

**Drainage Design Report
for Electric Vehicle fast-charging hub & Coffee drive-thru
facility at Tothenhill, Rathcoole, Co. Dublin.**

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2.0 Surface Water Design

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1 Foul Drainage

The proposed Foul Drainage Network for this site is illustrated on Drawing Number P3644-C004.

The main design features of this site are as follows:

- The foul discharge from the proposed site will discharge into the existing foul network from the adjacent service station. The existing 24-hour foul holding tank and associated EPS packaged pumping station will be relocated as part of the works. Details of the EPS pumping station are presented in Appendix A of this report.
- The following cover will be provided to all Foul Pipes:
 - 1200mm - Pipes under trafficked areas
 - 900mm - Pipes under footpaths
 - 600mm - Pipes within landscape areas

Where insufficient cover is available the pipes will be encased in lean mix concrete.

- The network has been designed in accordance with Section 3 of *“Recommendations for Site Developments Works for Housing Areas”* by the DoELG and the EPA's Wastewater Treatment Manual *“Treatment Systems for Small Communities, Business, Leisure Centres and Hotels”*.
- No foul drainage will discharge into the surface water system. There are no proposed combined sewers on the site.

2 Surface Water Drainage

The proposed Surface Water Drainage Network for this site is illustrated on Drawing Number P3644-C004.

The existing network has been modelled (pipe sizes, gradients etc) using the *Micro-Drainage Software Package*. The main design features on this site are as follows:

- The network has been designed (pipe sizes, gradients etc.) using 'BS EN 752: 2008 Drain and Sewer Systems outside buildings' and Building Regulations 2010, TGD Part H.
- As part of the revamp works, the following cover will be provided to all Surface Water Pipes:
 - 1200mm - Pipes under trafficked areas
 - 900mm - Pipes under footpaths
 - 600mm - Pipes within landscape areas

Where insufficient cover is available the pipes will be encased in lean mix concrete.

- No surface water / rainwater will discharge into the foul sewer system. There is no proposed combined sewer on the site.
- The Service Stations Drainage system has also been designed in accordance with the principles of *Sustainable Urban Drainage* and in compliance with the principles outlined in the *Greater Dublin Strategic Drainage Study*. An assessment was carried out from www.irishsuds.ie and the following suitable SuDS components were identified as being suitable for the site in question:
 - Attenuation Tank System
- The Micro-Drainage calculations for the surface water network are presented in Appendix A of this report. The attenuation tank has been sized to cater for the 1:1, 1:30 and 1:100 year storm, all with 10% climate change applied.
- A Hydrobrake flow control device will be fitted to the outlet of the attenuation tank to ensure that the maximum surface water discharge from this site will be limited to 2.0 litres per second.

3 Water Supply

As part of this development, it is proposed to use the existing metered mains water supply from the adjacent service station.

24-hour building supply water tank will be located within the storeroom of the proposed building.

4 Flood Risk Assessment

JBA Consulting Engineers undertook a full Flood Risk Assessment and Section 50 Consent Application in June 2016. This was submitted under planning file ref. SD16A/0280. The proposed development site is within the bounds the JBA 2016 report – see figure 2.1.

A Flood Risk Assessment (FRA) and a Section 50 (application to the OPW for the culverting of a watercourse) consent application was undertaken by JBA Consulting in June 2016 to accompany planning application reference number SD16A/0280.

The FRA was completed to identify, quantify, and communicate to all stakeholders the risk of flooding to land, property and people and the measures that would be recommended to manage the risk.

The extent and scope of the FRA included the lands which are the subject of application.

Approximately 30% of the Applegreen site was found to within the Flood Zone B (at moderate risk of flooding). Mitigation of the flood risk was achieved by the design of a new culvert. The proposed culvert through the site was designed to convey the Section 50 flows. The capacity of the culvert can convey the 0.1% annual exceedance probability (AEP) flow without any surcharging. The JBA FRA Report concluded that, following the construction of the culvert, the site would be protected beyond the 0.1% AEP, the site would be no longer at risk of flooding and there would be no negative impacts on the surrounding sites.

The culvert was installed in early 2018 as part of the redevelopment of the Service Station.

Appendix A EPS Pumping Station O&M Manual



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Operating and Maintenance Manual

Rathcoole Apple Green Foul Pump Station

Date	Status	Rev	Compiled By	Comments
July 2018		1	GB	

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Important Maintenance Notes

Before maintenance or repair disconnect the equipment from the power supply to avoid accidental start up! Always refer to the Manufacturers Operating and Maintenance Manual.

All work must be carried out safely. Personal Protection Equipment to be worn at all times.

Identify any hazards associated with the work to be carried out and the area in which the work is to be carried out before commencing any work. It is important that safety procedures, regulations and precautions are adhered to.

Only skilled and trained personnel are allowed to perform any maintenance or repair work on any of the equipment in the plant.

Before proceeding with any maintenance or repair work, ensure that all relevant persons are made aware of the time and nature of any work involved by issuing a "permit to work" form and receiving permission to proceed from the proper authority.

The equipment supplied comprises of moving parts and may start automatically without warning. Make sure that the equipment item to be worked on is fully powered off, isolated and made safe prior to any work commencing. Do not work on any equipment in motion under any circumstances.

Some items of equipment will generate heat and pressure while operating. Therefore time must be allowed for this equipment to become properly cooled before commencing work.

Gas detection equipment and safety harnesses must be worn before entering sumps or tanks.

All work on equipment must be carried out under the manufacturers instruction and recommendations.

There should be no smoking, consumption/storage of food or the use of mobile phones in restricted areas.

The above recommendations are applicable to all items of plant but should not be regarded as complete. Local Health and Safety Committees, Regulations and Procedures should be made available to all personnel and adhered to.

The observance and implementation of Health and Safety measures is of mutual benefit to oneself, ones colleagues, to the plant/process equipment and allows for the safe and efficient completion of the operation and/or work involved.



Health and Safety Recommendations

- Refer to appropriate Instruction Manual before attempting to install, maintain or operate any machinery. Safety precautions, general regulations and guidelines apply.
- Wear suitable protective clothing at all times as recommended in the operating manual.
- Wear suitable hearing protection when working in the vicinity of noisy machinery.
- Do not operate any part of the machine without all protective guards in position.
- Do not attempt to carry out any maintenance work until all electrical components have been properly isolated.
- Do not leave electrical components live and unattended without a suitable warning notice.
- Ensure that maintenance work on machines handling toxic materials is carried out in a well-ventilated atmosphere, where toxic fumes can be purged. Follow the strict guidelines for storage and handling of any toxic or hazardous equipment and materials.
- Observe all necessary fire precautions.
- Ensure all relief valves and other safety devices are kept operative and tested regularly.



Health and Safety

1. The equipment supplied comprises moving parts and may start automatically, and without warning. There is therefore a risk of injury unless correct Safety Precautions are taken and the following should then be adhered to before any maintenance, rectification work, cleaning etc. is carried out.
2. Only trained/competent and qualified operators, tradesmen and/or engineers as appropriate should carry out all work on, and all operation of the plant.
3. When effecting maintenance or operating in hazardous areas i.e. chambers, channels, pump wells etc, it is important those safety procedures and regulations are adhered to.
4. Before effecting maintenance on a particular item of equipment it must be made safe.
5. Protective guards must not be removed until the equipment has been isolated as above. Guards must be refitted correctly before restarting the plant/equipment.
6. Safety devices employed eg. bells, lights, sirens, etc. should be tested and checked for correct operation not less than once a month interval.
7. Where special repair or maintenance work is so located that the construction of a platform or ladder is required on a temporary basis to diminish the risk of injury, then such structures should be provided.
8. Life jackets and safety harness must be worn before entering the sumps.
9. The above basic recommendations are applicable to all items of plant but should not be regarded as complete. All local Health and Safety Committees, Regulations and Procedures should be followed.
10. The observance and implementation of Health and Safety measures is of mutual benefit to oneself, ones colleagues, to the plant/process equipment and allows for the safe and efficient completion of the operation and/or work involved.



Health and Safety

Please be advised that the following pages relating to Safety are general recommendations only.

To operate the facility correctly a full risk assessment must be carried out by the owner and operator of the site.

The Health, Safety and Welfare at work act and all statutory Instruments and accompanying legislation must be adhered to in the work place.

The following guidelines apply

- Keep a clean and tidy site, good housekeeping is essential
- Observe safety measures.
- Keep dates and records of all maintenance procedures.
- Date and record faults and any unusual occurrences.
- Maintain all equipment as described in the manufacture's instructions.
- Establish a routine for inspection and general maintenance.
- Record all process changes, setpoints changes, analyses and results.

Implementing all instructions described herein shall ensure an efficient operating plant.



Equipment Installed

Pump Station

A two Pump Pump Station has been installed. The Pumps are controlled Via a local control panel mounted a green kiosk near the sump. The control panel is feed from a distribution board in the main building.

Floats have been installed in the sump for level control, High level alarm and low level inhibit.



Manufactures Installation Operating and Maintenance Manuals

EQUIPMENT	MAKE/MODEL	RATING/INFO
Pump 1	Zenit DG200/80/4	6l/s @ 5m head
Pump 2	Zenit DG200/80/4	6l/s @ 5m head
Pump Start level float Switch Pump Sump	Mac3	N/A
Low Level inhibit float Switch Pump Sump	Mac3	N/A
Pump Stop level float Switch Pump Sump	Mac3	N/A
Pump sump high level alarm float Switch	Mac3	N/A



Commissioning Sheets Attached


C1 High level float
C2 Low level float
C3 Start float
C4 Stop float
C5 Pump one
C6 Pump two



Documents Attached

M1 Float Switch Manual
M2 Control panel drawings
M3 Pump Manual

Appendix B Surface Water Drainage Design Calculations

J A Gorman Consulting Engineers		Page 1
Unit 1 Block B Forest Park Mullingar Co Westmeath Ireland	AG Rathcoole SW Design	
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XP Solutions	Network 2019.1	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.000	21.820	0.145	150.5	0.018	5.00	0.600	o	225	Pipe/Conduit
1.001	23.295	0.155	150.0	0.061	0.00	0.600	o	225	Pipe/Conduit
2.000	7.186	0.048	149.7	0.044	5.00	0.600	o	225	Pipe/Conduit
1.002	17.230	0.115	150.0	0.007	0.00	0.600	o	225	Pipe/Conduit
3.000	4.344	0.029	149.8	0.014	5.00	0.600	o	225	Pipe/Conduit
3.001	2.760	0.018	153.3	0.011	0.00	0.600	o	225	Pipe/Conduit
1.003	3.664	0.024	150.0	0.000	0.00	0.600	o	225	Pipe/Conduit
1.004	16.431	0.011	1493.7	0.000	0.00	0.600	o	300	Pipe/Conduit
1.005	2.291	0.015	150.0	0.000	0.00	0.600	o	225	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
1.000	1	126.677	125.227	1.225	126.633	125.082	1.326		1200
1.001	2	126.633	125.082	1.326	126.531	124.927	1.379		1200
2.000	3	126.599	124.975	1.399	126.531	124.927	1.379		1200
1.002	4	126.531	124.927	1.379	126.638	124.812	1.601		1200
3.000	5	126.839	125.246	1.368	126.813	125.217	1.371		1200
3.001	6	126.813	125.217	1.371	126.638	125.199	1.214		1200
1.003	7	126.638	124.812	1.601	126.650	124.787	1.638		1200
1.004	8	126.650	124.787	1.563	126.431	124.776	1.355	Hydro-Brake®	1200
1.005	9	126.431	124.776	1.430	126.431	124.761	1.445		1200



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)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	126.617	1.450	Open Manhole	1200	1.000	125.227	225				
2	126.633	1.551	Open Manhole	1200	1.001	125.082	225	1.000	125.082	225	
3	126.599	1.624	Open Manhole	1200	2.000	124.975	225				
4	126.531	1.604	Open Manhole	1200	1.002	124.927	225	1.001	124.927	225	
								2.000	124.927	225	
5	126.839	1.593	Open Manhole	1200	3.000	125.246	225				
6	126.813	1.596	Open Manhole	1200	3.001	125.217	225	3.000	125.217	225	
7	126.638	1.826	Open Manhole	1200	1.003	124.812	225	1.002	124.812	225	
								3.001	125.199	225	387
8	126.650	1.863	Open Manhole	1200	1.004	124.787	300	1.003	124.787	225	
9	126.431	1.655	Open Manhole	1200	1.005	124.776	225	1.004	124.776	300	
	126.431	1.670	Open Manhole	1200 x 1200		OUTFALL		1.005	124.761	225	

No coordinates have been specified, layout information cannot be produced.

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)
1.000	o	225	1	126.671	125.227	1.225	Open Manhole	1200
1.001	o	225	2	126.633	125.082	1.326	Open Manhole	1200
2.000	o	225	3	126.599	124.975	1.399	Open Manhole	1200
1.002	o	225	4	126.531	124.927	1.379	Open Manhole	1200
3.000	o	225	5	126.839	125.246	1.368	Open Manhole	1200
3.001	o	225	6	126.813	125.217	1.371	Open Manhole	1200
1.003	o	225	7	126.638	124.812	1.601	Open Manhole	1200
1.004	o	300	8	126.650	124.787	1.563	Open Manhole	1200
1.005	o	300	9	126.431	124.776	1.430	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)
1.000	21.820	150.5	2	126.633	125.082	1.326	Open Manhole	1200
1.001	23.295	150.0	4	126.531	124.927	1.379	Open Manhole	1200
2.000	7.186	149.7	4	126.531	124.927	1.379	Open Manhole	1200
1.002	17.230	150.0	7	126.638	124.812	1.601	Open Manhole	1200
3.000	4.344	149.8	6	126.813	125.217	1.371	Open Manhole	1200
3.001	2.760	153.3	7	126.836	125.199	1.214	Open Manhole	1200
1.003	3.664	150.0	8	126.650	124.787	1.638	Open Manhole	1200
1.004	16.431	1493.7	9	126.431	124.776	1.355	Open Manhole	1200
1.005	2.291	150.0		126.431	124.761	1.445	Open Manhole	1200 x 1200

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.005		126.431	124.761	0.000	1200	1200


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Simulation Criteria for Storm

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.300		

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Online Controls for Storm


Hydro-Brake® Optimum Manhole: 8, DS/PN: 1.004, Volume (m³): 2.2

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	124.787
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

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	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		


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Storage Structures for Storm

Cellular Storage Manhole: 8, DS/PN: 1.004

Invert Level (m) 124.688 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	50.0	0.0	5.200	0.0	0.0
0.400	50.0	0.0	5.600	0.0	0.0
0.800	50.0	0.0	6.000	0.0	0.0
1.200	40.0	0.0	6.400	0.0	0.0
1.600	0.0	0.0	6.800	0.0	0.0
2.000	0.0	0.0	7.200	0.0	0.0
2.400	0.0	0.0	7.600	0.0	0.0
2.800	0.0	0.0	8.000	0.0	0.0
3.200	0.0	0.0	8.400	0.0	0.0
3.600	0.0	0.0	8.800	0.0	0.0
4.000	0.0	0.0	9.200	0.0	0.0
4.400	0.0	0.0	9.600	0.0	0.0
4.800	0.0	0.0	10.000	0.0	0.0

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details


Rainfall Model FSR Ratio R 0.300
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	360 Winter	100	+10%	100/60 Winter			
1.001	2	360 Winter	100	+10%	30/120 Winter			
2.000	3	360 Winter	100	+10%	30/60 Summer			
1.002	4	360 Winter	100	+10%	30/15 Summer			
3.000	5	360 Winter	100	+10%	100/120 Winter			
3.001	6	360 Winter	100	+10%	100/60 Winter			
1.003	7	360 Winter	100	+10%	30/15 Summer			
1.004	8	360 Winter	100	+10%	30/30 Summer			
1.005	9	1440 Winter	100	+10%				

PN	US/MH Name	Water			Surcharged		Flooded		Pipe	
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded	
1.000	1	125.646	0.194	0.000	0.03			1.1	SURCHARGED	
1.001	2	125.645	0.338	0.000	0.11			4.2	SURCHARGED	
2.000	3	125.644	0.444	0.000	0.08			2.5	SURCHARGED	
1.002	4	125.643	0.491	0.000	0.18			6.7	SURCHARGED	
3.000	5	125.640	0.169	0.000	0.03			0.9	SURCHARGED	
3.001	6	125.640	0.198	0.000	0.06			1.5	SURCHARGED	

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water		Surcharged		Flooded		Pipe		Level Exceeded
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status		
1.003	7	125.640	0.603	0.000	0.28		8.1	SURCHARGED		
1.004	8	125.639	0.551	0.000	0.09		1.9	SURCHARGED		
1.005	9	124.815	-0.187	0.000	0.07		1.9	OK		



INPUTS

Project Name	Costa Coffee Drive Rathcoole
Project Reference	JN200567
Date	16-Dec-20
Designer	LP
Liner	Permeable
Chamber Model	SC740
Required Storage Volume	60 m ³
Stone Porosity	43%
Excavation Batter	60 °
Stone Above Chambers	0.39 m
Stone Foundation Depth	0.25 m
Chamber Separation	0.15 m
Spacing at Sides	0.3 m
Spacing at Ends	0.3 m
No. of Rows	4
No. of Chambers per Row	4
Manholes - 1500mm dia	1
Isolator Rows	1

RESULTS

System Volume and Bed Size

Installed Storage Volume	60.0 m ³
Height per Chamber	0.762
Width per Chamber	1.295
Length per Chamber	2.169
Depth of System	1.402 m
Tank Overall Installed Width at Base	6.2 m
Tank Overall Installed Length at Base	9.7 m
Area of Dig at Base of System	60 m ²
Area of Dig at Top of System	89 m ²

System Components

Chambers	16
Endcaps	8
Amount of Stone Required (m ³)	84 m ³
Amount of Stone Required (tonne)	138 m ³
Volume of excavation (not including top-fill)	104 m ³