

**McArdle
Doyle**

Chartered Engineers
Architectural Services
& Project Managers

**Engineering
Report**

P1922 EMO Oil Ltd.

**Lands at David Nestor
Freight Services,
Crag Avenue Business
Park, Dublin 22.**

McArdle Doyle Ltd
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The Long Walk, Dundalk, Co Louth

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1.0 Introduction

We, McArdle Doyle, are instructed by the Applicant, **EMO Oil Ltd.** to prepare this Engineering Report in respect of South Dublin County Council's request for **Addition Information** in relation to **Pl. Reg. Ref. SD21A/0149** planning application for development on lands at **David Nestor Freight Services, Crag Avenue Business Park, Dublin 22.**

2.0 Scope of the Report

This report specifically addresses Point 10 on the request for Additional Information.

2.1 Request No.10(a)

"The applicant is requested to submit:

(a) a report to show what surface water attenuation is proposed for development and what is required in m³. Attenuation shall be by means of SuDS (Sustainable Drainage Systems) as much as possible. Examples of SuDS include, Green Roofs, Filter drains, Planter beds, Permeable Paving, Tree Pits, Rain Garden or other such SuDS"

2.2 Response No.10(a)

Further to the above request due to the existing nature of the site it will be difficult to retrofit many SuDS elements. The existing roof over the HGV refuelling bays is not designed to accommodate a green roof and which would require a rebuild. The addition of planter beds, tree pits or permeable paving will not reduce the existing surface water run-off rates significantly.

We have calculated the surface water discharge rate from the site as 50.1 l/sec. We propose to restrict the discharge rate to 10 l/sec. by providing a flow control device within manhole S9 and underground attenuation tank with a storage capacity of 60m³. Refer to Appendix 1 & 2 for Existing and Proposed Surface Water Calculations.

2.3 Request No.10(b)

"The applicant is requested to submit:


(b) a drawing showing what SuDS is proposed for the development."

2.4 Response No.10(a)

Further to the above request, please find enclosed revised drawing, P1922.C03 Proposed Drainage Layout_REV A, indicating the proposed underground attenuation tank.

APPENDIX 1

Existing Surface Water Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	17.100	Add Flow / Climate Change (%)	0
Ratio R	0.297	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	75	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm


PN	Length (m)	Fall (m)	Slope (1:X)	I. Area (ha)	T. E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	53.131	0.361	147.0	0.176	4.00	0.0	0.600	o	225	Pipe/Conduit	⊕
S2.000	30.171	0.201	150.0	0.028	4.00	0.0	0.600	o	150	Pipe/Conduit	⊕
S3.000	14.906	0.099	150.0	0.033	4.00	0.0	0.600	o	150	Pipe/Conduit	⊕
S3.001	24.586	0.164	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	⊕
S2.001	22.194	0.111	200.0	0.069	0.00	0.0	0.600	o	225	Pipe/Conduit	⊕
S2.002	10.480	0.052	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	⊕
S1.001	65.250	0.326	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	⊕

Network Results Table

PN	Rain (mm/hr)	T. C. (mins)	US/IL (m)	Σ I. Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	67.58	4.82	51.575	0.176	0.0	0.0	0.0	1.08	42.8	32.2
S2.000	68.69	4.61	52.150	0.028	0.0	0.0	0.0	0.82	14.5	5.2
S3.000	70.43	4.30	52.150	0.033	0.0	0.0	0.0	0.82	14.5	6.3
S3.001	67.68	4.80	52.051	0.033	0.0	0.0	0.0	0.82	14.5	6.3
S2.001	65.66	5.21	51.812	0.130	0.0	0.0	0.0	0.92	36.6	23.1
S2.002	64.76	5.40	51.701	0.130	0.0	0.0	0.0	0.92	36.6	23.1
S1.001	60.53	6.38	51.139	0.306	0.0	0.0	0.0	1.11	78.3	50.1

APPENDIX 2

Proposed Surface Water Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	17.100	Add Flow / Climate Change (%)	0
Ratio R	0.297	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	75	Maximum Backdrop Height (m)	2.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500


Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I. Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	53.131	0.361	147.2	0.176	4.00	0.0	0.600	o	225	Pipe/Conduit	☑
S2.000	30.171	0.201	150.1	0.028	4.00	0.0	0.600	o	150	Pipe/Conduit	☑
S3.000	14.906	0.099	150.6	0.033	4.00	0.0	0.600	o	150	Pipe/Conduit	☑
S3.001	24.586	0.164	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	☑
S2.001	22.194	0.111	200.0	0.069	0.00	0.0	0.600	o	225	Pipe/Conduit	☑
S2.002	10.480	0.052	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	☑
S4.000	10.595	0.035	300.0	0.000	4.00	0.0	0.600	o	300	Pipe/Conduit	☑
S4.001	5.000	0.041	122.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	☑
S1.001	65.250	0.326	199.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	☑

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I. Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	67.58	4.82	51.575	0.176	0.0	0.0	0.0	1.08	42.8	32.2
S2.000	68.69	4.61	52.150	0.028	0.0	0.0	0.0	0.82	14.5	5.2
S3.000	70.42	4.30	52.150	0.033	0.0	0.0	0.0	0.82	14.4	6.3
S3.001	67.68	4.81	52.051	0.033	0.0	0.0	0.0	0.82	14.5	6.3
S2.001	65.66	5.21	51.812	0.130	0.0	0.0	0.0	0.92	36.6	23.1
S2.002	64.75	5.40	51.701	0.130	0.0	0.0	0.0	0.92	36.6	23.1
S4.000	71.05	4.20	51.215	0.000	0.0	0.0	0.0	0.90	63.8	0.0
S4.001	70.71	4.25	51.180	0.000	0.0	0.0	0.0	1.42	100.5	0.0
S1.001	60.53	6.38	51.139	0.306	0.0	0.0	0.0	1.11	78.3	50.1

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Online Controls for Storm


Hydro-Brake® Optimum Manhole: S9, DS/PN: S1.001, Volume (m³): 4.8

Unit Reference	MD-SHE-0149-1000-0800-1000
Design Head (m)	0.800
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	149
Invert Level (m)	51.139
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	10.0	Kick-Flo®	0.569	8.5
Flush-Flo™	0.262	10.0	Mean Flow over Head Range	-	8.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	12.1	3.000	18.7	7.000	28.1
0.200	9.8	1.400	13.0	3.500	20.1	7.500	29.1
0.300	9.9	1.600	13.9	4.000	21.5	8.000	30.0
0.400	9.7	1.800	14.7	4.500	22.7	8.500	30.8
0.500	9.3	2.000	15.4	5.000	23.9	9.000	31.7
0.600	8.7	2.200	16.1	5.500	25.0	9.500	32.6
0.800	10.0	2.400	16.8	6.000	26.1		
1.000	11.1	2.600	17.5	6.500	27.1		


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Storage Structures for Storm

Cellular Storage Manhole: S8_DS/PN: S4.001

Invert Level (m) 51.180 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	80.0	0.0	2.600	0.0	0.0
0.200	80.0	0.0	2.800	0.0	0.0
0.400	80.0	0.0	3.000	0.0	0.0
0.600	80.0	0.0	3.200	0.0	0.0
0.800	80.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

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1 year Return Period 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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FSR Ratio R 0.297
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 17.100 Cv (Winter) 0.840

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

Profile(s)
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	1	+20%	30/15 Summer				51.708	-0.092
S2.000	S2	15 Winter	1	+20%	100/15 Summer				52.207	-0.093
S3.000	S3	15 Winter	1	+20%	100/15 Summer				52.214	-0.086
S3.001	S4	15 Winter	1	+20%	100/15 Summer				52.114	-0.087
S2.001	S5	15 Winter	1	+20%	30/15 Summer				51.928	-0.109
S2.002	S6	15 Winter	1	+20%	30/15 Summer				51.823	-0.103
S4.000	S7	30 Winter	1	+20%	30/15 Summer				51.348	-0.167
S4.001	S8	30 Winter	1	+20%	30/15 Summer				51.348	-0.132
S1.001	S9	15 Summer	1	+20%	1/15 Summer				51.502	0.063

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.62	25.5	OK	
S2.000	S2	0.000	0.31	4.3	OK	
S3.000	S3	0.000	0.38	5.0	OK	
S3.001	S4	0.000	0.36	4.9	OK	
S2.001	S5	0.000	0.52	17.4	OK	
S2.002	S6	0.000	0.56	17.2	OK	
S4.000	S7	0.000	0.00	0.1	OK	
S4.001	S8	0.000	0.14	8.8	OK	
S1.001	S9	0.000	0.13	9.6	SURCHARGED	

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30 year Return Period 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 * 10m ³ /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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details			
Rainfall Model	FSR	Ratio R	0.297
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	17.100	Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	ON		

Profile(s)		Summer and Winter	
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440		
Return Period(s) (years)		1, 30, 100	
Climate Change (%)		20, 20, 20	

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	30	+20%	30/15 Summer				52.200	0.400
S2.000	S2	15 Winter	30	+20%	100/15 Summer				52.242	-0.058
S3.000	S3	15 Winter	30	+20%	100/15 Summer				52.256	-0.044
S3.001	S4	15 Winter	30	+20%	100/15 Summer				52.191	-0.010
S2.001	S5	15 Winter	30	+20%	30/15 Summer				52.101	0.064
S2.002	S6	15 Winter	30	+20%	30/15 Summer				51.949	0.023
S4.000	S7	60 Winter	30	+20%	30/15 Summer				51.756	0.241
S4.001	S8	60 Winter	30	+20%	30/15 Summer				51.756	0.276
S1.001	S9	60 Winter	30	+20%	1/15 Summer				51.766	0.327

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	1.27	52.3	SURCHARGED	
S2.000	S2	0.000	0.67	9.3	OK	
S3.000	S3	0.000	0.84	11.2	OK	
S3.001	S4	0.000	0.75	10.3	OK	
S2.001	S5	0.000	1.16	38.8	SURCHARGED	
S2.002	S6	0.000	1.27	39.0	SURCHARGED	
S4.000	S7	0.000	0.00	0.1	SURCHARGED	
S4.001	S8	0.000	0.14	8.9	SURCHARGED	
S1.001	S9	0.000	0.13	9.7	SURCHARGED	

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100 year Return Period 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 * 10m ³ /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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details			
Rainfall Model	FSR	Ratio R	0.297
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	17.100	Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	ON		

Profile(s)		Summer and Winter	
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440		
Return Period(s) (years)		1, 30, 100	
Climate Change (%)		20, 20, 20	

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	100	+20%	30/15 Summer				52.599	0.799
S2.000	S2	15 Winter	100	+20%	100/15 Summer				52.333	0.033
S3.000	S3	15 Winter	100	+20%	100/15 Summer				52.411	0.111
S3.001	S4	15 Winter	100	+20%	100/15 Summer				52.331	0.130
S2.001	S5	15 Winter	100	+20%	30/15 Summer				52.213	0.176
S2.002	S6	180 Winter	100	+20%	30/15 Summer				52.186	0.260
S4.000	S7	120 Winter	100	+20%	30/15 Summer				52.007	0.492
S4.001	S8	120 Winter	100	+20%	30/15 Summer				52.007	0.527
S1.001	S9	180 Winter	100	+20%	1/15 Summer				52.365	0.926

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	1.58	65.1	SURCHARGED	
S2.000	S2	0.000	0.78	10.8	SURCHARGED	
S3.000	S3	0.000	0.96	12.7	SURCHARGED	
S3.001	S4	0.000	0.88	12.1	SURCHARGED	
S2.001	S5	0.000	1.41	47.2	SURCHARGED	
S2.002	S6	0.000	0.47	14.3	SURCHARGED	
S4.000	S7	0.000	0.00	0.1	SURCHARGED	
S4.001	S8	0.000	0.17	10.3	SURCHARGED	
S1.001	S9	0.000	0.13	10.1	SURCHARGED	