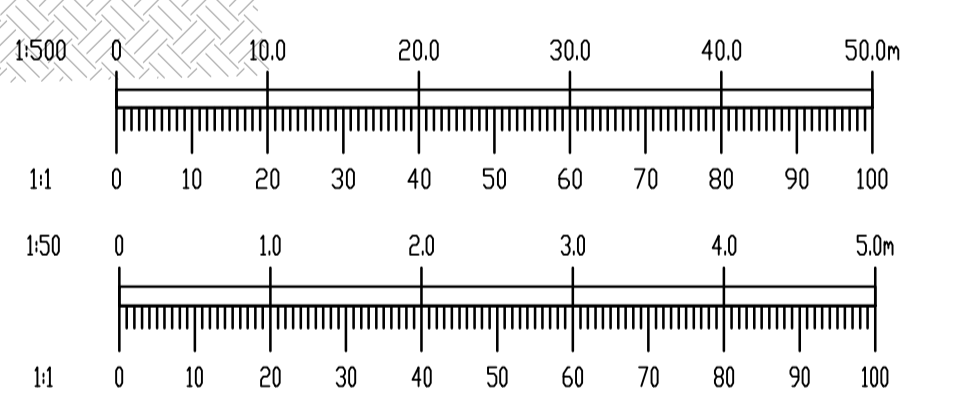
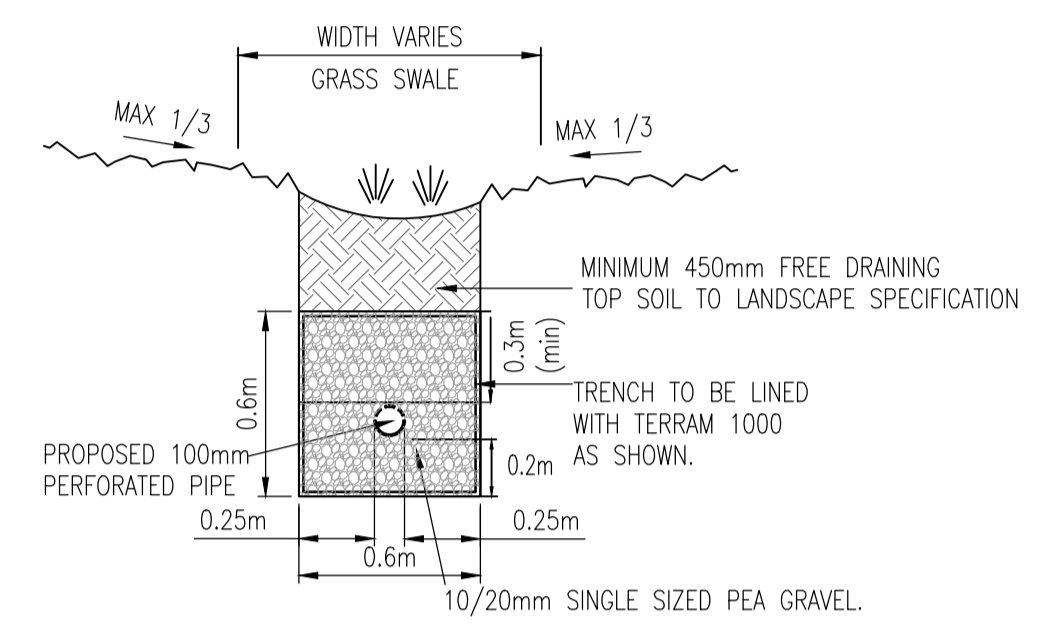
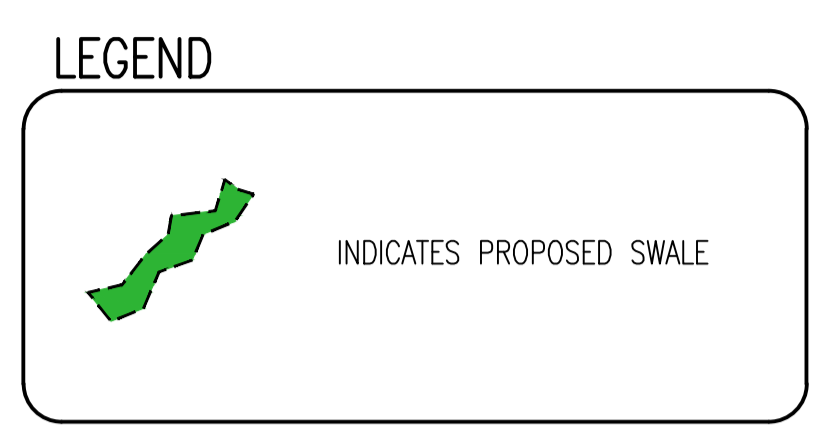


SECTION B-B – SWALE 2
SCALE 1:50 @A1



SECTION E-E – SWALE 5
SCALE 1:50 @A1

- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



REV.	DATE	AMENDMENT	DRN	APPD

STATUS: **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT: KW PRS ICVA ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND
ARCHITECT: O'MAHONY PIKE ARCHITECTS
PROJECT: BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.

TITLE: SWALE DRAINAGE DETAILS

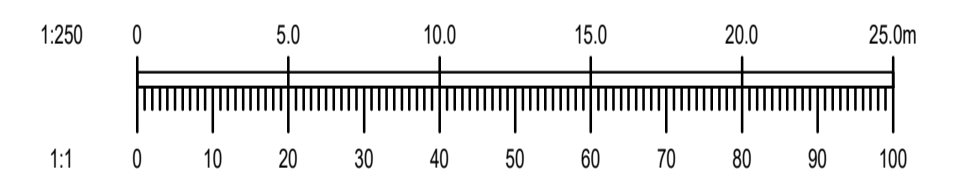
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:500 @A1	18-093	P210	

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer or copyright holder except as agreed for use on the project for which the document was originally issued.



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

- LEGEND:
- INDICATES OVERLAND FLOOD ROUTE
 - INDICATES OVERLAND FLOOD ROUTE (LOCAL PONDING MAY OCCUR BEFORE OVERTOPPING)
 - PROPOSED ROAD LEVEL
 - EXISTING ROAD LEVEL
 - PROPOSED FALLS



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**

ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS,
GRANGE DEVELOPMENTS,
BLACKROCK,
CO. DUBLIN**

TITLE **OVERLAND FLOOD ROUTE**

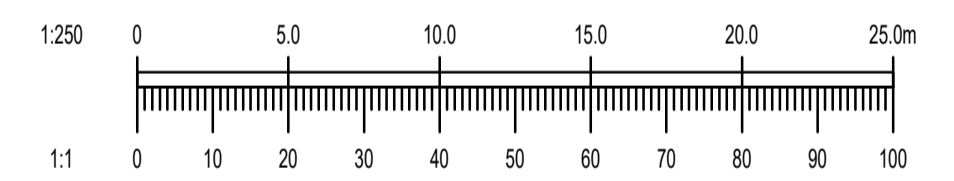
DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250	18-093	P209	

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer in copyright. Insofar as permitted by law, the drawing is hereby assigned to the client.



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

- LEGEND:
- INDICATES OVERLAND FLOOD ROUTE
 - INDICATES OVERLAND FLOOD ROUTE (LOCAL PONDING MAY OCCUR BEFORE OVERTOPPING)
 - PROPOSED ROAD LEVEL
 - EXISTING ROAD LEVEL
 - PROPOSED FALLS



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS IC AV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENTS, BLACKROCK, CO. DUBLIN**

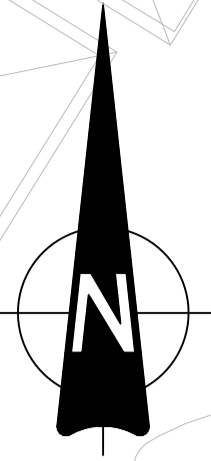
TITLE **OVERLAND FLOOD ROUTE**

DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:250	JOB NO. 18-093	DRG. NO. P209	REVISION

© 2017. This drawing is copyright. No part of this document may be re-produced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer in copyright. Insofar as permitted by law, the copyright in this drawing is reserved.


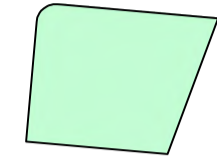
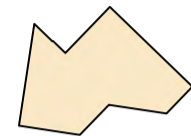
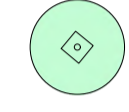
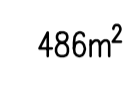
LIKELY OVERLAND FLOOD ROUTE FROM "THE GRANGE DEVELOPEMENT"

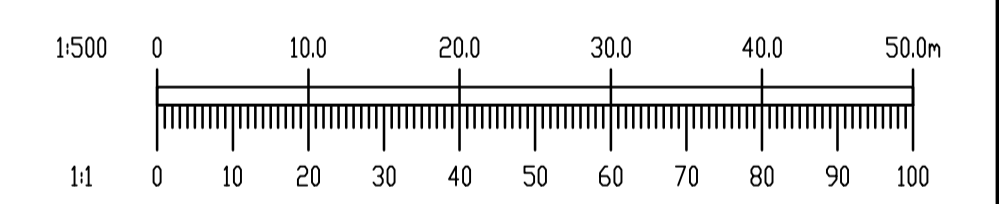
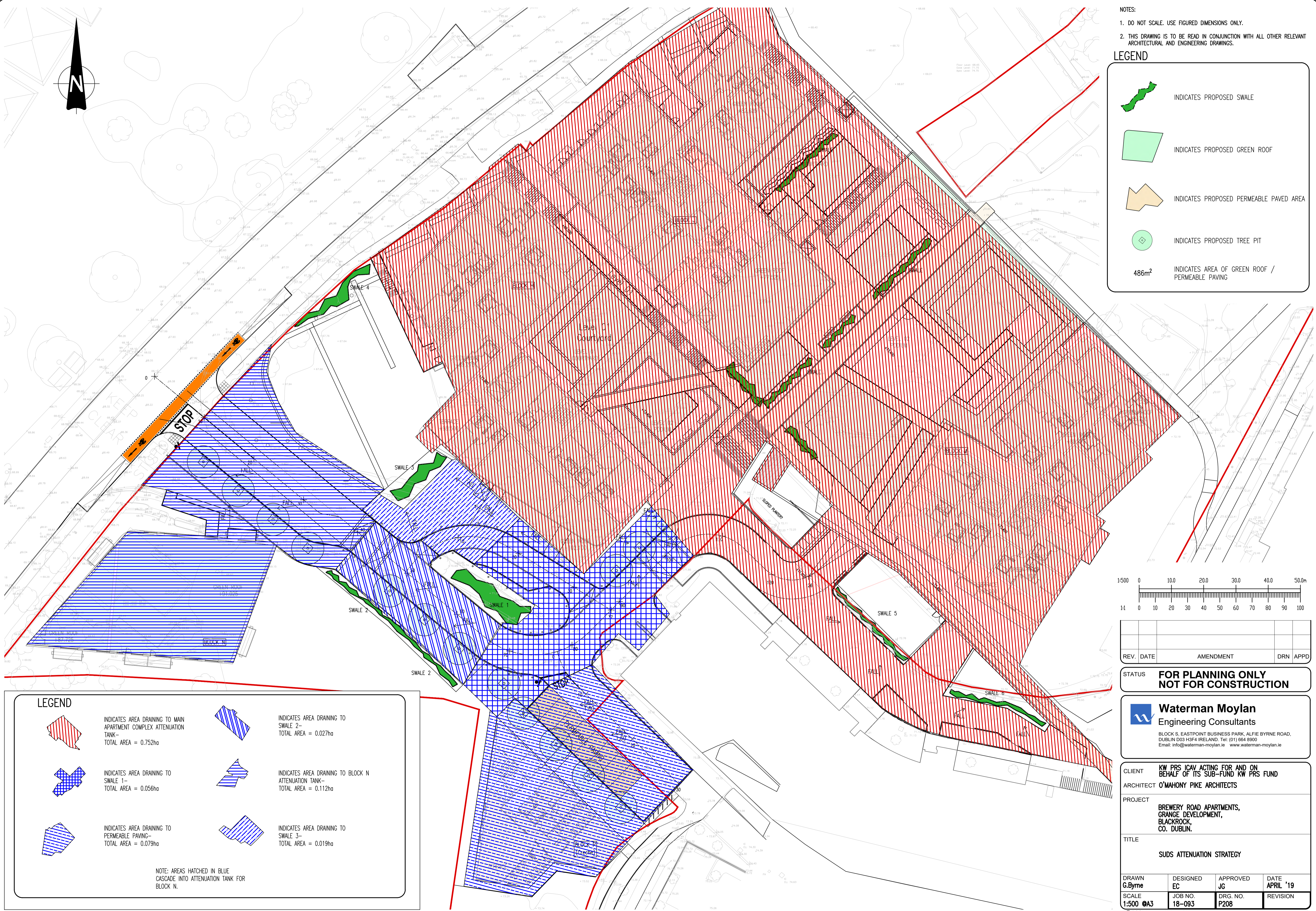
FFL: 72.75m
BLOCK P
(Creche)



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

-  INDICATES PROPOSED SWALE
-  INDICATES PROPOSED GREEN ROOF
-  INDICATES PROPOSED PERMEABLE PAVED AREA
-  INDICATES PROPOSED TREE PIT
-  INDICATES AREA OF GREEN ROOF / PERMEABLE PAVING



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

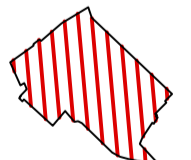
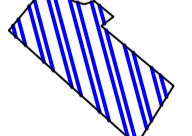
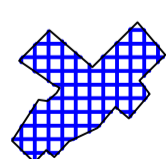

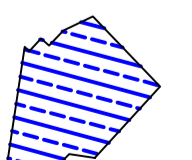
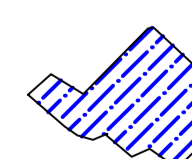
Waterman Moylan
Engineering Consultants
BLOCK 9, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS IC AV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**
PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS ATTENUATION STRATEGY**

DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:500 @A3	JOB NO. 18-093	DRG. NO. P208	REVISION

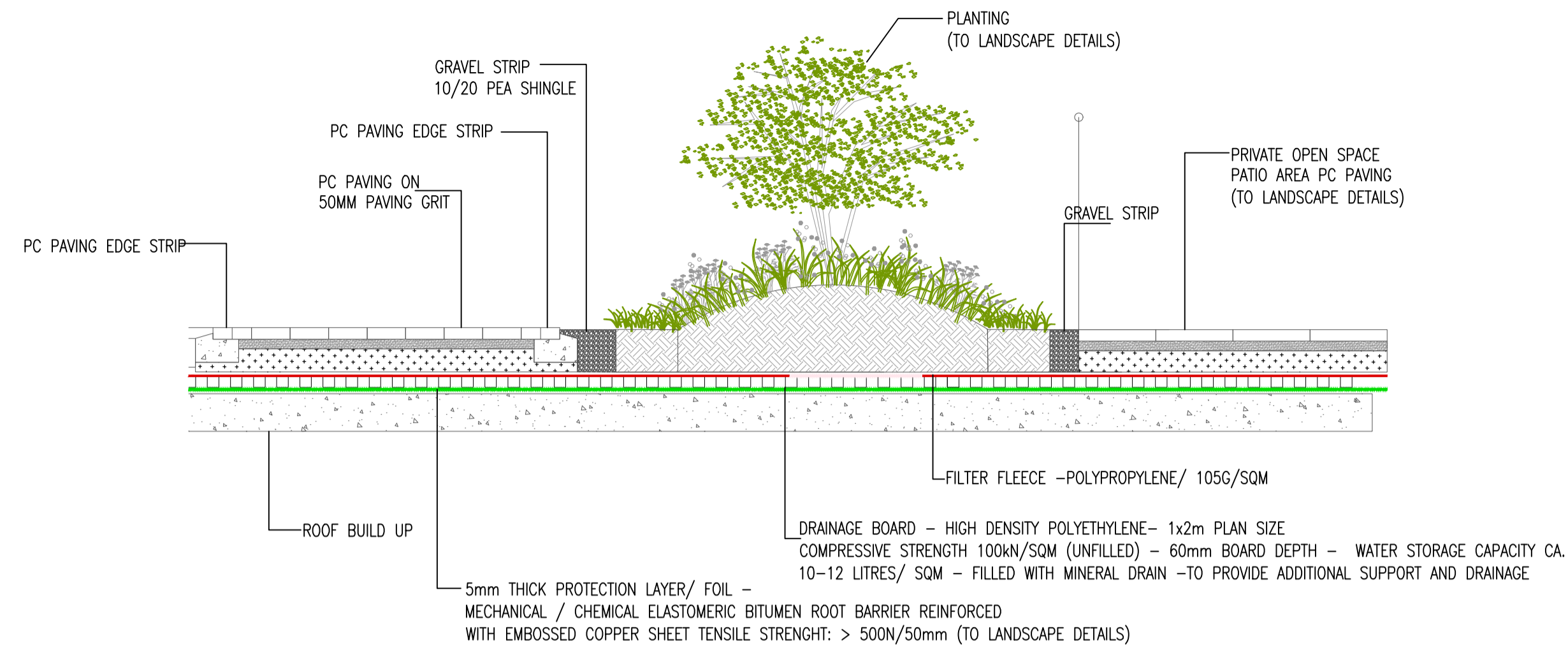
LEGEND

-  INDICATES AREA DRAINING TO MAIN APARTMENT COMPLEX ATTENUATION TANK- TOTAL AREA = 0.752ha
-  INDICATES AREA DRAINING TO SWALE 2- TOTAL AREA = 0.027ha
-  INDICATES AREA DRAINING TO SWALE 1- TOTAL AREA = 0.056ha
-  INDICATES AREA DRAINING TO BLOCK N ATTENUATION TANK- TOTAL AREA = 0.112ha
-  INDICATES AREA DRAINING TO PERMEABLE PAVING- TOTAL AREA = 0.079ha
-  INDICATES AREA DRAINING TO SWALE 3- TOTAL AREA = 0.019ha

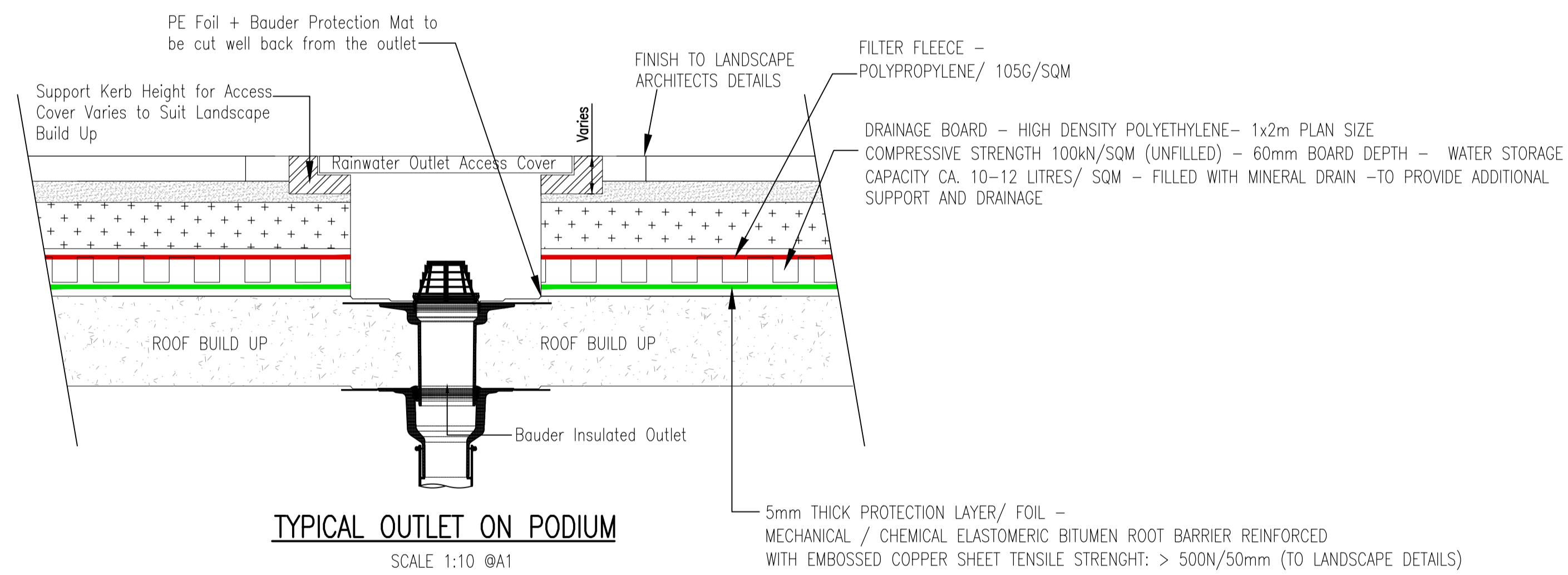
NOTE: AREAS HATCHED IN BLUE CASCADE INTO ATTENUATION TANK FOR BLOCK N.

NOTES:

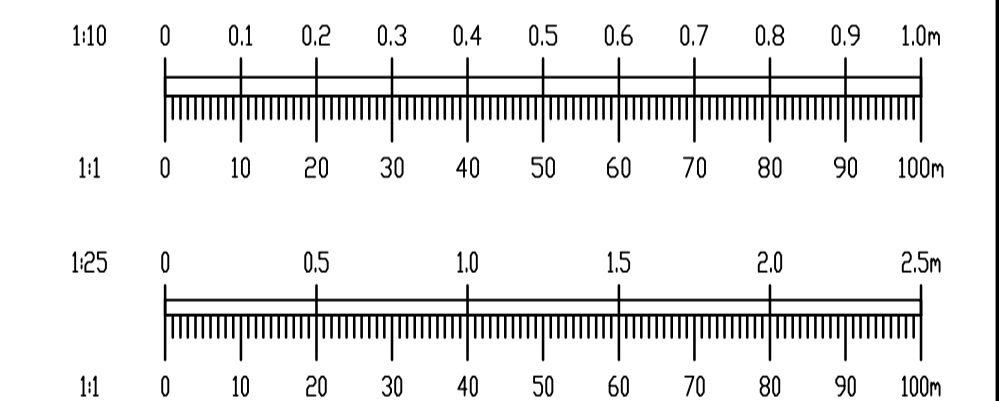
1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



SUDS DETAIL
TYPICAL SECTION THROUGH TREE PIT
SCALE 1:25



TYPICAL OUTLET ON PODIUM
SCALE 1:10 @A1



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

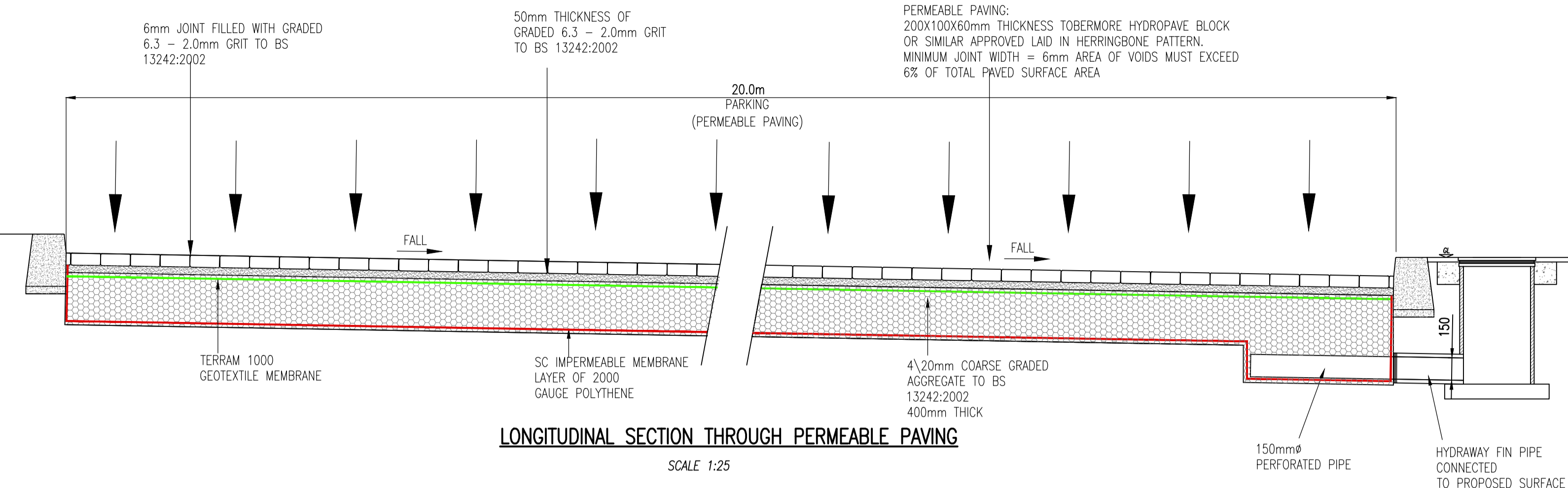
CLIENT **KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS DRAINAGE DETAILS SHEET 2 OF 2**

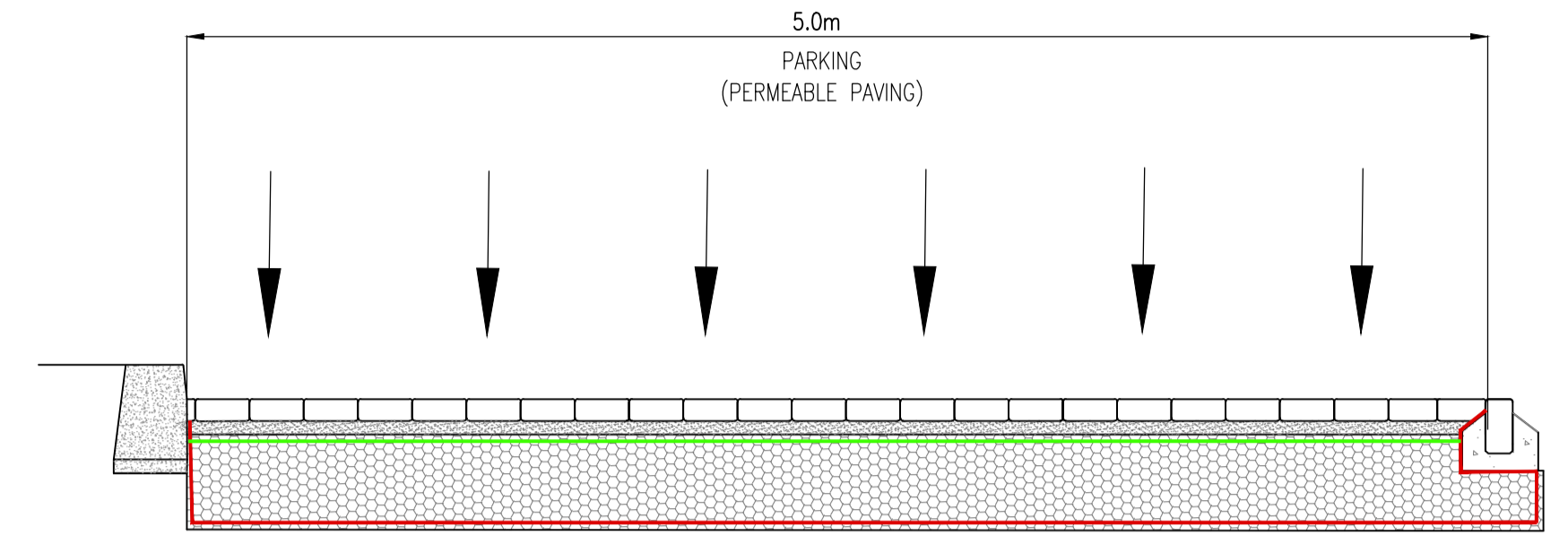
DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE AS SHOWN @A1	JOB NO. 18-093	DRG. NO. P207	REVISION

- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



LONGITUDINAL SECTION THROUGH PERMEABLE PAVING

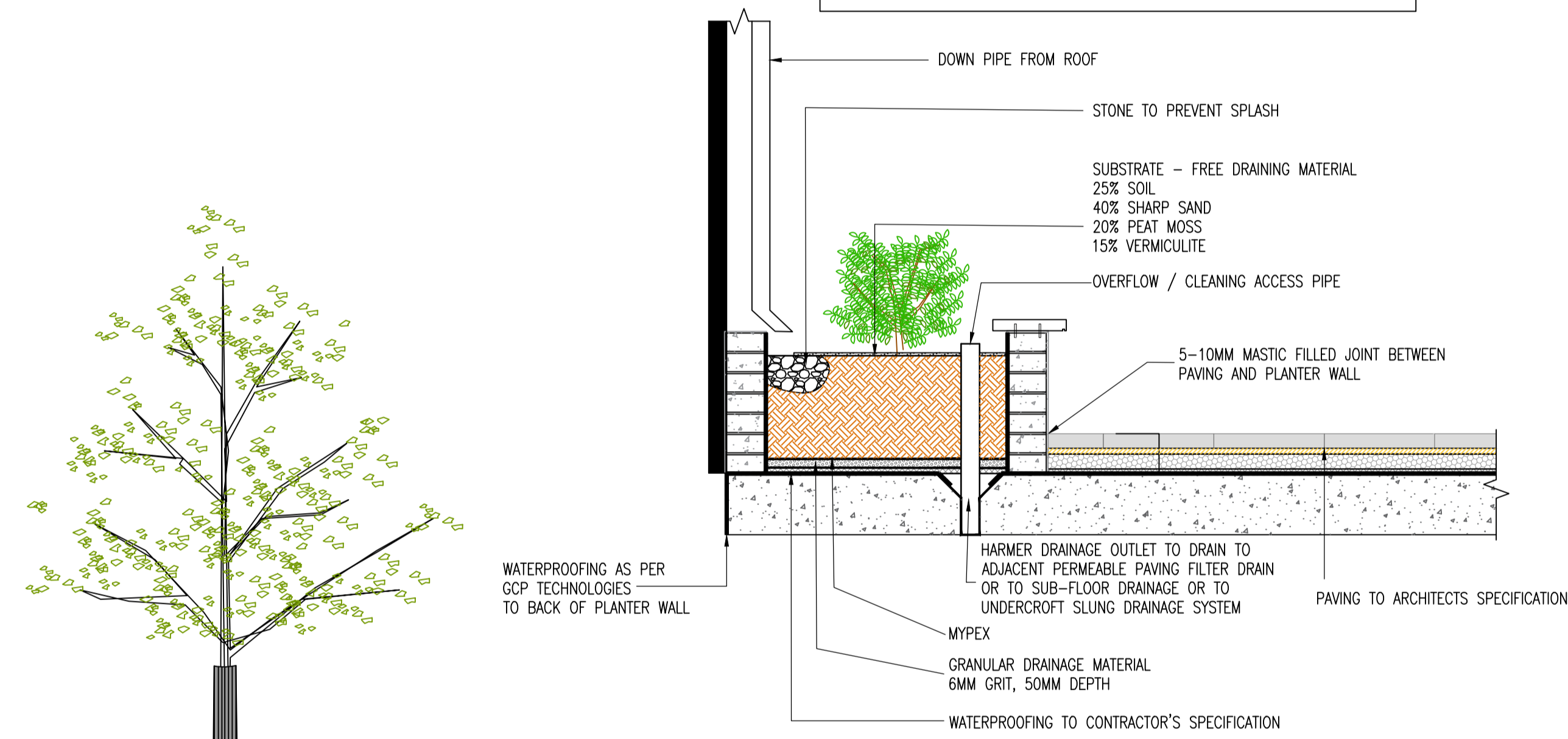
SCALE 1:25



CROSS SECTION THROUGH PERMEABLE PAVING

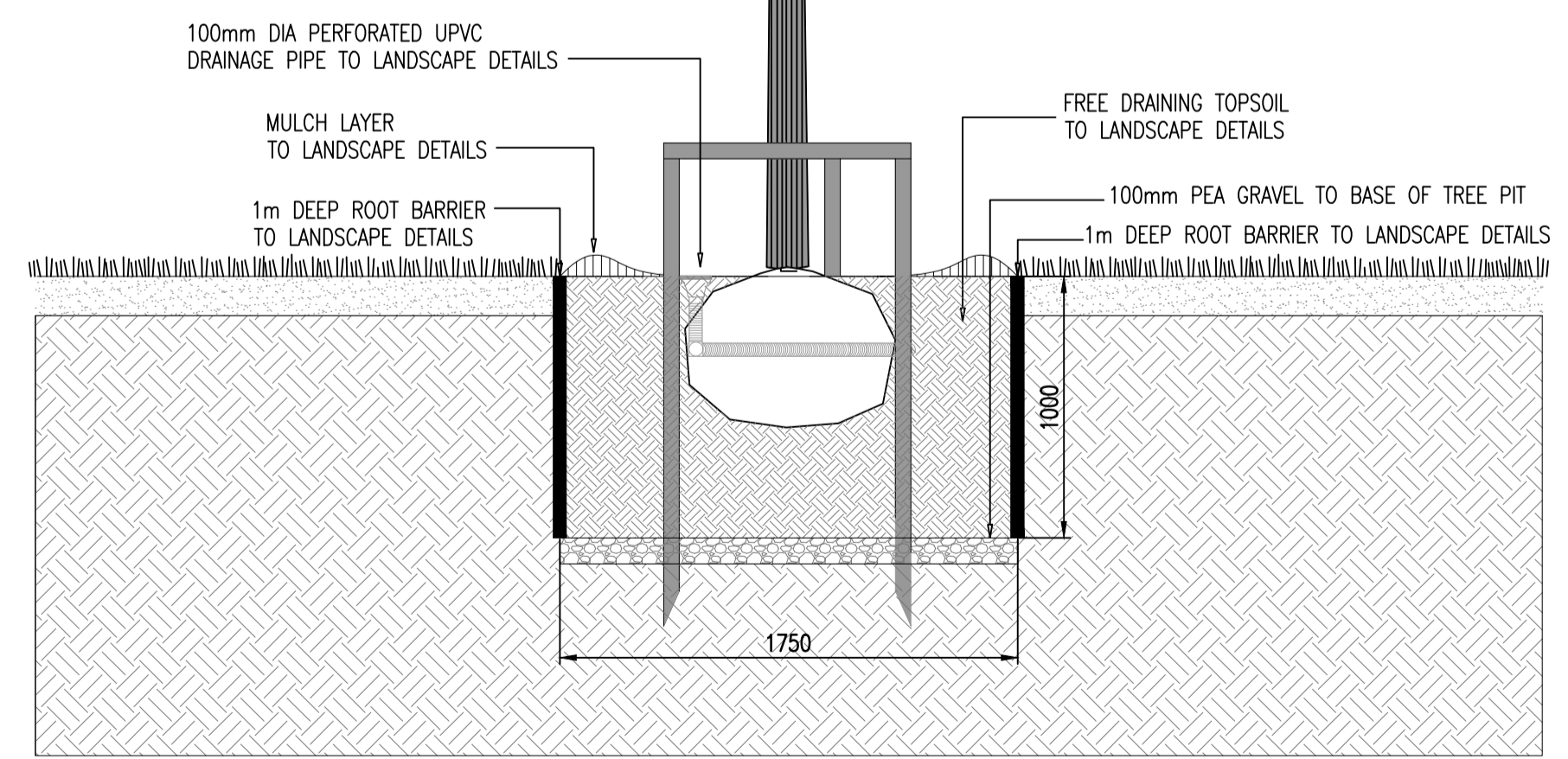
SCALE 1:25

NOTE:
 PROVIDE HARDER 150mm DIA. VERTICAL SPIGOT OUTLET OR EQUIVALENT TO EXISTING OPENINGS SHOWN AND WATERPROOFING TO BE DRESSED IN STRICTLY IN ACCORDANCE WITH MANUFACTURERS DETAILS & SPECIFICATION
 INSTALL SECONDARY ANTI-ROOT MEMBRANE STRIPS OR EQUIVALENT 1m WIDE FULLY BONDED WITH 100mm SIDE AND 150mm END UNDER PLANTER WALLS
 INSTALL ANTI-ROOT MEMBRANE OR EQUIVALENT FULLY BONDED WITH 100mm SIDE AND 150mm END LAPS TO MAIN PODIUM AREA



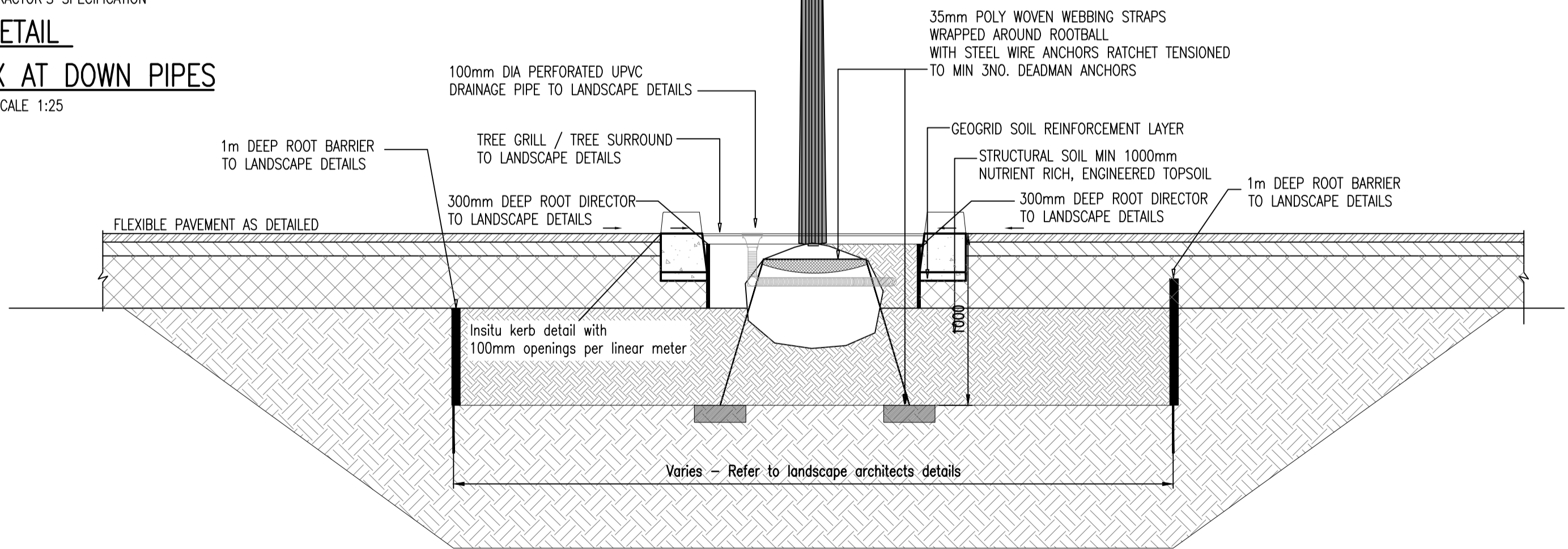
SUDS DETAIL PLANTER BOX AT DOWN PIPES

SCALE 1:25



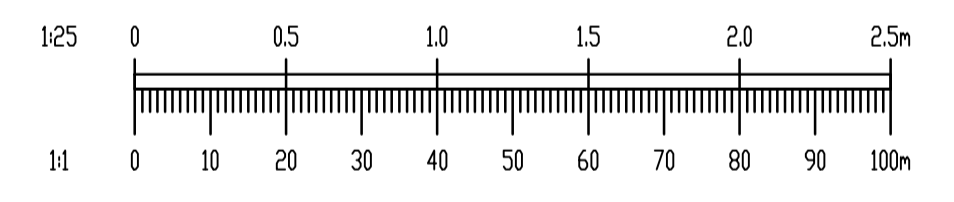
SUDS DETAIL TYPICAL SECTION THROUGH TREE PIT

SCALE 1:25



SUDS DETAIL TYPICAL SECTION THROUGH TREE PIT

SCALE 1:25



REV.	DATE	AMENDMENT	DRN	APPD

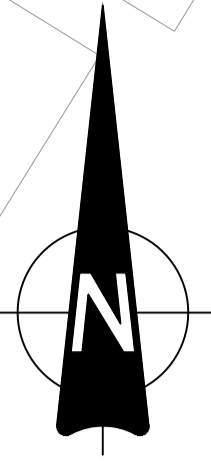
STATUS **FOR PLANNING ONLY NOT FOR CONSTRUCTION**

Waterman Moylan
 Engineering Consultants
 BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
 Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
 ARCHITECT **O'MAHONY PIKE ARCHITECTS**
 PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS DRAINAGE DETAILS SHEET 1 OF 2**

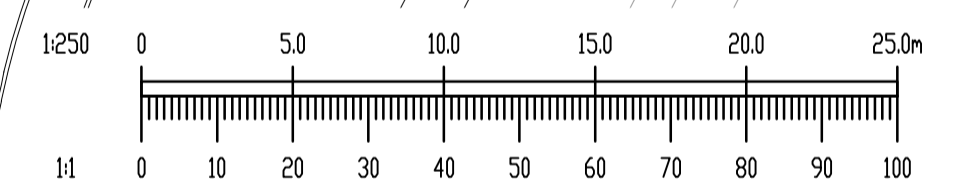
DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE AS SHOWN @A1	JOB NO. 18-093	DRG. NO. P206	REVISION



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

- INDICATES PROPOSED SWALE
- INDICATES PROPOSED GREEN ROOF
- INDICATES PROPOSED PERMEABLE PAVED AREA
- INDICATES PROPOSED TREE PIT
- 486m² INDICATES AREA OF GREEN ROOF / PERMEABLE PAVING



Area	Total Hard standing Area	Interception mechanism	Interception Area	Percentage Benefiting
Block H	1576.1 m ²	Green Roof	1142 m ²	80.97 %
		Terrace area draining to gravel filter strip.	137 m ²	
Block J	1619 m ²	Green Roof	1278 m ²	90.3 %
		Terrace area draining to gravel filter strip.	212 m ²	
Block M	1383 m ²	Green Roof	980 m ²	77.78 %
		Terrace area draining to gravel filter strip.	233 m ²	
Block N	537 m ²	Green Roof	428 m ²	83.95 %
		Terrace area draining to gravel filter strip.	23m ²	
Creche	332.1 m ²	Terrace area draining to gravel filter strip.	223m ²	67 %
Hard Standing	547 m ²	Swale	526m ²	96.2 %
Total	5994.2m²		5182m²	82.7%

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

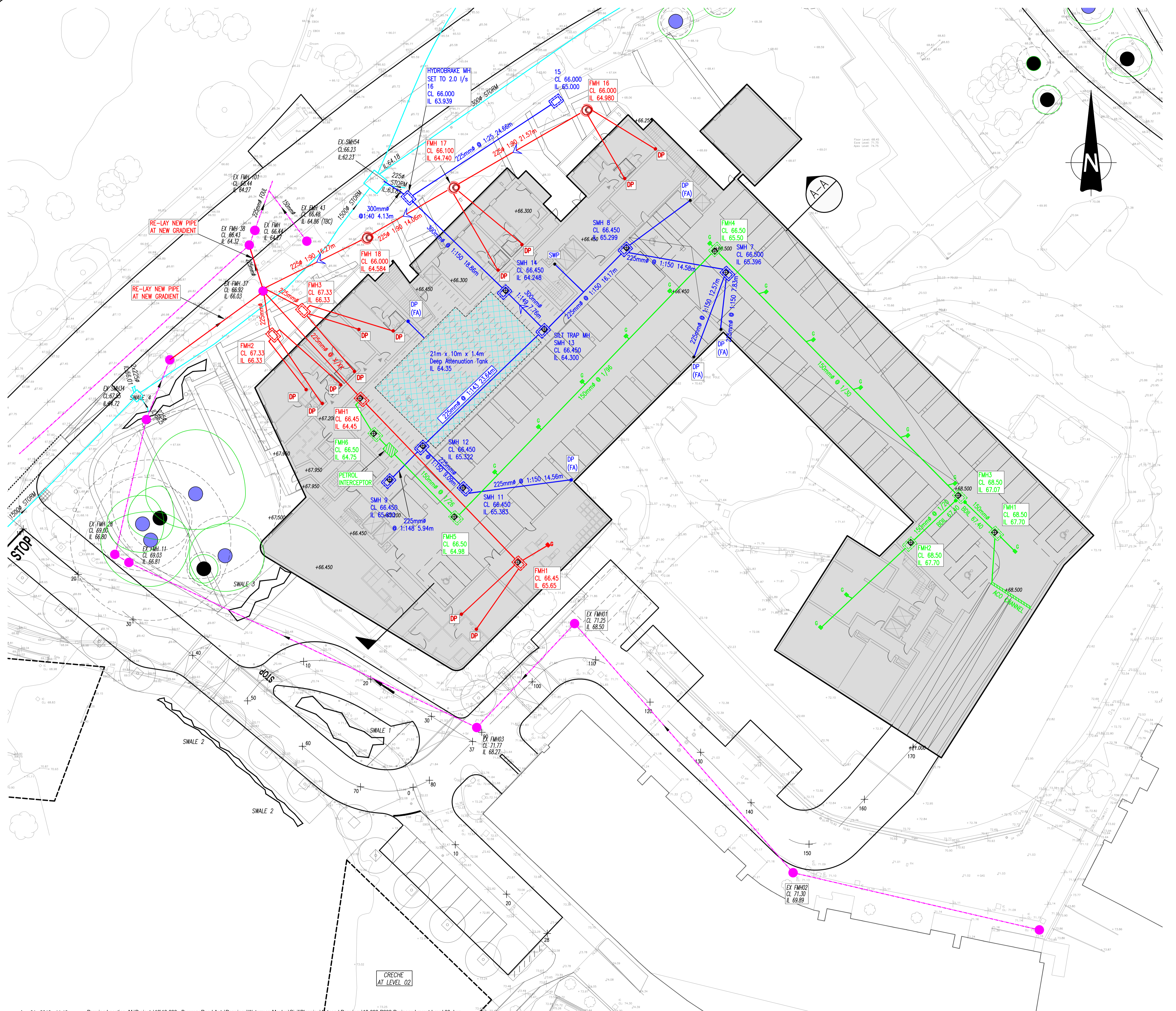
Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS IC AV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**
PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS DRAINAGE LAYOUT**

DRAWN	DESIGNED	APPROVED	DATE
C. Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P205	

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer or copyright holder except as agreed for use on the project for which the document was originally issued.



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

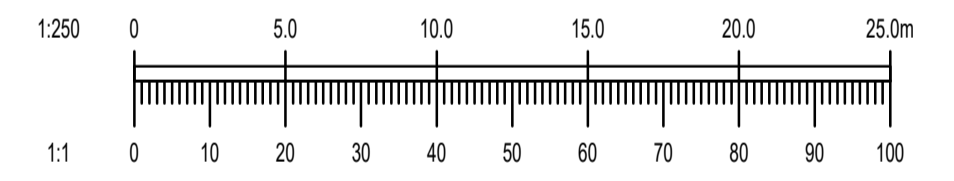
LEGEND

- FMH 16**
CL 66.00
IL 64.98
 225mm 1:90 22.48m PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- FMH7**
CL 70.00
IL 68.75
 150mm @ 1/150 PROPOSED FOUL WASTE BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- FMH4**
CL 69.50
IL 68.70
 150mm @ 1/150 PROPOSED CAR PARK BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- D.P.**
(T.B.) PROPOSED FOUL WASTE WATER DOWN PIPE (FROM ABOVE)
- FWP** PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 00)
- G** PROPOSED GULLY AND 100mm@ CONNECTION
- SMH4**
CL-3.700
IL-4.600
 150mm @ 1/150 PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- RWP** PROPOSED RAIN WATER DOWN PIPE (AT LEVEL 00)
- EX FMH 37**
CL 66.92
IL 66.03
 225mm@ EXISTING FOUL WATER DRAINAGE
- MH54**
CL 66.23
IL 62.23
 150mm@ EXISTING SURFACE WATER DRAINAGE
- EX TREE AND ROOT PROTECTION AREA

NOTE: HAND DIG IN ROOT PROTECTION AREAS IN LINE WITH METHOD STATEMENT APPROVED BY AGRICULTURALIST.

NOTE: PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS B) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE: FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WM-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m



Ordnance Survey Ireland Licence No. EN 0006018
© Ordnance Survey Ireland/Government of Ireland.

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 9, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 684 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10**

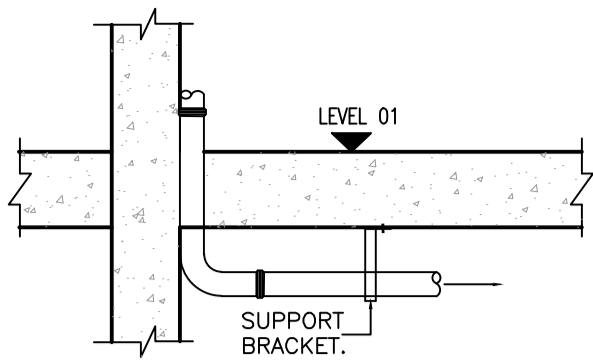
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **PROPOSED DRAINAGE LAYOUT LEVEL 00**

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P202	

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer in copyright. Issue must be agreed for use on the project for which the document was originally issued.

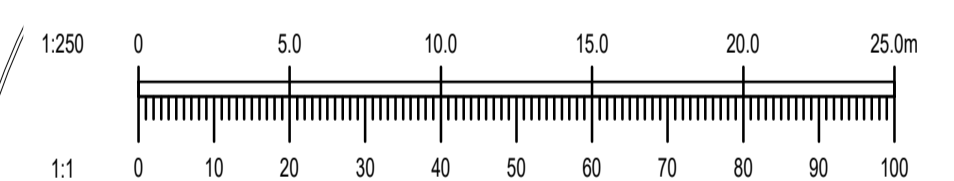
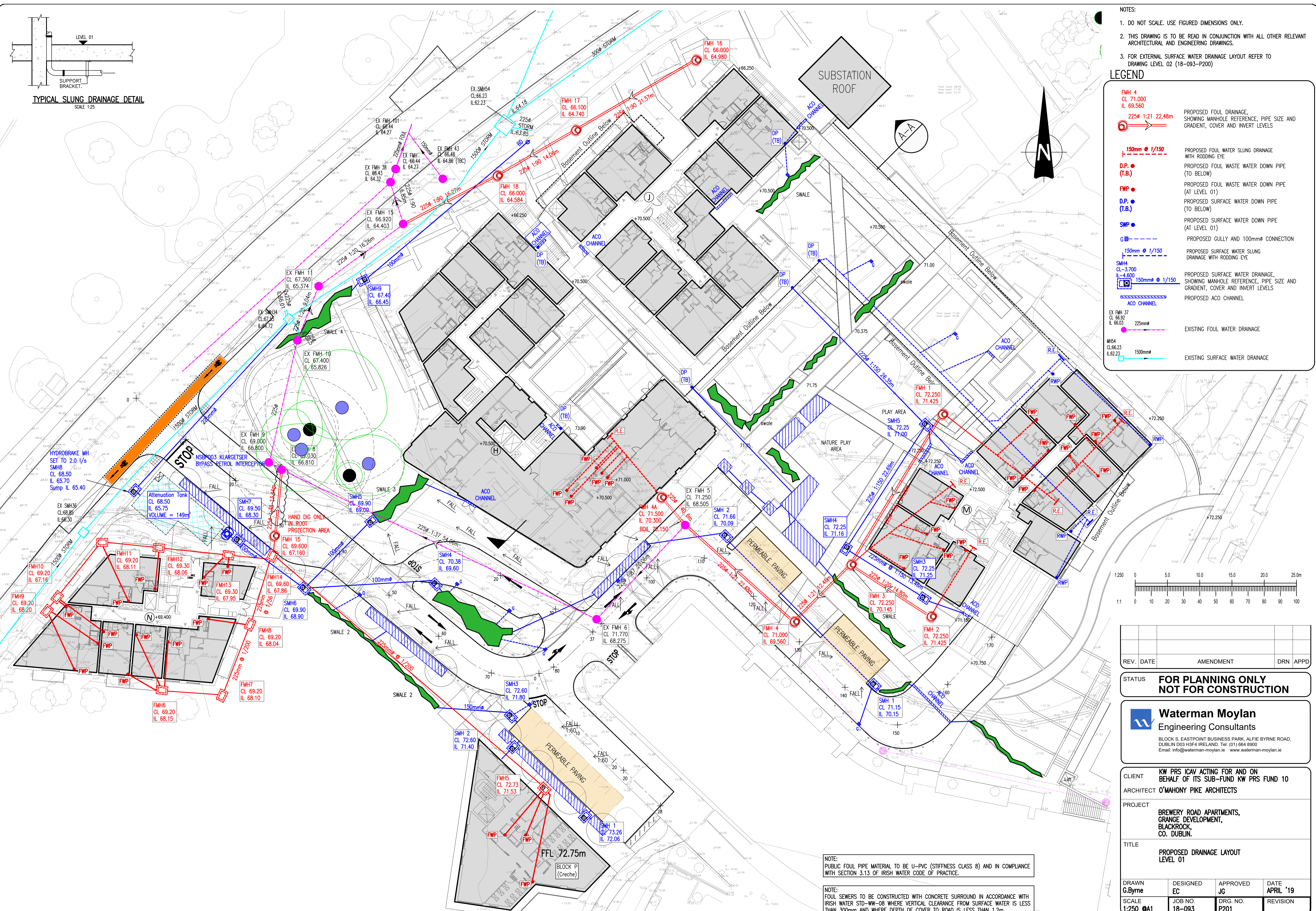


TYPICAL SLUNG DRAINAGE DETAIL
SCALE 1:25

- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
 - FOR EXTERNAL SURFACE WATER DRAINAGE LAYOUT REFER TO DRAWING LEVEL 02 (18-093-P200)

LEGEND

- FMH 4**
CL 71.000
IL 69.560
225ø 1:21 22.48m
PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- 150mm ø 1/150**
PROPOSED FOUL WATER SLUNG DRAINAGE WITH RODDING EYE
- D.P. ●**
PROPOSED FOUL WASTE WATER DOWN PIPE (TO BELOW)
- FWP ●**
PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 01)
- D.P. ● (T.B.)**
PROPOSED SURFACE WATER DOWN PIPE (TO BELOW)
- SWP ●**
PROPOSED SURFACE WATER DOWN PIPE (AT LEVEL 01)
- G**
PROPOSED GULLY AND 100mmø CONNECTION
- 150mm ø 1/150**
PROPOSED SURFACE WATER SLUNG DRAINAGE WITH RODDING EYE
- SMH 4**
CL 73.700
IL 4.600
150mm ø 1/150
PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- ACO CHANNEL**
PROPOSED ACO CHANNEL
- EX FMH 37**
CL 66.92
IL 66.03
225mmø
EXISTING FOUL WATER DRAINAGE
- EX SMH 4**
CL 66.23
IL 62.23
150mmø
EXISTING SURFACE WATER DRAINAGE



REV.	DATE	AMENDMENT	DRN	APPD

STATUS: **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT: KW PRS ICVA ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10
ARCHITECT: O'MAHONY PIKE ARCHITECTS

PROJECT: BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.

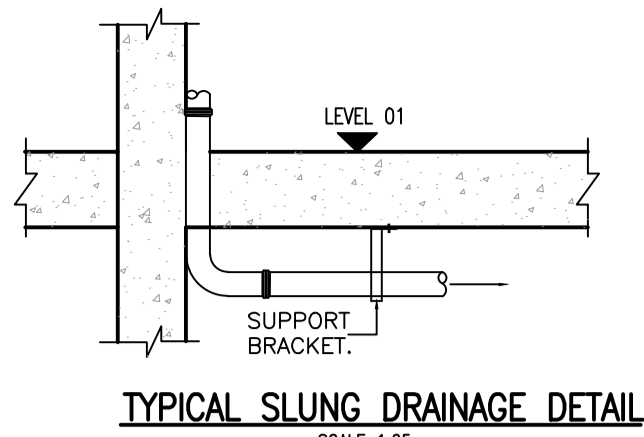
TITLE: PROPOSED DRAINAGE LAYOUT LEVEL 01

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P201	

NOTE: PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE: FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m

Appendix B Site Layout with Stage 1 Audit Findings Highlighted



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
 - FOR EXTERNAL SURFACE WATER DRAINAGE LAYOUT REFER TO DRAWING LEVEL 02 (18-093-P200)

LEGEND

- FMH 4**
CL 71.000
IL 69.560
225ø 1:21 22.48m
PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- 150mm ø 1/150**
PROPOSED FOUL WATER SLUNG DRAINAGE WITH RODDING EYE
- D.P. (T.B.)**
PROPOSED FOUL WASTE WATER DOWN PIPE (TO BELOW)
- FWP**
PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 01)
- D.P. (T.B.)**
PROPOSED SURFACE WATER DOWN PIPE (TO BELOW)
- SWP**
PROPOSED SURFACE WATER DOWN PIPE (AT LEVEL 01)
- G**
PROPOSED GULLY AND 100mmø CONNECTION
- 150mm ø 1/150**
PROPOSED SURFACE WATER SLUNG DRAINAGE WITH RODDING EYE
- SMH 4**
CL 3.700
IL 4.600
150mmø 1/150
PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- ACO CHANNEL**
PROPOSED ACO CHANNEL
- EX FMH 37**
CL 66.92
IL 66.03
225mmø
EXISTING FOUL WATER DRAINAGE
- EX SMH 4**
CL 66.23
IL 62.23
150mmø
EXISTING SURFACE WATER DRAINAGE

2.1.11. Confirm Hydrobrake sizes

2.1.13. Submit details of Attenuation tank

2.1.10. Consider SI to determine water table level

2.1.9. Consider re-locating/Altering swale

2.1.2. Confirm details of Petrol Interceptor

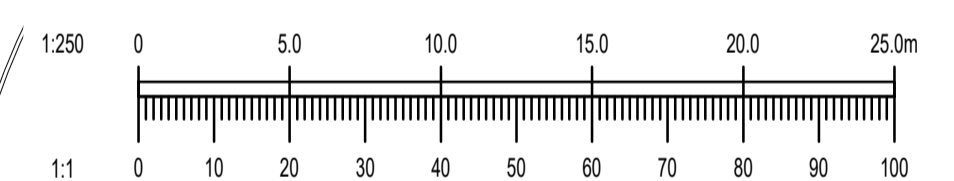
2.1.5. Confirm Discharge Locations

2.1.3. Consider Incorporating Permeable Paving

2.1.8. Confirm are these tree pits

NOTE:
PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE:
FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m



REV.	DATE	AMENDMENT	DRN	APPD

STATUS: **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

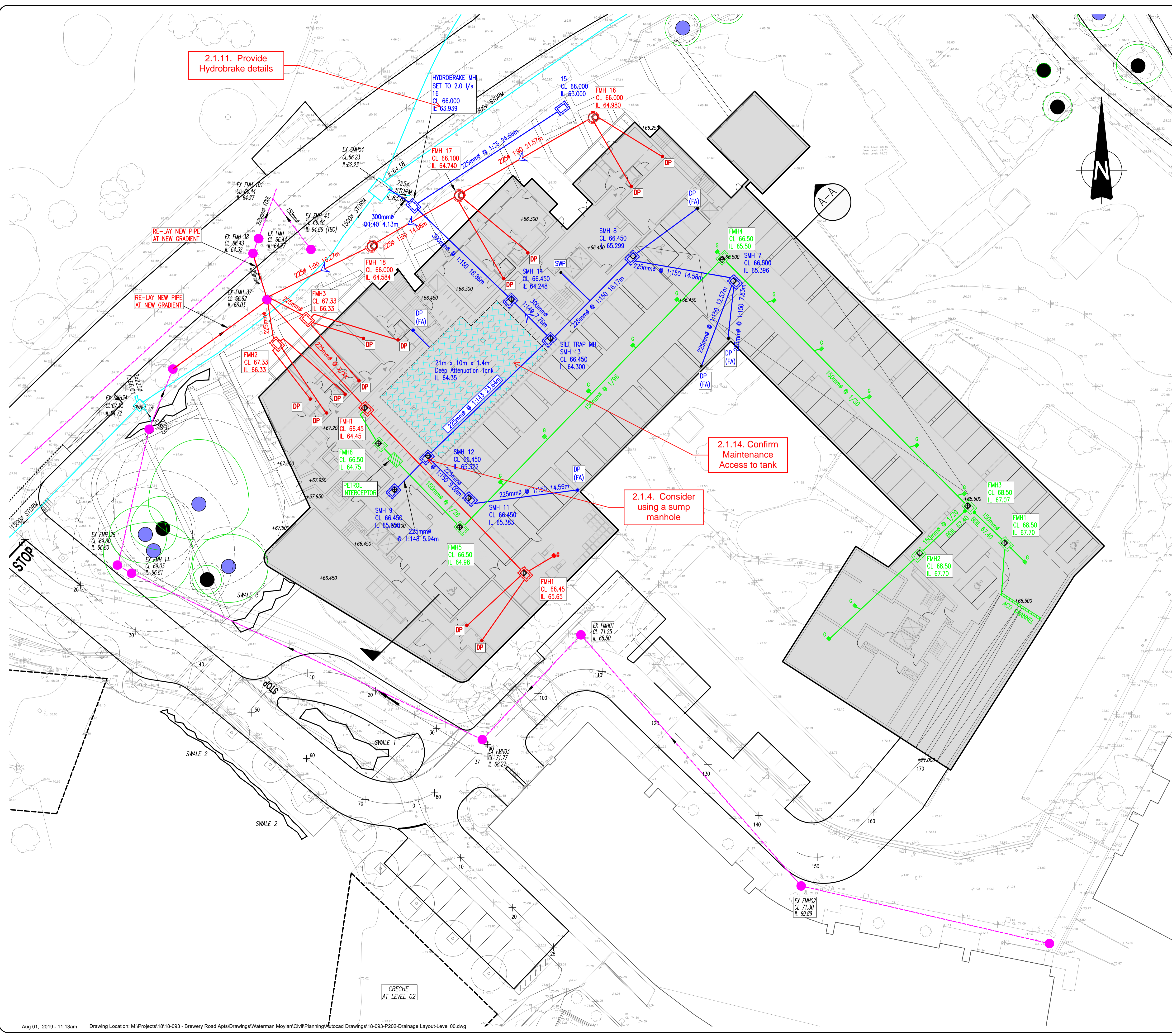
Waterman Moylan
Engineering Consultants
BLOCK 9, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT: KW PRS ICVA ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10
ARCHITECT: O'MAHONY PIKE ARCHITECTS

PROJECT: BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.

TITLE: PROPOSED DRAINAGE LAYOUT LEVEL 01

DRAWN	DESIGNED	APPROVED	DATE
C.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P201	



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

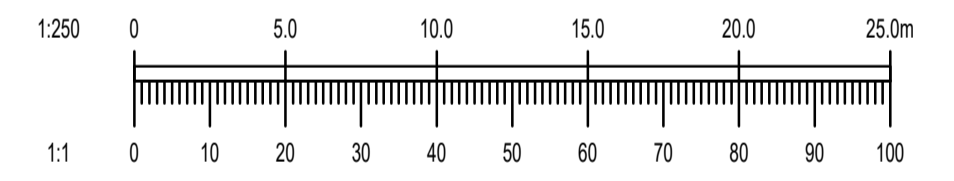
LEGEND

- FMH 16**
CL 66.00
IL 64.98
 225mm @ 1:90 22.48m PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- FMH7**
CL 70.00
IL 68.75
 150mm @ 1/150 PROPOSED FOUL WASTE BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- FMH4**
CL 69.50
IL 68.70
 150mm @ 1/150 PROPOSED CAR PARK BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- D.P.**
(T.B.) PROPOSED FOUL WASTE WATER DOWN PIPE (FROM ABOVE)
- FWP** PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 00)
- G** PROPOSED GULLY AND 100mm@ CONNECTION
- SMH4**
CL -3.700
IL -4.600
 150mm @ 1/150 PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- RWP** PROPOSED RAIN WATER DOWN PIPE (AT LEVEL 00)
- EX FMH 37**
CL 66.92
IL 66.03
 225mm@ EXISTING FOUL WATER DRAINAGE
- MH54**
CL 66.23
IL 62.23
 150mm@ EXISTING SURFACE WATER DRAINAGE
- EX TREE AND ROOT PROTECTION AREA

NOTE: HAND DIG IN ROOT PROTECTION AREAS IN LINE WITH METHOD STATEMENT APPROVED BY AGRICULTURALIST.

NOTE: PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS B) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE: FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m



Ordnance Survey Ireland Licence No. EN 0006018
© Ordnance Survey Ireland/Government of Ireland.

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 8, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 684 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10**

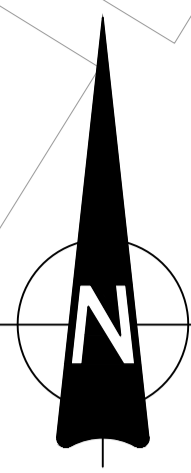
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **PROPOSED DRAINAGE LAYOUT LEVEL 00**

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P202	

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer or copyright holder except as agreed for use on the project for which the document was originally issued.



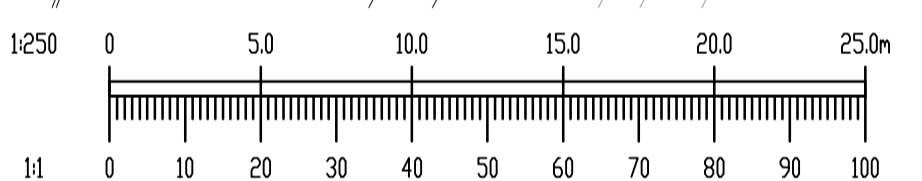
2.1.12. Confirm Green roof Extents

2.1.1. Clarify where these areas drain to

- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

- INDICATES PROPOSED SWALE
- INDICATES PROPOSED GREEN ROOF
- INDICATES PROPOSED PERMEABLE PAVED AREA
- INDICATES PROPOSED TREE PIT
- 486m² INDICATES AREA OF GREEN ROOF / PERMEABLE PAVING



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

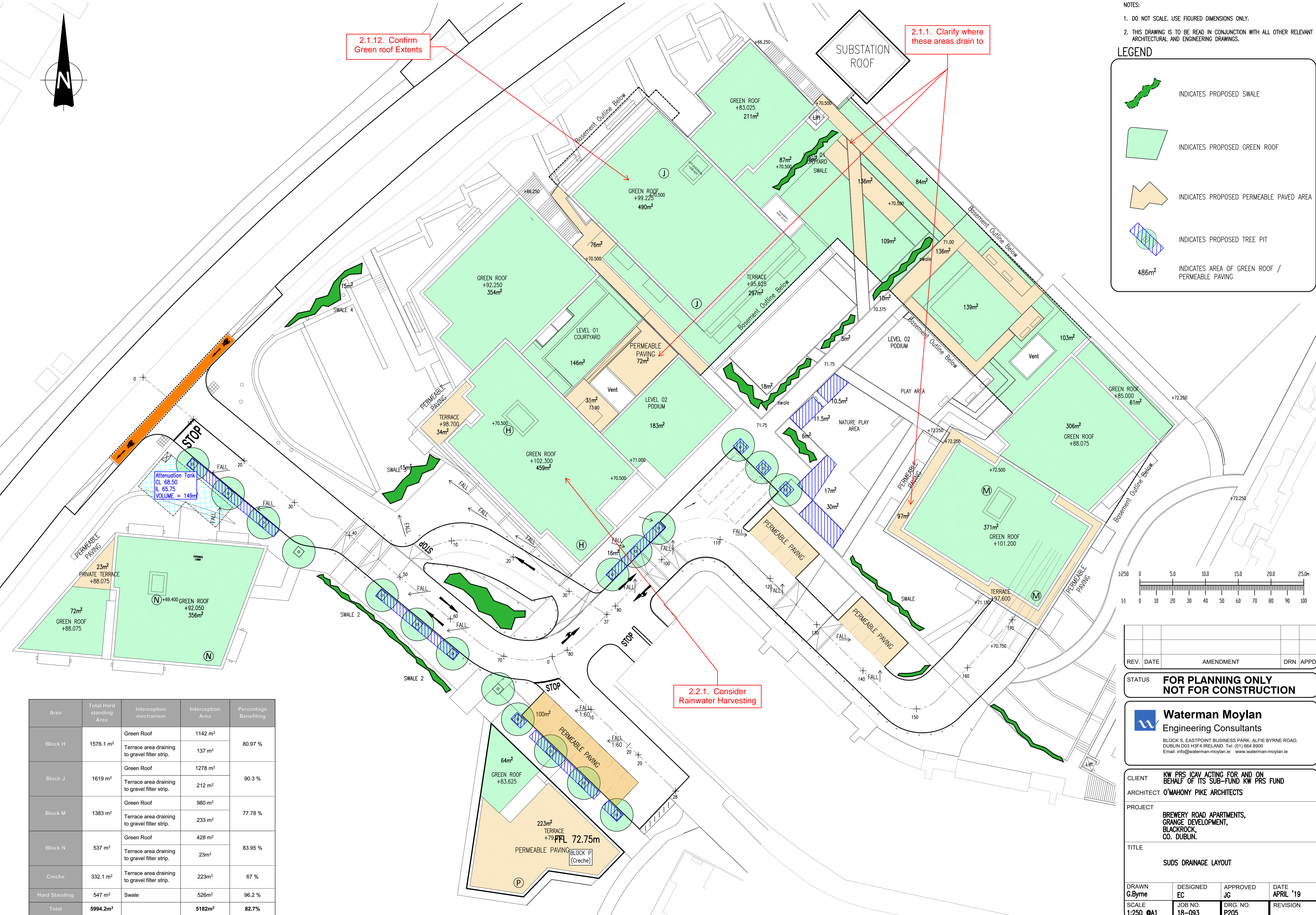
Waterman Moylan
Engineering Consultants
BLOCK 9, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS IC AV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**
PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS DRAINAGE LAYOUT**

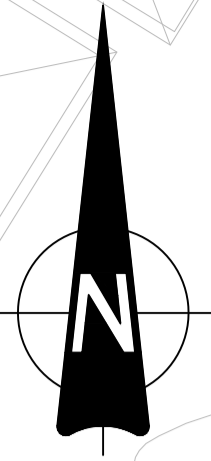
DRAWN C. Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:250 @A1	JOB NO. 18-093	DRG. NO. P205	REVISION

Area	Total Hard standing Area	Interception mechanism	Interception Area	Percentage Benefiting
Block H	1576.1 m ²	Green Roof	1142 m ²	80.97 %
		Terrace area draining to gravel filter strip.	137 m ²	
Block J	1619 m ²	Green Roof	1278 m ²	90.3 %
		Terrace area draining to gravel filter strip.	212 m ²	
Block M	1383 m ²	Green Roof	980 m ²	77.78 %
		Terrace area draining to gravel filter strip.	233 m ²	
Block N	537 m ²	Green Roof	428 m ²	83.95 %
		Terrace area draining to gravel filter strip.	23m ²	
Creche	332.1 m ²	Terrace area draining to gravel filter strip.	223m ²	67 %
Hard Standing	547 m ²	Swale	526m ²	96.2 %
Total	5994.2m²		5182m²	82.7%



2.2.1. Consider Rainwater Harvesting

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer or copyright holder except as agreed for use on the project for which the document was originally issued.

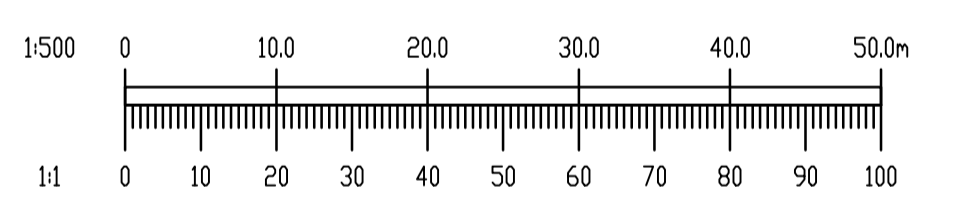
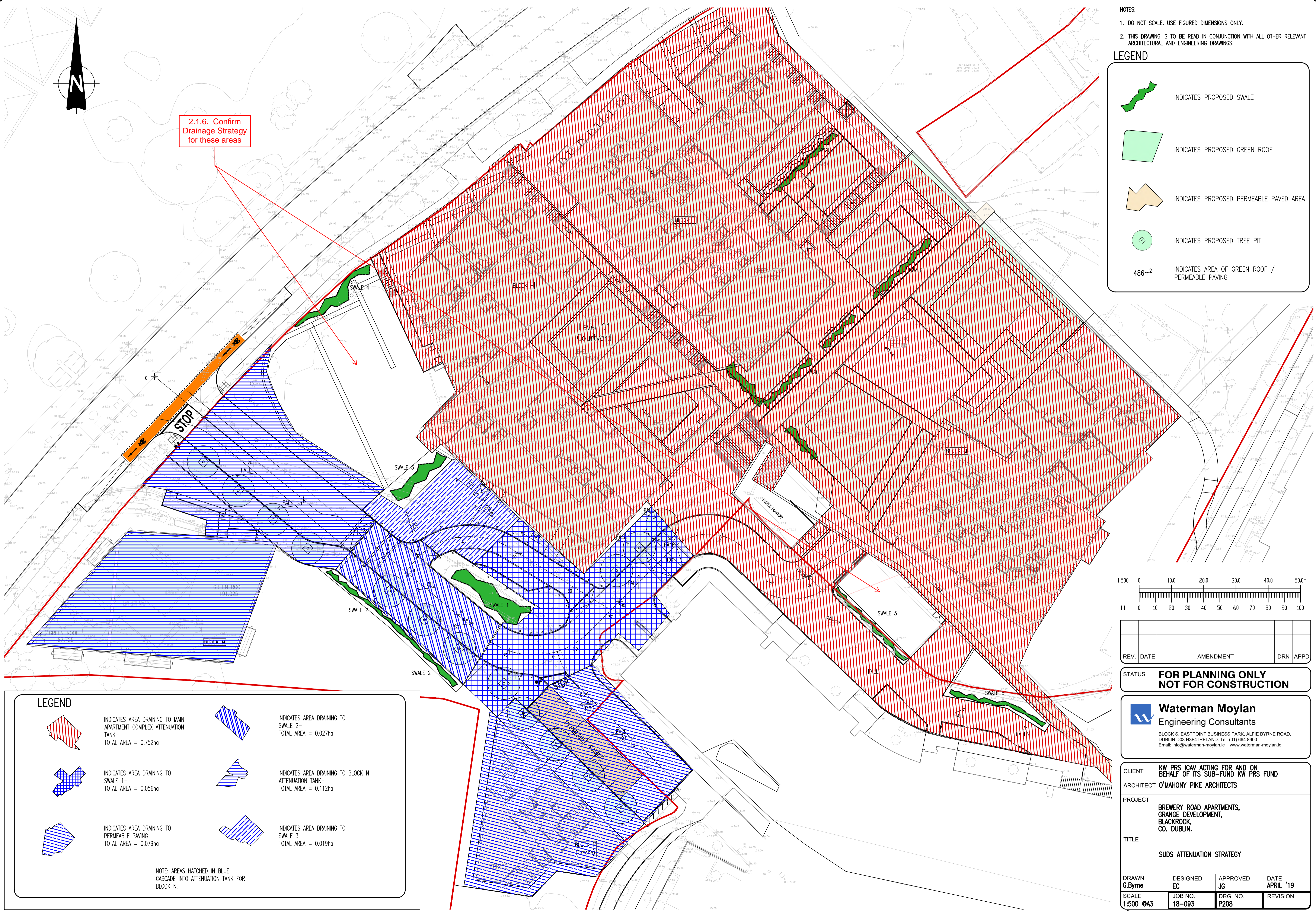


2.1.6. Confirm Drainage Strategy for these areas

- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

- INDICATES PROPOSED SWALE
- INDICATES PROPOSED GREEN ROOF
- INDICATES PROPOSED PERMEABLE PAVED AREA
- INDICATES PROPOSED TREE PIT
- INDICATES AREA OF GREEN ROOF / PERMEABLE PAVING



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK 9, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS IC AV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS,
GRANGE DEVELOPMENT,
BLACKROCK,
CO. DUBLIN.**

TITLE **SUDS ATTENUATION STRATEGY**

DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:500 A3	JOB NO. 18-093	DRG. NO. P208	REVISION

LEGEND

- INDICATES AREA DRAINING TO MAIN APARTMENT COMPLEX ATTENUATION TANK- TOTAL AREA = 0.752ha
- INDICATES AREA DRAINING TO SWALE 2- TOTAL AREA = 0.027ha
- INDICATES AREA DRAINING TO SWALE 1- TOTAL AREA = 0.056ha
- INDICATES AREA DRAINING TO BLOCK N ATTENUATION TANK- TOTAL AREA = 0.112ha
- INDICATES AREA DRAINING TO PERMEABLE PAVING- TOTAL AREA = 0.079ha
- INDICATES AREA DRAINING TO SWALE 3- TOTAL AREA = 0.019ha

NOTE: AREAS HATCHED IN BLUE CASCADE INTO ATTENUATION TANK FOR BLOCK N.

Appendix C Storm Water Audit Feedback Form

STORM WATER AUDIT FEEDBACK FORM

Scheme: Brewery Road Apartments, Stillorgan, Co. Dublin

Area: _____

Audit Stage: 1 Date Audit Completed: 07/08/2019 Our Ref : 192206

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.1.1	Y	Y	The permeable paving indicated on drawing P205 are either at roof level, in which case it will discharge to the green roof build up and the roof drainage system before discharging to the attenuation tank within the basement. The permeable paving on podium level will discharge into high level surface water drainage over the basement level. See "typical outlet on podium" on drawing P207.	Yes
2.1.2	Y	Y	The bypass separator next to block N is the same as that proposed for the basement.	Yes
2.1.3	Y	N	There are several existing services beneath the road and much of the access road is also existing. It is proposed to use permeable paving in the new parking areas as per our drawings however it is not feasible to introduce any additional permeable surface.	Yes
2.1.4	Y	Y	See revised drawing P202 attached. SW12 is also a silt trap manhole.	Yes
2.1.5	Y	Y	ACO channels in question are above the basement level and therefore discharge to the basement attenuation tank via high level basement rainwater pipes. In accordance with the architect's drawings.	Yes
2.1.6	Y	Y	See revised drawing P208 attached. The areas that have not been hatched are planting/green areas which do not require positive draiage.	Yes

STORM WATER AUDIT FEEDBACK FORM

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.1.7	Y	Y	See revised drawing P201 attached.	Yes
2.1.8	Y	Y	The noted areas are tree pits. Please see attached drawing P201 and P205 making this clear.	Yes
2.1.9	N	N	The proposed swale 4 has a lowest invert of 66.25m and the foul pipe running beneath the swale and a highest crown level of 66.05m. Therefore, there is 200mm clearance from the top of the pipe to the invert of the swale.	Yes. However note that Irish Water will need to be consulted to confirm the cover to the foul pipe meets their requirements.
2.1.10	Y	Y	A site investigation has been carried out and although no ground water was found during the investigation, groundwater monitoring pipes were installed, and water was found in all 3 pipes on later inspection. Water was found at a minimum depth of 1.25m BGL therefore all SUDS features will have an impermeable membrane at the base to prevent the ingress of groundwater into the drainage system. The SUDS features will provide attenuation only. See SI attached.	Yes
2.1.11	Y	Y	Please see revised Hydrobreak details, drawings and calculations attached. Hydro-International have confirmed that it is not possible to achieve a 75mm orifice with such a low flow rate therefore a mesh guard, which is installed on the hydrobreak to help prevent blockages, will be specified as standard practice. In addition, Silt trap manholes will be provided prior to the final discharge of the network into the attenuation tank which will reduce the volume of debris entering the tank.	Yes

STORM WATER AUDIT FEEDBACK FORM

PUNCH Consulting Engineers

Paragraph No. in Audit Report	Issue Accepted (Yes/No)	Recommended Measure Accepted (Yes/No)	Alternative Measures (described) [or reason problem not accepted]	Alternative Measures Accepted by Auditors (Yes/No)
2.1.12	Y	Y	The M&E consultant has confirmed that a zone of 1m x 2m is required for smoke extract next to each core. This is the only plant required on the roof. As such the 2m ² for each of the 4 cores totalling 8m ² has been removed from the calculations and this leaves a 70% green roof coverage. Table 5 of the EAR has also been updated to reflect these changes. See updated EAR attached.	Yes
2.1.13	Y	Y	See details of tank outside Block N attached on drawing P211.	Yes
2.1.14	Y	Y	Access can be provided from the cycle parking area for general maintenance. If a large vehicle is required for pumping it can park on Brewery Road and provide a rising main through the ground floor access to the cycle store from Brewery Road.	Yes
2.2.1	Y	N	Rainwater harvesting was considered however it was ruled out in favour of incorporating green roofs in line with DLRCC policy. Incorporating both green roofs and rainwater harvesting is considered cost prohibitive.	Yes

Signed: 

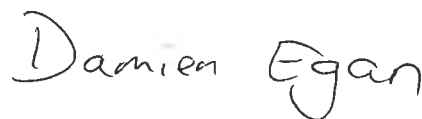
Design Team Project Manager

Date: 15/08/19

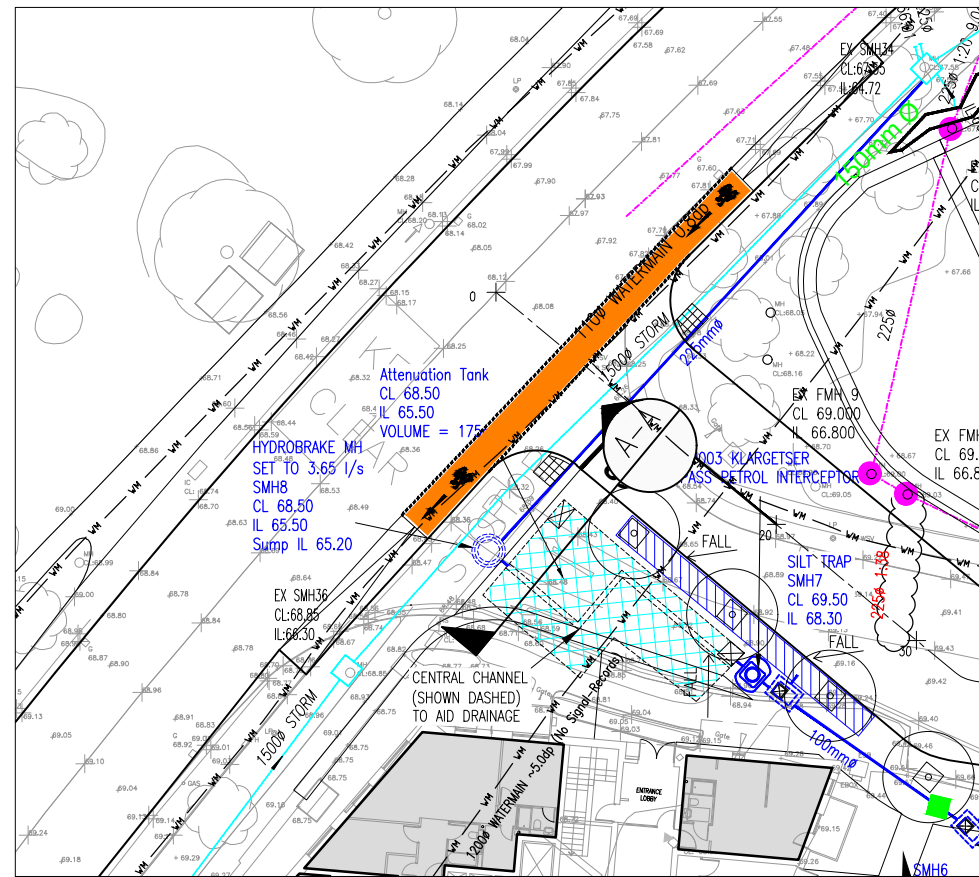
Please complete and return to the auditor

Auditor Signed Off:

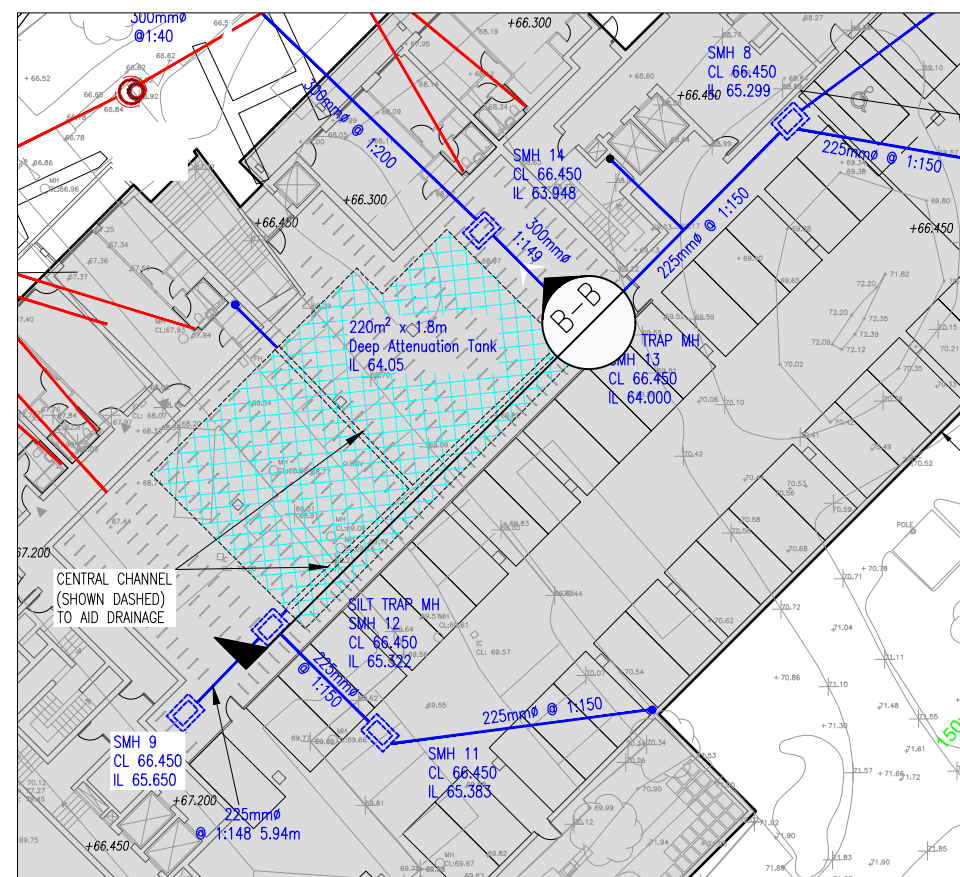
Date: 18/08/19



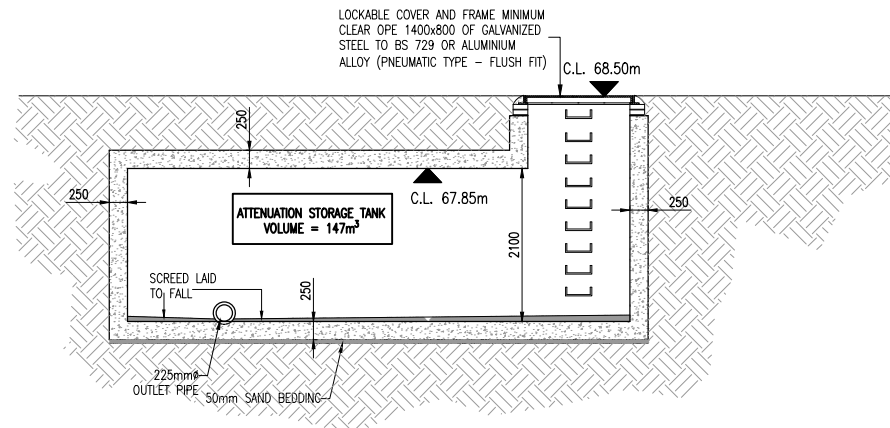
Appendix D Revised Drawings and Documents Examined by the Auditor



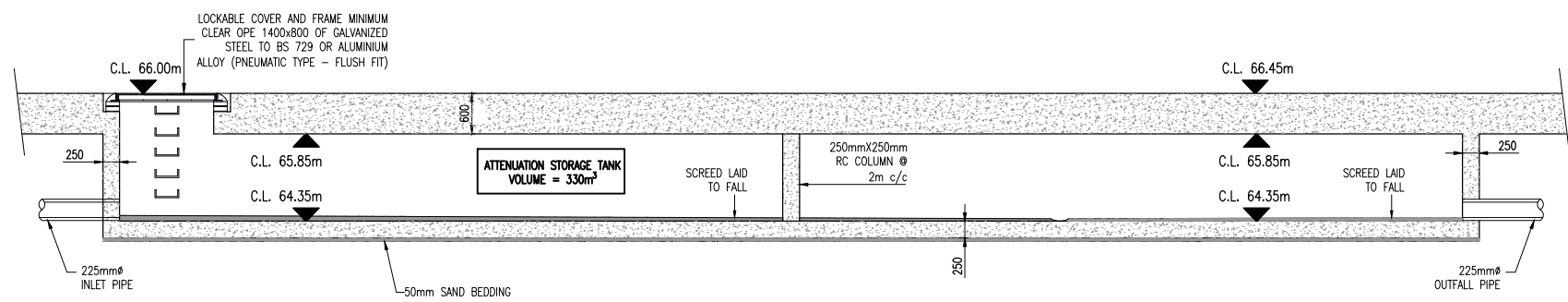
PLAN VIEW – ATTENUATION TANK 1 AT LEVEL 01
SCALE 1:200 @A1



PLAN VIEW – ATTENUATION TANK 2 AT LEVEL 00
SCALE 1:200 @A1

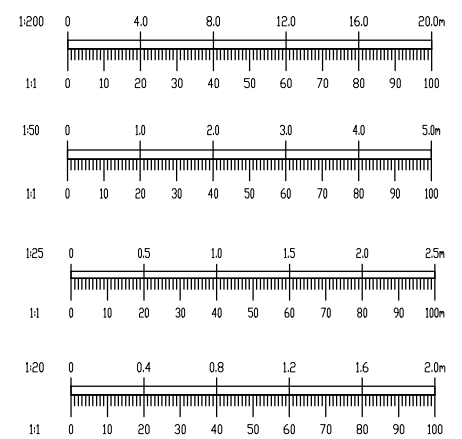


SECTION A-A
THROUGH ATTENUATION STORAGE TANK
SCALE 1:50



SECTION B-B
THROUGH ATTENUATION STORAGE TANK
SCALE 1:50

NOTES:
1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H0F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

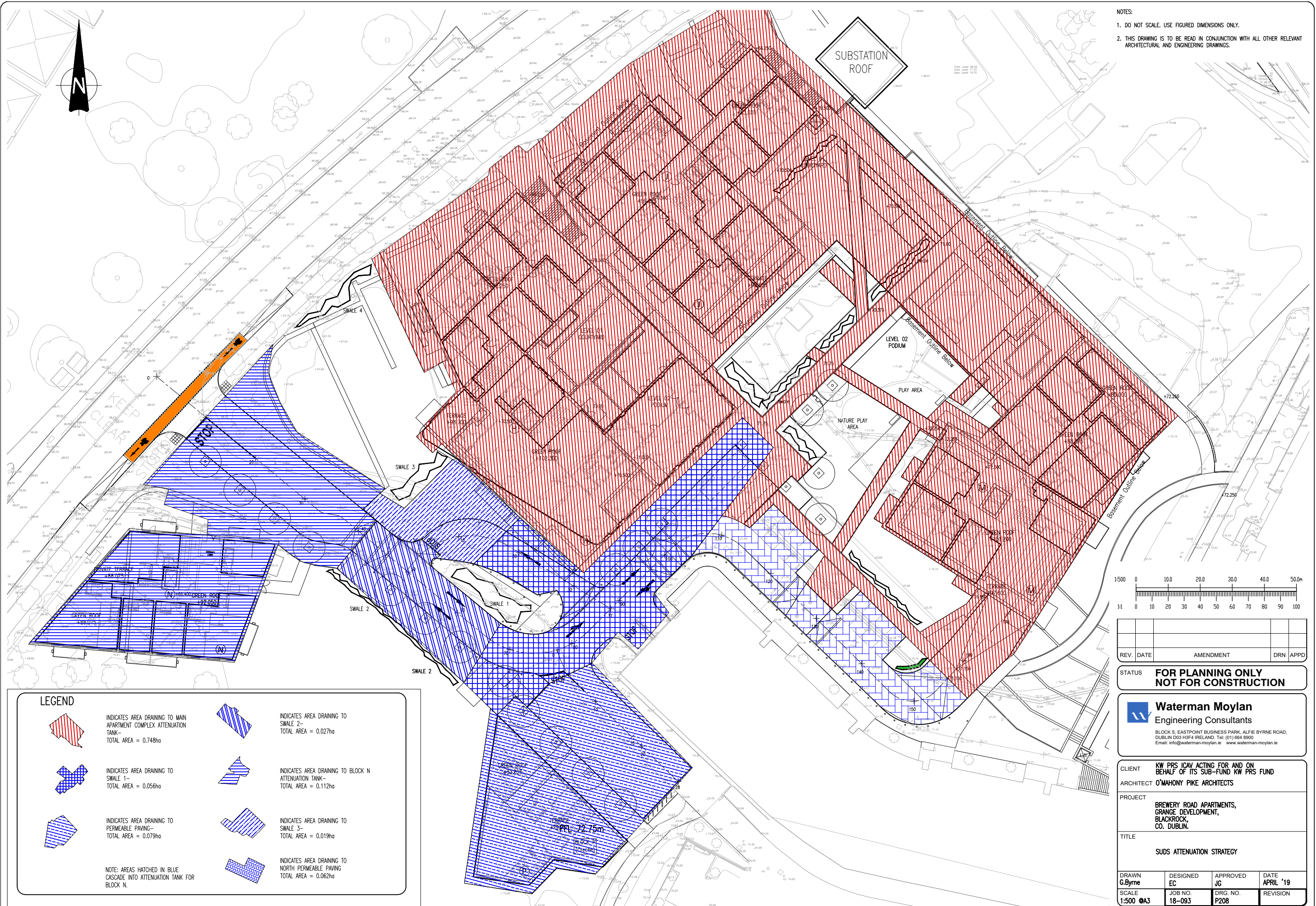
CLIENT **KW PRS ICVA ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **ATTENUATION DETAILS**

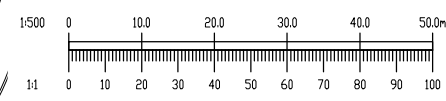
DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:200 @A1	JOB NO. 18-093	DRG. NO. P211	REVISION

- NOTES:
1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



LEGEND

	INDICATES AREA DRAINING TO MAIN APARTMENT COMPLEX ATTENUATION TANK- TOTAL AREA = 0.748ha		INDICATES AREA DRAINING TO SWALE 2- TOTAL AREA = 0.027ha
	INDICATES AREA DRAINING TO SWALE 1- TOTAL AREA = 0.056ha		INDICATES AREA DRAINING TO BLOCK N ATTENUATION TANK- TOTAL AREA = 0.112ha
	INDICATES AREA DRAINING TO PERMEABLE PAVING- TOTAL AREA = 0.079ha		INDICATES AREA DRAINING TO SWALE 3- TOTAL AREA = 0.019ha
NOTE: AREAS HATCHED IN BLUE CASCADE INTO ATTENUATION TANK FOR BLOCK N.			INDICATES AREA DRAINING TO NORTH PERMEABLE PAVING TOTAL AREA = 0.062ha



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

Waterman Moylan
Engineering Consultants
BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H0F4 IRELAND. Tel: (01) 654 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICAY ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

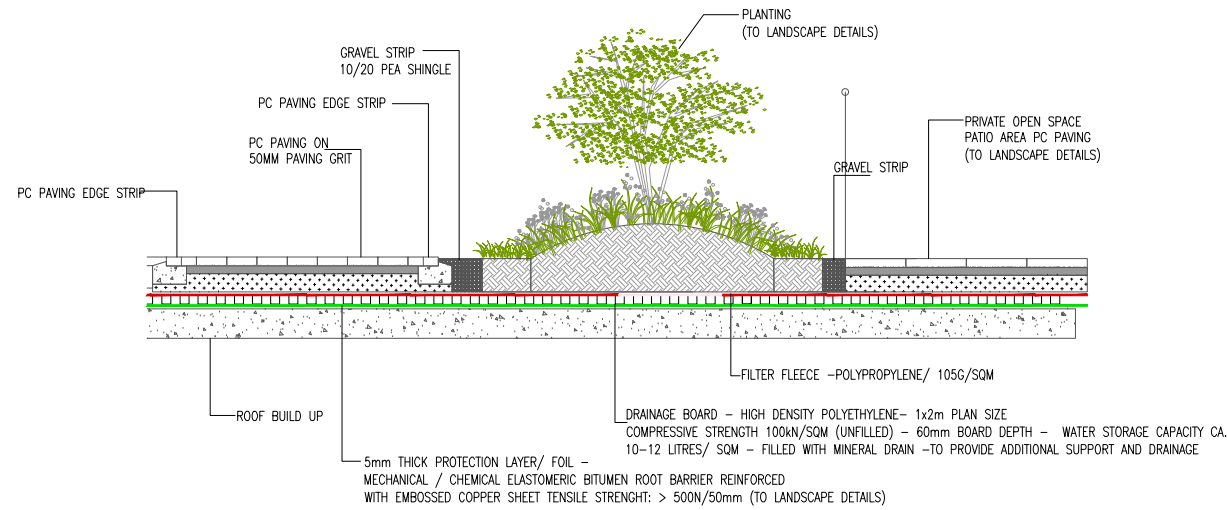
PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS ATTENUATION STRATEGY**

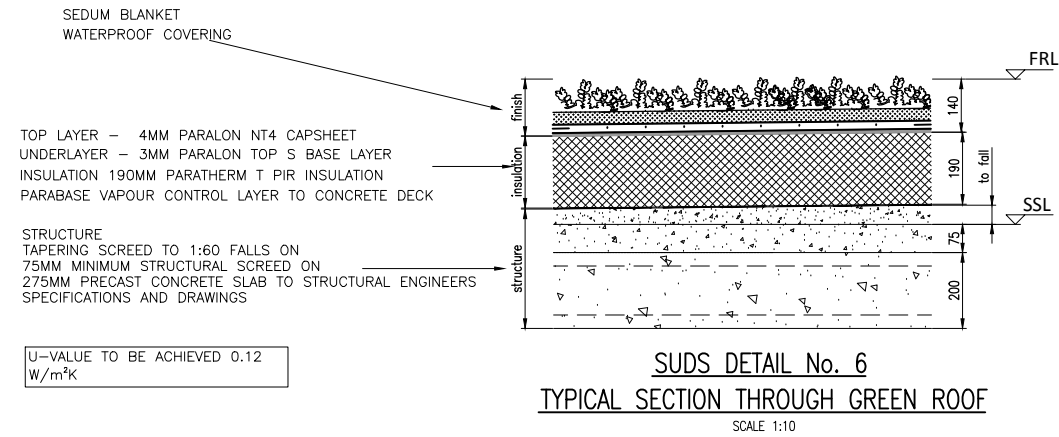
DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:500 @A3	JOB NO. 18-093	DRG. NO. P208	REVISION

NOTES:

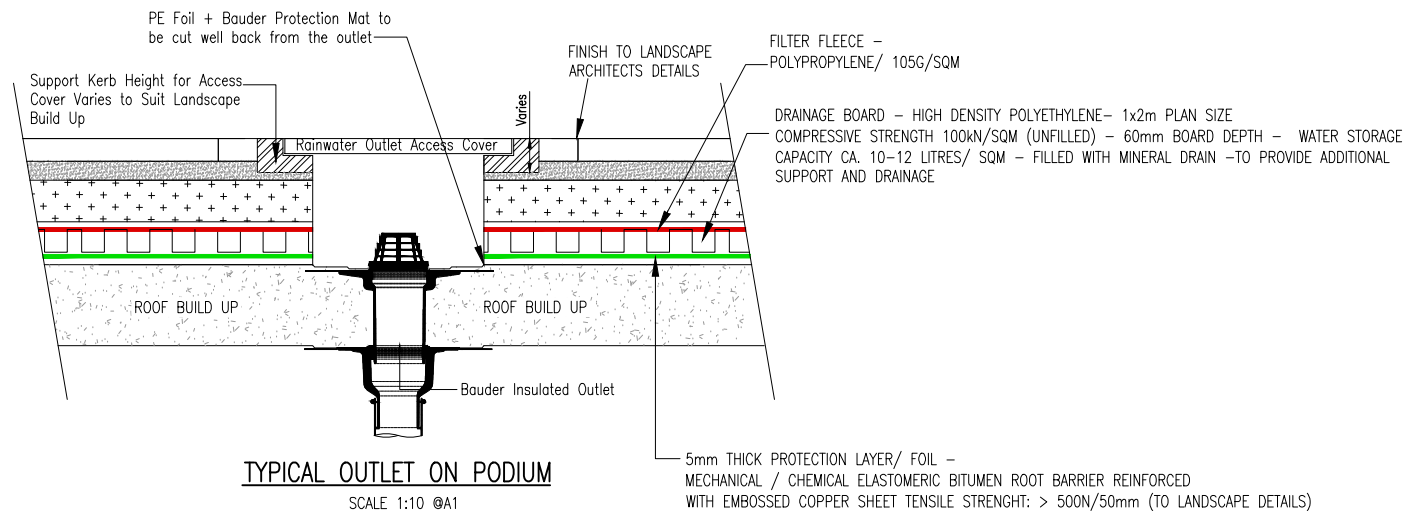
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



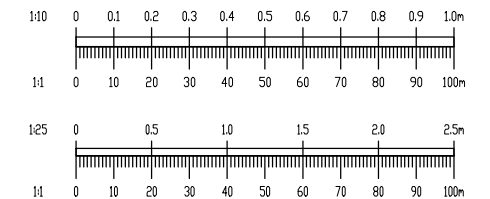
SUDS DETAIL
TYPICAL SECTION THROUGH TREE PIT
SCALE 1:25



SUDS DETAIL No. 6
TYPICAL SECTION THROUGH GREEN ROOF
SCALE 1:10



TYPICAL OUTLET ON PODIUM
SCALE 1:10 @A1



REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY**
NOT FOR CONSTRUCTION

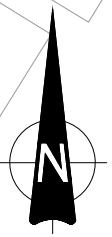
Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICAV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS DRAINAGE DETAILS SHEET 2 OF 2**

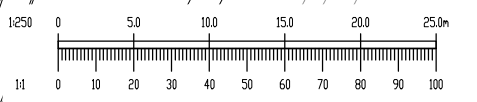
DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE AS SHOWN @A1	JOB NO. 18-093	DRG. NO. P207	REVISION



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

- INDICATES PROPOSED SWALE
- INDICATES PROPOSED GREEN ROOF
- INDICATES PROPOSED PERMEABLE PAVED AREA
- INDICATES PROPOSED TREE PIT
- 486m² INDICATES AREA OF GREEN ROOF / PERMEABLE PAVING



Area	Total hard standing Area	Interception mechanism	Interception Area	Percentage Benefiting
Block H	1576.1 m ²	Green Roof	1142 m ²	80.97 %
		Terrace area draining to gravel filter strip.	137 m ²	
Block J	1619 m ²	Green Roof	1278 m ²	90.3 %
		Terrace area draining to gravel filter strip.	212 m ²	
Block M	1383 m ²	Green Roof	980 m ²	77.78 %
		Terrace area draining to gravel filter strip.	233 m ²	
Block N	537 m ²	Green Roof	428 m ²	83.95 %
		Terrace area draining to gravel filter strip.	23m ²	
Creche	332.1 m ²	Terrace area draining to gravel filter strip.	223m ²	67 %
Hard Standing	547 m ²	Swale / Tree Pits	526m ²	96.2 %
Total	5994.2m²		5182m²	82.7%

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

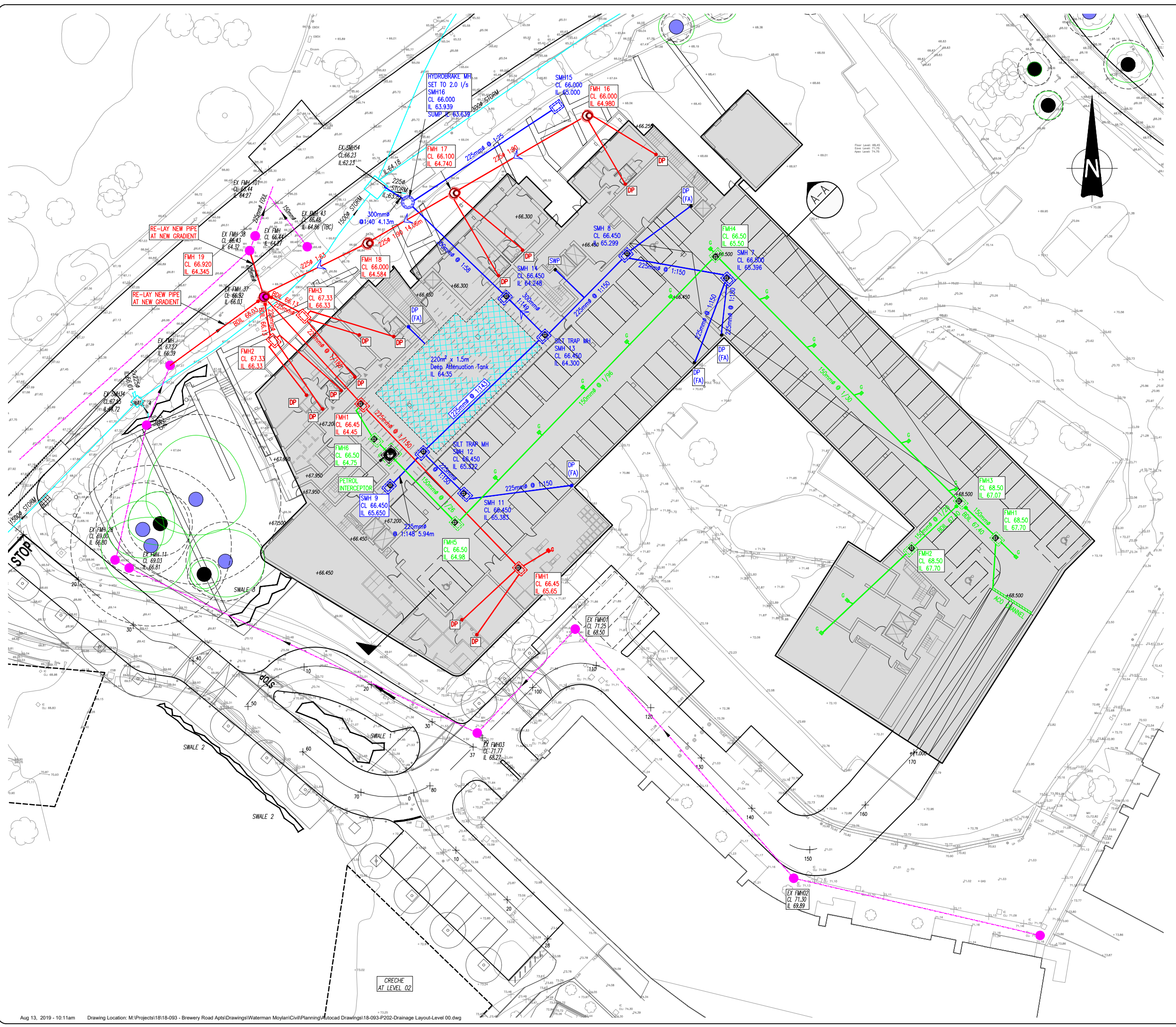
Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICV ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND**
ARCHITECT **O'MAHONY PIKE ARCHITECTS**
PROJECT **BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.**

TITLE **SUDS DRAINAGE LAYOUT**

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P205	

© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer as copyright holder except as agreed for use on the project for which the document was originally issued.



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

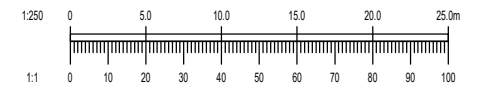
LEGEND

- FMH 16**
CL 66.00
IL 64.98
 225# 1:90 22.48m PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- FMH7**
CL 70.00
IL 68.75
 150mm# @ 1/150 PROPOSED FOUL WASTE BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- FMH4**
CL 69.50
IL 68.70
 150mm# @ 1/150 PROPOSED CAR PARK BASEMENT DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- D.P.**
(T.B.) PROPOSED FOUL WASTE WATER DOWN PIPE (FROM ABOVE)
- FWP** PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 00)
- G** PROPOSED GULLY AND 100mm# CONNECTION
- SMH4**
CL -3.700
IL -4.600
 150mm# @ 1/150 PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- RWP** PROPOSED RAIN WATER DOWN PIPE (AT LEVEL 00)
- EX FMH 37**
CL 66.92
IL 66.03
 225mm# EXISTING FOUL WATER DRAINAGE
- EX SMH4**
CL 66.23
IL 62.23
 150mm# EXISTING SURFACE WATER DRAINAGE
- EX TREE AND ROOT PROTECTION AREA

NOTE: HAND DIG IN ROOT PROTECTION AREAS IN LINE WITH METHOD STATEMENT APPROVED BY AGRICULTURALIST.

NOTE: PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE: FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m



Ordnance Survey Ireland Licence No. EN 0006018
© Ordnance Survey Ireland/Government of Ireland.

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **KW PRS ICV ACTING FOR AND ON
BEHALF OF ITS SUB-FUND KW PRS FUND 10**

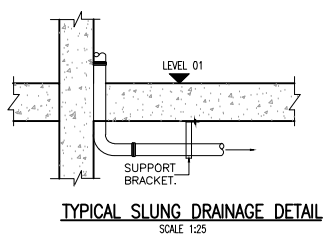
ARCHITECT **O'MAHONY PIKE ARCHITECTS**

PROJECT **BREWERY ROAD APARTMENTS,
GRANGE DEVELOPMENT,
BLACKROCK,
CO. DUBLIN.**

TITLE **PROPOSED DRAINAGE LAYOUT
LEVEL 00**

DRAWN G.Byrne	DESIGNED EC	APPROVED JG	DATE APRIL '19
SCALE 1:250 @A1	JOB NO. 18-093	DRG. NO. P202	REVISION

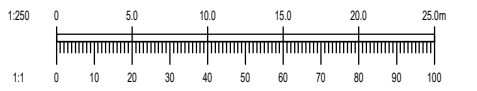
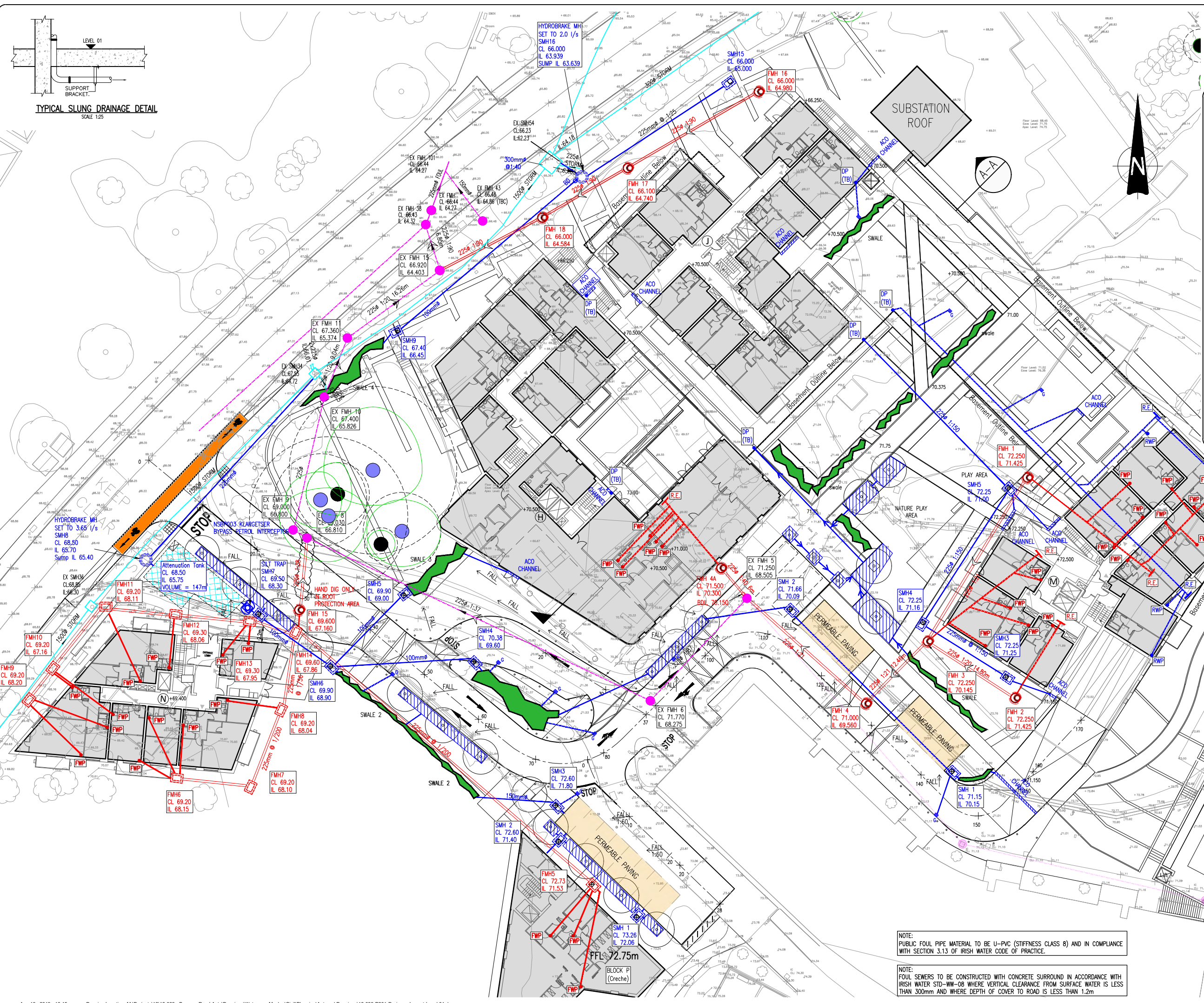
© 2017. This drawing is copyright. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission of the consulting engineer in copyright notice except as agreed for use on the project for which the document was originally issued.



- NOTES:
- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
 - FOR EXTERNAL SURFACE WATER DRAINAGE LAYOUT REFER TO DRAWING LEVEL 02 (18-093-P200)

LEGEND

- PROPOSED FOUL DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- PROPOSED FOUL WATER SLUNG DRAINAGE WITH RODDING EYE
- PROPOSED FOUL WASTE WATER DOWN PIPE (TO BELOW)
- PROPOSED FOUL WASTE WATER DOWN PIPE (AT LEVEL 01)
- PROPOSED SURFACE WATER DOWN PIPE (TO BELOW)
- PROPOSED SURFACE WATER DOWN PIPE (AT LEVEL 01)
- PROPOSED GULLY AND 100mm ϕ CONNECTION
- PROPOSED SURFACE WATER SLUNG DRAINAGE WITH RODDING EYE
- PROPOSED SURFACE WATER DRAINAGE, SHOWING MANHOLE REFERENCE, PIPE SIZE AND GRADIENT, COVER AND INVERT LEVELS
- PROPOSED ACO CHANNEL
- EXISTING FOUL WATER DRAINAGE
- EXISTING SURFACE WATER DRAINAGE
- INDICATES PROPOSED SWALE
- INDICATES PROPOSED PERMEABLE PAVED AREA
- INDICATES PROPOSED TREE PIT



REV.	DATE	AMENDMENT	DRN APPD

STATUS: **FOR PLANNING ONLY
NOT FOR CONSTRUCTION**

Waterman Moylan
Engineering Consultants
BLOCK 5, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT: KW PRS ICAY ACTING FOR AND ON BEHALF OF ITS SUB-FUND KW PRS FUND 10
ARCHITECT: O'MAHONY PIKE ARCHITECTS
PROJECT: BREWERY ROAD APARTMENTS, GRANGE DEVELOPMENT, BLACKROCK, CO. DUBLIN.

TITLE: PROPOSED DRAINAGE LAYOUT LEVEL 01

DRAWN	DESIGNED	APPROVED	DATE
G.Byrne	EC	JG	APRIL '19
SCALE	JOB NO.	DRG. NO.	REVISION
1:250 @A1	18-093	P201	

NOTE: PUBLIC FOUL PIPE MATERIAL TO BE U-PVC (STIFFNESS CLASS 8) AND IN COMPLIANCE WITH SECTION 3.13 OF IRISH WATER CODE OF PRACTICE.

NOTE: FOUL SEWERS TO BE CONSTRUCTED WITH CONCRETE SURROUND IN ACCORDANCE WITH IRISH WATER STD-WW-08 WHERE VERTICAL CLEARANCE FROM SURFACE WATER IS LESS THAN 300mm AND WHERE DEPTH OF COVER TO ROAD IS LESS THAN 1.2m